NATIONAL MARINE FISHERIES SERVICE REPORT

National Marine Fisheries Service (NMFS) Northwest Region will briefly report on recent regulatory developments relevant to groundfish fisheries and issues of interest to the Pacific Fishery Management Council (Council).

NMFS Northwest Fisheries Science Center (NWFSC) will also briefly report on groundfish-related science and research activities.

Council Task:

Discussion.

Reference Materials:

1. Agenda Item E.1.a, Attachment 1: *Federal Register* Notices Published Since the Last Council Meeting.

Agenda Order:

a. Regulatory Activities — Frank Lockhart
b. Fisheries Science Center Activities — Elizabeth Clarke
c. Reports and Comments of Management Entities and Advisory Bodies
d. Public Comment
e. Council Discussion

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Agenda Item E.1.a
Attachment 1
September 2009

FEDERAL REGISTER NOTICES

Groundfish and Halibut Notices
May 19, 2009 through August 21, 2009

Documents available at NMFS Sustainable Fisheries Groundfish Website
http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/index.cfm

74 FR 23390. Proposed information collection on Northwest Region Pacific Coast Groundfish Fishery logbook family of forms – 5/19/09

74 FR 26983. Suspension of primary Pacific whiting season for shore-based sector south of 42° north latitude – 6/5/09

74 FR 29431. Closure of Pacific whiting primary fishery for the mothership sector, effective June 1, 2009 – 6/22/09

74 FR 31874. Inseason changes to management measures in commercial Pacific Coast groundfish fisheries – 7/6/09

74 FR 34712. List of limited entry trawl vessels issued Pacific whiting vessel licenses - 7/17/09

74 FR 37176. Closure of primary Pacific whiting season for shore-based sector - 7/28/09

PFMC
08/26/09

WEST COAST SEAFOOD PROCESSORS ASSOCIATION
1618 SW First Avenue
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August 27, 2009

Mr. Barry Thom
Acting Regional Administrator
National Marine Fisheries Service
1201 NE Lloyd Boulevard, Suite 1100
Portland, OR 97232-1274

Dear Barry:

It has come to our attention that the Quileute Tribe has yet to commence harvesting the 8,000 mt of Pacific whiting that was made available to them by NMFS under their tribal treaty rights this year. We have also heard reports that the Tribe has no boats available to harvest the whiting and no fishing plan in effect. If this is indeed the case, we request that NMFS promptly pursue with the Tribe a reallocation of the unused whiting to other interested commercial fishing sectors. This would be in accordance with past practice regarding unharvested whiting from both the commercial and the tribal sectors. Any such reallocation would of course be without prejudice to any tribal treaty fishing rights.

For the non-tribal harvesting sectors, the Pacific groundfish regulations at 50 CFR 660.323 provide a reallocation mechanism that includes a survey of interest and a reallocation to be completed by September 15th or as soon as practicable thereafter and provides for reallocation based on percentages specified in federal regulations. We believe this is the best process to use in this case. An informal survey of shore-based whiting processors has indicated an interest in harvesting an appropriate share of the tribal fish and the fish remaining unharvested from the regular season opening. Whiting are still available to shore-based boats into the fall (weather permitting) and bycatch rates are traditionally low. A September 15th decision would also provide time for consultation with the Pacific Fishery Management Council during the NMFS report agenda item scheduled for September 14th. If the Quileute Tribe demonstrates that they intend to exercise their tribal treaty right to take whiting, then that can be clearly indicated so that there is no confusion or anticipation among non-tribal harvesting sectors. If not, then we hope that NMFS will honor the requirements of 16 U.S.C. 1851(a)(1).

Thank you for your consideration of this request.

Sincerely,

Rod Moore
Executive Director

Cc: NMFS/NWR Sustainable Fisheries
PFMC

PART II OF STOCK ASSESSMENTS FOR 2011-2012 GROUNDFISH FISHERIES

The Council process for setting groundfish harvest levels and other specifications depends on periodic assessments of the status of groundfish stocks and a report from a Stock Assessment Review (STAR) Panel. The Scientific and Statistical Committee (SSC) reviews this information and makes a recommendation relative to the standards of 1) the best available science, and 2) soundness for use in groundfish fishery management decision-making by the Council. The Council then approves the new assessments and relevant analyses used to set groundfish harvest levels and other specifications for the following biennial management period.

A new full assessment for petrale sole was considered for adoption at the June Council meeting. At that time the SSC recommended further review of the assessment and the biological basis for considering a target biomass (B_{MSY}) estimated in the assessment. Recommendations from the SSC Groundfish Subcommittee meeting on August 31 will be presented to the full SSC at this meeting. Their recommendations should be considered before adopting this new assessment.

The Council may want to set a B_{MSY} target and overfished level for this stock depending on SSC advice. The B_{MSY} target may be either a proxy value or deterministic as estimated in a quantitative assessment. The Groundfish Fishery Management Plan (FMP) specifies how B_{MSY} target levels are set in section 4.2 as follows:

> "Harvest policies are to be specified according to standard reference points such as MSY (MSY, interpreted as a maximum average achievable catch under prevailing ecological and environmental conditions over a prolonged period). The long-term average biomass associated with fishing at F_{MSY} is B_{MSY}. In this FMP, MSY generally refers to a constant F control rule that is assumed to produce the maximum average yield over time while protecting the spawning potential of the stock. … Absent a more accurate determination of F_{MSY}, the Council will apply default MSY proxies. … A biomass level of 40% (i.e., $0.4*B_{unfished}$) is a reasonable proxy for B_{MSY}. … If available information is sufficient, values of F_{MSY}, B_{MSY}, and more appropriate harvest control rules may be developed for any species or species group."

Section 4.4.3 of the FMP specifies how overfished levels are set as follows:

> "The default overfished/rebuilding threshold for category 1 groundfish (i.e., stocks with quantitative assessments) is $0.25*B_{unfished}$. The Council may establish different thresholds for any species based on information provided in stock assessments, the SAFE document, or other scientific or groundfish management-related report. For example, if B_{MSY} is known, the overfished threshold may be set equal to 50% of that amount."

The executive summary of the petrale sole assessment and the STAR panel report that were provided in June are provided again in Agenda Item E.2.a, Attachments 1 and 2, respectively. Agenda Item E.2.a, Attachment 3 is an addendum to the petrale sole assessment with the stock assessment team's responses to the SSC's June requests.

New full assessments for bocaccio, widow rockfish, lingcod, cabezon, yelloweye rockfish, and greenstriped rockfish were also prepared and reviewed by STAR Panels. The executive summaries of these assessments and the associated STAR Panel reports are provided as Agenda Item E.2.a, Attachments 4 through 15. An information session is scheduled for Saturday, September 12 to provide an opportunity to review assessment results and ask stock assessment teams (STATs) questions regarding their respective assessments. There will also be an opportunity to ask STATs and the SSC further questions under this agenda item. **All the assessments in their entirety and STAR Panel reports under Council consideration at this meeting are included in the CD copy of meeting materials.**

The Council should consider the new full assessments and STAR Panel reports, as well as the advice of the SSC, other advisory bodies, and the public before adopting the new stock assessments for use in 2011-2012 groundfish management.

Council Actions:

1. **Consider approving stock assessments.**
2. **Consider specifying a biomass target (B_{MSY}) and an overfished level for petrale sole pending SSC advice.**

Reference Materials:

1. Agenda Item E.2.a, Attachment 1: Executive Summary of "Draft Status of the U.S. Petrale Sole Resource in 2008."
2. Agenda Item E.2.a, Attachment 2: Petrale Sole STAR Panel Report.
3. Agenda Item E.2.a, Attachment 3: "2009 Petrale Sole Stock Assessment Addendum: SSC Requests."
4. Agenda Item E.2.a, Attachment 4: Executive Summary of "Status of Bocaccio, *Sebastes paucispinis*, in the Conception, Monterey, and Eureka INPFC Areas in 2009."
5. Agenda Item E.2.a, Attachment 5: Bocaccio Rockfish STAR Panel Report.
6. Agenda Item E.2.a, Attachment 6: Executive Summary of "Draft Status of the Widow Rockfish Resource in 2009."
7. Agenda Item E.2.a, Attachment 7: Widow Rockfish STAR Panel Report.
8. Agenda Item E.2.a, Attachment 8: Executive Summary of "Draft Status and Future Prospects for Lingcod in Waters off Washington, Oregon, and California as Assessed in 2009."
9. Agenda Item E.2.a, Attachment 9: Lingcod STAR Panel Report.
10. Agenda Item E.2.a, Attachment 10: Executive Summary of "Draft Status of Cabezon (*Scorpaenichthys marmoratus*) in California and Oregon Waters as Assessed in 2009."
11. Agenda Item E.2.a, Attachment 11: Cabezon STAR Panel Report.
12. Agenda Item E.2.a, Attachment 12: Executive Summary of "Status of the U.S. Yelloweye Rockfish Resource in 2009."
13. Agenda Item E.2.a, Attachment 13: Yelloweye Rockfish STAR Panel Report.
14. Agenda Item E.2.a, Attachment 14: Executive Summary of "Draft Status of Greenstriped Rockfish (Sebastes elongatus) Along the Outer Coast of California, Oregon, and Washington."
15. Agenda Item E.2.a, Attachment 15: Greenstriped Rockfish STAR Panel Report.

Agenda Order:

a. Agenda Item Overview — John DeVore
b. Follow-Up Questions on Assessments for Petrale Sole, Lingcod, and Cabezon; and Bocaccio, Widow, Yelloweye, and Greenstriped Rockfish
c. Scientific and Statistical Committee Report — Steve Ralston
d. Reports and Comments of Management Entities and Advisory Bodies
e. Public Comment
f. **Council Action:** Approve Final Stock Assessments

PFMC
08/28/09

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DRAFT Status of the U.S. petrale sole resource in 2008

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27 May, 2009

Table of Contents

Executive Summary

Stock

This assessment reports the status of the petrale sole (*Eopsetta jordani*) resource off the coast of California, Oregon, and Washington using data through 2008. While petrale sole are modeled as a single stock, the spatial aspects of the coast-wide population are addressed through geographic separation of data sources/fleets where possible and consideration of residual patterns that may be a result of inherent stock structure. There is currently no genetic evidence suggesting distinct biological stocks of petrale sole off the U.S. coast. The limited tagging data available to describe adult movement suggests that petrale sole may have some homing ability for deepwater spawning sites but also have the ability to move long distances between spawning sites and seasonally.

Catches

The earliest catches of petrale sole are reported in 1876 in California and 1884 in Oregon. Recent annual catches during 1981–2008 range between 1,244–2,854 mt (Table a, Figure a). Petrale sole are almost exclusively caught by trawl fleets. Non-trawl gears contribute less than 2% of the catches. Based on the previous 2005 assessment, subsequent OYs were reduced due to 2499 mt. From the inception of the fishery through the war years, the vast majority of catches occurred between March and October (the summer fishery), when the stock is dispersed over the continental shelf. The post-World War II period witnessed a steady decline in the amount and proportion of annual catches occurring during the summer months (March-October). Conversely, petrale catch during the winter season (November–February), when the fishery targets spawning aggregations, has exhibited a steadily increasing trend since the 1940's. Since the mid-1980s, catches during the winter months have been roughly equivalent to or exceeded catches throughout the remainder of the year (Figure a).

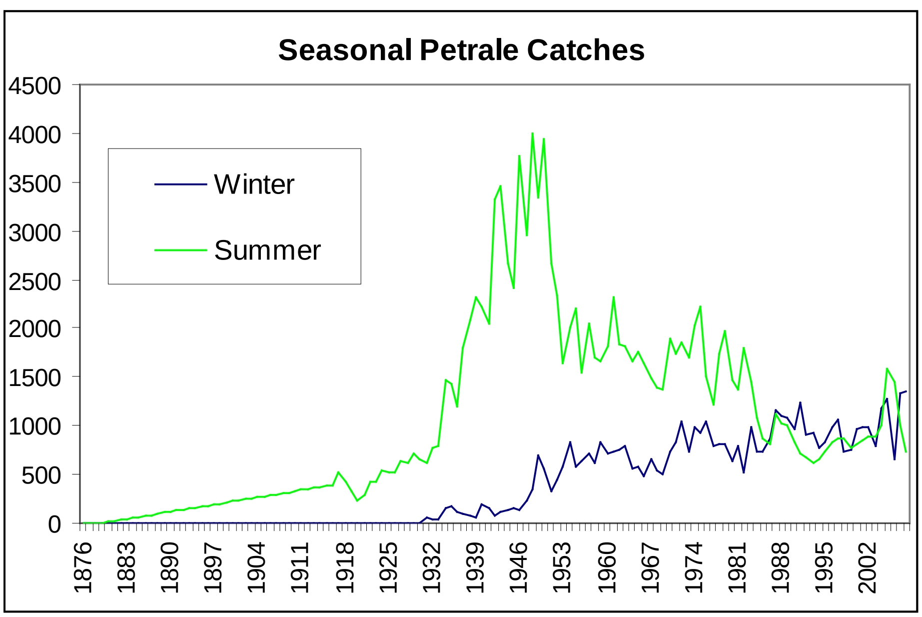

Figure a. Petrale sole catch history by season, 1876-2008.

Table a. Recent commercial fishery catches (mt) by combined summer and winter fleets.

Fishing year	Washington trawl	Oregon trawl	California trawl	Total
1999	443	517	560	1,520
2000	668	460	650	1,778
2001	675	584	579	1,838
2002	861	481	536	1,877
2003	837	408	441	1,686
2004	1,234	511	445	2,191
2005	1,319	661	874	2,854
2006	871	641	590	2,102
2007	635	732	963	2,329
2008	466	585	1,028	2,079

Data and Assessment

The previous stock assessment for petrale sole was developed during 2005 using Stock Synthesis 2. This assessment uses the Stock Synthesis 3 (SS-V3.03a-SAFE, 04/30/09) integrated length-age structured model. Due to higher wintertime catches in recent decades the assessment is based on winter (November to February) and summer (March to October) fishing seasons with the fishing year starting on November 1 and ending on October 31. The fisheries are divided into WA-Winter, WA-Summer, OR-Winter, OR-Summer, CA-Winter, and CA-Summer fisheries. The model includes catch, length- and age-frequency data from the trawl fleets described above as well as standardized CPUE indices developed by Sampson and Lee (1999) for the Oregon fleets from 1987–1997. The impact of rapidly changing regulations in the trawl fishery after these dates makes the fishery-based CPUE indices unreliable. Biological data are derived from both port and on-board observer sampling programs. The National Marine Fisheries Service (NMFS) triennial bottom trawl survey (1980, 1983, 1986, 1989, 1992, 1995, 1998, 2001, and 2004) and Northwest Fisheries Science Center (NWFSC) trawl survey (2003–2008) relative biomass indices and biological sampling provide fishery independent information on relative trend and demographics of the petrale sole stock.

The base case assessment model includes parameter uncertainty from a variety of sources, but likely underestimates the uncertainty in recent trend and current stock status. For this reason, in addition to asymptotic confidence intervals (based upon the model's analytical estimate of the variance near the converged solution), results from models that reflect alternate states of nature regarding the estimate of 2009 spawning biomass are presented as a decision table.

Stock biomass

Petrale sole were lightly exploited during the early 1900s but by the 1950s the fishery was well developed and showing clear signs of depletion and declines in catches and biomass (Figures a, b). The rate of decline in spawning biomass accelerated through the 1930s–1970s reaching minimums generally around or below 10% of the unexploited levels during the 1980s and 1990s (Figure b). The petrale sole spawning stock biomass is estimated to have increased slightly from the late 1990s, peaking in 2005, in response to above average recruitment (Table b, Figure b). However, this increasing trend has reversed since the 2005 assessment and the stock has been declining, most likely due to strong year classes having passed through the fishery (Table b). The estimated relative depletion level in 2009 is 11.6% (~95% asymptotic interval: ±4.8%, ~ 75% interval based on the range of states of nature: 9.4-13.8%), corresponding to 2937.6 mt (~95% asymptotic interval: ±832.7 mt, states of nature interval: 2407.8-3468.1 mt) of female spawning biomass in the base model (Table b). The base model indicates that the spawning biomass has been below 25% of the unfished level continuously since 1953.

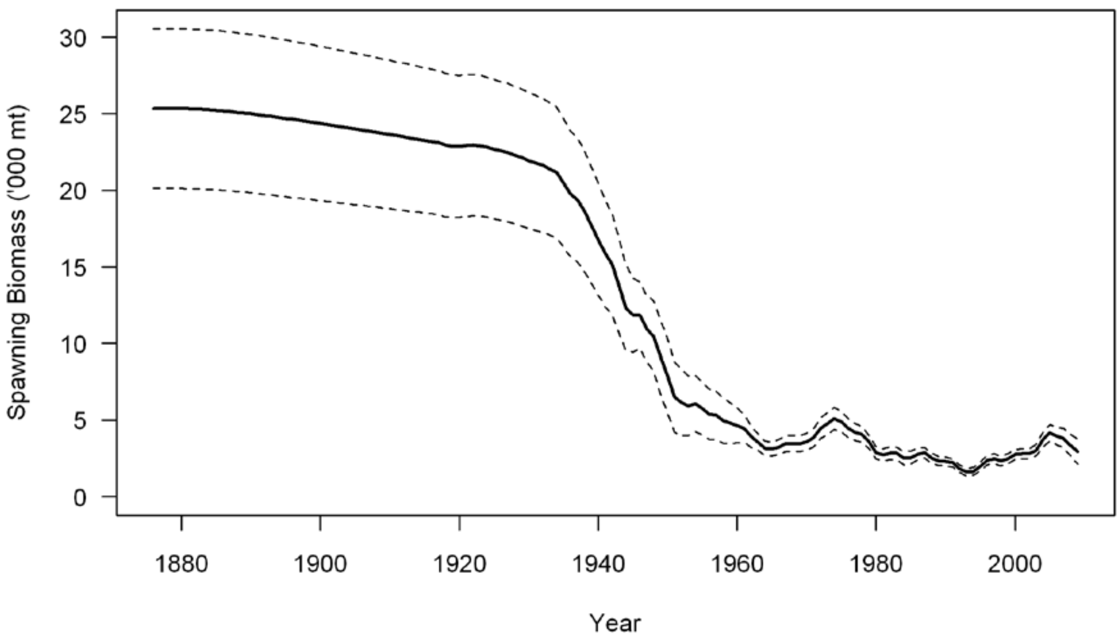

Figure b. Estimated spawning biomass time-series (1876-2009) for the base case model (solid line) with approximate asymptotic 95% confidence interval (dashed lines).

Table b. Recent trend in estimated petrale sole female spawning biomass and relative depletion.

Fishing year	Spawning biomass (mt)	~95% confidence interval	Range of states of nature	Estimated depletion	~95% confidence interval	Range of states of nature
2000	2,765.2	±329.7	2743.9-2776.9	10.9	±3.4	10.7-11.1
2001	2,810.3	±328.3	2781.5-2829.5	11.1	±3.4	10.8-11.3
2002	2,798.4	±333.6	2759.3-2827.8	11.0	±3.4	10.7-11.3
2003	3,030.0	±381.0	2969.1-3080.3	12.0	±3.8	11.5-12.3
2004	3,706.4	±463.0	3605.0-3796.5	14.6	±4.7	14.0-15.1
2005	4,160.7	±529.5	4002.0-4308.6	16.4	±5.2	15.5-17.2
2006	3,949.8	±576.0	3720.7-4169.9	15.6	±5.1	14.5-16.6
2007	3,818.0	±624.1	3507.4-4122.5	15.1	±5.1	13.6-16.4
2008	3,349.6	±704.6	2940.8-3755.2	13.2	±4.8	11.4-14.9
2009	2,937.6	±832.7	2407.8-3468.1	11.6	±4.8	9.4-13.8

Recruitment

Annual recruitment was treated as stochastic, and estimated as annual deviations from log-mean recruitment where mean recruitment is the fitted Beverton-Holt stock recruitment curve. The time-series of estimated recruitments shows a weak relationship with the decline in spawning biomass, punctuated by larger recruitments (Figure c). The four weakest recruitments since 1939 are estimated to be in 1972, 1985-1986, 1991 and 2003. The four strongest recruitments since 1939 are estimated to be in 1939-1940, 1960, 1965, and 1997-1998 (Figure c). The most recent above average recruitment event, is estimated to be in 2005, and is about 20% smaller than of the 1997–1998 recruitment event (Table c).

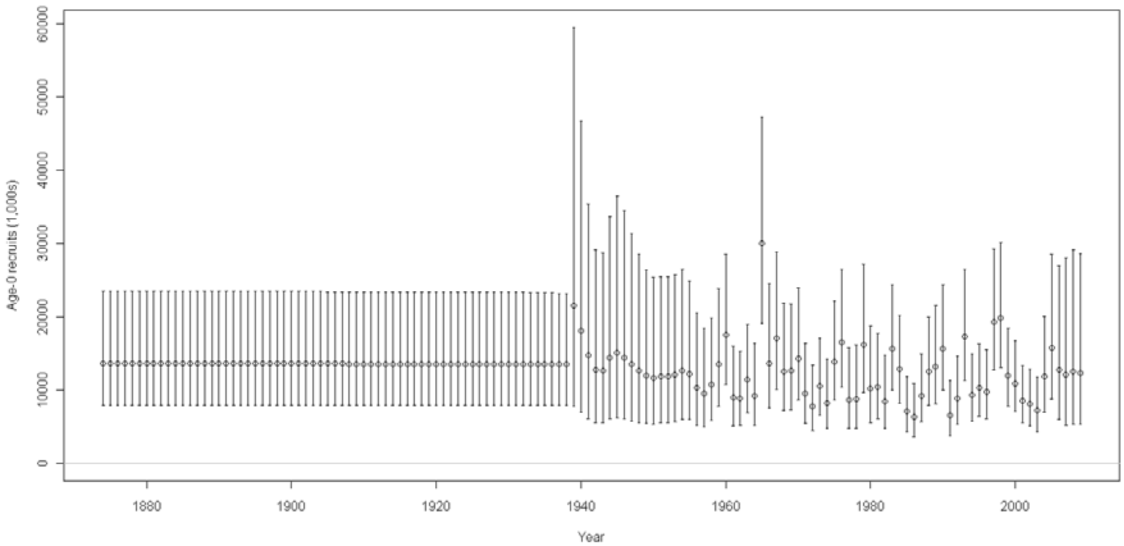

Figure c. Time series of estimated petrale sole recruitments for the base case model (round points) with approximate asymptotic 95% confidence interval (vertical bars).

Table c. Recent estimated trend in petrale sole recruitment.

Fishing year	Estimated recruitment (1000s)	~95% confidence interval	Range of states of nature
2000	10,903.2	±4,721.5	10,022.7-11,679.2
2001	8,562.7	±3,816.7	7,674-9,382.8
2002	8,161.0	±3,805.4	7,040.9-9,241.4
2003	7,164.5	±3,606.0	5,965.2-8,354.8
2004	11,897.1	±6,338.7	9,554.3-14,285.1
2005	15,770.9	±9,522.5	12,415.7-19,223.9
2006	12,740.4	±9,912.5	10,911.6-14,269.5
2007	12,048.8	±10,655.9	11,335.2-12,513
2008	12,508.7	±11,097.5	11,826.7-12,947.8
2009	10,903.2	±4,721.5	10,022.7-11,679.2

Reference Points

Unfished spawning stock biomass was estimated to be 25,334 mt in the base case model (Figure b). The target stock size ($SB_{40\%}$) is therefore 10,134 mt which gives a catch of 2060 mt (Table i, Figure b). The estimates of unfished spawning biomass, and therefore the $SB_{40\%}$ reference points were very sensitive to the assumption of stock-recruitment relationship (see section 2.9.1). Model estimates of spawning biomass at MSY and MSY yield were more robust to the assumption of stock-recruitment relationship (see section 2.9.1). Maximum sustained yield (MSY) applying recent fishery selectivity and allocations was estimated in the assessment model at 2376 mt, occuring at a spawning stock biomass of 4796 mt (SPR = 0.20) (Table i, Figures d,h,i) , which is 18.9% of the unfished level.

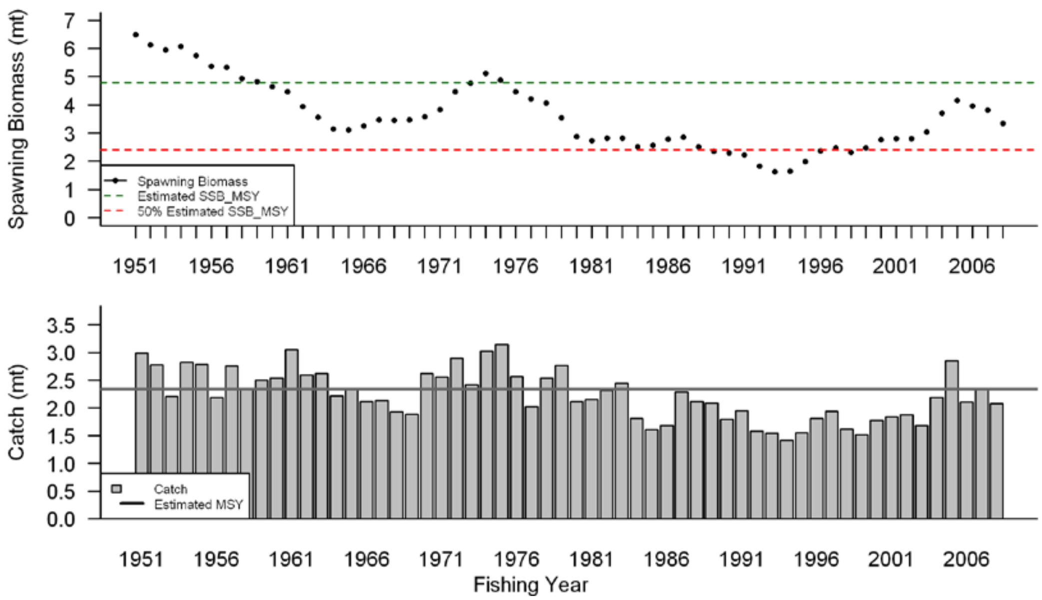

Figure d. Time series of catches startin in 1950 in comparison to the model estimated time series of spawning biomass and summary (age 3+) biomass. The solid horizontal line is the estimated MSY catch and the dashed line is the estimated spawning biomass at MSY.

Exploitation status

The abundance of petrale sole was estimated to have dropped below the $SB_{40\%}$ management target in 1949 and the overfished threshold in 1953. Beginning in 1980 the stock size was around 10–12% of unfished spawning biomass and in 1988 the stock dropped below 10% of the unfished spawning biomass (Figure e). Since 2000 the stock has increased, reaching a peak of 16.4% of unfished biomass in 2005, followed by a decreasing trend through 2009. Fishing mortality rates in excess of the current F-target for flatfish of $SPR_{40\%}$ are estimated to have begun in the late 1930s and persisted through 2008 (Table d, Figures f,g). Current F (catch/biomass of age-3 and older fish) is estimated to have been 0.29 in 2008 (Table d, Figure f).

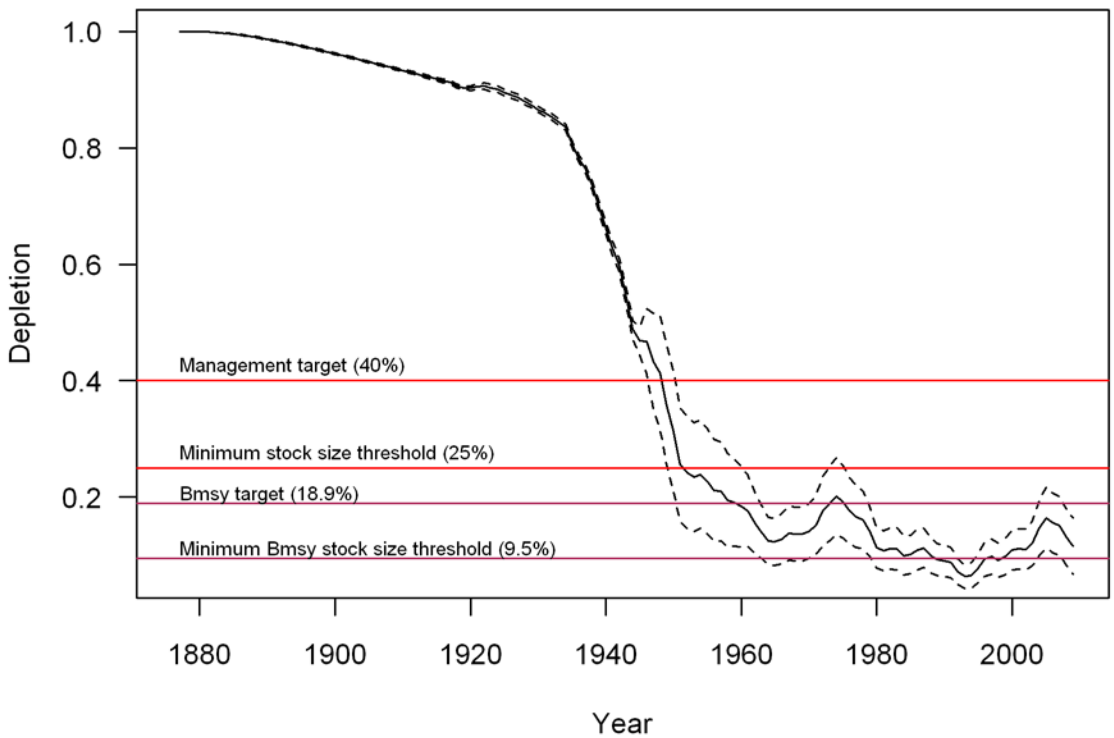

Figure e. Time series of depletion level as estimated in the base case model (round points) with approximate asymptotic 95% confidence interval (dashed lines) and alternate states of nature (light lines).

Table d. Recent trend in spawning potential ratio (1-SPR) and relative exploitation rate (catch/biomass of age-3 and older fish).

Fishing year	Estimated 1-SPR (%)	Range of states of nature	F	Range of states of nature
2000	0.86	0.86-0.86	0.28	0.28-0.27
2001	0.87	0.87-0.86	0.27	0.27-0.27
2002	0.86	0.87-0.86	0.26	0.27-0.26
2003	0.82	0.83-0.81	0.21	0.22-0.21
2004	0.83	0.84-0.83	0.25	0.26-0.24
2005	0.87	0.87-0.86	0.32	0.34-0.31
2006	0.83	0.85-0.82	0.27	0.29-0.25
2007	0.85	0.87-0.83	0.31	0.34-0.28
2008	0.85	0.87-0.83	0.29	0.34-0.26
2009	0.90	0.93-0.87	0.36	0.45-0.31

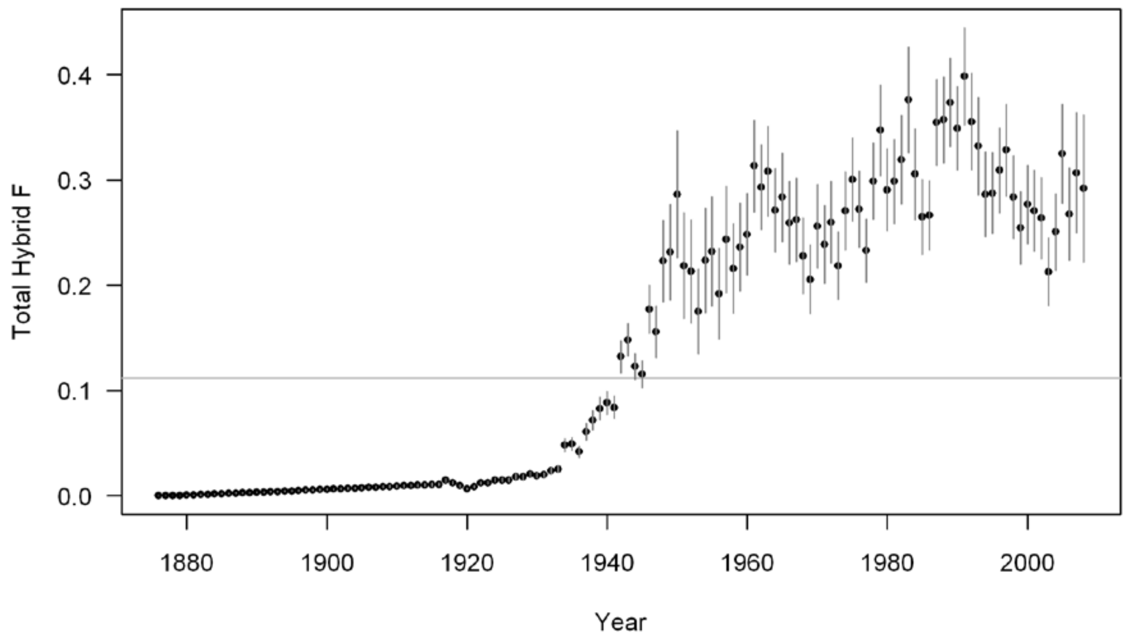

Figure f. Time series of estimated relative exploitation rate (catch/age 3 and older biomass) for the base case model (round points). Values of relative exploitation rate in excess of horizontal line are above the rate corresponding to the overfishing proxy from the base case.

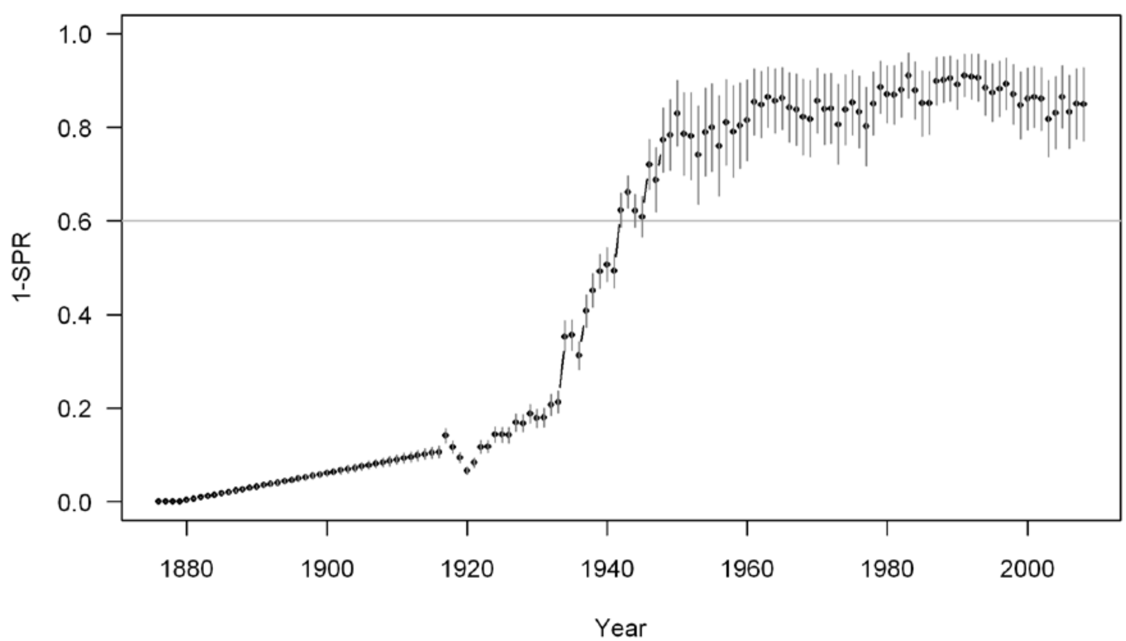

Figure g. Estimated spawning potential ratio from the base case model. One minus SPR is plotted so that higher exploitation rates occur on the upper portion of the y-axis.

Management performance

The most recent 2005 assessment of petrale sole stock assessment split the stock into two areas, the northern area that included U.S. Vancouver and Columbia INPFC areas and the southern area that included the Eureka, Monterey and Conception INPFC areas (Lai et al. 2006). In 2005 petrale sole were estimated to be at 34 and 29 percent of unfished spawning stock biomass in the northern and southern areas, respectively. Based on the 2005 stock assessment coast-wide ABCs were set at 3025 mt and 2919 mt for 2007 and 2008, respectively, with an OY of 2499 mt for both years (Table e). Recent coast-wide annual landings have not exceeded the ABC except for 2005 when the ABC was exceeded by 92 mt, 3.3%. The 2005 stock assessment estimated that petrale sole have been below the Pacific Council's minimum stock size threshold of 25 percent of unfished biomass from the mid-1970s until recently with estimated harvest rates in excess of the target fishing mortality rate of F40%. The 2005 assessment estimated the spawning stock biomass in 1998 at 12 percent of unfished stock biomass. The current assessment estimates that petrale sole have been below the $SB_{40\%}$ management target since 1949 and below the overfished threshold since 1953 (Table b, Figures e) with fishing mortality rates in excess of the current F-target for flatfish of $SPR_{40\%}$ since the late 1930s (Table d, Figure h). Using reference points based on the model estimates of Bmsy from the base case model suggests that the petrale sole fishery has been fishing at or near the management targets for a large portion of the time (Figure i). A summary of recent trends in the fishery and petrale sole population can be found in Table h.

Table e. Recent trend in estimated total petrale sole catch and commercial landings (mt) relative to management guidelines.

Fishing year	ABC (mt)	OY (mt)	Commercial Landings (mt)	Estimated[1] Total Catch (mt) for the Annual Year	Estimated Total Catch (mt) for the Fishing Year
1999	2,700	2,700	1,520	1,617	1,591
2000	2,950	2,950	1,778	1,888	1,856
2001	2,762	2,762	1,838	1,975	1,934
2002	2,762	2,762	1,877	2,066	2,024
2003	2,762	2,762	1,686	1,786	1,809
2004	2,762	2,762	2,191	2,273	2,284
2005	2,762	2,762	2,854	2,948	2,960
2006	2,762	2,762	2,102	2,173	2,183
2007	3,025	2,499	2,329	2,372	2,376
2008	2,919	2,499	2,079	2,114	2,117

[1] Total annual catches reflect the commercial landings plus the model estimated annual discard biomass (commercial landings * retained catch/total catch). The total amounts of discard may differ from those reported in the NWFSC reports on total catch for some of these years.

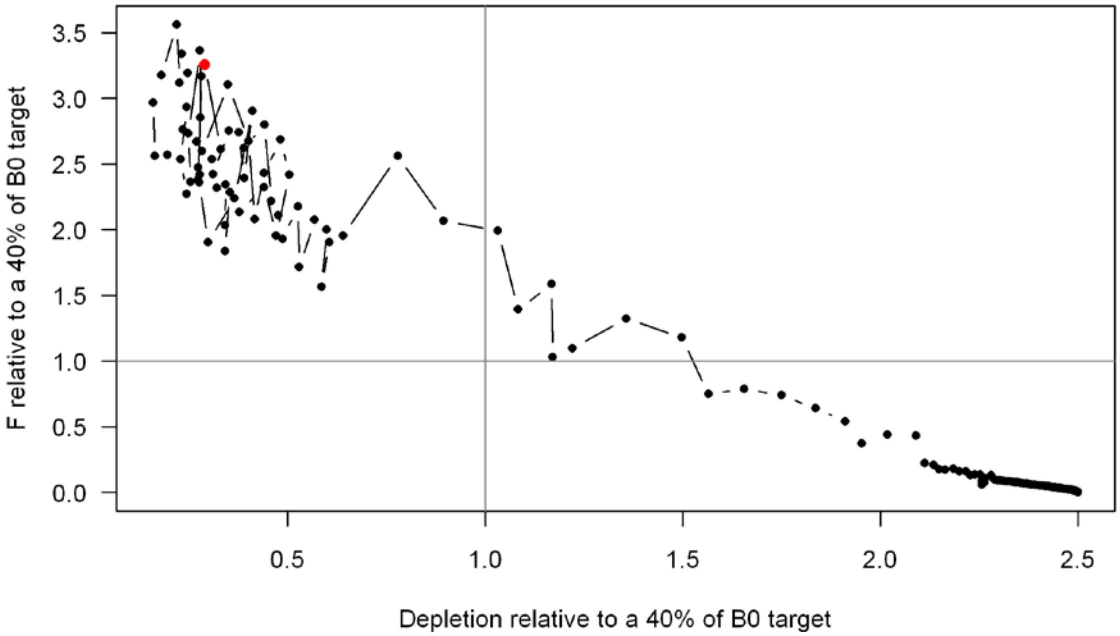

Figure h. Phase plot of estimated fishing intensity vs. relative spawning biomass for the base case model. Fishing intensity is the relative exploitation rate divided by the level corresponding to the overfishing proxy. Relative spawning biomass is annual spawning biomass relative to virgin spawning biomass divided by the 40% rebuilding target. The red point is 2009.

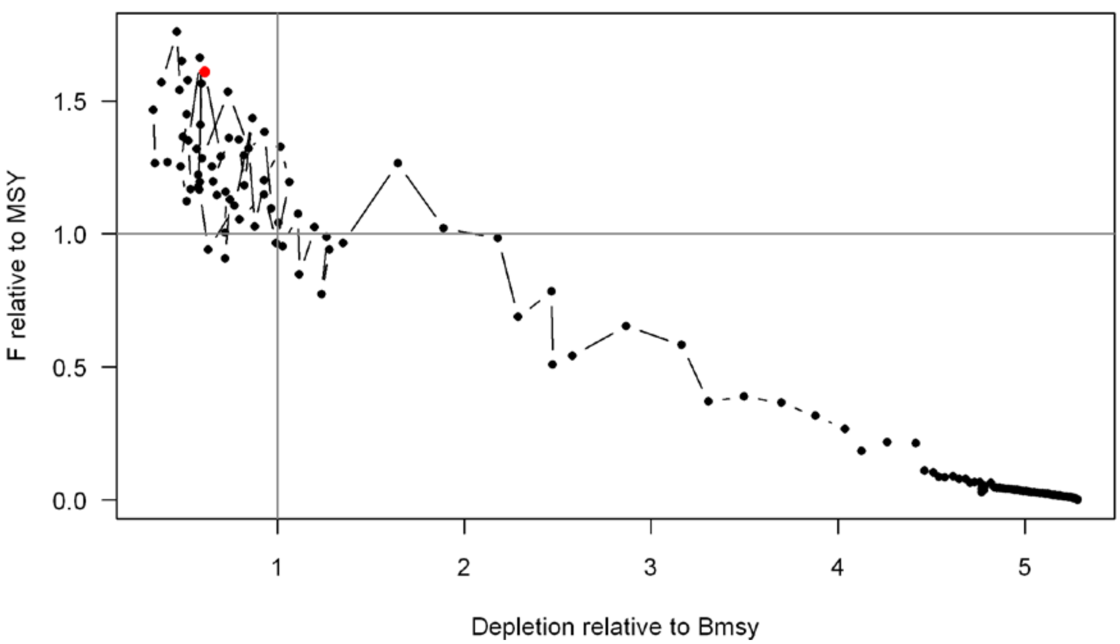

Figure i. Phase plot of estimated fishing intensity vs. relative spawning biomass for the base case model. Fishing intensity is the relative exploitation rate divided by the level corresponding to Fmsy. Relative spawning biomass is annual spawning biomass relative to the model estimate of Bmsy. The red point is 2009.

Unresolved problems and major uncertainties

Parameter uncertainty is explicitly captured in the asymptotic confidence intervals reported throughout this assessment for key parameters and management quantities. These intervals reflect the uncertainty in the model fit to the data sources included in the assessment, but do not include uncertainty associated with alternative model configurations, weighting of data sources (a combination of input sample sizes and relative weighting of likelihood components), or fixed parameters.

There are a number of major uncertainties regarding model parameters that have been explored via sensitivity analysis using both the model submitted to the STAR panel and variations which were evaluated during the STAR meeting. The most notable explorations involved the sensitivity of model estimates to the specification of the stock-recruitment relationship.

The comparability of age data within and between age-reading laboratories over time due to changes in ageing methods, a variety of ageing methods being applied to the same sample, inadequate otolith sampling, and between-laboratory variation is a major source of uncertainty. The application of the 'combo' age reading method for petrale, where petrale up to approximately age 10 are surface read and those otoliths thought to be greater than age 10 are broken and burned leads to a high level of variability in the age data, especially at older ages, when the 'combo' method is applied. Recent bomb radiocarbon analysis shows that the best ages for petrale are obtained using the break and burn method. The break and burn method should be used for ageing petrale sole.

There are problems with the Oregon commercial age data from 1981–1999. Ages from this period were aged using a combination of methods and non-randomly (i.e. one individual aged all males and another individual aged all females). While age reader information exists it is not currently in the PacFIN database, making it impossible to closely examine the impact of varying ageing methods and non-random reader design. This leads to large levels of ageing error for ages from this period of the Oregon fishery. If possible, these otoliths should be re-aged and age reader information needs to routinely be included in PacFIN.

Forecasts

The forecast of stock abundance and yield was developed using the base model. The total catch in 2009 and 2010 are set at 2433 and 2393 mt. The exploitation rate for 2011 and beyond is based upon an SPR of 40%. The 40:10 control rule reduces forecasted yields below those corresponding to $F_{40\%}$ because the stocks are estimated to be lower than the management target of $SB_{40\%}$ (Table f). The 2008 exploitation rate was used to distribute catches among the fisheries. Uncertainty in the forecasts is based upon the three states of nature agreed upon at the STAR panel. The high and low states are differentiated from the base case by the size of the 2009 spawning biomass, assuming values that were 1.25 standard deviations higher and lower, respectively, than the base case.. Manipulation of the amount of NWFSC survey biomass in 2008 was used to achieve these alternative sizes for the 2009 spawning biomass. Each forecast scenario includes random variability in future recruitment deviations (Table g). Current medium-term forecasts predict a declining trend in abundance and catch through 2011, with OY values for 2011 set at zero catch under the 40-10 harvest policy. This decline is followed by increasing abundance and catches, with the stock moving above the minimum stock size threshold of $SB_{25\%}$ in 2015. The following table shows the projection of expected petrale sole catch, spawning biomass and depletion from the base model using the 40-10 control rule (Table f).

Table f. Projection of potential petrale sole ABC, OY , spawning biomass and depletion for the base case model based on the SPR= 40% fishing mortality target used for the last plan (OY) and $F_{40\%}$ overfishing limit/target (ABC). Assuming the OYs of 2433 and 2393 mt are attained in 2009 and 2010.

Year	ABC (mt)	OY (mt)	Age 3+ biomass (mt)	Spawning biomass (mt)	Depletion
2009	2,499	2,433	7,151	2,938	11.6%
2010	2,499	2,393	6,776	2,400	9.5%
2011	535	0	6,468	2,171	8.6%
2012	802	311	8,646	3,427	13.5%
2013	1,068	680	10,680	4,712	18.6%
2014	1,301	997	12,358	5,843	23.1%
2015	1,489	1,311	13,675	6,778	26.8%
2016	1,631	1,489	14,678	7,503	29.6%
2017	1,735	1,621	15,437	8,037	31.7%
2018	1,812	1,718	16,022	8,431	33.3%
2019	1,870	1,794	16,482	8,740	34.5%
2020	1,917	1,838	16,850	8,991	35.5%

Decision table

Relative probabilities of each state of nature are based on the 2009 estimate of spawning biomass. Landings in 2009–2010 are 2,433 and 2,393 mt for all cases. Selectivity and fleet allocations are projected based on 2008 values.

Table g. Decision table of 12-year projections for alternate states of nature (columns) and management options (rows) beginning in 2011. There are two values for depletion, the first calculates depetion using the SB40% Bmsy proxy and the second calculates depletion relative to the model estimate of Bmsy. Relative probabilities of each state of nature are based on identifying low and high values from the model-estimated distribution of 2009 spawning biomass, those high and low values for 2009 were achieved through changing the size of the 2008 NWFSC survey biomass. Landings in 2009–2010 are 2433 mt

			State of nature							
			Low 2009 Spawning Biomass (-1.25 SD)			Base case			High 2009 Spawning Biomass (+1.25 SD)		
Relative probability			0.25			0.5			0.25		
			Depletion		Spawning biomass	Depletion		Spawning biomass	Depletion		Spawning biomass
Management decision	Year	Catch (mt)	SB0	Bmsy	(mt)	SB0	Bmsy	(mt)	SB0	Bmsy	(mt)
Catches Near Zero (3 mt)	2011	3	5%	29%	1,397	9%	48%	2,295	13%	67%	3,229
	2012	3	9%	50%	2,380	14%	74%	3,572	19%	100%	4,786
	2013	3	14%	75%	3,600	20%	105%	5,012	26%	134%	6,426
	2014	3	19%	104%	4,976	26%	136%	6,514	32%	168%	8,033
	2015	3	25%	134%	6,423	32%	167%	8,025	38%	200%	9,589
	2016	3	31%	164%	7,856	37%	198%	9,493	44%	231%	11,068
	2017	3	36%	192%	9,217	43%	227%	10,884	50%	260%	12,452
	2018	3	41%	219%	10,511	48%	254%	12,197	55%	286%	13,739
	2019	3	46%	245%	11,766	53%	280%	13,440	59%	311%	14,933
	2020	3	50%	271%	12,984	58%	305%	14,613	64%	334%	16,034
Half 40-10 catches from base case	2011	0	5%	50%	1,397	9%	48%	2,295	13%	67%	3,229
	2012	156	9%	37%	2,382	14%	75%	3,574	18%	95%	4,554
	2013	340	14%	29%	3,524	19%	103%	4,932	24%	127%	6,090
	2014	499	18%	50%	4,710	25%	130%	6,239	30%	156%	7,493
	2015	656	23%	73%	5,861	29%	155%	7,451	35%	182%	8,750
	2016	745	27%	98%	6,893	34%	178%	8,520	39%	205%	9,837
	2017	810	30%	122%	7,796	37%	197%	9,460	43%	225%	10,785
	2018	859	33%	144%	8,604	41%	215%	10,297	46%	242%	11,615
	2019	897	36%	163%	9,365	44%	231%	11,060	49%	257%	12,349
	2020	919	39%	179%	10,097	46%	245%	11,763	52%	271%	13,004
40-10 catches from base case	2011	0	5%	29%	1,397	9%	48%	2,295	13%	67%	3,229
	2012	311	9%	50%	2,382	14%	75%	3,574	19%	100%	4,788
	2013	680	13%	72%	3,444	19%	101%	4,849	25%	130%	6,258
	2014	997	17%	93%	4,439	24%	124%	5,959	30%	156%	7,469
	2015	1,311	21%	110%	5,291	27%	143%	6,871	34%	176%	8,418
	2016	1,489	23%	123%	5,918	30%	158%	7,576	36%	190%	9,095
	2017	1,621	25%	133%	6,358	32%	169%	8,096	38%	200%	9,579
	2018	1,718	26%	139%	6,669	33%	177%	8,480	39%	207%	9,920
	2019	1,794	27%	144%	6,923	35%	183%	8,782	40%	212%	10,161
	2020	1,838	28%	149%	7,152	36%	188%	9,026	41%	215%	10,331

Table g continued.

			State of nature							
			Low 2009 Spawning Biomass (-1.25 SD)			Base case			High 2009 Spawning Biomass (+1.25 SD)		
Relative probability			0.25			0.5			0.25		
			Depletion		Spawning biomass	Depletion		Spawning biomass	Depletion		Spawning biomass
Management decision	Year	Catch (mt)	SB0	Bmsy	(mt)	SB0	Bmsy	(mt)	SB0	Bmsy	(mt)
Constant 500 mt	2011	500	5%	29%	1,397	9%	48%	2,295	13%	67%	3,229
	2012	500	8%	44%	2,134	13%	69%	3,314	18%	94%	4,522
	2013	500	12%	64%	3,056	18%	93%	4,455	23%	122%	5,861
	2014	500	16%	86%	4,109	22%	118%	5,639	28%	149%	7,153
	2015	500	20%	109%	5,228	27%	142%	6,833	33%	175%	8,397
	2016	500	25%	132%	6,342	32%	167%	7,997	38%	200%	9,578
	2017	500	29%	154%	7,403	36%	190%	9,104	43%	223%	10,687
	2018	500	33%	176%	8,418	40%	212%	10,157	47%	244%	11,723
	2019	500	37%	196%	9,415	44%	233%	11,165	51%	265%	12,694
	2020	500	40%	217%	10,401	48%	253%	12,129	54%	284%	13,599
Constant 1500 mt	2011	1,500	5%	29%	1,397	9%	48%	2,295	13%	67%	3,229
	2012	1,500	6%	34%	1,649	11%	58%	2,802	16%	83%	3,995
	2013	1,500	8%	41%	1,979	13%	70%	3,341	19%	99%	4,728
	2014	1,500	9%	49%	2,367	15%	81%	3,874	21%	112%	5,375
	2015	1,500	11%	58%	2,791	17%	92%	4,407	24%	125%	5,973
	2016	1,500	12%	67%	3,210	19%	103%	4,926	26%	136%	6,534
	2017	1,500	14%	75%	3,599	21%	113%	5,424	28%	147%	7,062
	2018	1,500	15%	83%	3,968	23%	123%	5,907	30%	158%	7,564
	2019	1,500	17%	91%	4,348	25%	133%	6,388	32%	168%	8,050
	2020	1,500	18%	99%	4,752	27%	143%	6,869	34%	178%	8,519
Constant 2/3 Fmsy	2011	36	5%	29%	1,397	9%	48%	2,295	13%	67%	3,229
	2012	86	9%	50%	2,375	14%	74%	3,555	19%	100%	4,781
	2013	166	14%	75%	3,576	20%	103%	4,948	25%	133%	6,400
	2014	274	19%	102%	4,905	25%	132%	6,354	32%	166%	7,960
	2015	447	24%	131%	6,261	30%	161%	7,703	38%	196%	9,421
	2016	582	29%	157%	7,517	35%	186%	8,930	43%	224%	10,721
	2017	714	34%	180%	8,629	39%	209%	10,000	47%	247%	11,856
	2018	837	37%	200%	9,602	43%	228%	10,918	51%	267%	12,825
	2019	949	41%	218%	10,473	46%	244%	11,706	54%	284%	13,641
	2020	1,020	44%	235%	11,252	49%	258%	12,376	57%	298%	14,314
Ramp down catches between 2/3 Fmsy at Bmsy and 0 catch at 50%Bmsy	2011	0	5%	29%	1,397	9%	48%	2,295	13%	67%	3,229
	2012	354	9%	50%	2,382	14%	75%	3,574	18%	93%	4,478
	2013	764	14%	75%	3,603	19%	101%	4,826	24%	123%	5,921
	2014	977	19%	100%	4,795	23%	123%	5,888	29%	152%	7,307
	2015	1,161	23%	121%	5,819	27%	142%	6,807	34%	176%	8,421
	2016	1,280	26%	139%	6,650	30%	158%	7,585	37%	194%	9,306
	2017	1,379	28%	153%	7,320	32%	171%	8,224	40%	209%	10,030
	2018	1,461	31%	164%	7,868	35%	183%	8,754	42%	221%	10,618
	2019	1,530	32%	174%	8,354	36%	192%	9,211	44%	231%	11,100
	2020	1,574	34%	184%	8,801	38%	200%	9,610	46%	240%	11,494

Research and data needs

Progress on a number of research topics and data issues would substantially improve the ability of this assessment to reliably and precisely model petrale sole population dynamics in the future:

1. The estimate of the NWFSC survey catchability in the base case model is higher than expected. This may be due to the use of the total area within each strata during the expansion of the survey data rather than the trawlable areas only. At this time there are no area estimates for trawlable and untrawlable areas. However the petrale sole population is most likely well surveyed by the trawl survey and expanding using areas that include untrawlable areas may not be appropriate.
2. In the past many assessments have derived historical catches independently. Since 2005 each of the states has undertaken comprehensive historical catch reconstructions. At the time of this assessment only a partial reconstruction was available for Washington, and no catch reconstruction was available from Oregon Department of Fish and Wildlife. Completion of the Washington and Oregon catch reconstructions would provide the best possible estimated catch series that accounts for all the catch and makes sense for flatfish as a group.
3. Due to limited data, new studies on both the maturity and fecundity relationships for petrale sole would be beneficial.
4. Increased collection of commercial fishery age data from California would help reduce uncertainty. No recent age data are available from the California fleet. However, the greatest landings by state have come from California in the most recent two years. Without age data, the ability to estimate year-class strength and the extent of variation in recruitment is compromised.
5. The comparability of ages between agencies is unknown. A common set of otoliths should be aged by each agency to be able to compile between agency age error information.
6. Where possible historicalotoliths should be re-aged using the break-and-burn method.
7. Effect of fishery regulations. The impacts of trip-limits and other management approaches, such as closed areas, on discards and fishery selectivity requires further study.
8. Studies on stock structure and movement of petrale sole, particularly with regard to the winter-summer spawning migration of petrale sole.
9. Continue and if possible increase the recent collection of length compositions for discarded petrale sole for both the winter (Nov–Feb) and summer (Mar–Oct) fisheries.

Table h. Summary of recent trends in estimated petrale sole exploitation and stock levels from the base case model; all values reported at the beginning of the fishing year.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Commercial landings (mt)	1778	1838	1877	1686	2191	2854	2102	2329	2079	
Total catch (mt)	1895	1987	2088	1793	2276	2951	2176	2373	2115	
ABC (mt)	2950	2762	2762	2762	2762	2762	2762	3025	2919	2433
OY	2950	2762	2762	2762	2762	2762	2762	2499	2499	2499
1-SPR	0.86	0.87	0.86	0.82	0.83	0.87	0.83	0.85	0.85	0.9
Exploitation rate (catch/age 3+ biomass)	0.28	0.27	0.26	0.21	0.25	0.32	0.27	0.31	0.29	0.36
Age 3+ biomass (mt)	6846.92	7337.86	7912.96	8422.52	9079.6	9082.01	8132.41	7735.76	7240.22	7150.57
Spawning biomass (mt)	2,765.20	2,810.30	2,798.40	3,030.00	3,706.40	4,160.70	3,949.80	3,818.00	3,349.60	2,937.60
~95% Confidence interval	±329.7	±328.3	±333.6	±381.0	±463.0	±529.5	±576.0	±624.1	±704.6	±832.7
Range of states of nature	2743.9-2776.9	2781.5-2829.5	2759.3-2827.8	2969.1-3080.3	3605.0-3796.5	4002.0-4308.6	3720.7-4169.9	3507.4-4122.5	2940.8-3755.2	2407.8-3468.1
Recruitment	10,903.20	8,562.70	8,161.00	7,164.50	11,897.10	15,770.90	12,740.40	12,048.80	12,508.70	10,903.20
~95% Confidence interval	±4,721.5	±3,816.7	±3,805.4	±3,606.0	±6,338.7	±9,522.5	±9,912.5	±10,655.9	±11,097.5	±4,721.5
Range of states of nature	10,022.7-11,679.2	7,674-9,382.8	7,040.9-9,241.4	5,965.2-8,354.8	9,554.3-14,285.1	12,415.7-19,223.9	10,911.6-14,269.5	11,335.2-12,513	11,826.7-12,947.8	10,022.7-11,679.2
Depletion (%)	10.9	11.1	11	12	14.6	16.4	15.6	15.1	13.2	11.6
~95% Confidence interval	±3.4	±3.4	±3.4	±3.8	±4.7	±5.2	±5.1	±5.1	±4.8	±4.8
Range of states of nature	10.7-11.1	10.8-11.3	10.7-11.3	11.5-12.3	14.0-15.1	15.5-17.2	14.5-16.6	13.6-16.4	11.4-14.9	9.4-13.8

Table i. Summary of petrale sole reference points from the base case model. Values are based on 2008 fishery selectivity and allocation.

Quantity	Estimate	~95% Confidence interval
Unfished spawning stock biomass (SB_0, mt)	25,334	±5,209
Unfished 3+ biomass (mt)	39,211	±5296
Unfished recruitment (R_0, thousands)	13,604	±7,590
Reference points based on $SB_{40\%}$		
MSY Proxy Spawning Stock Biomass ($SB_{40\%}$)	10,134	±2084
SPR resulting in $SB_{40\%}$ ($SPR_{SB40\%}$)	0.408	±0.0178
Exploitation rate resulting in $SB_{40\%}$	0.112	±0.0197
Yield with $SPR_{SB40\%}$ at $SB_{40\%}$ (mt)	2,060	±162
Reference points based on SPR proxy for MSY		
Spawning Stock Biomass at SPR (SB_{SPR})(mt)	9,928	±2,476
$SPR_{MSY\text{-}proxy}$	0.4	NA
Exploitation rate corresponding to SPR	0.115	±0.0263
Yield with $SPR_{MSY\text{-}proxy}$ at SB_{SPR} (mt)	2,080	±203
Reference points based on estimated MSY values		
Spawning Stock Biomass at *MSY* (SB_{MSY}) (mt)	4,796	±582
SPR_{MSY}	0.200	±0.07
Exploitation Rate corresponding to SPR_{MSY}	0.23	±0.03
MSY (mt)	2,376	±86

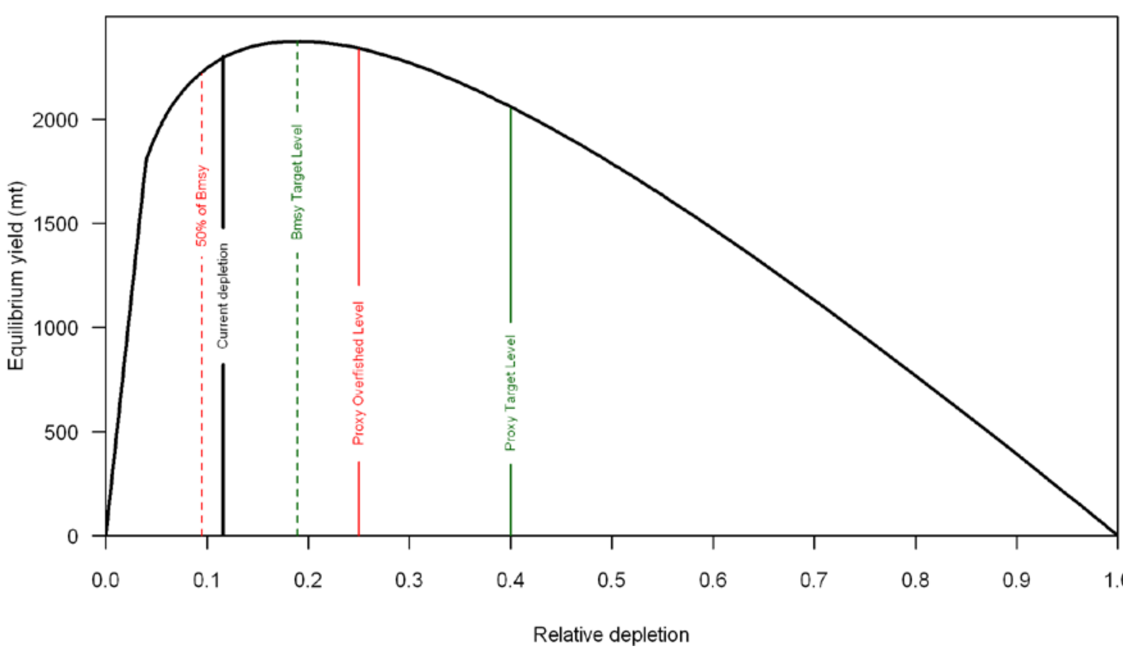

Figure j. Equilibrium yield curve (derived from reference point values reported in table i) for the base case model. Values are based on 2008 fishery selectivity and allocation. The depletion is relative to unfished spawning biomass

1. Introduction

1.1 Distribution and Stock Structure

Petrale sole (*Eopsetta jordani*) is a right-eyed flounder in the family Pleuronectidae ranging from the western Gulf of Alaska to the Coronado Islands, northern Baja California, (Hart 1973; Kramer et al. 1995; Love et al. 2005) with a preference for sand and mud bottoms at depths ranging from 0-550m (Love et al. 2005). Common names include brill, California sole, Jordan's flounder, cape sole, round nose sole, English sole, soglia, petorau, nameta, and tsubame garei (Smith 1937; Hart 1973; Gates and Frey 1974; Love 1996; Eschmeyer and Herald 1983). In northern and central California petrale sole are dominant on the middle and outer continental shelf (Allen et al. 2006). PacFIN fishery logbook data show that adults are caught in depths from 18 to 1,280 m off the U.S. west coast with a majority of the catches of petrale sole being taken between 70–220 m during March through October, and between 290–440 m during November through February.

There is little information regarding the stock structure of petrale sole off the U.S. Pacific coast. No genetic research has been undertaken for petrale sole and there is no other published research indicating separate stocks of petrale sole within U.S. waters. Tagging studies show adult petrale sole can move up 350 - 390 miles, having the ability to be highly migratory with the possibility for homing ability (Alverson 1957; MBC Appl. Environ. Sci. 1987). Juveniles show little coast-wide or bathymetric movement while some studies suggest that adults generally move inshore and northward onto the continental shelf during the spring and summer to feeding grounds and offshore and southward during the fall and winter to deep water spawning grounds (Hart 1973; MBC Appl. Environ. Sci. 1987; Horton 1989; Love 1996). Adult petrale sole can tolerate a wide range of bottom temperatures (Perry et al., 1994).

Tagging studies indicate limited mixing of adults between different spawning groups. DiDonato and Pasquale (1970) reported that five fish tagged on the Willapa Deep grounds during the spawning season were recaptured during subsequent spawning seasons at other deepwater spawning grounds, as far south as Eureka (northern California) and the Umpqua River (southern Oregon). However, Pederson (1975) reported that most of the fish (97%) recaptured from spawning grounds in winter were originally caught and tagged on those same grounds.

Mixing of fish from multiple deep water spawning grounds likely occurs during the spring and summer when petrale sole are feeding on the continental shelf. Fish that were captured, tagged, and released off the northwest coast of Washington during May and September were subsequently recaptured during winter from spawning grounds off Vancouver Island (British Columbia, 1 fish), Heceta Bank (central Oregon, 2 fish), Eureka (northern California, 2 fish), and Halfmoon Bay (central California, 2 fish) (Pederson, 1975). Fish tagged south of Fort Bragg (central California) during July 1964 were later recaptured off Oregon (11 fish), Washington (6 fish), and Swiftsure Bank (southwestern tip of Vancouver Island, 1 fish) (D. Thomas, California Department of Fish and Game, Menlo Park, CA, cited by Sampson and Lee, 1999).

Off British Columbia, the highest densities of spawning adults, as well as of eggs, larvae and juveniles, are found in the waters around Vancouver Island. Adults may utilize nearshore areas as summer feeding grounds and non-migrating adults may stay there during winter (Starr and Fargo, 2004).

Past assessments completed by Demory (1984), Turnock et al. (1993), and Sampson and Lee (1999) considered petrale sole in the Columbia and U.S. Vancouver INPFC areas a single stock. Sampson and Lee (1999) assumed that petrale sole in the Eureka and Monterey INPFC areas represented two additional distinct socks. The most recent 2005 petrale sole assessment assumed two stocks, northern (U.S. Vancouver and Columbia INPFC areas) and southern (Eureka, Monterey and Conception INPFC areas), to maintain continuity with previous assessments. Three stocks (west coast Vancouver Island, Queen Charlotte Sound, and Heceta Strait) are considered for petrale sole in the waters off British Columbia, Canada (Starr and Fargo, 2004). This assessment integrates the previously separate north-south assessments, providing a status evaluation through 2008. The decision to conduct a single-area assessment is based on strong evidence of a mixed stock from tagging studies, a lack of genetic studies on stock structure, and due to the fact that the limited evidence for differences in growth between the 2005 northern and southern assessment area are confounded with differences in data collection between Washington, Oregon, and California.

Fishing fleets are separated both geographically and seasonally to account for spatial and seasonal patterns in catch given the coast-wide assessment area. The petrale sole fisheries possess a distinct seasonality, with catches peaking during the winter months, so the fisheries are divided into winter (November-February) and summer (March-October) fisheries (Figure 1). Note that the "fishing year" for this assessment (November 1 to October 31) differs from the standard calendar year. The U.S.-Canadian border is the northern boundary for the assessed stock, although the basis for this choice appears to be largely due to current management needs. Given the lack of clear information regarding the status of distinct biological populations, this assessment treats the U.S. petrale sole resource from the Mexican border to the Canadian border as a single coast-wide stock.

1.2 Life history and ecosystem interactions

Petrale sole spawn during the winter at several discrete deepwater sites (270-460 m) off the U.S. west coast, from November to April, with peak spawning taking place from December to February (Harry 1959; Best 1960; Gregory and Jow 1976; Castillo et al. 1993; Carison and Miller 1982; Reilly et al. 1994; Castillo 1995; Love 1996; Moser 1996a; Casillas et al. 1998). Females spawn once each year and fecundity varies with fish size, with one large female laying as many as 1.5 million eggs (Porter, 1964). Petrale sole eggs are planktonic, ranging in size from 1.2 to 1.3 mm, and are found in deep water habitats at water temperatures of 4–10^{o}C and salinities of 25–30 ppt (Best 1960; Ketchen and Forrester, 1966; Alderdice and Forrester 1971; Gregory and Jow 1976). The duration of the egg stage can range from approximately 6 to 14 days (Alderdice and Forrester 1971; Hart 1973; Love 1996, Casillas et al. 1998). The most favorable conditions for egg incubation and larval growth are 6–7^{o}C and 27.5–29.5 ppt (Ketchen and Forrester, 1966; Alderice and Forrester, 1971; Castillo et al., 1995). Predators of petrale sole eggs include planktonic invertebrates and pelagic fishes (Casillas et al. 1998).

Petrale sole larvae are planktonic, ranging in size from approximately 3 to 20 mm, and are found up to 150 km offshore foraging upon copepod eggs and nauplii (Hart 1973; Moser 1996a; MBS Appl. Env. Sci 198; Casillas et al. 1998). The larval duration, including the egg stage, spans approximately 6 months with larvae settling at about 2.2cm in length on the inner continental shelf (Pearcy 1977). Juveniles are benthic and found on sandy or sand-mud bottoms (Eschmeyer and Herald 1983; MBS Appl. Environ. Sci. 1987) and range in size from approximately 2.2 cm to the size at maturity, 50% of the population is mature at approximately 38 cm and 41 cm for males and females, respectively (Casillas et al. 1998). No specific areas have been identified as nursery grounds for juvenile petrale sole. In the waters off British Columbia, Canada larvae are usually found in the upper 50 m far offshore, juveniles at 19–82 m and large juveniles at 25–125 m (Starr and Fargo 2004). Juveniles are carnivorous, foraging on annelid worms, clams, brittle star, mysids, scuplin, amphipods, and other juvenile flatfish (Ford 1965; Casillas et al. 1998; Pearsall and Fargo In prep. (see Starr and Fargo 2004). Predators on juvenile petrale sole include adult petrale sole as well as other larger fish (Ford 1965; Casillas et al. 1998) while adults are preyed upon by marine mammals, sharks, and larger fishes (Trumble 1995; Love 1996; Casillas et al. 1998).

One of the ambushing flatfishes, adult petrale sole have diverse diets which become more piscivourous at larger sizes (Allen et al. 2006). Adult petrale sole are found on sandy and sand-mud bottoms (Eschmeyer and Herald 1983) foraging for a variety of invertebrates including, crab, octopi, squid, euphausiids, and shrimp, as well as anchovies. hake, herring, sand lance, and other smaller rockfish and flatfish (Ford 1965; Hart 1973; Kravitz et al. 1977; Birtwell et al. 1984; Reilly et al. 1994; Love 1996; Pearsall and Fargo In prep.). In Canadian waters evidence suggests that petrale sole tend to prefer herring (Pearsall and Fargo In prep.). On the continental shelf petrale sole generally co-occur with English sole, rex sole, Pacific sand dab, and rock sole (Kravitz et al. 1977). Adult petrale sole achieve a maximum size of around 50 cm and 63 cm for males and females, respectively (Best 1963; Pedersen 1975). The maximum length reported for petrale sole is 70 cm (Hart 1973; Eschmeyer and Herald 1983; Love et al. 2005) while the maximum observed break and burn age is 31 years (Haltuch et al. In prep.).

Ecosystem factors have not been explicitly modeled in this assessment, but there are several important aspects of the California current ecosystem that may impact petrale sole population dynamics. Castillo (1992) and Castillo et al. (1995) suggest that density-independent survival of early life stages is low and show that offshore Ekman transportation of eggs and larvae may be an important source of variation in year-class strength in the Columbia INPFC area. The effects of the Pacific Decadal Oscillation (PDO) on California current temperature and productivity (Mantua et al. 1997) may also contribute to non-stationary dynamics for petrale sole. The prevalence of a strong 1999 year-class for many west coast groundfish species suggest that environmentally driven recruitment variation may be correlated among species with relatively diverse life-history strategies. Although current research efforts along these lines are limited, a more explicit exploration of ecosystem processes may be possible in future petrale sole stock assessments.

1.3 Historical and Current Fishery

Petrale sole have been caught in the flatfish fishery off the U.S. Pacific coast since the late 19th century. The fishery first developed off California where, prior to 1876, fishing in San Francisco Bay was by hand or using set lines and beach seining (Scofield 1948). By 1880 two San Francisco based trawler companies were running a total of six boats, extending the fishing grounds beyond the Golden Gate Bridge northward to Point Reyes (Scofield 1948). Steam trawlers entered the fishery in 1888 and in 1889 four steam tugs based out of San Francisco were sufficient to flood market with flatfish (Scofield 1948). By 1915 San Francisco and Santa Cruz trawlers were operating at depths of about 45–100 m with daily catches averaging 10,000 lbs per tow or 3,000 lbs per hour (Scofield 1948). Flatfish comprised approximately 90% of the catch with 20–25% being discarded as unmarketable (Scofield 1948). In 1915 laws prohibited dragging in California waters and declared it illegal to possess a trawl net from Santa Barbara County southward (Scofield 1948). By 1934 twenty 56–72 foot diesel engine trawlers operated out of San Francisco fishing between about 55 and 185 m (Scofield 1948). From 1944-1947 the number of California trawlers fluctuated between 16 to 46 boats (Scofield 1948). Although the flatfish fishery in California was well developed by the 1950s and 1960s catch statistics were not reported until 1970 (Heimann and Carlisle 1970). In this early California report petrale sole landings during 1916 to 1930 were not separated from the total flatfish landings. During 1931–68, the landings of petrale sole averaged about 700 mt annually.

The earliest trawl fishing off Oregon began in 1884-1885, but the fishery did not become established until 1937, with the fishery increasing rapidly during WWII (Harry and Morgan, 1961). Initially trawlers stayed close to the fishing grounds adjacent to Newport and Astoria, operating at about 35–90 m between Stonewall Bank and Depoe Bay. Fishing operations gradually extended into deep water. For example, Newport-based trawlers were commonly fishing at about 185 m in 1949, at about 185–365 m by 1952, and at about 550 fm by 1953.

Alverson and Chatwin (1957) describe the history of the petrale sole fishery off of Washington and British Columbia with fishing grounds ranging from Cape Flattery to Destruction Island. Petrale catches off of Washington were small until the late 1930s with the fishery extending to about 365 m following the development of deepwater rockfish fisheries in 1950s.

By the 1950s the petrale sole fishery was showing signs of depletion with reports suggesting that petrale sole abundance had declined by at least 50% during 1942 to 1947 (Harry 1956). Sampson and Lee (1999) reported that three fishery regulations were implemented during 1957–67: 1) a winter closure off Oregon, Washington and British Columbia, 2) a 3,000 lb per trip limit, and 3) no more than two trips per month during 1957. With the 1977 enactment of the Magnuson Fishery Conservation and Management Act (MFCMA) the large foreign-dominated fishery that had developed since the late 1960s was replaced by the domestic fishery that continues today. Petrale sole are harvested almost exclusively by bottom trawls in the U.S. west coast groundfish fishery. Recent petrale sole catches exhibit marked seasonal variation, with substantial portions of the annual harvest taken from the spawning grounds during December and January. Evidence suggests that the winter fishery on the deepwater spawning grounds developed sporadically during the 1950s and 1960s as fishers discovered new locations (e.g., Alverson and Chatwin, 1957; Ketchen and Forrester, 1966). Both historical and current petrale sole fisheries have primarily relied upon trawl fleets.

Lai et al. (2005) reconstructed the historical U.S. petrale sole landings from 1876 to 2004 from a variety of sources. Subsequently California has completed a comprehensive catch reconstruction that shows peak catches occurred during the late 1940s and 1950s. Off of Washington and Oregon peak catches occurred during the 1940s and 1950s followed by declines and remained at historical lows until the mid-2000s. (Table 1, Figure 1). Total reconstructed historical catches from 1876 to 2008 peaked at a high of 4515 mt in 1950 followed by a decline to a low of 1417 mt in 1994 (Table 1, Figure 1).

1.4 Management History and performance

Beginning in 1983 the Pacific Fishery Management Council (PFMC) established coast-wide Acceptable Biological Catch (ABC) limits for the annual harvests of petrale sole in the waters off the US west coast (see, for example, PFMC, 2002). Previous assessments of petrale sole in the U.S. Vancouver and Columbia INPFC areas have been conducted by Demory (1984), Turnock et al. (1993), Sampson and Lee (1999), and Lai at al. (2005) (Figure 2). Based on the 1999 assessment a coastwide ABC of 2762 mt was specified and remained unchanged between 2001 and 2006 (Table 2).

The most recent 2005 assessment of petrale sole stock assessment split the stock into two areas, the northern area that included U.S. Vancouver and Columbia INPFC areas and the southern area that included the Eureka, Monterey and Conception INPFC areas (Lai et al. 2006) (Figure 2). While petrale sole stock structure is not well understood data on growth, CPUE, and geographical differences between states were used to support the use of two separate assessment areas. In 2005 petrale sole were estimated to be at 34 and 29 percent of unfished spawning stock biomass in the northern and southern areas, respectively. In spite of different models and data biomass trends were qualitatively similar in both areas, providing evidence for a coast wide stock. Based on the 2005 stock assessment ABCs were set at 3025 mt and 2919 mt for 2007 and 2008, respectively, with an OY of 2499 mt for both years (Table 2). Recent coast-wide annual landings have not exceeded the ABC except for 2005 when the ABC was exceeded by 4 mt (PFMC 2006) (Table 2).

The 2005 stock assessment estimated that petrale sole had been below the Pacific Council's minimum stock size threshold of 25 percent of unfished biomass from the mid-1970s until recently with estimated harvest rates in excess of the target fishing mortality rate of F40%. In comparison to the 1999 assessment of petrale sole, the 2005 assessment represented a significant change in the perception of petrale sole stock status. The stock assessment conducted in 1999 (Washington-Oregon only) estimated the spawning stock biomass in 1998 at 39 percent of unfished stock biomass. The 2005 assessment estimated the spawning stock biomass in 1998 at a similar size as the 1999 assessment but the estimate of unfished biomass increased resulting in the estimate of current stock size at 12 percent of unfished stock biomass. The change in status between the 1999 and 2005 analysis was due to the use of the complete reconstructed catch history in the 2005 stock assessment. The 1999 stock assessment used a catch history that started in 1977, after the bulk of the removals from the fishery had already taken place. Thus the 1999 stock assessment produced a more optimistic view of the petrale stock.

The most recent 2005 petrale sole stock assessment determined that the stock was in the precautionary zone and was not overfished (i.e. the spawning stock biomass (SB) was not below 25% of the unfished spawning stock biomass (SB_0)). The fishery for petrale sole (and groundfish in general) has been altered substantially by changes in fishery regulations implemented since 1998. Specifically, the PFMC implemented 2-month cumulative vessel limits to reduce discards in 1996. Beginning in 2000, restrictions were placed on the use of large footropes (more than 8”). Large footrope gear has been prohibited from the waters inside of 275 m (150 fm) following the advent of rockfish conservation areas delineated by depth-based management lines. Although the January and February months of the winter petrale sole fishery have not been subject to vessel landing limits until recently, the 2-month limits have restricted petrale sole landings from March through October, and more recently during November and December. The areas in which the winter petrale sole fishery has been allowed to operate have also been restricted by actions designed to reduce bycatch of slope rockfish.

Area closures have been used by the PFMC for groundfish management since 2001. Current area closures are: i) the Cowcod Conservation Area (CCA): agreed upon in 2000 and implemented in 2001; ii) the Yelloweye Rockfish Conservation Area (YRCA): agreed upon in 2002 and implemented in 2003; and iii) the Rockfish Conservation Areas (RCAs) for several rockfish species: agreed upon in 2002, implemented as an emergency regulation during fall of 2002 and through regulatory amendment in 2003. Since then, RCAs have been specified continuously for regions north and south of 40^{o}10’N latitude for trawl and fixed-gear groups (Figure 2). The boundaries of the RCAs are delineated by depth-based management lines, and may be changed throughout the year in an effort to achieve fishery management objectives. The area between 180 m and 275 m has been continuously closed to most all bottom groundfish trawling since the implementation of the RCAs.

Vessels with exempt fishing permits (EFPs) issued under 50 CFR part 600 are allowed to operate in some conservation areas. Oregon EFP (Experimental Fishing Plan) vessels were allowed to fish in the RCA using more selective trawl gear from February–October during 2003 and 2004. Beginning in 2005, the modified “selective flatfish” trawl gear has been required shoreward of the RCA, north of 40^{o}10’N latitude. This gear was found to reduce the catch-per-unit-effort of overfished rockfish relative to standard commercial gear in pilot experiments (King et al. 2004). The ABC/OYs for several species under Rebuilding Plans have resulted in limited harvests of other groundfishes in recent years.

Port sampling conducted by each state routinely sample market categories to determine the species composition of these mixed-species categories. Since 1967, various port sampling programs have been utilized by state and federal marine fishery agencies to determine the species compositions of the commercial groundfish landings off the U.S. Pacific coast (Sampson and Crone 1997). Current port sampling programs use stratified multistage sampling designs to evaluate the species compositions of the total landings in each market category, as well as for obtaining biological data on individual species (Crone 1995, Sampson and Crone 1997).

1.5 Fisheries in Canada and Alaska

Landings of petrale sole in the Canadian fishery had decreased substantially by the mid-1960s after the largest removals during the late 1940s to late 1950s (Starr and Fargo 2004). By the 1970s, analysis conducted by Pederson (1975) suggested that petrale abundance was low, primarily due to environmental factors, and abundance remained low into the 1990s. As of 2005 petrale sole off of British Columbia were treated as three "stocks" and were considered to be at low levels. Winter quarter landings of petrale sole were limited to 44,000 lb per trip during 1985–91; to 10,000 lb per trip during 1991–95; and to 2,000 lb per trip in 1996. Since 1996, the British Columbia trawl fishers have been limited to incidental harvests only (Fargo, 1997). The recent assessments for the Canadian stocks have been based on catch histories and limited biological data.

The most recent assessment of petrale sole in British Columbia uses a single area combined sex delay-difference stock assessment model with knife edge recruitment (at 6 or 7 years old) and tuned to fishery CPUE, mean fish weight of the commercial landings, and a number of fishery independent surveys beginning in the early 1980s (pers. comm., P. Starr). Stock predictions are based on average recruitment (pers. comm., P. Starr). This assessment suggests that the stock is currently above the target reference point and that there is some evidence for above average recruitment (about 10% above average) since about 1996 (pers. comm., P. Starr). Petrale sole in Canadian waters appear to have similar life-history characteristics (Starr and Fargo 2004).

In Alaska petrale sole are not targeted in the Bering Sea/Aleutian Island fisheries and are treated as a minor species in the "other flatfish" management complex.

2. Assessment

The following sources of data were used in building this assessment:

1) Fishery independent data including bottom trawl survey-based indices of abundance and biological data (age and length) from 2003-2008 (NWFSC survey) and 1980-2004 (Triennial survey)
2) Estimates of fecundity, maturity, length-weight relationships and ageing error from various sources
3) Commercial landings from 1876-2008
4) Estimates of the length frequencies, mean weight, and total biomass discarded in the fishery obtained from the West Coast Groundfish Observer Program (WCGOP) and the study by Pikitch et al (1988).
5) Fishery CPUE (Oregon, 1987-1998).

Data availability by source and year is presented in Table a-3b. A description of each of the specific data sources is presented below.

2.1 Fishery Independent Data

2.1.1 NWFSC trawl survey

Data from the NWFSC fishery-independent shelf and slope trawl survey has become available since the 2005 petrale sole stock assessment. Three sources of information are produced by this survey: an index of relative abundance, length-frequency distributions, and age-frequency distributions. Only years in which the NWFSC survey included the continental shelf are considered (2003-2006) since petrale sole are found on the continental shelf.

The NWFSC survey is based on a random-grid design; covering the coastal waters from a depth of 55 m to 1,280 m (Keller et al. 2007). This design uses four industry chartered vessels per year, assigned to a roughly equal number of randomly selected grid cells and is divided into two 'passes' of the coast which are executed from north to south. Two vessels fish during each pass, which have been conducted from late-May to early-October each year. This design therefore incorporates both vessel-to-vessel differences in catchability as well as variance associated with selecting a relatively small number (~700) of possible cells from a very large population of possible cells spread from the Mexican to the Canadian border. Much effort has been expended on appropriate analysis methods for this type of data, culminating in the west coast trawl survey workshop held in Seattle in November 2006 (see background materials).

The NWFSC survey commonly encounters petrale sole along the U.S. west coast, except south of Point Conception (Table 4, Figures 3-4). Figure 4 shows the density of petrale catch in the NWFSC survey. The survey did not fish shallower than 54 meters and no petrale sole were caught deeper than 537.5 meters in any year. Figure 5 shows that the percentage of positive tows and the catch rate over depth peak around 100 meters and decline as depth increases. Figure 5 also shows that the prevalence and density of petrale are generally higher in the northern latitudes.

Petrale sole are known to form winter spawning aggregations in deep water. It could therefore be expected that large-sized petrale sole would also appear more frequently in deep water. Figure 6 displays the mean fish length per tow of petrale sole against tow depth and shows that the mean length of females increases initially with depth and then levels out (even though the survey was conducted during the summer rather than winter). This trend of increasing size at depth is also apparent for male petrale sole. Given the ontogenetic shift of increasing size at depth, the 2005 assessment (Lai et al. 2005) re-stratified the survey data into three depth strata. We followed a similar approach and used piece-wise linear regression (Neter et al., 1985) of year- and sex-specific mean length and depth data to aid in choosing a depth stratum boundary (Appendix A). Based on this analysis the survey tows were stratified into three depth zones (54.864–100 m, 100–182.88 m and 182.88–548.64 m) for each INPFC area (Figure 2).

Two indices of abundance are available from this time series: a design-based estimator relying on the mean catch-per-unit-effort in each of several strata, and an index based on a Generalized Linear Mixed Model (GLMM) approach which was endorsed by the trawl survey workshop for use in west coast stock assessments. These two methods are based on fundamentally different approaches to interpreting the data. In the GLMM approach, vessel-specific differences in catchability (due to engine power, trawling experience of the skipper, etc.) are explicitly captured via inclusion of random effects. In contrast, the design-based estimator relies on the balance of the design (which may be difficult to assess, given that this balance must occur through random allocation of cells in quality habitat for the species of interest). Further, due to the presence of a large number of tows capturing none of a given species and a few tows showing very high catch rates, the design-based estimator may be very sensitive to one or a small number of very large tows. The GLMM approach explicitly models both the zero catches as well as allows for skewness in the distribution of catch rates through the use of a Gamma or lognormal error structure. These factors result in the GLMM approach being much more robust to a few large tows and likely more reflective of actual trends in population abundance.

When implementing the GLMM approach, it is recommended that there are at least three positive tows in each stratum/year combination. Since the Eureka Deep and Vancouver Deep strata had fewer than three observations in some years, the original stratification of five INPFC areas and three depth zones was collapsed. Because depth shows strong trends in catch rates and fish lengths, and catch rates are smaller in the Conception area, the five INPFC strata were collapsed into three areas by combining Vancouver with Columbia and Eureka with Monterey (Figure 2).

The biomass index based on both methods shows an increase up to the year 2005, peaking around 24 000 metric tons, followed by a steady decline to around 13 000 metric tons in 2008 (Table 5, Figure 7). The biomass by stratum, estimated from the GLMM, shows a decreasing trend in recent years for the middle and shallow depths (Figure 8).

Length bins from 12 to 62 cm in increments of 2 cm were used to summarize the length frequency of the survey catches in each year. Table 4 shows the number of lengths taken by the survey. The first bin includes all observations less than 14 cm and the last bin includes all fish larger than 62 cm. The length frequency distributions for the NWFSC survey from 2003-2008 generally show a strong cohort growing through 2005 and smaller fish in 2007 and 2008 (Figure 9). Age-frequency data from the NWFSC survey (Figure 10) were included in the model as conditional age-at-length distributions by sex and year. Individual length- and age-observations can be thought of as entries in an age-length key (matrix), with age across the columns and length down the rows. The approach consists of tabulating the sums within rows as the standard length-frequency distribution and, instead of also tabulating the sums to the age margin, instead the distribution of ages in each row of the age-length key is treated as a separate observation, conditioned on the row (length) from which it came. This approach has several benefits for analysis above the standard use of marginal age compositions. First, age structures are generally collected as a subset of the fish that have been measured. If the ages are to be used to create an external age-length key to transform the lengths to ages, then the uncertainty due to sampling and missing data in the key are not included in the resulting age-compositions used in the stock assessment. If the marginal age compositions are used with the length compositions in the assessment, the information content on sex-ratio and year class strength is largely double-counted as the same fish are contributing to likelihood components that are assumed to be independent. Using conditional age-distributions for each length bin allows only the additional information provided by the limited age data (relative to the generally far more numerous length observations) to be captured, without creating a ‘double-counting’ of the data in the total likelihood. The second major benefit of using conditional age-composition observations is that in addition to being able to estimate the basic growth parameters (L_{minAge}, L_{maxAge}, K) inside the assessment model, the distribution of lengths at a given age, governed by two parameters for the standard deviation of length at a young age and the standard deviation at an older age, are also quite reliably estimated. This information could only be derived from marginal age-composition observations where very strong and well-separated cohorts existed and where they were quite accurately aged and measured; rare conditions at best. By fully estimating the growth specifications within the stock assessment model, this major source of uncertainty is included in the assessment results, and bias due to size-based selectivity is avoided. Therefore, to retain objective weighting of the length and age data, and to fully include the uncertainty in growth parameters (and avoid potential bias due to external estimation where size-based selectivity is operating) conditional age-at-length compositions were developed using the NWFSC trawl survey age data.

Age distributions included bins from age 1 to age 17, with the last bin including all fish of greater age (Figure 9). Approximately 4,738 fish were sampled for age from more than 74% of the tows containing petrale sole, compared to 21,348 fish sampled for length (Table 4). These data show the growth trajectory of females reaching a maximum size near 56 cm and males reaching a maximum size of about 41 cm (Figure 11).

It is often useful to compute the marginal age-compositions to allow for easier visual tracking of strong cohorts (although this information is still imparted to the model using conditional age-at-length observations, it is harder to visualize) and offer a more familiar summary view of the data. The NWFSC age distributions show what is probably the strong 97-98 cohort ageing from years 2003 to 2007, with younger fish appearing in 2008 (Figure 10). The exception to this is the female composition in 2005, where only one female fish aged from the tow with the largest catch rate. The expansion of numbers to tow can greatly affect the marginal age distribution, but does not have as much affect on the conditional age-at-length data. This time series is short, and does not encompass the period when substantial reductions in the petrale sole population occurred, and so may be relatively uninformative in the assessment model, except for estimation of growth parameters.

2.1.2 Triennial trawl survey

The triennial shelf trawl survey conducted by NMFS starting in 1977 is the second source of fishery-independent data regarding the abundance of petrale sole (Dark and Wilkins 1994). The sampling methods used in the survey over the 21-year period are most recently described in Weinberg et al. (2002); the basic design was a series of equally spaced transects from which searches for tows in a specific depth range were initiated (Figure 12). In general, all of the surveys were conducted in the mid-summer through early fall: the survey in 1977 was conducted from early July through late September; the surveys from 1980 through 1989 ran from mid-July to late September; the survey in 1992 spanned from mid-July through early October; the survey in 1995 was conducted from early June to late August; the 1998 survey ran from early June through early August; and the 2001, 2004 surveys were conducted in May-July (Figure 13). Haul depths ranged from 91–457 m during the 1977 survey with no hauls shallower than 91 m. In all subsequent years the survey sampled depths from 55–366 m. Given the different depths surveyed during 1977 the results from the 1977 survey are not included in this assessment. Water hauls (Zimmermann et al., 2003) and tows located in Canadian and Mexican waters were also excluded for the analyses of this assessment. Also, the Conception area was removed from the analysis since it was not surveyed in the early years.

Similarly to the NWFSC trawl survey, petrale sole were encountered throughout the West Coast (Table 6, Figure 14). Larger catch rates were observed around depths of 100 m but no trend in catch rate was apparent over latitude, other than low catch rates in the Conception INPFC area which was only partially sampled (Figure 15). An analysis of the mean length by depth also showed evidence of an ontogenetic movement of petrale to deeper water (Figure 16) and the same depth stratification was used for the triennial survey (54.864–100 m, 100–182.88 m and 182.88–548.64 m).

Two indices of abundance are available from the Triennial trawl survey, one each from a design-based and a general linear mixed model (GLMM) based estimator. For the design-based approach, the catch-per-unit-effort (CPUE) index was created from the swept-area estimates of biomass (Gunderson and Sample 1980) using INPFC and depth as strata. To provide an adequate number of positive tows in the GLMM analysis, the two deeper strata were combined as well as the Monterey and Eureka INPFC areas and the Columbia and Vancouver INPFC areas. The estimated total biomass by stratum for each survey index is given in Table 5 and Figure 17. Both methods show a general increase in biomass from 1992 onwards and a very large increase in 2004.

Size distributions (fork length in cm) were calculated following the same procedures as the NWFSC survey. The numbers of fish and number of hauls represented in each year of the survey are presented in Table 6. The length frequency distributions generally show little trend, although there is evidence of small fish in 1992 and large fish in 2004 (Figure 18).

There are no petrale sole age data for the Triennial survey.

2.1.3 Other fishery independent data

A series of trawl surveys was conducted by the ODFW during 1971–74, the data from which are stored in the survey database at the Alaska Fishery Science Center (RACEBASE). However, the data from these surveys are not included in the assessment owing to their very limited temporal and spatial coverage.

2.2 Biological Data

The following section outlines a number of biological parameters estimated outside the assessment model from a variety of data sources.

2.2.1 Weight-Length

The weight-length relationship is based on the standard power function: $W = a\ (L^b)$ where W is weight in grams and L is length in centimeters. The parameters used are those used in both the 1999 and 2005 assessments (Sampson and Lee 1999; Lai et al. 2005). These assessments used length and weight data from ODFW (1971–86), WDFW market samples, and the ODFW flatfish surveys (1971–72; Demory et al., 1976) to estimate the following length-weight relationships for males, $W = 0.007168L^{3.1337}$, and females, $W = 0.003416L^{3.3462}$ (Figure 19). No new length and weight data have been collected since the mid-1980s so these length-weight relationships represent the most current information for west coast petrale sole. The previous analysis of the length-weight data did not show any temporal trends however it would be preferable to have more recent data.

More recent length weight parameters estimated for the British Columbia petrale sole suggest that petrale sole in British Columbia generally weigh less at a given size than petrale sole of the U.S. west coast (Starr and Fargo 2004).

2.2.2 Maturity and fecundity

Petrale sole maturity-at-length information is generally sparse in space and time, has not been collected in a systematic fashion across time, is of varying quality, and does not always agree between studies. It is possible that maturity may have changed over time. However, it is not possible to assess this quantitatively owing to differences in when historical samples on which maturity ogives could be based were taken, and how maturity stage (visual vs. histological) was determined. The 2005 petrale sole assessment used the most recent study for the west coast of the U.S. that was based on observations collected during 2002 from Oregon and Washington (Hannah et al. 2002). The maturity observations were fitted to a logistic model: $p_l - \frac{e^{B_0+B_l^1}}{1+e^{B_0+B_l^1}}$ where p_l is the proportion of natural fish at length *l*, and B_0 and B_1 are the regression coefficients. Parameter estimates from the Hannah et al. (2002) are: β_0= -24.593, β_1=0.743. The length at 50% maturity for females is 33.1 cm (Figure 19).

2.2.3 Natural Mortality

The instantaneous rate of natural mortality for a wild fish population is notoriously difficult to estimate. One accepted method is to examine the age distribution of an unexploited or lightly exploited stock. This method cannot readily be applied to petrale sole given the long history of exploitation off the US West Coast. Ketchen and Forrester (1966) estimated that the natural mortality coefficients were 0.18–0.26 yr^{-1} for males and 0.19–0.21 yr^{-1} for females based on a catch curve analysis of relatively early (1943–45) Washington trawl data from Swiftsure Bank, off the southwest corner of Vancouver Island. Starr and Fargo (2004) estimated the instantaneous rate of natural mortality (*M*) using Hoenig's method (Hoenig 1983): $\ln(M) = 1.44 - 0.984\ln(t_{\max})$ where *M* is natural mortality and t_{max} is the maximum age of petrale sole. *M* Values of 0.22 and 0.15 were estimated given maximum ages of 20 and 30 years, respectively. An archived set of commercial samples collected between the late 1950s and early 1980s from Northern California recently found that multiple samples were aged between 20-31 years old suggesting a similar range of M values for U.S. west coast petrale sole encompass a similar range. Past and current British Columbia and U.S. stock assessments assumed a value of *M* = 0.2 for both sexes.

2.2.4 Length at age

Sager and Summler (1982) summarize the growth of petrale sole in length using several growth functions. Female petrale sole can grow to 70 cm total length, with males being smaller. Petrale sole can live to at least 30 yrs, although more recent data show that few are aged to be older than 17 yrs. This information on growth is subject to error for two reasons: 1) growth determination is difficult because two ageing techniques (otolith surface and break-and-burn) were used in the past, and 2) the observed lengths of young fish may be positively biased due to gear selectivity. Pederson (1975) estimated growth parameters for several locations (see Table 6 of Turnock et al. (1993)). Sampson and Lee (1999) estimated the values of the parameters of the von Bertalanffy growth curve using data based on BB readings for petrale sole older than age 3, and ODFW survey observations (1970–74) for younger ages. In the 2005 stock assessment the mean-length-at-age data used to estimate parameters for the growth equation were obtained from the 2004 NMFS triennial survey. The empirical estimate of the CV of length at age in the 2004 survey, used in Lai et al. (2005), is 0.08, the same value that was used by Sampson and Lee (1999).

In the current, 2009 assessment, length at age was estimated inside the stock assessment model. Starting parameter values for the estimation were determined by fitting the von-Bertalanffy model ($L_i = L_\infty e^{(-k[t-t_0])}$) where L_i is length in cm at age *i*, *t* is age in years, *k* is the rate of increase in growth, t_0 is the intercept, and L_∞ is the maximum length to data from the 2003 - 2008 NWFSC survey (Figure 6).

2.2.5 Sex Ratios

Both the Triennial and NWFSC sex ratios for petrale sole are generally about 50% each males and females (Figure20). Canadian data from the most recent published stock assessment also suggests sex ratios of petrale sole in British Columbia are generally 50% males, 50% females (Starr and Fargo 2004).

2.2.6 Ageing Precision and Bias

Historically petrale sole have been aged using the otolith surface ageing technique by all three state agencies that provide age data (WA, OR, and CA). At some point during the 1980s the Oregon and Washington protocols for ageing petrale sole were: i) surface readings for all males, ii) surface readings for females up to age 10, and iii) BB readings for any females that appeared to be older than 10 years (Lai et al. 2005). However, age readers often failed to track gender, resulting the break and burn ages for males and females (Bob Hannah, ODFW, pers. comm.). Otoliths that were difficult to read and appeared older were also broken and burned, resulting in break and burn ages for fish younger than age 7 (Bob Hannah, ODFW, pers. comm.). The Cooperative Aging Project (between the Oregon and NMFS) formed in 1996 and started aging petrale sole for the 1999 stock assessment. During 1999, otolith samples collected by ODFW between 1981 and 1999 were aged by three different age readers in the Cooperative Ageing Lab (CAP) in Newport, Oregon using a combination of surface and break-and-burn (BB) techniques. The samples were not randomly distributed between age readers, that is, one reader aged all females, one reader aged primarily males (and some females), and one reader read both. Furthermore, while two of the age readers produced surface ages one age reader was using a 'combination' ageing method where otoliths that appeared to be younger than about 10 years were surface aged and those that appeared older were broken and burned. The multitude of problems with the age data for Oregon resulted in most of these data being removed from the 2005 northern area stock assessment during the STAR panel review (Lai et al. 2005). Oregon otoliths aged for the 2005 stock assessment were solely surface aged. The Washington Department of Fish and Wildlife (WDFW) continue to use the 'combination' ageing method for all commercial otolith samples.

An unpublished study in 1981–82 by W. Barss (ODFW, Newport) indicated that ages based on otolith surface readings are biased relative to ages based on break-and-burn readings for male petrale sole, with significant under-aging for males older than about 10 years. However, the same study suggested that ages based on surface and break-and-burn (BB) readings were similar for females. Turnock et al. (1993) reported differences between ages based on surface and break-and-burn readings for males and also argued that there was no apparent bias for females. This unpublished information informed the ageing error used in the 1993 and 1999 assessments (Turnock et al., 1993; Sampson and Lee, 1999). However, given the variety of ageing protocols for petrale sole the results from early ageing bias and precision studies need to be revisited.

More recent comparisons of surface and BB readings were conducted by the CAP laboratory as well as comparisons of the 'combination' and break and burn methods by the WDFW for the 2005 petrale sole stock assessment. Lai et al. (2005) concluded that CAP ages based on surface readings are younger than those based on BB readings, but the differences were not statistically significant. However, the results of the CAP study are not consistent with those from the WDFW data analyzed by Lai et al. (2005). Nevertheless, both data sets suggested that the differences in age estimates between the surface and break and burn techniques are smaller than implied by the ageing error matrix reported by Turnock et al. (1993). The September 2005 STAR Panel discussed the ageing error matrices used in the 2005 stock assessment and the implied ageing error coefficients of variation. It was concluded that the current ageing error matrices are not informative and should be used with caution because the ageing method is not standardized between agencies.

Oregon commercial samples from 2000 to 2004 and a limited number of the 2004 NWFSC survey otoliths were exclusively surface aged for the 2005 stock assessment. For the current assessment Oregon commercial samples from 2007-2008 and the 2003 and 2005-2008 NWFSC survey otoliths were aged using the break and burn method for most fish except those young fish for which they feel only need to be surface aged (generally age 0-3 year olds that are very clear) (pers comm. P. MacDonald). It is common procedure for the CAP lab to surface read young fish with clear otoliths, no matter the species. Otolith samples from the 2004 survey that were not aged for the 2005 assessment were aged using the surface read method to complete the age composition previously partially completed for the 2005 assessment.

In order to conduct a comprehensive estimation of ageing bias and imprecision this assessment has compiled and analyzed all of the available double-read data from the state of Oregon, the CAP, and the WDFW, as well as unpublished information from a bomb radiocarbon age validation study for petrale sole off the U.S. west coast (Table 7) (Haltuch et al. in prep). For the current analysis, all sources of ageing information were revisited both through inspection of the various cross- and double-read efforts as well as through simultaneous estimation of bias and imprecision for all studies in a rigorous statistical framework programmed in AD Model Builder (Otter Research Ltd. 2005) by A. Punt, University of Washington (Punt et al. 2008). This program estimates the underlying age distribution of a sample from up to four double- or cross-reads for each age structure, and can do this for multiple samples simultaneously. The most important assumption of the estimation technique is that at least one ageing method must be unbiased, so it is therefore not an age-validation. Functional forms can be explored for each method for both the bias (none, linear, type 2) and the imprecision (constant CV, or type 2 increase in CV with age). Because the technique requires that the underlying age structure of each sample be estimated, a reasonably large quantity of data spread over the entire range of ages present in the sample is needed (Punt et al. 2008). A few very old ages do not contribute appreciable information but require many more parameters in the underlying model and create instability during estimation. For this reason, each analysis must be truncated at a maximum age that is reasonably well represented in all samples.

Results from the bomb radiocarbon study shows that age reader #1 break and burn ages are unbiased (Figure 22). Therefore these ages are used as the unbiased 'radiocarbon' ages in the analysis. Sex information is available for some, but not all, of the double read samples. In order to increase the power of the analysis and reduce the total number of data sets in the analysis double-read samples are pooled over age reader and sex. It is important to compress the data down into the fewest number of data sets in each analysis because this reduces the number of age compositions that need to be estimated (these are essentially nuisance parameters). Table 7 shows the double-read data collected by agency and ageing method. Tables 8a-c shows the structure of the analysis as well as which estimates of ageing bias and imprecision are used in the stock assessment. Data sets with triple and quadruple reads were treated as double reads since the ageing error program handles multiple data sets with double read information better than data sets with triple reads. The model cannot deal with quadruple reads. Tables 9a-c show the different models fit to each data set as well as the likelihoods, the model with the best fit model is highlighted. A variety of models were explored for each dataset (Tables 9a-c). The analysis of the CAP data found that both the bias and standard deviation are linear for both the break and burn and surface read age methods (Table 9a). Linear bias and standard deviation were also chosen for the CAP combo method as the modeling found a strong trade off between fitting bias as a type 2 function and fitting the standard deviation as increasing with age (Table 9b). When the bias was modeled as nonlinear, the estimate of bias at older ages was unreasonably large and when the standard deviation was modeled as an increase in CV with age, the CV was unreasonable large (Table 9b). None of these models converged. The only model that fit the WDFW dataset found that the bias follows a type 2 function and that the standard deviation is linear (Table 9c).

Generally, all of the ageing methods applied to petrale sole are negatively biased (under ageing), particularly for older ages (Table 10, Figure 23). The CAP break-and-burn ages show the least bias, about 0.5 years. The CAP combo method is only slightly more biased (generally less that one year for ages less than 30) than the break-and-burn method, followed by the Oregon surface ages (1-2 years) (Table 10, Figure 23). The WDFW combination method was the most biased, over-ageing fish less than five years and under ageing fish older than 7 years by 1-2 years (Table 10, Figure 23). The estimated standard deviations for combo-age methods were largest, followed by the break-and-burn method, with the surface method being the least variable (Table 10, Figure 23).

2.2.7 Research removals

Catches of petrale sole for research purposes are very small in comparison to the trawl fishery catches and are therefore included in the total catches.

2.3 Fishery Dependent Data

2.3.1 Historical Catch Reconstruction

The 2005 stock assessment reconstructed the historical removals to more realistically reflect both the cumulative removals that have occurred from the coast-wide petrale sole population as well as to capture the variability during the time series (Lai et al. 2005). Recently new catch data have been provided by the NWFSC, CDFW and WDFW for some years previously reconstructed by Lai et al. (2005). These new catch data represent the best catch reconstructions available and are noted in the description of data sources (Table 1, Figure 1). See Appendix B for a comparison between the 2005 and 2009 catch histories. The catches used in this assessment begin in 1916 with the commercial landings data obtained from the following sources:

i) The PacFIN database (1981–2004);

ii) The Pacific Marine Fisheries Commission (PMFC) Data Series for 1956-1980 (PMFC, 1979) for Washington and Oregon. A comprehensive set of these data were not available for the 2005 stock assessment. The paper document was key punched after the 2007 round of assessments and is generally accepted as the best data currently available for catches during this period. The only exception to this is for the state of California, which has completed a comprehensive catch reconstruction for this period (pers comm. D. Pearson).

iii) State of California catch reconstruction extending from 1931-1980 (pers comm. D. Pearson). CDFG Fish Bulletins for 1916–1930 catches (Heimann and Carlisle, 1970) as reconstructed by Lai et al. (2005). The California fishery began in 1876 but no catch data are available from 1876-1915. Therefore a linear interpolation between catches of 1 ton in 1876 and the catches recorded for 1916 are used to filling this period. Lai et al. (2005) found that this early assumed increase in the petrale sole fishery did not impact the model;

iv) Oregon Fish Commission publications for 1943–1949 catches (Cleaver, 1951) and for 1950–1953 catches (Smith, 1956) as reconstructed by Lai et al. (2005);

v) WDFW catch reconstruction for 1935 (ref), 1939 and 1949– 1969 (pers. comm. T. Tsou and G. Lippert). These catches from WDFW are much larger than the catches used for Washington in the 2005 (Lai et al. 2005) stock assessment. Therefore catches for the early years that have not yet been reconstructed by WDFW are filled in by interpolating between the years with catch data;

Changes to the historical reconstruction from 1916 through 1980 are due to the digitizing of the Pacific Marine Fisheries Commission (PMFC) Data Series (PMFC, 1979) as well as the states individual efforts to provide better catch data. Catch data from 1981 – 2008 have been extracted from PacFIN as updates and corrections to the PacFIN database can cause small changes to this portion of the catch history. Monthly data are mostly unavailable for the early petrale fisheries. If monthly landings data were not available all landings are assumed to be from the summer fishery because it is likely that most of the fleets operating early in the development of the fishery did not fish in deep water during winter. All catches are compiled by the fishing year and use the PFMC regions. The Washington fleet includes catches from PSMFC areas 3A, 3B and 3S. The Oregon fleet includes catches from PSMFC areas 2A, 2B, and 2C. The California fleet includes catches from PSMFC areas 1A, 1B, and 1C.

Although they are not used in this assessment, the Canadian landings of petrale sole can be found in Starr and Fargo (2004).

2.3.2 Recent Landings (1981 to present)

Commercial landings estimates of petrale sole from 1981 to 2008 were generated from the PacFIN database (Extraction: March, 2009). Annual catches as used in the model are summarized by state in Table 1 and Figure 1. The landings of petrale sole by gear types other than groundfish-trawl have been inconsequential, averaging < 2% of the coastwide landings during 1981–89. The non-trawl landings are included in the trawl landings but the catches do not include discarded petrale sole (Table 11).

The post-World War II period witnessed a steady decline in the amount and proportion of annual catches occurring during the summer months (March-October). Conversely, petrale catch during the winter season (November–February), when the fishery targets spawning aggregations, has exhibited a steadily increasing trend since the 1940's. In the past few decades there has been a distinct seasonality in petrale sole landings that corresponds to the targeting of spawning aggregations during winter. Due to the seasonal harvesting pattern this assessment, similarly to previous assessments, separates the landings into two time periods: winter (November-February) and summer (March–October). The landings are divided into six fisheries (Table 3) based on the fleets from the states of Washington, Oregon, and California. The six fleets are Washington-Winter, Washington-Summer, Oregon-Winter, Oregon-Summer, California-Winter and California-Summer.

2.3.3 Discards

The catch statistics in Table 1 do not include discards. Prior to the 2001 implementation of the Northwest Fishery Science Center West Coast Groundfish Observer Program (NWFSC WCGOP) data on fishery discard for petrale sole was sparse and of mostly questionable quality. While several historical studies report discard estimates, in most cases the original data and estimation methods, which likely vary between studies, are not reported.

A limited 1950 study of Astoria, Oregon based trawlers estimated that 32.5% of the "number" of the petrale sole caught were discarded (Harry 1956). However, the details of the data collection as well as the original data are missing so this value is not used in the assessment. A 1977–81 study reported annual discard factors for the U.S Vancouver and Columbia INPFC areas (total catch weight / retained catch) that ranged from 1.1 to 1.4 with an average value of 1.21, or 17% by total catch weight was discarded (Demory 1984). However, Demory (1984) did not provide the data used to derive the discard factor, $f = 1 + Discard/Retained$, from which the discard rate is derived. Therefore the Demory measures of discard are not used. Scofield (1948) reported that 20–25% of the catches of sole in California were discarded during the 1940s and 1950s, but no specific date, data sources, or analyses were reported, so this value is not used in the assessment. Data collected by Pikitch et al. (1988) off the Oregon coast during 1986-1987 inform discard rates for the Oregon fisheries and were analyzed by Sampson and Lee (1999), producing a discard rate of 8.8%. These more recent Pikitch (1988) discard estimates are used as discard fraction in the Oregon fishery.

Discard observations for the trawl fleet from the WCGOP provide yearly discard rates and average weight of the discard based on at-sea observer data for 2002-2008 (2008 includes winter only, as summer data are not yet avaliable) (pers. comm. E. Heery) (Table 11, Figure 24). Recently the collection of length data for petrale sole has begun, providing length compositions of the discard for 2006-2007 and summer 2008 (Figures 25-27). These length compositions are used to estimate the retention curves for each of the fleets.

Several studies have reported retention curves for petrale sole. TenEyck and Demory (1975) reported that the age-at-50%-retention is 5.6 years for male petrale sole and 5.1 years for females, equivalent to a 30 cm length-at-50%-retention. Turnock et al. (1993) estimated a logistic length-retention curve using the unpublished data collected during a mesh-size study (Wallace et al., 1996), and reported that the length-at-50%-retention was 21.3 cm. Sampson and Lee (1999) estimated the length-at-50%-retention to be 28.6 cm for males and 29.5 cm for females, based on unpublished data from the discard study by Pikitch et al. (1988).

2.3.4 Foreign Catches

The impact of catches of petrale sole by foreign fishing fleets prior to the institution of the exclusive economic zone (EEZ) of the U.S. west coast are currently not quantified and remains an area for research.

2.3.5 Fishery Logbooks

Sampson and Lee (1999) used commercial logbook data from PacFIN to construct a delta GLM based standardized CPUE indices of abundance for the Oregon fleets from 1987-1997. This index was also used in the 2005 northern area stock assessment (Lai et al. 2005). The logbook data for the years prior to 1987 were not included because information on location is not available for these data. Beginning in 1998 the west coast groundfish fishery was impacted by a series of regulatory changes that make the generation of a standardized CPUE index in the stock assessment unreliable.

Lai et al. (2005) produced delta GLM-based indices of abundance for the 2005 southern area assessment using data filtered in a similar manner to Sampson and Lee (1999). However the southern area CPUE indices used more vessels that had been in the fishery a relatively short amount of time and extended the index to 2004, well beyond the time where regulatory changes began to restrict the groundfish fishery. These problems were noted during the 2005 STAR panel review.

This assessment uses only the CPUE indices of abundance from Sampson and Lee (1999) (Figure 28) for the reasons noted above. Additional indices for the winter fleets were not analyzed due to concerns regarding the potential for hyper-stability in winter catch rates due to the targeting of spawning aggregations. However plots of raw CPUE (lbs/hour) for all fleets were calculated for comparison with the fishery independent NWFSC survey index (Figure 29). The downturn in the NWFSC survey index (from the summer season) during the last three years is also apparent in the raw CPUE from the summer fisheries (Figure 29).

2.3.6 Fishery Biological Sampling

Commercial landings and the biological characteristics of these landings were not consistently sampled for scientific purposes until the mid-1950s. Statewide sampling of landed catches began in 1955 in Washington, 1966 in Oregon, and sporadically in 1948 in California. The first rigorous monitoring programs that included routine collection of biological data (e.g., sex, age, size, maturity, etc.) began in 1980. Currently, port biologists employed by each state fishery agency (California Department Fish and Game, Oregon Department of Fish and Wildlife - ODFW, and Washington Department of Fish and Wildlife - WDFW) collect species-composition information and biological data from the landed catches of commercial trawling vessels. The sampling sites are commonly processing facilities located at ports in California, Oregon and Washington. The monitoring programs currently in place vary between the states but are generally based on stratified, multistage sampling designs.

The PacFIN BDS database contains data from ODFW (1966–2008) and WDFW (1955–2008), but only 2001–2008 data from CDFG. The CDFG dataset for the years prior to 2000 was extracted and provided from CALCOM by Brenda Erwin (CDFG). Demory and Bailey (1967) provide length compositions for the Columbia INPFC area for 1949–51, 1960, and 1963–65. However no information is provided on the total size of the landings or sampling protocol, making it impossible to expand the raw length data. Therefore, the Demory and Bailey (1967) data are not used in the current assessment.

Commercial length-frequency distributions based on the fishing year were developed for each fleet for which observations were available, following the same bin structure as was used for research observations (Table 12). For each fleet, the raw observations (compiled from the PacFIN and CalCOM databases) were expanded to the sample level, to allow for any fish that were not measured, then to the trip level to account for the relative size of the landing from which the sample was obtained. The commercial composition data were summarized by PSMFC strata (Figure 2) since this is the finest resolution for which the data are available. The expanded length observations were then expanded by the catches in each PSMFC strata and combined within years for each fleet. Age frequencies were computed in the same manner. Length and age data collected from commercial landings for each fleet are summarized by the number of samples and the number of fish measured (Tables 12-13). Figures 30-35 show plots of the length and age composition data.

2.4 History of Modeling Approaches

2.4.1 Previous assessments

United States

Early stock assessments only assessed petrale sole in the combined U.S. Vancouver and Columbia INPFC areas, i.e. petrale in these areas were treated as a unit stock, using time series of data that began during the 1970s (Demory 1984, Turnock et al. 1993). The first assessment used stock reduction analysis and the second assessment used the length-based Stock Synthesis model (Methot 1989). The third petrale sole assessment utilized the hybrid length-and-age-based Stock Synthesis 1 model using data from 1977–1998 (Sampson and Lee 1999). During the 1999 stock assessment an attempt was made to include separate area assessments for the Eureka and

Monterey INPFC areas but acceptable models could not be configured due to a lack of data (Sampson and Lee 1999).

The previous, 2005, petrale sole assessment was conducted as two separate stocks, the northern stock encompassing the U.S. Vancouver and Columbia INPFC areas and the southern stock including the Eureka, Monterey and Conception INPFC areas, using Stock Synthesis 2, a length-age structured model (Methot 2000). Both the northern and southern area models defined the fishing year as beginning on November 1 and ending on October 31 with a winter fishery including November–February and a summer fishery from March–October. Catches prior to 1957 were assumed to be taken during the summer season when monthly data were not available to split the historical catches seasonally. The complete catch history was reconstructed for petrale sole for the 2005 stock assessment, leading the northern area model to start in 1910 and the southern area model in 1876.

Canada

Ketchen and Forrester (1966) conducted the first assessment of petrale sole off British Columbia. A recent series of petrale sole assessments in Canadian waters were conducted by Tyler and Fargo (1990), Fargo (1997, 1999), Fargo et al. (2000), Starr and Fargo (2004), and Starr (pers. comm.). The 2004 stock assessment of petrale sole was based on three areas: the west coast of Vancouver Island, Queen Charlotte Sound, and Hecate Strait (Starr and Fargo, 2004). In the most recent 2006 assessment in British Columbia petrale sole are assessed using a single area, combined sex, delay-difference stock assessment model with knife edge recruitment (at 6 or 7 years old). The model is tuned to fishery CPUE, mean fish weight of the commercial landings, and a number of fishery independent surveys beginning in the early 1980s (pers. comm., P. Starr). Stock predictions are based on average recruitment (pers. comm., P. Starr).

2.4.2 GAP and GMT input

The GMT representative on the petrale sole STAR panel has compiled a history of regulatory actions that impacted the petrale sole fishery, and more generally the groundfish fishery (Appendix D). The GAP representative provided ancillary information on the comparative catches of petrale sole by the fishery, indicating that during the 1980s catch rates were very poor but that recently catch rates have much improved (pers comm. B. Pettinger). The GAP representative as well as members of the fleet present at the STAR panel provided invaluable information regarding the history of the fishery and the impact of management regulations on fleet behavior.

2.4.3 Response to the review panel recommendations in 2005

Both the 1999 and 2005 STAR panel reports called for increased collection of biological data for petrale sole. Although the biological data collection has generally improved one notable, gap is the lack of recent age data from the California fleets, the most data poor fleet in the assessment. This is of particular concern because total landings of petrale sole from California waters during the past two years have surpassed those of Washington and Oregon.

The STAR and “Follow-up” panel reports from 2005 outlined a number of research and modeling recommendations. The current assessment has addressed as many of these recommendations as possible and substantial progress, as outlined below, has been made on most of them.

1. The Panel noted that the petrale sole stock trends were similar in both northern and southern areas, in spite of the different modeling choices made for each area, and that a single coast-wide assessment should be considered. This assessment treats petrale sole as a single coast-wide stock.

2. In the 2005 southern area assessment there was not enough discard data to estimate retention curves. There was also an indication that the discard data were interacting in a pathological way with the age- and length-composition data. The group discussed at length approaches to correct this problem and noted that it would be preferable in this case to assume the discard rates based on limited observations and inflate the landings to reflect this level to eliminate the spurious interactions between the retention curve estimates and fits to length and age compositions. A simple assumption of a constant percent discard was agreed to by the Panel and STAT team, primarily because of concerns about the reliability of historical discard estimates. This relatively crude approach assumes that discard and landed catch have the same length distribution, but it is likely that discard is primarily market (i.e., size) based. Therefore a retention curve was not estimated in the final southern area model. This is no longer an issue in the current assessment as the model is able to fit both discard fractions, mean weight of the discards, and the discard length compositions available for each fleet as well as estimate retention curves for each fleet.

3. The panel requested plots investigating changes in sex ratio over time. The current assessment has produced these plots. There is no indication of changes in sex ratio over time in the recent survey data. The fishery data show a somewhat higher proportion of females to males, as might be expected given dimorphic growth and winter fisheries that target spawning aggregations.

4. A large proportion of the discussion focused on aging bias and imprecision for the various ageing methods applied to petrale sole otoliths. The panel found no data for specifying whether the CV should be equal to 0.06 or 0.12 (the options that were considered) and recommended instead using as an approximation the vector of standard deviations used from the surface-ageing method (where data were available). The ageing-errors for the break-and-burn age data were also based on surface age data. There were also apparent shifts in ageing criteria that were causing poor model fits in the northern area assessment which caused the STAR panel to recommend removing all age composition data from the stock assessment. A bomb radiocarbon age validation study was designed and carried out for petrale sole and all available double read information for each ageing method applied to petrale sole otoliths was compiled. All of these data were used to estimate the ageing bias and precision for each of the ageing methods used in the current petrale sole stock assessment. There are no longer strong conflicts between the age data and other data sources.

5. The STAR panel discussed the possibility for differential natural mortality for males and females. Based on Beverton (1992) a flatfish species with similar longevity as petrale sole had values for female M ranging from 0.17 to 0.25 per year and values for male M ranging from 0.2 to 0.3. The Panel therefore suggested doing a sensitivity run with female M specified at 0.2 (the default value, which will provide some consistency in female spawning biomass in the base-case configuration) and setting the natural mortality for males at a value of 0.25. The rationale for this sensitivity analysis is to improve the interpretation of the highly domed-shaped selectivity curves currently estimated for males in virtually all model runs. The current assessment is able to estimate the values of M for both females and males.

6. A number of age-structures were collected during the NWFSC survey but were not aged. These structures have been aged for the current assessment.

7. The 2005 STAR panel expressed general concern regarding possible changes in growth over time and suggested that spatial and/or temporal factors impacting growth should be investigated. Time-invariant growth is well estimated in the current assessment. Investigations into including time varying growth in the assessment model suggest that the data available do not strongly support time-varying growth.

8. The STAR panel was concerned that discard practices may have changed in recent years and that data are limited on where and when this may have occurred. The panel suggested that information on the size composition of discards should be collected and analyzed from the groundfish observer program. The current assessment has two years of length composition data from the WCGOP for each of the fleets in the model. There is a general lack of reliable historical discard data.

9. There was concern that the CPUE data used in the southern area GLM analysis may have been affected by changes in regulations during the recent period. It was also suggested that future GLM analysis of CPUE be based on a finer spatial scale and that a greater level of vessel standardization should be done. The southern area model CPUE has been removed from this analysis. Only the CPUE data from Sampson and Lee (1999) were used in the current assessment.

10. In comparison to previous assessments of petrale sole, this assessment represents a significant change in our perception of petrale sole stock status. For example, in the 1999 assessment, spawning biomass stock biomass in 1998 was estimated to be at 39% of unfished stock biomass. The current assessment now estimates biomass in 1998 to have been at 12% of unfished stock biomass (northern area). An extended period of low stock abundance followed by a rapid increase was a consistent feature of model results regardless of geographic area, model configuration, or selection of input data. Nevertheless, this pattern of extreme stock dynamics is difficult to reconcile with the long-term stability of the petrale sole fishery, and the Panel recommends exploration of this issue in future assessments. The catch history for petrale shows peak catches in 1950 followed by a general decline in total catches through the

1980s, low catches through the 1990s, and a small increase in subsequent years. This is generally consistent with the trend in biomass estimated by the stock assessment model and suggests that historically the fishery is not as stable as it first appears, particularly considering the offshore movement of the fishery to focusing on winter spawning aggregations during the 1980s. The difference between the 1999 and more recent 2005 and 2009 stock assessments is also a classic case of shifting baselines since the catch history used in the 1999 assessment started in 1977 and the catch history used in the 2005 stock assessment started in 1876. Figure 36 shows comparisons of each of the stock assessment models estimates of spawning biomass and stock depletion.

11. Concerns regarding limited data for California in comparison to Washington and Oregon remain an issue. Although collection of length data for petrale sole in Californiahas increased, no recent age data are available.

2.5 Model Description

2.5.1 Link from the 2005 to current assessment model

Based on the results of the 2005 stock assessment (Lai et al. 2005) and recommendations from the STAR panel reviews, the current stock assessment for petrale sole is implemented as a single area model. This is because the rather complicated modeling of multiple fisheries with dome-shaped selectivity patterns using sex-specific age data from different agencies caused model convergence to be slow and erratic. Thse problems suggest that the 2005 models may have been over parameterized given the quality and quantity of the available data. The current assessment has been upgraded to the newest version of SS. The data inputs have been rebuilt for a coastwide assessment and reflect the best information currently available. A thorough description of the 2009 assessment model is presented separately below; this section linking the two models is intended only to more clearly identify where substantive changes were made.

The 2005 northern area model removed all of the age data due to problems with shifts in ageing criteria for an uncertain period of time. This problem has been addressed in the best manner possible, and all of the age data from the northern area are now included in the assessment. A new analysis has provided ageing-error estimates of bias and standard deviations for each ageing method applied to petrale otoliths. The NWFSC survey was not included in the 2005 assessment since time series was not long enough to be informative. There are now six years of data from the NWFSC survey that provides a biomass index, length compositions, and conditional age-at-length data that are introduced in this 2009 assessment. Because of the use of conditional age data in place of marginal age-frequency distributions the parameters describing the distribution of length at a given age were freely estimable. The discard data from the WCGOP, that were not included in the 2005 assessment are used directly in this 2009 stock assessment. The catch history for petrale sole has also been updated, resulting in generally higher landings during the early part of the fishery.

2.5.2 Summary of data for fleets and areas

Fishery removals were divided among 6 fleets: 1) winter Washington trawl, 2) summer Washington trawl, 3) winter Oregon trawl, 4) summer Oregon trawl, 5) winter California trawl, and 6) summer California trawl. The landings for the Washington fleet are defined as those fish caught in PSMFC areas 3A (a small portion of northern Oregon is included in area 3A), 3B and 3S. The landings for the Oregon fleet are defined as those fish caught in PSMFC area 2A, 2B, and 2C. The landings for the California fleet are defined as those fish caught in PSFMC area 1A, 1B, and 1C. Removals associated with research projects (the trawl surveys, and other much smaller sources of permitted mortality due to scientific research) are very small and are included in the trawl fishery removal. The data available for each fleet are described in Table 2.

2.5.3 Modeling software

This assessment used the Stock Synthesis 3 modeling framework written by Dr. Richard Methot at the NWFSC. The most recent version (SS-V3.02E) was used, since it included many improvements and corrections to older versions (Methot 2007).

2.5.4 Sample Weighting

Indices of relative abundance all had variance estimates generated as part of the analysis of raw catch data. These variances are converted to standard deviations in log space (as is required by SSv3) for use in the model, no iterative re-weighting is done for the abundance indices. Initial input sample size for compositional data was based on a method developed by I. Stewart and S. Miller, as part of the data and modeling workshop in 2006 (see background materials). Briefly, this method was based on analysis of the input and model-derived effective sample sizes from stock assessments completed in 2005 for west coast groundfish. It makes the input sample size a function of both the number of fish sampled and the number of trips or hauls sampled. A piece-wise linear regression was used to estimate the increase in effective sample size per sample based on fish-per-sample and the maximum effective sample size for large numbers of individual fish. These values are likely to represent a reasonable starting point that generally reflects the degree of observation error commensurate with sampling a given number of fish from a given number of samples.

This assessment follows the iterative re-weighting approach to developing consistency between the input composition sample sizes (or standard errors) and the effective sample sizes based on model fit. This approach attempts to reduce the potential for particular data sources to have a disproportionate effect on total model fit, while creating estimates of uncertainty that are commensurate with the uncertainty inherent in the input data. Iterative re-weighting was applied to the length and age data from the survey and all fleets. This consisted of comparing the mean input sample size for compositional data with the mean effective sample size based on model fit. Where the input sample size was greater, this implied the model was unable to fit the data in a manner that was consistent with the level of variability expected in the data and so a multiplicative scalar was used to reduce the input sample size for all length- or age-composition samples for that fleet accordingly.

A second weighting issue arises when both length and age data are included from the same individual fish and samples. In this case, it is theoretically appealing to treat the age data as conditional to the length observations (as described above) and avoid duplication of the information content. This is the approach taken for survey data. However, due to the technical constraints described above (very long run times), this approach was not feasible for all of the commercial sampling in this assessment at this time. Instead the approach taken is to use the lambda values (emphasis; a direct multiplier on the likelihood component) reducing the lambdas to 0.5 for length and age data from a given fleet where both types of data are available. This is consistent with many other west coast groundfish assessments.

The value of σ_R was determined using an iterative procedure to ensure that the value of σ_R assumed by the assessment model and the empirical variance in recruitment were self-consistent. This involved setting σ_R to an initial value, fitting the model and calculating the variance of the recruitment deviations for the years for which recruitments are estimated in the model (1959–2005), replacing the assumed value of σ_R by the calculated value, and repeating the process until convergence occurred. Very little iterative reweighting was necessary for σ_R.

2.5.5 Priors

Priors were not applied to most estimated parameters in the base case model. Only natural mortality has a normally distributed prior with a mean of 0.2 and a standard deviation of 0.025 for females with males estimated as an offset from females. The parameter bounds are sufficiently wide to avoid truncating the searching procedure during maximum likelihood estimation.

2.5.6 General model specifications

Stock synthesis has a broad suite of structural options available for each application. Where possible, the 'default' or most commonly used approaches are applied to this stock assessment. The assessment is sex-specific, including separate growth curves and estimated for natural mortality for males and females, and therefore tracking the spawning biomass of only females for use in calculating management quantities.

For the internal population dynamics, ages 0-40 are individually tracked, with the accumulator age of 40 determining when the 'plus-group' calculations are applied. As there is little growth occurring at this age, and the data are accumulated at age 17, this should be a robust choice (there needs to be enough space between the data 'plus-group' and that of the dynamics to avoid ageing error moving very old fish into observations of younger ages where this is unwarranted).

There are no explicit areas structuring the modeled dynamics of this assessment. Seasons and fleets based on landings in each state are used to structure catches. Since the time-series of catches starts in 1876 the stock is assumed to be in equilibrium at the beginning of the modeled period. The sex-ratio at birth is fixed at 1:1, although by allowing increased natural mortality on males, size-based selectivity, and dimorphic growth the sex ratio can vary appreciably due to differential mortality by age and sex.

2.5.7 Estimated and fixed parameters

A full list of all estimated parameters and values of key parameters that are fixed is provided in Table 14. Time-invariant sex-specific growth is fully estimated in this assessment with the length at age 1 assumed to be equal for males and females. The log of the unexploited recruitment level for the Beverton-Holt stock-recruit function is treated as an estimated parameter. Recruitment deviations are estimated for each year of the period informed by the data (1939-2005) based on evaluation of the variance of the early deviations. This approach may underestimate uncertainty in recruitment variability (and therefore derived quantities like spawning biomass) in the early years of the model. However, it provides for an efficient maximum likelihood minimization and reduces unwarranted patterns in early deviations. Asymptotic selectivity is used for both the triennial and NWFSC surveys and for all fishing fleets in the base case model. Selectivity for the fishing fleets is modeled as time-varying using either four or five time blocks (Table 15). The catchability parameters are not directly estimated, but are set as scaling factors such that the estimate is median unbiased, which is comparable to the way q was treated in the 2005 stock assessment.

2.6 Model Selection and Evaluation

2.6.1 Key assumptions and structural choices

All structural choices for stock assessment models are likely to be important under some circumstances. In this assessment these choices are generally made to 1) be as objective as possible, 2) follow generally accepted methods of approaching similar models and data and 3) address the previous STAR and Follow-up panel concerns. The relative effect on assessment results of each of these choices is often unknown; however an effort is made to explore alternate choices through sensitivity analysis.

Major choices in the structuring of this stock assessment model include a coastwide model with seasonal fleet structure for each state, splitting the triennial survey into an early and late time period, and estimates selectivity and retention curves for each fleet.

2.6.2 Alternate models explored

Many variations on the base case model were explored during this analysis; only the most relevant and recent are reported in this document. Many of these are reported as sensitivity and retrospective analyses. Many of these types of runs are described below.

Both prior to and during the STAR panel, detailed exploration was made to evaluate:

1. time varying selectivity
2. time varying growth
3. estimation of natural mortality

4. estimation of the stock-recruitment steepness
5. tuning of composition sample sizes
6. the period over which recruitment deviations are estimated
7. asymptotic versus dome shaped selectivity curves for all fishing fleets and surveys
8. the tuning of recruitment variability
9. values for the NWFSC survey q
10. data sources that have been added since the 2005 assessment including, Oregon and Washington ages, discard data, and the NWFSC survey.
11. splitting of the trienneial survey into two time periods
12. commercial age data
13. the 2005 catch history

2.6.3 Convergence status

Convergence testing through use of over dispersed starting values often requires very extreme values to actually explore new areas of the multivariate likelihood surface. For this reason, a good target for convergence testing is to 'jitter' or randomly adjust starting values between reasonable upper and lower bounds by a factor that produces low (~20-40%) rates of successful model estimation. When too much over-dispersion is included the approach is very inefficient, when too little, other minima are unlikely to be identified. Jitter is an SSv3 option which allows the generation of a uniform random number equal to the product of the input value and the range between upper and lower parameter bounds for each parameter. These random numbers are then added to initial parameter values in the input files and the model minimization started at these new conditions.

Poor behavior may be primarily due to multivariate parameter correlation and 'ridges' in the likelihood surface making the search difficult. Further, conflicting signal from various data sources can cause shifts that yield very similar results, but with different combinations of parameters or values for specific likelihood components. This exercise was repeated for the final base-case model and none of these trials found a different global minimum. These results, in conjunction with other convergence checks, indicate that it is likely that the base case model result represents the global minimum.

2.7 Response to STAR panel recommendations

During the STAR panel review auxiliary analyses were performed to explore data sources, better understand model performance, and to identify a single base case model on which both the STAT and STAR panel were in agreement. Areas identified for future research include:

1. The completion of comprehensive catch reconstructions currently underway by Washington and Oregon.
2. Gaining a better understanding of the mixing of U.S. and Canadian catches, particularly for the historical catches for the Washington fleet.

3. Investigating simpler, less structured, models including statistical catch/length models for comparing and contrasting purposes.
4. Expand stock assessment area to include Canadian waters to cover the actual biological range.
5. Expansion of the survey area insore of the since the abundance vs. survey depth plot suggests that there are still a high abundance of petrale inshore of the survey area.
6. A management strategy for petrale sole because the estimates of B_0 and $B_{current}$ are highly sensitive to the assumed stock-recruitment relationship, making these reference points more uncertain, while B_{MSY} estimates are consistent among all the model run results.

2.8 Base case model results

The biological parameters estimated from the base case model are reasonable and consistent with the raw data (Tables 16-17, Figure 37). Female and male petrale sole have similar growth trajectories until about age 5, beyond age 5 females grow to a maximum size of 58.0 cm while males grow to 42.0 cm (Figure 37). Both sexes show a similar distribution of lengths-at-age and relative CVs at age (Figure 37). Natural mortality for females is estimated to be lower, 0.15, compared to males, 0.17 (Table 17). This difference in sex-specific natural mortality suggests that the sex ratios will be dominated by females at older ages.

Estimated selectivity curves for the NWFSC and triennial surveys were generally similar, although in the later years, the triennial survey selected a slightly higher fraction of small petrale sole (Figure 38). The catchability values for the NWFSC and the early and late triennial surveys are different, 3.07 and 0.52 and 0.72 (the direct model estimate of 0.295 needs to be multiplied by 2 to be in the same scale as the NWFSC catchability), respectively (Table 17). The catchability estimate for the triennial survey is in-between the values estimated by the 2005 northern area assessment, 0.35, and 0.706 for 2005 southern area assessment.

Selectivity curves for the fishing fleets largely showed, as expected, a tendency towards larger fish being caught in the winter fisheries and smaller fish being captured in the summer fisheries (Figures 39-44). Time blocks were implemented to account for residual patterns in the composition data that are likely due to the impact of changing management regulations. Ten year time blocks beginning in 1973, 1983, 1993, and 2003 are used to estimate different selectivity parameters in each fleet (Table 15).

The base case model was able to fit both fishery independent and dependent indices well, with the exception of the 2004 data point from the triennial survey (Figures 45-46). Fits to the length and age distributions are fairly good, with no strong trends in the Pearson residuals (Figures 48-51, Appendix B). The Pearson residuals reflect the noise in the data both within and between years. The model is unable to fit the last two years of NWFSC survey composition data very well (Figure 47-49). These compositions suggest that there are proportionally more small/young fish in the population than expected (Figure 47-49). The fishery length- and age-frequency data required some tuning of input sample sizes to make the average effective sample sizes equal to or greater than average input sample sizes (Appendix B). The model also fits the discard data well (Figures 55-60).

The estimated recruitment deviations show relatively low variability, input value of 0.4. output value of 0.33, which is slightly lower than the output values from the 2005 stock assessment, 0.5 and 0.46 for the northern and southern assessment models, respectively. The choice of start year for estimating recruitment deviations, 1939, is based on the estimated variance of the recruitment deviations from the model being close to the input value for recruitment variability. Extending the series to earlier years degraded the model fit and estimates of recruitment deviations since there is little or no composition data to inform the estimation of the recruitment deviations during the earlier years of the model. The time-series of estimated recruitments shows a weak relationship with the decline in spawning biomass, punctuate by larger recruitments (Table 18, Figures 61-62). The four weakest recruitments since 1939 are estimated to be in 1972, 1985-1986, 1991 and 2003(Table 18, Figures 61-62). The four strongest recruitments since 1939 are estimated to be in 1939-1940, 1960, 1965, and 1997-1998 (Table 18, Figures 61-62). The most recent above average recruitment event, is estimated to be in 2005, and is about 20% smaller than of the 1997–1998 recruitment event (Table 18, Figures 61-62). The estimate of stock-recruitment steepness is 0.95 (Table17, Figure 63), which is higher than in both the 2005 northern and southern area assessments.

The biomass time series shows a strong decline from the late-1930s through the mid 1960s, followed by a small recovery through the mid-1970s, and another decline to its lowest point during the early 1990s (7-8% of unexploited) (Tables 18-19, Figure 64). This general pattern of stock decline is coincident with increasing catches (Figure 1). From the mid-1990s through 2005 the stock increased slightly to an estimated depletion of 16.4%, but since 2005 the biomass has declined to an estimated depletion of 11.6% in 2009 (Table 18-19, 65).

2.9 Uncertainty and Sensitivity Analysis

The base case assessment model includes parameter uncertainty from a variety of sources, but underestimates the considerable uncertainty in recent trend and current stock status. For this reason, in addition to asymptotic confidence intervals (based upon the model's analytical estimate of the variance near the converged solution), two alternate states of nature regarding the size of the spawning biomass in 2009 were analyzed. In the high and low states, the 2009 spawning biomass amounts are roughly 1.25 standard deviations higher and lower, respectively, than the base case. These amounts were achieved through manipulation of the size of NWFSC survey biomass in 2008. Much additional exploration of uncertainty was performed prior to and during the STAR panel. Some of that exploration of other sources of uncertainty is provided below.

2.9.1 Sensitivity analysis

Sensitivity analysis was performed to determine the model behavior under different assumptions than those of the base case model. In the numerous sensitivity model runs that were explored before and during the STAR panel, the model provided generally consistent behavior between model and data assumptions with the exception of the choice of stock-recruitment relationship. Three sensitivity runs were done for the final base case model to examine the influence of using the Ricker stock-recruitment function, reducing the effective survey sample sizes by half, and removing all of the 2008 NWFSC survey data. Table 20 shows the results of the sensitivity runs compared to the base case, and Figure 66 shows the biomass trajectory for the sensitivity model runs.

The sensitivities show the following patterns (Table 20, Figure 66). First, the choice of the stock-recruitment relationship specified has a significant effect on the estimates of unfished spawning biomass and depletion. The Ricker stock-recruitment relationship results in a 43% lower estimate of unfished spawning biomass and an 83% higher depletion level than the Beverton-Holt stock-recruitment relationship. Removing the 2008 survey data resulted in more optimistic model results, while halving the effective sample sized for the survey composition data had minimal impact on model results.

2.9.2 Retrospective analysis

A retrospective analysis was conducted by running the model using data only through 2003, 2004, 2005, 2006, and 2007 (Table 21, Figure 67). The following retrospective patterns emerge. All of the retrospective model runs suggest that the unfished spawning biomass is about 25,000 mt. The current biomass (the beginning of the year spawning biomass after the last year of data) is higher for the retrospective runs using data up to 2004, 2005, 2006 and 2007, and lower when the data end in 2003, which shows a smaller biomass and the lowest depletion in 2004. Because the NWFSC survey had only one biomass estimate in 2003, this data point was removed, thus there are no biomass estimates from the NWFSC survey in that retrospective run. Overall, the current depletion is generally higher with the data up to 2007, but the inclusion of data up to 2008 (base case) leads the model to predict a downward trend in the recent spawning biomass. The declining trend in spawning biomass with the inclusion of the 2008 data is driven by the four consecutive years of downward trend in the NWFSC survey biomass index and by the observation of a higher proportion of smaller fish in the 2008 survey length and age-composition data.

2.9.3 Likelihood profiles

Likelihood profiles for steepness, natural mortality, and the NWFSC survey biomass catchability (q) were completed to investigate the uncertainty in the estimates of these parameters, as well as the effect of these parameters on the estimated status of the stock for the pre-STAR model. The pre-STAR model profile for female and male natural mortality suggested that the range of 0.12 to 0.23 for females was within the 95% confidence interval, with male natural moratlity consistenly being about 0.02 higher. The pre-STAR model steepness profile was symmetric and the 95% confidence interval is approximately 0.76–0.99.

Likelihood profiles for the NWFSC catchability (*q*) and steepness (*h*) from the final base case model are presented here. Profile results are shown in Figures 68. The profile on the NWFSC survey catchability shows that it is very unlikely for the estimate to be much larger than the current value or the lower that about 2 (Figure 68). The profile on *h* shows that h may range between about 0.84 and 1.

3. Rebuilding Parameters

Both the STAT team and STAR panel are suggesting that the SSC consider using reference point based on the model estimates of Bmsy rather than the standard Bmsy proxy reference points based on 40% of unfished spawning biomass. Since the SSC has not had the opportunity to consider this issue, the status of the petrale sole stock is yet to be determined.

4. Reference points

The abundance dropped below the $SB_{40\%}$ management target in 1949 and the overfished threshold in 1952. Beginning in 1980 the stock was around 10-12% of unfished spawning biomass and in 1988 the stock dropped below 10% of unfished spawning biomass (Figures 64-65). The estimated relative depletion level in 2009 is 11.6% (Tables 18-19, Figures 64-65). The estimated relative depletion level in 2009 is 11.6% (~95% asymptotic interval: ±4.8%, ~ 75% interval based on the range of states of nature: 9.4-13.8%), corresponding to 2937.6 mt (~95% asymptotic interval: ±832.7 mt, states of nature interval: 2407.8-3468.1 mt) of female spawning biomass in the base model (Table 18).

Fishing mortality rates in excess of the current F-target for flatfish of $SPR_{40\%}$ are estimated to have begun in the late 1930s and persisted through 2008 (Figures 69-70). Current relative exploitation rates (catch/biomass of age-3 and older fish) are estimated to have been 0.29 in 2008. Figure 71 shows a phase plot comparing the time series of estimated fishing mortality and relative depletion. Figure 72 shows a phase plot using the Fmsy and Bmsy reference points.

The equilibrium unfished spawning stock biomass was estimated to be 25,334 mt. The target stock size ($SB_{40\%}$) is therefore 10,134 mt which gives a catch of 2060 mt (Table 18). The estimates of unfished spawning biomass, and therefore the $SB_{40\%}$ reference points were very sensitive to the assumption of stock-recruitment relationship (see section 2.9.1). Model estimates of spawning biomass at MSY and MSY yield were more robust to the assumption of stock-recruitment relationship (see section 2.9.1). Maximum sustained yield (MSY) applying recent fishery selectivity and allocations was estimated in the assessment model at 2,376 mt, occuring at a spawning stock biomass of 4,796 mt (SPR = 0.20). Figure 73 shows the equilibrium yield curve from the base case model; note that the proxy Bmsy reference point (40% of unfished biomass) is very conservative in comparison to the model estimate of Bmsy.

5. Harvest projections and decision tables

The total OYs in 2009 and 2010 are 2433 and 2393 mt and the projections are based on the assumption that they will be reached. The exploitation rate for 2011 and beyond for the base model projection potential is based upon an SPR of 40% (Table 22). Selectivity and fleet allocations are projected at the values for the most recent year. The states of nature in the decision table are low and high 2009 spawning biomass scenarios (Table 23). Seven possible time series of catches are provided and include: 1) a minimal constant catch time series of 3mt, 2) ½ the catches from the 40-10 catch control rul, 3) the catches from the 40-10 catch control rule, 4) a constant catch of 500 mt, 5) a constant catch of 1500 mt, 6) a constant catch based on 2/3 of the estimate Fmsy, 7) a ramping down of catches from 2/3 Fmsy when the stock is as Bmsy to zero catch when the stock is at 50% of Bmsy. Since the STAR panel and STAT team are suggesting that the model estimate of Bmsy be used as a reference point two time series of stock depletion are provided for each combination of catch time series and state of nature. The first measure of stock depletion is based on the model estimate of unfished spawning biomass, the second measure of stock depletion is based on the model estimate of Bmsy.

6. Regional management considerations

The resource is modeled as a single stock. Spatial aspects of the coast-wide population are addressed through geographic separation of data sources/fleets where possible and consideration of residual patterns that may be a result of inherent stock structure. There is currently no genetic evidence that there are distinct biological stocks of petrale sole off the U.S. coat and the limited tagging data that describes adult movement suggests that movement may be significant across depth and latitude.

7. Research needs

Progress on a number of research topics would substantially improve the ability of this assessment to reliably and precisely model petrale sole population dynamics in the future and provide better monitoring of progress toward rebuilding:

1. The estimate of the NWFSC survey catchability in the base case model is higher than expected. This may be due to the use of the total area within each strata during the expansion of the survey data rather than the trawlable areas only, where petrale are most likely to be found. At this time there are no area estimates for trawlable and untrawlable areas. However the petrale sole population is most likely well surveyed by the trawl survey and expanding using areas that include untrawlable areas is probably not appropriate.
2. Expand the assessment to include the waters of British Columbia since petrale sole are likely a single stock that moves across the U.S. Canadian boarder.
3. Many assessments are deriving historical catch by applying various ratios to the total flatfish catch prior to the period when most species were delineated. While progress has been made in moving towards a comprehensive historical catch reconstruction it would be best if a complete catch reconstruction is available from each state for all flatfish species. This will make it possible to compile a best estimated catch series that accounts for all the catch and makes sense for both petrale sole and flatfish as a group.
4. Age data from the California fishery are needed.
5. Historical age data could be improved by obtaining new break and burn ages where structures are available.
6. The estimation of ageing error for the WDFW samples could be improved by doing break-and-burn cross reads with the CAP ageing lab.
7. Studies on recent biological data and stock structure. For example, due to inconsistencies between studies and scarcity of appropriate data, new data are needed on both the maturity and fecundity relationships.

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10. Tables

Table 1. Total landed catches (mt) of petrale sole by fleet and season used in the assessment model. See text for a description of sources.

Fishing year	WA Winter	WA Summer	OR Winter	OR Summer	CA Winter	CA Summer	Total Winter	Total Summer
1876	0.00	0.00	0.00	0.00	0.00	1.00	0	1
1877	0.00	0.00	0.00	0.00	0.00	1.00	0	1
1878	0.00	0.00	0.00	0.00	0.00	1.00	0	1
1879	0.00	0.00	0.00	0.00	0.00	1.00	0	1
1880	0.00	0.00	0.00	0.00	0.00	11.55	0	11.55
1881	0.00	0.00	0.00	0.00	0.00	22.10	0	22.1
1882	0.00	0.00	0.00	0.00	0.00	32.65	0	32.65
1883	0.00	0.00	0.00	0.00	0.00	43.20	0	43.2
1884	0.00	0.00	0.00	0.00	0.00	53.75	0	53.75
1885	0.00	0.00	0.00	0.00	0.00	64.30	0	64.3
1886	0.00	0.00	0.00	0.00	0.00	74.85	0	74.85
1887	0.00	0.00	0.00	0.00	0.00	85.40	0	85.4
1888	0.00	0.00	0.00	0.00	0.00	95.95	0	95.95
1889	0.00	0.00	0.00	0.00	0.00	106.50	0	106.5
1890	0.00	0.00	0.00	0.00	0.00	117.05	0	117.05
1891	0.00	0.00	0.00	0.00	0.00	127.60	0	127.6
1892	0.00	0.00	0.00	0.00	0.00	138.15	0	138.15
1893	0.00	0.00	0.00	0.00	0.00	148.71	0	148.71
1894	0.00	0.00	0.00	0.00	0.00	159.26	0	159.26
1895	0.00	0.00	0.00	0.00	0.00	169.81	0	169.81
1896	0.00	0.00	0.00	0.00	0.00	180.36	0	180.36
1897	0.00	0.00	0.00	0.00	0.00	190.91	0	190.91
1898	0.00	0.00	0.00	0.00	0.00	201.46	0	201.46
1899	0.00	0.00	0.00	0.00	0.00	212.01	0	212.01
1900	0.00	0.00	0.00	0.00	0.00	222.56	0	222.56
1901	0.00	0.00	0.00	0.00	0.00	233.11	0	233.11
1902	0.00	0.00	0.00	0.00	0.00	243.66	0	243.66
1903	0.00	0.00	0.00	0.00	0.00	254.21	0	254.21
1904	0.00	0.00	0.00	0.00	0.00	264.76	0	264.76
1905	0.00	0.00	0.00	0.00	0.00	275.31	0	275.31
1906	0.00	0.00	0.00	0.00	0.00	285.86	0	285.86
1907	0.00	0.00	0.00	0.00	0.00	296.41	0	296.41
1908	0.00	0.00	0.00	0.00	0.00	306.96	0	306.96
1909	0.00	0.00	0.00	0.00	0.00	317.51	0	317.51
1910	0.00	0.00	0.00	1.00	0.00	328.06	0	329.06
1911	0.00	0.00	0.00	1.00	0.00	338.61	0	339.61
1912	0.00	0.00	0.00	1.00	0.00	349.16	0	350.16
1913	0.00	0.00	0.00	1.00	0.00	359.71	0	360.71
1914	0.00	0.00	0.00	1.00	0.00	370.26	0	371.26
1915	0.00	0.00	0.00	1.00	0.00	380.81	0	381.81
1916	0.00	0.00	0.00	1.00	0.00	386.42	0	387.42
1917	0.00	0.00	0.00	1.00	0.00	526.41	0	527.41
1918	0.00	0.00	0.00	1.00	0.00	423.85	0	424.85
1919	0.00	0.00	0.00	1.00	0.00	333.44	0	334.44
1920	0.00	0.00	0.00	1.00	0.00	230.49	0	231.49
1921	0.00	0.00	0.00	1.00	0.00	293.76	0	294.76
1922	0.00	0.00	0.00	1.00	0.00	424.78	0	425.78
1923	0.00	0.00	0.00	1.00	0.00	427.36	0	428.36

Fishing year	WA Winter	WA Summer	OR Winter	OR Summer	CA Winter	CA Summer	Total Winter	Total Summer
1924	0.00	0.00	0.00	1.00	0.00	532.86	0	533.86
1925	0.00	0.00	0.00	1.00	0.00	528.47	0	529.47
1926	0.00	0.00	0.00	1.00	0.00	521.67	0	522.67
1927	0.00	0.00	0.00	1.00	0.00	632.04	0	633.04
1928	0.00	0.00	0.00	0.00	0.00	620.09	0	620.09
1929	0.00	0.00	0.00	3.08	0.00	706.04	0	709.12
1930	0.00	0.00	0.00	1.00	0.00	658.83	0	659.83
1931	0.00	80.59	0.00	0.98	63.39	530.88	63.39	612.45
1932	1.99	241.77	0.00	6.80	36.40	519.91	38.39	768.48
1933	5.96	402.95	0.00	4.31	38.57	392.08	44.53	799.34
1934	9.93	564.13	0.00	2.90	139.41	896.36	149.34	1,463.39
1935	13.90	644.72	0.00	5.71	155.38	777.21	169.28	1,427.64
1936	15.88	752.33	0.00	18.60	95.49	431.51	111.37	1,202.44
1937	19.75	967.53	0.00	81.39	74.53	741.05	94.28	1,789.97
1938	27.49	1182.73	0.00	4.10	47.86	890.00	75.35	2,076.83
1939	35.22	1290.33	0.00	2.50	30.84	1028.96	66.06	2,321.79
1940	39.09	1280.50	0.00	352.70	162.53	596.69	201.62	2,229.89
1941	41.40	1260.83	0.00	464.20	110.81	331.32	152.21	2,056.35
1942	46.00	1241.16	0.00	1868.70	24.37	215.56	70.37	3,325.42
1943	50.61	1221.48	0.00	1898.56	71.66	344.72	122.27	3,464.76
1944	55.21	1201.81	0.00	1007.50	85.53	446.58	140.74	2,655.89
1945	59.82	1182.14	0.00	785.42	101.75	439.34	161.57	2,406.9
1946	64.43	1162.46	0.00	1488.90	71.91	1115.57	136.34	3,766.93
1947	69.03	1142.79	0.00	720.46	153.68	1092.65	222.71	2,955.9
1948	73.64	1123.12	0.00	1326.50	272.66	1544.35	346.3	3,993.97
1949	75.94	1113.27	0.00	755.79	615.70	1476.28	691.64	3,345.34
1950	156.21	957.31	0.00	1643.80	410.94	1346.41	567.15	3,947.52
1951	117.97	774.51	0.00	949.08	207.05	938.14	325.02	2,661.73
1952	131.01	743.76	0.00	729.70	318.12	857.63	449.13	2,331.09
1953	46.07	354.35	0.00	502.68	525.77	778.53	571.84	1,635.56
1954	26.56	418.07	0.00	692.80	797.19	891.57	823.75	2,002.44
1955	57.14	398.57	0.00	882.91	520.17	925.76	577.31	2,207.24
1956	120.46	356.24	19.09	500.90	504.50	683.23	644.05	1,540.37
1957	106.45	361.57	83.20	739.29	517.79	954.42	707.44	2,055.28
1958	29.12	443.81	37.86	529.90	557.95	729.26	624.93	1,702.97
1959	73.98	678.12	389.39	364.92	370.52	625.42	833.89	1,668.46
1960	123.30	587.40	84.95	634.64	514.39	592.71	722.64	1,814.75
1961	133.94	802.19	56.76	595.02	540.53	927.43	731.23	2,324.64
1962	156.57	497.80	93.82	549.73	510.21	783.04	760.6	1,830.57
1963	118.57	535.59	151.70	473.51	530.82	810.08	801.09	1,819.18
1964	103.21	455.02	75.67	297.23	372.19	912.61	551.07	1,664.86
1965	127.72	434.58	82.28	468.00	373.44	845.83	583.44	1,748.41
1966	91.56	414.37	59.43	304.21	324.71	916.97	475.7	1,635.55
1967	60.01	312.00	73.88	307.81	521.08	858.30	654.97	1,478.11
1968	137.39	222.56	41.26	318.96	360.61	845.90	539.26	1,387.42
1969	52.02	161.12	34.88	369.51	420.97	848.19	507.87	1,378.82
1970	143.76	356.86	114.24	457.86	472.37	1070.97	730.37	1,885.69
1971	152.49	418.93	133.52	296.50	539.72	1015.59	825.73	1,731.02
1972	186.61	553.63	157.97	297.19	703.21	1000.27	1047.79	1,851.09
1973	200.86	545.65	106.25	407.14	417.44	741.68	724.55	1,694.47
1974	167.91	712.88	161.63	428.64	664.63	893.27	994.17	2,034.79
1975	189.29	703.09	178.26	611.08	560.51	900.92	928.06	2,215.09
1976	161.12	494.31	176.45	283.54	712.75	736.71	1050.32	1,514.56

Year	WA Winter	WA Summer	OR Winter	OR Summer	CA Winter	CA Summer	Total Winter	Total Summer
1977	161.77	437.19	152.86	294.20	484.15	494.81	798.78	1,226.2
1978	246.92	578.04	141.07	352.58	419.09	800.66	807.08	1,731.28
1979	248.02	514.70	200.94	505.39	352.88	944.80	801.84	1,964.89
1980	56.44	444.24	67.13	347.00	518.33	680.05	641.9	1,471.29
1981	262.96	417.96	166.68	420.06	352.88	533.63	782.52	1,371.65
1982	121.26	580.12	133.20	714.50	261.53	502.05	515.99	1,796.67
1983	229.54	750.63	491.38	340.79	272.72	364.76	993.64	1,456.18
1984	241.92	595.04	228.42	152.39	260.56	329.98	730.9	1,077.41
1985	286.38	282.35	173.60	124.38	273.29	471.93	733.27	878.66
1986	206.97	327.23	264.52	123.83	402.99	355.49	874.48	806.55
1987	422.20	439.51	431.99	126.17	310.94	556.37	1165.13	1,122.05
1988	333.64	449.18	409.10	160.73	349.17	411.28	1091.91	1,021.19
1989	298.05	397.97	396.63	184.84	393.89	414.79	1088.57	997.6
1990	383.28	300.53	257.06	158.15	319.63	373.52	959.97	832.2
1991	352.01	246.91	440.45	149.91	447.94	310.28	1240.4	707.1
1992	298.02	204.76	339.67	159.65	273.54	307.39	911.23	671.8
1993	271.41	213.33	413.08	173.93	237.99	235.66	922.48	622.92
1994	237.33	173.72	280.06	175.63	246.13	303.99	763.52	653.34
1995	235.31	236.41	354.51	201.96	236.03	290.53	825.85	728.9
1996	264.64	247.53	310.87	182.23	406.09	401.93	981.6	831.69
1997	247.73	233.34	366.99	176.33	451.30	461.33	1066.02	871
1998	217.87	330.41	303.30	242.54	221.71	302.80	742.88	875.75
1999	134.65	308.16	323.37	193.18	292.03	268.39	750.05	769.73
2000	241.94	425.75	323.49	136.28	408.47	241.95	973.9	803.98
2001	308.96	366.51	358.42	225.93	317.31	261.34	984.69	853.78
2002	346.36	514.31	295.64	185.37	340.01	195.69	982.01	895.37
2003	295.56	541.41	241.76	166.43	260.70	180.25	798.02	888.09
2004	683.93	550.18	322.90	188.51	177.27	267.84	1184.1	1,006.53
2005	555.51	763.67	374.93	286.19	339.46	534.42	1269.9	1,584.28
2006	252.38	618.63	277.56	363.47	125.64	464.78	655.58	1,446.88
2007	303.55	331.03	557.89	173.78	469.05	493.46	1330.49	998.27
2008	286.74	179.39	448.62	136.28	617.62	410.51	1352.98	726.18

Table 2. Recent trend in estimated total petrale sole catch and commercial landings (mt) relative to management guidelines.

Fishing year	ABC (mt)	OY (mt)	Commercial Landings (mt)	Estimated[1] Total Catch (mt) for the Annual Year	Estimated Total Catch (mt) for the Fishing Year
1999	2,700	2,700	1,520	1,617	1,591
2000	2,950	2,950	1,778	1,888	1,856
2001	2,762	2,762	1,838	1,975	1,934
2002	2,762	2,762	1,877	2,066	2,024
2003	2,762	2,762	1,686	1,786	1,809
2004	2,762	2,762	2,191	2,273	2,284
2005	2,762	2,762	2,854	2,948	2,960
2006	2,762	2,762	2,102	2,173	2,183
2007	3,025	2,499	2,329	2,372	2,376
2008	2,919	2,499	2,079	2,114	2,117

[1] Total annual catches reflect the commercial landings plus the model estimated annual discard biomass (commercial landings * retained catch/total catch). The total amounts of discard may differ from those reported in the NWFSC reports on total catch for some of these years.

Table 3a. Summary of fishery independent data sources available in 2009. Highlighted areas denote data used.

	YEAR																												
	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08
ABUNDANCE INDEX																													
AFSC Shelf Triennial																													
NWFSC Shelf-Slope																													
BIOLOGICAL DATA																													
Length																													
AFSC Shelf Triennial																													
NWFSC Shelf-Slope																													
Age **																													
NWFSC Shelf-Slope																								BB	SR	BB	BB	BB	BB

Table 3b. Continued.

	Hist. Data	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
LANDINGS																											
WA	35-54																										
OR	28-54																										
CA	16-54																										
CPUE																											
OR																											
DISCARDS																											
Fraction Discard																											
Mean Weights																											
Length Frequency																											
BIOLOGICAL DATA																											
Length																											
WA (PacFIN)																											
OR (PacFIN)																											
CA (CALCOM/PacFIN) 1948-1949																											
Age																											
WA (PacFIN)																											
OR (PacFIN)																											
CA (CALCOM)																											

Table 3b. Continuted.

	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08
LANDINGS																												
WA																												
OR																												
CA																												
CPUE																												
OR																												
DISCARDS																												
						OR																						
Fraction Discard						Only																						
Mean Weights																												
Length Frequency																												
BIOLOGICAL DATA																												
Length																												
WA (PacFIN)																												
OR (PacFIN)																												
CA (CALCOM/PacFIN) 1948-1949																												
Age																												
WA (PacFIN)																												
OR (PacFIN)																												
CA (CALCOM)																												

Table 4. Summary of the tow data from the NWFSC survey.

Year	Number of tows	Number of Tows with Petrale	Percent of Tows with Petrale
2003	558	203	36.4
2004	497	225	45.3
2005	674	293	43.5
2006	652	250	38.3
2007	696	261	37.5
2008	685	260	38.0

Year	Number of tows with lengths taken	Percent Petrale tows with lengths taken	Number of male lengths	Number of female lengths	Number of unsexed lengths
2003	202	99.5	1,422	1,442	4
2004	222	98.7	1,875	1,633	1
2005	290	99.0	2,470	2,246	16
2006	250	100.0	1,989	1,752	4
2007	261	100.0	1,976	1,479	6
2008	260	100.0	1,620	1,444	5

Year	Number of tows with ages taken	Percent Petrale tows with ages taken	Number of male ages	Number of female ages	Number of unsexed ages
2003	177	87.2	392	389	0
2004	185	82.2	548	370	1
2005	248	84.6	396	397	1
2006	239	95.6	425	358	2
2007	200	76.6	384	320	0
2008	228	87.7	401	353	1

Table 5. Estimates of biomass (mt) and standard errors (of the natural log of biomass).

	Triennial			NWFSC		
Year	Estimate (B)	log(B)	SE(logB)	Estimate (B)	log(B)	SE(logB)
1980	2,175	7.68	0.2104			
1981						
1982						
1983	2,084	7.64	0.1750			
1984						
1985						
1986	2,241	7.71	0.1744			
1987						
1988						
1989	3,613	8.19	0.1711			
1990						
1991						
1992	1,996	7.60	0.1682			
1993						
1994						
1995	2,330	7.75	0.1710			
1996						
1997						
1998	3,414	8.14	0.1644			
1999						
2000						
2001	3,488	8.16	0.1721			
2002						
2003				19,131	9.86	0.1332
2004	9,294	9.14	0.1719	22,168	10.01	0.1478
2005				23,494	10.06	0.1252
2006				19,573	9.88	0.1358
2007				15,892	9.67	0.1293
2008				13,532	9.51	0.1275

Table 6. Summary of the tow data from the Triennial survey.

Year	Number of tows	Number of Tows with Petrale	Percent of Tows with Petrale
1980	301	139	46.2
1983	479	250	52.2
1986	483	268	55.5
1989	440	275	62.5
1992	421	251	59.6
1995	441	209	47.4
1998	468	291	62.2
2001	466	256	54.9
2004	383	244	63.7

Year	Number of tows with lengths taken	Percent Petrale tows with lengths taken	Numberof male lengths	Number of female lengths	Number of unsexed lengths
1980	1	0.7	2	14	0
1983	2	0.8	20	10	0
1986	36	13.4	248	292	0
1989	141	51.3	642	773	4
1992	116	46.2	480	535	0
1995	145	69.4	565	804	0
1998	236	81.1	1,147	1,447	30
2001	254	99.2	1,453	1,559	4
2004	239	98	2,306	2,369	1

Table 7. The number of double read samples available for estimating ageing error for petrale sole. Shaded samples with the same number of reads between ageing method indicates a data set with triple or quadruple reads.

	Agency/Lab/Study					
Ageing Method	WDFW	Pre CAP (OR samples from before 1980)	Early CAP (OR samples from 1981-1999)	Recent CAP (OR and NWFSC samples 2000-present)	CDFW	Bomb Radiocarbon Study
BB v BB	590		7	199	0	333
BB v. Combo	590				0	
BB v. S		216	3	314	0	333
Combo v. Combo	156				0	
Combo v. S			142		0	
S v. S			338	362	0	333

Table 8a. The structure of the ageing bias and imprecision analysis for WDFW samples with the comparison(s) of interest for the assessment highlighted. The Radiocarbon ages are break and burn reads from a single reader from the bomb radiocarbon study that are known to be unbias. Therefore, these ages are used as the benchmark against which the other ageing methods are compared in the analysis.

	Radiocarbon v. BB	BB v. BB	BB v. Combo
Radiocarbon v. BB	**x**		
BB v. BB		**x**	
BB v. Combo			**x**

Table 8b. The same as table 8a except these are comparisons from the CAP laboratory.

	Radiocarbon v. BB	BB v BB	BB v. S	S v. S
Radiocarbon v. BB	**x**			
BB v BB		**x**		
BB v. S			**X**	
S v. S				**x**

Table 8c. The same as a except these are comparisons for a second tier analysis meant to estimate only the bias and imprecision of the combo ageing method (since the ageing error software can only handle three methods and the CAP data have four). In this case the BB method is set as the unbias benchmark and the bias estimated for the combo method is adjusted using the estimated bias for the BB samples from the tier 1 analysis

	BB v BB	BB v. S	S v. S	S v. Combo
BB v BB	**x**			
BB v. S		**x**		
S v. S			**X**	
S v. Combo				**X**

Table 9a. A subset of the different models fit to each CAP analysis #1 data set as well as the likelihoods, the model selected is highlighted. The bias options are 0 = unbias, 1 = linear, 2 = type 2. The standard deviation options are 1=constant CV and 2=increase in CV with age. There is one value specified for each age reading method in the analysis.

Model Run	Bias Options	Standard Deviation Options	Plus Group	Negative Log Likelihood
1	0,1,1	1,1,1	25	5956.49
2	0,1,1	1,1,1	30	Not Converged
3	0,1,1	1,2,2	25	Not Converged
4	0,1,1	2,2,2	25	Not Converged
5	0,1,2	1,1,1	25	Not Converged
6	0,1,2	1,1,2	25	Not Converged
7	0,2,2	1,1,1	25	Not Converged
8	0,2,2	2,2,2	25	Not Converged

Table 9b. The same as 9a but for the CAP analysis #2 data set.

Model Run	Bias Options	Standard Deviation Options	Plus Group	Negative Log Likelihood	Maximum Standard Deviation	Notes
1	0,1,1	1,1,1	25	5465.41	30	selected to limit the bias and standard deviation
2	0,1,1	1,1,1	25	Not Converged	10	Unreasonable huge bias at older ages
3	0,1,1	1,1,2	25	Not Converged	10	hit bound on maximum standard deviation
4	0,1,1	1,1,2	25	Not Converged	30	hit bound on maximum standard deviation
5	0,1,1	1,1,2	25	Not Converged	60	hit bound on maximum standard deviation
6	0,1,2	1,1,2	25	Not Converged	100	huge standard deviation

Table 9c. The same as 9a but for the WDFW data set.

Model Run	Bias Options	Standard Deviation Options	Plus Group	Negative Log Likelihood
1	0,1,1	1,1,1	25	Not Converged
2	0,1,2	1,1,1	25	3485.25
3	0,1,2	1,1,2	25	Not Converged

Table 10. The estimates of bias (mean observed age at true age) and imprecision (SD of observed age at true age) from the best fit models that are used for the various age reading methods in the assessment.

	Break and Burn		Surface		CAP Combo		WDFW Combo	
True Age	Bias	Standard Deviation	Bias	Standard Deviation	Bias	Standard Deviation	Bias	Standard Deviation
0.5	0	0.13	0	0.09	0	0.2	1.65	0.21
1.5	0.98	0.13	0.94	0.09	0.97	0.2	2.3	0.21
2.5	1.96	0.26	1.87	0.18	1.94	0.39	2.96	0.41
3.5	2.95	0.38	2.81	0.28	2.91	0.59	3.64	0.62
4.5	3.93	0.51	3.75	0.37	3.87	0.78	4.34	0.83
5.5	4.91	0.64	4.68	0.46	4.84	0.98	5.06	1.04
6.5	5.89	0.77	5.62	0.55	5.81	1.17	5.79	1.24
7.5	6.87	0.9	6.56	0.64	6.78	1.37	6.55	1.45
8.5	7.85	1.02	7.49	0.73	7.75	1.56	7.32	1.66
9.5	8.84	1.15	8.43	0.83	8.72	1.76	8.11	1.86
10.5	9.82	1.28	9.37	0.92	9.69	1.95	8.91	2.07
11.5	10.8	1.41	10.3	1.01	10.66	2.15	9.74	2.28
12.5	11.78	1.53	11.24	1.1	11.62	2.34	10.59	2.49
13.5	12.76	1.66	12.17	1.19	12.59	2.54	11.46	2.69
14.5	13.74	1.79	13.11	1.28	13.56	2.73	12.36	2.9
15.5	14.73	1.92	14.05	1.38	14.53	2.93	13.27	3.11
16.5	15.71	2.05	14.98	1.47	15.5	3.12	14.21	3.31
17.5	16.69	2.17	15.92	1.56	16.47	3.32	15.17	3.52
18.5	17.67	2.3	16.86	1.65	17.44	3.51	16.15	3.73
19.5	18.65	2.43	17.79	1.74	18.4	3.71	17.16	3.94
20.5	19.63	2.56	18.73	1.83	19.37	3.91	18.19	4.14
21.5	20.62	2.69	19.67	1.93	20.34	4.1	19.25	4.35
22.5	21.6	2.81	20.6	2.02	21.31	4.3	20.33	4.56
23.5	22.58	2.94	21.54	2.11	22.28	4.49	21.44	4.76
24.5	23.56	3.07	22.48	2.2	23.25	4.69	22.58	4.97
25.5	24.54	3.2	23.41	2.29	24.22	4.88	23.75	5.18
26.5	25.52	3.33	24.35	2.39	25.18	5.08	24.94	5.39
27.5	26.51	3.45	25.29	2.48	26.15	5.27	26.17	5.59
28.5	27.49	3.58	26.22	2.57	27.12	5.47	27.42	5.8
29.5	28.47	3.71	27.16	2.66	28.09	5.66	28.71	6.01
30.5	29.45	3.84	28.1	2.75	28.09	5.65	30.03	6.21
31.5	30.43	3.97	29.03	2.84	29.06	5.84	31.38	6.42
32.5	30.43	3.96	29.03	2.84	30.03	6.04	31.2	6.41
33.5	31.41	4.09	29.97	2.93	31	6.23	32.52	6.61
34.5	32.4	4.21	30.9	3.02	31.97	6.43	33.86	6.82
35.5	33.38	4.34	31.84	3.11	32.94	6.62	35.22	7.03
36.5	34.36	4.47	32.78	3.2	33.9	6.81	36.61	7.23
37.5	35.34	4.59	33.71	3.29	34.87	7.01	38.02	7.44
38.5	36.32	4.72	34.65	3.39	35.84	7.2	39.45	7.64
39.5	37.3	4.85	35.59	3.48	36.81	7.4	40.91	7.85
40.5	38.29	4.98	36.52	3.57	37.78	7.59	42.38	8.05

Table 11. Petrale sole discard biomass (mt) and bootstrap estimated CVs (WCGOP only) for the commercial fisheries used in the model.

Fishing year	Washington Winter	Washington Summer	Oregon Winter	Oregon Summer	California Winter	California Summer
1986				11.88 (0.50)		
1987				12.17 (0.50)		
2002	2.96 (0.21)	157.42 (0.13)	6.68 (0.43)	32.12 (0.18)	9.12 (0.36)	12.75 (0.22)
2003	3.12 (1.09)	106.13 (0.30)	0.64 (0.40)	12.65 (0.32)	14.74 (0.65)	7.74 (0.21)
2004	1.86 (0.51)	67.54 (0.22)	0.17 (0.61)	7.64 (0.57)	1.66 (1.70)	7.53 (0.28)
2005	1.60 (0.45)	55.66 (0.15)	3.33 (0.71)	10.34 (0.38)	2.06 (0.40)	5.43 (0.22)
2006	1.75 (0.26)	42.43 (0.24)	2.15 (0.43)	34.43 (0.18)	7.08 (0.34)	19.40 (0.28)
2007	1.77 (0.54)	32.55 (0.30)	1.47 (0.63)	28.06 (0.32)	5.65 (0.18)	36.73 (0.28)
2008	8.14 (0.82)		18.02 (0.57)		0.79 (0.32)	

Table 12. Summary of sampling effort generating length-frequency distributions used in the assessment model for the trawl fleets for females and then males.

Fishing year	Washington Winter N trips	Washington Winter N fish	Washington Summer N trips	Washington Summer N fish	Oregon Winter N trips	Oregon Winter N fish	Oregon Summer N trips	Oregon Summer N fish	California Winter N trips	California Winter N fish	California Summer N trips	California Summer N fish
1948											4	(196,209)
1949									10	(604,300)	4	(104,262)
1955	1	(168,339)										
1956	1	(64,36)	2	(344,345)								
1957			4	(678,375)								
1958			3	(920,1220)								
1959												
1960			1	(32,221)								
1961			1	(53,47)								
1962											3	(244,56)
1963												
1964			1	(86,114)					1	(54,44)	22	(1072,722)
1965			1	(52,48)					2	(10,63)	14	(800,366)
1966			28	(1258,1065)			9	(297,147)	8	(354,146)	33	(1358,1384)
1967	4	(132,68)	31	(851,1019)			11	(283,275)	20	(1046,662)	44	(2030,921)
1968	11	(378,184)	38	(2165,2455)			19	(554,389)	11	(724,276)	87	(3404,3404)
1969	9	(367,361)	37	(1193,1739)	1	(36,15)	18	(697,201)	14	(658,250)	49	(2043,1746)
1970	9	(521,222)	40	(2122,2625)			21	(713,306)	13	(506,342)	29	(962,828)
1971	11	(429,957)	10	(928,1291)			5	(291,210)	7	(336,164)	37	(1438,922)
1972	4	(460,440)	24	(1730,2567)			7	(318,383)	23	(1354,459)	39	(1432,1438)
1973	3	(398,252)	14	(950,940)			5	(227,273)	12	(506,317)	41	(1357,1556)
1974	3	(161,625)	35	(4250,4812)			7	(360,416)	31	(1364,988)	35	(1290,976)
1975	10	(1111,1081)	20	(1910,2347)			5	(210,290)	11	(402,248)	19	(1034,712)
1976	1	(105,274)	6	(1066,527)					12	(532,493)	26	(1200,1310)
1977	2	(206,115)	10	(629,691)			11	(549,541)	8	(524,276)	38	(2112,1488)
1978	3	(506,172)	9	(530,711)	1	(92,8)	12	(563,653)	17	(734,790)	33	(2024,1274)
1979	2	(53,166)	17	(1111,722)			6	(345,260)	7	(376,324)	12	(640,560)
1980	5	(468,205)	28	(1657,1225)	4	(188,207)	16	(934,630)	6	(404,190)	81	(4676,3408)
1981	8	(592,208)	8	(434,364)	2	(102,100)	29	(1844,1053)	36	(2504,1042)	65	(3642,2626)
1982	4	(244,156)	1	(72,29)	1	(41,59)	16	(990,608)	26	(1202,1236)	34	(1608,1256)
1983	1	(59,52)			3	(173,127)	1	(13,87)	26	(1478,1170)	33	(2024,1176)
	Washington Winter		Washington Summer		Oregon Winter		Oregon Summer		California Winter		California Summer	

Fishing year	N trips	N fish	N trips	N fish	N trips	N fish	N trips	N fish	N trips	N fish	N trips	N fish
1984	1	(111,90)			2	(133,78)			13	(636,520)	19	(1066,820)
1985		(,)	3	(156,146)			2	(173,27)	13	(612,688)	17	(1052,598)
1986	2	(112,87)	5	(277,224)	1	(53,48)	4	(265,129)	6	(270,330)	16	(894,708)
1987	6	(251,201)	9	(232,223)	1	(43,7)	7	(239,111)	10	(436,564)	14	(712,688)
1988	4	(118,81)	5	(149,102)			2	(75,25)	6	(296,304)	6	(322,210)
1989	5	(158,92)	7	(202,150)	6	(184,116)	6	(204,96)	9	(532,350)	9	(638,262)
1990	2	(39,62)	6	(164,138)	2	(44,56)	5	(151,99)	2	(162,38)	1	(48,28)
1991	2	(33,18)	5	(90,102)	9	(233,142)	2	(65,20)	12	(458,406)	1	(44,38)
1992	1	(5,24)	5	(123,64)	3	(61,83)	6	(155,86)	6	(222,146)		
1993	4	(56,47)	6	(173,62)	3	(44,71)	2	(44,17)				
1994	4	(66,50)	7	(152,152)	5	(132,92)	2	(44,23)				
1995	3	(36,81)	2	(44,22)	5	(108,76)						
1996	2	(26,41)	3	(95,33)	1	(23,12)	1	(24,16)				
1997	1	(30,9)	3	(78,47)	2	(63,36)	9	(242,97)				
1998	2	(39,47)	16	(453,276)	2	(26,39)	5	(111,104)				
1999	3	(63,67)	14	(429,229)	2	(49,15)			1	(17,10)		
2000	10	(191,220)	20	(548,304)	4	(87,46)	2	(47,4)				
2001	12	(197,264)	13	(433,195)	5	(107,53)	1	(27,14)			8	(180,79)
2002	7	(111,193)	20	(562,290)	2	(32,56)	3	(59,65)	12	(66,250)	9	(90,104)
2003	12	(272,206)	25	(597,402)	4	(89,38)	8	(177,114)	7	(78,124)	30	(245,205)
2004	13	(169,354)	22	(607,373)	5	(79,79)	6	(128,157)	12	(117,129)	13	(160,200)
2005	16	(304,196)	26	(775,396)	5	(81,96)	1	(12,37)	8	(125,74)	34	(435,494)
2006	8	(282,159)	27	(1141,631)	6	(96,143)	12	(257,197)	25	(307,380)	43	(392,614)
2007	8	(369,213)	18	(1048,562)	18	(308,261)	12	(191,157)	43	(381,807)	102	(1057,1858)
2008	8	(228,218)	23	(1014,743)	27	(470,340)	6	(99,81)	43	(472,823)	1	(26,4)

Table 13. Summary of sampling effort generating age-frequency distributions used in the assessment model for the trawl fleets.

	Washington Winter		Washington Summer		Oregon Winter		Oregon Summer		California Winter		California Summer	
Fishing year	N trips	N fish	N trips	N fish	N trips	N fish	N trips	N fish	N trips	N fish	N trips	N fish
1960			1	(24,144)								
1961			1	(53,47)								
1964			1	(86,114)								
1965			1	(52,48)								
1966			27	(904,812)			8	(276,119)	8	(212,68)	27	(602,661)
1967	4	(132,68)	31	(843,1015)			11	(282,275)	13	(326,301)	11	(244,277)
1968	11	(376,184)	34	(1819,1589)		18	(519,369)		56	(1354,1326)	1968	11
1969	9	(341,157)	35	(1019,1000)	1	(36,15)	18	(695,198)	8	(236,52)	31	(803,702)
1970	8	(389,183)	39	(1810,1587)			21	(706,303)	10	(251,200)	29	(761,636)
1971	5	(124,214)	9	(698,806)			5	(290,209)	6	(228,72)	37	(1074,786)
1972	4	(407,295)	23	(1430,1548)			7	(316,377)	23	(796,251)	38	(966,964)
1973	3	(364,178)	14	(925,784)			5	(225,272)	12	(360,212)	38	(903,990)
1974	3	(123,246)	28	(1280,1529)			7	(304,365)	29	(843,571)	34	(926,750)
1975	9	(472,392)	17	(778,829)			5	(206,288)	9	(244,158)	18	(590,356)
1976	1	(35,64)	5	(333,166)					12	(282,293)	23	(568,582)
1977	2	(103,96)	8	(447,342)			11	(529,535)	8	(284,116)	33	(946,698)
1978	3	(222,86)	8	(351,500)	1	(90,8)	8	(344,461)	9	(190,242)	32	(992,608)
1979			15	(975,640)			6	(342,259)	5	(128,122)	11	(294,248)
1980	3	(220,58)	22	(1211,952)	4	(185,206)	16	(924,629)	6	(196,106)	50	(1468,1022)
1981	6	(412,181)	8	(432,363)	2	(101,99)	29	(1826,1051)	18	(740,160)	27	(830,524)
1982	4	(232,114)	1	(71,28)	1	(40,58)	15	(429,216)	1	(38,12)	18	(434,266)
1983					3	(168,123)	1	(11,84)	12	(412,292)	8	(296,90)
1984					2	(131,78)			6	(167,104)	3	(72,76)
1985			3	(100,143)			2	(169,26)	2	(26,74)	4	(164,36)
1986	2	(111,86)	5	(216,106)	1	(26,23)	4	(226,115)				
1987	6	(187,158)	9	(169,155)	1	(21,4)	7	(171,79)				
1988	4	(59,39)	5	(105,79)	6	(159,113)	2	(33,14)				
1989	5	(97,85)	7	(175,118)	2	(29,42)	5	(174,73)				
1990	2	(27,32)	6	(81,65)	8	(103,57)	5	(76,49)	1	(48,2)		
1991	2	(33,18)	5	(41,68)	3	(50,79)	2	(32,10)	4	(74,90)		
1992	1	(5,24)	5	(121,64)	3	(44,71)	6	(153,86)				
1993	4	(56,47)	6	(173,62)	5	(132,92)	2	(44,17)				
	Washington Winter		Washington Summer		Oregon Winter		Oregon Summer		California Winter		California Summer	

Fishing year	N trips	N fish	N trips	N fish	N trips	N fish	N trips	N fish	N trips	N fish	N trips	N fish
1994	4	(66,50)	7	(152,152)	5	(107,75)	2	(44,23)				
1995	3	(36,81)	2	(44,22)	1	(23,12)						
1996	2	(26,41)	3	(94,32)	2	(63,36)	1	(23,16)				
1997	1	(30,9)	3	(77,47)	2	(26,39)	9	(239,96)				
1998	2	(39,47)	16	(451,275)			5	(111,104)				
1999	3	(63,67)	13	(398,134)					1	(17,10)		
2000	6	(135,136)	12	(359,201)								
2001	6	(121,138)	10	(354,131)								
2002	7	(111,191)	16	(464,240)	2	(32,56)	1	(33,2)				
2003	8	(160,137)	22	(528,349)	2	(41,24)	3	(79,59)				
2004	8	(112,265)	21	(589,367)	2	(36,27)	1	(23,18)				
2005	3	(77,73)	15	(514,211)								
2006	4	(132,66)	4	(142,56)								
2007	4	(135,65)	17	(548,281)	1	(16,14)	3	(46,44)	1	(25,6)		
2008	3	(89,61)	18	(483,325)	2	(47,13)	1	(10,18)				

Table 14. Description of model parameters in the base case assessment model.

Parameter	Number estimated	Bounds (low, high)	Prior (Mean, SD)
Natural mortality (*M*, female)	1	(0.05,0.4)	(0.2,0.025)
Natural mortality (*M*, male) (value estimated as offset from female)	1	(-0.5,0.7)	
Stock and recruitment			
Ln(R_0)	1	(5,99)	-
Steepness (*h*)	1	(0.2,1)	-
σ_r	-	-	-
Ln(Early Recruitment Deviations): 1939-1958	20	(-3,3)	-
Ln(Main Recruitment Deviations): 1959-2005	47	(-3,3)	-
Ln(Forecast Recruitment Deviations): 2005-2020	15	(-3,3)	-
Catchability			
Ln(*q*) – NWFSC survey	-	Analytic solution	
Ln(*q*) – Triennial survey	-	Analytic solution	
Selectivity (assympotitc, sex specific, with retention curves)			
Fisheries:			
	6		-
Length at peak selectivity		(15,75)	
Width of top (as logistic)	-		-
Ascending width (as exp[width])	6	(-4,12)	-
Descending width (as exp[width])	-		-
Initial selectivity (as logistic)	6	(-15,5)	-
Final selectivity (as logistic)	-		-
Male 1	6	(-15,15)	-
Male 2	6	(-15,15)	-
Male 3	-		-
Male 4	-		-
Retention 1	6	(10,40)	-
Retention 2	6	(0.1,10)	-
Retention 3	6	(0.001,1)	-
Retention 4	-		-
Time block parameters	28	(-20,20)	
Surveys:			-
Length at peak selectivity	2	(15,61)	-
Width of top (as logistic)	-		-
Ascending width (as exp[width])	2	(-4,12)	-
Descending width (as exp[width])	-		-
Initial selectivity (as logistic)	2	(-15,5)	-
Final selectivity (as logistic)	-		-
Male 1	2	(-15,15)	-
Male 2	2	(-15,15)	-
Male 3	-		-
Male 4	-		-
Individual growth			
Females:			
Length at age min	1	(10,45)	-
Length at age max	1	(45,80)	-
von Bertalanffy *K*	1	(0.04,0.5)	-
SD of length at age min	1	(0.02,8)	-
SD of length at age max offset to age min	1	(-1,1)	-
Males:			
Length at age min offset to females	1	(-1,2)	-
Length at age max offset to females	1	(-1,2)	-
von Bertalanffy K offset to females	1	(0.04,0.8)	-
SD of length at age min offset to females	1	(-1,1)	-
SD of length at age max offset to females	1	(-1,1)	-
Total: 100 + 82 recruitment deviations =182 estimated parameters			

Table 15. Time blocks

Block Pattern				
#1 (all fleets other than Winter-OR)	1973-1982	1983-1992	1993-2002	2003-2008
#2 (only fleet Winter-OR)		1983-1992	1993-2002	2003-2008

Table 16. Estimates of the growth parameters from the base case model. Age min is 2.83 and Age max is 15.83. Variability of the male estimates are not given because those parameters were estimated as offsets to female values.

Parameter	Value	SD
Females:		
Length at age min	17.3	0.43
Length at Linf	58.0	0.48
von Bertalanffy *K*	0.16	0.01
SD of length at age min	2.83	0.19
SD of length at age max	3.33	0.17
Males:		
Length at age min	16.7	–
Length at Linf	42.0	–
von Bertalanffy *K*	0.29	–
SD of length at age min	2.07	–
SD of length at age max	3.71	–

Table 17. Petrale sole catchability and productivity parameters.

Parameter	Value
Catchability:	
NWFSC survey catchability (*q*)	3.07
Triennial survey catchability (*q*) early, late	0.52; 0.72
Productivity:	
R_0	9.52
Steepness (*h*)	0.95
Female natural mortality (*M*)	0.15
Male natural mortality (*M*)	0.17

Table 18. Time-series of population estimates from the base case model.

Fishing year	Total biomass (mt)	Spawning biomass (mt)	Depletion	Age-0 recruits	Total catch (mt)	SPR	Relative exploitation rate
1876	39,388	25,334	100%	13,604	1	1.00	0.000
1877	39,387	25,333	100%	13,604	1	1.00	0.000
1878	39,386	25,333	100%	13,604	1	1.00	0.000
1879	39,385	25,332	100%	13,604	1	1.00	0.000
1880	39,384	25,331	100%	13,604	12	1.00	0.000
1881	39,373	25,324	100%	13,604	22	0.99	0.001
1882	39,353	25,309	100%	13,604	33	0.99	0.001
1883	39,324	25,288	100%	13,604	43	0.99	0.001
1884	39,287	25,261	100%	13,604	54	0.99	0.001
1885	39,242	25,229	100%	13,604	64	0.98	0.002
1886	39,191	25,191	99%	13,603	75	0.98	0.002
1887	39,135	25,149	99%	13,603	86	0.98	0.002
1888	39,073	25,104	99%	13,603	96	0.97	0.002
1889	39,007	25,054	99%	13,602	107	0.97	0.003
1890	38,936	25,002	99%	13,602	117	0.97	0.003
1891	38,862	24,946	98%	13,602	128	0.97	0.003
1892	38,785	24,888	98%	13,601	139	0.96	0.004
1893	38,706	24,828	98%	13,601	149	0.96	0.004
1894	38,623	24,766	98%	13,600	160	0.96	0.004
1895	38,539	24,703	98%	13,600	170	0.95	0.004
1896	38,453	24,638	97%	13,599	181	0.95	0.005
1897	38,365	24,571	97%	13,599	191	0.95	0.005
1898	38,276	24,504	97%	13,598	202	0.95	0.005
1899	38,186	24,435	96%	13,598	213	0.94	0.006
1900	38,095	24,366	96%	13,597	223	0.94	0.006
1901	38,002	24,296	96%	13,597	234	0.94	0.006
1902	37,909	24,225	96%	13,596	244	0.93	0.006
1903	37,815	24,154	95%	13,595	255	0.93	0.007
1904	37,721	24,082	95%	13,595	265	0.93	0.007
1905	37,625	24,009	95%	13,594	276	0.92	0.007
1906	37,530	23,937	94%	13,594	287	0.92	0.008
1907	37,434	23,863	94%	13,593	297	0.92	0.008
1908	37,337	23,790	94%	13,593	308	0.92	0.008
1909	37,240	23,716	94%	13,592	318	0.91	0.009
1910	37,143	23,642	93%	13,591	330	0.91	0.009
1911	37,044	23,567	93%	13,591	341	0.91	0.009
1912	36,946	23,492	93%	13,590	351	0.90	0.010
1913	36,847	23,417	92%	13,589	362	0.90	0.010
1914	36,748	23,341	92%	13,589	372	0.90	0.010
1915	36,648	23,266	92%	13,588	383	0.90	0.010
1916	36,549	23,190	92%	13,588	388	0.89	0.011
1917	36,454	23,118	91%	13,587	529	0.86	0.015
1918	36,234	22,957	91%	13,586	426	0.88	0.012
1919	36,130	22,877	90%	13,585	335	0.91	0.009
1920	36,126	22,867	90%	13,585	232	0.93	0.006
1921	36,226	22,932	91%	13,585	296	0.92	0.008
1922	36,263	22,956	91%	13,586	427	0.88	0.012
1923	36,172	22,890	90%	13,585	430	0.88	0.012
1924	36,085	22,826	90%	13,584	535	0.86	0.015

Fishing year	Total biomass (mt)	Spawning biomass (mt)	Depletion	Age-0 recruits	Total catch (mt)	SPR	Relative exploitation rate
1925	35,901	22,695	90%	13,583	531	0.86	0.015
1926	35,736	22,573	89%	13,582	524	0.86	0.015
1927	35,590	22,465	89%	13,581	635	0.83	0.018
1928	35,351	22,291	88%	13,580	622	0.83	0.018
1929	35,144	22,137	87%	13,578	711	0.81	0.020
1930	34,869	21,935	87%	13,576	662	0.82	0.019
1931	34,666	21,782	86%	13,575	678	0.82	0.020
1932	34,473	21,633	85%	13,573	811	0.79	0.024
1933	34,180	21,408	85%	13,571	849	0.79	0.025
1934	33,888	21,178	84%	13,569	1,621	0.65	0.048
1935	32,895	20,455	81%	13,561	1,606	0.64	0.049
1936	32,000	19,792	78%	13,554	1,323	0.69	0.042
1937	31,462	19,370	76%	13,549	1,897	0.59	0.061
1938	30,445	18,610	73%	13,539	2,168	0.55	0.072
1939	29,268	17,734	70%	21,489	2,405	0.51	0.083
1941	27,994	16,774	66%	18,107	2,450	0.49	0.088
1942	26,856	15,859	63%	14,729	2,226	0.51	0.084
1943	26,134	15,175	60%	12,738	3,420	0.38	0.132
1944	24,589	13,747	54%	12,685	3,614	0.34	0.148
1945	23,170	12,365	49%	14,401	2,822	0.38	0.123
1946	22,663	11,867	47%	15,114	2,593	0.39	0.115
1947	22,376	11,835	47%	14,478	3,934	0.28	0.177
1948	20,756	10,982	43%	13,509	3,204	0.31	0.156
1949	19,801	10,457	41%	12,616	4,371	0.23	0.223
1950	17,755	9,067	36%	11,945	4,068	0.22	0.231
1951	16,047	7,890	31%	11,676	4,552	0.17	0.287
1952	13,952	6,490	26%	11,852	3,016	0.21	0.219
1953	13,327	6,129	24%	11,893	2,807	0.22	0.213
1954	12,868	5,940	23%	12,067	2,224	0.26	0.175
1955	12,878	6,064	24%	12,634	2,846	0.21	0.224
1956	12,245	5,751	23%	12,167	2,806	0.20	0.232
1957	11,631	5,367	21%	10,303	2,201	0.24	0.192
1958	11,587	5,326	21%	9,589	2,784	0.19	0.243
1959	11,007	4,939	19%	10,786	2,348	0.21	0.216
1960	10,828	4,822	19%	13,582	2,526	0.20	0.236
1961	10,467	4,646	18%	17,507	2,562	0.19	0.248
1962	10,045	4,468	18%	9,034	3,088	0.15	0.313
1963	9,130	3,935	16%	8,910	2,616	0.15	0.293
1964	8,714	3,556	14%	11,459	2,649	0.14	0.308
1965	8,409	3,148	12%	9,246	2,247	0.14	0.271
1966	8,484	3,117	12%	30,055	2,365	0.14	0.284
1967	8,419	3,246	13%	13,621	2,137	0.16	0.259
1968	8,549	3,475	14%	17,088	2,153	0.16	0.262
1969	8,723	3,460	14%	12,526	1,945	0.18	0.228
1970	9,490	3,462	14%	12,631	1,907	0.18	0.205
1971	10,541	3,581	14%	14,363	2,655	0.14	0.256
1972	11,024	3,829	15%	9,504	2,591	0.16	0.239
1973	11,457	4,465	18%	7,718	2,932	0.16	0.260

Fishing year	Total biomass (mt)	Spawning biomass (mt)	Depletion	Age-0 recruits	Total catch (mt)	SPR	Relative exploitation rate
1974	11,473	5,105	20%	8,260	3,073	0.16	0.270
1975	10,749	4,887	19%	13,860	3,190	0.15	0.300
1976	9,664	4,464	18%	16,578	2,595	0.17	0.272
1977	8,988	4,217	17%	8,663	2,049	0.20	0.233
1978	8,797	4,068	16%	8,811	2,573	0.15	0.299
1979	8,212	3,537	14%	16,169	2,813	0.11	0.347
1980	7,569	2,867	11%	10,162	2,161	0.13	0.291
1981	7,568	2,726	11%	10,421	2,202	0.13	0.299
1982	7,533	2,823	11%	8,418	2,364	0.12	0.319
1983	7,382	2,820	11%	15,598	2,729	0.09	0.376
1984	6,745	2,521	10%	12,849	2,021	0.12	0.306
1985	6,680	2,567	10%	7,137	1,717	0.15	0.265
1986	6,858	2,777	11%	6,325	1,787	0.15	0.266
1987	7,021	2,856	11%	9,235	2,458	0.10	0.355
1988	6,579	2,509	10%	12,535	2,318	0.10	0.357
1989	6,138	2,342	9%	13,228	2,245	0.10	0.374
1990	5,593	2,291	9%	15,608	1,893	0.11	0.349
1991	5,333	2,221	9%	6,573	2,054	0.09	0.398
1992	5,014	1,824	7%	8,896	1,719	0.09	0.355
1993	5,173	1,620	6%	17,350	1,687	0.09	0.332
1994	5,525	1,652	7%	9,318	1,542	0.12	0.286
1995	5,998	1,983	8%	10,273	1,667	0.13	0.288
1996	6,288	2,373	9%	9,792	1,905	0.12	0.309
1997	6,392	2,481	10%	19,327	2,056	0.11	0.328
1998	6,366	2,321	9%	19,869	1,764	0.13	0.284
1999	6,635	2,475	10%	11,967	1,623	0.15	0.254
2000	7,082	2,765	11%	10,903	1,895	0.14	0.277
2001	7,490	2,810	11%	8,563	1,987	0.13	0.271
2002	8,048	2,798	11%	8,161	2,088	0.14	0.264
2003	8,532	3,030	12%	7,164	1,793	0.18	0.213
2004	9,183	3,706	15%	11,897	2,276	0.17	0.251
2005	9,188	4,161	16%	15,771	2,951	0.13	0.325
2006	8,298	3,950	16%	12,740	2,176	0.17	0.268
2007	7,932	3,818	15%	12,049	2,373	0.15	0.307
2008	7,403	3,350	13%	12,509	2,115	0.15	0.292
2009	7,308	2,938	12%	12,348	2,604	0.10	0.364

Table 19. Asymptotic standard deviation estimates for spawning biomass and recruitment.

Fishing year	SD Spawning biomass (mt)	SD Age-0 recruits (1000s)	Year	SD Spawning biomass (mt)	SD Age-0 recruits (1000s)	Year	SD Spawning biomass (mt)	SD Age-0 recruits (1000s)
1876	2,658	3,872	1921	2,356	3,846	1966	250	4,180
1877	2,658	3,872	1922	2,348	3,847	1967	267	4,635
1878	2,658	3,872	1923	2,340	3,846	1968	271	3,617
1879	2,658	3,872	1924	2,332	3,845	1969	271	3,578
1880	2,657	3,872	1925	2,323	3,844	1970	275	3,797
1881	2,657	3,872	1926	2,314	3,842	1971	302	2,711
1882	2,657	3,872	1927	2,304	3,841	1972	342	2,241
1883	2,656	3,872	1928	2,292	3,838	1973	362	2,631
1884	2,655	3,872	1929	2,278	3,836	1974	361	2,326
1885	2,653	3,871	1930	2,262	3,834	1975	339	3,361
1886	2,651	3,871	1931	2,246	3,832	1976	309	4,009
1887	2,649	3,870	1932	2,228	3,830	1977	281	2,693
1888	2,645	3,870	1933	2,207	3,827	1978	248	2,816
1889	2,642	3,869	1934	2,184	3,823	1979	215	4,350
1890	2,637	3,869	1935	2,145	3,813	1980	196	3,257
1891	2,633	3,868	1936	2,101	3,802	1981	199	2,897
1892	2,627	3,868	1937	2,056	3,795	1982	212	2,464
1893	2,621	3,867	1938	1,999	3,781	1983	219	3,623
1894	2,615	3,866	1939	1,930	11,956	1984	216	2,986
1895	2,608	3,866	1940	1,852	9,290	1985	206	1,871
1896	2,601	3,865	1941	1,767	6,918	1986	195	1,789
1897	2,593	3,864	1942	1,681	5,640	1987	179	2,303
1898	2,586	3,864	1943	1,574	5,523	1988	162	3,031
1899	2,577	3,863	1944	1,433	6,559	1989	149	3,342
1900	2,569	3,862	1945	1,230	7,152	1990	144	3,591
1901	2,560	3,861	1946	1,095	6,738	1991	135	1,872
1902	2,551	3,861	1947	1,100	6,077	1992	126	2,313
1903	2,542	3,860	1948	1,177	5,489	1993	125	3,797
1904	2,532	3,859	1949	1,238	5,041	1994	134	2,284
1905	2,523	3,858	1950	1,242	4,816	1995	147	2,458
1906	2,513	3,858	1951	1,174	4,808	1996	156	2,353
1907	2,503	3,857	1952	1,086	4,825	1997	158	4,131
1908	2,493	3,856	1953	999	4,855	1998	156	4,268
1909	2,483	3,855	1954	934	4,963	1999	162	2,652
1910	2,473	3,854	1955	880	4,588	2000	168	2,409
1911	2,462	3,854	1956	842	3,723	2001	168	1,947
1912	2,452	3,853	1957	808	3,293	2002	170	1,942
1913	2,441	3,852	1958	752	3,452	2003	194	1,840
1914	2,431	3,851	1959	680	3,988	2004	236	3,234
1915	2,420	3,850	1960	582	4,436	2005	270	4,858
1916	2,410	3,849	1961	466	2,673	2006	294	5,057
1917	2,399	3,848	1962	353	2,505	2007	318	5,437
1918	2,386	3,846	1963	278	3,003	2008	359	5,662
1919	2,374	3,846	1964	236	2,775	2009	425	5,536
1920	2,364	3,845	1965	230	7,019			

Table 20. Results from the sensitivity model runs.

Description	Base case	Ricker	½ Effective N NWFSC Survey Comps	No 2008 NWFSC Survey Data
Negative log-likelihoods				
Total	3076	3089	2407	2891
Indices	-25.2	-25.1	-26.1	-23.1
Length-frequency data	1178	1190	1061	1154
Age-frequency data	1926	1921	1377	1764
Discard biomass	97.0	96.7	96.4	96.4
Discard mean weight	-71.0	-71.4	-71.3	-71.9
Recruitment	-30.9	-22.6	-32.3	-32.3
Priors	2.0	0.44	2.43	3.51
Forecast recruitment	0.01	0.005	0.0001	0.001
Select parameters				
Stock-recruit, productivity				
R_0	9.52	9.35	9.43	9.32
Steepness (*h*)	0.95	2.32	0.97	0.99
Female M	0.15	0.18	0.14	0.13
Male M	0.17	0.19	0.16	0.15
Survey catchability & selectivity				
NWFSC survey catchability (*q*)	3.07	2.85	3.28	2.98
Triennial survey catchability (*q*) early	0.52	0.49	0.55	0.54
Triennial survey catchability (*q*) late	0.72	0.68	0.79	0.75
Individual growth				
Female length at age min	17.3	17.1	17.5	16.8
Female length at Linf	58.0	57.8	58.6	56.3
Female von Bertalanffy *K*	0.16	0.16	0.15	0.17
Female SD of length-at-age min	2.83	2.89	2.74	2.69
Female SD of length-at-age max	3.33	3.26	3.52	3.76
Male length at age min	16.7	16.6	16.7	16.3
Male length at Linf	42.0	42.0	42.6	42.0
Male von Bertalanffy *K*	0.29	0.29	0.29	0.30
Male SD of length-at-age at age min	2.07	2.07	2.00	1.96
Male SD of length-at-age at age max	3.71	3.71	3.74	3.82
Management quantities				
SB_0	25,334	14,415	25,501	26,206
2009 Spawning biomass	2,938	3,179	2,702	4,280
2009 Depletion	0.12	0.22	0.11	0.16
2009 1-*SPR*	0.90	0.86	0.91	0.85
2008 instantaneous fishing mortality	0.29	0.26	0.31	0.24
SSB MSY	4,796	5,447	4,566	4,395
1-SPR MSY	0.80	0.76	0.81	0.83
F MSY	0.23	0.22	0.24	0.25
2009 %Bmsy	0.61	0.58	0.59	0.97

Table 21. Results from the retrospective model runs.

Year assessed	SB0	Year-assessed SB	Assessed depletion	SB2005	2005 depletion	2009 depletion
2009	25.334	2,938	11.6	4,161	16.4	11.6
2008	25,872	4,545	17.6	4,483	17.3	17.5
2007	25,275	5,329	21.1	4,742	18.8	23.0
2006	25,058	4,394	17.5	4,192	16.7	22.8
2005	24,812	4,822	19.4	4,822	19.4	25.6
2004	24,980	2,752	11.0	3,311	13.3	12.9

Table 22. Projection of potential petrale sole ABC, OY, spawning biomass and depletion for the base case model based on the SPR= 0.4 fishing mortality target and $F_{40\%}$ overfishing limit/target (ABC). Assuming the OYs of 2433 and 2393 mt are attained in 2009 and 2010.

Year	ABC (mt)	OY (mt)	Age 3+ biomass (mt)	Spawning biomass (mt)	Depletion
2009	2,499	2,433	7,151	2,938	11.6%
2010	2,499	2,393	6,776	2,400	9.5%
2011	535	0	6,468	2,171	8.6%
2012	802	311	8,646	3,427	13.5%
2013	1,068	680	10,680	4,712	18.6%
2014	1,301	997	12,358	5,843	23.1%
2015	1,489	1,311	13,675	6,778	26.8%
2016	1,631	1,489	14,678	7,503	29.6%
2017	1,735	1,621	15,437	8,037	31.7%
2018	1,812	1,718	16,022	8,431	33.3%
2019	1,870	1,794	16,482	8,740	34.5%
2020	1,917	1,838	16,850	8,991	35.5%

Table 23. Decision table of 12-year projections for alternate states of nature (columns) and management options (rows) beginning in 2011. There are two values for depletion, the first calculates depetion using the SB40% Bmsy proxy and the second calculates depletion relative to the model estimate of Bmsy. Relative probabilities of each state of nature are based on low and high values for the model estimate of 2009 spawning biomass with the 2008 NWFSC survey biomass estimate as the axis of uncertainty. Landings in 2009–2010 are 2433 and 2393 mt, respectively, for all cases. Selectivity and fleet allocations are projected at the 2008 values

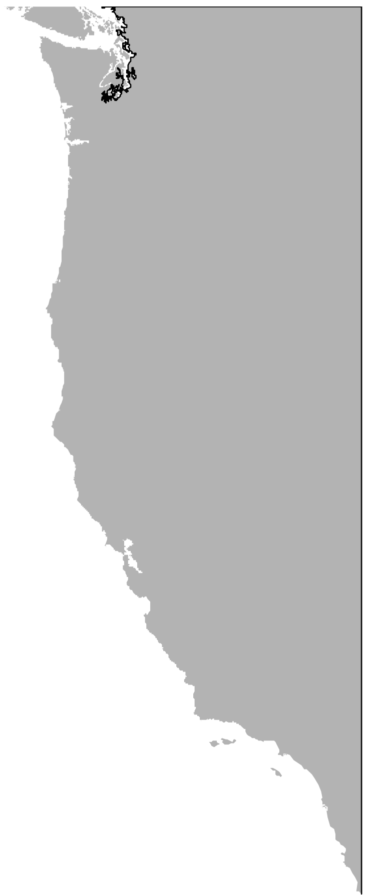
			State of nature								
			Low 2009 Spawning Biomass (-1.25 SD)			Base case			High 2009 Spawning Biomass (+1.25 SD)		
Relative probability			0.25			0.5			0.25		
			Depletion		Spawning biomass	Depletion		Spawning biomass	Depletion		Spawning biomass
Management decision	Year	Catch (mt)	SB0	Bmsy	(mt)	SB0	Bmsy	(mt)	SB0	Bmsy	(mt)
Catches Near Zero (3 mt)	2011	3	5%	29%	1,397	9%	48%	2,295	13%	67%	3,229
	2012	3	9%	50%	2,380	14%	74%	3,572	19%	100%	4,786
	2013	3	14%	75%	3,600	20%	105%	5,012	26%	134%	6,426
	2014	3	19%	104%	4,976	26%	136%	6,514	32%	168%	8,033
	2015	3	25%	134%	6,423	32%	167%	8,025	38%	200%	9,589
	2016	3	31%	164%	7,856	37%	198%	9,493	44%	231%	11,068
	2017	3	36%	192%	9,217	43%	227%	10,884	50%	260%	12,452
	2018	3	41%	219%	10,511	48%	254%	12,197	55%	286%	13,739
	2019	3	46%	245%	11,766	53%	280%	13,440	59%	311%	14,933
	2020	3	50%	271%	12,984	58%	305%	14,613	64%	334%	16,034
Half 40-10 catches from base case	2011	0	5%	50%	1,397	9%	48%	2,295	13%	67%	3,229
	2012	156	9%	37%	2,382	14%	75%	3,574	18%	95%	4,554
	2013	340	14%	29%	3,524	19%	103%	4,932	24%	127%	6,090
	2014	499	18%	50%	4,710	25%	130%	6,239	30%	156%	7,493
	2015	656	23%	73%	5,861	29%	155%	7,451	35%	182%	8,750
	2016	745	27%	98%	6,893	34%	178%	8,520	39%	205%	9,837
	2017	810	30%	122%	7,796	37%	197%	9,460	43%	225%	10,785
	2018	859	33%	144%	8,604	41%	215%	10,297	46%	242%	11,615
	2019	897	36%	163%	9,365	44%	231%	11,060	49%	257%	12,349
	2020	919	39%	179%	10,097	46%	245%	11,763	52%	271%	13,004
40-10 catches from base case	2011	0	5%	29%	1,397	9%	48%	2,295	13%	67%	3,229
	2012	311	9%	50%	2,382	14%	75%	3,574	19%	100%	4,788
	2013	680	13%	72%	3,444	19%	101%	4,849	25%	130%	6,258
	2014	997	17%	93%	4,439	24%	124%	5,959	30%	156%	7,469
	2015	1,311	21%	110%	5,291	27%	143%	6,871	34%	176%	8,418
	2016	1,489	23%	123%	5,918	30%	158%	7,576	36%	190%	9,095
	2017	1,621	25%	133%	6,358	32%	169%	8,096	38%	200%	9,579
	2018	1,718	26%	139%	6,669	33%	177%	8,480	39%	207%	9,920
	2019	1,794	27%	144%	6,923	35%	183%	8,782	40%	212%	10,161
	2020	1,838	28%	149%	7,152	36%	188%	9,026	41%	215%	10,331

Table 23 continued.

			State of nature							
			Low 2009 Spawning Biomass (-1.25 SD)			Base case			High 2009 Spawning Biomass (+1.25 SD)		
Relative probability			0.25			0.5			0.25		
			Depletion		Spawning biomass	Depletion		Spawning biomass	Depletion		Spawning biomass
Management decision	Year	Catch (mt)	SB0	Bmsy	(mt)	SB0	Bmsy	(mt)	SB0	Bmsy	(mt)
Constant 500 mt	2011	500	5%	29%	1,397	9%	48%	2,295	13%	67%	3,229
	2012	500	8%	44%	2,134	13%	69%	3,314	18%	94%	4,522
	2013	500	12%	64%	3,056	18%	93%	4,455	23%	122%	5,861
	2014	500	16%	86%	4,109	22%	118%	5,639	28%	149%	7,153
	2015	500	20%	109%	5,228	27%	142%	6,833	33%	175%	8,397
	2016	500	25%	132%	6,342	32%	167%	7,997	38%	200%	9,578
	2017	500	29%	154%	7,403	36%	190%	9,104	43%	223%	10,687
	2018	500	33%	176%	8,418	40%	212%	10,157	47%	244%	11,723
	2019	500	37%	196%	9,415	44%	233%	11,165	51%	265%	12,694
	2020	500	40%	217%	10,401	48%	253%	12,129	54%	284%	13,599
Constant 1500 mt	2011	1,500	5%	29%	1,397	9%	48%	2,295	13%	67%	3,229
	2012	1,500	6%	34%	1,649	11%	58%	2,802	16%	83%	3,995
	2013	1,500	8%	41%	1,979	13%	70%	3,341	19%	99%	4,728
	2014	1,500	9%	49%	2,367	15%	81%	3,874	21%	112%	5,375
	2015	1,500	11%	58%	2,791	17%	92%	4,407	24%	125%	5,973
	2016	1,500	12%	67%	3,210	19%	103%	4,926	26%	136%	6,534
	2017	1,500	14%	75%	3,599	21%	113%	5,424	28%	147%	7,062
	2018	1,500	15%	83%	3,968	23%	123%	5,907	30%	158%	7,564
	2019	1,500	17%	91%	4,348	25%	133%	6,388	32%	168%	8,050
	2020	1,500	18%	99%	4,752	27%	143%	6,869	34%	178%	8,519
Constant 2/3 Fmsy	2011	36	5%	29%	1,397	9%	48%	2,295	13%	67%	3,229
	2012	86	9%	50%	2,375	14%	74%	3,555	19%	100%	4,781
	2013	166	14%	75%	3,576	20%	103%	4,948	25%	133%	6,400
	2014	274	19%	102%	4,905	25%	132%	6,354	32%	166%	7,960
	2015	447	24%	131%	6,261	30%	161%	7,703	38%	196%	9,421
	2016	582	29%	157%	7,517	35%	186%	8,930	43%	224%	10,721
	2017	714	34%	180%	8,629	39%	209%	10,000	47%	247%	11,856
	2018	837	37%	200%	9,602	43%	228%	10,918	51%	267%	12,825
	2019	949	41%	218%	10,473	46%	244%	11,706	54%	284%	13,641
	2020	1,020	44%	235%	11,252	49%	258%	12,376	57%	298%	14,314
Ramp down catches between 2/3 Fmsy at Bmsy and 0 catch at 50%Bmsy	2011	0	5%	29%	1,397	9%	48%	2,295	13%	67%	3,229
	2012	354	9%	50%	2,382	14%	75%	3,574	18%	93%	4,478
	2013	764	14%	75%	3,603	19%	101%	4,826	24%	123%	5,921
	2014	977	19%	100%	4,795	23%	123%	5,888	29%	152%	7,307
	2015	1,161	23%	121%	5,819	27%	142%	6,807	34%	176%	8,421
	2016	1,280	26%	139%	6,650	30%	158%	7,585	37%	194%	9,306
	2017	1,379	28%	153%	7,320	32%	171%	8,224	40%	209%	10,030
	2018	1,461	31%	164%	7,868	35%	183%	8,754	42%	221%	10,618
	2019	1,530	32%	174%	8,354	36%	192%	9,211	44%	231%	11,100
	2020	1,574	34%	184%	8,801	38%	200%	9,610	46%	240%	11,494

11. Figures

Figure 1. Distribution of total catch among each state for each of the summer and winter seasons 1876-2008 in comparison to the total catch in each year.



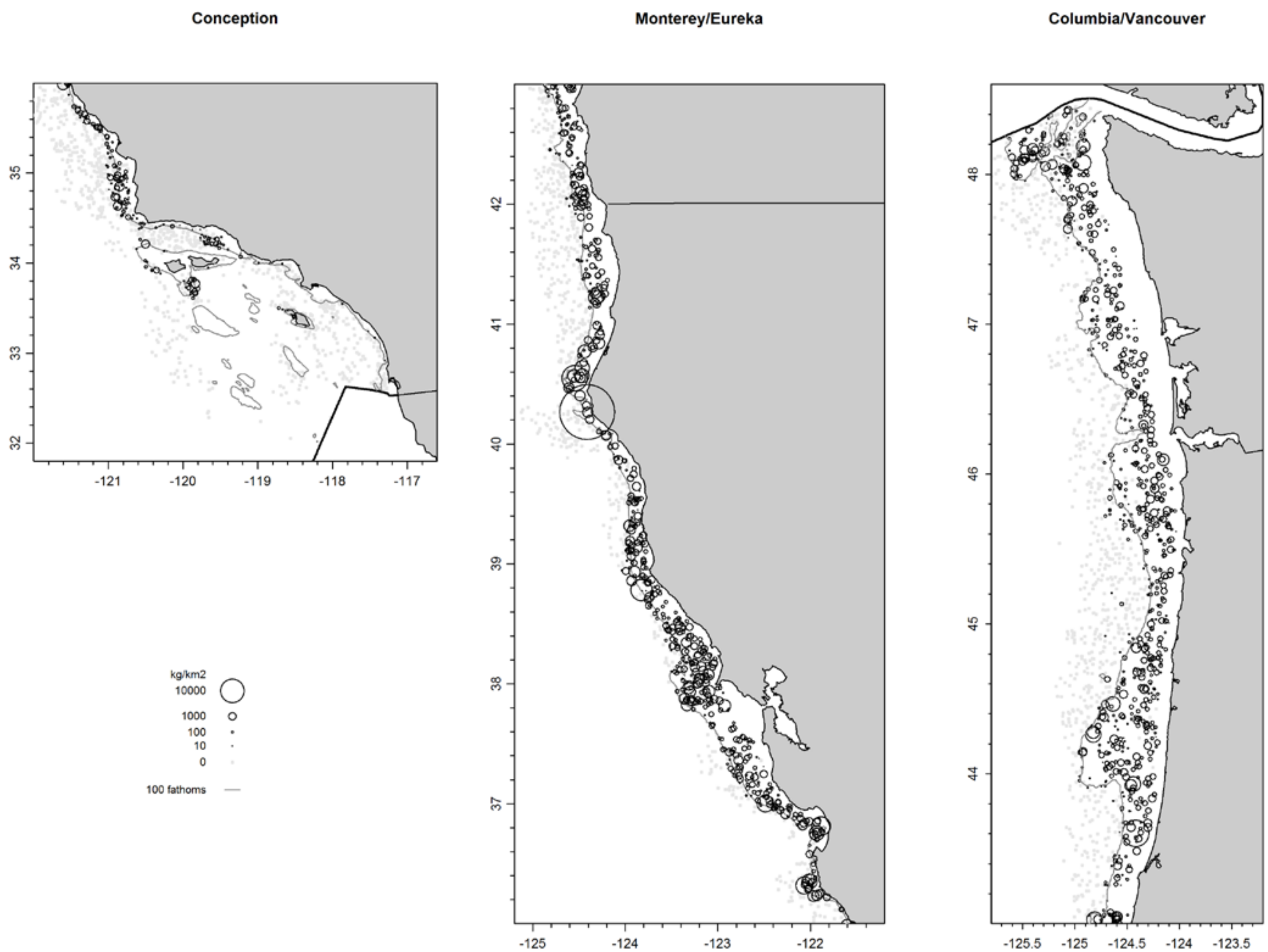


Figure 3. Catch rates over all years for the NWFSC survey.

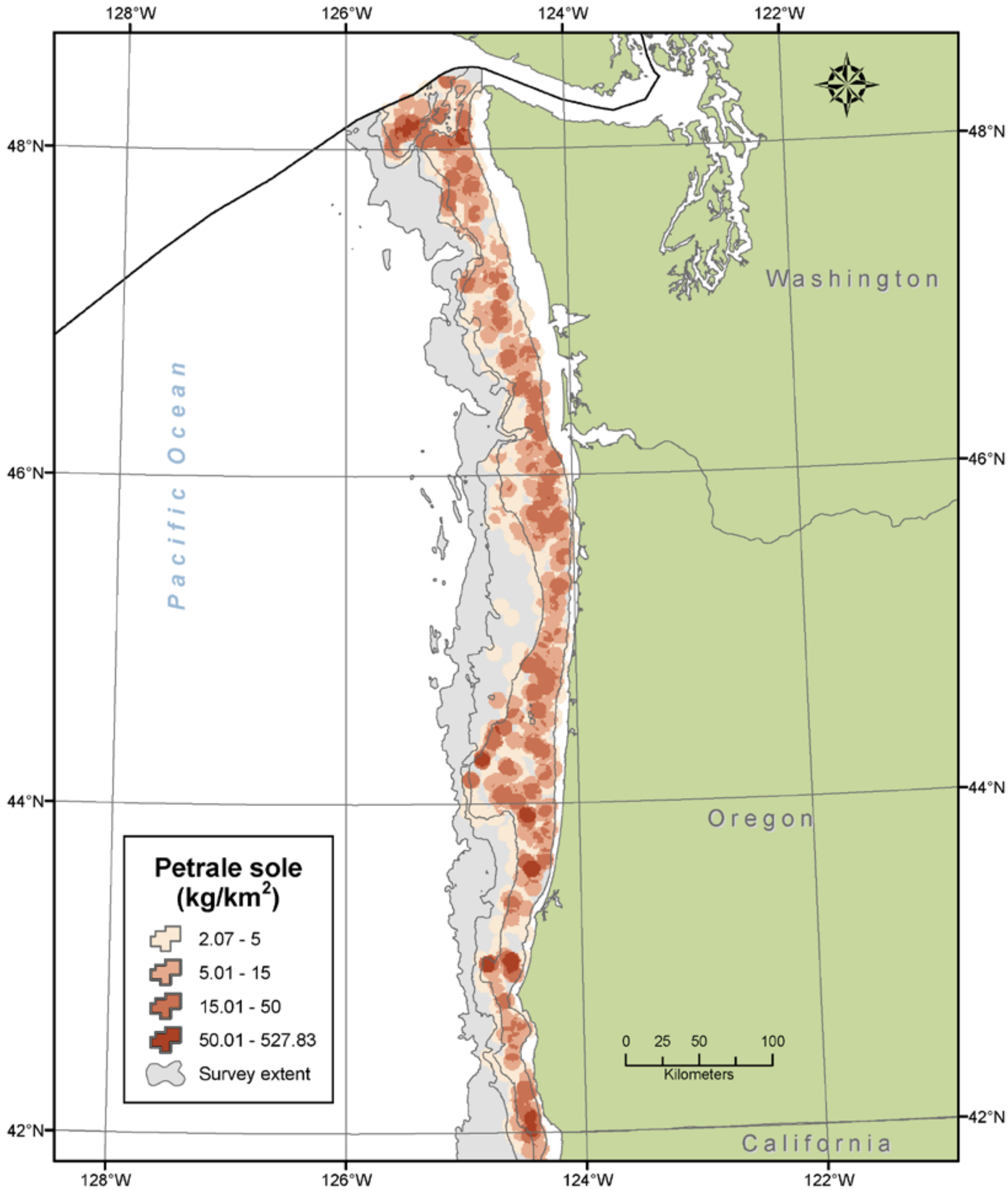


Figure 4a. Density of petrale sole (*Eopsetta jordani*) catch during NWFSC Groundfish Survey (2003-2008) of of Washington and Oregon. Three main survey strata are defined by the 30-, 100-, 300- and 700-fathom isobaths.

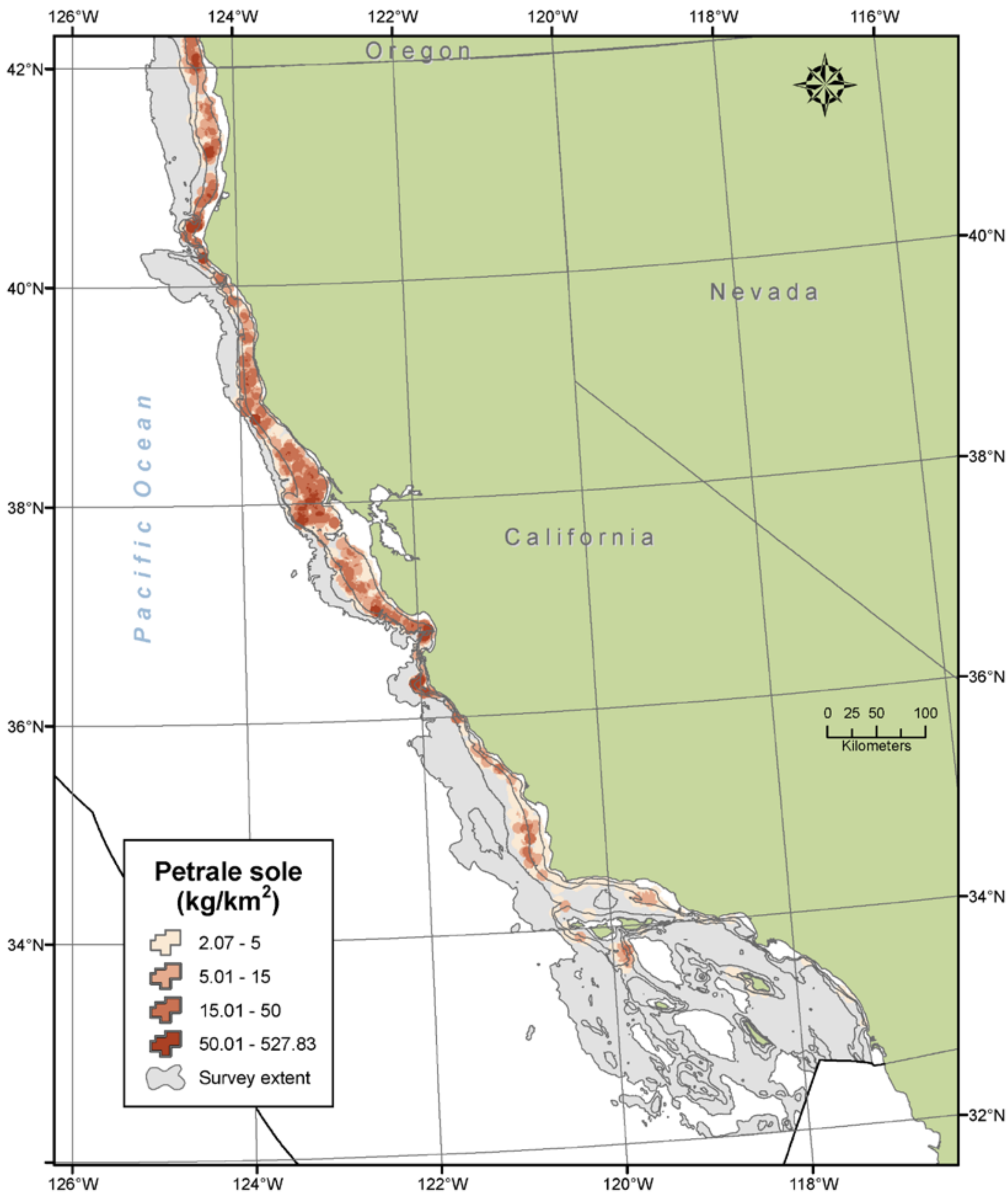


Figure 4b. Density of petrale sole (*Eopsetta jordani*) catch during NWFSC Groundfish Survey (2003-2008) off of California. Three main survey strata are defined by the 30-, 100-, 300- and 700-fathom isobaths.

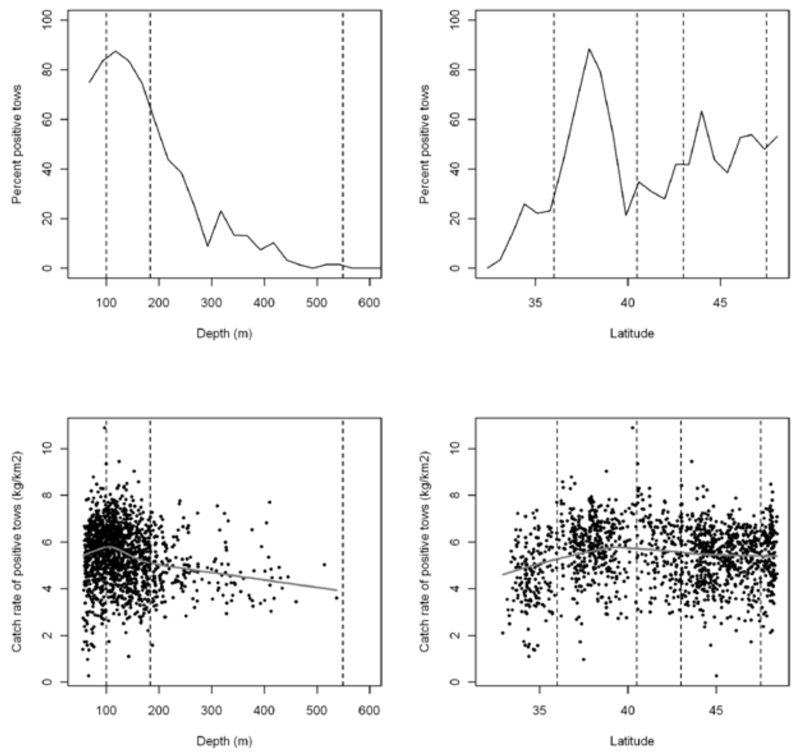


Figure 5. Plots of the percentage of positive tows and the catch rates for positive tows over depth and latitude.

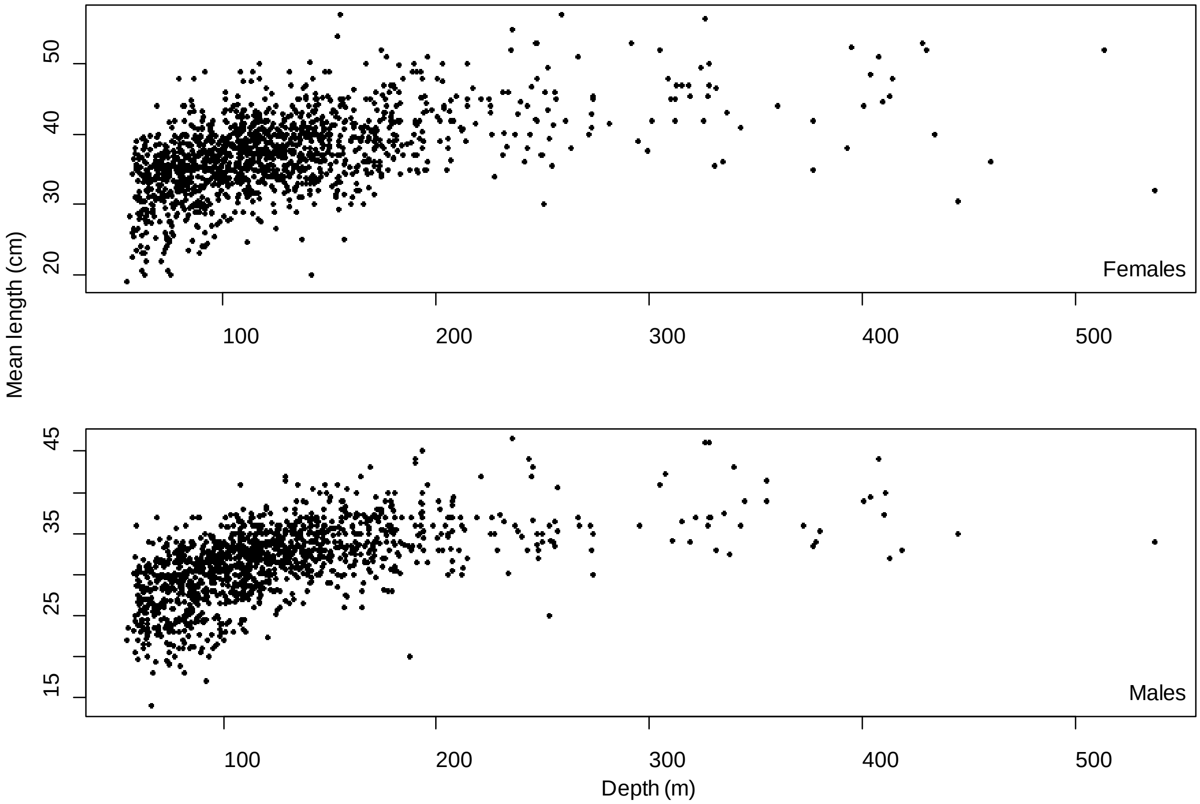


Figure 6. NWFSC survey mean length per tow by depth for females and males.

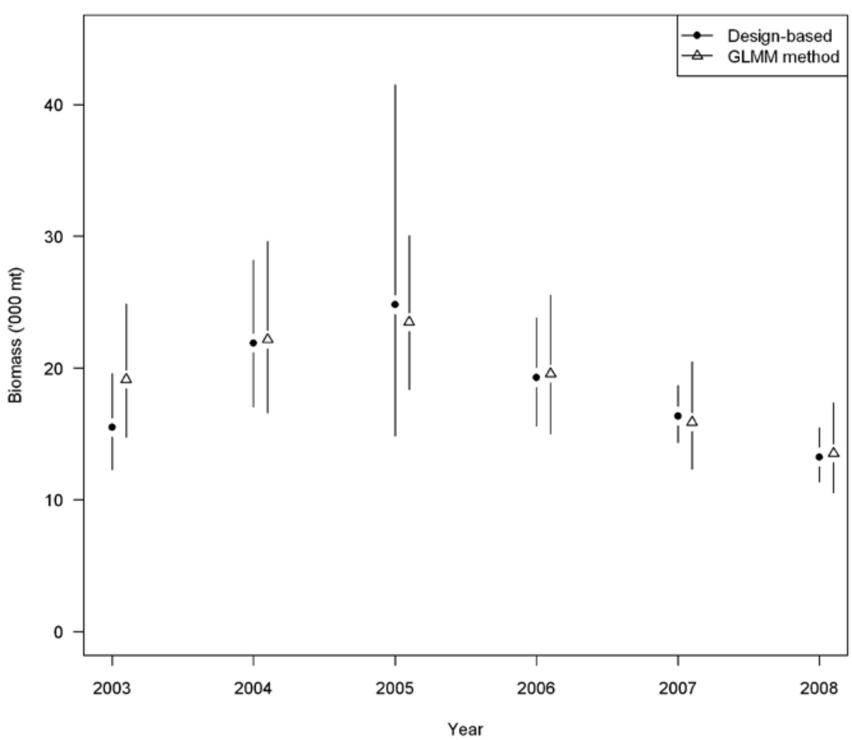


Figure 7. Design-based and GLMM biomass estimates from the NWFSC survey.

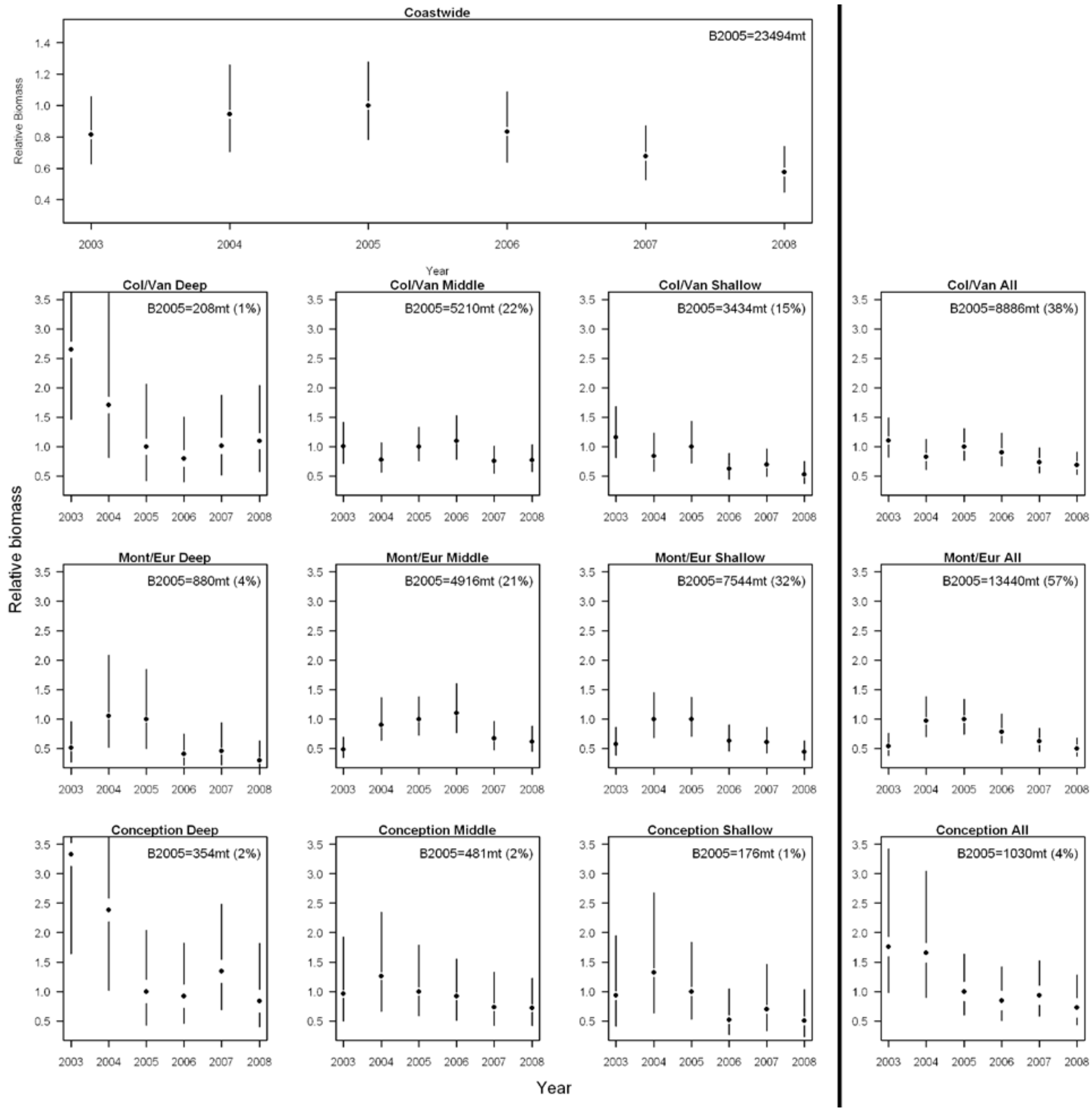


Figure 8. Plots of the estimated biomass relative to the year 2005 for each strata chosen for the GLMM using the NWFSC survey. The top wide plot is the entire coast and the plots to the right of the solid line are summed over depth.

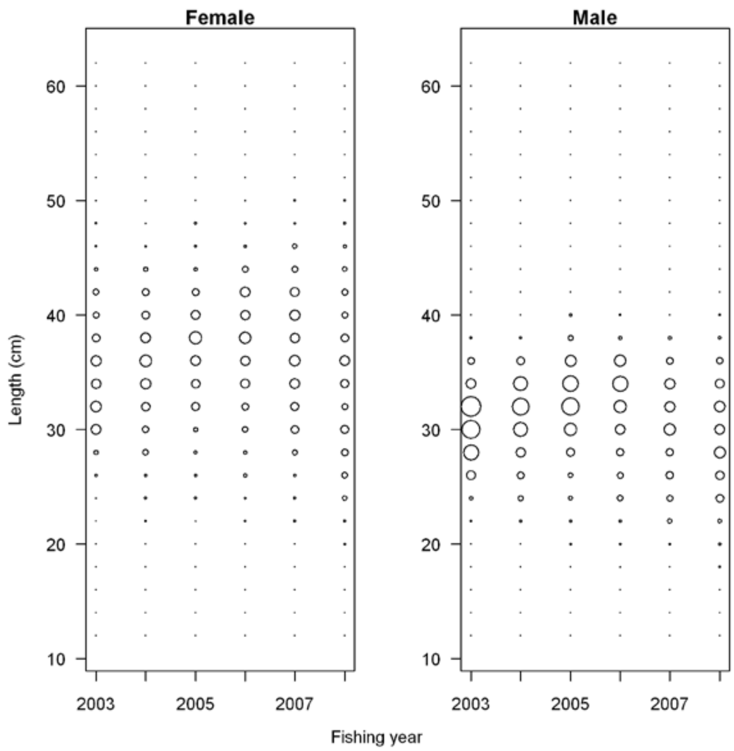


Figure 9. Length frequencies for the NWFSC survey.

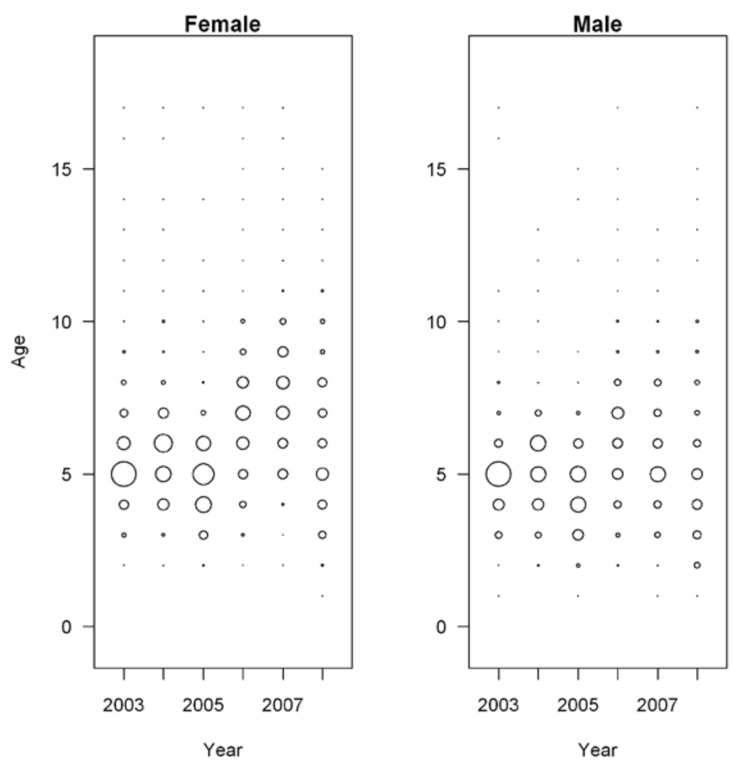


Figure 10. Age frequencies from the NWFSC survey.

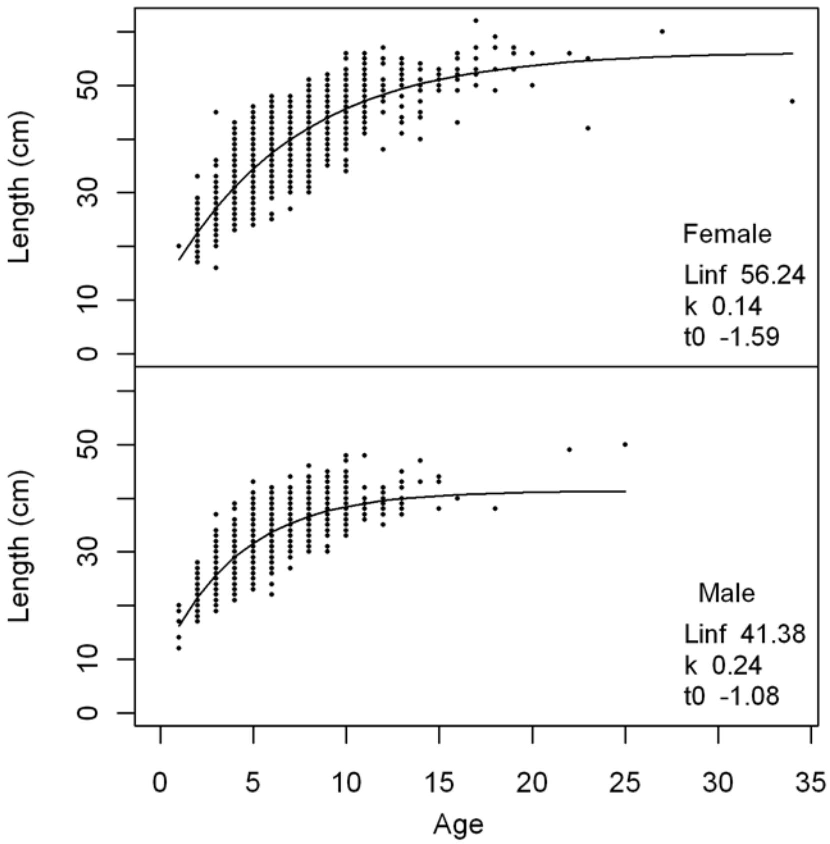


Figure 11. Length at age for males and females from the NWFSC survey with fits to the von Bertalanffy growth curve.

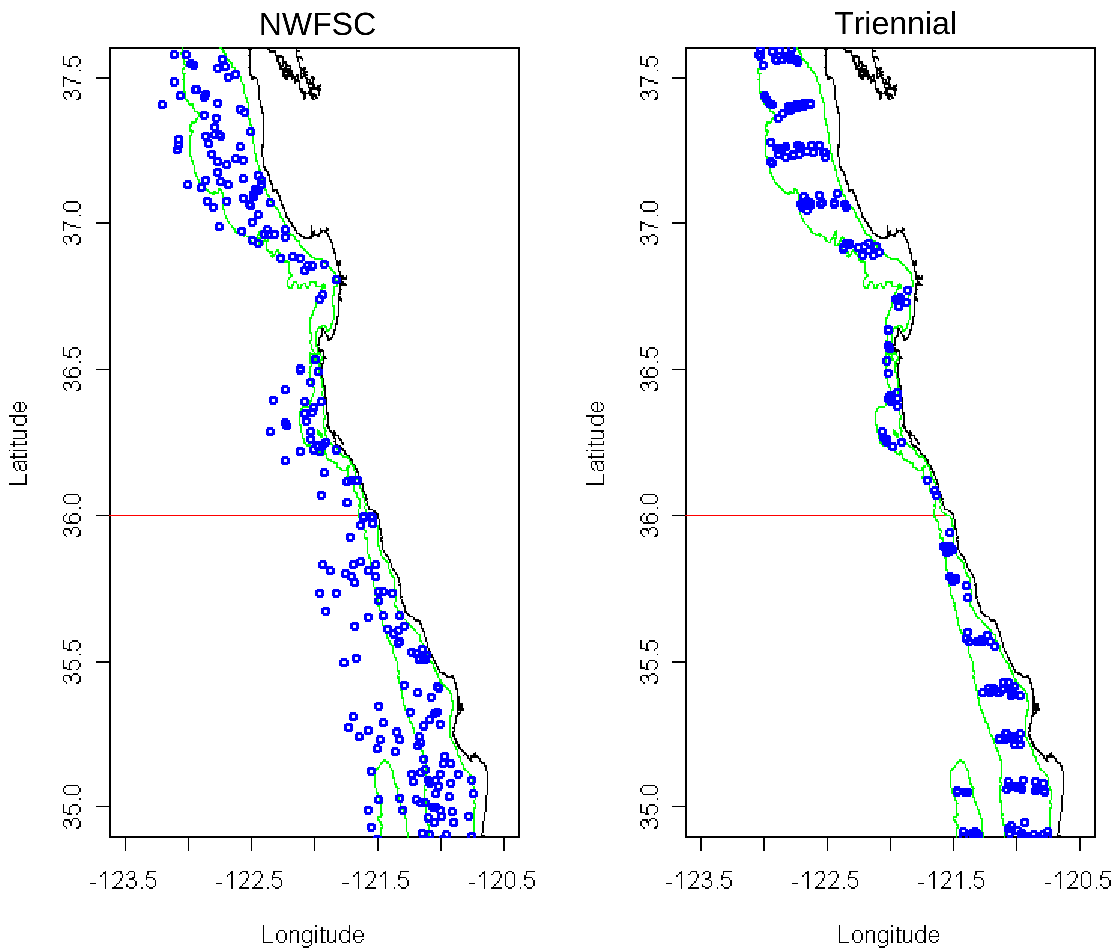


Figure 12. Survey tow locations in 2004, showing the difference in station design for the NWFSC survey relative to the Triennial trawl survey.

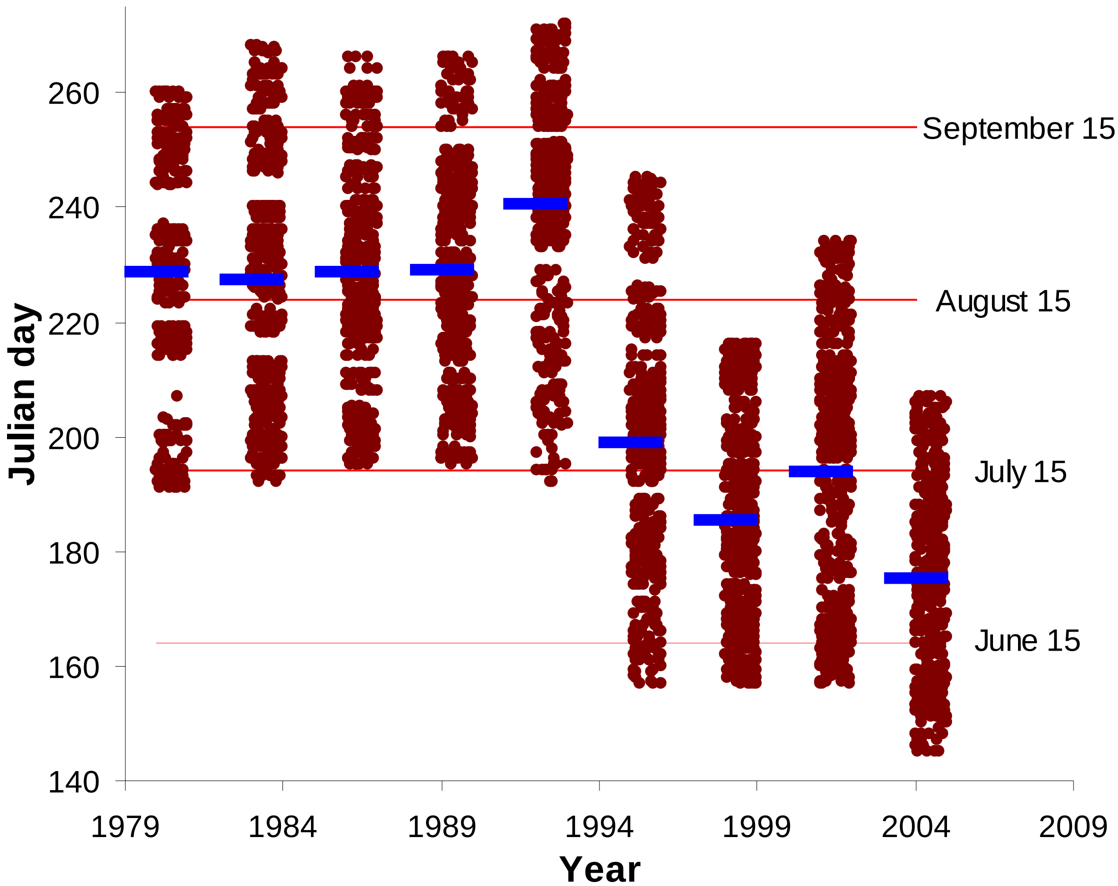


Figure 13. Distribution of dates of operation for the triennial survey (1980-2004). Solid bars show the mean date for each survey year, points represent individual hauls dates, but are jittered to allow better delineation of the distribution of individual points.

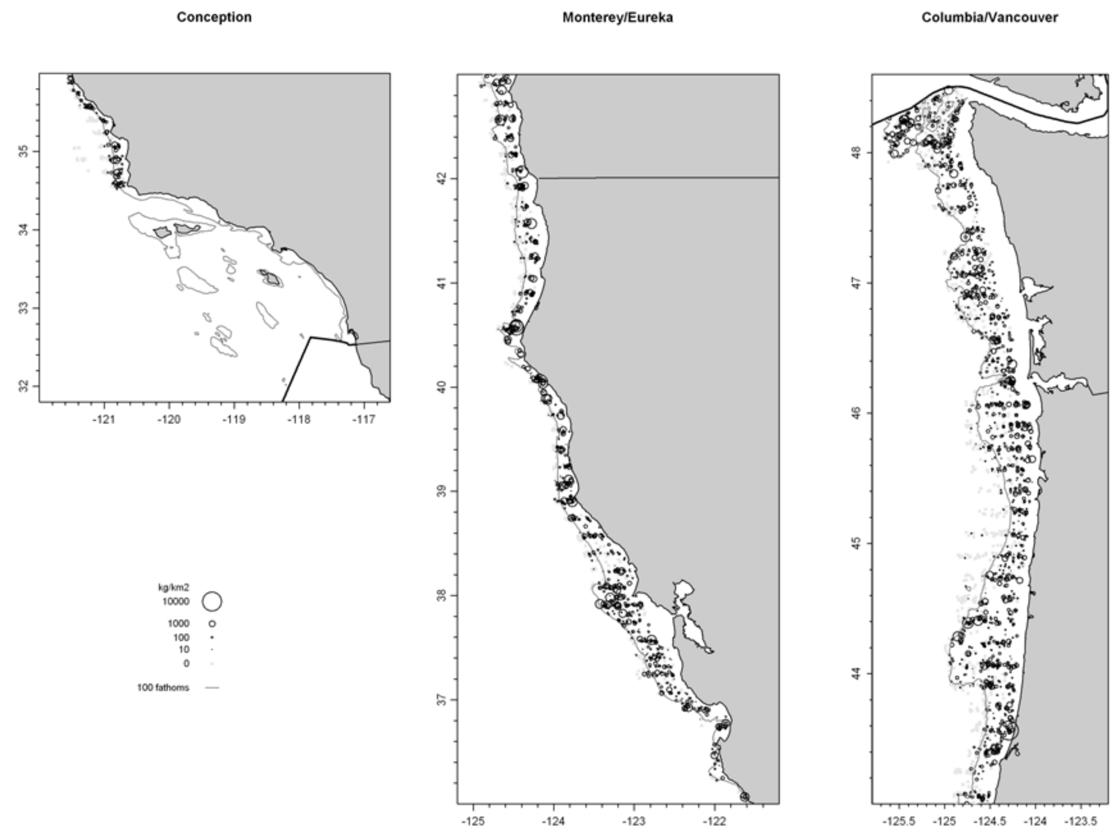


Figure 14. Catch rates over all years for the Triennial survey.

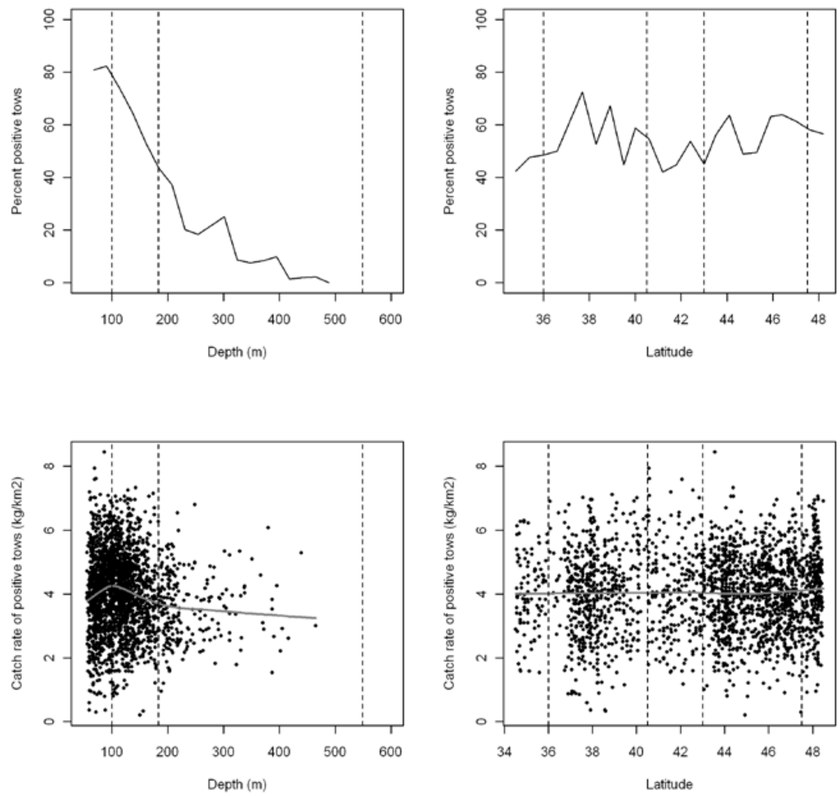


Figure 15. Plots of the percentage of positive tows and the catch rates for positive tows over depth and latitude.

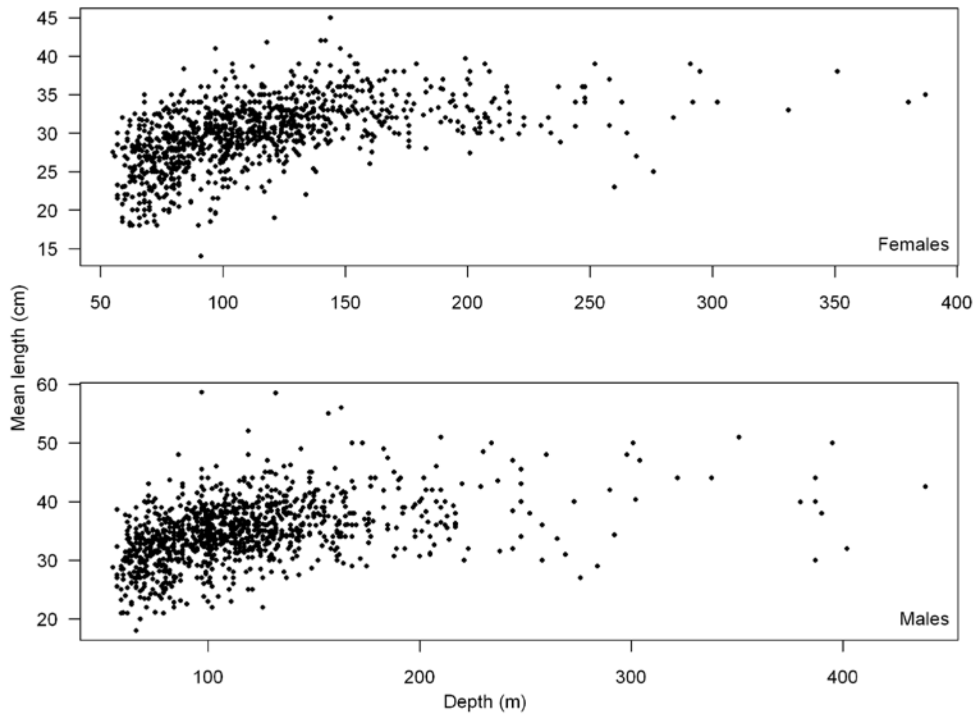


Figure 16. The mean length per tow from the Triennial survey data plotted over depth for females and males.

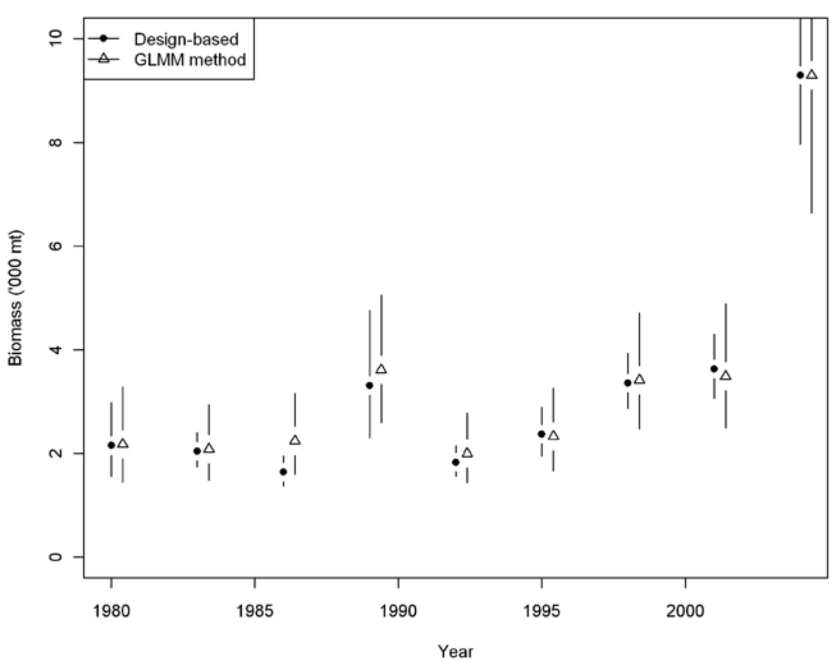


Table 17. Design-based and GLMM biomass estimates from the Triennial survey. The GLMM estimates were expanded by half of the area size, thus have been doubled to compare to the properly expanded design-based estimates.

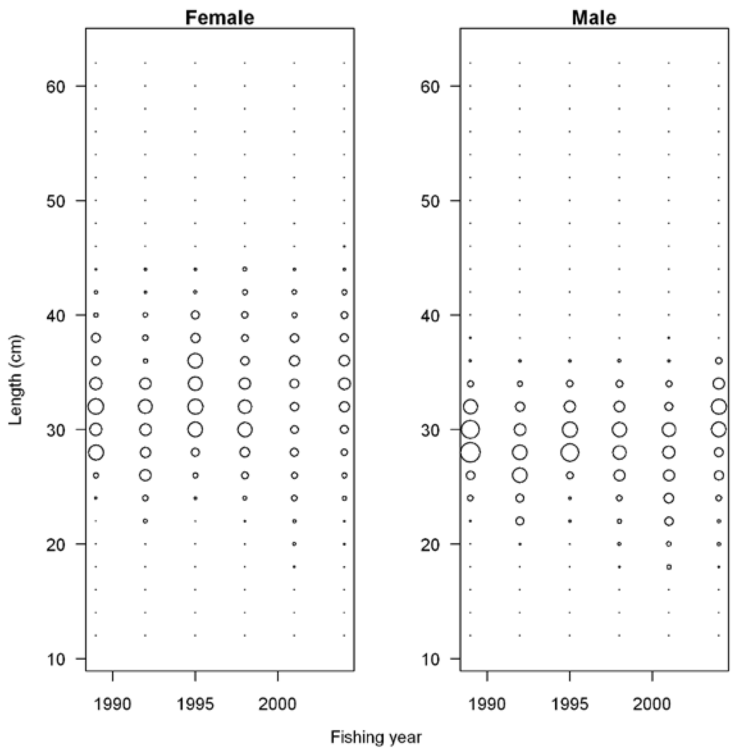


Figure 18. Plots of length frequencies from the triennial survey.

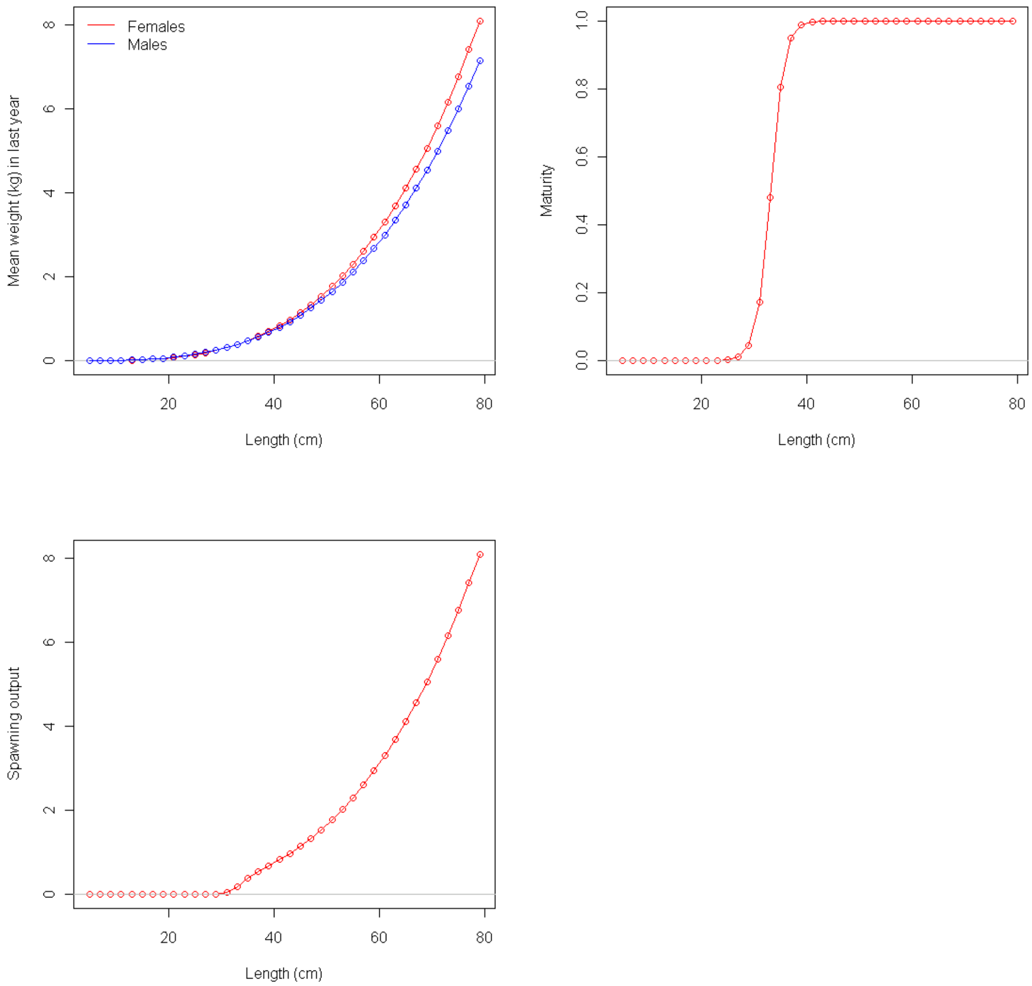
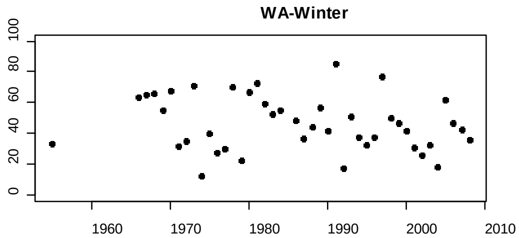
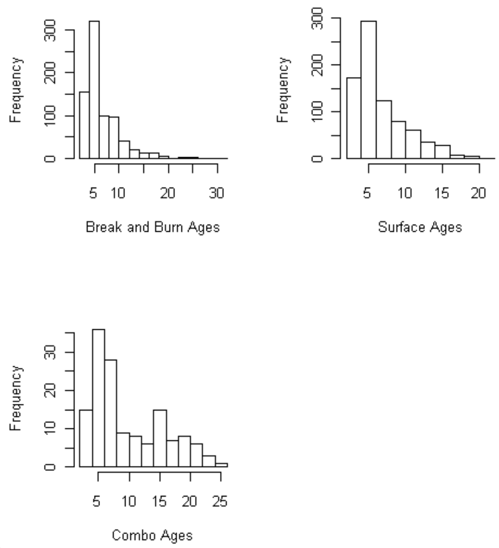
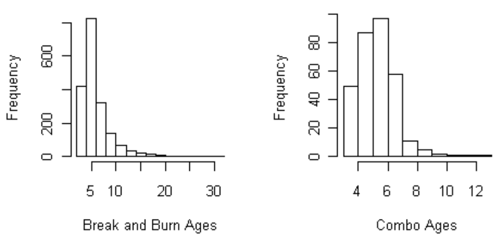


Figure 19. Biological relationships used for petrale sole weight-length relationship, maturity ogive (females only) and spawning output as a function of length.


WA-Winter
0
20
40
60
80
100
1960
1970
1980
1990
2000
2010



a



b

Figure 21. Distribution of double- and triple-reads used to calculate the ageing error keys for the CAP (a) and WDFW (b).

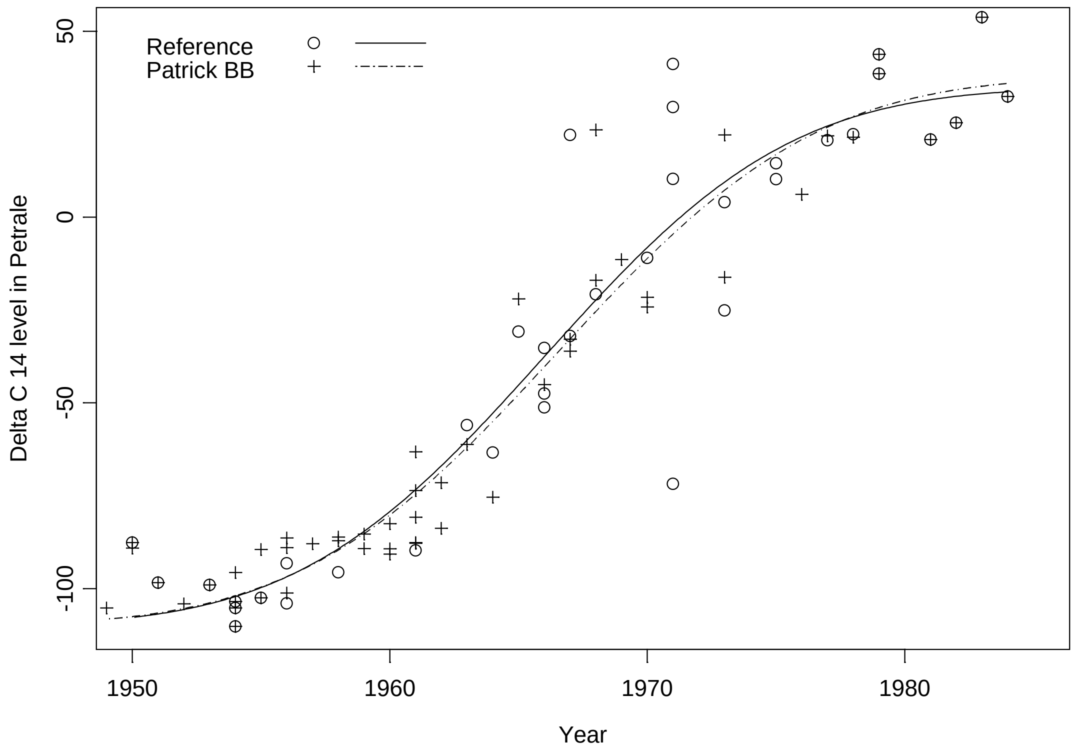


Figure 22. Fit of coupled-functions model (Hamel et al. 2008) to reference data and to age reader #1 break and burn ages of test samples (aged between 6 and 31) with early and late reference data (=1955, >=1979) added to ensure match at beginning and end of time series. No (or miniscule underageing) bias is seen (Haltuch et al. in prep).

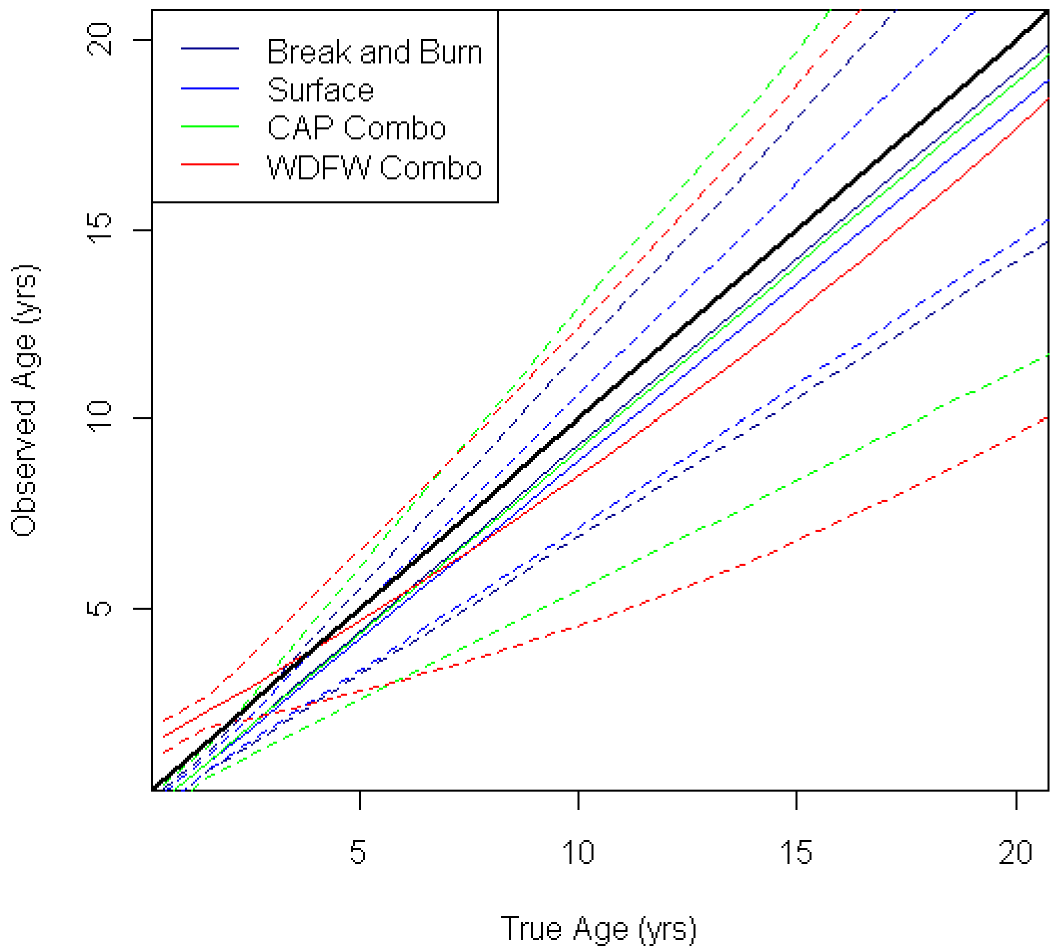


Figure 23. Plots of bias and imprecision for each data set.

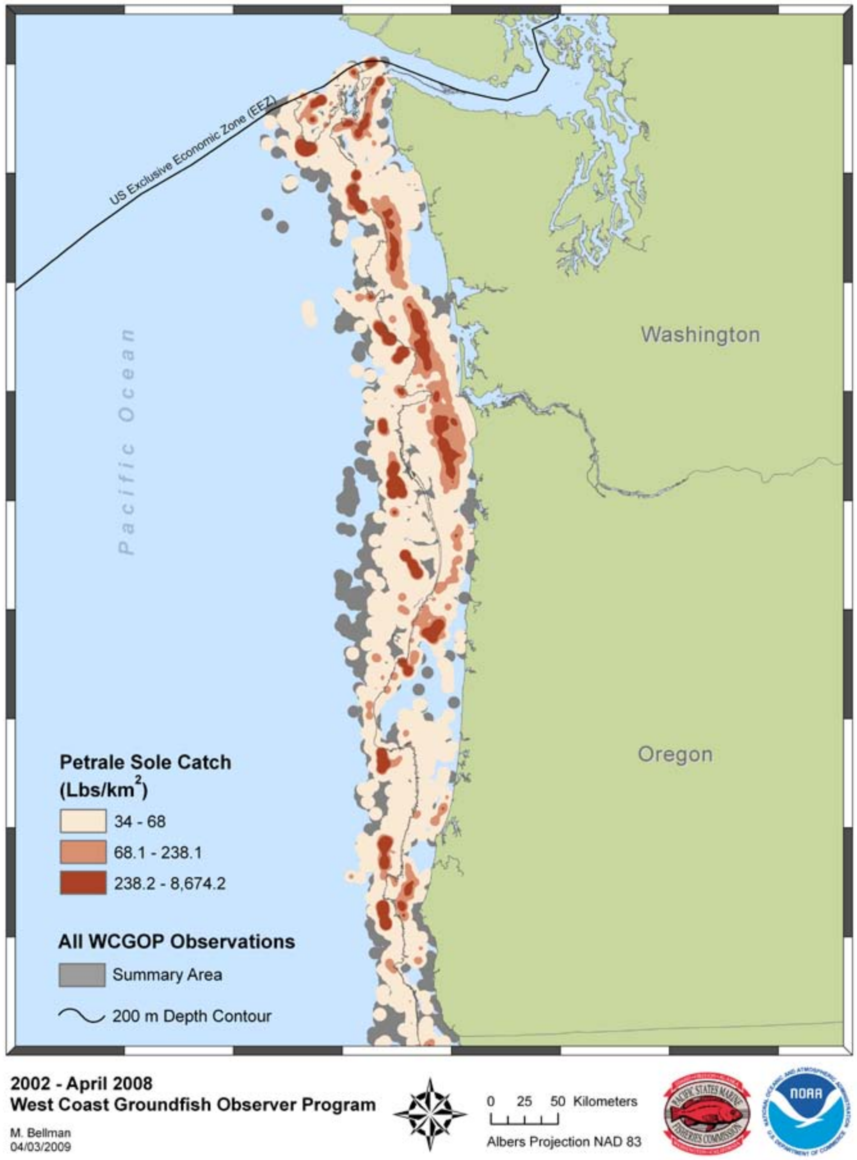


Figure 24a. Spatial distribution of petrale sole catch (lbs/km^2) observed by the West Coast Groundfish Observer Program from 2002 – April 2008 and the summary area of all observed fishing events off of Washington and Oregon.

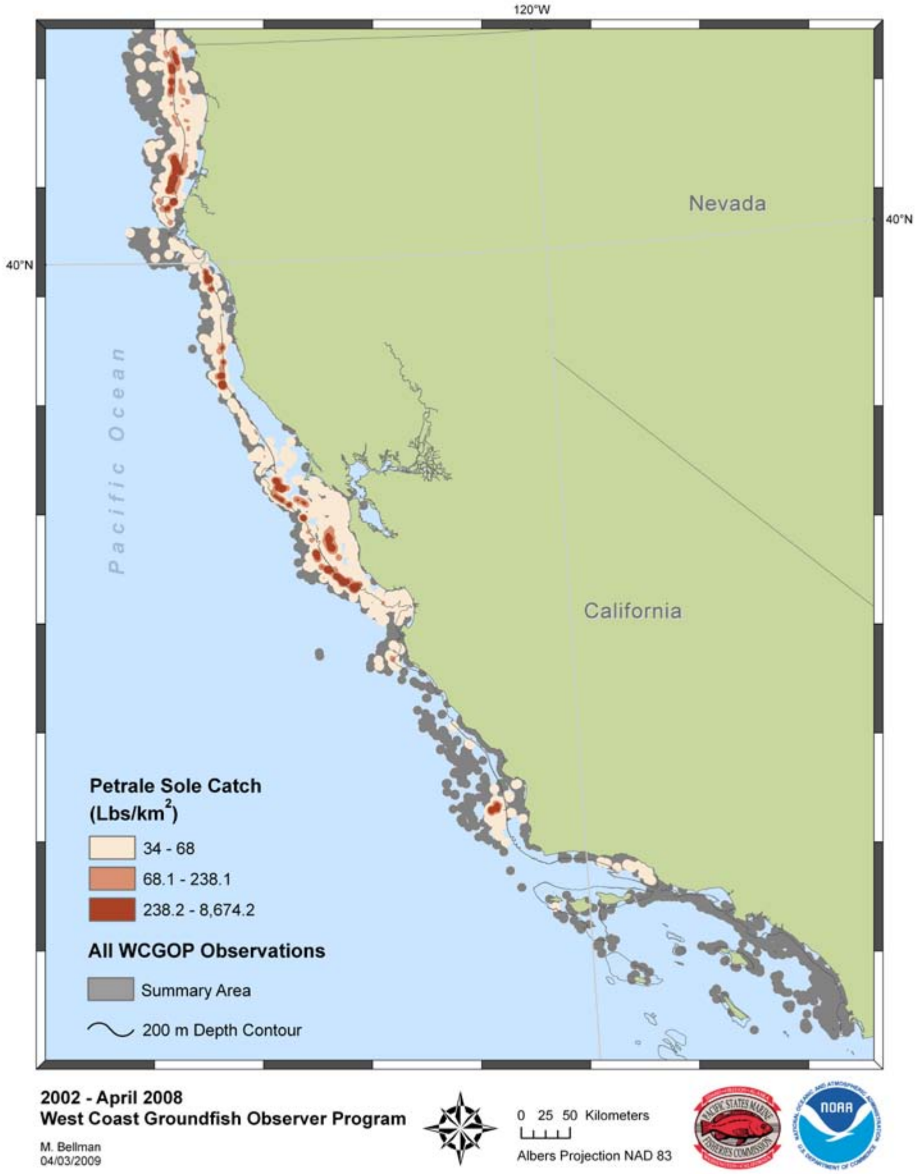


Figure 24b. Spatial distribution of petrale sole catch (lbs/km^2) observed by the West Coast Groundfish Observer Program from 2002 – April 2008 and the summary area of all observed fishing events off of California.

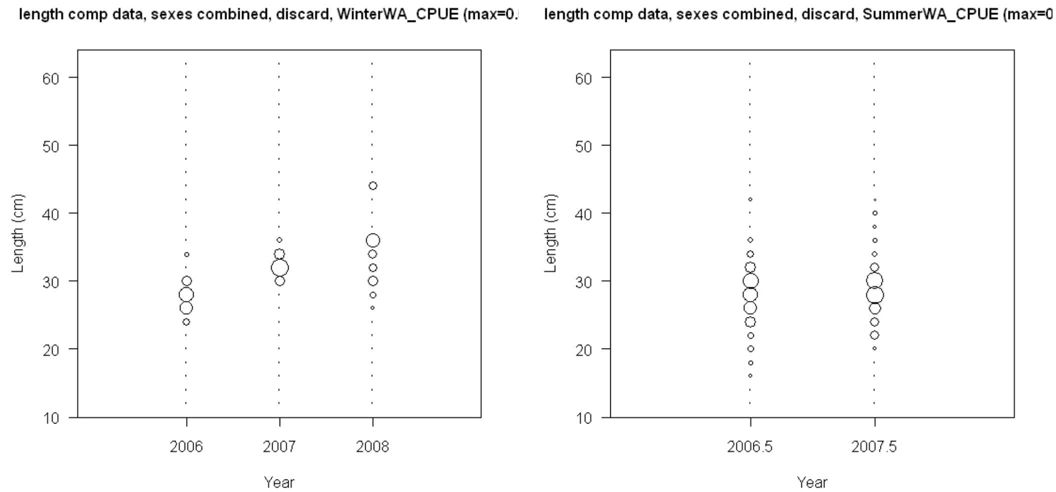


Figure 25. Discard length compositions by season for Washington.

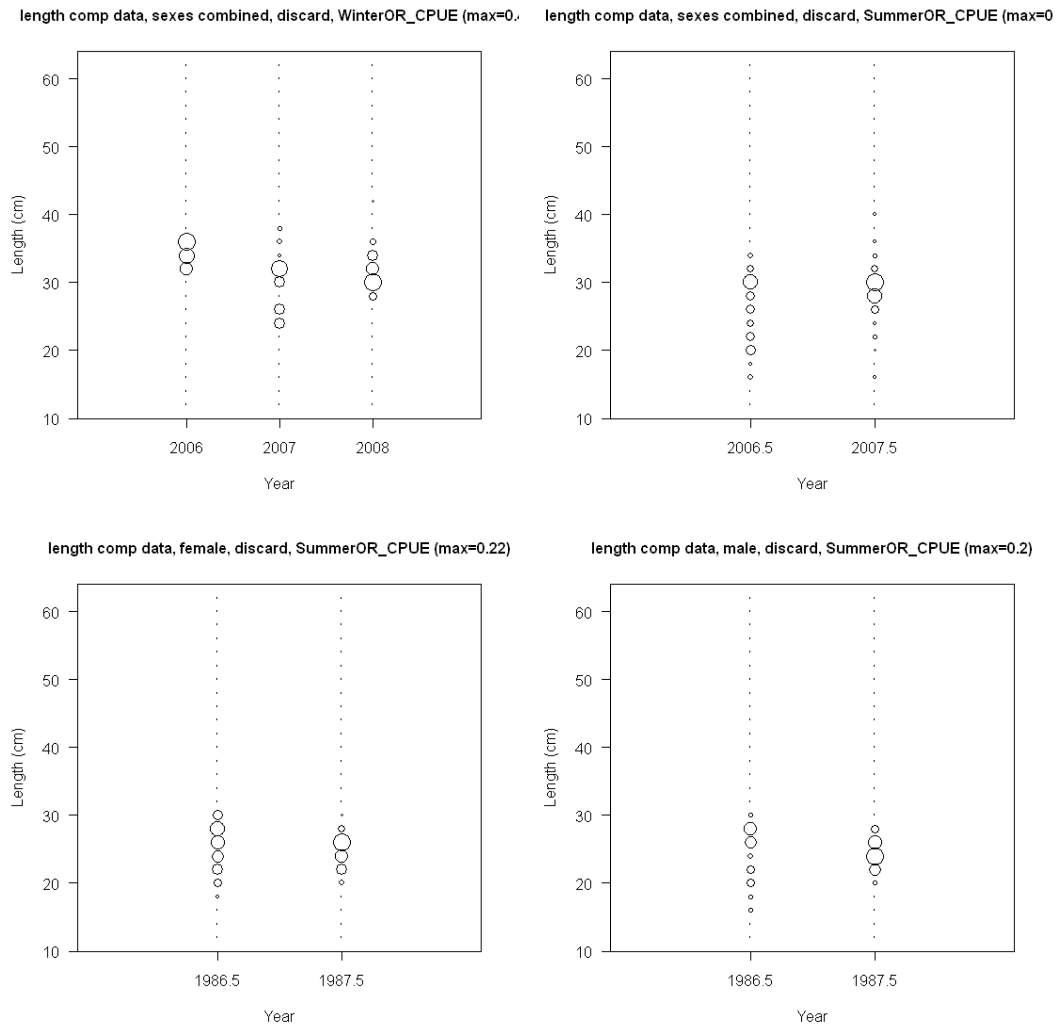


Figure 26. Discard length compositions by data source, season, and gender (where available) for Oregon.

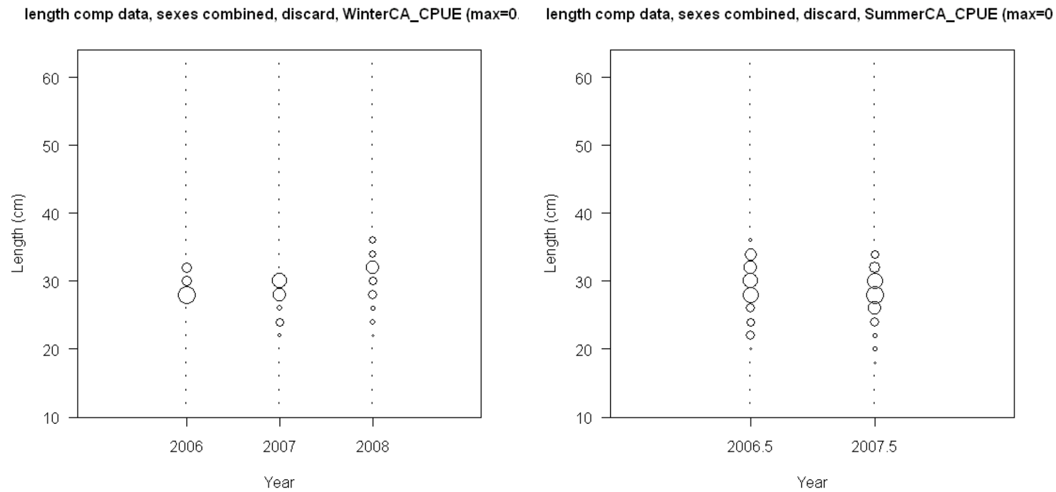


Figure 27. Discard length compositions by season for California.

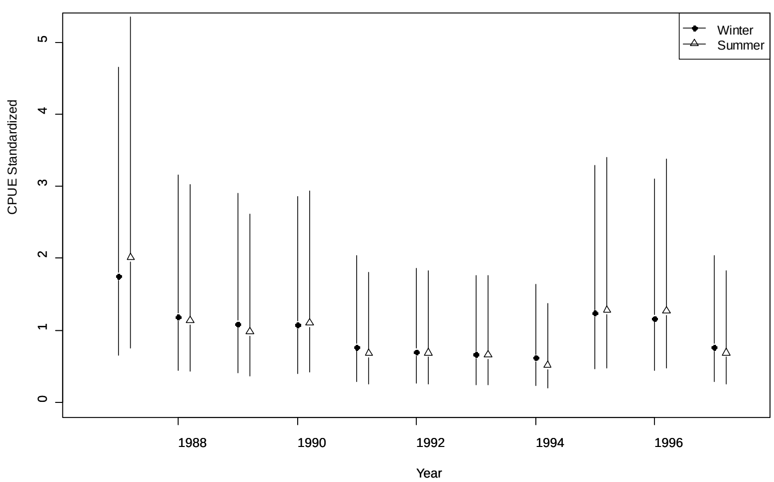


Figure 28. Plot of the OR CPUE Index.

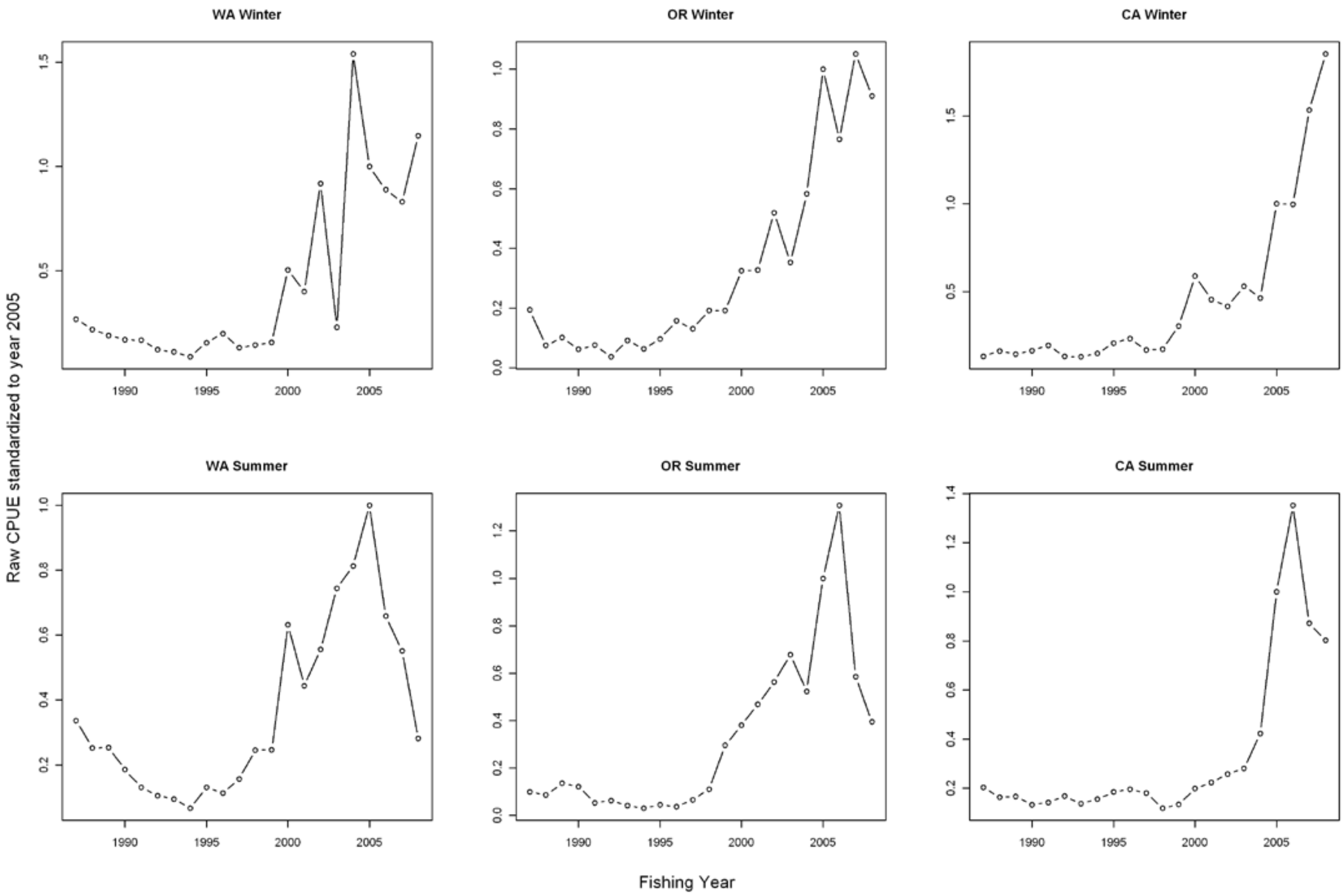


Figure 29. Plot of RAW CPUE.

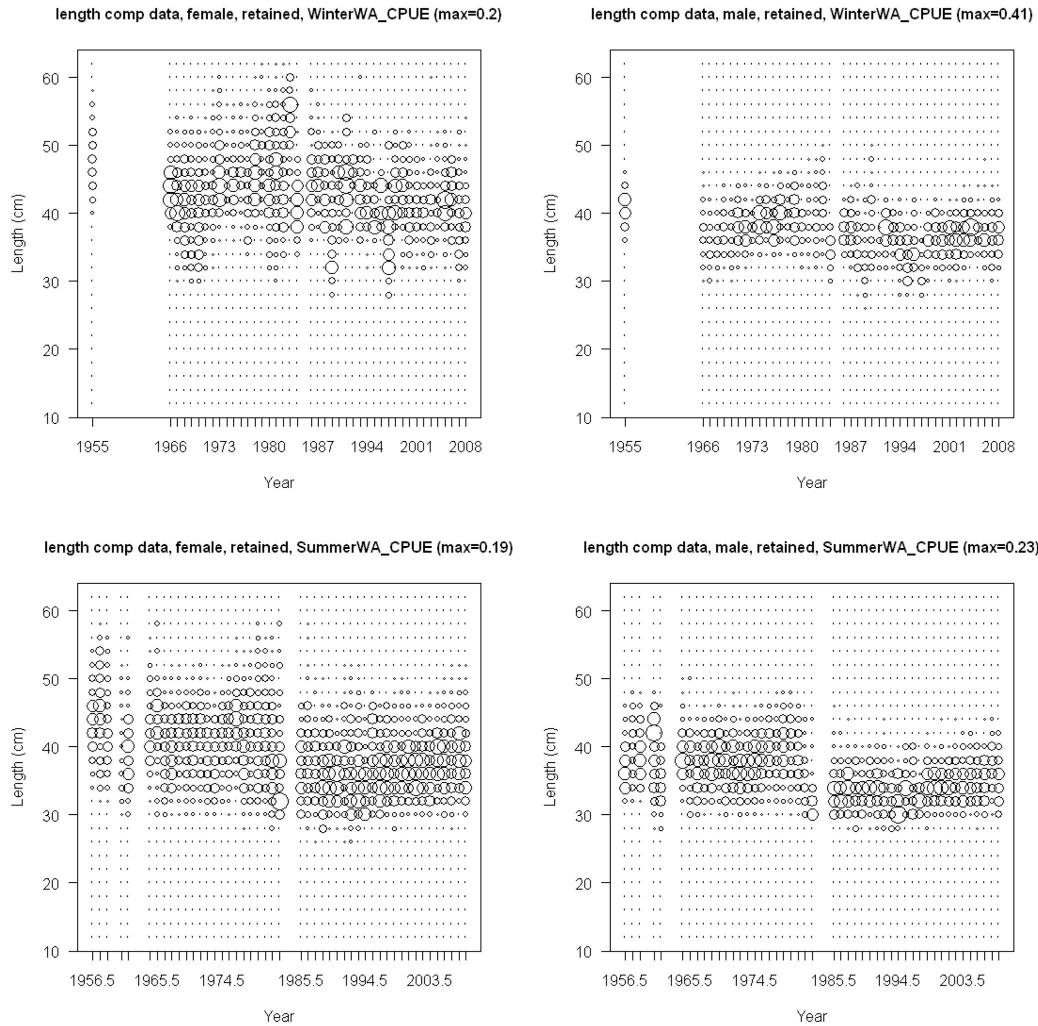


Figure 30. Length-frequency data by gender and season for the Washington fleets.

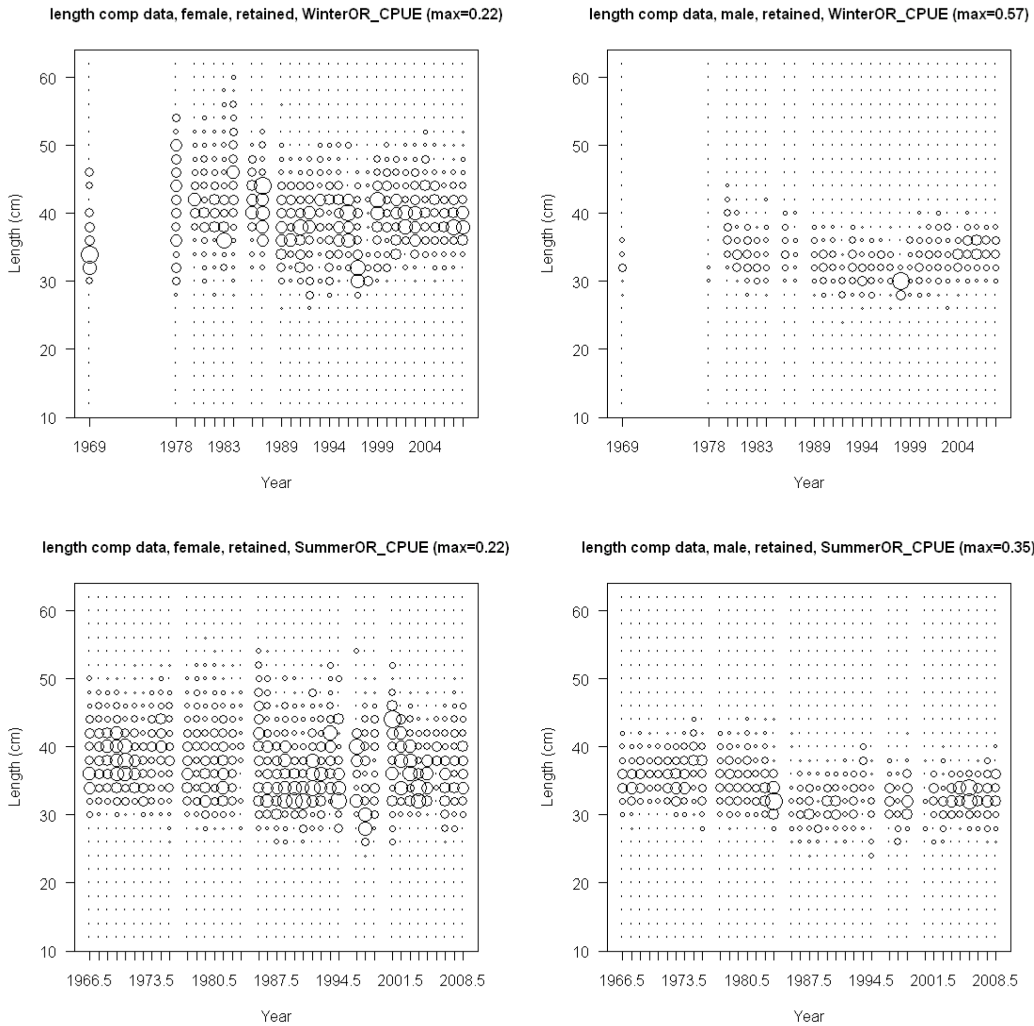


Figure 31. Length-frequency data by gender and season for the Oregon fleets.

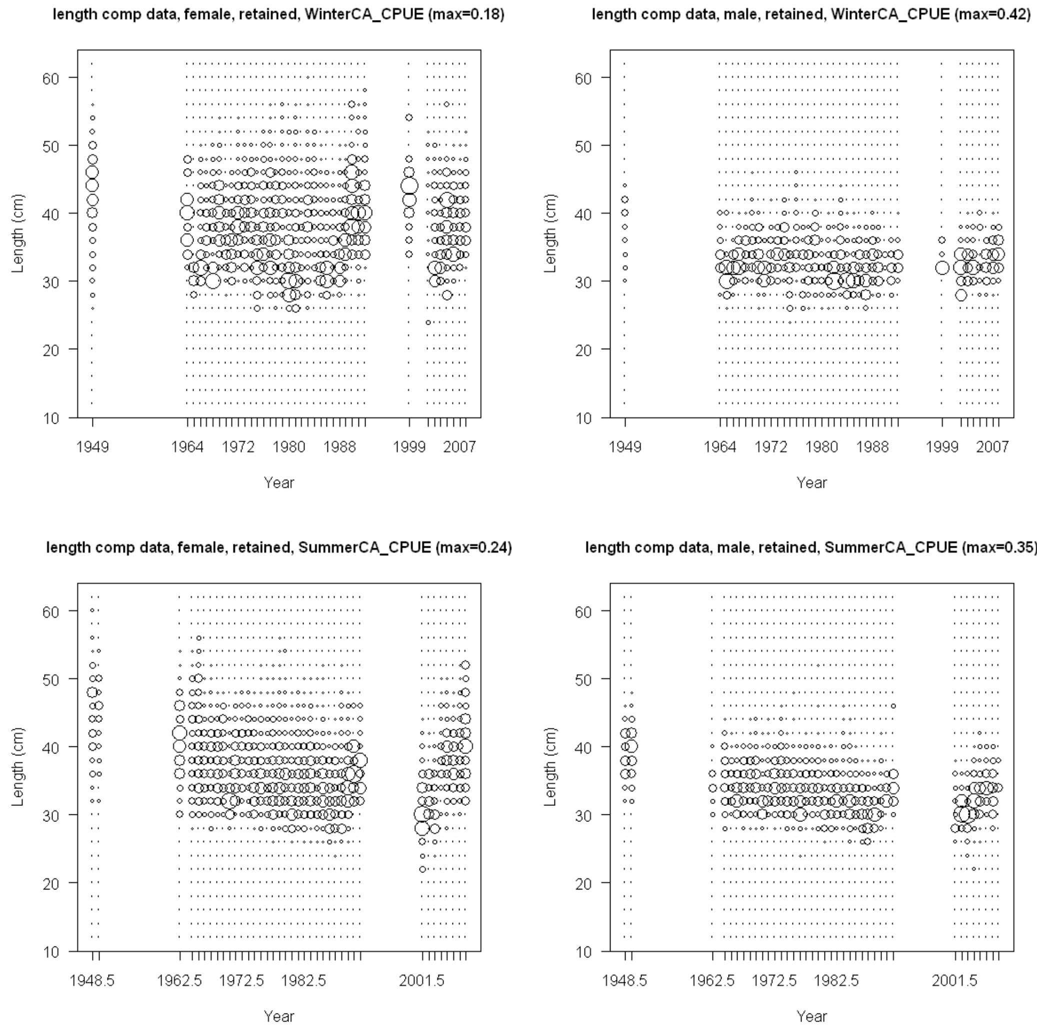


Figure 32. Length-frequency data by gender and season for the California fleets.

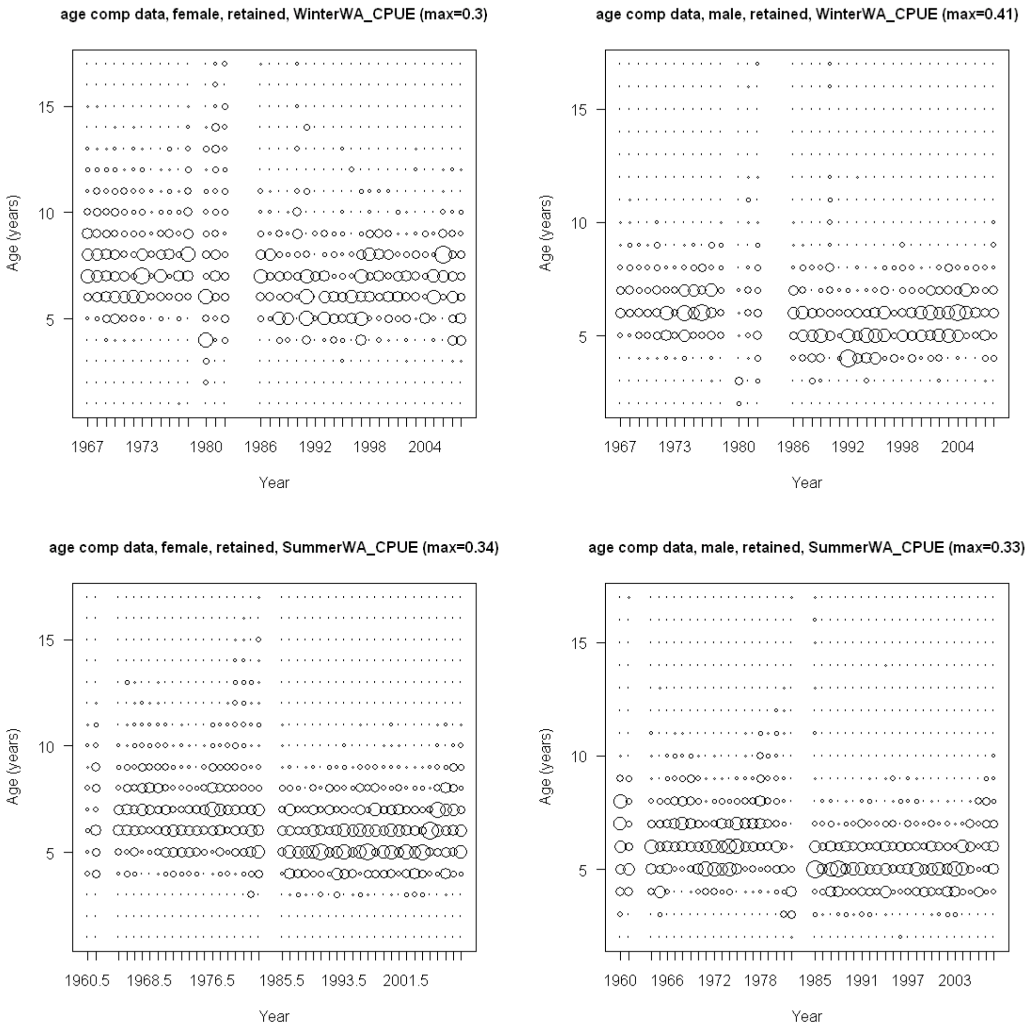


Figure 33. Age-frequency data by gender and season for the Washington fleets.

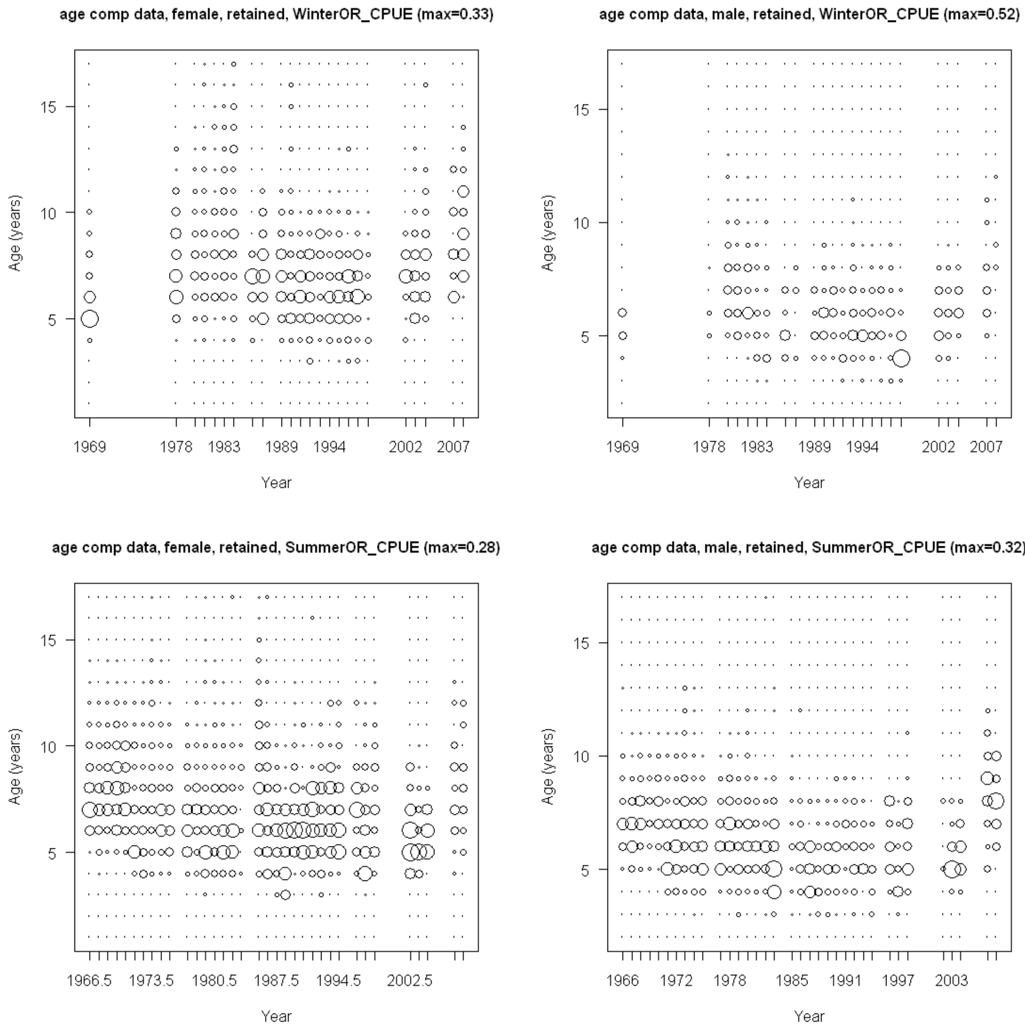


Figure 34. Age-frequency data by gender and season for the Oregon fleets.

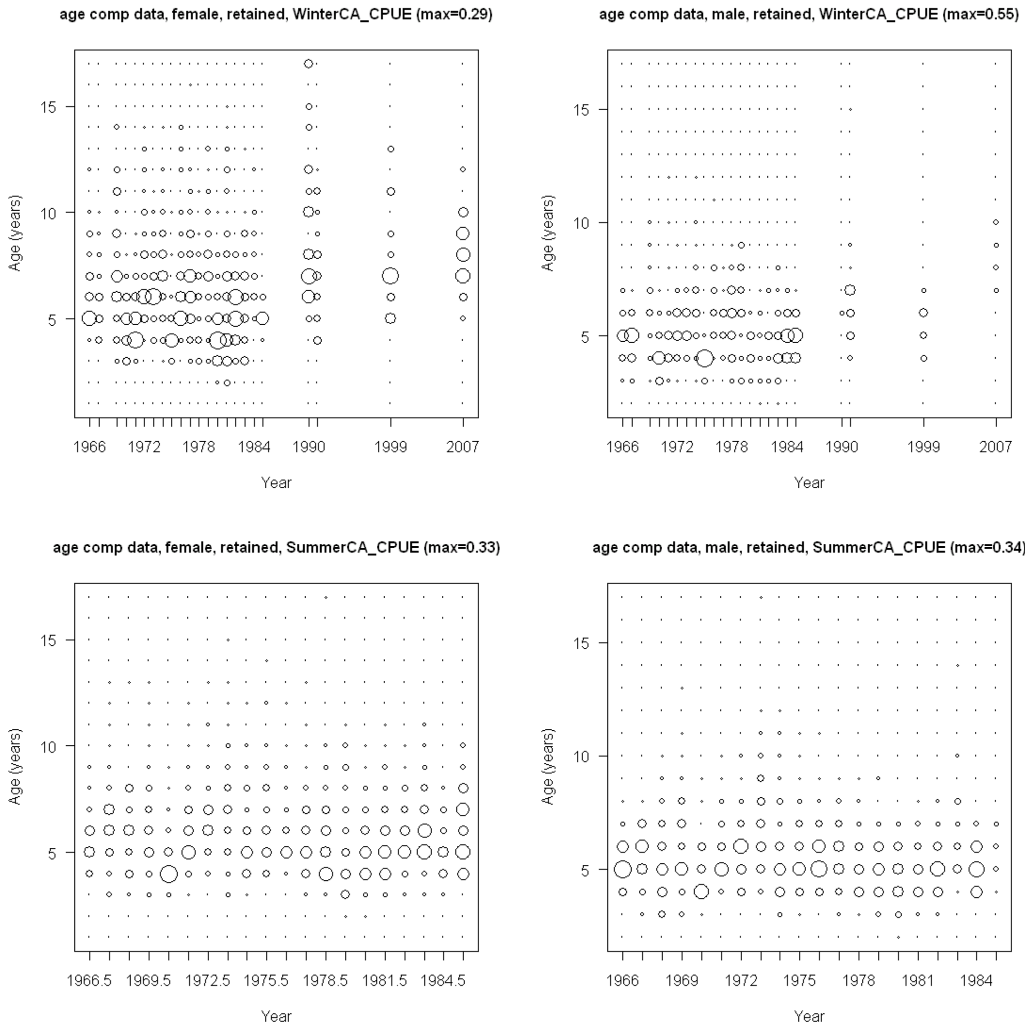
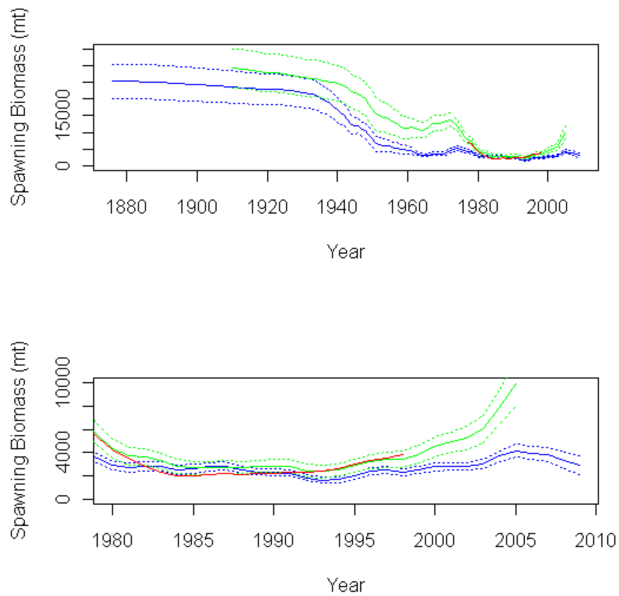
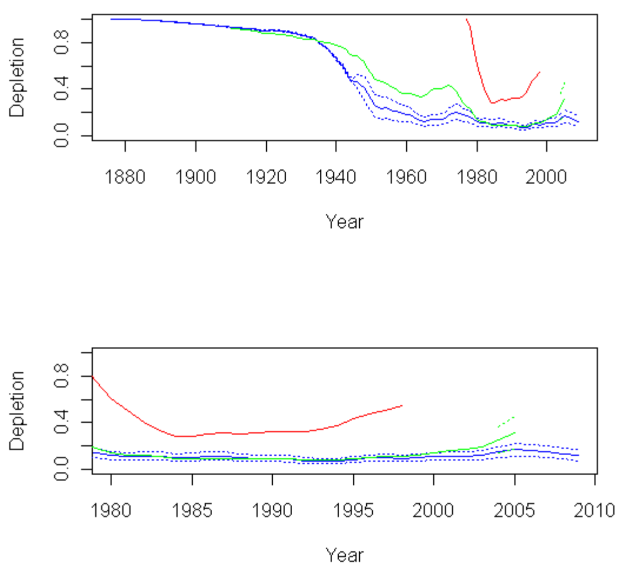


Figure 35. Age-frequency data by gender and season California fleets.



a



b

Figure 36. Comparisons of the model estimated spawning biomass (panel a) and stock depletion (panel b) for the 1999 (red), 2005 (green), and 2009 (blue) assessment models. Where available the ~95% confidence intervals are shown as broken lines.

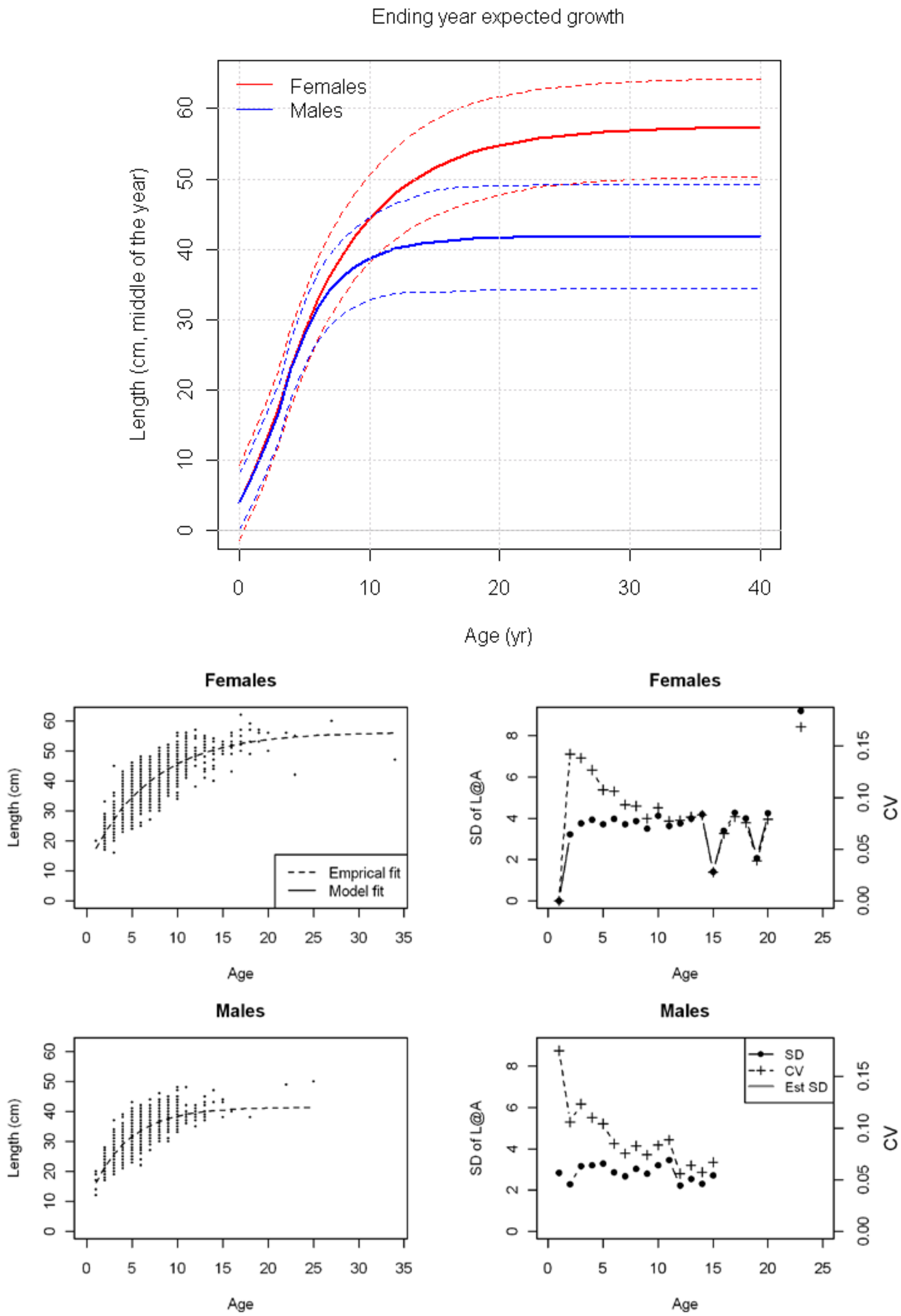


Figure 37. The top panel shows the growth curve for females (upper solid line) and males (lower solid line) with ~95% interval (dashed lines) indicating the estimated variability of length-at-age for the base case model. The bottom panel of four plots shows fits of the estimated growth curves to the NWFSC survey length-at-age data and the fits of the estimated standard deviations to the empirical standard deviation of length-at-age calculated from the NWFSC survey.

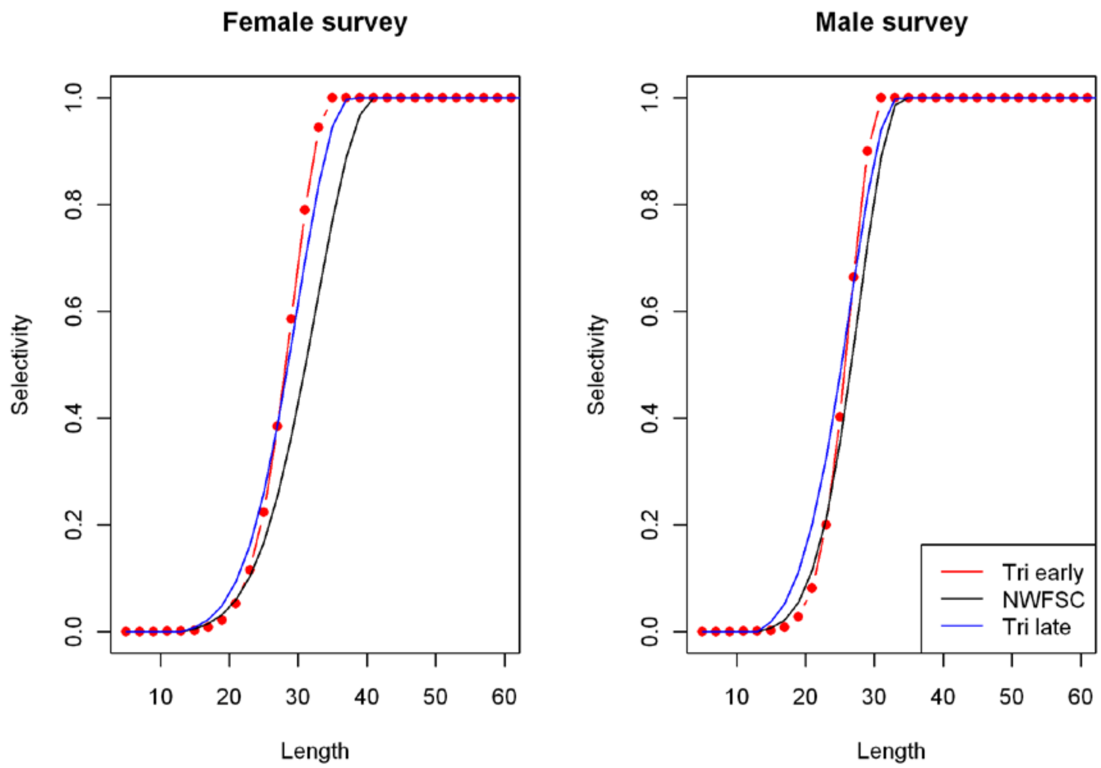
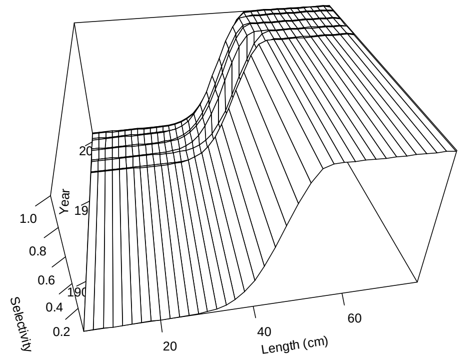
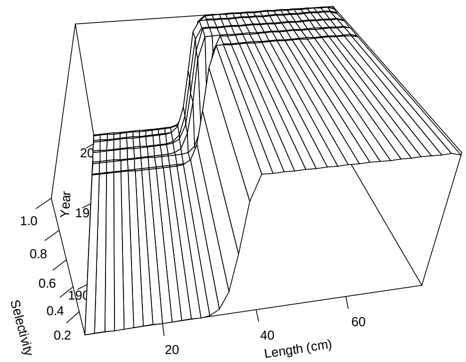


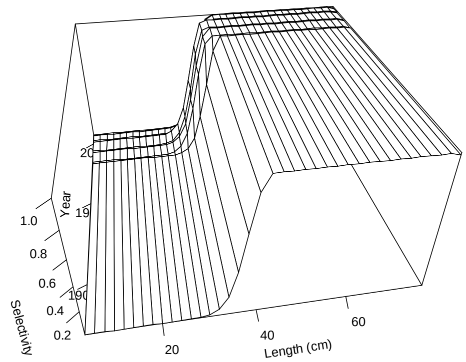
Figure 38. Estimated length-based selectivity curves for the NWFSC and triennial surveys.



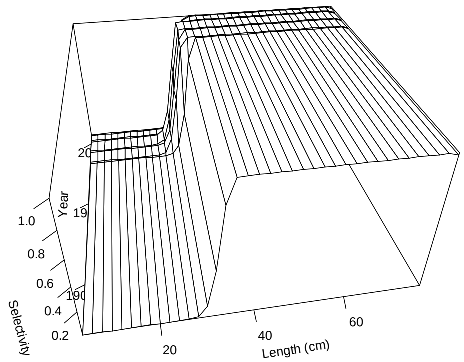
Year
20
19
190
1.0
0.8
0.6
0.4
0.2
Selectivity
20
40
60
Length (cm)



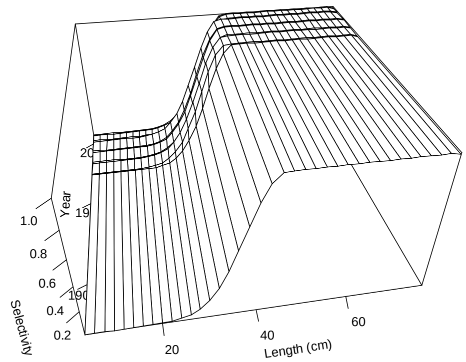
Selectivity
1.0
0.8
0.6
0.4
0.2
Year
20
19
190
20
40
60
Length (cm)



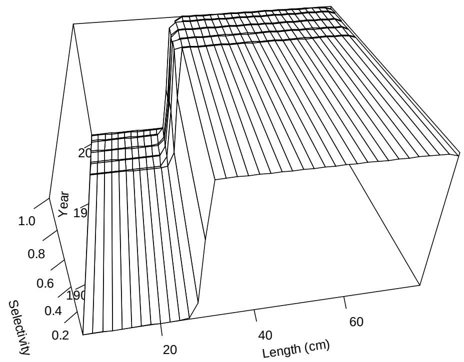
Selectivity
1.0
0.8
0.6
0.4
0.2
Year
20
19
190
20
40
60
Length (cm)



Year
20
19
190
1.0
0.8
0.6
0.4
0.2
Selectivity
20
40
60
Length (cm)



1.0
0.8
0.6
0.4
0.2
Selectivity
Year
20
40
60
Length (cm)


Selectivity
0.2
0.4
0.6
0.8
1.0
Year
20
40
60
Length (cm)

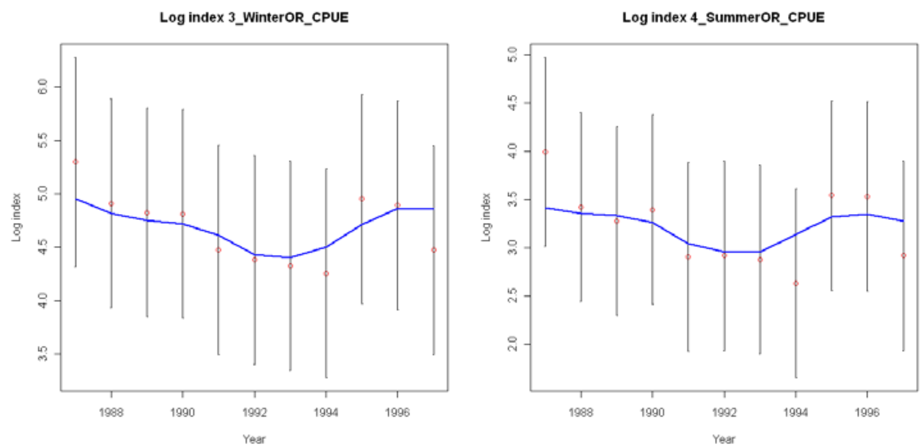


Figure 45. Fit to Oregon CPUE.

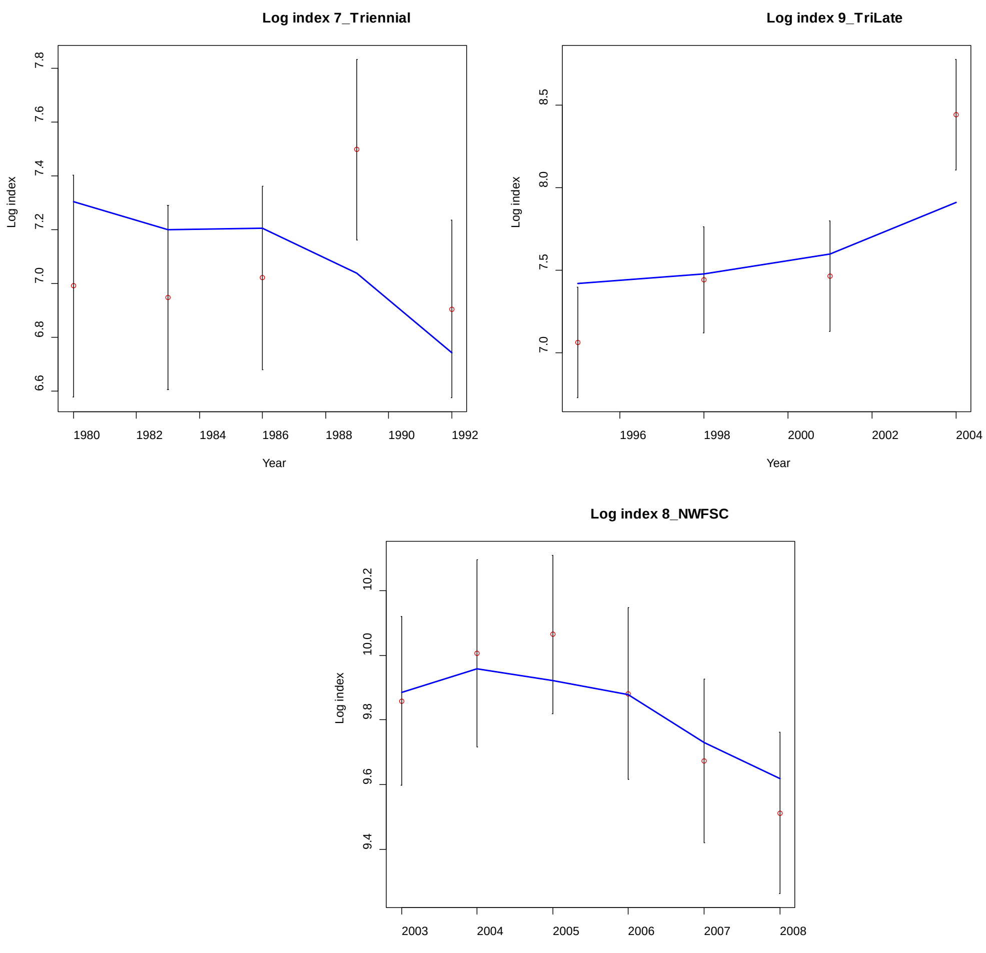


Figure 46. Fit to the early and late triennial (top) and NWFSC survey (bottom) GLMM-based time series of relative biomass in the base case model.

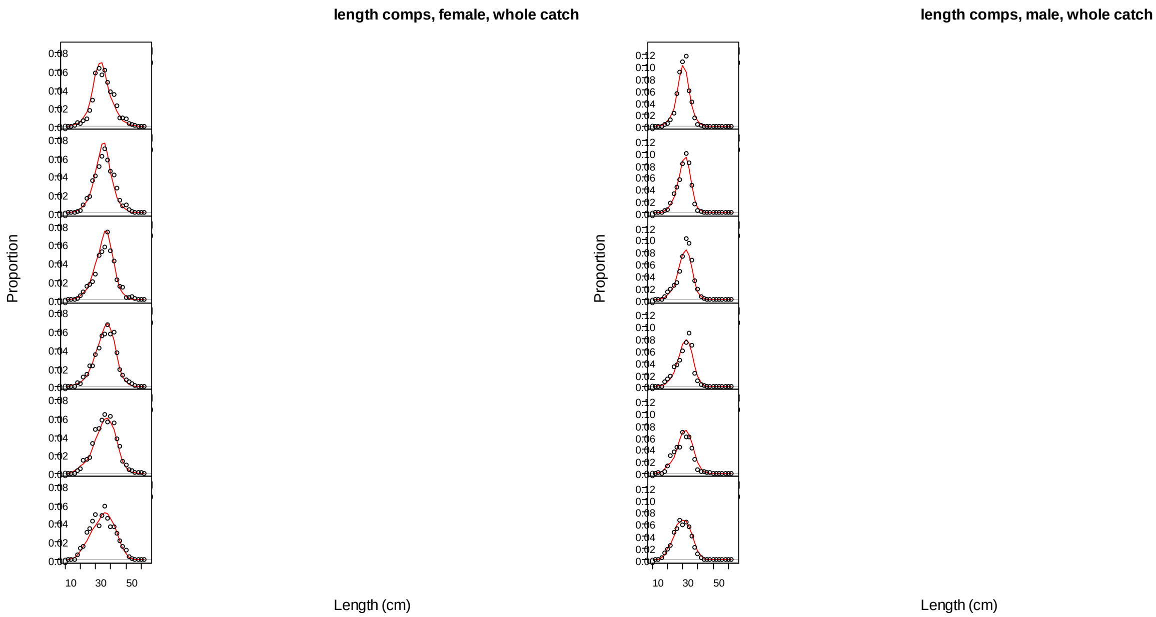


Figure 47. Fit to the NWFSC survey length-frequencies.

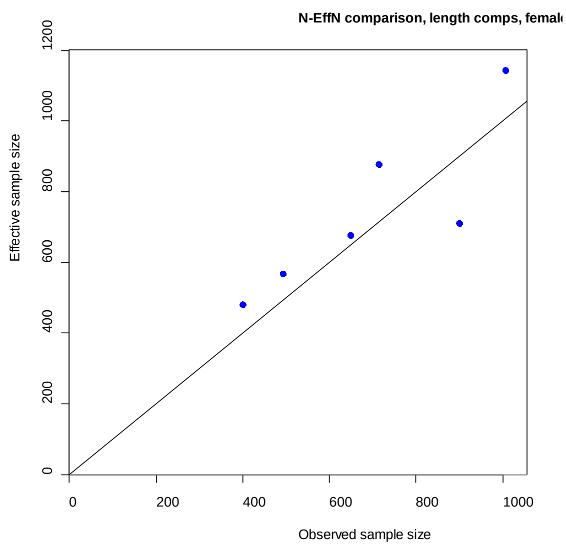


Figure 48. Observed and effective sample sizes for the NWFSC length-frequency observations.

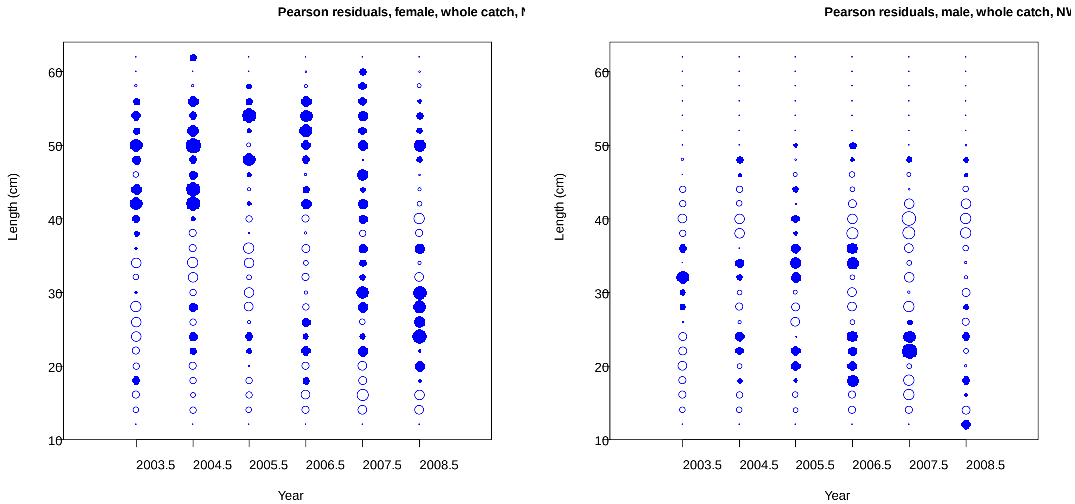


Figure 49. Pearson residuals for the fit to NWFSC survey length-frequencies.

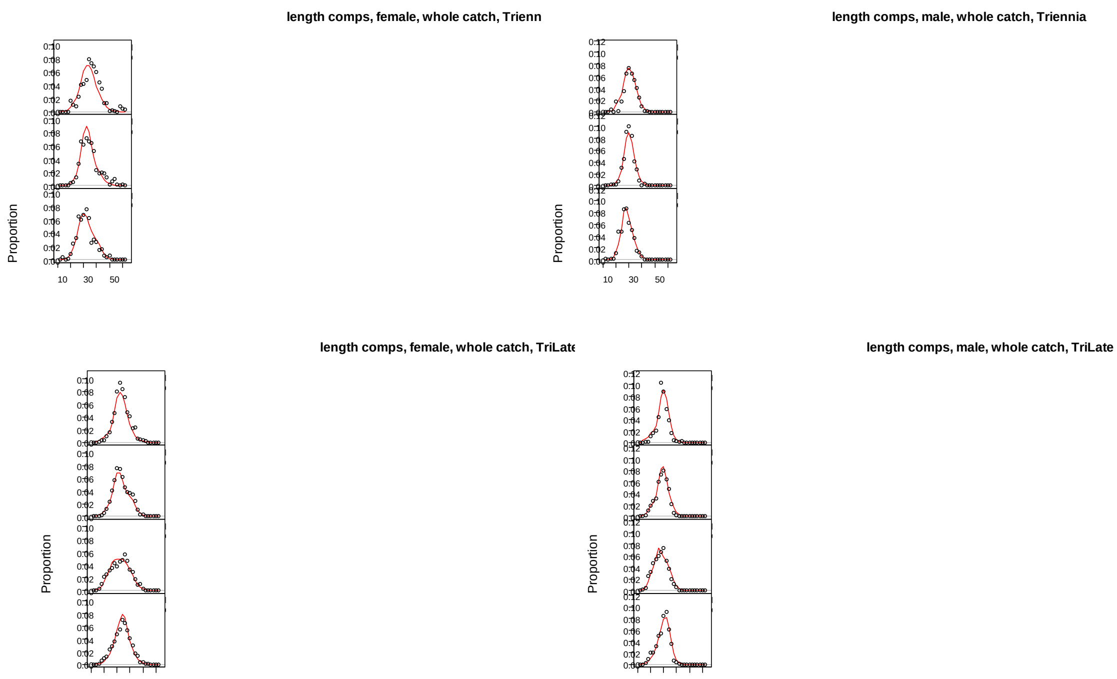


Figure 50. Fit to the early (top row) and late (bottom row) triennial survey length-frequencies.

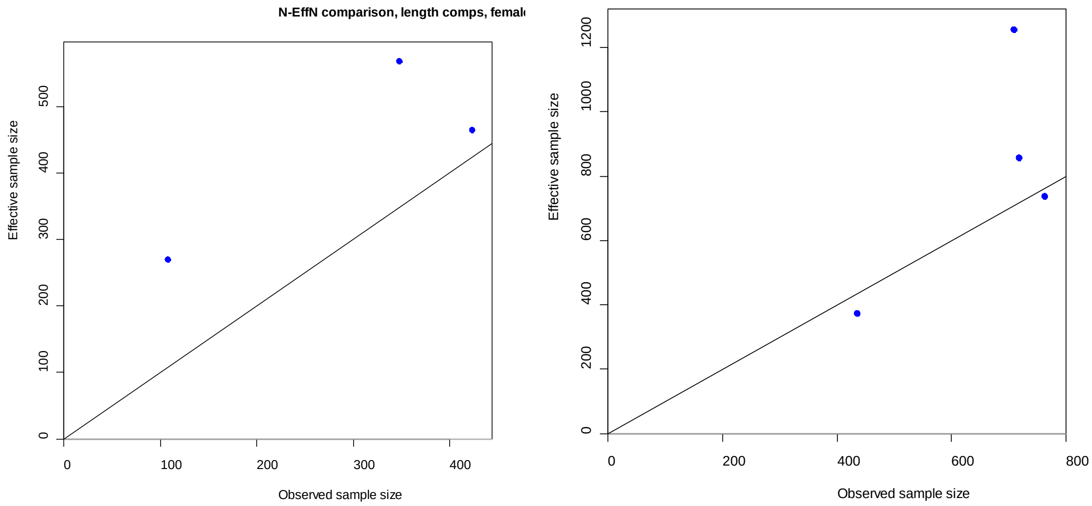


Figure 51. Observed and effective sample sizes for the early (left panel) and late (right panel) triennial length-frequency observations.

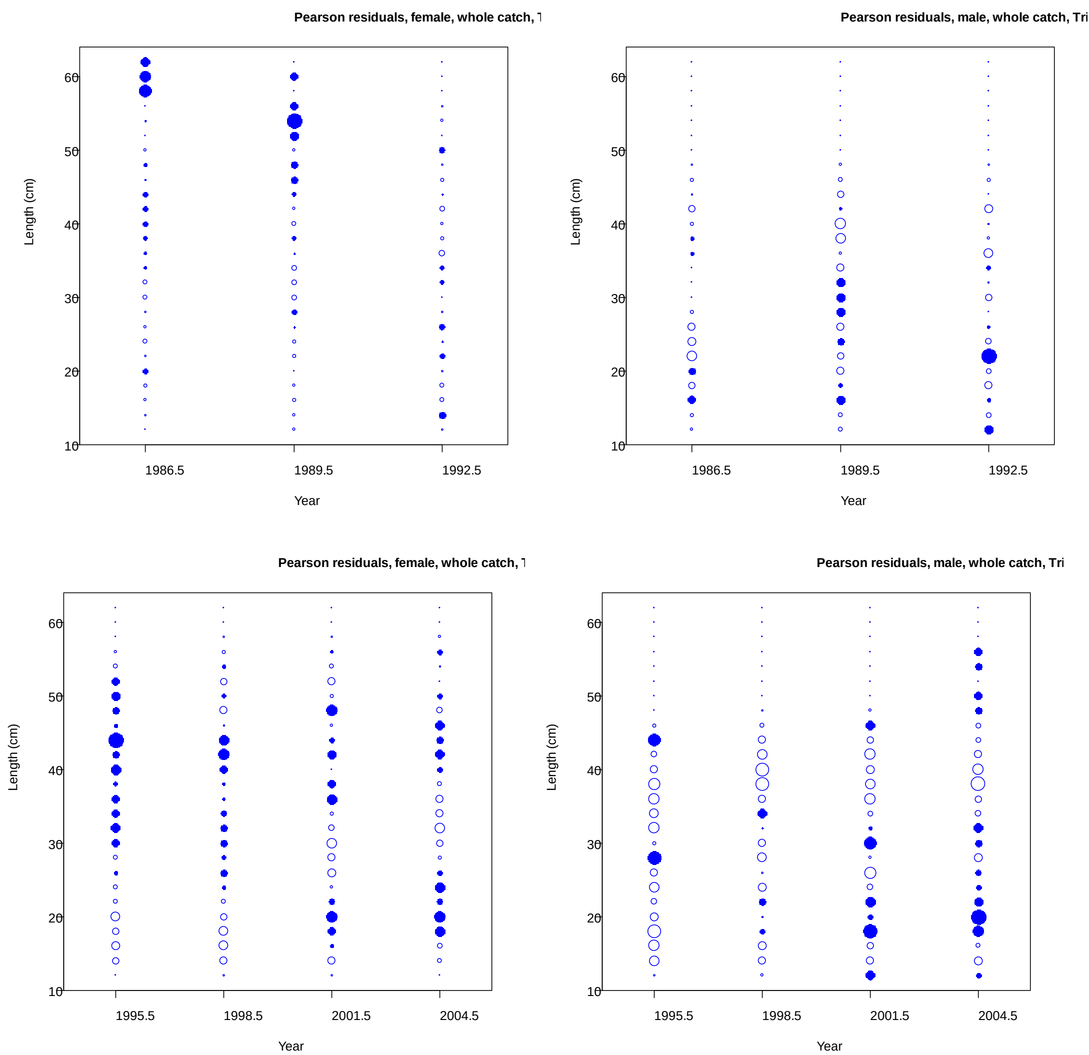


Figure 52. Pearson residuals for the fit to the early (top row) and late (bottom row) triennial survey length-frequencies.

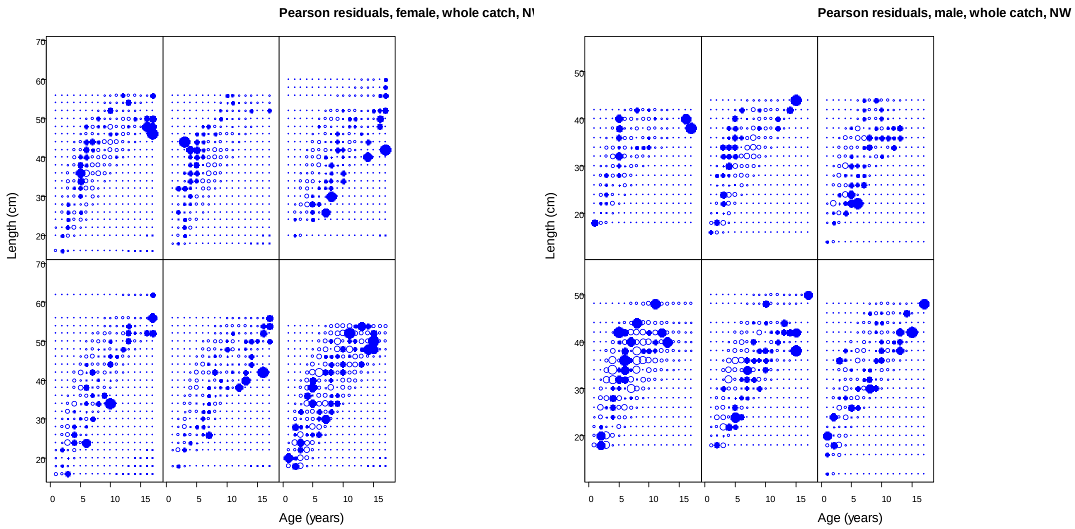
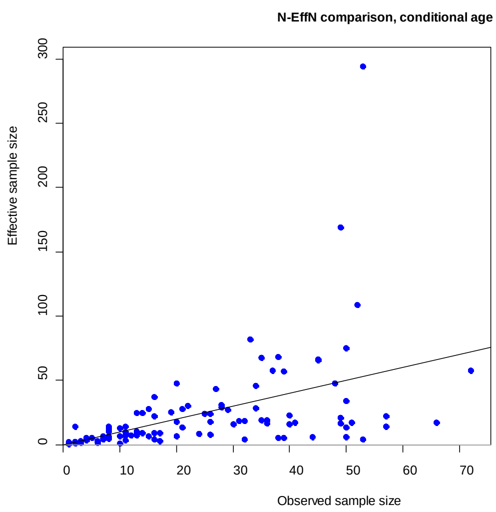


Figure 53. Pearson residuals for the fit to the NWFSC survey conditional age-at-length frequencies. Each panel is scaled independently.



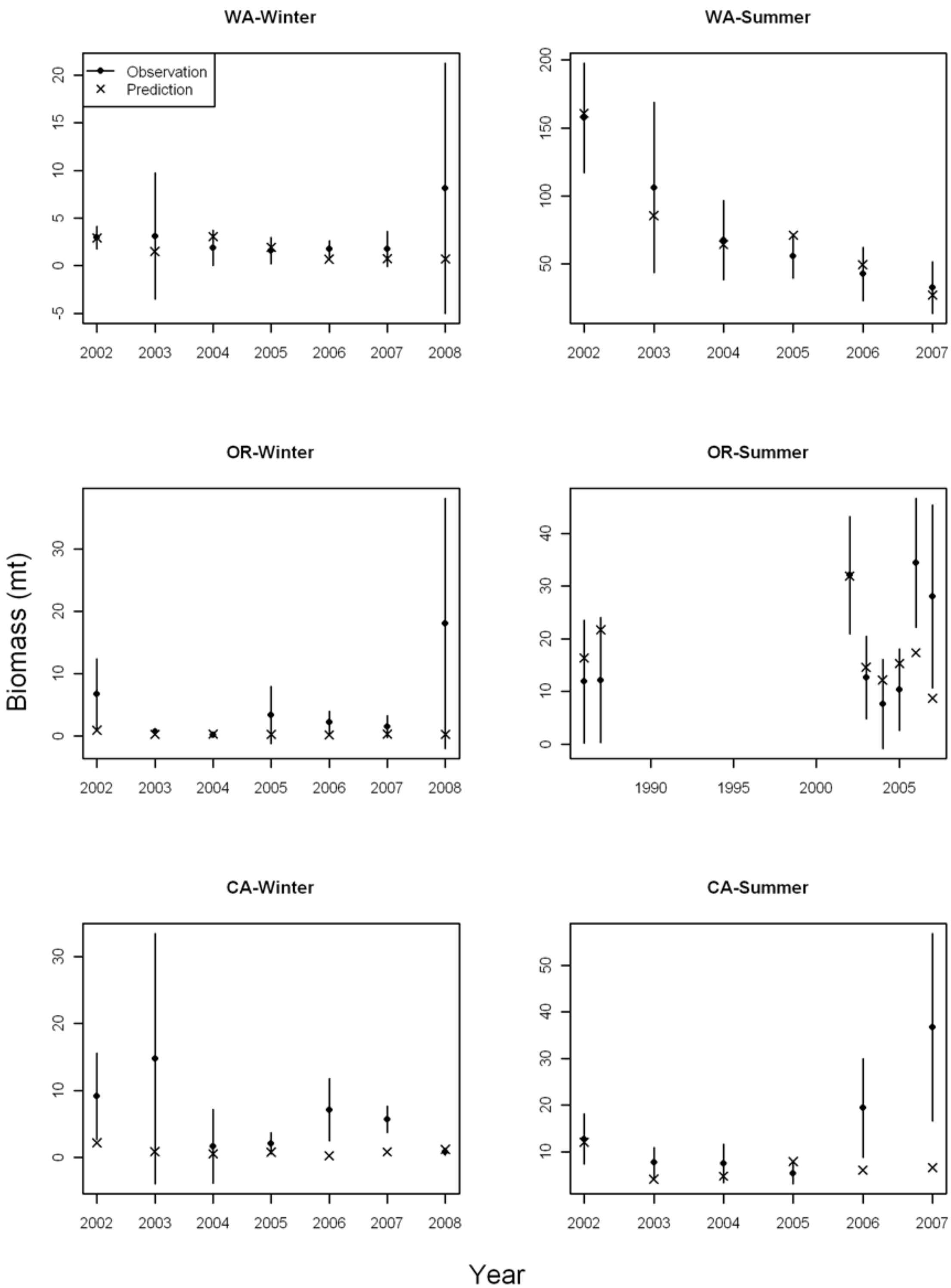


Figure 55: Fits to the total discarded biomass (mt) for each fleet and year for the base case model run.

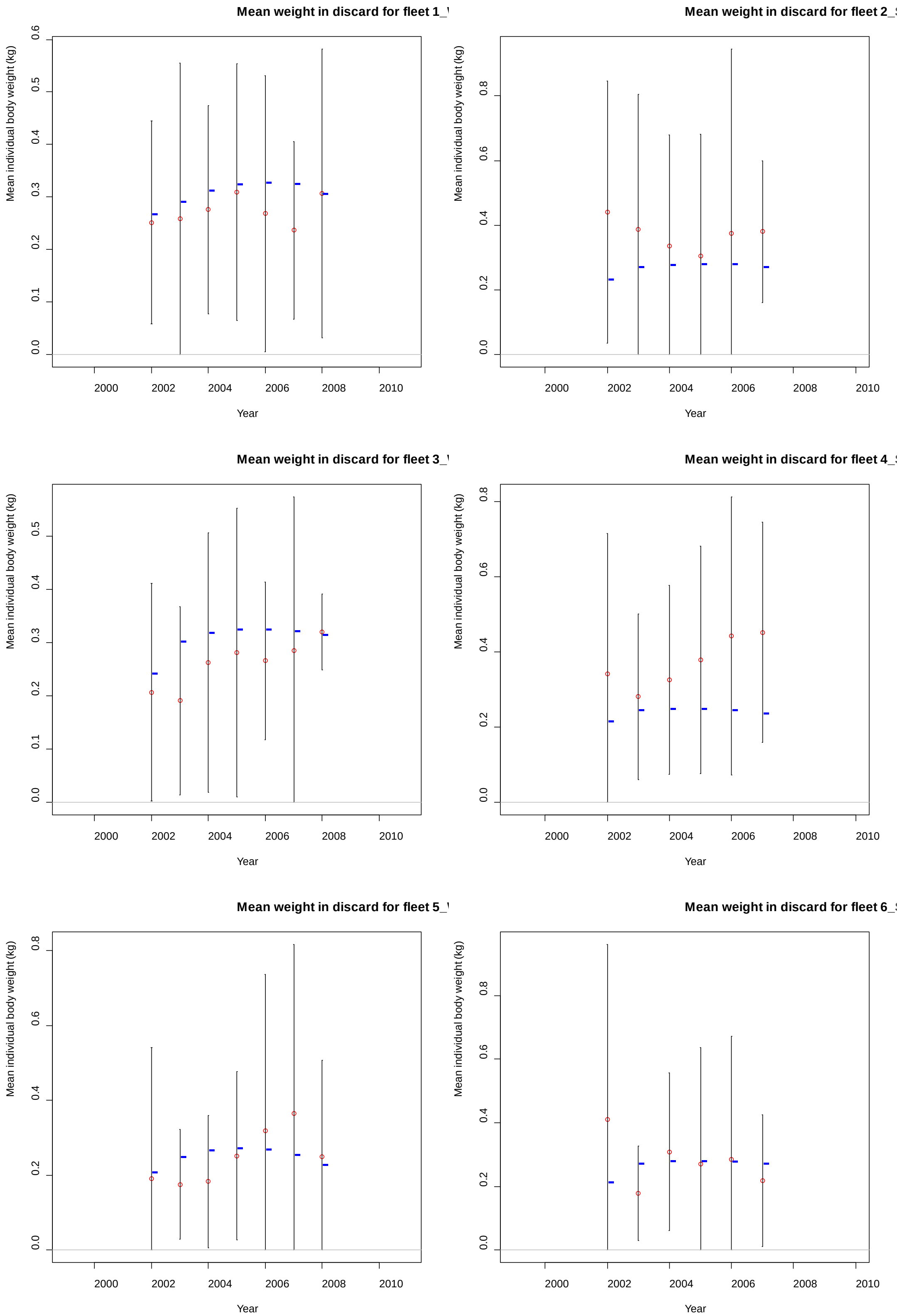


Figure 56. Fit to the mean weight of the discards recorded by the WCGOP.

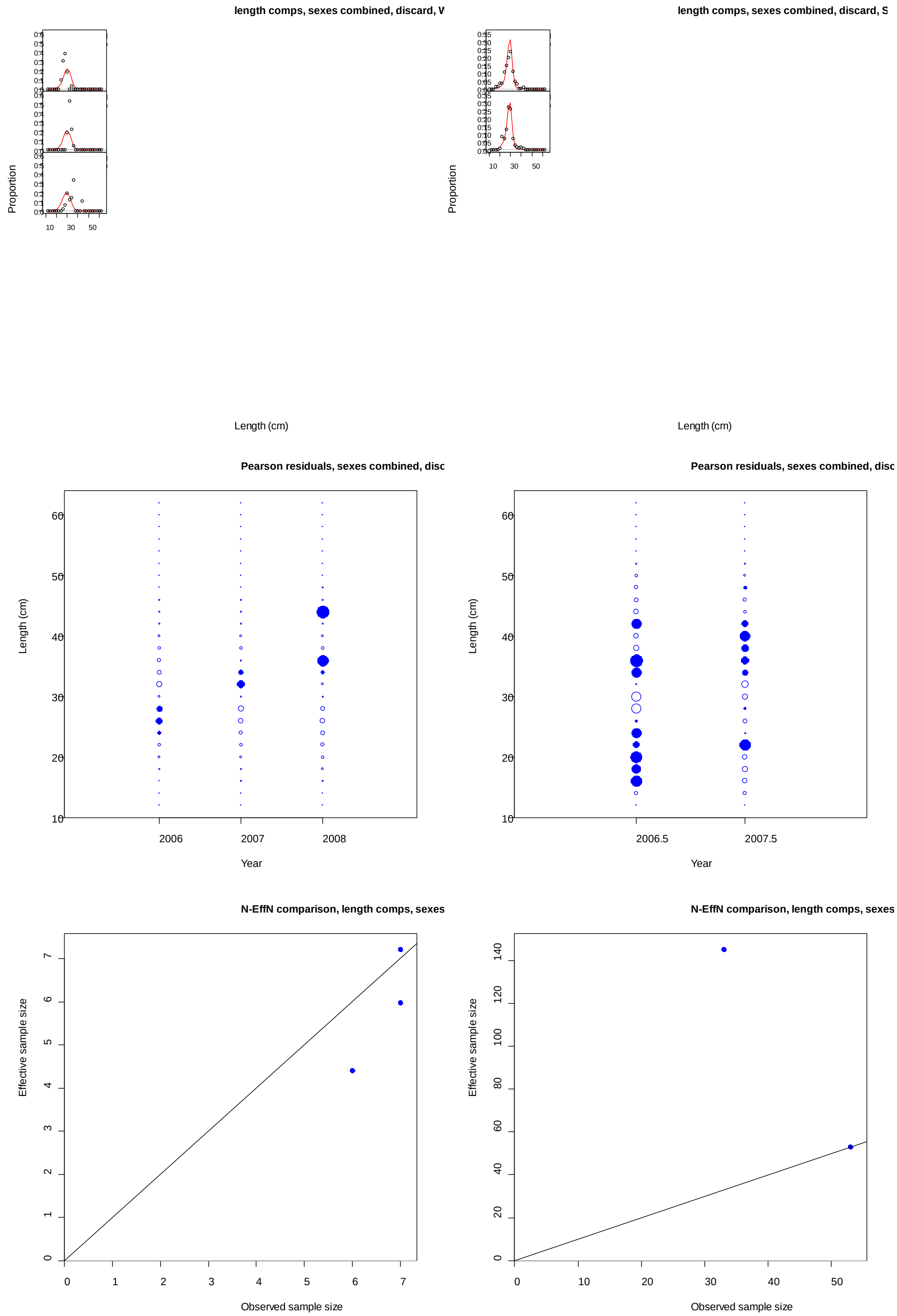


Figure 57. Fit to the Washington fleet discard length compositions.

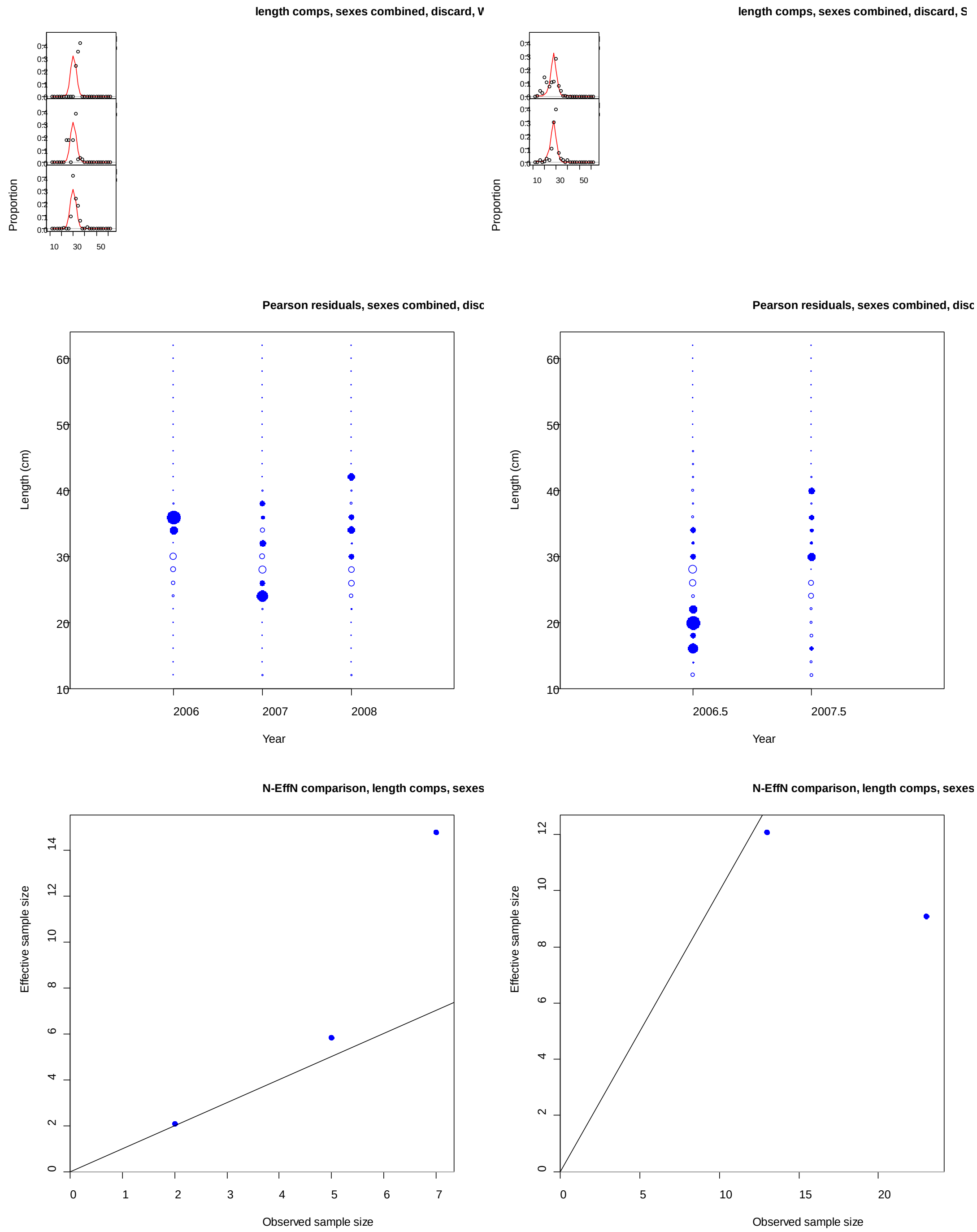


Figure 58. Fit to the Oregon fleet recent discard length compositions from the WCGOP.

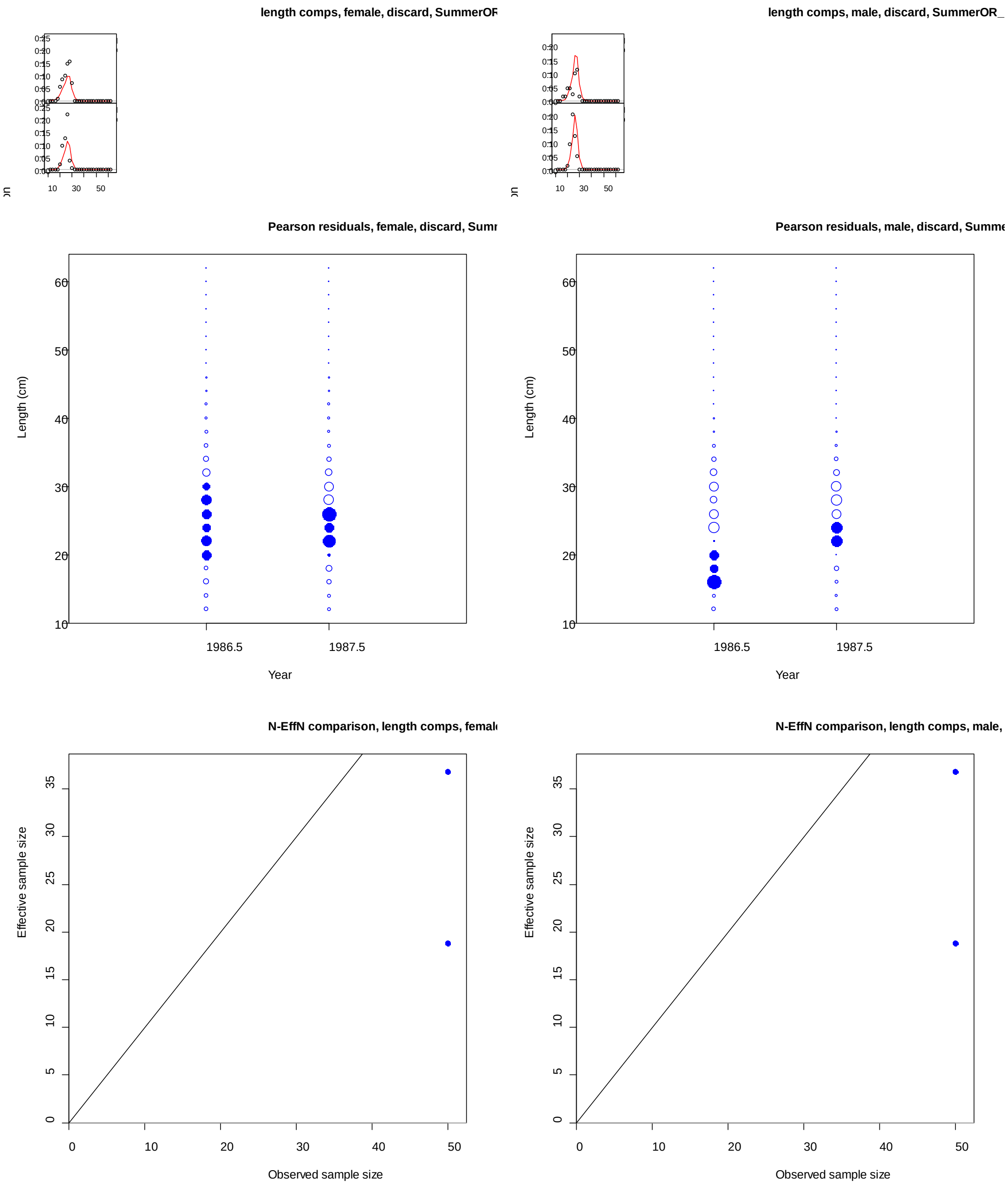


Figure 59. Fit to the Oregon fleet discard length compositions from Pikitch et al (1988).

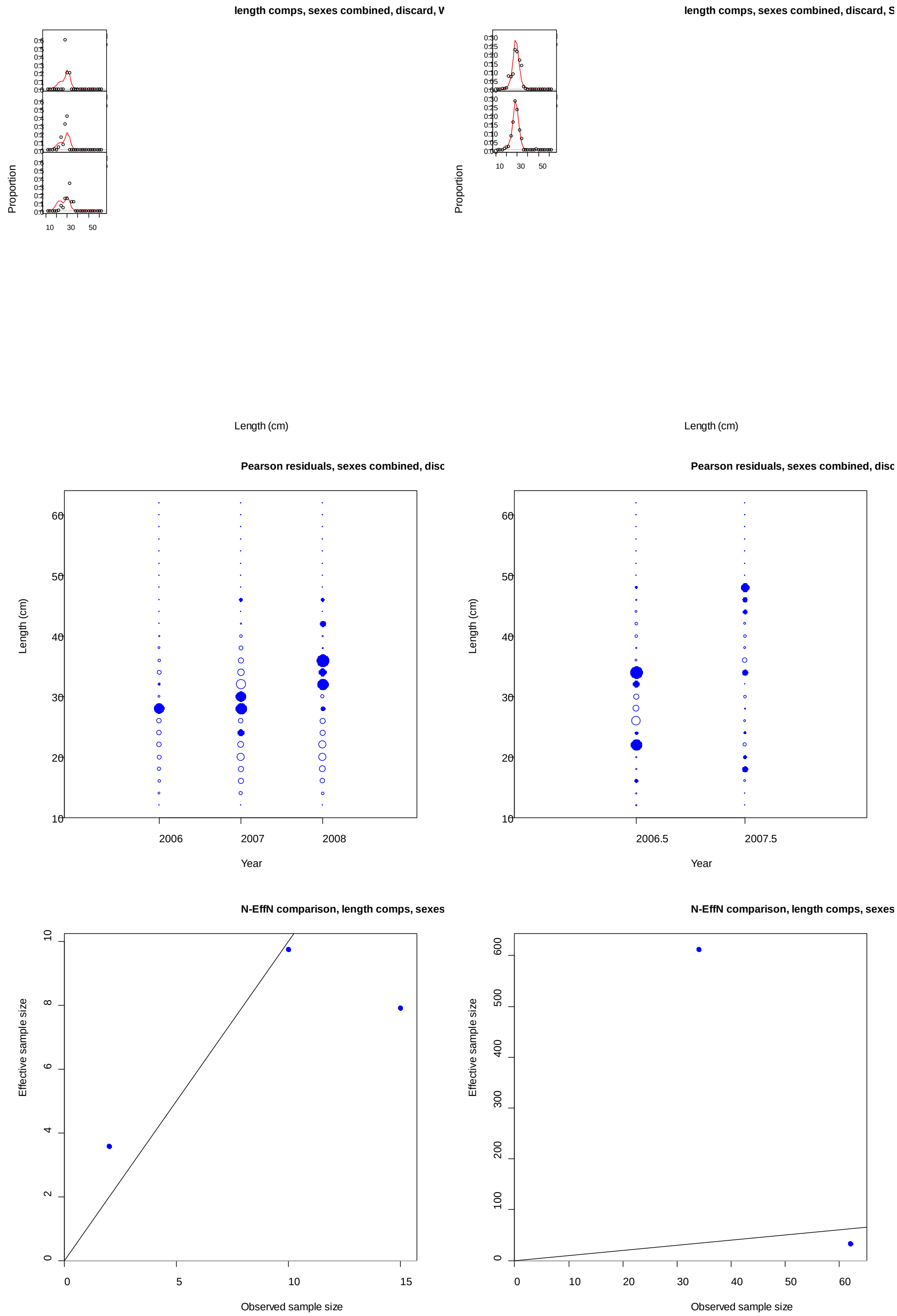


Figure 60. Fit to the California fleet discard length compositions.

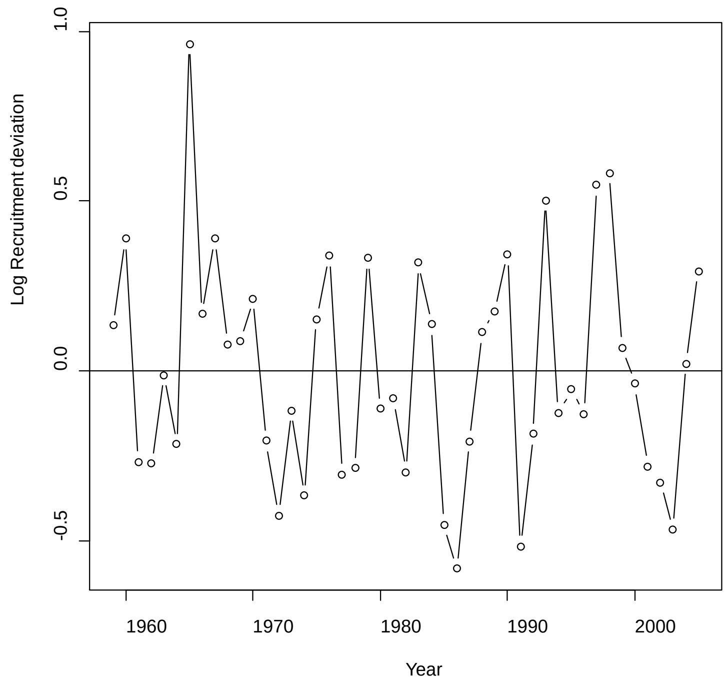


Figure 61. Log recruitment deviations from the base case model run.

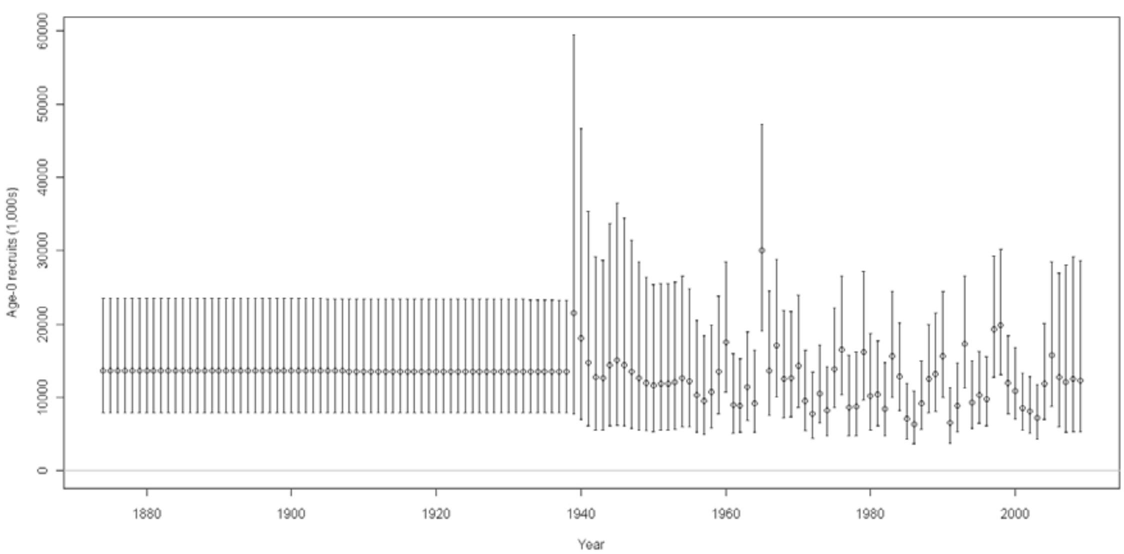


Figure 62. Time series of estimated petrale sole recruitments for the base case model (round points) with approximate asymptotic 95% confidence interval (horizontal lines).

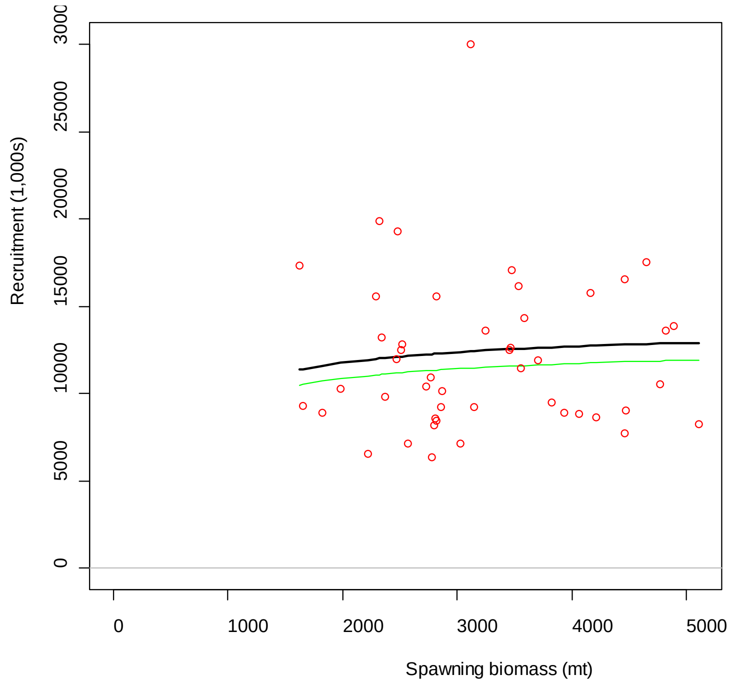


Figure 63. Stock-recruit function with predicted recruitments (points) and bias-corrected expectation (light line).

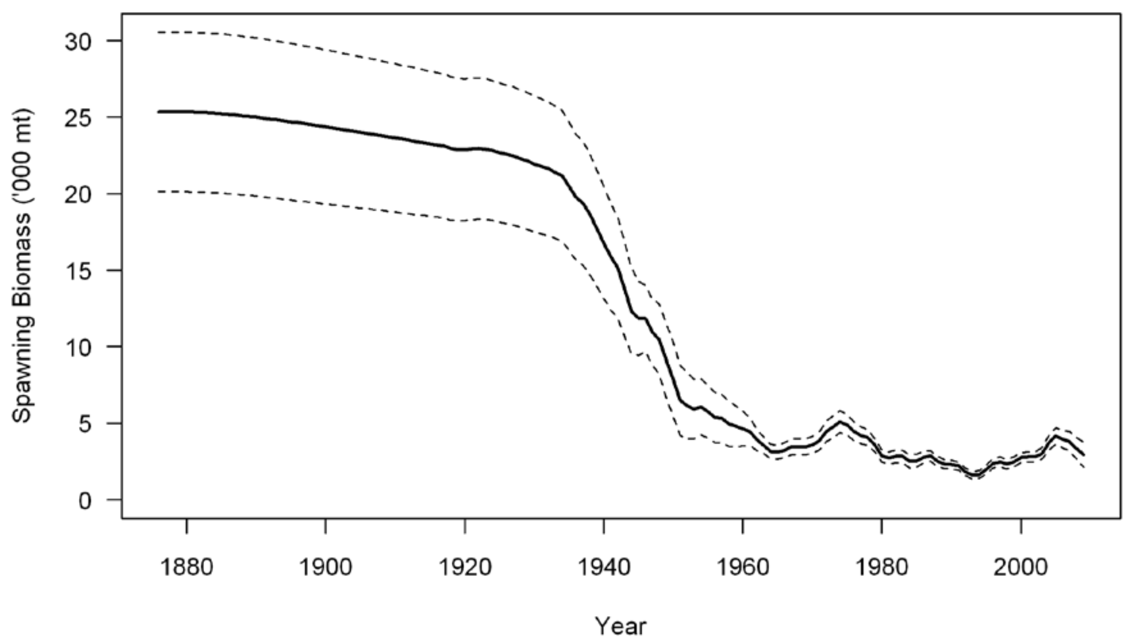


Figure 64. Estimated spawning biomass time-series (1916-2007) for the base case model (solid line) with approximate asymptotic 95% confidence interval (dashed lines).

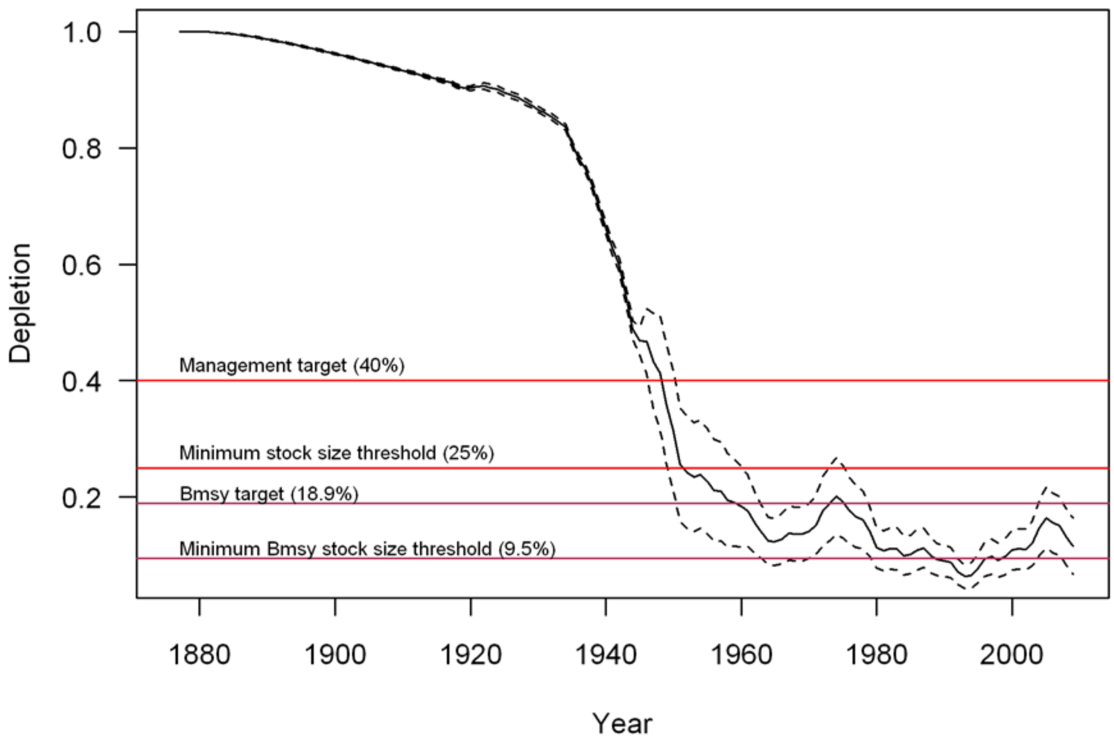


Figure 65. Time series of depletion level as estimated in the base case model (round points) with approximate asymptotic 95% confidence interval (dashed lines) and alternate states of nature (light lines).

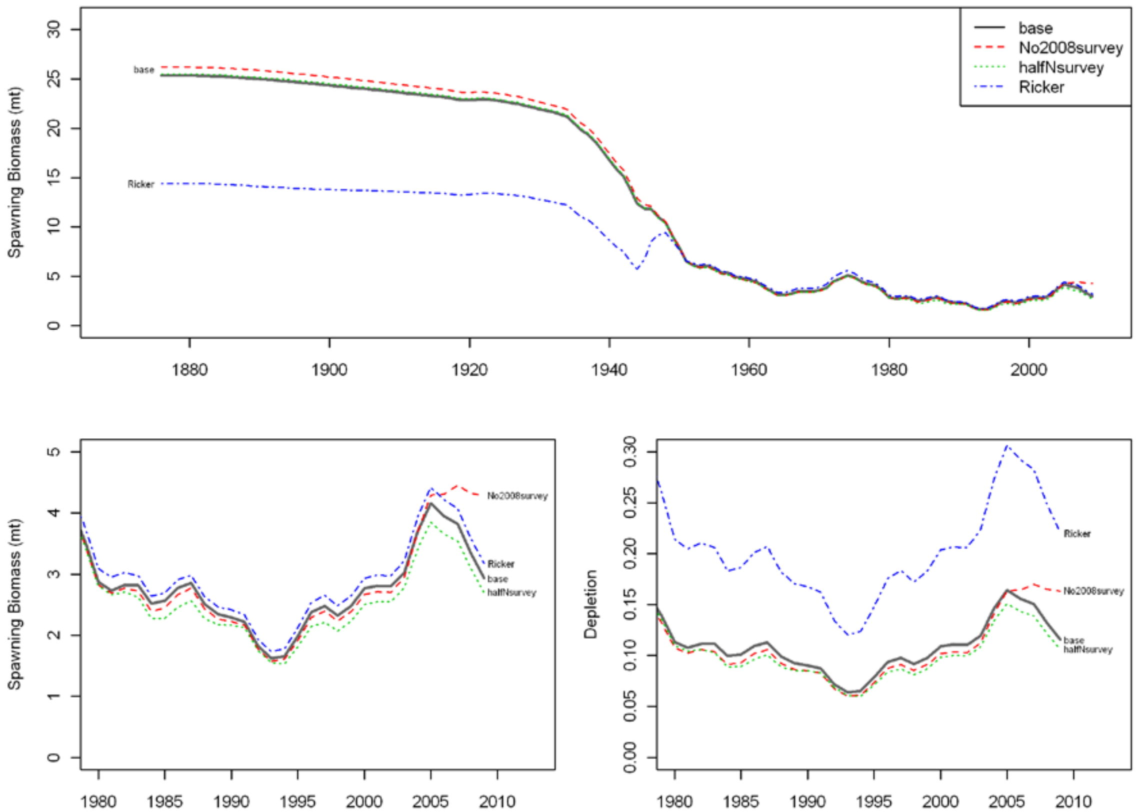


Figure 66. Plot showing sensitivity model runs.

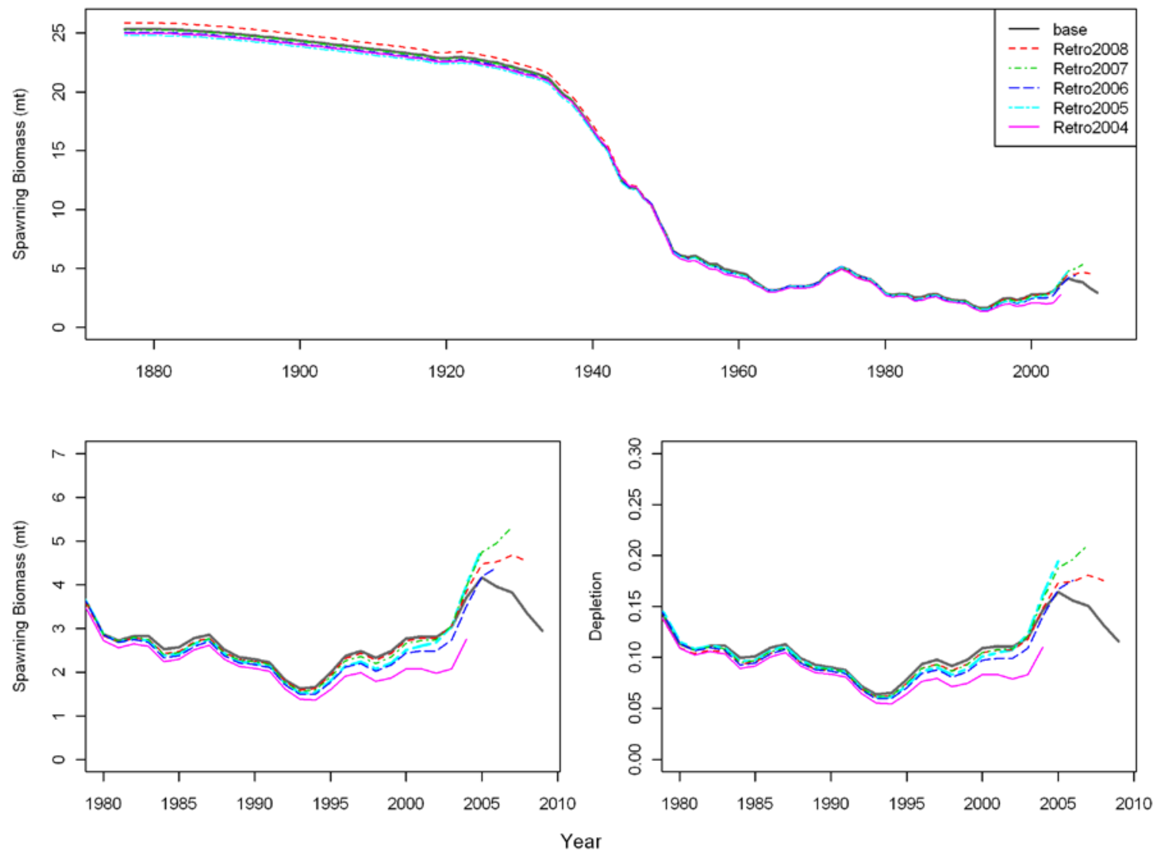


Figure 67. Results from a 5-year retrospective analysis. Each year of retrospective is performed as if the assessment were conducted in that year (i.e., retrospective in 2007 includes data through 2006).

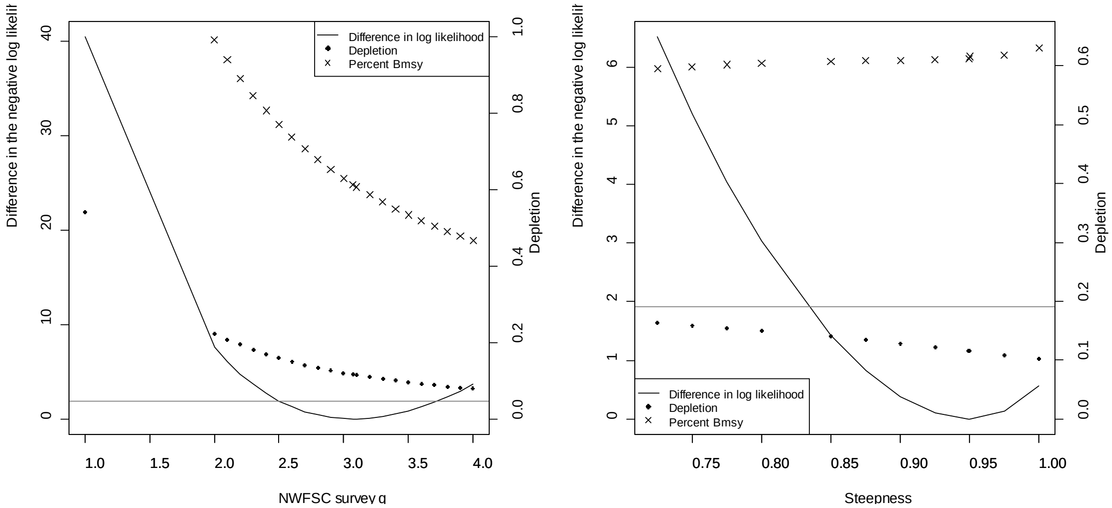


Figure 68. Individual likelihood profiles for the NWFSC survey catchability (q) and stock-recruitment steepness (h) parameters. The negative log likelihood is shown as a solid black line with a grey horizontal line indicating the approximate 95% confidence interval. Depletion (relative to unfished equilibrium biomass) is shown as dots and biomass in 2009 as a percentage of Bmsy is shown as an X's.

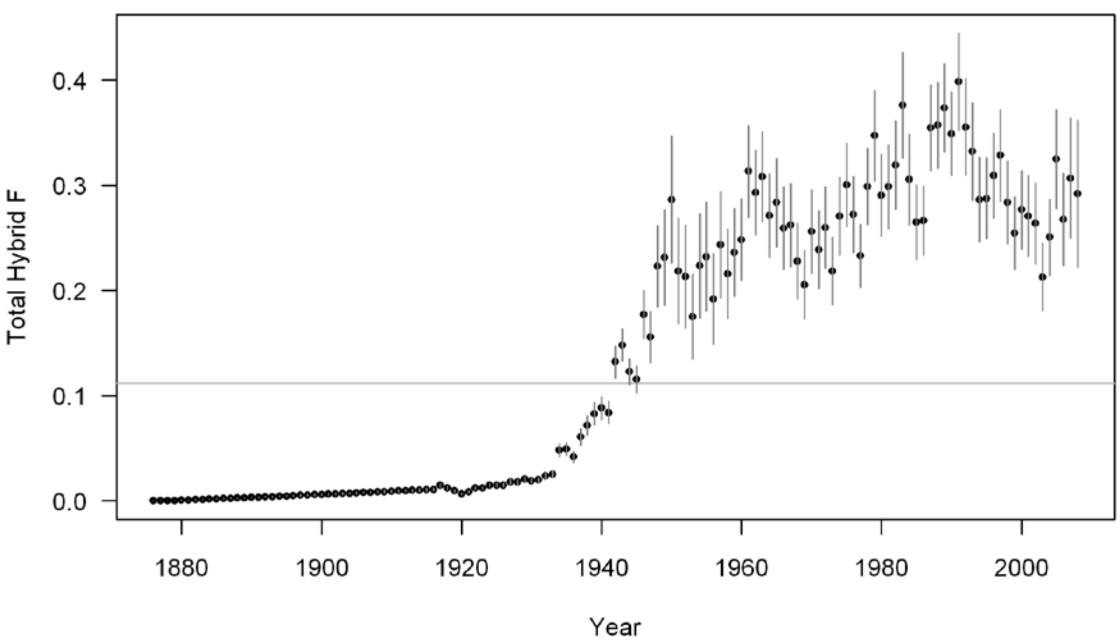


Figure 69. F time-series for all fleets combined.

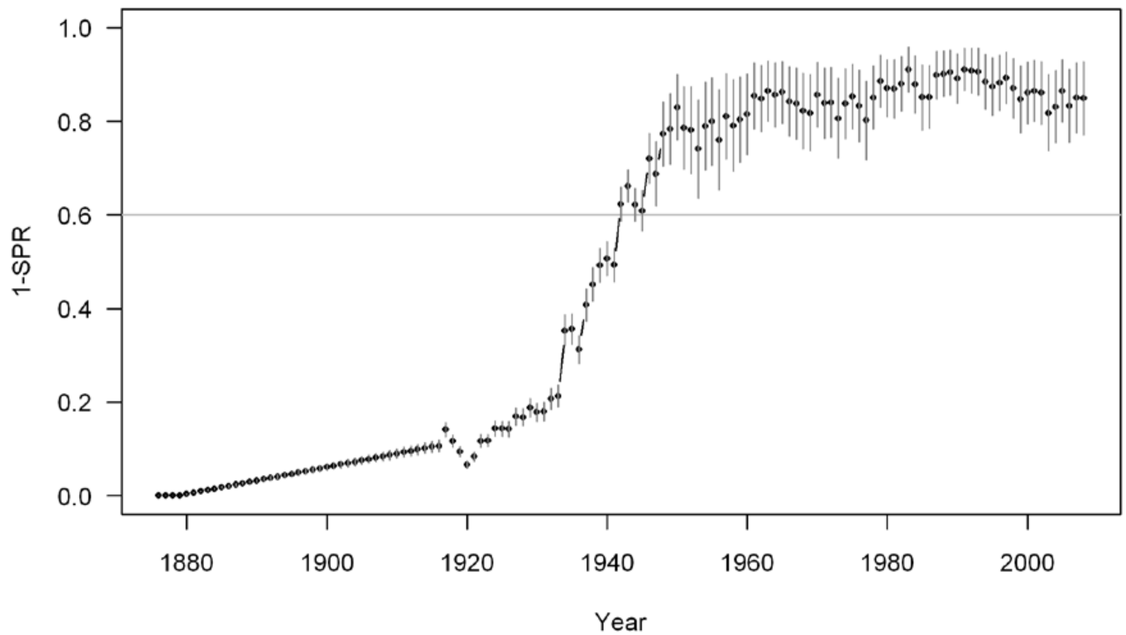


Figure 70. Time series of estimated spawning potential ratio (displayed as 1-SPR) for the base case model (round points). Values of SPR above 0.6 reflect harvests in excess of the current overfishing proxy.

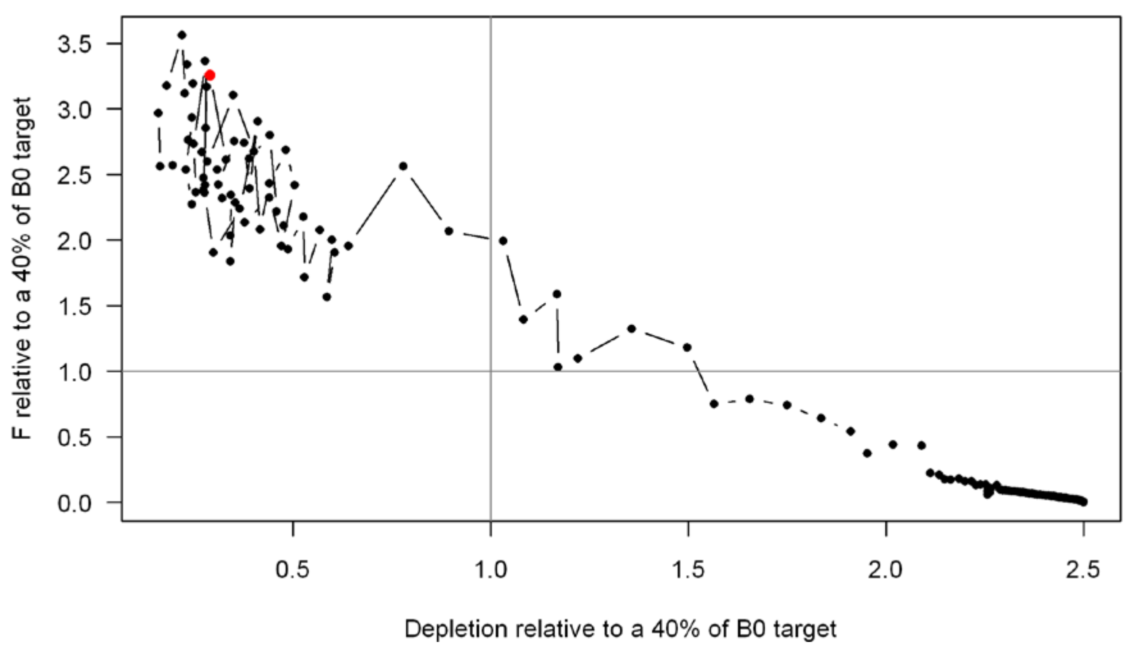


Figure 71. Phase plot of estimated fishing intensity vs. relative spawning biomass for the base case model. Fishing intensity is the relative exploitation rate divided by the level corresponding to the overfishing proxy (0.12). Relative spawning biomass is annual spawning biomass relative to virgin spawning biomass divided by the 40% rebuilding target.

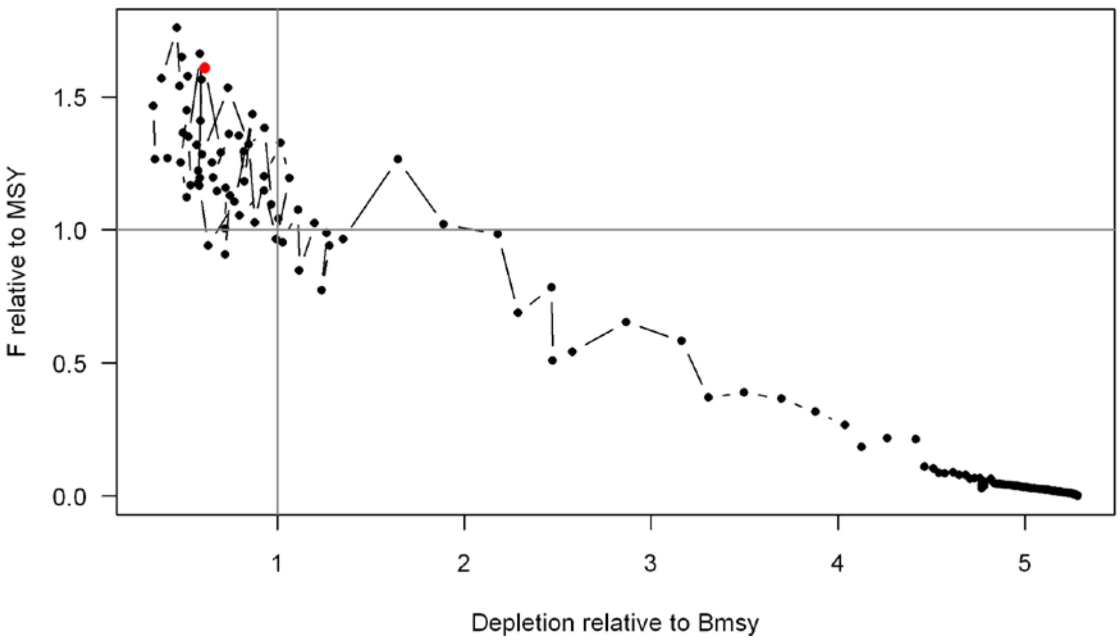


Figure 72. Phase plot of estimated fishing intensity vs. relative spawning biomass for the base case model. Fishing intensity is the relative exploitation rate divided by the level corresponding to Fmsy. Relative spawning biomass is annual spawning biomass relative to the model estimate of Bmsy. The red point is 2009.

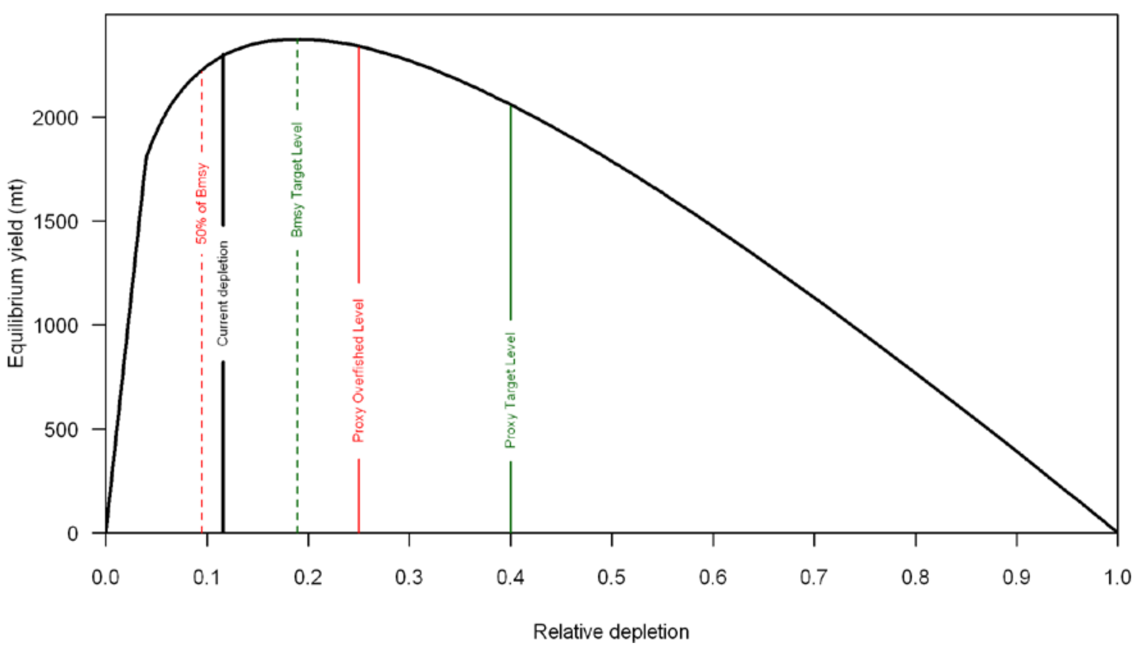


Figure 73. Equilibrium yield curve for the base case model. Values are based on 2008 fishery selectivity.

12. Appendix A: Post stratification of the Triennial and NWFSC surveys

The default stratification from the Triennial and NWFSC surveys is not necessarily the best stratification when analyzing the survey data for Petrale sole. The last Petrale assessment (Lai et al) post-stratified the Triennial survey data based on a Bayesian changepoint analysis of the length as a function of depth. The reasoning behind the changepoint analysis was that Petrale show an ontogenetic migration to deeper water. Therefore the mean length would increase with depth until some point when the slope of the relationship would decrease due to mixing of adult fish. Their results showed median changepoints of 114 m and 144 m for females and males, respectively, and they chose to post-stratify the survey data into three strata (50–100 m, 100–155 m, and 155–700 m).

We chose to revisit the post-stratification because the NWFSC survey was not analyzed in the 2005 assessment. Lai et al (2005) used Bayesian statistics with uninformative priors and MCMC sampling to calculate the posterior distribution. However, we used a frequentist approach since there is no prior information for any of the parameters, and the problem in the frequentist paradigm allows for quick point estimates which are used as guidance for the strata definitions.

Piecewise linear regression is similar to linear regression except that the data are split into two parts by a breakpoint, and separate linear relationships describe each part. In mathematical terms,

$$L = \alpha_1 + \beta_1 d \quad d \le \delta$$
$$L = \alpha_2 + \beta_2 d \quad d \ge \delta$$

Furthermore, because we are assuming that the fish are migrating to deeper water, the relationship at the breakpoint (δ) should be continuous. In other words, the relationships to the two pieces are equal at the breakpoint.

$$\alpha_1 + \beta_1 \delta = \alpha_2 + \beta_2 \delta$$
$$\alpha_2 = \beta_1 + \delta(\beta_1 - \beta_2)$$

Substituting in and rearranging the equations we arrive at the same model used by Lai et al. (2005).

$$L = \omega + \beta_1 (d - \delta) \quad d \le \delta$$
$$L = \omega + \beta_2 (d - \delta) \quad d \ge \delta$$

where $\omega = \alpha_1 + \beta_1 \delta = \alpha_2 + \beta_2 \delta$, or the length at the breakpoint. There are four parameters to estimate.

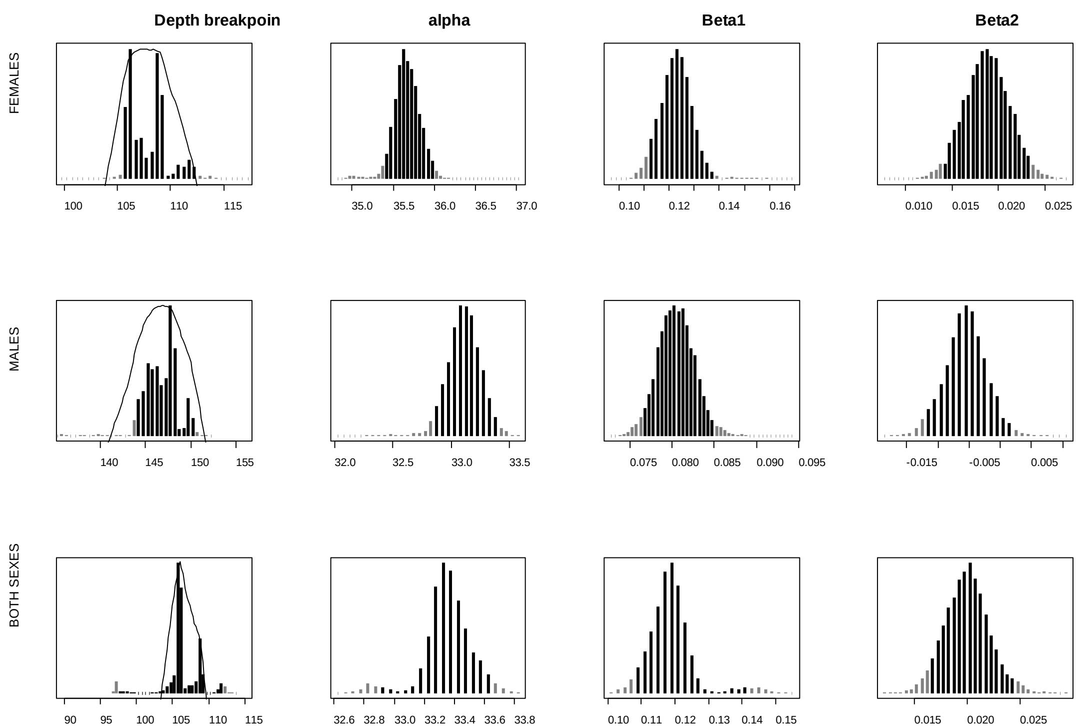
The parameters were estimated by minimizing the sum of the squared residuals and non-parametric bootstrapping was used to estimate the 95% confidence intervals.

Furthermore, likelihood profiles were compared with these confidence intervals after assuming that the residuals were normally distributed with equal variance.

The results here agreed with the analysis performed by Lai et al (2005), and we also chose a breakpoint at 100 m. A breakpoint around 110 m may be more reasonable, but strata specific values, such as stratum area, is more easily available with a breakpoint at 100 m.

Table A3: 95% confidence intervals of the breakpoint from the likelihood profiles and bootstraps for each survey.

	Triennial		NWFSC	
	Profile	Bootstrap	Profile	Bootstrap
Female	**104.2–112.2**	**105.2–112.1**	**105.2–121.2**	**104.3–120.4**
Male	**141.2–151.4**	**143.7–150.0**	**146.0–159.8**	**144.2–160.8**
Both	**103.6–109.4**	**97.0–112.0**	**112.6–120.8**	**112.8–120.4**



FigureA1: Plot of the Triennial survey bootstrap results from piecewise regression for each sex and all years combined. The line in the depth breakpoint plot is a likelihood profile (the 95% CI is where the profile crosses zero).

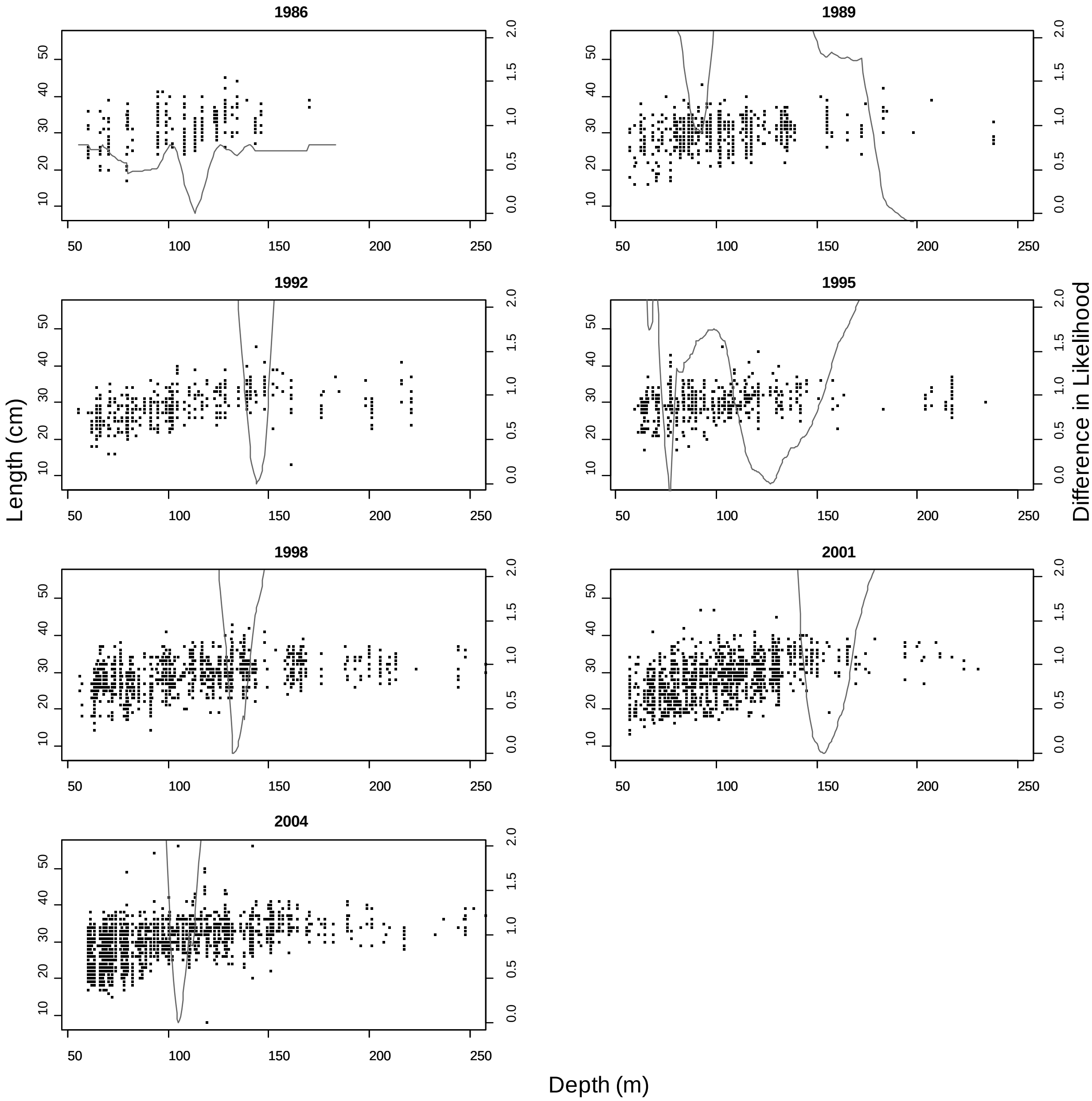


Figure A2: Plots of length vs depth from the Triennial survey for each year and males only with the likelihood profile of the breakpoint overlayed.

NWFSC Survey

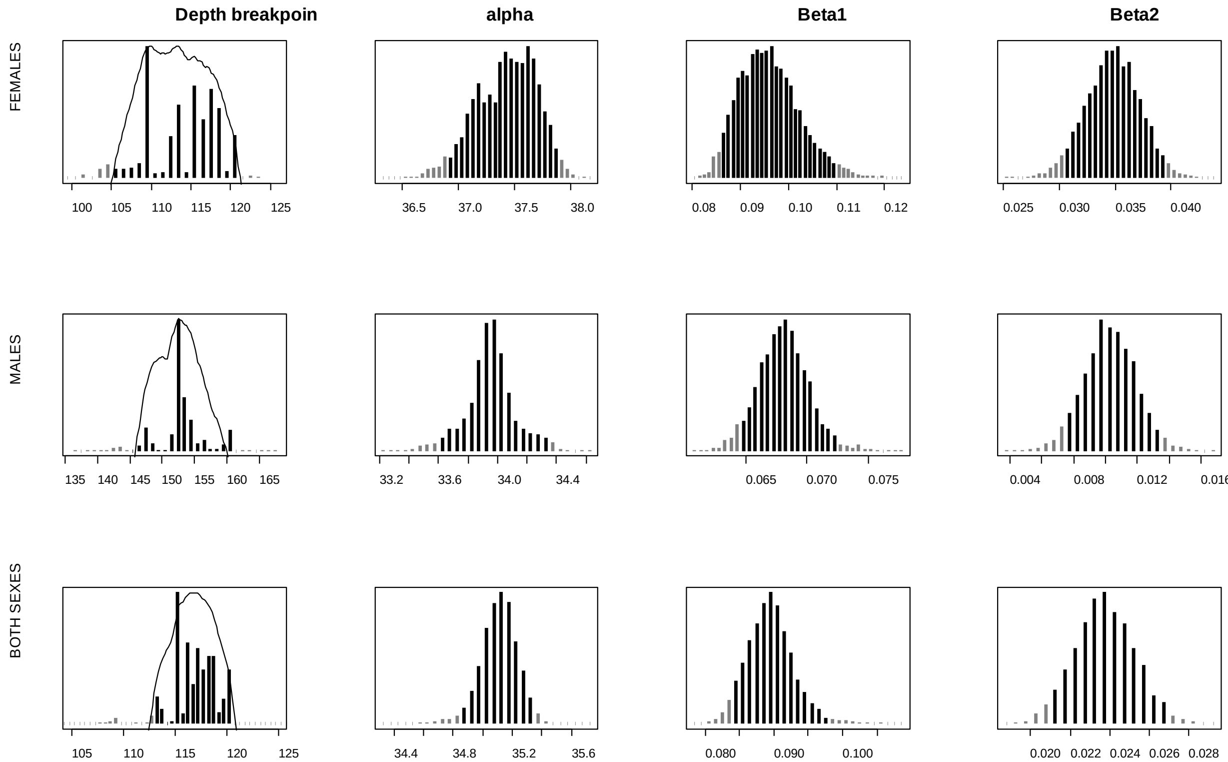
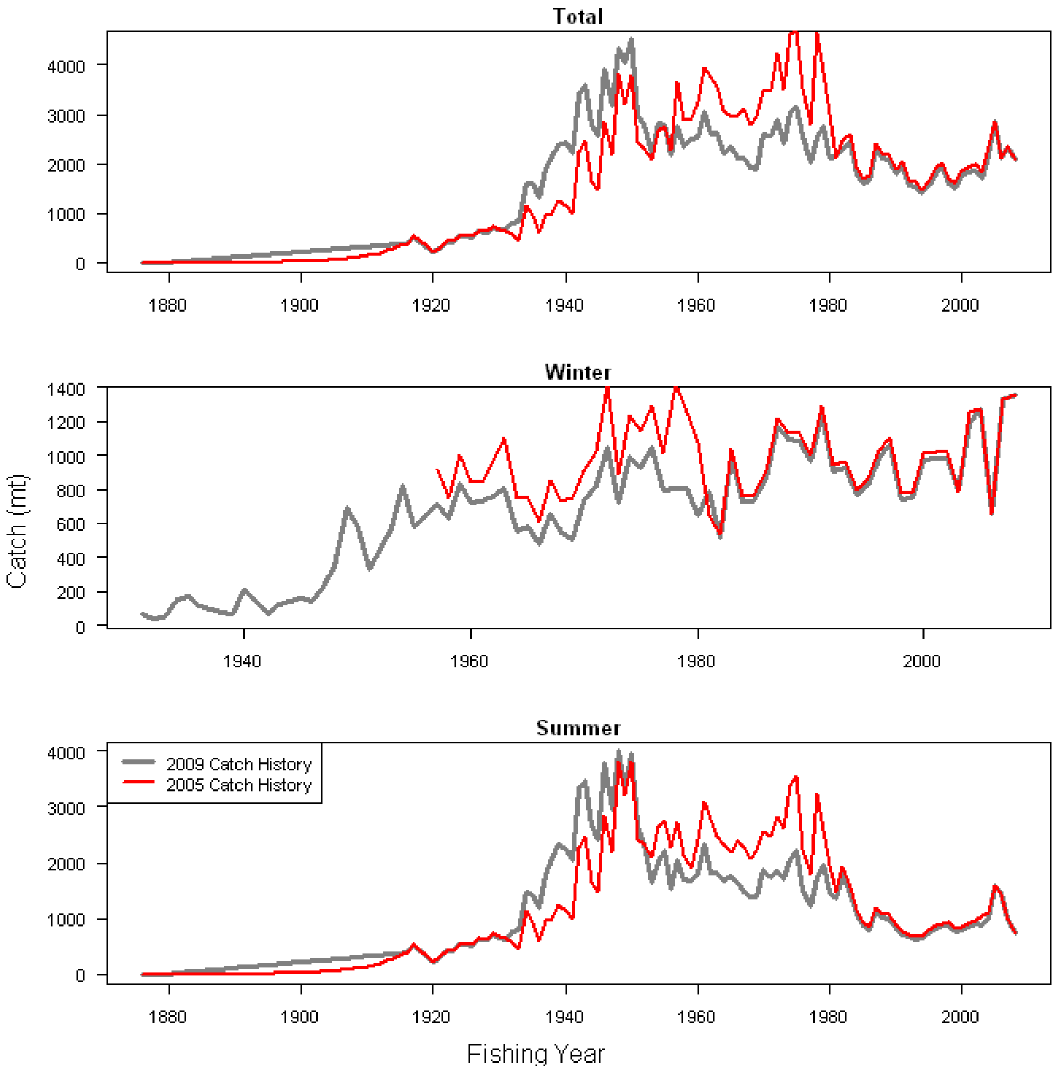
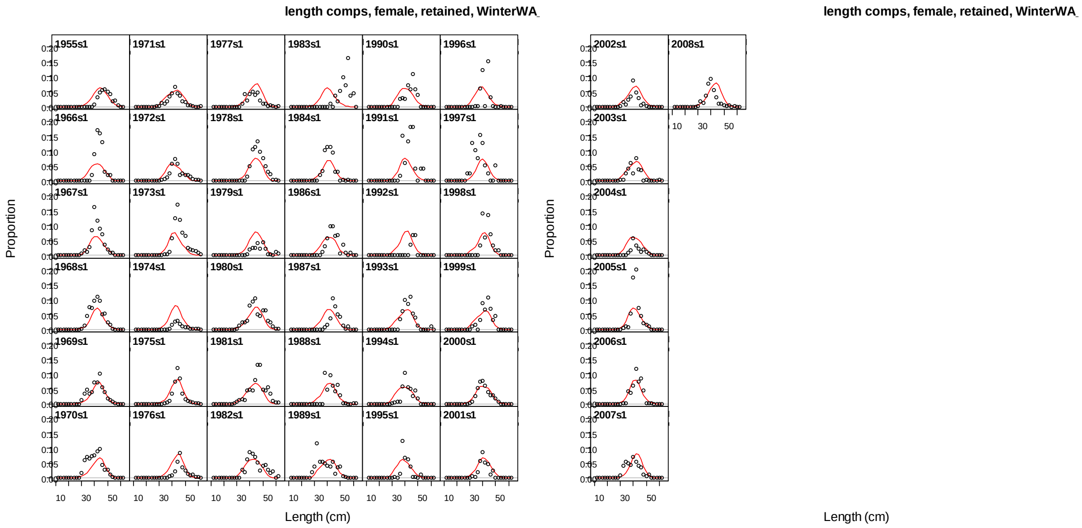


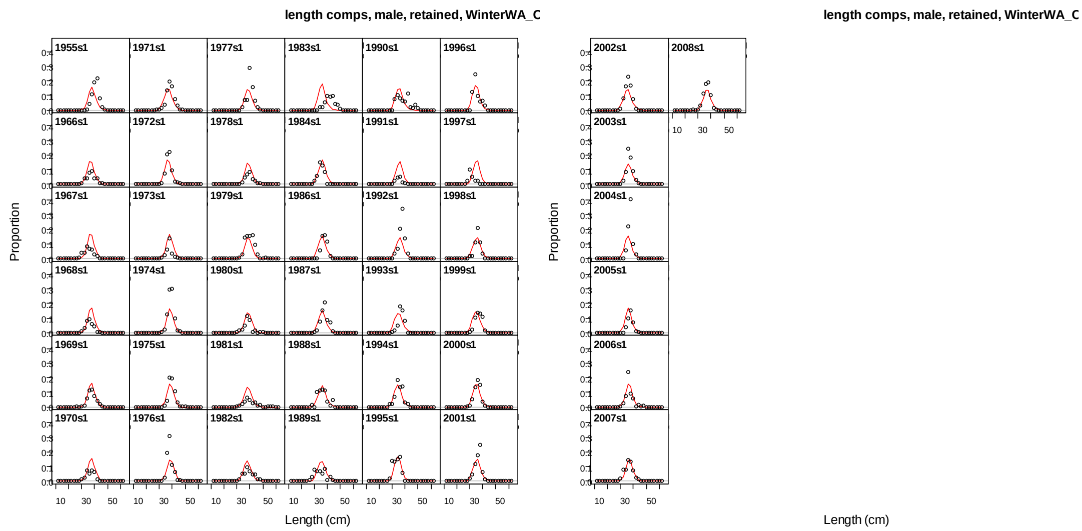
Figure A3: Plot of NWFSC survey bootstrap results from piecewise regression for each sex. The line in the depth breakpoint plot is a likelihood profile (the 95% CI is where the profile crosses zero).

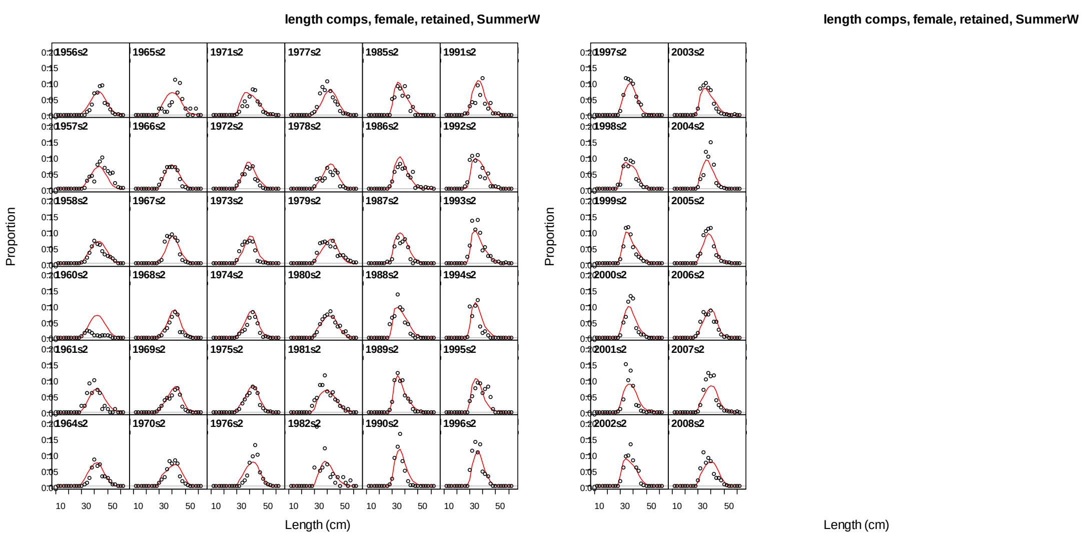
13. Appendix B: Comparison between the 2005 and 2009 catch histories.



14. Appendix C: Model fits and diagnostics for fishery age and length composition data.







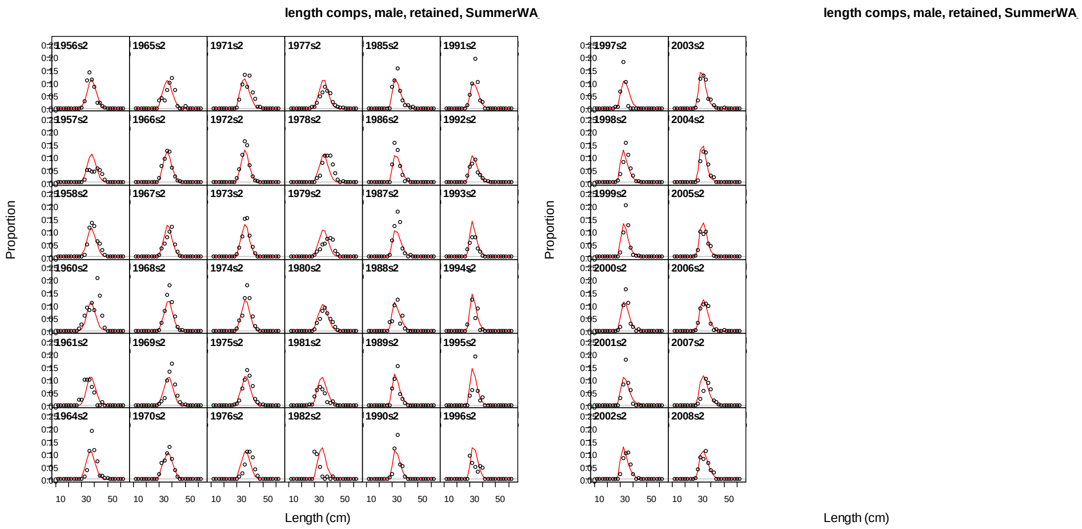


Figure C1. Fit to the Washington fishery length compositions.

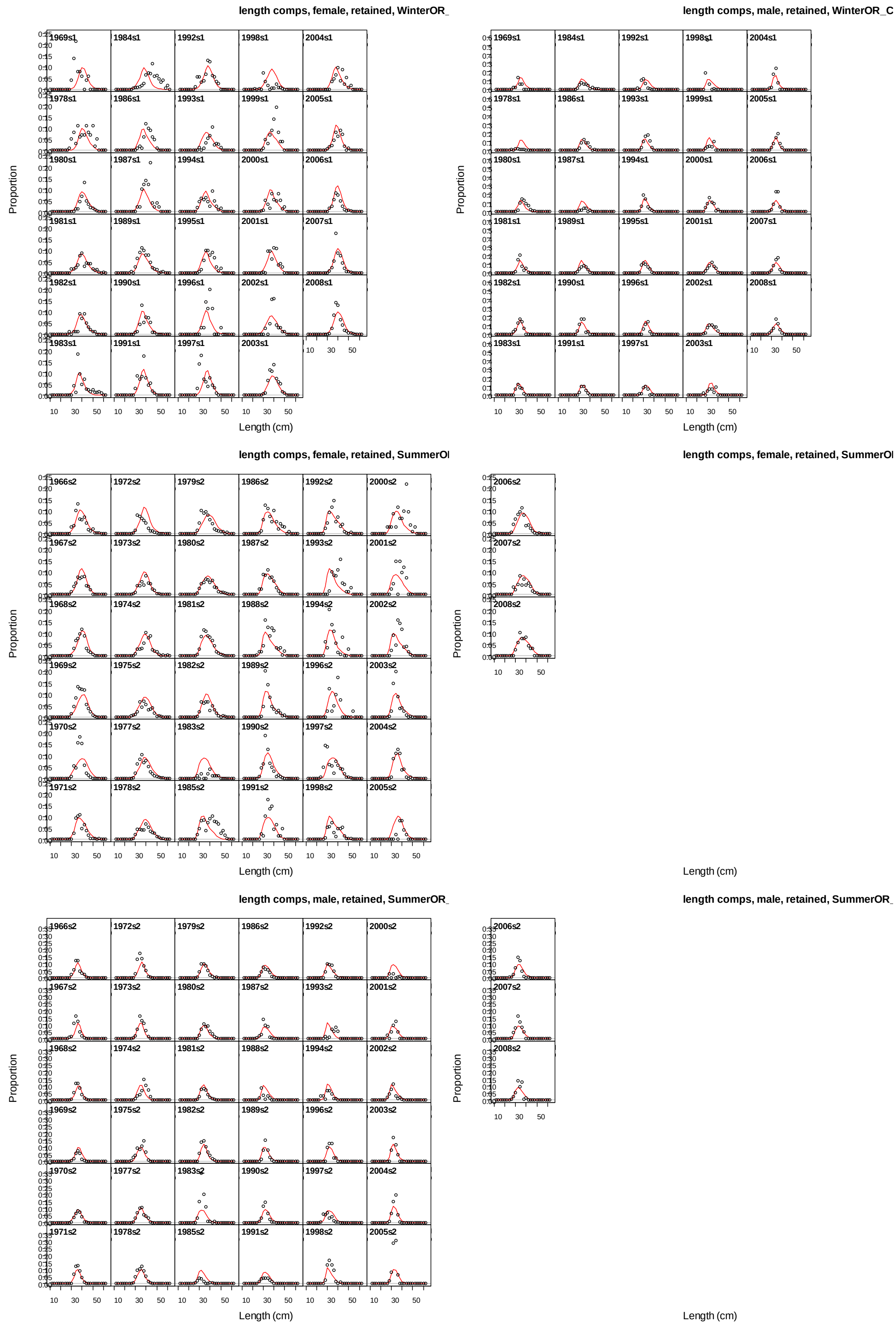
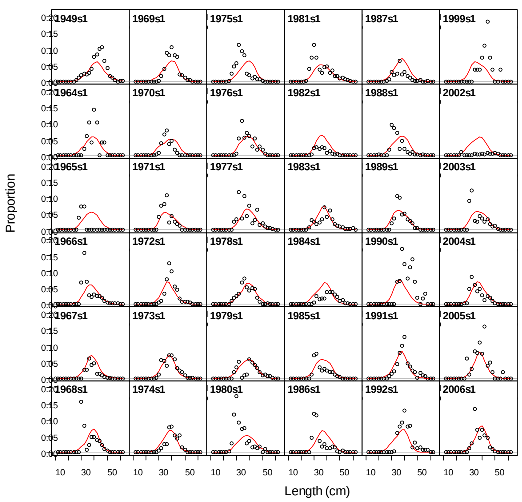
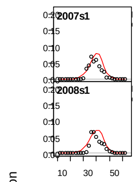


Figure C 2. Fit to the Oregon fishery length compositions.

length comps, female, retained, WinterCA_

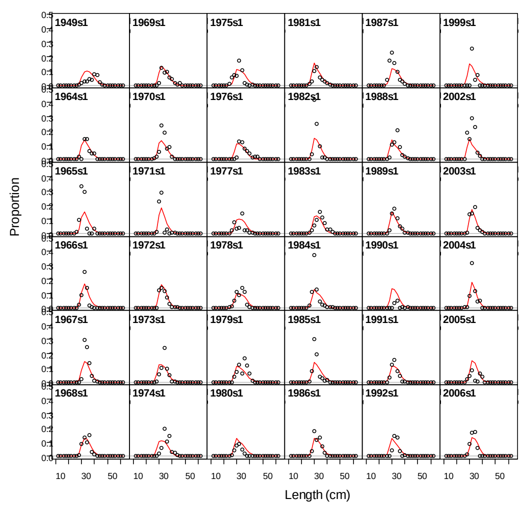


length comps, female, retained, WinterCA_

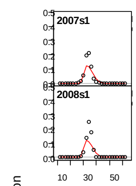


Length (cm)

length comps, male, retained, WinterCA_C



length comps, male, retained, WinterCA_C



Length (cm)

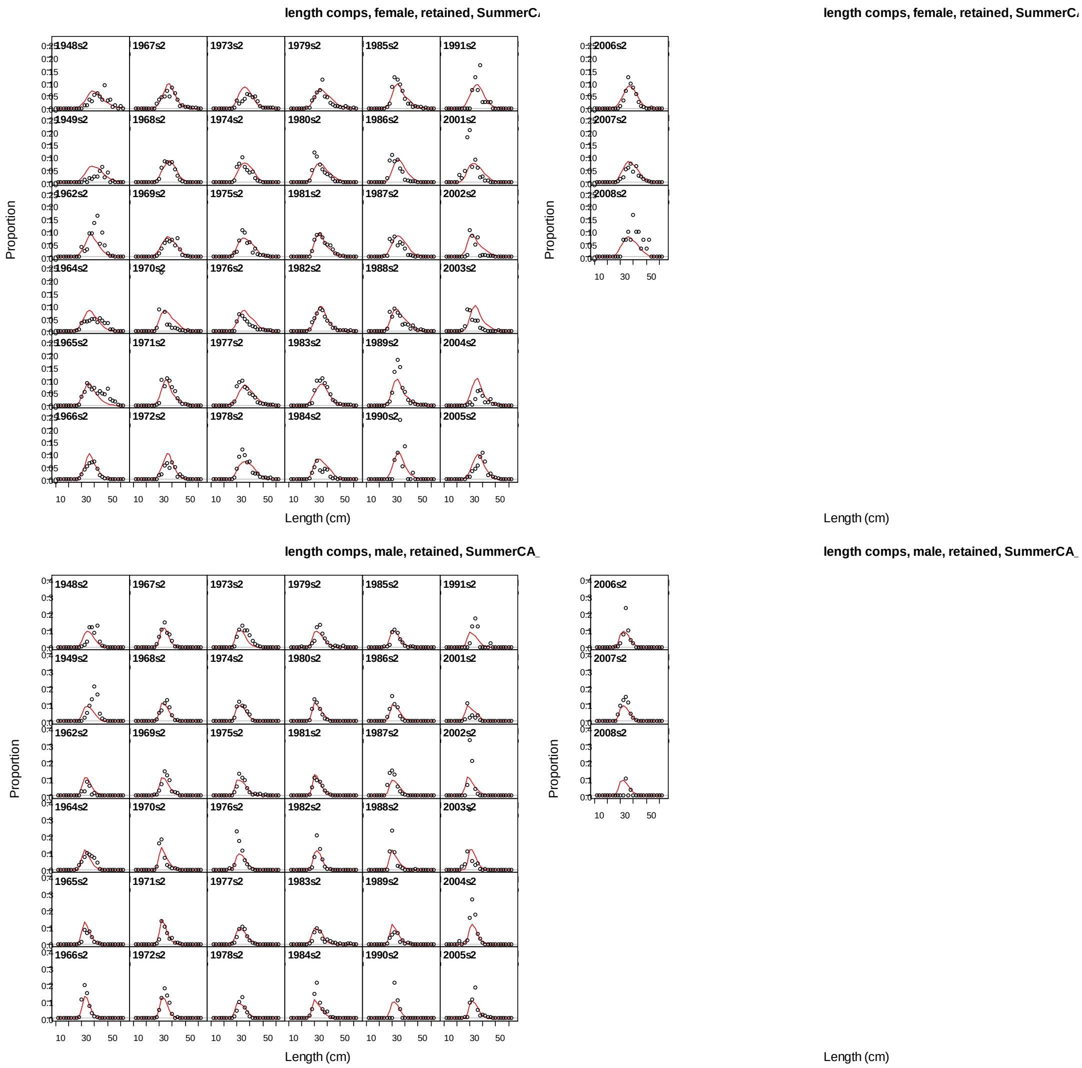


Figure C 3. Fit to the California fishery length compositions.

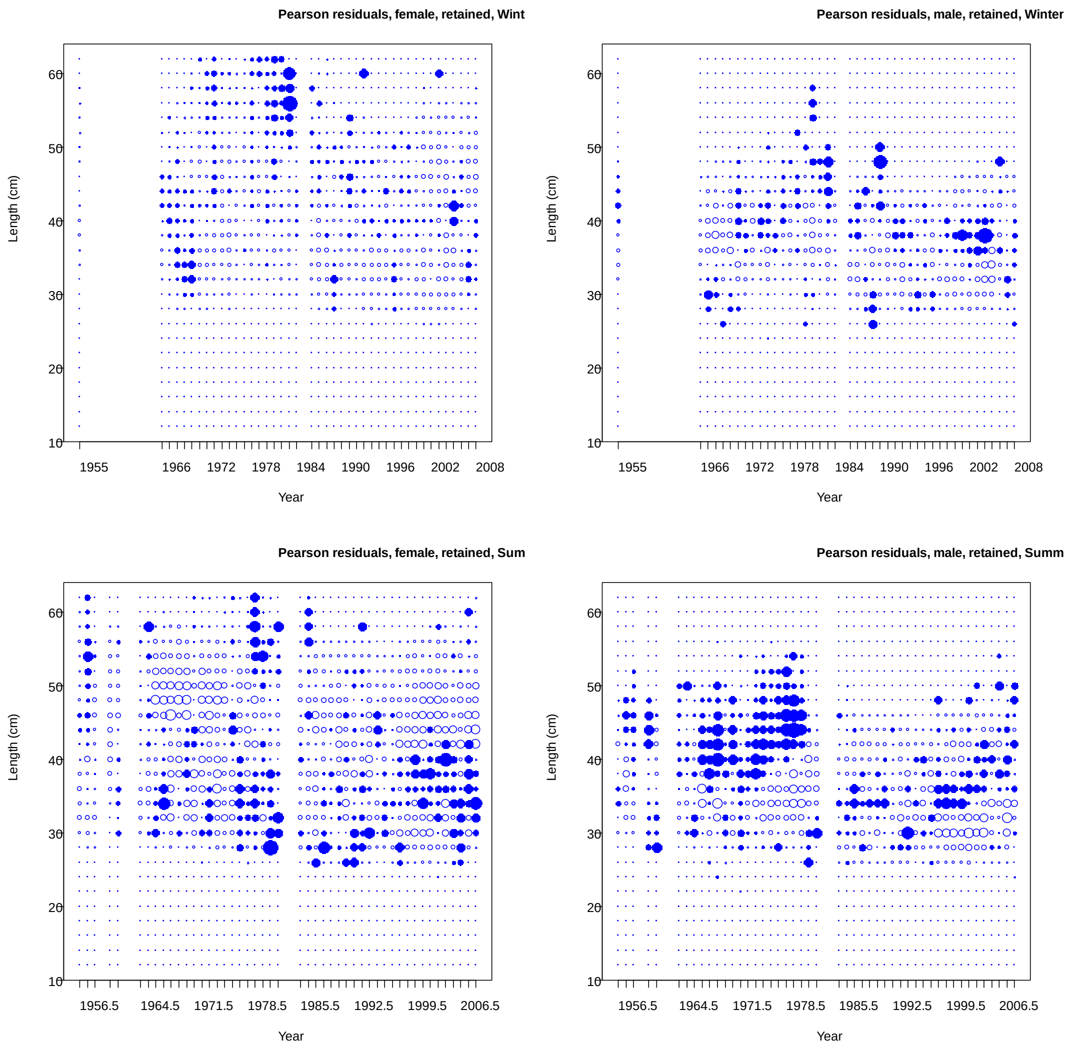


Figure C4. Pearson residuals for the Washington fishery length compositions.

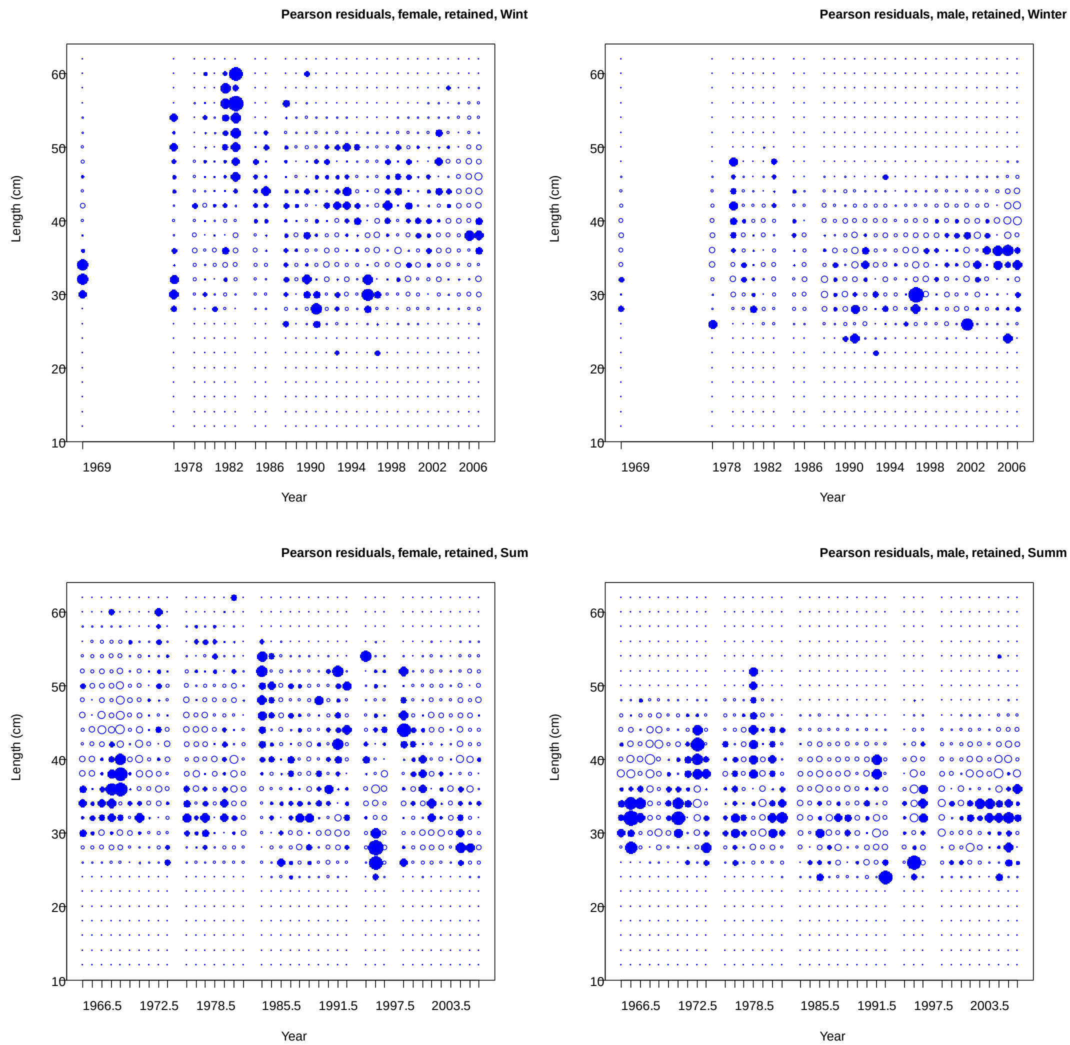


Figure C5. Pearson residuals for the Oregon fishery length compositions.

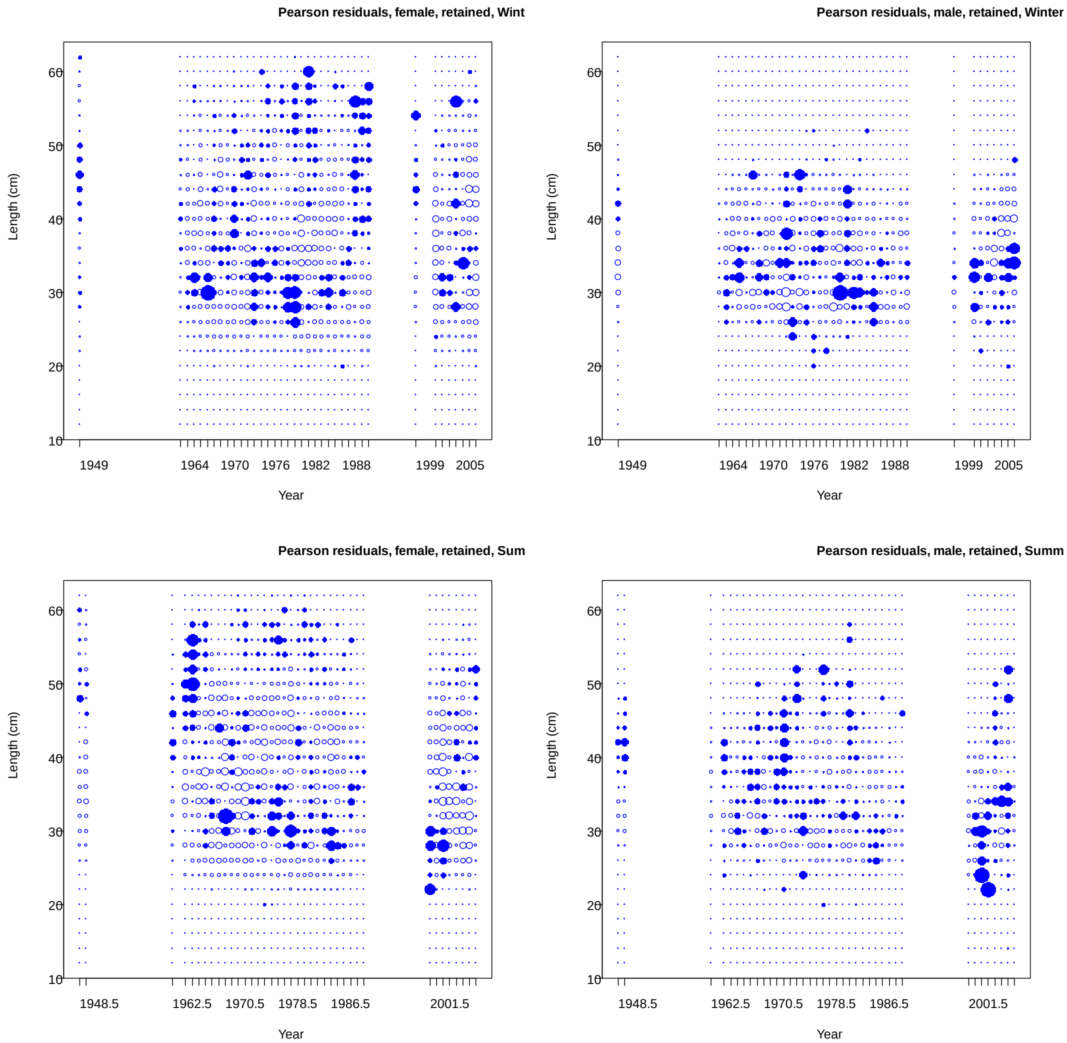
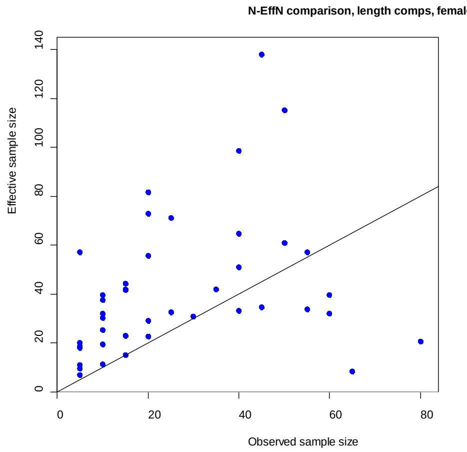
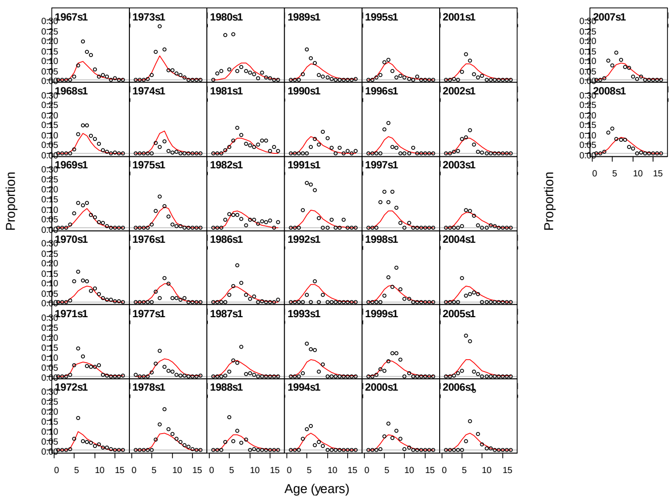


Figure C 6. Pearson residuals for the California fishery length compositions.

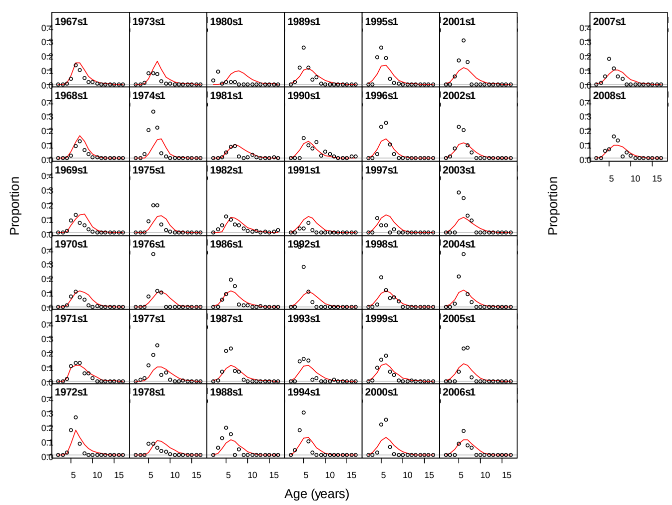

N-EffN comparison, length comps, femal
Effective sample size
Observed sample size
0
20
40
60
80
100
120
140
0
20
40
60
80

age comps, female, retained, WinterWA_CI **age comps, female, retained, WinterWA_CI**

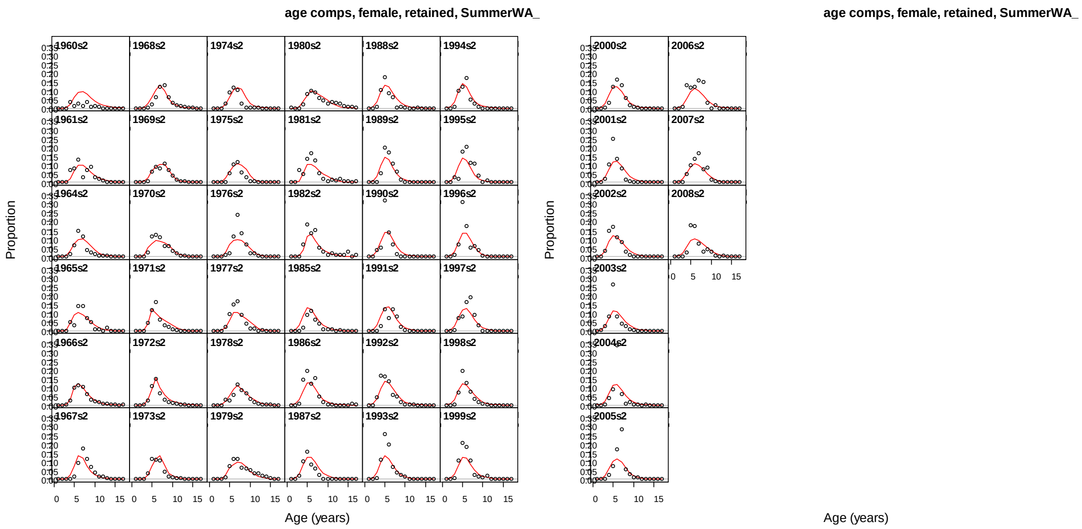


Age (years)

age comps, male, retained, WinterWA_CPU **age comps, male, retained, WinterWA_CPU**



Age (years)



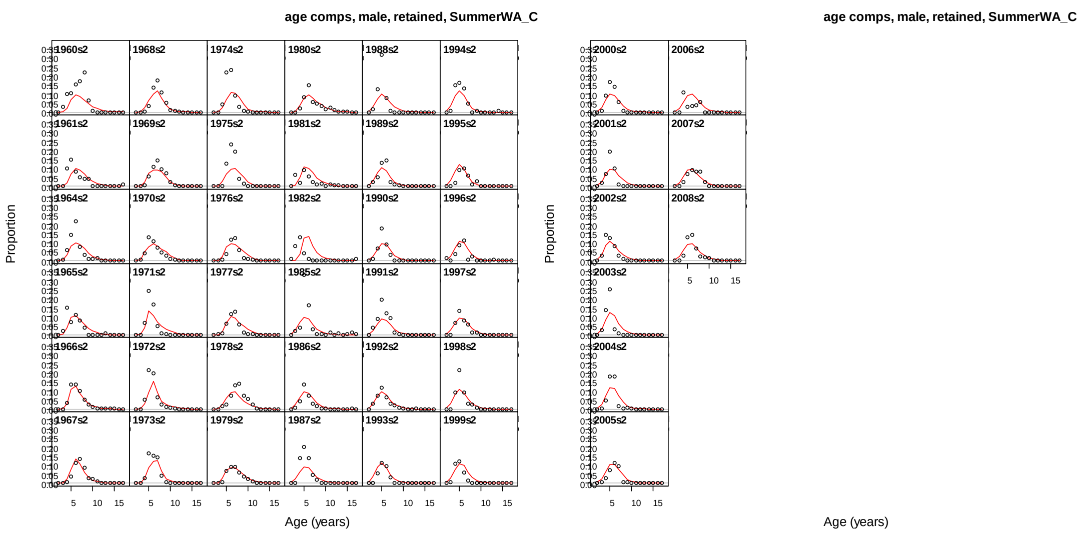


Figure C10. Fit to the Washington fishery age compositions.

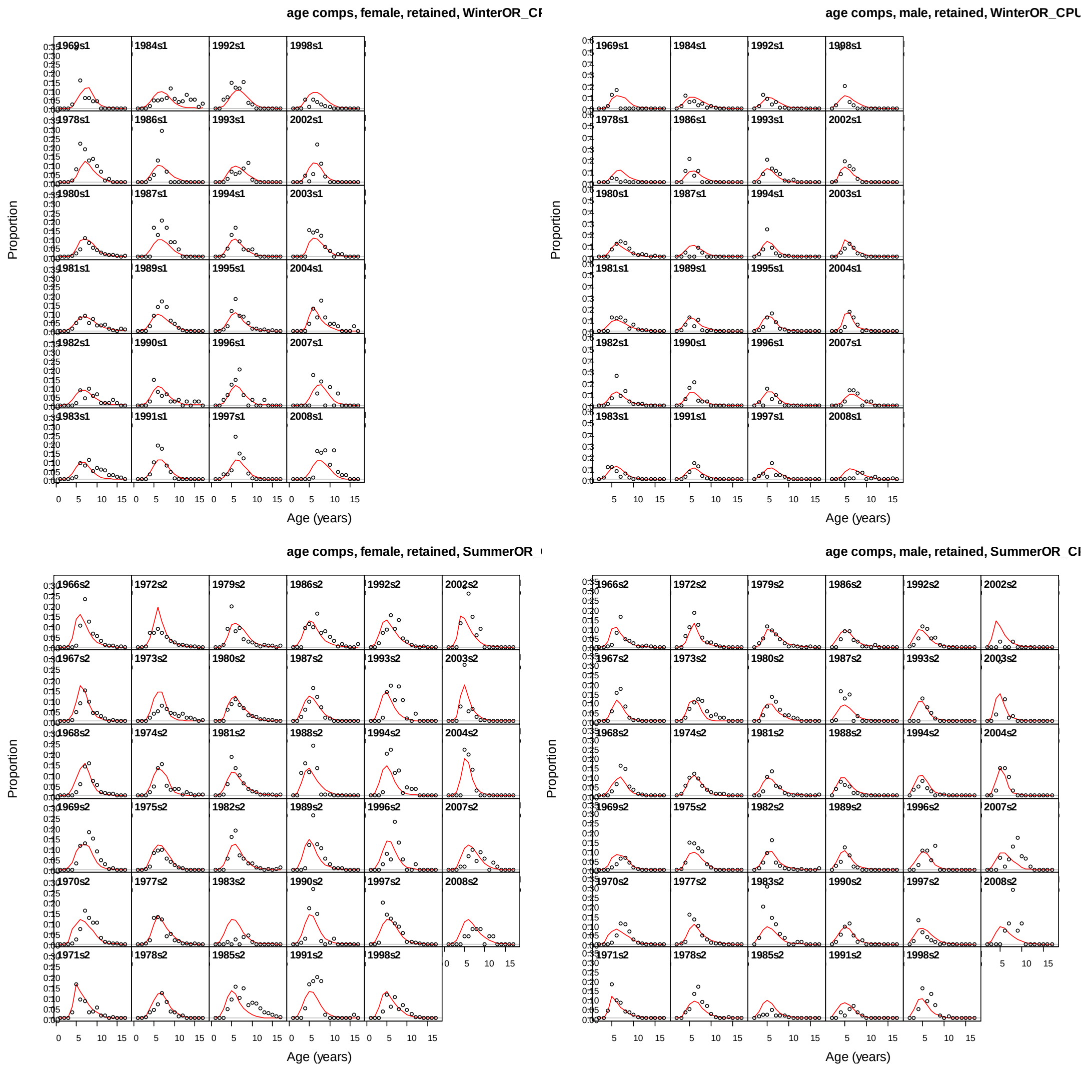


Figure C11. Fit to the Oregon fishery age compositions.

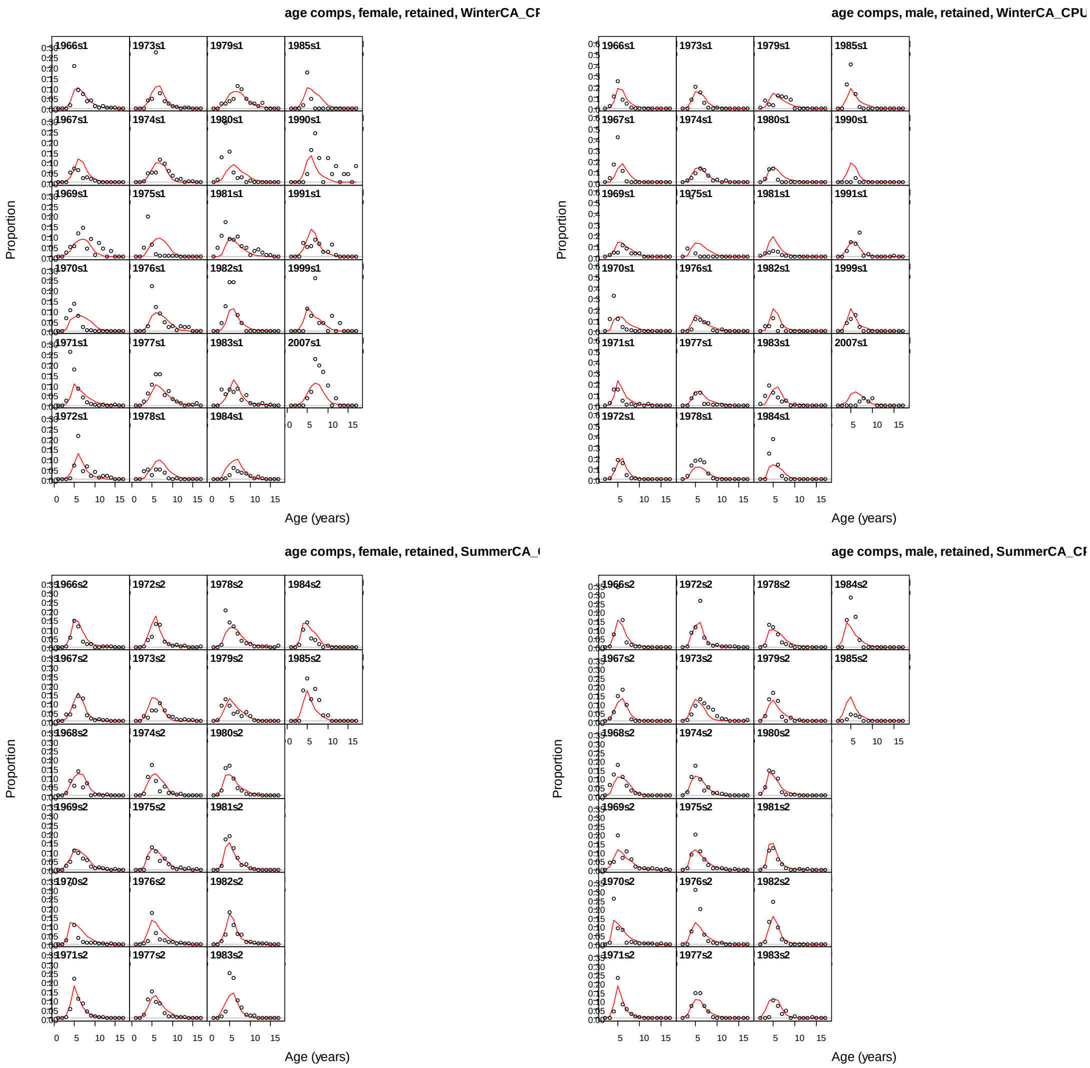


Figure C12. Fit to the California fishery age compositions.

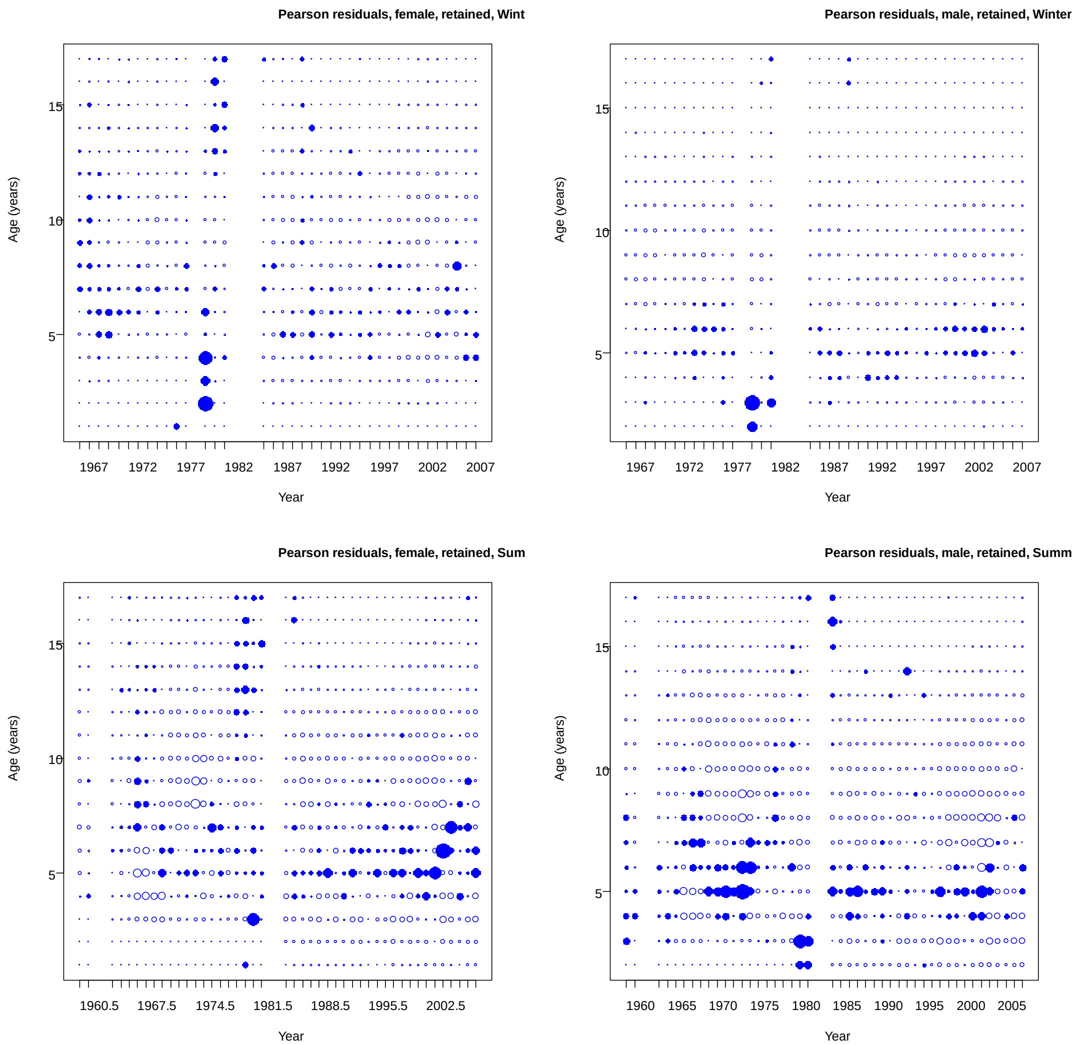


Figure C13. Pearson residuals for the Washington age compositions.

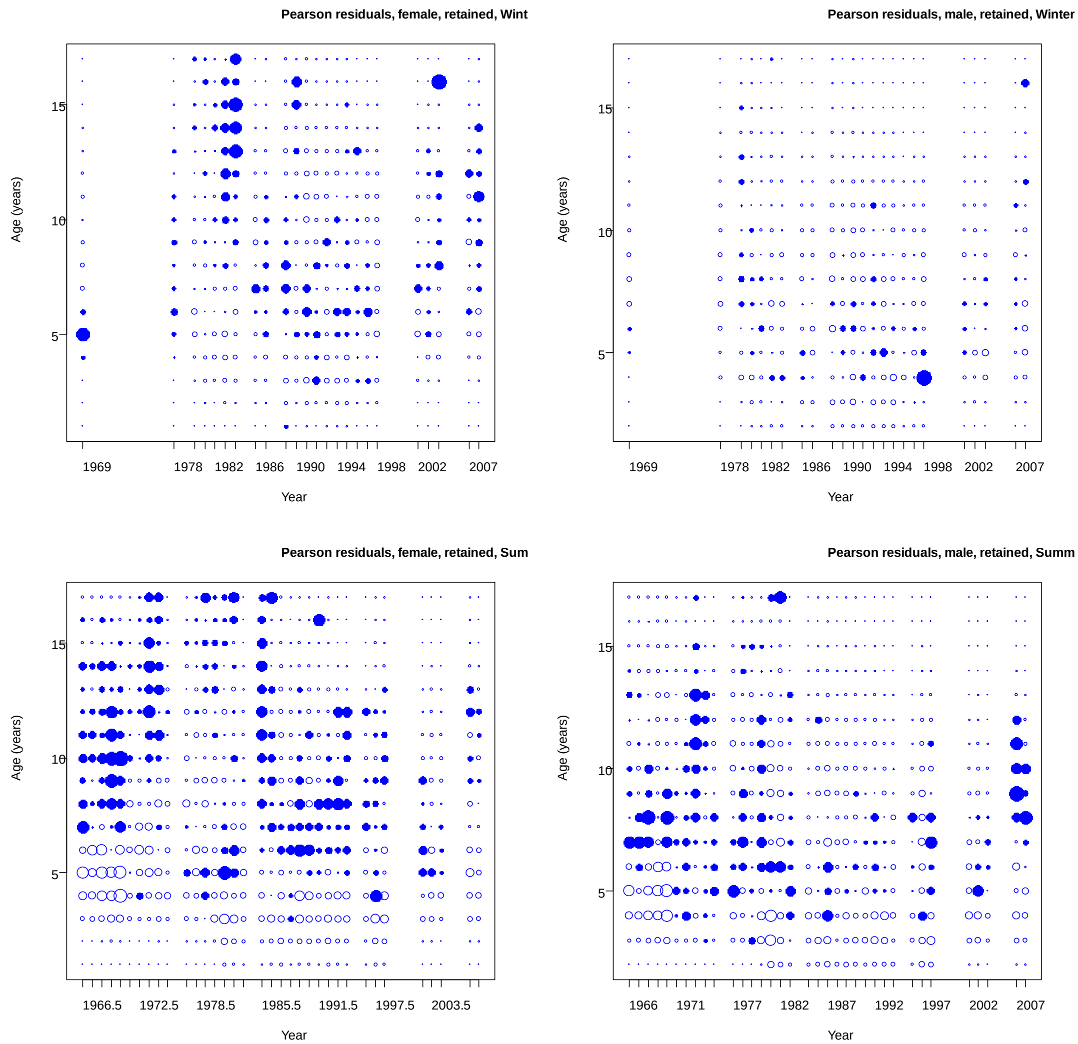


Figure C14. Pearson residuals for the Oregon age compositions.

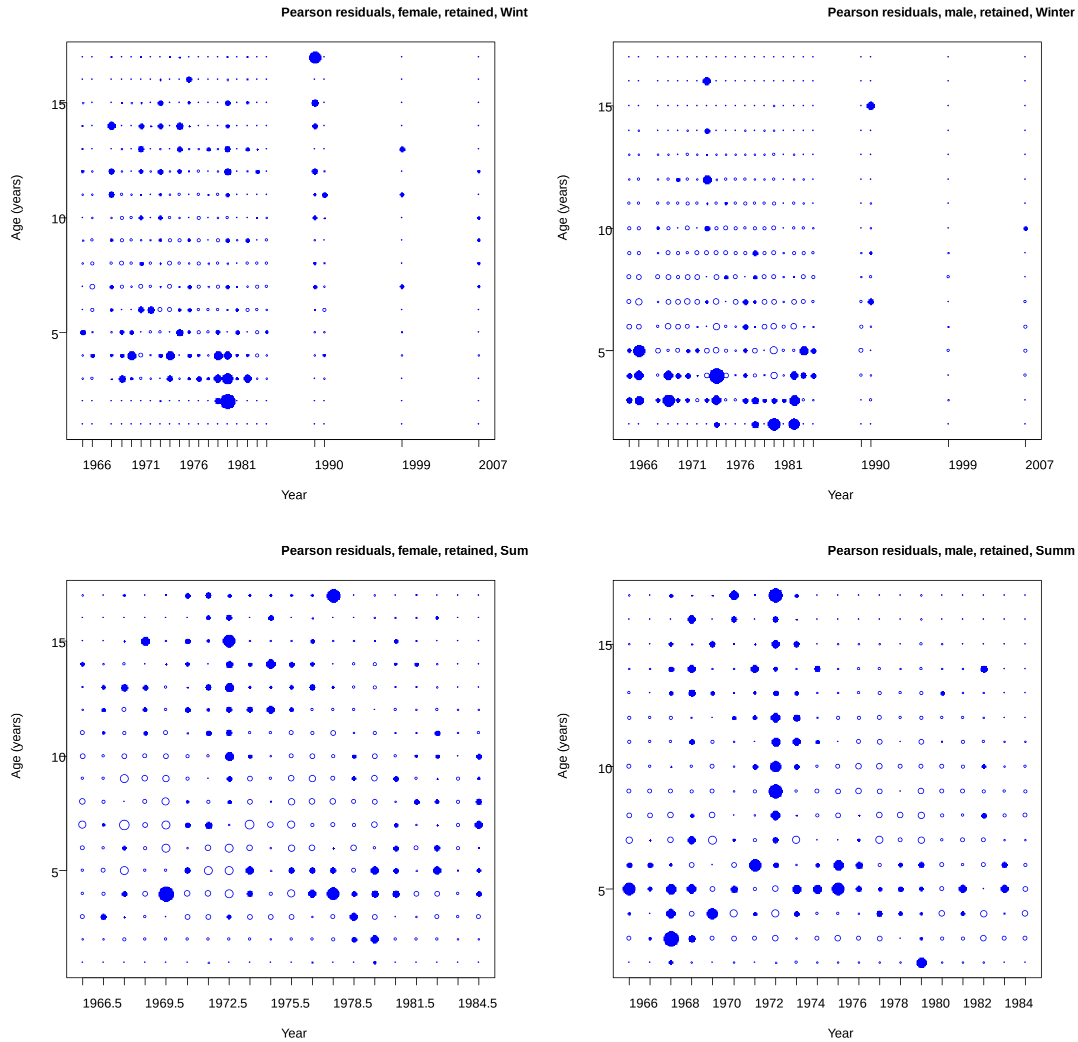
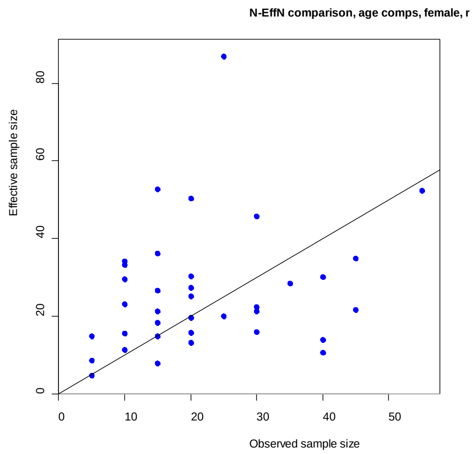


Figure C15. Pearson residuals for the California age compositions.


N-EffN comparison, age comps, female, r
Effective sample size
0
20
40
60
80
0
10
20
30
40
50
Observed sample size

15. Appendix D: Numbers at age matrix

Time	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1876	0	6154	5295	4556	3920	3373	2902	2497	2148	1849	1591	1369	1178	1013	872	750	645	555	478	411	354	304	262	225	194	167	144	124	106	91	79	68	58	50	43	37	32	27	24	20	125
1890	0	6153	5294	4555	3920	3372	2899	2490	2138	1835	1575	1353	1162	999	858	738	635	546	470	404	348	299	257	222	191	164	141	121	104	90	77	67	57	49	42	36	31	27	23	20	123
1900	0	6150	5292	4554	3918	3371	2896	2483	2126	1819	1557	1333	1142	978	838	718	616	528	453	389	334	287	246	212	182	156	135	116	100	86	74	63	55	47	40	35	30	26	22	19	117
1910	0	6148	5290	4552	3917	3369	2892	2475	2113	1802	1537	1312	1120	956	817	698	597	510	436	373	319	273	234	201	172	147	126	108	93	80	69	59	51	43	37	32	28	24	20	18	108
1920	0	6145	5287	4550	3915	3367	2889	2469	2101	1784	1515	1288	1096	932	794	676	576	491	418	357	304	260	222	189	162	138	118	101	86	74	63	54	46	40	34	29	25	21	18	16	97
1930	0	6142	5285	4548	3913	3364	2879	2446	2068	1746	1476	1248	1057	896	762	648	553	471	400	340	288	245	208	177	151	129	110	93	80	68	58	49	42	36	31	26	22	19	16	14	84
1931	0	6141	5284	4547	3913	3364	2879	2446	2066	1743	1471	1243	1051	890	755	641	546	465	396	337	286	243	206	176	149	127	108	92	79	67	57	49	42	36	30	26	22	19	16	14	83
1932	0	6140	5284	4547	3912	3364	2881	2450	2070	1744	1469	1238	1046	884	749	635	539	459	391	333	283	240	204	174	148	126	107	91	78	66	56	48	41	35	30	25	22	19	16	14	81
1933	0	6139	5283	4546	3912	3363	2880	2450	2071	1743	1465	1232	1037	875	740	626	531	451	384	327	278	237	201	171	145	123	105	89	76	65	55	47	40	34	29	25	21	18	16	13	79
1934	0	6138	5283	4546	3911	3363	2882	2454	2075	1746	1465	1228	1030	866	730	617	522	442	376	320	272	232	197	167	142	121	103	87	74	63	54	46	39	33	29	24	21	18	15	13	77
1935	0	6137	5282	4545	3911	3359	2868	2426	2040	1711	1432	1196	1000	837	703	592	500	422	358	304	259	220	188	159	135	115	98	83	71	60	51	44	37	32	27	23	20	17	14	12	73
1936	0	6134	5281	4545	3910	3359	2866	2416	2019	1683	1403	1168	973	811	678	568	478	403	341	289	245	209	178	151	129	109	93	79	67	57	49	41	35	30	26	22	19	16	14	12	69
1937	0	6131	5278	4544	3910	3361	2874	2431	2030	1683	1394	1155	958	795	662	552	463	389	328	277	235	199	169	144	123	104	89	75	64	54	46	39	34	29	24	21	18	15	13	11	65
1938	0	6128	5275	4541	3909	3358	2865	2416	2014	1663	1366	1123	926	765	633	525	438	367	308	260	219	186	158	134	114	97	83	70	60	51	43	37	31	27	23	19	16	14	12	10	60
1939	0	6124	5273	4539	3907	3356	2856	2397	1988	1635	1336	1088	888	728	599	495	410	341	286	240	202	171	144	123	104	89	76	64	55	46	39	33	28	24	21	18	15	13	11	9	55
1940	0	9720	5269	4537	3904	3352	2848	2378	1956	1597	1298	1049	848	688	562	461	380	314	262	219	184	155	131	110	94	80	68	58	49	42	35	30	26	22	19	16	13	11	10	8	49
1941	0	8190	8363	4534	3903	3351	2851	2379	1944	1568	1260	1011	809	649	525	427	350	288	238	198	165	139	117	99	83	71	60	51	44	37	31	27	23	19	16	14	12	10	9	7	43
1942	0	6662	7047	7196	3900	3352	2857	2393	1957	1567	1242	985	782	622	496	400	325	266	218	180	150	125	105	88	75	63	54	46	39	33	28	24	20	17	15	12	11	9	8	7	38
1943	0	5762	5732	6062	6189	3347	2845	2362	1904	1498	1163	903	706	556	439	350	281	228	186	153	126	105	88	73	62	52	44	37	32	27	23	20	17	14	12	10	9	7	6	5	31
1944	0	5738	4957	4931	5214	5308	2831	2330	1849	1425	1083	821	627	486	380	299	237	190	154	126	103	85	71	59	50	42	35	30	25	22	18	16	13	11	10	8	7	6	5	4	25
1945	0	6514	4937	4265	4241	4472	4495	2333	1851	1419	1063	791	591	447	344	268	210	167	133	108	88	72	60	50	41	35	29	25	21	18	15	13	11	9	8	7	6	5	4	3	20
1946	0	6837	5604	4247	3668	3638	3791	3713	1863	1431	1067	784	575	425	320	245	190	149	118	94	76	62	51	42	35	29	24	21	17	15	12	11	9	8	7	6	5	4	3	3	17
1947	0	6549	5882	4821	3652	3139	3042	3022	2796	1334	986	717	517	375	275	206	157	122	95	75	60	49	40	33	27	22	19	16	13	11	9	8	7	6	5	4	4	3	3	2	13
1948	0	6110	5634	5060	4146	3126	2631	2446	2318	2060	953	689	492	352	253	185	138	105	81	63	50	40	32	26	22	18	15	12	10	9	7	6	5	4	4	3	3	2	2	2	10
1949	0	5707	5257	4847	4351	3539	2583	2036	1758	1567	1332	598	424	299	212	151	110	82	62	48	38	30	24	19	16	13	11	9	7	6	5	4	4	3	3	2	2	2	1	1	7
1950	0	5403	4910	4523	4168	3711	2913	1983	1447	1173	997	821	360	252	176	124	88	64	47	36	28	22	17	14	11	9	7	6	5	4	4	3	3	2	2	2	1	1	1	1	5
1951	0	5281	4648	4223	3887	3548	3024	2168	1325	880	666	542	433	186	129	89	62	44	32	24	18	14	11	9	7	6	4	4	3	3	2	2	1	1	1	1	1	1	1	0	3
1952	0	5361	4544	3999	3631	3318	2930	2333	1544	879	554	404	320	252	107	73	51	35	25	18	13	10	8	6	5	4	3	3	2	2	1	1	1	1	1	1	1	0	0	0	2
1953	0	5379	4612	3909	3438	3100	2743	2269	1672	1033	558	339	241	187	145	61	42	29	20	14	10	8	6	4	3	3	2	2	1	1	1	1	1	1	0	0	0	0	0	0	1
1954	0	5458	4628	3968	3361	2938	2577	2157	1675	1171	697	367	220	155	120	93	39	27	18	13	9	6	5	4	3	2	2	1	1	1	1	1	1	0	0	0	0	0	0	0	1
1955	0	5715	4696	3982	3412	2868	2420	1976	1521	1101	732	422	219	129	90	70	54	23	15	11	7	5	4	3	2	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1
1956	0	5503	4916	4040	3423	2909	2356	1842	1376	984	676	435	246	126	74	51	39	30	13	9	6	4	3	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	4660	4735	4230	3474	2925	2414	1842	1344	945	646	431	272	152	77	45	31	24	18	8	5	4	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	4337	4010	4073	3636	2960	2395	1822	1265	851	566	373	243	151	84	42	25	17	13	10	4	3	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	4879	3732	3449	3502	3102	2439	1839	1287	831	531	341	220	142	87	48	24	14	10	7	6	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	6144	4198	3211	2966	2989	2563	1879	1290	825	497	303	188	119	76	46	25	13	7	5	4	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	7919	5286	3611	2760	2529	2458	1951	1296	811	483	276	163	99	62	39	24	13	6	4	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	4086	6813	4547	3103	2344	2039	1783	1246	738	423	236	129	74	44	27	17	10	5	3	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	4030	3515	5861	3908	2638	1897	1491	1152	721	392	212	114	61	34	20	12	8	5	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	5183	3467	3024	5036	3316	2116	1355	925	629	357	182	94	49	26	14	8	5	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	4182	4459	2983	2599	4273	2659	1518	857	526	330	177	87	44	22	11	6	4	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	13594	3598	3836	2563	2206	3429	1903	948	475	266	157	80	38	19	9	5	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	6161	11696	3095	3297	2178	1781	2506	1242	563	262	139	79	40	19	9	5	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	7729	5301	10062	2661	2803	1762	1307	1646	744	315	141	73	41	20	9	4	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	5666	6650	4560	8650	2264	2279	1311	881	1025	437	178	77	39	22	11	5	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	5713	4875	5721	3920	7362	1842	1696	885	552	610	252	101	43	22	12	6	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	6497	4915	4193	4917	3328	5908	1321	1069	501	288	302	121	47	20	10	5	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	4299	5590	4229	3605	4182	2699	4355	871	639	278	152	153	60	23	10	5	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	3491	3699	4809	3635	3066	3394	1992	2867	517	349	143	75	73	28	11	4	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	4776	3004	3182	4131	3079	2479	2550	1389	1873	320	208	82	42	40	15	6	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	3736	4109	2584	2733	3486	2452	1802	1690	850	1079	176	111	43	21	20	8	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	6269	3214	3535	2219	2301	2751	1747	1157	995	469	567	89	55	21	10	10	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	7499	5394	2765	3036	1874	1837	2010	1166	715	580	262	308	48	29	11	5	5	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	3919	6452	4640	2376	2574	1520	1388	1407	763	445	347	153	176	27	16	6	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	3985	3371	5550	3984	2000	2029	1084	897	837	425	235	177	75	85	13	7	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	7313	3429	2900	4762	3328	1528	1355	636	474	408	195	103	75	31	34	5	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	4596	6292	2949	2489	3993	2583	1052	831	355	247	203	94	49	35	14	16	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	4714	3955	5413	2532	2095	3141	1815	652	458	178	115	89	39	20	14	6	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	3808	4055	3401	4645	2127	1633	2155	1082	344	220	80	49	36	16	8	5	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	7055	3276	3480	2875	3701	1514	1015	1186	546	165	103	37	22	16	7	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	5812	6070	2813	2955	2337	2760	1016	620	676	298	87	53	19	11	8	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	3228	5000	5217	2402	2444	1798	1941	660	378	395	168	48	29	10	6	4	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	2861	2777	4298	4453	1988	1888	1267	1252	398	218	222	93	26	16	5	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	4177	2461	2386	3656	3625	1465	1220	723	648	193	101	99	40	11	7	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	5670	3594	2114	2027	2967	2663	942	688	368	308	88	44	43	17	5	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	5983	4878	3087	1797	1644	2172	1699	525	344	172	137	38	19	18	7	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	7060	5148	4191	2628	1468	1227	1438	999	279	170	80	61	16	8	7	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	2973	6074	4423	3566	2138	1077	774	771	468	119	68	31	23	6	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	4024	2558	5218	3762	2897	1566	684	424	374	209	50	27	12	9	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	7848	3462	2198	4448	3073	2144	1002	373	203	165	87	20	11	5	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	4215	6752	2976	1877	3657	2320	1443	598	202	103	79	40	9	5	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	4647	3626	5805	2542	1548	2790	1591	885	336	107	52	39	20	4	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	4429	3998	3118	4955	2086	1164	1876	958	488	175	53	25	19	9	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	8742	3811	3437	2659	4046	1545	762	1089	507	243	84	25	12	9	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	8987	7521	3276	2932	2184	3063	1056	473	628	279	130	44	13	6	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	5413	7732	6466	2799	2428	1689	2167	685	288	368	160	74	25	7	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	4932	4657	6647	5522	2315	1872	1182	1372	401	160	199	85	38	13	4	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	3873	4243	4003	5675	4557	1775	1300	743	798	221	85	103	43	19	6	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	3691	3332	3647	3417	4693	3519	1246	826	436	442	118	44	53	22	10	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	3241	3176	2866	3129	2888	3803	2655	860	524	258	249	64	24	28	11	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	5381	2788	2732	2459	2645	2339	2860	1814	531	296	136	124	31	11	12	5	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	7134	4630	2398	2341	2059	2074	1653	1800	1027	276	145	63	56	14	5	5	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	5763	6137	3982	2055	1964	1628	1503	1101	1119	608	159	81	35	31	7	3	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	5450	4958	5279	3417	1732	1563	1178	972	643	609	316	80	40	17	15	4	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	5658	4689	4265	4532	2885	1385	1136	763	567	347	312	157	39	19	8	7	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

16. Appendix E: Management Actions Potentially Impacting the Petrale Sole Fishery

Dan Erickson, ODFW Marine Resource Program, in collaboration with Brad Pettinger and members of industry compiled the following summaries of how management actions may have impacted the petrale sole fishery.

Major Management Shifts that could Impact Stock Assessments.

Effective October 18, 1982

- First trip limits established (widow rockfish and sablefish).

Effective January 1, 1992

- First **cumulative trip limits** for various species and species groups (widow RF; Sebastes complex; Pacific ocean perch; deepwater complex; non-trawl sablefish).

Effective May 9, 1992

- Increased the **minimum legal codend mesh size** for roller trawl gear north of Point Arena, California (40^o 30' N latitude) from 3.0 inches to 4.5 inches; prohibited double-walled codends; removed provisions regarding rollers and tickler chains for roller gear with codend mesh smaller than 4.5 inches.

Effective January 1, 1994

- Divided the commercial groundfish fishery into two components: the **limited entry** fishery and the open access fishery.

  A federal limited entry permit is required to participate in the limited entry segment of the fishery. Permits are issued based on the fishing history of qualifying fishing vessels.

Effective September 8, 1995

- The **trawl minimum mesh size** now applies throughout the net; removed the legal distinction between bottom and roller trawls and the requirement for continuous riblines; clarified the distinction between bottom and pelagic (midwater) trawls; modified chafing gear requirements;

Effective January 1, 1999:

- Dividing line between north and south management areas moved to 40^o 10'.

Effective January 1, 2000

- **chafing gear** may be used only on the last 50 meshes of a small footrope trawl, running the length of the net from the terminal (closed) end of the codend.

New rockfish categories in 2000.

- Rockfish (except thornyheads) are divided into new categories north and south of 40° 10' N. lat., depending on the depth where they most often are caught:

nearshore, shelf, or slope. New trip limits have been established for "minor rockfish" species according to these categories.

Nearshore: numerous minor rockfish species including black and blue rockfishes.

Shelf: shortbelly, widow, yellowtail, bocaccio, chilipepper, cowcod rockfishes, and others.

Slope: Pacific ocean perch, splitnose rockfish, and others

New Limited Entry Trawl Gear Restrictions in 2000.

- Limited entry trip limits may vary depending on the type of trawl gear that is onboard a vessel during a fishing trip: large footrope, small footrope, or midwater trawl gear.

  Large footrope trawl gear is bottom trawl gear, with a footrope diameter larger than 8 in. (20 cm) (including rollers, bobbins or other material encircling or tied along the length of the footrope).

  Small footrope trawl gear is bottom trawl gear, with a footrope diameter 8 in. (20 cm) or smaller (including rollers, bobbins or other material encircling or tied along the length of the footrope), except chafing gear may be used only on the last 50 meshes of a small footrope trawl, running the length of the net from the terminal (closed) end of the codend.

  Midwater trawl gear is pelagic trawl gear, The footrope of midwater trawl gear may not be enlarged by encircling it with chains or by any other means.

Effective during 2001:

- First conservation area was established (Cowcod Conservation Area)
- The West Coast Observer Program was initiated
- It is unlawful to take and retain, possess or land petrale sole from a fishing trip if large footrope gear is onboard and the trip is conducted at least in part between May 1 and October 31

Effective during 2002:

- Darkblotched Conservation Area was established.

Effective during 2003:

- Vessel buyback program was initiated (December 4, 2003)
- Yelloweye Rockfish Conservation Area was established
- Rockfish Conservation areas for several rockfish species were established.

Effective during 2004:

- Vessel Monitoring System (VMS) was initiated.

Effective during 2005:

- Selective flatfish trawl required shoreward of the RCA North of 40^{o} 10'.

Petrale Sole – First Major Regulations

Effective 1983
- First established coast-wide ABC limits for annual harvest of petrale sole.

Effective April 1, 1999 (April 16, 1999 for "B" platoon vessels)
- Limited Entry and Open Access *Sebastes* complex: north and south of Cape Mendocino, if a vessel takes and retains, possesses, or lands any splitnose or chilipepper rockfish south of Cape Mendocino, then the more restrictive *Sebastes* complex cumulative trip limit applies throughout the same cumulative limit period, no matter where the *Sebastes* complex is taken and retained, possessed, or landed.

Effective during 2000:
- For Limited Entry: large footrope trawl gear may be used to take………petrale sole from January 1-February 29 and November 1-December 31……., but these exceptions apply only on a trip that is conducted entirely during the periods in which use of large footrope gear is authorized. The presence of rollers or bobbins larger than 8 in. (20 cm) in diameter on board the vessel, even if not attached to a trawl, will be considered to mean a large footrope trawl is on board. Dates will be adjusted for the "B" platoon.

Effective during 2001:
- It is unlawful to take and retain, possess or land petrale sole from a fishing trip if large footrope gear is onboard and the trip is conducted at least in part between May 1 and October 31

Effective 2002:
- First cumulative trip limits for petrale sole

  In 2001, no restrictions except requirement for small footrope.

  In 2002, monthly limit of 15,000 pounds during July and August.

Effective 2003:
- Bimonthly cumulative trip limits for petrale sole were initiated.

Table E1. Annual RCA depth boundaries 2002 – 2009 (does not include in-season changes).

<table>
<tr><th>Year</th><th>Location</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td rowspan="10">2008</td><td>North 48 10</td><td colspan="2">0 - [m]200</td><td colspan="2">0 - 200</td><td colspan="6">0 - 150</td><td colspan="2">0 - [m]200</td></tr>
<tr><td>48 10 - 46 38.17</td><td colspan="2" rowspan="4">75 - [m]200</td><td colspan="2">60 - 200</td><td colspan="5">60 - 150</td><td rowspan="2">75 - 150</td><td colspan="2" rowspan="4">75 - [m]200</td></tr>
<tr><td>46 38.17 - 46 16</td><td colspan="4">60 - 200</td><td colspan="3">60 - 150</td></tr>
<tr><td>46 16 - 45 46</td><td colspan="2">75 - 200</td><td colspan="4">75 - 150</td><td colspan="2">75 - 200</td></tr>
<tr><td>45 46 - 43 20.83</td><td colspan="8">75 - 200</td></tr>
<tr><td>43 20.83 - 42 40.50</td><td colspan="2">0 - [m]200</td><td colspan="8">0 - 200</td><td colspan="2">0 - [m]200</td></tr>
<tr><td>42 40.5 - 40 10</td><td colspan="2">75 - [m]200</td><td colspan="2">75 - 200</td><td colspan="5">60 - 200</td><td>75 - 200</td><td colspan="2">75 - [m]200</td></tr>
<tr><td>40 10 - 34 27</td><td colspan="12" rowspan="2">100 - 150</td></tr>
<tr><td>South 34 27 (mainland)</td></tr>
<tr><td>South 34 27 (islands)</td><td colspan="12">0 - 150</td></tr>
<tr><td rowspan="8">2007</td><td>North 48 10</td><td colspan="2">0 - [m]200</td><td colspan="2">0 - 200</td><td colspan="6">0 - 150</td><td colspan="2">0 - [m]200</td></tr>
<tr><td>48 10 - 46 16</td><td colspan="2" rowspan="2">75 - [m]200</td><td colspan="2">60 - 200</td><td colspan="4">60 - 150</td><td colspan="2">75 - 150</td><td colspan="2" rowspan="2">75 - [m]200</td></tr>
<tr><td>46 16 - 43 20.83</td><td colspan="8">75 - 200</td></tr>
<tr><td>43 20.83 - 42 40.50</td><td colspan="2">0 - [m]200</td><td colspan="8">0 - 200</td><td colspan="2">0 - [m]200</td></tr>
<tr><td>42 40.50 - 40 10</td><td colspan="2">75 - [m]200</td><td colspan="8">75 - 200</td><td colspan="2">75 - [m]200</td></tr>
<tr><td>40 10 - 34 27</td><td colspan="12" rowspan="2">100 - 150</td></tr>
<tr><td>South 34 27 (mainland)</td></tr>
<tr><td>South 34 27 (islands)</td><td colspan="12">0 - 150</td></tr>
<tr><td rowspan="5">2006</td><td>North 40 10</td><td colspan="2">75 - [m]200</td><td colspan="4">75 - 200</td><td colspan="2">100 - 250</td><td colspan="2">75 - 250</td><td colspan="2">75 - [m]200</td></tr>
<tr><td>40 10 - 38</td><td colspan="2" rowspan="3">75 - 150</td><td colspan="4" rowspan="3">100 - 150</td><td colspan="2">100 - 200</td><td colspan="2">100 - 250</td><td colspan="2">75 - [m]250</td></tr>
<tr><td>38 - 34 27</td><td colspan="4" rowspan="2">100 - 150</td><td colspan="2" rowspan="2">75 - 150</td></tr>
<tr><td>South 34 27 (mainland)</td></tr>
<tr><td>South 34 27 (islands)</td><td colspan="12">0 - 150</td></tr>
<tr><td rowspan="6">2005</td><td>North 40 10</td><td colspan="2">75 - [m]200</td><td colspan="7">100 - 200</td><td colspan="3" rowspan="2">0 - 250</td></tr>
<tr><td>40 10 - 38</td><td colspan="2" rowspan="4">75 - 150</td><td colspan="2">100 - 200</td><td colspan="5">100 - 150</td></tr>
<tr><td>38 - 36</td><td colspan="7" rowspan="3">100 - 150</td><td colspan="3">0 - 200</td></tr>
<tr><td>36 - 34 27</td><td colspan="3" rowspan="2">50 - 200</td></tr>
<tr><td>South 34 27 (mainland)</td></tr>
<tr><td>South 34 27 (islands)</td><td colspan="9">0 - 150</td><td colspan="3">0 - 200</td></tr>
</table>

2004	North 40 10	75 - [m]200	60 - 200	60 - 150	75 - 150		0 - 250	
	40 10 - 38	75 - 150		100 - 150		75 - 150		
	38 - 36						0 - 200	
	36 - 34 27						0 - 150	
	South 34 27 (mainland)							
	South 34 27 (islands)	0 - 150						
2003	North 40 10	100 - [m]250	100 - 250	50 - 200	75 - 200	50 - 200		0 - [m]200
	40 10 - 38	50 - [m]250	60 - 250	60 - 200				
	38 - 34 27	50 - 150	60 - 150					
	South 34 27 (mainland)	100 - 150		100 - 200				0 - 200
	South 34 27 (islands)	0 - 150		0 - 200				
2002	North 40 10	Within DBCA - CLOSED TO TRAWLING;				Special footrope requirments outside DBCA		

[m]The "modified" depth" line is modified to exclude certain petrale sole areas from the RCA.

17. Appendix F: SS2 Data file

#_bootstrap file: 1
#year is from Nov-Oct
#Winter 2008 includes Nov-Dec from 2007
#Last data is from Summer (March-October) 2008
1876 #_styr
2008 #_endyr
2 #_nseas
4 8 #_months/season
1 #_spawn_seas
6 #_Nfleet
3 #_Nsurveys
1 #_N_areas
WinterWA_CPUE%SummerWA_CPUE%WinterOR_CPUE%SummerOR_CPUE%WinterCA_CPUE%SummerCA_CPUE%Triennial%NWFSC%TriLate
0.5 0.5 0.5 0.5 0.5 0.5 0.6 0.5 0.5 #_surveytiming_in_season
1 1 1 1 1 1 1 1 1#_area_assignments_for_each_fishery_and_survey
1 1 1 1 1 1 #_units of catch: 1=bio; 2=num
0.01 0.01 0.01 0.01 0.01 0.01 #_se of log(catch) only used for init_eq_catch and for Fmethod 2 and 3
2 #_Ngenders
40 #_Nages

0 0 0 0 0 0 #_init_equil_catch_for_each_fishery
266 #_N_lines_of_catch_to_read

#WA-Winter	WA-Summer	OR-Winter	OR-Summer	CA-Winter	CA-Summer	Year	Season
0.00	0.00	0.00	0.00	0.00	0.00	1876	1
0.00	0.00	0.00	0.00	0.00	0.00	1877	1
0.00	0.00	0.00	0.00	0.00	0.00	1878	1
0.00	0.00	0.00	0.00	0.00	0.00	1879	1
0.00	0.00	0.00	0.00	0.00	0.00	1880	1
0.00	0.00	0.00	0.00	0.00	0.00	1881	1
0.00	0.00	0.00	0.00	0.00	0.00	1882	1
0.00	0.00	0.00	0.00	0.00	0.00	1883	1
0.00	0.00	0.00	0.00	0.00	0.00	1884	1
0.00	0.00	0.00	0.00	0.00	0.00	1885	1
0.00	0.00	0.00	0.00	0.00	0.00	1886	1
0.00	0.00	0.00	0.00	0.00	0.00	1887	1
0.00	0.00	0.00	0.00	0.00	0.00	1888	1
0.00	0.00	0.00	0.00	0.00	0.00	1889	1
0.00	0.00	0.00	0.00	0.00	0.00	1890	1
0.00	0.00	0.00	0.00	0.00	0.00	1891	1
0.00	0.00	0.00	0.00	0.00	0.00	1892	1

0.00	0.00	0.00	0.00	0.00	0.00	1893	1
0.00	0.00	0.00	0.00	0.00	0.00	1894	1
0.00	0.00	0.00	0.00	0.00	0.00	1895	1
0.00	0.00	0.00	0.00	0.00	0.00	1896	1
0.00	0.00	0.00	0.00	0.00	0.00	1897	1
0.00	0.00	0.00	0.00	0.00	0.00	1898	1
0.00	0.00	0.00	0.00	0.00	0.00	1899	1
0.00	0.00	0.00	0.00	0.00	0.00	1900	1
0.00	0.00	0.00	0.00	0.00	0.00	1901	1
0.00	0.00	0.00	0.00	0.00	0.00	1902	1
0.00	0.00	0.00	0.00	0.00	0.00	1903	1
0.00	0.00	0.00	0.00	0.00	0.00	1904	1
0.00	0.00	0.00	0.00	0.00	0.00	1905	1
0.00	0.00	0.00	0.00	0.00	0.00	1906	1
0.00	0.00	0.00	0.00	0.00	0.00	1907	1
0.00	0.00	0.00	0.00	0.00	0.00	1908	1
0.00	0.00	0.00	0.00	0.00	0.00	1909	1
0.00	0.00	0.00	0.00	0.00	0.00	1910	1
0.00	0.00	0.00	0.00	0.00	0.00	1911	1
0.00	0.00	0.00	0.00	0.00	0.00	1912	1
0.00	0.00	0.00	0.00	0.00	0.00	1913	1
0.00	0.00	0.00	0.00	0.00	0.00	1914	1
0.00	0.00	0.00	0.00	0.00	0.00	1915	1
0.00	0.00	0.00	0.00	0.00	0.00	1916	1
0.00	0.00	0.00	0.00	0.00	0.00	1917	1
0.00	0.00	0.00	0.00	0.00	0.00	1918	1
0.00	0.00	0.00	0.00	0.00	0.00	1919	1
0.00	0.00	0.00	0.00	0.00	0.00	1920	1
0.00	0.00	0.00	0.00	0.00	0.00	1921	1
0.00	0.00	0.00	0.00	0.00	0.00	1922	1
0.00	0.00	0.00	0.00	0.00	0.00	1923	1
0.00	0.00	0.00	0.00	0.00	0.00	1924	1
0.00	0.00	0.00	0.00	0.00	0.00	1925	1
0.00	0.00	0.00	0.00	0.00	0.00	1926	1
0.00	0.00	0.00	0.00	0.00	0.00	1927	1
0.00	0.00	0.00	0.00	0.00	0.00	1928	1
0.00	0.00	0.00	0.00	0.00	0.00	1929	1
0.00	0.00	0.00	0.00	0.00	0.00	1930	1
0.00	0.00	0.00	0.00	63.39	0.00	1931	1
1.99	0.00	0.00	0.00	36.40	0.00	1932	1
5.96	0.00	0.00	0.00	38.57	0.00	1933	1
9.93	0.00	0.00	0.00	139.41	0.00	1934	1
13.90	0.00	0.00	0.00	155.38	0.00	1935	1
15.88	0.00	0.00	0.00	95.49	0.00	1936	1
19.75	0.00	0.00	0.00	74.53	0.00	1937	1
27.49	0.00	0.00	0.00	47.86	0.00	1938	1

35.22	0.00	0.00	0.00	30.84	0.00	1939	1
39.09	0.00	0.00	0.00	162.53	0.00	1940	1
41.40	0.00	0.00	0.00	110.81	0.00	1941	1
46.00	0.00	0.00	0.00	24.37	0.00	1942	1
50.61	0.00	0.00	0.00	71.66	0.00	1943	1
55.21	0.00	0.00	0.00	85.53	0.00	1944	1
59.82	0.00	0.00	0.00	101.75	0.00	1945	1
64.43	0.00	0.00	0.00	71.91	0.00	1946	1
69.03	0.00	0.00	0.00	153.68	0.00	1947	1
73.64	0.00	0.00	0.00	272.66	0.00	1948	1
75.94	0.00	0.00	0.00	615.70	0.00	1949	1
156.21	0.00	0.00	0.00	410.94	0.00	1950	1
117.97	0.00	0.00	0.00	207.05	0.00	1951	1
131.01	0.00	0.00	0.00	318.12	0.00	1952	1
46.07	0.00	0.00	0.00	525.77	0.00	1953	1
26.56	0.00	0.00	0.00	797.19	0.00	1954	1
57.14	0.00	0.00	0.00	520.17	0.00	1955	1
120.46	0.00	19.09	0.00	504.50	0.00	1956	1
106.45	0.00	83.20	0.00	517.79	0.00	1957	1
29.12	0.00	37.86	0.00	557.95	0.00	1958	1
73.98	0.00	389.39	0.00	370.52	0.00	1959	1
123.30	0.00	84.95	0.00	514.39	0.00	1960	1
133.94	0.00	56.76	0.00	540.53	0.00	1961	1
156.57	0.00	93.82	0.00	510.21	0.00	1962	1
118.57	0.00	151.70	0.00	530.82	0.00	1963	1
103.21	0.00	75.67	0.00	372.19	0.00	1964	1
127.72	0.00	82.28	0.00	373.44	0.00	1965	1
91.56	0.00	59.43	0.00	324.71	0.00	1966	1
60.01	0.00	73.88	0.00	521.08	0.00	1967	1
137.39	0.00	41.26	0.00	360.61	0.00	1968	1
52.02	0.00	34.88	0.00	420.97	0.00	1969	1
143.76	0.00	114.24	0.00	472.37	0.00	1970	1
152.49	0.00	133.52	0.00	539.72	0.00	1971	1
186.61	0.00	157.97	0.00	703.21	0.00	1972	1
200.86	0.00	106.25	0.00	417.44	0.00	1973	1
167.91	0.00	161.63	0.00	664.63	0.00	1974	1
189.29	0.00	178.26	0.00	560.51	0.00	1975	1
161.12	0.00	176.45	0.00	712.75	0.00	1976	1
161.77	0.00	152.86	0.00	484.15	0.00	1977	1
246.92	0.00	141.07	0.00	419.09	0.00	1978	1
248.02	0.00	200.94	0.00	352.88	0.00	1979	1
56.44	0.00	67.13	0.00	518.33	0.00	1980	1
262.96	0.00	166.68	0.00	352.88	0.00	1981	1
121.26	0.00	133.20	0.00	261.53	0.00	1982	1
229.54	0.00	491.38	0.00	272.72	0.00	1983	1
241.92	0.00	228.42	0.00	260.56	0.00	1984	1

286.38	0.00	173.60	0.00	273.29	0.00	1985	1
206.97	0.00	264.52	0.00	402.99	0.00	1986	1
422.20	0.00	431.99	0.00	310.94	0.00	1987	1
333.64	0.00	409.10	0.00	349.17	0.00	1988	1
298.05	0.00	396.63	0.00	393.89	0.00	1989	1
383.28	0.00	257.06	0.00	319.63	0.00	1990	1
352.01	0.00	440.45	0.00	447.94	0.00	1991	1
298.02	0.00	339.67	0.00	273.54	0.00	1992	1
271.41	0.00	413.08	0.00	237.99	0.00	1993	1
237.33	0.00	280.06	0.00	246.13	0.00	1994	1
235.31	0.00	354.51	0.00	236.03	0.00	1995	1
264.64	0.00	310.87	0.00	406.09	0.00	1996	1
247.73	0.00	366.99	0.00	451.30	0.00	1997	1
217.87	0.00	303.30	0.00	221.71	0.00	1998	1
134.65	0.00	323.37	0.00	292.03	0.00	1999	1
241.94	0.00	323.49	0.00	408.47	0.00	2000	1
308.96	0.00	358.42	0.00	317.31	0.00	2001	1
346.36	0.00	295.64	0.00	340.01	0.00	2002	1
295.56	0.00	241.76	0.00	260.70	0.00	2003	1
683.93	0.00	322.90	0.00	177.27	0.00	2004	1
555.51	0.00	374.93	0.00	339.46	0.00	2005	1
252.38	0.00	277.56	0.00	125.64	0.00	2006	1
303.55	0.00	557.89	0.00	469.05	0.00	2007	1
286.74	0.00	448.62	0.00	617.62	0.00	2008	1
0.00	0.00	0.00	0.00	0.00	1.00	1876	2
0.00	0.00	0.00	0.00	0.00	1.00	1877	2
0.00	0.00	0.00	0.00	0.00	1.00	1878	2
0.00	0.00	0.00	0.00	0.00	1.00	1879	2
0.00	0.00	0.00	0.00	0.00	11.55	1880	2
0.00	0.00	0.00	0.00	0.00	22.10	1881	2
0.00	0.00	0.00	0.00	0.00	32.65	1882	2
0.00	0.00	0.00	0.00	0.00	43.20	1883	2
0.00	0.00	0.00	0.00	0.00	53.75	1884	2
0.00	0.00	0.00	0.00	0.00	64.30	1885	2
0.00	0.00	0.00	0.00	0.00	74.85	1886	2
0.00	0.00	0.00	0.00	0.00	85.40	1887	2
0.00	0.00	0.00	0.00	0.00	95.95	1888	2
0.00	0.00	0.00	0.00	0.00	106.50	1889	2
0.00	0.00	0.00	0.00	0.00	117.05	1890	2
0.00	0.00	0.00	0.00	0.00	127.60	1891	2
0.00	0.00	0.00	0.00	0.00	138.15	1892	2
0.00	0.00	0.00	0.00	0.00	148.71	1893	2
0.00	0.00	0.00	0.00	0.00	159.26	1894	2
0.00	0.00	0.00	0.00	0.00	169.81	1895	2
0.00	0.00	0.00	0.00	0.00	180.36	1896	2
0.00	0.00	0.00	0.00	0.00	190.91	1897	2

0.00	0.00	0.00	0.00	0.00	201.46	1898	2
0.00	0.00	0.00	0.00	0.00	212.01	1899	2
0.00	0.00	0.00	0.00	0.00	222.56	1900	2
0.00	0.00	0.00	0.00	0.00	233.11	1901	2
0.00	0.00	0.00	0.00	0.00	243.66	1902	2
0.00	0.00	0.00	0.00	0.00	254.21	1903	2
0.00	0.00	0.00	0.00	0.00	264.76	1904	2
0.00	0.00	0.00	0.00	0.00	275.31	1905	2
0.00	0.00	0.00	0.00	0.00	285.86	1906	2
0.00	0.00	0.00	0.00	0.00	296.41	1907	2
0.00	0.00	0.00	0.00	0.00	306.96	1908	2
0.00	0.00	0.00	0.00	0.00	317.51	1909	2
0.00	0.00	0.00	1.00	0.00	328.06	1910	2
0.00	0.00	0.00	1.00	0.00	338.61	1911	2
0.00	0.00	0.00	1.00	0.00	349.16	1912	2
0.00	0.00	0.00	1.00	0.00	359.71	1913	2
0.00	0.00	0.00	1.00	0.00	370.26	1914	2
0.00	0.00	0.00	1.00	0.00	380.81	1915	2
0.00	0.00	0.00	1.00	0.00	386.42	1916	2
0.00	0.00	0.00	1.00	0.00	526.41	1917	2
0.00	0.00	0.00	1.00	0.00	423.85	1918	2
0.00	0.00	0.00	1.00	0.00	333.44	1919	2
0.00	0.00	0.00	1.00	0.00	230.49	1920	2
0.00	0.00	0.00	1.00	0.00	293.76	1921	2
0.00	0.00	0.00	1.00	0.00	424.78	1922	2
0.00	0.00	0.00	1.00	0.00	427.36	1923	2
0.00	0.00	0.00	1.00	0.00	532.86	1924	2
0.00	0.00	0.00	1.00	0.00	528.47	1925	2
0.00	0.00	0.00	1.00	0.00	521.67	1926	2
0.00	0.00	0.00	1.00	0.00	632.04	1927	2
0.00	0.00	0.00	0.00	0.00	620.09	1928	2
0.00	0.00	0.00	3.08	0.00	706.04	1929	2
0.00	0.00	0.00	1.00	0.00	658.83	1930	2
0.00	80.59	0.00	0.98	0.00	530.88	1931	2
0.00	241.77	0.00	6.80	0.00	519.91	1932	2
0.00	402.95	0.00	4.31	0.00	392.08	1933	2
0.00	564.13	0.00	2.90	0.00	896.36	1934	2
0.00	644.72	0.00	5.71	0.00	777.21	1935	2
0.00	752.33	0.00	18.60	0.00	431.51	1936	2
0.00	967.53	0.00	81.39	0.00	741.05	1937	2
0.00	1182.73	0.00	4.10	0.00	890.00	1938	2
0.00	1290.33	0.00	2.50	0.00	1028.96	1939	2
0.00	1280.50	0.00	352.70	0.00	596.69	1940	2
0.00	1260.83	0.00	464.20	0.00	331.32	1941	2
0.00	1241.16	0.00	1868.70	0.00	215.56	1942	2
0.00	1221.48	0.00	1898.56	0.00	344.72	1943	2

0.00	1201.81	0.00	1007.50	0.00	446.58	1944	2
0.00	1182.14	0.00	785.42	0.00	439.34	1945	2
0.00	1162.46	0.00	1488.90	0.00	1115.57	1946	2
0.00	1142.79	0.00	720.46	0.00	1092.65	1947	2
0.00	1123.12	0.00	1326.50	0.00	1544.35	1948	2
0.00	1113.27	0.00	755.79	0.00	1476.28	1949	2
0.00	957.31	0.00	1643.80	0.00	1346.41	1950	2
0.00	774.51	0.00	949.08	0.00	938.14	1951	2
0.00	743.76	0.00	729.70	0.00	857.63	1952	2
0.00	354.35	0.00	502.68	0.00	778.53	1953	2
0.00	418.07	0.00	692.80	0.00	891.57	1954	2
0.00	398.57	0.00	882.91	0.00	925.76	1955	2
0.00	356.24	0.00	500.90	0.00	683.23	1956	2
0.00	361.57	0.00	739.29	0.00	954.42	1957	2
0.00	443.81	0.00	529.90	0.00	729.26	1958	2
0.00	678.12	0.00	364.92	0.00	625.42	1959	2
0.00	587.40	0.00	634.64	0.00	592.71	1960	2
0.00	802.19	0.00	595.02	0.00	927.43	1961	2
0.00	497.80	0.00	549.73	0.00	783.04	1962	2
0.00	535.59	0.00	473.51	0.00	810.08	1963	2
0.00	455.02	0.00	297.23	0.00	912.61	1964	2
0.00	434.58	0.00	468.00	0.00	845.83	1965	2
0.00	414.37	0.00	304.21	0.00	916.97	1966	2
0.00	312.00	0.00	307.81	0.00	858.30	1967	2
0.00	222.56	0.00	318.96	0.00	845.90	1968	2
0.00	161.12	0.00	369.51	0.00	848.19	1969	2
0.00	356.86	0.00	457.86	0.00	1070.97	1970	2
0.00	418.93	0.00	296.50	0.00	1015.59	1971	2
0.00	553.63	0.00	297.19	0.00	1000.27	1972	2
0.00	545.65	0.00	407.14	0.00	741.68	1973	2
0.00	712.88	0.00	428.64	0.00	893.27	1974	2
0.00	703.09	0.00	611.08	0.00	900.92	1975	2
0.00	494.31	0.00	283.54	0.00	736.71	1976	2
0.00	437.19	0.00	294.20	0.00	494.81	1977	2
0.00	578.04	0.00	352.58	0.00	800.66	1978	2
0.00	514.70	0.00	505.39	0.00	944.80	1979	2
0.00	444.24	0.00	347.00	0.00	680.05	1980	2
0.00	417.96	0.00	420.06	0.00	533.63	1981	2
0.00	580.12	0.00	714.50	0.00	502.05	1982	2
0.00	750.63	0.00	340.79	0.00	364.76	1983	2
0.00	595.04	0.00	152.39	0.00	329.98	1984	2
0.00	282.35	0.00	124.38	0.00	471.93	1985	2
0.00	327.23	0.00	123.83	0.00	355.49	1986	2
0.00	439.51	0.00	126.17	0.00	556.37	1987	2
0.00	449.18	0.00	160.73	0.00	411.28	1988	2
0.00	397.97	0.00	184.84	0.00	414.79	1989	2

0.00	300.53	0.00	158.15	0.00	373.52	1990	2
0.00	246.91	0.00	149.91	0.00	310.28	1991	2
0.00	204.76	0.00	159.65	0.00	307.39	1992	2
0.00	213.33	0.00	173.93	0.00	235.66	1993	2
0.00	173.72	0.00	175.63	0.00	303.99	1994	2
0.00	236.41	0.00	201.96	0.00	290.53	1995	2
0.00	247.53	0.00	182.23	0.00	401.93	1996	2
0.00	233.34	0.00	176.33	0.00	461.33	1997	2
0.00	330.41	0.00	242.54	0.00	302.80	1998	2
0.00	308.16	0.00	193.18	0.00	268.39	1999	2
0.00	425.75	0.00	136.28	0.00	241.95	2000	2
0.00	366.51	0.00	225.93	0.00	261.34	2001	2
0.00	514.31	0.00	185.37	0.00	195.69	2002	2
0.00	541.41	0.00	166.43	0.00	180.25	2003	2
0.00	550.18	0.00	188.51	0.00	267.84	2004	2
0.00	763.67	0.00	286.19	0.00	534.42	2005	2
0.00	618.63	0.00	363.47	0.00	464.78	2006	2
0.00	331.03	0.00	173.78	0.00	493.46	2007	2
0.00	179.39	0.00	136.28	0.00	410.51	2008	2

#Abundance indices

37	#nobs					
#Year	Seas	Fleet	Value	SE(log(B))		
1987	1	3	200.5	0.5	#	OR-Winter
1988	1	3	135.8	0.5	#	OR-Winter
1989	1	3	124.7	0.5	#	OR-Winter
1990	1	3	122.9	0.5	#	OR-Winter
1991	1	3	87.9	0.5	#	OR-Winter
1992	1	3	80.1	0.5	#	OR-Winter
1993	1	3	75.6	0.5	#	OR-Winter
1994	1	3	70.5	0.5	#	OR-Winter
1995	1	3	141.6	0.5	#	OR-Winter
1996	1	3	133.6	0.5	#	OR-Winter
1997	1	3	87.7	0.5	#	OR-Winter
1987	2	4	54.3	0.5	#	OR-Summer
1988	2	4	30.6	0.5	#	OR-Summer
1989	2	4	26.5	0.5	#	OR-Summer
1990	2	4	29.8	0.5	#	OR-Summer
1991	2	4	18.3	0.5	#	OR-Summer
1992	2	4	18.5	0.5	#	OR-Summer
1993	2	4	17.8	0.5	#	OR-Summer
1994	2	4	13.9	0.5	#	OR-Summer
1995	2	4	34.5	0.5	#	OR-Summer
1996	2	4	34.2	0.5	#	OR-Summer
1997	2	4	18.5	0.5	#	OR-Summer
#Year	Season	Fleet	Value		seLogB	

```
1980    2       7       1087.625        0.2103654
1983    2       7       1041.779        0.1750205
1986    2       7       1120.639        0.174408
1989    2       7       1806.327        0.1710698
1992    2       7        998.072        0.1682171
1995    2       9       1164.989        0.170984
1998    2       9       1707.132        0.1644474
2001    2       9       1743.905        0.1721106
2004    2       9       4646.915        0.1719107
#Year   Season Fleet   Value    seLogB
2003    2       8       19131.02        0.1332327
2004    2       8       22167.83        0.1478154
2005    2       8       23493.97        0.1252356
2006    2       8       19573.3                 0.1358262
2007    2       8       15892.02        0.1292938
2008    2       8       13532.48        0.1274826

#_Discards
1       #disc_type      #(1=biomass,2=fraction)
41      #nobs_disc
#Year   Seas    Fleet   Biomass         CV
1986    2               4               11.88   0.5 #Pikitch
1987    2               4               12.17   0.5 #Pikitch
2002    1       1       2.962   0.207
2003    1       1       3.121   1.088
2004    1       1       1.860   0.506
2005    1       1       1.600   0.449
2006    1       1       1.753   0.256
2007    1       1       1.768   0.541
2008    1       1       8.143   0.824
2002    2       2       157.418         0.131
2003    2       2       106.134         0.302
2004    2       2       67.541 0.221
2005    2       2       55.660 0.149
2006    2       2       42.433 0.236
2007    2       2       32.551 0.300
#2008   2       2       0.610   0.573
2002    1       3       6.680   0.433
2003    1       3       0.641   0.399
2004    1       3       0.167   0.606
2005    1       3       3.329   0.712
2006    1       3       2.150   0.426
2007    1       3       1.474   0.625
2008    1       3       18.017 0.569
2002    2       4       32.116 0.177
2003    2       4       12.649 0.318
```

2004	2	4	7.639	0.568
2005	2	4	10.335	0.383
2006	2	4	34.425	0.182
2007	2	4	28.060	0.316
#2008	2	4	0.203	0.256
2002	1	5	9.115	0.364
2003	1	5	14.736	0.649
2004	1	5	1.659	1.702
2005	1	5	2.057	0.396
2006	1	5	7.082	0.336
2007	1	5	5.648	0.179
2008	1	5	0.786	0.323
2002	2	6	12.749	0.216
2003	2	6	7.737	0.214
2004	2	6	7.532	0.279
2005	2	6	5.432	0.218
2006	2	6	19.404	0.279
2007	2	6	36.729	0.279
#2008	2	6	4.924	0.238

#_Mean_BodyWt
39 #nobs_mnwt #N_observations
#from Eliza Heery. Observer data.
#converted pounds to kilograms

#YEAR	SEASON	Fleet	Partition	Value	CV
2002	1	1	1	0.251494506	0.37566349
2002	2	2	1	0.440379037	0.450094176
2002	1	3	1	0.20674581	0.484416392
2002	2	4	1	0.340817491	0.536126025
2002	1	5	1	0.190468703	0.900302405
2002	2	6	1	0.409963409	0.658202015
2003	1	1	1	0.258824784	0.560178165
2003	2	2	1	0.388033409	0.527295899
2003	1	3	1	0.190986028	0.453567402
2003	2	4	1	0.280719613	0.382745202
2003	1	5	1	0.175144082	0.408831844
2003	2	6	1	0.17819576	0.40686274
2004	1	1	1	0.276220008	0.351541708
2004	2	2	1	0.336294807	0.500064846
2004	1	3	1	0.262462298	0.455029267
2004	2	4	1	0.326095345	0.377502619
2004	1	5	1	0.183139401	0.47245741
2004	2	6	1	0.308563264	0.393827606
2005	1	1	1	0.309580384	0.386269476
2005	2	2	1	0.304282942	0.608578161
2005	1	3	1	0.281369609	0.471241102

2005	2	4	1	0.378378781	0.391726503
2005	1	5	1	0.251940986	0.437513829
2005	2	6	1	0.270195308	0.664186516
2006	1	1	1	0.268167159	0.479955216
2006	2	2	1	0.37423087	0.74778404
2006	1	3	1	0.26579564	0.272187554
2006	2	4	1	0.442844434	0.408942969
2006	1	5	1	0.318455215	0.642855376
2006	2	6	1	0.283956712	0.668245725
2007	1	1	1	0.236528007	0.349096152
2007	2	2	1	0.380615449	0.281934778
2007	1	3	1	0.284921288	0.497038596
2007	2	4	1	0.451858101	0.317272602
2007	1	5	1	0.364290824	0.608735944
2007	2	6	1	0.218025226	0.465842432
2008	1	1	1	0.306975307	0.438951873
#2008	2	2	1	0.59492934	0.478065859
2008	1	3	1	0.319782621	0.109233767
#2008	2	4	1	0.396380027	0.402940346
2008	1	5	1	0.249521688	0.50384834
#2008	2	6	1	0.300154419	0.44548394

#Population length bins
2 # length bin method: 1=use databins; 2=generate from binwidth,min,max below; 3=read vector
2 # binwidth for population size comp
4 # minimum size in the population (lower edge of first bin and size at age 0.00)
78 # maximum size in the population (lower edge of last bin)

#Length bins
-1 #min_tail
#min_proportion_for_compressing_tails_of_observed_composition
0.0001 #min_comp #constant_added_to_expected_frequencies
0 #_combine males into females at or below this bin number
#_Length_Composition_Data

26 #nlength #N_length_bins

#len_bins(1,nlength) #_lower_edge_of_length_bins

12 14 16 18 20 22 24 26 28 30 32 34 36 38
40 42 44 46 48 50 52 54 56 58 60
62

#LENGTH_COMPOSITIONS:Replicates_(by_state)_must_be_contigent_within_Year-Seas-Fleet-Sex

266 #nobs length nSamp adj Flt1
Flt2 Flt3 Flt4 Flt5 Flt6 max

#lendata(1,nobsl,1,6+gender*nlength)
#Sorted_by_year_fleet_mkt:_0:Survey_1:Discard_2:Fisheries
5 5 6 6 3 2 150

#1 year Season Fleet gender partition nSamps F12 F14 F16
F18 F20 F22 F24 F26 F28 F30 F32 F34 F36 F38
F40 F42 F44 F46 F48 F50 F52 F54 F56 F58 F60
F62 M12 M14 M16 M18 M20 M22 M24 M26 M28 M30
M32 M34 M36 M38 M40 M42 M44 M46 M48 M50 M52
M54 M56 M58 M60 M62 nSamps
1955 1 1 3 2 5 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0.788954635
3.15581854 4.733727811 5.522682446 5.719921105 4.930966469
4.142011834 1.775147929 1.972386588 0.394477318 0 0 0
0 0 0 0 0 0 0 0 0 0
0.394477318 4.142011834 11.04536489 18.93491124 21.69625247
8.08678501 2.169625247 0.394477318 0 0 0 0 0
0 0 # 1
1966 1 1 3 2 5 0 0 0 0 0
0 0 0 0 0 0 0 0 2 9 17
16 13 3 2 2 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 4 4

8 9 4 4 1 1 0 0 0 0 0
0 0 0 # 1
1967 1 1 3 2 20 0 0 0 0 0
0 0 0 0 0.603315608 1.659720647 1.056405039
2.716125686 8.523215583 16.07914297 11.67512749 8.827481926
7.034841809 3.661850656 2.034840061 0.868481872 0.978435022 0
0 0 0 0 0 0 0 0 0 0 0
0.528202519 3.922756902 3.737690664 8.555198716 6.7473819
6.29429247 2.758528723 1.736963745 0 0 0 0 0
0 0 0 0 0 # 4
1968 1 1 3 2 55 0 0 0 0 0
0 0 0 0 0.139874863 1.374020654 4.625996463
7.390789722 7.188150968 9.796847201 10.89363384 9.772587809
5.114066544 5.358086425 2.326464266 1.502352969 0.293894099 0
0 0 0 0 0 0 0 0 0 0 0
0 1.298279801 3.441719077 8.152902058 9.190520983 6.028280785
4.573996101 0.695692159 0.694896166 0.14694705 0 0 0
0 0 0 0 0 # 11
1969 1 1 3 2 45 0 0 0 0 0
0 0 0 0 1.242809566 3.519833902 4.834840005
3.541849007 3.980797849 7.129351522 7.161138122 10.25341679
5.556381776 3.862873609 1.863135782 1.228900909 0.787468202
0.262489401 0 0 0 0 0 0 0 0 0
0 0.211136728 0 0.316978209 1.032539884 6.032029714
11.23353233 12.02925469 7.405826525 4.489453057 1.761473021
0.262489401 0 0 0 0 0 0 0 0 #
9
1970 1 1 3 2 45 0 0 0 0 0
0 0 0 0.189022068 1.638995343 5.989721299 7.076604341
6.687024183 7.358605674 7.605345592 9.007796748 9.865001074
4.541149981 2.932623747 2.870480435 1.171224758 0.277515682
0.204435426 0.192491188 0.027633633 0 0 0 0 0
0 0 0 0 0.503541308 1.128392128 2.54633297
7.268682257 5.133162015 7.308759516 6.535919618 1.452564286
0.329715111 0.15725962 0 0 0 0 0 0 0
0 # 9
1971 1 1 3 2 55 0 0 0 0 0
0 0 0 0.122547256 0.24100606 1.208794751 0.968112692
1.791029151 3.430890772 4.411833439 6.530262469 4.614654226
3.812451471 1.797653871 1.641518149 0.53437872 0.539037855
0.181388588 0.05644096 0 0.11791772 0 0 0 0
0 0 0 0 0.365597542 0.484140628 1.500093026
3.899271581 13.76605595 19.8606588 16.18310268 7.574169985
3.392674209 0.663612183 0.263742585 0.046962687 0 0 0
0 0 0 # 11

1972 1 1 3 2 20 0 0 0 0 0
0 0 0 0 0.002004648 0.374994031 0.5298028
1.286912773 2.623678927 5.736728956 7.305999501 5.718256243
2.129164283 2.614102793 1.997449522 1.945100642 1.486987829
0.582811305 0.389237854 0.304711558 0 0 0 0 0
0 0 0 0 0.036697544 0.042711489 0.868804666
7.335548804 20.7212427 22.31507027 9.589114284 1.919827505
1.588930537 0.554108541 0 0 0 0 0 0 0
0 # 4
1973 1 1 3 2 15 0 0 0 0 0
0 0 0 0 0 0 0.217590411 0.362650685
1.043708169 5.726172681 12.39692959 16.90999236 11.93917886
7.45883465 6.56994052 2.425244787 2.031647119 1.783998888
1.320531814 0.857064741 0.285688247 0 0 0 0 0
0 0 0 0 0 0.575808795 2.315162155 6.385147784
14.1208852 3.238144765 1.221486995 0.669130509 0.145060274 0
0 0 0 0 0 0 0 # 3
1974 1 1 3 2 15 0 0 0 0 0
0 0 0 0 0 0 0 0.086174008 0.172348015
1.603995563 2.715385956 2.815243347 1.986966918 1.170643153
0.798350756 0.660141507 0.215435019 0.365074879 0.163399777
0.163399777 0 0 0 0 0 0 0 0 0
0 0 0.412973561 2.382719123 12.43598489 29.48094262
30.20560558 9.735871462 1.458568796 0.809781367 0.160993938 0
0 0 0 0 0 0 # 3
1975 1 1 3 2 50 0 0 0 0 0
0 0 0 0 0 0 0.069153154 0.376919962
0.8806053 3.377939261 7.425191699 11.93897318 8.42612738
3.311031054 1.624384515 1.101757973 0.729075937 0.492346148
0.15774783 0.131467618 0.012692227 0 0 0 0 0
0 0.009471368 0 0 0 0.083734234 1.019391254
4.276982316 19.9515676 19.47865029 11.0303474 3.183439864
0.534458713 0.219299636 0.131859641 0.025384453 0 0 0
0 0 # 10
1976 1 1 3 2 5 0 0 0 0 0
0 0 0 0 0 0 0 0 0.527704485
0.791556728 2.374670185 5.540897098 8.443271768 3.693931398
2.638522427 1.319261214 0.791556728 1.055408971 0.263852243
0.263852243 0 0 0 0 0 0 0 0 0
0 0 0 2.638522427 19.52506596 31.13456464 11.34564644
6.068601583 0.527704485 1.055408971 0 0 0 0 0
0 0 0 # 1
1977 1 1 3 2 10 0 0 0 0 0
0 0 0 0 0 0 1.055833299 4.332597367
2.111666598 4.150877445 4.952535071 4.078421695 4.679374641
1.948350886 0.928745463 0.910341252 0.163896258 0.382424602

0.109264172 0.054632086 0.109264172 0 0 0 0 0
0 0 0 0 0 0 2.275562856 7.045216911
7.099848997 29.05381993 15.58274326 6.334999793 2.111666598
0.527916649 0 0 0 0 0 0 0 # 2
1978 1 1 3 2 15 0 0 0 0 0
0 0 0 0 0 0 0 0 1.460075309
5.024286445 10.64251189 11.31747851 13.36265267 9.93973396
7.591688358 4.876829037 2.956338175 2.321205494 0.323245719
0.519464902 0.254053072 0 0 0 0 0 0 0
0 0 0.081115295 0.16223059 1.353247688 4.588223481
6.940898968 8.661825118 3.673713933 2.540530724 0.762159217
0.646491439 0 0 0 0 0 0 0 # 3
1979 1 1 3 2 10 0 0 0 0 0
0 0 0 0 0 0 0 0 0.396913175
1.984565873 2.381479048 2.507209959 4.094862657 2.110296784
4.346324479 2.236027695 0.396913175 0.396913175 0 1.045288172
0.522644086 0 0 0 0 0 0 0 0 0
0 0.522644086 2.778392222 14.4417339 15.36129116 15.61275299
16.26112798 9.195572604 2.884402692 0 0 0.522644086 0
0 0 0 0 # 2
1980 1 1 3 2 25 0 0 0 0 0
0 0 0 0.082083021 0.328332086 1.209155988 2.430241778
2.452395847 3.027886275 7.986720986 9.472428912 10.49393505
4.997157317 4.600267564 6.321968841 6.411588386 2.940073826
2.427476773 1.104761431 0.32521901 0.296203491 0 0 0
0 0 0 0 0.134910083 0 0.57458115 1.484661012
1.94441925 5.014743594 11.66169629 8.833572984 0.692792392
1.829987595 0.164166043 0.322586816 0.433986209 0 0 0
0 0 0 # 5
1981 1 1 3 2 40 0 0 0 0 0
0 0 0 0.131724407 0.710876129 1.240516534 1.572665935
1.301879731 4.378584227 4.632448815 4.612388395 7.978542957
13.1018405 13.10140997 4.795673228 4.356238115 5.500501732
3.281506108 1.11250796 0.365289345 0.542637508 0 0 0
0 0 0 0 0 0.030154442 0.64555267 1.001191822
2.269370245 3.568946957 6.380555564 4.559058374 2.732693859
2.919657427 1.013385473 1.264300204 0 0 0.320480814
0.346452329 0.23096822 0 0 # 8
1982 1 1 3 2 20 0 0 0 0 0
0 0 0 0 0 0.182224518 2.823876022 2.004469698
6.314649608 8.741944812 8.279198144 7.115830887 5.339471257
2.597979944 4.139599072 4.337812997 2.928138042 1.849197775
2.267677554 0.106574144 0.516277306 0 0 0 0 0
0 0 0 0 0.091112259 1.52259846 5.270383509
5.299839843 9.774911236 7.011300187 4.382300083 4.379633311

1.47085068 1.252148651 0 0 0 0 0 0 0
4
1983 1 1 3 2 5 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
0.900900901 0 3.603603604 1.801801802 5.405405405 9.90990991
7.207207207 16.21621622 3.603603604 4.504504505 0 0 0
0 0 0 0 0 0 0 0 0 1.801801802
1.801801802 5.405405405 9.90990991 9.009009009 9.90990991
4.504504505 3.603603604 0.900900901 0 0 0 0 0
0 # 1
1984 1 1 3 2 5 0 0 0 0 0
0 0 0 0 0 0 1.990049751 3.482587065
10.44776119 11.44278607 11.44278607 9.452736318 2.985074627
2.985074627 0 0.497512438 0 0.497512438 0 0 0
0 0 0 0 0 0 0 0 0 2.487562189
5.970149254 14.92537313 12.93532338 8.457711443 0 0 0
0 0 0 0 0 0 0 0 0 # 1
1986 1 1 3 2 10 0 0 0 0 0
0 0 0 0 0.157375069 0 0 1.10162548
2.984320551 5.811266033 9.846688958 9.7903601 6.598141376
6.648664481 0.629500274 3.66434393 0.837398448 0 0.837398448
0 0 0 0 0 0 0 0 0 0 0
0.157375069 0.157375069 5.496515896 15.49477417 16.17479755
11.5156801 1.624273791 0.314750137 0.157375069 0 0 0
0 0 0 0 0 # 2
1987 1 1 3 2 30 0 0 0 0 0
0 0 0 0 0 0 0 0.066982633 0.863221106
1.665605257 3.760725207 10.56176093 7.899100974 5.111869917
4.390284919 1.193528535 0.358536422 0.948739965 0.013204635
0.026409271 0 0 0 0 0 0 0 0 0
0 0.347303713 1.456197487 7.648247069 15.50234597 20.9785011
8.918953816 7.068158698 1.207117749 0.013204635 0 0 0
0 0 0 0 0 # 6
1988 1 1 3 2 20 0 0 0 0 0
0 0 0 0 0 0 0 0 10.40760658
4.730554775 9.480453661 5.975954784 4.320468846 6.317875061
2.801186627 0.279592567 0.139796284 0 0 0.070251107
0.070251107 0 0 0 0 0 0 0 0
1.22817369 0 10.32654544 11.26431653 11.97622577 11.39990956
3.436333226 0.861809626 4.912694759 0 0 0 0 0
0 0 0 0 # 4
1989 1 1 3 2 25 0 0 0 0 0
0 0 0 1.959590187 3.84192231 11.75754112 5.40353795
5.410034796 5.011386497 4.19226387 3.885199441 5.416332865
1.570080311 3.511244454 3.940198842 0.560296984 0.322025947
0.161012973 0 0 0 0 0 0 0 0 0

0 0.941166062 2.823498185 7.91255999 6.747426047 6.947730921
4.916326562 8.629647899 0.819099976 2.734935096 0.584940716 0
0 0 0 0 0 0 0 0 # 5
1990 1 1 3 2 10 0 0 0 0 0
0 0 0 0 0 0 0 2.668389274 2.77598869
2.668389274 7.203571233 5.815576888 10.9371566 5.815576888
3.841184787 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 7.78996899 10.56595768
8.005167822 6.245974553 6.138375136 11.15235544 1.974392101
1.280394929 3.841184787 1.280394929 0 0 0 0 0
0 # 2
1991 1 1 3 2 10 0 0 0 0 0
0 0 0 0 0 0 0 1.845971966 15.14176422
6.072794722 13.29579226 18.137939 18.137939 4.226822756 0
4.226822756 4.226822756 0 0 0 0 0 0 0
0 0 0 0 0 0 0 2.461295954 4.922591909
5.457470733 1.230647977 0.615323989 0 0 0 0 0
0 0 0 0 0 0 # 2
1992 1 1 3 2 5 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
3.448275862 6.896551724 6.896551724 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 3.448275862 6.896551724 20.68965517 34.48275862 13.79310345
3.448275862 0 0 0 0 0 0 0 0 0
0 # 1
1993 1 1 3 2 20 0 0 0 0 0
0 0 0 0 0 0 0 3.471090509 6.135407643
9.964258455 8.687974851 10.90700516 5.471719027 4.078904163
1.276283604 0 0 0 0 1.067075304 0 0 0
0 0 0 0 0 0 0 0.668469951 1.699112358
4.90033827 17.93745106 15.35286311 8.382046538 0 0 0
0 0 0 0 0 0 0 0 # 4
1994 1 1 3 2 20 0 0 0 0 0
0 0 0 0 0.205313454 0.410626908 0.615940362
0.615940362 5.893241248 10.47269416 5.623668175 4.948750786
2.649713942 4.45328434 1.803570397 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1.803570397
2.214197306 7.137487373 18.54645748 13.47153812 14.00540167
3.325033124 1.803570397 0 0 0 0 0 0 0
0 0 0 # 4
1995 1 1 3 2 15 0 0 0 0 0
0 0 0 0 0 0.273840582 0 1.482536515
12.39091168 6.743137004 6.23607731 3.778063974 0.273840582
0.273840582 0 1.168074464 0 0 0 0 0 0
0 0 0 0 0 0 0 1.756377097 14.0038434

13.64875988 15.16993897 16.79789976 6.002858198 0 0 0
0 0 0 0 0 0 0 0 0 # 3
1996 1 1 3 2 10 0 0 0 0 0
0 0 0 0 0 0 0.09386624 0.187732479
6.13853384 12.37093392 0.281598719 15.29940148 3.0223338
0.09386624 0 0 0.09386624 0 0 0 0 0
0 0 0 0 0 0 0 0 0.09386624
12.37093392 24.55413536 10.0056638 6.13853384 6.23240008
3.0223338 0 0 0 0 0 0 0 0 0
0 # 2
1997 1 1 3 2 5 0 0 0 0 0
0 0 0 2.564102564 2.564102564 12.82051282 10.25641026
7.692307692 15.38461538 12.82051282 5.128205128 2.564102564 0
0 5.128205128 0 0 0 0 0 0 0 0
0 0 0 0 0 0 2.564102564 10.25641026
5.128205128 2.564102564 2.564102564 0 0 0 0 0
0 0 0 0 0 0 0 0 # 1
1998 1 1 3 2 10 0 0 0 0 0
0 0 0 0 0 0 0 0 3.233728502
13.97871468 5.914858722 13.4465817 6.999589988 3.233728502
1.616864251 1.616864251 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1.596398955 1.596398955
11.25665387 20.97830467 11.29758446 3.233728502 0 0 0
0 0 0 0 0 0 0 0 # 2
1999 1 1 3 2 15 0 0 0 0 0
0 0 0 0 0 1.065363385 1.704581416 0
3.178309616 8.913491356 6.741051852 10.7121589 6.968028774
3.164405371 4.596420837 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0.440049599
2.441445516 10.51655041 13.62146251 13.39448558 10.95304007
1.589154808 0 0 0 0 0 0 0 0 0
0 # 3
2000 1 1 3 2 50 0 0 0 0 0
0 0 0 0 0.128056945 0.615079911 2.555489996
5.344043932 7.449829832 7.621144705 6.001442798 3.846409167
2.768171864 2.86174169 1.836884301 0.720106885 0 0 0
0 0 0 0 0 0 0 0 0 0.016768415
0.204212194 0.680226595 5.13414751 13.77125627 18.57488236
15.46221075 3.718529114 0.689364764 0 0 0 0 0
0 0 0 0 0 # 10
2001 1 1 3 2 60 0 0 0 0 0
0 0 0 0 0.059819459 0.598194588 0.358916753
1.926833304 5.816791336 8.732551214 5.214341569 4.672148202
1.201586722 2.441911307 0.157338044 0.16908136 0 0
0.052651594 0 0 0 0 0 0 0 0 0
0 0.059819459 1.689963125 4.501575366 11.60069825 18.08545428

25.12075374 6.261694193 1.277876136 0 0 0 0 0
0 0 0 0 0 # 12
2002 1 1 3 2 35 0 0 0 0 0
0 0 0 0 0.131795615 1.638028632 0.746408143
2.271275903 3.361131526 8.840515956 4.722911875 2.842205371
0.382266685 1.006299577 0.065897808 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
0.825631516 8.305073904 16.21990791 23.17367356 16.97937434
7.530442146 0.957159535 0 0 0 0 0 0 0
0 0 0 # 7
2003 1 1 3 2 60 0 0 0 0 0
0 0 0 0 0.320398756 0.498650132 2.66936547
4.259673673 6.088713192 2.424827038 7.638625662 3.90266465
3.684651651 0.223794203 0.41257799 0.20088183 0.001207649 0
0 0.514476902 0 0 0 0 0 0 0 0
0 0 0.359711375 2.445658606 8.483917074 24.49111473
18.52912683 9.217415568 2.782173696 0.850373313 0 0 0
0 0 0 0 0 0 # 12
2004 1 1 3 2 65 0 0 0 0 0
0 0 0 0.002460485 0.024604855 0.041828253 0.029525826
0.961754891 1.793078166 5.65774221 3.18952599 2.076281129
1.063327837 1.808302507 1.087663204 0.594034867 0.040576136 0
0 0 0 0 0 0 0 0 0 0 0
0 0.019683884 0.245706811 5.430619143 21.92074263 41.0625761
10.26686738 2.683097698 0 0 0 0 0 0 0
0 0 0 # 13
2005 1 1 3 2 80 0 0 0 0 0
0 0 0 0.010440954 0.013921272 0.617340895 1.167279907
0.907649829 5.294334162 17.54554413 20.08925831 7.180553
4.431525885 2.146211328 1.468873478 0.930706456 0.014538828
0.064194936 0 0 0 0 0 0 0 0 0
0 0 0.003480318 0.070652502 0.219100559 3.812521989
9.669380964 15.27493033 7.258014091 1.084550121 0.724995752 0
0 0 0 0 0 0 0 0 # 16
2006 1 1 3 2 40 0 0 0 0 0
0 0 0 0.002968577 0.041494504 0.097810519 0.179954182
4.315894156 3.650452971 6.178680141 11.81280112 7.480683885
8.464606284 4.480285848 0.29750023 0.092234057 0.092234057 0
0 0 0 0 0 0 0 0 0 0 0
0.005937154 0.538168451 2.609429519 7.621273861 23.92101448
9.096868013 5.854181367 0.407629341 1.416732514 0.276702172
1.064462594 0 0 0 0 0 0 0 # 8
2007 1 1 3 2 40 0 0 0 0 0
0 0 0 0.043135976 1.016659516 4.037501325 5.427438094
4.94225551 4.522795334 6.974871268 5.521333182 4.135327082
3.608258786 1.099401032 0.527378719 1.209794785 0.019401441 0

0 0 0 0 0 0 0 0 0 0 0
0.155142935 1.770362676 8.065977106 7.918590736 14.80398817
13.43050423 7.1583298 2.524011348 1.087540953 0 0 0
0 0 0 0 0 0 # 8
2008 1 1 3 2 40 0 0 0 0 0
0 0 0 0 0.108727624 1.7397346 1.306457697
3.575911542 7.859854231 9.324967523 5.593791407 3.105641126
0.99416276 0.896569537 0.514125685 0.138196912 0.49463367 0
0.15392619 0 0 0 0 0 0 0 0 0
0.15392619 0 0.262653814 3.177553077 11.60882936 18.01578754
18.88683618 10.09656688 1.438543088 0.552603362 0 0 0
0 0 0 0 0 0 # 8
1956 2 2 3 2 10 0 0 0 0 0
0 0 0 0 0 0 0.994527973 1.525105416
3.111082348 6.709136822 7.112215835 9.008305745 9.36202404
3.735844765 3.092157389 1.796149537 0.795866166 0.234852964
0.088429574 0 0 0 0 0 0 0 0 0
0 0 0.088429574 2.589138003 10.83201334 14.0039672
11.17422084 8.365058192 2.105043577 1.989055945 0.933656457
0.353718296 0 0 0 0 0 0 0 # 2
1957 2 2 3 2 20 0 0 0 0 0
0 0 0 0 0.031995265 0.472552588 2.644498577
4.001359055 4.240886842 2.482400153 7.685227122 8.751294019
9.892990613 6.733194115 5.593697981 4.871582909 5.07278359
1.960968133 0.581340206 0.313730901 0.280580998 0 0 0
0 0 0 0 0 0 0.280580998 1.227995451
4.699135211 4.98317885 4.349325428 4.293239479 5.604360397
4.747336434 3.15724828 1.013366502 0.033149903 0 0 0
0 0 0 # 4
1958 2 2 3 2 15 0 0 0 0 0
0 0 0 0 0.229910921 0.487180591 1.877775163
3.408261019 5.2901625 6.981680824 6.025518782 5.732881345
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0.695828518 0.169219473 0.039428454 0 0 0 0 0
0 0 0 0 0 0.13323148 0.635701118 4.87036684
11.36730125 13.26696908 12.00310168 6.114475954 4.953228256
2.498751282 0.617878585 0.187606052 0.093803026 0 0 0
0 0 # 3
1960 2 2 3 2 5 0 0 0 0 0
0 0 0 0 0.395256917 1.581027668 2.371541502
1.976284585 1.581027668 0.790513834 0.790513834 0.395256917
0.790513834 0.790513834 0.790513834 0.395256917 0 0 0
0 0 0 0 0 0 0 0 0 0
0.790513834 2.371541502 5.928853755 9.090909091 8.300395257
11.06719368 8.300395257 20.55335968 13.83399209 5.928853755
1.185770751 0 0 0 0 0 0 0 # 1

1961 2 2 3 2 5 0 0 0 0 0
0 0 0 0 2 2 6 9 6 10 7
6 1 2 1 0 0 1 0 0 0 0
0 0 0 0 0 0 0 2 2 10 10
10 7 5 0 0 1 0 0 0 0 0
0 0 0 # 1
1964 2 2 3 2 5 0 0 0 0 0
0 0 0 0 0 0.5 1 2.5 6 8.5 6.5
7 3 3 2.5 1.5 0.5 0.5 0 0 0 0
0 0 0 0 0 0 0 0 0 1 3.5
11 19 11.5 7 1.5 1.5 0.5 0.5 0 0 0
0 0 0 # 1
1965 2 2 3 2 5 0 0 0 0 0
0 0 0 0 2 2 1 1 3 4 11
7 10 5 2 0 2 0 2 0 0 0
0 0 0 0 0 0 0 0 3 4 3
7 10 12 7 1 0 0 1 0 0 0
0 0 0 # 1
1966 2 2 3 2 140 0 0 0 0 0
0 0 0 0.02273712 1.260276045 3.051699557 5.386168954
6.962240624 6.91955468 6.9089734 6.924012278 5.843679323
3.238656885 0.886236893 0.668700956 0.160275719 0.1087053
0.024439502 0.026613494 0.004368787 0 0 0 0 0
0 0 0 0 0.018992189 1.773483859 6.56756668
9.399733228 12.38516126 11.96230526 5.862380052 2.320543818
0.872836777 0.347537494 0.079013508 0.013106361 0 0 0
0 0 0 # 28
1967 2 2 3 2 150 0 0 0 0 0
0 0 0 0.039060182 0.434849586 0.976512643 6.946292335
8.493590824 8.482402753 9.015043671 8.141705657 7.075030165
2.903868454 1.004519554 0.670878584 0.388630812 0 0.089220001
0.062886235 0 0 0 0 0 0 0 0 0
0 0.032565374 0.690870609 3.142275662 4.960159935 7.480713148
9.92708051 11.59883603 4.897350448 1.891630833 0.515508153
0.138517847 0 0 0 0 0 0 0 # 31
1968 2 2 3 2 150 0 0 0 0 0
0 0 0 0.023966388 0.37370297 0.69954837 2.208112507
2.898547878 4.895348087 6.651939849 8.007384166 7.18698363
1.666481565 1.702999717 0.679352885 0.390437149 0.168274706
0.092376016 0.016563016 0.004245182 0 0 0 0 0
0 0 0 0.018554319 0.042618998 0.246699365 3.155731964
7.781662485 14.15120644 17.91778742 11.29628683 5.577779218
1.704312777 0.291647655 0.149448445 0 0 0 0 0
0 0 # 38
1969 2 2 3 2 150 0 0 0 0 0
0 0 0 0.067155371 0.991158449 1.889598779 3.644275579

4.455144756 4.298912575 5.123055503 7.035704204 7.386801676
5.336501942 1.719044941 0.647151034 0.272845876 0.135201268
0.00171814 0.000286357 0.009368046 0.000286357 0 0 0
0 0 0 0.017097858 0 0.049465687 0.585031446
1.416864788 2.781909226 9.679966367 12.94777698 16.19752154
8.119914104 3.793588715 1.031658915 0.196344682 0.168362481 0
0 0.000286357 0 0 0 # 37
1970 2 2 3 2 150 0 0 0 0 0
0 0 0 0.06646708 1.00261671 2.191983863 2.970572529
5.428904592 7.833573917 7.162714542 8.190998483 7.145314957
3.063272104 1.614731806 0.775069684 0.380148247 0.18083158
0.045275255 0.040670708 0.004195009 0 0 0 0 0
0 0 0 0.015558756 0.11224874 1.967330439 6.484894053
7.466978572 10.13401746 12.69140091 8.008268798 3.677680655
0.995498888 0.225658912 0.085630356 0.037492398 0 0 0
0 0 0 # 40
1971 2 2 3 2 50 0 0 0 0 0
0 0 0 0.008684359 0.094660588 0.968765238 2.825528966
4.302969743 2.698010372 5.745807237 8.00337709 7.622090355
4.233746027 3.117957048 0.858606774 0.684365735 0.277485046
0.151419171 0.098918348 0.017832964 0.024086372 0 0 0
0 0 0 0 0 0.00973469 0.179365551 3.300829827
9.397737598 13.06130715 8.276767058 12.91544975 6.223460849
3.680769582 0.649992861 0.57027365 0 0 0 0 0
0 0 # 10
1972 2 2 3 2 120 0 0 0 0 0
0 0 0.005938297 0.040319235 1.048254345 2.279588693
4.587632753 4.629371557 6.981102898 6.470565876 7.246209177
3.229623222 2.664872656 1.153163463 0.36622546 0.147861892
0.158013671 0.065952218 0.043307278 0.002138016 0.013688881 0
0 0 0 0 0.005938297 0 0 0.155219916
1.558197469 5.195719305 10.84683648 16.13970679 14.533987
6.8553893 2.274267431 0.804718994 0.412313457 0.039727781
0.025596934 0 0.018551256 0 0 0 0 # 24
1973 2 2 3 2 70 0 0 0 0 0
0 0 0 0.079822945 1.053254793 3.859312512 5.92379308
6.823692039 6.607892095 7.037862347 6.758457793 3.963265639
0.928513164 0.475741379 0.263734256 0.259491198 0.112950318
0.018233569 0.00149906 0 0.015702908 0 0 0 0
0 0 0 0 0.019732629 1.041741118 3.372681729
7.950065278 14.6949978 15.12421278 8.101066867 3.925544663
1.441823225 0.097588982 0.047325836 0 0 0 0 0
0 0 # 14
1974 2 2 3 2 150 0 0 0 0 0
0 0 0 0.001840986 0.229588835 1.186269309 1.99524446
2.38522673 3.9261905 6.325345059 8.065925193 6.500235518

4.453350856 1.463481343 0.297197496 0.431745015 0.150439668
0.044853376 0.032572573 0.004223025 0.001012711 0 0 0
0 0 0 0 0 0.044048711 0.864519699 4.0201848
5.874912411 12.73259342 17.7832686 12.72073235 5.647494251
1.995396659 0.633815622 0.126914326 0.027832661 0.025460242
0.008083596 0 0 0 0 # 35
1975 2 2 3 2 100 0 0 0 0 0
0 0 0 0 0.343835344 0.80727587 2.618461764
3.970014796 5.08990679 5.903859433 7.922238338 7.45151603
5.885839455 2.205421741 1.227750663 0.475410259 0.099195239
0.119938688 0.03734999 0.021526248 0.008348239 0 0 0
0 0 0 0 0 0.085874498 0.574261278 1.896496074
6.395518408 9.933017677 13.72728776 11.64289014 7.554898664
2.394972038 1.070758736 0.361218249 0.125450203 0.032770916
0.016696478 0 0 0 0 # 20
1976 2 2 3 2 30 0 0 0 0 0
0 0 0 0 0.008657572 0.123656798 1.031323311
1.907123651 3.339174449 7.316761817 9.492395642 13.0296458
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0 0 0 0 0 0 0.093406788 0.915635577
2.476133637 5.745247809 10.67892595 10.94553933 8.537782263
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0.017255682 0 0 0 # 6
1977 2 2 3 2 50 0 0 0 0 0
0 0 0 0.336984757 1.005939661 2.394171699 6.746511997
8.792020139 7.729616562 10.49731383 7.472749843 5.585104074
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0 0 0 0 0.394569883 0.492012318 2.240278983
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2.545231443 1.161458075 0.574577525 0.149146327 0.101319379 0
0 0 0 0 # 10
1978 2 2 3 2 45 0 0 0 0 0
0 0 0.016341977 0 0.849923992 3.04434092 3.476076112
2.671158251 3.294521482 6.640531673 5.393277086 4.374460473
5.804937205 5.150744061 0.968065837 0.890612314 0.344154081
0.236468104 0.119694816 0.016341977 0 0 0 0 0
0 0 0 0 0.054185745 0.294460667 1.797996107
2.80362161 7.718706503 10.44828291 10.52936535 10.66302034
7.204568817 3.506847298 0.974395701 0.294155586 0.386059059
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1979 2 2 3 2 85 0 0 0 0 0
0 0 0 0.131292897 0.78927728 3.29888798 6.266682927
6.700435214 6.803357448 6.299278229 5.338608305 7.210705446
5.186265649 2.359159948 2.5936397 2.497953575 1.74944546

1.154793849 0.732848242 0.293464849 0.185050783 0 0 0
0 0 0 0 0 0.01957547 0.577167829 2.048279018
2.972546359 4.876516591 5.044330131 6.988073605 7.439729094
6.804494351 2.23807871 1.120048849 0.145434097 0 0.134578115
0 0 0 0 # 17
1980 2 2 3 2 140 0 0 0 0 0
0 0 0 0.026277032 0.657650093 1.653900749 4.277206091
5.860434873 6.859714287 7.318212726 8.18539112 6.590278087
4.695852012 3.594648126 3.710780886 1.764275262 2.100719552
0.369574288 0.094356933 0.034560252 0.009384715 0 0 0
0 0 0 0 0 0.086524681 0.59308856 3.10815434
4.592860084 7.699137638 9.15814118 6.777452196 4.83387865
3.326912356 1.66178547 0.233817817 0.066613223 0.032569111
0.025847607 0 0 0 0 # 28
1981 2 2 3 2 40 0 0 0 0 0
0 0 0 1.933476628 3.685654928 4.339135575 8.448635435
8.475015665 11.41841982 6.406796357 5.27393 6.24534164
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0.858465762 0.026177623 0 0.016259058 0 0 0 0
0 0 0 0.322246105 0.338505162 3.504554788 5.935176316
7.13022314 6.252400471 4.530386694 1.191788748 0.874931529
1.386862462 0.166565573 0.052355247 0 0 0 0 0
0 0 # 8
1982 2 2 3 2 5 0 0 0 0 0
0 0 0 0 5.940594059 18.81188119 4.95049505
5.940594059 11.88118812 6.930693069 2.97029703 3.96039604
0.99009901 2.97029703 0 2.97029703 0.99009901 0
1.98019802 0 0 0 0 0 0 0 0 0
0 0 10.89108911 9.900990099 4.95049505 0.99009901 0
0.99009901 0 0.99009901 0 0 0 0 0 0
0 0 0 # 1
1985 2 2 3 2 15 0 0 0 0 0
0 0 0 0 5.07420337 5.514872531 8.957654604
8.187111572 5.925970448 9.117134024 5.709152378 1.181640947
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0 0 0 0 0 0 0 0 8.360931363
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1.162528064 0.251618496 0.465011226 0 0 0 0 0
0 0 0 # 3
1986 2 2 3 2 25 0 0 0 0 0
0 0 0 0.92927948 2.287802496 5.346615293 6.840989463
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5.3073714 0.246595245 0.862456496 0.621088225 0.068962363
0.586607043 0.327784703 0.25882234 0.034481182 0 0 0
0 0 0 0 0.261541608 0 7.106223124 15.67941177
12.75873883 6.425344003 2.989646047 0.614088103 0.951592196

0.293303521	0.103443545	0.034481182	0.034481182	0	0	0
0	0	0	#	5
1987	2	2	3	2	45	0	0	0	0	0
0	0	0.502349711	0.212954328	1.375637729	5.46629224
8.07070387	6.443470628	6.971759411	7.657972109	5.20346988
1.292104988	0.159957914	0.783162277	0.565900331	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0.750845323	6.361121207	11.84520144	17.68728443	13.51445019
3.135091162	1.218731563	0.215638939	0.565900331	0	0	0
0	0	0	0	0	0	#	9
1988	2	2	3	2	25	0	0	0	0	0
0	0	0	4.198165956	6.163559039	6.693262011	13.58953017
9.629155611	8.804924536	4.711525917	4.227311286	1.365999426
0.83540785	0	0.530591576	0	0	0	0	0	0
0	0	0	0	0	0	0	0	3.455690944
3.871609555	10.07441239	12.08112598	2.75645407	5.957696684
1.053577006	0	0	0	0	0	0	0	0	0
0	0	#	5
1989	2	2	3	2	35	0	0	0	0	0
0	0	0	0.547730997	3.232771643	9.984290017	12.38454824
9.835134106	10.05512791	5.277374025	4.086373743	3.302156851
0.9716407	0.26573464	0.257971462	0.26573464	0	0	0
0	0	0	0	0	0	0	0	0	0
0.032523435	6.343883832	10.31531416	15.3894996	4.29417755
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0	0	0	0	#	7
1990	2	2	3	2	30	0	0	0	0	0
0	0	0	0.576146522	2.426856771	9.027596612	12.34371709
16.56325552	7.924167793	4.880099799	1.586219616	0.474212944
0.379708723	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0.745460438	1.965958257
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0	0	0	0	0	0	0	0	0	0	#
6
1991	2	2	3	2	25	0	0	0	0	0
0	0	0.482896363	0.482896363	2.676268959	3.871347438
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1.823022842	3.786133971	0.342808076	0.482896363	0.482896363	0
0	0	0	0	0	0	0	0	0	0	0
0	1.053055107	5.24198331	9.797060558	19.47812697	10.37992753
3.194045222	2.337025031	0	0	0	0	0	0	0
0	0	0	0	#	5
1992	2	2	3	2	25	0	0	0	0	0
0	0	0.878985951	2.086600103	9.15656268	10.55264439
9.058027037	10.70276333	3.971452771	6.611354675	3.490477219
4.93816028	0.992468057	0.992468057	0.992468057	0.496234028	0

0 0 0 0 0 0 0 0 0 0 0
0 2.636957852 6.147170682 7.471953803 9.007590178 3.914248166
2.844976725 1.864870555 0.695331375 0.496234028 0 0 0
0 0 0 0 0 0 # 5
1993 2 2 3 2 30 0 0 0 0 0
0 0 0 1.964336853 5.590106986 13.40558427 10.59675155
13.53994234 9.552573482 4.181893356 4.989003406 2.302307346
2.352126014 1.10197063 0.630276466 0.471694165 0 0
0.315138233 0 0 0 0 0 0 0 0 0
0 2.952015625 5.348443891 7.712600621 7.462372907 3.198559853
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0 0 0 0 # 6
1994 2 2 3 2 35 0 0 0 0 0
0 0 0 0.214294284 9.840659768 6.762627454 10.17669988
11.81443518 3.556762855 1.559494892 1.99095349 0.743547794
0.023228873 0.013068625 0 0.024072312 0 0 0 0
0 0 0 0 0 0 0 0 0 2.572956009
23.43917745 12.2222198 4.966529361 8.875106301 0.450160362
0.754005311 0 0 0 0 0 0 0 0 0
0 0 # 7
1995 2 2 3 2 10 0 0 0 0 0
0 0 0 0 3.398670351 4.967365181 7.451047771
9.281023292 9.019742602 5.882352941 7.189767081 8.104754841
4.706084491 0.91498776 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 3.659951041
5.882352941 19.08460796 5.489926561 1.82997552 3.137389661 0
0 0 0 0 0 0 0 0 0 0 #
2
1996 2 2 3 2 15 0 0 0 0 0
0 0 0 0 5.195458626 11.11331042 13.88304481
10.6124191 13.21150277 4.699439905 3.89483485 3.090229795
0.850583592 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 9.185364023
6.53678358 4.919587404 3.044251258 5.28389746 4.479292405 0
0 0 0 0 0 0 0 0 0 0 #
3
1997 2 2 3 2 15 0 0 0 0 0
0 0 0 0 1.159684542 6.211386303 11.49759817
11.34554676 10.84849824 9.716842007 5.714337786 4.002504221
3.146922498 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0.386561514 0.386561514
6.487460814 18.19154078 10.13143183 0.773123028 0 0 0
0 0 0 0 0 0 0 0 0 0 #
3
1998 2 2 3 2 80 0 0 0 0 0
0 0 0.137906343 1.375959679 1.432931908 7.210198279

9.498705216 7.20362947 8.977530782 8.39378272 3.01356145
2.510308692 1.249178412 0.633634863 0.524522762 0.060022384
0.089767245 0 0 0 0 0 0 0 0 0
0 0 0 0.817747043 3.318198031 8.089394554 15.4238004
10.76626196 5.545952113 2.639252268 0.550688434 0.330234177 0
0.206830825 0 0 0 0 0 0 0 # 16
1999 2 2 3 2 70 0 0 0 0 0
0 0 0 0.051771968 1.362127056 5.300222865 11.21542303
11.28589673 9.234791837 5.091121205 2.820781219 1.953007322
1.606082988 0.760266218 0.442755109 0.046160303 0 0.010661626
0 0 0 0 0 0 0 0 0 0 0
0.002991103 1.748323545 9.636431449 20.16927867 12.36597067
3.566256824 0.711336746 0.36088886 0.257452654 0 0 0
0 0 0 0 0 0 # 14
2000 2 2 3 2 100 0 0 0 0 0
0 0 0 0.073097701 0.749167927 4.728203478 6.477188067
11.42366891 12.99550613 12.28759103 2.961884825 1.855837536
1.082122391 0.927922246 0.245907255 0.059992782 0 0 0
0 0 0 0 0 0 0 0 0 0
0.198382795 1.527163665 10.06845013 16.46568093 11.04527503
2.902892474 1.459959555 0 0.464105133 0 0 0 0
0 0 0 0 0 # 20
2001 2 2 3 2 65 0 0 0 0 0
0 0 0 0.043007187 0.906726207 4.045960081 15.01091807
10.05124718 13.08480619 8.236059521 2.172745338 1.895076331
0.340281776 0.235107859 0.018769977 0.197808553 0.050957356 0
0 0 0 0 0 0 0 0 0 0 0
0.041131914 2.800523725 7.994855418 17.83734361 8.573633415
5.851526094 0.535078165 0.020126103 0.05630993 0 0 0
0 0 0 0 0 0 # 13
2002 2 2 3 2 100 0 0 0 0 0
0 0 0 0.127869429 1.65025854 5.77923701 9.436164467
9.779346739 13.16200924 8.122320648 5.885956567 4.926938765
0.980105693 0.31077226 0.075711859 0.102334869 0.152255605
0.0137405 0 0 0 0 0 0 0 0 0
0 0.012300071 0.15962667 1.857969905 8.213459147 10.02063451
10.59510444 5.699171287 2.125294055 0.2102003 0.447715115 0
0.153502304 0 0 0 0 0 0 0 # 20
2003 2 2 3 2 125 0 0 0 0 0
0 0.000822309 0.000822309 0.063271923 2.066396751 8.217660884
9.176942081 10.0693291 8.380306519 7.862720243 3.45075572
1.842409779 1.03503278 0.371283106 0.130565535 0.15435519
0.030111715 0 0.079531509 0 0 0 0 0 0
0 0 0 0.023233169 0.122362772 3.002381543 11.47938097
12.83084696 11.16919114 3.837690007 3.260047779 1.028322612

0.238329161 0 0 0.075896435 0 0 0 0 0
0 # 25
2004 2 2 3 2 110 0 0 0 0 0
0 0 0 0.00465706 0.523117929 3.07111946 4.306105823
11.58396525 10.22966226 14.65283477 7.658433063 1.788803373
1.233086775 0.645789038 0.278905597 0.189909473 0 0 0
0 0 0 0 0 0 0 0 0 0
0.00685651 0.631699428 8.175287623 12.01430223 11.64907096
6.908182616 2.553156498 1.874898395 0.003531272 0.009196007
0.007428597 0 0 0 0 0 0 0 # 22
2005 2 2 3 2 130 0 0 0 0 0
0 0 0.041818348 0.013821933 2.31019231 3.12787622
8.767579747 10.03101824 10.80234828 11.21166017 5.431319729
2.561560638 2.082190311 0.899386818 0.505386358 0.249480881
0.23744789 0.041818348 0.011278252 0 0 0 0 0
0 0 0 0 0 0.530624362 2.708003306 9.850633972
8.934336132 9.936796529 5.174249782 4.155474026 0.349862661
0.033834755 0 0 0 0 0 0 0 0 0
26
2006 2 2 3 2 135 0 0 0 0 0
0 0 0.089382461 0.478989481 1.581827702 5.086224666
8.151384911 7.391613782 7.316179062 8.430737238 4.986920209
5.111925361 2.505304505 1.027154088 0.351947111 0.470319512
0.017375851 0.028083326 0.000863772 0.002014959 0 0 0
0 0 0 0 0 0.002679261 0.35027287 3.016036186
8.884681444 10.42707166 10.75720269 9.705633661 2.740310448
0.329025507 0.528893898 0.038222872 0.007773952 0.139256326 0
0.04469123 0 0 0 0 # 27
2007 2 2 3 2 90 0 0 0 0 0
0 0 0 0 0.172827612 2.22636428 7.020333263
10.34598433 12.37535564 11.14895178 11.41614891 3.665937331
2.127539291 1.467710783 0.488975685 0.343930019 0.232286282
0.169380609 0.010016757 0.141521986 0 0 0 0 0
0 0 0 0 0.01501833 0.612139829 2.324070506
5.672113504 10.30473055 8.668195572 6.162119613 1.635773489
1.021957462 0.197257844 0.033358748 0 0 0 0 0
0 0 # 18
2008 2 2 3 2 115 0 0 0 0 0
0 0 0.008306665 0.183899638 1.963282761 5.612937452
10.60672144 7.395164242 8.863249356 7.966464589 3.918052643
2.709432815 2.646549025 1.742850123 0.551021182 0.402246268
0.091462494 0.043384884 0.032814146 0.004059452 0.010648898 0
0 0 0 0 0 0.012958904 0.024206185 0.338165033
3.859081452 8.61687581 7.907369911 11.05645934 6.263050884
3.548415792 2.788373555 0.260976685 0.193778546 0.26663988
0.11109995 0 0 0 0 0 0 # 23

1969 1 3 3 2 6 0 0 0 0 0
0 0 0 0 3.921568627 13.7254902 21.56862745
7.843137255 7.843137255 5.882352941 0 3.921568627 5.882352941
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 1.960784314 1.960784314 13.7254902
5.882352941 5.882352941 0 0 0 0 0 0 0
0 0 0 0 0 0 # 1
1978 1 3 3 2 6 0 0 0 0 0
0 0 0 1 5 8 3 11 6 7 7
11 8 7 11 2 5 0 0 0 0 0
0 0 0 0 0 0 1 0 2 2 1
1 1 0 0 0 0 0 0 0 0 0
0 0 0 # 1
1980 1 3 3 2 24 0 0 0 0 0
0 0 0 0 0 0 1.20673396 1.192760433
4.477257392 6.916742176 12.96575608 4.809787225 3.374927405
1.875199813 1.560734986 0.918086163 0.286971964 0 0 0
0 0 0 0 0 0 0 0 0 0
0.170978845 2.049328298 9.849716999 14.99726725 13.11555379
9.65019594 6.760005802 2.197536574 0.692653563 0.931805333 0
0 0 0 0 0 0 # 4
1981 1 3 3 2 12 0 0 0 0 0
0 0 0 0 1.639247887 1.639247887 2.458871831
3.448970841 7.547090559 8.707664635 3.003048418 4.471821239
4.163622494 3.993147428 1.842474341 1.193325464 1.501524209
0.170475066 0 0.170475066 0 0 0 0 0 0
0 0 0 0 1.501524209 15.29740757 20.69382504
7.442118268 2.662098285 5.599643927 0.852375332 0 0 0
0 0 0 0 0 0 0 # 2
1982 1 3 3 2 6 0 0 0 0 0
0 0 0 1 0 1 1 1 9 7 9
5 3 2 1 1 0 0 0 0 0 0
0 0 0 0 0 0 0 3 5 13 17
14 7 0 0 0 0 0 0 0 0 0
0 0 0 # 1
1983 1 3 3 2 18 0 0 0 0 0
0 0 0 0 0 4.192230621 1.397410207 18.49314601
9.463924236 4.74194692 7.289419949 2.868734594 2.597438785
1.653623695 2.504631955 1.253973154 1.194476827 1.642520194
1.019966668 0.157854907 0 0 0 0 0 0 0
0 0 0.698705103 6.987051034 12.18814482 8.486134175
8.349821803 1.96535469 0.512426976 0.111035013 0.18561366 0
0.011103501 0.033310504 0 0 0 0 0 0 #
3
1984 1 3 3 2 12 0 0 0 0 0
0 0 0 0.39954503 0.799090059 0.799090059 1.198635089

1.598180118	2.680080966	6.300657385	7.265823992	6.866278962
11.47669314	5.809049267	6.067188903	4.72714842	3.245702543
4.044792602	0.540950424	1.622851271	0	0	0	0	0
0	0	0	0	1.598180118	5.194085385	7.616026715
5.901112356	5.64297272	4.161526843	0.940495453	2.163801695
0.39954503	0.540950424	0.39954503	0	0	0	0	0
0	0	#	2
1986	1	3	3	2	6	0	0	0	0	0
0	0	0	0	0	0.99009901	1.98019802	0.99009901
5.940594059	11.88118812	9.900990099	8.910891089	5.940594059
4.95049505	0.99009901	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	2.97029703
8.910891089	12.87128713	8.910891089	8.910891089	3.96039604	0
0.99009901	0	0	0	0	0	0	0	0	0
#	1
1987	1	3	3	2	6	0	0	0	0	0
0	0	0	0	0	2	2	10	12	14	12
22	4	2	4	2	0	0	0	0	0	0
0	0	0	0	0	0	0	0	2	2	4
4	0	2	0	0	0	0	0	0	0	0
0	0	0	#	1
1989	1	3	3	2	36	0	0	0	0	0
0	0	0.551898172	0	2.713729167	6.344750729	8.990851383
11.29166609	10.1474927	7.989991831	8.061670288	4.672042203
2.463182713	1.750597705	1.354172607	0	0.199341799	0.551898172
0	0	0	0	0	0	0	0	0	0
0.148945597	1.114292034	4.728568918	6.952493839	8.588483322
6.94773848	3.78865908	0.64753317	0	0	0	0	0
0	0	0	0	0	0	#	6
1990	1	3	3	2	12	0	0	0	0	0
0	0	0	0	0.908310157	1.091689843	4.183379687
12.73351875	5.091689843	7.458449217	7.27506953	5.27506953
0.908310157	0.908310157	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	3.816620313
11.09168984	17.44986094	17.08310157	2	2.72493047	0	0
0	0	0	0	0	0	0	0	0	0	#
2
1991	1	3	3	2	54	0	0	0	0	0
0	0	0	0	3.039306724	8.609187576	7.106935444
8.30775688	17.4428693	7.849528206	4.633085104	5.358403119
1.830119656	1.128349134	0.118069172	0.165467454	0	0	0
0.123583292	0	0	0	0	0	0	0	0.162509691
0	0.57636218	3.443230358	9.890586627	10.4365697	6.005073439
2.797279628	0.487863662	0.487863662	0	0	0	0	0
0	0	0	0	0	#	9

1992 1 3 3 2 18 0 0 0 0 0
0 0 1.079995849 5.399979244 5.399979244 3.239987547
3.712912418 6.755867244 12.8297199 12.17941924 6.050279906
5.423551998 3.515879697 2.435883848 0 0 0 0 0
0 0 0 0 0 0 0 0 1.079995849
0.09851636 10.58695295 11.7138626 6.432056647 1.572577651
0.394065441 0.09851636 0 0 0 0 0 0 0
0 0 0 0 0 # 3
1993 1 3 3 2 18 0 0 0 0 0
0 0 0 0 1.344773708 0 1.014644801 3.236029571
5.554404059 6.723868541 10.3702308 2.592557699 3.099880099
2.728707171 1.344773708 0 0 0 0 0 0 0
0 0 0 0 0 0 0 3.196869817 10.33107104
16.47488554 17.62379555 10.93349889 3.430009006 0 0 0
0 0 0 0 0 0 0 0 0 # 3
1994 1 3 3 2 30 0 0 0 0 0
0.128920998 0 0 1.804893977 4.586515498 5.936952546
5.2676212 6.315209315 4.371566021 2.476473087 9.330760603
4.700458893 2.436035745 0.79652248 1.427805484 0 0 0
0 0 0 0 0 0 0 0 0.128920998 0
1.031367987 6.095251226 19.01368459 14.36004874 5.167404184
3.276989719 1.346596712 0 0 0 0 0 0 0
0 0 0 0 0 # 5
1995 1 3 3 2 30 0 0 0 0 0
0 0 0 0 0.664872731 1.556750529 5.716740762
9.974452111 9.916848325 7.950004642 9.11240359 6.656255503
2.50884868 0.777309262 2.107292567 0 0 0 0 0
0 0 0 0 0 0 0 0 0.891877798
8.896001657 11.17989116 9.847300166 6.880091081 4.471181636
0.665110574 0 0 0 0.226767225 0 0 0 0
0 0 0 0 # 5
1996 1 3 3 2 6 0 0 0 0 0
0 0 0 0 0 2.857142857 2.857142857 14.28571429
11.42857143 20 11.42857143 0 0 0 2.857142857 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 5.714285714 11.42857143 14.28571429 2.857142857
0 0 0 0 0 0 0 0 0 0 0
0 0 # 1
1997 1 3 3 2 12 0 0 0 0 0
0 0 0 3.155848534 13.88573355 17.67275179 7.308804741
5.913849457 4.020340336 7.908064802 4.518894172 3.389170629
1.129723543 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 1.893509121 1.893509121
8.937082121 10.33203741 6.910957129 0 1.129723543 0 0
0 0 0 0 0 0 0 0 0 0 #
2

1998 1 3 3 2 12 0 0 0 0 0
0.274803849 0 0.274803849 0 7.366695726 3.408544014
1.704272007 0 0.549607697 0.549607697 2.198430789 0.824411546
0.824411546 0.274803849 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 18.74699208
57.06538778 5.662423719 0 0.274803849 0 0 0 0
0 0 0 0 0 0 0 0 0 # 2
1999 1 3 3 2 12 0 0 0 0 0
0 0 0 0 0.967408032 4.837040159 3.004073996
6.873706123 9.114071889 13.95111205 19.19555181 8.044813956
3.971482028 3.971482028 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 3.004073996
3.971482028 4.93889006 3.971482028 10.18332982 0 0 0
0 0 0 0 0 0 0 0 0 0 #
2
2000 1 3 3 2 24 0 0 0 0 0
0 0 0 0.343585869 0.636664763 5.193620492 3.286133262
1.563901361 7.917972369 5.33016434 4.900897381 8.113984085
5.090099482 1.272973744 1.98882444 0 0 0 0 0
0 0 0 0 0 0 0 0 0.132199968
4.378592665 9.655345862 16.58494146 10.92831961 9.126901772
1.00892959 2.545947488 0 0 0 0 0 0 0
0 0 0 0 # 4
2001 1 3 3 2 30 0 0 0 0 0
0 0 0 0 0.212004644 0 9.803489668 9.709558351
6.096341843 11.29276834 10.78564039 3.409294851 4.09626727
2.774208666 0 0 0 0 0 0 0 0
0 0 0 0 0 0 2.266152259 5.507309826
8.391529899 12.15060771 7.346371458 5.676352878 0.482101949 0
0 0 0 0 0 0 0 0 0 0 #
5
2002 1 3 3 2 12 0 0 0 0 0
0 0 0 0 0 2.443222889 0 4.560085505
15.39140837 15.71776864 4.030869851 2.972438543 2.972438543
1.221611444 1.221611444 0 0 0 0 0 0 0
0 0 0 0 0 0 0.529215654 1.221611444
7.532524048 10.34178246 10.3814577 7.898559566 8.061739702
3.501654197 0 0 0 0 0 0 0 0 0
0 0 # 2
2003 1 3 3 2 24 0 0 0 0 0
0 0 0 0 0.695882162 0.927842883 6.618735949
11.42272405 10.73906436 13.53282564 7.485652157 6.151318734
4.983056325 1.678778731 1.114982541 0 0 0 0 0
0 0 0 0 0 0 0 0 2.265484994 0
4.629190393 7.492337144 7.328614401 3.514207851 9.419301682 0

0 0 0 0 0 0 0 0 0 0 0
4
2004 1 3 3 2 30 0 0 0 0 0
0 0 0 0 0 0 3.48299726 4.545932039
6.318017802 9.671162806 3.828135581 8.899538514 2.362969005
5.080106818 0.94445314 1.757696569 0 0 0 0 0
0 0 0 0 0 0 0 0 1.147009353
2.273864665 17.44564152 24.20685293 7.766126673 0.134747662 0
0.134747662 0 0 0 0 0 0 0 0 0
0 # 5
2005 1 3 3 2 30 0 0 0 0 0
0 0 0 0 0.590742369 1.710362848 2.171074626
4.540346176 7.984969454 6.367926326 8.957774543 7.06780623
1.890845274 0.19942376 1.128390714 0 0 0 0.19942376
0 0 0 0 0 0 0 0 0 0 0
3.515272254 7.919836616 15.16228303 19.15150519 8.242228901
3.199787935 0 0 0 0 0 0 0 0 0
0 0 # 5
2006 1 3 3 2 36 0 0 0 0 0
0 0 0 0 0 1.46450033 2.424830309 5.355617242
8.386817958 7.453698577 4.726661259 2.523617071 1.048878491
0.279054207 0.732250165 0.311434521 0 0 0 0 0
0 0 0 0 0 0 0 0 0.727056361
2.439788009 8.91260345 23.0652299 23.43817404 5.87854443 0
0.831243679 0 0 0 0 0 0 0 0 0
0 # 6
2007 1 3 3 2 108 0 0 0 0 0
0 0 0 0 0 0.988842645 2.236092318 5.43257202
17.71672553 8.809430659 7.781141889 4.286310934 1.91192722
0.704638625 0.454931771 0.275870587 0 0 0 0 0
0 0 0 0 0 0 0.216740177 0 0.587554655
2.662015616 8.372530307 15.39785521 17.83709759 3.684778729
0.642943515 0 0 0 0 0 0 0 0 0
0 0 # 18
2008 1 3 3 2 150 0 0 0 0 0
0 0 0 0 0 0.176007516 2.636681172 8.361316869
14.00964504 12.99458897 6.293253695 3.965029486 1.580390646
1.440696471 0.431506335 0.469048875 0.084442947 0 0 0
0 0 0 0 0 0 0 0 0 0.955326189
3.884963021 6.944639451 17.47331505 12.0710302 5.239400119
0.974362391 0.014355565 0 0 0 0 0 0 0
0 0 0 # 27
1966 2 4 3 2 54 0 0 0 0 0
0 0 0 0 2.756292482 3.328708693 10.01044285
12.95357558 6.456685763 6.114581925 7.154369966 4.539155739
1.538180583 1.156786878 2.044293964 0.068862367 0.077031606

0.075551946 0 0 0 0 0 0 0 0 0
0 0 0 2.212299423 5.436379294 12.06552335 12.01833448
4.610211273 3.104585363 2.14042174 0.137724734 0 0 0
0 0 0 0 0 0 # 9
1967 2 4 3 2 66 0 0 0 0 0
0 0 0 0 1.240381427 3.50075246 5.126902796
7.600559256 7.265848401 7.596060222 7.981084815 3.981025447
3.623639483 2.089998301 0.148686375 0.163387159 0 0 0
0 0 0 0 0 0 0 0 0 0
1.014026313 1.743676321 10.95124194 16.09320081 12.24303263
4.826627007 2.081930552 0.558150911 0 0.169787381 0 0
0 0 0 0 0 0 # 11
1968 2 4 3 2 114 0 0 0 0 0
0 0 0 0 0.193917312 3.333877852 6.679164756
7.758478397 9.54291418 11.69491837 8.744025033 3.275042425
2.010506124 1.412606063 0.530314668 0.068722835 0.080047042 0
0 0 0 0 0 0 0 0 0 0 0
0 0.547500523 5.463230781 11.61398531 12.00659562 8.689308011
3.947198285 1.672950638 0.574601689 0.068722835 0.091371249 0
0 0 0 0 0 0 # 19
1969 2 4 3 2 108 0 0 0 0 0
0 0 0 0 1.438630799 4.562720863 8.458240676
13.43725171 12.52784053 12.17116059 11.80874251 5.406180096
3.726370288 2.370425815 0.726315422 0.365176667 0 0 0
0.110362486 0 0 0 0 0 0 0 0 0
0.146056293 0.363331011 2.036388942 5.419252867 7.292991055
5.467603266 1.285223273 0.666684562 0.110362486 0.102687796 0
0 0 0 0 0 0 0 # 18
1970 2 4 3 2 126 0 0 0 0 0
0 0 0 0 0.69682603 5.551466429 4.689002272
15.54560009 18.11566209 15.36444265 5.635695721 2.094666121
1.279340787 0.439566969 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0.387650122
3.418088181 6.424104855 8.469651557 7.234627762 4.133229206
0.434126553 0.08625261 0 0 0 0 0 0 0
0 0 # 21
1971 2 4 3 2 30 0 0 0 0 0
0 0 0 0 0 2.880874608 9.433619938 10.2462117
11.02228133 4.883099493 6.546127239 4.022933859 1.913611662
0.505958246 0.536596467 0.383712712 0.159206163 0.315251121 0
0 0 0 0 0 0 0 0 0 0 0
0 6.872889679 12.41796589 12.95175398 8.999392294 4.454500273
1.135601018 0.318412325 0 0 0 0 0 0 0
0 0 # 5
1972 2 4 3 2 42 0 0 0 0 0
0 0 0.058811766 0.117623531 1.381980193 8.056620981

7.437284859 6.623082657 5.862715226 4.665494408 2.121228036
1.089895699 0.998749145 0.646089804 0.352409311 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0.058114407 2.905608816 12.86431175 16.99856426 13.57287925
8.148604358 5.082078411 0.592517351 0.365335786 0 0 0
0 0 0 0 0 0 # 7
1973 2 4 3 2 30 0 0 0 0 0
0 0 0 0.287936155 0.99318211 4.002623585 4.024067942
5.602462299 4.33981737 8.148077505 5.222644154 4.74068233
2.388760541 1.798896212 0.534196004 0.358434212 0.161533531 0
0 0 0 0 0 0 0 0 0 0
0.171049951 0.57587231 2.257101091 6.882383339 16.25376484
12.67523597 10.7977772 5.743422352 1.847982889 0 0.192096103
0 0 0 0 0 0 0 0 # 5
1974 2 4 3 2 42 0 0 0 0 0
0 0 0 0.071765216 0.910791132 3.105035857 3.029557573
3.373639112 5.71271677 10.3388602 7.852505414 8.935785799
2.74365658 1.975834858 1.773065542 0.708437414 0.053651067
0.291510566 0.145755283 0.291510566 0 0 0 0 0
0 0 0 0 0 0.809647816 2.82206379 4.048884984
6.746955625 14.45361751 10.236508 7.068065001 2.285574061
0.214604266 0 0 0 0 0 0 0 0 #
7
1975 2 4 3 2 30 0 0 0 0 0
0 0 0.497308777 0.994617555 1.208031814 2.415989272
6.620660209 4.451794953 7.106854661 5.521603828 3.238445392
3.609154647 3.998647111 1.733819117 0.296781603 0.445172404
0.329269288 0 0 0 0 0 0 0 0 0
0 0 0.248654389 2.632182244 3.988482416 9.155826957
8.310230454 10.74585417 14.70177312 6.468960265 1.131494557
0.148390801 0 0 0 0 0 0 0 0 0
5
1977 2 4 3 2 66 0 0 0 0 0
0 0 0 0.260772529 2.271926559 6.444693389 8.461496675
10.42796582 6.973031134 7.872960975 5.266954093 2.95238659
2.031023274 0.939247493 0.85320455 0.346786433 0.199501975
0.089830105 0 0 0 0 0 0 0 0 0
0 0 0.187119712 3.162117834 7.094853002 10.02381003
10.77932451 5.573536603 4.3329102 2.952942454 0.48658441
0.015019649 0 0 0 0 0 0 0 0 #
11
1978 2 4 3 2 72 0 0 0 0 0
0 0 0 0.488764504 2.103557038 4.564664517 4.46530019
4.16607997 4.325140433 6.737869453 5.458589655 3.566662273
3.000346647 2.871324002 1.411163285 1.045384151 0.338471088
0.336531495 0.078826071 0 0 0 0 0 0 0

0	0	0.176508657	0.734537832	5.020233898	9.603940975					
10.40642888	12.41666328	9.125576328	5.314111872	1.723839815						
0.432923317	0.086560367	0	0	0	0	0	0	0		
0	#	12								
1979	2	4	3	2	36	0	0	0	0	0
0	0	0	1.263200814	4.50347907	10.17552265	9.005510142				
9.642355678	8.195701798	6.039197872	4.225558637	2.013969885						
1.351604205	1.138147251	0.859909078	0.922223997	0.06231492						
0.610623632	0	0	0	0	0	0	0	0	0	
0	0	0.402388077	3.999415616	9.536300015	9.828635996					
8.288926414	5.14890649	1.80380923	0.649131753	0	0.333166779					
0	0	0	0	0	0	0	0	#	6	
1980	2	4	3	2	96	0	0	0	0	0
0	0	0.019245683	0.730997201	2.866702904	4.790423867					
5.493723095	6.796395116	6.459138617	5.3775792	6.319366692						
3.383922395	2.933892489	1.389604117	1.140702238	0.98944772						
0.711985863	0.296559768	0.078466339	0	0	0	0	0			
0	0	0	0	0	0.217097166	2.763844372	6.874070186			
10.48519225	8.869947246	9.361356063	5.494210614	3.275195809						
1.851041453	0.530982912	0.185043272	0.170987975	0.142877382	0					
0	0	0	0	#	16					
1981	2	4	3	2	150	0	0	0	0	0
0	0	0.034414921	0.507424416	2.907889265	8.506759109					
11.47745212	10.78957185	8.849394547	8.108348639	6.664562584						
4.543985686	1.925938038	1.299711151	0.681693495	0.463250316						
0.169663636	0.087944353	0.016318495	0.009615639	0	0	0				
0	0	0	0	0	0.009982762	0.463264544	2.560253916			
7.679936373	8.132696745	7.078186087	3.690040236	1.764171965						
1.119283339	0.458245772	0	0	0	0	0	0	0		
0	0	#	29							
1982	2	4	3	2	96	0	0	0	0	0
0	0	0	0.22916231	2.380649687	6.593044544	6.21144785				
6.695177563	6.665031488	2.846348658	4.830353055	3.307671394						
1.749208347	0.442950858	0.078442264	0.66142664	0.127935063						
0.113236473	0	0	0.112458517	0	0	0	0	0		
0	0	0	0.083761744	5.621070427	13.45123335	14.30993686				
10.24454257	6.766793671	4.13429321	1.619345573	0.708745718						
0.015732163	0	0	0	0	0	0	0	0	#	
16										
1983	2	4	3	2	6	0	0	0	0	0
0	0	0	1	0	2	0	0	2	4	1
1	1	1	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	3	15	35	20
11	1	1	0	1	0	0	0	0	0	0
0	0	0	#	1						

1985 2 4 3 2 12 0 0 0 0 0
0 0 0 2.269850744 4.809552231 8.269850744 8.634925372
4 7.460298512 9.095223884 10.36507463 7.904776116 7.82537314
6.730149256 2.730149256 3.904776116 2 0.365074628 0 0
0 0 0 0 0 0 0 0 0.730149256
2.269850744 3.730149256 3.269850744 1.634925372 0.365074628
0.365074628 0.634925372 0.634925372 0 0 0 0 0
0 0 0 0 0 # 2
1986 2 4 3 2 24 0 0 0 0 0
0 0 0.228228709 1.208643768 5.940307437 12.32617351
10.87862483 7.356597983 5.085777223 10.20609443 5.073156444
2.102901373 4.28247976 3.088604058 2.752925146 0 0.679094849
0 0 0 0 0 0 0 0 0 0 0
1.394735448 3.886310243 7.440568388 6.014635997 5.288096614
3.488197683 1.015016229 0.262829878 0 0 0 0 0
0 0 0 0 0 0 # 4
1987 2 4 3 2 42 0 0 0 0 0
0 0 2.394401289 2.413532925 9.017795465 8.602571757
10.81931257 7.401156314 7.611677394 5.904333367 3.173265399
1.449558599 0.423457365 0.208399952 0 0 0 0 0
0 0 0 0 0 0 0 0 0.654003645
1.962455318 3.25138306 14.02182471 9.781500155 8.714298838
1.346973603 0.848098278 0 0 0 0 0 0 0
0 0 0 0 0 # 7
1988 2 4 3 2 12 0 0 0 0 0
0 0.331676476 1.668323524 1.668323524 4.331676476 15.67826467
12.6732941 8.663352952 12.34161762 11.00497057 3.658382379
2.995029428 3.668323524 0.331676476 2 0 0 0 0
0 0 0 0 0 0 0 0 0 1.668323524
8.341617621 3.336647048 0.663352952 2.985088283 1.326705903
0.331676476 0.331676476 0 0 0 0 0 0 0
0 0 0 0 # 2
1989 2 4 3 2 36 0 0 0 0 0
0 0 0 0.173221739 4.574926037 20.42993534 14.29774268
8.805038572 4.561197104 3.417271343 1.87765023 2.902960161
1.784378993 0.418954102 0.780448164 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1.428458083
8.106252906 15.07069911 7.815523173 2.716459585 0.838882686 0
0 0 0 0 0 0 0 0 0 0 0
6
1990 2 4 3 2 30 0 0 0 0 0
0 0 0.843373193 4.627152116 6.345071999 18.7477856
12.78755961 6.679592063 5.000652159 3.094214149 0.77162706
1.26505979 0.765274275 0.256788643 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0.67847524
3.166527631 11.53013348 14.19228428 6.463686971 2.230963323

0.276889208 0.276889208 0 0 0 0 0 0 0
0 0 0 0 # 5
1991 2 4 3 2 12 0 0 0 0 0
0 0 0 2.386580877 1.433456041 10.26305153 17.65919097
13.60275724 14.79227889 4.536764938 6.443014609 1.669852856
1.433456041 4.773161753 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1.669852856 3.583640102
4.056433733 3.820036917 3.820036917 2.386580877 1.669852856 0
0 0 0 0 0 0 0 0 0 0 0
2
1992 2 4 3 2 36 0 0 0 0 0
0 0 0 2.238086638 4.723272556 9.110217041 11.65149253
14.36299966 5.283984019 7.27930116 3.044125382 3.936866267
0.808581112 0.237554678 0.064389173 0.45517837 0 0 0
0 0 0 0 0 0 0 0 0 0
3.964062441 9.776905662 9.34564212 8.787522489 4.342264908
0.587553796 0 0 0 0 0 0 0 0 0
0 0 0 # 6
1993 2 4 3 2 12 0 0 0 0 0
0 0 0 0 0 1.695826652 10.17495991 8.479133261
8.169171673 10.9409018 15.71842017 5.087479957 4.467556781
1.385865065 1.385865065 3.081691717 0 0 0 0 0
0 0 0 0 0 0 0 0 1.695826652 0
1.385865065 6.929325323 5.543460258 8.315190387 5.543460258 0
0 0 0 0 0 0 0 0 0 0 #
2
1994 2 4 3 2 12 0 0 0 0 0
0 0 0 6.139625856 3.585502448 20.48163565 13.82632027
10.75650734 5.64826053 1.547068561 0.51568952 8.202383937 0
0 3.069812928 0 0 0 0 0 0 0 0
0 0 0 0 3.069812928 3.069812928 0.51568952
6.67963957 6.703963765 4.125516163 1.031379041 1.031379041 0
0 0 0 0 0 0 0 0 0 0 0
2
1996 2 4 3 2 6 0 0 0 0 0
0 0 0 0 2.5 12.5 2.5 5 10 17.5 7.5
0 0 0 0 0 2.5 0 0 0 0 0
0 0 0 0 0 0 0 0 10 12.5 12.5
2.5 2.5 0 0 0 0 0 0 0 0 0
0 0 0 # 1
1997 2 4 3 2 54 0 0 0 0 0
0 0.448778313 4.995626938 14.47009165 14.02005412 6.102122172
5.529310574 2.255031988 7.391264974 5.622152337 4.323318593
3.887431529 1.948468327 0.432839856 0.550935161 0.253309102 0
0.044316956 0 0 0 0 0 0 0 0 0
0.448778313 6.142322356 5.500941333 6.694145116 3.203703898

3.978840055 1.275522702 0.292264903 0.123524377 0.044316956 0
0 0.020587396 0 0 0 0 0 0 0 #
9
1998 2 4 3 2 30 0 0 0 0 0
0 0 0 0.834050116 5.380124301 5.734268053 7.434533822
2.940803095 1.137929284 4.753315712 4.853247917 5.426538193
1.60065651 0.49333914 0.49333914 0.318127523 0 0 0
0 0 0 0 0 0 0 0 0 0
2.737032171 13.49705389 16.82261223 13.17413532 9.551717505
1.486549403 0.343948395 0.986678281 0 0 0 0 0
0 0 0 0 0 # 5
2000 2 4 3 2 12 0 0 0 0 0
0 0 2.910179562 2.910179562 2.910179562 8.730538687
2.910179562 11.64071825 6.507784525 6.507784525 9.761676788
21.74610774 9.417964088 3.597604963 0.687425401 2.910179562 0
0 0 0 0 0 0 0 0 0 0 0
0 2.910179562 0 2.910179562 0 0.343712701 0.687425401
0 0 0 0 0 0 0 0 0 0 0
0 # 2
2001 2 4 3 2 6 0 0 0 0 0
0 0 0 0 2.43902439 4.87804878 14.63414634 0
14.63414634 9.756097561 12.19512195 7.317073171 0 0 0
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4.87804878 0 0 0 0 0 0 0 0 0
0 0 0 0 # 1
2002 2 4 3 2 18 0 0 0 0 0
0 0 0 0 2.352329833 9.198586316 4.771089882
15.75407366 14.35328771 11.61734636 3.76672169 4.083902985
1.711564121 0.660774743 0 0 0 0 0 0 0
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7.797000705 11.14729561 2.722335436 1.004368192 2.055157569
0.660774743 0 0 0 0 0 0 0 0 0
0 0 # 3
2003 2 4 3 2 48 0 0 0 0 0
0 0 0 0.303352427 2.60528699 14.97073098 20.01738231
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0.007335813 0.141696617 0.063512495 0.004196154 0 0 0
0 0 0 0 0 0 0 0 0 0 0
7.972638561 16.696456 11.7697429 4.678405805 0.173152861
0.018837953 0 0 0 0 0 0 0 0 0
0 0 # 8
2004 2 4 3 2 36 0 0 0 0 0
0 0 0 0 0.443450358 8.711450038 10.90188947
12.79100005 10.97161023 3.602927235 4.029943092 0.542415649 0
0.542415649 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 0.884440235 6.34533731
14.75454066 19.59607709 5.411245505 0.471257428 0 0 0
0 0 0 0 0 0 0 0 0 # 6
2005 2 4 3 2 6 0 0 0 0 0
0 0 0 0 0 0 2.040816327 0 8.163265306
8.163265306 4.081632653 2.040816327 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 2.040816327 8.163265306 28.57142857 30.6122449 6.12244898
0 0 0 0 0 0 0 0 0 0 0
0 0 # 1
2006 2 4 3 2 72 0 0 0 0 0
0 0 0.480190166 3.896481777 6.315956237 8.224130076
9.393256278 11.21943074 8.162777094 3.345289831 3.607782023
2.196625859 1.172210867 0.184099534 0.034847263 0.086437924 0
0 0 0 0 0 0 0 0 0 0
0.16509065 0.16509065 2.075753732 6.920967454 14.39419901
12.21924206 4.6032449 0.766000668 0.090187281 0.245860664 0
0 0 0 0 0.034847263 0 0 0 0 #
12
2007 2 4 3 2 72 0 0 0 0 0
0 0 0 3.352695252 2.249313935 4.597554215 8.321803055
4.289620846 6.898759732 4.067397806 5.086106167 3.741300559
1.534775544 1.15055652 0.740179649 0 0 0 0 0
0 0 0 0 0 0 0 0 0.784720967
4.271303204 7.596853104 15.94938875 12.10299783 8.008089743
5.022217796 0.234365322 0 0 0 0 0 0 0
0 0 0 0 # 12
2008 2 4 3 2 36 0 0 0 0 0
0 0 0 0 2.746543127 5.836151506 10.30973919
7.750380533 7.584648446 8.317404393 4.325528 3.313855257
3.344255628 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0.69545616 2.267777332
5.308430631 13.65423112 9.469922769 12.98476915 0.50379338
1.587113377 0 0 0 0 0 0 0 0 0
0 0 # 6
1949 1 5 3 2 30 0 0 0 0 0
0 0 0.322410404 1.130366164 2.025216495 2.510761851
2.282965022 2.657476731 3.99967893 7.506367639 8.483025142
10.21469273 10.56542377 6.457667711 4.26630268 1.666855211
1.263401816 0.323365513 0 0.197491577 0.267935052 0 0
0 0 0 0 0 0 0.644820807 1.722131371
2.825901233 2.677283195 4.548482345 3.896394373 8.029478675
6.923973382 1.997655448 0.592474731 0 0 0 0 0
0 0 0 # 10
1964 1 5 3 2 3 0 0 0 0 0
0 0 0 0 0 2.040816327 6.12244898 10.20408163

4.081632653	14.28571429	10.20408163	0	4.081632653	4.081632653					
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	2.040816327	0	14.28571429	14.28571429			
6.12244898	4.081632653	4.081632653	0	0	0	0	0			
0	0	0	0	0	0	#	1			
1965	1	5	3	2	6	0	0	0	0	0
0	0	0	3.659494966	7.318989933	7.318989933	0	0			
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1.460654497	
9.988997785	33.65792322	29.27595973	3.659494966	0	0					
3.659494966	0	0	0	0	0	0	0	0	0	
0	0	#	2							
1966	1	5	3	2	24	0	0	0	0	0
0	0	0	0	6.583510467	15.96723382	6.97042628				
2.642588762	2.094827651	2.981261102	2.562180019	2.520478376						
2.078702704	1.083954152	0.572971608	0.192312581	0.192312581						
0.192312581	0.179315143	0	0	0	0	0	0	0		
0	0	0	2.117504832	9.083154928	25.60669937	14.16279816				
1.651514588	0.371627724	0.192312581	0	0	0	0	0			
0	0	0	0	0	0	#	8			
1967	1	5	3	2	60	0	0	0	0	0
0	0	0.000410345	0.000205172	0.006654045	2.758737765					
2.626117273	6.141480266	4.184400798	4.627958285	1.446755856						
1.293204108	0.87708601	0.469718384	0.11533374	0.075237015						
0.000637974	0.000537126	0	0	0	0	0	0	0		
0	0	0	0	0.001913922	2.225133772	30.07955173				
24.70709888	13.14041541	4.264237959	0.83887809	0.118296075	0					
0	0	0	0	0	0	0	0	0	#	20
1968	1	5	3	2	33	0	0	0	0	0
0	0	0	0.008363431	15.79653209	8.35655421	0.884088083				
2.304353843	4.711659041	4.857000669	3.750192087	3.524728297						
2.24820858	1.117796449	0.645305772	0.113596466	0.113596466	0					
0	0	0	0	0	0	0	0	0	0	0
0.667215444	8.669904528	13.20624065	9.946589558	14.97815473						
2.812826132	1.287093469	0	0	0	0	0	0	0		
0	0	0	0	#	11					
1969	1	5	3	2	42	0	0	0	0	0
0	0	0	0.043072055	0.238851156	1.709182127	3.790936022				
8.851056213	8.045081828	10.58925418	8.048585258	7.582801602						
2.16520817	1.884936139	1.088482188	0.493863731	0.367683901						
0.051686466	0.017228822	0	0	0	0	0	0	0		
0	0	0	0.025843233	1.577449402	12.26943073	8.983846194				
9.307132981	5.436557723	4.182532446	1.684810559	0.184948373						
1.317889049	0.061649458	0	0	0	0	0	0	0		
#	14									

1970 1 5 3 2 39 0 0 0 0 0
0 0 0.133079071 0.399237213 0.814723622 3.788860803
6.476325535 7.695291727 3.642430738 4.492895152 1.934518951
0.853645647 0.173175502 0.017080236 0.115832273 0.066732286 0
0.066732286 0.020377902 0 0 0 0 0 0 0
0 0 0.931553498 2.135349677 5.228177084 24.008805
18.65776624 7.491827666 8.759162272 2.088268459 0 0.008151161
0 0 0 0 0 0 0 0 0 # 13
1971 1 5 3 2 21 0 0 0 0 0
0 0 0 0 3.911770965 7.517036734 7.90037454
10.70840272 2.312732135 4.163564592 2.443481087 1.786316964
1.231491821 0.045722595 0.056516953 0.107804794 0 0 0
0 0 0 0 0 0 0 0 0 0
1.521994324 22.7251717 28.82855833 0.417910459 2.846052565
0.052070447 0.711513141 0.711513141 0 0 0 0 0
0 0 0 0 0 # 7
1972 1 5 3 2 69 0 0 0 0 0
0.011591228 0 0 0.003458185 0.418918425 0.862129258
3.262492373 7.706986054 12.70165049 10.24085411 5.380998296
4.396562278 1.667684205 0.778345032 0.68477075 0.799410628
0.388917625 0.079309013 0.02953583 0.013312453 0 0 0
0 0 0 0 0 0 0.015591229 12.54462414
14.23247094 11.87172192 7.147984782 2.921265353 0.568710823
0.808063155 0.388691367 0.07395005 0 0 0 0 0
0 0 0 # 23
1973 1 5 3 2 36 0 0 0 0 0
0 0 0 0.167347398 1.136141724 5.657184751 5.351544162
3.78140642 7.071152192 7.135306682 5.992630682 3.125884547
2.341960517 2.019166561 0.881382828 0.145862267 0.170293173
0.043418558 0.034722592 0 0 0 0 0 0 0
0 0 0 0.605652677 5.270231799 9.761776656 24.1571362
9.259274507 5.118424784 0.16644564 0.605652677 0 0 0
0 0 0 0 0 0 0 # 12
1974 1 5 3 2 93 0 0 0 0 0
0 0.01309474 0.002257013 0.009028052 0.666643139 1.362931296
2.513914107 2.697839983 7.804812631 8.095224684 5.386960352
4.430416041 5.27778892 1.587220227 0.908938673 0.185642618
0.005926624 0.002376388 0.015241598 0 0 0 0 0
0 0 0 0 0.028446493 0.146664338 1.710918676
5.926459389 19.7339543 10.19358621 14.57421793 2.853102354
2.754402153 0.647857414 0.464133668 0 0 0 0 0
0 0 0 # 31
1975 1 5 3 2 33 0 0 0 0 0
0 0.257137809 2.379252088 4.617885996 5.548761428 11.34608157
9.45896876 8.126608837 2.369784215 1.959941117 0.9776026
1.307674938 0.65209408 0.742294613 0.146313807 0.013752667

0.013752667 0 0 0 0 0 0 0 0 0
0 0.771413428 5.272779794 7.082972774 6.8316461 17.36290474
10.82788123 1.40970825 0.250394638 0 0.272391863 0 0
0 0 0 0 0 0 0 0 # 11
1976 1 5 3 2 36 0 0 0 0 0
0 0 0 0.032329774 0.649675477 5.201388311 10.68053047
5.661019354 7.183224841 6.076499656 2.849165224 5.320335486
1.904662358 2.745386836 1.765936082 0.722361791 0.104200072
0.048051745 0 0.156165363 0 0 0 0 0 0
0 0 0 0.048494661 1.162133852 12.45785524 12.24966329
7.523800854 5.989290963 3.977736715 1.48476617 1.797096897
2.20822852 0 0 0 0 0 0 0 0 #
12
1977 1 5 3 2 24 0 0 0 0 0
0 0 0.018925548 2.507344508 3.366470751 11.70144055
3.626915061 10.5828286 4.331173975 7.500231046 2.095574249
3.048603792 6.371916775 1.469341435 2.024445749 1.046607819
0.444187974 0.632690247 0.212525297 0 0 0 0 0
0 0 0 0 2.436561021 8.154802462 3.359610558
4.239222792 14.02190711 2.206426317 2.626529154 0.496176935
0.737191258 0.312140665 0.364285063 0.037851095 0 0.026072199
0 0 0 0 0 # 8
1978 1 5 3 2 51 0 0 0 0 0
0 0.087884015 0.996537324 1.919547994 2.420556912 3.160185509
6.795377916 7.951583037 5.272030793 4.166380957 4.844926589
4.817915009 1.908539444 0.612197211 0.092066464 0 0.254113537
0 0 0 0 0 0 0 0 0.104801569
0.104801569 0.351536058 0.83392411 4.935510119 11.00935622
8.853795077 14.27735084 11.28032858 2.321600294 0.418744586 0
0.169957593 0 0 0 0.038450667 0 0 0 0
0 # 17
1979 1 5 3 2 21 0 0 0 0 0
0 0 0.031432732 1.843873631 3.394195091 5.013719672
0.19493405 0.978720169 1.105504996 5.942362138 4.867547219
4.178597485 3.124428509 1.93775847 0.916554456 1.046112406
0.75135092 0.718582823 0.19552662 0 0 0 0 0
0 0 0 0 0 3.568676556 7.212568591 12.03875924
5.911658415 16.57323177 11.76933945 5.770520765 0.914043821 0
0 0 0 0 0 0 0 0 0 # 7
1980 1 5 3 2 18 0 0 0 0 0
0 0.455618352 2.952404486 11.72030801 17.54413664 9.320705013
7.378168948 7.572366656 2.776497141 3.614785825 1.520553028
1.876305349 1.342676868 1.790235824 0 1.115034343 0.156238867
0 0 0 0 0 0 0 0 0 0.312477735
0 0.802076962 4.002237802 7.749227111 8.585779905 4.690508238

2.09622178 0.447558956 0 0 0 0 0.17787616 0
0 0 0 0 0 0 # 6
1981 1 5 3 2 108 0 0 0 0 0
0 0.183782793 3.998029919 7.417801049 11.32591241 7.483233447
3.761776092 2.685756985 4.450078769 4.747858737 2.774794092
3.307355794 1.724451976 1.761328735 1.038527571 1.238037928
0.773003508 0.359969389 0.249556688 0.003446099 0.002596554 0
0 0 0 0 0 0.02943569 0.845093641 2.877589841
10.16757814 12.90216535 5.591961805 3.772615986 2.505649692
1.422988766 0.492905554 0.077637711 0 0 0.027079288 0
0 0 0 0 0 # 36
1982 1 5 3 2 78 0 0 0 0 0
0 0 0.003920042 0.376101178 2.465704658 2.565941714
2.220568711 2.48125964 2.388622648 0.749436001 1.405875638
0.709029355 0.33297989 0.558062531 0.15993225 0.068662423
0.028883679 0.05125814 0.008419366 0 0 0 0 0
0 0 0 0 0.04711043 3.670818298 42.22776849
25.22528059 9.048537564 1.19336209 1.57708095 0.230166517
0.16344639 0.041770823 0 0 0 0 0 0 0
0 0 # 26
1983 1 5 3 2 78 0 0 0 0 0
0 0 0.744573561 3.12764534 2.635356825 1.660876509
2.363134607 3.277011337 7.061797602 3.994823362 5.99028097
3.253131666 1.856939284 1.273693928 1.051703557 0.867295054
0.265938326 0.361415965 0.276601733 0.464813331 0 0 0
0 0 0 0 0.18614339 0.57145976 2.206228188
5.792613968 10.01060705 15.13135394 11.21638597 7.424486366
2.810459316 2.72281099 1.370208235 0.030209866 0 0 0
0 0 0 0 0 # 26
1984 1 5 3 2 39 0 0 0 0 0
0 0 0 0 0.417836523 2.365175477 1.351903132
1.754919851 1.608341196 3.692765031 3.751371725 3.646257097
3.080197089 2.123016359 0.899124995 1.133251007 0.148816608
0.227768359 0.085614772 0 0 0 0 0 0 0
0 0 1.576344773 11.25690552 37.25797744 13.18045289
4.620255176 2.476193661 1.820607848 0.778720819 0.340394813
0.275594757 0.130193087 0 0 0 0 0 0 0
0 # 13
1985 1 5 3 2 39 0 0 0 0 0
0 0 0 1.152917569 7.114429162 7.656699529 3.50267084
2.294580248 3.00502564 2.299762339 1.878399589 1.909760159
1.053861518 0.537471946 0.37441102 0 0.021165895 0.011905993
0 0 0 0 0 0 0 0 0 0
0.503893531 7.949676308 30.45706697 19.57458171 3.768382497
2.727166764 0.826741793 1.25855733 0 0.023811986 0
0.097059661 0 0 0 0 0 0 0 # 13

1986 1 5 3 2 18 0 0 0 0 0
0 0 0 4.681674213 11.92612115 11.46325554 3.654612388
1.82793913 2.611992697 1.451476131 1.279959346 1.741705085
1.555318754 0.264985645 0.212699029 0.525253043 0 0 0
0 0 0 0 0 0 0 0 0 0
3.698854223 17.89249135 11.64881139 13.35148735 7.018737242
2.237457622 0.343362497 0.447406122 0 0 0 0
0.164400049 0 0 0 0 0 # 6
1987 1 5 3 2 30 0 0 0 0 0
0 0 0.293070036 0.586140072 2.90993917 1.941125142
2.368265834 6.311743485 2.160402269 3.026323411 1.565640848
1.051290319 0.448170268 0.240506568 0.162103782 0.304148861
0.039784304 0.04942103 0.217202044 0.039784304 0 0 0
0 0 0 0 0 3.853546794 17.35624612 23.02620433
15.71058147 9.569788349 3.561350165 2.431281184 0.728777331 0
0.047162514 0 0 0 0 0 0 0 0 0
10
1988 1 5 3 2 18 0 0 0 0
0.276386838 0 0 0.172784216 1.900286836 9.567006037
8.650351855 7.166245469 2.166214174 4.657055457 1.997591281
1.120661211 0.69579496 1.139668664 0.422137187 0.457381177 0
0.318695344 0 0.148479413 0 0 0 0 0 0
0 0 0 0.086392108 1.247605037 10.38846828 12.24727962
20.91412856 8.699306476 3.006803155 1.915885954 0.637390687 0
0 0 0 0 0 0 0 0 0 # 6
1989 1 5 3 2 27 0 0 0 0 0
0 0 0 0 1.923436481 3.595632111 10.54868138
10.06454616 4.836779646 4.943859238 3.288587465 2.677965853
1.962462851 0.591752004 0.59122656 0 0 0 0 0
0 0 0 0 0 0 0 0 0 2.532796912
13.99214964 17.49954113 10.87449551 4.954106439 3.624140932
0.578809784 0.578809784 0.340220129 0 0 0 0 0
0 0 0 0 # 9
1990 1 5 3 2 6 0 0 0 0 0
0 0 0 0 0 0 6.913264907 7.275509938
17.10203975 12.36224503 7.811225156 11.27550994 14 6.913264907
2 0 1.637754969 3.275509938 0 0 0 0 0
0 0 0 0 0 0 0 0 3.086735093
5.26020528 0 0.724490062 0 0.362245031 0 0 0
0 0 0 0 0 0 0 # 2
1991 1 5 3 2 36 0 0 0 0 0
0 0 0 0.57695458 1.528637966 2.096394935 4.412476305
7.837528339 10.08048784 12.87854653 4.647250819 3.754883479
2.413672524 1.906828996 0.284575962 1.627191683 0.934950027
0.543925294 0 0 0 0 0 0 0 0 0
0 0.082891233 3.213774273 12.42271642 15.47241691 7.787992342

4.536214273 0.627443564 0.332245707 0 0 0 0 0
0 0 0 0 0 0 # 12
1992 1 5 3 2 18 0 0 0 0 0
0 0 0 0 0 0.440551287 6.089432242 8.106804772
9.182986332 12.88120469 8.133097924 8.186062288 1.621183441
3.064403839 1.343878816 1.485563423 0.742781712 0.742781712
0.742781712 0 0 0 0 0 0 0 0 0
0 0 4.416092512 14.5089663 13.47435369 3.680178634
0.311803789 0.845090884 0 0 0 0 0 0 0
0 0 0 0 # 6
1999 1 5 3 2 3 0 0 0 0 0
0 0 0 0 0 0 3.703703704 3.703703704
3.703703704 7.407407407 11.11111111 18.51851852 7.407407407
3.703703704 0 0 3.703703704 0 0 0 0 0
0 0 0 0 0 0 0 0 0 25.92592593
3.703703704 7.407407407 0 0 0 0 0 0 0
0 0 0 0 0 0 # 1
2002 1 5 3 2 36 0 0 0 0 0
0 1.197759461 0 0 0 0 0.662018482 0.388924166
0.319006024 0.724763086 0.238950817 0.909888741 0.594296432
0.658416796 0.741651333 0.501619202 0.088178661 0 0 0
0 0 0 0 0 0 0 0 0 18.83542089
14.58830785 29.19178067 22.82130957 4.699962785 2.288776686
0.264146406 0.237373619 0.047448325 0 0 0 0 0
0 0 0 0 # 12
2003 1 5 3 2 21 0 0 0 0 0
0 0 0 0.156626128 9.096442297 12.27853667 2.787180666
2.479367485 4.165523046 3.485026832 2.567173082 3.182026162
1.73844056 1.018232038 1.368663456 0.224396369 0 0 0
0 0 0 0 0 0 0 0.156626128 0 0
0.626504511 13.67967827 14.13435795 18.91665478 3.890111751
2.352293567 1.022949145 0.329518893 0.343670214 0 0 0
0 0 0 0 0 0 # 7
2004 1 5 3 2 36 0 0 0 0 0
0 0 0.111903473 0.223806945 4.689622379 8.353433052
5.879762334 3.992990609 4.671192653 2.658086394 1.106264423
2.567747674 2.063285774 0.850800544 0.167855416 0.015281092 0
0 0 0 0 0 0 0 0 0 0 0
0.486865808 0.602739546 8.730757729 31.69529128 11.79483326
4.422515626 4.914963993 0 0 0 0 0 0 0
0 0 0 0 0 # 12
2005 1 5 3 2 24 0 0 0 0 0
0 0 0 6.025229008 1.274875314 2.8622415 8.241588041
7.844483531 11.05573122 7.498301452 16.14902105 3.801854793
4.833667849 1.856072796 0 0 0 1.830356416 0 0
0 0 0 0 0 0 0 0 0 2.062125384

4.602968393 8.542788228 1.144754749 0.603535206 6.109692231
3.660712832 0 0 0 0 0 0 0 0 0
0 0 # 8
2006 1 5 3 2 75 0 0 0 0 0
0 0 0 0.105694913 1.339337038 2.941414488 13.41536382
7.118198884 4.583777662 6.993688183 5.259573613 4.480428487
1.584055307 0.980128028 0.351205696 0.21604529 0.037958923 0
0 0 0 0 0 0 0 0 0 0
0.151902862 1.542551986 8.721030702 16.7865717 17.19726126
5.735399634 0.45841152 0 0 0 0 0 0 0
0 0 0 0 0 # 25
2007 1 5 3 2 129 0 0 0 0 0
0 0 0 0 0.093218034 3.262479313 4.02757268
6.9662245 5.404950892 5.910510739 3.919050539 2.569113687
2.055516789 0.482055894 0.408338351 0.275618508 0 0 0
0.05213598 0 0 0 0 0 0.04880113 0 0
0.188872209 1.337069656 5.556968745 19.4920829 21.30299187
11.5755119 3.473063858 1.114392093 0.483459727 0 0 0
0 0 0 0 0 0 0 # 43
2008 1 5 3 2 129 0 0 0 0 0
0 0.107614875 0 0 0 0.44176571 2.390131894
6.440652016 6.601542399 4.962495535 3.705329778 3.101743818
2.745786321 1.462873804 0.513559556 0.334501059 0.124935221
0.209804409 0 0 0 0 0 0 0 0 0
0 0.003262441 0.683034664 3.824495374 13.64689894 25.03504303
17.58359031 5.407547867 0.127195236 0.369420529 0 0
0.176775207 0 0 0 0 0 0 0 # 43
1948 2 6 3 2 8 0 0 0 0 0
0 0 0 0 0 1.136897933 1.136897933 3.410693799
2.680280588 5.2846753 6.073609022 4.582450431 3.340219411
8.963670825 3.202673333 3.324112915 0.429261575 1.248901378 0
0.835746298 0 0 0 0 0 0 0 0 0
0 0.406484722 1.543382655 3.328137565 11.6853525 11.70800928
8.458523373 12.88920205 3.187248824 0.730413211 0.41315508 0
0 0 0 0 0 0 # 4
1949 2 6 3 2 8 0 0 0 0 0
0 0 0 0 0 1.000983598 0 1.854399975
1.427691786 2.310237076 2.295335367 4.444869784 6.222421297
2.176897059 3.941313134 0 0.881870785 0 0 0 0
0 0 0 0 0 0 0 0 0 0
2.339365989 5.223878475 9.416295429 13.18200419 20.52192474
15.78914198 4.354211379 1.749514366 0.867643581 0 0 0
0 0 0 0 # 4
1962 2 6 3 2 6 0 0 0 0 0
0 0 0 0 3.85552741 2.404930064 3.053884056
9.122011964 9.382469438 13.35104601 16.29716195 5.166933215

9.708119096 4.54118588 1.198356645 0.473057972 0.473057972 0
0 0 0 0 0 0 0 0 0 0 0
0 2.404930064 2.252240701 8.283664131 6.03142343 0.473057972
1.526942028 0 0 0 0 0 0 0 0 0
0 0 # 3
1964 2 6 3 2 44 0 0 0 0 0
0 0 0.391883529 0.639246638 3.106452905 3.856566846
3.793657452 3.955335002 4.750909085 4.763899443 3.329321828
5.133019801 3.946034242 3.225958688 3.082277827 0.677503309
0.618189933 0 0 0 0 0 0 0 0 0
0 0.130627843 0.261255686 2.763343353 4.917289923 7.628722543
9.939173006 8.89066834 8.147465266 7.311264407 4.099046664
0.640886441 0 0 0 0 0 0 0 0 0
22
1965 2 6 3 2 28 0 0 0 0 0
0 0 0 0.133552508 3.523914762 5.285918096 8.70655157
7.389459476 6.224164895 6.870988686 4.649937835 5.521286526
4.610669917 4.195964642 6.603163658 2.479279483 1.797462267
1.432908398 0.267845313 0 0 0 0 0 0 0
0 0 0 0.216583222 1.33661243 8.409949328 6.493404764
7.307615595 4.373779229 1.048200829 0.785617832 0.335168739 0
0 0 0 0 0 0 0 0 # 14
1966 2 6 3 2 66 0 0 0 0 0
0 0 0.012546576 0.40659974 1.933521922 4.043090878
5.323219715 6.559089245 6.772012178 6.954321588 4.305014153
1.759158859 1.015355416 0.577576508 0.439032855 0.108910462
0.204020491 0.154738853 0.015551102 0.015551102 0 0 0
0 0 0 0 0 0 0.58765576 10.96636344
19.92123513 15.16348742 7.521722608 3.219004675 1.337727305
0.613428843 0.07006318 0 0 0 0 0 0 0
0 0 # 33
1967 2 6 3 2 88 0 0 0 0 0
0 0 0 1.685219953 3.406392781 4.441665738 4.70724993
7.022284988 4.647468386 8.042701623 6.009309205 3.559683486
0.936914457 1.068824326 0.625863277 0.526429925 0.332517312
0.135285522 0.168630305 0 0 0 0 0 0 0
0 0 0.001437248 1.744510919 6.075836222 10.22396632
14.43255674 8.345226147 7.516633281 3.500287177 0.458152603
0.384952123 0 0 0 0 0 0 0 0 0
44
1968 2 6 3 2 150 0 0 0 0 0
0 0 0 0.3705097 1.567752869 5.917228149 8.486947477
8.083918723 7.344534911 7.998914479 5.338784342 2.787659568
1.249841247 0.42983876 0.147782364 0.165310309 0.018752923
0.035298412 0.004523723 0 0 0 0 0 0 0
0 0.026668042 0.055187744 1.227885769 5.105500016 6.196390966

10.93181517 12.69065245 8.550498451 3.610961079 0.887090588
0.6999982 0.068905321 0.000566463 0.000281788 0 0 0
0 0 0 # 87
1969 2 6 3 2 98 0 0 0 0 0
0 0 0.099543591 0.32208807 1.401093093 3.215150018
5.489896319 6.732987539 6.079206295 6.769634977 4.627055763
7.406189181 3.071479288 0.781891979 0.287010796 0.360534465
0.034418071 0.041405681 0.008024109 0 0 0 0 0
0 0 0 0 0.430810512 0.773799937 3.125376758
6.68703485 14.59723066 11.92546136 9.193972594 2.607981085
1.981475551 1.490521529 0.289316131 0.024880159 0.144529642 0
0 0 0 0 0 # 49
1970 2 6 3 2 58 0 0 0 0 0
0 0 0 1.113480272 8.573931585 23.05609164 7.542784129
2.45828791 2.480372557 1.193933874 1.188249946 1.068322931
0.364748338 0.151940333 0.122911545 0.290641423 0.078715496
0.032510549 0.009789704 0 0 0 0 0 0 0
0.030475461 0 0 1.922161519 15.77511311 18.16938993
7.330532021 2.985534602 1.712625631 1.080051063 0.861763318
0.342469422 0.049871291 0.013300402 0 0 0 0 0
0 0 # 29
1971 2 6 3 2 74 0 0 0 0 0
0 0 0 0.301144806 0.829364362 9.891427606 7.504832487
10.54717194 9.720596088 7.338071346 5.537462534 2.629375209
1.619518742 0.62752816 0.408610746 0.27699313 0.052207552
0.034176623 0.045470768 0 0 0 0 0 0 0
0 0 0.059713446 0.252386373 2.672884747 13.74664787
10.50132104 6.406450183 3.400076816 3.502064422 0.763031853
0.978740425 0.352730727 0 0 0 0 0 0 0
0 # 37
1972 2 6 3 2 78 0 0 0 0 0
0 0 0 0.197782368 1.819323928 2.110309627 5.647197488
6.600537016 4.718637456 6.762964772 4.969341802 1.229358095
2.069238495 1.060744879 0.295856711 0.111534343 0.051005602
0.095494424 0.031826285 0.031635247 0.002299054 0 0 0
0 0 0 0 0.041555082 0.638212688 4.795652784
12.26692883 17.94584651 13.75286922 9.094515641 2.695991465
0.413940969 0.467468375 0.081930844 0 0 0 0 0
0 0 0 # 39
1973 2 6 3 2 82 0 0 0 0 0
0 0 0 0.379822019 3.075853875 1.831621914 2.677980546
3.688680213 5.724286169 5.331126698 4.19982681 4.813124058
2.671050414 0.950058287 0.367779749 0.336530999 0.26322074
0.124222562 0.151176013 0.030000306 0 0 0 0 0
0 0.105642225 0 0.025378952 0.461609872 6.132572697
10.59564835 12.78882962 9.941996437 9.895512964 7.158531003

3.482442701 1.71989471 0.829401854 0.222900749 0.023276497 0
0 0 0 0 0 # 41
1974 2 6 3 2 70 0 0 0 0 0
0 0 0.10893525 0.683340983 6.271818775 7.478681739
10.07622194 6.141744294 4.941112888 4.067286476 4.31638797
1.63443956 0.800039299 0.449194029 0.279040258 0.159205512
0.054340588 0 0.009602256 0 0 0 0 0 0
0 0 0 0.407595563 2.15479164 8.87581714 11.46820634
9.251973816 9.011048267 5.803011291 4.061454132 0.913724059
0.34523034 0.235755593 0 0 0 0 0 0 0
0 # 35
1975 2 6 3 2 38 0 0 0 0 0
0 0 0.355686732 1.710496934 2.003720971 6.287729941
10.58012829 9.583702093 5.344001875 5.903609697 1.733958064
3.089674878 0.971308288 0.784629735 0.578440151 0.46180029
0.405875909 0 0 0 0 0 0 0 0 0
0 0 0.20049167 1.78883189 5.267113893 13.13677093
10.60376397 9.325373944 4.579626114 1.865275224 0.613544263
0.949280183 0.42319073 0.829699053 0.207424763 0.414849526 0
0 0 0 0 # 19
1976 2 6 3 2 52 0 0 0 0
0.027841113 0.01494995 0 0.01494995 0.082729416 3.697920887
6.508095658 6.037776461 4.768035993 3.639467611 2.469456753
1.759939651 1.472078378 0.619367233 0.558401988 0.615439665
0.383465455 0.248881144 0.180532045 0.130417002 0.01157273 0
0 0 0 0 0 0 0.757951007 0.406816617
3.028815308 23.04554423 17.12383975 11.534101 5.538442125
3.301217934 1.253414324 0.415282591 0.172672398 0.068392585
0.082710476 0 0 0.02948057 0 0 0 0 #
26
1977 2 6 3 2 76 0 0 0 0
0.006225133 0 0.034728141 0.569216836 1.570618769 7.578907688
9.198531991 9.648065098 7.230650502 6.602429984 4.784777241
4.119297064 3.019147128 1.309243978 0.773540293 0.547533227
0.646490371 0.250061645 0.234320878 0.138959738 0 0.009514729
0 0 0 0 0 0 0.033522963 0.230943355
0.718249188 4.180132969 9.11904271 10.43443142 8.767502088
4.626107427 2.295490438 0.8863347 0.418244927 0.01773738 0
0 0 0 0 0 0 0 # 38
1978 2 6 3 2 66 0 0 0 0 0
0 0 0.007316712 0.836444181 4.37722891 9.034244088
11.78770902 9.628451236 6.684065673 7.206822151 2.825847169
2.44701006 2.229815102 1.005752517 0.622546615 0.781362365
0.482733469 0.712247736 0.124418735 0 0 0 0 0
0 0 0 0.041482888 0.027668823 1.041679339 4.382994958
9.595478071 12.78250478 6.339215882 3.602948098 1.300319724

0.071141141 0.020550556 0 0 0 0 0 0 0
0 0 # 33
1979 2 6 3 2 24 0 0 0 0 0
0 0.096728481 0.344105202 3.111976591 4.473639795 6.411264357
7.082551555 11.37686037 4.653190332 4.427232225 2.172507677
1.548269565 0.931557788 0.912909969 0.507761672 0.178262895
0.843736134 0.274940478 0 0.257118678 0 0 0 0
0 0.115615642 0 0.051795467 0.22337755 2.064398394
3.771954805 11.60144921 13.2218857 8.043663913 5.123473912
2.80924556 0.631812394 0.089650907 1.056398844 0.542161487
0.08450442 0.963998031 0 0 0 0 0 # 12
1980 2 6 3 2 150 0 0 0 0 0
0 0.011272739 0.816056131 4.958051055 11.95263752 10.30834349
7.152063502 5.248023289 3.86243786 3.381772755 2.638951512
1.309161061 0.600462205 0.482559296 0.349518447 0.168983846
0.140280985 0.097023621 0.03490124 0.004603153 0.003408344 0
0 0 0 0 0 0.005555001 0.879341558 7.15010951
13.05622074 11.0174719 7.227769712 4.154269743 1.525867684
1.104723779 0.271762818 0.050839667 0 0.02599609 0.009559742
0 0 0 0 0 0 # 81
1981 2 6 3 2 130 0 0 0 0 0
0 0.041776821 0.186882424 2.20015525 6.712805559 8.564941823
8.911575865 7.735157825 5.4200889 4.852465717 4.435501934
2.802524118 1.23198819 1.058880062 0.325620552 0.293643283
0.153056836 0.128399481 0.001574236 0.006647865 0 0 0
0 0 0 0 0 0.614411041 5.098000124 10.52277571
8.954220686 8.448954295 5.740215819 2.952167348 1.560920344
0.535602733 0.290770556 0.089598006 0.045755528 0.082921068 0
0 0 0 0 0 # 65
1982 2 6 3 2 68 0 0 0 0 0
0 0.009528321 0.466701309 3.324393427 4.973799251 6.957688412
8.801272475 8.213101721 5.536225877 4.188096489 2.685765557
1.253472168 1.1554886 0.432848997 0.413292975 0.141515946
0.188605138 0.093107501 0.162774811 0.081720895 0.010825208 0
0 0 0 0 0 0 0.214309497 1.319876763
7.416858546 20.36068457 12.30580862 6.344183771 1.828887934
0.616146532 0.406272078 0.096746609 0 0 0 0 0
0 0 0 0 # 34
1983 2 6 3 2 66 0 0 0 0 0
0.006581111 0 0.558124947 0.725328581 5.975768905 9.697481286
9.652686389 10.54583438 8.766640258 7.184768779 4.187270839
2.194477586 1.395334323 0.510042521 0.546983427 0.33729377
0.337578084 0.172916851 0.066958358 0 0 0 0 0
0 0 0 0 0.323969479 1.789772597 6.861726932
9.394596597 7.620403363 3.401808981 1.316478705 2.552150447

1.707022937 0.78797312 0.703020838 0.084952282 0.27681642
0.021238071 0 0.197332554 0.098666277 0 0 # 33
1984 2 6 3 2 38 0 0 0 0 0
0 0 0.59927138 2.753675725 4.983000012 7.292718638
3.773513321 3.089413865 4.247229935 3.864786435 0.959278189
0.302795781 0.687053109 0.264031988 0.575202994 0 0.183521232
0 0.171980773 0 0 0 0 0 0 0.015034856
0 0.074372854 1.518010565 5.294032211 14.52003189 21.00077012
9.174629994 5.525166535 3.414253538 4.150072035 0.747161106
0.818990921 0 0 0 0 0 0 0 0 0
19
1985 2 6 3 2 34 0 0 0 0 0
0 0.022378398 0.646050617 1.664359003 8.413127332 12.20091215
11.47855413 9.388101251 6.98908154 3.77197062 1.844054384
1.927946646 0.693027891 0.803429423 0.644605512 0.560191238
0.019422747 0.195444621 0.005932107 0 0 0 0 0
0 0 0 0.133861448 0.24087844 1.431382885 8.756293422
10.45084283 8.604881121 4.723718197 2.904121128 0.885520963
0.063644457 0.357510335 0.178755167 0 0 0 0 0
0 0 0 # 17
1986 2 6 3 2 32 0 0 0 0 0
0 0 1.860189689 8.664700574 10.92639083 8.453919558
8.874276535 5.58668955 4.385897974 0.990496541 0.82660856
0.350502016 0.393924776 0.356778306 0.033265661 0.073168371
0.034520108 0 0 0 0 0 0 0 0 0
0 0.078923257 2.763876212 7.367907134 14.84468568 10.13793884
8.151559346 3.270755323 1.192248804 0.380776347 0 0 0
0 0 0 0 0 0 0 0 # 16
1987 2 6 3 2 28 0 0 0 0 0
0 0.459935726 0.510045511 7.196746911 6.190487113 7.929723213
4.629850087 5.821376438 5.060148579 3.185981567 0.636803886
0.542044004 0.332735007 0.151340249 0.261224173 0.094214686 0
0.00402665 0.080025317 0 0 0 0 0 0 0
0 0 6.235089032 13.49704496 14.92200381 12.6098735
5.551501931 2.525948503 0.853132762 0.535203173 0.183493213 0
0 0 0 0 0 0 0 0 0 # 14
1988 2 6 3 2 12 0 0 0 0 0
0 0 0.875121392 7.753680538 5.690427882 8.95757403
7.181897271 6.148803058 2.44088212 2.713759954 2.417987823
0.913548272 2.195201514 0.870915009 0.36810497 0.522549005
0.362798174 0 0 0 0 0 0 0 0
0 0 0 10.89136793 23.20125771 10.64533579 2.381230162
1.740994782 0.990352672 0.174183002 0.193921968 0 0
0.36810497 0 0 0 0 0 0 0 # 6
1989 2 6 3 2 18 0 0 0 0 0
0 0 0.528752504 1.586257512 4.951886165 13.14190539

18.11727261 15.23269501 6.902160118 5.36619235 2.255240482
0.995077555 1.552448733 0.66468518 0.103384796 0.206769593
0.103384796 0.310154389 0 0 0 0 0 0 0
0 0 0 0.264376252 3.703882285 5.808668253 7.068271125
6.508649714 1.280400913 2.165875109 0.310154389 0.66468518
0.206769593 0 0 0 0 0 0 0 0 0
9
1990 2 6 3 2 2 0 0 0 0 0
0 0 0 0 0 7.894736842 10.52631579 23.68421053
5.263157895 13.15789474 0 0 2.631578947 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 21.05263158 10.52631579 5.263157895 0
0 0 0 0 0 0 0 0 0 0 0
0 # 1
1991 2 6 3 2 2 0 0 0 0 0
0 0 0 0 0 7.317073171 12.19512195 7.317073171
17.07317073 2.43902439 2.43902439 2.43902439 2.43902439 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 2.43902439 12.19512195 17.07317073
12.19512195 0 0 0 0 2.43902439 0 0 0
0 0 0 0 0 # 1
2001 2 6 3 2 16 0 0 0 0 0
2.855639282 1.846104271 4.652900205 18.05219475 20.85675968
6.331607402 8.99982093 5.865256724 2.036725502 2.422661947
0.822092427 0.687044996 0.047144966 0.266094932 0.047144966
0.047144966 0 0 0 0 0 0 0 0 0
0 0 0 1.25485389 10.53111824 2.217535278 3.39970595
2.231546042 3.498597665 0.747435194 0.282869796 0 0 0
0 0 0 0 0 0 0 0 # 8
2002 2 6 3 2 18 0 0 0 0 0
0 0 0 0.588139052 10.4184025 8.215668281 4.67822485
7.666704295 0.251140567 0.64952962 0.613516626 0.401081448
0.317538882 0.306022305 0.182038045 0.153011152 0.029026893 0
0 0 0 0 0 0 0 0 0 0
0.028787066 6.079117493 33.16915602 20.72817393 4.133765657
1.242168315 0.119760108 0.029026893 0 0 0 0 0
0 0 0 0 0 0 # 9
2003 2 6 3 2 60 0 0 0 0 0
0 0.443090816 1.964099617 8.398953039 8.375758641 4.563002445
3.946994607 4.158287983 1.309999743 1.016043472 0.364000416
0.014453973 0.109277273 0.005724129 0 0.358866138 0.000577277
0 0 0 0 0 0 0 0 0 0
1.99590783 3.523323493 11.15936843 35.6247352 5.171737818
2.816437696 3.857359091 0.422764001 0.044608841 0.354628023 0
0 0 0 0 0 0 0 0 0 # 30

```
2004	2	6	3	2	26	0	0	0	0	0
0	0	0	0.082018259	1.079543886	0.343935424	2.465137244
5.566892205	5.898771236	3.802894332	1.143659683	1.300753645
2.276583121	0.481372064	0.631574161	0.250712104	0.017430576	0
0	0	0	0	0	0	0	0	1.74262699
0.037935141	0.927800016	2.238596291	15.7302307	26.38676453
17.71864609	6.133629656	3.074236039	0.668256603	0	0	0
0	0	0	0	0	0	0	0	#	13
2005	2	6	3	2	68	0	0	0	0	0
0	0.010554485	0	1.073959564	0.983892536	3.424174797
4.32326928	5.525420588	8.990546321	10.55450176	7.150343733
1.593788102	2.302804136	0.987837654	0.627465077	0.40281954
0.081709896	0	0	0	0	0	0	0	0	0
0	0	0.726847504	0.82939519	9.251886407	11.24913345
18.40498834	4.806649291	1.687325491	2.21439031	1.522067382
0.550302039	0.491473019	0.079508946	0.152945172	0	0	0
0	0	0	#	34
2006	2	6	3	2	86	0	0	0	0	0
0	0	0	0.041334318	0.720916563	3.020533671	6.745242981
12.19344959	9.68326957	8.049969144	5.610635955	2.561100061
0.798321623	0.493711784	0.043336125	0.011475491	0.131999033	0
0.024565832	0	0	0	0	0	0	0	0
0.025165499	0.115152594	0.452672174	2.21662843	7.507774335
23.0514772	9.892996615	4.146872513	2.324260904	0.109998594
0.027139399	0	0	0	0	0	0	0	0	0
#	43
2007	2	6	3	2	150	0	0	0	0	0
0.001537629	0	0.006150515	0.344678583	1.277721509	2.080319824
5.119753947	5.752352468	7.303540462	4.229136837	6.571198665
2.774051834	2.226957671	1.532461338	0.643979904	0.460709502
0.077509235	0.005682923	0	0	0	0	0.009864525	0
0	0	0.024725997	0.118814845	0.223152289	3.991976211
9.307104727	12.49243549	14.34558382	11.09433082	4.316669575
2.1117629	0.508176288	0.410345153	0	0.389203336	0.019137513
0.228973662	0	0	0	0	0	#	102
2008	2	6	3	2	2	0	0	0	0	0
0	0	0	0	0	6.666666667	6.666666667	10
6.666666667	16.66666667	10	10	3.333333333	6.666666667
3.333333333	6.666666667	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	10	0
3.333333333	0	0	0	0	0	0	0	0	0
0	0	0	#	1
#	#DISCARDS
```

#
\# #Year season fleet sex prt Nsamp 12 14 16 18 20
22 24 26 28 30 32 34 36 38 40 42
44 46 48 50 52 54 56 58 60 62 12
14 16 18 20 22 24 26 28 30 32 34
36 38 40 42 44 46 48 50 52 54 56
58 60 62 # Nsamp
1986 2 4 3 1 50 0 0 0 1 7
11 13 19 20 9 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 2 2 6 6 3 13 15 2 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 # 50
1987 2 4 3 1 50 0 0 0 0 3
13 17 30 5 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 2 13 28 17 7 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 # 50
\# #year Season Fleet gender partition nSamps U12 U14 U16
U18 U20 U22 U24 U26 U28 U30 U32 U34 U36 U38
U40 U42 U44 U46 U48 U50 U52 U54 U56 U58 U60
U62 U12.1 U14.1 U16.1 U18.1 U20.1 U22.1 U24.1 U26.1 U28.1 U30.1
U32.1 U34.1 U36.1 U38.1 U40.1 U42.1 U44.1 U46.1 U48.1 U50.1 U52.1
U54.1 U56.1 U58.1 U60.1 U62.1 # nSamps
2006 1 1 0 1 7 0 0 0 0 0
0 9.8628982 30.1076 37.9376732 18.66241 0
3.4294174 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
9.8628982 30.1076 37.9376732 18.66241 0 3.4294174
0 0 0 0 0 0 0 0 0 0 0
0 0 0 # 7
2007 1 1 0 1 6 0 0 0 0 0
0 0.3895674 0 0.3895674 18.85506 53.1369914
22.3981768 4.8306356 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0.3895674 0 0.3895674 18.85506 53.1369914
22.3981768 4.8306356 0 0 0 0 0 0 0
0 0 0 0 0 0 # 6
2008 1 1 0 1 7 0 0 0 0 0
0 0 2.268713 6.5638742 19.48375 12.1541167
14.6504999 33.791279 0 0 0 11.0877634 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 2.268713 6.5638742 19.48375 12.1541167

14.6504999 33.791279 0 0 0 11.0877634 0 0
0 0 0 0 0 0 0 # 7
2006 2 2 0 1 53 0 0.0145547 1.400822
1.5834835 3.674926 3.7290985 10.5953416 15.075532
19.7043435 23.61028 11.2126292 4.7461738 3.0954613
0.1309923 0.1339032 1.2924574 0 0 0 0 0
0 0 0 0 0 0 0.0145547 1.400822
1.5834835 3.674926 3.7290985 10.5953416 15.075532
19.7043435 23.61028 11.2126292 4.7461738 3.0954613
0.1309923 0.1339032 1.2924574 0 0 0 0 0
0 0 0 0 0 # 53
2007 2 2 0 1 33 0 0 0 0.2428436
1.1081138 8.3647316 7.1079386 13.308321 27.3843514
26.18828 7.10749 3.013289 1.828234 1.2871137
1.8867053 0.8884057 0.1301862 0 0.1539952 0 0
0 0 0 0 0 0 0 0 0.2428436
1.1081138 8.3647316 7.1079386 13.308321 27.3843514
26.18828 7.10749 3.013289 1.828234 1.2871137
1.8867053 0.8884057 0.1301862 0 0.1539952 0 0
0 0 0 0 0 # 33
2008 2 2 0 1 1 0 0 0 0 0
0 0 0 0 60 20 20 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 60 20 20
0 0 0 0 0 0 0 0 0 0 0
0 0 0 # 1
2006 1 3 0 1 2 0 0 0 0 0
0 0 0 0 0 23.6021301 34.7850894 41.6127805
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 23.6021301 34.7850894 41.6127805 0 0 0 0
0 0 0 0 0 0 0 0 0 # 2
2007 1 3 0 1 5 0 0 0 0 0
0 17.6785714 17.678571 0 17.67857 38.2142857
2.3214286 3.75 2.6785714 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 17.6785714 17.678571 0 17.67857 38.2142857
2.3214286 3.75 2.6785714 0 0 0 0 0 0
0 0 0 0 0 0 # 5
2008 1 3 0 1 7 0 0 0 0 0
0.4190349 0 0 9.3565128 41.47866 23.4659561
17.9886323 6.034103 0 0 1.2571048 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0.4190349 0 0 9.3565128 41.47866 23.4659561
17.9886323 6.034103 0 0 1.2571048 0 0 0
0 0 0 0 0 0 0 # 7

2006 2 4 0 1 23 0 0.5698264 4.237238
2.2613913 13.9656002 10.1472687 7.3674479 10.308824
11.1746035 27.81766 7.7192164 4.0592208 0.1858534
0.1858534 0 0 0 0 0 0 0 0 0
0 0 0 0 0.5698264 4.237238 2.2613913
13.9656002 10.1472687 7.3674479 10.308824 11.1746035
27.81766 7.7192164 4.0592208 0.1858534 0.1858534 0
0 0 0 0 0 0 0 0 0 0 0
23
2007 2 4 0 1 13 0 0 1.921435 0
0.9718087 2.6320164 1.5988078 10.050175 29.8480643
39.3052 7.3496369 2.636585 1.9740089 0.0444113
1.6234406 0 0.0444113 0 0 0 0 0 0
0 0 0 0 0 1.921435 0 0.9718087
2.6320164 1.5988078 10.050175 29.8480643 39.3052
7.3496369 2.636585 1.9740089 0.0444113 1.6234406 0
0.0444113 0 0 0 0 0 0 0 0 0
13
2006 1 5 0 1 2 0 0 0 0 0
0.08 0 0 59.952 19.984 19.984 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0.08 0 0 59.952 19.984 19.984 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 # 2
2007 1 5 0 1 15 0 0.0817351 0
0.8377853 0.0817351 3.1982964 15.35331 6.446179
31.8273019 41.23662 0.5283594 0.2452054 0.0817351 0
0 0 0 0.0817351 0 0 0 0 0 0
0 0 0 0.0817351 0 0.8377853 0.0817351
3.1982964 15.35331 6.446179 31.8273019 41.23662
0.5283594 0.2452054 0.0817351 0 0 0 0
0.0817351 0 0 0 0 0 0 0 0 #
15
2008 1 5 0 1 10 0 0.0815827 0 0
0 1.2441362 6.2900265 4.164797 15.4476851 15.04385
34.117887 11.2257801 11.2257801 0.5547624 0.0815827
0.4405466 0 0.0815827 0 0 0 0 0 0
0 0 0 0.0815827 0 0 0 1.2441362
6.2900265 4.164797 15.4476851 15.04385 34.117887
11.2257801 11.2257801 0.5547624 0.0815827 0.4405466 0
0.0815827 0 0 0 0 0 0 0 0 #
10
2006 2 6 0 1 62 0 0 0.138187
0.1439448 0.5815369 7.3770714 7.2056735 8.451895
22.6088617 21.47204 16.6067372 13.6188223 1.3230915
0.4145609 0.028789 0 0 0 0.028789 0 0

```
	0	0	0	0	0	0	0	0.138187	0.1439448
	0.5815369	7.3770714	7.2056735	8.451895	22.6088617
	21.47204	16.6067372	13.6188223	1.3230915	0.4145609
	0.028789	0	0	0	0.028789	0	0	0	0
	0	0	0	#	62
	2007	2	6	0	1	34	0	0	0	0.95884
	1.7330146	2.2159858	8.1110763	16.083858	28.2490681
	23.43394	11.3587881	6.6693078	0.1704604	0.2485882	0
	0	0.191768	0.191768	0.383536	0	0	0	0
	0	0	0	0	0	0	0.95884	1.7330146
	2.2159858	8.1110763	16.083858	28.2490681	23.43394
	11.3587881	6.6693078	0.1704604	0.2485882	0	0
	0.191768	0.191768	0.383536	0	0	0	0	0
	0	0	#	34
#	2008	2	6	0	1	12	0	0	0	0.3221909
	7.7325816	10.2456706	13.2098268	15.940395	24.0837696
	22.79501	3.221909	2.1264599	0.3221909	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.3221909	7.7325816	10.2456706	13.2098268
	15.940395	24.0837696	22.79501	3.221909	2.1264599
	0.3221909	0	0	0	0	0	0	0	0	0
	0	0	0	0	#	12
#	#Early LFs from Demory & Bailey 1967 (no expansions)

						#
#	#Year	season	fleet	sex	mkt	Nsamp	Fem12	14	16	18	20
	22	24	26	28	30	32	34	36	38	40	42
	44	46	48	50	52	54	56	58	60	62
	MAL12		14	16	18	20	22	24	26	28	30
	32	34	36	38	40	42	44	46	48	50	52
	54	56	58	60	62	#	Nsamp
#	1949	2	4	3	2	28	0	0	0	0	0
	0	0	0	0.290275762	0.725689405	2.757619739	2.757619739
	6.095791001	6.095791001	8.127721335	8.127721335	9.869375907
	10.59506531	8.708272859	5.079825835	2.90275762	0.290275762
	0.435413643	0	0	0	0	0	0	0	0	0
	0	0.145137881	0.725689405	0.435413643	1.45137881	3.193033382
	5.079825835	7.692307692	5.660377358	1.596516691	0.580551524
	0.145137881	0.435413643	0	0	0	0	0	0	0
	#	23
#	1949	2	2	3	2	82	0	0	0	0	0
	0	0	0	0.389294404	1.070559611	2.530413625	3.114355231
	4.671532847	4.866180049	6.569343066	6.763990268	4.330900243
```

3.698296837 2.04379562 0.681265207 0.291970803 0.194647202 0
0.0486618 0 0 0 0 0 0 0 0 0
0.097323601 0.291970803 0.827250608 3.406326034 6.180048662
11.58150852 15.47445255 12.11678832 5.936739659 2.481751825
0.291970803 0.0486618 0 0 0 0 0 0 0
69
1950 2 4 3 2 52 0 0 0 0 0
0 0 0 0 1.607963247 2.756508423 4.82388974
5.28330781 7.427258806 8.039816233 8.039816233 9.954058193
10.10719755 7.656967841 2.756508423 1.378254211 0.153139357
0.076569678 0 0 0 0 0 0 0 0 0
0 0 0.153139357 1.761102603 3.598774885 5.436447167
6.661562021 6.967840735 3.36906585 1.45482389 0.535987749 0
0 0 0 0 0 0 0 0 # 44
1950 2 2 3 2 115 0 0 0 0 0
0 0 0.10460251 0.383542538 1.569037657 2.405857741
3.69595537 3.626220363 4.637377964 8.193863319 8.751743375
8.647140865 7.531380753 5.020920502 3.172942817 1.080892608
0.523012552 0.10460251 0.034867503 0 0 0 0 0
0 0 0 0 0 0.453277545 1.429567643 2.649930265
5.19525802 6.90376569 10.25104603 7.461645746 4.60251046
1.255230126 0.313807531 0 0 0 0 0 0 0
0 # 96
1951 2 4 3 2 8 0 0 0 0 0
0 0 0 1.005025126 2.010050251 3.015075377 3.51758794
5.527638191 5.025125628 8.542713568 3.51758794 9.045226131
9.547738693 9.547738693 4.020100503 1.507537688 0 0 0
0 0 0 0 0 0 0 0 0 0
1.005025126 2.010050251 4.020100503 5.527638191 9.045226131
6.030150754 3.015075377 2.010050251 1.005025126 0.502512563 0
0 0 0 0 0 0 0 # 7
1951 2 2 3 2 71 0 0 0 0 0
0 0 0 0.22675737 1.303854875 2.891156463 4.024943311
4.931972789 4.761904762 4.308390023 5.158730159 5.839002268
6.065759637 6.009070295 3.344671202 2.721088435 0.907029478
0.113378685 0 0 0 0 0 0 0 0 0
0 0 0.340136054 2.040816327 4.421768707 6.292517007
9.693877551 9.070294785 9.467120181 4.081632653 1.41723356
0.340136054 0.22675737 0 0 0 0 0 0 0
59
1960 2 4 3 2 8 0 0 0 0 0
0 0 0 0 0 3 5.5 10.5 6.5 8 6
3 2.5 1 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 2 5 11 12.5
10 6.5 5 1 0 0 0 0 0 0 0
0 0 0 # 7

1963 2 4 3 2 4 0 0 0 0 0
0 0 0 0 0 1 3 5 3 7 8
10 5 6 2 2 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 3
6 7 5 8 2 6 6 4 1 0 0
0 0 0 # 3
1963 2 2 3 2 8 0 0 0 0 0
0 0 0 0 1.5 8.5 9 18.5 15.5 11.5 8.5
2.5 2.5 1 1.5 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1 3
3 3.5 6 2 0.5 0 0.5 0 0 0 0
0 0 0 # 7
1964 2 4 3 2 3 0 0 0 0 0
0 0 0 0 0 0 0 0 5.797101449
7.246376812 15.94202899 13.04347826 4.347826087 7.246376812
8.695652174 0 0 0 1.449275362 0 0 0 0
0 0 0 0 0 0 0 0 7.246376812
15.94202899 8.695652174 2.898550725 0 0 0 1.449275362
0 0 0 0 0 0 0 0 # 2
1964 2 2 3 2 82 0 0 0 0 0
0 0 0 0.048947626 0.685266765 1.468428781 2.692119432
4.013705335 6.999510524 10.08321096 10.23005384 8.370044053
5.286343612 3.622124327 1.908957416 1.223690651 0.342633382
0.097895252 0.048947626 0 0 0 0 0 0 0
0 0 0 0.097895252 0.881057269 3.377386197 8.272148801
11.06216349 9.64268233 5.726872247 2.300538424 0.930004895
0.440528634 0.146842878 0 0 0 0 0 0 0
68
1965 2 4 3 2 16 0 0 0 0 0
0 0 0 0 1.75 7 6 5.25 6 6.25 5.25
3.5 2.25 1 0 0.25 0 0 0 0 0 0
0 0 0 0 0 0 0 0 4.5 10.25 12.75
11 11.25 3.25 1.25 1 0.25 0 0 0 0 0
0 0 0 # 13
1965 2 2 3 2 88 0 0 0 0 0
0 0 0 0.182648402 1.643835616 2.785388128 4.383561644
4.748858447 5.570776256 8.493150685 8.858447489 9.497716895
6.347031963 3.378995434 2.146118721 0.821917808 0.228310502
0.319634703 0 0 0 0 0 0 0 0 0
0 0.091324201 0.182648402 3.105022831 5.707762557 7.853881279
8.949771689 9.086757991 3.835616438 1.232876712 0.319634703
0.182648402 0.0456621 0 0 0 0 0 0 0
73
#Triennial #year season fleet gender partition Nsamp F120 F140 F160
F180 F200 F220 F240 F260 F280 F300 F320 F340 F360 F380
F400 F420 F440 F460 F480 F500 F520 F540 F560 F580 F600

F620 M120 M140 M160 M180 M200 M220 M240 M260 M280 M300
M320 M340 M360 M380 M400 M420 M440 M460 M480 M500 M520
M540 M560 M580 M600 M620 # Nsamp
1980 2 7 3 0 3 0 0 0 0 0
0 0 0 0 6.25 6.25 12.5 6.25 0 0 6.25
12.5 12.5 6.25 12.5 0 0 0 0 6.25 0 0
0 0 0 0 0 0 0 0 6.25 0 6.25
0 0 0 0 0 0 0 0 0 0 0
0 0 0 # 3
1983 2 7 3 0 6 0 0 0 0 0
0 0 0 0 0 0 6.822302 0 3.231572
6.642723 6.822302 3.231572 3.231572 3.4111508 0
0 0 0 0 0 0 0 0 0 0
0 0 0 3.411151 3.411151 6.463144 13.285446
26.570891 0 13.4650245 0 0 0 0 0 0
0 0 0 0 0 # 6
1986 2 7 3 0 108 0 0 0 0
1.6596962 1.0041337 0.8354633 2.303782 4.058277
4.182472 4.791801 7.88288 7.350428 6.827802
5.986836 4.478384 3.434614 1.3090633 1.2332347
0.1166741 0.16013406 0.11667405 0 0.779496 0.4666962
0.3500223 0 0 0.3109241 0 1.740464 0.1373429
1.674172 3.482537 6.477298 7.342662 6.517345
5.345761 4.046476 2.4557747 0.8926017 0.08997406
0.15810508 0 0 0 0 0 0 0 0 0
108
1989 2 7 3 0 423 0 0 0 0.1052069
0.3588284 0.5028671 1.2169388 3.259815 6.730053
6.187266 7.194915 6.631582 6.421608 5.175934
2.302481 1.90465 1.934135 1.8950102 1.1990297
0.2007844 0.61579352 1.0539511 0.20778636 0 0.1142395
0 0 0 0.1828081 0.24676949 0.2584429 0.789397
3.079195 4.484612 9.072959 10.093828 8.410339
4.135139 2.788852 0.8127312 0.1065291 0.32552306 0
0 0 0 0 0 0 0 0 0 # 423
1992 2 7 3 0 348 0 0.32474368 0
0.1394901 0.8133533 2.4790727 3.320116 6.583255
6.061974 6.79271 7.625509 6.235333 2.576828
3.017801 2.67297 1.521939 1.628344 0.5814746
0.3306431 0.5680355 0.06839995 0 0 0 0 0
0.11792894 0 0.1749639 0.19041256 1.1222446 4.70739
4.696595 8.496584 8.70146 6.313356 5.073841
3.679695 1.466543 1.2328105 0.6198415 0 0.06434122
0 0 0 0 0 0 0 0 0 # 348
1995 2 9 3 0 435 0 0 0.07113167
0.3083666 0.3002779 1.0183571 1.615746 3.182806

4.682894 7.976058 9.403384 8.463475 7.125601
4.737101 4.117477 2.183041 2.379451 0.6279602
0.4756187 0.353512 0.17624917 0 0 0 0 0
0 0 0.1479033 0.06763529 1.0742453 1.6033388
2.028175 4.437839 10.357724 8.828668 5.842812
3.848924 1.624353 0.4160944 0.2297767 0.06059428
0.23341073 0 0 0 0 0 0 0 0 0
435
1998 2 9 3 0 708 0 0 0 0.1586272
0.6080436 1.2437724 2.2963795 4.126429 5.761948
7.596899 7.509087 6.218312 4.620368 3.801603
3.741353 3.456325 2.447267 1.0059622 0.262176
0.2705981 0 0.0443206 0 0 0 0 0
0.10668527 0.2330066 1.0904484 1.8345259 2.6689145
3.175284 6.063336 7.278262 7.960775 6.49672
4.838427 2.206804 0.67589 0.1366078 0.06484532 0
0 0 0 0 0 0 0 0 0 # 708
2001 2 9 3 0 762 0 0 0.32694347
0.9743474 2.105 2.51571 3.2258802 3.558763 4.257112
3.832461 4.541249 4.756083 5.675763 4.643002
3.300652 2.971125 1.746044 0.9005112 1.0294343
0.249347 0.02490968 0.02289351 0.02402995 0 0 0
0.04157596 0.10822993 0.4084969 2.58638596 3.2142443
4.7297788 5.427194 5.973989 6.624309 7.334986
5.207461 3.781314 2.034424 1.1740123 0.5313371
0.02555972 0.02484693 0.09059624 0 0 0 0 0
0 0 0 # 762
2004 2 9 3 0 717 0 0.02139436 0.08299942
0.5802772 1.0488736 1.1848177 2.3620079 2.879266
3.638375 4.819311 5.524271 7.105853 6.528354
5.366425 4.13232 3.02099 1.742089 1.3468938
0.3893162 0.3487207 0.12168253 0.05431382 0.04138902 0
0 0 0.01373919 0.01136348 0.215975 1.00410174
2.1033238 2.0606149 3.217523 5.016838 5.432054
8.442793 9.185533 6.038449 3.555717 0.7214951
0.3462715 0.14573032 0.04220321 0 0.02931007 0.0269788
0 0.02253336 0.02751366 0 0 0 # 717
#NWFSC #year Season Fleet gender partition nSamps F12 F14
F16 F18 F20 F22 F24 F26 F28 F30 F32 F34 F36
F38 F40 F42 F44 F46 F48 F50 F52 F54 F56 F58
F60 F62 M12 M14 M16 M18 M20 M22 M24 M26 M28
M30 M32 M34 M36 M38 M40 M42 M44 M46 M48 M50
M52 M54 M56 M58 M60 M62 # nSamps
2003 2 8 3 0 493 0 0 0.01877643
0.40938952 0.3125195 0.5485925 0.801338 1.706796
2.772621 5.782943 6.314213 5.599588 6.02302

4.733309 3.68086 3.441981 2.229069 0.869815
0.9133759 0.7659347 0.2466838 0.1817079 0.06385544 0
0 0 0 0 0 0.1973245 0.4359071 0.995766
2.216433 5.445056 8.941569 10.790088 11.661486
5.950402 4.024553 1.392444 0.3322417 0.1724648 0
0.02787445 0 0 0 0 0 0 0 0 #
493
2004 2 8 3 0 715 0 0 0.0674172
0.12823294 0.2596461 0.8886104 1.567845 1.729331
3.486215 3.999988 5.070125 6.165554 6.948147
5.754094 4.560612 4.101817 2.727049 1.328842
0.8024231 0.8117775 0.3399389 0.1173192 0.09074055 0
0 0.02211853 0 0 0.0358443 0.4262148 0.6043179
1.605769 3.189877 4.242105 5.607728 8.233125
9.930771 8.374688 4.562269 1.464345 0.432132
0.2275731 0.02139565 0.03940873 0.03459175 0 0 0
0 0 0 0 # 888
2005 2 8 3 0 400 0 0 0.0189594
0.09704056 0.3923734 0.8129282 1.48417 1.684573
1.968721 2.784068 4.802026 5.16024 5.744723
7.356768 5.252322 4.166974 2.190004 1.429004
1.3400072 0.2640078 0.2099209 0.3682885 0.07373302
0.02411111 0 0 0 0 0.02893454 0.4212878
1.2950154 1.798336 2.337493 2.857662 4.755684
7.193623 10.25173 9.349382 6.519004 3.20883
1.6998875 0.424341 0.21884677 0 0 0.01497982 0
0 0 0 0 0 # 618
2006 2 8 3 0 650 0 0 0 0.38905396
0.2484907 0.9908918 1.29679 2.209467 2.249322
3.400046 4.117683 5.427163 5.653915 6.708127
5.636122 5.891209 3.648475 1.816476 1.2075807
0.6925664 0.5029241 0.2428963 0.10635415 0 0 0
0 0 0.05181557 0.8181597 1.1667544 1.650285
3.292664 3.628642 4.393952 5.854331 7.28206
8.874523 6.892426 2.205878 0.9927107 0.2970759
0.1115627 0 0.02337908 0.02822869 0 0 0 0
0 0 # 1164
2007 2 8 3 0 900 0 0 0 0.27565458
0.4654033 1.405391 1.52235 1.711185 3.248635 4.7081
4.832215 5.716683 6.405386 5.534528 6.139135
5.43838 3.745655 2.896406 1.2565027 0.8758471
0.3605776 0.219202 0.07993635 0.0388256 0.02395023 0
0 0.03204842 0 0.2514884 1.1923495 2.955485
3.548982 4.296 4.277412 6.750812 6.076102 6.116831
4.204365 2.213094 0.5998826 0.311594 0.20896582

0.02856122 0.0360803 0 0 0 0 0 0 0
1326
2008 2 8 3 0 1006 0 0 0.07010762
0.57848649 1.3000447 1.4989521 2.993416 3.416637
4.198241 4.911097 3.727493 4.765384 5.83626
4.514046 3.584713 3.556828 2.872904 2.091704
1.4243352 1.0165623 0.3504387 0.1569903 0.04928623 0
0 0 0.04206115 0 0.32817021 1.0762901 1.8220267
2.363253 4.565726 5.202579 6.573746 5.8888 6.320536
5.461118 3.906732 2.013987 0.9521366 0.3379088
0.13307933 0.06908919 0.02883517 0 0 0 0 0
0 0 # 1006

#_AGE_DATA
17 #n_abins #_N_agebins
#(<=_#_of_age,_the_model_always_start_at_age_0)
#age_bins1(1,n_abins) #_lower_age_of_agebins
1 2 3 4 5 6 7 8 9 10 11 12
13 14 15 16 17

#_Age_error

5 #N_ageerr #3_ageerr_types_see_belows

#age_err(1,N_ageerr,1,2,0,nages)
#_vector_with_stddev_of_ageing_precision_for_each_AGE_and_type

#Age0 1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22
23 24 25 26 27 28 29 30 31 32 33
34 35 36 37 38 39 40
#perfect_age_(ageerr=1_given_but_not_used)

-1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1
-1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1

-1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1
-1 -1 -1 -1 -1 -1 -1
0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001
0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001
0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001
0.001 0.001 0.001 0.001 0.001 0.001 0.001
#bias and stdev from CAP bomb v. bb; bb1 v. bb2 for survey bb ages

use this for survey ages (except 2004) and OR commerical ages 07-08

0 0.98167 1.96334 2.94501 3.92668 4.90835
5.89002 6.87169 7.85336 8.83503 9.8167 10.7984
11.78 12.7617 13.7434 14.7251 15.7067 16.6884
17.6701 18.6517 19.6334 20.6151 21.5967
22.5784 23.5601 24.5418 25.5234 26.5051
27.4868 28.4684 29.4501 30.4318 30.4327
31.4144 32.3961 33.3778 34.3595 35.3412
36.3229 37.3046 38.2863
0.127912 0.127912 0.255825 0.383737 0.511649 0.639562
0.767474 0.895386 1.0233 1.15121 1.27912 1.40704
1.53495 1.66286 1.79077 1.91868 2.0466 2.17451
2.30242 2.43033 2.55825 2.68616 2.81407
2.94198 3.0699 3.19781 3.32572 3.45363 3.58155
3.70946 3.83737 3.96528 3.9585 4.0857 4.2129 4.3401 4.4673
4.5945 4.7217 4.8489 4.9761
#bia and stdev from CAP bomb v. bb v. surface reads

#use this for all CA ages, WA ages up to 1982, and OR commerical ages from 2000-2004/5

0 0.936529 1.87306 2.80959 3.74612 4.68264
5.61917 6.5557 7.49223 8.42876 9.36529 10.3018
11.2383 12.1749 13.1114 14.0479 14.9845 15.921
16.8575 17.794 18.7306 19.6671 20.6036 21.5402
22.4767 23.4132 24.3498 25.2863 26.2228

27.1593 28.0959 29.0324 29.0315 29.968 30.9045
31.841 32.7775 33.714 34.6505 35.587 36.5235
0.0917434 0.0917434 0.183487 0.27523 0.366973 0.458717
0.55046 0.642204 0.733947 0.82569 0.917434
1.00918 1.10092 1.19266 1.28441 1.37615
1.46789 1.55964 1.65138 1.74312 1.83487
1.92661 2.01835 2.1101 2.20184 2.29358 2.38533
2.47707 2.56881 2.66056 2.7523 2.84404 2.8381 2.9293
3.0205 3.1117 3.2029 3.2941 3.3853 3.4765 3.5677
#bias and stdev from CAP combo methods

#use this for OR commercial ages from 1981-1999 where a combination of methods were used

0 0.968652 1.9373 2.90596 3.87461 4.84326 5.81191
6.78056 7.74921 8.71787 9.68652 10.6552
11.6238 12.5925 13.5611 14.5298 15.4984
16.4671 17.4358 18.4044 19.373 20.3417 21.3103
22.279 23.2477 24.2163 25.1849 26.1536 27.1223
28.0909 28.0923 29.061 30.0297 30.9984 31.9671
32.9358 33.9045 34.8732 35.8419 36.8106
37.7793
0.195255 0.195255 0.39051 0.585766 0.781021 0.976276
1.17153 1.36679 1.56204 1.7573 1.95255 2.14781
2.34306 2.53832 2.73357 2.92883 3.12408
3.31934 3.51459 3.70985 3.9051 4.10036 4.29562
4.49087 4.68613 4.88138 5.07664 5.27189
5.46715 5.6624 5.6508 5.8448 6.0388 6.2328 6.4268 6.6208 6.8148 7.0088
7.2028 7.3968 7.5908
#bias and stdev from WDFW combo method, post 1982

1.64587 2.29561 2.96139 3.6436 4.34264 5.05894
5.79292 6.54502 7.31568 8.10536 8.91453
9.74367 10.5933 11.4639 12.3559 13.27 14.2066
15.1664 16.1498 17.1576 18.1902 19.2482
20.3324 21.4434 22.5818 23.7482 24.9435
26.1683 27.4233 28.7092 30.0269 31.3772
31.2006 32.5181 33.8586 35.2221 36.6086
38.0181 39.4506 40.9061 42.3846

0.207122 0.207122 0.414244 0.621367 0.828489 1.03561
1.24273 1.44986 1.65698 1.8641 2.07122 2.27834
2.48547 2.69259 2.89971 3.10683 3.31396
3.52108 3.7282 3.93532 4.14244 4.34957 4.55669
4.76381 4.97093 5.17806 5.38518 5.5923 5.79942
6.00654 6.21367 6.42079 6.4076 6.6135 6.8194 7.0253 7.2312
7.4371 7.643 7.8489 8.0548

#_AGE_COMPOSITIONS(duplicates_must_be_contigent_within_Year-Seas-Fleet-Sex_because_of_ageerr_and_states)

396 #nobsa #ageerr:_2:imprecision_age(BB)_3:Biased_age(Surface)
nsampls adj Flt1 Flt2 Flt3 Flt4 Flt5 Flt6

3 #_Lbin_method: 1=poplenbins; 2=datalenbins; 3=lengths
5 5 6 6 2 2

1 #_combine males into females at or below this bin number

#1 year Season Fleet gender partition ageErr LbinLo LbinHi nSamps
F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11
F12 F13 F14 F15 F16 F17 M1 M2 M3 M4 M5
M6 M7 M8 M9 M10 M11 M12 M13 M14 M15 M16
M17 nSamps
1967 1 1 3 2 3 4 76 20 0 0
0 0 1.656863719 7.061838006 19.2127911 14.039827
12.37724942 5.225621903 1.58175063 2.453089431 1.58175063 0
0.528202519 0 0 0 0 0 0.450232503 3.624880586
13.01870805 9.573460736 4.153083105 1.428667525 1.428667525
0.603315608 0 0 0 0 0 0 # 4
1968 1 1 3 2 3 4 76 55 0 0
0.190901241 0.190901241 2.033612774 9.711561923 14.03237056
14.39454372 9.047060391 7.257007518 5.124650243 1.775533808
0.899647721 0.146875082 0.778604044 0 0.146875082 0 0
0 0.501153822 1.916734982 8.642543494 12.10857824 6.01992669

3.054348934 0.818980472 0.792962915 0.244486556 0.170138548 0
0 0 0 # 11
1969 1 1 3 2 3 4 76 45 0 0
0 1.524588261 7.417834053 12.38507574 11.43733515 12.38649971
6.406557923 5.313039556 3.037322725 2.303474204 0.937969368
0.130757371 0.142458196 0 0.130757371 0 0 0.384067263
1.158882794 8.379459059 12.20562344 6.503566806 4.848458479
2.089088182 0.484912233 0.392272114 0 0 0 0 0
0 # 9
1970 1 1 3 2 3 4 76 40 0 0
0 0.909505262 10.46505786 15.23196261 10.78647866 10.27269
5.492814822 6.599310912 4.132994097 2.049183231 1.130796488
0.985584875 0.227719486 0.176962636 0.075906495 0 0 0
0.974552421 7.047631776 10.3831722 6.365112101 4.90859086
1.234957273 0.227719486 0.321296467 0 0 0 0 0
0 # 8
1971 1 1 3 2 3 4 76 25 0 0
0 0.803277242 5.378918479 13.81514542 9.813887741 5.014706571
4.544503808 4.599121235 5.513464323 0.803277242 0.330432084 0
0 0 0.330432084 0 0 0 1.308038831 10.19617451
12.47965615 12.69469816 5.39687088 5.132227324 1.84516792 0
0 0 0 0 0 0 # 5
1972 1 1 3 2 3 4 76 20 0 0
0 0.668283508 5.862510025 16.2613514 4.546876246 4.161851339
3.675838457 2.366313245 3.017559394 1.325498555 1.251837245
0.674097365 0.300218027 0.249252892 0.249252892 0 0
0.008605123 2.080532866 17.46479457 26.45574635 7.825104959
1.452545271 0.101930271 0 0 0 0 0 0 0
0 # 4
1973 1 1 3 2 3 4 76 15 0 0
0 0.18756618 2.358882207 14.05539888 26.55558395 14.9320941
4.558881934 4.704123738 3.256333699 2.328917823 0.994460235 0
0 0 0 0 0 0 1.162477053 7.35275149
7.413418322 7.296933998 2.259928496 0.300898631 0.28134927 0
0 0 0 0 0 0 # 3
1974 1 1 3 2 3 4 76 15 0 0
0 0.060549523 0.121099046 5.403698057 3.322627831 6.088531977
1.448250584 0.64497559 1.10602261 0.302747616 0.18164857 0
0 0 0 0 0 0 2.770464147 19.50049689
32.58940096 21.36081616 3.792588068 1.245532849 0.060549523 0
0 0 0 0 0 0 # 3
1975 1 1 3 2 3 4 76 45 0 0
0 0.050834015 1.749478717 8.518143699 15.77695958 10.70616462
5.819352178 1.798335188 0.724305041 0.787400953 0.238165198
0.219922733 0 0 0 0 0 0 0.28457118
7.820043796 18.83099563 18.71268044 5.772810457 1.697986129

0.394304835 0.097545602 0 0 0 0 0 0 #
9
1976 1 1 3 2 3 4 76 5 0 0
0 0 0 5.050505051 2.02020202 12.12121212 9.090909091
2.02020202 2.02020202 1.01010101 2.02020202 0 0 0
0 0 0 0 0 7.070707071 36.36363636 11.11111111
10.1010101 0 0 0 0 0 0 0 0 0
1
1977 1 1 3 2 3 4 76 10 0.714966054
0 0 0 1.901537061 6.419577236 12.73787778 4.502922928
2.844746968 2.129780914 0.786008256 0.157201651 0.314403302 0
0 0 0.157201651 0 0 0.872167705 2.144898161
10.79553301 18.1023952 24.53708968 4.289796322 5.719728429
0.714966054 0 0 0.157201651 0 0 0 0 #
2
1978 1 1 3 2 3 4 76 15 0 0
0 0 0 5.319700326 12.89360106 20.78780186 10.41667692
7.984413029 5.836869055 3.972592284 2.716422829 1.606138274
0.654385657 0 0 0 0 0 0.297366959 7.765502993
8.030691369 5.432845659 2.81530303 2.564214411 0.905474276 0
0 0 0 0 0 0 # 3
1980 1 1 3 2 3 4 76 15 0
3.083415845 4.111221126 22.27222719 5.234444491 22.71410725
4.257838622 6.301745607 4.27404247 3.548480491 2.534628922
0.688316279 3.639175738 1.013851569 0.506925784 0 0 0
2.569513204 8.736344894 0.181390495 1.413878258 1.36042871
1.467327806 0 0.090695247 0 0 0 0 0 0
0 0 # 3
1981 1 1 3 2 3 4 76 30 0 0
0.31254353 1.622904285 3.224743967 6.633991529 12.945501
9.449399275 5.078450977 4.284396562 3.459394121 4.708665768
6.43105058 6.511196617 1.496895427 3.448012726 1.325151102 0
0 0.104181177 0.778417399 3.918112523 7.877507148 8.389517014
1.503333759 0.475815372 1.011976865 2.456281915 0.933442014
0.490043857 0.220447348 0.049149161 0.785994531 0.073482449 #
6
1982 1 1 3 2 3 4 76 20 0 0
0 3.909176189 6.698915585 6.435357761 6.392984416 4.341417816
1.394869698 4.175600021 4.178603046 2.030379928 3.133724346
2.917401139 3.864539809 0.173949863 2.705088716 0 0
2.491425009 5.37498966 11.1726089 9.168673382 5.914282907
5.101208494 3.111625923 1.033743606 0.415237502 1.033743606 0
0.637601504 0.116663666 0.415237502 1.660950006 # 4
1986 1 1 3 2 5 4 76 10 0 0
0 0.159768325 3.6330983 7.824298338 18.28368664 9.461379972
3.6330983 1.477313309 2.834256674 0.159768325 0.319536651

0.159768325 0 0 0.998008333 0 0 0 4.830273339
8.982074996 18.68202006 14.56961678 1.676480015 0.838240008
0.998008333 0 0 0.319536651 0.159768325 0 0 0
2
1987 1 1 3 2 5 4 76 30 0 0
0 0.450380211 2.303449527 7.89372194 6.857406486 14.50044535
1.22322787 1.291987788 0.796983036 0.070043014 0.014008603 0
0.068016034 0 0 0 0 0.363470011 6.6648719
20.63865108 22.41144192 7.1794079 6.482028604 0.790458729 0
0 0 0 0 0 0 0 # 6
1988 1 1 3 2 5 4 76 20 0 0
0 4.216468266 16.44723662 4.373589329 9.973345762 3.733957175
5.351747608 0 0.378426447 0 0 0 0 0
0.202564944 0 0 5.346513728 11.67914874 19.23643145
14.84410168 0 4.216468266 0 0 0 0 0 0
0 0 0 # 4
1989 1 1 3 2 5 4 76 25 0 0
0 2.595901276 14.9991968 10.86841367 8.312546123 2.199381124
1.508051558 0.896824189 0.205494623 0 0 0 0 0
0.125392426 0 0 1.768905573 11.4739407 25.49179344
11.35745333 2.915009657 4.795860567 0.485834943 0 0 0
0 0 0 0 0 # 5
1990 1 1 3 2 5 4 76 10 0 0
0 0 0 3.507910059 7.382488198 4.711862971 10.99434693
7.853104951 3.14124198 0 3.14124198 0 1.57062099 0
1.57062099 0 0 0 0 14.39830832 8.953109188
7.015820119 11.25706634 1.937289069 4.711862971 3.14124198
1.57062099 0 0 0 1.57062099 1.57062099 # 2
1991 1 1 3 2 5 4 76 10 0 0
0 9.068969501 22.36476176 21.82988293 18.75326299 4.842146745
0 0 4.226822756 0 0 4.226822756 0 0 0
0 0 0 3.076619943 3.076619943 6.68811871 1.845971966
0 0 0 0 0 0 0 0 0 0 #
2
1992 1 1 3 2 5 4 76 5 0 0
0 0 3.448275862 0 10.34482759 0 3.448275862 0
0 0 0 0 0 0 0 0 0 0
41.37931034 27.5862069 10.34482759 3.448275862 0 0 0
0 0 0 0 0 0 0 # 1
1993 1 1 3 2 5 4 76 20 0 0
0 1.495065241 16.34841192 13.61849637 12.95820737 2.345823349
5.708939505 0 0 0 0 0 0 0 0 0
0 0 13.8010716 15.16047611 14.38544224 0.810016143
2.174767497 0 0 0 1.193282657 0 0 0 0
0 # 4

1994 1 1 3 2 5 4 76 20 0 0
0 5.772655262 10.68656967 12.33073048 2.558429365 4.176056533
2.03453691 0.106982712 0 0 0 0 0 0 0
0 0 3.612148904 17.67036842 29.65913303 9.405832604
1.986556107 0 0 0 0 0 0 0 0 0
0 # 4
1995 1 1 3 2 5 4 76 15 0 0
1.168074464 2.336148928 8.764823881 10.09538422 4.133147494
1.168074464 2.030217678 1.168074464 0.273840582 0 1.482536515
0 0 0 0 0 0 0 18.70823193 25.41927827
17.98303582 3.786594775 1.208695933 0.273840582 0 0 0
0 0 0 0 0 # 3

1996 1 1 3 2 5 4 76 10 0 0
0 0.09386624 12.37093392 15.5810002 3.21006628 3.11620004
0 0 0.09386624 3.0223338 0 0 0 0
0.09386624 0 0 0 3.11620004 21.6256678 24.6480016
9.536332599 3.303932519 0.187732479 0 0 0 0 0
0 0 0 # 2
1997 1 1 3 2 5 4 76 5 0 0
0 12.82051282 17.94871795 12.82051282 17.94871795 10.25641026
2.564102564 0 2.564102564 0 0 0 0 0 0
0 0 0 10.25641026 5.128205128 5.128205128 0
2.564102564 0 0 0 0 0 0 0 0 0
1
1998 1 1 3 2 5 4 76 10 0 0
0 0 3.233728502 12.38231573 7.531722973 17.21244318
6.446991707 1.616864251 1.616864251 0 0 0 0 0
0 0 0 0 1.616864251 20.46663698 11.78878685
5.894393426 6.446991707 3.745396191 0 0 0 0 0
0 0 0 # 2
1999 1 1 3 2 5 4 76 15 0 0
0.521275967 3.593165666 2.623387994 7.463977475 11.33478928
11.35179745 8.104697543 0 1.405625858 0 0 0 0
0 0 0 0 0.260637983 9.010797215 15.03039089
17.75582785 6.370014082 4.097046493 0.538284127 0 0
0.538284127 0 0 0 0 0 # 3

2000 1 1 3 2 5 4 76 30 0 0
0.071136371 0.607537001 7.015238487 13.24388448 6.012215099
9.616948951 5.678830902 0.449828452 1.414700532 0 0
0.322991518 0 0 0 0 0 0.394127889 2.159729643
21.44268375 24.77099907 6.026327888 0.772819969 0 0 0
0 0 0 0 0 0 # 6

2001 1 1 3 2 5 4 76 30 0 0
0.302507761 0 3.774601825 12.66844367 9.536089747 2.804509783
1.002087014 1.742345875 0.066169734 0 0 0 0 0
0 0 0 0 5.648479545 16.55431005 30.3494874
15.48479787 0.066169734 0 0 0 0 0 0 0
0 0 # 6
2002 1 1 3 2 5 4 76 35 0
0.231510527 1.012885406 1.292247622 7.510265398 8.143341911
11.86156544 4.625329991 0.794678521 0.632778434 0 0 0
0 0 0 0 0 0.231510527 1.597526981 6.965807001
21.92988322 19.89396524 9.052897788 4.112905615 0.110900374 0
0 0 0 0 0 0 0 # 7
2003 1 1 3 2 5 4 76 40 0 0
0.012359518 0.140984623 0.827425705 8.831748389 8.541983649
6.207978717 1.329644336 0 0 1.083287768 0.889248442 0
0.006179759 0 0 0 0.006179759 0.013664932 0.215616473
27.56471834 23.92555032 11.62985989 8.700646964 0.072922418 0
0 0 0 0 0 0 0 # 8
2004 1 1 3 2 5 4 76 40 0
0.008935662 0.071485294 0.040210478 11.79852739 3.238888055
3.792547829 4.60384474 4.024384112 0.118142273 0.07685756 0
0 0.041284712 0 0 0 0 0 0.1260037
2.050106569 20.76649665 36.69672087 8.615925121 3.565772482
0.181933252 0 0 0.181933252 0 0 0 0 0
8
2005 1 1 3 2 5 4 76 15 0 0
0.082796579 1.282315166 2.630867596 20.37546344 17.32625582
2.29968128 1.14984064 0.016559316 0 0 0 0 0
0 0 0 0 0.016559316 0.049677947 6.457310199
22.38118529 23.21493251 2.716554893 0 0 0 0 0
0 0 0 0 # 3
2006 1 1 3 2 5 4 76 20 0
0.059444747 0.355614996 0.205942831 0.064753044 4.69600111
14.40051107 29.89567497 8.330999328 3.159929534 0.862350985
0.862350985 0 0 0 0 0 0 0.018045484
0.174093053 0.095535714 7.797401417 16.66503477 6.895771763
5.460544198 0 0 0 0 0 0 0 0 0
4
2007 1 1 3 2 5 4 76 20 0 0
0.701045512 9.682562272 7.000645691 13.36393665 9.850719534
6.466988065 6.046445686 1.463646255 0.198526314 1.463646255 0
0 0 0 0 0 0 1.049769525 5.245754257
17.37414277 10.95672775 5.188536825 3.946906635 0 0 0
0 0 0 0 0 0 # 4

2008 1 1 3 2 5 4 76 15 0 0
0.929774789 10.7688688 12.52548669 7.363962921 7.00284947
7.178007963 3.318168894 2.485927554 0 0.646286382 0 0
0 0 0 0 0 0.185954958 5.441298472 6.560397268
15.30164075 12.45999798 1.473129489 4.419388467 1.938859146 0
0 0 0 0 0 0 # 3
1960 2 2 3 2 3 4 76 5 0 0
0 3.571428571 1.19047619 2.380952381 1.19047619 3.571428571
0.595238095 1.19047619 0.595238095 0 0 0 0 0
0 0 0 2.976190476 10.11904762 10.71428571 15.47619048
17.26190476 22.02380952 6.547619048 0.595238095 0 0 0
0 0 0 0 # 1
1961 2 2 3 2 3 4 76 5 0 0
0 7 8 13 3 7 9 3 2 1 0
0 0 0 0 0 0 0 10 15 8 5
4 4 0 0 0 0 0 0 0 1 #
1
1964 2 2 3 2 3 4 76 5 0 0
0 1.5 6.5 14.5 11.5 3.5 2.5 1.5 0.5 0.5 0.5
0 0 0 0 0 0 0.5 6 14.5 22 7.5
3 1 1 1.5 0 0 0 0 0 0 #
1
1965 2 2 3 2 3 4 76 5 0 0
0 5 3 14 14 7 5 1 1 0 2
0 0 0 0 0 0 2 15 7 11 8
4 0 0 0 0 1 0 0 0 0 #
1
1966 2 2 3 2 3 4 76 135 0 0
0.129395654 2.547778439 9.954600111 11.08135053 10.48820539
6.267982287 2.990652454 2.251355519 1.564313633 0.78762892
0.663052241 0.221611709 0.193440706 0.027088484 0.176338513 0
0 0.025006289 3.59885369 13.6398081 13.65344781 9.956080338
5.065220923 2.370663669 1.256547645 0.491242643 0.276425267
0.12097085 0.099967656 0.100970542 0 0 # 27
1967 2 2 3 2 3 4 76 155 0 0
0 0.397976064 1.622274801 9.288035599 17.53624458 11.39671632
7.072059025 3.918040079 1.540056093 1.382984582 0.517646557
0.362200513 0.098694151 0.082663597 0.066040181 0 0
0.037227169 0.410749127 3.681540457 11.49362868 13.43291713
8.632692484 3.070250399 2.419335123 1.031016349 0.386919868
0.122091065 0 0 0 0 # 31
1968 2 2 3 2 3 4 76 170 0 0
0.012317022 0.242147303 2.246444049 6.076689517 12.06417582
12.94525302 6.173558711 2.85480186 1.880119549 1.087583086
0.567127956 0.353729564 0.108972563 0.036396284 0.036245331 0
0 0.058694494 0.508464199 3.441367154 13.54305789 17.51581876

10.96556925 4.994408629 1.201436174 0.767996762 0.20283133
0.019287661 0.066221486 0.029284583 0 0 # 34
1969 2 2 3 2 3 4 76 175 0 0
0 0.647439924 6.018259333 8.80939229 7.996042218 10.80125453
6.85729263 3.701961213 1.696627359 0.776055917 0.701837308
0.374265387 0.108254826 0.060716007 0.030522942 0 0
0.05744122 0.820598893 5.341035771 10.86742792 14.26977655
9.743331788 7.335610948 2.369037898 0.448420816 0.075044643
0.031305786 0.030522942 0 0.030522942 0 # 35
1970 2 2 3 2 3 4 76 195 0 0
0.114571754 2.13535841 11.2352904 12.11771444 11.14769466
6.054378498 6.138223915 3.384663213 1.8590855 0.51786064
0.437543702 0.157615119 0.135747639 0.041460068 0.071618557 0
0 0.43540178 3.958383165 12.90533432 10.86144658 7.417834786
4.569221451 2.897007941 0.846827994 0.392622561 0.109238624
0.04645901 0.011395282 0 0 0 # 39
1971 2 2 3 2 3 4 76 45 0 0
0.023896894 4.60026 11.76104639 16.06229338 6.367425679
3.123700468 2.016430324 1.015615832 0.237117075 0.190231088
0.054428348 0.011900295 0 0 0 0 0 0.147219638
6.770704049 24.22903572 16.93501801 4.956361245 0.849780051
0.606588841 0.039909854 0.001036818 0 0 0 0 0
0 # 9
1972 2 2 3 2 3 4 76 115 0 0
0.093765423 2.676789456 10.72446747 14.91551271 6.770746544
2.9439239 1.454659558 1.175529062 0.650881459 0.195557478
0.181457495 0.02356197 0.047636852 0.014077923 0.014077923 0
0 0.035707373 5.360379837 21.74678528 19.80464412 6.630017143
2.472412007 1.003090466 0.731949096 0.231976836 0.059184678
0.027130023 0.014077923 0 0 0 # 23
1973 2 2 3 2 3 4 76 70 0 0
0.130880553 3.271866694 11.49412927 11.26324991 10.52705862
4.440833927 1.609557729 0.952436389 0.509054373 0.524135285
0.207335546 0.186239829 0.079398798 0.097388964 0.077348579 0
0 0.126261785 2.84694141 16.72098111 15.20988154 14.33822105
4.097983555 0.692799606 0.327917563 0.073626157 0.118530605 0
0.023873171 0.017121417 0.017121417 0.017825136 # 14
1974 2 2 3 2 3 4 76 140 0 0
0.010915433 2.404832005 8.997332484 11.79253592 10.10579983
2.499312913 0.551952114 0.376884034 0.30659583 0.122712814
0.028727542 0.032785636 0.006912891 0.013273809 0.01209604 0
0 0.069778837 4.399393802 21.95504755 23.52571918 9.113937512
2.780323901 0.560785944 0.114048506 0.077996233 0.090081696
0.02539966 0.006360919 0.01209604 0 0.006360919 # 28
1975 2 2 3 2 3 4 76 85 0 0
0.03428851 0.205947002 5.178322809 10.28865358 11.32811114

5.78800768 3.121934137 0.76189498 0.442469987 0.219965904
0.252378987 0.107183086 0.040949313 0 0.040348395 0 0
0.033304093 0.332131382 12.67062135 23.48481681 19.38157405
4.365849186 1.353883807 0.208727393 0.16998328 0.01301733
0.175635815 0 0 0 0 # 17
1976 2 2 3 2 3 4 76 25 0 0
0 0.91616329 1.732713098 11.2772249 23.52138291 13.27004951
6.996442954 2.074722203 2.090530531 0.42063077 0.280420513 0
0 0 0 0 0 0.181858442 0.597201652 3.62929888
11.48464395 12.53985273 5.982724903 1.422733775 0.905633232
0.675771762 0 0 0 0 0 0 # 5
1977 2 2 3 2 3 4 76 40 0 0
0.118288652 2.292322038 9.701601171 15.05844041 16.67298534
8.890503117 4.165971519 1.2814722 1.372161199 0.065222639
0.224244554 0.02674225 0 0 0 0 0 0.343088143
0.959812231 6.083284682 11.62337387 12.94979158 5.72797781
1.494100776 0.57773759 0.215011277 0.155866951 0 0 0
0 0 # 8
1978 2 2 3 2 3 4 76 40 0 0
0 3.178072963 2.541946671 5.901510053 11.53458123 8.599553582
6.813648973 3.368047871 1.837188872 0.640433681 0.513538308
0.111990571 0.114160289 0.028306409 0.049729996 0 0 0
1.769822361 2.490498324 7.582323699 12.96163667 13.92109306
7.255569154 5.709461448 2.685536348 0.30643024 0.056612817
0.028306409 0 0 0 # 8
1979 2 2 3 2 3 4 76 75 0 0
0.107200508 1.164763323 7.647272377 11.44618467 11.43498557
6.412253067 6.00101407 5.288233003 3.529165847 3.503899209
1.991239163 1.536880894 0.770621931 0.093581021 0.295573377 0
0 0 0.607757634 6.760744761 8.900309322 9.242288426
5.839148582 3.843640406 2.186490978 0.886721086 0.298983195
0.160044689 0.051002896 0 0 0 # 15
1980 2 2 3 2 3 4 76 110 0.113740611
0 0.099690374 2.228078972 8.11960365 10.01009403 8.761694992
5.831165293 4.499100536 2.667373374 3.304636998 2.826320354
2.720875451 1.339265152 0.787529005 0.676663905 0.180987648 0
0 0.009353591 1.90966037 8.312658397 14.84857838 5.831998647
4.832262653 3.264054169 1.879584907 2.430054514 1.18631537
0.45567426 0.504842767 0.308264781 0.056870306 0.003006537 #
22
1981 2 2 3 2 3 4 76 40 0 0
6.906312598 4.770690099 13.4449554 16.72143709 12.34125867
5.019329998 1.822192961 0.761468792 1.72284394 1.010831713
2.083695652 0.498668667 0.482120504 0.137952586 0.562634352 0
0.321991428 6.596024826 1.915513799 9.000363791 5.358426674
2.504466849 1.297735049 1.32551693 0.310203528 0.950194393

0.594772628 0.710389809 0.372112665 0.204450119 0.072628508
0.17881597 # 8
1982 2 2 3 2 3 4 76 5 0 0
0 7.070707071 18.18181818 13.13131313 15.15151515 5.050505051
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1.01010101 3.03030303 0 1.01010101 0 1.01010101
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0 1.693370811 9.220285073 11.14864083 6.255037173 4.164410728
0.988415967 0.988415967 0.988415967 0 0.494207983 0 0
0 0 0 0 2.398325655 3.765525282 33.15622488
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0 0.824515468 0 0.58953052 1.179061041 0.58953052 #
3
1986 2 2 3 2 5 4 76 25 0 0
0.745764039 14.22223463 19.25350977 11.88855336 15.08943546
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0 0 0.586842538 0.293421269 0 0 0.744178425
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0 # 5
1987 2 2 3 2 5 4 76 45 0 0
2.04164113 10.21817727 15.67269145 8.496100319 6.213771137
2.502403219 0.251982645 0 0 0 0 0 0 0
0 0 0 0.226327101 13.99891324 20.18075087 13.80730351
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0 0 # 9
1988 2 2 3 2 5 4 76 25 0 0
0.818253483 10.12902013 17.3559654 8.697631244 6.23152247
0.334902888 0.856308735 0.223268592 0 0 0.111634296 0
0 0 0 0 0 1.591726841 12.86303862 32.04023777
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0 0 0 # 5
1989 2 2 3 2 5 4 76 35 0 0
0 5.215759835 19.48754352 16.79500573 10.68114857 5.952257807
1.739503755 0.267055546 0.262085791 0 0 0.262085791 0
0 0 0 0 2.352892596 5.199475652 13.19651592
14.26709503 2.386552111 1.14379522 0.529141336 0 0 0
0 0.262085791 0 0 0 # 7
1990 2 2 3 2 5 4 76 30 0 0
3.524264175 5.020157266 31.95799175 13.6422003 6.884564665
1.430656866 0 0 0 0 0 0 0 0 0
0 0 0.779435053 6.804053139 17.99215743 8.846497846
3.118021506 0 0 0 0 0 0 0 0 0
0 # 6

1991 2 2 3 2 5 4 76 25 0 0
0 2.893670192 12.17407103 7.360015131 12.18717933 7.985178429
2.10100045 0.41719203 0 0 0 0 0 0 0
0 0 3.783621089 8.952111399 19.58053021 11.94306275
9.252419566 1.161352381 0.208596015 0 0 0 0 0
0 0 0 # 5
1992 2 2 3 2 5 4 76 25 0 0
4.390145765 16.39136239 16.3373271 13.60964865 5.764528463
4.876752263 1.70705647 0.328800213 0.496493769 0.496493769 0
0 0 0 0 0 0 2.750739519 7.394914586
11.93875236 6.727960677 3.053231537 2.14573404 0.894363098
0.328800213 0 0 0.366895115 0 0 0 0 #
5
1993 2 2 3 2 5 4 76 30 0 0
0.471694165 11.09607689 25.53838559 19.61436746 7.062892342
3.603097981 2.271103907 1.336086756 0 0 0 0 0
0 0 0 0 0 5.331092288 11.10383674 9.419939431
3.151426456 0 0 0 0 0 0 0 0 0
0 # 6
1994 2 2 3 2 5 4 76 35 0 0
0.829740938 9.768539776 12.30890469 17.10574848 4.861215684
2.748150058 0.828845599 0.051911854 0.03257453 0 0 0
0 0 0 0 0 0.814111731 15.19212671 16.26139398
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0 0 0.636034643 0 0 0 # 7
1995 2 2 3 2 5 4 76 10 0 0
2.883174101 1.821013814 17.60235137 20.18221871 11.22938964
10.47053612 3.642027628 0 1.062160287 0 0 0 0
0 0 0 0 0 2.124320574 9.256135823 10.01498935
5.766348202 1.062160287 2.883174101 0 0 0 0 0
0 0 0 # 2
1996 2 2 3 2 5 4 76 15 0 0
0.928721982 7.048743289 30.76515525 17.38410624 5.25577732
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0 0 0 1.387379527 0 3.75655214 8.601039572
11.32272752 0.464360991 2.321804955 0 0 0 0
0.464360991 0 0 0 0 # 3
1997 2 2 3 2 5 4 76 15 0 0
0.386780597 7.378579126 8.299539304 16.14526076 19.06953679
9.006063248 3.180080943 0 0 0 0 0 0 0
0 0 0 0 6.741468051 13.1241997 8.124096127
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0 0 0 # 3
1998 2 2 3 2 5 4 76 80 0 0
0.494925845 7.030019614 19.14345521 12.64074397 7.779177969
3.59271908 1.576696255 0.636907928 0.473118255 0.081109383 0

0 0.029416882 0 0 0 0 0.066781365 9.363701196
21.69333857 9.215777574 2.952042441 2.53127416 0.631563175
0.050849532 0.016381595 0 0 0 0 0 0 #
16
1999 2 2 3 2 5 4 76 65 0
0.227244178 0.721480746 10.41833804 20.53765932 18.1248335
10.63320523 2.531297358 1.750879185 1.049254876 1.825687761
0.227244178 0.198475756 0 0.043098117 0 0 0
0.005585359 0.551913159 10.98243144 12.29472056 5.818591323
1.597221248 0.284520307 0.014329082 0.10297216 0.014329082
0.030358951 0 0 0 0 0.014329082 # 13
2000 2 2 3 2 5 4 76 60 0 0
0.164716944 2.952781787 12.11097836 16.06017022 13.22270604
5.546362522 1.723057814 0.732003443 0.379464289 0.080684795 0
0 0 0 0 0 0 0.657650184 9.372970259
16.66016645 13.88311873 5.690724075 0.762444081 0 0 0
0 0 0 0 0 0 # 12
2001 2 2 3 2 5 4 76 50 0
0.115889046 1.956465569 10.19878222 24.88618927 13.27828821
7.698196947 1.533002197 0.609396545 0.120699156 0.02745534 0
0.067574626 0.019835204 0 0 0 0 0.265067417
1.8569755 6.727477821 19.29775205 10.03751437 1.249354404
0.034248905 0.019835204 0 0 0 0 0 0 0
0 # 10
2002 2 2 3 2 5 4 76 80 0
0.079025647 3.479080381 14.64897302 16.71053456 11.13483636
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0.116040823 0.132849904 0 0 0 0 0 0.084157086
2.60649211 14.20078501 12.7441901 7.880038112 2.976975383
0.933518477 0 0.032343862 0 0 0 0 0 0
0 # 16
2003 2 2 3 2 5 4 76 110 0
0.417751325 2.714997037 8.247461743 26.32301472 8.038495214
4.144752668 2.856054434 0.966620013 0.250131674 0 0
0.11806836 0 0 0.04606571 0.088917052 0 0.123758898
2.477047133 13.52334682 25.33758006 3.070269655 0.976729791
0.17919382 0.053678155 0.04606571 0 0 0 0 0
0 0 # 22
2004 2 2 3 2 5 4 76 105 0
0.00272205 0.117699754 3.733297293 8.825306343 33.80763777
6.248189585 0.853399746 1.815770277 0.493136069 0.375176768
0.037076438 0.177929734 0 0 0 0 0 0.018253611
0.116516922 4.551540558 18.04448245 17.88365484 1.832007382
0.424788585 0.537731241 0.103682588 0 0 0 0 0
0 0 # 21

2005 2 2 3 2 5 4 76 75 0
0.00195851 0.313730311 2.480776571 7.61710802 16.7600972
28.37027579 5.825044835 3.071190034 1.313155103 1.036430977
0.344833641 0.173655609 0.036927207 0 0 0 0 0
0.516227494 2.707546753 7.469863984 11.20277021 9.388824693
0.620764595 0.447011537 0.110603011 0.191203909 0 0 0
0 0 0 # 15
2006 2 2 3 2 5 4 76 20 0 0
0.816539702 13.01077775 11.86431027 12.11797938 15.93630324
14.77968895 2.828878795 0 1.487816923 0 0 0 0
0 0 0 0 0.091703437 11.15697007 2.811519715
3.55371506 3.819364568 5.72443215 0 0 0 0 0
0 0 0 0 # 4
2007 2 2 3 2 5 4 76 85 0 0
0.184875211 4.74332906 9.817340625 13.23143748 16.30503681
7.418516701 8.508215279 1.769575384 0.575176251 0.24588166
0.117697761 0.112668059 0.145249911 0 0.213273521 0 0
0.064146293 2.283418886 6.711366137 9.10185954 8.08524895
8.021842208 2.214010667 0.047407147 0.054950971 0.015802382 0
0.011673103 0 0 0 # 17
2008 2 2 3 2 5 4 76 90 0 0
0.21424098 2.439897158 17.9421078 17.41274184 7.16078216
2.772638402 4.090795619 3.000341756 0.635599794 0.30297961
0.354284993 0.010574684 0.168726604 0.128972739 0.073130186 0
0 0.113488227 2.978057741 13.10460953 14.5110394 6.880258428
2.143822163 1.760843622 1.505329301 0.247534087 0 0
0.047203169 0 0 0 # 18
1969 1 3 3 2 3 4 76 6 0 0
0 1.960784314 33.33333333 15.68627451 5.882352941 5.882352941
3.921568627 3.921568627 0 0 0 0 0 0 0
0 0 0 1.960784314 11.76470588 15.68627451 0 0
0 0 0 0 0 0 0 0 0 # 1
1978 1 3 3 2 3 4 76 6 0 0
0 1.020408163 7.142857143 21.42857143 18.36734694 12.24489796
13.26530612 9.183673469 6.12244898 1.020408163 2.040816327 0
0 0 0 0 0 0 0 4.081632653 3.06122449
0 1.020408163 0 0 0 0 0 0 0 0
0 # 1
1980 1 3 3 2 3 4 76 24 0 0
0 0.70830212 1.974000721 4.290458785 10.34161451 7.540629085
4.886873526 3.61469735 2.16718778 1.315592901 1.07332922
1.064493599 0.46603844 0 0.35415106 0 0 0.21289872
0.21289872 6.288482759 11.49665867 13.75429938 11.98749027
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0.506914697 0 0 # 4

1981 1 3 3 2 4 4 76 12 0 0
0 1.168489653 4.617961035 7.07386951 8.417285911 4.324105118
6.780013594 3.036686296 3.036686296 3.680395707 1.343416401
0.349853495 0.174926747 1.168489653 0.818636158 0 0 0
0.174926747 11.69183054 11.27904546 11.69183054 9.060995322
2.162052559 5.261670446 1.343416401 0.524780242 0.818636158 0
0 0 0 # 2
1982 1 3 3 2 4 4 76 6 0 0
0 0 1.020408163 8.163265306 4.081632653 9.183673469
5.102040816 6.12244898 1.020408163 1.020408163 1.020408163
3.06122449 1.020408163 0 0 0 0 0 1.020408163
6.12244898 25.51020408 8.163265306 12.24489796 3.06122449
1.020408163 1.020408163 1.020408163 0 0 0 0 0
1
1983 1 3 3 2 4 4 76 18 0 0
0 0.853100248 1.713417678 9.128015089 7.723929487 10.7819436
4.498185623 6.400984595 5.730048459 4.913034118 2.310430285
2.346516192 1.36624798 1.064133086 0.203815657 0 0
1.706200496 10.53210069 10.77200226 7.254084843 2.197696684
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0.014434363 0.134385145 0.021651544 0.26877029 # 3
1984 1 3 3 2 4 4 76 12 0 0
0 1.201131683 4.303243092 4.202336679 4.853355727 5.852674585
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4.801278309 4.951013717 0.950489863 2.750563176 0 0
1.751244318 11.25939137 5.702939177 6.454864637 2.301356953
4.202336679 0.550112635 2.050715133 0.550112635 0 0 0
0 0 0 # 2
1986 1 3 3 2 4 4 76 6 0 0
0 2.040816327 4.081632653 12.24489796 28.57142857 6.12244898
0 0 0 0 0 0 0 0 0 0 0
0 10.20408163 20.40816327 6.12244898 10.20408163 0 0
0 0 0 0 0 0 0 0 # 1
1987 1 3 3 2 4 4 76 6 0 0
0 0 16 12 20 16 8 8 4 0 0
0 0 0 0 0 0 0 4 0 0 8
4 0 0 0 0 0 0 0 0 0 #
1
1989 1 3 3 2 4 4 76 36 0 0
0 2.574705437 8.251384298 13.2274197 16.60909999 13.47066895
5.812624659 4.134811635 1.801637689 0.547145045 0 0 0
0 0 0.182381682 0 0.822920164 5.616629459 11.5808747
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0 0 0 0 0 0 # 6
1990 1 3 3 2 4 4 76 12 0 0
0 2.164855344 14.01133359 7.516767558 5.351912214 6.25366145

2.044403053 2.044403053 3.18705687 0 2.164855344 0
2.164855344 2.164855344 0 0 0 0 5.231459923
15.3330229 19.90363817 4.209258397 3.06660458 3.18705687 0
0 0 0 0 0 0 0 # 2
1991 1 3 3 2 4 4 76 48 0 0
0 2.956092424 9.755088608 18.85805714 17.01570181 7.620109989
4.009167218 0.760687515 0 0 0 0 0 0 0
0 0 0 2.2801268 6.780793975 14.28303643 11.65196445
2.90604124 0.850192391 0 0 0 0.272940009 0 0
0 0 # 8
1992 1 3 3 2 4 4 76 18 0 0
4.910957521 6.338491317 14.24030663 11.5636269 10.97469561
14.82923792 3.169245658 2.112830439 0 0 0 0 0
0 0 0 0 2.112830439 11.63491025 8.183775886
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0 0 0 0 0 0 # 3
1993 1 3 3 2 4 4 76 18 0 0
0 1.852096109 5.82858727 4.813942469 5.692437798 7.738513342
10.73951946 1.344773708 0 0 0 0 0 0 0
0 0 0 7.134201224 20.04104402 11.94814369 9.806962698
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0 0 0 # 3
1994 1 3 3 2 4 4 76 30 0 0
0.316341789 4.411427677 12.14225676 16.36577847 8.414467483
4.027203386 3.458110458 3.966388346 1.081086747 0 0 0
0 0 0 0 0 1.90992021 6.1503696 24.13853667
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0 0 0 0 0 0 # 5
1995 1 3 3 2 4 4 76 30 0 0
0.666501558 2.58572665 11.35479854 17.61753179 8.575181584
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3.258713254 12.00347684 15.48507626 7.548651399 2.01895981
1.582728204 0 0 0 0 0 0 0 0 #
5
1996 1 3 3 2 4 4 76 6 0 0
2.857142857 5.714285714 11.42857143 14.28571429 20 5.714285714
0 2.857142857 0 0 2.857142857 0 0 0 0
0 0 2.857142857 0 14.28571429 5.714285714 8.571428571
2.857142857 0 0 0 0 0 0 0 0 0
1
1997 1 3 3 2 4 4 76 12 0 0
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0 0 0 0 3.028781114 5.30036695 2.271585836

14.18933399 3.467785865 3.467785865 2.112490572 0 0 0
0 0 0 0 0 # 2
1998 1 3 3 2 4 4 76 12 0 0
0 4.722149728 0.761418901 4.645331567 3.503203216 2.284256703
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0 0 2.361074864 52.32435646 19.26930836 5.483568629
2.741784315 0 0 0 0 0 0 0 0 0
0 # 2
2002 1 3 3 2 3 4 76 12 0 0
0 3.570780952 0.71415619 4.72534779 21.21052484 10.60526242
3.297035409 0 0 0 0 0 0 0 0 0
0 0.71415619 7.361767228 18.24077519 14.66999424 11.59316415
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2
2003 1 3 3 2 3 4 76 12 0 0
0 0 14.68862725 13.36013211 14.24579553 11.62965537
5.593411826 3.01812177 0 1.287645028 1.287645028 0 0
0 0 0 0 0 3.862935084 6.881056854 11.62965537
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0 0 0 # 2
2004 1 3 3 2 3 4 76 12 0 0
0 0 4.029228487 12.60699184 7.356472552 17.1555267
7.356472552 4.029228487 4.029228487 2.625259643 0 0 0
2.625259643 0 0 0 0 0 3.327244065 16.81889837
11.90500742 5.433197331 0 0.701984422 0 0 0 0
0 0 0 # 2
2007 1 3 3 2 2 4 76 6 0 0
0 0 0 16.66666667 6.666666667 13.33333333 0 10
0 6.666666667 0 0 0 0 0 0 0 0
0 3.333333333 13.33333333 13.33333333 10 0 3.333333333
3.333333333 0 0 0 0 0 0 # 1
2008 1 3 3 2 2 4 76 12 0 0
0 0 0 0.887616257 15.77905041 15.10856585 16.44953497
8.441899181 16.44953497 4.22094959 2.445717076 2.445717076 0
0 0 0 0 0 0 0 0.887616257 0.887616257
5.996182104 5.77905041 0 0.887616257 2.445717076 0 0
0 0.887616257 0 # 2
1966 2 4 3 2 3 4 76 48 0 0
0 0 0.779324755 10.32825589 23.02374582 12.12500141
6.431323522 5.417517814 3.104047763 1.092632292 0.634655374
0.802229832 0 0.162803213 0 0 0 0 0.162803213
1.151957052 7.330391331 16.14132067 4.311177309 3.327970879
2.081013336 0.290484082 0.475645748 0.655157366 0.170541314 0
0 0 # 8
1967 2 4 3 2 3 4 76 66 0 0
0 0.519437681 4.373725185 8.597318407 14.78350817 9.376296377

4.046268793 4.05646615 2.51014152 1.305627963 0.163046653
0.477600313 0 0 0 0 0 0 0.327513567
5.102228544 15.04857024 17.12456928 7.961462398 2.07775306
0.700457836 0.818900551 0.31455366 0.31455366 0 0 0
0 # 11
1968 2 4 3 2 3 4 76 108 0 0
0 0.059885966 1.609988738 5.502574285 13.77399605 15.45455114
6.886477444 5.148392492 1.776137277 1.323458276 0.714010046
0.759131846 0.100273124 0.160746335 0 0 0 0
0.056991113 2.004234352 6.029324347 15.77524924 14.06854234
4.553358294 2.893610046 0.751179333 0.396695225 0.160746335 0
0 0.040446357 0 # 18
1969 2 4 3 2 3 4 76 108 0 0
0 0 2.960611479 11.40426302 12.58501647 17.97361436
14.74678227 8.779809665 4.662545821 2.563357769 0.536842916
0.880095542 0.096256775 0.090651967 0 0 0 0 0
1.230037947 3.116413696 6.121427215 6.49908425 3.78310139
1.362520328 0.483616191 0.12395093 0 0 0 0 0
18
1970 2 4 3 2 3 4 76 126 0 0
0 0.071008558 2.147521666 7.251113634 16.11809693 12.39844825
10.05919174 10.28467169 2.890505443 1.199920232 0.686077725
0.212719723 0.187941355 0 0 0 0 0 0
0.68565708 4.459239364 10.91134387 10.5030206 6.507954779
2.343996137 0.682470463 0.327091396 0 0.072009362 0 0
0 # 21
1971 2 4 3 2 3 4 76 30 0 0
0.145176617 2.997077225 16.11004699 8.889206184 8.320027883
2.790657042 3.244257168 4.94507673 1.274558059 1.37880023
0.279274013 0.427714565 0 0 0 0 0 0
4.04252766 17.86297971 9.373946565 8.381313056 3.557444822
3.295521117 1.781722443 0.599776511 0.151447704 0.151447704 0
0 0 0 # 5
1972 2 4 3 2 3 4 76 42 0 0
0.262692555 6.868310929 6.768100711 8.844704131 6.823900877
4.744207185 2.775176558 2.178329013 1.112258478 1.178680338
0.664266792 0.34993787 0.089545164 0.084273845 0.084273845 0
0 0 5.792692949 10.57359475 18.10932066 11.57051055
4.833731013 2.345024675 2.508885601 1.064051173 0.373530336 0
0 0 0 0 # 7
1973 2 4 3 2 3 4 76 30 0 0
0.191876897 1.664172707 3.595460075 4.948797998 7.320077683
6.001065588 3.986521605 3.547671287 2.536352841 3.721762787
1.530198306 1.622128436 0.905860726 0.18990297 0.503058723 0
0 0 2.053831251 6.517683722 9.940553101 11.75366566

10.98708793 5.340898442 2.873356642 3.591598279 2.001934377
2.040030795 0.170854761 0.292741647 0 0.170854761 # 5
1974 2 4 3 2 3 4 76 42 0 0
0.103674551 1.510265425 4.327277761 13.03103696 14.83206171
4.620272306 2.939104104 3.087824026 3.026796868 0.433588358
1.608412882 0.848078204 0.183968615 0.309535837 0.451941924 0
0 0.827210321 4.971132488 9.534520301 11.39591822 9.180037242
5.127869458 3.123598023 1.589351595 0.954265753 1.081402617
0.842453054 0.058401393 0 0 0 # 7
1975 2 4 3 2 3 4 76 30 0 0
0.251720882 1.39682668 8.198604012 9.056006272 9.502286528
5.460027175 3.952474755 2.346729988 1.102522715 0.766388887 0
0.148940381 0 0 0 0 0 0.251720882 3.905337806
14.4165667 14.0508093 11.26253421 9.800246351 3.092261198
1.03799528 0 0 0 0 0 0 0 # 5
1977 2 4 3 2 3 4 76 66 0 0
0.283253678 1.976700915 12.44489497 12.85760551 11.91399672
3.819879005 4.723547307 1.913235422 1.554104277 0.339821278
0.306260817 0.016340566 0.209813935 0 0 0 0
0.103187489 1.332346046 15.48408753 12.84371931 9.80096925
4.5343348 2.406608486 0.67900215 0.209274543 0.247015982 0
0 0 0 0 # 11
1978 2 4 3 2 3 4 76 48 0 0
0.466034116 2.797771905 4.091805749 6.760314 11.91379567
7.724735832 3.291876035 3.005124562 0.96203251 1.435275564
0.282851913 0.282829682 0.141896802 0.099328552 0.099328552 0
0 0.083253119 3.031600019 4.736574633 12.89088105 16.86594537
8.61655947 6.449392852 2.222926504 0.75196875 0.223387811
0.14093288 0.420470771 0.140156924 0 0.070948401 # 8
1979 2 4 3 2 3 4 76 36 0 0
1.10497958 8.724395765 19.23314816 7.489502221 9.223403866
3.807244299 2.627226641 2.275968561 0.961385177 0.398805997
1.214156079 0.736459781 0.519799423 0.077451197 0.677482278 0
0 1.940622708 4.693393848 10.9281595 8.95994364 6.865905777
4.039865904 1.91050754 0.415438478 0.618255772 0.208644323 0
0.077451197 0.270402287 0 0 # 6
1980 2 4 3 2 3 4 76 96 0 0
0.102533285 5.379613791 8.249688073 10.50991648 7.832220672
6.331478476 3.022947861 2.288120419 2.032240904 0.937309133
1.131882735 0.675536565 0.406340046 0.133263478 0.12773519 0
0 0.056152099 3.199384068 7.88473842 12.83170978 10.24596141
6.272978736 3.281500105 3.122564688 1.797975242 1.507241253
0.294426457 0.185859671 0.147513333 0 0.011167624 # 16
1981 2 4 3 2 4 4 76 174 0 0
0.395006214 5.579458887 18.53249583 12.97766541 9.835684352
5.975434136 3.13308322 2.084609843 1.488835153 0.555659343

0.540484998 0.339582938 0.380353794 0.203010532 0.418554471 0
0 0.03512274 2.347137963 9.791440466 13.00877064 5.087375369
4.231027822 1.176574374 0.363141077 0.219897457 0.408874676
0.148010741 0.206132928 0.151767824 0.042154736 0.342652062 #
29
1982 2 4 3 2 4 4 76 90 0 0
0.133176909 5.273899707 15.57720383 18.55138152 7.031863595
5.160837396 3.228646516 3.224091093 0.981193 0.881266925
0.093961995 0.429973197 0.075098357 0.463740766 1.039630261 0
0 0.745365149 3.655555994 8.992799753 15.71033822 3.759182006
2.090526716 0.934284339 0.442919654 0.273821439 0.021374011
0.282525364 0 0.038718812 0 0.906623478 # 15
1983 2 4 3 2 4 4 76 6 0 0
0 1.052631579 0 2.105263158 0 3.157894737 4.210526316
1.052631579 0 0 0 0 0 0 0 0 0
3.157894737 20 30.52631579 13.68421053 10.52631579 5.263157895
3.157894737 0 0 1.052631579 1.052631579 0 0 0
0 # 1
1985 2 4 3 2 4 4 76 12 0 0
0 4.384876711 8.966899154 14.93211151 9.717320853 14.37883555
6.260930958 7.28799064 7.189417774 4.858660426 2.705968197
2.607395331 1.678908515 0.750421698 0.651848833 0 0
1.027059682 1.678908515 1.678908515 4.582022443 1.303697665
1.402270531 1.303697665 0.651848833 0 0 0 0 0
0 0 # 2
1986 2 4 3 2 4 4 76 24 0 0
0.039686367 9.145571012 11.05412473 9.343983416 15.80718923
6.714149277 7.479581737 4.881650463 2.910075085 0.18232772
1.312396189 0.142641353 0 0 1.312396189 0 0 0
4.282461039 8.511756523 8.15724301 3.860499168 2.954842187
0.452387764 0.142641353 0 1.312396189 0 0 0 0
0 # 4
1987 2 4 3 2 4 4 76 42 0 0
2.223127568 5.369447923 9.184352148 15.97768874 11.67828585
6.510246161 1.721364254 1.141857818 0.070944527 0.070944527 0
0 0 0 0 0 0 0.620737839 15.93034165
11.95402835 14.2179237 0.397117807 2.704302905 0.156343713 0
0.070944527 0 0 0 0 0 0 # 7
1988 2 4 3 2 4 4 76 12 0 0
10.67214054 15.50107513 11.30791775 23.8873899 13.21524935
0.635777202 0.635777202 0.635777202 0 0 0 0 0
0 0 0 0 3.557380181 7.114760363 5.464711787
4.828934585 1.271554404 1.271554404 0 0 0 0 0
0 0 0 0 # 2
1989 2 4 3 2 4 4 76 30 0 0
0 0.867911804 11.73439365 25.87304937 12.37253151 10.34967175

5.447207861 2.679052028 0.619293891 0.660641441 0.693843806 0
0 0 0 0 0 2.136577145 4.341340527 11.78839951
7.438975257 1.543107135 1.45400333 0 0 0 0 0
0 0 0 0 # 5
1990 2 4 3 2 4 4 76 30 0 0
0.473837529 2.74191481 17.17786605 26.33182345 14.5037916
1.518531147 0.055342197 0.759265574 2.410327236 0 0 0
0 0 0 0 0 1.003017255 4.95472414 9.389913748
10.97389789 4.347745077 1.265060026 2.092942269 0 0 0
0 0 0 0 0 # 5
1991 2 4 3 2 4 4 76 12 0 0
0 4.849307774 16.05484558 17.89030883 19.72577208 17.89030883
1.506922262 0 0 0 0 0 0 1.506922262 0
0 0 0 3.013844524 1.506922262 4.849307774 6.684771023
3.013844524 1.506922262 0 0 0 0 0 0 0
0 # 2
1992 2 4 3 2 4 4 76 36 0 0
1.771249187 6.615621525 8.484312207 15.19962924 8.526642745
12.9464075 4.085623497 2.692190626 1.09313852 0.221731185 0
0.092360082 0 0 0 0 0.483832535 1.285400742
4.59443941 11.04984488 9.768936335 4.575426914 4.807310611
1.189396255 0.516506001 0 0 0 0 0 0 0
6
1993 2 4 3 2 4 4 76 12 0 0
0 1.795351234 14.03465728 16.96905455 10.11580221 16.64090196
10.11580221 1.467198638 0 3.590702469 0 0 0 0
0 0 0 0 0 12.0657417 7.33599319 4.401595914
1.467198638 0 0 0 0 0 0 0 0 0
2
1994 2 4 3 2 4 4 76 12 0 0
0 1.622365899 19.88163904 22.0192855 10.73924843 11.8208257
1.081577266 3.760012355 3.219223722 3.219223722 0 0 0
0 0 0 0 3.219223722 4.841589622 7.545532787
3.785520432 2.163154533 0 0.540788633 0.540788633 0 0
0 0 0 0 0 # 2
1996 2 4 3 2 4 4 76 6 0 0
0 2.564102564 7.692307692 5.128205128 23.07692308 12.82051282
5.128205128 0 0 2.564102564 0 0 0 0 0
0 0 0 2.564102564 10.25641026 10.25641026 5.128205128
12.82051282 0 0 0 0 0 0 0 0 0
1
1997 2 4 3 2 4 4 76 54 0 0
0.58454382 19.61621688 13.92662968 12.18975564 9.895573507
8.145062566 5.11866107 1.06640407 1.207229987 0.67065836
0.131865199 0.038958884 0 0 0 0 0 1.75363146
12.63385768 6.067501052 3.788916466 2.033324617 0.937946464

0.075295069 0.079008656 0.038958884 0 0 0 0 0
0 # 9
1998 2 4 3 2 4 4 76 30 0 0
0 3.243255096 11.29647743 5.38580182 10.11871107 4.190082801
6.346967425 4.061801587 2.236008874 0.651994005 0.656300822 0
0 0 0 0 0 0 4.861544629 15.91451712
8.980626173 12.88059727 6.770202312 1.248616141 0 1.156495422
0 0 0 0 0 0 # 5
2002 2 4 3 2 3 4 76 6 0 0
0 11.42857143 28.57142857 25.71428571 14.28571429 5.714285714
8.571428571 0 0 0 0 0 0 0 0 0
0 0 0 2.857142857 0 0 2.857142857 0 0
0 0 0 0 0 0 0 # 1
2003 2 4 3 2 3 4 76 18 0 0
0 7.187233515 26.98403139 4.899695947 5.853765149 2.139966831
0.711538577 0.618966386 0 0 0 0 0 0 0
0 0 0 3.713002419 31.65725 11.52159002 1.85610326
2.856856507 0 0 0 0 0 0 0 0 0
3
2004 2 4 3 2 3 4 76 6 0 0
0 0 21.95121951 19.51219512 12.19512195 2.43902439 0
0 0 0 0 0 0 0 0 0 0 0
2.43902439 14.63414634 14.63414634 9.756097561 2.43902439 0
0 0 0 0 0 0 0 0 # 1
2007 2 4 3 2 2 4 76 18 0 0
0 1.485458422 1.485458422 6.568855076 9.372978614 4.191770369
8.583523295 5.445813142 0 3.235521743 1.485458422 0 0
0 0 0 0 0 0 6.402061769 1.831280287
5.429218518 12.30810299 17.14348937 7.391499643 5.791635006
1.847874911 0 0 0 0 0 # 3
2008 2 4 3 2 2 4 76 6 0 0
0 0 3.571428571 3.571428571 7.142857143 7.142857143
7.142857143 0 3.571428571 3.571428571 0 0 0 0
0 0 0 0 0 0 7.142857143 10.71428571
28.57142857 7.142857143 10.71428571 0 0 0 0 0
0 0 # 1
1966 1 5 3 2 3 4 76 16 0 0
0 1.548525009 20.73525062 8.981080185 6.923098759 3.489970042
3.942548779 1.186159132 0.27308884 1.126846797 0.464403876
0.203951613 0.210698884 0 0 0 0 2.235753443
11.17876722 24.93278057 7.75283238 4.126504519 0.687739338 0
0 0 0 0 0 0 0 0 # 8
1967 1 5 3 2 3 4 76 26 0 0
0 4.831767328 6.787565451 6.177460761 2.121817148 2.376186746
1.621105366 0.925875758 0.217120532 0.108560266 0.150647024 0
0 0 0 0 0 3.722605628 16.7140154 41.61826262

10.37298865 1.374347644 0.277085575 0.602588096 0 0 0
0 0 0 0 0 # 13
1969 1 5 3 2 3 4 76 16 0 0
1.885181728 4.810724041 5.063295819 11.42468722 14.16795734
3.846250632 8.499144909 1.056655538 6.635845726 3.805513249
0.114064674 2.814037524 0.016294953 0.02444243 0.057032337 0
0 1.885181728 3.764775865 3.813660725 10.35173673 7.52955173
2.805890047 2.805890047 2.822185001 0 0 0 0 0
0 0 # 8
1970 1 5 3 2 3 4 76 20 0 0
6.076534647 10.15031605 13.28738619 7.305967532 2.117109487
0.531539083 0.397165423 0.027437119 0 0.046806281 0.019369162
0.038738324 0.079499423 0 0 0 0 11.28839238
32.44433865 10.80872605 3.496634144 1.429526809 0.428013439 0
0 0 0 0 0 0.026499808 0 0 # 10
1971 1 5 3 2 3 4 76 12 0 0
2.165424585 26.04847848 17.39630245 8.171331029 3.611867079
1.349471221 0.735245702 0.326006966 0 0.206382733 0 0
0.264431484 0 0 0 0 1.929702848 14.79715813
14.17302666 4.3674427 0.407842787 1.349961714 0 1.349961714
0 1.349961714 0 0 0 0 0 # 6
1972 1 5 3 2 3 4 76 46 0 0
0.011964289 0.684758128 6.968702579 21.10971662 4.165707092
6.37635522 1.763443147 3.568948908 1.089520794 1.751113843
1.848043862 0.93304295 0.134691924 0.005219513 0.04162435 0
0 1.286772415 9.343543243 17.5528288 15.34796859 4.017015027
0.778033839 1.067825264 0.053075232 0.053075232 0.047009139 0
0 0 0 0 # 23
1973 1 5 3 2 3 4 76 24 0 0
0.053104858 3.776601048 4.419418474 27.2991686 7.306552327
3.555611002 2.373669266 1.023583349 0.535702246 0.053104858
0.127032721 0.23448808 0 0 0 0 0 0
8.196544328 19.80817983 14.61999816 5.190877584 0.737207951 0
0.689155309 0 0 0 0 0 0 0 # 12
1974 1 5 3 2 3 4 76 58 0
0.049135718 0.600916946 4.546318465 4.769513398 4.69822636
11.11489208 9.048057317 5.653303951 3.396367926 1.196480856
1.586871881 0.002124478 0.756995072 0.510506369 0.09400519
0.00986405 0 0 1.701035805 3.748887351 8.507491926
12.82993808 11.23754683 6.337404633 1.511342388 2.458713199
0.66637594 1.88751092 0.180358873 0.433448347 0 0.466365651
0 # 29
1975 1 5 3 2 3 4 76 18 0 0
4.470115566 19.6085593 6.001497466 1.363228177 0.310553953
0.576113793 0.498847489 0.521429279 0.289535429 0.023975589 0
0 0 0.023975589 0.023975589 0 0.289660693 7.631922403

54.76629666 2.930279763 0 0 0.23743595 0 0 0
0.43259732 0 0 0 0 0 # 9
1976 1 5 3 2 3 4 76 24 0 0
0.092683759 2.391519078 21.76415248 11.7978647 8.515923752
4.194364276 1.850514863 2.150820307 0.483458379 2.400851492
1.80595675 1.988847124 0 0 0.154043684 0 0
0.023037513 1.343546605 11.07470385 10.36377198 7.866323968
7.364175717 0.816589133 0 1.556850593 0 0 0 0
0 0 # 12
1977 1 5 3 2 3 4 76 16 0 0
1.889964287 5.897356732 10.00689045 14.97377492 15.22086114
5.078816796 6.858549225 3.045610532 1.757797197 1.066124316 0
0.446845404 0.357000503 0.976279414 0 0 0 0
6.289171771 10.75279818 11.37008871 1.480724889 1.240871799
0.486627838 0.357000503 0.446845404 0 0 0 0 0
0 # 8
1978 1 5 3 2 3 4 76 18 0 0
4.074796886 4.822777317 2.114857035 4.98786766 4.745435817
3.130030038 0.666479844 0.29357949 0.5894285 0.044768218
0.146789745 0 0 0 0 0 0 3.364947163
12.90053469 16.99887673 18.21812233 15.67040506 5.229777842
1.387466591 0.613059046 0 0 0 0 0 0 0
9
1979 1 5 3 2 3 4 76 10 0 0
2.284098747 2.219498767 3.554063644 4.538922417 10.87434175
9.112435557 4.538922417 2.539929796 2.284804709 0.89127217
2.635139705 0 0 0 0 0 0.761366249 6.787696261
3.434476796 2.734435696 11.77357551 11.0061412 9.886373076
8.142505541 0 0 0 0 0 0 0 0 #
5
1980 1 5 3 2 3 4 76 12 0
1.529925384 12.37874724 29.22295019 15.01060766 5.01385343
2.142489333 2.432144104 0.325827725 0.890244328 0 0 0
0 0 0 0 0 0 3.492419013 12.16030527
12.80655835 2.268100246 0.325827725 0 0 0 0 0
0 0 0 0 0 # 6
1981 1 5 3 2 3 4 76 36 0
4.281178603 10.24298827 17.10487995 8.633010128 8.352203436
9.949255638 5.313887511 4.576346476 0.940698785 2.648365448
3.562365743 2.051888443 0.760193746 0.907935584 0.178028888
0.054139524 0 1.208153836 3.204003675 3.659130248 5.340589145
4.64492148 1.63784228 0.729906696 0 0 0.018086466 0
0 0 0 0 0 # 18
1982 1 5 3 2 3 4 76 2 0 0
4 12 24 24 8 4 0 0 0 0 0
0 0 0 0 0 0 4 4 12 0 4

0 0 0 0 0 0 0 0 0 0 #
1
1983 1 5 3 2 3 4 76 24 0 0
7.717626403 5.186037323 7.612887893 6.389726803 8.235048558
2.428717903 5.118427878 0.984705181 0.459801169 0.438907018
0.909708965 0 0.264944967 0.067784859 0.067784859 0
1.394933626 8.458510101 18.1353088 11.60521001 7.229712849
3.094298414 3.912678062 0.067784859 0.219453509 0 0 0
0 0 0 0 # 12
1984 1 5 3 2 3 4 76 12 0 0
0 0.49426028 2.265471963 5.590156534 3.904467829 3.140038821
2.758991586 1.702830862 0.450868316 1.352604947 0.450868316 0
0 0.024988856 0 0 0 0 24.02733277 36.87081991
13.28262891 3.430643535 0.253026571 0 0 0 0 0
0 0 0 0 # 6
1985 1 5 3 2 3 4 76 4 0 0
0 1.494991573 17.49499157 4.484974719 0 0 0 0
0 0 0 0 0 0 0 0 0 0
22.02003371 40 13.01001685 1.494991573 0 0 0 0
0 0 0 0 0 0 # 2
1990 1 5 3 2 3 4 76 2 0 0
0 0 4 16 24 12 0 12 4 8 0
4 4 0 8 0 0 0 0 0 4 0
0 0 0 0 0 0 0 0 0 0 #
1
1991 1 5 3 2 3 4 76 8 0 0
0 6.748307398 4.937499444 5.008777442 8.175269763 6.433705873
2.281620507 2.37735125 5.847647382 0.681789234 0 0 0
0 0 0 0 0 5.502008804 13.21436012 11.98544354
22.14724749 1.188675625 2.281620507 0 0 0 0 0
1.188675625 0 0 # 4
1999 1 5 3 2 3 4 76 2 0 0
0 0 11.11111111 7.407407407 25.92592593 3.703703704
3.703703704 0 7.407407407 0 3.703703704 0 0 0
0 0 0 0 7.407407407 11.11111111 14.81481481
3.703703704 0 0 0 0 0 0 0 0 0
0 # 1
2007 1 5 3 2 3 4 76 2 0 0
0 0 3.225806452 6.451612903 22.58064516 19.35483871
16.12903226 9.677419355 0 3.225806452 0 0 0 0
0 0 0 0 0 0 0 3.225806452 6.451612903
3.225806452 6.451612903 0 0 0 0 0 0 0
1
1966 2 6 3 2 3 4 76 54 0 0
0.253292586 5.337412524 14.31048974 11.51833725 3.058901823
1.806681408 1.641152087 0.084877476 0.097689622 0.206201015

0.148350623 0.239703574 0.033502559 0 0 0 0
0.215770387 7.311281505 33.98293014 15.39004793 2.570332252
1.137027393 0.491869957 0.114962815 0.049185331 0 0 0
0 0 0 # 27
1967 2 6 3 2 3 4 76 22 0 0
3.596390159 3.900950085 8.10444048 14.05266671 12.5748711
3.251219887 1.564818371 0.741359585 1.062680941 0.681321328
0.6102526 0 0 0 0 0 0 1.408751933
5.357433617 14.55226832 17.94985436 9.184053263 1.077180116 0
0.258418406 0 0 0.071068729 0 0 0 0 #
11
1968 2 6 3 2 3 4 76 112 0 0
1.508147984 8.202890669 5.501432532 13.28355498 4.306330923
6.88471512 0.263179484 0.518284605 0.391932161 0.07768865
0.638389118 0.028828242 0.074681418 0.011534799 0.0664063 0
0.098193073 5.826895422 12.12690217 17.57038762 10.46990822
5.783624852 3.037225733 1.329206347 1.000274034 0.283078002
0.065829886 0.239941911 0.200256761 0.13486426 0.002518383
0.072896342 # 56
1969 2 6 3 2 3 4 76 62 0 0
2.331565141 4.356330288 10.35940754 9.364556712 6.287504588
5.105652585 1.810896698 0.894785047 1.135839214 0.804217669
0.603227328 0.082485449 0.531629239 0.017213675 0.020475901 0
0 3.87016677 4.350025175 19.40897739 6.581944985 10.62621933
5.881450948 1.83327291 0.801941337 1.102888254 0.265239138
0.674914092 0.489836877 0.06421606 0.303593148 0.039526506 #
31
1970 2 6 3 2 3 4 76 58 0 0
1.932853931 32.94408035 10.23146835 3.59090556 1.254074485
0.741441296 0.630953055 0.573340372 0.173999875 0.150899259
0.018196019 0.127351543 0.008053331 0.008910535 0.024159993 0
0 0.89243835 25.69818784 8.919810754 8.179006232 0.575114427
1.162069268 0.960241381 0.37151537 0.098866231 0.170821473
0.238608672 0.018343934 0.265235713 0.005368887 0.033683509 #
29
1971 2 6 3 2 3 4 76 74 0 0
0.641717706 4.870788964 21.61477698 10.87379523 7.997237452
3.830102922 1.418332524 0.861393101 0.834166843 0.745245675
0.193362449 0.193939304 0.184808311 0 0.125790089 0 0
0.178808021 3.893029816 23.12252397 7.708115404 5.06779307
2.334984414 1.164355465 0.734095675 0.349762989 0.386475541
0.111750137 0 0.033931928 0.174697868 0.354218154 # 37
1972 2 6 3 2 3 4 76 76 0 0
0.454745214 3.848220442 5.705462661 12.66964298 12.34870794
2.78073488 1.657644267 0.686654841 1.226866111 0.43967322
0.578520142 0.038974194 0.068078233 0.097844568 0.151169161

0.011153689 0 0.507937843 8.211124543 11.03905728 26.20896881
5.562087584 2.086123535 0.806417195 1.297349977 0.37280263
0.514421952 0.174970097 0.383394194 0.047888927 0 0.023362886
38
1973 2 6 3 2 3 4 76 76 0 0
2.756489175 2.001847701 5.925779308 5.92330337 10.00860829
5.844629341 2.88488939 2.530475764 1.097029291 0.811345458
0.930873238 0.447171751 0.810857785 0.150652288 0.077042282 0
0.079822441 0.563091036 4.053783786 8.836044867 12.42217664
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1.07578987 0.345475748 0.157477943 0.27969386 0.160771045
0.723237401 # 38
1974 2 6 3 2 3 4 76 68 0 0
0.850500776 10.06084505 16.97906404 8.156415841 2.245474568
4.72760237 1.542774987 1.470494768 0.326741393 0.822005645
0.236962695 0.181991948 0.01112656 0.01112656 0.062913022 0
0 2.076814869 10.78027659 17.01399228 9.259642111 2.832803892
4.740313726 1.639444999 1.495392391 1.203575231 0.74994399
0.231021569 0 0.204975784 0.027881647 0.057880711 # 34
1975 2 6 3 2 3 4 76 36 0 0
0.194765196 6.733363705 12.18044862 10.17818333 4.883834731
6.106455664 2.942928195 1.423956022 0.387045522 1.436980063
0.267867562 1.04085492 0 0.207580496 0.073361774 0 0
0.843101115 8.457138186 20.12636834 10.63172669 5.926374462
2.918281302 0.893434389 0.781790768 0.745256773 0.207580496 0
0.411321684 0 0 0 # 18
1976 2 6 3 2 3 4 76 46 0 0
0.189064804 1.514890671 17.11841991 5.857719389 2.571948666
1.885269051 1.217896619 1.049142832 0.28038677 0.78606122
0.449622049 0.365570595 0 0 0.071223327 0 0 0
7.054884092 30.78017422 19.93315547 5.453040784 1.569324465
0.76437849 0.423487569 0.609733898 0.013308815 0.027987488
0.013308815 0 0 0 # 23
1977 2 6 3 2 3 4 76 66 0.007864741
0 1.76937299 10.27424992 14.85867857 8.941201928 8.039893986
2.835173438 1.088774714 0.99185138 0.755107532 0.430899431
0.726146936 0.318172622 0.159470224 0.058594065 0.081796523 0
0 1.32138134 6.92478008 14.13727076 14.15272273 6.958597808
3.907566852 0.761262402 0.214249983 0.147580732 0.123306732
0.014031585 0 0 0 0 # 33
1978 2 6 3 2 3 4 76 64 0 0
1.181163256 20.12320001 13.40486566 11.23100552 7.399054842
3.605072681 2.265254066 1.535947436 0.265305984 0.47684503
0.482450752 0.1324844 0 0.015170793 0.960779962 0 0
0.709879514 12.68843957 11.29183647 7.218629581 2.480654956

1.755482924 0.725238809 0.020685284 0.030552507 0 0 0
0 0 0 # 32
1979 2 6 3 2 3 4 76 22 0
0.851826662 8.586149742 12.31111796 8.386441976 4.133230875
5.271561117 2.870101353 4.968559695 2.950440443 0.708025864
0.247866727 0.118336987 0 0 0 0 0 0
3.127268976 12.52686521 16.14321105 11.41889859 2.403705168
0.362471851 1.914053323 0.118336987 0.581529454 0 0 0
0 0 0 # 11
1980 2 6 3 2 3 4 76 100 0.021497645
0.721638555 2.559755855 15.12705452 16.5090493 9.165924436
4.205376082 2.566586365 1.021607019 0.703476724 0.52452167
0.457247678 0.094845338 0.029952915 0.093454381 0 0 0
0.936837235 4.555229568 14.18848067 13.10124537 9.834317293
2.141653562 0.519070754 0.51937906 0.346629868 0 0.055168136
0 0 0 0 0 # 50
1981 2 6 3 2 3 4 76 54 0 0
2.346608582 16.83757367 18.44569484 12.09471351 6.53899003
2.670825027 2.924832041 0.787996362 0.595072625 0.171583567
0.191058153 0.175052221 0.191058153 0.035261054 0 0 0
1.89661153 10.71849151 12.42059076 5.798925848 3.154231479
1.099143089 0.201391697 0.038624208 0.376579984 0.021774883
0.26731517 0 0 0 0 # 27
1982 2 6 3 2 3 4 76 36 0 0
1.719732924 5.092472948 17.65224915 10.46479418 5.733277962
5.082671383 1.072516653 1.111230518 0.548107246 0.166033641
0.164772799 0.245406513 0.066401687 0.036365922 0.022133896 0
0 1.195022688 12.39448021 24.04718368 9.352253471 2.588684447
1.244208087 0 0 0 0 0 0 0 0 0
18
1983 2 6 3 2 3 4 76 16 0 0
1.285122226 3.872256193 24.90625267 22.24559088 9.845795388
6.132640634 1.909534298 1.492214534 1.288428025 0 0 0
0 0.115245584 0 0 0 0 0.762575781 10.37742144
6.807597456 2.517569558 4.443680108 0.082308556 1.26843647 0
0 0 0.647330197 0 0 0 # 8
1984 2 6 3 2 3 4 76 6 0 0
1.415489707 9.68478108 13.5346868 4.564449959 3.993893715
1.711668735 0 0.570556245 0 0 0 0 0 0
0 0 0 0 15.22455373 28.13795394 17.0884135
4.073552595 0 0 0 0 0 0 0 0 0
0 # 3
1985 2 6 3 2 3 4 76 8 0 0
0 16.96340704 23.40855358 11.9488957 17.87344978 11.66535815
3.413379744 3.341447207 0 0 0 0 0 0 0
0 0 0 1.144735994 4.061835202 3.575652001 2.603285598

0 0 0 0 0 0 0 0 0 0 #
4
#NWFSC age-at-length

2003 2 8 1 0 2 16 16 1 0 100
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 100 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
2003 2 8 1 0 2 20 20 1 0 100
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 100 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
2003 2 8 1 0 2 22 22 7 0
28.571429 71.428571 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 28.571429
71.428571 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2003 2 8 1 0 2 24 24 8 0 12.5
62.5 25 0 0 0 0 0 0 0 0 0
0 0 0 0 0 12.5 62.5 25 0 0 0
0 0 0 0 0 0 0 0 0 0
2003 2 8 1 0 2 26 26 11 0 0
45.454545 27.272727 27.272727 0 0 0 0 0
0 0 0 0 0 0 0 0 0 45.454545
27.272727 27.272727 0 0 0 0 0 0 0
0 0 0 0 0
2003 2 8 1 0 2 28 28 16 0 0
31.25 43.75 25 0 0 0 0 0 0 0 0
0 0 0 0 0 0 31.25 43.75 25 0 0
0 0 0 0 0 0 0 0 0 0
2003 2 8 1 0 2 30 30 34 0 0
8.823529 32.352941 47.058824 11.764706 0 0 0
0 0 0 0 0 0 0 0 0 0
8.823529 32.352941 47.058824 11.764706 0 0 0
0 0 0 0 0 0 0 0
2003 2 8 1 0 2 32 32 34 0 0
2.941176 35.294118 50 11.764706 0 0 0 0
0 0 0 0 0 0 0 0 0 2.941176
35.294118 50 11.764706 0 0 0 0 0 0
0 0 0 0 0
2003 2 8 1 0 2 34 34 50 0 0
0 16 58 18 6 2 0 0 0 0 0
0 0 0 0 0 0 0 16 58 18 6
2 0 0 0 0 0 0 0 0 0

2003 2 8 1 0 2 36 36 53 0 0
0 11.320755 69.811321 9.433962 9.433962 0 0
0 0 0 0 0 0 0 0 0 0 0
11.320755 69.811321 9.433962 9.433962 0 0 0
0 0 0 0 0 0 0
2003 2 8 1 0 2 38 38 49 0 0
0 4.081633 36.734694 38.77551 14.285714 4.081633
2.040816 0 0 0 0 0 0 0 0 0
0 0 4.081633 36.734694 38.77551 14.285714
4.081633 2.040816 0 0 0 0 0 0 0
0
2003 2 8 1 0 2 40 40 36 0 0
0 0 22.222222 38.888889 22.222222 11.111111
2.777778 0 2.777778 0 0 0 0 0 0
0 0 0 0 22.222222 38.888889 22.222222
11.111111 2.777778 0 2.777778 0 0 0 0
0 0
2003 2 8 1 0 2 42 42 30 0 0
0 0 3.333333 33.333333 33.333333 16.666667
13.333333 0 0 0 0 0 0 0 0 0
0 0 0 3.333333 33.333333 33.333333 16.666667
13.333333 0 0 0 0 0 0 0 0
2003 2 8 1 0 2 44 44 24 0 0
0 0 0 20.833333 37.5 33.333333 8.333333 0
0 0 0 0 0 0 0 0 0 0 0
0 20.833333 37.5 33.333333 8.333333 0 0 0
0 0 0 0 0
2003 2 8 1 0 2 46 46 13 0 0
0 0 0 0 7.692308 15.384615 23.076923
30.769231 15.384615 0 0 0 0 0 7.692308
0 0 0 0 0 0 7.692308 15.384615
23.076923 30.769231 15.384615 0 0 0 0 0
7.692308
2003 2 8 1 0 2 48 48 13 0 0
0 0 0 7.692308 0 23.076923 30.769231 0
7.692308 0 7.692308 0 0 15.384615 7.692308
0 0 0 0 0 7.692308 0 23.076923
30.769231 0 7.692308 0 7.692308 0 0
15.384615 7.692308
2003 2 8 1 0 2 50 50 8 0 0
0 0 0 0 0 25 12.5 12.5 12.5 0 0
12.5 0 12.5 12.5 0 0 0 0 0 0 0
25 12.5 12.5 12.5 0 0 12.5 0 12.5 12.5
2003 2 8 1 0 2 52 52 1 0 0
0 0 0 0 0 0 0 100 0 0 0

0	0	0	0	0	0	0	0	0	0	0
0	0	100	0	0	0	0	0	0	0	
2003	2	8	1	0	2	54	54	1	0	0
0	0	0	0	0	0	0	0	0	0	100
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	100	0	0	0	0	
2003	2	8	1	0	2	56	56	2	0	0
0	0	0	0	0	0	0	0	0	50	0
0	0	0	50	0	0	0	0	0	0	0
0	0	0	0	50	0	0	0	0	50	
2004	2	8	1	0	3	16	16	1	0	0
100	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	100	0	0	0	0
0	0	0	0	0	0	0	0	0	0	
2004	2	8	1	0	3	18	18	1	0	100
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	100	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	
2004	2	8	1	0	3	20	20	2	0	50
50	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	50	50	0	0	0	0
0	0	0	0	0	0	0	0	0	0	
2004	2	8	1	0	3	22	22	8	0	62.5
37.5	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	62.5	37.5	0	0	0	0
0	0	0	0	0	0	0	0	0	0	
2004	2	8	1	0	3	24	24	17	0	
11.764706	23.529412	58.823529	0	5.882353	0	0				
0	0	0	0	0	0	0	0	0	0	
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0	0	0	0	0	0	0	0	0		
2004	2	8	1	0	3	26	26	16	0	0
25	68.75	6.25	0	0	0	0	0	0	0	0
0	0	0	0	0	0	25	68.75	6.25	0	0
0	0	0	0	0	0	0	0	0	0	
2004	2	8	1	0	3	28	28	31	0	0
16.129032	58.064516	19.354839	6.451613	0	0	0				
0	0	0	0	0	0	0	0	0	0	
16.129032	58.064516	19.354839	6.451613	0	0	0				
0	0	0	0	0	0	0	0			
2004	2	8	1	0	3	30	30	52	0	0
13.461538	38.461538	38.461538	5.769231	3.846154	0					
0	0	0	0	0	0	0	0	0	0	0
13.461538	38.461538	38.461538	5.769231	3.846154	0					
0	0	0	0	0	0	0	0	0		

2004 2 8 1 0 3 32 32 49 0 0
0 34.693878 42.857143 20.408163 2.040816 0 0
0 0 0 0 0 0 0 0 0 0 0
34.693878 42.857143 20.408163 2.040816 0 0 0
0 0 0 0 0 0 0
2004 2 8 1 0 3 34 34 57 0 0
0 5.263158 47.368421 38.596491 3.508772 3.508772
0 1.754386 0 0 0 0 0 0 0 0
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3.508772 0 1.754386 0 0 0 0 0 0
0
2004 2 8 1 0 3 36 36 72 0 0
0 9.722222 34.722222 29.166667 20.833333 2.777778
2.777778 0 0 0 0 0 0 0 0 0
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2.777778 2.777778 0 0 0 0 0 0 0
0
2004 2 8 1 0 3 38 38 66 0 0
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0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0
2004 2 8 1 0 3 40 40 53 0 0
0 0 15.09434 37.735849 26.415094 15.09434
3.773585 1.886792 0 0 0 0 0 0 0
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15.09434 3.773585 1.886792 0 0 0 0 0
0 0
2004 2 8 1 0 3 42 42 49 0 0
0 0 0 30.612245 46.938776 14.285714 4.081633
4.081633 0 0 0 0 0 0 0 0 0
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4.081633 0 0 0 0 0 0 0
2004 2 8 1 0 3 44 44 21 0 0
0 0 0 23.809524 19.047619 19.047619 9.52381
28.571429 0 0 0 0 0 0 0 0 0
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28.571429 0 0 0 0 0 0 0
2004 2 8 1 0 3 46 46 20 0 0
0 0 0 0 5 25 25 30 15 0 0
0 0 0 0 0 0 0 0 0 0 5
25 25 30 15 0 0 0 0 0 0
2004 2 8 1 0 3 48 48 8 0 0
0 0 0 0 0 25 25 12.5 12.5 25 0
0 0 0 0 0 0 0 0 0 0 0
25 25 12.5 12.5 25 0 0 0 0 0

2004 2 8 1 0 3 50 50 13 0 0
0 0 0 0 0 0 15.384615 38.461538
15.384615 7.692308 23.076923 0 0 0 0 0
0 0 0 0 0 0 0 15.384615 38.461538
15.384615 7.692308 23.076923 0 0 0 0
2004 2 8 1 0 3 52 52 8 0 0
0 0 0 0 0 0 0 12.5 12.5 0 37.5
12.5 0 12.5 12.5 0 0 0 0 0 0 0
0 0 12.5 12.5 0 37.5 12.5 0 12.5 12.5
2004 2 8 1 0 3 54 54 1 0 0
0 0 0 0 0 0 0 0 0 0 100
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2004 2 8 1 0 3 56 56 2 0 0
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0 0 0 100 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 100
2004 2 8 1 0 3 62 62 1 0 0
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0 0 0 0 0 0 0 0 0 100
2005 2 8 1 0 2 18 18 2 0 100
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 100 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
2005 2 8 1 0 2 20 20 2 0 0
100 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 100 0 0 0 0
0 0 0 0 0 0 0 0 0 0
2005 2 8 1 0 2 22 22 11 0
18.181818 81.818182 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 18.181818
81.818182 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2005 2 8 1 0 2 24 24 17 0
17.647059 64.705882 17.647059 0 0 0 0 0
0 0 0 0 0 0 0 0 0 17.647059
64.705882 17.647059 0 0 0 0 0 0 0
0 0 0 0 0 0
2005 2 8 1 0 2 26 26 16 0 18.75
37.5 31.25 12.5 0 0 0 0 0 0 0 0
0 0 0 0 0 18.75 37.5 31.25 12.5 0 0
0 0 0 0 0 0 0 0 0 0
2005 2 8 1 0 2 28 28 26 0 0
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0 0 0 0 0 0 0 0 0 30.769231

53.846154 15.384615 0 0 0 0 0 0 0
0 0 0 0 0
2005 2 8 1 0 2 30 30 26 0 0
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0 0 0 0 0 0 0 0 0 0
11.538462 61.538462 19.230769 7.692308 0 0 0
0 0 0 0 0 0 0 0
2005 2 8 1 0 2 32 32 41 0
2.439024 17.073171 34.146341 34.146341 12.195122 0
0 0 0 0 0 0 0 0 0 0 0
2.439024 17.073171 34.146341 34.146341 12.195122 0
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2005 2 8 1 0 2 34 34 39 0 0
0 33.333333 53.846154 10.25641 2.564103 0 0
0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0
2005 2 8 1 0 2 36 36 50 0 0
2 20 46 28 2 2 0 0 0 0 0
0 0 0 0 0 0 2 20 46 28 2
2 0 0 0 0 0 0 0 0 0
2005 2 8 1 0 2 38 38 44 0 0
0 11.363636 43.181818 34.090909 11.363636 0 0
0 0 0 0 0 0 0 0 0 0 0
11.363636 43.181818 34.090909 11.363636 0 0 0
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0 0 0 0 0 0 0
2005 2 8 1 0 2 42 42 32 0 0
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0 0 0 0 0 0 0 12.5 34.375 34.375 18.75
0 0 0 0 0 0 0 0 0 0
2005 2 8 1 0 2 44 44 16 0 0
6.25 0 18.75 31.25 12.5 18.75 6.25 6.25 0 0 0
0 0 0 0 0 0 6.25 0 18.75 31.25 12.5
18.75 6.25 6.25 0 0 0 0 0 0 0
2005 2 8 1 0 2 46 46 12 0 0
0 0 8.333333 25 16.666667 41.666667 8.333333
0 0 0 0 0 0 0 0 0 0 0
0 8.333333 25 16.666667 41.666667 8.333333 0
0 0 0 0 0 0 0
2005 2 8 1 0 2 48 48 11 0 0
0 0 0 9.090909 36.363636 0 9.090909

18.181818 18.181818 9.090909 0 0 0 0 0
0 0 0 0 0 9.090909 36.363636 0
9.090909 18.181818 18.181818 9.090909 0 0 0
0 0
2005 2 8 1 0 2 50 50 4 0 0
0 0 0 0 0 0 50 25 25 0 0
0 0 0 0 0 0 0 0 0 0 0
0 50 25 25 0 0 0 0 0 0
2005 2 8 1 0 2 52 52 3 0 0
0 0 0 0 0 0 33.333333 0 0 0
0 33.333333 0 0 33.333333 0 0 0 0
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33.333333 0 0 33.333333
2005 2 8 1 0 2 54 54 4 0 0
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0 0 0 0 0 0 0 0 0 0 0
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2005 2 8 1 0 2 56 56 2 0 0
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0 0 50 50 0 0 0 0 0 0
2006 2 8 1 0 2 18 18 1 0 100
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2006 2 8 1 0 2 22 22 6 0 0
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30 50 10 0 0 0 0 0 0 0 0
0 0 0 0 0 10 30 50 10 0 0
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2006 2 8 1 0 2 26 26 19 0 0
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47.368421 31.578947 10.526316 5.263158 5.263158 0
0 0 0 0 0 0 0 0 0
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41.666667 41.666667 16.666667 0 0 0 0 0
0 0 0 0 0 0
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20	25	15	5	0	0	0	5	0	0
2006	2	8	2	0	2	40	40	12	0	0
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0	8.333333	0	0	0	0	0	0	0	0
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2006	2	8	2	0	2	42	42	9	0	0
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0	11.111111	11.111111	11.111111	11.111111	11.11111
11.11111	0	0
2006	2	8	2	0	2	44	44	3	0	0
0	0	0	0	0	33.333333	0	33.333333	0
0	33.333333	0	0	0	0	0	0	0	0
0	0	0	33.333333	0	33.333333	0	0
33.333333	0	0	0	0
2006	2	8	2	0	2	48	48	1	0	0
0	0	0	0	0	0	0	100	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	100	0	0	0	0	0	0	0
2006	2	8	2	0	2	50	50	1	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	100	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	100
2007	2	8	2	0	2	14	14	1	100	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	100	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
2007	2	8	2	0	2	18	18	1	0	100
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	100	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
2007	2	8	2	0	2	20	20	6	0
66.666667	16.666667	16.666667	0	0	0	0	0
0	0	0	0	0	0	0	0	0	66.666667
16.666667	16.666667	0	0	0	0	0	0	0
0	0	0	0	0	0
2007	2	8	2	0	2	22	22	17	0	0
52.941176	29.411765	11.764706	5.882353	0	0	0
0	0	0	0	0	0	0	0	0	0

52.941176 29.411765 11.764706 5.882353 0 0 0
0 0 0 0 0 0 0 0
2007 2 8 2 0 2 24 24 19 0
10.526316 57.894737 5.263158 26.315789 0 0 0
0 0 0 0 0 0 0 0 0 0
10.526316 57.894737 5.263158 26.315789 0 0 0
0 0 0 0 0 0 0 0 0
2007 2 8 2 0 2 26 26 26 0 0
26.923077 30.769231 30.769231 7.692308 3.846154 0
0 0 0 0 0 0 0 0 0 0 0
26.923077 30.769231 30.769231 7.692308 3.846154 0
0 0 0 0 0 0 0 0 0
2007 2 8 2 0 2 28 28 23 0 0
4.347826 47.826087 30.434783 13.043478 4.347826 0
0 0 0 0 0 0 0 0 0 0 0
4.347826 47.826087 30.434783 13.043478 4.347826 0
0 0 0 0 0 0 0 0 0
2007 2 8 2 0 2 30 30 45 0 0
2.222222 11.111111 51.111111 26.666667 8.888889 0
0 0 0 0 0 0 0 0 0 0 0
2.222222 11.111111 51.111111 26.666667 8.888889 0
0 0 0 0 0 0 0 0 0
2007 2 8 2 0 2 32 32 46 0 0
0 15.217391 39.130435 26.086957 10.869565 6.521739
0 2.173913 0 0 0 0 0 0 0 0
0 0 15.217391 39.130435 26.086957 10.869565
6.521739 0 2.173913 0 0 0 0 0 0
0
2007 2 8 2 0 2 34 34 57 0 0
0 3.508772 15.789474 24.561404 26.315789 22.807018
3.508772 1.754386 0 1.754386 0 0 0 0
0 0 0 0 3.508772 15.789474 24.561404
26.315789 22.807018 3.508772 1.754386 0 1.754386
0 0 0 0 0
2007 2 8 2 0 2 36 36 55 0 0
0 0 10.909091 12.727273 10.909091 30.909091
14.545455 10.909091 5.454545 1.818182 1.818182 0
0 0 0 0 0 0 0 10.909091 12.727273
10.909091 30.909091 14.545455 10.909091 5.454545
1.818182 1.818182 0 0 0 0
2007 2 8 2 0 2 38 38 17 0 0
0 0 11.764706 0 23.529412 23.529412 23.529412
0 5.882353 5.882353 5.882353 0 0 0 0
0 0 0 0 11.764706 0 23.529412 23.529412
23.529412 0 5.882353 5.882353 5.882353 0 0
0 0

2007 2 8 2 0 2 40 40 2 0 0
0 0 0 0 50 0 0 50 0 0 0
0 0 0 0 0 0 0 0 0 0 50
0 0 50 0 0 0 0 0 0 0
2007 2 8 2 0 2 42 42 2 0 0
0 0 0 0 50 0 0 50 0 0 0
0 0 0 0 0 0 0 0 0 0 50
0 0 50 0 0 0 0 0 0 0
2007 2 8 2 0 2 44 44 3 0 0
0 0 0 0 33.333333 0 66.666667 0 0
0 0 0 0 0 0 0 0 0 0 0
0 33.333333 0 66.666667 0 0 0 0 0
0 0 0
2008 2 8 2 0 2 12 12 1 100 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 100 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
2008 2 8 2 0 2 16 16 3 66.66667
33.333333 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 66.66667 33.333333 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0
2008 2 8 2 0 2 18 18 8 0 100
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 100 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
2008 2 8 2 0 2 20 20 17 11.76471
52.941176 35.294118 0 0 0 0 0 0 0
0 0 0 0 0 0 0 11.76471 52.941176
35.294118 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2008 2 8 2 0 2 22 22 16 0 37.5
43.75 18.75 0 0 0 0 0 0 0 0 0
0 0 0 0 0 37.5 43.75 18.75 0 0 0
0 0 0 0 0 0 0 0 0 0
2008 2 8 2 0 2 24 24 25 0 32
44 20 4 0 0 0 0 0 0 0 0
0 0 0 0 0 32 44 20 4 0 0
0 0 0 0 0 0 0 0 0 0
2008 2 8 2 0 2 26 26 34 0
2.941176 26.470588 38.235294 26.470588 5.882353 0
0 0 0 0 0 0 0 0 0 0 0
2.941176 26.470588 38.235294 26.470588 5.882353 0
0 0 0 0 0 0 0 0 0 0
2008 2 8 2 0 2 28 28 28 0 0
28.571429 53.571429 17.857143 0 0 0 0 0

0 0 0 0 0 0 0 0 0 28.571429
53.571429 17.857143 0 0 0 0 0 0 0
0 0 0 0 0
2008 2 8 2 0 2 30 30 41 0 0
9.756098 19.512195 31.707317 26.829268 0 9.756098
2.439024 0 0 0 0 0 0 0 0 0
0 9.756098 19.512195 31.707317 26.829268 0
9.756098 2.439024 0 0 0 0 0 0 0
0
2008 2 8 2 0 2 32 32 54 0 0
3.703704 16.666667 29.62963 22.222222 14.814815
11.111111 1.851852 0 0 0 0 0 0 0
0 0 0 3.703704 16.666667 29.62963 22.222222
14.814815 11.111111 1.851852 0 0 0 0 0
0 0 0
2008 2 8 2 0 2 34 34 43 0 0
0 2.325581 27.906977 27.906977 23.255814 13.953488
4.651163 0 0 0 0 0 0 0 0 0
0 0 2.325581 27.906977 27.906977 23.255814
13.953488 4.651163 0 0 0 0 0 0 0
0
2008 2 8 2 0 2 36 36 37 0 0
2.702703 5.405405 13.513514 10.810811 18.918919
16.216216 18.918919 13.513514 0 0 0 0 0
0 0 0 0 2.702703 5.405405 13.513514
10.810811 18.918919 16.216216 18.918919 13.513514 0
0 0 0 0 0 0
2008 2 8 2 0 2 38 38 26 0 0
0 3.846154 7.692308 7.692308 11.538462 19.230769
15.384615 23.076923 0 3.846154 7.692308 0 0
0 0 0 0 0 3.846154 7.692308 7.692308
11.538462 19.230769 15.384615 23.076923 0 3.846154
7.692308 0 0 0 0
2008 2 8 2 0 2 40 40 11 0 0
0 0 0 9.090909 9.090909 18.181818 18.181818
27.272727 0 9.090909 9.090909 0 0 0 0
0 0 0 0 0 9.090909 9.090909 18.181818
18.181818 27.272727 0 9.090909 9.090909 0 0
0 0
2008 2 8 2 0 2 42 42 3 0 0
0 0 0 0 0 0 33.333333 0 0 0
33.333333 0 33.33333 0 0 0 0 0 0
0 0 0 0 33.333333 0 0 0 33.333333
0 33.33333 0 0
2008 2 8 2 0 2 44 44 2 0 0
0 0 0 0 0 0 50 50 0 0 0

```
        0       0       0       0       0       0       0       0       0       0       0
        0       50      50      0       0       0       0       0       0       0
        2008    2       8       2       0       2       46      46      3       0       0
        0       0       0       0       0       33.333333       0       33.333333       0
        0       0       33.33333        0       0       0       0       0       0       0
        0       0       0       33.333333       0       33.333333       0       0       0
        33.33333        0       0       0
        2008    2       8       2       0       2       48      48      1       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       100     0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       100

0       #nobsal         #_Number_of_size_at_age_observations    #Skip_reading
#2003   2       2       2       2       3       110     10      10      10      10      10
        10      10      10      10      10      10      10      10      10      10      10
        10      4       30      62      42      18      19      7       10      1       10
        10      10      10      10      10
#       10      10      10      10      10      10      10      10      10      10      10
        10      10      10      10      10      10      4       30      62      42      18
        19      7       10      1       10      10      10      10      10      10

#_environmental_data
0       #N_envvar
0       #N_observations
#1980   1       1       #env_temp(1,N_envdata,1,3) #Skip

0       # N sizefreq methods to read
#25     #Sizefreq N bins per method
#2      #Sizetfreq units(bio/num) per method
#3      #Sizefreq scale(kg/lbs/cm/inches) per method
#1e-005         #Sizefreq mincomp per method
#0      #Sizefreq N obs per method
#_Sizefreq bins
#26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 68 72 76 80 90
#_Year season Fleet Partition Gender SampleSize <data>
#1 1971 1 1 3 0 125  0 0 0 0 0 0 0 0 4 1 1 2 4 1 5 6 2 3 11 8 4 5 0 0 0 0 0 0 0 0 0 0 1 0 1
3 0 3 4 2 4 5 9 17 8 3 8 0 0

0 # no tag data

0 # no morphcomp (stock) data
```

999

ENDDATA

18. Appendix G: SS2 Control file

#C 2009 coastwide Petrale assessment in SS3
#_data_and_control_files: petrale09.dat // petrale09.ctl
#_SS-V3 (with seasonal recruitment fix)
1 #_N_Growth_Patterns
1 #_N_Morphs_Within_GrowthPattern
#_Cond 1 #_Morph_between/within_stdev_ratio (no read if N_morphs=1)
#_Cond 1 #vector_Morphdist_(-1_in_first_val_gives_normal_approx)

#Recruitment occurs in season 2 (summer)
1 # N recruitment designs goes here if N_GP*nseas*area>1
0 # placeholder for recruitment interaction request
1 2 1 # recruitment design element for GP=1, seas=2, area=1

#_Cond 0 # N_movement_definitions goes here if N_areas > 1
#_Cond 1.0 # first age that moves (real age at begin of season, not integer) also cond on do_migration>0
#_Cond 1 1 1 2 4 10 # example move definition for seas=1, morph=1, source=1 dest=2, age1=4, age2=10

2 #_Nblock_Patterns
4 3 #3 2 #_blocks_per_pattern
begin and end years of blocks
1973 1982 1983 1992 1993 2002 2003 2008
1983 1992 1993 2002 2003 2008

0.5 #_fracfemale
0 #_natM_type:_0=1Parm; 1=N_breakpoints;_2=Lorenzen;_3=agespecific;_4=agespec_withseasinterpolate
#2 #_N_breakpoints
4 15 # age(real) at M breakpoints

1 # GrowthModel: 1=vonBert with L1&L2; 2=Richards with L1&L2; 3=not implemented; 4=not implemented
2.833 #_Growth_Age_for_L1 (minimum age for growth calcs. Used 0.8333 for 10 month in year)
15.833 #_Growth_Age_for_L2 (999 to use as Linf) (maximum age for growth calcs)
0.0 #_SD_add_to_LAA (set to 0.1 for SS2 V1.x compatibility) ??????(FIND OUT WHAT THIS PARAMETER IS)???????
3 #_CV_Growth_Pattern: 0 CV=f(LAA); 1 CV=F(A); 2 SD=F(LAA); 3 SD=F(A) #plots of sd at age support a constant sd across ages
1 #_maturity_option: 1=length logistic; 2=age logistic; 3=read age-maturity matrix by growth_pattern; 4=read age-fecundity (Changed from length to age based in this assessment, believe that the ages below 9 are relatively well determined)

#_placeholder for empirical age-maturity by growth pattern
3 #_First_Mature_Age
1 #_fecundity option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b
0 #hermaphrodite
3 #_parameter_offset_approach (1=none, 2= M, G, CV_G as offset from female-GP1, 3=like SS2 V1.x)
1 #_env/block/dev_adjust_method (1=standard; 2=with logistic trans to keep within base parm bounds)

#_growth_parms
#GP_1_Female
#LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
0.05 0.40 0.2 0.2 0 0.025 5 0 0 0 0 0.5 0 0
#1 F_M_young
10 45 22.0 17.18 -1 10 2 0 0 0 0 0.5 0 0
#2 F_L@Amin (Amin is age entered above)
45 80 53.0 58.7 -1 10 3 0 0 0 0 0.5 0 0
#3 F_L@Amax
0.04 0.5 0.13 0.13 -1 0.8 2 0 0 0 0 0.5 0 0
#4 F_VBK
0.02 8.00 4.00 0.08 -1 0.8 2 0 0 0 0 0.5 0 0
#5 F_SD@AFIX
-1 1.00 0.00 0.08 -1 0.8 5 0 0 0 0 0.5 0 0
#6 F_SD@AFIX2=ln(SD@AFIX2/SD@AFIX)
#GP_1:::Male
-0.5 0.70 0.0 0.0 -1 0.05 5 0 0 0 0 0.5 0 0
#7 M_young
-1 2 0.04 0.04 -1 10 2 0 0 0 0 0.5 0 0 #8 LN(F_L@Amin/M_L@Amin)
-1 2 0.25 0.25 -1 10 3 0 0 0 0 0.5 0 0 #9 LN(F_L@Amax/M_L@Amax)
0.04 0.8 0.24 0.24 -1 0.8 2 0 0 0 0 0.5 0 0
#10 M_VBK
-1.0 1.00 0.00 0.0 -1 0.8 2 0 0 0 0 0.5 0 0
#11 M2_SD@AFIX
-1 1.00 0.00 0.0 -1 0.8 5 0 0 0 0 0.5 0 0 #12 M2_SD@AFIX2
#GP_1:::Male (Direct Estimation)
#0.05 0.40 0.0 0.2 0 0.8 -3 0 0 0 0 0.5 0 0 #M1_M_young (when set to zero and not estimated it will be set equal to females)
#10 45 15.5 15.5 0 10 3 0 0 0 0 0.5 0 0 #M1_L@Amin (Amin is age entered above)
#45 80 42.0 42.0 0 10 3 0 0 0 0 0.5 0 0 #M2_L@Amax
#0.04 0.5 0.24 0.24 0 0.8 3 0 0 0 0 0.5 0 0 #M2_VBK

#0.02 0.15 0.0 0.08 0 0.8 -3 0 0 0 0 0.5 0 0 #M2_CV@AFIX
#-1 0.15 0.0 0.08 0 0.8 -3 0 0 0 0 0.5 0 0 #M2_CV@AFIX2

#LW_female
#LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
-3 3 2.05E-06 2.05E-06 0 0.8 -3 0 0 0 0 0.5 0 0
#WL_intercept_female
1 5 3.476 3.476 0 0.8 -3 0 0 0 0 0.5 0 0
#WL_slope_female
#Female_maturity
10 50 33.1 33.1 0 0.8 -3 0 0 0 0 0.5 0 0 #mat_intercept #L50
-3 3 -0.743 -0.743 0 0.8 -3 0 0 0 0 0.5 0 0 #mat_slope From Hannah et al 2002
#Fecundity___Assume_same_as_spawning_biomass
-3 3 1 1 0 1 -3 0 0 0 0 0.5 0 0 #mat_intercept #L50
-3 3 0 0 0 1 -3 0 0 0 0 0.5 0 0 #mat_slope
#LW_Male
-3 3 3.12E-06 3.12E-06 0 0.8 -3 0 0 0 0 0.5 0 0
#WL_intercept_male
-3 5 3.351 3.351 0 0.8 -3 0 0 0 0 0.5 0 0
#WL_slope_slope_male

#LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
#Allocate_R_by_areas_x_gmorphs
0 1 1 0.2 0 9.8 -3 0 0 0 0 0.5 0 0 #frac to GP 1 in area 1
#Allocate_R_by_areas_(1_areain_this_case)
0 1 1 1 0 9.8 -3 0 0 0 0 0.5 0 0 #frac R in area 1
#Allocate_R_by_season_(2seasons_in_this_case)
#LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
-4 4 -4 1 0 9.8 -3 0 0 0 0 0.5 0 0 #frac R in season 1 (in log space)
-4 4 4 0 0 9.8 -3 0 0 0 0 0.5 0 0 #frac R in season 2 (in log space)

#CohortGrowDev
#SS3 manual says it must be given a value of 1 and a negative phase
#LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
0 1 1 1 -1 0 -4 0 0 0 0 0 0 0

#_Cond 0 #custom_MG-env_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no MG-environ parameters

#_Cond 0 #custom_MG-block_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no MG-block parameters

#_seasonal_effects_on_biology_parms
0 0 0 0 0 0 0 0 0 0 #_femwtlen1,femwtlen2,L1,K,Malewtlen1,malewtlen2,L1,K
???
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no seasonal MG parameters

#_Cond -4 #_MGparm_Dev_Phase

#_Spawner-Recruitment
3   #_SR_function
#_LO   HI INIT   PRIOR   PR_type SD PHASE
5   99 10   9   -1   10   1   #Ln(R0)
0.2   1   0.8   0.8   -1   3   5   #steepness(h)---base_case #Prior from Dorn? (his mu=, sd= in normal space)
0   2   0.4   0.9   0   5   -99   #sigmaR---base_case (tuned to 0.4 from 0.5)
-5   5   0   0   0   1   -99   #Env_link_parameter
-5   5   0   0   0   0.2   -2   # SR_R1_offset
0   0   0   0   -1   0   -99   # SR_autocorr
0   #_SR_env_link
0   #_SR_env_target_0=none;1=devs;_2=R0;_3=steepness

1   #do_recdev: 0=none; 1=devvector; 2=simple deviations

1959   # first year of main recr_devs; early devs can preceed this era
2005   # last year of main recr_devs; forecast devs start in following year
1   #_recdev phase
1   # (0/1) to read 11 advanced options
-20 #_Cond 0 #_recdev_early_start (0=none; neg value makes relative to recdev_start)
3   #_recdev_early_phase
0   #_Cond 0 #_forecast_recruitment phase (incl. late recr) (0 value resets to maxphase+1)
1   #_Cond 1 #_lambda for prior_fore_recr occurring before endyr+1
1949   #_last_early_yr_nobias_adj_in_MPD
1959   #_first_yr_fullbias_adj_in_MPD
2005   #_last_yr_fullbias_adj_in_MPD
2008   #_first_recent_yr_nobias_adj_in_MPD
1   #max bias
0   #reserved for future use
-3 #min rec_dev
3   #max rec_dev
0   #_read_recdevs
#_end of advanced SR options

#Fishing Mortality info

0.3 # F ballpark for tuning early phases
-2001 # F ballpark year (neg value to disable)
3 # F_Method: 1=Pope; 2=instan. F; 3=hybrid (hybrid is recommended)
4 # max F or harvest rate, depends on F_Method
no additional F input needed for Fmethod 1
read overall start F value; overall phase; N detailed inputs to read for Fmethod 2
NUM ITERATIONS, FOR CONDITION 3
5 # read N iterations for tuning for Fmethod 3 (recommend 3 to 7)
#Fleet Year Seas F_value se phase (for detailed setup of F_Method=2)

#_initial_F_parms
#_LO HI INIT PRIOR PR_type SD PHASE
0 1 0 0.0001 0 99 -1 #Fleet1_(WinterWA)
0 1 0 0.0001 0 99 -1 #Fleet2_(SummerWA)
0 1 0 0.0001 0 99 -1 #Fleet1_(WinterOR)
0 1 0 0.0001 0 99 -1 #Fleet2_(SummerOR)
0 1 0 0.0001 0 99 -1 #Fleet1_(WinterCA)
0 1 0 0.0001 0 99 -1 #Fleet2_(SummerCA)

#_Q_setup
A=do power, B=env-var, C=extra SD,
#D=devtype(<0=mirror, 0/1=none, 2=cons, 3=rand, 4=randwalk)
#E=0=num/1=bio, F=err_type
#DISCUSS WHICH OPTION FOR Q (0 OR 1, OR 2)
#A B C D E F
0 0 0 0 1 0 #Fleet1_(WinterWA)
0 0 0 0 1 0 #Fleet2_(SummerWA)
0 0 0 0 1 0 #Fleet1_(WinterOR)
0 0 0 0 1 0 #Fleet2_(SummerOR)
0 0 0 0 1 0 #Fleet1_(WinterCA)
0 0 0 0 1 0 #Fleet2_(SummerCA)
0 0 0 0 1 0 #Triennial
0 0 0 0 1 0 #NWFSC
0 0 0 0 1 0 #Triennial

#_Cond 0 #_If q has random component, then 0=read one parm for each fleet with random q; 1=read a parm for each year of index
#_Q_parms(if_any)
LO HI INIT PRIOR PR_type SD PHASE
#-5 5 -0.4462 -0.4 0 5 1 #

#Seltype(1,2*Ntypes,1,4) #SELEX_&_RETENTION_PARAMETERS
#Size_Slectivity,_enter_4_cols
#N_sel Do_retain Do_male Special
24 1 3 0 #Fleet(WinterWA)
24 1 3 0 #Fleet(SummerWA)

24 1 3 0 #Fleet(WinterOR)
24 1 3 0 #Fleet(SummerOR)
24 1 3 0 #Fleet(WinterCA)
24 1 3 0 #Fleet(SummerCA)
24 0 3 0 #Triennial
24 0 3 0 #NWFSC
24 0 3 0 #Triennial
#Age_selectivity #set_to_1
10 0 0 0 #Fleet(WinterWA) is Logistic
10 0 0 0 #Fleet(SummerWA) is Logistic
10 0 0 0 #Fleet(WinterOR) is Logistic
10 0 0 0 #Fleet(SummerOR) is Logistic
10 0 0 0 #Fleet(WinterCA) is Logistic
10 0 0 0 #Fleet(SummerCA) is Logistic
10 0 0 0 #Triennial
10 0 0 0 #NWFSC
10 0 0 0 #Triennial

#Selectivity parameters
#LO HI INIT PRIOR PR_TYPE SD PHASE env-var use_dev dev_yr1 dev_yr2 dev_sd nblks blk_pat #
#Size_selectivity for FISHERY WINTER WA
#FEMALE
#LO HI INIT PRIOR PR_TYPE SD PHASE env-var use_dev dev_yr1 dev_yr2 dev_sd nblks blk_pat #
15 75 35.0 43.1 -1 5 1 0 0 0 0 0.5 1 1 #PEAK (see Selex24.xls)
-5 3 3.0 0.7 -1 5 -3 0 0 0 0 0.5 0 0 #TOP (see Selex24.xls)
-4 12 4.1 3.42 -1 5 2 0 0 0 0 0.5 0 0 #ASC_WIDTH (see Selex24.xls)
-2 6 6.0 0.21 -1 5 -3 0 0 0 0 0.5 0 0 #DSC_WIDTH (see Selex24.xls)
-15 5 -5.0 -8.9 -1 5 4 0 0 0 0 0.5 0 0 #INIT (see Selex24.xls)
-5 5 -999 0.15 -1 5 -4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#-5 5 -4.0 0.15 -1 5 4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#RETENTION
10 40 30 15 -1 9 1 0 0 0 0 0 0 0 # Retain_1 Inflection
0.1 10 3 3 -1 9 2 0 0 0 0 0 0 0 # Retain_2 Slope
0.001 1 0.98 1 -1 9 4 0 0 0 0 0 0 0 # Retain_3 Asymptote
-10 10 0 0 -1 9 -2 0 0 0 0 0 0 0 # Retain_4 Male offset (additive)
#...DO_MALE (AS OFFSET)
-15 15 0 0 -1 5 3 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-15 15 0 0 -1 5 4 0 0 0 0 0.5 0 0 #ASC_WIDTH (see Selex24.xls)
-15 15 0 0 -1 5 -4 0 0 0 0 0.5 0 0 #DSC_WIDTH (see Selex24.xls)
-15 15 0 0 -1 5 -4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#Size_selectivity for FISHERY SUMMER WA
#FEMALE

#LO HI INIT PRIOR PR_TYPE SD PHASE env-var use_dev dev_yr1 dev_yr2 dev_sd nblks blk_pat #
15 75 35.0 43.1 -1 5 1 0 0 0 0 0.5 1 1 #PEAK (see Selex24.xls)
-5 3 3.0 0.7 -1 5 -3 0 0 0 0 0.5 0 0 #TOP (see Selex24.xls)
-4 12 4.1 3.42 -1 5 2 0 0 0 0 0.5 0 0 #ASC_WIDTH (see Selex24.xls)
-2 6 6.0 0.21 -1 5 -3 0 0 0 0 0.5 0 0 #DSC_WIDTH (see Selex24.xls)
-15 5 -5.0 -8.9 -1 5 4 0 0 0 0 0.5 0 0 #INIT (see Selex24.xls)
-5 5 -999 0.15 -1 5 -4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#-5 5 -4.0 0.15 -1 5 4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#RETENTION
10 40 30 15 -1 9 1 0 0 0 0 0 0 0 # Retain_1 Inflection
0.1 10 3 3 -1 9 2 0 0 0 0 0 0 0 # Retain_2 Slope
0.001 1 0.98 1 -1 9 4 0 0 0 0 0 0 0 # Retain_3 Asymptote
-10 10 0 0 -1 9 -2 0 0 0 0 0 0 0 # Retain_4 Male offset (additive)
#...DO_MALE (AS OFFSET)
-15 15 0 0 -1 5 3 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-15 15 0 0 -1 5 4 0 0 0 0 0.5 0 0 #ASC_WIDTH (see Selex24.xls)
-15 15 0 0 -1 5 -4 0 0 0 0 0.5 0 0 #DSC_WIDTH (see Selex24.xls)
-15 15 0 0 -1 5 -4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#Size_selectivity for FISHERY WINTER OR
#FEMALE
#LO HI INIT PRIOR PR_TYPE SD PHASE env-var use_dev dev_yr1 dev_yr2 dev_sd nblks blk_pat #
25 75 35.0 43.1 -1 5 1 0 0 0 0 0.5 2 1 #PEAK (see Selex24.xls)
-5 3 3.0 0.7 -1 5 -3 0 0 0 0 0.5 0 0 #TOP (see Selex24.xls)
-4 12 4.1 3.42 -1 5 2 0 0 0 0 0.5 0 0 #ASC_WIDTH (see Selex24.xls)
-2 6 6.0 0.21 -1 5 -3 0 0 0 0 0.5 0 0 #DSC_WIDTH (see Selex24.xls)
-15 5 -5.0 -8.9 -1 5 4 0 0 0 0 0.5 0 0 #INIT (see Selex24.xls)
-5 5 -999 0.15 -1 5 -4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#-5 5 -4.0 0.15 -1 5 4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#RETENTION
10 40 30 15 -1 9 1 0 0 0 0 0 0 0 # Retain_1 Inflection
0.1 10 3 3 -1 9 2 0 0 0 0 0 0 0 # Retain_2 Slope
0.001 1 0.98 1 -1 9 4 0 0 0 0 0 0 0 # Retain_3 Asymptote
-10 10 0 0 -1 9 -2 0 0 0 0 0 0 0 # Retain_4 Male offset (additive)
#...DO_MALE (AS OFFSET)
-15 15 0 0 -1 5 3 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-15 15 0 0 -1 5 4 0 0 0 0 0.5 0 0 #ASC_WIDTH (see Selex24.xls)
-15 15 0 0 -1 5 -4 0 0 0 0 0.5 0 0 #DSC_WIDTH (see Selex24.xls)
-15 15 0 0 -1 5 -4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#Size_selectivity for FISHERY SUMMER OR
#FEMALE

#LO HI INIT PRIOR PR_TYPE SD PHASE env-var use_dev dev_yr1 dev_yr2 dev_sd nblks blk_pat #
15 75 35.0 43.1 -1 5 1 0 0 0 0 0.5 1 1 #PEAK (see Selex24.xls)
-5 3 3.0 0.7 -1 5 -3 0 0 0 0 0.5 0 0 #TOP (see Selex24.xls)
-4 12 4.1 3.42 -1 5 2 0 0 0 0 0.5 0 0 #ASC_WIDTH (see Selex24.xls)
-2 6 6.0 0.21 -1 5 -3 0 0 0 0 0.5 0 0 #DSC_WIDTH (see Selex24.xls)
-15 5 -5.0 -8.9 -1 5 4 0 0 0 0 0.5 0 0 #INIT (see Selex24.xls)
-5 5 -999 0.15 -1 5 -4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#-5 5 -4.0 0.15 -1 5 4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#RETENTION
10 40 30 15 -1 9 1 0 0 0 0 0 0 0 # Retain_1 Inflection
0.1 10 3 3 -1 9 2 0 0 0 0 0 0 0 # Retain_2 Slope
0.001 1 0.98 1 -1 9 4 0 0 0 0 0 0 0 # Retain_3 Asymptote
-10 10 0 0 -1 9 -2 0 0 0 0 0 0 0 # Retain_4 Male offset (additive)
#...DO_MALE (AS OFFSET)
-15 15 0 0 -1 5 3 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-15 15 0 0 -1 5 4 0 0 0 0 0.5 0 0 #ASC_WIDTH (see Selex24.xls)
-15 15 0 0 -1 5 -4 0 0 0 0 0.5 0 0 #DSC_WIDTH (see Selex24.xls)
-15 15 0 0 -1 5 -4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#Size_selectivity for FISHERY WINTER CA
#FEMALE
#LO HI INIT PRIOR PR_TYPE SD PHASE env-var use_dev dev_yr1 dev_yr2 dev_sd nblks blk_pat #
15 75 35.0 43.1 -1 5 1 0 0 0 0 0.5 1 1 #PEAK (see Selex24.xls)
-5 3 3.0 0.7 -1 5 -3 0 0 0 0 0.5 0 0 #TOP (see Selex24.xls)
-4 12 4.1 3.42 -1 5 2 0 0 0 0 0.5 0 0 #ASC_WIDTH (see Selex24.xls)
-2 6 6.0 0.21 -1 5 -3 0 0 0 0 0.5 0 0 #DSC_WIDTH (see Selex24.xls)
-15 5 -5.0 -8.9 -1 5 4 0 0 0 0 0.5 0 0 #INIT (see Selex24.xls)
-5 5 -999 0.15 -1 5 -4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#-5 5 -4.0 0.15 -1 5 4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#RETENTION
10 40 30 15 -1 9 1 0 0 0 0 0 0 0 # Retain_1 Inflection
0.1 10 3 3 -1 9 2 0 0 0 0 0 0 0 # Retain_2 Slope
0.001 1 0.98 1 -1 9 4 0 0 0 0 0 0 0 # Retain_3 Asymptote
-10 10 0 0 -1 9 -2 0 0 0 0 0 0 0 # Retain_4 Male offset (additive)
#...DO_MALE (AS OFFSET)
-15 15 0 0 -1 5 3 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-15 15 0 0 -1 5 4 0 0 0 0 0.5 0 0 #ASC_WIDTH (see Selex24.xls)
-15 15 0 0 -1 5 -4 0 0 0 0 0.5 0 0 #DSC_WIDTH (see Selex24.xls)
-15 15 0 0 -1 5 -4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#Size_selectivity for FISHERY SUMMER CA
#FEMALE

#LO HI INIT PRIOR PR_TYPE SD PHASE env-var use_dev dev_yr1 dev_yr2 dev_sd nblks blk_pat #
15 75 35.0 43.1 -1 5 1 0 0 0 0 0.5 1 1 #PEAK (see Selex24.xls)
-5 3 3.0 0.7 -1 5 -3 0 0 0 0 0.5 0 0 #TOP (see Selex24.xls)
-4 12 4.1 3.42 -1 5 2 0 0 0 0 0.5 0 0 #ASC_WIDTH (see Selex24.xls)
-2 6 6.0 0.21 -1 5 -3 0 0 0 0 0.5 0 0 #DSC_WIDTH (see Selex24.xls)
-15 5 -5.0 -8.9 -1 5 4 0 0 0 0 0.5 0 0 #INIT (see Selex24.xls)
-5 5 -999 0.15 -1 5 -4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#-5 5 -4.0 0.15 -1 5 4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#RETENTION
10 40 30 15 -1 9 1 0 0 0 0 0 0 0 # Retain_1 Inflection
0.1 10 3 3 -1 9 2 0 0 0 0 0 0 0 # Retain_2 Slope
0.001 1 0.98 1 -1 9 4 0 0 0 0 0 0 0 # Retain_3 Asymptote
-10 10 0 0 -1 9 -2 0 0 0 0 0 0 0 # Retain_4 Male offset (additive)
#...DO_MALE (AS OFFSET)
-15 15 0 0 -1 5 3 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-15 15 0 0 -1 5 4 0 0 0 0 0.5 0 0 #ASC_WIDTH (see Selex24.xls)
-15 15 0 0 -1 5 -4 0 0 0 0 0.5 0 0 #DSC_WIDTH (see Selex24.xls)
-15 15 0 0 -1 5 -4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#Size_selectivity for TRIENNIAL SURVEY
#FEMALE
#LO HI INIT PRIOR PR_TYPE SD PHASE env-var use_dev dev_yr1 dev_yr2 dev_sd nblks blk_pat #
15 61 33.1 43.1 -1 5 1 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-5 3 3.0 0.7 -1 5 -2 0 0 0 0 0.5 0 0 #TOP (see Selex24.xls)
-4 12 3.7 3.42 -1 5 1 0 0 0 0 0.5 0 0 #ASC_WIDTH (see Selex24.xls)
-2 6 6.0 0.21 -1 5 -2 0 0 0 0 0.5 0 0 #DSC_WIDTH (see Selex24.xls)
-15 5 -5.0 -8.9 -1 5 4 0 0 0 0 0.5 0 0 #INIT (see Selex24.xls)
-5 5 -999 0.15 -1 5 -4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#...DO_MALE (AS OFFSET)
-15 15 0 0 -1 5 2 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-15 15 0 0 -1 5 2 0 0 0 0 0.5 0 0 #ASC_WIDTH (see Selex24.xls)
-15 15 0 0 -1 5 -3 0 0 0 0 0.5 0 0 #DSC_WIDTH (see Selex24.xls)
-15 15 0 0 -1 5 -3 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#Size_selectivity for NWFSC SURVEY
#FEMALE
#LO HI INIT PRIOR PR_TYPE SD PHASE env-var use_dev dev_yr1 dev_yr2 dev_sd nblks blk_pat #

15 61 33.1 43.1 -1 5 1 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-5 3 3.0 0.7 -1 5 -2 0 0 0 0 0.5 0 0 #TOP (see Selex24.xls)
-4 12 3.7 3.42 -1 5 1 0 0 0 0 0.5 0 0 #ASC_WIDTH (see Selex24.xls)
-2 6 6.0 0.21 -1 5 -2 0 0 0 0 0.5 0 0 #DSC_WIDTH (see Selex24.xls)
-15 5 -5.0 -8.9 -1 5 4 0 0 0 0 0.5 0 0 #INIT (see Selex24.xls)
-5 5 -999 0.15 -1 5 -4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#...DO_MALE (AS OFFSET)
-15 15 0 0 -1 5 2 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-15 15 0 0 -1 5 2 0 0 0 0 0.5 0 0 #ASC_WIDTH (see Selex24.xls)
-15 15 0 0 -1 5 -3 0 0 0 0 0.5 0 0 #DSC_WIDTH (see Selex24.xls)
-15 15 0 0 -1 5 -3 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#Size_selectivity for TRIENNIAL SURVEY
#FEMALE
#LO HI INIT PRIOR PR_TYPE SD PHASE env-var use_dev dev_yr1 dev_yr2 dev_sd nblks blk_pat #
15 61 33.1 43.1 -1 5 1 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-5 3 3.0 0.7 -1 5 -2 0 0 0 0 0.5 0 0 #TOP (see Selex24.xls)
-4 12 3.7 3.42 -1 5 1 0 0 0 0 0.5 0 0 #ASC_WIDTH (see Selex24.xls)
-2 6 6.0 0.21 -1 5 -2 0 0 0 0 0.5 0 0 #DSC_WIDTH (see Selex24.xls)
-15 5 -5.0 -8.9 -1 5 4 0 0 0 0 0.5 0 0 #INIT (see Selex24.xls)
-5 5 -999 0.15 -1 5 -4 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)
#...DO_MALE (AS OFFSET)
-15 15 0 0 -1 5 2 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-15 15 0 0 -1 5 2 0 0 0 0 0.5 0 0 #ASC_WIDTH (see Selex24.xls)
-15 15 0 0 -1 5 -3 0 0 0 0 0.5 0 0 #DSC_WIDTH (see Selex24.xls)
-15 15 0 0 -1 5 -3 0 0 0 0 0.5 0 0 #FINAL (see Selex24.xls)

0 #_custom block setup (0/1)
-0.7 0.7 0 0 -1 99 4
2 #logistic bounding

Tag loss and Tag reporting parameters go next
0 # TG_custom: 0=no read; 1=read if tags exist
#_Cond -6 6 1 1 2 0.01 -4 0 0 0 0 0 0 0 #_placeholder if no parameters

0 #_Variance_adjustments_to_input_values
#_1 2 3
0 0 0 #_add_to_fleet and survey_CV
0 0 0 #_add_to_discard_stddev
0 0 0 #_add_to_bodywt_CV
1 1 1 #_mult_by_lencomp_N
1 1 1 #_mult_by_agecomp_N
1 1 1 #_mult_by_size-at-age_N
30 #_DF_for_discard_like
30 #_DF_for_meanbodywt_like

15 #_maxlambdaphase
1 #_sd_offset

12 # number of changes to make to default Lambdas (default value is 1.0)
Like_comp codes: 1=surv; 2=disc; 3=mnwt; 4=length; 5=age; 6=SizeFreq; 7=sizeage; 8=catch;
9=init_equ_catch;   10=recrdev;   11=parm_prior;   12=parm_dev;   13=CrashPen; 14=Morphcomp; 15=Tag-comp; 16=Tag-negbin
#like_comp fleet/survey phase value sizefreq_method
5 1 1 0.5 1 #commercial age comps
5 2 1 0.5 1 #commercial age comps
5 3 1 0.5 1 #commercial age comps
5 4 1 0.5 1 #commercial age comps
5 5 1 0.5 1 #commercial age comps
5 6 1 0.5 1 #commercial age comps
4 1 1 0.5 1 #commercial lgth comps
4 2 1 0.5 1 #commercial lgth comps
4 3 1 0.5 1 #commercial lgth comps
4 4 1 0.5 1 #commercial lgth comps
4 5 1 0.5 1 #commercial lgth comps
4 6 1 0.5 1 #commercial lgth comps
#5 8 1 0.1 1 #survey Age conditionals
#4 8 1 0.1 1 #survey lgth comps
#4 7 1 0.1 1 #triennial survey lgth comps
#2 1 1 20 1
#2 2 1 20 1
#2 3 1 20 1
#2 4 1 20 1
#2 5 1 20 1
#2 6 3 20 1
#2 1 3 5 1
#2 2 3 5 1
#2 3 3 5 1
#2 4 3 5 1

```
#2 5 3 5 1
#2 6 3 5 1
#2 1 4 1 1
#2 2 4 1 1
#2 3 4 1 1
#2 4 4 1 1
#2 5 4 1 1
#2 6 4 1 1
#3 1 1 10 1
#3 2 1 10 1
#3 3 1 10 1
#3 4 1 10 1
#3 5 1 10 1
#3 6 1 10 1
#4 1 1 1 1
#4 2 1 1 1
#4 3 1 1 1
#5 1 1 1 1
#5 2 1 1 1

0 # (0/1) read specs for more stddev reporting
# 1 1 -1 5 1 5 # selex type, len/age, year, N selex bins, Growth pattern, N growth ages
# -5 16 27 38 46 # vector with selex std bin picks (-1 in first bin to self-generate)
# 1 2 14 26 40 # vector with growth std bin picks (-1 in first bin to self-generate)

999
```

19. Appendix H: SS2 Starter file

#C Petrale 2009 assessment (Melissa Haltuch and Allan Hicks)
petrale09.dat
petrale09.ctl
1 # 0=use init values in control file; 1=use ss3.par
1 # run display detail (0,1,2)
1 # detailed age-structured reports in REPORT.SSO (0,1)
0 # write detailed checkup.sso file (0,1)
0 # write parm values to ParmTrace.sso (0=no,1=good,active; 2=good,all; 3=every_iter,all_parms; 4=every,active)
1 # Cumulative Report
0 # Include prior_like for non-estimated parameters (0,1)
1 # Use Soft Boundaries to aid convergence (0,1) (recommended)
1 # Number of bootstrap datafiles to produce (N-2), 1 means reporduce data, 2 means add expected values
10 # Turn off estimation for parameters entering after this phase
10 # MCMC burn interval
2 # MCMC thin interval
0.0001 # jitter initial parm value by this fraction
-1 # min yr for sdreport outputs (-1 for styr)
-2 # max yr for sdreport outputs (-1 for endyr; -2 for endyr+Nforecastyrs
0 # N individual STD years
#vector of year values
1973 1976
0.0001 # final convergence criteria (e.g. 1.0e-04)
0 # retrospective year relative to end year (e.g. -4)
3 # min age for calc of summary biomass
1 # Depletion basis: denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel X*B_styr
1 # Fraction (X) for Depletion denominator (e.g. 0.4)
4 # (1-SPR)_reporting: 0=skip; 1=rel(1-SPR); 2=rel(1-SPR_MSY); 3=rel(1-SPR_Btarget); 4=notrel
1 # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num); 3=sum(frates)
0 # F_report_basis: 0=raw; 1=rel Fspr; 2=rel Fmsy ; 3=rel Fbtgt
999 # check value for end of file

20. Appendix I: SS2 Forecast file

1 # Forecast: 0=none; 1=F(SPR); 2=F(MSY) 3=F(Btgt); 4=F(endyr); 5=Ave F (enter yrs); 6=read Fmult
-4 # first year for recent ave F for option 5 (not yet implemented)
-1 # last year for recent ave F for option 5 (not yet implemented)
0.74 # F multiplier for option 6 (not yet implemented
0 # first year to use for averaging selex to use in forecast (e.g. 2004; or use -x to be rel endyr)
0 # last year to use for averaging selex to use in forecast
1 # Benchmarks: 0=skip; 1=calc F_spr,F_btgt,F_msy
2 # MSY: 1= set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt); 4=set to F(endyr)
0.4 # SPR target (e.g. 0.40)
0.4 # Biomass target (e.g. 0.40)
12 # N forecast years
1 # read 10 advanced options
0 # Do West Coast gfish rebuilder output (0/1)
2000 # Rebuilder: first year catch could have been set to zero (Ydecl)(-1 to set to endyear+1)
2002 # Rebuilder: year for current age structure (Yinit) (-1 to set to endyear+1)
1 # Control rule method (1=west coast adjust catch; 2=adjust F)
0.4 # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40)
0.1 # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)
1 # Control rule fraction of Flimit (e.g. 0.75)
1 # basis for max forecast catch by seas and area (0=none; 1=deadbio; 2=retainbio; 3=deadnum; 4=retainnum)
0 # 0= no implementation error; 1=use implementation error in forecast (not coded yet)
0.1 # stddev of log(realized F/target F) in forecast (not coded yet)
end of advanced options
max forecast catch
0
0 #Reserved for future use
rows are seasons, columns are areas
1 # fleet allocation (in terms of F) (1=use endyr pattern, no read; 2=read below)
0.225768
12 # Number of forecast catch levels to input (rest calc catch from forecast F
2 # basis for input forecatch: 1=retained catch; 2=total dead catch
#Year Seas Fleet Catch
2009 1 1 323.46
2009 2 2 433.38
2009 1 3 492.89
2009 2 4 258.53
2009 1 5 465.34
2009 2 6 525.39
2010 1 1 323.46
2010 2 2 433.38

2010	1	3	492.89
2010	2	4	258.53
2010	1	5	465.34
2010	2	6	525.39

999 # verify end of input

PETRALE SOLE

STAR Panel Report

May 4-8, 2009
Northwest Fisheries Science Center
Hatfield Marine Science Center
2032 SE Oregon State University Drive,
Newport, OR 97365

Reviewers:
Robin Cook, Center for Independent Experts
Xi He, Southwest Fisheries Science Center
Jean-Jacques Maguire, Center for Independent Experts
Theresa Tsou (Chair), Scientific and Statistical Committee (SSC) representative

Advisors:
John DeVore, Pacific Fishery Management Council (PFMC) representative
Dan Erickson, Groundfish Management Team (GMT) representative
Brad Pettinger, Groundfish Advisory Subpanel (GAP) representative

STAT Team Members present:
Melissa Haltuch, Northwest Fisheries Science Center
Allan Hicks, Northwest Fisheries Science Center

Overview

A draft assessment of the coastwide petrale sole (*Eopsetta jordani*) off the U.S. west coast was reviewed by the STAR panel during May 4-8, 2009. This assessment used the Stock Synthesis platform version 3.03a and incorporated a variety of data sources into the candidate base model. Data from commercial trawl fisheries included landings, discards, and age and length composition data. Abundance indices used in the model were a standardized CPUE index of the Oregon trawl fleets from 1987-1997 from Sampson and Lee (1999), the triennial shelf trawl survey (1980-2004), and the NWFSC shelf/slope trawl survey (2003-08). Biological information collected from both trawl surveys was also included.

Petrale sole was last assessed in 2005. Significant differences in data sources and model configuration between the 2005 and current assessment include:

- A coastwide model instead of separate north and south assessments in 2005;
- Reconstructed historical catches from California and Washington;
- An updated ageing error matrix;
- Incorporation of the NWFSC shelf/slope survey;
- Direct inclusion of discard information from Pikitch et al. (1988) and from the West Coast Groundfish Observer Program.

Multiple model runs were conducted and reviewed to examine model assumptions and structure, and to identify uncertainties in the assessment. The panel noticed that the estimates of B_0 and 2009 biomass are very sensitive to the assumption of the stock recruitment relationship and the 2008 NWFSC survey data. While the current stock status with reference to B_0 is notably different among model runs, the B_{MSY} estimate remains consistent. The panel is concerned that the 25% B_0 minimum stock size threshold (MSST or overfished threshold) proxy is highly uncertain because both B_0 and $B_{CURRENT}$ are highly uncertain in this assessment. Therefore, the panel recommends that reference points based on MSY are investigated as an alternative MSST. . The Panel notes that catches since 1951 have been fluctuating around MSY. The spawning biomass has largely been in the precautionary zone since about 1958 with the exception of a few years above B_{MSY} in the mid-1970s, and a series of years below B_{MSY} between the late 1980s to mid-late 1990s.

The STAR panel concluded that the petrale sole assessment was based on the best available data, and that this new assessment constitutes the best available information on petrale sole off the U.S. west coast. The STAR panel thanks the STAT team for their willingness to respond to panel requests and their dedication in finding possible solutions to difficult assessment problems.

Analyses requested by the STAR panel

1. **Split the triennial survey due to changes in starting date.**
   <u>Rationale</u>: The difference in the timing of the surveys, approximately one month later since 1995, is expected to result in a change in catchability of petrale sole because of its seasonal onshore-offshore migrations.

Response: Splitting the survey improved the fit marginally and the resulting catchability coefficients (q) were 0.51 for the early time series of the survey and 0.71 for the later time series of the survey. The selectivity curves for the NWFSC shelf/slope survey also changed marginally.

2. **Plot the biomass trends from the 1999, 2005 and current assessments to compare the differences.**
Rationale: This is a standard request to put the results of the current assessment in the context of previous ones. This was seen as particularly important for petrale sole given the changed perception in stock status.
Response: The biomass trajectories in the 1999, 2005 and the current assessments for 1980 to 2000 period are very similar and the confidence intervals for B_0 estimates in the 2005 and current assessments overlap. The 1999 and 2005 assessments suggested that biomass was increasing at the time of each assessment; while the current assessment indicates that biomass peaked in 2005 and has been decreasing since. The ratio of $B_{current}$ to B_0 (depletion) was higher in the 1999 assessment because the estimate of B_0 was smaller, largely due to the fact that historical catches back to 1976 were incorporated in the 1999 assessment and historical catches back to 1876 were incorporated in the 2005 and current assessments. The estimated 2005 depletion from the 2005 assessment is within the confidence interval of the estimated 2005 depletion from the current assessment.

3. **Remove all data related to 2008 NWFSC shelf/slope survey.**
Rationale: The objective of this request was to evaluate the influence of the 2008 NWFSC survey data.
Response: Removing the 2008 NWFSC survey data significantly increased the estimate of current biomass, decreased the estimated recruitment strength of the 2005 year class, and increased the recruitment strength of the three previous year classes from lower than average to average recruitment by losing the signal for the 2005 year class. The estimated current depletion changed from 0.14 to 0.24 due to a higher estimated 2008 biomass.

4. **Use a Ricker stock and recruitment relationship.**
Rationale: The Beverton-Holt stock recruitment curve is the standard choice for most assessments but there is no specific evidence to support this model over others for petrale sole. This species is an ambush predator and it could be hypothesised that the habitat available for young petrale sole to settle could become limited at high adult stock size. There is a high potential for density dependence, though no direct evidence for it. This request is to test and evaluate the influence of the assumed stock-recruitment relationship.
Response: Assuming a Ricker relationship provides a very similar fit to the Beverton-Holt assumption for the 1954 to 2008 time period, but the B_0 estimate is substantially lower. Because of the lower B_0, the ratio of $B_{current}$ to B_0 was higher. MSY estimates were very consistent under both stock-recruitment assumptions.

5. **Start assessment in 1939 and estimate initial F/depletion.**
   Rationale: Catch estimates prior to 1939 are more uncertain than those since. Size information is scarce before the 1960s and reliable fishery-independent abundance estimates start in 1980. Also, 1939 was the earliest reliable estimate for catches in Washington.
   Response: Three ways of doing this were explored: 1) start with an equilibrium catch and estimate initial equilibrium Fs; 2) start with an equilibrium age structure and estimate a multiplier on initial recruitment; and 3) start at a virgin, equilibrium state. All 3 options showed similar trends. The panel concluded that the current biomass trends were similar and MSY estimates were robust across these assumptions. Because the starting year did not make a difference in the results, the panel decided to initiate the assessment in 1876 when the first historical catches of petrale sole were documented.

6. **Allow selectivity functions to deviate without assuming blocks.**
   Rationale: The panel wanted to evaluate patterns and / or trends in fishery selectivity over time rather than using blocks.
   Response: Allowing smooth changes in fishery selectivities using annual blocks seemed to chase recruitments. The panel initially thought that time blocks on fishery selectivities were not necessary, but, under a no-time block structure, patterns in residuals appeared worse and the Hessian matrix did not invert. The panel finally decided on ten-year blocks starting in 1973. Results from a five-year blocking structure starting in 1973 were more variable and less parsimonious.

7. **Profiling on the length at minimum age.**
   Rationale: The panel wanted to test the influence of size at minimum age and investigate the effects of external estimates of growth.
   Response: The model-estimated length at minimum age seemed to explain the data better. Externally-estimated L_{MIN} resulted in a larger B_0 estimate and a lower current depletion of 4%. The model fit was degraded and the data did not support externally estimated parameters.

8. **Plot summer fishery CPUE and NWFSC survey biomass on same graph.**
   Rationale: The panel requested this plot to make it easier to directly compare these indices.
   Response: When plotted on the same graph and scales, the correspondence was seen to be very similar in recent years, especially for the Washington portion of the catch. There was a slight time shift in the peak values for Oregon and California fisheries CPUE compared with the survey. The panel concluded that future exploration of the Summer CPUE series as an index of abundance may be warranted.

9. **Provide the actual catch values for the big tows in NWFSC survey.**
   Rationale: The panel wanted to get an appreciation for the magnitude of petrale sole tows during the survey.
   Response: The STAT presented the top ten tows in the surveys, which ranged from 76 to 747 kg resulting in density estimates of 4 357 to 53 085 kg/km^2.

10. **Provide the data informing the length at maturity relationship.**
Rationale: The panel wanted to get an appreciation for how well the maturity model from Hannah et. al (2002)[1] fitted the macroscopic and microscopic observations of maturity.
Response: The panel was satisfied that the data supported the length at maturity relationship used in the model.

11. **Provide the historical Washington catch data used to interpolate historical catches during the 1930-1950 period.**
Rationale: The reconstruction of historical Washington catch estimates is one of the reasons for the difference between the 2009 and the 2005 assessments. The panel wanted to see if different interpolations could have been possible.
Response: The data were presented and the panel concluded that sensible catch interpolations had been done.

12. **Plot the catch series used in the 2005 and current assessments.**
Rationale: The panel requested these plots for direct comparison of catch histories used in these assessments.
Response: The panel could not evaluate the catch data directly; however, it was concluded that the new catch series should be used.

13. **Check the maximum length in surveys and compare with the maximum length in the winter fishery.**
Rationale: The commercial length frequencies seemed to show more larger fish than captured in trawl surveys and this could have implications for estimated fishery selectivities.
Response: A plot of the proportions at lengths greater than 50 cm showed that the maximum lengths in the surveys and winter fisheries were similar.

14. **Reduce effective sample sizes for survey data.**
Rationale: The panel wanted to see the effect of giving less weight to survey data.
Response: Reducing the effective sample sizes of survey data by half did not significantly affect selectivities nor other results.

15. **Provide the estimated growth parameters from other studies or assessments.**
Rationale: The panel was concerned that estimated growth parameters in the model and fishery selectivities could potentially be confounded, i.e. it could be growth rather than selectivity that varied over time..
Response: Estimated growth parameters from other studies were provided and were similar to those estimated in the model. The panel therefore concluded that there was no reason to assume alternative growth functions from other studies.

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[1] Hannah, R.W., S.J. Parker and E.L. Fruth. 2002, Length and age at maturity of female petrale sole (Eopsetta jordani) determined from samples collected prior to spawning aggregation. U.S. Fish. Bull. 100:711-719.

16. **Explore the areal expansion used to expand survey results to estimate biomass.**
    Rationale: The panel was concerned that the areal expansion may have included areas where petrale sole are not found.
    Response: The habitat areas used by petrale were not available. The petrale sole densities are therefore expanded to the entire area surveyed which may contain habitats that are not suitable for petrale sole.

17. **Plot recruitment deviations in log space without error bars since 1939 for the base model and under requested sensitivity runs (i.e., no time blocking of fishery selectivities and start the fishery in 1939).**
    Rationale: The panel wanted to see how the various runs compared to understand the sensitivity of recruitment estimates to assumptions regarding time-varying fishery selectivity and the historical catch prior to 1939.
    Response: This graph was provided for all requested runs and showed a similar pattern of recruitment deviations, especially from 1970 to present.

Description of base model and alternative models used to bracket uncertainty.

The final base model uses data from the beginning of the fishery in 1876. The model estimates separate selectivity curves for 1876 to 1972, 1973-1982, 1983-1992 and 2003-2008, splits the triennial survey in 1995 into two series and assumes a Beverton-Holt stock recruitment relationship. A sensitivity run assuming a Ricker stock-recruitment relationship showed very similar trends in biomass estimates from the early 1950s to 2008, but a substantially smaller B_0. This resulted in a higher ratio of $B_{current}$ to B_0. A second sensitivity run excluded the 2008 NWFSC survey data, which resulted in a markedly higher biomass estimate for 2008 and, consequently, a higher $B_{current}$ to B_0 ratio. A final sensitivity run assigned half the effective sample size to the survey length composition data, which resulted in no significant change to the base model results.

Comments on the technical merits

The current assessment and the 2005 assessment provide similar biomass and depletion trajectories, with overlapping confidence intervals and similar estimates during the 1980-2000 periods. The 2005 assessment suggested that biomass was generally increasing through 2005 while the current assessment indicates that the stock has been declining since the peak biomass in 2005. While the 2005 assessment indicated that the stock was not overfished in 2005 and that overfishing was not occurring it did show that the stock had been below the minimum stock size threshold (MSST) for much of the previous three decades and had only increased above the MSST during the previous 1-3 years. Both the current and 2005 assessments agree that that stock declined below the B40% reference point during the 1950s to an all time minimum stock size during the early 1990s, followed by increases in the stock up to 2005.

The petrale assessment was thorough, with no major flaws, and well investigated with all requested sensitivity runs provided. The document was clear and well written.

Explanation of areas of disagreement regarding STAR panel recommendations:

A. Among STAR panel members (including concerns raised by GAP and GMT representatives); and

There were no areas of disagreement among STAR panel members, though concerns were raised regarding the estimated *q* value for the NWFSC shelf/slope survey. The panel regards the *q* value as a scaling factor and noted that biomass was expanded to the whole survey area in the depths petrale occur while it is unlikely the whole area represents petrale habitat. Potential differences in growth between the northern and southern substocks may need further exploration given that the 2005 assessment estimated higher growth rates for the southern substock than for the northern substock. However, there are no recent age data available from California fisheries to better explore these potential differences.

B. Between the STAR panel and STAT team:

There were no areas of disagreement between the STAR panel and the STAT

Unresolved problems and major uncertainties

The choice of an assumed stock-recruitment relationship is uncertain in the petrale sole assessment. While there are theoretical reasons to expect a Ricker stock-recruitment relationship, there is insufficient evidence to choose between Ricker and Beverton-and-Holt, and the panel defaulted to the more commonly used B&H relationship. Choosing a Ricker relationship, however, would result in a lower B_0 estimate and thus higher $B_{CURRENT}$ to B_0. The difference in perception is smaller if MSY – based reference points are used.

The q estimated for the NWFSC shelf/slope is approximately 6 times higher than that for the AFSC triennial surveys. Higher catch rates were observed in the NWFSC survey when compared to the Triennial survey, and even though some of the difference can be explained by gear design and the NWFSC survey ability to move around rocks, further investigation is needed

The model is sensitive to the 2008 survey data and removing the 2008 survey data results in a markedly higher 2009 biomass estimate.

While the STAT addressed aging errors, uncertainties in age-composition remain important.

Management, data, or fishery issues raised by the GMT or GAP representatives

The history of key management changes was provided and was useful in ground-truthing historical catch reconstructions and time-blocking fishery selectivities. The details regarding development of the fishery were provided and important events were identified.

Prioritized recommendations for future research and data collection.

- The comprehensive catch reconstructions currently underway in Washington and Oregon need to be completed. The mixing of U.S. and Canadian catches is of particular concern for the Washington fleet. The break-and-burn aging technique is recommended for determining petrale ages because it was estimated to be less biased than surface-read ages through a bomb radiocarbon age validation study.

- The current assessment platform (SS3) is structurally complex, making it difficult to understand how individual data elements are affecting outcomes. The panel recommends investigating simpler, less structured models, including statistical catch/length models, to compare and contrast results as data and assumptions are changed.
- Expand the stock assessment area to include Canadian waters to cover the entire biological range of petrale sole.
- The abundance vs. survey depth plot suggests that the highest summer densities of petrale sole are inshore of the survey area. Expanding the survey area inshore or implementing a new nearshore survey is recommended.
- A winter shelf/slope survey would be particularly valuable for a stock like petrale with seasonal onshore-offshore migrations.
- A management strategy evaluation is recommended for petrale sole because the estimates of B_0 and $B_{current}$ are sensitive to the assumed stock-recruitment relationship, making these reference points more uncertain, while B_{MSY} estimates are consistent among all the model run results. The usefulness of the Summer CPUE series as an index of abundance should be evaluated.

Agenda Item E.2.a
Attachment 3
September 2009

2009 petrale sole stock assessment addendum: SSC requests

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August 21, 2009

This document addresses the requests made on July 8 after the SSC review of the petrale assessment at the June 2009 PFMC meeting. The SSC requests were prepared under two general headers (1) Parameter confounding and (2) Use of model-based BMSY vs. the Council proxy for management advice with multiple deliverables under each heading. This document is structured by the deliverables requested with a note showing which main SSC request contained each deliverable.

1. **MCMC results for the base model and sensitivity model run with the steepness prior** SSC (1 & 2)

There were some bugs in Stock Synthesis with regard to the treatment of the recruitment deviations when conducting MCMC that were completely resolved on August 10. Due to a power shut down August 15-16 at the Montlake Lab the correct set of MCMC model runs for the petrale assessment were not started until August 17 and are currently running. These results are not included in this document but will be presented to the SSC groundfish subcommittee meeting during August 31 to September 2.

Specific items requested include:
Provide bi-variate plots of MCMC draws of NWFSC q, natural mortality, and stock recruit parameter of steepness and Rzero.
Characterize uncertainty in B_0, B_{MSY}, F_{MSY}, stock depletion, and $B_{40\%}$.
Use the asymptotic STdevs and the MCMC output
Annual SS3 SSB estimates and their variances from MCMC output.

2. Comparison of US and Canadian landings and size/age composition data
SSC (1)

The recent Canadian stock assessments of petrale sole (Fargo and Starr 2004, Fargo 2006) both suggest that Canadian landings of petrale sole in the B.C. trawl fishery averaged around 3000 mt annually between the late 1940s and the late 1950s. U.S. trawlers fishing in Canadian waters also landed substantial amounts of petrale sole during this period. However, the landings time series in these assessment models begins during 1956 (2004) and 1966 (2006), and do not include the peak removals of petrale sole in B.C. that occurred during the 1940's and early 1950's. The landings data from the Canadian stock assessments are available only in summarized form. Landings from 1966 to 1978 are summarized based on the calendar year while 1979-2006 are based on a fishing year beginning on April 1 and ending on March 31. The monthly Canadian landings data were requested in mid-July but are not available at this time. The lack of monthly landings data results in a mismatch between the seasonal structure of the US fleets in the US petrale sole stock assessment and the available Canadian landings data. To use the Canadian landings in the US petrale sole stock assessment the yearly Canadian data were allocated to the winter and summer fleets based on the seasonal proportions of catches from the Washington fleet.

While the Canadian assessments do not include the peak fishery removals during the 1940s and early 1950s both assessments note that by the mid-1960s landings had decreased (Figure 1) and petrale sole abundance had declined substantially (Ketchen and Forrester 1966). Both Canadian assessments concur that the petrale stock was at low abundance during the 1980s and 1990s and a TAC of 497 mt was established for this species in 1997 (Fargo and Starr 2004, Starr 2006). The TAC has increased to 600 mt in recent years (Star 2006).

The WDFW provided internal documents by Alverson and Chatwin (1957) that have area specific information on historical petrale sole landings in Canadian waters from 1938-1955. These landings are of the same order of magnitude suggested by the two previous Canadian petrale sole stock assessments, except for the peak catches in 1948 at around 6200 mt, which is coincident with the period of peak landings recorded in the US. A second grey literature document from WDFW (Anon. 1956) records landings from the period 1942-1949 of similar magnitude but the landings in this document are not used due to a lack of area specific information (it is not possible to separate US and Canadian catches from Canadian waters) and the shorter time series. Alverson and Chatwin (1957) also report results from petrale sole tagging experiments that record petrale sole moving as much as 350 miles. Since petrale sole are known to have the ability to move such long distances all landings in Canadian waters (PSMFC areas 3C, 3D, 5A, 5B, 5C, 5D, and 5E), with the exception of those from the Strait of Georgia, are included in the Canadian landings history used as a sensitivity model run in the US petrale sole stock assessment. In summary the Canadian landings data are taken from the following sources:

1. 1938-1955 Alverson and Chatwin (1957)
2. 1956-1978 2004 assessment
3. 1979-2009 2006 assessment
4. 2006-2008 assumed equal to TAC of 600 mt

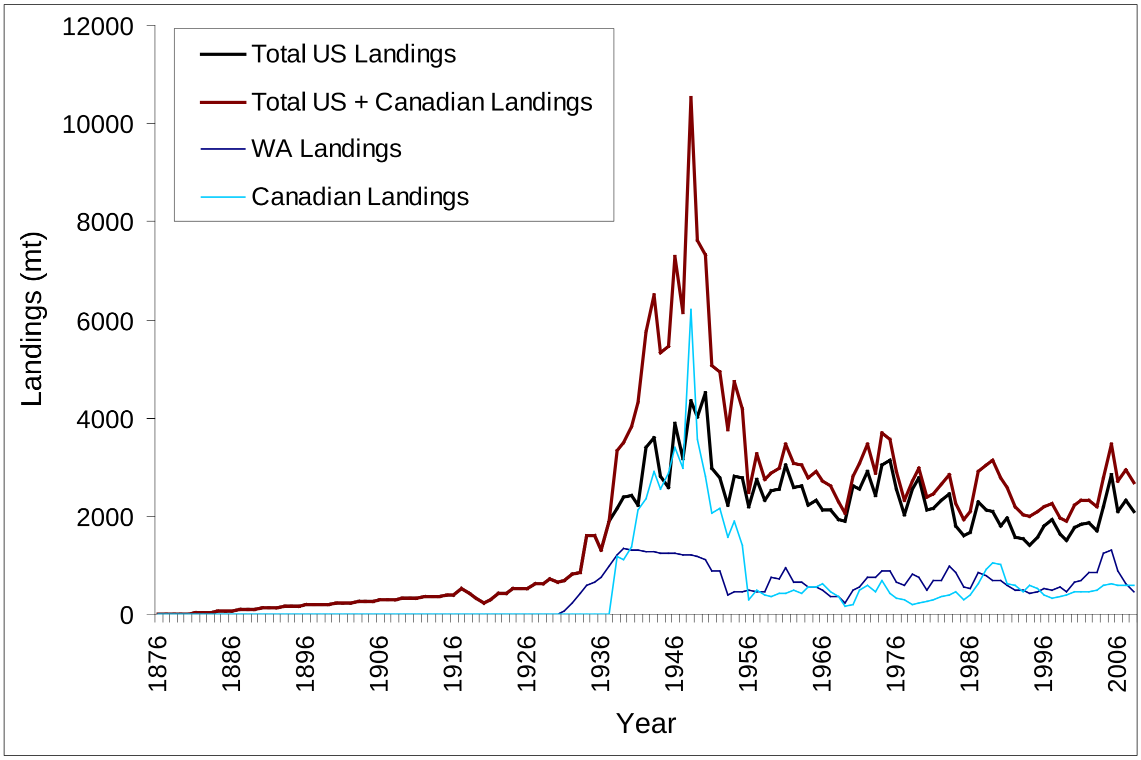

Figure 1. Landings of petrale sole from Washington, Canada, total US, and combined US and Canadian waters.

The two previous Canadian stock assessments used delay difference models due to sparse fishery data with low sample sizes and spatially limited research samples from the early 2000s that are not representative of the stock (Fargo and Starr 2004, Starr 2006). However, we received the raw Canadian age- and length-composition data on August 10 and present these data. The age and length compositions discussed below are expanded by the total weight for each sample but are not expanded by the total catch for each area. Where data are sparse the compositions are presented annually using the fishing year (November – October) as described in the 2009 petrale sole assessment. The data presented seasonally use the same seasons as the 2009 petrale sole stock assessment.

Petrale sole begin to be observed in both the Canadian and Washington petrale sole fisheries around 4 years old, although the Washington fishery has more frequent observations of 2 and 3 year old fish (Figures 2-3). However, the maximum ages observed in the Canadian commercial data are greater than the ages from the Washington commercial data (Figures 2-3). Male petrale sole aged greater than 20 years are routinely present in the Canadian commercial age data whereas the Washington fishery rarely takes male petrale sole older than 10 years. Similarly female petrale sole aged greater than 20 years, and up to 40 years, are commonly observed in the Canadian fishery, while female petrale sole taken in the Washington fishery are rarely older than 15 years. The marked difference in ages between petrale sole observed in the commercial fisheries in US and Canadian waters suggest a more lightly exploited stock in Canada.

Comparisons between the US and Canadian commercial length-composition data suggest that both fisheries start to routinely take petrale sole around 30 cm (Figures 4-5). The Canadian fishery observations generally take larger petrale sole (males 50 cm, females 65 cm) compared to the US fishery (males 45 cm, females 55 cm) (Figures 4-5).

Canadian age data from research samples are very sparse and do not cover the full range of the stock. It is also difficult to compare the US survey data and Canadian research samples since these samples do not cover the same period of time (Figure 6-7). Therefore we do not try to draw conclusions from these data. The same patterns persist between the US and Canadian length-composition data from survey/research samples as those described above for the commercial samples (Figure 8-9).

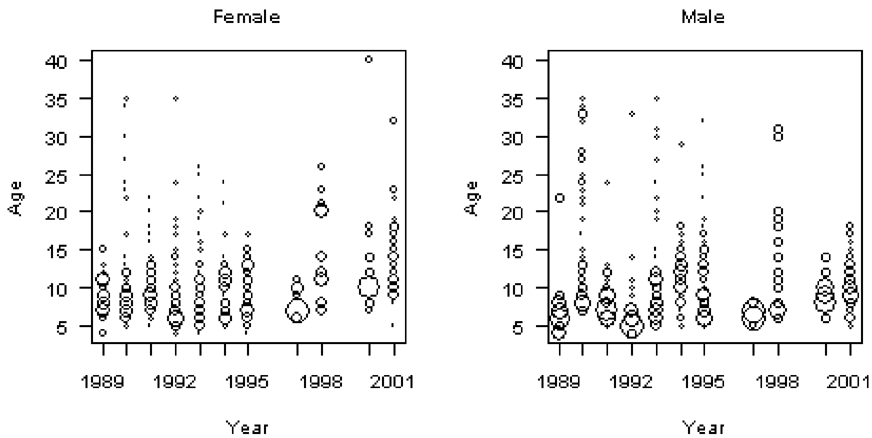

Figure 2. Canadian petrale sole commercial age compositions, observed ages range from 4 to 40.

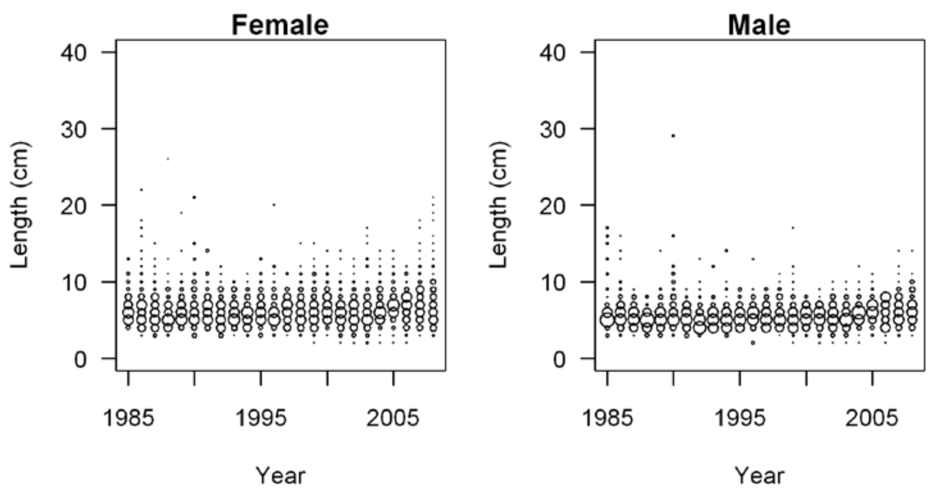

Figure 3a. Age-frequency data by gender for the Washington fleets for 1985 -2008.

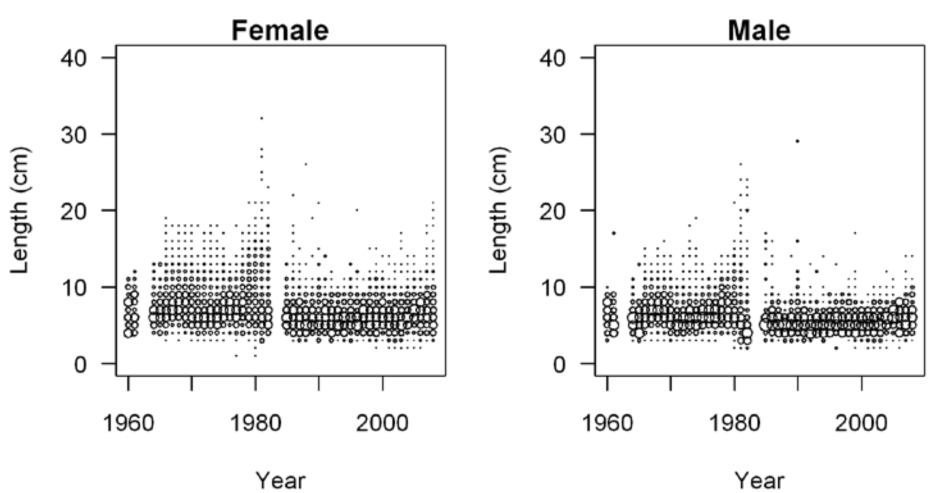

Figure 3b. Age-frequency data by gender for the Washington fleets for all years with data.

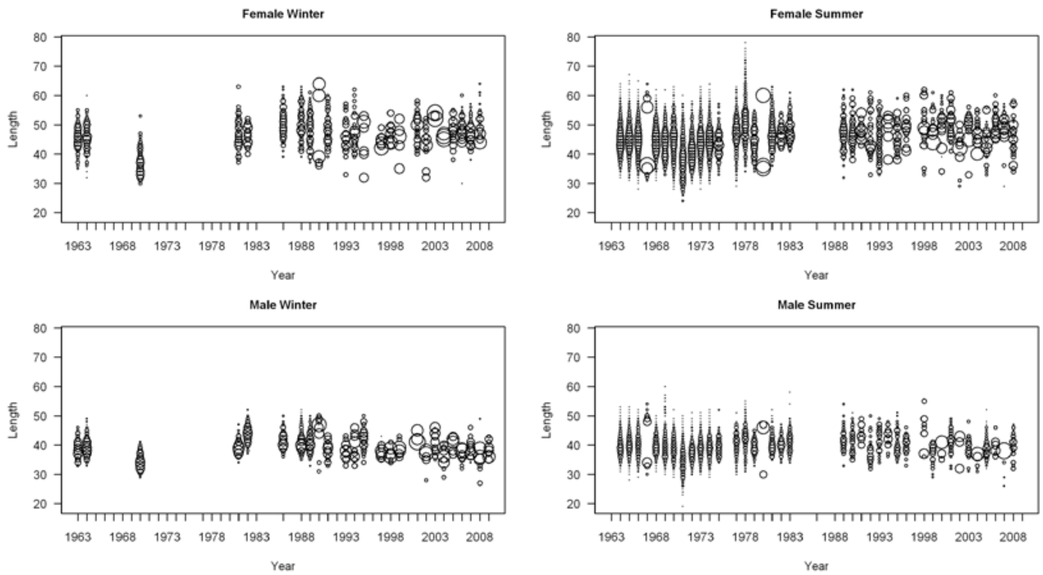

Figure 4. Canadian petrale sole commercial length compositions, observed lengths range from 19 to 82 cm.

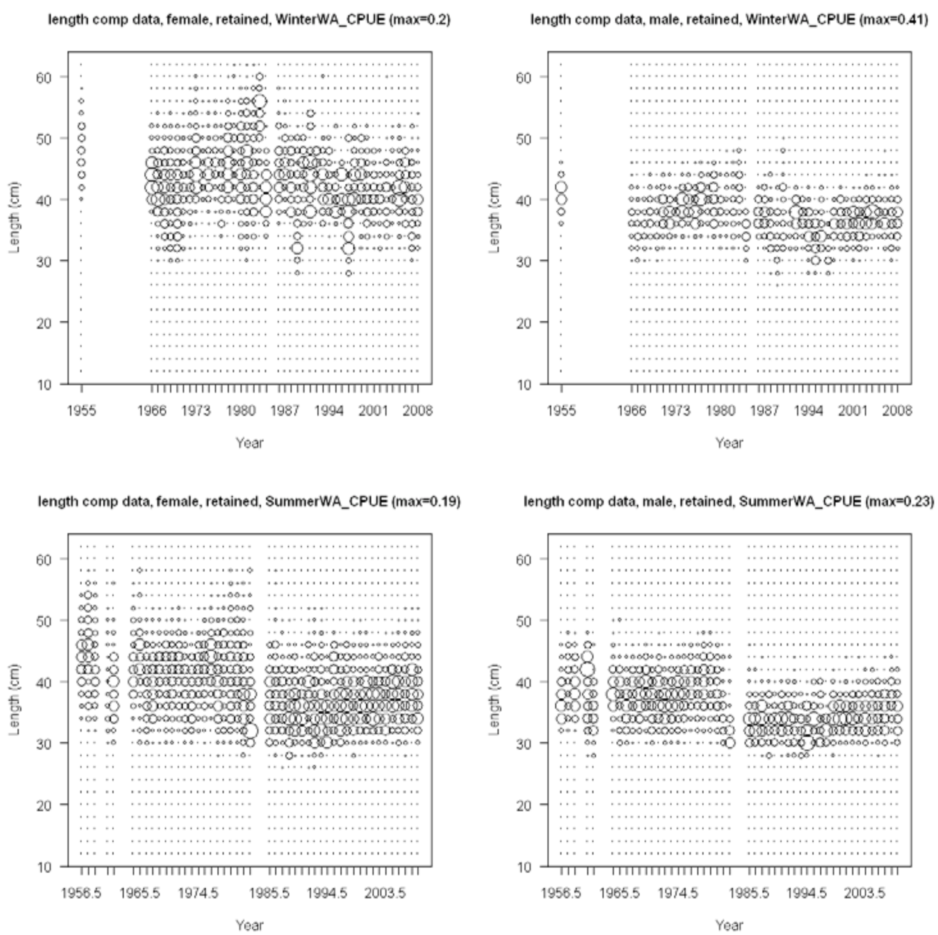

Figure 5. Length-frequency data by gender and season for the Washington fleets (Figure 30 from the 2009 stock assessment).

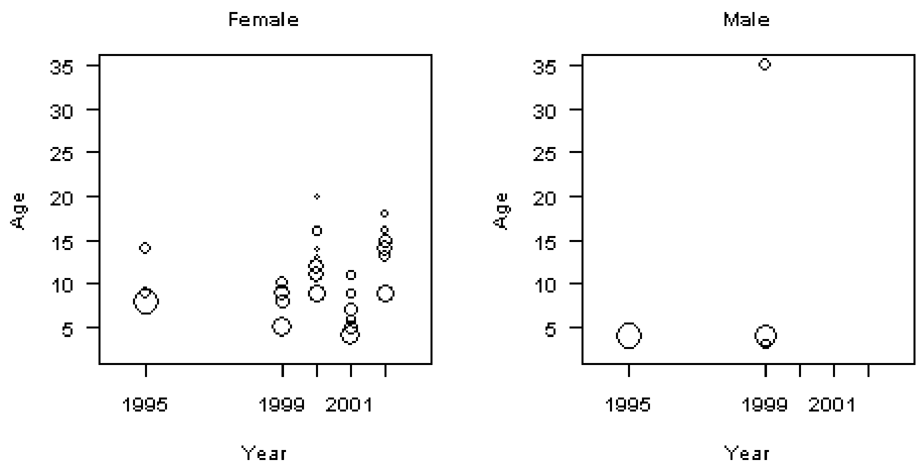

Figure 6. Canadian petrale sole research age compositions, observed ages range between 2 and 35 years.

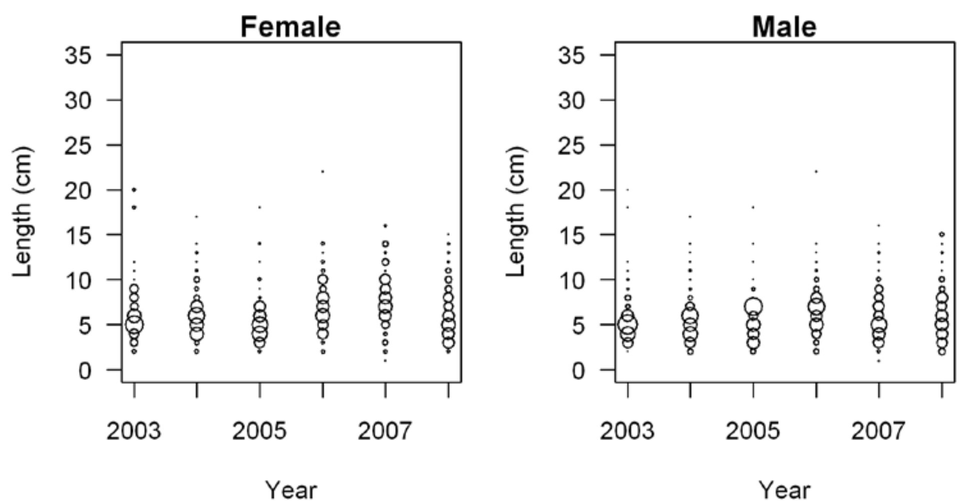

Figure 7. Age frequencies from the Vancouver and Columbia NWFSC survey.

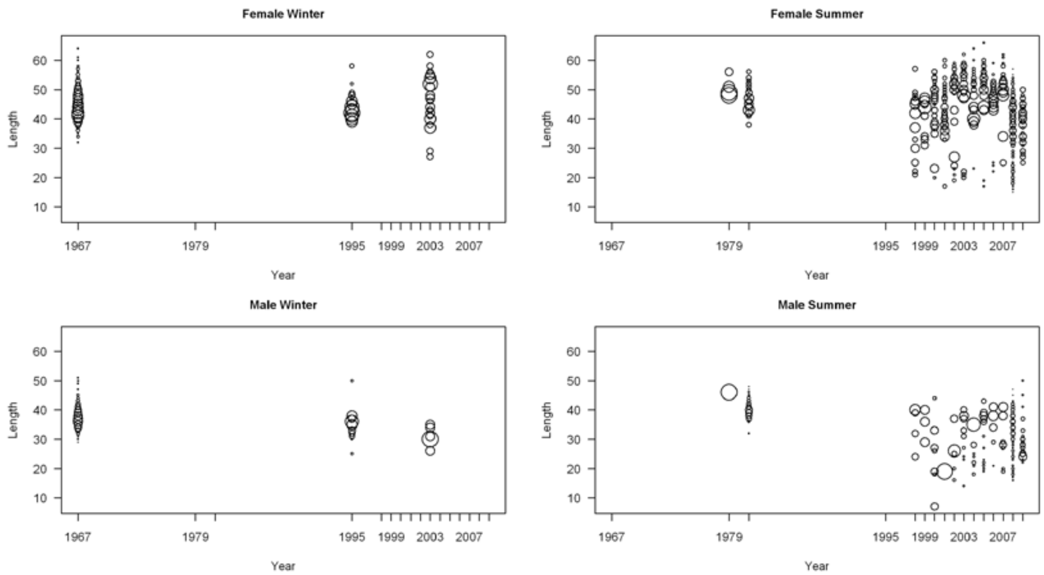

Figure 8. Canadian petrale sole research length compositions, observed lengths range between 7 and 65 cm.

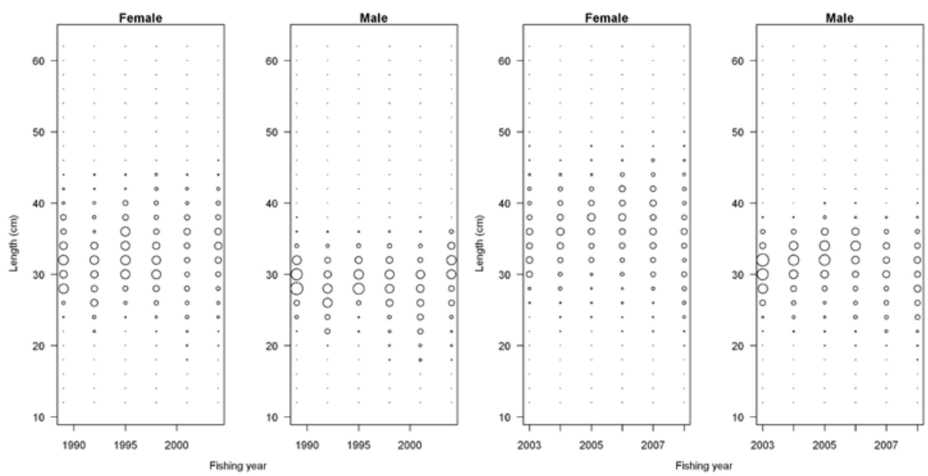

Figure 9. Plots of length frequencies from the triennial survey (left panels) and NWFSC survey (right panels) (Figures 18 and 9 from the 2009 stock assessment).

3. **Model sensitivity with Canadian data** (SSC 1)

The Canadian landings are included in the base model using multiple methods. The first method adds the Canadian landings directly to the Washington landings. Method 1 was not successful, the model was poorly behaved, took about 10 hours to run, and clearly did not converge. The second method includes the Canadian landings as catches from a separate fleet and then mirrors the Canadian fleet retention and selectivity to the Washington fleet. Similarly to method 1, method 2 was poorly behaved, did not converge, and took a very long time to run. Both of these methods implicitly assume that the Canadian 'fleet' shares the same characteristics as the Washington fleet. This assumption is less than satisfactory for the following reasons:

1. In order to correctly remove the catch from the population (to estimate selectivity) the model needs length and/or age data from the catch. Furthermore, the time blocking on selectivity is based upon management actions that affected the behavior of the US fleets and does not necessarily impact the Canadian fleet, particularly since 1977.
2. In order to account for discarding the model needs estimates of discard rates from the Canadian fleet as well as length and/or age compositions of the discard (to estimate retention. While discard practices may have been more similar in the pre1977 fisheries more recent regulations have likely impacted discard practices in the Canadian fleet.
3. The survey indices that are currently in the model are spatially inconstant with the area covered by the Canadian fleet in the model. To do this properly requires a survey index from Canadian waters.
4. The NWFSC survey is the main source of information for estimating growth in the assessment model. However the survey does not extend into Canadian waters so the growth must be assumed to be the same between the US and Canada, which may not necessarily the case.
5. While the Canadian ages are break and burn reads and likely to have low levels of bias and imprecision it is unclear what, if any, information exists to estimate the correct ageing error bias and imprecision associated with the age data for inclusion in the model.

A third method for including the Canadian catches allowed the free estimation of selectivity curves for the Canadian fleet, did not estimate a retention curve, and did not use the time blocks that were used for the Washington fleets. This model also failed to converge and had extremely long run times. The results from these model sensitivity runs are not presented under deliverable 4 since there were obvious problems with lack of convergence.

Given the points above and the multitude of problems with including only the Canadian catches in the model the STAT feels that it is necessary to include all of the appropriate Canadian data to evaluate the impact of the Canadian fleet on the petrale sole population ranging from B.C. to California. This is a substantial undertaking that would result in an essentially new assessment for petrale sole. A joint US-Canadian assessment will require buy-in from staff at the Canadian Department of Fisheries and Oceans since considerable collaborative effort between US and Canadian stock assessors will be needed to complete a joint assessment. The management implications of such an assessment should also be considered prior to such an undertaking.

4. **Model sensitivity runs** SSC (1)
    a. steepness prior of Pleuronectids in Meyers (1999), mean = 0.794, standard deviation = 0.093.
    b. a more informative prior on female M, mean 0.2, standard deviation 0.0125
    c. Canadian landings (not included, see point 3)

The full comparison of the requested model sensitivities with the base case model is shown in Table 1 below. The model sensitivity with the Meyers (1999) pleuronectid prior on h has a marginally higher negative log likelihood but essentially fits the data equally well. The estimate of h decreased from 0.95 to 0.91 and the estimate of M increased from 0.15 to 0.17. The unfished biomass decreased and the current biomass increased to produce a final stock status of 13% depletion rather than 12% depletion (Figure 10). The model sensitivity with a more restrictive prior on M has a worse fit to the data. This model produces a higher estimate for female M (0.18) and a lower estimate of h (0.86). The unfished biomass decreased and the current biomass increased to produce a final stock status of 14% depletion rather than 12% depletion (Figure 10). It is notable that the depletion relative to the estimated Bmsy remains the same across both the h and M model sensitivity runs (Table 1).

Table 1. Model sensitivity runs.

Description	baseMay08	baseMay08-priorSteepness	baseMay08-strongMprior
Nparameters	182	182	182
Gradient	0.0025	0.00024	0.00024
Negative log-likelihoods			
Total	3075.82	3076.81	3104.83
Indices	-25.16	-25.14	-25.08
Length-frequency data	1178.07	1179.32	1211.77
Age-frequency data	1925.71	1925.19	1919.67
Discard biomass	97.04	96.99	98.39
Discard mean weight	-71	-71	-71.16
Recruitment	-30.88	-30.11	-29.78
Priors	1.974	1.508	0.944
Forecast recruitment	0.012	0.008	0.006
Select parameters			
Stock-recruit, productivity			
R_0	9.52	9.72	9.9
Steepness (*h*)	0.95	0.91	0.86
Recruitment Variability (out)	0.33	0.33	0.33
Female M	0.15	0.17	0.18
Male M offset	0.11	0.11	0.1
Survey catchability & selectivity			
Triennial survey catchability (*q*) early	0.26	0.25	0.24
Triennial survey catchability (*q*) late	0.36	0.35	0.34
NWFSC survey catchability (*q*)	3.07	2.98	2.86
Individual growth			
Female length at age min	17.25	17.22	17.14
Female length at age max	52.68	52.66	52.61
Female von Bertalanffy *K*	0.16	0.16	0.16
Female SD of length-at-age min	2.83	2.83	2.83
Female SD of length-at-age max	0.16	0.17	0.16
Male length at age min	-0.03	-0.03	-0.03
Male length at Linf	-0.24	-0.24	-0.24
Male von Bertalanffy *K*	0.62	0.61	0.6
Male SD of length-at-age at age min	-0.32	-0.31	-0.3
Male SD of length-at-age at age max	0.59	0.59	0.55
Management quantities			
Spawning Biomass	25334	23700	22870
2009 Spawning biomass	2938	3011	3135
2009 Depletion	0.12	0.13	0.14
2009 1-*SPR*	0.9	0.88	0.86
2008 instantaneous fishing mortality	0.29	0.28	0.27
SSB MSY	4796	4938	5157
1-SPR MSY	0.8	0.77	0.74
F MSY	0.23	0.22	0.21
2009 Depletion Relative to SSB MSY	0.61	0.61	0.61
MSY Catch	2376	2393	2425

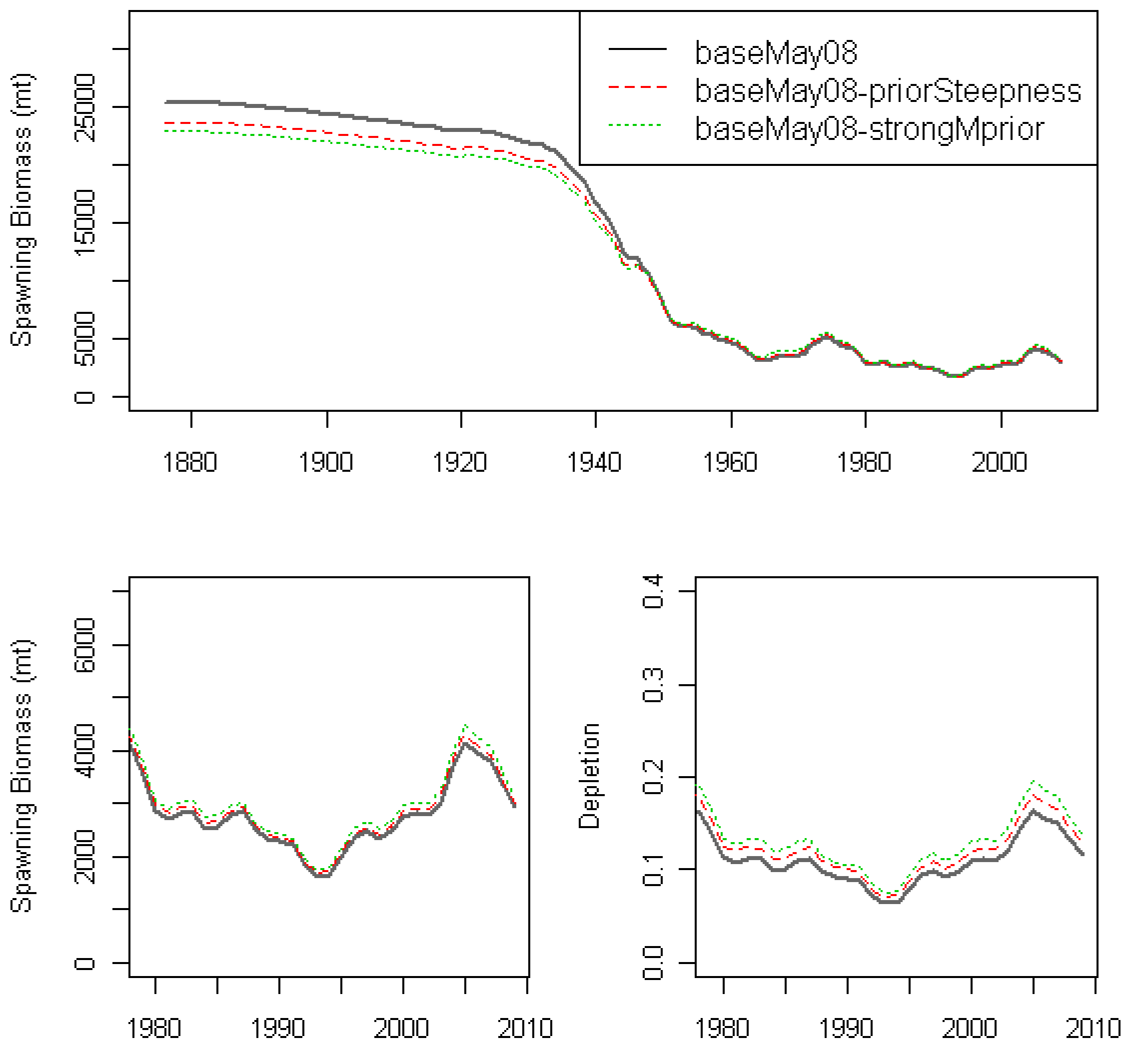

Figure 10. Time series of spawning biomass and stock depletion (as a function on unfished biomass) for the base model and model sensitivity runs.

5. **Sensitivity of Bmsy to selectivity patterns and the distribution of catch among fleets** SSC (2)

The original SSC request was to examine the impact of selectivity patterns on the estimates of the MSY spawning biomass. However, the STAT feels that the distribution of catch between fleets, particularly as the fishery shifted from the summer to the winter season, is potentially more important than changes in selectivity. The intent was to present results for both changing selectivity and catches between fleets. Unfortunately the STAT discovered a bug in the SS forecast report for seasonal models shortly before this meeting. The program is not changing the selectivity patterns, regardless of the choice of years specified for averaging selectivity over in the forecast.SS file. The program does correctly use the distribution of catches between fleets provided in the forecast.SS file. Therefore, the STAT provides a set of MSY reference points for six scenarios, whereby all of the catch is taken by each fleet in turn. The STAT feels that this will provide some information on the range of plausible MSY reference points.

The results are presented for MSY based management quantities for the average catches between fleets during each of the selectivity time blocks as well as for all catches being taken evenly between either the summer or winter fleets given the 2003-2008 selectivity patterns (Table 2a). The results of each of the six petrale sole fleets taking all of the catch given the 2003-2008 selectivity patterns are shown in Table 2b. These scenarios are meant to bound the range of potential values for the reference points. Table 3 shows the management quantities from the base model for comparison. When the catches are taken only during the summer and winter the MSY reference points are more variable (Tables 2a and 2b). The estimates of MSY spawning biomass range between a low of 4,277 mt and a high of 5,010 mt when all of the catch is taken by an individual fleet (Tables 2a and 2b). The current base model estimate is 4,796 mt (Table 3). The stock depletion as a fraction of the estimate Bmsy is ranges between 57%-69% (Tables 2a and 2b). Depending upon the distribution of catches between fleets the MSY catches range between 2,148 and 2,740 mt.

Table 2a. MSY based biological reference points from the 2009 petrale sole stock assessment base case model considering the time blocks on fishery selectivity as well as the distribution of catches between fleets.
**Only the distribution of catches between fleets, not selectivity patterns, are changing in this table due to the SS bug discussed above.

Distribution of Catches Between Fleets	Reference Point	Time/Selectivity Block** 1973-1982	1983-1992	1993-2002	2003-2008
All Summer	SSB MSY				4444
	1-SPR MSY				0.8
	F MSY				0.22
	2009 %Bmsy				0.66
	Tot MSY catch				2204
	Ret MSY catch				2101
	Disc MSY catch				103
Average F for each selectivity block	SSB MSY	4696	4812	4815	4840
	1-SPR MSY	0.8	0.8	0.8	0.8
	F MSY	0.22	0.23	0.23	0.23
	2009 %Bmsy	0.63	0.61	0.61	0.61
	Tot MSY catch	2297	2370	2373	2379
	Ret MSY catch	2205	2310	2314	2313
	Disc MSY catch	92	60	59	66
All Winter	SSB MSY				4848
	1-SPR MSY				0.8
	F MSY				0.24
	2009 %Bmsy				0.61
	Tot MSY catch				2498
	Ret MSY catch				2493
	Disc MSY catch				5

Table 2b. MSY based biological reference points from the 2009 petrale sole stock assessment base case model considering the total catch is taken by each fleet.

Reference Point	WA-winter	WA summer	OR winter	OR summer	CA winter	CA summer
SSB MSY	5010	4657	4380	4400	4919	4277
1-SPR MSY	0.79	0.81	0.82	0.82	0.80	0.82
F MSY	0.25	0.23	0.25	0.22	0.23	0.22
2009 %Bmsy	0.57	0.63	0.67	0.67	0.60	0.69
Tot MSY catch	2740	2300	2486	2148	2410	2185
Ret MSY catch	2731	2115	2484	2039	2405	2153
Disc MSY catch	9	185	2	109	5	32

Table 3. Management quantities from the 2009 petrale sole stock assessment base model.

	baseMay08
SB0	25334
2009 SpBio	2938
2009 Depl	0.12
2009 1-SPR	0.9
2008 instant F	0.29212
SSB MSY	4796
1-SPR MSY	0.8
F MSY	0.23
2009 %Bmsy	0.61
Tot MSY catch	2376
Ret MSY catch	2337

6. **State the case for using either revised proxy reference points or species specific estimates of Bmsy from the assessment model** SSC (2)

The STAR panel review report and the 2009 petrale sole stock assessment provide results regarding the reliability of the estimated reference points presented in the 2009 petrale sole stock assessment. The choice of approached for quantifying reference points, either the current 40% Bmsy proxy, the estimate of Bmsy, or some revised proxy based on a value such as Bmsy/B0, should be independent of the acceptance of the assessment. Below, the STAT summarizes the STAR report, assessment results, and further investigations requested after the June 2009 SSC meeting regarding the reliability of the Bmsy estimates from the 2009 petrale sole stock assessment that can inform this management choice.

- The STAR panel notes that annual catches since 1951 have been fluctuating around the estimated MSY. The MSY-based reference points from the 2009 assessment suggest that the spawning biomass has largely been between the estimated Bmsy and 50% Bmsy, since about 1958 with the exception of a few years above B_{MSY} during the mid-1970s, and a series of years below B_{MSY} between the late 1980s to mid-late 1990s.
- The estimates of Bmsy as a fraction of B0 from recent flatfish assessments on the west coast that report Bmsy, petrale sole, English sole, and arrowtooth flounder, are consistently around 20% B0. The estimated Bmsy reported in the 2005 Dover sole assessment is roughly 25% of B0. These are much less than the proxy management target of 40% B0. Flatfish generally have higher natural mortality, grow faster, and mature earlier than many rockfish, making them more productive, which is illustrated by the typical estimates of 20-25% of B0 for flatfish assessments.
- The choice of an assumed stock-recruitment relationship is uncertain in the petrale sole assessment. While there are theoretical reasons to expect a Ricker stock-recruitment relationship, there is insufficient evidence to choose between Ricker and Beverton-and-Holt, and the panel defaulted to the more commonly used B&H relationship. Choosing a Ricker relationship, however, would result in a lower B_0 estimate and thus a higher ratio of $B_{CURRENT}$ to B_0. The difference in perception between the two assumptions is smaller if MSY based reference points are used. Therefore, the panel recommended that reference points based on MSY are investigated as an alternative MSST.
- Both the current and 2005 assessments agree that the stock declined below the B40% reference point during the 1950s to an all time minimum stock size during the early 1990s, followed by increases in the stock up to 2005. The current flatfish proxy reference points (40% B0 and 25% B0) suggest the stock has been below the current overfished threshold since the 1950s and that catches in excess of F40% have been occurring for nearly this entire time period. However, the petrale sole stock is productive enough to have maintained stable catches over the past approximately 50 years and has shown

large recruitments at low stock sizes, resulting in increases in abundance since the early 1990s.

Literature

Alverson, D.L., and Chatwin, B.M. (1957) Results from tagging experiment on a spawning stock of petrale sole (Eopsetta jordani). Washington Department of Fish and Wildlife grey literature.

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Fargo J. and Starr, P.J. 2004. Petrale sole stock assessment for 2003 and recommendations for management in 2004. Canadian Scientific Advisory Secretariat Research Document 2004/036. Canadian Groundfish Research and Conversation Society, Nanaimo, B.C., Canada and Department of Fisheries and Oceans Canada, Nanaimo, B.C., Canada

Starr, P.J. 2006. Draft Petrale sole (*Eopsetta jordani*) in British Columbia, Canada: Stock assessment for 2006-2007 and advice to managers for 2007-2008. PSARC Working Paper G2007-01. Canadian Groundfish Research and Conversation Society, Nanaimo, B.C., Canada.

Status of bocaccio, *Sebastes paucispinis*, in the Conception, Monterey and Eureka INPFC areas for 2009

Post-STAR Panel, pre-SSC review draft
August 20 2009

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EXECUTIVE SUMMARY

Stock

This assessment reports the status of the bocaccio rockfish (*Sebastes paucispinis*) off of the west coast of the United States, from the U.S.-Mexico border to Cape Blanco, Oregon (representing the Conception, Monterey and Eureka INPFC areas). Although the range extends considerably further north, there is some evidence that there are two demographic clusters of bocaccio, centered around southern/central California and the west coast of British Columbia, with a relative rarity of bocaccio (particularly smaller fish) in the region between Cape Mendocino and the Columbia river mouth. This is supported by apparent differences in growth, maturity and longevity, although genetic evidence seems to indicate a single west coast population. Within the stock area, there is also evidence of limited demographic separation, which is treated through some separation of fleets and data. These and other issues related to stock identification and relative levels of demographic mixing and isolation remain important research questions for future assessments.

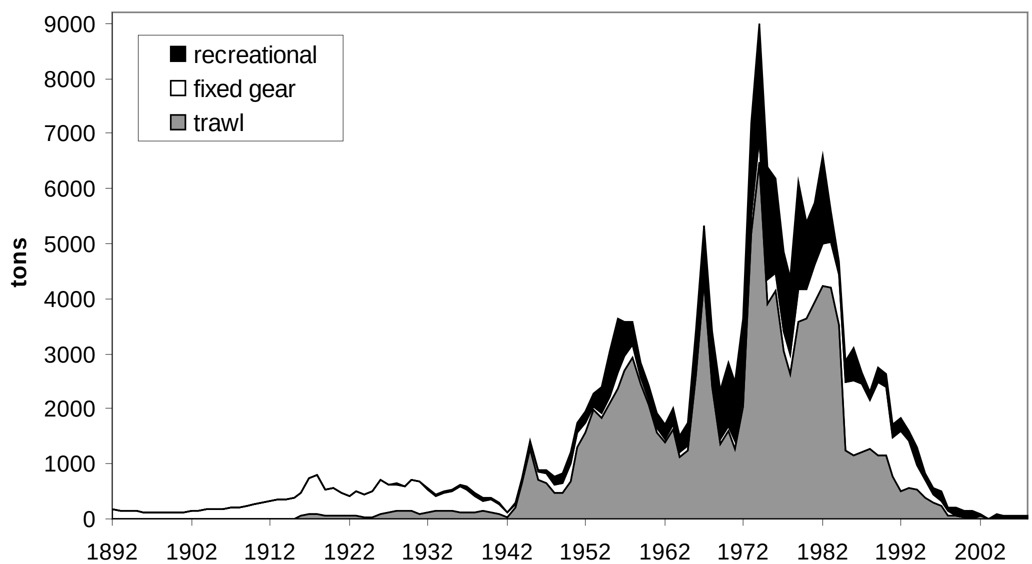


Figure E1: Catch history of bocaccio rockfish (in metric tons) in the assessment area from 1892-present

Catches

Bocaccio rockfish have long been one of the most important targets of both commercial and recreational fisheries in California waters, accounting for between 25 and 30% of the commercial rockfish (*Sebastes*) historical catch over the past century. However, this percentage has declined in recent years as a result of stock declines, management actions and the development of alternative fisheries (particularly the widow rockfish fishery in the early 1980s). The catch history for this assessment begins in 1892, a major shift from recent assessments which began in 1951, and relies heavily on the catch reconstruction efforts and products recently developed for historical California groundfish landings. Although the recent (post-1950) catch history has changed only modestly, the revised catch history prior to 1950 has a substantial impact on the perception of stock status.

Table E1. Recent catches (in metric tons) of bocaccio rockfish south of Cape Blanco

	trawl south of 38° N	trawl north of 38° N	hook and line	setnet	rec south of 34.5° N	rec north of 34.5° N
1999	19.0	26.0	20.7	7.2	80.1	60.2
2000	13.2	6,6	7,0	0,7	58.2	74.4
2001	9.2	4.4	7.8	0.8	62.7	53.8
2002	28.0	20.7	0.1	0.0	35.9	4.9
2003	5.1	0.3	0.0	0.0	5.5	1.9
2004	13.9	3.5	1.8	0.2	63.4	2.3
2005	24.6	0.4	1.5	0.2	69.9	10.7
2006	16.1	0.3	2.3	0.3	29.0	11.8
2007	4.1	1.6	3.4	0.4	44.2	8.9
2008	28.7	1.6	13.4	0.5	30.3	3.6

Data and Assessment

The last full assessment of bocaccio rockfish was done in 2003 in Stock Synthesis 1, and subsequently updated (with the same software) in 2005 and 2007. This assessment uses the Stock Synthesis 3 (version 3.03a), expands the area modeled from Cape Mendocino, CA to Cape Blanco, OR, and begins the model at 1892 rather than 1950. This model includes catch and length-frequency from six fisheries, two trawl fisheries (north and south of 38° N), a hook and line fishery, a set net (gillnet) fishery and recreational fisheries south and north of Point Conception, CA. No age data are used in this model. Fisheries dependent relative abundance (CPUE) indices, unchanged from the last assessment, are used for the trawl fishery and the two recreational fisheries; a recruitment (age-0) index based on recreational pier fishing is also included, revised since its removal from the 2003 assessment. Fisheries independent data used in the last assessment and continued here include the CalCOFI larval abundance time series and the triennial trawl survey index; new fisheries independent indices include a GLMM index based on the NWFSC combined survey index, the new NWFSC Southern California Bight hook and line survey, and the revised (coastwide) pelagic juvenile index. A recruitment index based on power plant impingement data is described but not included in the base model, as are point estimates of spawning and total biomass in the Southern California Bight based on larval production. The most significant parameter change includes the estimation of a steepness value of 0.57 in the base model; the natural mortality rate is unchanged from recent assessments (0.15). Growth is estimated within the model and results are consistent with past assessments.

Stock spawning output

The spawning output was estimated to be very slightly below the estimated unfished levels in the beginning of the modeled period, due to very moderate fishing pressure that began no later than the 1850s. The spawning output trajectory continues a very moderate decline until about 1950, but is estimated to have declined steeply from the early 1950s through the early 1960s as catches rose from several hundred to several thousand tons. The biomass increased sharply thereafter, as a result of one or several very strong recruitment events in the early 1960s, exceeding the mean unfished biomass level through the early 70s, when catches again began to climb rapidly to their peak levels, associated with high fishing mortality rates and a rapid drop in spawning output. Fishing mortality remained high throughout the 1980s and 1990s, even as catches, biomass and spawning output declined rapidly. Fishing mortality declines towards the end of the 1990s, in response to severe management restrictions, and coincident with a series of several strong year classes (following a decade of very poor recruitment) that began in 1999. Since the early 2000s, spawning output has been increasing steadily. The base model estimates a current (2009) depletion level of 28%, a 2008 SPR of 0.950, with the forecast under constant harvest rates indicating a continued increase in spawning output.

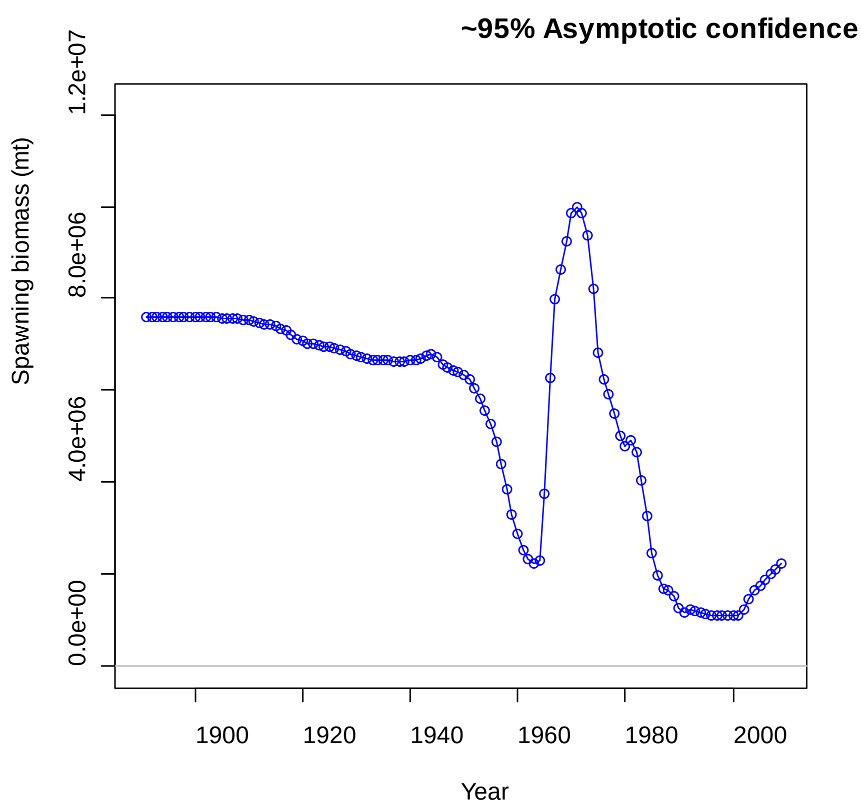


Figure E2. Estimated spawning output time series (1892-2008) for the base case model with approximate asymptotic 95% confidence interval.

Table E2. Recent trends in estimated spawning output and relative depletion level

Year	Spawning Output	Confidence interval (~95%)	Depletion	Confidence interval (~95%)
1999	1091300	(803600 - 1379000)	13.88%	(0.09 - 0.17)
2000	1087600	(792900 - 1382300)	13.84%	(0.09 - 0.17)
2001	1094600	(792340 - 1396860)	13.93%	(0.09 - 0.18)
2002	1225700	(884940 - 1566460)	15.59%	(0.10 - 0.20)
2003	1453900	(1046540 - 1861260)	18.50%	(0.12 - 0.24)
2004	1628200	(1169340 - 2087060)	20.72%	(0.14 - 0.27)
2005	1733900	(1239080 - 2228720)	22.06%	(0.15 - 0.28)
2006	1848700	(1313540 - 2383860)	23.52%	(0.16 - 0.3)
2007	1980000	(1400300 - 2559700)	25.19%	(0.17 - 0.33)
2008	2103200	(1480260 - 2726140)	26.76%	(0.18 - 0.35)
2009	2209900	(1546440 - 2873360)	28.12%	(0.18 - 0.37)

Recruitment

Recruitment for bocaccio is highly variable, with a small number of year classes tending to dominate the catch in any given fishery or region. Recruitment appears to have been at very low levels throughout most of the 1990s, but several recent year classes (1999, 2003, 2005) have been relatively strong given the decline in spawner abundance, and have resulted in an increase in abundance and spawning output. The juvenile cruise index suggests low recruitment in 2007 and 2008, years in which length composition data are not indicative of above average recruitment . Estimated recruitments and confidence intervals for those values are shown in Table E3 and Figure E3.

Table E3. Estimated recruitment with 95% confidence interval, 1999-2009

Year	Recruits (x1000)	Confidence interval (~95%)
1999	8067	(5647 - 10487)
2000	268	(22 - 514)
2001	318	(74 - 562)
2002	1250	(714 - 1786)
2003	3952	(2660 - 5244)
2004	566	(232 - 900)
2005	3642	(2368 - 4916)
2006	433	(129 - 737)
2007	838	(308 - 1368)
2008	850	(0 - 1742)
2009	3428	(0 - 10336)

Figure E3. Estimated recruitment of bocaccio rockfish with 95% asymptotic confidence intervals, from 1892-2009 (freely estimated only from 1954-2008).

Reference Points

Reference points are presented in Table E4, which presents the unfished summary biomass, unfished spawning output, mean unfished recruitment and the proxy estimates for MSY based on the $SPR_{50\%}$ rate, the fishing mortality rate associated with a spawning stock output of 40% of the unfished level, and MSY estimated based on the spawner/recruit relationship. The corresponding yields for these three estimates vary by a relatively minor amount, ranging from 1250 tons based on the spawning output proxy and 1270 tons based on the MSY estimate. However, the relative impact of the higher harvest rate on spawner abundance is results in a significantly lower equilibrium spawning output and summary biomass with both the SPR proxy and the estimated MSY rate, relative to the spawning output reference point. Additionally, estimates of the different MSY proxies are based on the relative proportion of total catches by fishery in 2008 (which in no way are intended to imply a de facto sector allocation), and will change modestly depending upon allocation among fisheries with differing selectivity curves.

Table E4. Summary of reference points for bocaccio rockfish from the base model

Unfished Stock	Estimate	95% Confidence Limits Lower	Upper
Summary (1+) Biomass	44070	36029	52111
Spawning Output	7860000	6426040	9293960
Equilibrium recruitment	5060	4129	5991

	Yield reference Points		
	$SSB_{40\%}$	SPR proxy	MSY est.
SPR	0.512	0.500	0.461
Exploitation rate	0.066	0.069	0.078
Yield	1250	1258	1270
Spawning output	3140000	3031020	2651890
SSB/SSB_0	0.40	0.39	0.34

Exploitation Status

The 2009 spawning output is estimated to be at 28.3% of the unfished spawning output, significantly lower than the target levels, but slightly above the minimum stock size threshold (Figure E5). The draft base model indicates that the exploitation rates for bocaccio rockfish has remained at low levels since the turn of the millennia, and the population has been increasing accordingly (Table E5, Figures E5-E6).

Table E5. Base model estimated exploitation rate and spawning potential ratio (SPR)

Year	Exploitation rate	SPR rate
1999	0.034	0.754
2000	0.023	0.825
2001	0.018	0.912
2002	0.010	0.988
2003	0.001	0.922
2004	0.008	0.906
2005	0.010	0.949
2006	0.005	0.949
2007	0.005	0.941
2008	0.006	0.950

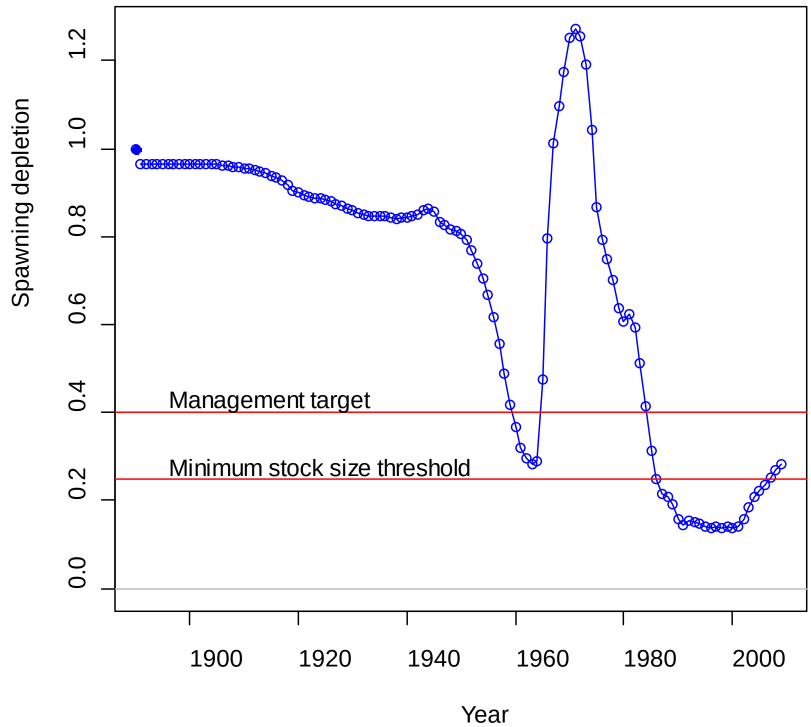
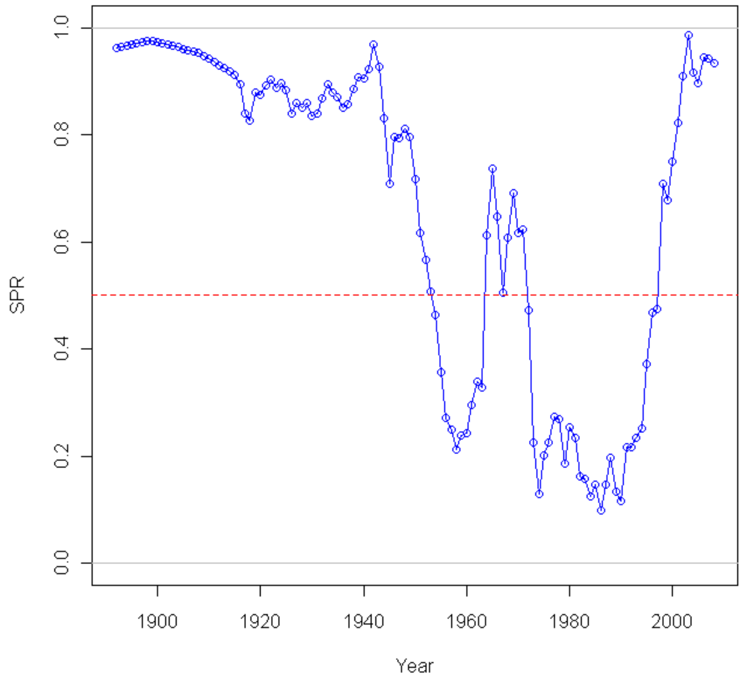
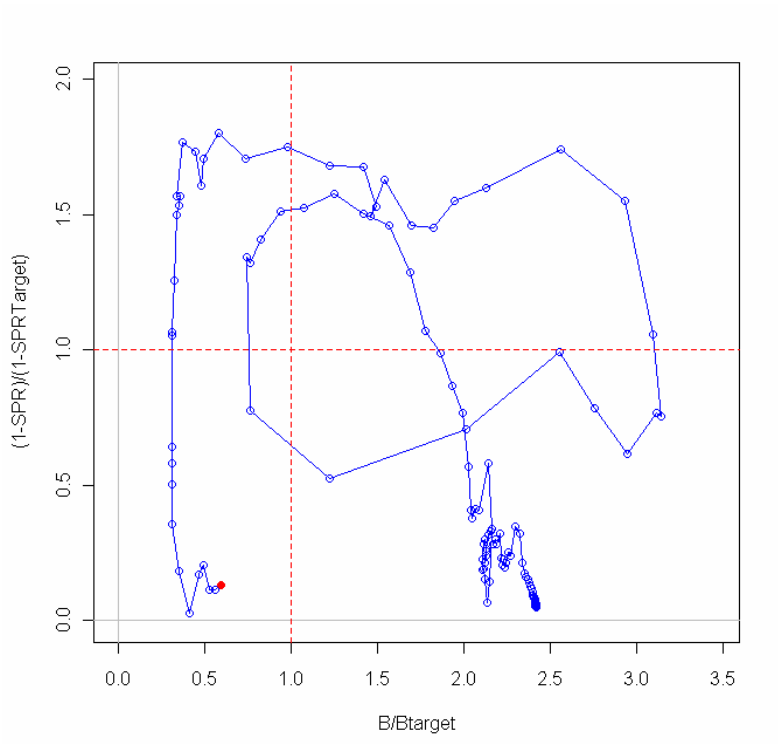


Figure E4. Time series of estimated depletion level of bocaccio from the base model

Management Performance

Bocaccio rockfish were formally designated as overfished in March of 1999, after the groundfish FMP was amended to incorporate the mandates of the Sustainable Fisheries Act reauthorization to the MSFCMA. The rebuilding policy adopted by the PFMC held the rebuilding OY constant at 100 MT for the years 2000-2002, with the intention of switching to a constant fishing rate policy beginning in 2003. However, due to an extremely pessimistic 2002 assessment, the 2003 OY was set to 20 tons OY. A more optimistic assessment in 2003 led to a 2004 OY of 199 tons. The OY has been set at a range of values between 218 and 307 tons since then (Table E6), with actual catches (including discards) estimated to be less than half of that amount in most years since 2003.





Figures E5- E6. Spawner potential ratio (SPR) over time (top), with reference proxy for *Sebastes* (0.5) and phase plot of SPR rate plotted against SSB, against target levels (bottom).

Table E6. Management performance

	commercial catches	recreational catches	ABC	OY
1999	73	124	230	230
2000	28	112	164	100
2001	22	109	122	100
2002	49	41	122	100
2003	5	7	244	20
2004	19	66	400	199
2005	27	81	566	307
2006	19	41	549	306
2007	9	53	602	218
2008	44	34	618	218

Unresolved problems and major uncertainties

Although much of the parameter uncertainty is reported, natural mortality (M) is treated as fixed, as are several important selectivity parameters. Consequently, the reported asymptotic confidence intervals underestimate the true parameter uncertainty. Although the data seem to be relatively informative with respect to steepness, the lack of age data lead to a potentially misleading interpretation of the sensitivity to alternative values of natural mortality. There is clear tension in the model between several key indices, particularly the CalCOFI index and the southern recreational CPUE index, which tend to reflect a more optimistic view of stock status, and the trawl cpue and triennial survey index, which tend to reflect a more pessimistic view of stock status. This tension is explored further in the decision table. The manner in which selectivity is estimated for the triennial trawl survey continues to be problematic, as it has for past assessments, although the application of a GLMM index seems to result in a more plausible index. Despite other sources of parameter and model uncertainty, and the potentially confounding impacts of management actions in both reducing the availability of data in recent years, there appears to be clear signs that the stock is rebuilding at a relatively rapid rate. Data from relative recent, short term surveys do not yet appear to be informative with respect to trends in abundance, although they are informative with respect to cohort strength.

Table E7. Forecast of bocaccio ABC, OY, spawning biomass and depletion for the base model based on the SPR= 0.777 fishing mortality target (OY) from the previously adopted rebuilding plan, and $F_{50\%}$ overfishing limit/target (ABC).

Year	ABC (mt)	OY (mt)	Age 1+ biomass (mt)	Spawning output	Depletion
2009	831	267	12,808	2,209,950	28.11%
2010	744	251	12,618	2,228,890	28.35%
2011	714	246	12,671	2,206,150	28.06%
2012	753	265	13,018	2,199,380	27.98%
2013	824	299	13,605	2,252,490	28.65%
2014	894	339	14,340	2,352,740	29.93%
2015	950	377	15,151	2,481,040	31.56%
2016	992	413	15,991	2,625,210	33.39%
2017	1025	445	16,833	2,777,630	35.33%
2018	1051	474	17,663	2,933,000	37.31%
2019	1074	500	18,472	3,087,910	39.28%
2020	1094	517	19,256	3,239,680	41.21%

Decision Table

As both the STAT and the STAR Panel identified the major sources of uncertainty in the model as relating to the tension between two generally pessimistic indices (both derived primarily from north of Point Conception, California) and two optimistic indices (both derived primarily from south of Point Conception). Consequently, the two alternative states of nature sequentially increased the emphasis on each of these groups to bracket uncertainty (Table E8). The low abundance scenario (State 1) was obtained by upweighting ($\lambda = 10$) the triennial and southern trawl CPUE indices, while the high biomass scenario (State 2) was obtained by upweighting the southern recreational CPUE index and the CalCOFI indices. Thus, these scenarios also provided useful contrast between an apparent, but poorly understood, spatial dimension to relative abundance trends, as the data suggest that recovery may be taking place more rapidly in the south, and recovery in the central/northern California region may be dependent on an influx of fish from the southern area.

Table E8: Decision Table for the bocaccio assessment, where State 1 has the triennial and trawl CPUE indices emphasized, and State 2 emphasizes southern rec CPUE and the CalCOFI indices.

		State1 (low biomass)		**Base Model**		**State2(high biomass)**	
catch with 2008 F		larvae	depletion	larvae	depletion	larvae	depletion
2009	65	1034540	**0.15**	2209950	**0.28**	2658620	**0.38**
2010	62	1056130	**0.15**	2259880	**0.29**	2715680	**0.39**
2011	62	1059020	**0.15**	2267600	**0.29**	2720120	**0.39**
2012	68	1076100	**0.15**	2289230	**0.29**	2736480	**0.40**
2013	78	1133840	**0.16**	2371870	**0.30**	2819550	**0.41**
2014	90	1224880	**0.18**	2506410	**0.32**	2959720	**0.43**
2015	102	1337490	**0.19**	2675120	**0.34**	3137450	**0.45**
2016	113	1464190	**0.21**	2865660	**0.36**	3338590	**0.48**
2017	123	1600700	**0.23**	3069460	**0.39**	3552450	**0.51**
2018	129	1744400	**0.25**	3280130	**0.42**	3770470	**0.55**
2019	136	1893960	**0.27**	3493470	**0.44**	3986640	**0.58**
2020	142	2048240	**0.29**	3706040	**0.47**	4196180	**0.61**
SPR 0.77 (base)		larvae	depletion	larvae	depletion	larvae	depletion
2009	267	1034540	**0.15**	2209950	**0.28**	2658620	**0.38**
2010	251	1025030	**0.15**	2228890	**0.28**	2684700	**0.39**
2011	246	997328	**0.14**	2206150	**0.28**	2658730	**0.38**
2012	265	986019	**0.14**	2199380	**0.28**	2646800	**0.38**
2013	299	1013570	**0.14**	2252490	**0.29**	2700770	**0.39**
2014	339	1068090	**0.15**	2352740	**0.30**	2807790	**0.41**
2015	377	1136160	**0.16**	2481040	**0.32**	2947220	**0.43**
2016	413	1210440	**0.17**	2625210	**0.33**	3105210	**0.45**
2017	445	1287560	**0.18**	2777630	**0.35**	3272010	**0.47**
2018	474	1365920	**0.20**	2933000	**0.37**	3440210	**0.50**
2019	500	1444790	**0.21**	3087910	**0.39**	3604600	**0.52**
2020	517	1523620	**0.22**	3239680	**0.41**	3761180	**0.54**
SPR 0.77(State 2)		larvae	depletion	larvae	depletion	larvae	depletion
2009	353	1034540	**0.15**	2209950	**0.28**	2658620	**0.38**
2010	326	1009690	**0.14**	2213630	**0.28**	2669450	**0.39**
2011	314	967342	**0.14**	2176350	**0.28**	2628970	**0.38**
2012	328	942839	**0.13**	2156410	**0.27**	2603940	**0.38**
2013	360	956879	**0.14**	2196410	**0.28**	2645010	**0.38**
2014	395	995845	**0.14**	2282340	**0.29**	2738290	**0.40**
2015	429	1045960	**0.15**	2394880	**0.30**	2863010	**0.41**
2016	459	1100950	**0.16**	2522930	**0.32**	3006440	**0.43**
2017	479	1158410	**0.17**	2659810	**0.34**	3159810	**0.46**
2018	497	1217370	**0.17**	2800930	**0.36**	3316360	**0.48**
2019	512	1277570	**0.18**	2943370	**0.37**	3471380	**0.50**
2020	527	1338790	**0.19**	3084810	**0.39**	3621160	**0.52**

Research and Data Needs

Stock structure for bocaccio rockfish on the West Coast remains an important issue to consider with respect to both future assessments and future management actions. Although a reanalysis of the genetic evidence done for this assessment suggests no significant differentiation among the major oceanographic provinces in the California Current, the apparent differences in growth, maturity, and longevity, are indicative of moderate demographic isolation. Although an area model could be a worthy approach for addressing some of these questions, the lack of mixing or movement data would make such an effort challenging, and questions regarding the appropriate scale of such models remain largely unresolved.

The potential to develop defensible aging criteria for bocaccio in the southern area should be evaluated further, particularly if such criteria could be developed in a coordinated effort among workers along the west coast. Although production aging is likely to remain a challenge, future aging efforts would likely improve the ability to adequately inform natural mortality rates, growth and variability of size at age, and possibly contribute to an improved understanding of differences in life history parameters and rates in different regions of the West Coast.

With respect to both time varying growth and a more comprehensive evaluation of the interaction between climate and fecundity, additional research into the consequences of poor environmental conditions in affecting bioenergetic allocation patterns should be explored in greater detail. Efforts underway to investigate these questions, which should ultimately improve the interpretation of the CalCOFI larval abundance data as well as better inform efforts to model time-varying growth.

Since large scale area closures and other management actions were initiated in 2001, the spatial distribution of fishing mortality has changed over both large and small spatial scales. Not only has this effectively truncated several abundance indices (recreational CPUE indices), this confounds the interpretation of survey indices as well as fishery dependent and independent length frequency data. This is a problem for virtually all west coast groundfish, and should be addressed accordingly.

The application of juvenile indices to inform future recruitment remains an area ripe for additional investigations. Such indices have successfully captured the magnitude of some large recruitment events in the past, although they have missed others. Given the high recruitment variability observed in bocaccio, even indices with high uncertainty are likely to be an improvement over recruitment predicted from the spawner-recruit relationship. However, a better appreciation of the strengths and weaknesses of these indices is an important research priority.

C. INTRODUCTION

The name bocaccio is derived from the Italian for "bigmouth," bocaccio were also often called "bocacc" by early Italian fishermen, "merou" by Portuguese fishermen, "jack" by some American fishermen, "andygumps" by some British Columbia fishermen, "tomcod" for young bocaccio caught around wharfs, salmon grouper, and longjaw and many others (Love et al. 2002). The genus, *Sebastes*, is Latin for magnificent of course, and the species name, *paucispinis*, is a reference to the paucity of head spines relative to most other species of *Sebastes*. The body shape is best described as an elongate, laterally compressed fish with a very large mouth (thus the name) and a protruding lower jaw with a prominent knob at the end of their lower jaw. The upper jaw (maxillary) also extends to beyond the eye, distinguishing bocaccio from the often co-occurring chilipepper rockfish (Miller and Lea 1972). Underwater, subadult and adult bocaccio appear pink, pink-brown, gray or red; upon capture most appear a brighter reddish or salmon color mixed with brown, however considerable variation in colors and mottled patterns have been reported (Love et al. 2002). Both juvenile and adult stages grow rapidly, although growth slows considerably in mature adults; maximum reported sizes are 91 cm and to approximately 8 kg. In an extensive review of phylogenetic relationships among *Sebastes*, Hyde and Vetter (2007) found that bocaccio were most closely related to both chilipepper (*S. goodei*) and shortbelly (*S. jordani*) rockfish, although that lineage dated back approximately 6 million years. Adult systematics are described in more detail in Phillips (1957; 1964) and Love et al. (2002); larval distribution and descriptions are provided by Moser (1967; 1996) and pelagic juvenile life history stages and growth are described in Woodbury and Ralston (1991).

C.1 Management History

As the management history is closely linked to the history of many of the past assessments, highlights from previous modeling approaches are included in this section, and the assessment history section focuses on the transition from the 2003 assessment (and subsequent updates) to this assessment. Together with chilipepper rockfish (*Sebastes goodei*), bocaccio have long been one of the most important rockfish species in California commercial fisheries, particularly off of central and southern California (development of fisheries and trends in landings in the historical period are discussed in great detail in the catch reconstruction section). Throughout most of this period, domestic groundfish fisheries were managed by state management agencies, and in California waters there were few restrictions on harvest other than prohibitions on trawl fishing in state waters (within 3 miles of shore) and minimum mesh size requirements. Foreign fisheries caught significant volumes of some groundfish (Rogers 2003; also discussed in the landings section) in offshore waters of the west coast from 1966 through 1976, at which point harvest was limited by passage of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), which extended U.S. control over living marine resources within 200 miles of the coastline. The Pacific Fishery Management Council (PFMC) assumed management responsibility for west coast groundfish when the Groundfish Fishery Management Plan (FMP) became effective in September 1982.

From 1983 through 1990 the PFMC routinely adopted an acceptable biological catch (ABC) for bocaccio of 4,100 MT for the Monterey INPFC area and 2,000 MT for the Conception area from 1983 through 1990. Landings in other areas were considered too small to warrant a separate

ABC. These ABCs were based solely on historical (domestic) landings during selected periods; however actual landings were a (declining) fraction of the allowable landings throughout this period. In response to concerns about bocaccio stock conditions, an assessment was conducted in 1990 (Bence and Hightower 1990). The assessment results initially resulted in a recommendation for an 800 metric ton (mt) ABC for the combined Conception-Monterey-Eureka INPFC areas (for both commercial and recreational fisheries) for 1991; however, a harvest guideline of 1,100 mt was ultimately adopted for both 1991 and 1992. During those two years, actual harvest exceeded the harvest guideline by 300-500 mt (Figure 1; Table 1). Management measures used to constrain catches were primarily effort controls, with trip limits for commercial fisheries (trawl and fixed gear) and daily bag limits of rockfish in recreational fisheries. Trip limits were implemented for all rockfish species as a complex through 1990, generally limited to 40,000 lbs per trip. Species-specific trip limits began to be implemented in 1991, when trip limits were constrained to 25,000 lbs per trip of which no more than 5,000 lbs could be bocaccio. However, these limits were relaxed to 50,000 lbs per trip of which no more than 10,000 lbs could be bocaccio in 1992.

In 1992 the PFMC reviewed a new assessment for bocaccio (Bence and Rogers 1992). The ABC estimated from that assessment, based on strict adherence to the target fishing mortality rate at that time ($F_{35\%}$), was 1,540 mt. The assessment also projected that spawning and total biomass were expected to continue to decline under status quo harvest rates, and recommended that the 1,100 mt ABC be maintained. However, the PFMC adopted the 1,540 ton ABC (with the harvest guideline the same) for 1993 and 1994. The new assessment had also accommodated some expected discard in the trawl and set net fisheries that often fished to the trip limits. In 1994 the Council determined that few trips were being impacted by trip limits, such that the discard-based reduction was unnecessary and the ABC and harvest guideline was adjusted to 1,700 mt for 1995 and 1996. During this period, trip limits were replaced by monthly catch limits, which fluctuated in values throughout the year in response to efforts to achieve, but not exceed, harvest guidelines. Actual catches of bocaccio during this period were far below harvest guidelines, presumably in response to declining availability associated with continued harvest and ocean conditions that led to a long period of very poor recruitment.

A stock assessment conducted in 1996 (Ralston et al. 1996) indicated that the stock was in severe decline, and the PFMC drastically reduced the ABC to 265 mt in 1997, and to 230 mt with adoption of an $F_{40\%}$ policy in 1998 and 1999. In March of 1999 the stock was formally designated as overfished, after the groundfish FMP was amended to incorporate the mandates of the Sustainable Fisheries Act reauthorization to the MSFCMA. Later that year, an assessment by MacCall et al. (1999) estimated that the southern stock was only 2.1 percent of the unfished spawning output. Perhaps ironically, both the management regime and the climate regime shifted almost simultaneously; the decade-long string of poor recruitments ended in 1999 with early indications of a strong 1999 year class. The rebuilding policy adopted by the PFMC held the rebuilding OY constant at 100 mt for the years 2000-2002, with the intention of switching to a constant fishing rate policy beginning in 2003. Trip limits for trawl and fixed gear fisheries were reduced substantially during this period, in recreational fisheries a two-fish daily bag limit was imposed for bocaccio, and additional time-area closures were implemented in 2002 to reduce the recreational catch of bocaccio.

The 2002 assessment (MacCall 2002) utilized more information, particularly recreational fisheries CPUE indices and recruitment indices, and examined both a California-wide model as well as individual models for the areas north and south of Point Conception. The regional models provided a more optimistic perspective of stock status in the southern region, and a more pessimistic perspective of the central/northern California region, due to the absence of evidence for the strong 1999 year class in fisheries data from the northern area. However, the review panel recommended that a single, coastwide model be used to provide management advice. This model recognized the importance of the 1999 year class, but estimated that the stock spawning output was at only 4.8% of the unfished level, and the subsequent rebuilding analysis estimated that the stock would take nearly 100 years to rebuild to target levels (40% of the unfished output). The results of this assessment, combined with pessimistic assessments of other rockfish species coastwide, contributed to severe management constraints in 2003, including significant area closures and a near total cessation of recreational and commercial fisheries in shelf and shelf break waters. The estimated total catch of bocaccio declined to approximately 11 mt in 2003, roughly 10% of the total catch in 2002 and less than 1% of the catch ten years prior. Total mortality in 2003 fisheries was restricted to a 20 mt OY as a means of conserving the stock while minimizing adverse socioeconomic impacts to communities.

The 2003 bocaccio assessment differed greatly from the 2002 assessment. Both the CalCOFI time series and the recreational CPUE indices showed increasing trends as a result of the strong 1999 year class. However, the recreational CPUE indices were adjusted to account for regulatory changes (principally bag limit changes), and all of these indices were in conflict with the triennial trawl survey time series. The most recent triennial survey data was from 2001 and showed little evidence of an increase in abundance (although the length frequency data was indicative of a strong 1999 cohort). The STAR Panel recommended the use of two assessment models, each of which excluded the conflicting data, as a means of bracketing uncertainty from the very different signals between the recreational CPUE data and the triennial survey. However, the STAT Team was not in full agreement with this approach, and for the purposes of management decisions developed and presented a third "hybrid" model (STATc) that incorporated the data from all of the indices to the PFMC SSC. The SSC recommended and the Council approved the use of this third modeling approach. This resulted in modest improvement in estimated stock size, but had very significant impacts on the estimated productivity of the stock and rebuilding scenarios. These results were more optimistic with respect to the rebuilding outlook for bocaccio, suggesting the stock could rebuild to B_{MSY} within 25 years while sustaining an OY of approximately 300 mt in 2004. The 2004 OY was set at 199 mt.

The 2003 assessment was updated in 2005 (MacCall 2006). The assessment used the original Stock Synthesis model (SS1), and did not develop an equivalent new Stock Synthesis 2 (SS2) version of the assessment. In addition to new length frequency data, new data points were included from both the triennial survey and the CalCOFI larval abundance index, both of which suggested an increasing upwards trajectory for the stock. Importantly, the updated triennial trawl survey index (updated with a 2004 data point, now the last point in that time series) was now consistent with the increase in abundance suggested in the 2003 model with the recreational CPUE and CalCOFI indices. The updated base-case (STATc) model continued to forecast a slow increase in biomass (spawning output), with depletion (current spawning output divided by unfished spawning output) increasing from a current value of 10.7 percent to approximately 20 percent over the coming decade. The 2006 OY was ultimately set at 218 mt. The 2003 assessment was updated again in 2007 (MacCall 2008) without a major change in the perception of stock status. The only significant differences in the 2007 model were slight revisions to historical catches and updates of catch, length frequency, and the CalCOFI time series; the latter was the only time series of relative abundance that continued from the 2003 assessment. OY values have been maintained at 218 mt since 2007, with actual catches (including discards) estimated to be less than half of that amount.

C.2 Stock Distribution and Life History

The distribution of bocaccio has been described as ranging from Stepovak Bay on the Alaskan Peninsula (as well as Kodiak Island, Alaska) to Punta Blanca, Baja California (Miller and Lea 1972; Eschmeyer 1983; Love et al. 2002). It is abundant off southern and central California, uncommon between Cape Mendocino and the Oregon/Washington border, and moderately abundant from the Oregon-Washington border into Queen Charlotte Sound and Hecata Strait, British Columbia. The southern U.S. stock (the stock evaluated in past assessments) was petitioned for listing under the U.S. Endangered Species Act (ESA) in 2002. Although this petition was denied, bocaccio have been listed as a “Species of Concern” by the NMFS since 2002, and a more recent petition has proposed listing the population of bocaccio in the Georgia Basin Ecosystem under the ESA.

The U.S. stock assessment has traditionally assessed bocaccio from the U.S./Mexico border to either Cape Mendocino (MacCall 2002; MacCall 2003 and recent updates), or through the Eureka INPFC area (Ralston et al. 1996; MacCall et al. 1999). This has been based on a conceptual model of two centers of population density, one around southern and central California and another from Queen Charlotte Sound through the northwest coast of Washington State. Both historical and recent catch statistic and surveys suggest low relative abundance levels of bocaccio between approximately Cape Mendocino and the Columbia River mouth (essentially, the Eureka and Columbia INPFC areas; Figure 2). Moreover, most of the bocaccio observed in this region tend to be very large (Figure 3a), suggesting the possibility that there is little or no localized recruitment in this region and the animals that are observed are likely to be slowly dispersing or diffusing adults. Similarly, a summary of bocaccio catches in Russian trawl surveys conducted off of the U.S. west coast from 1963 to 1978, prior to what has been estimated to be the greatest period of depletion of this stock or stocks, is consistent with a pattern of low abundance from north of Cape Mendocino through Oregon, with higher catches in southern and northern regions (Figure 4).

There is a fair amount of data and information on the status of bocaccio in Canadian waters, where landings have ranged from several hundred to over 1000 mt per year in recent decades. In 2002, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) listed bocaccio as threatened (COSEWIC 2002) based on an apparent population decline of more than 95% over a two decade period, and the stock is under consideration for listing under the Canadian Species at Risk Act (SARA). A stock assessment was performed on this stock in 2004 (Stanley and Starr 2004), in which most evidence suggested that bocaccio had been widespread over their habitat and stable in abundance since the mid-1990s, a period in which total catches (primarily from bottom trawl) ranged from 300 to 330 mt; however, the magnitude of the decline over the preceding decades was unclear. That assessment was based on observed trends in spatial distribution, and irregular catch rates from bottom trawl surveys. Interestingly, one of these surveys was described as suggesting a peak relative abundance in the 1980s, noting that the abundance levels observed in that period might not be appropriate rebuilding targets (Stanley and Starr 2004).

More recent work in Canada includes the preparation of a stock assessment (Stanley et al. in prep.; pers. com.) and a recovery potential assessment (DFO Canada, Canadian Science Advisory Secretariat, in press) to provide scientific advice for the recovery strategy in Canadian waters. The recovery potential assessment (DFO Canada, Canadian Science Advisory Secretariat, in press) is based on the results of a Bayesian surplus production model fitted to one fishery-dependent and six fishery-independent abundance indices and a reconstructed catch history that stretched back to 1935. In their reference case model, the biomass was estimated to demonstrate a monotonic decline from the 1930s through the early 2000s, with the steepest decline taking place from the mid-1980s through the mid-1990s and some suggestion of a flattening of the biomass trend since the late 1990s. The model estimated a posterior median for the estimated 2008 biomass of 2,324 mt (posterior mean of 3,022 mt), with the posterior median relative stock size (B_{08}/B_{MSY}) of 0.111 (posterior mean 0.155). In general, the recovery potential assessment indicates that contemporary Canadian catches of approximately 150 mt per year will not place the population in short-term jeopardy, but that reductions in harvest will be necessary to implement the probability of future population increases.

There is also what is currently described as a discrete population segment (DSP) of bocaccio rockfish in the Georgia Basin ecosystem (Puget Sound plus the Strait of Georgia), spanning the inland waters of the U.S. (Washington State) and Canada (Southwestern British Columbia). The National Marine Fisheries Service (NMFS) recently issued a proposed rule (and request for comment) to list this DSP of bocaccio as endangered (at high risk of extinction) under the Endangered Species Act (ESA).[1] This proposed rule came about as a result of a petition to enlist this and several other population units of rockfish in this region (the other four species were canary, yelloweye, greenstriped and redstriped rockfish), of these five only bocaccio is proposed to be listed as endangered, while yelloweye and canary are proposed to be listed as threatened and greenstriped and redstriped were found not to be at risk of extinction. This petition follows an earlier petition to list three other species of rockfish (among other species), although the initial petition was ultimately denied (Stout et al. 2001).

The proposed rule is based on the evaluation of abundance trends, spatial structure of the populations, and the suite of somewhat unique threats in these ecosystem. Among the factors related directly to bocaccio are the rapid decline and current total absence of bocaccio in recreational rockfish catches within the Georgia Basin (consistent with a substantial overall decline in the catch rates of all rockfish, but of a greater magnitude), the highly variable nature of bocaccio recruitment, and the observation that historical length composition data were indicative of multiple strong cohorts (interpreted as evidence that fish present in the ecosystem were unlikely to be infrequent strays from the coastal population). Specifically, from 1975-1979

[1] Proposed rule published in the U.S. Federal Register, Vol. 74, No. 77, Thursday April 23, 2009. Proposed rule and supporting background documents, including the Biological Review Team (BRT) report are available at http://www.nwr.noaa.gov/Other-Marine-Species/Puget-Sound-Marine-Fishes/esa-PS-rockfish.cfm.

bocaccio accounted for an average of 4.6% of the total catch, from 1980-1990 they represented 0.24% of the catch, and no bocaccio have been observed from 1996 through 2007. The total absence of bocaccio from observed catches or surveys since 1996 was noted as being of particular concern, indicative of at least some possibility that the population has already been extirpated. Among the more general observations that support the conclusion that the bocaccio DPS may be at high risk is the unique and relatively isolated nature of the Georgia Basin ecosystem, the cumulative impact of various anthropogenic threats to habitat in this ecosystem (including contamination from pollutants, declines in oxygen levels, habitat impacts, and impacts of harvest) and the observations that multiple studies have found evidence that rockfish (and several other finfish species) inhabiting geographically isolated areas have been demonstrated to have genetic differentiation from coastal populations (Stout et al. 2001).

Although the southern/central California "stock" and the British Columbia "stock," as well as the more recently described Puget Sound/Georgia Basin stock, are treated independently by their respective management entities, an accurate understanding of stock structure both among and within these regions remains unclear. Wishard et al. (1980) described electrophoretic patterns in a series of samples collected between the Southern California Bight and Cape Mendocino. Although the PGI-1 and ADH loci were polymorphic and heterozygosity was high, there was no genetic differentiation among the samples at these or three other loci. However, no samples were collected and evaluated north of Cape Mendocino. Results of genetic research conducted in conjunction with the 1999 assessment (MacCall et al. 1999) suggested genetic differentiation between bocaccio collected off southern California and fish from Washington, but that fish from southern California and Monterey Bay do intermix genetically (MacCall et al. 1999). In that study, a lack of samples from intermediate locations did not allow geographic identification of genetic stock boundaries or possible areas of limited mixing.

Matala et al. (2004) used likelihood tests of homogeneity of allele frequencies at seven highly polymorphic microsatellite loci to evaluate population connectivity along the west coast. Samples were divided into eight regions: Queen Charlotte Island and Vancouver Island in British Columbia, Monterey Bay in Central California, four locations in the Southern California Bight (Point Conception, Tanner Banks, Santa Barbara Channel, and Santa Monica Bay), and Punta Colnett, Mexico. Unfortunately, there were no samples evaluated from Northern California, Oregon or Washington, nor from the Puget Sound/Georgia Basin region. Analysis based on fixation index (F_{ST}) values revealed no statistically significant geographic divergence, or evidence for isolation-by-distance (Matala et al. 2004). However, an ad hoc method for partitioning the samples based on genetic and geographic homogeneity could not reject the possibility of some population structure related to geographic location. These patterns appeared to be related to oceanographic features, possibly suggesting limited gene flow between British Columbia and California, as well as limited flow around Point Conception, California. However, a re-analysis of the same data (D.E. Pearse, FED/SWFSC, pers. comm.) using the Bayesian partitioning program STRUCTURE 2.0 (Pritchard et al. 2000), found no support for the presence of population genetic structure among the samples of bocaccio analyzed by Matala et al. (2004; Figure 5). This most recent analysis suggests that from a population genetic perspective, all bocaccio from British Colombia, Canada to Baja, Mexico, should probably be considered to be a single, panmictic unit.

As Waples et al. (2008) and Berntson and Moran (2009) suggest, demographic independence does not necessarily require strong evidence of genetic isolation. As pointed out by Waples et al. (2008), population genetic analyses typically have considerable power to identify separate populations connected only by low levels of migration, but struggle to identify differentiation at the level of connectivity that would indicate demographically coupled stocks. Similarly, Berntson and Moran (2009) suggest that while relatively few migrants per generation will typically result in low F_{ST} values, indicative of a single evolutionary genetic population, such low levels of migration would likely not be sufficient to result in rebuilding stocks in regions where there might be a wide disparity in abundance. Thus, although the failure to identify clear evidence of population genetic structure among bocaccio populations in the Canadian/Northern U.S. region and the southern/central California region suggests that some migratory connectivity exists, the apparent differences in growth rates, size (and presumably age) at maturity, and longevity suggest that some level of demographic independence is likely.

We maintain the tradition of distinguishing the southern bocaccio population unit from the northern unit in this assessment. However, in evaluating commercial length frequency data and landings trends (described later), we suggest that the fish in the Eureka INPFC area are likely to be most closely linked with the southern subpopulation, and we include this region in this assessment. Consequently, the geographic range of the southern bocaccio stock is assumed to correspond to the waters south of Cape Blanco, Oregon (the northern boundary of the Eureka INPFC area). This is consistent with the suggestion of a break in population distribution based on both historical and recent abundance data, the paucity of data in the northern part of the range, and a long history of previous assessments.

Even less is known about the abundance and distribution of bocaccio at the southern end of their range. MacCall (2003) used the CalCOFI larval abundance data from the 1950s and 1960s (CalCOFI cruises ceased to sample Mexican waters in the 1970s) to estimate that the historical distribution of spawning abundance over the assessment range. He found that approximately 4.6 percent of larvae were encountered in Mexican waters, 46 percent in southern California waters, and 50 percent in central/northern California waters (from Pt. Conception to Bodega Bay). No information is available on catches or stock status and trends of bocaccio in waters off northern Baja California; and although there is presumably population connectivity between the Southern California Bight and Baja California, we are constrained to treating the stock as distinct north of the U.S./Mexico border. As Mexican oceanographers have begun occupying the historical CalCOFI stations off of the Baja Penninsula in recent monitoring efforts, the potential to include or analyze data from these efforts should be revisited in the future.

Genetics and effective population size

Narum (2007) evaluated the evidence for reduced effective population sizes for eighteen species of rockfish, most at multiple sites, using microsatellite data from the published literature. Although such analyses are sensitive to the estimates of mutation rate and life history characteristics, most species identified as having low effective population sizes were those that have been heavily exploited by marine fisheries, including bocaccio, copper (S. *caurinus*) and quillback (*S. maliger*). For bocaccio, Narum (2007) interpreted the results as indicative of recent bottlenecks (dramatic reductions in population size) across all locations. However, bottlenecks of sufficient magnitude to result in such low effective population sizes are in all likelihood much more extreme events than the past assessments might suggest. The most recent assessment (MacCall 2007) estimated that at its lowest point the mature female population was represented by a population on the order of five million mature and spawning females. Nonetheless, as highlighted by Berntson and Moran (2009), there are several examples in which effective population sizes have been demonstrated to be several orders of magnitude lower than actual abundance (e.g. red drum, Turner et al. 2002; darkblotched rockfish, Gomez-Uchida and Banks 2006).

C.3 Life history, habitat preferences and movement patterns

Like all *Sebastes*, bocaccio are primitively viviparous and bear live young at parturition. They copulate during September-October, although fertilization is often delayed, and embryonic development takes at least a month to complete, with larvae hatching internally (Moser 1967). Parturition occurs during the winter months (Wyllie Echeverria, 1987) and larvae eventually metamorphose into pelagic juveniles (Moser and Boehlert, 1991). The combined larval and juvenile pelagic phase typically lasts about 150 days, consequently the spatial dispersal of larvae and juveniles likely links populations among fairly broad regions. This might be particularly true as bocaccio appear to orient higher in the water column than juveniles of most other winter-spawning rockfish species (Ross and Larson 2003), and propagule dispersal tends to be greater at shallower depths (Peterson et al., in press). The rapid growth of bocaccio is initiated at the juvenile stage; Woodbury and Ralston (1991) describe linear species-specific growth rates (and interannual variability in the same) for juvenile rockfish in approximately the first 50 to 150 days of life, in which those for bocaccio ranged from 0.56 to 0.97 mm/day, the highest rate amongst the species evaluated. Settlement to littoral and demersal habitats begins in late spring and extends throughout the summer months.

Pelagic bocaccio young-of-year typically recruit to shallow habitats, and subadult bocaccio are more common in shallower water than adults, with average size becoming notably larger at greater depths (Figure 3b). Strong year classes frequently lead to high densities and high catches of young bocaccio from piers and other shore structures from the early summer through winter of the first year of life; data describing such events are discussed in greater detail in the section on the pier fishery survey data. Adult bocaccio are typically described as occurring in a broad range of habitats and depths, including developing large midwater aggregations, high densities tend to be more associated with more complex substrates. As with many other shelf species of rockfish, there is a clear trend towards larger fish at greater depths as well as towards higher latitudes (Figures 3a-b).

In southern California, juveniles often recruit to oil platforms, often in large numbers during strong recruitment years. For example, in 2003 Love et al. (2006) estimated a minimum of 430,000 juvenile (age ~0.75 yrs.) bocaccio recruiting to just 8 oil platforms in the Santa Barbara Channel. They estimated that this represented approximately 20% of the average number of juveniles in any given year, and estimated further that densities of juveniles around oil platforms that year tended to be greater than the density of juveniles over nearby shallow habitat areas more typically considered juvenile habitat. Their results also suggested very high patchiness in the distribution of juvenile bocaccio; over 80% of the total estimated number of juveniles recruited to just one platform (Grace), two other platforms in the immediate vicinity accounted for another 10% of the total numbers of recruits, but at widely disparate densities. Although they acknowledge that considerable uncertainty exists with respect to the potential role of platforms in providing recruitment habitat, Love et al. (2006) suggest that bocaccio and other rockfish that recruit to these structures likely represent production that would have been lost to the population in the absence of these structures. Love et al. (2005) also estimated higher densities of adult bocaccio at platform habitat relative to the densities on nearby natural reefs, suggesting that platforms could represent a source of subadults to neighboring natural habitats

In considering habitat preferences more generally, we obtained data on over 2800 bocaccio observations from 14 years of submersible surveys of southern California habitats from M. Love (University California at Santa Barbara) and colleagues. These surveys have been used to assess the abundance of rockfish and other species on oil platforms (as described in the preceding paragraph), to develop absolute abundance indices for other species of rockfish (e.g., Yoklavich et al. 2007) and to characterize assemblages of rockfish communities (Love et al. 2009); details of the survey methods and results can be found in those publications and others. We evaluated rockfish densities by size and habitat, although rather than use complex habitat types, we simply described habitat as low, moderate, or high relief (for each dive, this rating is given to a primary habitat type, as habitats often vary within dives, a secondary habitat type is also ascribed). We grouped fish size data at 5 cm increments and looked at mean densities of fishes by size and by year over different habitat types (Figure 6). In general, there was a clear trend towards greater densities of fish of all sizes over high relief habitats, such that 30-40 cm fish over high relief habitats were found at roughly 2-3 times the abundance levels at moderate relief habitats, and roughly 9 times the abundance at low relief habitats. For larger fish (50 cm and greater) this discrepancy was even greater; virtually no large fish were seen in low relief habitats and 4-5 times as many large bocaccio were seen in high relief habitats relative to those with moderate relief. Interestingly, when the mean densities by habitat type are compared by year, it is seen that the greatest number of fish were seen in low relief habitat in the year 2000, following the strong 1999 year class, a year in which densities in all habitats were notably greater. This could reflect either, or both, a tendency for smaller, younger fish to occupy less optimal habitat particularly in years of high abundance due to strong recruitment pulses. Moreover, if there are density-related habitat preferences, such that less suitable habitat is occupied only during periods of relatively high abundance (over either short- e.g., recruitment pulses, or long, e.g., low frequency trends in abundance), then traditional trawl surveys may be less likely to provide unbiased estimates of stock abundance.

With respect to movement patterns, the evidence for most rockfish suggests that the bulk of the adults are highly sedentary, with some ontogenetic movement to greater depths common for most shelf and slope species. However, some rockfish have shown fairly extensive movements, usually of late juvenile and early adult stages. For example, Hartmann (1987) reported the results of tagging studies of nearly 25 species of rockfish from over 10,000 fish tagged in the Southern California Bight (olive, blue, widow, bocaccio, kelp and copper rockfish comprised over 90% of both the fish tagged and recaptured). The total number of recaptures was 696, of which 606 were recaptured at or very near to the site of tagging. Of the remaining 90 only 12 (of four species) moved greater than 10 km. Most of these were juvenile bocaccio, which moved as far as 150 km. By contrast no movement was observed in adult bocaccio, although relatively few were tagged. Lea et al. (1999) found no movement for bocaccio rockfish, although they only had three tags returned (out of 56 deployed). However, in a movement study using fish captured and surgically implanted with acoustic transmitters, most spent only a small fraction of their time in the 12 square kilometer study area, with frequent small scale movements in both horizontal and vertical planes (Starr et al. 2001). By contrast, six greenspotted rockfish tagged in the same study exhibited substantially lower movement rates.

Although there are no quantitative food habits studies of this species, they have long been described as primarily piscivorous, consistent with their name. Phillips (1964) stated that even before completing their first year of life, young bocaccio (which, as previously mentioned, tend to recruit to shallow, nearshore waters late in their first year of life) prey on other young-of-year rockfish, surfperch, jack mackerel and other small inshore species. Adults in deeper waters feed on small rockfish and sablefish, anchovies, mesopelagic fishes, and squids such as the California market squids. Pelagic juveniles feed primarily on copepods, juvenile (and other stages) of euphausiids, and other fish larvae; while their diet was found to be highly similar to other pelagic juveniles of winter-spawning species, there is some suggestion that that bocaccio fed on larger prey than the other species (Reilly et al. 1992). Pelagic juveniles are preyed upon by a wide range of predators, including seabirds, salmon, lingcod, and marine mammals (Merkle 1957; Sydeman et al. 2001). Predators of larger adults are likely limited to larger piscivorous fishes and marine mammals, although few studies have identified rockfish prey to the species level.

C.4 Growth, Maturity, Fecundity and Natural Mortality

Growth

The stock synthesis approach uses the Schnute (1981) parameterization of the von Bertalanffy growth equation (Methot 2009). Bocaccio have long been described as having very rapid growth during the early years of life, more so than most other *Sebastes*, which can be tracked by the progression of strong cohorts in fisheries length frequency data. Due to the problems associated with ageing of bocaccio rockfish (described in greater detail below, in the section on natural mortality), past assessments have typically estimated the growth coefficient (K) internally, while fixing L_{min} and L_{max} based on the length frequency data (MacCall et al. 2002; MacCall 2003). The 2003 assessment (and subsequent updates) fixed values for L_{min} at 27 cm (for an age of 1.5 years) and L_{max} at 65.6 and 75.9 cm for males and females, respectively, with K estimated as 0.184 and 0.210 for females and males, respectively. The forthcoming Canadian bocaccio assessment estimated a L_{inf} of 78.32 and 69.98 for females and males, with corresponding von-Bertalanffy growth parameters (K values) of 0.163 and 0.108 respectively. This suggests that bocaccio in Canada tend to grow larger and slower than fish in the southern/central California region; consistent with observations regarding apparent greater longevity and age at maturity, as discussed later in this section.

We explored several options for modeling growth, including the approach used in the last assessment, freeing all of the growth parameters, and fixing L_{min} at 0.16 at an age (A_{min}) of 0.75 yrs. The latter was based on the observed length frequencies from recreational pier and shore fisheries, which show the modal progression of recently settled age 0 juveniles (Figure 7; length data pooled among all available years). However, this parameterization, as well as freely estimating all of the primary growth parameters, often led to problems in which growth was unrealistically slow (essentially shifting the strong recruitment years to the left) or in which male and female L_{min} values were dramatically different. Consequently, we maintained an approach by which L_{min} was treated as a fixed value for age 1.5.

To confirm that a reasonable value could be derived, we examined wave-specific length frequency data from recreational fisheries in which age-1 fish were caught in high abundance. Modal progression of strong year classes was easily discernable in many such datasets, particularly in the southern California recreational fisheries. As the 1970s CPFV observer program collected the greatest number of length frequency observations (over 77,000 in four years of collections), and the 1977 year class was among the strongest observed historically, we evaluated the size frequency of the 1978 length frequency data from this fishery to confirm a plausible size at age 1.5. Figure 8a shows the length frequencies from this fishery by wave in 1978 with a bin resolution of 1 cm (where waves are the 2-month intervals used in RecFIN statistics; although note that calendar dates for each observation are available for this dataset), with the maximum size of the 1977 cohort estimated visually from the data and larger sizes removed from the dataset. When these larger sizes are removed, the wave 3 and 4 data (May-August) have a mean of 25.98 cm, a median of 25.95 cm, and a standard deviation of 2.73 cm, leading to a CV of 0.105 (n = 1330). Over all waves, the same data have a mean of 27.87 cm, a median of 27.39 cm, a standard deviation of 37.14 and a CV of 0.136 (n = 3908).

Although few other years included comparable numbers of measured fish during the summer period (as rockfish tend to be a more important recreational target during the winter months, when more desirable warm-water species are unavailable), these results are consistent with RecFIN data for the size distribution of other strong cohorts at age 1.5, such as the 1984, 1988, and 1999 cohorts. Consequently, we fixed L_{min} for both sexes at 26 cm at age 1.5. The CV for L_{min} was set at 0.10, based on the described analysis and an evaluation of changes in the model likelihood with different combinations of CVs; there was a clear improvement in fit when the CV of L_{min} was raised from 0.08 to 0.1, and an equally significant improvement when the CV of older fish was decreased from 0.1 or 0.12 to 0.08 (the fit began to degrade again at lower values). More evaluation of this issue is included in the section on model sensitivity. Similarly, as past assessments have noted, periods of consistent variability in expected length at age, which may be attributed to climate-modulated variability in growth rates, leads to an exploration of time-varying growth in this assessment (see the model-sensitivity section).

The length-weight relationship was re-estimated using a total of 5,050 weight and length observations from the triennial trawl survey, the NWFSC combined trawl survey, the SWFSC groundfish ecology cruise dataset and the NWFSC hook-and-line survey in the Southern California Bight (Figure 9). Estimates were based on bias-corrected data from a log linear regression between fork length (cm) and weight (kg). The estimated values for a and b were a = 7.355 E-06, b = 3.11359, which are very similar to the values carried over from the 1996 assessment (then based solely on several hundred fish from the triennial survey) of 6.19 E-06 and 3.1712 for a and b, respectively.

Maturity

We compare results from four previous studies that describe the proportion of female bocaccio that are mature as a function of body length. To facilitate comparison, we standardized all lengths to centimeters fork length using the equations from Echeverria and Lenarz (1984). Phillips (1964) found that 50% of females from statewide samples in California were mature by 40.4 cm, and indicated a few were mature by 34.9 cm. Gunderson et al. (1980) examined 84female bocaccio from 34°08' to 40°26' N latitude (central California), finding that 50% were mature by 48.2 cm. Wyllie Echeverria (1987) estimated length at 50% maturity as 46.5 cm based on samples from central and northern California. Wyllie Echeverria reports interannual differences in size at maturity, although the reported lengths at 50% maturity differ by only 1 cm for bocaccio. No significant regional differences (north and south of Point Arena) were detected in the latter study. Thus, the estimated proportion of mature females at length differs among studies (Figure 10a). As Phillips only reported the length of 50% maturity, the curve based on his results uses the slope equal to that of Love et al. (1990). The curve shown for Love et al. (1990) is fitted to a fork length of 35.3 cm at 50% maturity and 43 cm at 99% maturity.

Differences in maturity at length among these studies may be due to spatial or temporal variation (including density dependence) in length at maturity, or changes in methodology such as determination of maturity stages. Love et al. (1990) report a larger proportion of fish maturing at smaller sizes relative to the other studies, based on samples from the Southern California Bight (SCB). Phillips (1964) combined statewide samples from CA, reporting a higher proportion of mature females at a given length relative to Love et al (1990). Wyllie Echeverria (1987) and Gunderson (1980) based their maturity estimates on fish captured north of Point Conception, and both studies estimated larger lengths at 50% maturity than were reported for the studies that included SCB data. However, temporal changes in maturity at length may have caused the observed differences among studies, and there is insufficient overlap in the timing of the surveys to eliminate either possibility. Regarding definitions of maturity stages, it is important to recognize the difficulty in distinguishing ovaries of immature rockfish (those that have never spawned) from ovaries of mature individuals in early stages of vitellogenesis or resting periods (Wyllie Echeverria, 1987). Errors in assignment of rockfish maturity stages are most likely to occur during non-spawning seasons (Wyllie Echeverria, 1987).

We obtained maturity data for female bocaccio from four studies conducted off the west coast of North America: 1) CalCOM, 2) the NMFS Southwest Fisheries Science Center Groundfish Ecology cruise conducted by the Fisheries Ecology Division, 3) the west coast triennial trawl survey, and 4) the Department of Fisheries and Oceans, Canada (R. Stanley, DFO, pers. com.).

CalCOM maturity data are collected by port samplers in California, who have recorded maturity stages of female bocaccio landed by commercial vessels since 1993. Sample sizes vary considerably over time (1993-2008) and by port complex. Central California port complexes have the highest number of observations, and sample sizes decrease in the more northern California ports. Very few samples are available from ports south of Pt. Conception (25 fish), and all of these southern specimens were mature; moreover, 90% were caught during the non-reproductive season for bocaccio (July – September). Consequently, we excluded CalCOM samples taken south of Pt. Conception or during the months of July through September from our analysis.

The SWFSC Fisheries Ecology Division collected rockfish maturity data from 2001-2007 in central California (Monterey area). We removed samples from the non-reproductive season (61 out of 343 observations). The majority of samples were collected during peak spawning season for bocaccio (January-April). Maturity samples from the west coast triennial survey were available for 1977, 1986, 1989, 1992, 1995, and 1998. We excluded samples from the non-reproductive season for bocaccio (July-September), leaving data from 1995 and 1998 only. Maturity data from Washington and Oregon were collected during non-reproductive months for bocaccio, so these data are excluded from our analysis. Most survey years exclusively contained samples during the non-reproductive period, so the triennial data in our final analysis are samples from central California in 1995 and 1998. Starting latitudes for each trawl tow were used to assign fish to regions roughly consistent with the CalCOM port complexes. Data from Canadian waters were provided by DFO, Canada (R. Stanley, pers. comm.) and used to evaluate evidence of latitudinal changes in size at maturity and seasonality of reproduction for bocaccio, as such trends have been reported for many rockfish species (Haldorson and Love, 1991). The DFO data were collected from 1967-1971, 1978-1980, 1988-1991, and 2002-2007.

The number of maturity stage observations among port complexes is not consistent over time (Table 2). Analysis of interannual changes in maturity at size were therefore limited to regional subsets of the data (e.g., Morro Bay from 1993-1998 and Monterey in 1993 and 2000-2004). Our evaluation of regional differences in size at maturity does not account for temporal trends due to minimal overlap among regions with larger sample sizes.

We considered all observations taken in U.S. waters during the reproductive season for the final analysis, classifying individual fish as either immature (0) or mature (1) using the maturity stage data supplied with each study. All fish assigned to the early vitellogenic maturity stage (stage 2) were excluded to minimize the number of classification errors. We define all stage 1 ovaries as immature. Fish with ovaries in late vitellogenic stages, with fertilized eggs or eyed larvae, or spent and recovering stages were classified as mature. We model the proportion of individuals that are mature at a given length using generalized linear models (GLM) with binomial error structures and logit link functions. The response variable is binary (immature=0, mature=1), and covariates examined include fork length, port complex, and year. The simplest model for maturity at length pools all data across years and areas (Figure 10b). The combined model estimated lengths at 50% and 95% maturity as 39.9 and 48.1 cm fork length, respectively (corresponding slope parameter is -0.359). These estimates were used in the draft assessment.

Interannual differences in maturity are confounded with differences in spatial coverage among studies. We restricted our analysis of temporal effects to individual regions and studies with adequate sample sizes. Models fit to Groundfish Ecology data from Monterey suggest that a larger fraction of females were mature at larger lengths in 2004 (ogive shifted to the right) relative to other years. No interannual differences were detected in the CalCOM data for Morro Bay. Regional difference in length at maturity have been reported in previous studies (Haldorson and Love, 1991). No consistent latitudinal trend in length at maturity is evident among the data sets we examined; however, the data suggest that differences in maturity exist among regions (Table 3). Fish from Canadian waters appear to mature at larger sizes, based on the DFO data (pooled across areas and years). Lengths at 50% and 95% maturity for the bocaccio from Canadian waters were estimated at 49.2 cm and 57.3 cm, respectively, consistent with published accounts of increasing size at maturity in northern latitudes. Proportions of fish that are mature at length also appear to vary by data source (CalCOM, triennial survey, or Groundfish Ecology survey), even after accounting for variability among regions (Table 3).

Although the length compositions of mature fish do not vary considerably among studies, there are differences in the distribution of lengths for immature fish, which may provide evidence of differences in gear selectivity (Figure 11a). Selectivity differences are expected between the samples from scientific surveys and commercial landings, but smaller differences were also detected between the triennial and Groundfish Ecology surveys. If fish landed by the commercial fisheries are generally larger than the survey fish, then it is possible that a bias may be introduced into maturity estimates based on commercial samples because smaller (possibly mature) fish are not caught in the fishery. Methodological differences among studies may also introduce variability in maturity estimates. Given the effect of data source on maturity estimates, we examined an alternative data set that did not include the samples from the commercial fishery. A binomial GLM fit to these data indicates that fish from Morro Bay differ significantly from those in Monterey, San Francisco, and Bodega. However, we chose to group the data among regions because a number of strata lack observations (unbalanced data), and all regions are within central California. Estimated lengths at 50% and 95% maturity from the combined survey model are 37.7 and 44.4 cm fork length, respectively (Figure 11b), approximately 2.2 and 3.7 cm less (respectively) than the combined model. This estimate, as well as the values used in previous models, was evaluated in a sensitivity analysis.

Fecundity

Bocaccio stock assessments since 1996 have used a linear model for relative fecundity as a function of weight developed by Ralston (1996) from data reported by Phillips (1964). Dick (2009) estimated relative fecundity as function of weight for 40 species of *Sebastes* using a hierarchical linear model for relative fecundity. His results for bocaccio are similar to that of Ralston, with a slightly steeper slope (Figure 12). The relationship used in this assessment is that of Dick (2009):

$$\frac{E}{W} \quad 192.5 \quad 49.3W \qquad (1)$$

where E is number of eggs and W is weight in kilograms.

Natural Mortality

Although age determinations of bocaccio are known to be imprecise, Ralston and Ianelli (1996) reported that the maximum known age of bocaccio is 45 years. Piner et al. (2006) used radiocarbon levels measured in otoliths from fish taken off the coast of Washington state to confirm that bocaccio can live up to at least 37 years. Andrews et al. (2005)used lead-radium dating in an attempt to independently age bocaccio otoliths, but found that measured levels of lead and radium were among the lowest in the literature, resulting in poor age resolution. Their results were consistent with a longevity of 30-40 years. The Canadian assessment (Stanley et al., in prep, pers. comm.) documents age frequencies for over 900 aged bocaccio, in which the maximum ages were 57 for males and 52 for females (99% ages were 52 and 46 for males and females respectively). Based on those ages they used the Hoenig (1983) relationship with the bias correction suggested by MacCall (2003) to derive estimates of total mortality of 0.097 and 0.086 for females and males respectively. The difficulties encountered in ageing bocaccio, which may be greater in the southern part of the range, are discussed in greater detail in the section on age data.

In 1996, Ralston and Ianelli (1996) reviewed the information relating to the natural mortality rate of bocaccio and used a natural mortality rate of 0.15 in their model. Due to computational problems in the then-current SS1 program (subsequently fixed), MacCall (1999) was unable to develop a model with the 0.15 mortality rate and developed a model with M set to 0.2, which was adopted as the base model. In the 2002 assessment, MacCall examined both M=0.15 and M=0.25, but retained M=0.2 as the base model because it was consistent with the previous assessment and rebuilding analysis. During discussions following the 2002 STAR Panel, it was generally agreed that M=0.2 was probably too high, and lower values of natural mortality rate should be considered. MacCall (2003) used the Hoenig (1983) method to estimate a total mortality rate of 0.092 for the maximum age of 45, but noted that this estimate is a geometric mean, and estimated that a bias-corrected total mortality rate should be approximately 0.1. However, the 2003 STAR Panel recommended a natural mortality rate of 0.15, and this value has been used in subsequent updates (MacCall 2005; MacCall 2007).

It might be noted that the maximum age of 45 was from fish in the northern part of the range, for which the maximum age has more recently been estimated as 57 (as above). Of the more than 1300 fish aged using break-and-burn methods for the 1996 assessment (fishery-dependent samples from 1988, 1991 and 1994), the oldest was 37 years. This would correspond to a total mortality (Z) of approximately 0.121 (with the bias adjustment), still quite below the rate of 0.15 used in past assessments (particularly given the high fishing mortality rates known to have been taking place in the decades preceding sample collection). Despite this, in the absence of convincing evidence for a different value, we maintain this estimate; and sensitivity to this estimate is evaluated and discussed in the section on model sensitivity.

D. ASSESSMENT

D.1 DATA

D.1.a. Catch History

One of the most significant changes to this assessment is consideration of the catch history of bocaccio. Together with chilipepper rockfish (*Sebastes goodei*), bocaccio have long been described as one of the dominant rockfish species for both commercial and recreational fisheries throughout California. Although landings of many California groundfish are typically reported in single species market categories, group market categories have been the most common approach for sorting rockfish catches in California, with a trend towards single species categories in recent years due to regulatory constraints.

Commercial Catches

In order to obtain reliable estimates of species-specific landings, a sampling program for commercial fisheries, the California Cooperative Groundfish survey (CCGS) was implemented in 1978 by the California Department of Fish and Game, the Pacific States Marine Fisheries Commission and the National Marine Fisheries Service. The primary objective is to collect species composition data for rockfish landed under various market categories, as well as biological information and samples (sex, maturity, length, weight, and ageing structures) to help manage commercial fisheries. Detailed descriptions of the sampling framework and program are provided in Sen (1984), Pearson and Erwin (1997), and Pearson et al. (2008). Commercial landings of bocaccio from 1978 through 2008 are based on this program, and landings from 1969 to 1977 are based on applying the species composition of market categories in the sampled period to the reported catches by market category in that period.

The most recent catch estimates for bocaccio for the period from 1968 to the present have changed modestly from those used in the 2007 assessment in response to slight revisions to the estimation procedures (correcting minor errors such as mis-specified port or gear codes and invalid market categories) reported in Pearson et al. (2008). The recent commercial and recreational catch estimates relative to those used in the 2007 assessment are reported in Figures 13a-e and are discussed in more detail below. Pearson et al. (2008) also developed an index (largely subjective) of the reliability of landings estimates by species, based on the potential for misidentification, sorting requirements, the percentage of landings based on port samples, and other criteria. Landings estimates for bocaccio from 1969 to the present are considered to be very reliable, as this is one of the most commonly caught species of rockfish, landings are usually reported into the bocaccio market category (required since 1991), and problems associated with misidentification are minimal as bocaccio are likely to be confused only with relatively uncommon species such as silvergrey (*S. brevispinis*) and Mexican (*S. macdonaldi*) rockfish (Pearson et al. 2008).

For the 2007 model, estimates of historical catches from 1950 through 1968 had been largely unchanged since the 1996 assessment (although the 2002 assessment used the methodology developed in the 1996 assessment to apportion catches north and south of Point Conception in separate area models). The 1996 assessment had apportioned the total California rockfish catch based on total rockfish catches (as reported in CDFG Bulletins) and the percentage of total rockfish catch estimated to be bocaccio by region based on early species composition samples reported by Nitsos (1965) and other sources. Following the PFMC recommendation to evaluate historical catches as part of the "off-year" science activities, concerted efforts were undertaken to develop a comprehensive estimation of the historical catches of west coast groundfish, with the species composition of historical rockfish catches in California representing a major focus of those efforts. At that time, the SWFSC was in the process of several efforts that have and will continue to aid in this effort, including a major effort to digitize spatially explicit (monthly summaries of catches by 10-minute CDFG geographic blocks) catch records extending from 1931 through the CalCOM (1969) period. Additionally, efforts are underway to digitize vessel-specific historical fish ticket information; both of these projects are currently funded by the NESDIS Climate Database Modernization Program (CDMP). These efforts were folded into the historical catch reconstruction efforts described below for commercial and recreational species, respectively. For both commercial and recreational catch histories, it should be recognized that reconstruction efforts are ongoing and the exercise is likely to be an iterative and multistage process. Consequently, catch estimates may change again in the future, although we expect that the magnitude of such changes should be minimal.

The methodology for reconstructing historical commercial catches for bocaccio and other groundfish is reported in detail in Ralston et al. (in prep; will be in supplementary materials). The recovered block summary data were decomposed into "trawl" and "non-trawl" landings based on the observed differences between trawl summary block data and total catch by block data, after accounting for irregularities, missing years and assuming a constant ratio for years for which no trawl summary data exist. Next, market category catches (by area and gear) were converted into species-specific catches by applying stratum-specific species compositions of the highly mixed market categories from port samples collected during the 1978-1984 time period. This assumes that the proportional representation of a given species in a given market category was static over time, an unavoidable consequence given the paucity of more detailed information, but validated to a considerable extent by comparing these reconstructed species-specific catches to the species composition of trawl-caught rockfish reported by Nitsos (1965) (see Figure 6 in Ralston et al., in prep).

Figures 14 a-c show the historical commercial catches(1916-2000) for all rockfish throughout the entire state as well as north and south of Point Conception, based on the catch reconstruction of the three most important (by volume) rockfish species over the last century: bocaccio, chilipepper, and widow rockfish (with all other species lumped together). The percentage of the total rockfish catch estimated to be bocaccio rockfish is also shown. Total rockfish landings were reported to be approximately 2,000 to 3,500 mt statewide from the early part of the 20th century, dipping slightly in the late 1930s and into the beginning of the war years in the 1940s. During this period, slightly more than half of the total California catch was taken south of Point Conception, with the majority of the remainder coming from central California ports (particularly San Francisco and Monterey). Although paranzella trawling (and later otter-board trawling) have been an important source of marine fisheries landings in central California since 1876, most of the trawl catch in early years was composed of flatfish (petrale and English sole) fished over soft bottom (Clark 1935), and rockfish catches were primarily from hook-and-line fisheries (Wolford 1930; Phillips 1949).

Based on the catch reconstruction efforts, bocaccio represented approximately 20% of the total catch (by volume) in both regions (19% in southern California and 22% in central/northern California) during this period (1916- early 1940s), although in both regions this percentage fluctuates somewhat. Phillips (1939) reported on the species composition of rockfish from the Monterey wholesale fish markets between April 1937 and March 1938, in which 39.4% of the fish in the market were bocaccio, compared to 30.8% chilipepper rockfish and 7.9% yellowtail rockfish. Catch reconstruction estimates are consistent with Phillip's observation, as they estimate that bocaccio represented 35.9% and 32.8% of the rockfish catch (by weight) in the Monterey region for 1937 and 1938, respectively. Phillips also noted that catches (and presumably local abundance and/or availability) of bocaccio and chilipepper seemed to be negatively correlated and, when both of these species were uncommon, catches were bolstered by yellowtail, vermilion, and canary rockfish. The 1937-38 catches examined by Phillips may have been during a peak in the relative abundance of bocaccio, as the reconstruction estimates that the percentage of bocaccio estimated in Southern California catches increased to peak (pre-1950) values in the 1936-1938 period, to 27-29% in southern California and 24-26% in central/northern California (above the 1916-1940 averages of 19% and 22%, respectively), presumably as more fish were landed in the bocaccio market categories that are the foundation of the reconstruction.

As stated earlier, total California rockfish catches declined through the 1930s and into the early war years, although most of this decline was observed in southern California, while central California landings were relatively constant. Although paranzella trawling was an important fishery during this period, ranging up and down the coast, over 70% of trawl catches during the mid-1930s were English, rex, or petrale sole, while only about 5% of the catch was rockfish (Clark 1935). Consequently, most rockfish catches were from hook-and-line gear throughout the state. However, in 1943 the balloon trawl was introduced to northern California waters from Oregon, in association with a strong market for frozen rockfish by the military to support the war effort. Trawl gear rapidly surpassed hook-and-line gear in accounting for the majority of California rockfish landings, particularly in the northern ports of Eureka and Fort Bragg (Scofield 1948; Phillips 1949). Although the initial pulse of landings was north of Cape Mendocino, where bocaccio represented a fairly modest fraction of the catch, the fishing gear and methods found their way to central California fisheries rapidly and resulted in a rapid increase in rockfish landings from the late 1940s through the early 1950s. The percentage of the total catch estimated to be bocaccio in the catch reconstruction increased as well throughout this period; in the early 1950s bocaccio represented 45% of the total rockfish catch in the San Francisco and Monterey regions, 38% of the southern California rockfish catch, and 34% of the total statewide catch (for which northern California continued to represent a significant fraction of total landings).

This is consistent with reports from CDFG biologists at the time; Phillips (1955) had described bocaccio as the dominant species "at present" in the statewide commercial catch, followed by chilipepper, canary, vermilion, yellowtail, and black rockfish. Heimann and Miller (1960) described the species composition of trawl fisheries in the Morro Bay region, based on 64 drags observed over a one year period from 1957-1958. Bocaccio were the most frequently encountered species, caught in every haul and representing 65.6% of the total catch (followed by 31.8% chilipepper and less than 1% stripetail, widow, shortbelly, vermilion, and several other species). The authors reported that most bocaccio (and other desirable species) were retained, with discards representing 0.43% of the total catch (by contrast nearly all stripetail, shortbelly, and greenstriped rockfish were discarded). Their samples suggested an average total length of 48.3 cm for bocaccio (based on over 1,200 measurements; would be nice to know whether those still exist!), with the discarded bocaccio averaging 30.7 cm (14 measurements). Heimann (1963) also reported the species composition of trawl catches in the Monterey Bay area from a 1960 study, in which bocaccio were the most important rockfish species in the shallow water (targeting largely flatfish; less than 10% of the catches in this sector were rockfish) fishery; accounting for 53.3% of the rockfish landed in that sector, and were the second most important rockfish species in the intermediate depth fishery (which targeted rockfish, which were nearly 90% of the catch) at 34.9% of the rockfish caught, following chilipepper at 49.5%. Retention of both species was high for both sectors; only 0.7% of bocaccio were discarded in the shallow (flatfish-oriented) fishery, and only 0.1% of bocaccio were discarded in the intermediate depth (rockfish-oriented) fishery. Consequently, we have assumed discards to be negligible in the historical era of the fishery.

Bocaccio remained the most significant species in California rockfish fisheries throughout the 1960s and 1970s, representing approximately 33% to 35% of the statewide catch throughout that era. As with earlier eras, bocaccio represented a modest (generally 5-10%) fraction of the rockfish catch in northern California, and a greater (often greater than 50%) fraction of the catch in central California. Again, catch reconstruction estimates of the species composition of the catch are consistent with other reports throughout that period (e.g., Nitsos 1965 and Gunderson et al. 1974). Landings in both the hook-and-line and the trawl fisheries throughout this period are reported for the regions north and south of both 38 N latitude (used as a break point for the trawl fishery as described later) and Point Conception from 1916 through 1968 in Table 4. Landings for the 1969-2008 period are presented in Table 5 for the three major gear types, with the same latitudinal break points, and including estimates of catches in the Eureka INPFC area of Oregon (all are assumed to be trawl). Oregon landings from 1969-1980 were taken from Douglas (1998), landings from 1981-2002 were taken from PacFIN (query March 2009). Landings of bocaccio are assumed to be negligible in Oregon waters prior to 1969.

Rockfish, including bocaccio, were observed in California fish markets as early as the 1850s, and even David Starr Jordan (Jordan 1884) described bocaccio as “rather more abundant southward than about San Francisco. It is, however, a common market fish, and its flesh is considered excellent.” Eigenmann (1894) also described bocaccio as abundant from San Diego to British Columbia. To estimate catches of bocaccio prior to 1916, we used rockfish landings reported by Sette and Fiedler (1928), who report landings irregularly from 1892 through 1926 (1892, 1895, 1899, 1904, 1908, and 1915). Landings are interpolated between unreported years, and an equilibrium catch was implemented prior to 1892 based on the average of the first two estimates of catches (for 1892 and 1895). To estimate the fraction of these catches that were bocaccio, we applied the proportion of catches north and south of the major Points (Point Conception and Cape Mendocino) as estimated in the historical catch reconstruction (average of 1916-1920 values, although the ratios were nearly constant through this period), in which 52.4% of landings were from south of Conception, and 47.6% were north of Conception (the percentage of landings north of Mendocino were minimal, less than 0.1%). Next we applied the fraction of the catch by region assumed to be bocaccio (again averaging 1916-1920 values), which was 18.9% south of Conception and 21.5% from Conception to Cape Mendocino. Table 6 provides the total California rockfish catch estimates based on Sette and Fiedler from 1892 to 1915, and the estimated catches of bocaccio by region based on these ratios. We assumed that all catches prior to 1916 were hook-and-line caught, based on the observation by Clark (1935) that the use of gasoline powered paranzella trawlers (the predecessors of diesel powered trawlers) peaked in the 1917-1922 period, at which time they began to replace earlier steam trawlers that fished shallow fishing grounds just outside of the entrance to San Francisco Bay, targeting primarily small flatfish.

Landings from north of the assessment area (Cape Blanco, Oregon) are reported for the remaining Oregon catches, Washington catches, and British Columbia catches, in Table 7. For Oregon and Washington these numbers represent PacFIN estimates (query March 2009) for 1981-present, and Douglas (1998) for 1969-1980 (the latter are likely an underestimate, as the species composition of the catch was not sampled in earlier landings). In general, bocaccio represent a modest proportion of the rockfish caught north of Cape Mendocino, where widow, canary, yellowtail and Pacific ocean perch dominate the catches. From 1981-2000, bocaccio represented less than 3% of the annual *Sebastes* catch. However, given that the total catch was considerably greater in this region, this still represents a significant fraction of the total coastwide catch of bocaccio. From 1969-2008, the total landings of bocaccio are estimated to be just over 85,700 mt, with 15,400 mt (18%) coming from the region north of Mendocino (by contrast, total commercial landings south of Point Conception were 12,300 mt in the same period, although total recreational landings were an additional 14,600 mt). As this assessment maintains the spatial structure of past assessments, and does not extend north of Cape Blanco, these landings are reported for informational purposes only.

From 1965 through 1976, foreign fishing fleets, primarily Russian and Japanese, fished for Pacific hake, rockfish and other species along the U.S. west coast. In recognition of the inconsistent manner in which estimated catches in these fisheries were (or were not) included in stock assessments, Rogers (2003) developed a method of allocating these catches to all *Sebastes* and *Sebastolobus* species by year and INPFC area. The estimated catches for bocaccio for this period are reported in Table 8, and catches from the Monterey INPFC are pooled with the "southern" trawl fishery, while those from the Eureka INPFC are pooled with the "northern" trawl fishery.

As described in the section on management measures, since 2002 both commercial and recreational fisheries have been subject to very restrictive management measures. Regulatory discards consequently represent a significant fraction of the catch, thus recent catches and discards, for the 2002-2007 period, are based on the total mortality reports produced by the Pacific States Marine Fisheries Commission and the Northwest Fisheries Science Center, based on a combination of landings data and observer reported discarding (Bellman et al. 2008; provided by E. Heery). The 2008 estimates are based on the PFMC's Groundfish Management Team scorecard (J. DeVore, PFMC) and recreational estimates from California Department of Fish and Game (J. Budrick, CDFG). For the purposes of the model, catches by the various open access fleets and research catches (the latter of which are principally trawl-caught) are pooled with the southern trawl fishery (note that due to reporting constraints the northern trawl landings in this period only reflect those north of 40 10' N latitude). Discards represented approximately 75% of total trawl landings during this period, and for commercial fisheries have been centered around the central California (Monterey Bay to San Francisco) region (Figures 15a-b). Table 9 reports these data by the fisheries used in the model. The length frequency data for these discards is consistent with being regulatory discards, as discarded fish tended to be larger on average than those in the retained catch in earlier years. This is likely a consequence of a shift in most fishing effort that encounters bocaccio to waters seaward of the Rockfish Conservation Areas (RCAs). It is likely that an offset or blocked selectivity pattern for the post 2002 period would be a more appropriate way to model recent catches; however, as these landings were modest overall, and as incidental landings for other fisheries as well as research surveys are included in trawl catches (and indeed are comparable or exceed total trawl catches in magnitude for many recent years), this was not determined to be a high priority for this model. Similarly, we did not attempt to estimate a discard rate for the period following substantial management restrictions, but prior to the implementation of the RCAs and the bycatch monitoring program, although this may well be an unrealistic assumption. Greater consideration of these factors is recommended for future efforts.

Figure 16 summarizes the total catches in the assessment area (Cape Blanco through the U.S./Mexico border), from 1892-2008, by the fleet definitions used in the model, while Figure 17 shows the total estimated catches of bocaccio by INPFC area in the region north of Cape Blanco from 1969 through the present.

Commercial Length Frequency Compositions

The length composition of commercial landings (here broken out into trawl, hook-and-line, and set net fisheries) were obtained from the CalCOM database, and cover the years 1978-2008. Figure 18 shows the length compositions for bocaccio by year caught in the trawl fisheries; Figure 19 shows the length information for the hook-and-line fishery, and Figure 20 shows this information for the set net fishery. Figures 21a-c show the length frequency distributions for the three major gear types for both sexes and all years combined, in order to evaluate possible differences in the vulnerability (or fishing methods) of fish of different sizes in different regions. Although there appeared to be some differences in the size composition of fish landed in all gear types along the coast, with a general trend towards catching fewer smaller fish and more larger fish in more northern regions. The apparent shift to the right in trawl fishery length frequencies between the Monterey/San Francisco region and the Bodega Bay/Fort Bragg region was the primary rationale in separating the trawl fishery north and south of 38° N.

After careful evaluation of the raw (individual fish) versus expanded (based on fish ticket and port information) length frequency data, we compiled length frequencies using raw length observations. This is consistent with past assessments (MacCall 2003, MacCall 2007) for which length frequency data were "sharpened," essentially adjusted using the Von Bertalanffy growth curve to grow (or shrink) observed length data to reflect the length at the middle of the year (the time at which the predicted length frequencies are estimated by the model). As length composition data is based on expansion methods that typically borrow over time (months, seasons) and space (ports), sharpening was not possible with the expanded length data.

Although we did not continue with the sharpening approach, based on what we considered to be reasonable model performance with the unadjusted length frequency data, concerns over borrowing across both seasons and ports led us to evaluate more closely the differences among raw versus expanded length composition data. This evaluation suggested that while the differences between raw and expanded length frequencies were typically negligible, where there were differences they tended to result in an apparent coarsening of the length frequency data, which would presumably add noise to the model. The initial effective sample sizes (input N) for commercial, recreational and fishery independent length frequency data were calculated using the approach developed by Stewart (2008) in which:

$$N_{eff} = N_{trips} + 0.138N_{fish} \qquad \text{if } N_{fish}/N_{trips} < 44$$
$$N_{eff} = 7.06N_{trips} \qquad \text{if } N_{fish}/N_{trips} \geq 44$$

In this method, trips are considered equivalent to sampling clusters in CalCOM or hauls in the triennial or NWFSC combined survey, and the maximum input N_{eff} is capped at 400. This approach tended to result in N_{eff} values for most fisheries and surveys that were more precise than the model-estimated effective sample sizes, but not to the magnitude at which trips (for CPFV trips) or clusters (which are subsamples of trips for sampling commercial landings) alone tended to result in lower effective sample sizes than those estimated by the model. The number of subsamples taken, fish measured, and the initial effective multinomial sample sizes for the commercial fisheries are provided in Tables 10-11.

Recreational catches

Until this assessment, estimates of recreational catches for the pre-RecFIN (pre-1980) era had changed little since the 1996 assessment, when they were estimated as a constant fraction of CPFV-reported rockfish catches for southern and central/northern California as reported in CDFG Fish Bulletins (e.g., Young 1969; Best 1963). As with the commercial catch reconstruction, the methodology for reconstructing historical (pre-1980) recreational catches for bocaccio (and other rockfish) are reported in Ralston et al. (in prep) and summarized only briefly here. The reconstruction was based primarily on linking historical CPFV logbook-reported catches of rockfish (where CDFG blocks are reported with the catch) with the species composition of rockfish catches for those blocks from more recent CPFV observer data and other sources. Skiff and private vessel estimates are considerably more uncertain, and the approach developed used estimates of private boat catch from studies in the 1960s and interpolated catches to the RecFIN era. The interpolation was developed to match early 1980s RecFIN catches, although we excluded 1980, which was only a partially sampled year and has been considered highly uncertain in retrospect due to anomalously high catch estimates of several species. Species composition information for skiff and shore modes is very limited, despite the apparently great significance of this component of the recreational fishery even in the pre-1980 era, and consequently estimations are much more uncertain. These early catch estimates are presented in Table 12.

A combination of RecFIN and California Recreational Fisheries Survey (CRFS) data provides ready access to catch and discard estimates to the species level for the recent period (1980-present). RecFIN data are based on Marine Recreational Fisheries Statistics Survey (MRFSS) catch estimates, which are based on a combination of angler field surveys and randomized telephone surveys from 1980 through 2008 (with a hiatus from 1990 through 1992), with four primary fishing modes: CPFV, private vessel, pier, and shore (only the first two catch notable quantities of bocaccio in most years, although, as discussed earlier, catches are high during years of exceptional recruitment). For 1980 through 2003, catches in both numbers of fish and weight of fish were obtained from the RecFIN database. Spatial resolution of these catch estimates is generally limited to north and south of Point Conception, although some data can be retrieved at the county level. As RecFIN records include a significant fraction of “unknown” rockfish catches, the proportion of bocaccio observed in the “known” catches was applied to the reported catches of “unknown” rockfish and the total bocaccio catch was adjusted accordingly (Table 13). This is recognized to be a problem that, similar to the historical catch reconstruction, will require a more sophisticated evaluation and analysis for future assessment cycles.

Recreational Length Frequency Data

Recreational length frequency data were collected in CPFV fisheries during onboard observer programs for different periods in northern and southern California fisheries. In southern California, observers monitored CPFV catches during 1975-1978 and 1986-1989; collecting a total of nearly 78,000 fish in over 1000 trips during the 70s program, and another 14,000 fish in over 400 trips in the 1980s program. The central/northern California CPFV observer program collected nearly 12,000 length frequency observations from a total of just over 1300 trips (that encountered bocaccio). As all of these observer program measured fish in total length and other data series are in fork length, lengths were converted by the equation: Fork_length = a+b*total_length; where a=0.93 and b= 0.956. Table 14 and Figure 22-23 show the length frequencies and associated sample sizes, including the initial effective N estimated in the same manner as the commercial effective sample sizes.

The central/northern California observer program was also the source of the recreational CPUE index developed in prior assessments to which these length frequencies are linked. In past assessments, the length frequencies were pooled directly with the RecFIN length frequencies. We differ from the past in linking the length frequency information from the observer program directly to the index itself (which is treated as a survey), rather than pooling the length frequencies together. In past assessments the independence of these observations has been questioned and evaluated, although it does appear that there is some contamination of RecFIN length information with data from these observer programs for years in which the two overlapped. This overlap is generally minimal and the southern California length frequency information was not used in the model as a result of these concerns (the data have little influence when included, this decision could be revisited).

Two other sources of length information were considered as well; one is length frequency information for the years 1959-1961 and 1966 from the Miller and Gotshall (1965) and Miller and Odemar (1968; and additional unpublished CDFG data). These data were collected as part of an exhaustive effort to evaluate recreational fisheries in the central and northern California region by CDFG, from which the recreational catch reconstruction effort in Ralston et al. (in prep) drew from considerably. Beyond the summaries reported in the publications, the raw length frequency and species composition data for Monterey Bay area recreational skiff and CPFV fisheries were recovered from paper forms by Jan Mason (ERD, SWFSC; pers. com.) with some of the results reported in Mason (1995) and Mason (1998).

Although the currently available data are limited to this region, this region was responsible for slightly more than 1/3rd of the recreational rockfish catch in central/northern California fisheries during this period. Additional paper records exist for Half Moon Bay, San Francisco, and Bodega Bay recreational fisheries, and efforts to digitize and utilize these data are also being implemented. While the early 1960s data suggest a consistent size mode without particular evidence of extremely strong recent year classes, the 1966 length frequency data is consistent with both a strong year class several years earlier (approximately 1962-63) as well as a strong year class that year (1966) based on the high frequency of 20-30 cm fish (Figure 24). Moreover, the percentage of the total rockfish catch represented by bocaccio also shifts during this period, from a range of 2-5% of the total recreational catch in from 1959-1964, to a range of 5-9% of the total rockfish catch from 1966 through 1972. This is consistent with the perceived increase in the relative abundance of bocaccio in the mid-1960s as evidenced from the CalCOFI data and recent assessments. However, as it seems likely that the recreational fishery had a more limited spatial distribution (across both latitude and depth) and it is not clear how compatible these data are with later length data, this information is not currently included in the model. Further evaluation of these data, as well as the spatial patterns of development of the recreational fisheries more generally, would be beneficial to future assessment efforts.

Most of the recreational length frequency data are from the 1980-2008 period (exclusive of the MRFSS hiatus of 1990-1992) and, as in past assessments, the length frequencies and catches are divided into southern and northern components (Figures 25-26). Oregon and Washington length frequency data (outside of the modeled area) are also presented (Figure 27), but as pooled 5 year intervals due to the paucity of data. Sexes are pooled in all RecFIN rockfish data. As in prior assessments, strong year classes tend to show up earlier in southern California fisheries than in northern California fisheries, with northern California fisheries tending to catch larger individuals. The 1999 and 2003 year classes are particularly prominent in these data in the southern fisheries, with a suggestion of a strong 2005 year class as well. Sampling is generally comprehensive in southern and northern California, where bocaccio represent a significant fraction of the total recreational rockfish catch. The total number of clusters, fish sampled, and initial effective sample sizes are presented as Table 15.

Ageing Uncertainties and Age Data

The 1996 bocaccio assessment (Ralston et al. 1996; Ralston and Ianelli 1998) attempted to utilize age-frequency information from otoliths aged using break-and-burn methods from trawl fishery samples collected in 1988, 1991, and 1994. Just over 1,300 otoliths were aged, and approximately one of every four was subsequently reexamined by a second age reader to determine the precision of the break-and-burn age data. They found that the percent agreement between readers declined from ~90% for age 1 fish to ~10% agreement at age 20. The pattern of decline appeared to reflect an exponential decay in the precision of age estimates with increasing age. In their evaluation of the diverse sources of data, the assessment authors concluded that the age composition data were in fundamental disagreement with all of the other data sources. This was primarily due to the bias and imprecision in the ageing results, which resulted in an uninformative age composition data that were wholly inconsistent with the highly variable recruitment patterns clearly informed by the length frequency data. Since that assessment, age data have not been utilized in any of the subsequent southern bocaccio stock assessments, although STAR Panels have frequently recommended re-examination of age information and the potential for developing ageing criteria that could be used to guide production ageing efforts.

Ralston and Ianelli (1998) also noted that the rapid growth of young bocaccio and the relatively brief seasonality of spawning likely exacerbated the interpretation of bocaccio otoliths, as they resulted in a proliferation of false annuli and accessory check marks that were difficult to interpret, resolve, and validate through the application of marginal increment analysis. These results are consistent with the later age validation efforts of Andrews et al. (2005) and Piner et al. (2006), both of whom validated the longevity ranges described in earlier break-and-burn estimates of age structure, and both of whom found a high degree of ageing imprecision. Piner et al. (2006) used otoliths from twenty four adult fish captured near the U.S./Canada border (~47 -49 N latitude), for which initial age estimates were available from the collecting agency. Second and third independent age determinations were made from experienced readers in two separate laboratories to provide an estimate of ageing precision and possible age bias. Their results indicated that ageing precision was low for most samples, although they found no evidence of bias in this imprecision. The number of samples in this effort was inadequate to evaluate whether and how ageing error changed as a function of age. In contrast to their results, Andrews et al. (2005), using otoliths collected from central California, did report a bias towards under-ageing of bocaccio, which they also found to be very difficult to age using break-and-burn methods. However, the otoliths that they evaluated had not been aged based on established ageing criteria.

The inconsistencies with respect to possible bias in ageing are to some extent consistent with expectations; although bocaccio have long been known to be among the most difficult fish to age by experienced readers, age readers in northern regions have tended to report less difficulty and smaller inter-reader errors than those in southern regions. To evaluate this issue more rigorously, the one experienced reader contributing to this assessment (Pearson) aged a number of similarly sized fish from the same or similar years, from three regions of the coast; southern California (south of Point Conception), central California (Monterey Bay) and the west coast of Washington. To facilitate the evaluation, otoliths were cut using a Isomet low speed precision saw with a diamond encrusted blade, and then burnt, rather than the break-and-burn method typically used in production ageing.

In general, we found a trend towards easier readability with more northerly latitudes, which would be consistent with the more rapid growth and smaller age at maturity in southern animals, as well as the more variable ocean conditions in southern waters. Moreover, Parrish (1981) noted that upwelling winds, which drive much of coastal ocean productivity, were strongly seasonal in northern waters (north of Cape Mendocino), with upwelling favorable winds in spring and summer seasons, and downwelling during fall and winter. Upwelling winds demonstrate a somewhat more extended and slightly weaker seasonality in northern and central

California, where onshore transport during winter tends to have more frequent interruptions. Seasonal patterns become weaker still south of Point Conception and into Baja California, where a more continuous but less intense level of offshore transport occurs year round.

Figure 28 shows examples of cut and aged otoliths from fish that were approximately 600 cm long and taken from similar time periods from each of the three regions of coast. For future research efforts it may be possible to develop more rigorous ageing criteria for the ageing of southern bocaccio based on the more resolved patterns observed in fish from the north; an effort that might merit collaboration among age readers from California, the Pacific Northwest and British Columbia. In the foreseeable future, it is unlikely that production ages will play a meaningful role in future assessment efforts, and we have maintained the approach of previous assessments of excluding the sparse, and highly uncertain, age data from this assessment.

D.1.b Fishery-Dependent Indices

Trawl Catch per Unit Effort

Ralston (1999) developed a CPUE index of bocaccio abundance based on California trawl logbooks that was initially used in the assessment (Figure 29). Because the logbooks do not identify most individual species such as bocaccio, Ralston applied species compositions from local port sampling to the overall catch rates of rockfish from the trawl logbooks. This assessment uses Ralston's "area-weighted" index of bocaccio CPUE, and the associated standard errors (average CV is 32%).

Recreational CPUE Indices

Recreational CPUE indices were developed for the 2003 assessment (MacCall 2003) using catch and effort data were from two sources, the RecFIN database (Wade Van Buskirk, Pers. Comm.) and the Northern California partyboat monitoring conducted by CDFG (Deb Wilson-Vandenberg, Pers. Comm.). These two sources contain different kind of information and were treated differently in the 2003 assessment, although for the RecFIN data only the partyboat catch and effort data were used, as bocaccio catch rates from private boats appeared to be less consistent than those from partyboats.

MacCall (2003) developed indices based on the RecFIN data using a multispecies discriminant function analysis (Stephens and MacCall 2004) to identify which fishing trips are appropriate to include in calculation of a CPUE index of abundance. The concept behind the method is that the species mix in the catch of a fisherman or a fishing trip is indicative of the habitat where fishing occurred, allowing discrimination between those trips where the target species (bocaccio in this case) could have been caught and trips where bocaccio were unlikely to have been caught. Essentially, given the various fishing strategies of CPFV operators across many different habitats, seasons, and target species, the latter trips are not informative, and should be excluded from the CPUE analysis. The approach involves identifying the general list of species commonly caught on fishing trips in the region under consideration, and then converting trip records to a vector of presences (1) and absences (0) of those species.

For each trip record, the probability of the target species (bocaccio) being present was fit by maximum likelihood using a logit function based on an indicator function consisting of the sum of estimated species-specific coefficients, such that these coefficients include large positive values for species that consistently co-occur with bocaccio (e.g., chilipepper and bank rockfish), and large negative values for species that occur in habitats where bocaccio are unlikely to be encountered (e.g., oceanic species such as albacore, and nearshore species such as barracuda). Figure 30 shows an example of these coefficients for the southern California recreational index (for additional details, see past assessments, including responses to past STAR Panels). Next, each trip record is assigned an estimated probability that bocaccio could have been encountered. The trip records are sorted by descending probability, and a threshold probability is chosen for exclusion of trips from the CPUE calculation. After additional refinements to account for discards and other factors (See MacCall 2003, or Stephens and MacCall 2004 for a greater detailed description of the analysis), a delta-GLM model is applied to the retention-corrected records to arrive at a relative abundance index, with year and wave effects estimated as factors.

The resulting indices were also corrected to account for the expected impact of bag limits and for intentional avoidance of bocaccio in the post-2000 period, although the behavioral changes associated with increased regulatory activity from 2000 onward are difficult to fully understand. Consequently, the post-2000 data points should be interpreted as being more uncertain than previous points, and following the 2003 assessment the index was not updated due to the expectation of even greater bias as a result of management activities. Consequently, the indices included in this assessment are unchanged from those developed in the 2003 assessment (and subsequent updates), and additional details (including additional analyses conducted for past STAR Panels) should be referred to from those documents or from the publication that originated from this analysis by Stephens and MacCall (2004). It is also worth noting that the approach has subsequently been applied in many other west coast groundfish stock assessments for which recreational catches and effort represent a significant fraction of the fishery, including those for gopher rockfish (Key et al. 2006), yelloweye rockfish (Wallace et al. 2006), blue rockfish (Key et al. 2008), and black rockfish (Sampson et al. 2008).

In addition to the indices derived from the MRFSS data, the California Department of Fish and Game conducted on-board monitoring of partyboat catches in central and northern California from 1988 to 1998. Presence of location and depth information associated with catch and effort at individual fishing sites (Deb Wilson-Vandenberg, Pers. Comm.) allowed a more direct identification of appropriate records for use in a CPUE calculation. The analysis used only those fishing sites with at least seven occupations and at least five positive occurrences of bocaccio catch in the data set. Initial exploration allowed collapse of monthly effects into a seasonal winter (January, February and March) and nonwinter effect; and the few records from depths greater than 80 fm were combined to form an 80+ fm depth effect. The final delta-lognormal GLM included year (12), season (2), site (100) and depth (8) effects. As with the other recreational CPUE indices, this index was not revisited for this assessment. However, the index was treated as an independent survey in this assessment, with the length frequency information (which was pooled with the RecFIN length frequency information in the 2003 assessment and subsequent updates) treated as independent observations from the RecFIN data. The independence was somewhat artificial, in that the selectivity curves for the RecFIN length frequency data and this survey were linked (mirrored selectivity), consistent with the notion that the two data sources are related. Sensitivity analysis suggests that the two curves were highly similar when estimated independently, however, this allowed for these data to be evaluated and weighted (tuned) independently. All three of these recreational CPUE indices developed for the 2003 assessment are shown in Figures 31a-b.

D.1.c. Fishery-Independent Data

CalCOFI larval abundance data

The historical ichthyoplankton abundance data from the California Cooperative Oceanic and Fisheries Investigations (CalCOFI) surveys was first used in the bocaccio stock assessment in 1996, although it was not included in the 1999 assessment due to the re-analysis of the CalCOFI dataset during that period (it was used again beginning in the 2002 and subsequent assessments). Egg or larval abundance data from these surveys have also been used in stock assessments for other important west coast species, including northern anchovy (Jacobson and Lo 1994), Pacific sardine (Hill et al. 2007), shortbelly rockfish (Field et al. 2007) and California sheephead (Alonzo et al. 2004). Although a larval abundance index was developed in the first stock assessment for cowcod (*S. levis*, Butler et al. 1999), this index was not included in the most recent assessment (Piner et al. 2006) out of concerns for the rarity of cowcod in sampled tows. Similarly, these data were explored for an a recent assessment of the closely related and often co-occurring chilipepper rockfish (*Sebastes goodei*), the index was ultimately not included in the final model as most of the data were from the southern periphery of that stock's range, and the near total absence of larvae in the southern region between the early 70s and 2000 (Field 2008).

Bocaccio rockfish are one of only several *Sebastes* species for which larvae are readily identifiable using morphometric methods (Moser et al. 1977). Most of these larvae were not identified to the species level in initial plankton sorting efforts; rather the core area dataset was reanalyzed following the development of morphological criteria that allowed for conclusive identification to the species level. Consequently, data for the northern regions are only available for a subset of years, although historical samples are currently being enumerated from 1968 back to 1951 (W. Watson, SWFSC, pers. comm.). Table 16 shows the number of total tows, positive tows, and the mean CPUE of positive tows for the southern and northern stations, for years in which adequate sampling took place during the winter (November-May) spawning period (sampling was generally triennial from 1969-1984). The mean catch rates by station and decade are also shown as Figures 32a-f, note that for the central Californian stations, sampling effort is typically far lower than the south (as shown in Table 16). Although contemporary sampling effort in the central California region is not as intensive as that in the southern region, the time series for central California will continue to grow both forwards and backwards in time.

We developed the CalCOFI index consistent with the approach from past assessments, in which we used tow specific information and a delta-GLM approach to derive an index of spawning output. Fixed effects in the model included year (fixed to spawning season, such that data from November and December are used to estimate the year effect for the following year, along with the January-April data from that year), month and line-station effects. We also explored alternatives to the line.station factor approach, including combinations of line, distance from shore, and depth. Although these approaches used a lesser number of parameters, they also resulted in models that had significant interactions among the different factors, and when such factors were accounted for using interaction terms the effective number of parameters varied little from the line.station model. As the resulting indices were all comparable, and AIC additionally indicated that the line.station model explained more of the variance in the model, we continued with the use of line.station effects for this index. However, we did evaluate alternative link terms in the binomial component of the model, and found that a complementary log log (cloglog) link function performed better (AIC of 20 likelihood units) than the logit link term used in the past. This link term was consequently used to develop the relative abundance index.

These estimates and the associated standard errors estimated from a jackknife routine were used in the model as a relative index of population spawning output (Figures 33a-b). The trends suggested by both the raw data (percent positive tows and catch rates of positive tows) suggest that relative abundance was declining through the 1950s, but increased sharply in the 1960s through the early 70s, after which the index declines similar to the decline observed in other indices. Throughout the time series, there is considerable high frequency year-to-year variability in larval distribution and abundance that may be related to variability in climate, oceanographic features and circulation patterns, or variable reproductive output (MacGregor 1986, Moser et al. 2000; Lenarz et al. 1995).

Larval production estimates

In addition to the relative abundance estimates based on the delta-GLM model, we consider estimates of absolute biomass developed by Ralston and MacFarlane (in review), for the Southern California Bight (U.S. waters south of Point Conception). These estimates are developed from an estimation of the spawning output necessary to produce observed daily rates of larval production, using a methodology developed first by Ralston et al. (2003) for shortbelly rockfish (*Sebastes jordani*) and subsequently used in an assessment of that unfished population (Field et al. 2007). Ralston and MacFarlane used expanded the daily rates of larval production observed in the CalCOFI Ichthyoplankton surveys during 2002-2003, a year in which sampling in the Southern California Bight was enhanced within the region currently encompassed by the Cowcod Conservation Areas (CCA's) as part of an effort to improve the assessment of that stock. Their results indicate that in 2002 and 2003 there were approximately 3470 and 5921 mt, respectively, of female spawning biomass in the Southern California Bight, corresponding to 6953 and 10,656 mt of total biomass. Interestingly, their results also indicate that the concentration of bocaccio in the years of their survey was strongly centered around the Cowcod Conservation Areas (CCA's), which have been closed to fishing since 2001, and which was not typical of the long-term average distribution of larval abundance through the duration of the time-series (Figures 34a-b). While the causes of this shift in distribution are unclear (certainly it is not reasonable to think that it was the result of a 1-2 year closure), the consequence does have implications for the interpretation of data from those indices that sample in the Conception area, but avoid sampling within the Cowcod Conservation Areas themselves. Additional details can be found in the manuscript included in the assessment background materials.

Additional visual and acoustic methods of abundance estimation currently under development

Several additional non-lethal methodologies for the assessment and monitoring of rockfish stocks off Southern California are currently under development and may provide useful data for future assessments. For example, data from multifrequency echosounders and underwater cameras have been used jointly by the Advanced Survey Technology (AST) and In-Situ Survey groups at the Fisheries Resources Division (SWFSC) in La Jolla to map the dispersions and estimate the abundances of rockfish at a suite of historical fishing sites within this region. The techniques were developed in 2003/04 from the Commercial Passenger Fishing Vessel (CPFV) Outer Limits; applied throughout the SCB in 2004/05 and 2007 (COAST07), largely from NOAA Ship David Starr Jordan. The frequency dependence of sound-scatter intensity is commonly exploited to classify fish, zooplankton and seabed observed in acoustic surveys. Although less utilized, techniques based on scattering statistics of echo amplitudes can also be used to extract information, and workers have developed a hybrid, statistical-spectral method for target identification (SSID), which incorporates information contained in both the signal amplitudes and phases (Demer et al. 2009). This approach should ultimately provide the means to separate scatter from demersal fish and the seabed, as well as estimate seabed depth, within-beam slope, hardness and roughness, and the height of the dynamic acoustic dead zone. Additionally, preliminary success has been made in investigating sound production in rockfishes, including the identification of sounds made by bocaccio and several other species (Širović and Demer 2009). From August to October 2007, the acoustic and visual surveys described above were augmented with two passive-acoustic seabed recorders, which were subsequently analyzed for the presence of rockfish sounds. A repetitive pulsing from bocaccio was the most commonly recorded sound and it occurred predominately at night. The daily calling rates at each site were quantitatively compared with the rockfish abundance estimates obtained from the active-acoustic survey, and they were positively correlated (Širović et al. 2009). These results suggest it may be feasible to use passive acoustic tools to efficiently monitor changes in rockfish populations, possibly in conjunction with acoustic and/or visual survey methodologies. However, as all of these approaches show some promise for potentially useful survey methodologies, none was sufficiently developed to be used as an index in this assessment.

Triennial Trawl Survey

A primary source of fishery independent information for most managed and assessed groundfish species in the California Current is the West Coast triennial trawl survey conducted between 1977 and 2004 (e.g., Weinberg et al. 2002). As the general consensus from recent data workshops has been to exclude 1977 data, we have not used these data in either the area-swept or GLMM indices, but continue to report the data here. We obtained both stratum-specific area swept biomass estimates and haul-specific survey data from 1980 to 2004 (M. Wilkins, AFSC; B. Horness, NWFSC), both of which were generated after excluding bad performance tows and "water hauls," in which few benthic organisms were noted (Zimmermann et al. 2001). Catch rates pooled over all years are shown relative to the latitude and longitude in Figure 35, while the log of tow specific CPUEs from this survey by year, relative to both latitude and depth (but excluding depth contours to better capture the depth distribution) are shown in Figures 36a-j, which also illustrate the variation in the latitudinal range of this survey over time. The number of hauls, number of positive hauls, number of hauls in which lengths were measured, and total number of lengths measured by year are presented as Table 17. Biomass estimates, and their associated coefficients of variation based on area-swept indices are presented by depth and INPFC strata in Table 18.

The area-swept index of abundance has been criticized in the past due to the infrequent occurrence of very large hauls, which leads to noisy abundance estimates in the time series. This is a consequence primarily of the aggregating behavior and habitat associations of many semi-pelagic rockfish species, which tend to be characterized by patchy distributions and often highly specific habitat associations. Consequently, survey workshop recommendations and trends in stock assessment applications have been to developed survey indices an index of abundance using the Generalized Linear Mixed Model (GLMM) approach described in Helser et al. (2007); this method is also used for the Northwest Fisheries Science Center combined survey data described later. The model uses depth strata and latitude (or INPFC latitude proxies) as fixed effects, and vessel as a random effect, to develop stratum-specific estimates of catch rates (kg/ha), which are then expanded to the total area of a given stratum to arrive at an abundance estimate. The model assumes a log-normal error variance assumption for the positive observations, which is consistent with observations of observed catch rates (Figure 37a). Models with gamma or inverse Gaussian error distributions generally failed to converge, likely due to low sample sizes in many strata. Point estimates of biomass and the associated CVs are based on the median of the marginal posterior density from MCMC (although standard errors and CVs are reported in the tables, the starting value for the indices in the assessments were based on the square root of the CV+1).

The STAT considered the standard depth and area stratification structure used for the GLMM to be potentially problematic for bocaccio. The traditional stratification is based on the INPFC areas (essentially, proxies for latitude effects) and depth bins from 55-183 meters, 183-300 meters, and 300-550 meters (deeper strata are not used for rockfish). However, the northern region of the Conception INPFC area was sampled only occasionally (and was never sampled south of Point Conception), such that there are essentially no Conception area data for the 1980-1986 period. Consequently, we evaluated an alternative stratification in which the northern Conception area (34.5-36° N) was grouped with the southern Monterey area (36-38° N), and the remaining Monterey INPFC area (38- 40.5° N) was considered a distinct region. We also had concerns regarding the design of the depth strata, which essentially bisect the depths of greatest abundance for bocaccio. Figures 38a-c show depth effects (as factors) with the standard depth strata, and with alternative 50 and 25 meter depth bins, illustrating that the greatest catch rates of bocaccio tend to occur between 150 and 250 meters, with low catches in both shallower and deeper depths. Consequently, we also explored alternative depth stratification, in which strata were redesigned into 100 meter depth bins (55-150, 150-250, 250-350). Revised estimates of the total areas of these new strata were provided by Beth Horness (NWFSC, pers. com.).

As seen in Figures 39a-c, there is a significant difference between the design-based estimate and the GLMM estimates. This is a consequence of the down-weighted significance a small number of tows with very large positive catches. The influence of these tows is reduced in the GLMM under the assumption of a log-normal error distribution, and consequently the index has a smoother (temporally autocorrelated) trend, as opposed to the relatively noisy trend of the area-swept index. However, the difference among the indices with the standard versus the alternative area stratifications was relatively modest (note that the standard stratification in this example excludes the Conception area data entirely due to the lack of data in many years). Similarly, a coastwide GLMM that incorporates the (relatively modest volume) data from the Columbia and Vancouver INPFC areas (using the standard, rather than alternative stratification, and thus excluding the Conception area data) was nearly identical to the index based on the assessment area alone, not surprising due to the paucity of positive tows in the northern INPFC areas (Table 19). Similarly, there was little difference when the alternative depth strata were used, suggesting that the model does not require informative depth factors to arrive at consistent results. Due to the apparent habitat preferences of bocaccio, which tend to prefer untrawlable habitat, as well as the fact that the triennial survey did not survey the Conception INPFC area in many years (and never extended to the core of that area, south of Point Conception), this index is treated as an index of relative, rather than absolute biomass, such that q is treated as a nuisance parameter.

Length frequencies for the triennial survey were calculated based on standard estimation methods (Dark and Wilkins 1994). However, it was noted that in the early years of the trawl survey, length measurements were not taken from every haul, and in fact most hauls with only a small number of bocaccio (less than 10 fish) in the catch did not report length frequency information (Figures 37b-c). This may have led to a bias in which larger fish were disproportionately excluded from the length frequency data, as the mean weight of fish in the hauls with no length frequency data tended to be greater than the mean weight of fish in hauls that did include length frequency data. Length frequency data are shown in Figure 40.

Northwest Center Trawl Survey

The Northwest Fishery Science Center has conducted combined shelf and slope trawl surveys since 2003, based on a random-grid design from depths 0of 55 to 1280 meters. Additional details on this survey and design are available in the abundance and distribution reports by Keller et al. (2008). Geographic locations of catches and negative tows pooled over all years are shown as Figure 41, while tow-specific Log CPUE estimates from this survey by latitude, depth and year are shown as Figures 42a-f. Additional data on the number of tows, number of positive tows, number of length measurements and mean CPUE rates by depth and INPFC area are provided in Tables 20. The design-based area-swept biomass estimates for the West Coast are provided by INPFC area in Table 21, which range from 1235 mt in 2003 to 9184 mt in 2004, with a (very general) declining trend suggested from 2005 through 2008 (3644 to 1784 mt). The vast majority of the estimated biomass is found in the assessment area (Conception, Monterey and Eureka INPFC areas), and in the shallower depth strata.

As with the triennial survey, an alternative index GLMM methods described above for the triennial survey index (the error distribution was assumed to be lognormal). We explored both the standard stratification (INPFC area and 55-183, 183-300, 300-549 meter depth bins) and the revised depth stratification used for the triennial survey as described in the previous section (Figure 38a-b); we maintained the standard INPFC area stratification due to the consistency in sampling the entire Conception INPFC area throughout the survey. However, it should be noted that sampling density in the Conception area is relatively modest, and does not include the habitat in the Cowcod Conservation Areas (CCAs). As with the triennial survey, the results varied little among the two models, similarly there was little difference between the assessment area estimate and the coastwide model estimate (Figure 43). For consistency with the area-swept biomass estimates and the expanded length-frequency estimates, which were derived using the standard depth stratification, we used the index from the model with the standard depth stratification. As the indices vary little among the alternative stratifications, we do not consider this to be a major concern.

Length frequency data were based on the expanded length frequencies provided by Beth Horness (NWFSC), shown in Figure 44. The length frequency data in most of these years are dominated by the 1999 year class, with signs of the incoming 2003 and 2005 year classes in later survey years.

NWFSC Southern California Bight hook-and-line survey

Since 2004 the NWFSC has conducted a hook-and-line survey for rockfish in the region south of Point Conception, using essentially recreational gear types, surveying locations that are either likely or known sites where recreational fishing occurs, and chartering recreational (CPFV) vessels to conduct the survey (Harms et al. 2008; Harms et al. in prep). Importantly, this survey does not include fishing sites within the Cowcod Conservation Areas, a large region closed to commercial and recreational fishing in order to rebuild the cowcod rockfish (*S. levis*). Consequently, the trends inferred from this index should be interpreted with some caution.

Bocaccio rockfish are among the most frequently encountered species in the survey, representing approximately 25% of all fishes encountered. Harms et al. (in prep; included in supplementary materials) standardized catch rates of bocaccio rockfish from 2004 – 2007 using a Bayesian Generalized Linear Model to account for site, fishing time, survey vessel, angler, and other statistically significant effects. Their results are moderately indicative of a slight downward trend in the biomass vulnerable to this survey (Figure 45a), which like the southern California recreational fishery, is likely to show dome-shaped selectivity. As with the NWFSC combined survey and the southern recreational fishery length frequency data, the length-frequency distributions are dominated by the 1999 year class from 2004-2006, with signs of the incoming 2003 year class, which together with an apparent strong 2005 year class tends to dominate the length frequencies of the later years of survey data (Figure 45b).

Recruitment Indices

Two recruitment indices were used in the 2002 bocaccio assessment: the Midwater Trawl Survey of juvenile rockfish in Central California, and an index based on impingement rates at Southern California electrical generating stations (Power Plant Index). The 2003 assessment added a third recruitment index, the Pier CPUE Index based on recreational catches of young-of-the-year bocaccio from piers. However, the 2003 STAR Panel recommended that all three recruitment indexes be removed from the model, so the 2003 assessment, as well as the 2005 and 2007 update assessments did not include any recruitment indexes. All three recruitment indexes are reconsidered in the 2009 assessment. The Power Plant Index data end in 2000 and have not been updated due to changes in plant ownership, but the index has been re-estimated here. The Midwater Trawl Survey and Pier CPUE Index have been substantially revised and extended. Although all of these indexes are imprecise, they potentially provide improved stability to the pre-1970 abundance and recruitment estimates when length composition information is otherwise lacking.

Power Plant Index (Southern California)

Annual impingement rates (number of bocaccio per volume of intake water) at five Southern California electrical generating stations from 1972 to 2000 form the basis of a recruitment index (data supplied by Kevin Herbinson, Southern California Edison). The five power plants (sites) are El Segundo (ES), Huntington Beach (HB), Ormond Beach (OB), Redondo Beach (RB), and San Onofre (SO). San Onofre consists of three time series for three separate intakes; the first extends from 1972 to 1993, and the other two extend from ca. 1982 to 2000. A preliminary delta-GLM produced overlapping jackknife confidence intervals for the three San Onofre "effects" which supported using a combined average value for San Onofre (this avoids need for complicated weighting to preserve equal weighting among power plant sites). A gamma model of the positives was marginally better than a lognormal model, deltaAIC = 2.48, and was used in this analysis. The shape parameter of the gamma distribution was 0.87, indicating an approximately exponential distribution of the positive values.

Jackknife estimates of standard error were possible for most years. The three years 1982, 1993 and 1994 contained only one positive site; index values were estimable and approximate standard errors were based on an assumed CV of 1.5, derived from the trend of CV vs. index value. El Nino years 1983 and 1998 contained no positive sites, but an index value of zero cannot be used by Synthesis. These two years were represented by an index value somewhat smaller than the minimum observed positive values, and with an assumed CV of 2. The time series of log(index) values is shown in Figure 46a, and shows a general trend of declining recruitment over the duration of the observations.

Pier CPUE Index

Young-of-the-year bocaccio have long been known to be occasional targets of recreational fishermen from fishing piers, where high catch rates appear to be associated with strong year classes. MacCall (2003) developed an index of bocaccio recruitment along the California coast based on bocaccio catches and associated effort from piers during the May-October period. Based on these data, San Luis Obispo County was described as the apparent center of historical bocaccio recruitment, with Santa Barbara (34° 24' N) to Santa Cruz (36° 58' N) being the typical geographic range of large recruitment events. Juveniles were rarely observed at piers in or south of Ventura and Los Angeles Counties, and MacCall concluded that there was no evidence of separate southern California recruitment events from this analysis. This analysis demonstrated that 1980, 1984, 1988 and 1993 were years of strong bocaccio recruitment; most other years in the time series showed weak or no catches of bocaccio.

Miller and Gotschall (1965) reported on one such event in 1956 and 1957, during which large numbers of young bocaccio occurred at all piers from Avila Beach, CA (35° 11" N) to Princeton, CA (39° 24' N; four coastal counties). They reported that the greatest concentrations appeared in mid-1956; by 1957 larger fish had moved to deeper waters and by 1958 they were not observed from piers or near shore. This event was also observed by Dr. Milton Love (USCB, pers. Com), who as a young fisherman witnessed very high catch rates of bocaccio at the Cayucos Pier (just north of Morro Bay) during a family vacation in August of 1956. Sadly, Love lost half of his fishing pole through the slats in the Cayucos Pier during this experience, and did not manage to land any of these fish himself. Large numbers of bocaccio were also observed in pier fisheries in the Central California region during the fall of 1966, accounting for 26.4% of the 1.3 million fish estimated to have been caught in pier fisheries in three different central California counties during that year (Miller and Odemar 1968).

The bulk of the pier data were obtained from the RecFIN database covering most of the years from 1980 to 2008. RecFIN records of bocaccio catch per angler hour were summarized by years (26), 2-month waves (3), and counties (6), each combination constituting a single record. Records with bocaccio mean length larger than 175mm FL were dropped (9 positive records). Also, the seasonal frame was restricted to May-October, which removed two more positive records, leaving 42 positive records out of a total of 438. No pier-caught bocaccio were seen in 13 of the years, and bocaccio were very rare in some locations such as Los Angeles and Ventura Counties.

Analysis of an initial GLM including year, wave and county effects indicated that the three wave effects were indistinguishable, allowing the model to be simplified to just year and county effects. Individual wave records were treated as replicates. AIC values showed no significant difference between gamma and lognormal models (deltaAIC = 0.06) , and the estimated gamma shape parameter of 86.7 indicated a non-zero mode for the positive observations. Consequently the lognormal model was chosen for the pier CPUE data. Values for the 13 zero-index years were replaced by minimum values of 0.01, which is about one-half the smallest non-zero estimate, and associated CVs were set at 1.5. All of the CVs were subsequently converted to standard errors in log space (sigma) by the transformation, sigma = sqrt(ln(CV^2+1)). These data were merged with the RecFIN data to produce the final index values. Miller and Gotshall (1965) anecdotally observed that bocaccio catch rates had been much higher in 1954 and 1956, so nominal index values for those years were set at 0.1 (1955 and 1957 were set at the default minimum of 0.01), and all were assigned large CVs. The final time series is shown in Figure 46b. The value for 1966 is quite high, but is strongly supported by observed data.

Midwater juvenile rockfish survey

The Fishery Ecology Division of the Southwest Fishery Science Center has conducted a standardized midwater trawl survey during May-June aboard the NOAA R/V David Starr Jordan every year since 1983. The primary purpose of the survey is to estimate the abundance of pelagic juvenile rockfishes (*Sebastes spp*.) and to develop indices of year-class strength for use in groundfish stock assessments on the U. S. west coast. This is possible because the survey samples young-of-the-year rockfish when they are ~100 days old, an ontogenetic stage that occurs after year-class strength is established, but well before cohorts recruit to commercial and recreational fisheries. This survey has encountered tremendous interannual variability in the abundance of the ten species that are routinely indexed, as well as high apparent synchrony in abundance among the ten most frequently encountered species. Past assessments have used this survey as an index of year-class strength, including assessments for widow rockfish (He et al. 2005), Pacific hake (Helser et al. 2006), shortbelly rockfish (Field et al. 2007) and chilipepper rockfish (Field 2008).

Historically, the survey was conducted between 36°30' to 38°20' N latitude (approximately Carmel to just north of Point Reyes, CA), but starting in 2004 the spatial coverage expanded to effectively cover the entire range of shortbelly rockfish indexed in this model, from Cape Mendocino in the north to the U.S./Mexico border (Sakuma et al. 2006). Additionally, since 2001 juvenile rockfish data are available from a comparable survey conducted by the Pacific Whiting Conservation Cooperative and the Northwest Fisheries Science Center (spanning from just south of Monterey Bay to Westport, WA; see Sakuma et al. 2007). Comparison of the coastwide data have revealed two types of shifts in the distribution of most pelagic species, in which species characterized by a more southerly geographic range (e.g., bocaccio, shortbelly, and squarespot rockfish) were caught in relatively large numbers south of Point Conception, while species with more northerly distributions (widow, canary, and yellowtail rockfish) were caught in moderate numbers north of Cape Mendocino. Thus the near absence of fish in the core survey area during the 2005-2007 period, which saw two of the lowest abundance levels of juvenile rockfish ever observed in the core area time series, was associated with an apparent redistribution of fish, both to the north and the south.

The survey index is calculated after the raw catch data are adjusted to a common age of 100 days to account for interannual differences in age structure. For this assessment cycle, a number of survey indices were developed by S. Ralston (SWFSC) as a combined index that uses both SWFSC and NWFSC/PWCC survey data (report in supporting materials). As the core area index seems to have failed to capture the magnitude of the 1999 year class for most stocks, the recommendations from the juvenile rockfish survey workshop held in 2005 were to exclude the core juvenile indices unless a convincing case could be made otherwise. The coastwide juvenile bocaccio index (Figure 47) was developed by integrating the results of both surveys in an ANOVA model with year, latitude, vessel, period, and depth effects, was used to inform the relative year class strength for the years 2001-2006. Past assessments have used a power coefficient to transform the index (He et al. 2006), based on the assumption of a compensatory relationship between pelagic juvenile abundance and subsequent recruitment to the adult population following settlement (Adams and Howard 1996). However, due to the short duration of the time series, a power transformation was not estimated for the coastwide index in this assessment.

D.2 History of modeling approaches and transition to new modeling platform

D.2.a Pre-STAR Panel Consultations

Due to time and budget constraints, a pre-assessment data workshop was not held for the bocaccio stock assessment. Email communications were exchanged between the STAT team and the GAP, GMT and PFMC representatives regarding major changes to the model and the new data sources being considered. In particular, a draft of the historical catch reconstruction was circulated to these members, as this was among the more significant changes with an effect on the ultimate model outcome.

D.2.b Responses to previous STAR Panel recommendations

The 2003 STAR Panel report and subsequent STAR Panel reports from the 2005 and 2007 updates highlighted a number of recommendations for future research activities. All of these recommendations were addressed to the greatest extent practicable in this assessment. The primary research recommendations from the 2003 STAR Panel report, and a narrative on how these recommendations were addressed, follows. Most of the 2005 and 2007 STAR Panel recommendations were similar in nature, those that are not addressed in the discussion below are summarized and responded to in the paragraph that follows the response to the 2003 recommendations.

> *Due to the extensive fishery closures and regulations prohibiting retention of catch in excess of the legal limits, fishery CPUE indices in the future will be biased indices of abundance. The Council and NMFS need to consider to how to monitor bocaccio status in the future. The CPFV data set consisting of reef-specific indices of abundance from partyboats is extremely valuable for evaluating of local fishing effects and as an index of overall abundance. Reef-specific CPUE is not as subject to the typical limitations of fishery CPUE data. A program of exempted fishing permits for partyboats with observers to monitor stock status should be considered.*

The Southern California Bight hook-and-line survey discussed earlier was developed in part as a result of that recommendation (Harms et al. 2007; Harms et al. in prep), and is incorporated into this assessment. The performance of this index is discussed in the model evaluation section. The STAT Team also points out that the CalCOFI larval abundance index, which represents the longest (largely) continuous time series of relative abundance for any west coast groundfish, seems to be working well for bocaccio over long time periods, and it is doubtful that exempted CPFV fishing would provide information of greater utility. This is particularly true given the uncertain effects of the area closures (CCAs and RCAs), particularly in southern California, which are likely to be biased with respect to relative abundance trends which are currently limited to those regions open to fishing and do not sample in regions where fishing has been excluded (now for nearly 8 years). The diagnostics of the relative shift in the spatial distribution of spawning output inferred from the larval production paper (Ralston and MacFarlane, in review) provide substantive evidence of this problem.

> *More attention needs to be given to how growth is modeled in the assessment. A model with time varying growth or cohort-specific growth may improve the fit to the length frequency data. Alternative ways to model variation in length with age should also be considered. Also, the Panel recommends that ageing of bocaccio be re-visited. A modest ageing sample could be used to evaluate whether the linear trend in the coefficient of variation (CV) of length with age in Stock Synthesis is a reasonable assumption, as well as confirming the model estimates of growth.*

In this assessment, growth is revisited and continues to be estimated internally. Although improvements in the fits to the length composition seem to reduce the necessity of exploring time-varying growth, there are still patterns in the residuals that suggest either time- or cohort-specific growth patterns that contribute to poor fits to some data. Initial efforts to incorporate time-varying growth did result in an improvement in the fit to the data and indicate that this process is important to incorporate into the modeling framework. However, the initial results also suggest that the results of the base model change only marginally with incorporation of time varying growth, thus for the purposes of this assessment, time-varying growth is not adopted. The CV of length at age was explored to the extent it could be with available data as well as through the relative change in fit with varying values, and profiles of the CV of length at age were used to inform the final values. Although several age validation manuscripts have been published since the 2003 assessment, all recognize the difficulty in ageing bocaccio; we have initiated an effort to better understand if, and why, bocaccio from the southern region of the California Current appear to be more difficult to age than those from the north, which likely is a combination of factors relating to the differences in the seasonality of secondary production among these regions, acting in concert with the very rapid and likely variable growth typical of bocaccio in the southern region.

> *The Stock Synthesis model apparently does not perform well with the diverse data sets used to assess bocaccio. Consideration should be given to moving the bocaccio assessment to a new modeling environment, ideally one with optimization routines using automatic differentiation rather than numerical differentiation as in Stock Synthesis.*

Movement of the model to the SS3 modeling platform addressed this need in a highly satisfactory way, with an apparent improvement in model performance, improvements in fit related to more plausible model parameters (e.g., steepness), and greatly improved run times (draft base model run time is approximately seven minutes without inverting the Hessian matrix, versus over two hours for the 2003 SS1 model).

> *Early catch history of bocaccio is a significant source of assessment uncertainty. Focused research on historical catch is needed. A comprehensive approach should be taken where historical catches of all West Coast groundfish species are investigated at the same time. Assessing historical effort in West Coast groundfish fisheries may be more successful as a collaborative undertaking between an expert in historical research and a stock assessment scientist.*

As discussed in the comparison to the most recent assessments, this assessment uses a greatly revised catch history based on a major effort to reconstruct historical landings for groundfish throughout California waters. The authors of this assessment were deeply involved in this effort.

> *Work needs to be done to figure how to the start the model with appropriate initial conditions and with sensible initial depletion which is consistent with the data.*

The revised catch history and time period of the model (which now starts in 1892 rather than 1950) addresses these concerns.

> *The relationship between the CalCOFI index and climate should be evaluated. Two analyses are suggested. The first is to compare the residual patterns in model fits to an environmental index such as the Scripps Pier water temperatures. Adding an environmental covariate to the CalCOFI index catchability coefficient may improve the model fit to the index if annual egg production is influenced by environment conditions. A second analysis would be to compare biomass trends to indices associated with regime-*

scale environmental variability to see if significant correlations exist that would help explain long-term abundance trends.

We have not had sufficient time to evaluate this in great detail. However, initial evaluation of the residuals of the CalCOFI index to environmental indices (such as the multivariate ENSO index or the Pacific Decadal Oscillation index) do not show great promise for explaining much of the variability; interestingly the fit to climate indices tends to be better with the raw data than with the residuals to the fitted index (although neither would be considered a good fit in any meaningful sense). This suggests that climate conditions relate to fecundity (larval production) patterns as well as growth, and these interactions will be investigated in greater detail in the interim period between this assessment and the next assessment cycle, in concert with the research efforts related to time varying growth (discussed above).

The recommendations of the 2005 and 2007 STAR Panels (for the two assessment updates) varied little from those in the 2003 STAR Panel report, and the vast majority are consequently addressed in the above discussions. Among the topics not explicitly addressed in the above responses from the 2005 STAR Panel were the observation that an exploratory delta-GLM analysis of the triennial survey appeared to offer a more promising approach to evaluating the information from that time series (implemented in this assessment for both the triennial and the NWFSC combined survey); that the multiple spawning of bocaccio should be investigated with respect to the significance of this on larval counts or juvenile indices (addressed to some extent in the Ralston and MacFarlane, in review, manuscript described in this document); and that consideration should be given to the development of a more spatially-disaggregated model for bocaccio, similar to the approach developed but rejected in the 2002 model. Among the topics not explicitly addressed in the above responses from the 2007 STAR Panel report were to evaluate assumptions about stock structure and boundaries in light of information on catches of bocaccio rockfish taken off Mexico, Oregon, and Washington (addressed to the extent practicable in the discussion on genetics, stock structure and differences in growth and maturity patterns between the southern region modeled here and the northern/Canadian regional center of bocaccio abundance); and that length data be modeled seasonally (not addressed in this model).

D.2.c Transition to SS3 modeling platform and comparison to most recent assessment

In the last full assessment (MacCall 2003), contrasting information from a low 2001 triennial trawl survey data point with high recreational CPUE indices was difficult to reconcile, and the STAR Panel consequently adopted two "equally likely" but separate models. The first omitted the triennial trawl survey data (STARb1) and the second omitted the recreational CPUE data (STARb2). The STAT Team preferred a single, intermediate model (STATc) which included all of the data despite their inconsistencies, and the PFMC's SSC subsequently agreed that all three models could be considered by the Council as bracketing the full range of uncertainty. The STATc model was subsequently the focus of the two updates to the 2003 model (in 2005 and 2007), with updated data sources confirming the strength of the 1999 year class (which had been observed to be strong in the 2003 assessment) and a relatively high 2004 triennial survey data point reducing (albeit not eliminating) the tension between the triennial survey and the recreational CPUE indices. Consequently we focused our attention on developing an SS3 model comparable to the most recent update of the STATc model in 2007.

To replicate the 2007 STATc model (herein called the 2007 model), an SS3 model was developed with an identical time frame and fisheries (trawl, hook-and-line, set net, recreational south and recreational central) as well as three surveys (CalCOFI larval abundance, triennial trawl survey, and the CPFV observer survey referred to as the Wilson-Vandenberg survey in the 2007 model). The 2007 model, as with earlier models, was a length-based model, the 2007 model began in the year 1951 with equilibrium catches estimated at 2000 mt/year and significant initial depletion. Landings were unchanged, as were the years in which recruitment deviations were estimated. Survey and length frequency data from the SS1 model were imported into the SS3 file structure with the associated tuned CVs and effective sample sizes from the tuned 2007 model. As with the 2007 model, the lambda (emphasis) on the stock/recruitment relationship was downweighted to 0.1, all other likelihood components were set at 1.

As the selectivity curves in the 2007 model were double logistic, the curves were duplicated as closely as possible using the double logistic parameterization in SS3 and "fitting" the curves visually with the slider bars in the selex24 spreadsheet provided by Rick Methot. The parameters from these "fits" were used as fixed values in the SS3 model. While not absolutely identical, the selectivity curves were replicated with a high degree of accuracy and we expect that their performance was effectively identical to the 2007 model parameterization (spreadsheet and parameters to compare the selectivity curves available upon request). As in the 2007 model, the selectivity of the CPFV observer time series was set equal to that of the central recreational fishery. The growth parameters in the SS3 model were estimated with a T_{min} of 1.6 and a T_{max} of 25 with starting values taken from the 2007 assessment (noting that the growth parameters were freely estimated in the 2007 model as well). All other biological parameters (natural mortality, weight/length, maturity, fecundity) were set to the 2007 model, as was sigma-R (set to 1). As R0 was to some extent a nuisance parameter in the 2007 model (model estimated h was approximately 0.2), this parameter was freely estimated in the SS3 model, and a range of steepness values was explored.

The trends observed in the SS1 model could be simulated reasonably well in SS3, however could not be perfectly replicated. There have been tremendous changes between the SS1 and SS3 modeling framework, including the use of ADMB and changes in the parameterization of the spawner-recruit relationship and the recruitment deviation values. The current model (SS3) fits vector of recruitment deviation parameters, by contrast, SS1 would fit individual log recruitments and then estimated the spawner recruit relationship with a component of goodness of fit to that relationship. The high recruitment variability observed in all previous bocaccio models led to very poor estimates of productivity (steepness) in the spawner-recruit relationship, and the emphasis on this relationship was downweighted in the final model. The earlier (SS1) model did not have as sophisticated a translation between pre-dev and post-dev bias adjustments to the spawner-recruit relationship, which is also likely responsible for some of the discrepancies between the models run with identical data and similar parameterizations. Other changes in the model structure that may have led to discrepancies between SS1 and SS2 (and would therefore be equally true for transitioning to SS3) were reported in the 2004 modeling workshop. For example, the likelihood components associated with length-frequency data often differed among the two modeling approaches, likely due to a simpler structure implemented for the emphasis coefficients in SS2. Another modest change was that small constants (which can be user defined) are added to composition data in SS2 (an option not available in SS1), mean weight at age is calculated from weight at length internally (rather than input directly) and SS1 had no adjustment for growth of individuals in the accumulator age within the population (Summary Report from the Stock Assessment Modeling Workshop, October 25-29, 2004, Northwest Fisheries Science Center).

Despite these discrepancies, the SS3 model replicated general trends in biomass, spawning output and recruitment with a fairly high degree of similarity (Figures 48a-c). As early runs clearly indicated that the low steepness (h=0.21) scenario was not as comparable as runs with higher steepness values, we explored a range of steepness values, including the h=0.44 estimate (based on the posterior median estimated in the 2007 model), and scenarios in which h was fixed at the 2007 Dorn prior (based on updating the rockfish steepness meta-analysis of Dorn 2002) of 0.61, as well as the mean plus one standard deviation (h=0.79). Interestingly, the trends from the SS1 model were best replicated with a considerably higher (0.79) steepness value; the SS3 model with steepness set to the SS1 estimated value of 0.21 diverged notably in the early part of the model (particularly the 1960s through the early 1970s, during which CalCOFI larval abundance was essentially the only source of information). Additionally, the Hessian does not converge when steepness is fixed at 0.21, suggesting that the low steepness configuration was inconsistent with the data and results. In general, the model run with steepness set at 0.44 and 0.61 resulted in trends and reference points similar to the h=0.75 run, and a likelihood profile demonstrated that this version was close to the best-fitting estimate of steepness for this SS3 model configuration. Likelihood values were quite different between the SS1 model results and the SS3 models, further evidence that the substantial changes in the modeling framework have made exact replication of the results nearly impossible.

All of the SS3 models estimate a slightly lower total biomass and spawning output (relative to the SS1 model) during the period from the mid-1970s through the early 1990s, the cause of this discrepancy is unclear. There are some interesting differences in the distribution of recruitment pulse in the early 1960s that is driven by the fits to CalCOFI data, with the "high steepness" SS3 model "smearing" the unusually strong 1962 year across several years, while the low steepness models reflect a single year pulse of strong recruitment. As these recruitments are driven by trends in the (somewhat noisy) CalCOFI data rather than informed by length information on recruitment, this presumed artifact of the manner by which recruitment deviations are estimated is of little concern, particularly as later recruitments (which are informed by very strong signals in length frequency data) are nearly identical during most of the modeled period. Similarly, all three models produce nearly identical estimates of the total and spawning output from the late 1990s to the end of the modeled period (2006), such that the range of difference in ending (2006) spawning output among these three models is less than 27 mt. However, the resulting depletion levels in 2006 differ more significantly, from 12.7% of SSB_0 in the SS1 model to 16.9% of SSB_0 in the SS3 model with low steepness (h=0.21) model and 20.7% of SSB_0 in the h= 0.79 model, due to the substantial differences in the estimated unfished spawning output levels among the models. Table 22 provides the estimated mean unfished recruitment, SPR, SSB_0 and relative (2006) depletion for the 2007 SS1 model relative to the 2009 SS3 model that is most similar to the SS1 biomass and spawning output trajectories (the h=0.79 version). Although the percent change was not trivial for all of these metrics, it was relatively modest (within 10%) for all.

To compare the influence of the new catch data, which together with the transition to the SS3 modeling platform are the most significant and influential changes in this assessment, we next compared the SS3 version most compatible with the 2007 SS1 model (the h=0.75 version) with the same model after the revised catch history and start year were revised from the 2007 model. As with the comparison between SS1 and SS3, the two models track each other closely in the recent historical period (~1970-present), however the revised catch history leads to a major change in the perception of starting (unfished) biomass and the relative abundance of bocaccio immediately prior to the 1950s when the 2007 model was initiated. The greatly revised catch history is largely responsible for this shift; whereas the SS3 best fit to the 2007 model had a initial (1950) equilibrium depletion level estimated to be at 43% of the equilibrium unfished level, the same model with the revised catch history and start year of 1892 had a 1950 depletion level of 87% of the unfished spawning output (Figures 49a-c).

This is due to the fact that the model beginning in 1951 had an estimated equilibrium catch of 2000 mt, comparable to the total estimated catch of bocaccio in the 1950s in the catch reconstruction developed for earlier assessments (Ralston 1996). In contrast, while the results of the catch reconstruction effort (Ralston et al., in prep) are consistent with that level of landings in the 1950s, catches of bocaccio in the 1940s appeared to be at relatively low levels, despite the fact that total catches of rockfish in California waters increased rapidly during this period. However, much of this increase was in northern California waters, particularly north of Cape Mendocino, where bocaccio appear to have historically represented a much smaller fraction of total rockfish catches. As described in the catch reconstruction document, as well as the abridged discussion of the catch reconstruction in this document, bocaccio trawl catches rose rapidly from several hundred to nearly 3000 mt per year during the 1950s as the balloon trawl fleet expanded from Oregon and northern California waters to central California waters (declining again in the late 1950s and early 1960s). Bocaccio catches in central California until that period had rarely been greater than 500 to 600 mt, caught primarily with hook-and-line gear. Overall, this revision is the primary cause of one of the most significant changes in our perception of the relative stock status of bocaccio in California waters. Remaining revisions are numerous, and are discussed in the description of the base model, the intent here was to capture the history of modeling approaches used in the last several assessments (including updates) and provide documentation of the major aspects of the transition from the last assessment.

D.3 Model Description

Modeling software

This assessment used the Stock Synthesis 3 modeling framework developed by Dr. Richard Methot (Methot 2009a; Methot 2009b). For the comparison to the SS1 assessment, we used the most recent (at the time) version, (SS-V3.02B). The final model used the most recent version at the time (May 2009), SS-V3.03A.

Model Priors

This model used uninformative priors on many of the selectivity parameters in early modeling efforts, which contribute trivially to the total likelihood function. The Dorn (2002 and updated, pers. comm..) beta prior distribution for steepness was used to steepness in both the early modeling to compare the SS1 bocaccio model to the SS3 model, and in the final base model. The final base model steepness was estimated with the updated Dorn prior following the reanalysis of past stock assessments, which for bocaccio was 0.736 with a standard deviation of 0.186, considerably higher than the 2007 bocaccio point estimate of 0.612 with a standard deviation of 0.18. The resulting model posterior was 0.573 (nearly one standard deviation below the point estimate), which was consistent with the results of a likelihood profile across the fixed values of steepness.

D.3.a Base model selection, evaluation and description

From the SS3 model developed to evaluate the transition from SS1 and the impact of the revised catch history (describe in detail in the previous section), a number of alternative models were explored, for which comparable sensitivity analysis similar to that provided to document the transition to SS3 and the revised catch reconstruction would be overwhelming. New or revised survey indices, length frequency information, growth and maturity parameters, and other explorations were done based in part on the availability of new information and time, through over 100 versions of the control and data files (including a transition from the earlier version of SS3 and the May 2009 release of SS3.03). For example, in evaluating the utility of modeling northern and southern trawl fisheries independently, we implemented an incremental approach in which we visually evaluated the length frequency data by port group, compared the results of pooling all length frequencies, of pooling length frequencies north and south of Cape Mendocino, and of pooling length frequencies north and south of 38° N. In all cases the two fleet models had selectivity curves estimated independently and jointly ("mirrored"), and the relative improvement in fit with independently estimated curves, as well as visual analysis of the residual patterns, was used to divide the data from this fleet north and south of 38° N. Additionally, while the F estimation method in the early comparison models was based on estimating fishing mortalities as year and fleet specific parameters (comparable to the SS1 model), the new model uses the "hybrid" method (Methot 2009b), which reduced the run time from ~40 minutes to ~7. While the data, control and many of the output files are archived from this transition, including an annotated log of the significant change in each model version, the number of model versions and minor changes (many of which were reversed or later superseded by other changes) is too lengthy and convoluted to present in a clear and concise manner. Consequently, the impacts of the most significant of those changes are evaluated in the model sensitivity section.

As mentioned earlier, these changes include an expansion of the modeled assessment area, such that the northern boundary is now Cape Blanco, OR rather than Cape Mendocino, WA. In part due to this change, and in part due to patterns observed in the trawl length frequency data by port group, the trawl fishery was subsequently split into a northern and southern trawl fishery. The remaining fleets (hook-and-line, set net, southern recreational and northern recreational) are consistent with earlier modeling approaches. In the base model we include most of the survey indices, which include the trawl CPUE time series (linked here to the southern trawl fishery), the three recreational CPUE time series, the triennial trawl survey index (based on the GLMM index), the new NWFSC combined survey index, the new NWFSC Southern California Bight hook-and-line survey, the revised pier index and the revised (coastwide) pelagic juvenile index.

The power plant impingement data is not included, as it has not been updated to reflect recent years, and recruitment for the years for which the data do exist are well informed by length frequency data. The larval abundance biomass estimates were not included in the base model due to the mismatch in the spatial distribution of the estimates. Many of the selectivity and other parameters are estimated with diffuse, normal priors that are close to their final estimated value, which seemed to be helpful in stabilizing the model early in the development (particularly for growth parameters).

Although the base model is not spatially disaggregated, most of the data sources have some regional bias within the assessment area, thus the spatial nature of the various fisheries and indices is captured to the extent practicable by the separation of fisheries and indices. As described earlier, the trawl fishery was broken up into southern (south of 38° N) and northern fleets, as described above, the geographic pattern of other fisheries was held constant relative to earlier model configurations. In other words, both hook and line and setnet catches and length frequency data were pooled across all areas (although catches are very low north of Cape Mendocino, and there were no data for the small amount of the assessment area north of the California/Oregon border for these fisheries), and the recreational fisheries were treated independently north and south of Point Conception, CA (34.5° N). The three recreational fisheries indices are in turn based on data exclusively from southern or central/northern California respectively, similarly the trawl fishery CPUE index is derived from data derived from central California logbooks (this time series is linked to the trawl fishery south of 38° N), and the triennial trawl survey reflects data N of 34.5° N (with inconsistent coverage between 34.5° N and 36.5° N). The NWFSC combined trawl survey covers the entire assessment area, although trawl density is relatively sparse south of Point Conception, and the survey does not sample within the Cowcod Conservation Area (CCA) closures. The NWFSC hook-and-line survey is exclusive of the southern California Bight (south of Point Conception), although this too excludes the CCAs. The CalCOFI indices, while inclusive of data from the central California for many years, primarily reflect the "core" CalCOFI survey area (south of 35° N), the pier index reflect primary central (south of 37° N) and southern California, as juveniles are rarely caught in pier fisheries north of Half Moon Bay, while the coastwide juvenile survey includes data from the entire assessment area, although most data is from north of Point Conception (34.5° N).

In the base model, the size at age 1.5 is fixed at 26 cm for both males and females (as discussed in the growth section), although values for sex-specific Lmax and K are freely estimated for each sex (estimation is as independent parameters, rather than the option in which male growth parameters are estimated as exponential offsets from females). Growth is time-invariant in the base model. Other growth and maturity parameters are fixed as discussed in the section on growth and maturity. Length bins start at 16 cm (versus 26 in the 2007 model) and are incremented at 2 cm intervals to the largest sizes (68, 72 and 76 cm), at which point bins are in 4 cm increments due to the relative rarity of larger fish (as in the 2007 model). Ages 0-20 are individually tracked, with 21 representing the accumulator age. R_0 (mean unfished recruitment) is freely estimated, steepness is estimated with an informative prior as described above, and sigma-R is fixed at 1. Recruitment deviations are freely estimated from 1954 through 2008; early deviation parameters are influenced only by the CalCOFI and pier index data, while year class strengths from about 1970 through 2006 are well informed by length data. The most recent years (2007-2008) are influenced primarily from the juvenile trawl index. All catchability coefficients (q parameters) in the base model were freely estimated as nuisance parameters. Recruitment deviations were estimated from 1954 through 2008, a slight shift from the 2007 model which began estimating recruitment deviations in 1960. This shift was done to allow the incorporation of some information from the pier survey index, but the difference between a start of 1954 and 1960 was negligible.

As with earlier models, and as noted in earlier STAR panels, the parameterization of the selectivity pattern for the triennial survey is notoriously unstable. In both early and quasi-final versions of this assessment, it was noted that when the model was "jittered" or when some starting (initial) values were altered, the selectivity pattern for this survey would vacillate between a strongly dome-shaped pattern (in which selectivity was greatest for age 1-2 fish, and declined sharply for larger, older fish) and a nearly asymptotic pattern (in which selectivity rose sharply for young, small fish but stayed high into larger, older fish, declining very modestly at sizes greater than approximately 70 cm). This seemed to be the result of two local minima in the negative log likelihood. Although the dome-shaped selectivity pattern resulted in an improved fit to the data, the model seemed to be unable to achieve that minimum in many model runs in which initial values were "jittered." This same phenomenon took place with both the NWFSC combined survey selectivity pattern, and the selectivity pattern for the southern trawl fishery; in the case of the latter, an approximately 100 likelihood point difference took place when the jittered run found the local minimum associated with the "asymptotic" selectivity relative to the dome-shaped.

Consequently, the selectivity patterns for the triennial survey were fixed at values arrived at from the best fitting "jittered" run, the selectivity pattern for the NWFSC combined survey was fitted as asymptotic, and the latter five (of six) selectivity parameters for the southern trawl fishery were fixed at the values that resulted in the best fit to the data upon multiple "jittered" runs (parameter 1, the peak of the ascending inflection, remained freely estimated). The selectivity pattern for the southern fishery is best fitted as a double-normal selectivity option, while the northern fishery is best fitted as an asymptotic selectivity option. Selectivity patterns for the hook-and-line, set net, and southern recreational fishery are also modeled as double-normal, while the selectivity for the central/northern recreational fishery is modeled as asymptotic. Selectivity patterns for the triennial survey and the NWFSC Southern California Bight hook-and-line survey are modeled as double-normal, while the selectivity for the NWFSC combined trawl survey is modeled as asymptotic (see below). Selectivity for the CalCOFI larval abundance time series is set to mirror population fecundity, while selectivity for the age 0 recruitment indices is strictly age-based, such that age-0 fish are fully vulnerable and all other ages are fully invulnerable. Upon fixing these parameters, model results were generally stable when jittered, although slight excursions (of 0.5 to 1.5 likelihood units) did take place in a small fraction (approximately 30%) of the jittered runs. This likely reflects an irregular likelihood surface, and similar results have been seen in many other relatively "data rich" models in which there are conflicting signals from various data sources. Although a cause for some concern, the effects of this did not seem to be severe with respect to the model results.

As so many of the survey variances were derived from different approaches (jackknife routines, MCMC routines, ANOVA routines), iterative re-weighting was applied to these indices by adding a constant to the variance adjustment in the control file such that the model estimated

RMSE was approximately equivalent to the mean input RMSE plus the adjustment (within ~5%). Table 23 reports the model observed RMSE values, along with the mean input values and the input variance adjustments. Similarly, effective sample sizes for the length frequency data were iteratively reweighted using the multiplicative scalar to adjust the input sample sizes for each fleet. Table 24 reports the mean input sample sizes, the mean effective sample sizes, and the corresponding multiplicative scalars used to reweight the length frequency data in the base model.

Table 25 shows values for the key fixed parameters, and all estimated parameters, along with the model estimated standard deviations for estimated parameters (although steepness was fixed, the standard deviation from the run where steepness was estimated with the Dorn prior is also reported, in parentheses). The model estimated growth curve is also shown as Figure 50, all of the estimated selectivity curves are shown as Figures 51a-j. The southern trawl fishery, hook-and-line, set net, and southern recreational fisheries all had greatly improved fits to length data with dome-shaped (double logistic) selectivity, while the central/northern recreational fishery and the northern (north of 38˚) trawl fishery fits to length data did not improve with double-logistic selectivity, and were fit using logistic selectivity curves. As discussed above, the triennial survey selectivity was fixed to avoid local minima in the negative log likelihood surface, as were all but the peak selectivity parameter for the southern trawl fishery. Although it seems illogical that the NWFSC combined survey would have a selectivity pattern dramatically different from the triennial trawl survey, the fit to the length frequency data degraded substantially when dome-shaped selectivity was either "fixed" for this survey, or when selectivity was explicitly linked ("mirrored") to triennial selectivity. The best fitting selectivity curve using the double-logistic parameterization was "virtually logistic," thus a logistic curve was used for this survey. The CPFV observer index and associated length frequency data from the central/northern California recreational fishery were explicitly linked to the central/northern CPUE time series based on the RecFIN dataset (and associated length frequency data) by mirroring those selectivity curves. and Figures 52a-b show the estimated recruitment deviation parameter values and the associated asymptotic standard error.

STAR Panel Requests and Response by the STAT Team

1. Eliminate the central CA rec. CPUE (MRFSS) index. Rationale: These data could be misleading because they may be more indicative of changes in the spatial pattern of the fishery than in the fish stock.

Elimination of the central recreational cpue index resulted in a drop in 2009 depletion from 25 to 22%. The index was ultimately included in the final model (see request #11).

2. Iteratively up-weight each informative index to determine the major conflicts in the model and to bracket more of the model uncertainty (adjust lambdas) and determine the estimates of current biomass and depletion under each scenario. Rationale: To identify major conflicts amongst the biomass indices and determine which indices were optimistic and which were pessimistic.

Due to growing run times, this request was not fully completed, and results that were completed were merged with request number 3.

3. Iteratively re-weight "optimistic" indices and "pessimistic" indices Rationale: To provide a useful pair of runs to bracket uncertainty.

Response: Based on both past assessments and various sensitivity analyses in the draft assessment, the STAT and STAR had identified the fundamental tensions in this model as being primarily between two pessimistic indices, the triennial trawl survey index and trawl fishery CPUE and two optimistic indices, the southern recreational CPUE index and the CalCOFI larval abundance index. The two pessimistic indices both indicate a steep decline in the 1980s, a decline also observed in the optimistic indices (albeit of lesser severity), while the two optimistic indices both suggest stronger rebuilding in the early 2000s. Upweighting the pessimistic indices resulted in a better fit to the 1980s decline and changed depletion to 16% (from the then "base" level of 22%). Upweighting the optimistic indices produced a better fit to the 2000s rebuild and indicated considerably less depletion (39% when recSO was upweighted; 36% when CalCOFI was upweighted).

4. Evaluate the effect of the relative weighting of the biomass indices and the compositional data by down-weighting the compositional data. Rationale: To determine whether there are any conflicts between the biomass and compositional data.

Response: All length frequency lambdas were scaled by 0.5 and 0.25 in two separate runs, and by fishery-specific scalars provided by the STAR Panel based on a methodology developed by Dr. Chris Francis (see STAR Panel report). The overall effect relative to the base model was fairly modest, the fit to survey indices improved by less than 2 likelihood points with lambdas of 0.5, another 3 with lambdas of 0.25. Fits to the trawl CPUE and triennial index improved more, resulting in a slightly more pessimistic perception of stock status (depletion in 2009 changed from 0.22 to 0.21 with lambda of 0.5, and to 0.20 with lambdas of 0.25). The result was similar when the lambdas were scaled by the values provided by the STAR Panel, with a consequent dip in depletion from 0.22 to 0.19.

5. Do a model run as a sensitivity analysis that incorporates all coastwide catches and mirrors selectivity of the northern trawl fishery. Rationale: To evaluate the effect of uncertainty about the northern boundary of the stock.

Response: The primary consequence of including OR and WA catches (when the compositional data were not included) was simply to scale up the biomass trajectory. In this scenario, the catches were simply combined with the "northern trawl" fishery catches, and the estimated current status was slightly more pessimistic (23% depletion, from 22%).

6. Do an additional model run as a sensitivity analysis that incorporates all coastwide catches and compositional data. Rationale: To evaluate the effect of uncertainty about the northern boundary of the stock.

Inclusion of the compositional data required the creation of a 7th "fishery" for Oregon and Washington landings and length frequency information. As length comps, which were based on relatively sparse data, were comprised almost exclusively of very large fish, an asymptotic selectivity curve was used, adding two parameters to the model. No relative abundance indices were available for this region. In this scenario, the assessment became more optimistic (28% depletion), although the exact reason was unclear. Growth parameters changed slightly in this scenario, with L_{max} increasing by several cm for both males and females, and the growth coefficient (K) decreasing, resulting in a degraded fit to many of the length compositional data. One problem noted with this approach is that the size bin structure developed for the base model is not optimal for the large sizes of the fish observed in northern catches.

7. Fix M for older fish at 0.1 and allow M to be estimated for younger fish. Rationale: Based on the Hoenig method, an M of 0.1 is more consistent with the longevity data than the current value of 0.15. There are also indications that mortality of younger fish (before settlement to demersal habitat) may be higher that that of older fish.

Response: The result is highly sensitive to the (assumed) fixed ages of "young" and "old" mortality rates (rates are interpolated between the two). If "young"=3 and "old"=5, M_{young} is estimated ~0.06, a counterintuitive result. However, if "old" age is 8 or 10, M_{young} estimated at 0.17 and 0.21 respectively. Depletion changes from 0.22 in base, to 0.20 and 0.19 in the latter two cases. Overall fit degrades 25 and 20 units respectively, with improvement to the pessimistic indices and degradation to the optimistic indices (CalCOFI, Southern RecCPUE). Although the STAT and STAR were in agreement that the assumed value for natural mortality is not entirely consistent with estimates of longevity for this species, it was agreed not to change the value of M used in the base model, given the sensitivity to the definition of "old" fish age and inadequate data for estimation of M for "young" fish.

8. Include in the assessment report reference to the proposed listing of bocaccio in Georgia basin as endangered (under the terms of the Endangered Species Act). Rationale: A proposed listing of a distinct population segment of bocaccio rockfish is important background information that managers may want to consider when developing management measures for rebuilding the southern bocaccio stock.

Response: A new section has been drafted for the assessment report.

9. Assess the effect of the maturity curve by doing alternative runs using the maturity curves of Love et al. (1990) and Wyllie Echeverria (1987). Rationale: To evaluate the sensitivity of the assessment to previously published maturity curves.

Response: Although trajectories of biomass, spawning output and recruitment changed slightly, the effect on 2009 depletion was negligible (all 3 runs estimated 2009 depletion at 25%; note that this request was filled after implementing request 11). The Wyllie Echeverria (1987) curve resulted in a slightly poorer fit, the Love et al. (1990) maturity curve resulted in a modestly improved fit.

10. Specify the area covered by the assessment in the title of the assessment report. Rationale: To improved clarity since the entire US west coast was not assessed.

Response: The report title was amended to include the area assessed.

11. Include recCEN index back in the base model. Rationale: It seemed more reasonable that this index be downweighted, rather than removed, and the tuning procedure already does this downeighting.

Response: Reintroducing the recCEN index changed the depletion from 22% to 25%.

12. Conduct two runs to bracket the uncertainty in the assessment: one upweighting the triennial and trawlsou indices, and the other upweighting the recSO and CalCOFI indices. Rationale: To bracket the uncertainty.

Response: Upweighting an index was done by setting the associated $\lambda = 10$. The depletion changed from 25% to 14% when the triennial & trawlsou indices were upweighted, and to 38% when recSO and CalCOFI were upweighted. The standard deviation for 2009 depletion (based on the estimation of the hessian) was 0.033 (range 22-28%) but this only accounts for variance in estimated parameters.

13. Provide confidence intervals for model outputs, with and without delta method (McCall, in prep.) contributions for uncertainty in steepness, h, and natural mortality, M. Rationale: For models in which h and M are fixed, the usual confidence intervals (based on the inverse Hessian) may substantially underestimate uncertainty.

Response: When uncertainty in both M and h was included in the calculation of standard errors, this made the changes caused by the two bracketing runs (see request 12) approximately equivalent to ± 1 s.e. in depletion as estimated by the base model.

14. For the base model use the revised CalCOFI index (presented to the Panel) that utilizes a complementary log log link in the binomial part of the GLM (instead of the usual logit link). Rationale: An alternative GLM, using a complementary log log link in the binomial model, rather than the previously used logit link, fitted the CALCOFI data better (AIC decreased by 20 in the index GLM).

Response: This change had only a slight effect on the biomass trajectory, changing the depletion from 25% to 26%.

15. Conduct run in which catches north of 40° 10´ N were removed. Rationale: To evaluate the consequences of using the assessment to manage bocaccio fisheries south of 40° 10´.

Response: This change had only a slight effect on the biomass trajectory, changing the depletion from 26% to 27%. The catch north of 40° 10´ throughout the assessment period was approximately 6.7% of the total catch. The 2009 spawning biomass for the model excluding the catch north of 40° 10´ is 5.4% lower, while the summary biomass is 5.0% lower.

D.3.b Base model results

The base model results for summary biomass, spawning output, depletion and age-0 recruitment are shown as Figures 53-54, and in Tables 26. The initial unfished summary (age 1+) biomass is estimated to be 44,070 mt, with a spawning output (SSB_0) of 7,861 x 10^9 larvae and mean age 0 recruitment (R_0) of 5,060,000 recruits. The estimated steepness (h) for the base model was 0.573, approximately one standard deviation lower than the prior point estimate of 0.73. The initial (fixed) value for sigma-R was 1, the effective (output) sigma-R is 1.10; when the early years of estimated recruitments (1954-1969) are excluded the effective sigma-R remains high (1.16) indicating that the recruitment estimates for the early (poorly informed) part of the time series are not having an undue influence on the effective sigma-R. Sensitivity tests suggested little change in model fit or results when slightly higher fixed values for sigma-R were used. As the error around early recruitments is essentially as great or greater as sigma-R for most early years, these recruitments should be considered relatively poorly estimated from the data, and do not necessarily represent the nature of episodic recruitment in this early period that likely existed. The spawner-recruit curve, and the observed recruitments are shown as Figure 55. The total catches, fishing mortality rates (by fishery), estimated SPR rates and a phase plot of the SPR rates against depletion, are shown as Figures 56-57. Table 27 and 28 provide the numbers at age (female and male, respectively) estimated by the base model.

The summary biomass, spawning output and recruitment in 1892 (when the catch history begins) are slightly below the estimated unfished levels (96.8, 96.4 and 99.3% of unfished estimates respectively), due to the assumed existence of a very moderate fishery beginning in the 1850s. The population trajectory exhibits a very moderate decline until about 1950, when summary biomass, spawning output and recruitment are estimated to be at 82.6 80.7 and 95.7% of the unfished levels respectively. From 1950 through the 1960s the biomass is estimated to have declined steeply, as catches rose from several hundred to several thousand mt, reaching a local minimum in 1963 of 28.4% of the unfished spawning output, associated with harvest rates significantly above the (current) target levels. The biomass increased sharply thereafter, as a result of one or several very strong recruitment events in the early 1960s (informed primarily by the CalCOFI time series, with some support by irregular years of pier fishery data), exceeding the mean unfished biomass level through the early 70s, when catches again began to climb rapidly to their peak levels, associated with high (SPR of less than 0.2) fishing mortality rates and a rapid drop in biomass. By the mid 1980s depletion was at approximately 20% of the unfished level, and by the early 1990s depletion was at about 15%. Fishing mortality remained high throughout this period, even as catches declined rapidly, and recruitment during the 1990s was at very low levels. Fishing mortality declined only at the very end of the 1990s, in response to severe management restrictions. By 2002 SPR was generally close to or above 0.9, and in concert with a strong 1999 year, and relatively strong year classes in 2003 and 2005, spawning output has been increasing steadily. The base model estimates a current (2009) depletion level of 28.1%, a 2008 SPR of 0.947, with the forecast under constant harvest rates indicating a continued increase in spawning output.

Fits to the relative abundance indices, in both arithmetic and log space, and including plots of the observed vs. predicted values, are shown as Figures 58-67 for all of the indices used in the model. Fits to the length frequency data are shown as Figures 68-78. Fits to the CPUE indices were generally reasonable, the model was able to replicate the trends of both the trawl fishery and southern recreational fishery fairly well, although the model fits to the central/northern recreational fishery were poor, particularly in the last several years of the index, and the fit to the CPFV CPUE index completely missed the rapid rise and fall in catch rates from 1989 through 1992 that appears to have resulted from a strong 1988 year class. It is possible that a disproportionate influence of larger fish in the catches in some later years, when the fishery may have explored fishing grounds not widely exploited by recreational fleets earlier in the fishery, resulted in a selectivity curve that failed to predict higher catches of smaller fish from strong cohorts. Alternatively, strong year classes may result in large numbers of fish available in atypical habitat types (e.g., soft bottom) prior to dispersal, or fisheries may target abundant year classes resulting in higher catch rates and relatively greater catches of smaller individuals. Some greater exploration of this would be worthwhile. Fits to survey indices were also reasonable.

Although the relative lack of conflicting information facilitates the fit to the early years of the CalCOFI index, this index also captures the rapid decline in the 1970s through the 1990s and the increase in abundance in the post 1999 era that are observed in other indices and consequently predicted by the model. The use of the GLMM for the triennial trawl survey index also results in a relative improvement to the model fit to the data, although there is some suggestion of autocorrelation in the residuals in that the model underestimates the index in early years and overestimates the index in several years towards the end of the time series. As described earlier, there is considerable evidence that both past and present trawl survey methods are ill-suited for sampling bocaccio. The NWFSC trawl survey index and the index developed from the NWFSC hook-and-line survey in the southern California Bight are neither consistent with nor influential to the model estimated trends in abundance in recent years; both predict relatively flat or slightly declining trends while the model is estimating a relative increase in abundance. Although the pier survey index has little conflicting information for the early years, the data do conflict with the model biomass and recruitment estimates as informed by the CalCOFI data. This index does capture many of the strong recruitments in the period informed by length composition data (e.g., 1984, 1988, 1999, 2005), although it often underestimates the magnitude of these events, and also indicated strong year classes for several years in which strong cohorts did not later appear from the length composition data. The juvenile index seems to have overestimated the relative strength of the 2001 and 2002 year classes while underestimating the magnitude of the 2003 year class; the index may have captured the 2005 year class to a reasonable extent. The effectiveness of this index has yet to be determined, although the relatively low values observed are consistent with the generally unusual and low productivity ocean conditions observed in recent years (e.g., Goericke et al. 2007).

For the most part, the length composition data fit reasonably well in most fleets, particularly the southern recreational fishery and south/central trawl fishery, both of which clearly demonstrating the modal progression of strong year classes. There are some patterns of autocorrelation in the residuals to the length composition data that suggest an inability to perfectly fit the strong year class modes. This could be a consequence of slight differences in the timing of landings for some fisheries (as growth during the first several years is sufficiently rapid that data early or late in the year may not match expected length frequencies in the middle of the year), the geographic areas of given fleets (which may tend to capture slightly smaller or larger fish depending on the region), or variability in growth rates with differences in oceanographic conditions. The likelihood values associated with the base model are presented with values in the sensitivity analysis (below).

D.3.c Uncertainty and sensitivity analysis

Several diagnostics were developed to assess the sensitivity of the model to different values for key parameters, particularly steepness (h) and natural mortality (M). Profiles for those two values are shown in Figures 79a-b and differences in key reference points and relative likelihood values (by survey and/or fleet) are presented as Tables 29 and 30. The profile of steepness shows that the best fit occurs within a range of 0.4 to 0.6, consistent with the model estimated value of 0.573 when steepness was estimated with the Dorn prior. Although the fit is still reasonable at most higher levels of steepness, low levels of steepness appear less plausible based on the likelihood profile. However, as seen in Table 29, different data components have different responses in fit to the range of steepness values. In general, the trawl CPUE index (and trawl fishery length frequency data) and the triennial survey have better fits with lower values of h, while the recreational CPUE indices and associated length frequencies, as well as the CalCOFI time series, have a better fit with high values of h.

Similarly, a profile of natural mortality (M) suggests that the model has a better fit with higher values of M, with the best likelihood values in the range of 0.16 to 0.22. The trawl fishery CPUE and length frequency data, and triennial trawl survey, had better fits with lower M, while recreational fishery CPUE and CalCOFI indices fit had the best fit with higher M. Given the lack of age data in the model, improvements in fit alone were not deemed adequately informative to alter the estimated natural mortality rate, which remains one of the most significant unknowns in the model. The potential effect of migration of strong cohorts from the south to the north is an added complication. The relative influence of alternative values for steepness and natural mortality are shown as Figures 80-81, the results of which are generally intuitive. With higher assumed steepness values (and natural mortality rates), the estimated historical unfished biomass declines, leading to a more optimistic perception of stock productivity and relative abundance, the opposite is of course observed with lower assumptions of steepness and natural mortality.

In addition to the sensitivity to these life history parameters, we evaluated the sensitivity to changes in the data included in the model, to changes in model structure (developing essentially independent models north and south of Point Conception) and the influence of incorporating time-varying growth. These explorations were explored and discussed during the STAR Panel review, and the STAR Panel and STAT Team ultimately agreed that alternatively weighting a suite of indices for which the greatest source of model tension existed would capture the major axes of uncertainty in the model. Consequently, two models were developed to reflect the primary sources of uncertainty in the model, and thus bracket the plausible states of nature. State one is the scenario in which the two pessimistic indices (the triennial trawl survey and the trawl fishery CPUE index) were upweighted by setting the associated lambdas equal to ten. State two is the scenario in which the two optimistic indices (CalCOFI larval abundance and the southern California recreational fishery index) were upweighted, also with lambdas of ten. Figures 82a-c show the results of these two scenarios. The estimated depletion changed from 25% to 14% when the triennial and trawl fishery CPUE indices were upweighted, and to 38% when recSO and CalCOFI were upweighted. The corresponding point estimates of steepness in each of these scenarios was 0.539 for state one (the pessimistic scenario) and 0.724 for state two (the optimistic scenario), relative to 0.573 for the base model.

The retrospective analysis (Figures 83a-c) do not seem to demonstrate a major shift in perception of stock status when data from the last 2, 4 or 6 years are removed (only 2 and 6 are shown, as 4 is essentially no different). It is likely that a retrospective analysis that went back more years would reflect greater uncertainty with respect to stock status, trends and productivity, as it is clear that the 1999 year class was among the most defining events in altering the perception of the status and productivity of this stock. This is illustrated further in Figures 84a-b, which show the results of this base model relative to past assessments, from 1996 to the most recent (2007) update of the 2003 model (2005 varied little from 2007, so is excluded to improve readability). Again, prior to the clear recognition of the magnitude of the 1999 year class, assessments were highly pessimistic.

E. Reference Points

Reference points are presented in Table 31, which provides the unfished summary biomass, unfished spawning output, mean unfished recruitment and the proxy estimates for MSY based on the $SPR_{50\%}$ rate as well as the fishing mortality rate associated with a spawning stock output of 40% of the unfished level and with MSY estimated based on the spawner/recruit relationship and yield curve. The corresponding yields for these three estimates vary by a relatively minor amount, ranging from 1250 tons based on the spawning output proxy and 1270 tons based on the MSY estimate. However, the relative impact of the higher harvest rate on spawner abundance is results in a significantly lower equilibrium spawning output and summary biomass with both the SPR proxy and the estimated MSY rate, relative to the spawning output reference point.

Harvest projections and decision tables

The base model indicates that larval production, as a function of spawning output, has been increasing since the 1999 recruitment event and several subsequent year classes of moderate magnitude. The spawning output trajectory indicates that the stock is likely to continue to increase in coming years under current harvest rates, although the form of this trajectory is highly dependent on the magnitude of several year classes currently thought to be of moderate magnitude, as well as future recruitment events, which are highly uncertain. The results of the base model, coupled with a (largely unrealistic) assumption of mean recruitment into the future, would indicate that this stock should approach 40% of the unfished spawning output in approximately 2018, if current (2008) harvest rates are maintained. However, as bocaccio are a rebuilding species, tradeoffs among future harvest projections and population trajectories will be evaluated in greater detail in the rebuilding analysis.

The alternative states of nature used in the decision table (Table 32) were developed in conjunction with the STAR Panel. As both the STAT and the STAR Panel identified the major sources of uncertainty in the model as relating to the tension between two generally pessimistic indices (both derived primarily from north of Point Conception, California) and two optimistic indices (both derived primarily from south of Point Conception), the two alternative states of nature sequentially increased the emphasis on each of these groups to bracket uncertainty. The low abundance scenario was obtained by upweighting ($\lambda = 10$) the triennial and southern trawl CPUE indices, while the high biomass scenario was obtained by upweighting the southern recreational CPUE index and the CalCOFI indices. Thus, these scenarios also provided useful contrast between an apparent, but poorly understood, spatial dimension to relative abundance trends, as the data suggest that recovery may be taking place more rapidly in the south, and recovery in the central/northern California region may be dependent on an influx of fish from the southern area.

Catch trajectories for the three scenarios were developed in coordination with the Pacific Fishery Management Council (PFMC), Groundfish Management Team (GMT) and Groundfish Advisory Subpanel (GAP) representatives to the STAR Panel, and were based on three possibilities. The first catch stream was based on the fishing mortality rates associated with status quo (2008) catches projected into the future. In this scenario, catches then track changes in biomass, including a very slight dip in 2010 due to anticipated poor recruitment in 2007 and 2008. As recent catches have been less than half of the adopted OY values, this scenario is considered the low catch scenario; the 2009 catch in this scenario would be 65 tons. The second scenario projected catches that are associated with the SPR rate adopted in the Council's rebuilding plan of 0.77 in the base model, which results in a 2009 OY of 267 tons. Finally, the third catch stream was based on the Council-adopted SPR rate applied to the "optimistic" state of nature. Although the ABC (based on the 40:10 rule) would have been greater than this catch stream, the likelihood of management adopting an OY equal to the ABC for this rebuilding species was considered unlikely.

Regional management considerations

As described throughout the document, the stock structure for bocaccio is poorly understood. The decision to extend the boundaries of what we consider to be the southern subpopulation from Cape Mendocino to Cape Blanco was based on the observation that catches (both fishery and survey-derived) do not end abruptly at Cape Mendocino, but rather tend to taper off to the north. As such the fish in this region were more likely to originate from the southern subpopulation than the subpopulation distributed to the north. However, either boundary is imperfect. More significantly for management, it is worth noting that as the vast majority of the catches, and virtually all of the data used to inform the indices, are derived from the region south of Cape Mendocino, it may be reasonable to apply the results of this assessment to management measures applied to bocaccio solely in this region. Correspondingly, it would likely not be appropriate to set catch targets and limits for a small part of the northern range based on a downscaling of model results (for example, the small area of Oregon south of Cape Blanco ostensibly covered by this assessment). Practical considerations relating to the complexities associated with implementing catch monitoring or catch sharing agreements could preclude the application of these results in this region. There is clearly a need to devote additional effort into understanding population structure and connectivity, and to evaluating trends in abundance in the waters of the Pacific Northwest, as discussed in the research needs section below.

Future Research Needs

Stock structure for bocaccio rockfish on the West Coast remains an important issue to consider in future assessments as well as management. Although reanalysis of the genetic evidence suggests no genetic differentiation among the major oceanographic provinces in the California Current, both recent and historical data on the distribution of bocaccio rockfish, and the apparent differences in growth, maturity, and longevity, are indicative of moderate demographic isolation. This assessment does not address population abundance levels or trends in the Columbia or U.S. Vancouver INPFC areas, which might be considered more likely to be comparable to those observed in Canadian waters than waters south of Cape Blanco. However, this issue has yet to be resolved. It is possible that more refined genetic analysis, trace elements analysis of archived otoliths (Elsdon et al. 2008) or parasitology studies, could potentially shed some light on population structure, connectivity and/or movement patterns throughout their range. Ideally, such efforts would be conducted in coordination with Canadian and Mexican researchers. Similarly, several of the indices developed for this assessment could be improved by greater evaluation and consideration of the spatial distribution of fishing effort and fish size, particularly in the context of possible ontogenetic movement patterns.

Closely related to this issue is the question of whether a separate area model could be developed for bocaccio. There could be clear advantages with regard to the ability to more appropriately link the various indices to their appropriate spatial scale. However, possible diffusion or migration patterns and rates are completely unknown for this stock, and would likely prove to be a source of significant uncertainty.

Currently the CalCOFI index is the longest time series of relative abundance in the model, and may be the longest time series currently used for any west coast groundfish. However, for most of the time series the data are only available for the southern region of the range of bocaccio. Current CalCOFI surveys have surveyed the central California region for most of the past decade, additionally, ongoing efforts are retrospectively analyzing samples from the northern stations collected in the 1950s and 1960s. Both of these efforts will increase the data available for both monitoring trends and possibly for better understanding differences in relative abundance trends among these regions. As such these efforts are of high importance for future assessment.

The potential to develop defensible ageing criteria for bocaccio in the southern area should be evaluated further, and such criteria could possibly be developed in a coordinated effort among workers throughout the West Coast. Although production ageing is likely to remain a challenge given the expectation of high ageing error and uncertainty, as well as the high information content of the length frequency data in assessing growth and year class strength from animals of younger ages, future ageing efforts would likely improve the ability to adequately inform natural mortality rates, variability of size at age, and possibly contribute to an improved understanding of differences in life history parameters and rates in different regions of the West Coast.

With respect to both time varying growth and a more comprehensive evaluation of the interaction between climate and fecundity (as a potential source of error or bias in the CalCOFI data). Time varying growth has been shown to be an important factor in a number of stock assessments of west coast groundfish, and a more focused exploration of time-varying growth has also been strongly encouraged in past models and STAR Panel reviews of bocaccio. Although time constraints limited the extent of exploration that could be done in this assessment, some exploration of time-varying growth was developed in the draft assessment, by estimating offsets to the von Bertalanffy growth parameter (K) as free parameters in various types of time blocks. As these preliminary explorations did not have a tremendous influence on the outcome in the current assessment, the final model did not include a time-varying growth component. However, the STAT Team intends to expand on process studies relating environmental conditions to growth and fecundity, using those results to modify existing bioenergetics models, and further investigating mechanisms by which climate may drive changes in energy budgets. Our hope is that the results of that effort can improve upon the manner by which time-varying growth (and potentially fecundity) have can subsequently be incorporated into future stock assessments.

The trawl survey indices (triennial and NWFSC combined shelf-slope survey) are not well suited to species that largely associate with highly structured habitat. Research to develop or improve upon alternative survey methodologies would benefit this assessment.

Currently, most of the fishing mortality on bocaccio rockfish takes place in the southern California recreational fishery, where a broad area of habitat is closed to fishing in the cowcod conservation areas (CCAs) and rockfish conservation areas (RCAs). Although the entire coast has significant RCA closures, with consequent impacts on the distribution of fishing effort and likely consequences on selectivity, the Cowcod Conservation Areas have been treated as closed to most monitoring efforts as well (the NWFSC SCB hook-and-line survey, the NWFSC combined trawl survey), unlike the RCAs. Consequently, the time series derived from these indices in this region are likely to be biased, and the inability to develop time series of abundance, as well as to assess potential differences in demographic structure, could eventually compromise the ability to assess the status of this stocks. This is by no means a problem limited to bocaccio (Field et al. 2006), however the problem may be particularly acute in the Southern California Bight, as suggested by the difference in trends observed from the CalCOFI data relative to the hook-and-line survey, and the apparent concentration of spawning output in the area now protected by the CCAs.

Although the influence of alternative maturity curves was relatively modest in this assessment, there have been few historical, and no recent, histology studies to confirm macroscopic staging for confirming the maturity relationship. Additionally, there is very little data available in the southern area (south of Conception) for smaller fish, somewhat complicating efforts to detect differences in maturity across space.

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Table 1. Total catches (metric tons) and PFMC adopted ABC/OY values for bocaccio rockfish.

	commercial	recreational	ABC	OY
1980	4177	1057		
1981	4610	1071		
1982	5001	1516		
1983	5021	566	6100	6100
1984	4427	244	6100	6100
1985	2471	387	6100	6100
1986	2511	599	6100	6100
1987	2451	193	6100	6100
1988	2153	151	6100	6100
1989	2492	257	6100	6100
1990	2396	324	6100	6100
1991	1486	292	1100	1100
1992	1604	259	1100	1100
1993	1409	128	1540	1540
1994	982	220	1540	1540
1995	716	47	1700	1700
1996	447	93	1700	1700
1997	318	156	265	265
1998	152	52	230	230
1999	73	124	230	230
2000	28	112	164	100
2001	22	109	122	100
2002	49	41	122	100
2003	5	7	244	20
2004	19	66	400	199
2005	27	81	566	307
2006	19	41	549	306
2007	9	53	602	218
2008	43	34	618	218

Table 2. Sample sizes of maturity data by year and port complex. Combined data from CALCOM, West Coast triennial survey, and Groundfish Ecology survey.

year	Morro Bay	Monterey	San Fran.	Bodega	Bragg	Eureka	Crescent City
1993	180	201	73		38	10	
1994	137	14	10	1	42	9	
1995	216	5	1	14	8	11	2
1996	130		3				
1997	173		31	12	1		5
1998	110	32	26	20			21
1999	19		20	5	5		
2000		52	2	11			
2001		190		4			
2002	1	104	8	9	5	1	
2003		68					
2004	1	129	3				
2005		25					
2006		29		7			
2007		28		3		1	
2008			1	10		10	

Table 3. AIC values associated with alternative model structures, data pooled across years. Data source included maturity estimates from commercial landings (CALCOM).

model	covariates	parameters	AIC	AIC-min(AIC)
1	FL	2	770.5	105.3
2	FL + port	8	697	31.8
3	FL + port + source	10	672.8	7.6
4	FL + port + source + FL:port	16	665.4	0.2
5	FL + port + source + FL:port + FL:source	18	665.2	0

Table 4. Estimated catches of bocaccio rockfish (metric tons) in California by region and gear type from the historical catch reconstruction, 1916-1968.

	North 38	South of 38		South of Conception	
year	trawl	trawl	h&line	trawl	h&line
1916	0	55	377	0.0	42
1917	0	86	593	0.0	69
1918	1	97	641	0.0	60
1919	0	66	428	0.0	35
1920	0	68	443	0.0	39
1921	0	56	372	0.0	34
1922	0	49	333	0.0	34
1923	0	55	387	0.0	47
1924	0	37	331	0.0	74
1925	1	30	395	0.0	80
1926	1	83	534	0.0	93
1927	2	111	422	0.0	75
1928	1	151	423	0.0	60
1929	28	119	380	0.0	62
1930	17	136	490	0.0	61
1931	50	46	490	0.0	88
1932	37	69	386	0.0	44
1933	59	90	215	0.0	42
1934	41	109	289	0.1	28
1935	43	91	341	0.0	28
1936	18	108	449	0.0	25
1937	41	92	391	0.0	17
1938	48	76	284	0.0	12
1939	86	50	184	0.0	16
1940	60	46	220	0.0	18
1941	53	32	168	0.0	20
1942	26	8	63	0.0	8.8
1943	196	8	65	0.0	5.4
1944	635	3	82	0.0	2.1
1945	1211	54	123	0.8	3.7
1946	612	111	116	0.1	6.6
1947	632	6	193	0.0	5.5
1948	397	82	141	0.3	9.4
1949	380	93	163	1.2	13
1950	375	303	313	0.3	15
1951	532	765	249	0.6	13
1952	268	1308	172	3.3	8.8
1953	305	1676	63	2.1	7.5
1954	246	1583	79	15	10
1955	335	1586	111	179	12
1956	350	1897	285	109	15
1957	469	2074	257	145	15
1958	482	2323	198	137	16
1959	379	2001	110	61	15
1960	345	1603	77	128	16
1961	266	1193	63	105	18
1962	230	1054	54	93	14
1963	326	1197	64	117	21
1964	190	869	52	74	18
1965	273	896	59	70	22
1966	196	1237	103	72	26
1967	294	1065	91	115	27
1968	325	1036	61	118	20

Table 5. Estimated domestic commercial landings of bocaccio rockfish South of Cape Blanco, OR by region and gear type, 1969-2008 (metric tons).

	North of 38			Conception to 38			South of Conception			Total		
year	CA trawl	CA H&L	OR Erk	trawl	H&L	set net	trawl	H&L	set net	trawl	H&L	set net
1969	223	6	9	806	40	7	279	34	10	1317	80	17
1970	250	4		1126	53	9	215	27	5.8	1591	83	15
1971	324	9	4	766	44	54	195	30	4.6	1289	83	59
1972	371	18		1278	64	67	332	44	3.6	1980	126	71
1973	335	9		2484	101	156	379	43	11	3198	153	167
1974	489	28		1705	102	222	381	39	40	2575	170	262
1975	556	11		1870	97	248	399	54	37	2825	162	285
1976	691	26		1932	133	82	486	65	41	3109	225	123
1977	674	19		1880	124	109	501	53	49	3055	197	158
1978	745	39		1507	152	24	372	80	101	2624	270	125
1979	286	46	207	2950	194	10	349	131	226	3793	371	235
1980	586	20	45	2797	220	34	258	96	182	3686	335	216
1981	2165	0	18	1580	196	89	200	116	264	3962	312	353
1982	1897	2	62	2087	218	182	237	173	205	4284	393	387
1983	2280	2	121	1663	160	479	251	78	109	4315	239	588
1984	1621	17	70	1808	273	247	84	77	300	3584	367	547
1985	654	21	81	555	71	687	27	62	404	1318	154	1092
1986	377	104	12	696	71	695	94	97	391	1179	272	1086
1987	555	128	9	564	120	673	86	56	295	1214	304	968
1988	695	185	14	533	207	268	57	125	104	1299	518	371
1989	553	90	16	532	202	744	62	95	238	1163	386	982
1990	463	125	25	618	160	554	64	212	239	1170	497	793
1991	263	37	13	455	110	266	44	124	192	774	271	458
1992	133	61	9	322	134	418	40	284	222	504	479	640
1993	203	104	15	334	101	228	25	241	202	577	446	430
1994	150	24	12	300	56	179	77	126	84	538	206	263
1995	162	18	20	191	26	206	24	24	76	398	69	281
1996	63	36	2	212	21	53	14	36	38	290	93	92
1997	94	19	4	128	14	25	8.8	24	10	234	58	35
1998	32	15	1	36	13	34	4.7	14	4.8	74	42	39
1999	26	10	0.2	18	8	5.5	1.2	3.5	1.7	45	21	7.2
2000	7	2.5	4.0	13	3	0.7	0.1	1.9	0.0	24	7	0.7
2001	4	2.7	0.2	9	3	0.5	0.1	2.6	0.3	14	8	0.9
2002	6	0.7	0.1	12	0	0.1	0.1	2.0	0.1	18	3	0.2
2003	0.0	0.0	0.1	0	0	0.0	0.0	0.4		0	0	0.0
2004	0.3	0.3	0.0	6	1	0.3	0.1	4.4	0.0	6	5	0.3
2005	0.2	0.5	0.0	4	1	0.0	0.1	3.1	0.0	4	4	0.1
2006	0.4	0.8	0.0	0	1	0.2	0.2	4.7	0.1	1	7	0.2
2007	0.2	0.8	0.0	1	1	0.2	0.0	3.2	0.0	2	5	0.2
2008	1.6	1.0	0.0	0	1	0.2	0.0	2.9	0.0	2	5	0.2

Table 6. Total rockfish catch and estimated catch of bocaccio rockfish (metric tons) by region from 1892 to 1915 (all catch is assumed to be hook and line gear for this period).

		Estimated catches of bocaccio		
	Total CA rockfish	South of Men.	South of Conc.	Conc. to Mendocino
equil	764	153	76	77
1892	**834**	167	83	84
1893	*788*	157	78	80
1894	*741*	148	73	75
1895	**694**	139	69	70
1896	*655*	131	65	66
1897	*616*	123	61	62
1898	*578*	115	57	58
1899	**539**	108	53	54
1900	*596*	119	59	60
1901	*654*	131	65	66
1902	*711*	142	70	72
1903	*768*	154	76	78
1904	**826**	165	82	83
1905	*882*	176	87	89
1906	*939*	188	93	95
1907	*996*	199	98	101
1908	**1052**	210	104	106
1909	*1184*	237	117	120
1910	*1316*	263	130	133
1911	*1447*	289	143	146
1912	*1579*	316	156	159
1913	*1711*	342	169	173
1914	*1843*	368	182	186
1915	**1975**	395	195	199

Table 7. Total reported catches of bocaccio rockfish outside the assessment area (north of Cape Blanco, Oregon), 1969-2008.

	Northern U.S.		Canada		Total	
	OR	WA	VN INPFC	CH INPFC	U.S.	Canada
1969	57		90	725	57	815
1970	62		208	98	62	306
1971	112		32	140	112	172
1972	50		72	151	50	223
1973	36		98	648	36	746
1974	31		39	669	31	708
1975	56		37	467	56	504
1976	18		210	285	18	495
1977	39		44	326	39	370
1978	143		28	221	143	249
1979	510		84	394	510	478
1980	294		15	163	294	177
1981	630	45	11	79	675	90
1982	619	46	11	89	665	101
1983	785	136	46	102	921	148
1984	244	152	65	104	396	169
1985	483	123	164	243	606	407
1986	274	80	304	396	354	700
1987	247	110	206	504	357	710
1988	192	96	594	728	288	1323
1989	254	247	336	449	501	785
1990	182	267	270	763	448	1032
1991	213	363	321	742	577	1063
1992	152	205	361	588	358	949
1993	153	132	458	671	285	1129
1994	107	50	281	327	158	607
1995	99	47	170	340	146	510
1996	71	43	117	185	114	302
1997	102	54	89	159	156	248
1998	45	37	67	151	82	217
1999	25	10	97	130	35	228
2000	0.3	1.9	96	178	2	275
2001	5.1	7.6	92	165	13	257
2002	0.0	5.4	68	204	5	272
2003	0.3	6.4	62	155	7	217
2004	0.2	3.8	42	104	4	146
2005	0.4	0.9	56	84	1.3	140
2006	0.7	0.0	42	67	0.7	110
2007	0.1	0.7			0.9	
2008	0.0	0.0			0.0	

Table 8. Total foreign catches of bocaccio rockfish by INPFC area, 1966-1976, from Rogers (2003).

	INPFC Area				
	U.S. VAN	COL	EUR	MON	CON
1966	23	188	0	1101	0
1967	20	90	1	2856	0
1968	9	30	67	842	0
1969	2	29	0	48	0
1970	3	37	0	0	0
1971	5	17	0	0	0
1972	5	28	9	39	0
1973	4	49	313	1375	299
1974	2	11	37	3835	35
1975	0	16	23	1047	0
1976	0	13	14	1007	0

Table 9. Total mortality (landed plus discarded catch) for the 2002-2008 period Based on NWFSC total mortality reports (2002-2007) and the GMT scorecard (2008).

	trawl south of 38° N	trawl north of 38° N	hook and line	setnet	rec south of 34.5° N	rec north of 34.5° N
1999	19	53	26	20.7	7.2	71
2000	13.5	60	6.6	7	0.7	52
2001	9.2	49	4.4	7.8	0.9	60
2002	28.04	20.67	0.13	0.01	35.88	4.93
2003	5.07	0.31	0	0	5.53	1.87
2004	13.86	3.52	1.84	0.21	63.43	2.27
2005	24.64	0.43	1.5	0.17	69.9	10.7
2006	16.09	0.31	2.25	0.25	29	11.8
2007	4.06	1.58	3.39	0.38	44.2	8.92
2008	28.73	1.58	13.4	0.5	30.3	3.59

Table 10. Number of subsamples (clusters), length observations and initial effective sample sizes (Neff) for the southern and northern commercial trawl fisheries.

	Trawl South			Trawl North		
year	Nsamp	Nfish	Neff	Nsamp	Nfish	Neff
1978	64	963	197	99	584	180
1979	62	1085	212	44	170	67
1980	108	992	245	129	666	221
1981	78	631	165	96	719	195
1982	133	1515	342	119	905	244
1983	134	1558	349	202	1187	366
1984	189	1801	438	122	897	246
1985	182	1151	341	114	595	196
1986	108	1892	369	92	545	167
1987	99	1768	343	111	1048	256
1988	93	1198	258	87	662	178
1989	90	721	189	70	429	129
1990	108	1496	314	84	552	160
1991	98	1911	362	44	580	124
1992	71	1370	260	17	210	46
1993	73	1063	220	12	230	44
1994	51	313	94	16	272	54
1995	43	240	76	19	154	40
1996	34	349	82	10	59	18
1997	53	368	104	8	70	18
1998	21	281	60	7	106	22
1999	21	417	79	5	21	8
2000	11	103	25	5	65	14
2001	30	451	92	5	16	7
2002	16	160	38	9	107	24
2003	1	2	1			
2004	17	118	33			
2005	1	4	2	1	2	1
2007	4	10	5	2	2	2
2008	2	2	2	7	21	10

Table 11. Number of subsamples (clusters), length observations and initial effective sample sizes (Neff) for the commercial hook-line and setnet fisheries.

	Hook and line			Setnet		
#Yr	Nsamp	Nfish	Neff	Nsamp	Nfish	Neff
1978				9	73	19
1979	3	17	5	1	20	4
1980	12	50	19			
1982	15	20	18	1	9	2
1983	11	55	19	33	60	41
1984	16	47	22	82	46	88
1985	22	94	35	231	852	349
1986	37	259	73	165	1260	339
1987	25	227	56	119	1049	264
1988	12	82	23	93	960	225
1989	29	112	44	130	1401	323
1990	14	68	23	106	916	232
1991	33	122	50	37	384	90
1992	66	329	111	71	1186	235
1993	77	239	110	50	447	112
1994	57	212	86	53	196	80
1995	27	90	39	42	204	70
1996	62	318	106	27	121	44
1997	40	265	77	13	84	25
1998	32	191	58	16	127	34
1999	10	98	24	1	26	5
2000	10	44	16			
2001	20	152	41			
2002	5	14	7	1	25	4
2004				2	17	4

Table 12. Total estimated recreational catch of bocaccio rockfish 1928-1980 from the California historical catch reconstruction effort (metric tons).

year	south	north	year	south	north
1928	2.0	2.4	1955	761	69
1929	4.0	4.8	1956	917	77
1930	6.0	5.5	1957	530	77
1931	8.0	7.3	1958	301	123
1932	10	9.2	1959	178	103
1933	12	11	1960	185	81
1934	14	13	1961	212	69
1935	16	15	1962	204	80
1936	16	17	1963	194	89
1937	28	20	1964	244	75
1938	22	19	1965	319	107
1939	20	17	1966	564	118
1940	14	24	1967	770	111
1941	13	22	1968	832	104
1942	7	12	1969	785	111
1943	7	11	1970	1039	118
1944	5	9	1971	967	104
1945	7	12	1972	1309	123
1946	12	21	1973	1511	186
1947	37	17	1974	1893	201
1948	102	34	1975	1865	200
1949	133	44	1976	1489	216
1950	157	54	1977	1265	194
1951	136	63	1978	1174	196
1952	152	55	1979	1714	230
1953	171	47	1980	943	264
1954	411	58			

Table 13. Total RecFIN recreational landings (metric tons), 1980-2003, with four year bracketing average values used for missing years (1990-92 in south, 1990-95 in north) and corrected for "unknown" rockfish.

	All RecFIN rock		unknown rockfish		bocaccio		bocaccio+unk	
	south	north	south	north	south	north	south	North
1980	5236	2770	4	603	1755	178	1756	227
1981	2544	2956	204	64	841	230	914	235
1982	3589	4038	209	155	1158	358	1230	372
1983	1562	2757	7	85	265	301	266	311
1984	1906	2035	53	7	177	67	182	67
1985	2284	2033	24	70	321	66	325	68
1986	2238	2021	30	55	428	171	434	176
1987	932	1710	22	60	90	103	92	106
1988	900	1961	0	14	107	44	107	44
1989	971	1683	19	89	179	78	182	82
1990							161	68
1991							161	68
1992							161	68
1993	410		24		109		116	68
1994	910		124		215		249	68
1995	458		56		30		35	68
1996	600	1083	11	264	67	26	68	34
1997	283	1562	112	56	49	107	82	111
1998	288	938	51	124	29	23	35	26
1999	596	1245	75	169	71	53	81	61
2000	325	1278	42	300	52	60	59	79
2001	232	1099	10	113	60	49	63	54
2002	269	824	26	80	76	8	84	9
2003	249	1488	29	14	11	0	12	0

Table 14. Number of subsamples (clusters), length observations and initial effective sample sizes (Neff) for southern and central/northern CPFV observer programs conducted by CDFG.

	South CPFV Observer			Central/North CPFV Observer		
	Nsamp	Nfish	Neff	Nsamp	Nfish	Neff
1975	290	21866	2030			
1976	326	25900	2282			
1977	222	11431	1554			
1978	238	18579	1666			
1986	111	4110	678			
1987	93	2949	500	71	917	198
1988	83	1870	341	131	1227	300
1989	137	5025	830	163	1435	361
1990				58	976	193
1991				59	871	179
1992				161	1702	396
1993				137	1159	297
1994				111	721	210
1995				121	750	225
1996				105	580	185
1997				122	982	258
1998				65	433	125

Table 15.Number of subsamples (clusters), length observations and initial effective sample sizes (Neff) for southern and central/northern recreational fisheries from RecFIN. Note that effective starting samples greater than 400 were set to 400.

	South RecFIN			Central/North RecFIN		
	Nsamp	Nfish	Neff	Nsamp	Nfish	Neff
1980	176	2606	536	70	252	105
1981	148	2233	456	34	252	69
1982	135	1819	386	50	311	93
1983	99	706	196	46	359	96
1984	181	594	263	69	187	95
1985	147	1331	331	99	554	175
1986	119	1299	298	105	942	235
1987	32	132	50	37	225	68
1988	39	79	50	36	48	43
1989	50	489	117	36	119	52
1993	17	53	24	30	56	38
1994	23	86	35	26	50	33
1995	17	35	22	29	68	38
1996	35	116	51	78	229	110
1997	15	53	22	108	787	217
1998	39	105	53	83	504	153
1999	118	460	181	127	623	213
2000	95	526	168	47	277	85
2001	57	380	109	38	326	83
2002	102	720	201	18	180	43
2003	20	122	37			
2004	200	912	326	49	80	60
2005	200	1449	400	103	259	139
2006	200	1860	457	124	279	163
2007	200	2139	495	138	262	174
2008	200	1811	450	87	162	109

Table 16. Total number of bongo plankton tows, positive (for bocaccio) tows, and the mean cpue of positive tows for years with adequate sampling, 1951-2008.

	Northern area (lines<77)			Southern area (lines>=77)		
	total tows	positive	ave cpue	total tows	positives	ave cpue
1951				128	32	2.4
1952				190	42	1.6
1953				240	59	3.7
1954				259	92	5.7
1955				180	56	3.1
1956				210	31	2.2
1957				205	44	3.6
1958				251	54	3.1
1959				291	37	1.1
1960				307	57	2.2
1961				100	23	2.8
1962				94	26	1.9
1963				118	28	2.1
1964				136	29	3.5
1965				119	34	2.8
1966				193	62	3.0
1967				52	12	1.7
1968				50	26	15.6
1969	120	38	6.7	205	71	8.1
1970				51	7	0.9
1972	120	47	10.5	161	66	9.8
1975	99	23	4.0	306	65	5.0
1976				64	13	4.0
1978	116	15	2.0	284	27	2.2
1981	130	16	2.0	270	25	4.7
1983	44	2	0.5	83	6	1.5
1984	107	17	2.7	165	31	2.5
1985				86	5	0.7
1986				131	6	0.4
1987				135	9	1.0
1988				142	19	1.3
1989				96	13	3.5
1990				135	9	0.5
1991				135	21	2.6
1992				91	17	1.9
1993				96	4	0.6
1994				146	13	0.6
1995				89	2	0.2
1996				92	19	3.6
1997				97	9	0.6
1998				120	5	0.2
1999				118	8	0.6
2000				96	8	0.8
2001				93	6	0.5
2002				118	10	1.0
2003	46	4	0.6	143	14	1.0
2004	46	3	1.3	99	11	4.9
2005				146	16	1.6
2006	28	4	1.6	149	13	0.7
2007	10	4	5.6	108	11	1.2
2008				134	13	1.8

Table 17. Summary of survey information for Triennial trawl survey, 1977-2004.

Total number of hauls, 50 to 350 m

lat	1977	1980	1983	1986	1989	1992	1995	1998	2001	2004
34	388				626	201	93	39	57	75
36	415	264	129	106	730	231	77	65	53	123
38	347	249	363	124	90	57	79	60	65	84
40.5	24	61	101	72	49	54	48	54	54	49
43	290	336	579	430	325	346	249	262	233	168

Number of positive tows

lat	1977	1980	1983	1986	1989	1992	1995	1998	2001	2004
34	350				616	189	77	19	35	59
36	392	258	112	100	697	189	49	29	15	94
38	320	241	339	108	51	16	37	10	18	61
40.5	1	50	64	45	7	5	3		3	4
43	101	111	257	81	43	51	9	21	10	

Percent positive

lat	1977	1980	1983	1986	1989	1992	1995	1998	2001	2004
34	0.90				0.98	0.94	0.83	0.49	0.61	0.79
36	0.94	0.98	0.87	0.94	0.95	0.82	0.64	0.45	0.28	0.76
38	0.92	0.97	0.93	0.87	0.57	0.28	0.47	0.17	0.28	0.73
40.5	0.04	0.82	0.63	0.63	0.14	0.09	0.06	0.00	0.06	0.08
43	0.35	0.33	0.44	0.19	0.13	0.15	0.04	0.08	0.04	0.00

Number of length measurements

lat	1977	1980	1983	1986	1989	1992	1995	1998	2001	2004
34	317				613	189	77	19	35	59
36	382	247	102	81	695	186	49	29	15	94
38	278	224	327	87	49	15	37	10	18	61
40.5		38	49	42	2	4	3		3	4
43	62	70	193	56	28	49	9	21	10	

Table 18. Triennial survey area-swept biomass estimates and coefficient of variation (CV).

Depth Stratum		Biomass (mt)									
US Vancouver		1977	1980	1983	1986	1989	1992	1995	1998	2001	2004
	55-183 m	1568	130	313	108	101	16	1	99	1	0
	184-366 m	49	28	19	8	20	181	10	44	26	0
	367-475 m	0						0	0	0	0
	all depths	1617	159	332	116	121	198	11	143	27	0
Columbia											
	55-183 m	566	475	462	214	33	0	32	0	51	0
	184-366 m	340	41	128	325	41	74	0	0	16	0
	367-475 m	6						0	0	0	0
	all depths	912	516	590	539	74	74	32	0	67	0
Eureka											
	55-183 m	13	668	142	1840	19	0	7	0	12	0
	184-366 m	10	93	176	217	30	23	4	0	16	20
	367-475 m	0						0	0	0	0
	all depths	22	761	318	2057	49	23	11	0	27	20
Monterey											
	55-183 m	2393	2956	892	4268	478	473	192	97	77	1760
	184-366 m	3691	546	5294	322	601	64	294	33	33	329
	367-475 m	1						7	0	0	12
	all depths	6085	3502	6187	4591	1078	537	494	130	110	2101
Conception											
	55-183 m	623				8450	1010	31	4	38	148
	184-366 m	181				196	58	27	6	14	66
	367-475 m	0						0	2	0	0
	all depths	804				8646	1068	58	11	52	215
Total US Area											
	55-183 m	5163	4230	1809	6430	9080	1500	263	200	179	1908
	184-366 m	4271	708	5617	873	888	401	335	84	105	415
	367-475 m	7						7	2	0	12
	all depths	9441	4938	7427	7303	9968	1900	606	285	284	2335

		Coefficient of Variation									
Depth Stratum		1977	1980	1983	1986	1989	1992	1995	1998	2001	2004
US Vancouver											
	55-183 m	0.91	0.70	0.48	0.37	0.34	0.34	0.58	0.48	1.00	
	184-366 m	0.54	1.00	0.52	1.00	0.43	0.43	0.71	0.47	1.00	
	367-475 m	-						-	-	-	
	all depths	0.89	0.61	0.46	0.35	0.29	0.29	0.63	0.36	0.96	
Columbia											
	55-183 m	0.54	0.35	0.39	0.40	0.70	0.70	0.81		0.61	
	184-366 m	0.30	0.36	0.24	0.86	0.82	0.82	-		0.69	
	367-475 m	1.00						-		-	
	all depths	0.35	0.33	0.31	0.54	0.55	0.55	0.81		0.49	
Eureka											
	55-183 m	1.00	0.43	0.45	0.84	0.78	0.78	0.92		1.00	1.00
	184-366 m	1.00	0.52	0.65	0.53	0.52	0.52	1.00		0.69	1.00
	367-475 m	-						-		-	-
	all depths	0.71	0.38	0.41	0.75	0.44	0.44	0.69		0.58	1.00
Monterey											
	55-183 m	0.43	0.40	0.33	0.84	0.36	0.36	0.37	0.48	0.43	0.62
	184-366 m	0.62	0.48	0.74	0.59	0.60	0.60	0.81	0.51	0.70	0.41
	367-475 m	0.75						1.00	-	-	1.00
	all depths	0.41	0.35	0.64	0.78	0.37	0.37	0.50	0.38	0.37	0.52
Conception											
	55-183 m	0.63				0.90	0.90	0.92	0.41	0.51	0.69
	184-366 m	0.24				0.97	0.97	0.60	0.46	0.94	0.51
	367-475 m	1.00						-	1.00	-	-
	all depths	0.49				0.88	0.88	0.56	0.31	0.45	0.51
Total US Area											
	55-183 m	0.35	0.29	0.21	0.80	0.84	0.84	0.31	0.33	0.28	0.59
	184-366 m	0.54	0.38	0.70	0.49	0.62	0.62	0.71	0.33	0.38	0.35
	367-475 m	0.85						1.00	1.00	-	1.00
	all depths	0.31	0.26	0.53	0.70	0.77	0.77	0.42	0.25	0.23	0.48

Table 19. Summary of key GLMM results for the Triennial trawl survey.

	GLMM, Mont, Erk only, trad. depth		GLMM, coast, no Con traditional depth		GLMM, revise depth, and INPFC strata	
Year	Index	CV	Index	CV	Index	CV
1980	1882	0.29	2262	0.19	2228	0.15
1983	1423	0.33	1891	0.18	1849	0.18
1986	632	0.90	924	0.21	724	0.16
1989	302	0.40	450	0.25	530	0.14
1992	181	0.41	252	0.38	319	0.23
1995	165	0.38	167	0.43	193	0.20
1998	47	0.53	79	0.46	57	0.31
2001	74	0.43	131	0.38	121	0.27
2004	379	0.42	341	0.30	439	0.22

Table 20. Summary of survey information for NWFSC survey, by latitude and inside of 350 meters depth, 2003-2008.

Total number of hauls, 50 to 350 m

lat	2003	2004	2005	2006	2007	2008
32	44	46	63	54	63	51
34.5	22	21	18	16	24	24
36	25	29	41	31	30	41
38	34	39	52	45	33	43
40.5	56	28	50	34	41	36
43	132	139	169	173	196	165

Number of positive tows

lat	2003	2004	2005	2006	2007	2008
32	11	11	21	13	12	2
34.5	8	4	3	2	6	3
36	6	9	14	9	6	8
38	8	10	8	12	1	8
40.5	4	0	3	1	2	1
43	5	0	2	3	3	4

Percent positive

lat	2003	2004	2005	2006	2007	2008
32	0.25	0.24	0.33	0.24	0.19	0.04
34.5	0.36	0.19	0.17	0.13	0.25	0.13
36	0.24	0.31	0.34	0.29	0.20	0.20
38	0.24	0.26	0.15	0.27	0.03	0.19
40.5	0.07	0	0.06	0.03	0.05	0.03
43	0.04	0	0.01	0.02	0.02	0.02

Mean cpue (kg/ha) of positives

lat	2003	2004	2005	2006	2007	2008
32	1.6	2.4	1.3	1.6	6.1	2.3
34.5	1.0	5.8	1.1	29.0	3.7	1.7
36	2.1	51.8	13.5	2.1	4.7	11.4
38	3.5	4.0	3.2	3.4	1.9	4.8
40.5	2.7		2.7	0.3	2.7	0.0
43	5.0		1.4	27.1	6.8	5.1

Number of length measurements

lat	2003	2004	2005	2006	2007	2008
32	37	54	111	95	98	7
34.5	15	29	4	81	25	10
36	11	378	165	16	21	63
38	25	32	22	22	1	21
40.5	9		15	1	4	1
43	16		2	50	8	9

Table 21. Design-based (area-swept) biomass estimates for bocaccio rockfish by year, depth strata and INPFC area.

	Biomass Estimates (tons)						
	depth (m)	2003	2004	2005	2006	2007	2008
CONCEPTION	55-182	177	566	362	1173	1049	64
	183-550	402	425	61	32	284	89
	total	579	991	423	1206	1334	152
MONTEREY	55-182	407	7370	829	484	443	1325
	183-550	249	824	2391	306	55	307
	total	657	8194	3220	790	498	1632
EUREKA	55-182	76	0	11	0	76	0
	183-550	28	0	75	4	0	0
	total	104	0	85	4	76	0
COLUMBIA	55-182	469	0	38	0	0	0
	183-550	0	0	0	0	30	34
	total	469	0	38	0	30	34
VANCOUVER	55-182	83	0	0	1152	252	252
	183-550	0	0	0	65	0	49
	total	83	0	0	1218	252	300
Assessment Area Total		1235	9184	3644	1995	1832	1784
Coastwide Total		1891	9184	3767	3217	2190	2119

	Coefficient of Variation						
	depth (m)	2003	2004	2005	2006	2007	2008
CONCEPTION	55-182	0.58	0.58	0.51	0.75	0.80	0.57
	183-550	0.61	0.48	0.75	0.78	0.60	0.72
	total	0.46	0.39	0.45	0.73	0.65	0.48
MONTEREY	55-182	0.60	0.51	0.40	0.30	0.73	0.61
	183-550	0.39	0.77	0.69	0.48	0.73	0.57
	total	0.40	0.46	0.53	0.26	0.65	0.51
EUREKA	55-182	0.84		1.00		0.92	1.00
	183-550	0.84		0.72	1.00		
	total	0.65		0.65	1.00	0.92	1.00
COLUMBIA	55-182	1.00		0.98			1.00
	183-550					1.00	1.00
	total	1.00		0.98		1.00	0.99
VANCOUVER	55-182	0.50			0.91	0.71	1.00
	183-550				1.00		1.00
	total	0.50			0.86	0.71	0.85
Assessment Area CV		0.30	0.42	0.47	0.45	0.50	0.47
Coastwide CV		0.32	0.42	0.45	0.43	0.43	0.41

Table 22. Basic reference points and likelihood estimates from the 2007 SS1 model relative to a comparable model in SS3.

	2007	2009 comp	% change
aveR 51-86 (07), 50-85 (09)	5449	6257	0.13
SPR(f=0) (age 1 recruits)	2.49	2.30	0.08
SSB_0	13572	12391	-0.10
40%SSB_0	5429	4956	-0.10
SSB_{2006}	1727	1681	-0.03
SSB_{2006}/Sunf	12.7%	13.6%	0.06

Table 23. Input (index) RSME values (formula), additive variance adjustment, combined average input plus adjusted variance, model RSME and ratio of input/model RSME.

Fleet	years	mean input rsme	variance adjustment	input+ adjustment	model rsme	input+ adj/model
trawlsouth	15	0.32	0.38	0.38	0.38	1.00
recSO	20	0.17	0.76	0.76	0.76	1.01
recCEN	20	0.15	0.75	0.75	0.74	1.01
CalCOFI	51	0.31	0.59	0.60	0.58	1.04
Triennial trawl survey	9	0.20	0.70	0.70	0.70	1.00
CPFV CPUE	12	0.15	0.37	0.37	0.38	0.98
NWFSChook&line	5	0.22	0.16	0.16	0.15	1.05
NWFSC trawl survey	6	0.24	0.49	0.49	0.48	1.02
juvenile trawl survey	8	0.02	0.98	0.98	0.97	1.01
pier_juv	32	0.89	0.89	0.89	0.88	1.01

Table 24. Input mean sample sizes, effective mean sample sizes, and variance adjustment values used for tuning the length frequency data in the base model.

Fleet	years	mean start effN	mean model effN	Var_Adj	Harmonic mean (effN)	model effN/ input*var.adj
trawlsouth	26	202	154	0.76	92	1.00
hook and line	23	46	52	1.00	31	1.13
setnet	17	151	122	0.81	59	1.00
recSO	26	205	121	0.63	62	0.94
recCEN	32	107	91	0.83	57	1.02
trawlnorth	25	121	59	0.49	36	1.00
Triennial trawl survey	9	96	31	0.32	26	1.00
South CPFV observer	8	393	235	0.63	152	0.95
Central CPFV observer	12	244	292	1.00	141	1.20
NWFSChook&line	5	72	103	1.00	92	1.44
NWFSC trawl survey	6	66	67	1.00	52	1.02

Table 25. Fixed and estimated parameter values with standard deviations for the base model.

Parameter	est.	value	st. dev	Parameter	est.	value	st. dev
Natural mortality, both sexes	no	0.15		RecrDev_1954	yes	0.13	0.68
Length@Amin, both sexes	no	26		RecrDev_1955	yes	-1.03	0.76
Length@Amax, females	yes	67.75	0.37	RecrDev_1956	yes	0.26	0.71
VonBert K females	yes	0.22	0	RecrDev_1957	yes	-0.96	0.78
Length@Amax, males	yes	58.89	0.33	RecrDev_1958	yes	-0.31	0.94
VonBert K males	yes	0.27	0.01	RecrDev_1959	yes	0.36	1.2
CV of size at Amin, both sexes	no	0.1		RecrDev_1960	yes	0.07	1.08
CV of size at Amax, both sexes	no	0.08		RecrDev_1961	yes	0	1.05
log R0	yes	8.53	0.09	RecrDev_1962	yes	3.18	0.3
Steepness (h)	yes	0.57	0.08	RecrDev_1963	yes	0.04	1.08
Sigma-R	no	1		RecrDev_1964	yes	0.03	1.07
Initial F, hook and line fleet	yes	0.0060	0.0006	RecrDev_1965	yes	0	1.05
length@peak_trawlsou	yes	43.42	0.18	RecrDev_1966	yes	1.42	0.58
Width of top_trawlsou	no	-4.82		RecrDev_1967	yes	-0.14	0.97
Ascending width_trawlsou	no	4.3		RecrDev_1968	yes	-0.13	0.97
Decending width_trawlsou	no	4.76		RecrDev_1969	yes	0.02	1.02
Initial sel_trawlsou	no	-10.5		RecrDev_1970	yes	0.42	1.14
final sel_trawlsou	no	-0.77		RecrDev_1971	yes	0.52	0.99
length@peak_hook and line	yes	50.24	0.78	RecrDev_1972	yes	1.02	0.38
Width of top_hook and line	yes	-4.09	2.46	RecrDev_1973	yes	1.96	0.13
Ascending width_hook and line	yes	4.33	0.13	RecrDev_1974	yes	0.95	0.16
Decending width_hook and line	yes	3.98	0.53	RecrDev_1975	yes	-0.87	0.37
Initial sel_hook and line	yes	-9.41	4.07	RecrDev_1976	yes	-0.15	0.23
final sel_hook and line	yes	-0.67	0.32	RecrDev_1977	yes	2.57	0.07
length@peak_setnet	yes	48.57	0.36	RecrDev_1978	yes	-0.14	0.41
Width of top_setnet	yes	-7.41	5.36	RecrDev_1979	yes	1.01	0.1
Ascending width_setnet	yes	3.45	0.1	RecrDev_1980	yes	-0.32	0.19
Decending width_setnet	yes	4.15	0.18	RecrDev_1981	yes	-0.97	0.2
Initial sel_setnet	yes	-6.07	0.32	RecrDev_1982	yes	-2.66	0.38
final sel_setnet	yes	-1.59	0.21	RecrDev_1983	yes	-0.22	0.11
length@peak_southern rec	yes	38.37	0.56	RecrDev_1984	yes	1.77	0.06
Width of top_southern rec	yes	-7.64	5.19	RecrDev_1985	yes	-0.58	0.17
Ascending width_southern rec	yes	4.66	0.12	RecrDev_1986	yes	-0.65	0.16
Decending width_southern rec	yes	5.47	0.11	RecrDev_1987	yes	0.6	0.13
Initial sel_southern rec	yes	-4.47	0.28	RecrDev_1988	yes	1.67	0.12
final sel_southern rec	yes	-3.23	0.5	RecrDev_1989	yes	-1.31	0.33
logistic, size infl_central rec	yes	34.44	0.48	RecrDev_1990	yes	0.56	0.17
logistic, width 95%_central rec	yes	11.7	0.57	RecrDev_1991	yes	0.5	0.18
logistic, size infl_northern trawl	yes	40.34	0.39	RecrDev_1992	yes	-0.81	0.33
logistic, width 95%_northern trawl	yes	6.35	0.52	RecrDev_1993	yes	0.04	0.19
length@peak_triennial	no	24		RecrDev_1994	yes	-0.25	0.2
Width of top_triennial	no	-9.79		RecrDev_1995	yes	-0.86	0.25
Ascending width_triennial	no	6.11		RecrDev_1996	yes	-0.27	0.2
Decending width_triennial	no	5.56		RecrDev_1997	yes	-1.84	0.38
Initial sel_triennial	no	-2.86		RecrDev_1998	yes	-0.13	0.22
final sel_triennial	no	-1.25		RecrDev_1999	yes	1.73	0.16
length@peak_SCB hook line	yes	55.07	1.97	RecrDev_2000	yes	-1.67	0.45
Width of top_SCB hook line	yes	-5.73	7.45	RecrDev_2001	yes	-1.5	0.38
Ascending width_SCB hook line	yes	6	0.24	RecrDev_2002	yes	-0.2	0.21
Decending width_SCB hook line	yes	2.92	1.16	RecrDev_2003	yes	0.85	0.14
Initial sel_SCB hook line	yes	-7.76	4.84	RecrDev_2004	yes	-1.15	0.27
final sel_SCB hook line	yes	-1.12	0.56	RecrDev_2005	yes	0.68	0.14
logistic, size inflection_NWFSC combo	yes	22.56	1.95	RecrDev_2006	yes	-1.48	0.33
logistic, width 95% inflect_NWFSC combo	yes	15.19	3.93	RecrDev_2007	yes	-0.86	0.29
				RecrDev_2008	yes	-0.87	0.5

Table 26. Total and summary biomass, spawning output, age 0 recruitment, total catch, exploitation rate (catch/summary biomass) and SPR mortality rate.

Year	Total biomass	Summary biomass	Spawning output	CV spawning	Depletion	Recruits (x 10^3)	CV recruits	Total catch	Exploit. rate	SPR rate
Unfished	44136	44070	7861300	0.091	1.000	5060	0.092	0	0	1
1892	42722	42656	7580000	0.095	0.964	5026	0.091	167	0.004	0.966
1893	42706	42640	7580000	0.095	0.964	5025	0.091	157	0.004	0.968
1894	42695	42629	7580000	0.095	0.964	5025	0.091	148	0.003	0.97
1895	42688	42623	7580000	0.095	0.964	5025	0.091	139	0.003	0.971
1896	42687	42621	7580000	0.095	0.964	5025	0.091	131	0.003	0.973
1897	42689	42623	7580000	0.094	0.964	5026	0.091	123	0.003	0.975
1898	42696	42630	7580000	0.094	0.964	5026	0.091	115	0.003	0.976
1899	42708	42643	7590000	0.094	0.965	5026	0.091	108	0.003	0.974
1900	42726	42661	7590000	0.094	0.965	5026	0.091	119	0.003	0.971
1901	42731	42665	7590000	0.094	0.965	5027	0.091	131	0.003	0.969
1902	42723	42657	7590000	0.094	0.965	5026	0.091	142	0.003	0.966
1903	42703	42637	7590000	0.094	0.965	5026	0.091	154	0.004	0.964
1904	42672	42607	7580000	0.094	0.964	5025	0.091	165	0.004	0.961
1905	42632	42567	7570000	0.094	0.963	5024	0.091	176	0.004	0.959
1906	42584	42518	7560000	0.094	0.962	5023	0.091	188	0.004	0.956
1907	42527	42462	7550000	0.094	0.960	5022	0.091	199	0.005	0.954
1908	42464	42398	7540000	0.094	0.959	5021	0.091	210	0.005	0.948
1909	42394	42328	7530000	0.094	0.958	5019	0.091	237	0.006	0.943
1910	42303	42237	7510000	0.094	0.955	5017	0.090	263	0.006	0.937
1911	42193	42127	7490000	0.094	0.953	5014	0.090	289	0.007	0.931
1912	42064	41999	7470000	0.094	0.950	5011	0.090	316	0.008	0.926
1913	41920	41854	7440000	0.095	0.946	5008	0.090	342	0.008	0.92
1914	41760	41694	7410000	0.095	0.943	5004	0.090	368	0.009	0.914
1915	41586	41521	7380000	0.095	0.939	4999	0.090	395	0.010	0.897
1916	41400	41334	7350000	0.096	0.935	4995	0.090	474	0.011	0.842
1917	41147	41082	7300000	0.096	0.929	4989	0.090	747	0.018	0.831
1918	40637	40572	7210000	0.097	0.917	4976	0.089	799	0.020	0.882
1919	40108	40043	7110000	0.099	0.904	4963	0.089	529	0.013	0.877
1920	39886	39821	7070000	0.099	0.899	4957	0.089	550	0.014	0.895
1921	39667	39602	7020000	0.100	0.893	4950	0.089	463	0.012	0.905
1922	39557	39492	7000000	0.100	0.890	4946	0.089	417	0.011	0.889
1923	39507	39442	6980000	0.100	0.888	4944	0.088	489	0.012	0.899
1924	39392	39328	6960000	0.100	0.885	4941	0.088	442	0.011	0.886
1925	39335	39271	6950000	0.100	0.884	4939	0.088	505	0.013	0.843
1926	39222	39157	6920000	0.100	0.880	4935	0.088	711	0.018	0.862
1927	38909	38845	6870000	0.101	0.874	4927	0.088	610	0.016	0.854
1928	38716	38651	6830000	0.101	0.869	4922	0.088	639	0.017	0.863
1929	38505	38441	6790000	0.101	0.864	4916	0.088	597	0.016	0.838
1930	38351	38287	6760000	0.102	0.860	4911	0.087	715	0.019	0.844
1931	38092	38028	6710000	0.102	0.854	4904	0.087	689	0.018	0.87
1932	37879	37815	6670000	0.103	0.848	4897	0.087	556	0.015	0.896
1933	37817	37753	6650000	0.103	0.846	4894	0.087	429	0.011	0.882
1934	37891	37827	6660000	0.102	0.847	4896	0.087	494	0.013	0.874

Table 26 (continued)

Year	Total biomass	Summary biomass	Spawning output	CV spawning	Depletion	Recruits (x 10^3)	CV recruits	Total catch	Exploit. rate	SPR rate
1935	37898	37834	6660000	0.102	0.847	4895	0.087	534	0.014	0.853
1936	37865	37801	6650000	0.102	0.846	4894	0.087	632	0.017	0.861
1937	37732	37668	6630000	0.102	0.843	4891	0.087	589	0.016	0.889
1938	37649	37585	6610000	0.102	0.841	4888	0.087	461	0.012	0.909
1939	37700	37636	6620000	0.102	0.842	4889	0.086	373	0.010	0.907
1940	37841	37777	6640000	0.101	0.845	4892	0.086	382	0.010	0.924
1941	37967	37903	6660000	0.100	0.847	4895	0.087	308	0.008	0.969
1942	38160	38096	6690000	0.100	0.851	4900	0.087	124	0.003	0.929
1943	38526	38462	6750000	0.099	0.859	4910	0.087	292	0.008	0.835
1944	38710	38646	6780000	0.098	0.862	4915	0.087	737	0.019	0.714
1945	38455	38391	6730000	0.099	0.856	4907	0.087	1413	0.037	0.801
1946	37559	37495	6550000	0.101	0.833	4879	0.086	880	0.023	0.798
1947	37223	37160	6490000	0.102	0.826	4868	0.086	890	0.024	0.816
1948	36904	36840	6420000	0.103	0.817	4857	0.086	766	0.021	0.801
1949	36714	36650	6390000	0.103	0.813	4851	0.085	828	0.023	0.723
1950	36464	36401	6340000	0.104	0.806	4844	0.085	1216	0.033	0.625
1951	35822	35759	6240000	0.106	0.794	4826	0.085	1759	0.049	0.576
1952	34654	34592	6040000	0.109	0.768	4791	0.084	1966	0.057	0.517
1953	33294	33232	5810000	0.113	0.739	4749	0.084	2271	0.068	0.475
1954	31676	31606	5540000	0.118	0.705	5334	0.652	2402	0.076	0.37
1955	29963	29942	5250000	0.125	0.668	1648	0.757	3053	0.102	0.283
1956	27526	27449	4860000	0.134	0.618	5872	0.688	3650	0.133	0.262
1957	24340	24318	4370000	0.144	0.556	1679	0.780	3566	0.147	0.224
1958	21287	21246	3840000	0.158	0.488	3099	0.945	3580	0.169	0.251
1959	18198	18123	3290000	0.176	0.419	5779	1.202	2847	0.157	0.257
1960	16078	16025	2870000	0.195	0.365	4091	1.095	2436	0.152	0.305
1961	14748	14701	2510000	0.220	0.319	3617	1.076	1924	0.131	0.344
1962	15233	14140	2310000	0.231	0.294	83792	0.215	1731	0.122	0.329
1963	20471	20424	2230000	0.257	0.284	3584	1.112	2008	0.098	0.614
1964	31740	31693	2270000	0.286	0.289	3587	1.104	1523	0.048	0.744
1965	43555	43500	3740000	0.179	0.476	4200	1.053	1746	0.040	0.658
1966	53013	52766	6260000	0.145	0.796	18923	0.552	3418	0.065	0.52
1967	58213	58161	7960000	0.152	1.013	3997	0.964	5331	0.092	0.622
1968	59341	59290	8610000	0.161	1.095	3904	0.964	3405	0.057	0.703
1969	60097	60041	9230000	0.147	1.174	4327	1.017	2347	0.039	0.63
1970	60022	59942	9850000	0.121	1.253	6203	1.129	2846	0.047	0.636
1971	58025	57939	9990000	0.103	1.271	6595	0.991	2497	0.043	0.488
1972	55715	55581	9860000	0.090	1.254	10277	0.366	3653	0.066	0.24
1973	52373	52049	9360000	0.078	1.191	24770	0.091	7201	0.138	0.143
1974	46760	46651	8190000	0.071	1.042	8370	0.139	9001	0.193	0.22
1975	41054	41037	6810000	0.068	0.866	1256	0.365	6404	0.156	0.233
1976	38031	37998	6240000	0.060	0.794	2508	0.221	6177	0.163	0.27
1977	34550	34059	5890000	0.051	0.749	37567	0.036	4861	0.143	0.255
1978	33142	33109	5500000	0.046	0.700	2473	0.409	4367	0.132	0.159
1979	34256	34156	4990000	0.044	0.635	7629	0.084	6116	0.179	0.217

Table 26 (continued)

Year	Total biomass	Summary biomass	Spawning output	CV spawning	Depletion	Recruits (x 10^3)	CV recruits	Total catch	Exploit. rate	SPR rate
1980	33324	33298	4760000	0.039	0.605	1994	0.181	5384	0.162	0.207
1981	32051	32038	4900000	0.032	0.623	1041	0.189	5752	0.180	0.154
1982	28829	28826	4660000	0.028	0.593	190	0.376	6599	0.229	0.164
1983	23258	23230	4030000	0.027	0.513	2092	0.103	5598	0.241	0.143
1984	18002	17816	3250000	0.029	0.413	14196	0.029	4676	0.262	0.165
1985	14083	14067	2460000	0.033	0.313	1215	0.164	2864	0.204	0.1
1986	12972	12959	1960000	0.038	0.249	1032	0.141	3121	0.241	0.123
1987	11690	11647	1680000	0.041	0.214	3318	0.078	2649	0.227	0.177
1988	10837	10713	1620000	0.041	0.206	9495	0.051	2304	0.215	0.132
1989	10417	10411	1500000	0.044	0.191	464	0.318	2756	0.265	0.128
1990	9779	9743	1250000	0.053	0.159	2708	0.108	2624	0.269	0.242
1991	9057	9026	1130000	0.063	0.144	2395	0.128	1714	0.190	0.244
1992	8999	8990	1220000	0.067	0.155	678	0.317	1832	0.204	0.258
1993	8466	8446	1190000	0.077	0.151	1565	0.151	1593	0.189	0.26
1994	7796	7781	1150000	0.090	0.146	1147	0.170	1294	0.166	0.364
1995	7168	7160	1110000	0.102	0.141	608	0.232	818	0.114	0.44
1996	6841	6827	1090000	0.113	0.139	1080	0.173	547	0.080	0.452
1997	6636	6633	1090000	0.121	0.139	227	0.379	498	0.075	0.701
1998	6374	6358	1080000	0.128	0.137	1237	0.213	211	0.033	0.684
1999	6409	6304	1090000	0.132	0.139	8067	0.150	213	0.034	0.754
2000	6821	6817	1090000	0.135	0.139	268	0.459	160	0.023	0.825
2001	7802	7798	1090000	0.139	0.139	318	0.384	139	0.018	0.912
2002	8735	8718	1230000	0.139	0.156	1250	0.214	90	0.010	0.988
2003	9532	9480	1450000	0.140	0.184	3952	0.164	13	0.001	0.922
2004	10326	10319	1630000	0.141	0.207	566	0.295	85	0.008	0.906
2005	11055	11008	1730000	0.143	0.220	3642	0.175	107	0.010	0.949
2006	11683	11677	1850000	0.145	0.235	433	0.351	60	0.005	0.949
2007	12320	12309	1980000	0.146	0.252	838	0.316	63	0.005	0.941
2008	12703	12692	2100000	0.148	0.267	850	0.525	77	0.006	0.95

Table 27. Female numbers at age over time from the base model.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
VIRG	2.53	2.18	1.87	1.61	1.39	1.20	1.03	0.89	0.76	0.66	0.56	0.49	0.42	0.36	0.31	0.27	0.23	0.20	0.17	0.15	0.13	0.78
INIT	2.53	2.18	1.87	1.61	1.38	1.19	1.02	0.87	0.75	0.64	0.55	0.47	0.40	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.72
1892	2.51	2.18	1.87	1.61	1.38	1.19	1.02	0.87	0.75	0.64	0.55	0.47	0.40	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.72
1893	2.51	2.16	1.87	1.61	1.38	1.19	1.02	0.87	0.75	0.64	0.55	0.47	0.40	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.72
1894	2.51	2.16	1.86	1.61	1.38	1.19	1.02	0.87	0.75	0.64	0.55	0.47	0.40	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.72
1895	2.51	2.16	1.86	1.60	1.38	1.19	1.02	0.87	0.75	0.64	0.55	0.47	0.40	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.72
1896	2.51	2.16	1.86	1.60	1.38	1.19	1.02	0.87	0.75	0.64	0.55	0.47	0.40	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.72
1897	2.51	2.16	1.86	1.60	1.38	1.18	1.02	0.87	0.75	0.64	0.55	0.47	0.40	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.72
1898	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.87	0.75	0.64	0.55	0.47	0.40	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.72
1899	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.87	0.75	0.64	0.55	0.47	0.40	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.72
1900	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.87	0.74	0.64	0.55	0.47	0.40	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.72
1901	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.87	0.74	0.64	0.55	0.47	0.41	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.72
1902	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.87	0.74	0.64	0.55	0.47	0.41	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.72
1903	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.87	0.74	0.64	0.55	0.47	0.41	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.72
1904	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.87	0.74	0.64	0.55	0.47	0.40	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.72
1905	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.86	0.74	0.64	0.55	0.47	0.40	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.72
1906	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.86	0.74	0.63	0.55	0.47	0.40	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.72
1907	2.51	2.16	1.86	1.60	1.37	1.18	1.01	0.86	0.74	0.63	0.54	0.47	0.40	0.35	0.30	0.25	0.22	0.19	0.16	0.14	0.12	0.72
1908	2.51	2.16	1.86	1.60	1.37	1.18	1.01	0.86	0.74	0.63	0.54	0.47	0.40	0.34	0.30	0.25	0.22	0.19	0.16	0.14	0.12	0.72
1909	2.51	2.16	1.86	1.60	1.37	1.18	1.01	0.86	0.74	0.63	0.54	0.47	0.40	0.34	0.30	0.25	0.22	0.19	0.16	0.14	0.12	0.72
1910	2.51	2.16	1.86	1.60	1.37	1.17	1.00	0.86	0.73	0.63	0.54	0.46	0.40	0.34	0.29	0.25	0.22	0.19	0.16	0.14	0.12	0.72
1911	2.51	2.16	1.86	1.60	1.37	1.17	1.00	0.86	0.73	0.63	0.54	0.46	0.40	0.34	0.29	0.25	0.22	0.19	0.16	0.14	0.12	0.72
1912	2.51	2.16	1.86	1.60	1.37	1.17	1.00	0.85	0.73	0.63	0.54	0.46	0.40	0.34	0.29	0.25	0.22	0.19	0.16	0.14	0.12	0.72
1913	2.50	2.16	1.86	1.60	1.37	1.17	1.00	0.85	0.73	0.62	0.53	0.46	0.39	0.34	0.29	0.25	0.21	0.18	0.16	0.14	0.12	0.72
1914	2.50	2.16	1.86	1.60	1.37	1.17	0.99	0.85	0.72	0.62	0.53	0.46	0.39	0.34	0.29	0.25	0.21	0.18	0.16	0.14	0.12	0.71
1915	2.50	2.15	1.85	1.60	1.37	1.17	0.99	0.84	0.72	0.62	0.53	0.45	0.39	0.34	0.29	0.25	0.21	0.18	0.16	0.14	0.12	0.71
1916	2.50	2.15	1.85	1.59	1.37	1.16	0.99	0.84	0.72	0.61	0.53	0.45	0.39	0.33	0.29	0.25	0.21	0.18	0.16	0.13	0.12	0.71
1917	2.49	2.15	1.85	1.59	1.36	1.16	0.98	0.84	0.71	0.61	0.52	0.45	0.38	0.33	0.28	0.24	0.21	0.18	0.16	0.13	0.11	0.70
1918	2.49	2.15	1.85	1.59	1.35	1.14	0.97	0.83	0.70	0.60	0.52	0.44	0.38	0.33	0.28	0.24	0.21	0.18	0.15	0.13	0.11	0.70
1919	2.48	2.14	1.85	1.59	1.35	1.13	0.96	0.81	0.69	0.59	0.51	0.44	0.37	0.32	0.28	0.24	0.20	0.18	0.15	0.13	0.11	0.69
1920	2.48	2.14	1.84	1.59	1.35	1.14	0.96	0.81	0.69	0.59	0.50	0.43	0.37	0.32	0.27	0.24	0.20	0.17	0.15	0.13	0.11	0.68
1921	2.48	2.13	1.84	1.58	1.35	1.14	0.96	0.81	0.68	0.58	0.50	0.43	0.37	0.32	0.27	0.23	0.20	0.17	0.15	0.13	0.11	0.68
1922	2.47	2.13	1.84	1.58	1.35	1.15	0.97	0.81	0.69	0.58	0.50	0.42	0.36	0.31	0.27	0.23	0.20	0.17	0.15	0.13	0.11	0.67
1923	2.47	2.13	1.83	1.58	1.35	1.15	0.97	0.82	0.69	0.58	0.49	0.42	0.36	0.31	0.27	0.23	0.20	0.17	0.15	0.13	0.11	0.67
1924	2.47	2.13	1.83	1.57	1.35	1.14	0.97	0.82	0.70	0.59	0.50	0.42	0.36	0.31	0.27	0.23	0.20	0.17	0.15	0.13	0.11	0.66
1925	2.47	2.13	1.83	1.57	1.34	1.14	0.97	0.82	0.70	0.59	0.50	0.42	0.36	0.31	0.26	0.23	0.19	0.17	0.14	0.12	0.11	0.66
1926	2.47	2.13	1.83	1.57	1.34	1.14	0.96	0.82	0.70	0.59	0.50	0.43	0.36	0.31	0.26	0.22	0.19	0.17	0.14	0.12	0.11	0.65
1927	2.46	2.12	1.83	1.57	1.34	1.13	0.95	0.81	0.69	0.59	0.50	0.43	0.36	0.31	0.26	0.22	0.19	0.16	0.14	0.12	0.10	0.64
1928	2.46	2.12	1.83	1.57	1.33	1.13	0.95	0.80	0.68	0.58	0.50	0.42	0.36	0.31	0.26	0.22	0.19	0.16	0.14	0.12	0.10	0.64
1929	2.46	2.12	1.82	1.57	1.33	1.12	0.95	0.80	0.68	0.58	0.49	0.42	0.36	0.31	0.26	0.22	0.19	0.16	0.14	0.12	0.10	0.63
1930	2.46	2.12	1.82	1.56	1.33	1.12	0.95	0.80	0.67	0.57	0.49	0.42	0.36	0.31	0.26	0.22	0.19	0.16	0.14	0.12	0.10	0.62
1931	2.45	2.11	1.82	1.56	1.33	1.12	0.94	0.79	0.67	0.57	0.48	0.41	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.10	0.62
1932	2.45	2.11	1.82	1.56	1.33	1.12	0.94	0.79	0.67	0.57	0.48	0.41	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.10	0.61
1933	2.45	2.11	1.82	1.56	1.33	1.12	0.94	0.79	0.67	0.57	0.48	0.41	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.10	0.60
1934	2.45	2.11	1.81	1.56	1.33	1.13	0.95	0.80	0.67	0.57	0.48	0.41	0.35	0.30	0.25	0.22	0.19	0.16	0.14	0.12	0.10	0.60
1935	2.45	2.11	1.81	1.55	1.33	1.13	0.95	0.80	0.68	0.57	0.48	0.41	0.35	0.30	0.25	0.22	0.19	0.16	0.14	0.12	0.10	0.59
1936	2.45	2.11	1.81	1.55	1.32	1.12	0.95	0.80	0.68	0.57	0.48	0.41	0.35	0.30	0.25	0.22	0.18	0.16	0.14	0.12	0.10	0.59
1937	2.45	2.11	1.81	1.55	1.32	1.11	0.94	0.80	0.68	0.57	0.49	0.41	0.35	0.30	0.25	0.21	0.18	0.16	0.13	0.12	0.10	0.59
1938	2.44	2.10	1.81	1.55	1.32	1.11	0.94	0.79	0.67	0.57	0.49	0.41	0.35	0.30	0.25	0.21	0.18	0.16	0.13	0.11	0.10	0.58
1939	2.44	2.10	1.81	1.55	1.32	1.12	0.94	0.79	0.67	0.57	0.49	0.41	0.35	0.30	0.25	0.21	0.18	0.16	0.13	0.11	0.10	0.58
1940	2.45	2.10	1.81	1.55	1.33	1.12	0.95	0.80	0.68	0.57	0.49	0.42	0.35	0.30	0.25	0.22	0.18	0.16	0.13	0.11	0.10	0.58
1941	2.45	2.11	1.81	1.55	1.33	1.13	0.95	0.81	0.68	0.57	0.49	0.42	0.36	0.30	0.26	0.22	0.18	0.16	0.13	0.11	0.10	0.58
1942	2.45	2.11	1.81	1.55	1.33	1.13	0.96	0.81	0.69	0.58	0.49	0.42	0.36	0.30	0.26	0.22	0.19	0.16	0.13	0.11	0.10	0.58
1943	2.46	2.11	1.81	1.56	1.33	1.14	0.97	0.82	0.70	0.59	0.50	0.42	0.36	0.31	0.26	0.22	0.19	0.16	0.13	0.11	0.10	0.58
1944	2.46	2.11	1.81	1.56	1.33	1.14	0.97	0.83	0.70	0.59	0.50	0.43	0.36	0.31	0.26	0.22	0.19	0.16	0.14	0.12	0.10	0.58
1945	2.45	2.12	1.82	1.56	1.33	1.13	0.96	0.82	0.70	0.59	0.50	0.42	0.36	0.30	0.26	0.22	0.19	0.16	0.14	0.11	0.10	0.57
1946	2.44	2.11	1.82	1.56	1.31	1.10	0.93	0.79	0.68	0.58	0.49	0.41	0.35	0.30	0.25	0.21	0.18	0.16	0.13	0.11	0.09	0.55
1947	2.43	2.10	1.82	1.56	1.32	1.10	0.92	0.78	0.66	0.57	0.48	0.41	0.35	0.30	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.55
1948	2.43	2.09	1.81	1.56	1.32	1.10	0.92	0.77	0.65	0.56	0.48	0.41	0.34	0.29	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.54
1949	2.43	2.09	1.80	1.54	1.31	1.11	0.93	0.77	0.65	0.55	0.47	0.40	0.34	0.29	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.53

Table 27 (continued). Female numbers at age over time from the base model

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1950	2.42	2.09	1.79	1.53	1.30	1.10	0.93	0.78	0.65	0.54	0.46	0.40	0.34	0.29	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.53
1951	2.41	2.08	1.79	1.52	1.27	1.07	0.90	0.76	0.64	0.54	0.45	0.39	0.33	0.28	0.24	0.21	0.17	0.15	0.13	0.11	0.09	0.52
1952	2.40	2.08	1.79	1.50	1.24	1.02	0.86	0.73	0.62	0.53	0.44	0.37	0.32	0.27	0.23	0.20	0.17	0.14	0.12	0.10	0.09	0.51
1953	2.37	2.06	1.78	1.48	1.20	0.97	0.81	0.69	0.59	0.51	0.43	0.36	0.31	0.26	0.23	0.19	0.17	0.14	0.12	0.10	0.09	0.49
1954	2.67	2.04	1.76	1.46	1.16	0.92	0.76	0.64	0.55	0.48	0.41	0.35	0.30	0.25	0.21	0.18	0.16	0.14	0.12	0.10	0.08	0.47
1955	0.82	2.29	1.74	1.43	1.12	0.88	0.71	0.59	0.51	0.44	0.38	0.33	0.28	0.24	0.20	0.18	0.15	0.13	0.11	0.09	0.08	0.46
1956	2.94	0.71	1.94	1.36	1.04	0.81	0.65	0.54	0.46	0.40	0.35	0.30	0.26	0.23	0.19	0.16	0.14	0.12	0.10	0.09	0.08	0.43
1957	0.84	2.52	0.59	1.47	0.95	0.71	0.57	0.47	0.40	0.34	0.30	0.27	0.24	0.21	0.18	0.15	0.13	0.11	0.10	0.08	0.07	0.40
1958	1.55	0.72	2.13	0.45	1.01	0.64	0.49	0.40	0.34	0.29	0.26	0.23	0.20	0.18	0.16	0.14	0.12	0.10	0.09	0.07	0.06	0.37
1959	2.89	1.33	0.61	1.62	0.30	0.66	0.42	0.33	0.28	0.25	0.22	0.19	0.17	0.15	0.14	0.12	0.10	0.09	0.08	0.06	0.06	0.33
1960	2.05	2.49	1.13	0.47	1.11	0.20	0.44	0.29	0.24	0.21	0.18	0.16	0.14	0.13	0.12	0.10	0.09	0.08	0.07	0.06	0.05	0.29
1961	1.81	1.76	2.11	0.87	0.32	0.74	0.14	0.31	0.21	0.18	0.15	0.14	0.12	0.11	0.10	0.09	0.08	0.07	0.06	0.05	0.04	0.26
1962	41.9	1.56	1.49	1.65	0.62	0.23	0.52	0.10	0.23	0.16	0.13	0.12	0.11	0.09	0.08	0.08	0.07	0.06	0.05	0.05	0.04	0.24
1963	1.79	36.0	1.32	1.18	1.21	0.44	0.16	0.39	0.08	0.18	0.12	0.10	0.09	0.08	0.07	0.07	0.06	0.05	0.05	0.04	0.04	0.22
1964	1.79	1.54	30.7	1.05	0.86	0.85	0.32	0.12	0.29	0.06	0.14	0.09	0.08	0.07	0.06	0.06	0.05	0.05	0.04	0.04	0.03	0.20
1965	2.10	1.54	1.32	25.7	0.85	0.69	0.69	0.26	0.10	0.24	0.05	0.11	0.08	0.07	0.06	0.05	0.05	0.04	0.04	0.04	0.03	0.20
1966	9.46	1.81	1.32	1.12	21.3	0.70	0.57	0.57	0.22	0.08	0.20	0.04	0.09	0.07	0.06	0.05	0.04	0.04	0.04	0.03	0.03	0.19
1967	2.00	8.14	1.55	1.10	0.90	17.1	0.57	0.47	0.47	0.18	0.07	0.17	0.03	0.08	0.05	0.05	0.04	0.04	0.03	0.03	0.03	0.18
1968	1.95	1.72	6.95	1.26	0.86	0.70	13.3	0.45	0.37	0.38	0.14	0.06	0.14	0.03	0.06	0.05	0.04	0.03	0.03	0.03	0.03	0.17
1969	2.16	1.68	1.47	5.74	1.01	0.68	0.56	10.8	0.37	0.31	0.31	0.12	0.05	0.11	0.02	0.05	0.04	0.03	0.03	0.03	0.02	0.17
1970	3.10	1.86	1.43	1.22	4.68	0.82	0.56	0.46	9.00	0.31	0.26	0.26	0.10	0.04	0.09	0.02	0.05	0.03	0.03	0.02	0.02	0.16
1971	3.30	2.67	1.58	1.18	0.98	3.74	0.66	0.46	0.38	7.44	0.26	0.21	0.22	0.08	0.03	0.08	0.02	0.04	0.03	0.02	0.02	0.15
1972	5.14	2.84	2.27	1.30	0.95	0.78	3.02	0.54	0.38	0.31	6.19	0.21	0.18	0.18	0.07	0.03	0.07	0.01	0.03	0.02	0.02	0.15
1973	12.39	4.42	2.40	1.81	1.00	0.72	0.61	2.39	0.43	0.30	0.26	5.07	0.17	0.15	0.15	0.06	0.02	0.06	0.01	0.03	0.02	0.14
1974	4.19	10.65	3.70	1.80	1.22	0.66	0.49	0.43	1.74	0.32	0.23	0.20	3.89	0.13	0.11	0.12	0.05	0.02	0.04	0.01	0.02	0.12
1975	0.63	3.60	8.81	2.60	1.08	0.71	0.40	0.32	0.29	1.21	0.23	0.17	0.14	2.86	0.10	0.08	0.09	0.03	0.01	0.03	0.01	0.11
1976	1.25	0.54	3.00	6.52	1.73	0.70	0.48	0.28	0.23	0.21	0.90	0.17	0.13	0.11	2.20	0.08	0.07	0.07	0.03	0.01	0.02	0.09
1977	18.78	1.08	0.45	2.26	4.45	1.16	0.48	0.34	0.20	0.17	0.16	0.69	0.13	0.10	0.08	1.70	0.06	0.05	0.05	0.02	0.01	0.09
1978	1.24	16.15	0.91	0.35	1.60	3.10	0.82	0.35	0.25	0.15	0.13	0.12	0.53	0.10	0.08	0.07	1.34	0.05	0.04	0.04	0.02	0.08
1979	3.81	1.06	13.55	0.70	0.25	1.12	2.20	0.60	0.26	0.19	0.12	0.10	0.10	0.42	0.08	0.06	0.05	1.05	0.04	0.03	0.03	0.07
1980	1.00	3.28	0.89	10.02	0.46	0.16	0.73	1.50	0.42	0.19	0.14	0.09	0.08	0.07	0.32	0.06	0.05	0.04	0.81	0.03	0.02	0.08
1981	0.52	0.86	2.77	0.69	7.08	0.31	0.11	0.52	1.10	0.32	0.14	0.11	0.07	0.06	0.06	0.25	0.05	0.04	0.03	0.63	0.02	0.08
1982	0.09	0.45	0.73	2.19	0.49	4.86	0.22	0.08	0.37	0.80	0.23	0.11	0.08	0.05	0.04	0.04	0.18	0.04	0.03	0.02	0.47	0.08
1983	1.05	0.08	0.37	0.54	1.45	0.31	3.10	0.14	0.05	0.26	0.56	0.16	0.08	0.06	0.04	0.03	0.03	0.13	0.03	0.02	0.02	0.40
1984	7.10	0.90	0.07	0.29	0.37	0.91	0.19	1.98	0.09	0.03	0.18	0.38	0.11	0.05	0.04	0.03	0.02	0.02	0.09	0.02	0.01	0.29
1985	0.61	6.11	0.76	0.05	0.19	0.22	0.53	0.12	1.24	0.06	0.02	0.12	0.26	0.08	0.04	0.03	0.02	0.01	0.01	0.06	0.01	0.21
1986	0.52	0.52	5.14	0.59	0.04	0.11	0.13	0.33	0.08	0.83	0.04	0.02	0.08	0.18	0.06	0.03	0.02	0.01	0.01	0.01	0.05	0.16
1987	1.66	0.44	0.44	3.90	0.37	0.02	0.06	0.07	0.19	0.05	0.53	0.03	0.01	0.06	0.13	0.04	0.02	0.01	0.01	0.01	0.01	0.15
1988	4.75	1.43	0.38	0.35	2.71	0.22	0.01	0.04	0.04	0.12	0.03	0.36	0.02	0.01	0.04	0.09	0.03	0.01	0.01	0.01	0.01	0.11
1989	0.23	4.08	1.22	0.31	0.25	1.77	0.14	0.01	0.02	0.03	0.09	0.02	0.26	0.01	0.01	0.03	0.06	0.02	0.01	0.01	0.00	0.08
1990	1.35	0.20	3.47	0.96	0.21	0.15	1.01	0.08	0.00	0.02	0.02	0.06	0.02	0.18	0.01	0.00	0.02	0.05	0.01	0.01	0.01	0.06
1991	1.20	1.16	0.17	2.72	0.63	0.12	0.08	0.57	0.05	0.00	0.01	0.01	0.04	0.01	0.12	0.01	0.00	0.01	0.03	0.01	0.00	0.05
1992	0.34	1.03	0.99	0.14	1.98	0.42	0.08	0.05	0.39	0.04	0.00	0.01	0.01	0.03	0.01	0.09	0.00	0.00	0.01	0.02	0.01	0.04
1993	0.78	0.29	0.88	0.80	0.10	1.31	0.27	0.05	0.04	0.28	0.03	0.00	0.01	0.01	0.02	0.01	0.07	0.00	0.00	0.01	0.02	0.04
1994	0.57	0.67	0.25	0.71	0.59	0.07	0.88	0.19	0.04	0.03	0.20	0.02	0.00	0.00	0.01	0.02	0.00	0.05	0.00	0.00	0.01	0.04
1995	0.30	0.49	0.57	0.20	0.52	0.41	0.05	0.62	0.14	0.03	0.02	0.16	0.01	0.00	0.00	0.00	0.01	0.00	0.04	0.00	0.00	0.04
1996	0.54	0.26	0.42	0.47	0.15	0.39	0.30	0.04	0.47	0.10	0.02	0.02	0.12	0.01	0.00	0.00	0.00	0.01	0.00	0.03	0.00	0.03
1997	0.11	0.46	0.22	0.35	0.37	0.12	0.30	0.24	0.03	0.38	0.08	0.02	0.01	0.10	0.01	0.00	0.00	0.00	0.01	0.00	0.03	0.03
1998	0.62	0.10	0.40	0.18	0.28	0.29	0.09	0.23	0.19	0.02	0.30	0.07	0.01	0.01	0.08	0.01	0.00	0.00	0.00	0.01	0.00	0.04
1999	4.03	0.53	0.08	0.34	0.15	0.23	0.24	0.08	0.19	0.16	0.02	0.25	0.06	0.01	0.01	0.07	0.01	0.00	0.00	0.00	0.01	0.04
2000	0.13	3.47	0.45	0.07	0.28	0.13	0.19	0.20	0.06	0.16	0.13	0.02	0.21	0.05	0.01	0.01	0.06	0.01	0.00	0.00	0.00	0.04
2001	0.16	0.12	2.97	0.38	0.06	0.23	0.10	0.16	0.17	0.05	0.14	0.11	0.01	0.18	0.04	0.01	0.01	0.05	0.00	0.00	0.00	0.03
2002	0.63	0.14	0.10	2.51	0.32	0.05	0.19	0.09	0.13	0.14	0.05	0.12	0.09	0.01	0.15	0.03	0.01	0.01	0.04	0.00	0.00	0.03
2003	1.98	0.54	0.12	0.08	2.14	0.27	0.04	0.16	0.08	0.11	0.12	0.04	0.10	0.08	0.01	0.13	0.03	0.01	0.00	0.04	0.00	0.02
2004	0.28	1.70	0.46	0.10	0.07	1.83	0.23	0.04	0.14	0.06	0.10	0.10	0.03	0.09	0.07	0.01	0.11	0.03	0.00	0.00	0.03	0.02
2005	1.82	0.24	1.46	0.39	0.09	0.06	1.56	0.20	0.03	0.12	0.06	0.08	0.09	0.03	0.07	0.06	0.01	0.10	0.02	0.00	0.00	0.05
2006	0.22	1.57	0.21	1.24	0.33	0.07	0.05	1.33	0.17	0.03	0.10	0.05	0.07	0.08	0.02	0.06	0.05	0.01	0.08	0.02	0.00	0.04
2007	0.42	0.19	1.35	0.18	1.06	0.29	0.06	0.04	1.14	0.15	0.02	0.09	0.04	0.06	0.07	0.02	0.05	0.04	0.01	0.07	0.02	0.04
2008	0.42	0.36	0.16	1.15	0.15	0.90	0.24	0.05	0.04	0.98	0.13	0.02	0.08	0.04	0.05	0.06	0.02	0.05	0.04	0.00	0.06	0.05

Table 28. Male numbers at age over time from the base model

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
VIRG	2.53	2.18	1.87	1.61	1.39	1.20	1.03	0.89	0.76	0.66	0.56	0.49	0.42	0.36	0.31	0.27	0.23	0.20	0.17	0.15	0.13	0.78
INIT	2.53	2.18	1.87	1.61	1.39	1.19	1.02	0.87	0.75	0.64	0.55	0.47	0.40	0.34	0.29	0.25	0.22	0.19	0.16	0.14	0.12	0.70
1892	2.51	2.18	1.87	1.61	1.39	1.19	1.02	0.87	0.75	0.64	0.55	0.47	0.40	0.34	0.29	0.25	0.22	0.19	0.16	0.14	0.12	0.70
1893	2.51	2.16	1.87	1.61	1.39	1.19	1.02	0.87	0.75	0.64	0.55	0.47	0.40	0.34	0.29	0.25	0.22	0.19	0.16	0.14	0.12	0.70
1894	2.51	2.16	1.86	1.61	1.39	1.19	1.02	0.87	0.75	0.64	0.55	0.47	0.40	0.34	0.29	0.25	0.22	0.19	0.16	0.14	0.12	0.70
1895	2.51	2.16	1.86	1.60	1.39	1.19	1.02	0.87	0.75	0.64	0.55	0.47	0.40	0.34	0.29	0.25	0.22	0.19	0.16	0.14	0.12	0.70
1896	2.51	2.16	1.86	1.60	1.38	1.19	1.02	0.87	0.75	0.64	0.55	0.47	0.40	0.34	0.29	0.25	0.22	0.19	0.16	0.14	0.12	0.70
1897	2.51	2.16	1.86	1.60	1.38	1.18	1.02	0.87	0.75	0.64	0.55	0.47	0.40	0.34	0.29	0.25	0.22	0.19	0.16	0.14	0.12	0.70
1898	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.87	0.75	0.64	0.55	0.47	0.40	0.34	0.30	0.25	0.22	0.19	0.16	0.14	0.12	0.70
1899	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.87	0.75	0.64	0.55	0.47	0.40	0.34	0.30	0.25	0.22	0.19	0.16	0.14	0.12	0.70
1900	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.87	0.74	0.64	0.55	0.47	0.40	0.35	0.30	0.25	0.22	0.19	0.16	0.14	0.12	0.70
1901	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.87	0.74	0.64	0.55	0.47	0.40	0.35	0.30	0.25	0.22	0.19	0.16	0.14	0.12	0.70
1902	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.87	0.74	0.64	0.55	0.47	0.40	0.35	0.30	0.25	0.22	0.19	0.16	0.14	0.12	0.70
1903	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.87	0.74	0.64	0.55	0.47	0.40	0.35	0.30	0.25	0.22	0.19	0.16	0.14	0.12	0.70
1904	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.87	0.74	0.64	0.55	0.47	0.40	0.35	0.30	0.25	0.22	0.19	0.16	0.14	0.12	0.70
1905	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.87	0.74	0.64	0.55	0.47	0.40	0.34	0.30	0.25	0.22	0.19	0.16	0.14	0.12	0.70
1906	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.86	0.74	0.63	0.54	0.47	0.40	0.34	0.29	0.25	0.22	0.19	0.16	0.14	0.12	0.70
1907	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.86	0.74	0.63	0.54	0.47	0.40	0.34	0.29	0.25	0.22	0.19	0.16	0.14	0.12	0.70
1908	2.51	2.16	1.86	1.60	1.38	1.18	1.01	0.86	0.74	0.63	0.54	0.46	0.40	0.34	0.29	0.25	0.22	0.19	0.16	0.14	0.12	0.70
1909	2.51	2.16	1.86	1.60	1.37	1.18	1.01	0.86	0.74	0.63	0.54	0.46	0.40	0.34	0.29	0.25	0.22	0.18	0.16	0.14	0.12	0.70
1910	2.51	2.16	1.86	1.60	1.37	1.18	1.01	0.86	0.74	0.63	0.54	0.46	0.40	0.34	0.29	0.25	0.21	0.18	0.16	0.14	0.12	0.70
1911	2.51	2.16	1.86	1.60	1.37	1.18	1.00	0.86	0.73	0.63	0.54	0.46	0.39	0.34	0.29	0.25	0.21	0.18	0.16	0.13	0.12	0.70
1912	2.51	2.16	1.86	1.60	1.37	1.17	1.00	0.86	0.73	0.63	0.53	0.46	0.39	0.34	0.29	0.25	0.21	0.18	0.16	0.13	0.12	0.70
1913	2.50	2.16	1.86	1.60	1.37	1.17	1.00	0.85	0.73	0.62	0.53	0.46	0.39	0.33	0.29	0.25	0.21	0.18	0.16	0.13	0.11	0.69
1914	2.50	2.16	1.86	1.60	1.37	1.17	1.00	0.85	0.73	0.62	0.53	0.45	0.39	0.33	0.28	0.24	0.21	0.18	0.15	0.13	0.11	0.69
1915	2.50	2.15	1.85	1.60	1.37	1.17	1.00	0.85	0.72	0.62	0.53	0.45	0.39	0.33	0.28	0.24	0.21	0.18	0.15	0.13	0.11	0.68
1916	2.50	2.15	1.85	1.60	1.37	1.17	0.99	0.85	0.72	0.61	0.52	0.45	0.38	0.33	0.28	0.24	0.21	0.18	0.15	0.13	0.11	0.68
1917	2.49	2.15	1.85	1.59	1.36	1.16	0.99	0.84	0.72	0.61	0.52	0.44	0.38	0.32	0.28	0.24	0.20	0.18	0.15	0.13	0.11	0.67
1918	2.49	2.15	1.85	1.59	1.36	1.15	0.98	0.83	0.70	0.60	0.51	0.44	0.37	0.32	0.27	0.23	0.20	0.17	0.15	0.13	0.11	0.66
1919	2.48	2.14	1.85	1.59	1.35	1.14	0.96	0.82	0.69	0.59	0.50	0.43	0.37	0.31	0.27	0.23	0.20	0.17	0.14	0.12	0.11	0.65
1920	2.48	2.14	1.84	1.59	1.36	1.15	0.97	0.81	0.69	0.58	0.50	0.42	0.36	0.31	0.27	0.23	0.19	0.17	0.14	0.12	0.11	0.64
1921	2.48	2.13	1.84	1.58	1.36	1.15	0.97	0.81	0.69	0.58	0.49	0.42	0.36	0.31	0.26	0.22	0.19	0.16	0.14	0.12	0.10	0.63
1922	2.47	2.13	1.84	1.58	1.35	1.15	0.97	0.82	0.69	0.58	0.49	0.42	0.36	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.10	0.62
1923	2.47	2.13	1.83	1.58	1.35	1.15	0.98	0.83	0.69	0.58	0.49	0.42	0.36	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.10	0.62
1924	2.47	2.13	1.83	1.58	1.35	1.15	0.97	0.83	0.70	0.59	0.49	0.42	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.10	0.61
1925	2.47	2.13	1.83	1.57	1.35	1.15	0.97	0.83	0.70	0.59	0.50	0.42	0.35	0.30	0.26	0.22	0.19	0.16	0.14	0.12	0.10	0.61
1926	2.47	2.13	1.83	1.57	1.35	1.14	0.97	0.82	0.70	0.59	0.50	0.42	0.35	0.30	0.25	0.22	0.18	0.16	0.14	0.12	0.10	0.60
1927	2.46	2.12	1.83	1.57	1.34	1.14	0.96	0.81	0.69	0.58	0.50	0.42	0.35	0.30	0.25	0.21	0.18	0.16	0.13	0.11	0.10	0.59
1928	2.46	2.12	1.83	1.57	1.34	1.13	0.96	0.81	0.68	0.58	0.49	0.42	0.35	0.30	0.25	0.21	0.18	0.15	0.13	0.11	0.10	0.58
1929	2.46	2.12	1.82	1.57	1.34	1.13	0.95	0.80	0.68	0.57	0.49	0.41	0.35	0.30	0.25	0.21	0.18	0.15	0.13	0.11	0.10	0.57
1930	2.46	2.12	1.82	1.57	1.34	1.13	0.95	0.80	0.68	0.57	0.48	0.41	0.35	0.30	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.56
1931	2.45	2.11	1.82	1.56	1.33	1.13	0.95	0.80	0.67	0.57	0.48	0.41	0.35	0.29	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.56
1932	2.45	2.11	1.82	1.56	1.33	1.12	0.95	0.79	0.67	0.56	0.48	0.40	0.34	0.29	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.55
1933	2.45	2.11	1.82	1.56	1.33	1.13	0.95	0.80	0.67	0.56	0.48	0.40	0.34	0.29	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.54
1934	2.45	2.11	1.81	1.56	1.33	1.13	0.96	0.80	0.68	0.57	0.48	0.40	0.34	0.29	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.54
1935	2.45	2.11	1.81	1.56	1.33	1.13	0.96	0.81	0.68	0.57	0.48	0.40	0.34	0.29	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.53
1936	2.45	2.11	1.81	1.55	1.33	1.13	0.95	0.81	0.68	0.57	0.48	0.41	0.34	0.29	0.24	0.21	0.18	0.15	0.13	0.11	0.09	0.53
1937	2.45	2.11	1.81	1.55	1.32	1.12	0.95	0.80	0.68	0.57	0.48	0.41	0.34	0.29	0.24	0.21	0.18	0.15	0.13	0.11	0.09	0.53
1938	2.44	2.10	1.81	1.55	1.32	1.12	0.94	0.80	0.67	0.57	0.48	0.41	0.34	0.29	0.24	0.21	0.17	0.15	0.13	0.11	0.09	0.52
1939	2.44	2.10	1.81	1.55	1.33	1.12	0.95	0.80	0.67	0.57	0.48	0.41	0.35	0.29	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.52
1940	2.45	2.10	1.81	1.55	1.33	1.13	0.95	0.80	0.68	0.57	0.49	0.41	0.35	0.29	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.52
1941	2.45	2.11	1.81	1.55	1.33	1.13	0.96	0.81	0.68	0.58	0.49	0.41	0.35	0.30	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.52
1942	2.45	2.11	1.81	1.55	1.33	1.13	0.96	0.82	0.69	0.58	0.49	0.41	0.35	0.30	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.52
1943	2.46	2.11	1.81	1.56	1.34	1.14	0.97	0.83	0.70	0.59	0.50	0.42	0.36	0.30	0.26	0.22	0.18	0.15	0.13	0.11	0.09	0.53
1944	2.46	2.11	1.81	1.56	1.34	1.14	0.97	0.83	0.70	0.60	0.50	0.42	0.36	0.30	0.26	0.22	0.18	0.16	0.13	0.11	0.09	0.53
1945	2.45	2.12	1.82	1.56	1.33	1.13	0.96	0.82	0.70	0.59	0.50	0.42	0.36	0.30	0.26	0.22	0.18	0.16	0.13	0.11	0.09	0.53
1946	2.44	2.11	1.82	1.56	1.32	1.11	0.94	0.80	0.68	0.58	0.49	0.41	0.35	0.30	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.51
1947	2.43	2.10	1.82	1.56	1.32	1.11	0.93	0.78	0.67	0.57	0.48	0.41	0.35	0.29	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.51
1948	2.43	2.09	1.81	1.56	1.32	1.11	0.93	0.78	0.65	0.56	0.47	0.40	0.34	0.29	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.50
1949	2.43	2.09	1.80	1.54	1.32	1.11	0.93	0.78	0.65	0.55	0.47	0.40	0.34	0.29	0.24	0.21	0.17	0.15	0.12	0.11	0.09	0.50

Table 28 (continued). Male numbers at age over time from the base model

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1950	2.42	2.09	1.79	1.53	1.30	1.10	0.93	0.78	0.65	0.54	0.46	0.39	0.33	0.29	0.24	0.21	0.17	0.15	0.12	0.11	0.09	0.49
1951	2.41	2.08	1.79	1.52	1.28	1.07	0.91	0.76	0.64	0.54	0.45	0.38	0.33	0.28	0.24	0.20	0.17	0.14	0.12	0.10	0.09	0.48
1952	2.40	2.08	1.79	1.51	1.24	1.03	0.86	0.73	0.62	0.52	0.44	0.37	0.31	0.27	0.23	0.19	0.16	0.14	0.12	0.10	0.08	0.47
1953	2.37	2.06	1.78	1.49	1.21	0.98	0.81	0.68	0.58	0.49	0.42	0.35	0.30	0.25	0.21	0.18	0.16	0.13	0.11	0.10	0.08	0.45
1954	2.67	2.04	1.76	1.47	1.17	0.93	0.76	0.63	0.53	0.46	0.39	0.33	0.28	0.24	0.20	0.17	0.15	0.13	0.11	0.09	0.08	0.43
1955	0.82	2.29	1.74	1.43	1.13	0.89	0.71	0.58	0.49	0.42	0.36	0.31	0.26	0.22	0.19	0.16	0.14	0.12	0.10	0.09	0.07	0.40
1956	2.94	0.71	1.94	1.37	1.06	0.82	0.64	0.52	0.43	0.37	0.32	0.28	0.24	0.20	0.17	0.15	0.12	0.11	0.09	0.08	0.07	0.37
1957	0.84	2.52	0.59	1.48	0.97	0.72	0.56	0.45	0.37	0.31	0.27	0.23	0.20	0.18	0.15	0.13	0.11	0.09	0.08	0.07	0.06	0.33
1958	1.55	0.72	2.13	0.46	1.04	0.65	0.49	0.38	0.31	0.26	0.22	0.19	0.17	0.15	0.13	0.11	0.10	0.08	0.07	0.06	0.05	0.29
1959	2.89	1.33	0.61	1.64	0.31	0.68	0.42	0.32	0.26	0.21	0.18	0.16	0.14	0.12	0.11	0.09	0.08	0.07	0.06	0.05	0.04	0.25
1960	2.05	2.49	1.13	0.48	1.15	0.21	0.45	0.28	0.22	0.18	0.15	0.13	0.11	0.10	0.09	0.08	0.07	0.06	0.05	0.04	0.04	0.21
1961	1.81	1.76	2.11	0.88	0.33	0.77	0.14	0.30	0.20	0.15	0.13	0.11	0.09	0.08	0.07	0.06	0.06	0.05	0.04	0.04	0.03	0.18
1962	41.90	1.56	1.49	1.67	0.64	0.23	0.54	0.10	0.22	0.14	0.11	0.09	0.08	0.07	0.06	0.05	0.05	0.04	0.04	0.03	0.03	0.16
1963	1.79	36.05	1.32	1.19	1.23	0.46	0.17	0.39	0.07	0.16	0.11	0.08	0.07	0.06	0.05	0.05	0.04	0.04	0.03	0.03	0.02	0.14
1964	1.79	1.54	30.72	1.06	0.88	0.88	0.32	0.12	0.28	0.05	0.12	0.08	0.06	0.05	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.13
1965	2.10	1.54	1.32	25.75	0.86	0.71	0.70	0.26	0.10	0.23	0.04	0.10	0.06	0.05	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.12
1966	9.46	1.81	1.32	1.12	21.43	0.71	0.58	0.58	0.22	0.08	0.19	0.04	0.08	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.12
1967	2.00	8.14	1.55	1.11	0.91	17.24	0.57	0.47	0.47	0.18	0.07	0.15	0.03	0.07	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.11
1968	1.95	1.72	6.95	1.27	0.87	0.70	13.29	0.45	0.37	0.37	0.14	0.05	0.12	0.02	0.05	0.04	0.03	0.02	0.02	0.02	0.02	0.11
1969	2.16	1.68	1.47	5.76	1.02	0.69	0.56	10.67	0.36	0.30	0.30	0.11	0.04	0.10	0.02	0.04	0.03	0.02	0.02	0.02	0.01	0.10
1970	3.10	1.86	1.43	1.22	4.71	0.83	0.56	0.46	8.77	0.30	0.25	0.25	0.09	0.04	0.08	0.02	0.04	0.02	0.02	0.02	0.01	0.10
1971	3.30	2.67	1.58	1.18	0.98	3.76	0.67	0.45	0.37	7.15	0.24	0.20	0.21	0.08	0.03	0.07	0.01	0.03	0.02	0.02	0.01	0.09
1972	5.14	2.84	2.27	1.31	0.95	0.79	3.02	0.54	0.37	0.30	5.86	0.20	0.17	0.17	0.06	0.02	0.06	0.01	0.02	0.02	0.01	0.09
1973	12.39	4.42	2.40	1.82	1.01	0.73	0.60	2.34	0.42	0.29	0.24	4.67	0.16	0.13	0.14	0.05	0.02	0.05	0.01	0.02	0.01	0.08
1974	4.19	10.65	3.70	1.82	1.25	0.67	0.48	0.41	1.62	0.30	0.21	0.17	3.40	0.12	0.10	0.10	0.04	0.01	0.03	0.01	0.01	0.07
1975	0.63	3.60	8.81	2.64	1.12	0.73	0.39	0.29	0.26	1.04	0.19	0.14	0.12	2.30	0.08	0.07	0.07	0.03	0.01	0.02	0.00	0.06
1976	1.25	0.54	3.00	6.60	1.79	0.73	0.47	0.26	0.20	0.18	0.73	0.14	0.10	0.08	1.67	0.06	0.05	0.05	0.02	0.01	0.02	0.05
1977	18.78	1.08	0.45	2.29	4.58	1.19	0.49	0.32	0.18	0.14	0.13	0.53	0.10	0.07	0.06	1.23	0.04	0.04	0.04	0.01	0.01	0.05
1978	1.24	16.15	0.91	0.35	1.64	3.19	0.83	0.34	0.23	0.13	0.10	0.09	0.39	0.07	0.05	0.05	0.93	0.03	0.03	0.03	0.01	0.04
1979	3.81	1.06	13.55	0.70	0.25	1.14	2.22	0.59	0.25	0.17	0.10	0.08	0.07	0.29	0.06	0.04	0.03	0.70	0.02	0.02	0.02	0.04
1980	1.00	3.28	0.89	10.14	0.47	0.16	0.73	1.45	0.39	0.17	0.12	0.07	0.05	0.05	0.21	0.04	0.03	0.03	0.51	0.02	0.02	0.04
1981	0.52	0.86	2.77	0.70	7.29	0.32	0.11	0.51	1.02	0.28	0.12	0.08	0.05	0.04	0.04	0.16	0.03	0.02	0.02	0.38	0.01	0.04
1982	0.09	0.45	0.73	2.20	0.51	5.05	0.22	0.08	0.35	0.71	0.20	0.09	0.06	0.04	0.03	0.03	0.11	0.02	0.02	0.01	0.27	0.04
1983	1.05	0.08	0.37	0.55	1.49	0.32	3.18	0.14	0.05	0.23	0.48	0.13	0.06	0.04	0.02	0.02	0.02	0.08	0.01	0.01	0.01	0.22
1984	7.10	0.90	0.07	0.30	0.38	0.95	0.20	1.98	0.09	0.03	0.15	0.31	0.09	0.04	0.03	0.02	0.01	0.01	0.05	0.01	0.01	0.15
1985	0.61	6.11	0.76	0.05	0.20	0.23	0.55	0.12	1.17	0.05	0.02	0.09	0.19	0.05	0.02	0.02	0.01	0.01	0.01	0.03	0.01	0.10
1986	0.52	0.52	5.14	0.60	0.04	0.12	0.14	0.33	0.07	0.72	0.03	0.01	0.06	0.13	0.04	0.02	0.01	0.01	0.01	0.01	0.02	0.07
1987	1.66	0.44	0.44	3.95	0.40	0.02	0.07	0.07	0.18	0.04	0.41	0.02	0.01	0.04	0.08	0.02	0.01	0.01	0.00	0.00	0.00	0.06
1988	4.75	1.43	0.38	0.36	2.85	0.25	0.01	0.04	0.04	0.10	0.02	0.25	0.01	0.00	0.02	0.05	0.01	0.01	0.00	0.00	0.00	0.04
1989	0.23	4.08	1.22	0.31	0.26	1.93	0.16	0.01	0.02	0.03	0.07	0.02	0.17	0.01	0.00	0.02	0.03	0.01	0.00	0.00	0.00	0.03
1990	1.35	0.20	3.47	0.97	0.22	0.16	1.11	0.09	0.00	0.01	0.02	0.04	0.01	0.10	0.01	0.00	0.01	0.02	0.01	0.00	0.00	0.02
1991	1.20	1.16	0.17	2.75	0.67	0.13	0.09	0.60	0.05	0.00	0.01	0.01	0.02	0.01	0.06	0.00	0.00	0.01	0.01	0.00	0.00	0.01
1992	0.34	1.03	0.99	0.14	2.05	0.46	0.08	0.06	0.39	0.03	0.00	0.01	0.01	0.02	0.00	0.04	0.00	0.00	0.00	0.01	0.00	0.01
1993	0.78	0.29	0.88	0.81	0.10	1.41	0.30	0.05	0.04	0.26	0.02	0.00	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.00	0.01	0.01
1994	0.57	0.67	0.25	0.72	0.61	0.07	0.94	0.20	0.04	0.03	0.18	0.02	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.01
1995	0.30	0.49	0.57	0.20	0.53	0.43	0.05	0.65	0.14	0.03	0.02	0.13	0.01	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.01
1996	0.54	0.26	0.42	0.47	0.16	0.40	0.32	0.04	0.48	0.10	0.02	0.01	0.10	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
1997	0.11	0.46	0.22	0.35	0.38	0.12	0.31	0.24	0.03	0.38	0.08	0.02	0.01	0.08	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01
1998	0.62	0.10	0.40	0.18	0.28	0.30	0.09	0.24	0.19	0.02	0.30	0.06	0.01	0.01	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.01
1999	4.03	0.53	0.08	0.34	0.15	0.23	0.24	0.08	0.20	0.16	0.02	0.25	0.05	0.01	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.01
2000	0.13	3.47	0.45	0.07	0.28	0.13	0.19	0.20	0.06	0.16	0.13	0.02	0.21	0.04	0.01	0.01	0.04	0.00	0.00	0.00	0.00	0.01
2001	0.16	0.12	2.97	0.38	0.06	0.23	0.11	0.16	0.17	0.05	0.14	0.11	0.01	0.17	0.04	0.01	0.01	0.04	0.00	0.00	0.00	0.01
2002	0.63	0.14	0.10	2.51	0.32	0.05	0.19	0.09	0.13	0.14	0.05	0.12	0.09	0.01	0.15	0.03	0.01	0.00	0.03	0.00	0.00	0.01
2003	1.98	0.54	0.12	0.08	2.14	0.27	0.04	0.16	0.08	0.11	0.12	0.04	0.10	0.08	0.01	0.12	0.03	0.01	0.00	0.03	0.00	0.01
2004	0.28	1.70	0.46	0.10	0.07	1.84	0.23	0.04	0.14	0.06	0.10	0.10	0.03	0.09	0.07	0.01	0.11	0.02	0.00	0.00	0.02	0.01
2005	1.82	0.24	1.46	0.39	0.09	0.06	1.56	0.20	0.03	0.12	0.06	0.08	0.09	0.03	0.07	0.06	0.01	0.09	0.02	0.00	0.00	0.03
2006	0.22	1.57	0.21	1.24	0.33	0.07	0.05	1.33	0.17	0.03	0.10	0.05	0.07	0.08	0.02	0.06	0.05	0.01	0.08	0.02	0.00	0.03
2007	0.42	0.19	1.35	0.18	1.06	0.29	0.06	0.04	1.14	0.15	0.02	0.09	0.04	0.06	0.06	0.02	0.05	0.04	0.01	0.07	0.01	0.02
2008	0.42	0.36	0.16	1.15	0.15	0.90	0.24	0.05	0.04	0.97	0.12	0.02	0.08	0.03	0.05	0.06	0.02	0.05	0.04	0.00	0.06	0.03

Table 29. Sensitivity of model outputs and likelihood estimates under scenarios with alternative assumed values for the steepness of the spawner-recruit relationship (h).

	h=0.21	h=0.3	h=0.4	h=0.5	h=0.57	h=0.6	h=0.7	h=0.8	h=0.9	h=0.99
R0	8607	6653	5968	5325	5060	4958	4600	4412	4238	4117
Larval output	1.3E+07	1.0E+07	9.2E+06	8.2E+06	7.9E+06	7.7E+06	7.2E+06	6.9E+06	6.6E+06	6.4E+06
Unfished biomass	73614	57298	51718	46273	44070	43199	40120	38514	37006	35951
S2009/SSB0	0.146	0.188	0.223	0.252	0.281	0.302	0.338	0.357	0.386	0.410
B2009/B0	0.146	0.191	0.229	0.259	0.291	0.339	0.383	0.370	0.402	0.427
Total like	3133.9	3113.6	3104.0	3102.3	3102.1	3101.9	3103.0	3104.3	3105.7	3106.9
Survey	94.5	88.2	87.4	85.2	85.4	85.2	84.3	85.2	85.7	86.2
Length_comp	2984.1	2981.3	2980.9	2982.0	2982.4	2982.6	2983.4	2983.5	2983.7	2983.7
Recruitment	54.1	42.9	34.6	34.0	32.9	33.0	34.2	34.5	35.3	35.9
Parm_priors	1.2	1.1	1.1	1.1	1.4	1.1	1.1	1.1	1.1	1.1
Surveys										
Trawl_south	7.6	7.2	7.4	7.2	7.6	7.6	7.7	8.3	8.6	8.9
RecSouth	8.1	8.0	7.9	7.9	7.7	7.7	7.7	7.6	7.6	7.6
RecCentral	10.9	10.9	10.5	10.5	10.1	10.0	9.9	9.4	9.2	9.0
CalCOFI	28.6	24.3	23.8	21.6	21.3	21.0	19.8	19.8	19.7	19.6
Triennial	3.9	3.8	3.9	3.9	4.1	4.1	4.2	4.4	4.6	4.7
CPFV_index	5.6	5.6	5.8	5.8	6.0	6.1	6.1	6.4	6.6	6.7
SCB_hook	1.8	2.0	2.2	2.3	2.4	2.4	2.4	2.5	2.5	2.5
Combo	2.8	2.8	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Juv_trawl	4.6	4.3	4.1	4.0	3.9	3.9	3.9	3.9	3.9	3.8
Pier_index	20.7	19.3	19.0	19.2	19.4	19.5	19.7	20.0	20.2	20.4
Length comps										
Trawl_south	465.0	465.6	466.9	467.4	468.1	468.2	468.4	468.9	469.1	469.2
hook-line	362.9	362.9	363.0	362.9	363.0	363.0	363.0	363.2	363.3	363.3
setnet	352.7	354.0	355.2	355.7	356.2	356.3	356.5	356.7	356.8	356.9
RecSouth	373.0	373.7	374.5	375.1	375.4	375.5	375.8	376.0	376.0	376.1
RecCentral	368.2	366.8	365.8	365.4	365.2	365.2	365.0	364.9	364.9	364.9
Trawl_north	371.9	369.0	366.8	366.2	365.4	365.3	365.2	364.8	364.6	364.6
Triennial	148.1	149.1	150.2	150.7	151.0	151.1	151.2	151.4	151.4	151.4
CPFV CenCal	212.5	212.7	212.9	213.1	213.1	213.1	213.2	213.0	212.9	212.8
SCB_hook	62.4	61.8	61.3	61.1	60.9	60.9	60.8	60.8	60.8	60.8
Combo	137.6	137.3	137.3	137.3	137.3	137.3	137.3	137.3	137.3	137.3
delete	179.4	181.5	183.6	184.6	185.4	185.6	186.0	186.3	186.4	186.4
CPFV SouCal	129.9	128.4	127.1	127.2	126.6	126.6	126.8	126.5	126.5	126.4

Table 30. Sensitivity of model outputs and likelihood estimates under scenarios with alternative assumed values for the natural mortality rate (M), with steepness estimated.

	M=0.08	M=0.1	M=0.12	M=0.14	M=0.15	M=0.16	M=0.18	M=0.20	M=0.22	M=0.24
R0	2040	2726	3543	4495	5060	5566	5566	8817	11369	15243
Larval output	9.1E+06	8.6E+06	8.2E+06	7.9E+06	7.9E+06	7.6E+06	7.6E+06	7.7E+06	8.1E+06	8.9E+06
Unfished biomass	46361	45053	44353	43911	44070	43442	43442	46333	50047	56849
S2009/SSB0	0.292	0.293	0.295	0.286	0.281	0.276	0.268	0.244	0.225	0.206
B2009/B0	0.331	0.325	0.318	0.300	0.291	0.281	0.273	0.235	0.211	0.187
steepness	0.95	0.84	0.73	0.62	0.57	0.54	0.44	0.37	0.31	0.25
Total like	3134.5	3121.7	3112.8	3104.9	3102.1	3099.8	3096.3	3093.9	3092.5	3092.4
Survey	92.7	89.6	87.9	85.8	85.4	84.2	85.0	83.9	84.9	86.7
Length_comp	3000.5	2994.5	2989.2	2984.5	2982.4	2980.7	2976.9	2974.3	2971.5	2969.2
Recruitment	39.4	36.3	34.7	33.3	32.9	33.3	32.1	32.7	32.5	32.1
Parm_priors	1.8	1.3	1.1	1.3	1.4	1.6	2.3	3.0	3.7	4.4
Survey										
Trawl_south	5.3	5.9	6.6	7.2	7.6	7.8	8.7	9.2	10.0	11.2
RecSouth	7.6	7.6	7.6	7.7	7.7	7.8	7.9	8.1	8.3	8.4
RecCentral	10.1	10.0	9.9	10.0	10.1	10.3	10.3	10.8	11.0	11.1
CalCOFI	26.3	24.2	23.6	21.7	21.3	20.3	20.8	19.8	20.0	20.3
Triennial	3.6	3.7	3.9	4.0	4.1	4.1	4.3	4.3	4.5	4.8
CPFV_index	5.3	5.5	5.8	5.9	6.0	6.0	6.3	6.2	6.4	6.6
SCB_hook	5.5	4.4	3.5	2.7	2.4	2.0	1.5	1.0	0.7	0.6
Combo	3.3	3.2	3.1	2.9	2.9	2.9	2.8	2.7	2.7	2.7
Juv_trawl	4.3	4.2	4.1	4.0	3.9	3.9	3.8	3.7	3.6	3.6
Pier_index	21.4	20.8	19.8	19.7	19.4	19.1	18.6	18.0	17.6	17.4
Length										
Trawl_south	469.0	468.6	468.5	468.2	468.1	467.9	468.0	467.8	468.0	468.6
hook-line	361.5	361.9	362.5	362.8	363.0	363.2	363.7	363.9	364.3	364.7
setnet	356.3	356.1	356.2	356.1	356.2	356.2	356.5	356.5	356.8	357.3
RecSouth	377.4	376.8	376.2	375.7	375.4	375.2	374.7	374.2	373.7	373.2
RecCentral	369.2	368.0	366.9	365.7	365.2	364.7	363.8	362.9	362.0	361.2
Trawl_north	375.6	372.6	369.5	366.8	365.4	364.3	361.7	359.8	357.5	355.3
Triennial	149.7	150.0	150.4	150.8	151.0	151.3	151.8	152.5	153.2	154.2
CPFV CenCal	215.4	214.7	214.0	213.4	213.1	212.9	212.2	211.8	211.2	210.5
SCB_hook	61.8	61.6	61.4	61.1	60.9	60.8	60.5	60.3	60.0	59.7
Combo	137.2	137.2	137.2	137.2	137.3	137.3	137.4	137.6	137.7	137.9
delete	180.5	181.9	183.3	184.7	185.4	186.1	187.5	188.8	190.3	192.0
CPFV SouCal	127.5	127.1	126.5	126.7	126.6	126.9	126.6	127.2	127.1	126.8

Table 31. Summary of Reference Points for bocaccio rockfish.

		95% Confidence Limits	
Unfished Stock	Estimate	Lower	Upper
Summary (1+) Biomass	44070	36029	52111
Spawning Output	7860000	6426040	9293960
Equilibrium recruitment	5060	4129	5991

	Yield reference Points		
	$SSB_{40\%}$	SPR proxy	MSY est.
SPR	0.512	0.5	0.461
Exploitation rate	0.066	0.068	0.078
Yield	1250	1258	1270
Spawning output	3140000	3031020	2651890
SSB/SSB_0	0.40	0.39	0.34

Table 32: Decision Table for the bocaccio assessment, where State 1 has the triennial and trawl CPUE indices emphasized, and State 2 emphasizes southern rec CPUE and the CalCOFI indices.

		State1		**Base Model**		**State2**	
catch with 2008 F		larvae	depletion	larvae	depletion	larvae	depletion
2009	65	1034540	**0.15**	2209950	**0.28**	2658620	**0.38**
2010	62	1056130	**0.15**	2259880	**0.29**	2715680	**0.39**
2011	62	1059020	**0.15**	2267600	**0.29**	2720120	**0.39**
2012	68	1076100	**0.15**	2289230	**0.29**	2736480	**0.40**
2013	78	1133840	**0.16**	2371870	**0.30**	2819550	**0.41**
2014	90	1224880	**0.18**	2506410	**0.32**	2959720	**0.43**
2015	102	1337490	**0.19**	2675120	**0.34**	3137450	**0.45**
2016	113	1464190	**0.21**	2865660	**0.36**	3338590	**0.48**
2017	123	1600700	**0.23**	3069460	**0.39**	3552450	**0.51**
2018	129	1744400	**0.25**	3280130	**0.42**	3770470	**0.55**
2019	136	1893960	**0.27**	3493470	**0.44**	3986640	**0.58**
2020	142	2048240	**0.29**	3706040	**0.47**	4196180	**0.61**
SPR of 0.77 (base)		larvae	depletion	larvae	depletion	larvae	depletion
2009	267	1034540	**0.15**	2209950	**0.28**	2658620	**0.38**
2010	251	1025030	**0.15**	2228890	**0.28**	2684700	**0.39**
2011	246	997328	**0.14**	2206150	**0.28**	2658730	**0.38**
2012	265	986019	**0.14**	2199380	**0.28**	2646800	**0.38**
2013	299	1013570	**0.14**	2252490	**0.29**	2700770	**0.39**
2014	339	1068090	**0.15**	2352740	**0.30**	2807790	**0.41**
2015	377	1136160	**0.16**	2481040	**0.32**	2947220	**0.43**
2016	413	1210440	**0.17**	2625210	**0.33**	3105210	**0.45**
2017	445	1287560	**0.18**	2777630	**0.35**	3272010	**0.47**
2018	474	1365920	**0.20**	2933000	**0.37**	3440210	**0.50**
2019	500	1444790	**0.21**	3087910	**0.39**	3604600	**0.52**
2020	517	1523620	**0.22**	3239680	**0.41**	3761180	**0.54**
SPR of 0.77(State 2)		larvae	depletion	larvae	depletion	larvae	depletion
2009	353	1034540	**0.15**	2209950	**0.28**	2658620	**0.38**
2010	326	1009690	**0.14**	2213630	**0.28**	2669450	**0.39**
2011	314	967342	**0.14**	2176350	**0.28**	2628970	**0.38**
2012	328	942839	**0.13**	2156410	**0.27**	2603940	**0.38**
2013	360	956879	**0.14**	2196410	**0.28**	2645010	**0.38**
2014	395	995845	**0.14**	2282340	**0.29**	2738290	**0.40**
2015	429	1045960	**0.15**	2394880	**0.30**	2863010	**0.41**
2016	459	1100950	**0.16**	2522930	**0.32**	3006440	**0.43**
2017	479	1158410	**0.17**	2659810	**0.34**	3159810	**0.46**
2018	497	1217370	**0.17**	2800930	**0.36**	3316360	**0.48**
2019	512	1277570	**0.18**	2943370	**0.37**	3471380	**0.50**
2020	527	1338790	**0.19**	3084810	**0.39**	3621160	**0.52**

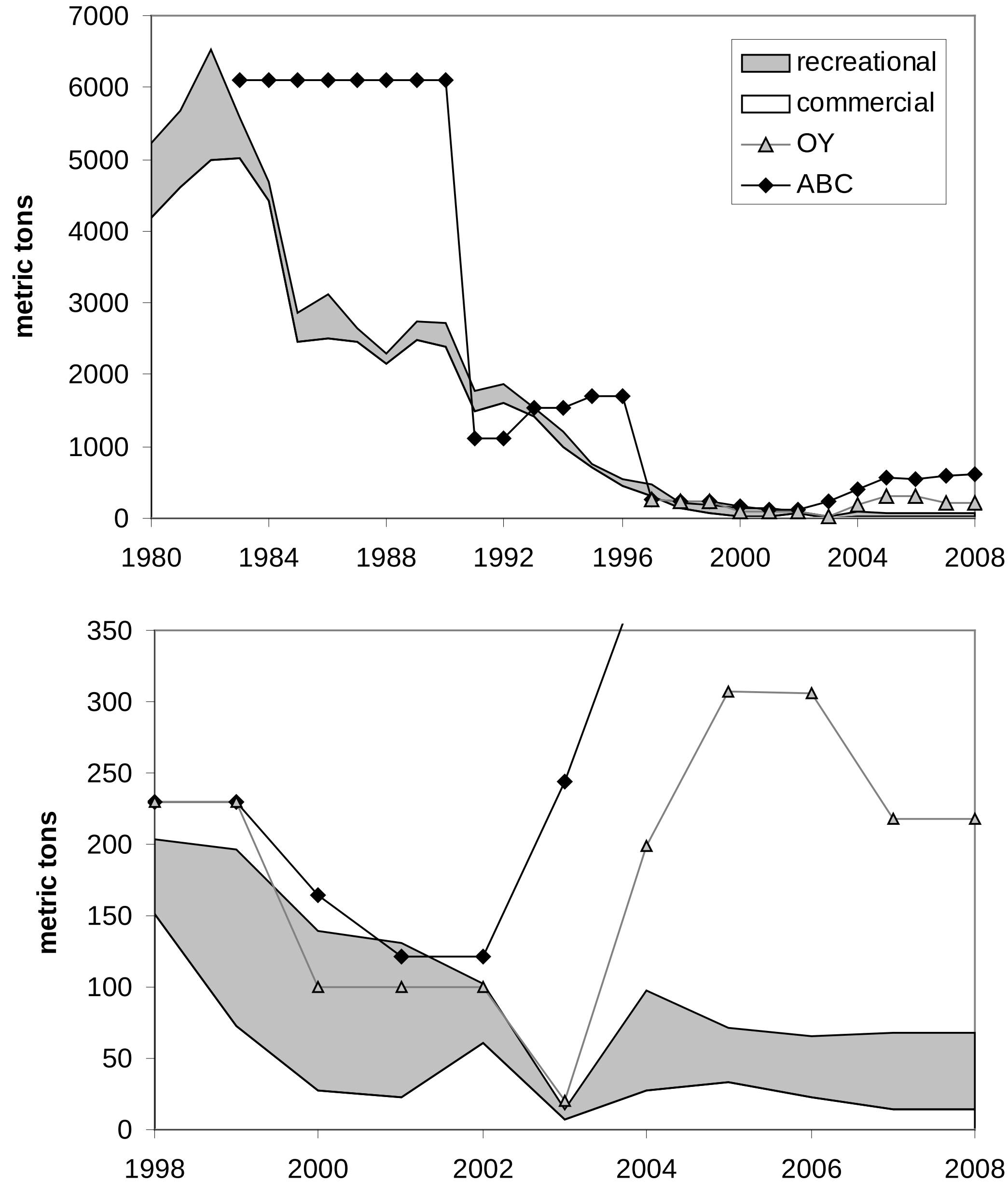


Figure 1: Management performance with PFMC adopted ABC and OY values relative to estimated landings (1980-2002) and landings + discards (2002-2007; 2008 is set to 2007 until final numbers provided). Lower graph provided for scale in recent years.

Figure 2: Map of the West Coast INPFC management areas. This assessment covers the bocaccio stock in the Eureka, Monterey and Conception management areas.

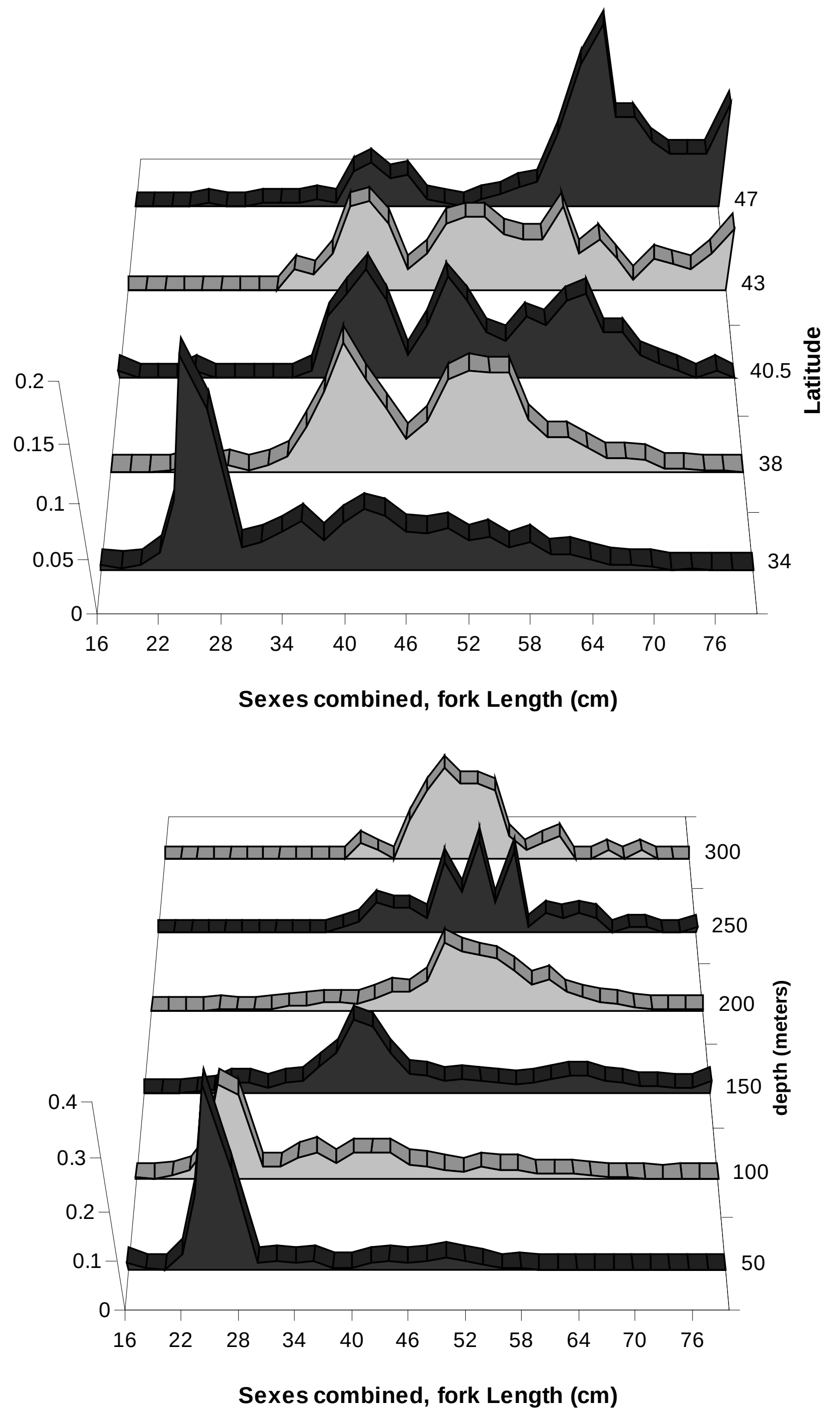


Figure 3a-b. 3a (top) Length frequency information from the triennial trawl survey by region; all years aggregated, demonstrating the shift in size distribution in the northern areas; 3b (bottom) length frequency information by depth bin, illustrating ontogenetic movement to deeper water with size.

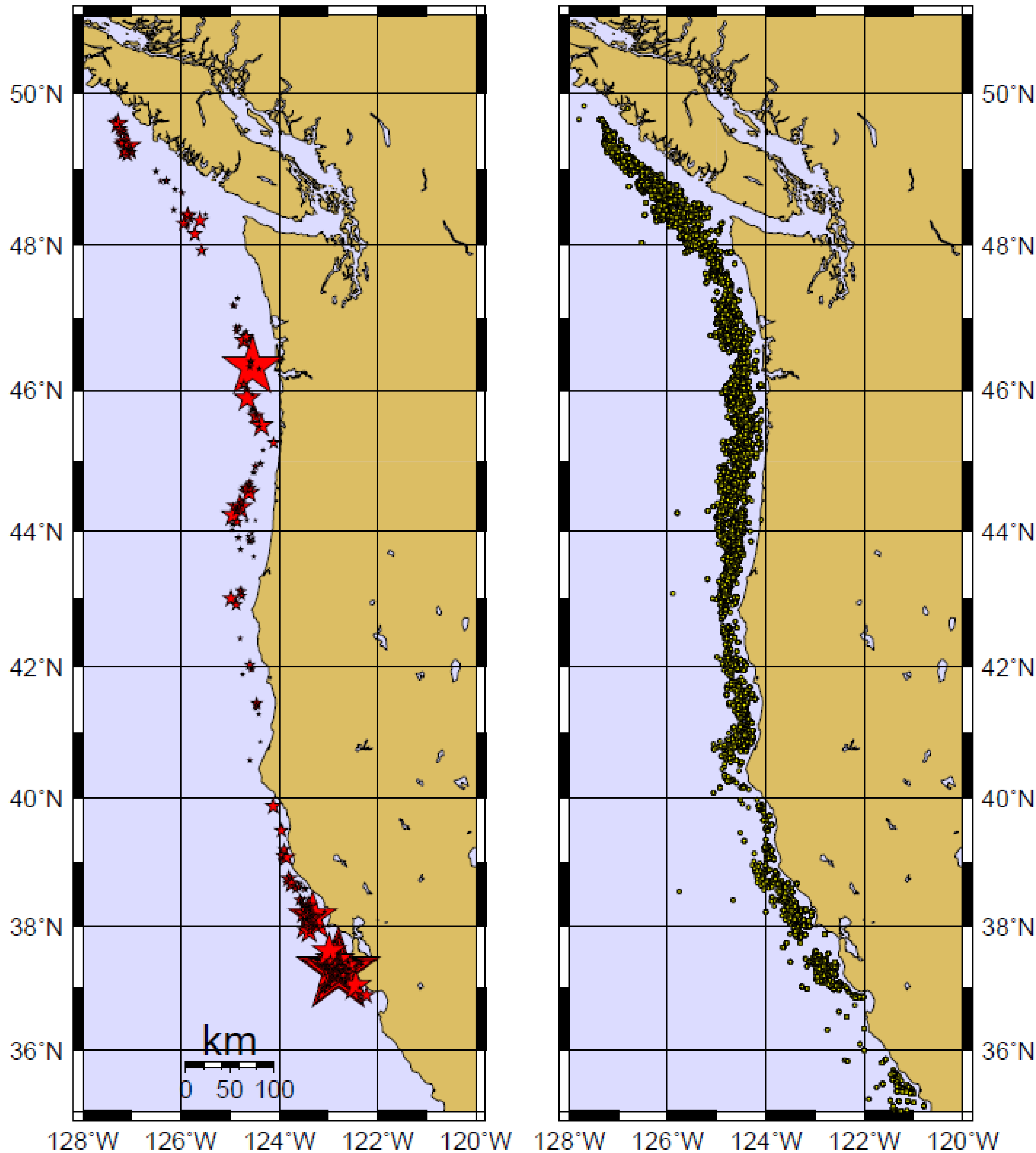


Figure 4. Locations of Russian trawls where bocaccio were caught (left panel) versus tow locations where no bocaccio were found (right panel) from trawls taken between 1963-1978. Stars are sized proportional to the square root of the total number caught per tow.

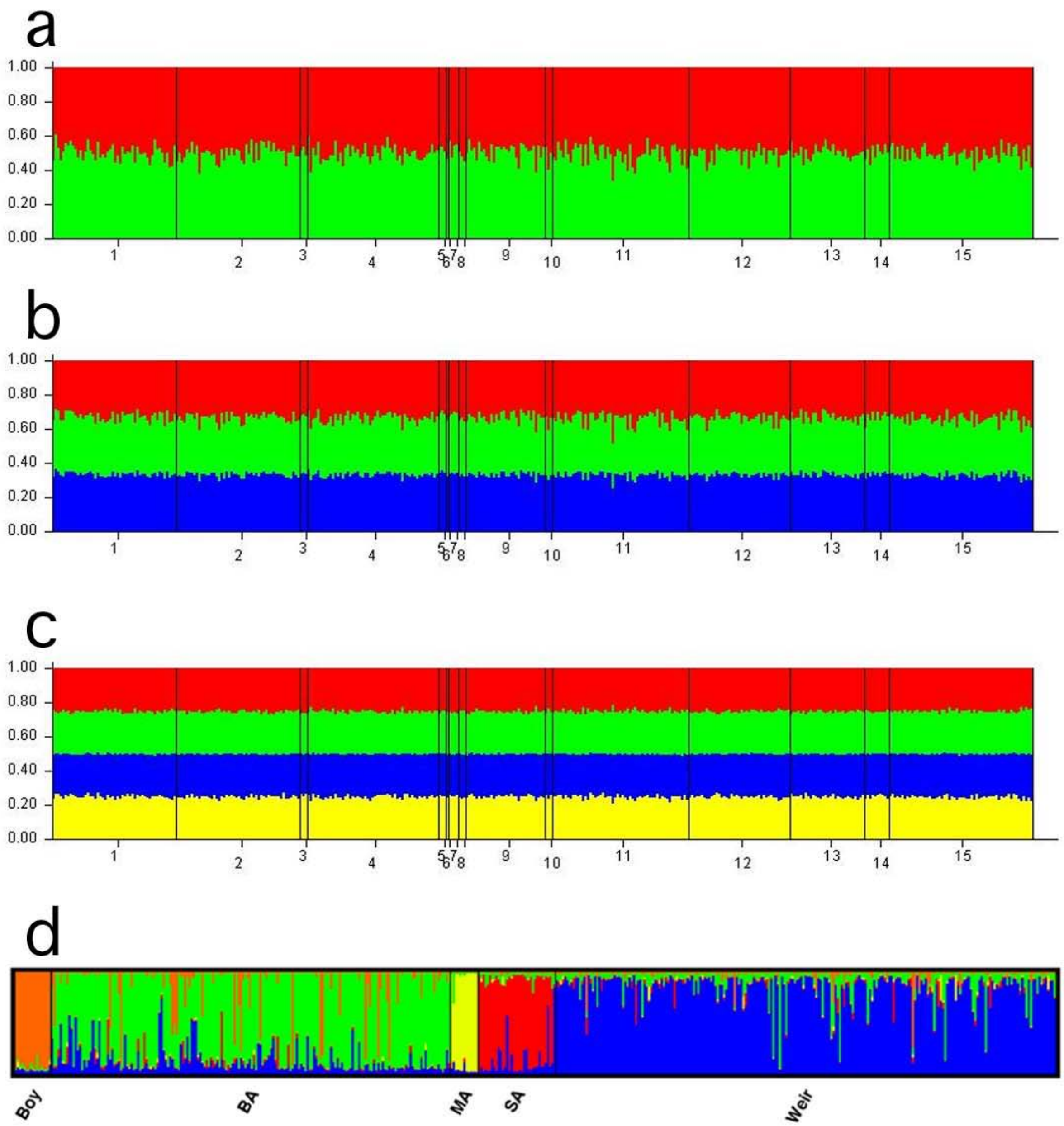


Figure 5a-d. Results of analysis of data from seven microsatellite loci in 386 *S. paucispinis* using the program STRUCTURE (Pritchard et al. 2000; data from Matala et al. 2004; analysis by D. E. Pearse, FED/SWFSC/NMFS). Each vertical line represents an individual, and color indicates membership in a specified number of distinct genetic groups. Panels a, b, and c show results for two, three, and four groups, respectively. For comparison, analysis of five genetically-differentiated populations of steelhead/rainbow trout is shown in 5d (*from* Pearse et al. *In Press*).

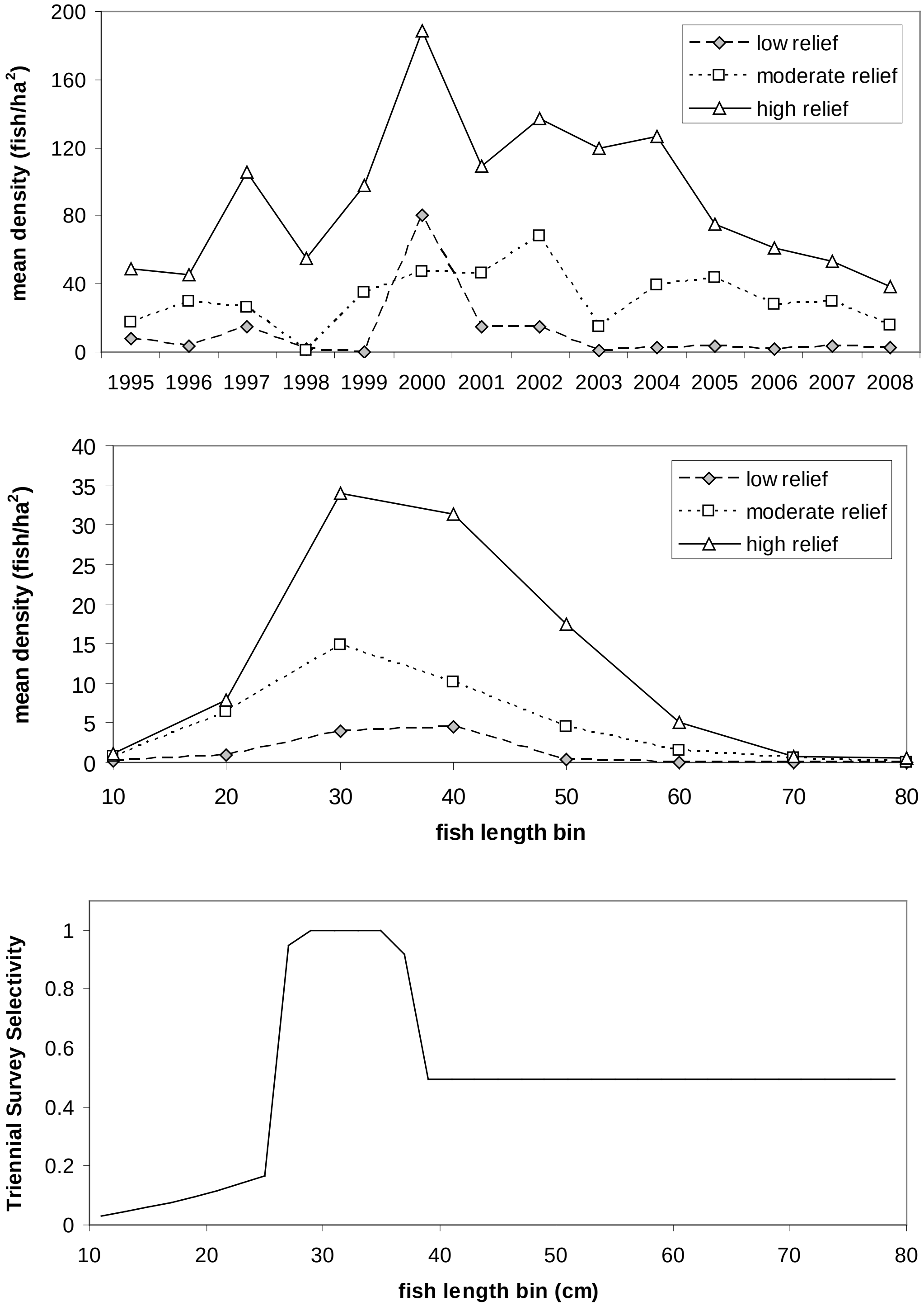


Figure 6. Habitat associations of bocaccio based on submersible observation data from Love (pers. com). Top panel shows the mean density (in numbers of fish observed per hectare) by year (pooled over all sizes), middle figure shows the mean density by habitat type and fish size, bottom figure shows the estimated selectivity of trawl survey from the 2007 model.

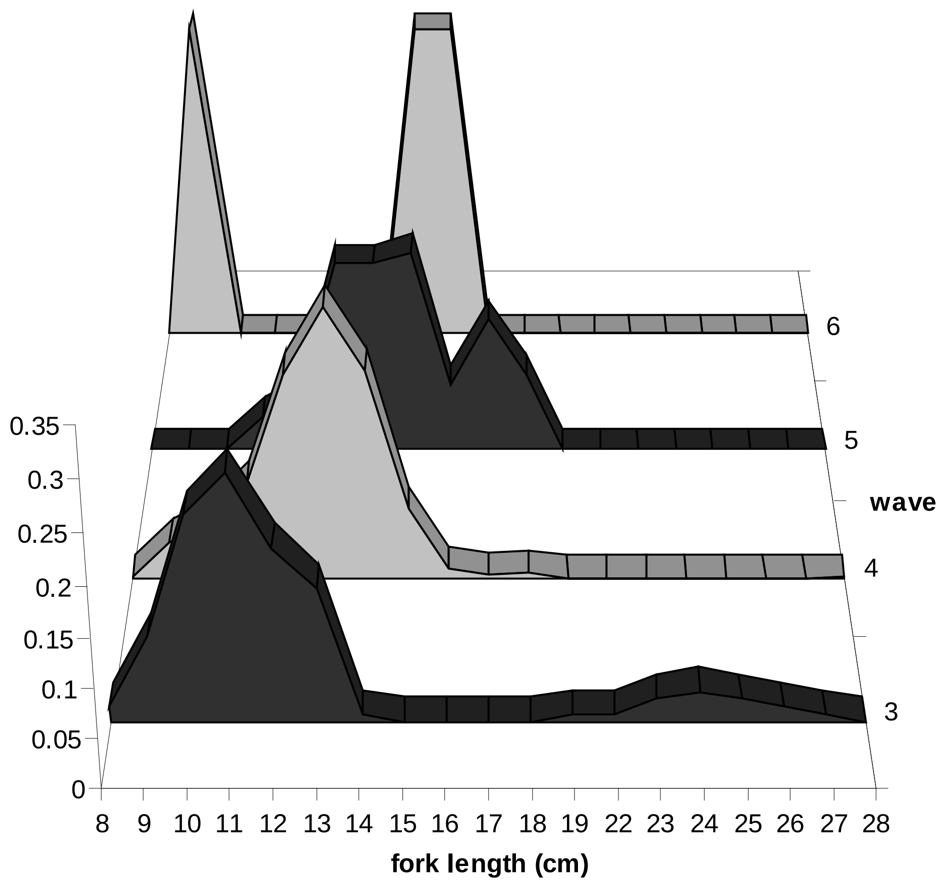


Figure 7. Length frequency data from recreational pier and shore fisheries in California (all years combined) showing the modal progression of age-0 size at age. Waves correspond to bimonthly sampling periods (such that wave 3 is May-June, wave 4 is July-August, etc).

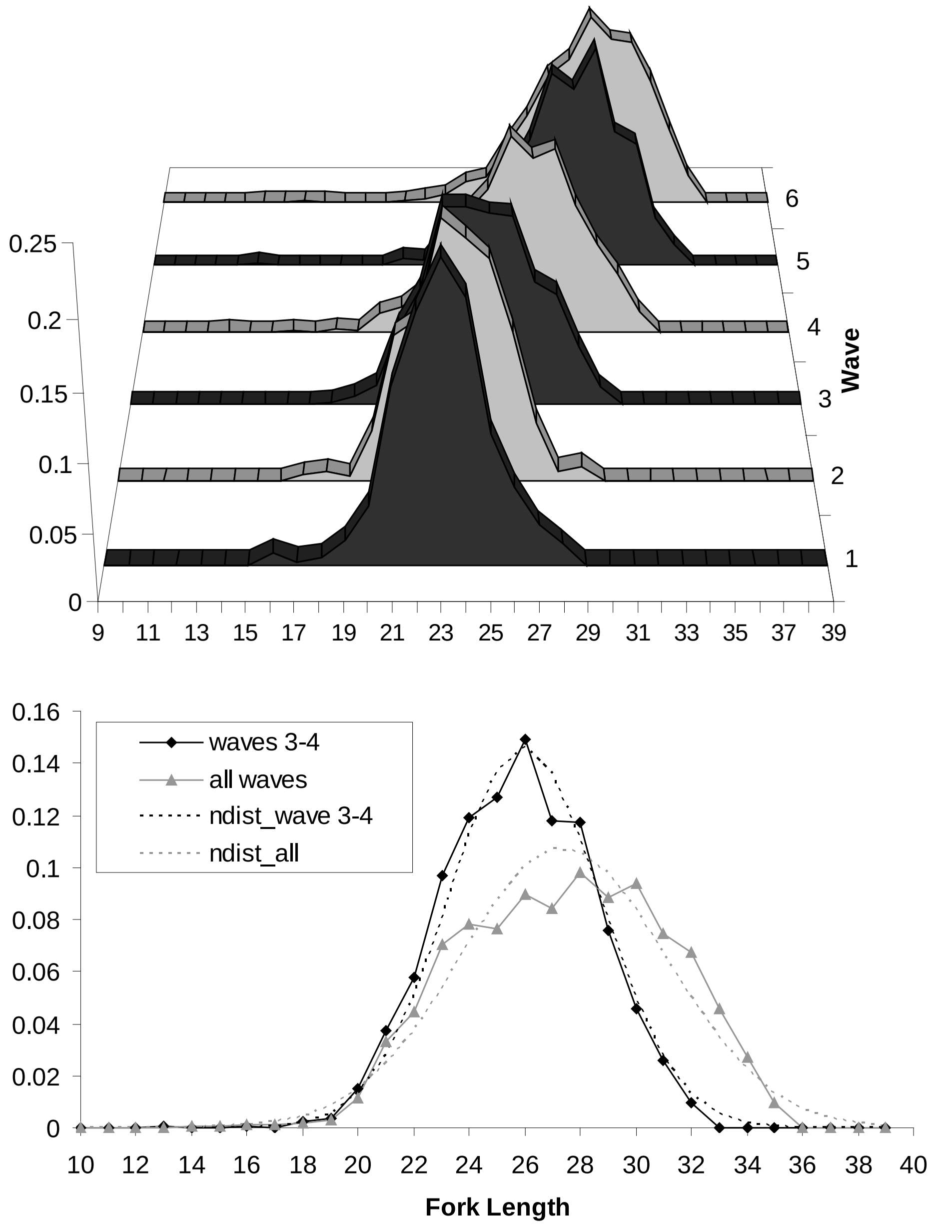


Figure 8a and 8b. Length frequency data from the Southern California CPFV fishery in 1978, with sizes data truncated above a wave-specific maximum to illustrate the modal progression of the 1977 year class by wave. Bottom figure shows the same data with a fitted normal distribution for all waves versus waves 3-4 (May-August).

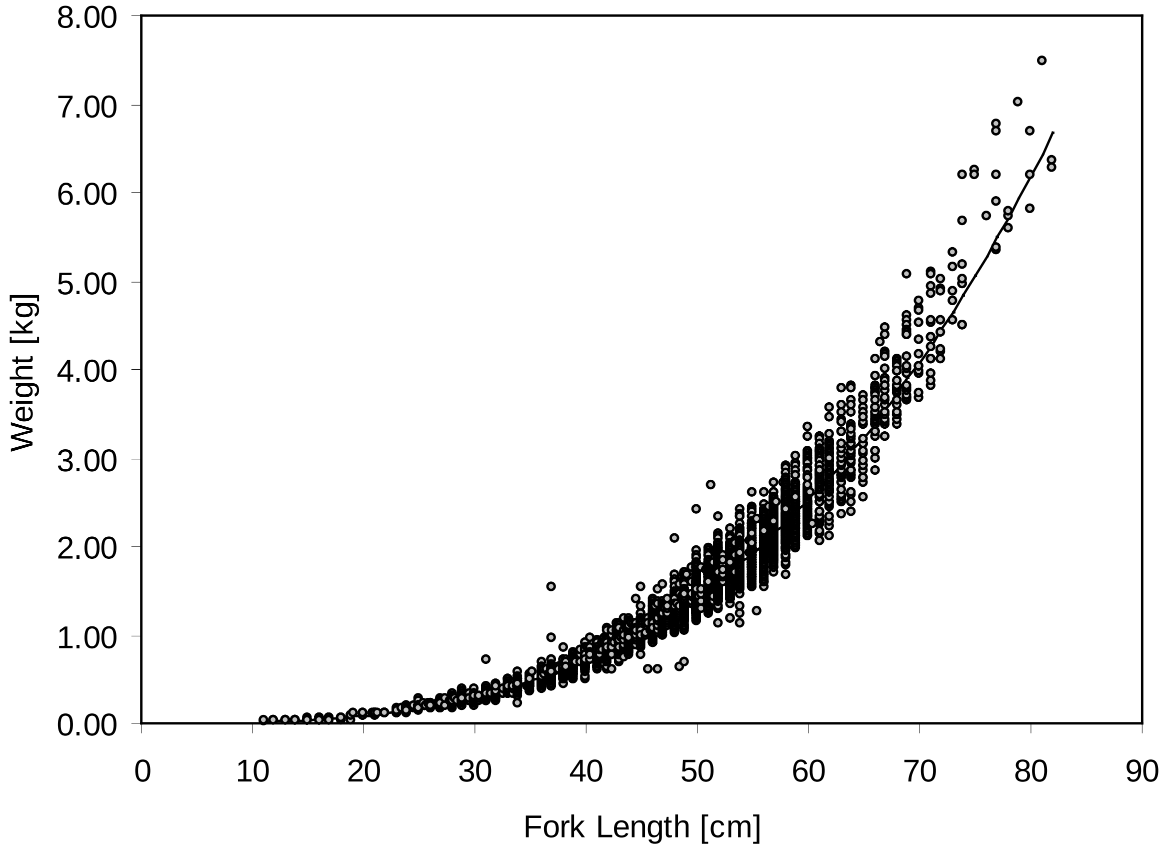
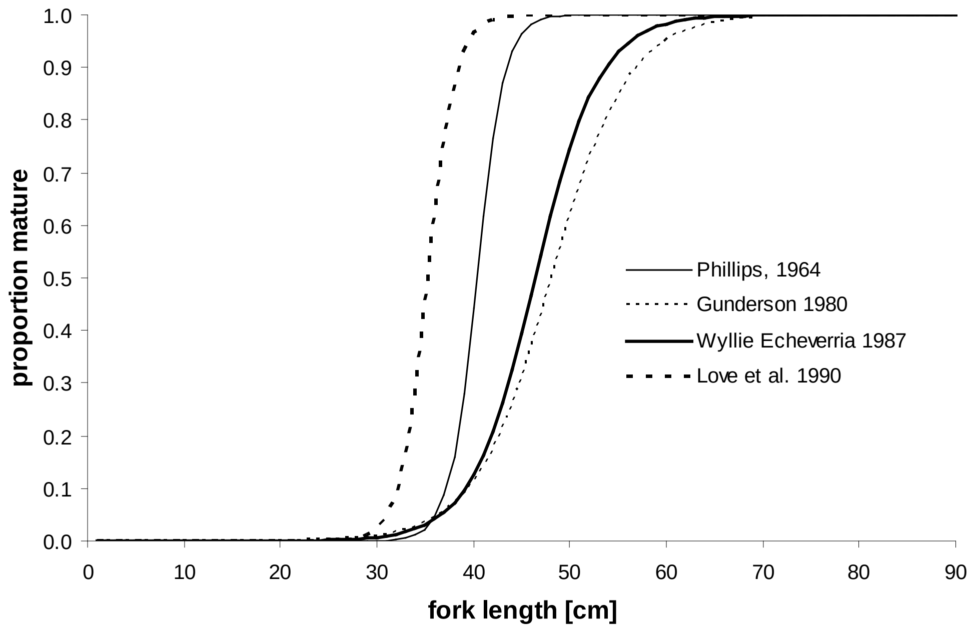


Figure 9. Weight-length relationship for bocaccio rockfish.



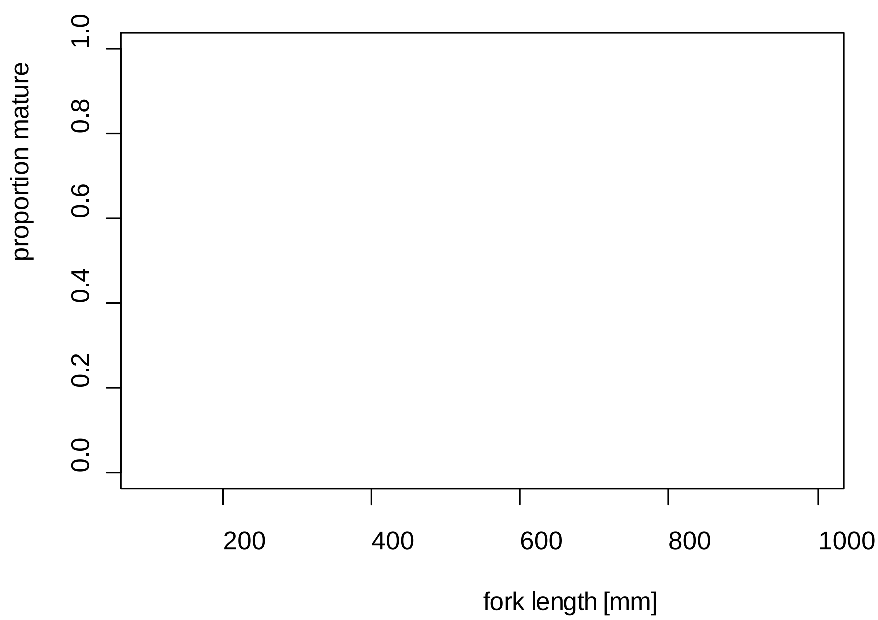
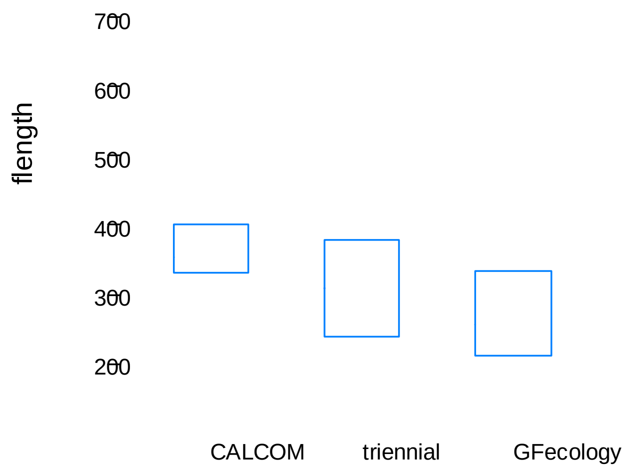


Figure 10a-b. 10a (top) Logistic curves representing the proportion of female bocaccio that are mature as a function of body length, as reported in four published studies. Figure 10b (bottom) observed proportion of mature female bocaccio at length (solid circles, 2-cm length bins) and binomial GLM predictions (solid line) for central and northern California, all years and regions combined.


flength
700
600
500
400
300
200
CALCOM
triennial
GFecology

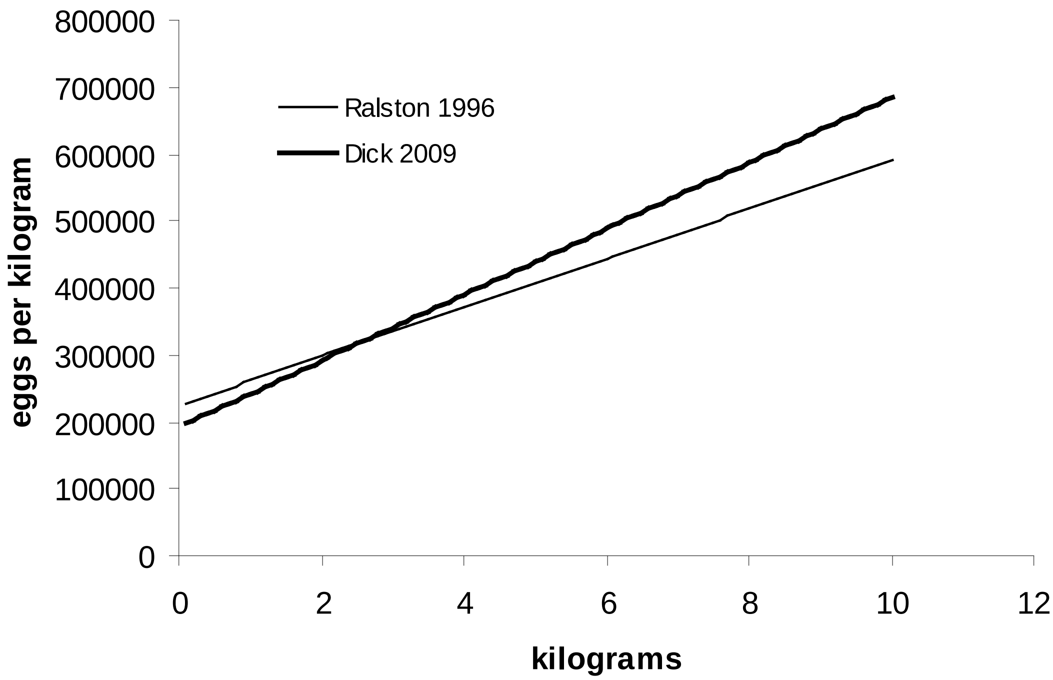
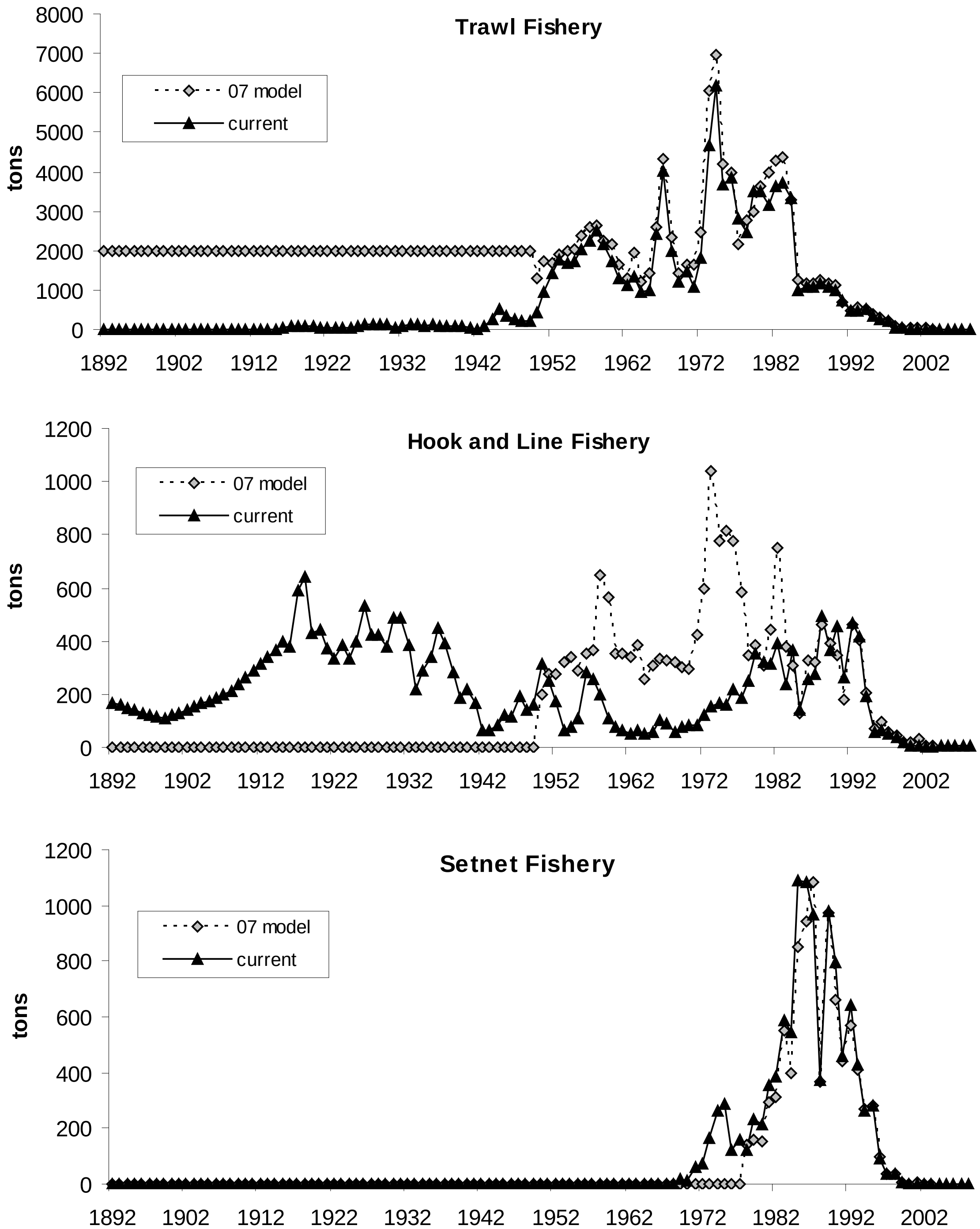
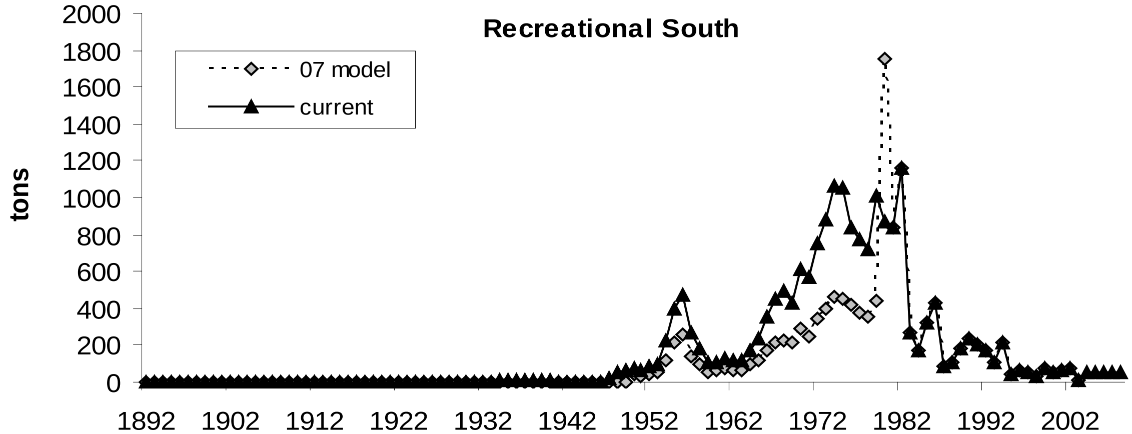
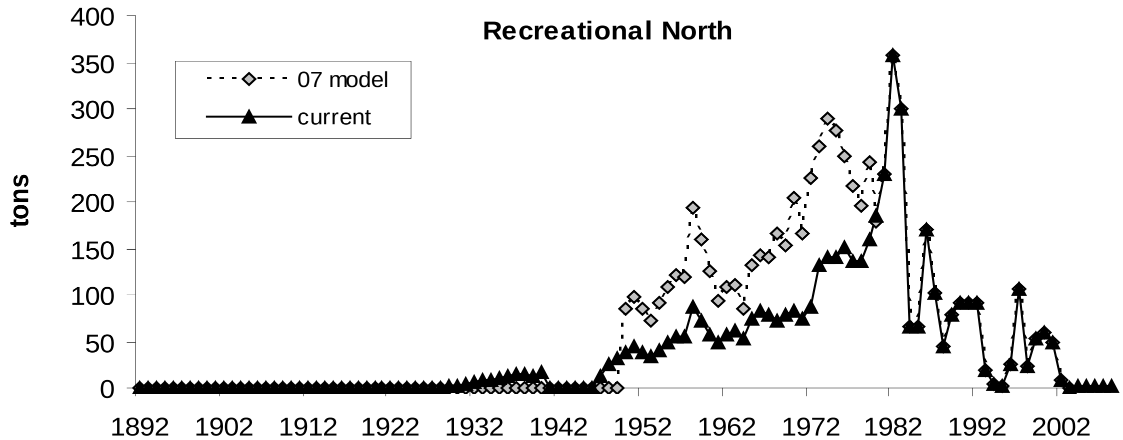


Figure 12. Linear models for relative fecundity (eggs per kilogram) of female bocaccio as a function of weight.

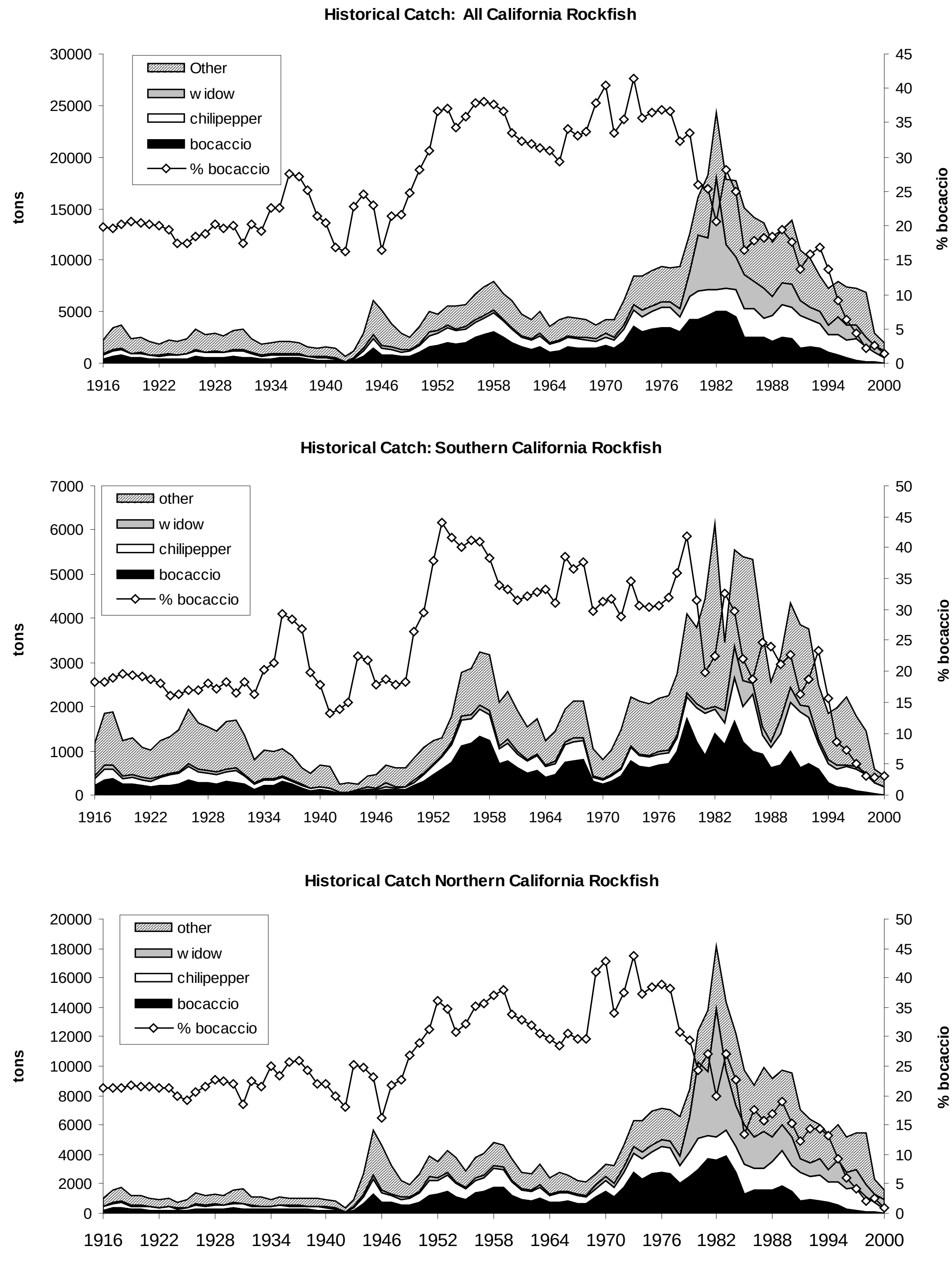


Figures 13a-c. Comparison of 2007 and current model catch estimates commercial gears; trawl (top), hook and line (middle) and set net (bottom)





Figures 13d-e. Comparison of 2007 and current model catch estimates for the two recreational fisheries, south (top) and north (bottom) of Point Conception.



Figures 14a-c. Reconstructed commercial catches of California rockfish for bocaccio, chilipepper, widow and all other rockfish species, including the percentage of the total catch estimated to be comprised of bocaccio rockfish, for all of California (top), south of Point Conception (middle) and north of Point Conception (bottom).

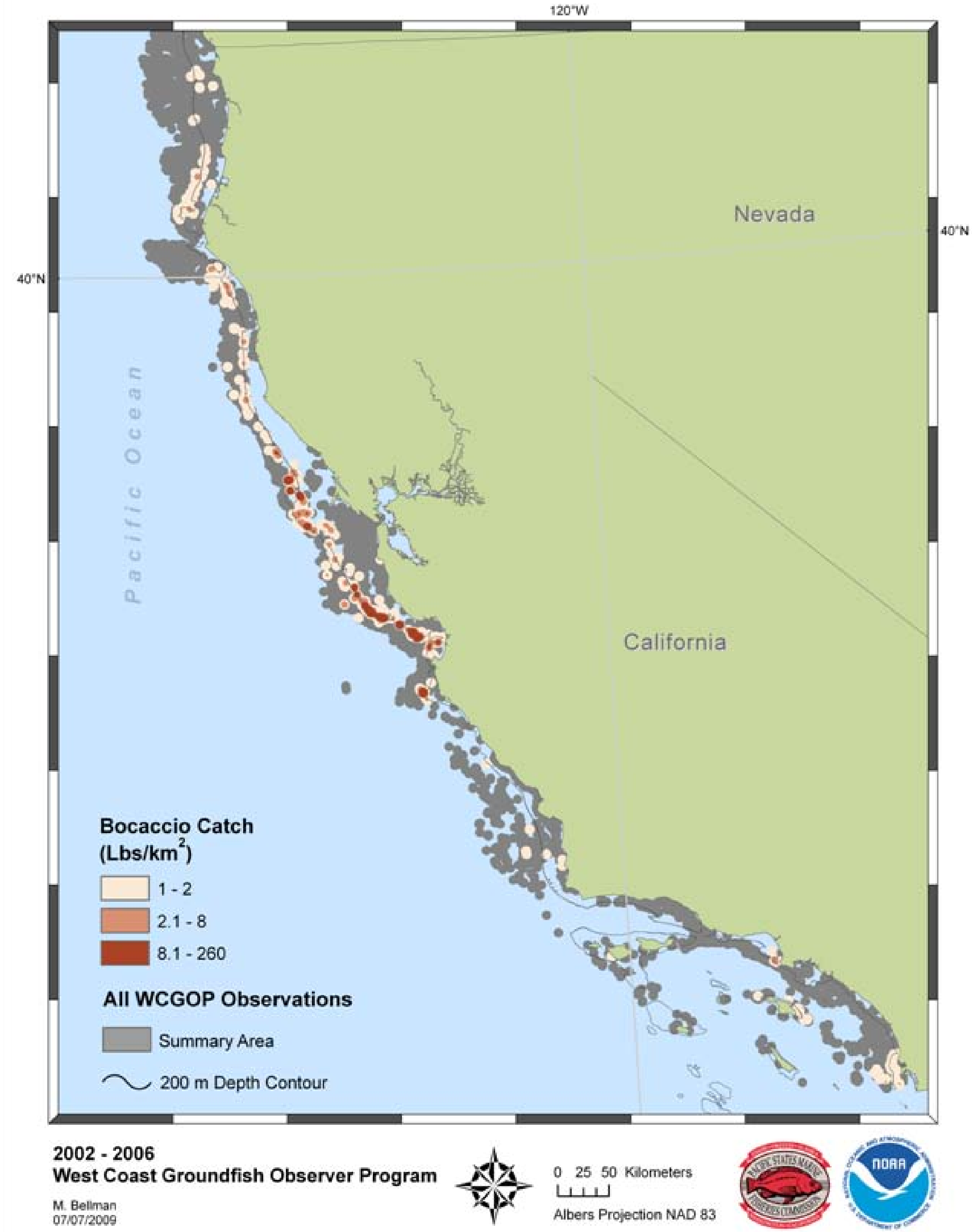
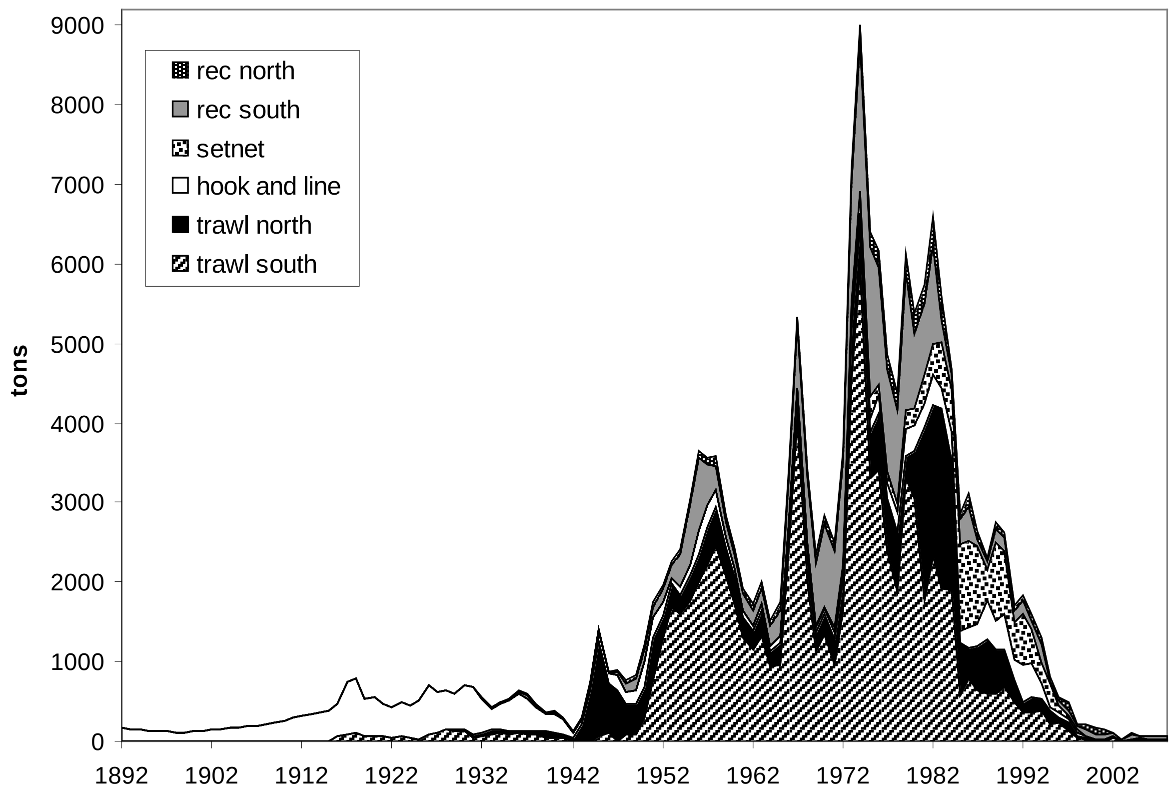


Figure 15: Bocaccio bycatch rates for California waters, from the West Coast Groundfish Observer Program (WCGOP).



Figures 16. Assessment area (U.S. waters south of Cape Blanco) catch estimates for the six fisheries used in the model.

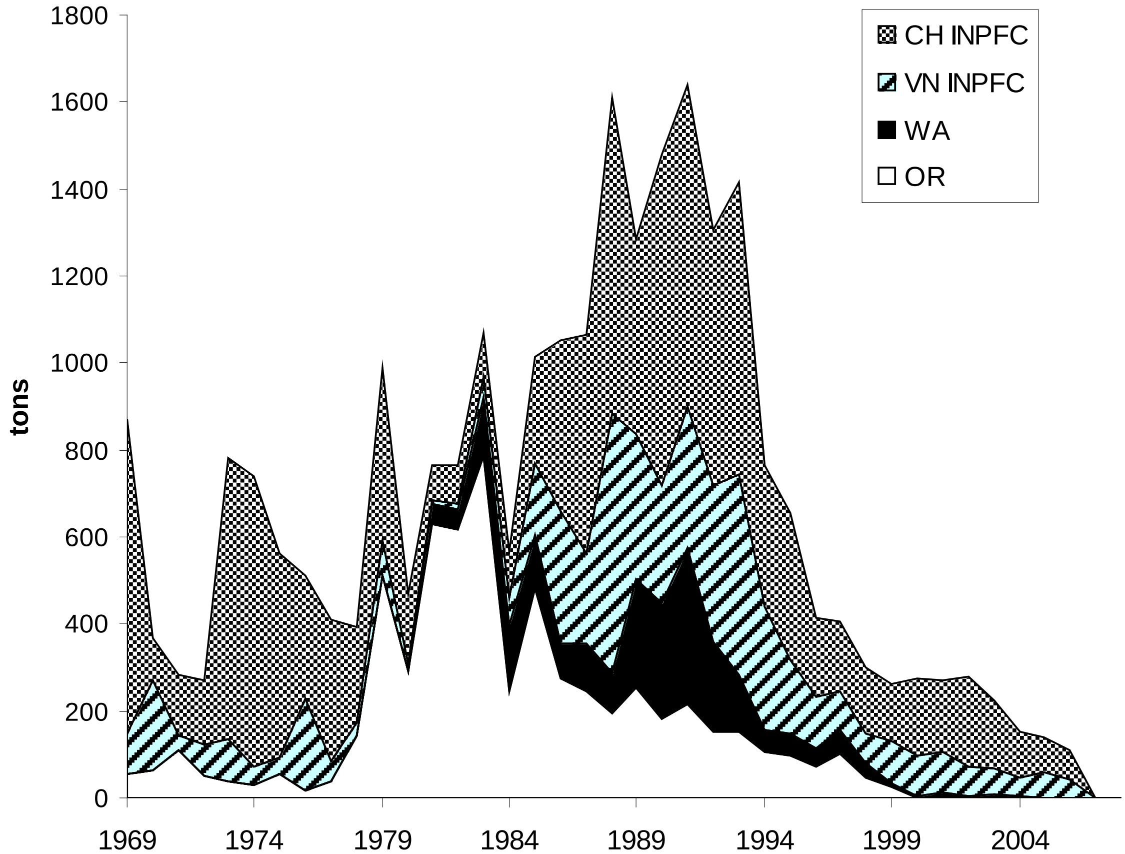


Figure 17. Catch estimates for the recent (1969-2006) period for areas north of Cape Blanco, Oregon, not included in the assessment model.

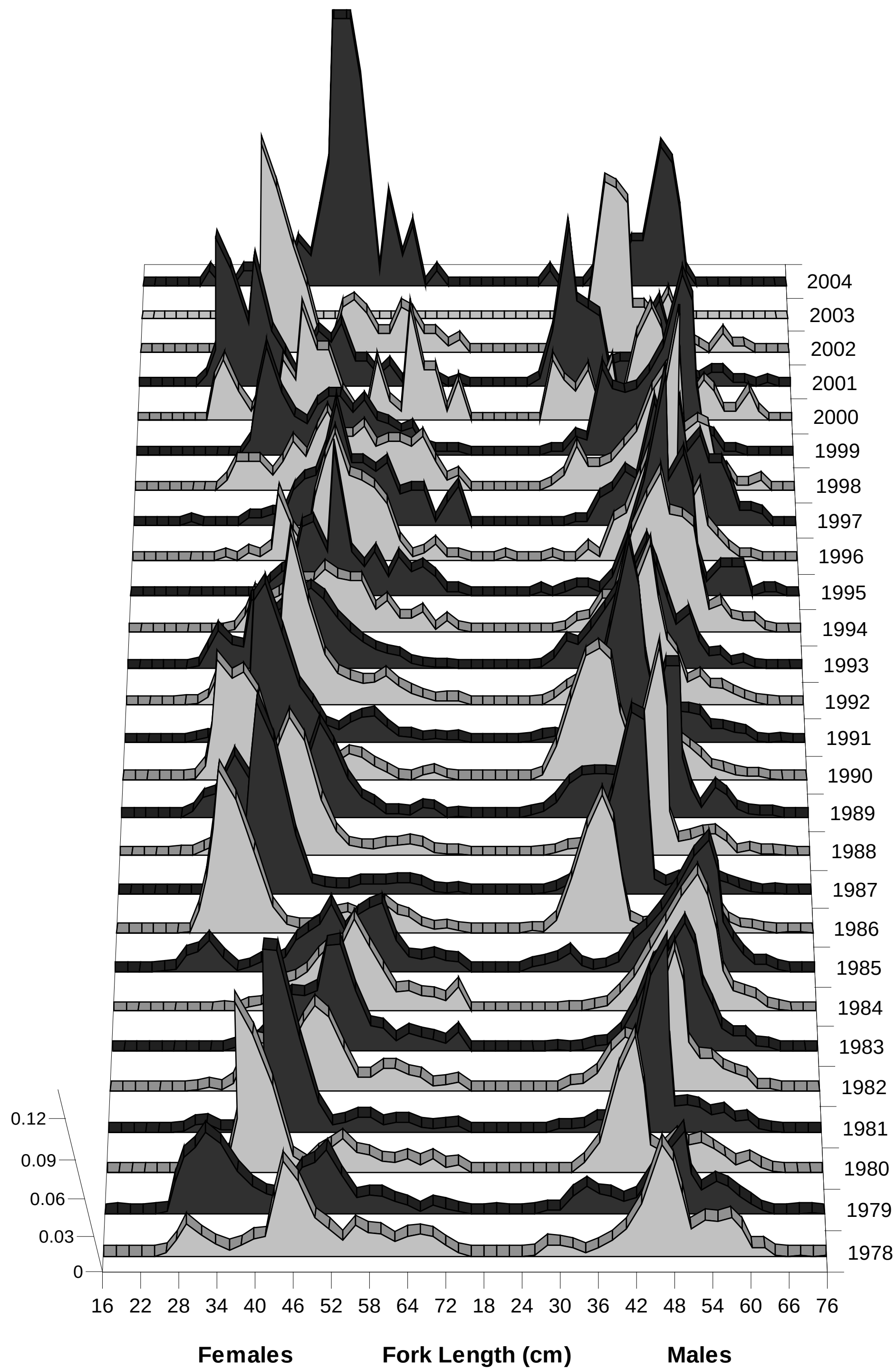


Figure 18. Length frequencies for all California trawl catches, 1978-2004.

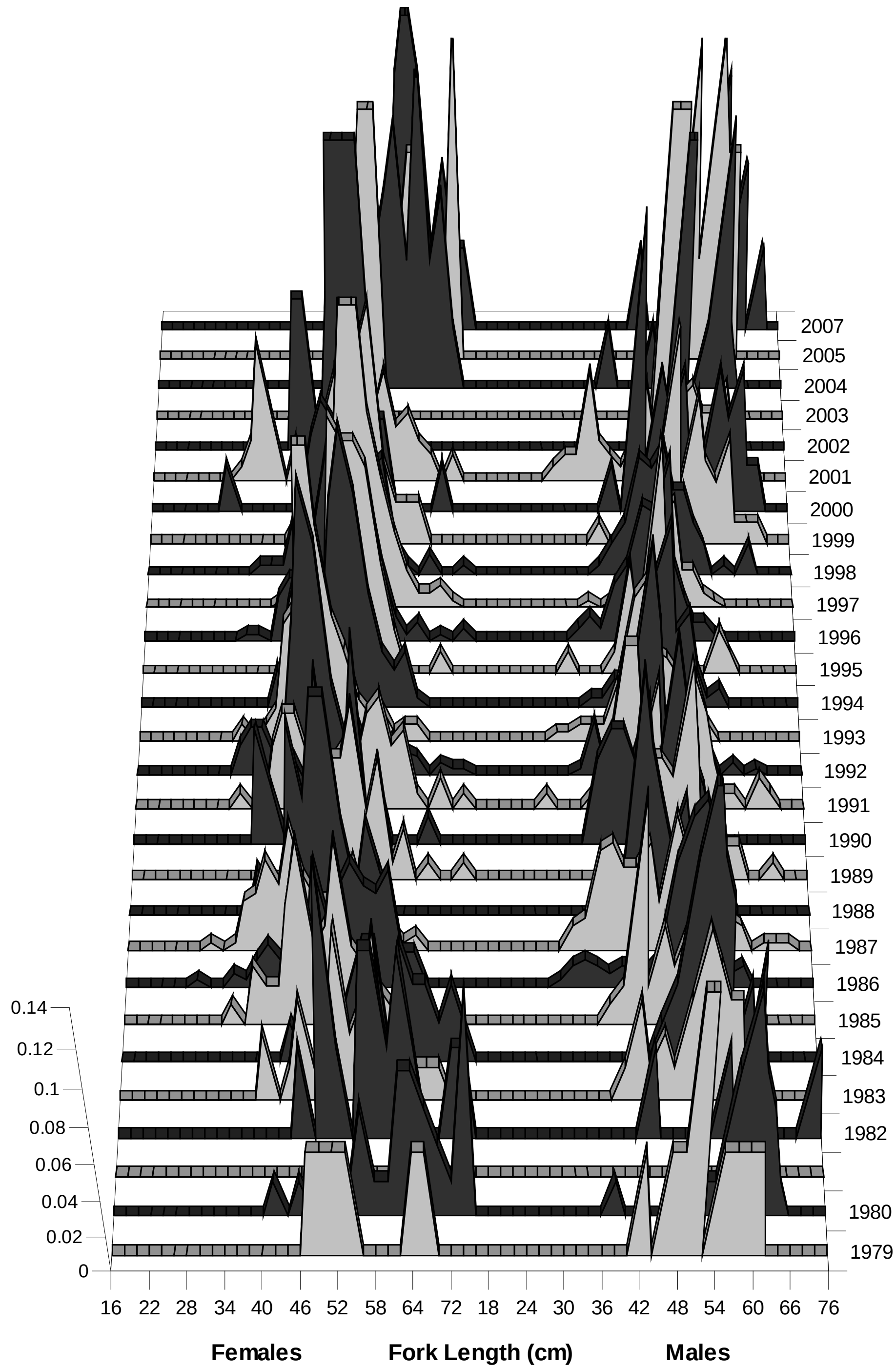


Figure 19. Length frequencies for all California hook-and-line catches, 1978-2004.

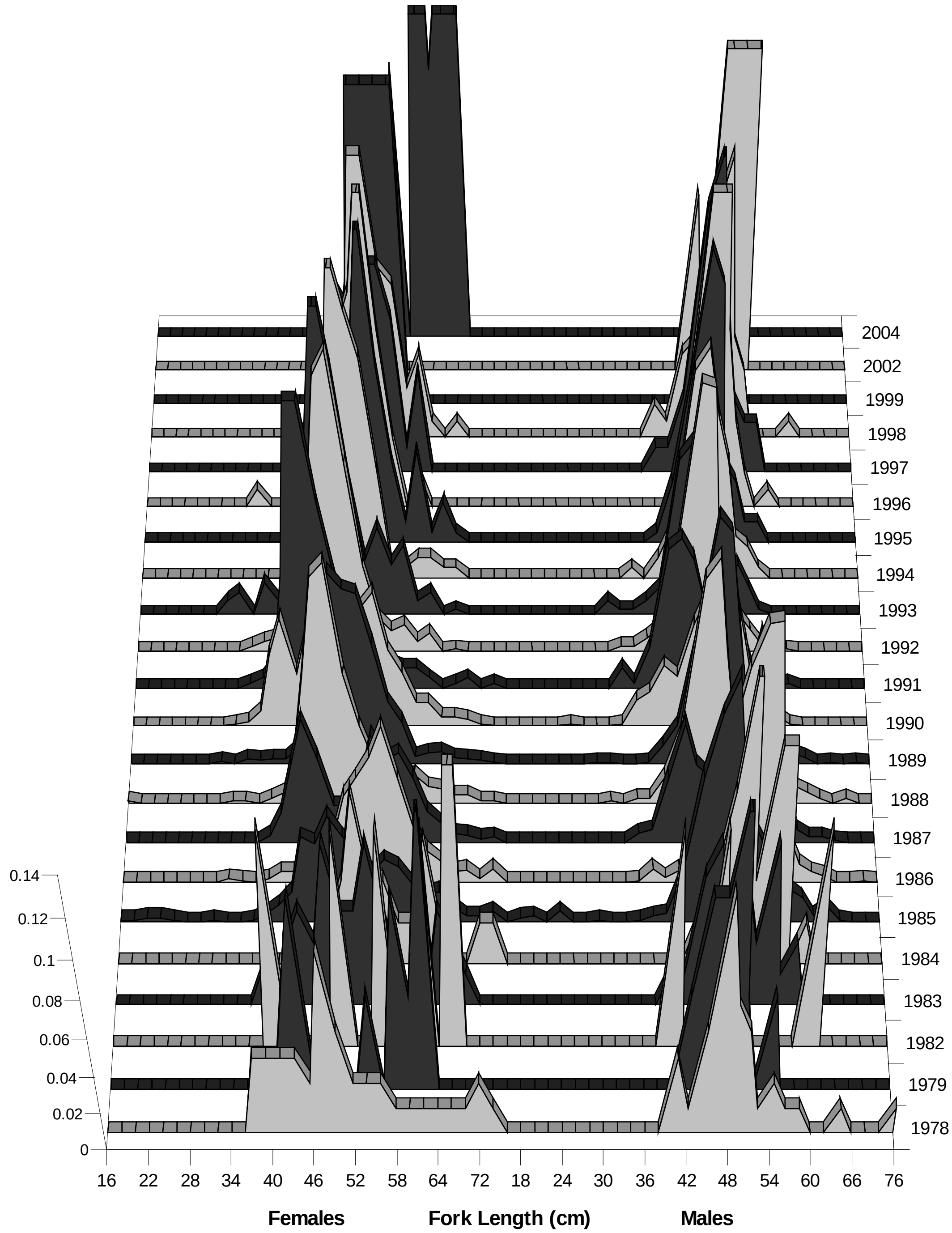
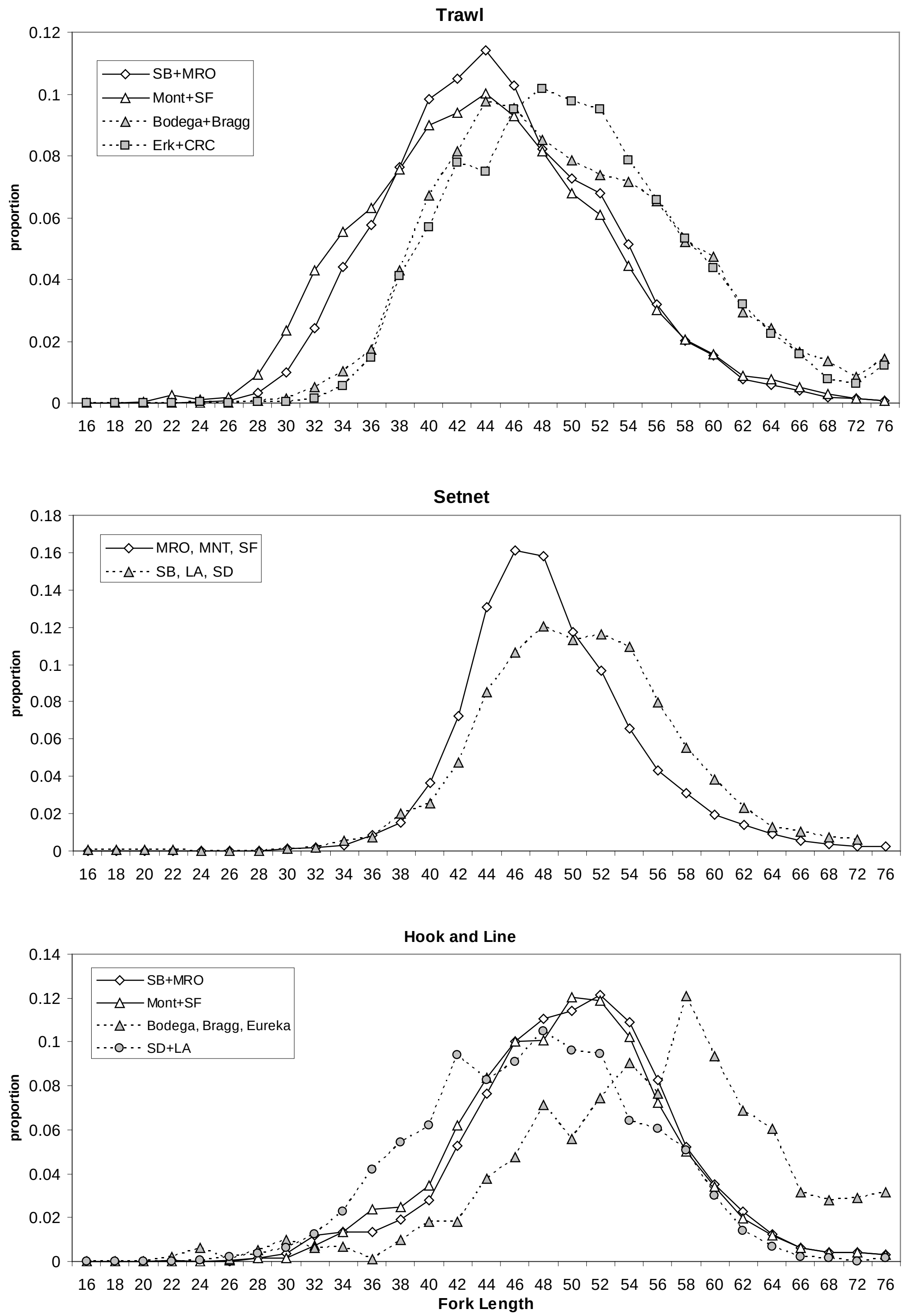


Figure 20. Length frequencies for all California set net catches, 1978-2004.



Figures 21a-c. Length frequency composition data for the trawl, hook-and-line and set net fisheries by port groups and regions. From south to north, port groups (essentially regions) are SD (San Diego), LA (Los Angeles), SB (Santa Barbara), MRO (Morro Bay), MNT (Monterey Bay), SF (San Francisco Bay), Bodega (Bodega Bay), Bragg (Fort Bragg), Erk (Eureka) and CRC (Crescent City).

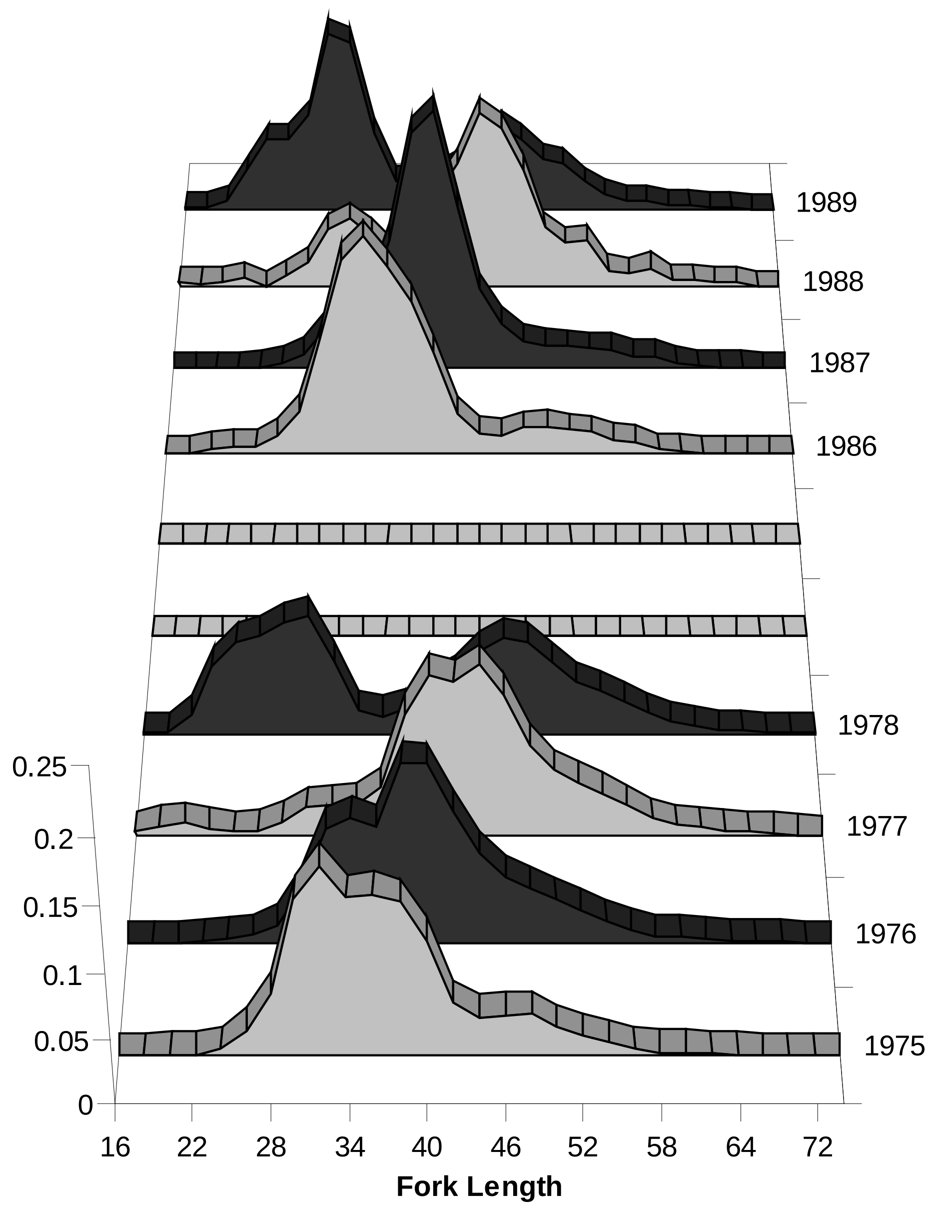


Figure 22. Length frequency distribution for Southern California CPFV observer program1975-1978 and 1986-1989.

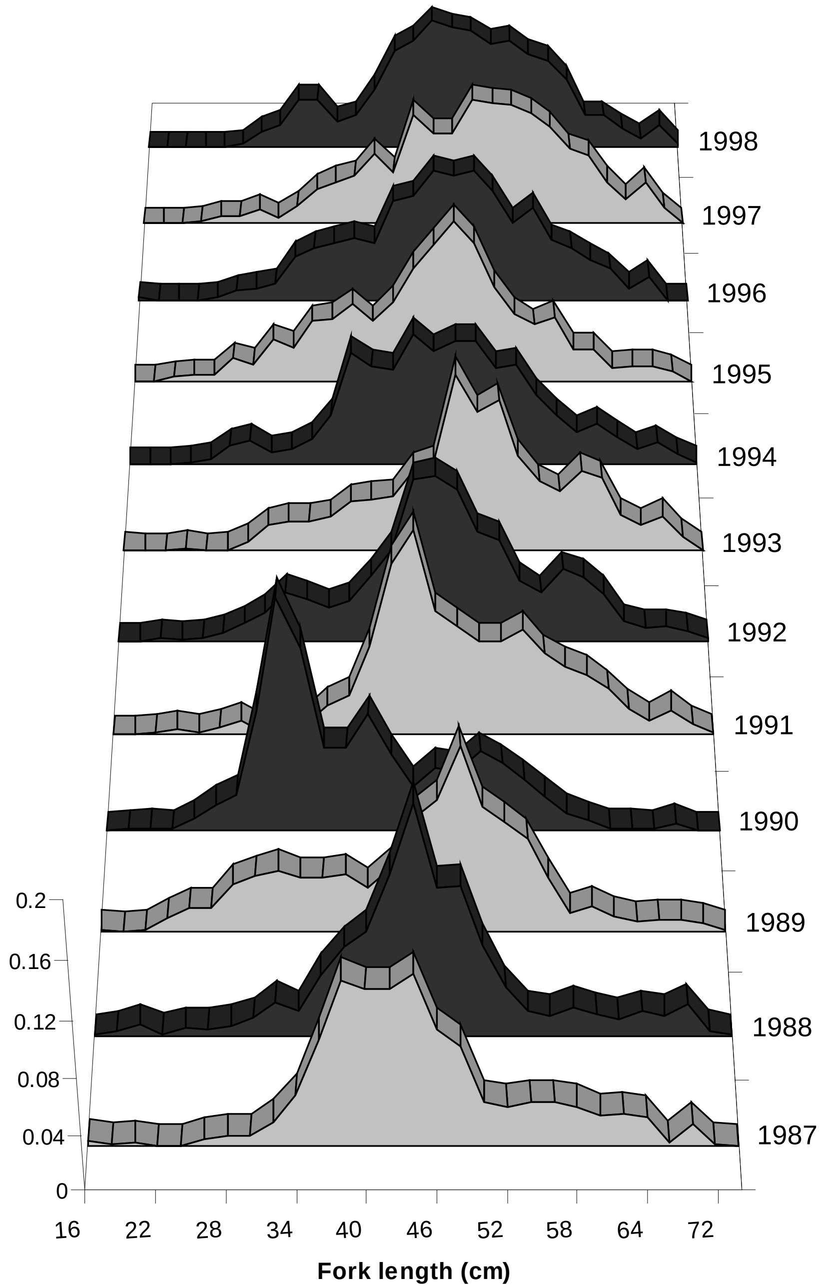


Figure 23. Length frequency distribution of sampled bocaccio from the central California CPFV observer program, 1987-1998.

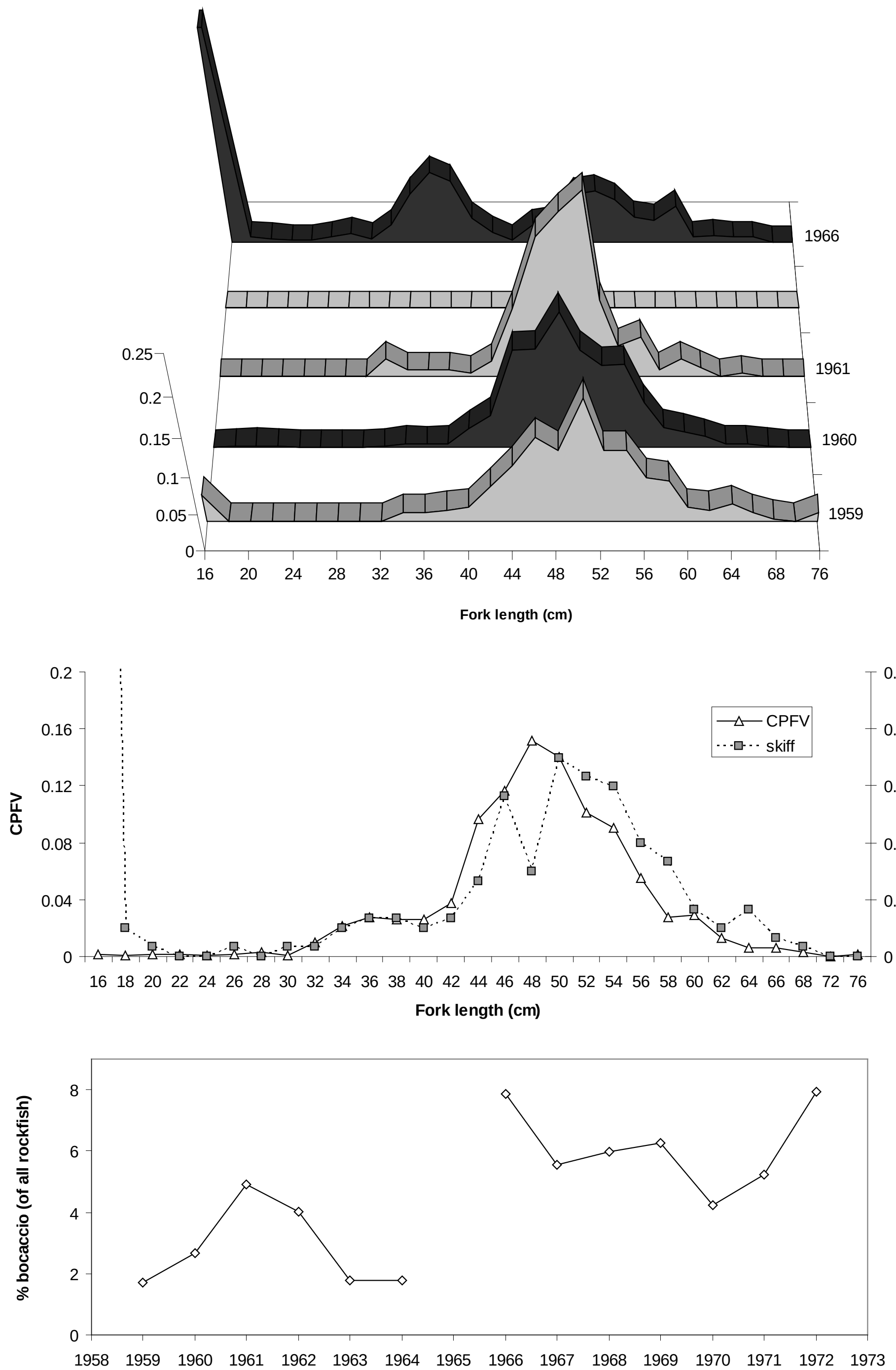


Figure 24a-c. 24a, Length frequency distribution for Monterey Bay CPFV and skiff recreational fisheries from the Miller and Gotshall monitoring efforts, 24b, pooled length frequencies showing difference between skiff and CPFV lengths, and 24c the percentage of the total recreational rockfish catch observed to be bocaccio in Monterey Bay, 1959-1972.

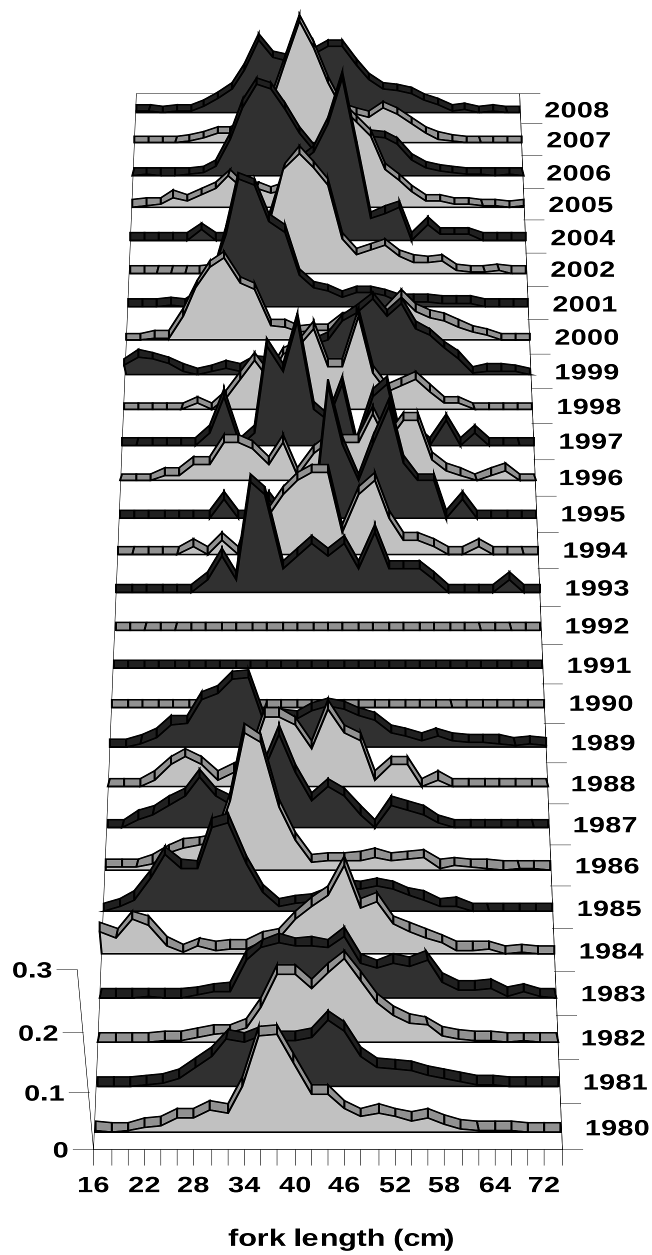


Figure 25. Length frequency composition of bocaccio for Southern California recreational fisheries (excluding shore modes) from the RecFIN database, 1980-2008. Note that no sex information is available, no data were collected from 1990-1992, and 1980-1989 data are derived from weight-frequency information.

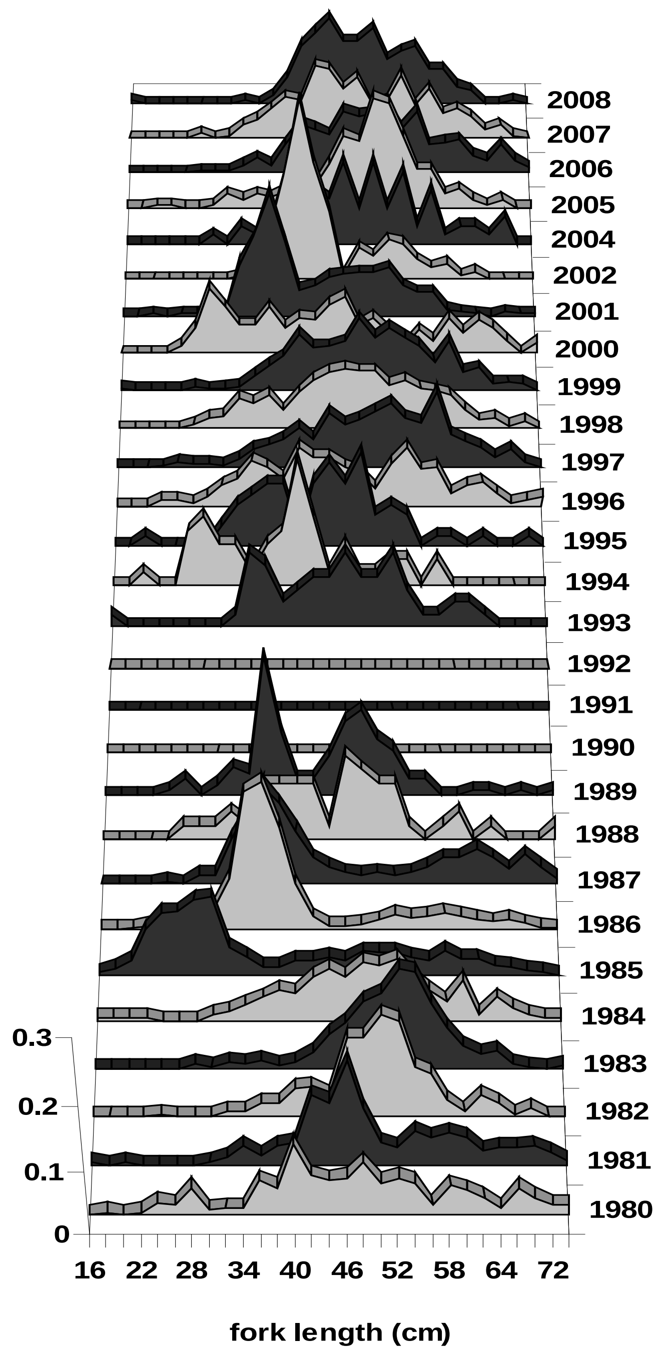


Figure 26. Length frequency composition of bocaccio sampled in central and northern California recreational fisheries (excluding shore modes) from the RecFIN database, 1980-2008. Note that no sex information is available, no data were collected from 1990-1992, and 1980-1989 data are derived from weight-frequency information.

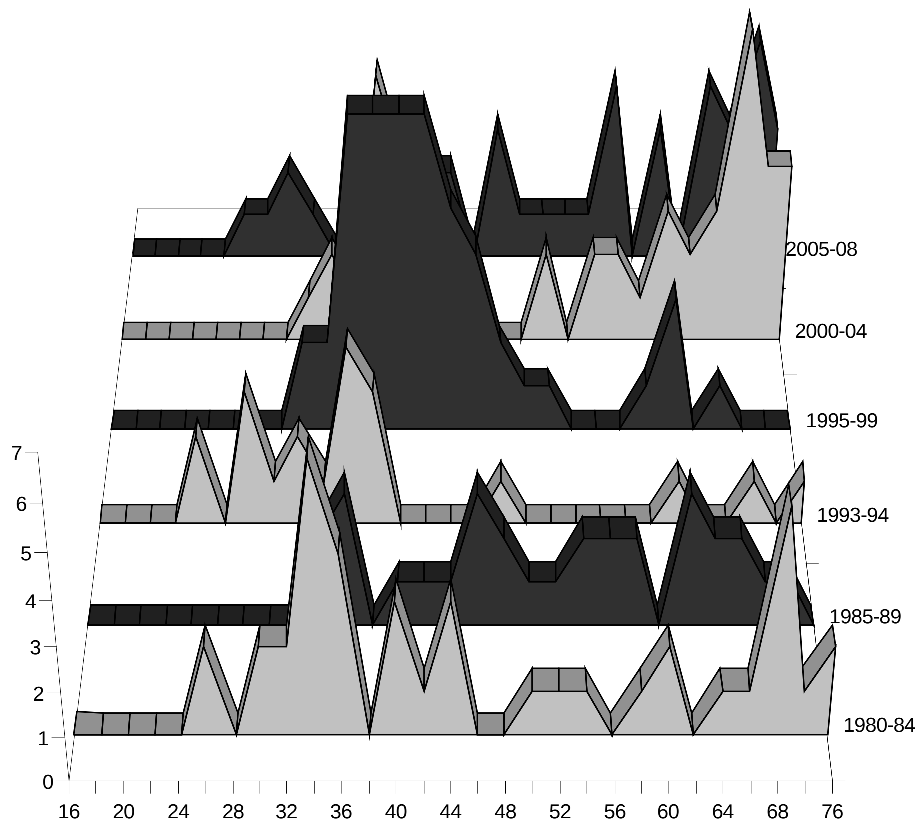


Figure 27. Length frequency composition of bocaccio sampled in Oregon and Washington recreational fisheries (excluding shore modes) from the RecFIN database, 1980-2008. As very limited information is available and many years had either no observations or only observations in single digits, data are pooled into 5-year intervals.

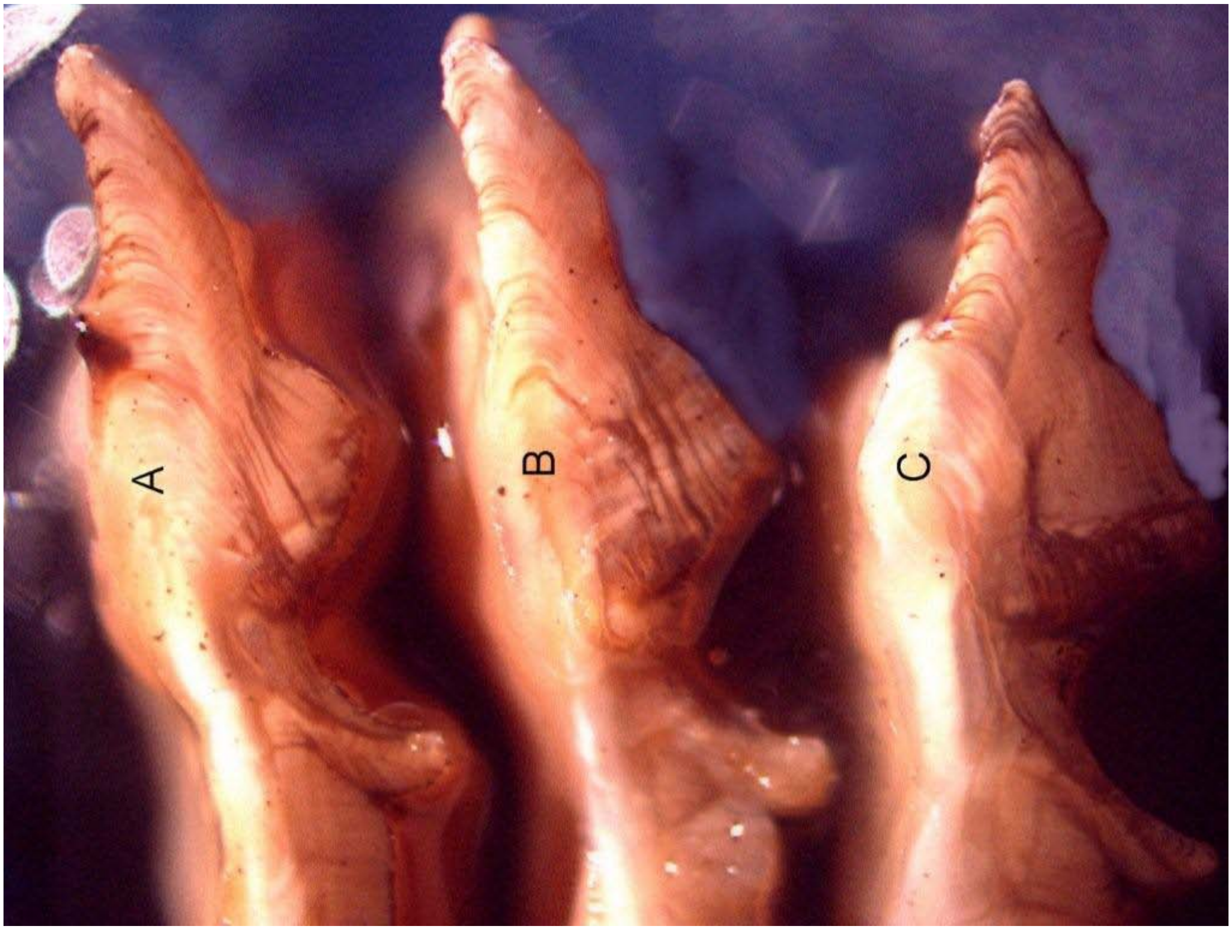


Figure 28. Three otoliths from similarly sized bocaccio along different regions of the west coast; otolith A: Washington, September 23, 2003: 55cm male, otolith B: Monterey, December 3, 1992: 57cm male, otolith C: Los Angeles, May 7, 1987: 56 cm male.

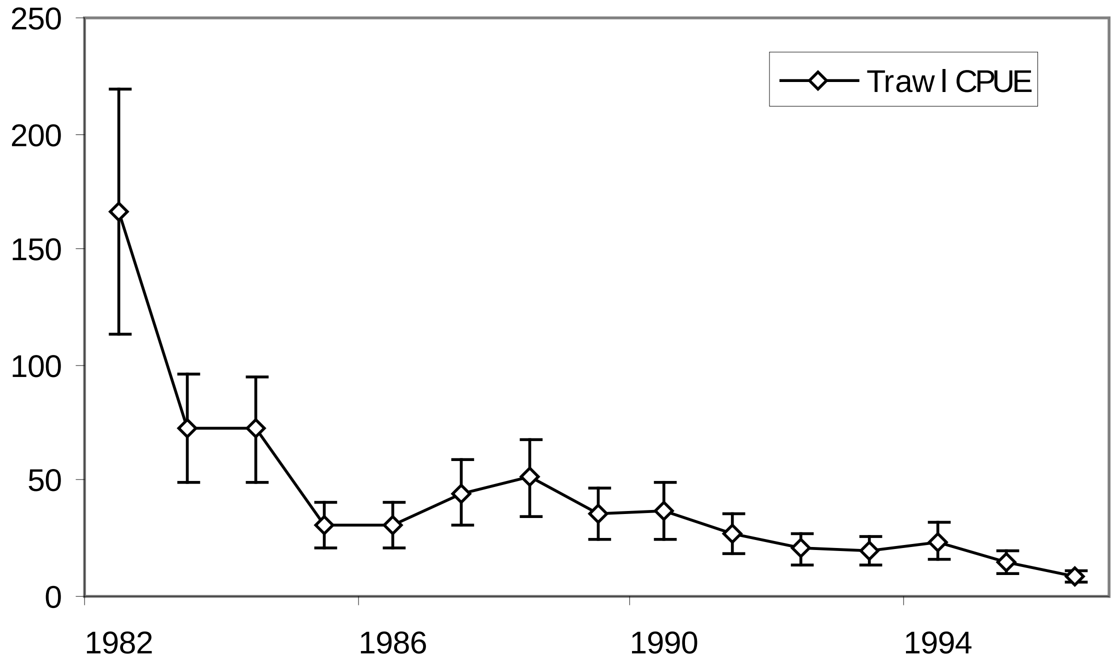


Figure 29. Trawl fishery CPUE index of bocaccio abundance developed in Ralston (1998)

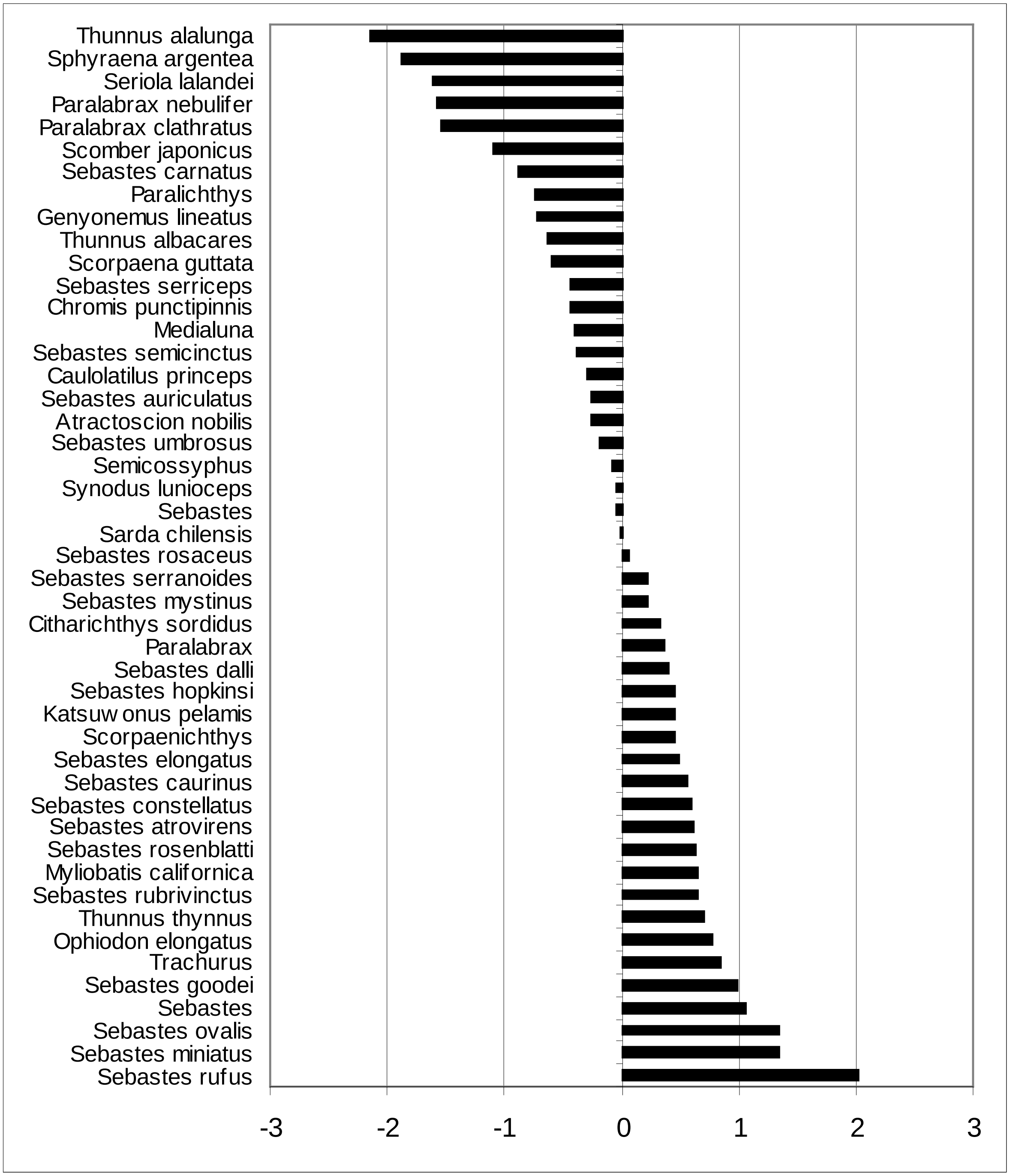


Figure 30. Species-specific catch coefficients developed to filter appropriate trips for the southern recreational fishery CPUE index of bocaccio abundance.

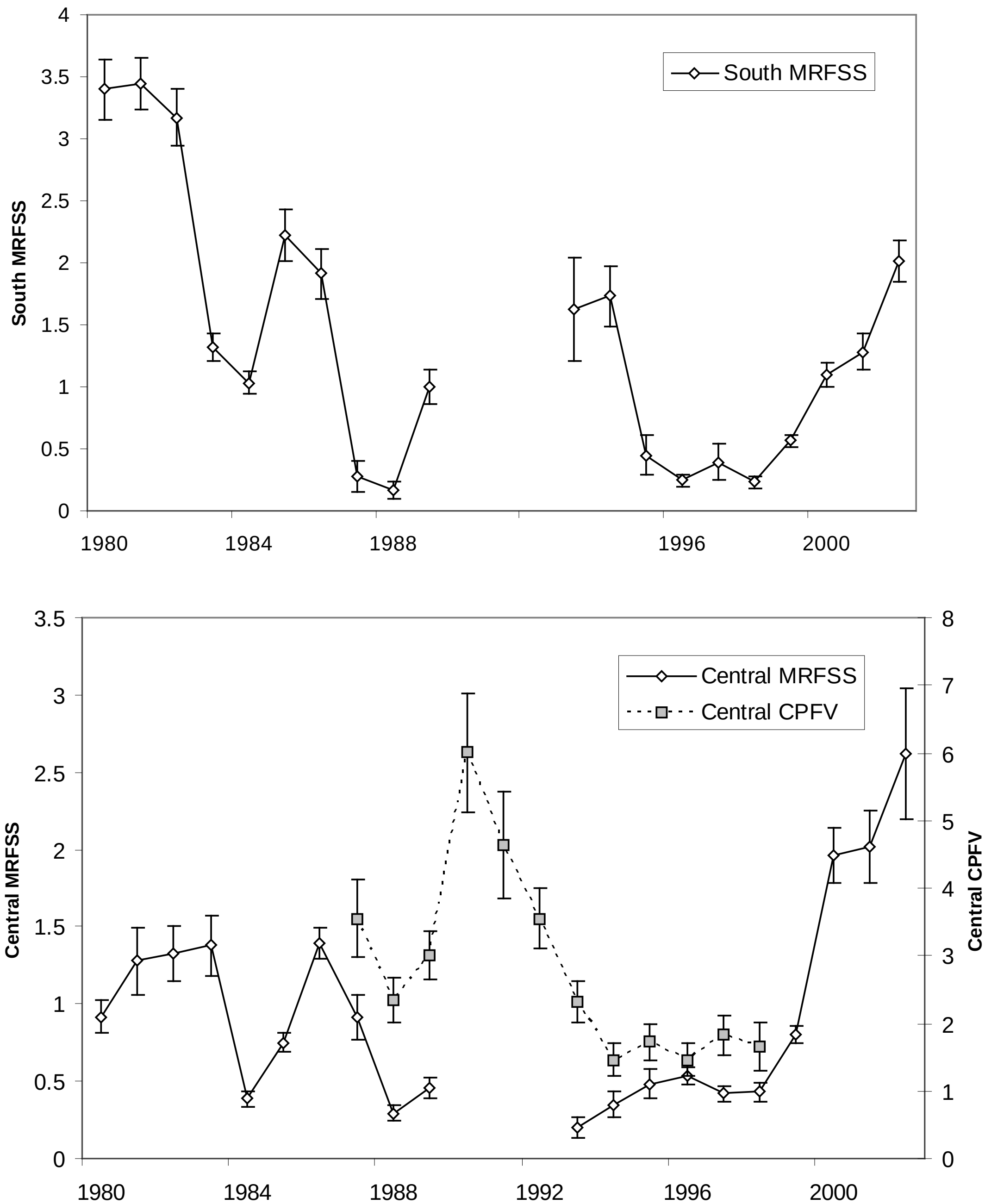
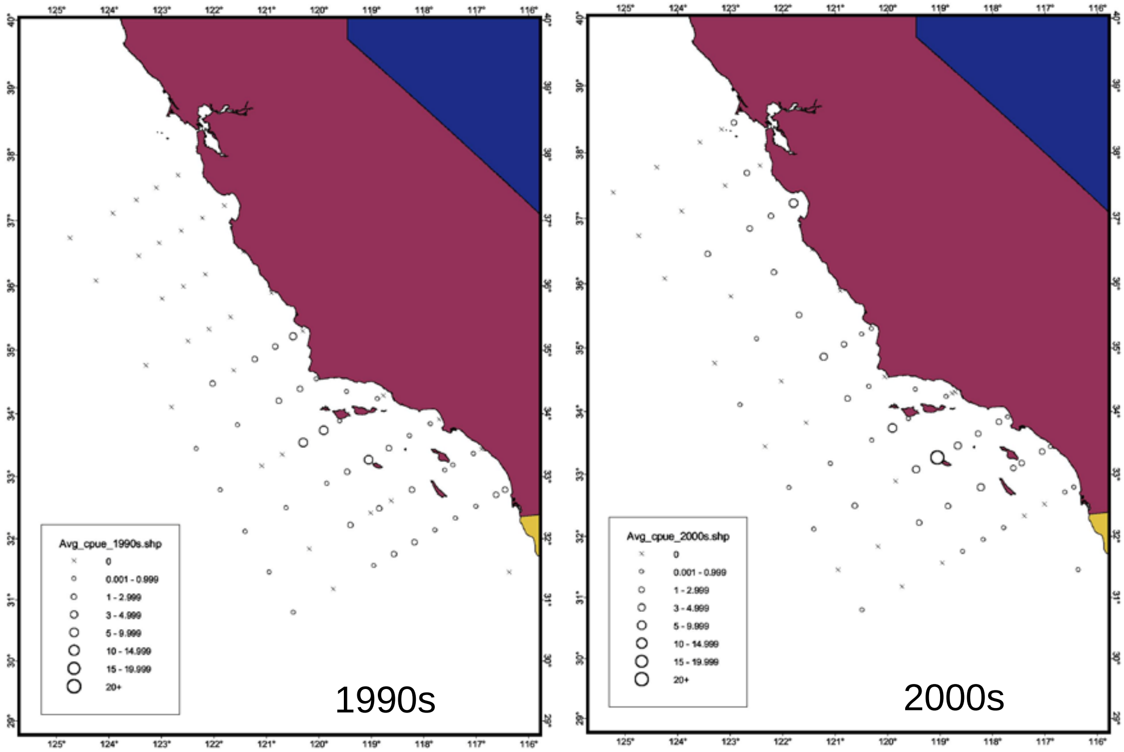
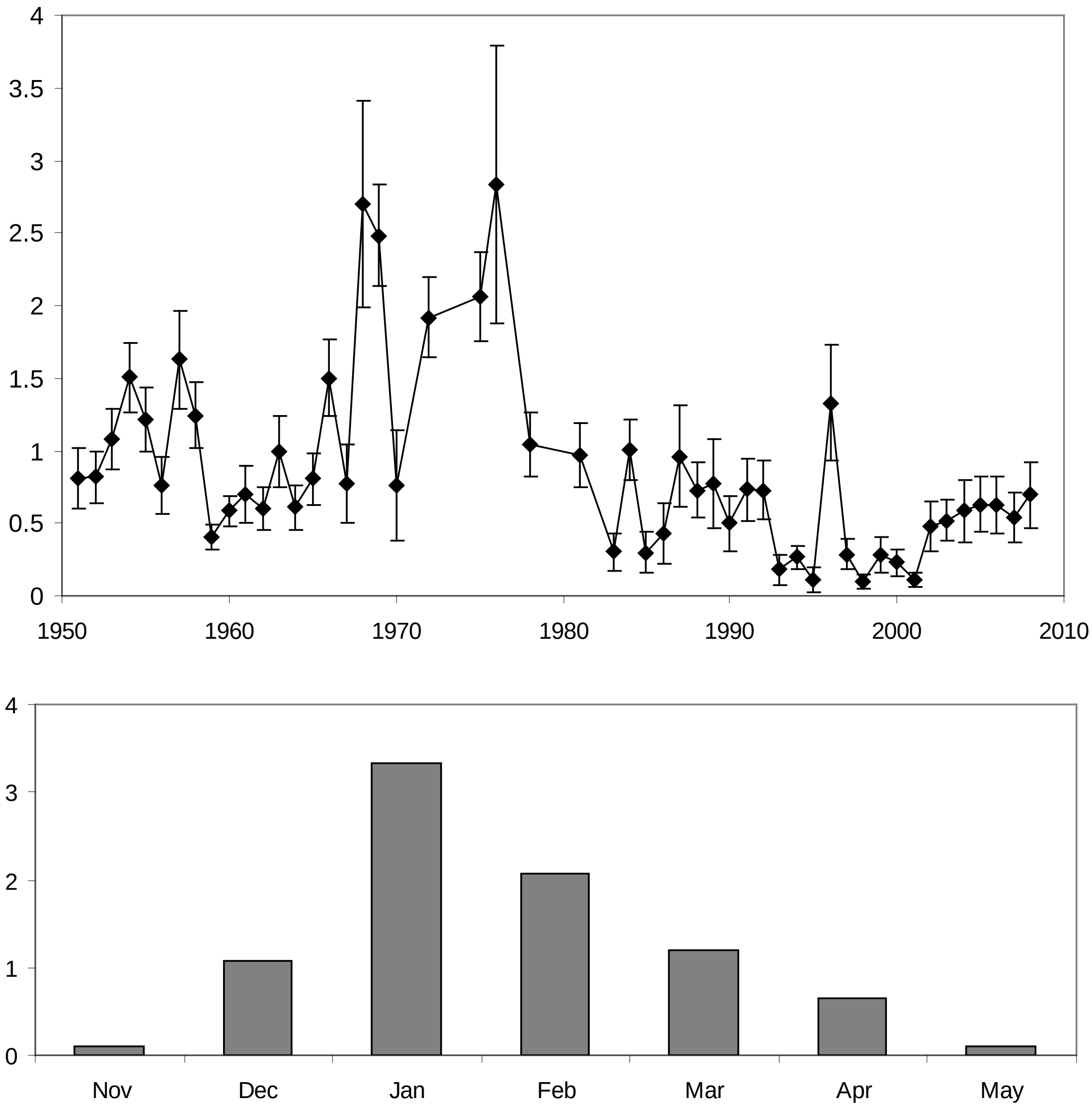


Figure 31a-b. Southern California recreational fishery CPUE index (top) and the two central/northern California recreational CPUE indices (bottom) of bocaccio abundance.

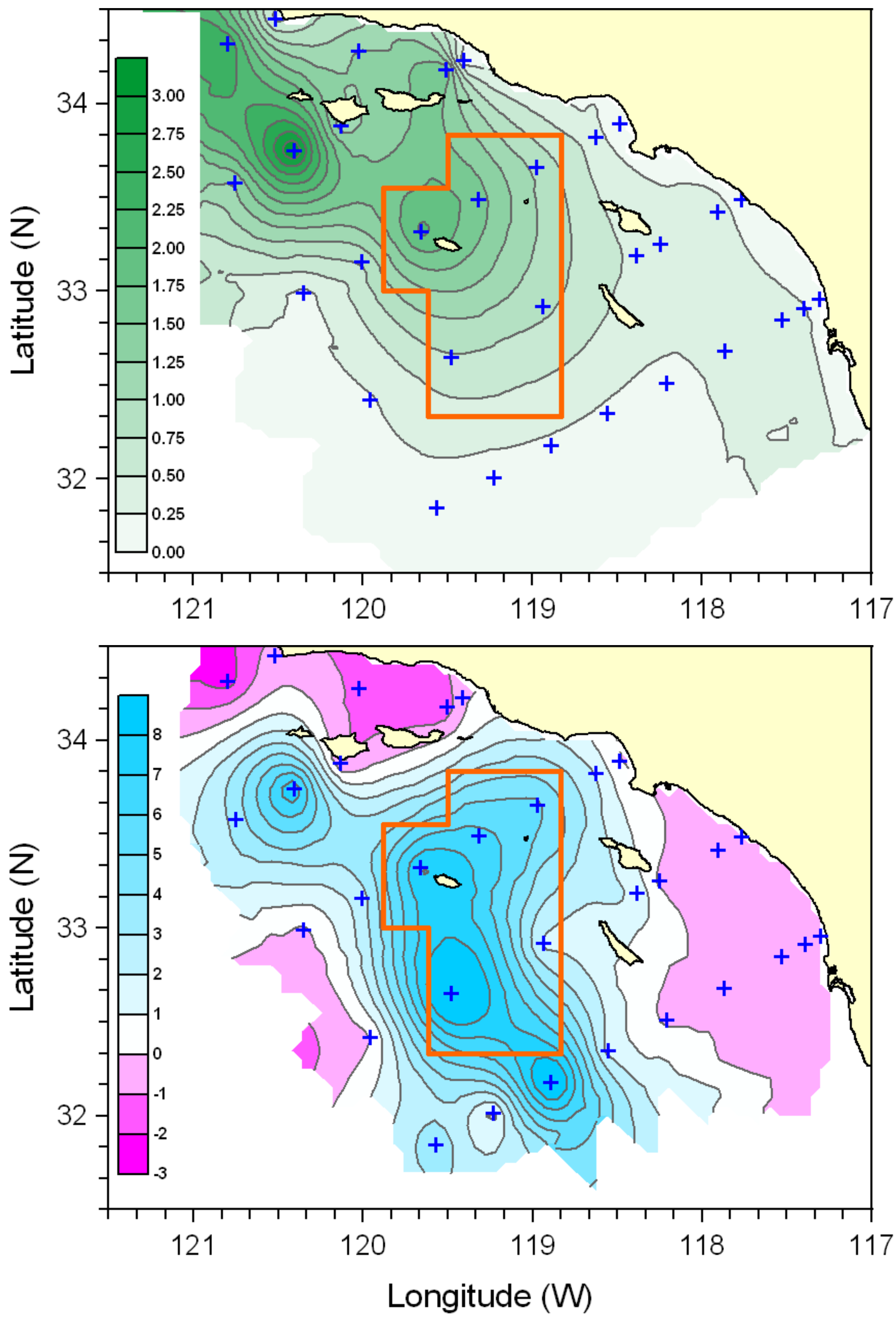
Figures 32a-d. CalCOFI mean CPUE rate of larval bocaccios by station and decade



Figures 32e-f. CalCOFI mean CPUE rate of larval bocaccios by station and decade



Figures 33a-b. CalCOFI larval abundance indices (top) for the coastwide bocaccio model, with asymptotic standard errors based on a jackknife routine; (bottom) month effects for the delta-GLM model.



Figures 34a-b. Spatial distribution of bocaccio larvae in the Southern California Bight (top) based on estimated station effects [#/10 m^2] from a delta-GLM analysis of the entire CalCOFI time series (1951-2005). Bottom figure reflects the spatial distribution of bocaccio larvae in 2002-03 represented as anomalies from the long-term mean distribution. From Ralston and MacFarlane (in review).

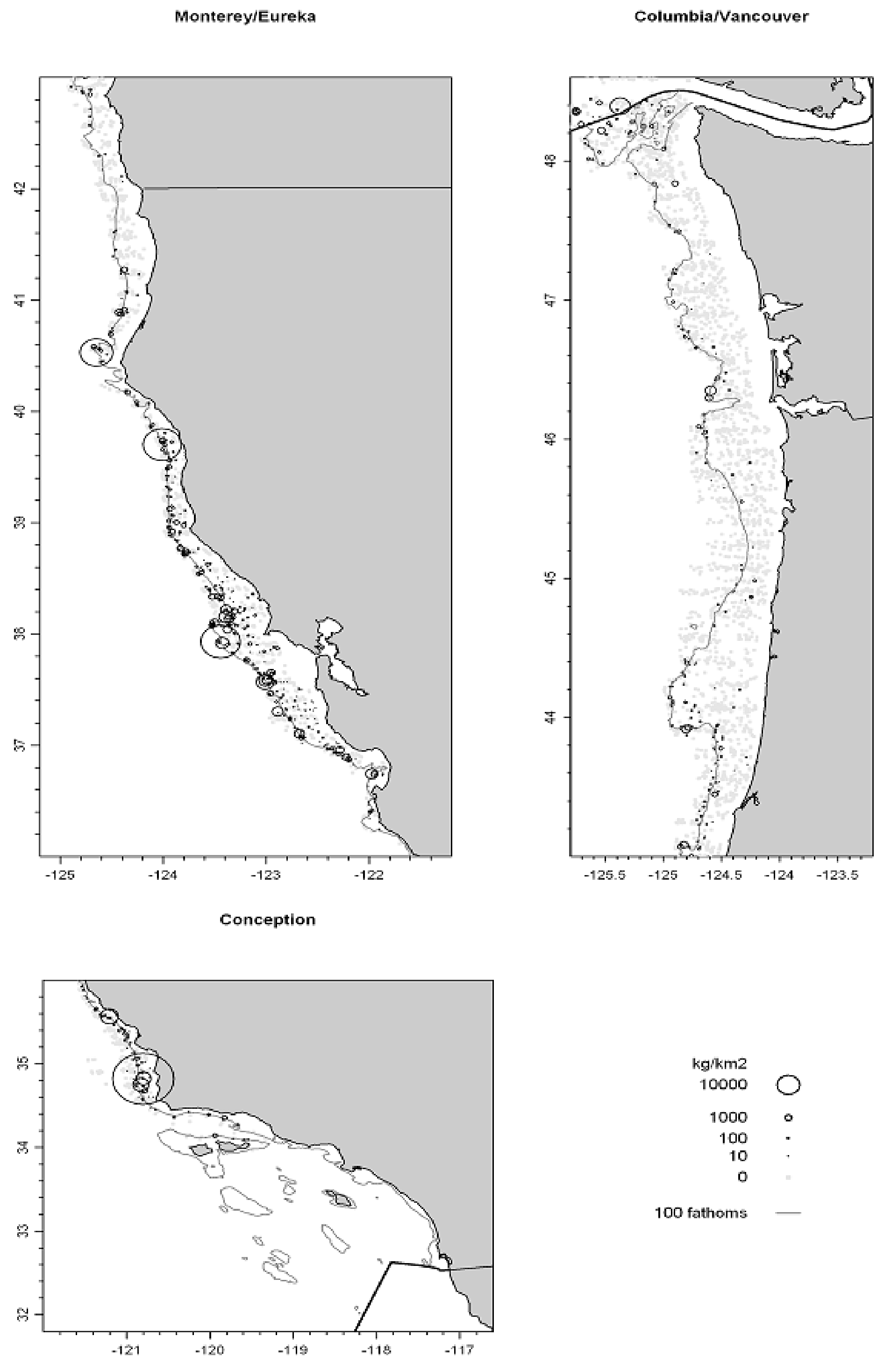
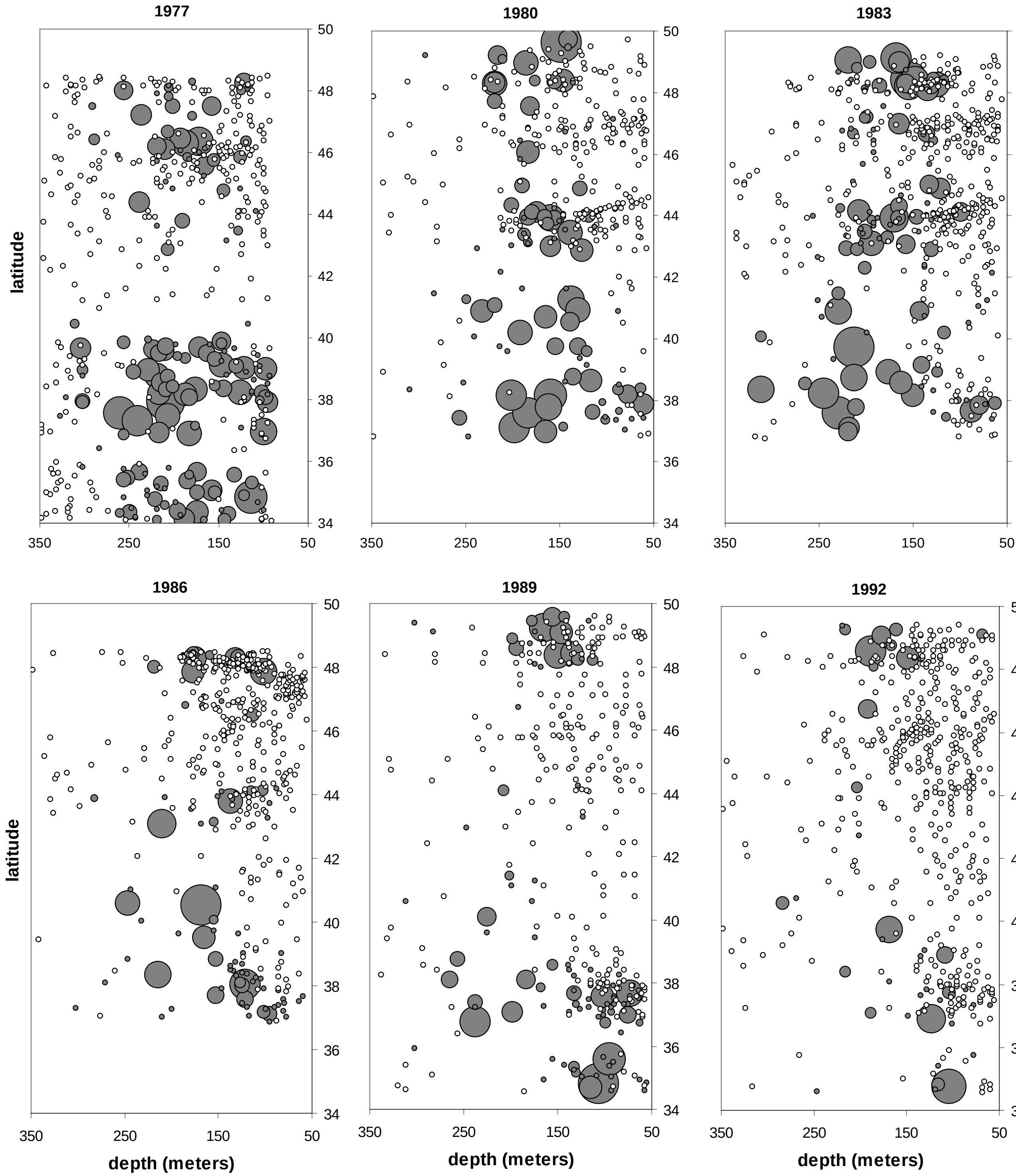
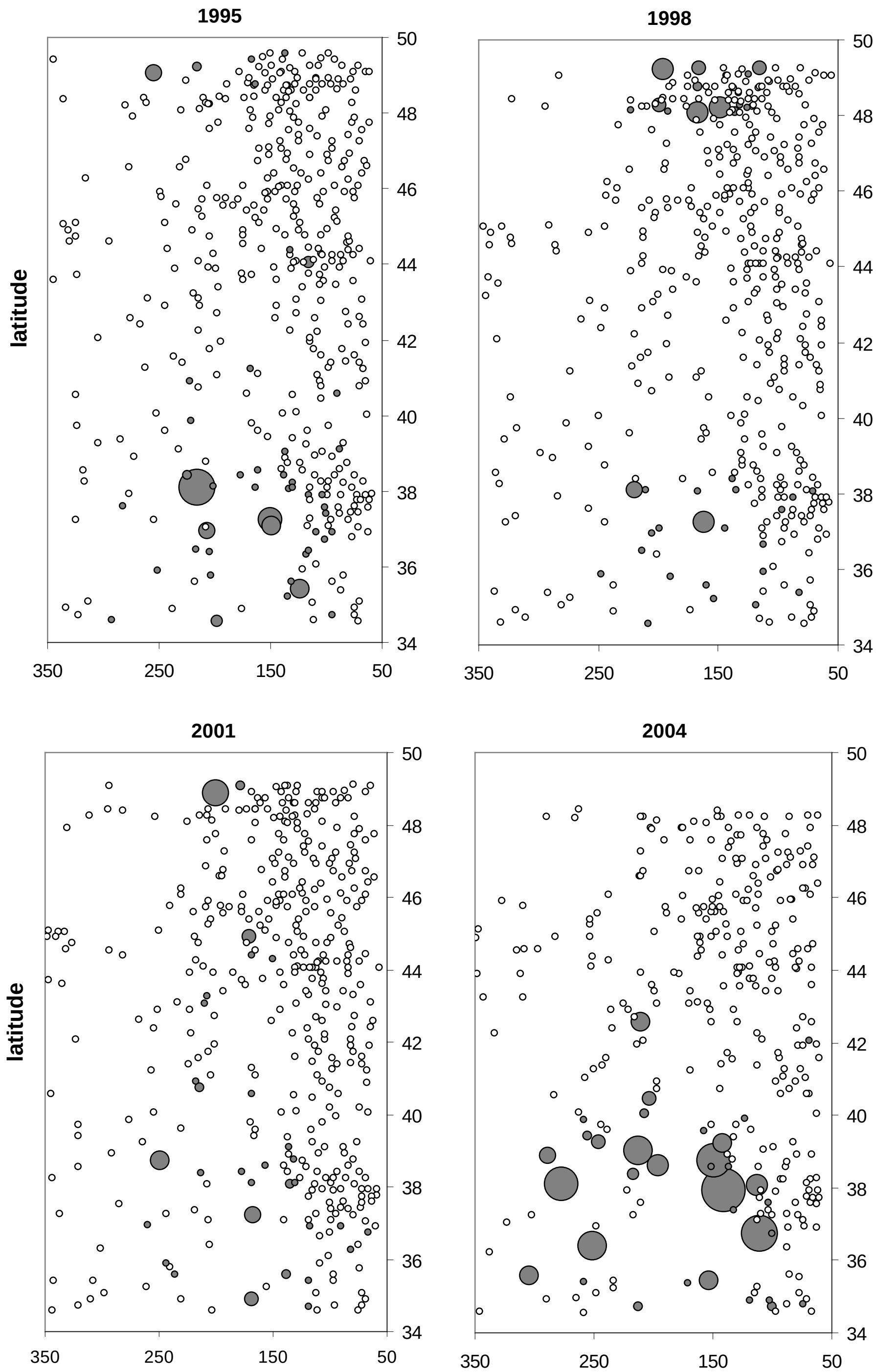


Figure 35: Triennial trawl survey CPUE over space, all years (1980-2004) combined.



Figures 36a-f. Triennial trawl survey catches of bocaccio rockfish, 1977-1992, plotted as the log of the catch (with a minimum size threshold) by year, depth and latitude (note that longitude is absent). Empty circles represent non-positive hauls.



Figures 36g-j. Triennial trawl survey catches of bocaccio rockfish, 1977-1992, plotted as the log of the catch (with a minimum size threshold) by year, depth, and latitude (note that longitude is absent). Empty circles represent non-positive hauls.

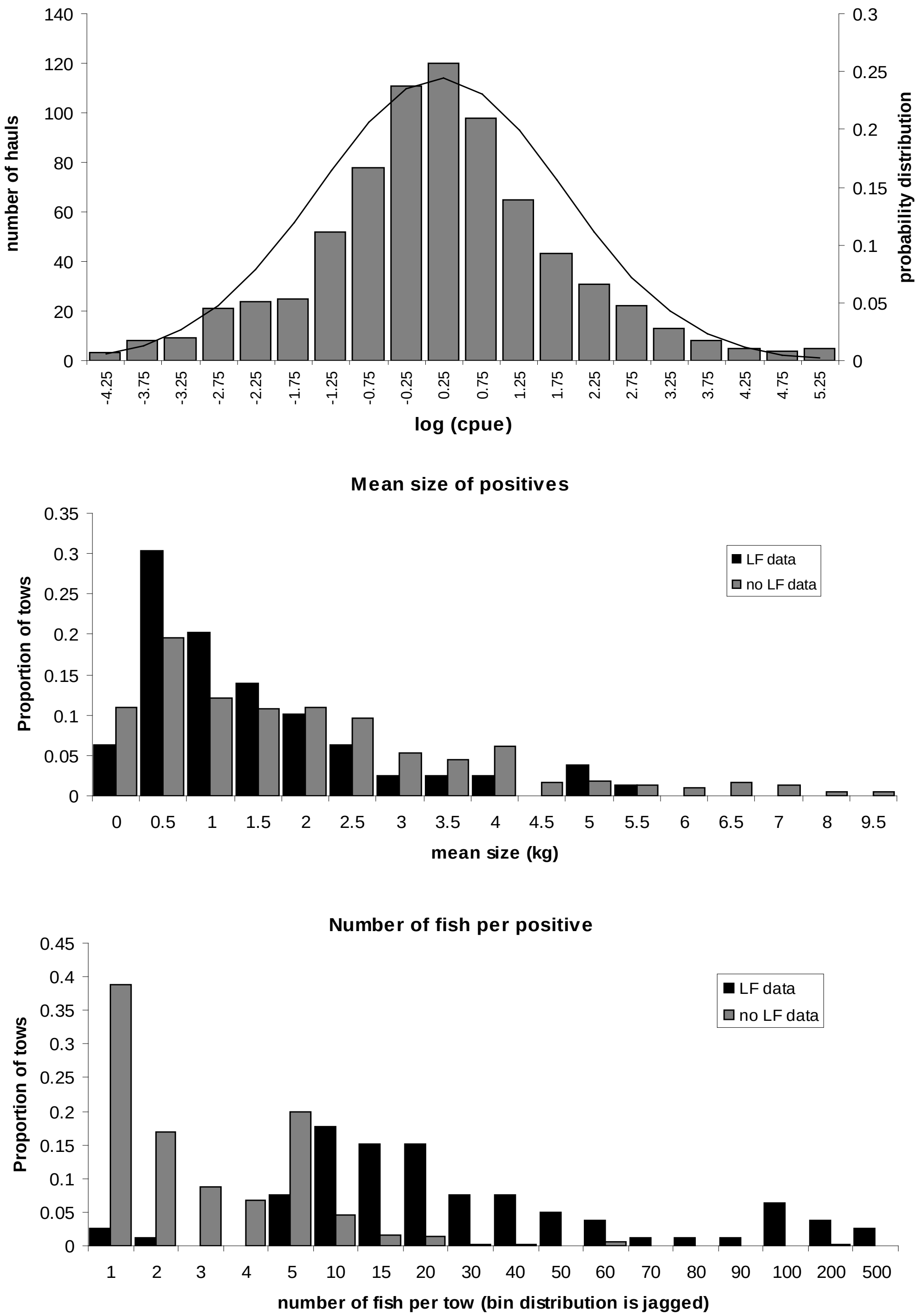
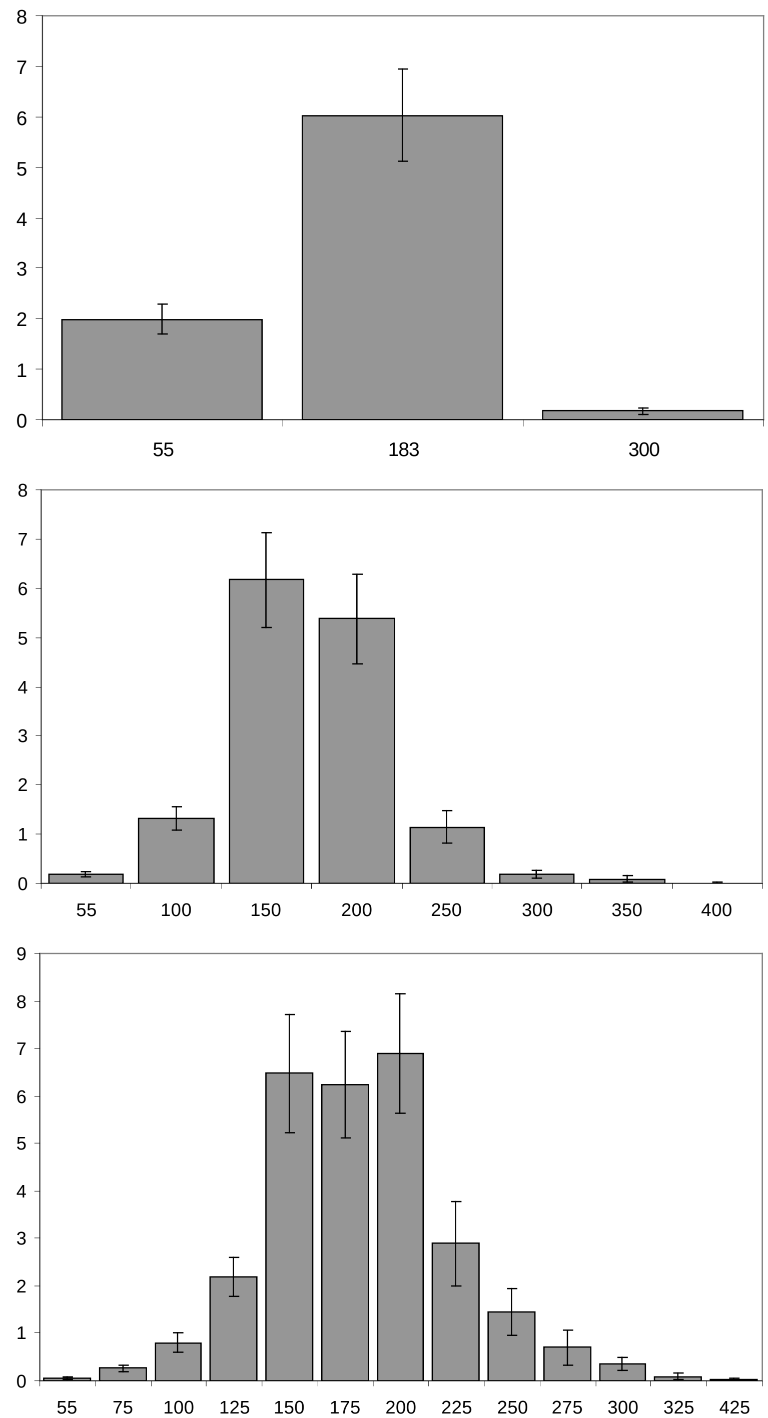


Figure 37a-c. Distribution of bocaccio CPUE for the triennial survey in log scale (top), distribution of average weight (center) and of the count (bottom) of bocaccio per haul for hauls in which length frequencies were taken versus hauls in which they were not.



Figures 38a-c. Depth factor coefficients across a range of depth bins from GLM of triennial CPUE data (in all cases, year effects, and INPFC area effects also estimated). Standard errors based on a jackknife routine.

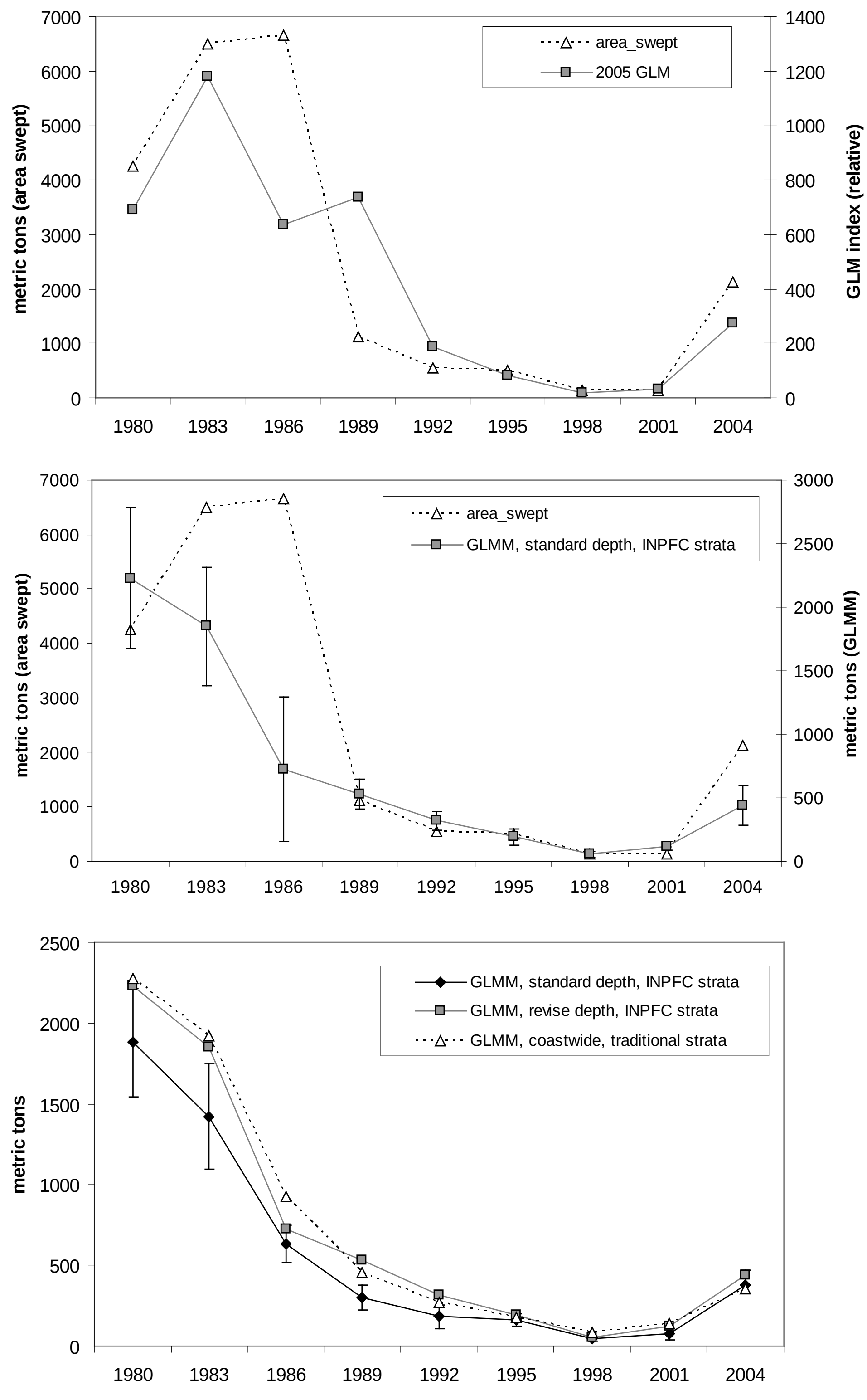


Figure 39a-c. Area swept (Monterey and Eureka INPFC areas only), 2005 assessment GLM (includes Conception INPFC observed and predicted) and GLMM estimates of relative abundance of bocaccio based on the 1980-2004 triennial survey data for this assessment. Error bars not shown for all indices to minimize confusion (CVs are also reported in Tables).

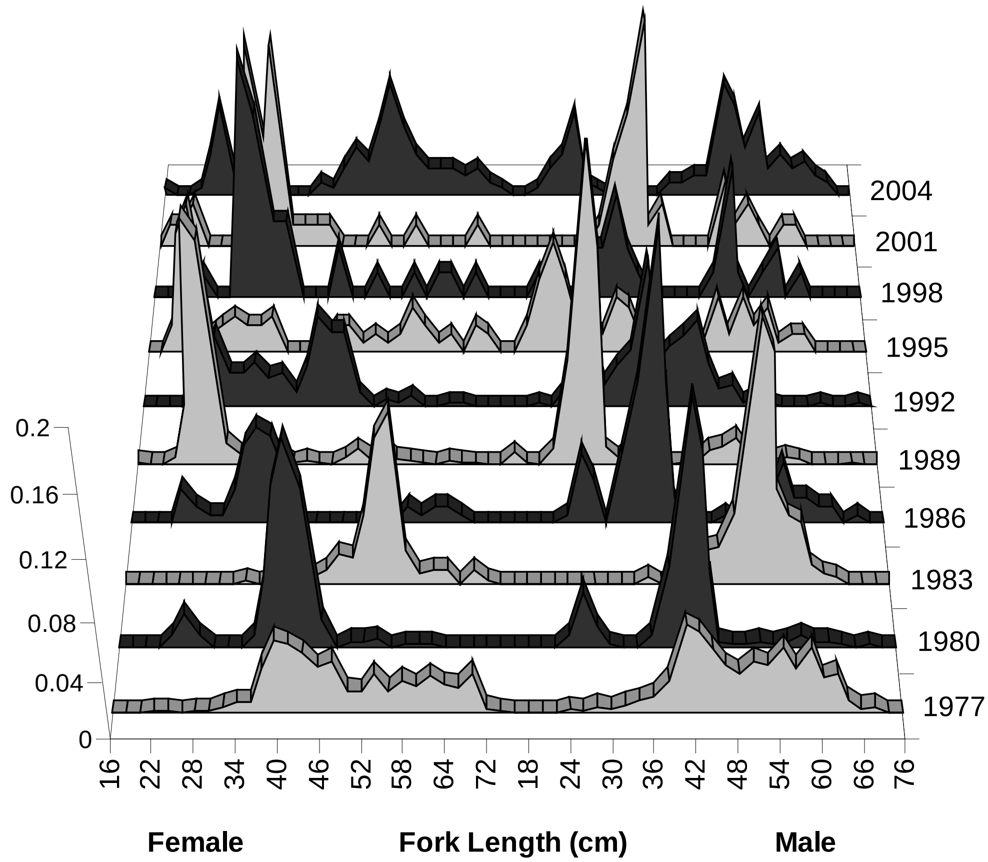


Figure 40. Length frequency information for bocaccio from the triennial trawl survey by year for the assessment area (south of Cape Blanco).

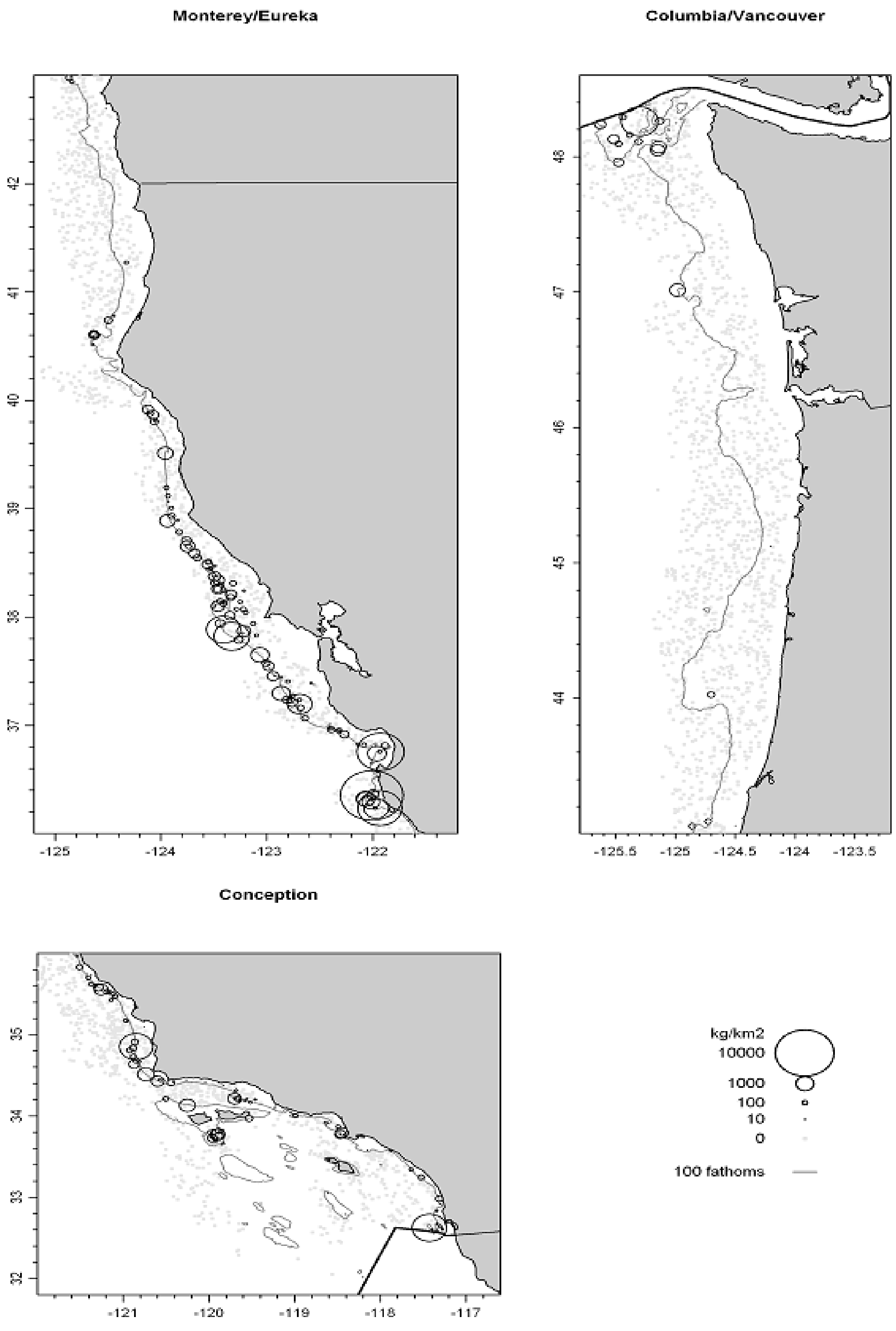
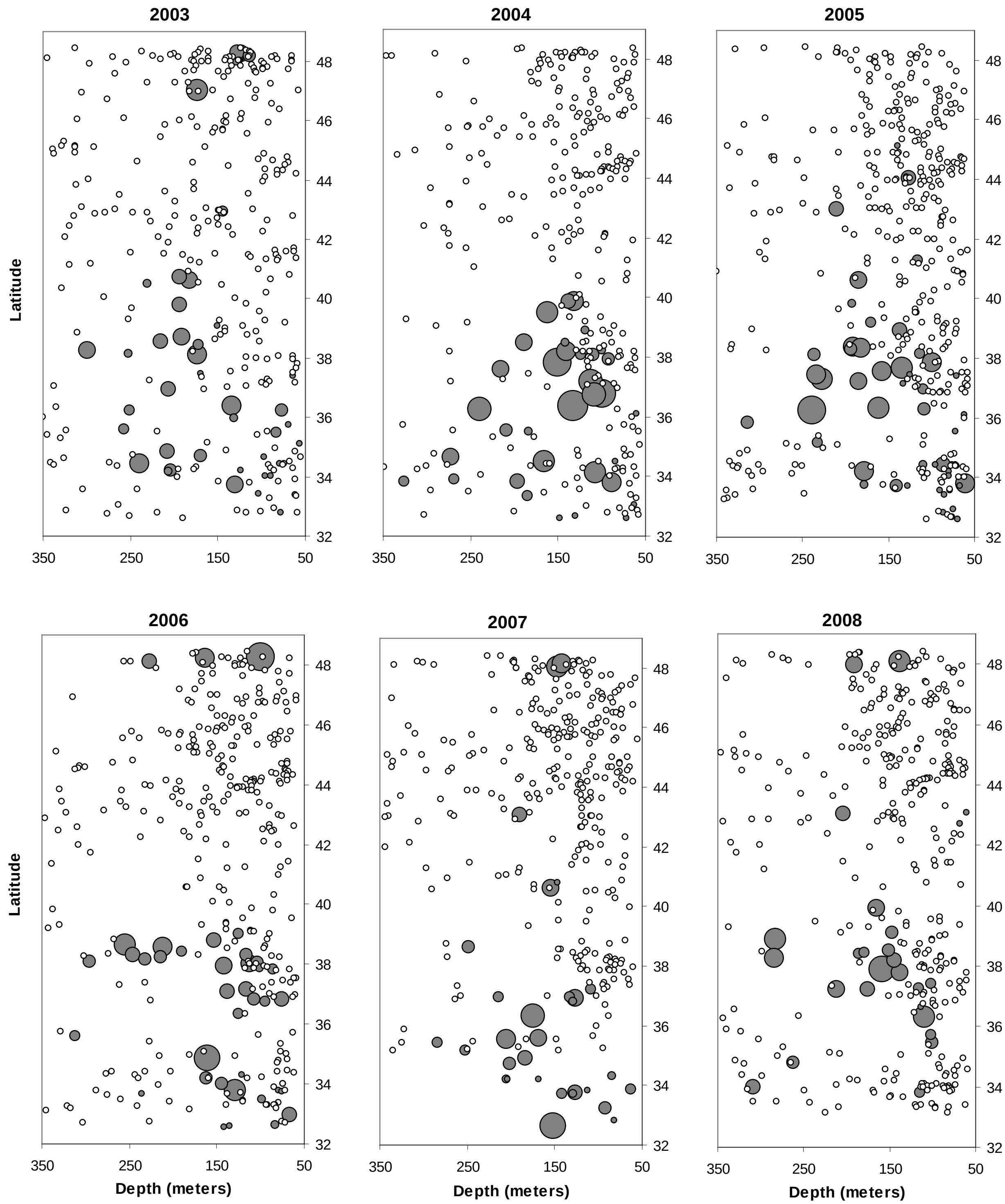
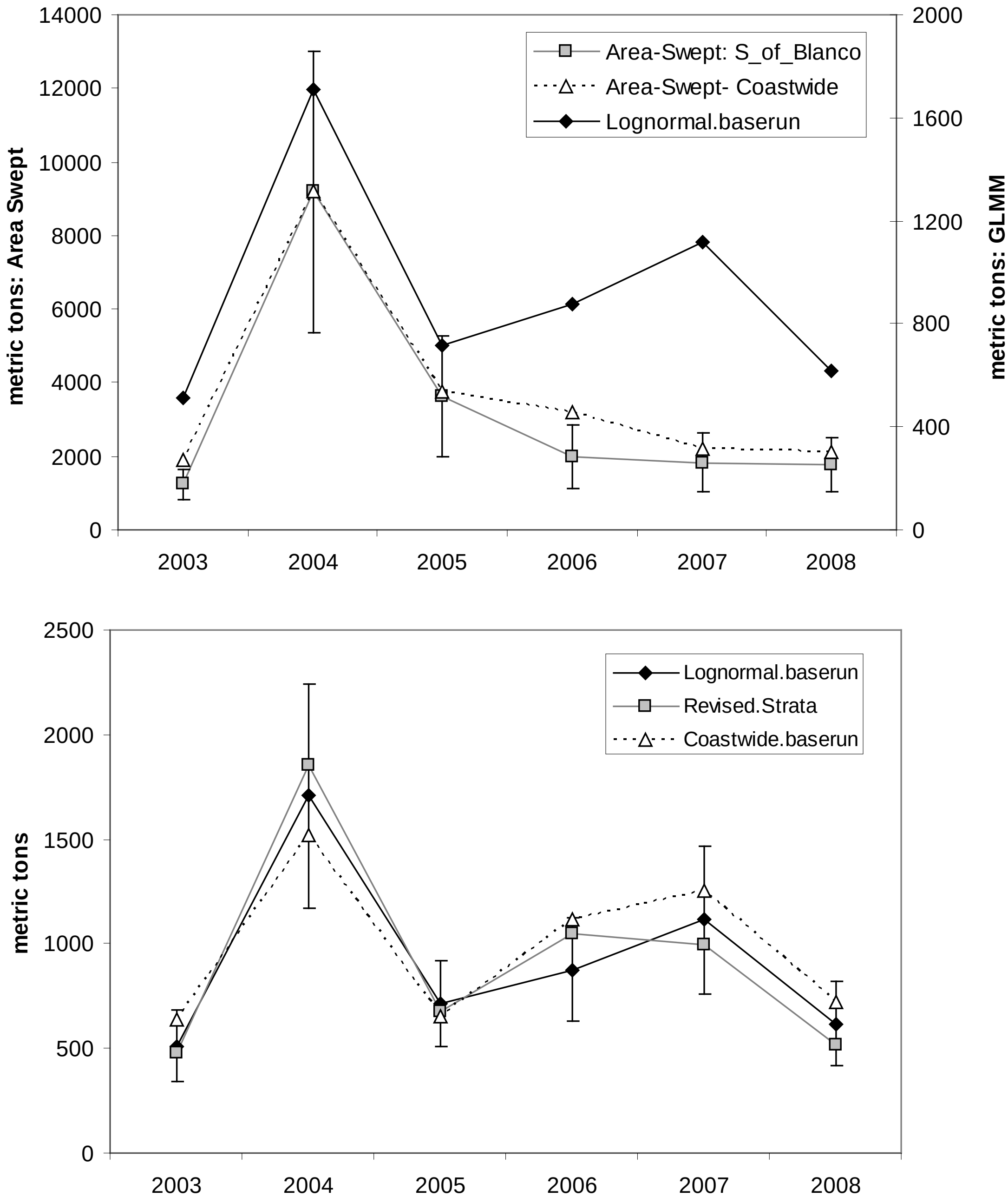


Figure 41: NWFSC Combined shelf-slope survey CPUE for bocaccio rockfish, all years (2003-2008) combined.



Figures 42a-f. Northwest Fisheries Science Center survey catches of bocaccio rockfish, plotted as the log of the catch (with a minimum size threshold) by year, depth and latitude (note that longitude is absent). Empty circles represent non-positive hauls.



Figures 43a-b. Comparison of area-swept versus GLMM abundance estimates for bocaccio rockfish from the NWFSC Combined survey (note different axes for different surveys).

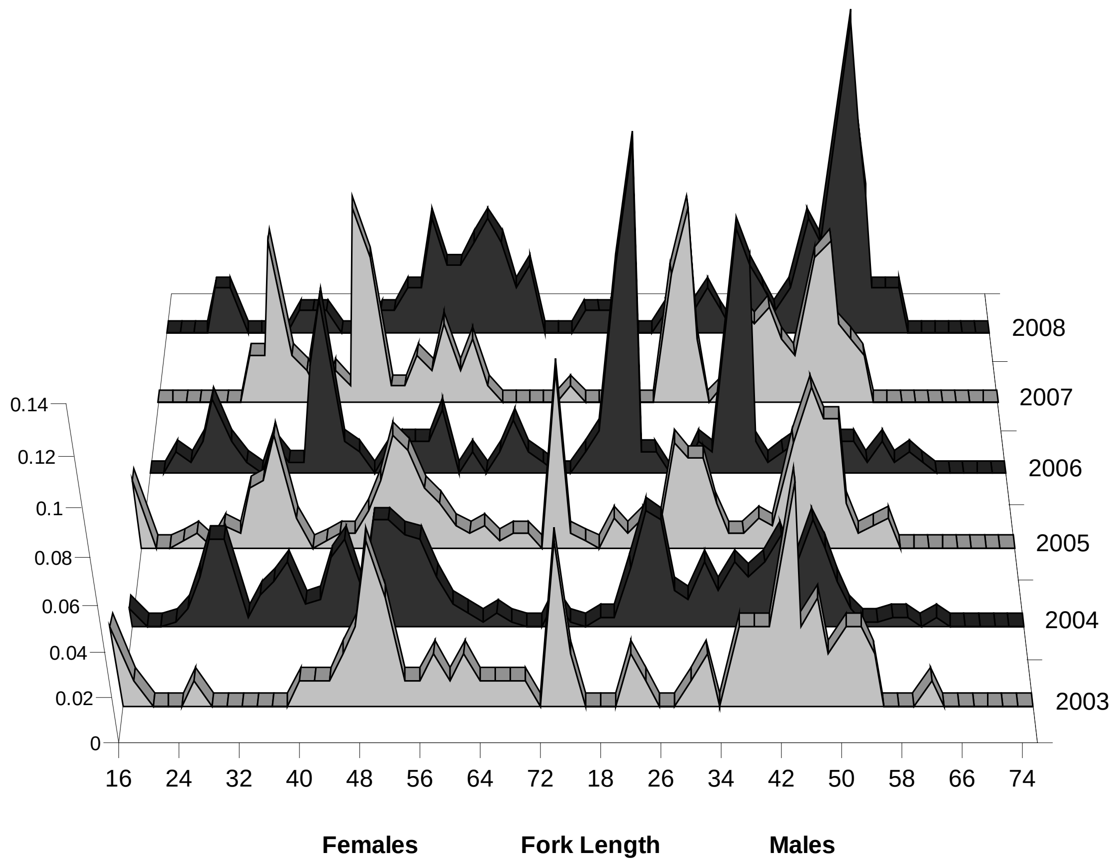


Figure 44. Length frequency information for bocaccio from the NWFSC combined survey (assessment area only).

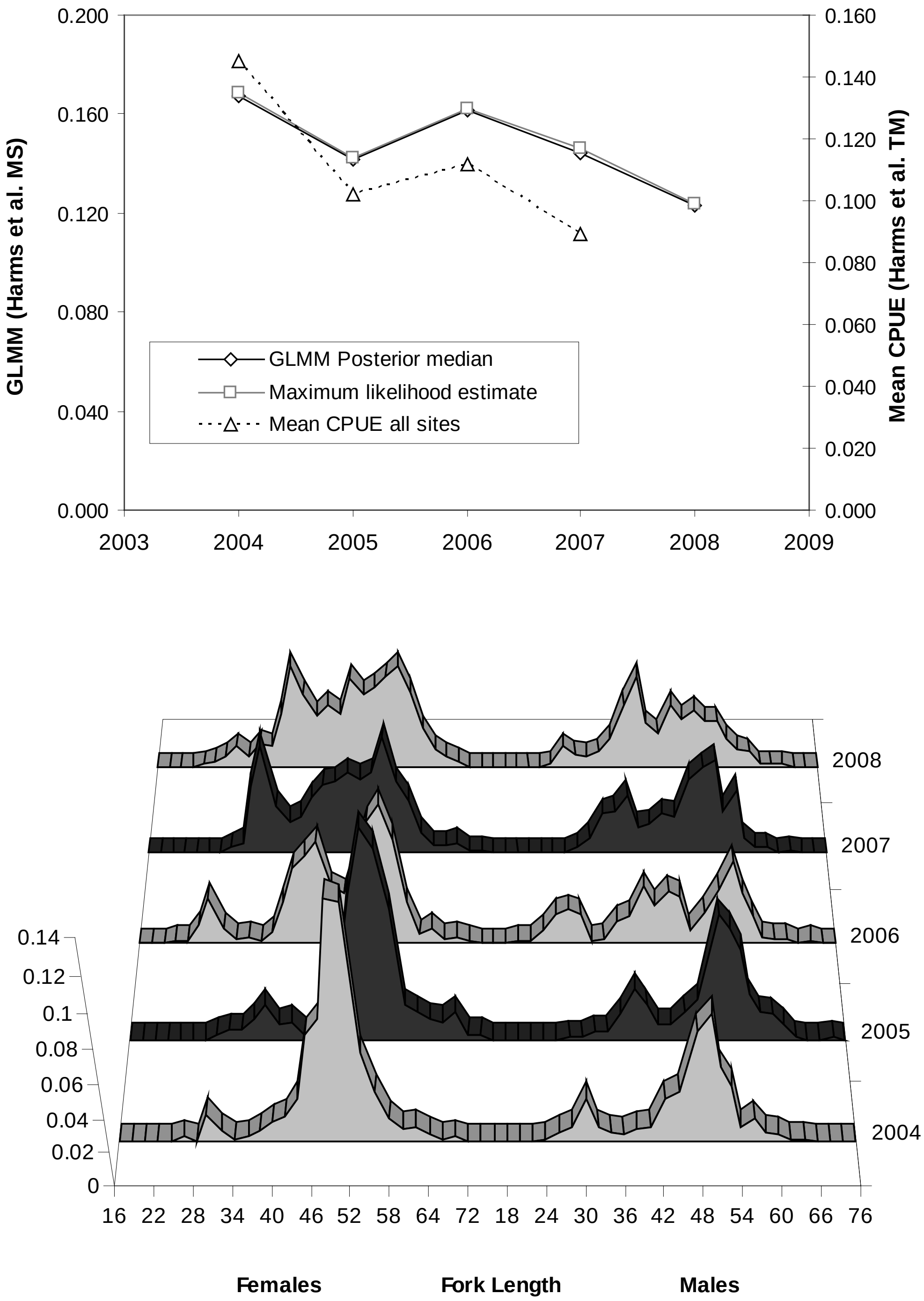
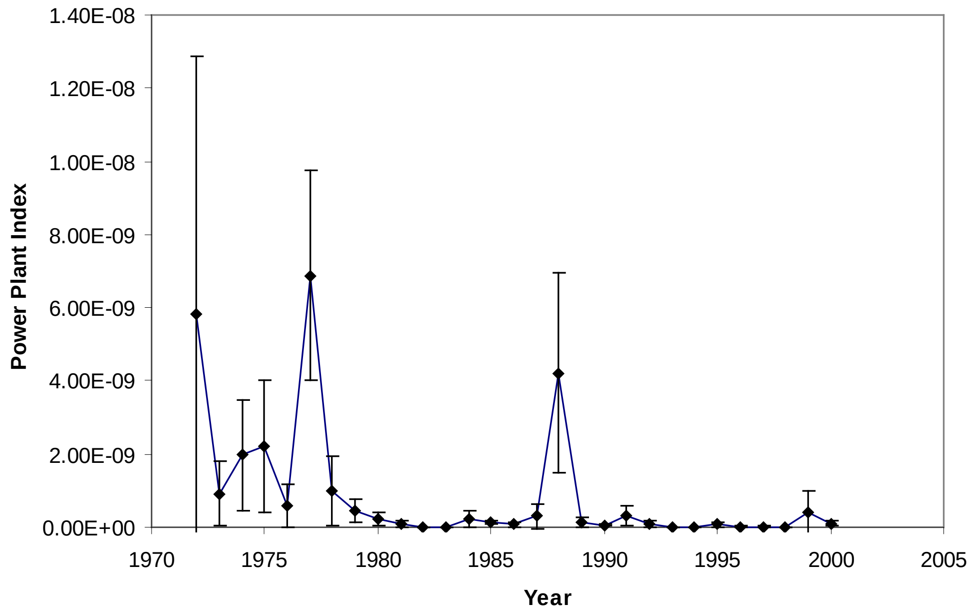
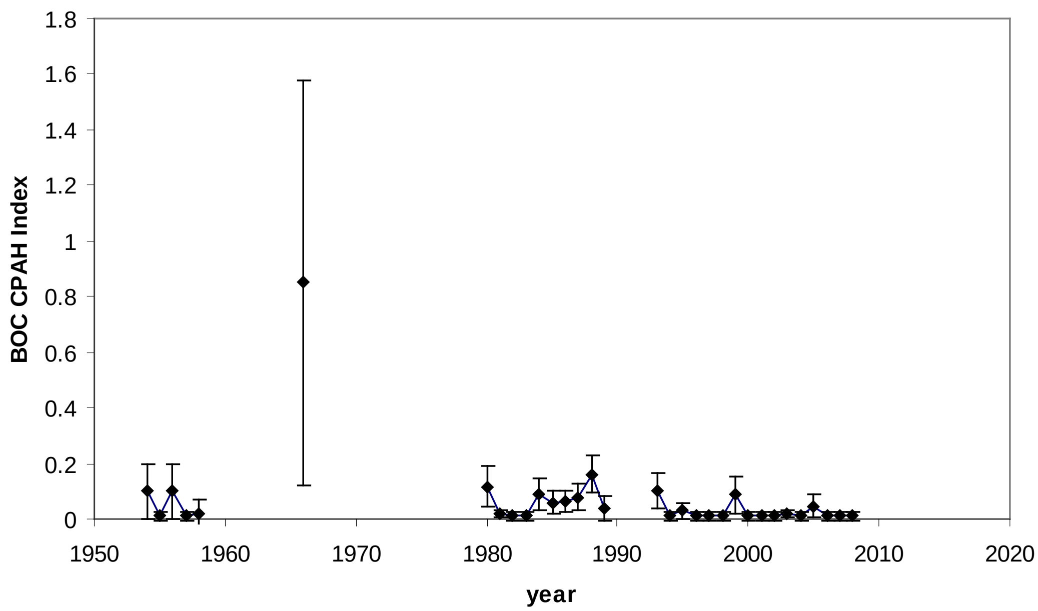
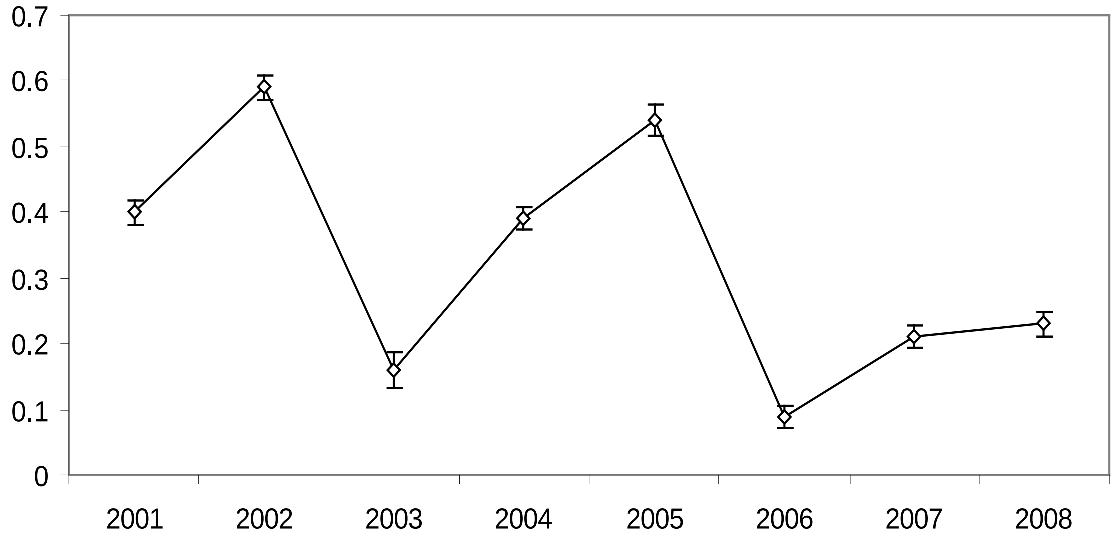


Figure 45a-b. Figure 45a (top) Catch rate indices of bocaccio abundance for the NWFSC hook-and-line survey in the Southern California Bight, 2004-2008 and Figure 45b (bottom), length frequency distribution for all bocaccio rockfish measured in the same survey.

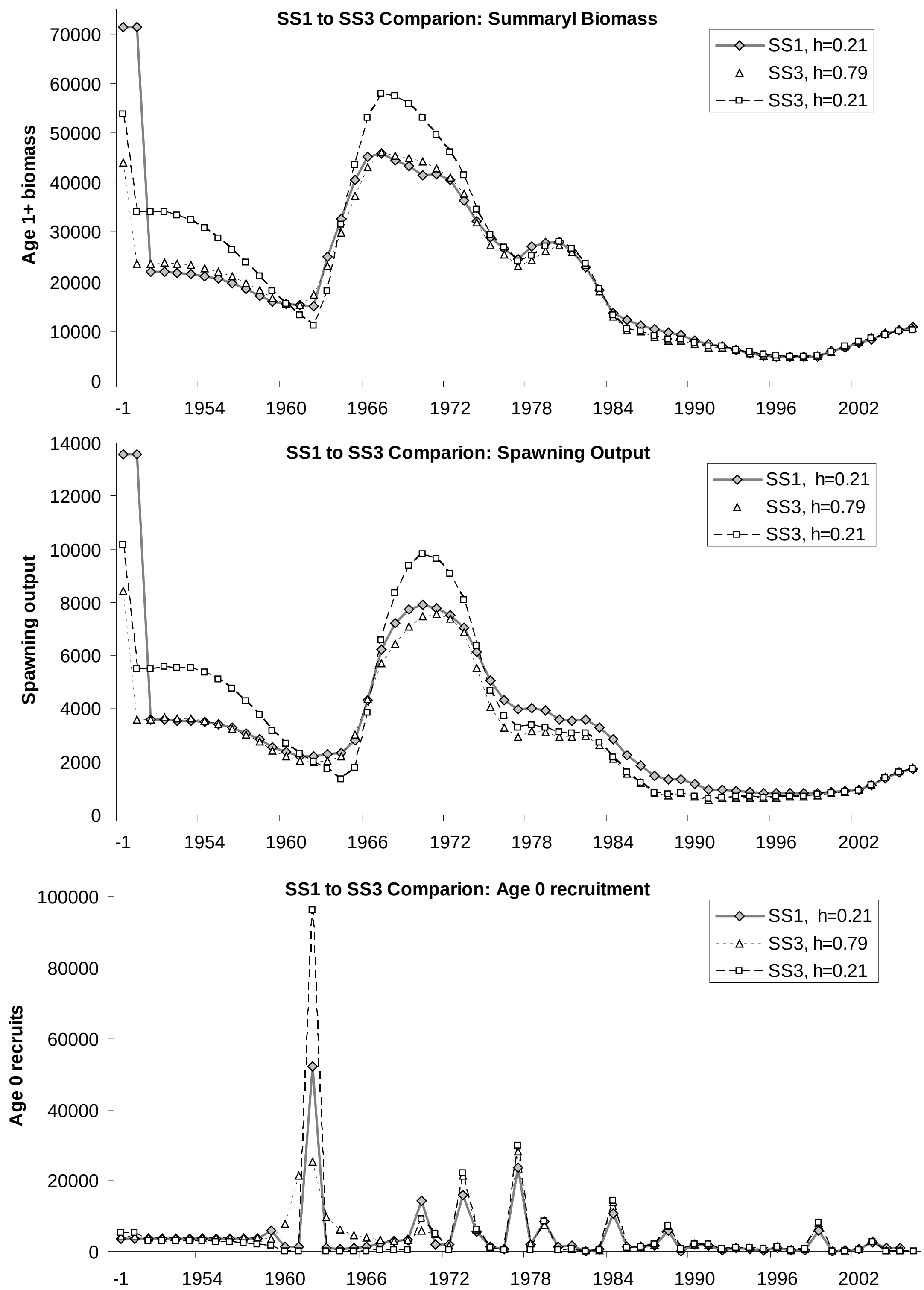




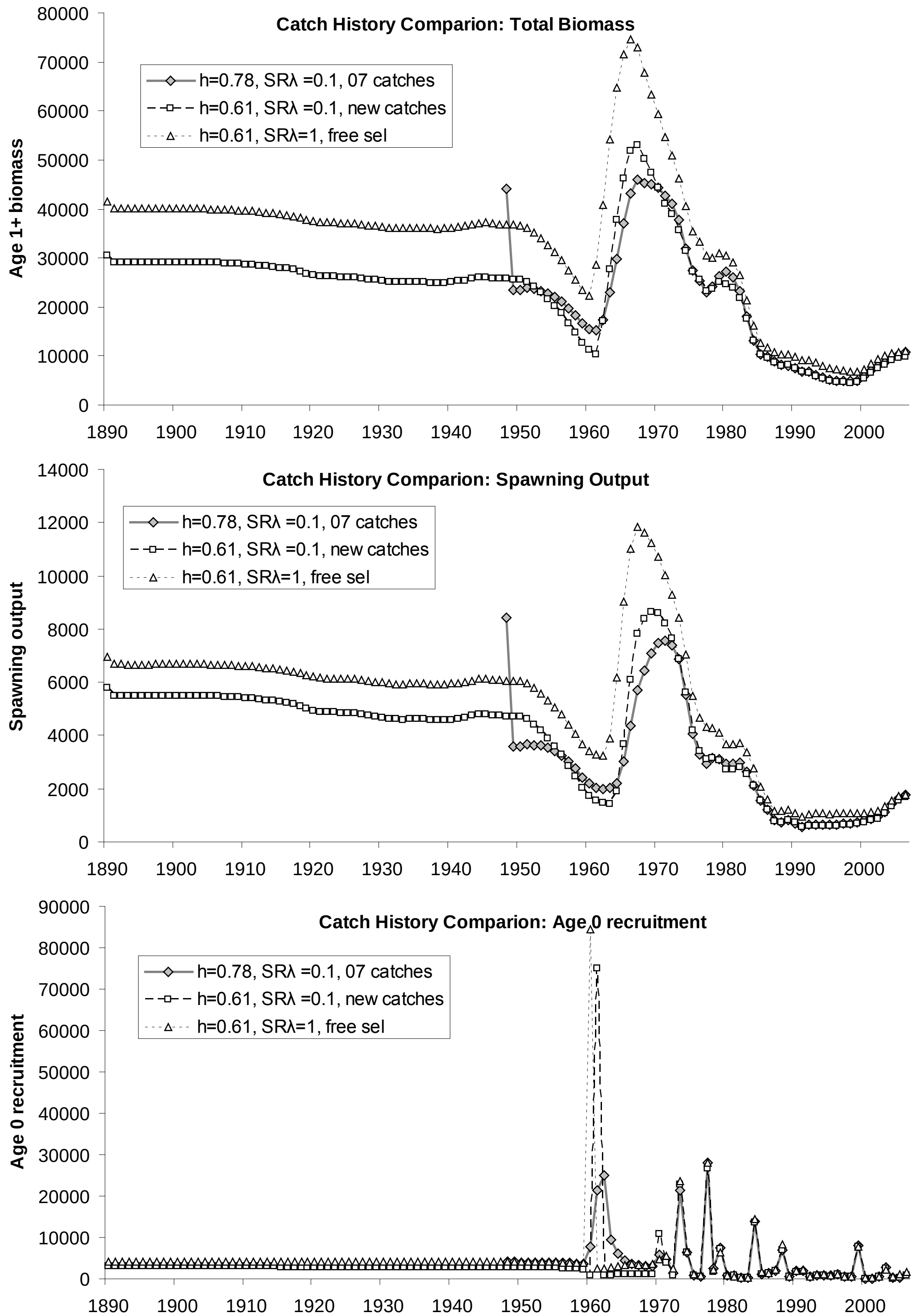
Figures 46a-b. Figure 46a (top) Juvenile indices of bocaccio recruitment for the power plant impingement index, and the pier survey index (Figure 46b, bottom).



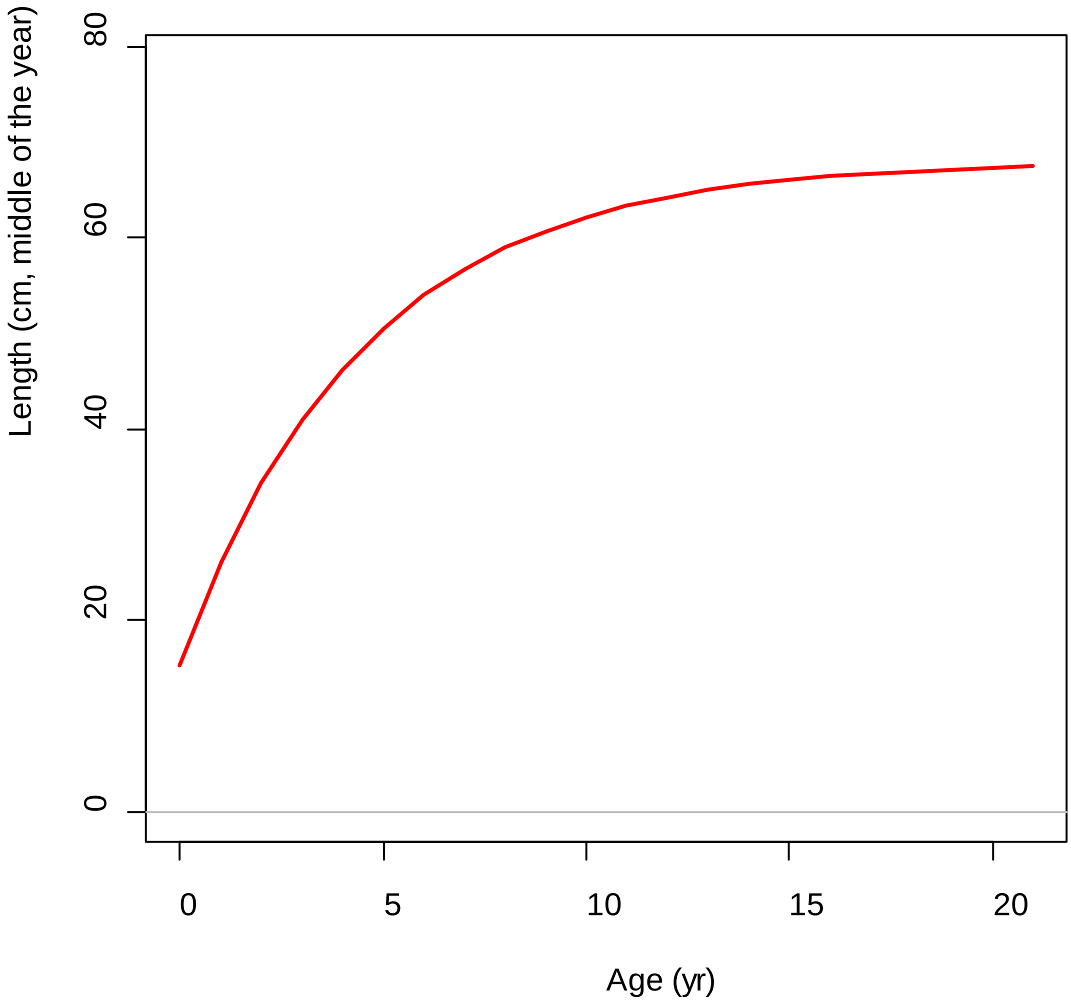
Figures 47. The coastwide pelagic juvenile trawl survey index of bocaccio abundance.



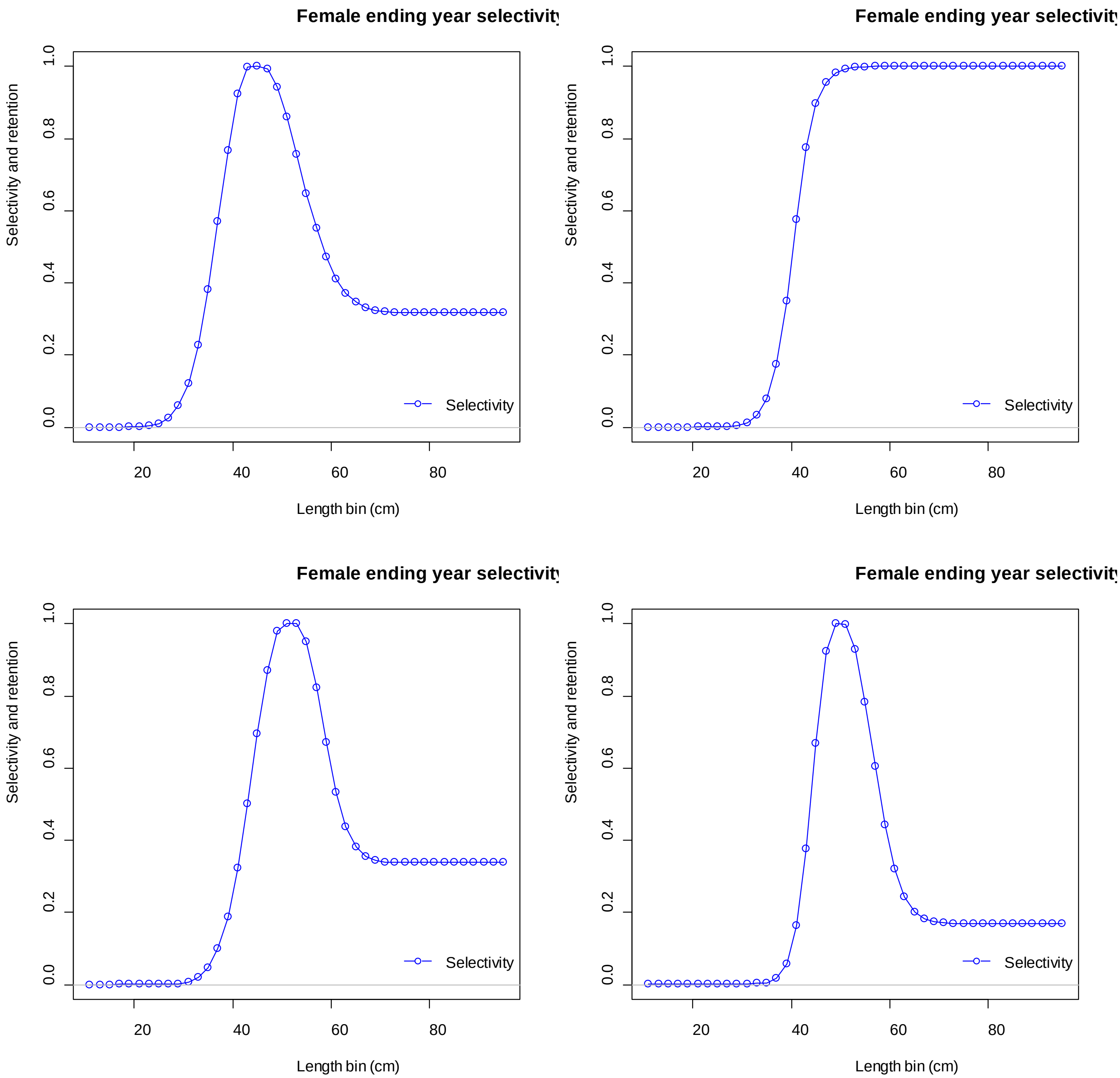
Figures 48a-c. SS1 versus SS3 bocaccio model results (biomass, spawning biomass and recruitment) with alternative values of h for the SS3 model.



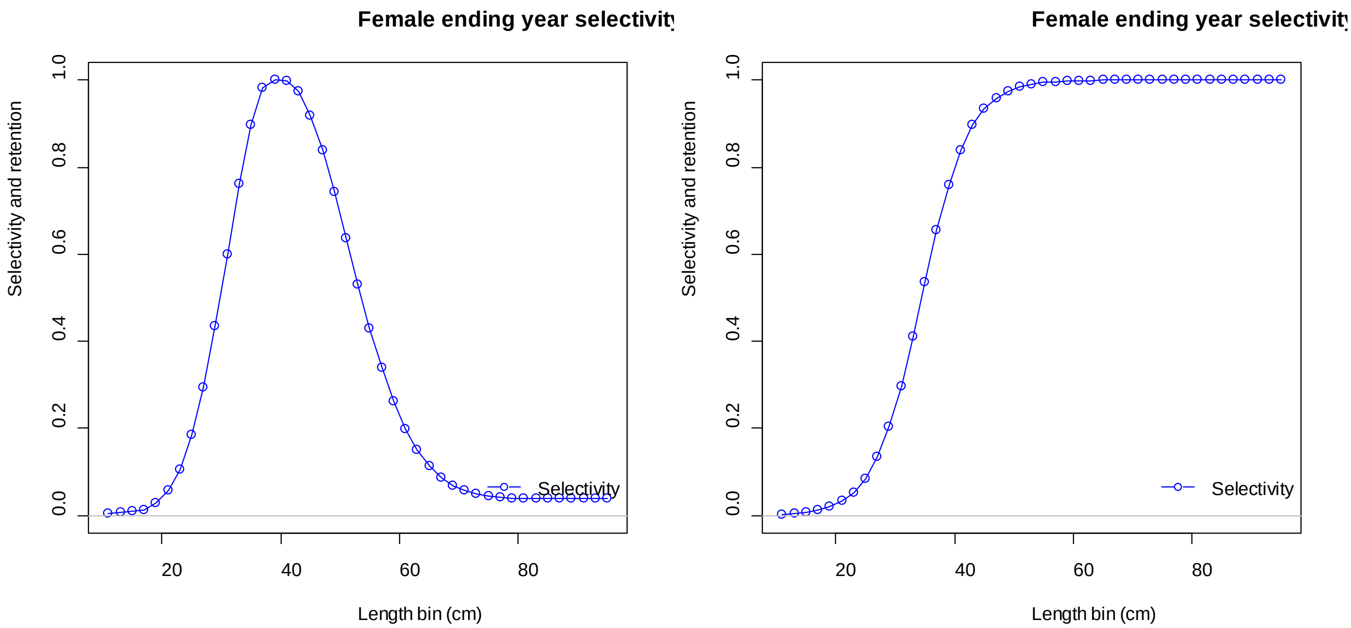
Figures 49a-c. The SS3 bocaccio model built to transition from the 2007 SS1 model (with h=0.78 and SR =0.1) with the 2007 catch history and start year, relative to the new catch history and start year developed for this assessment.



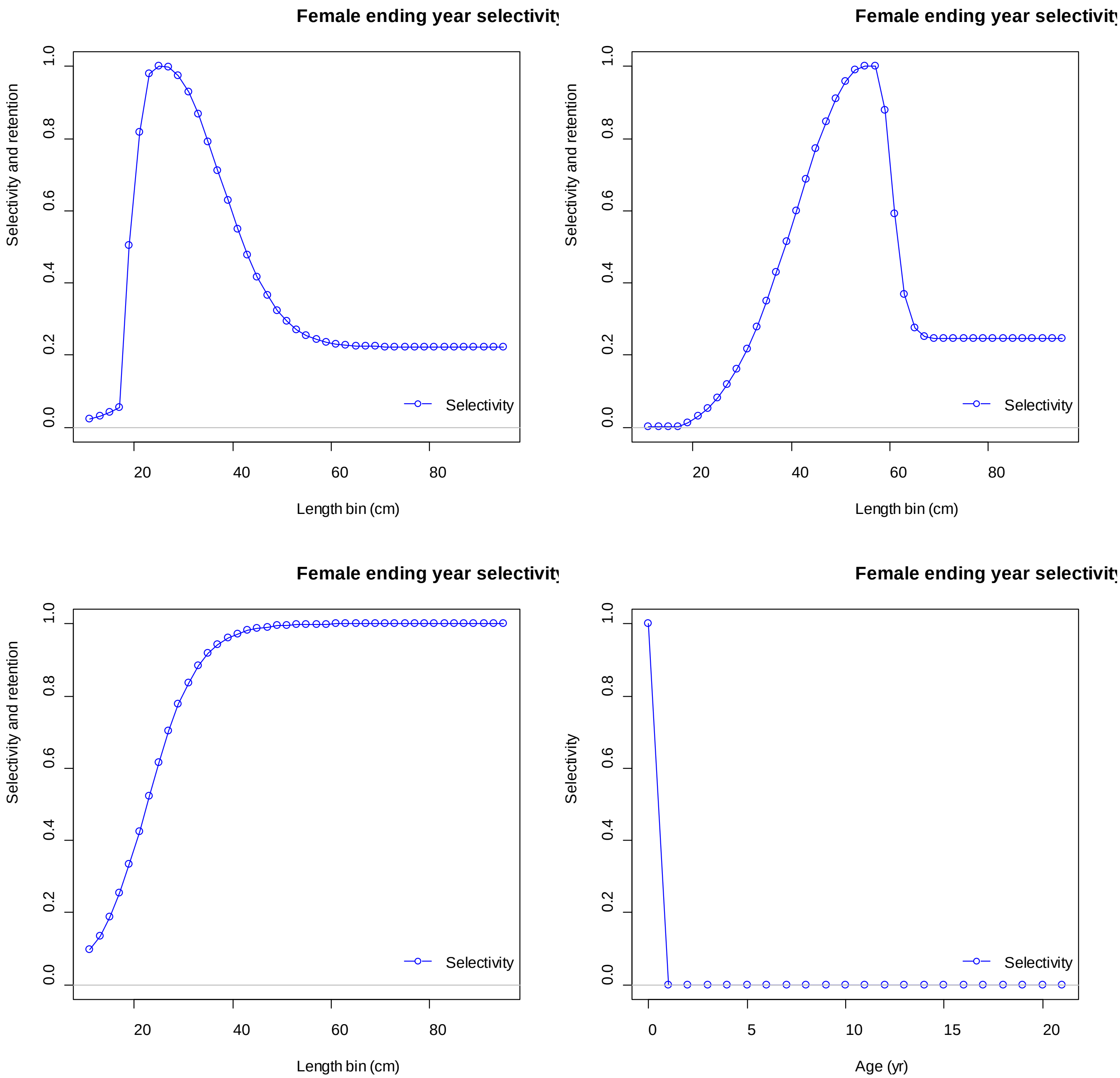
Length (cm, middle of the year)
0
20
40
60
80
0
5
10
15
20
Age (yr)



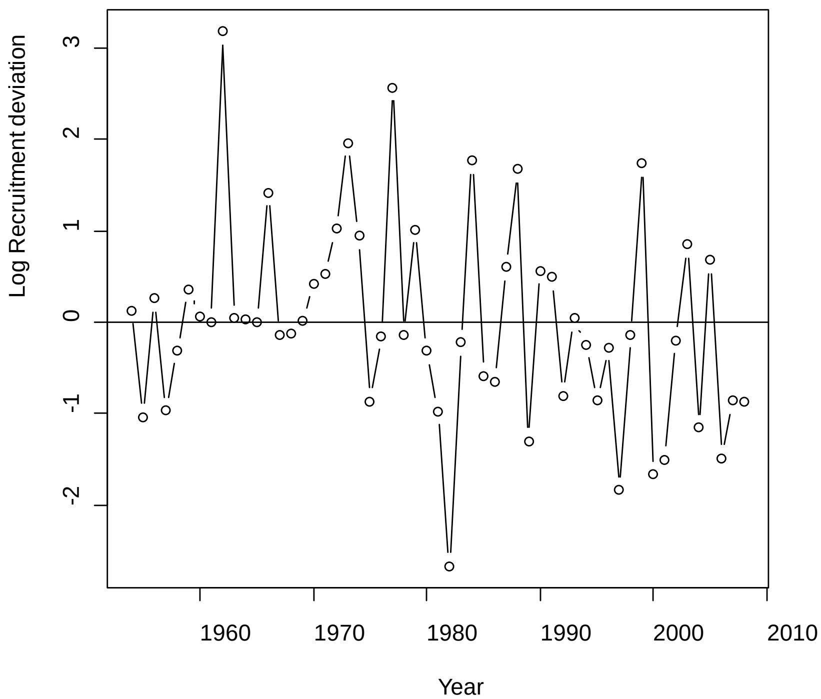
Figures 51a-d. Estimated selectivity curves for the bocaccio base model for commercial fisheries, trawl (north and south of 38˚ N latitude), hook-and-line, and set net.

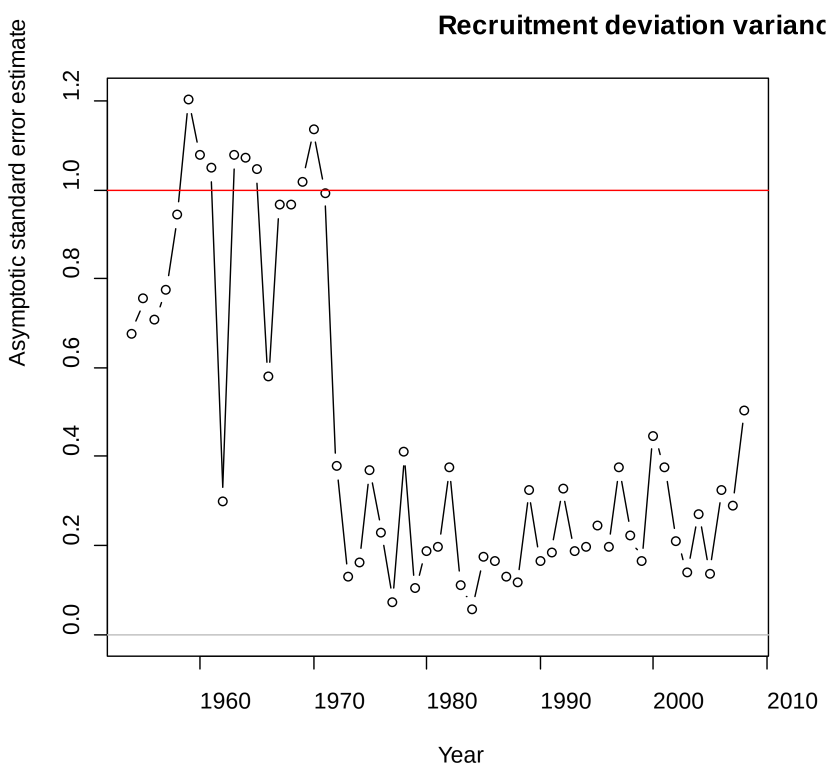


Figures 51e-f. Estimated selectivity curves for bocaccio in the southern and central California recreational fisheries.

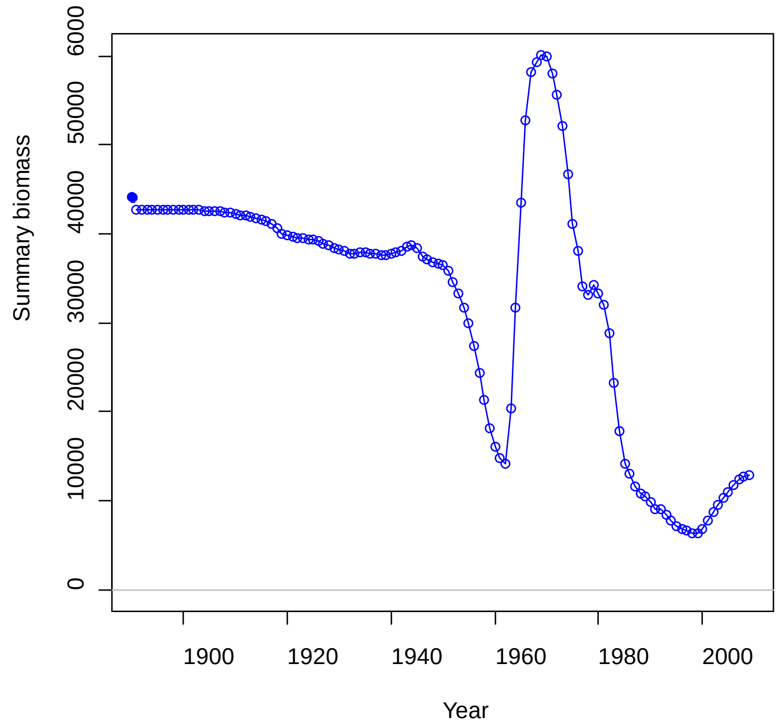


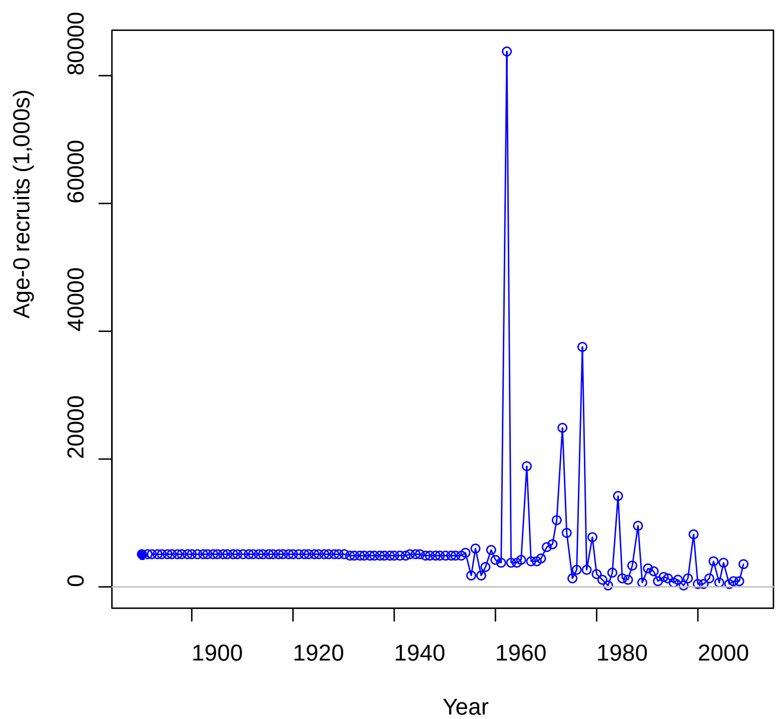
Figures 51g-j. Selectivity curves for bocaccio in the triennial survey (fixed), the NWFSC Southern California Bight hook-and-line survey, the NWFSC combined shelf and slope survey, and age selectivity for the pelagic juvenile age-0 survey.



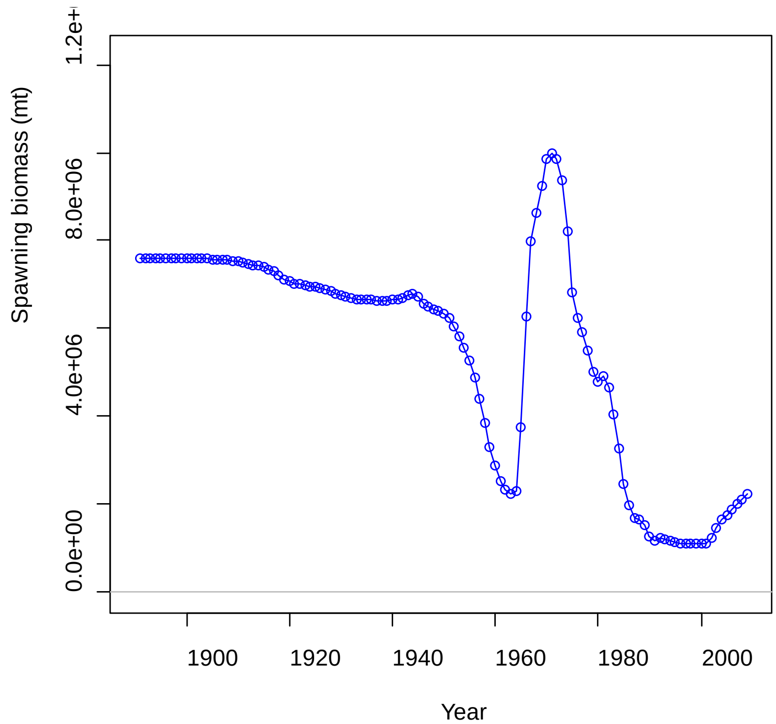


Figures 52a-b. Recruitment deviation parameter estimates for bocaccio (top) and asymptotic standard error estimates (bottom).





Figures 53a-b. Summary (age 1+) biomass and recruitment (age 0) of bocaccio for the base model.



Figures 54a-b. Spawning output (x10^6) estimated for bocaccio, with asymptotic confidence intervals (top) and relative depletion for the base model.

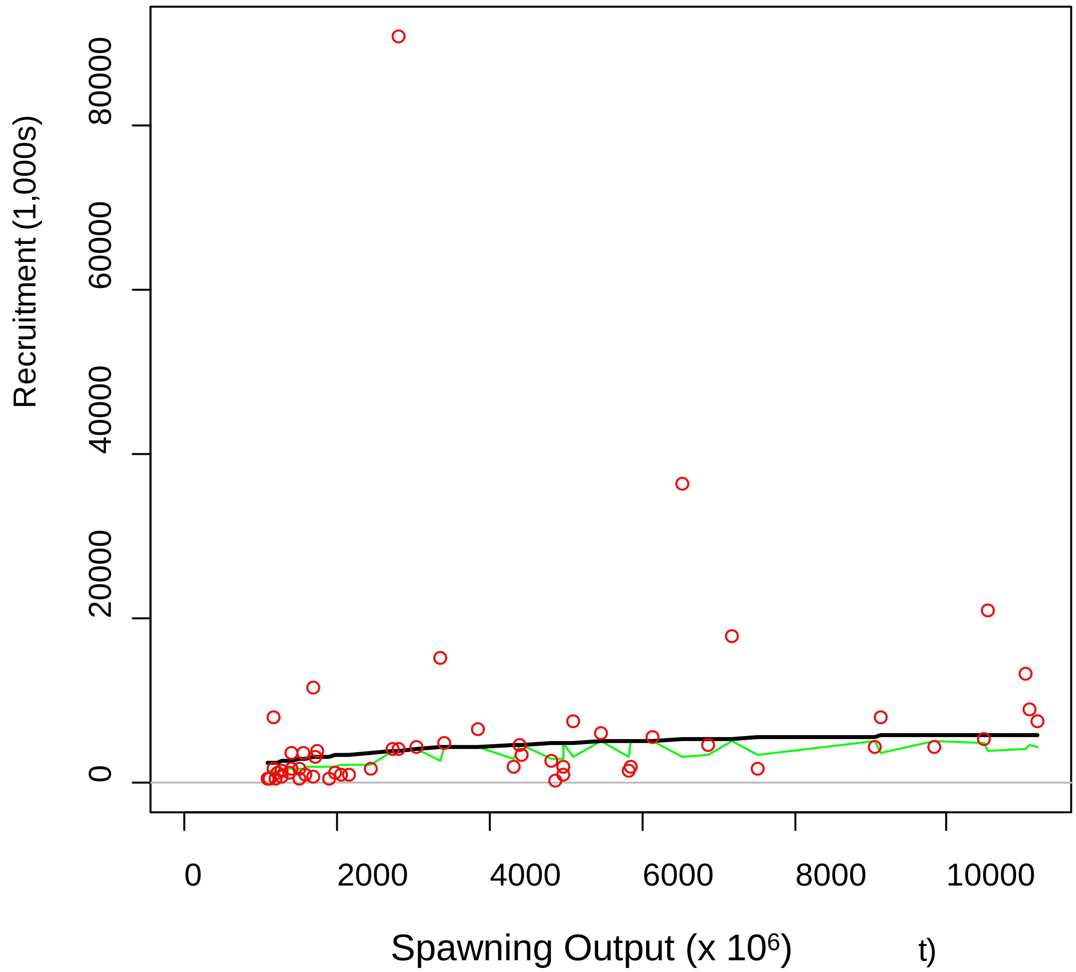
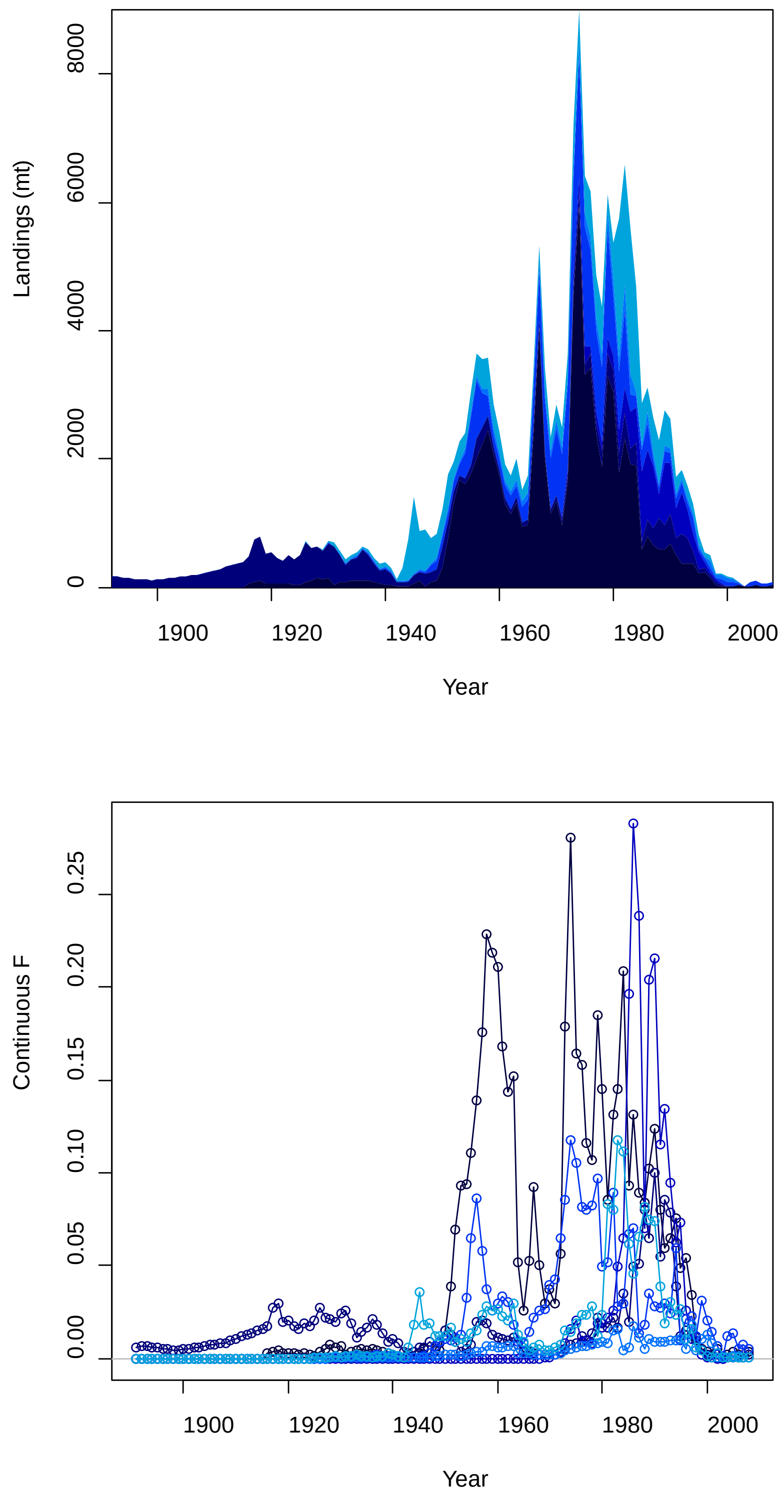
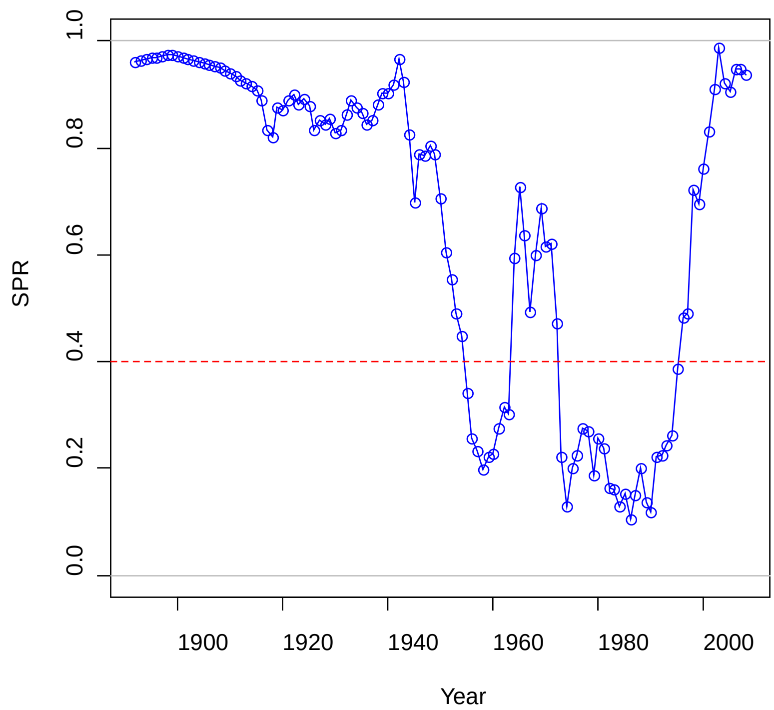
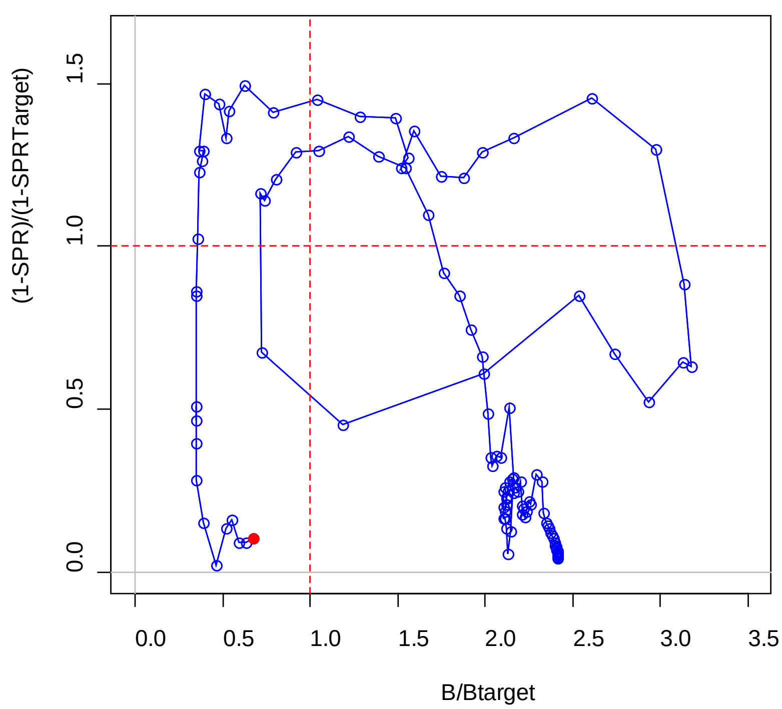


Figure 55. Spawner-recruit curve for bocaccio, based on the steepness value of 0.53.

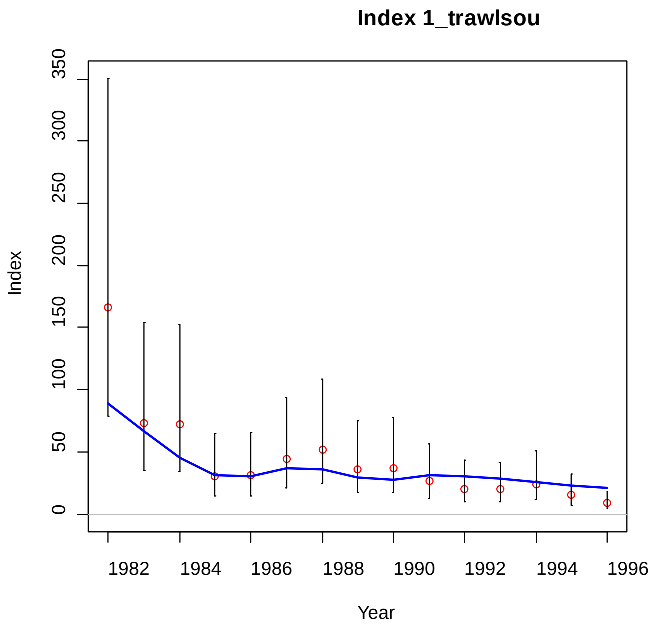


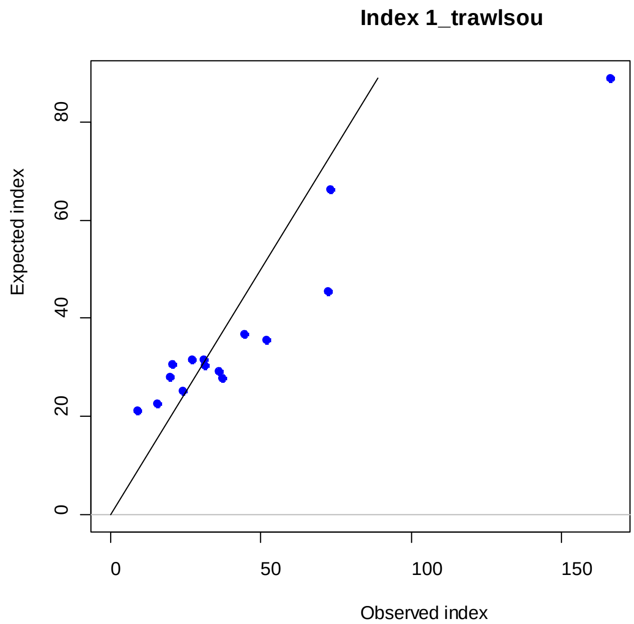
Figures 56a-b. Total catches of bocaccio and instantaneous fishing mortality rates for bocaccio by fishery.



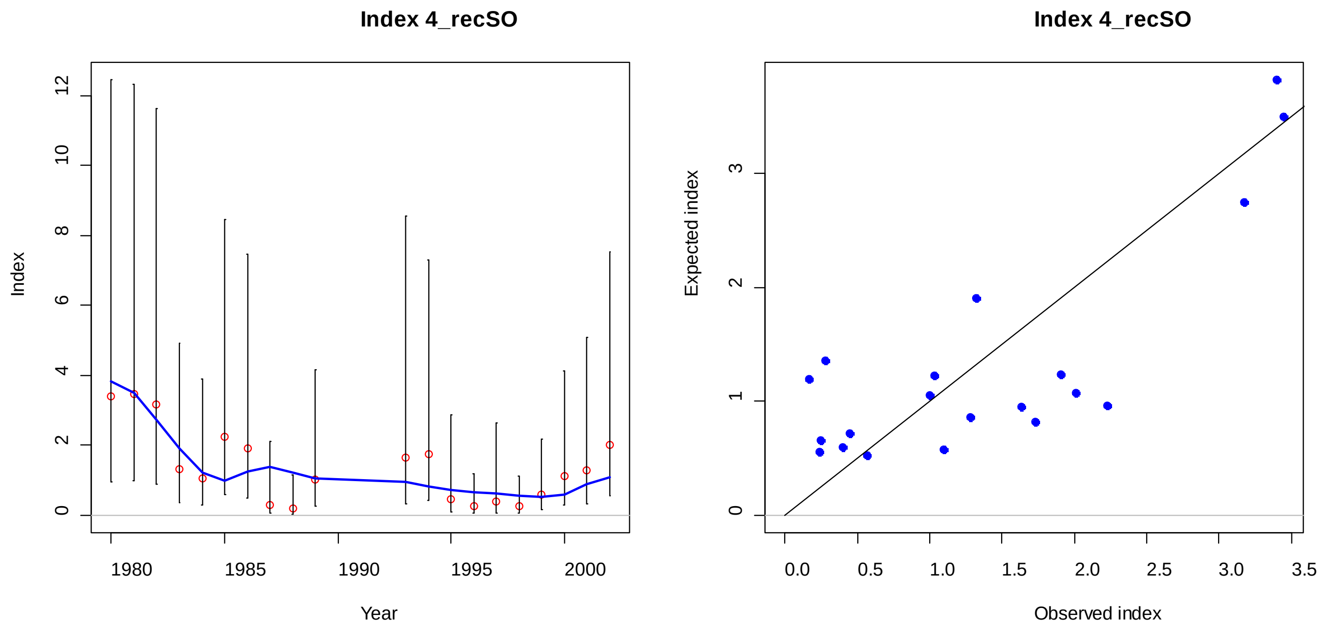


Figures 57a-b. 1-SPR rate (top) over time, with reference proxy for *Sebastes* and phase plot of SPR rate plotted against SSB target levels (bottom).

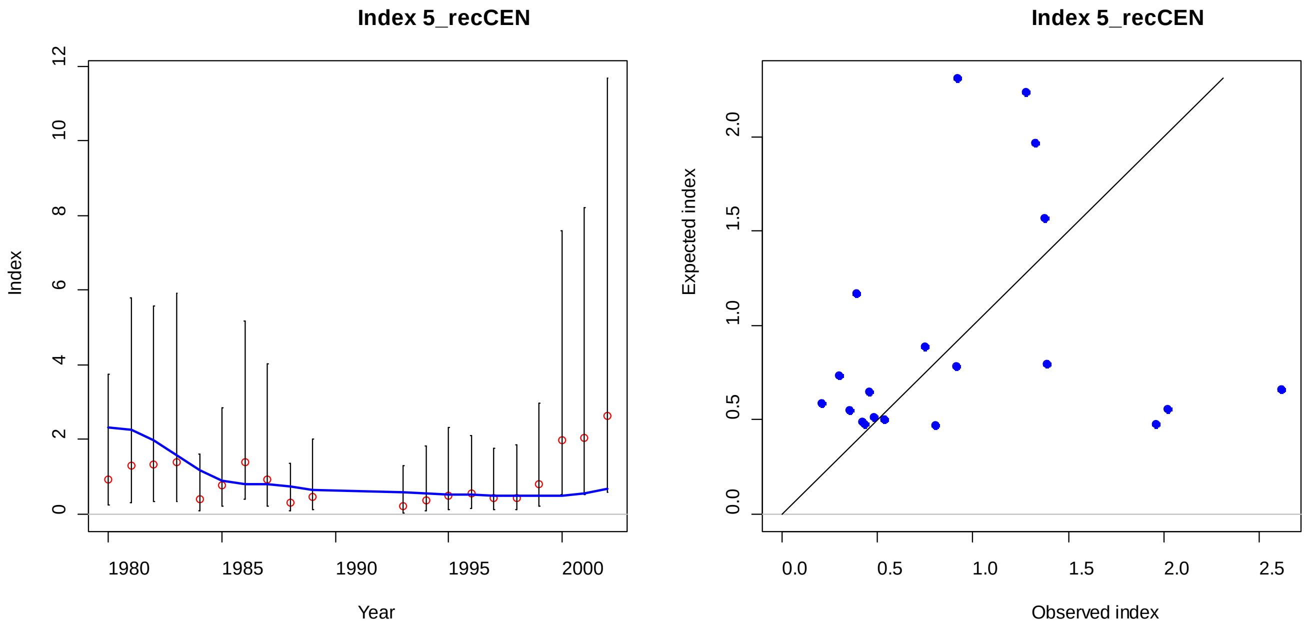




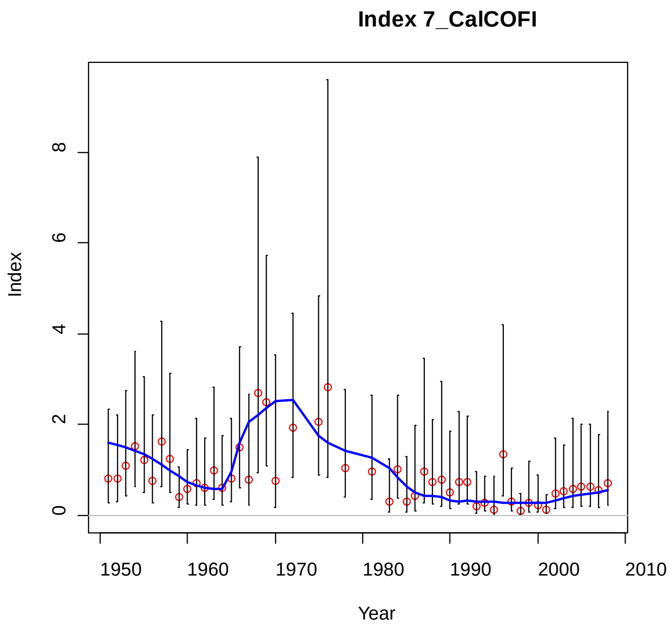
Figures 58a-d. Arithmetic and log fits, with corresponding observed and predicted values, to the trawl fishery CPUE time series of bocaccio abundance.

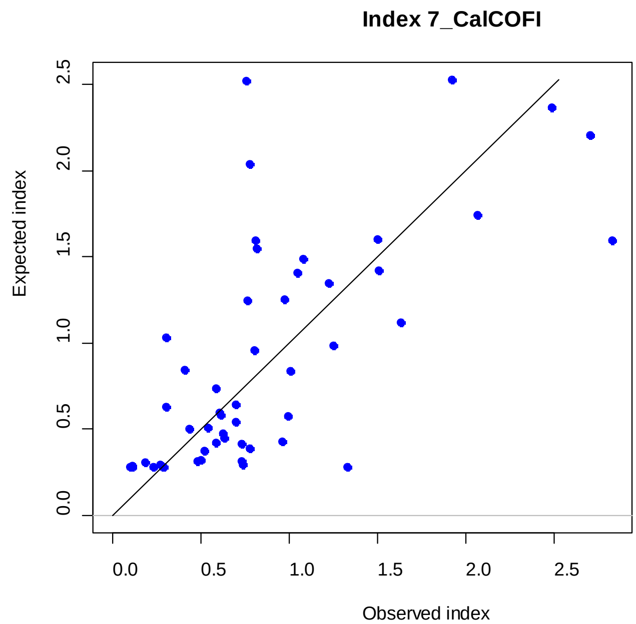


Figures 59a-d. Arithmetic and log fits, with corresponding observed and predicted values, to the southern recreational fishery CPUE time series of bocaccio abundance.

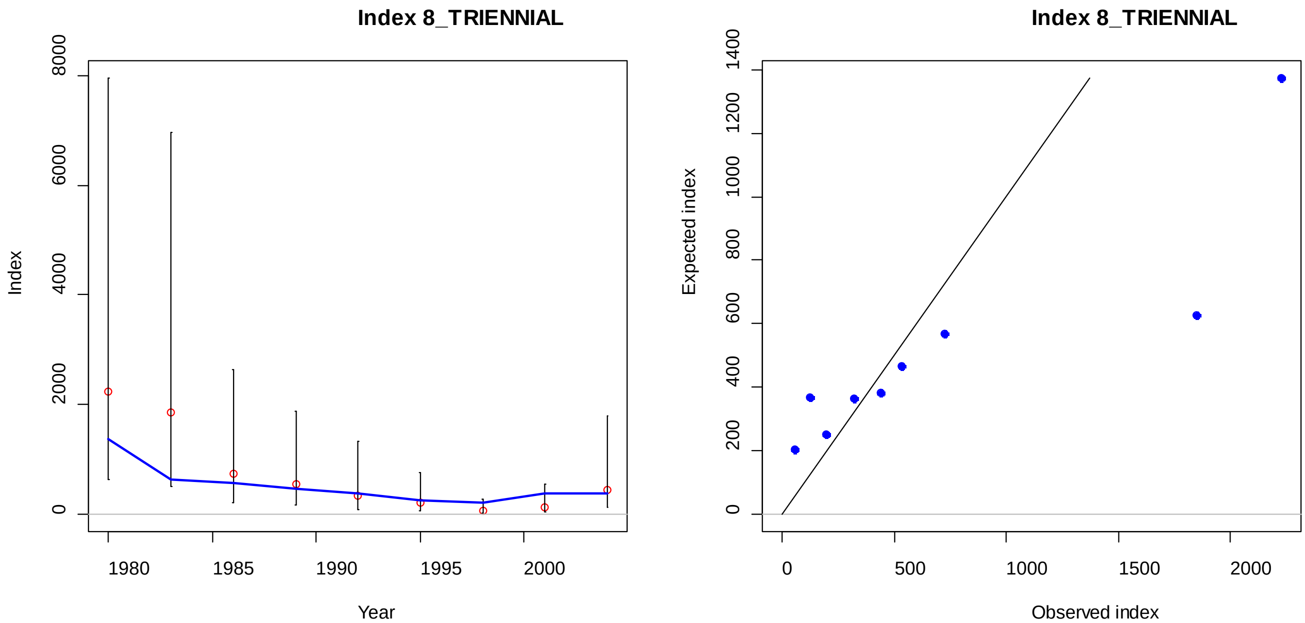


Figures 60a-d. Arithmetic and log fits, with corresponding observed and predicted values, to the northern recreational fishery CPUE time series of bocaccio abundance.

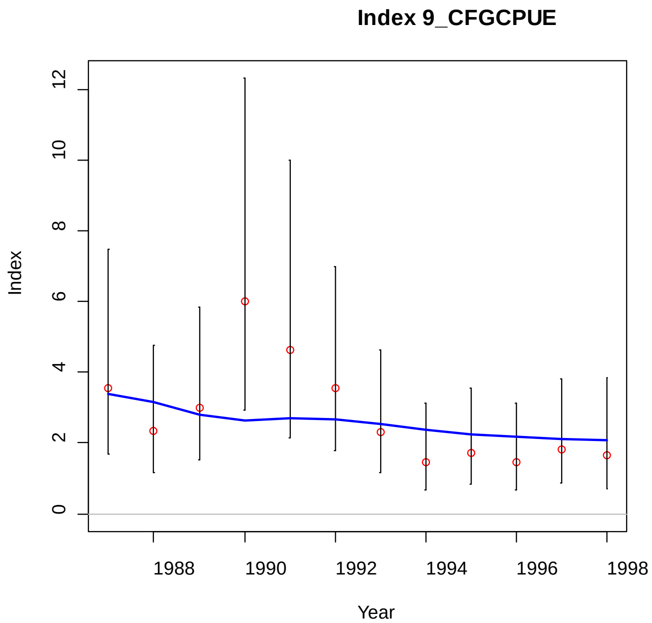


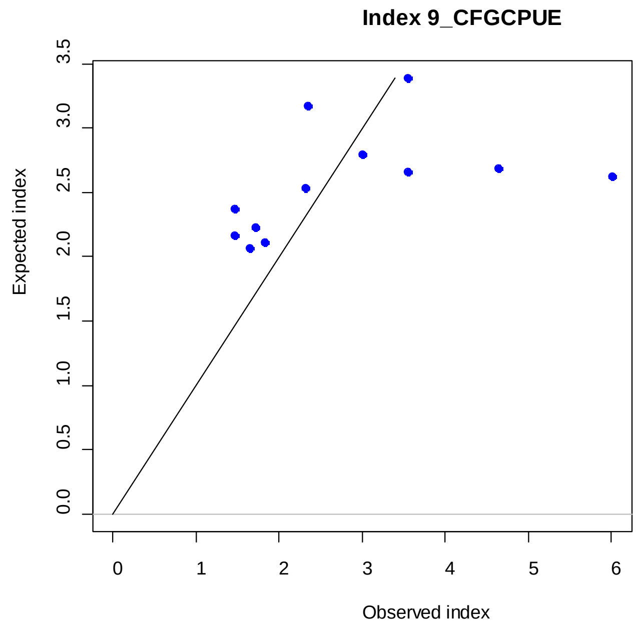


Figures 61a-d. Arithmetic and log fits, with corresponding observed and predicted values, to the CalCOFI larval abundance time series of bocaccio abundance.

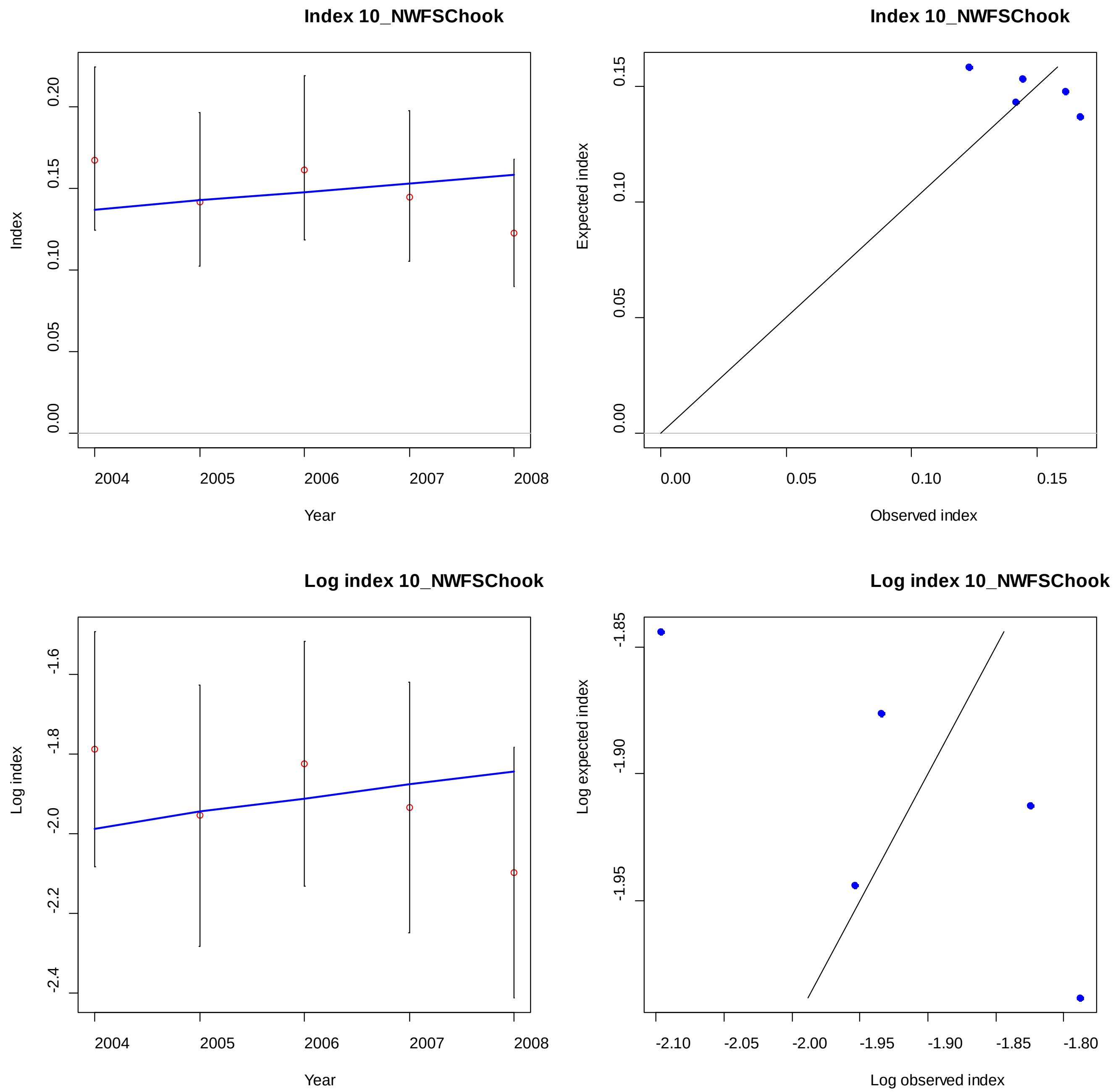


Figures 62a-d. Arithmetic and log fits, with corresponding observed and predicted values, to the triennial trawl fishery GLMM index of bocaccio abundance.

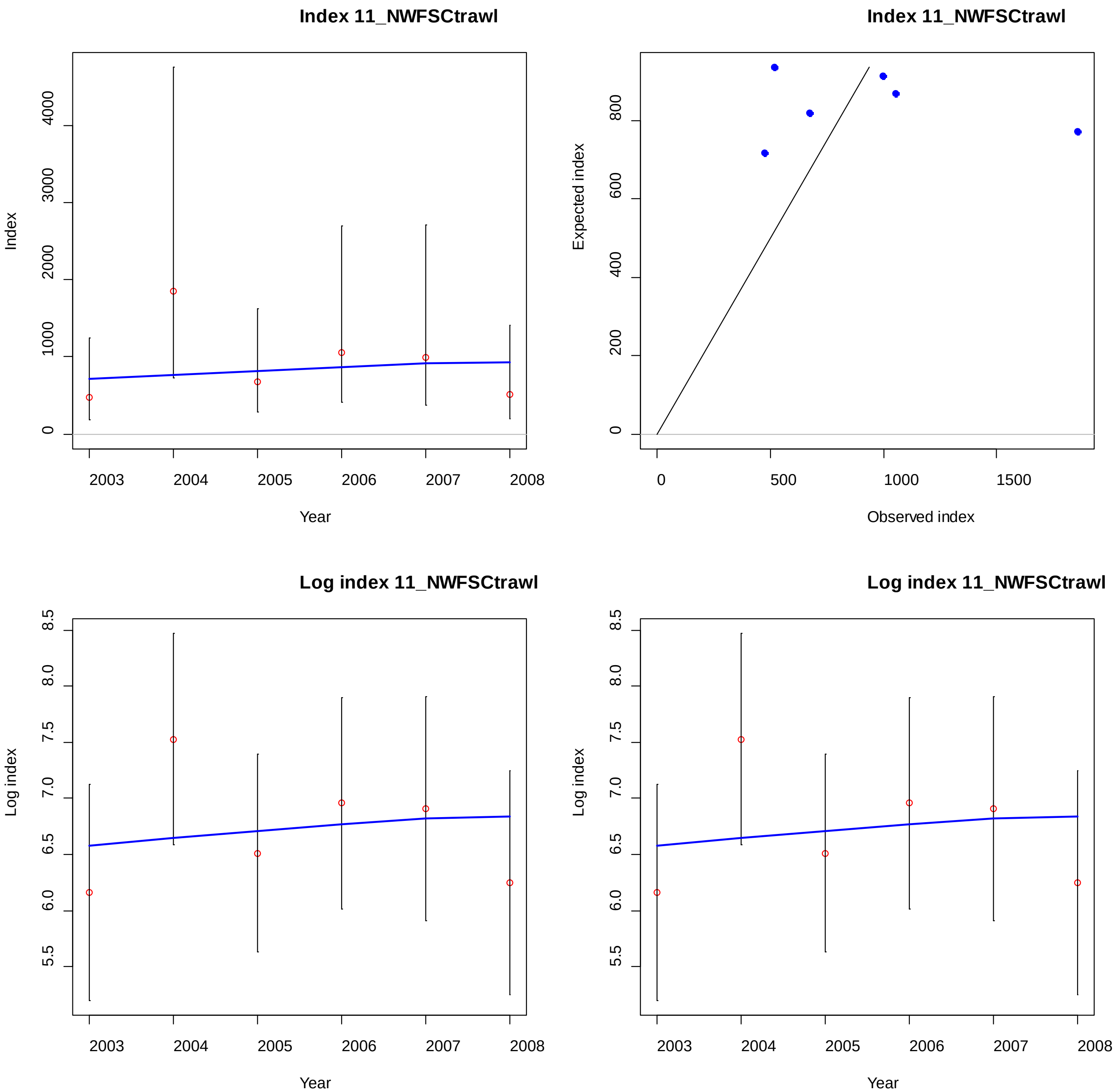




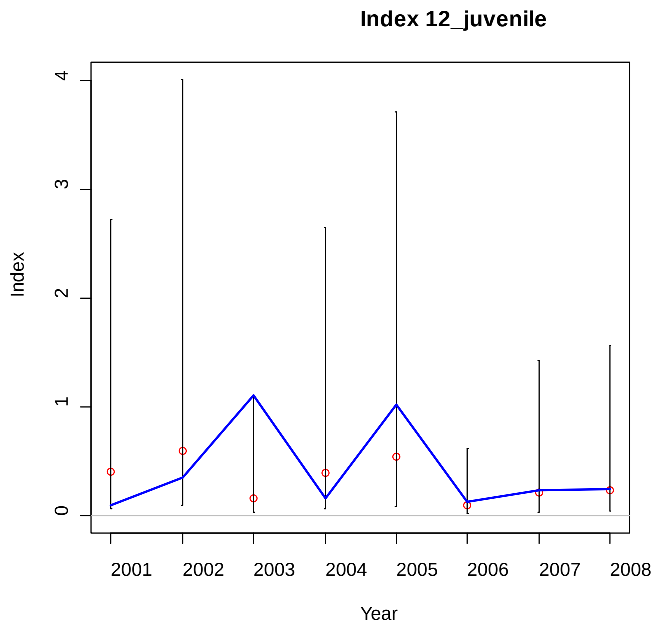
Figures 63a-d. Arithmetic and log fits, with corresponding observed and predicted values, to the Northern California CPFV CPUE time series of bocaccio abundance.

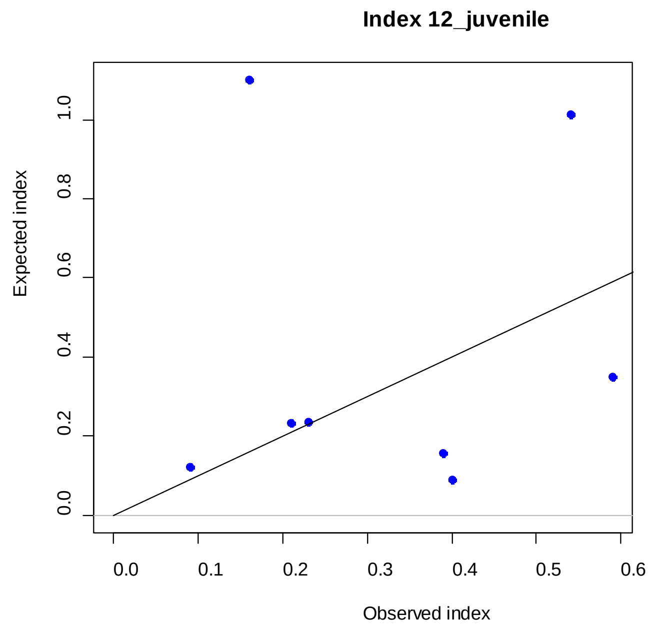


Figures 64a-d. Arithmetic and log fits, with corresponding observed and predicted values, to the Northern California CPFV CPUE time series of bocaccio abundance.

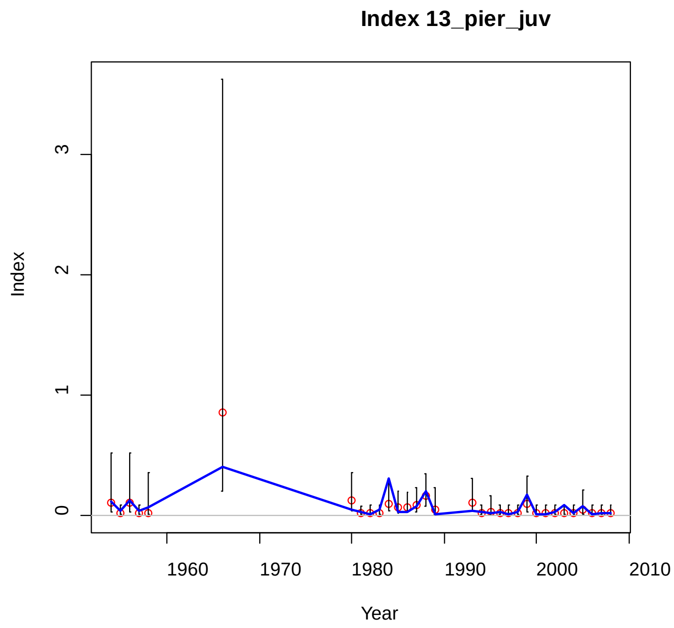


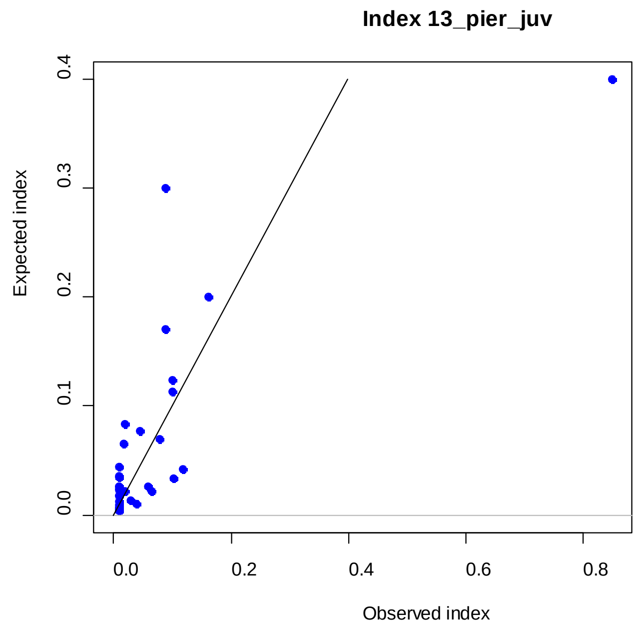
Figures 65a-d. Arithmetic and log fits, with corresponding observed and predicted values, to the NWFSC combined trawl survey GLMM index of bocaccio abundance.



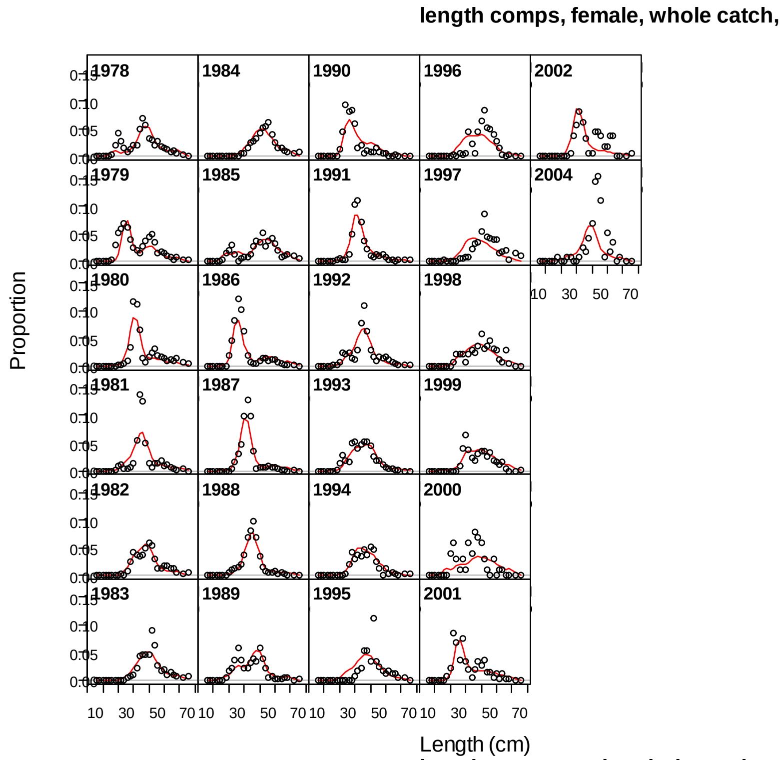


Figures 66a-d. Arithmetic and log fits, with corresponding observed and predicted values, to the NWFSC combined trawl survey GLMM index of bocaccio abundance.





Figures 67a-d. Arithmetic and log fits, with corresponding observed and predicted values, to the pier fishery index of bocaccio abundance.



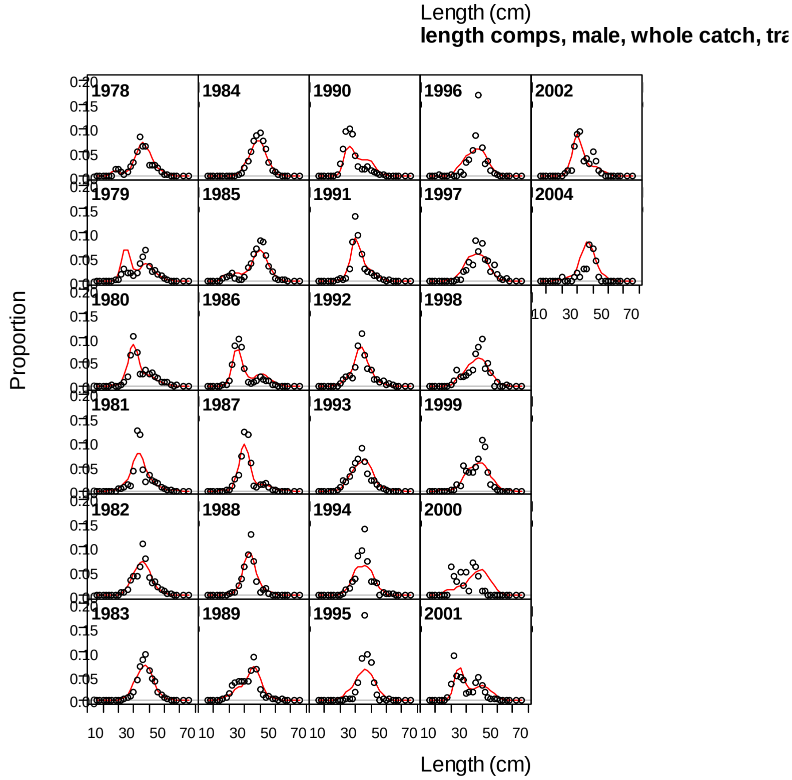


Figure 68a-b. Bocaccio model fits to female and male length frequency data for the trawl fishery south of 38˚ N latitude.

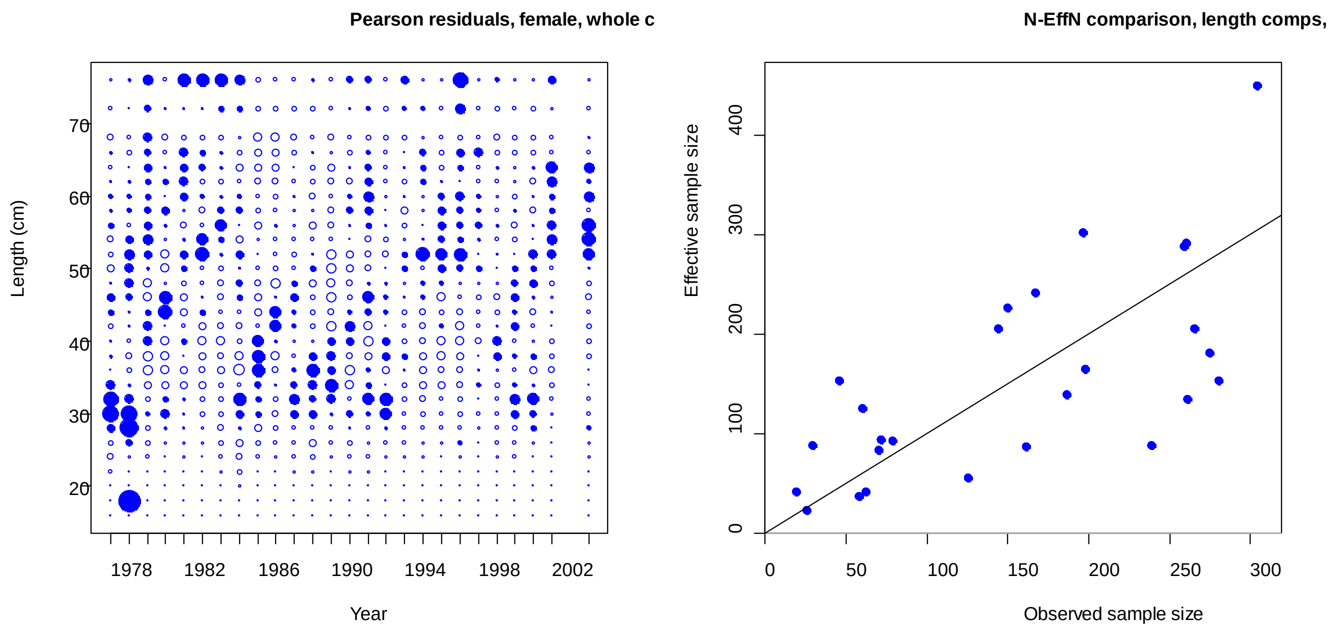
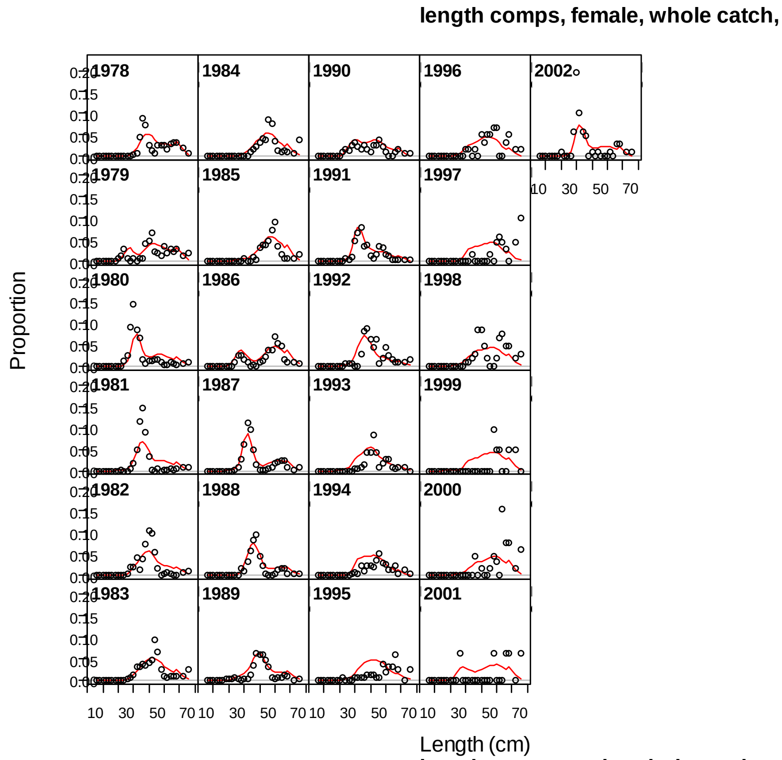
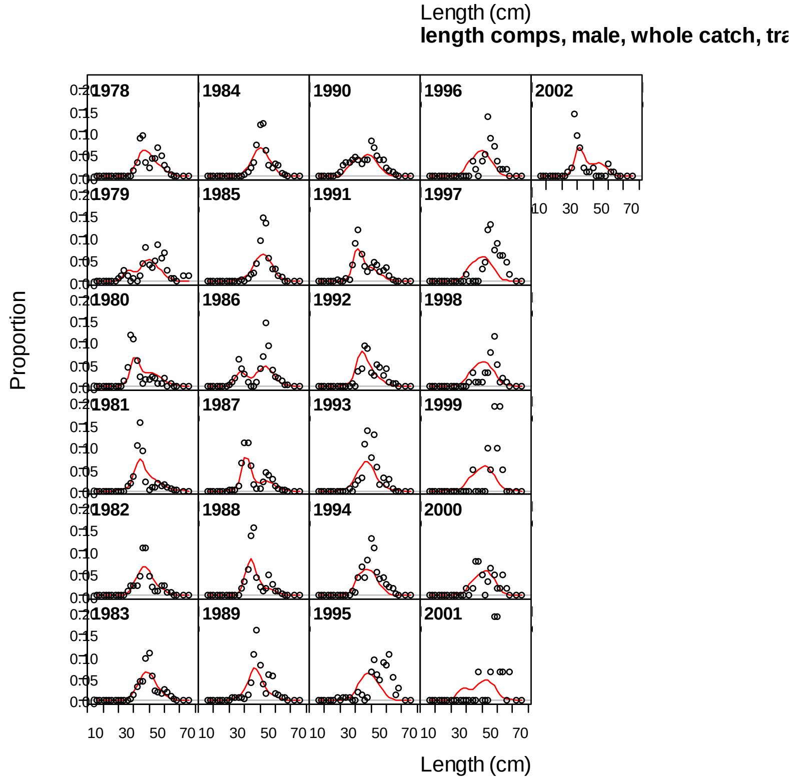
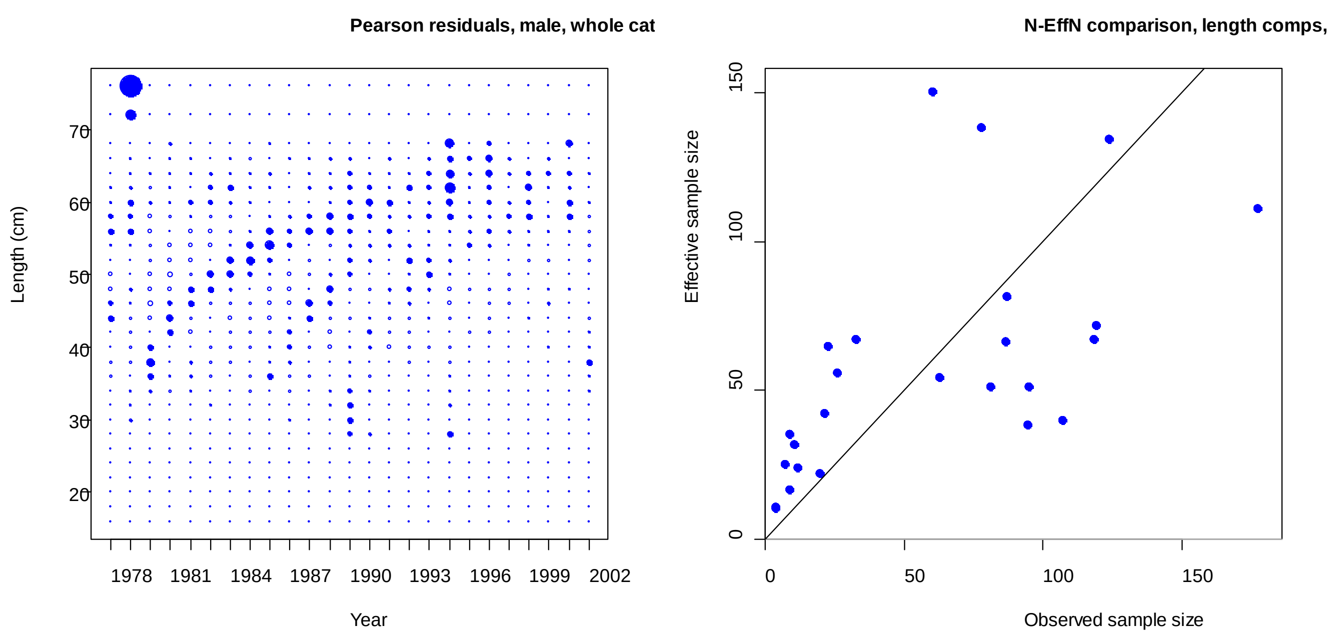


Figure 68c-f. Residuals and input versus effective sample sizes for the southern trawl fishery for the bocaccio base model.

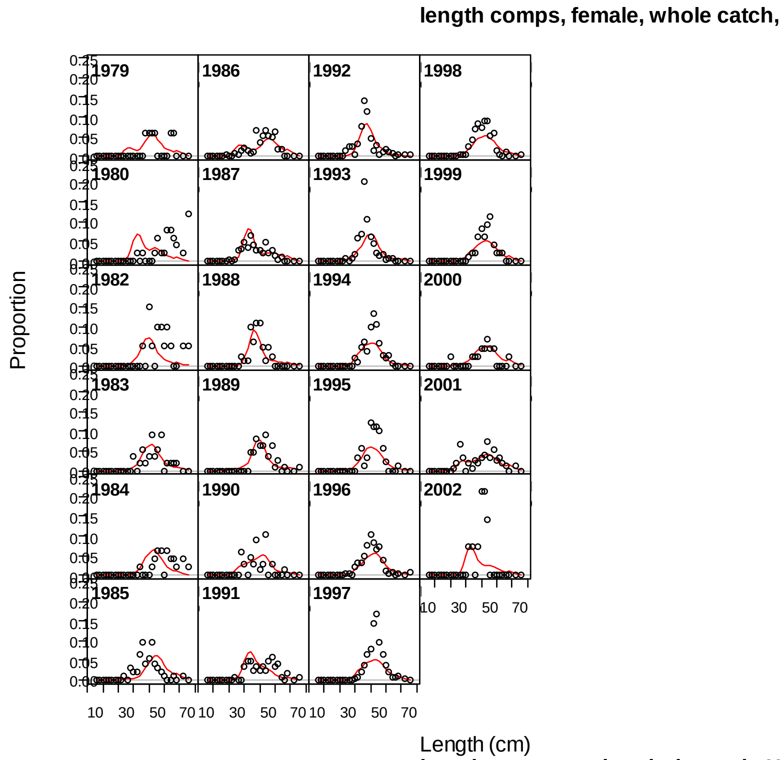


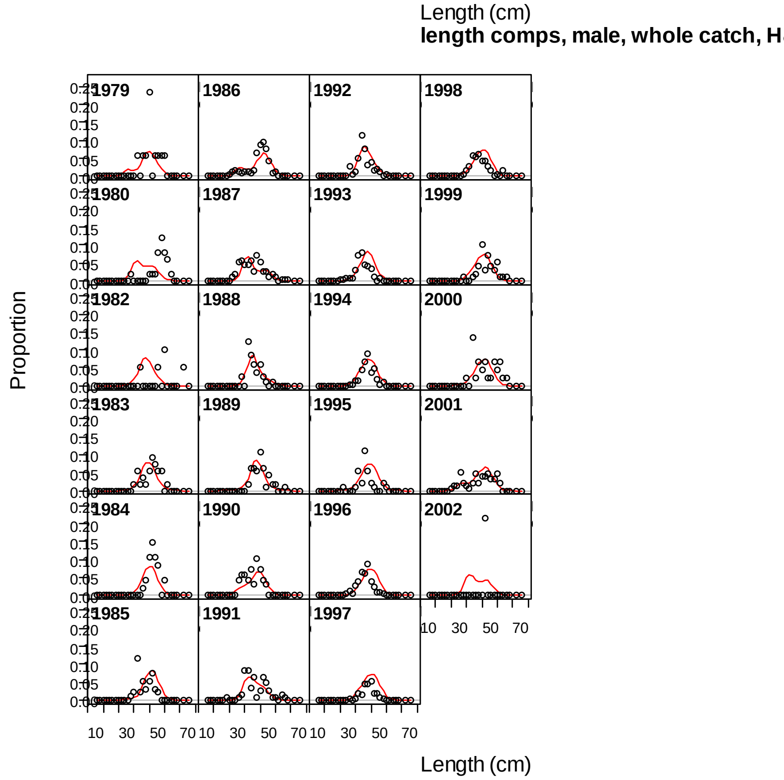


Figures 69a-b. Fits to female and male length frequency data for bocaccio for the trawl fishery north of 38˚ N latitude.

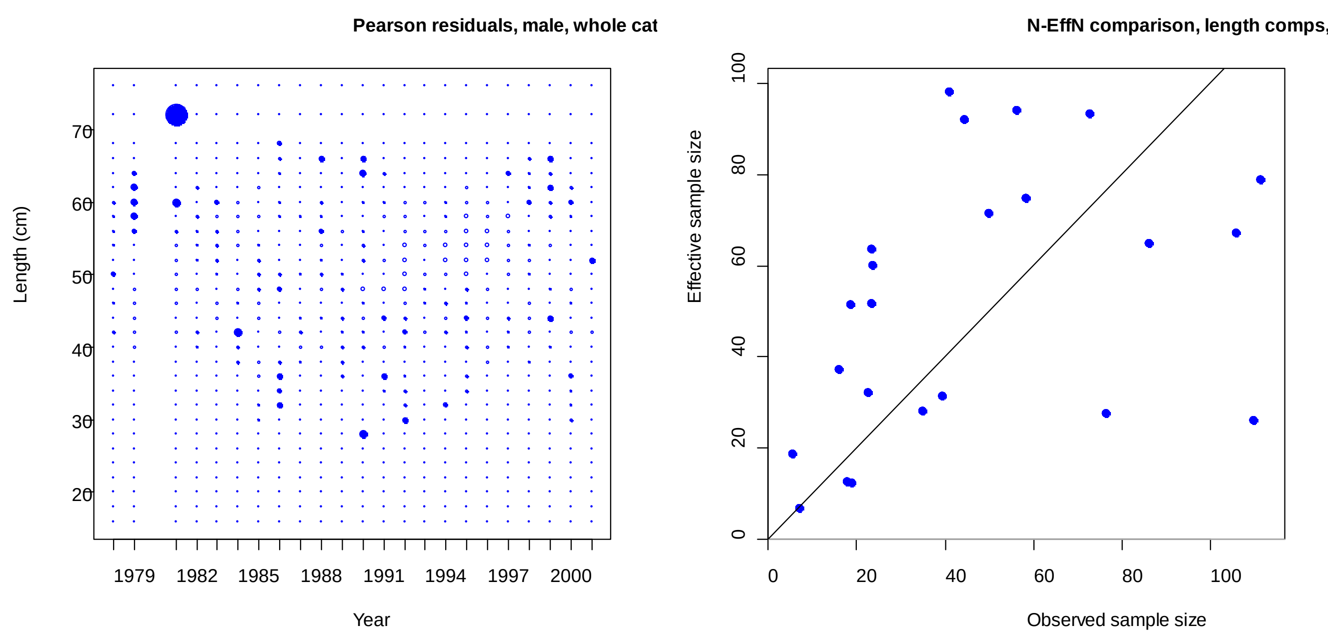


Figures 69c-f. Residuals and input versus effective sample sizes for the northern trawl fishery.

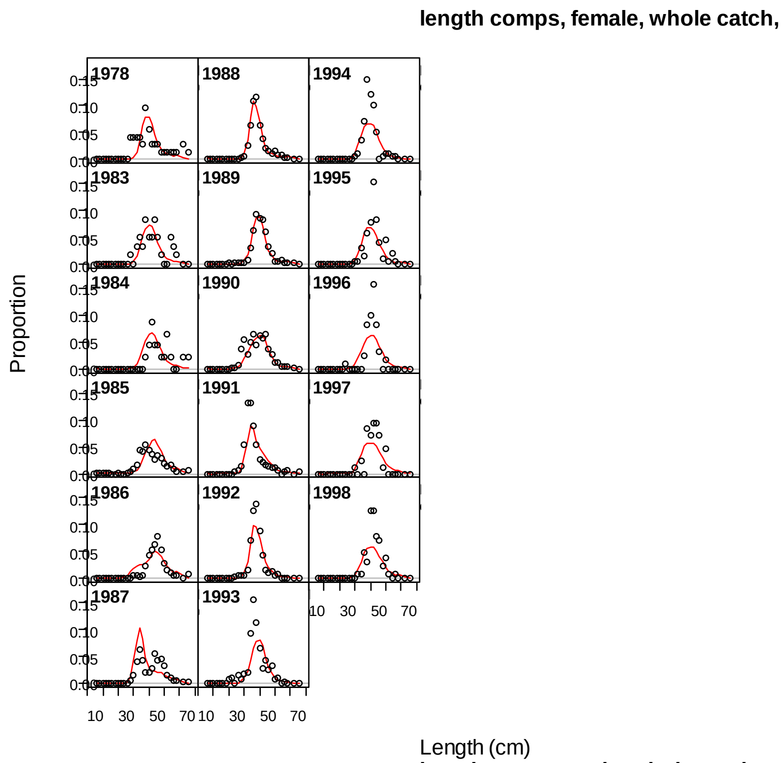


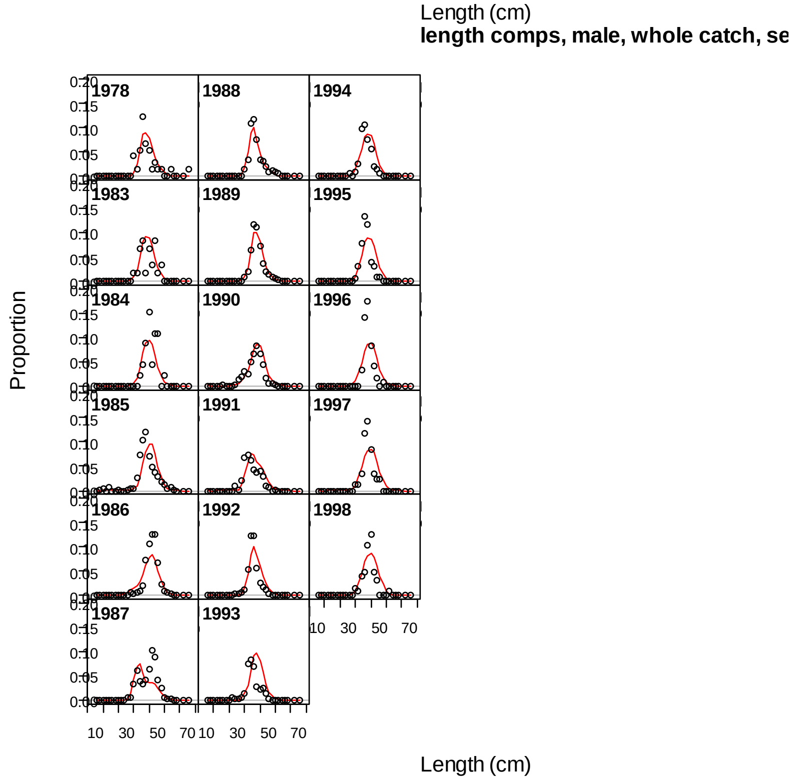


Figures 70a-b. Fits to female and male length frequency data for the hook-and-line fishery.

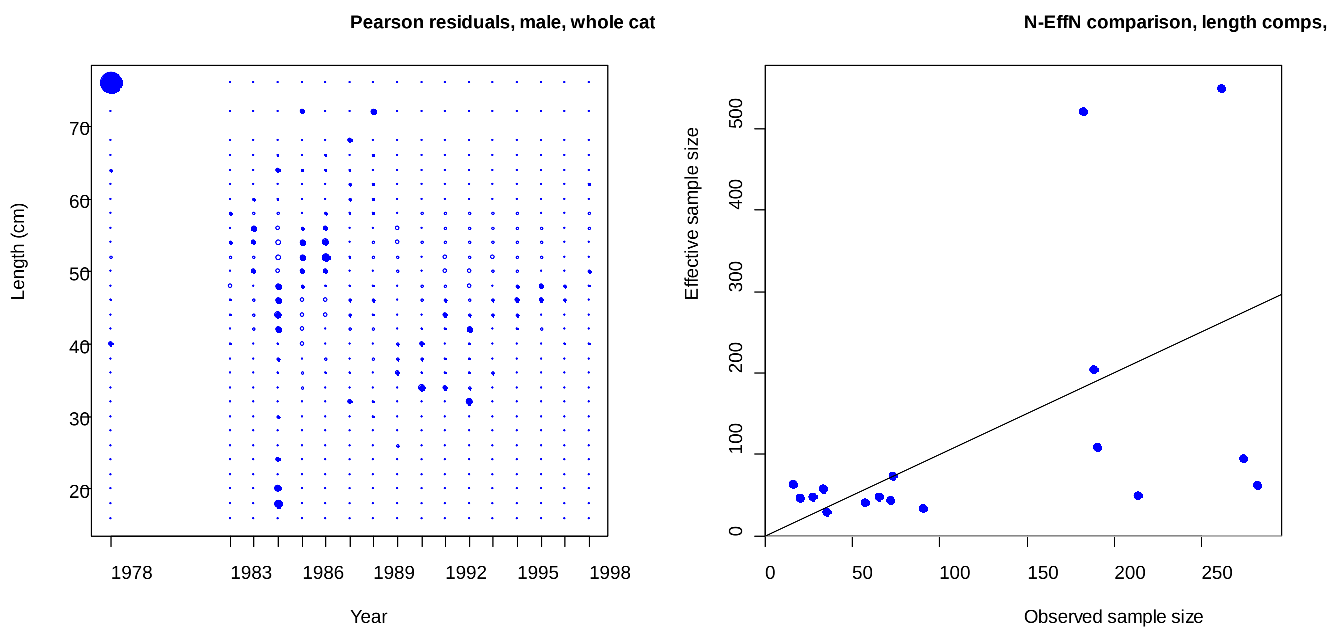


Figures 70c-f. Residuals and input versus effective sample sizes for the hook-and-line fishery.





Figures 71a-b. Fits to female and male length frequency data for the set net fishery.



Figures 71c-f. Residuals and input versus effective sample sizes for the set net fishery.

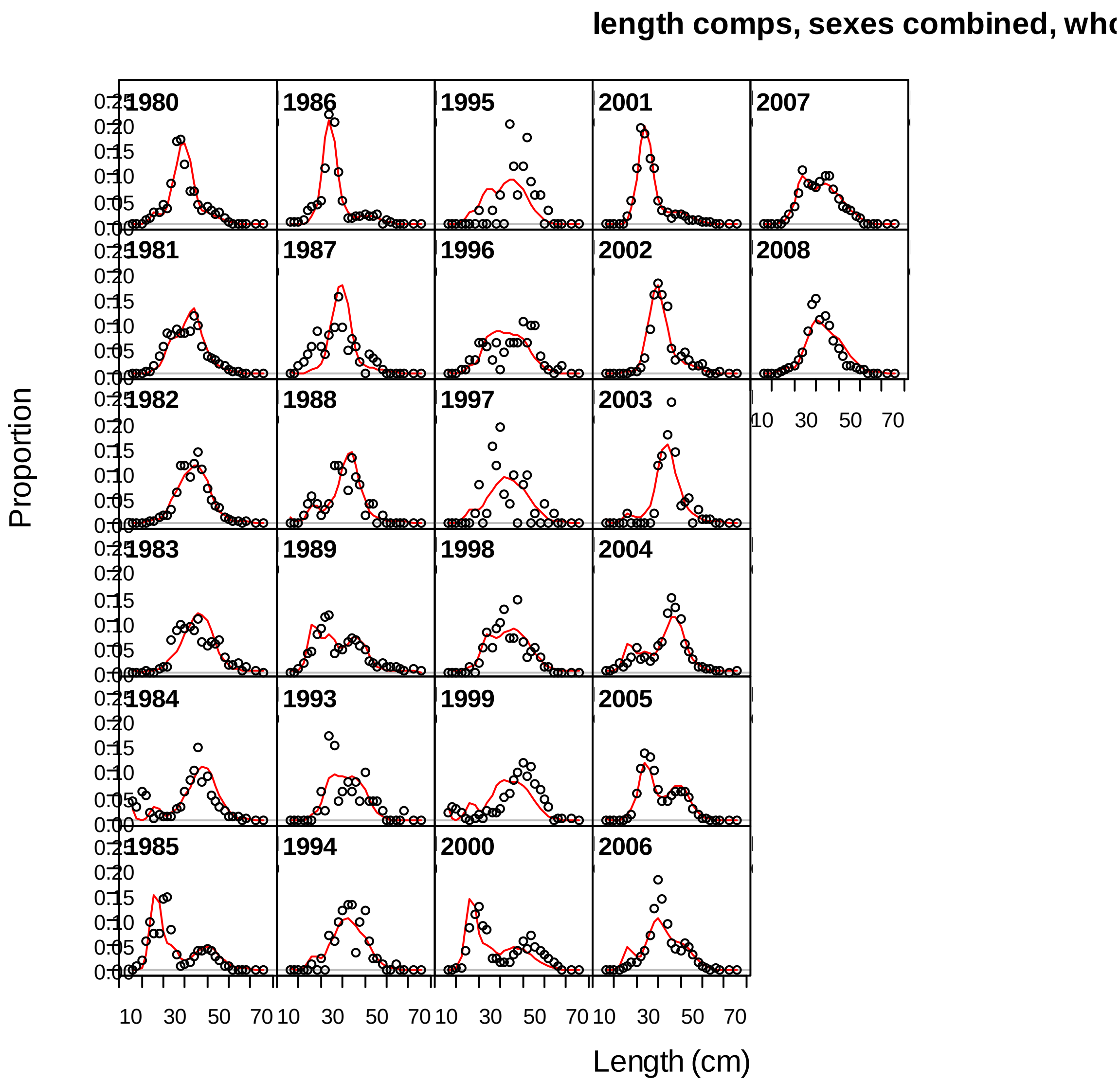
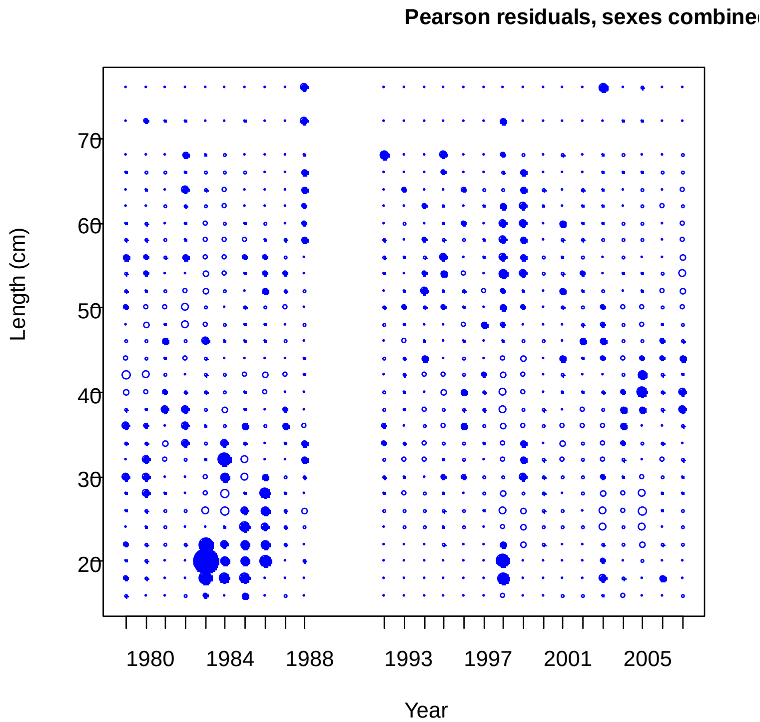
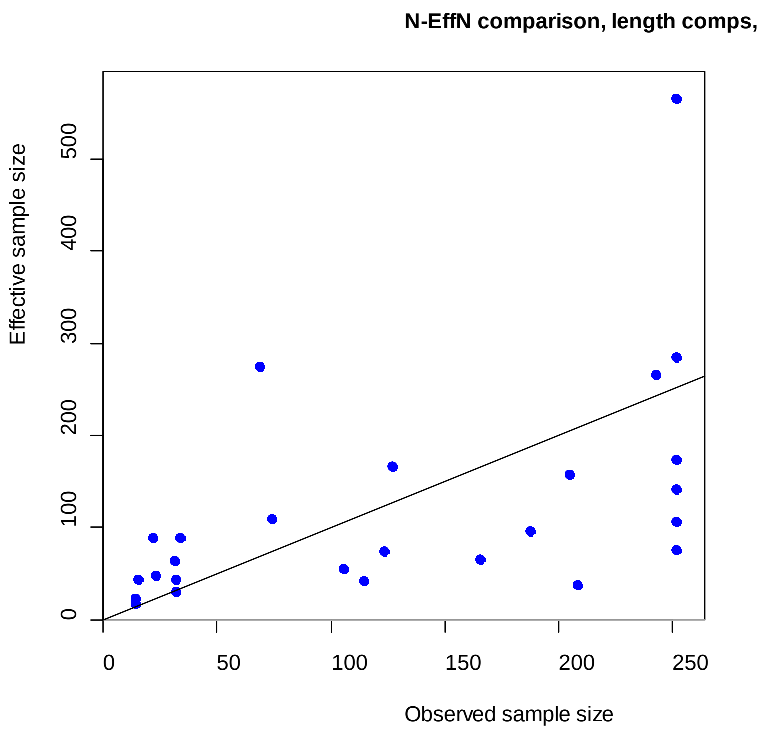


Figure 72a. Fits to combined sex length frequency data for the southern recreational fishery.





Figures 72b-c. Residuals and input versus effective sample sizes for the southern California recreational fishery.

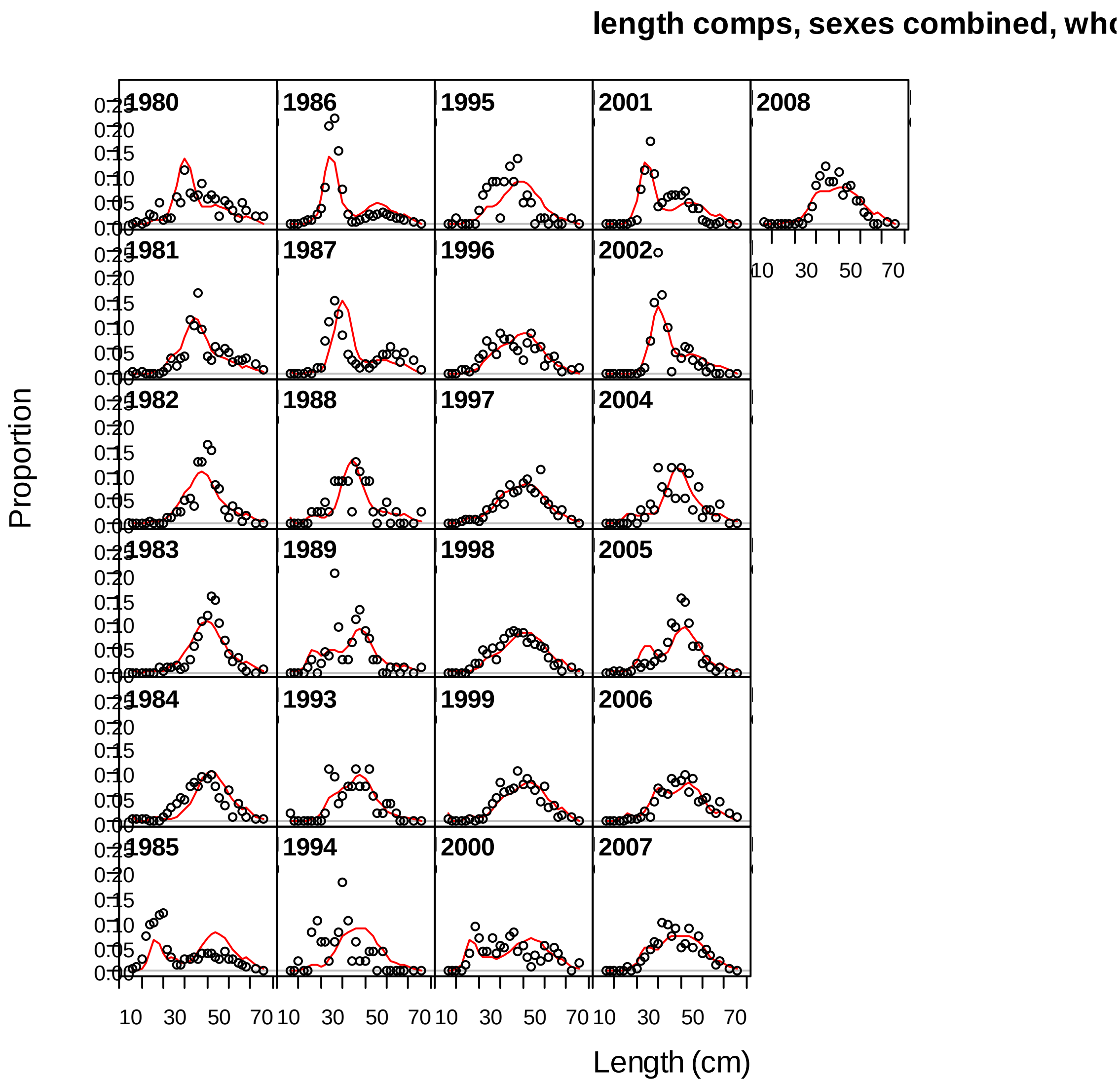
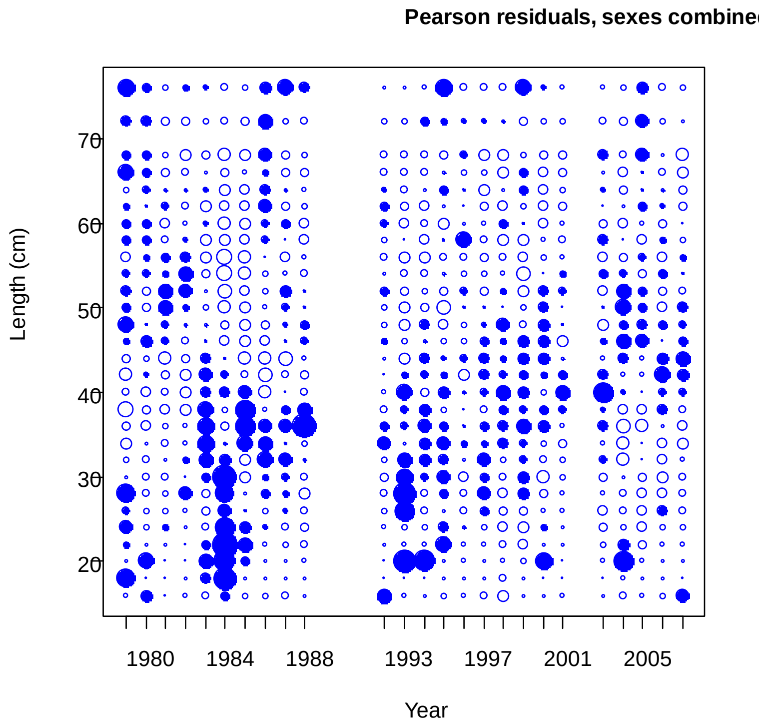
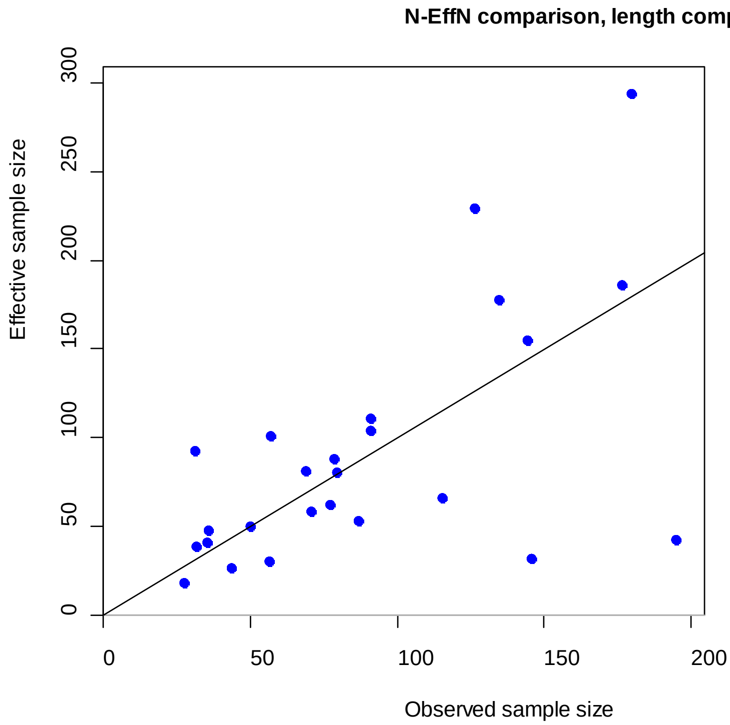
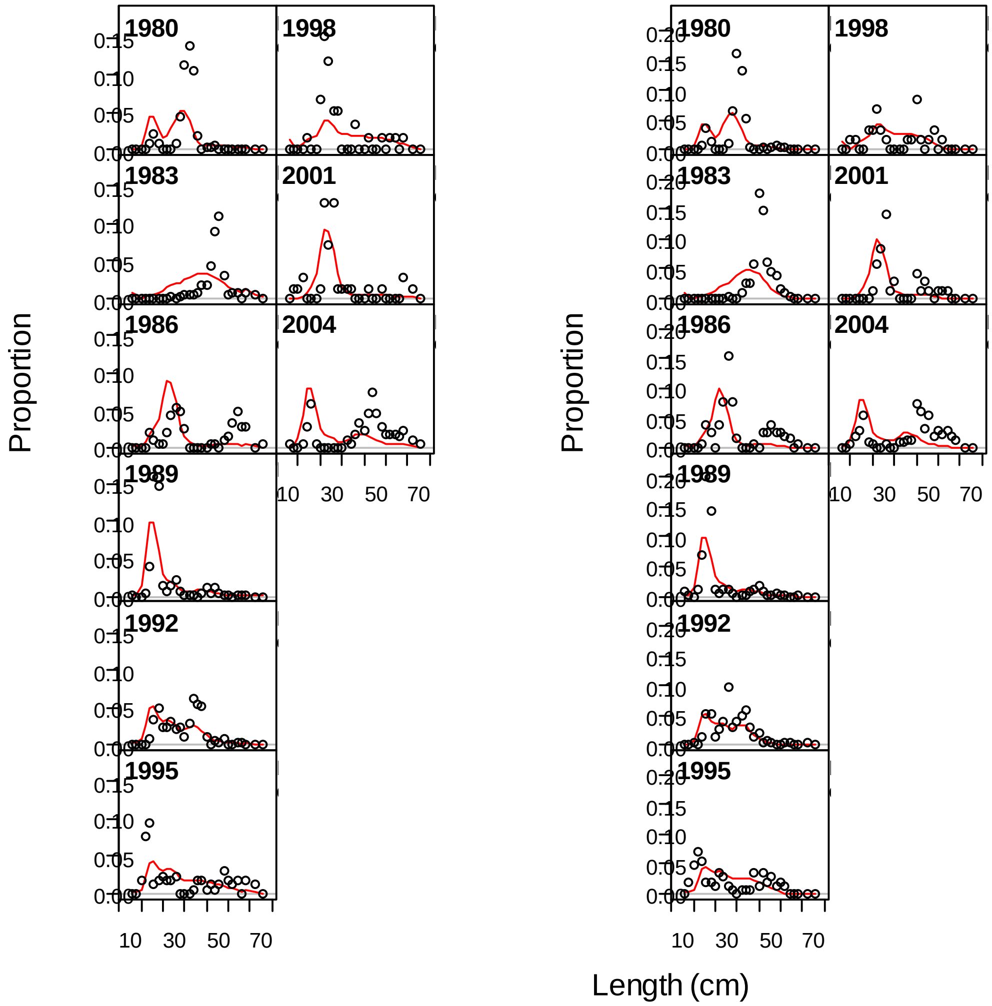


Figure 73a. Fits to combined sex length frequency data for the central California recreational fishery.

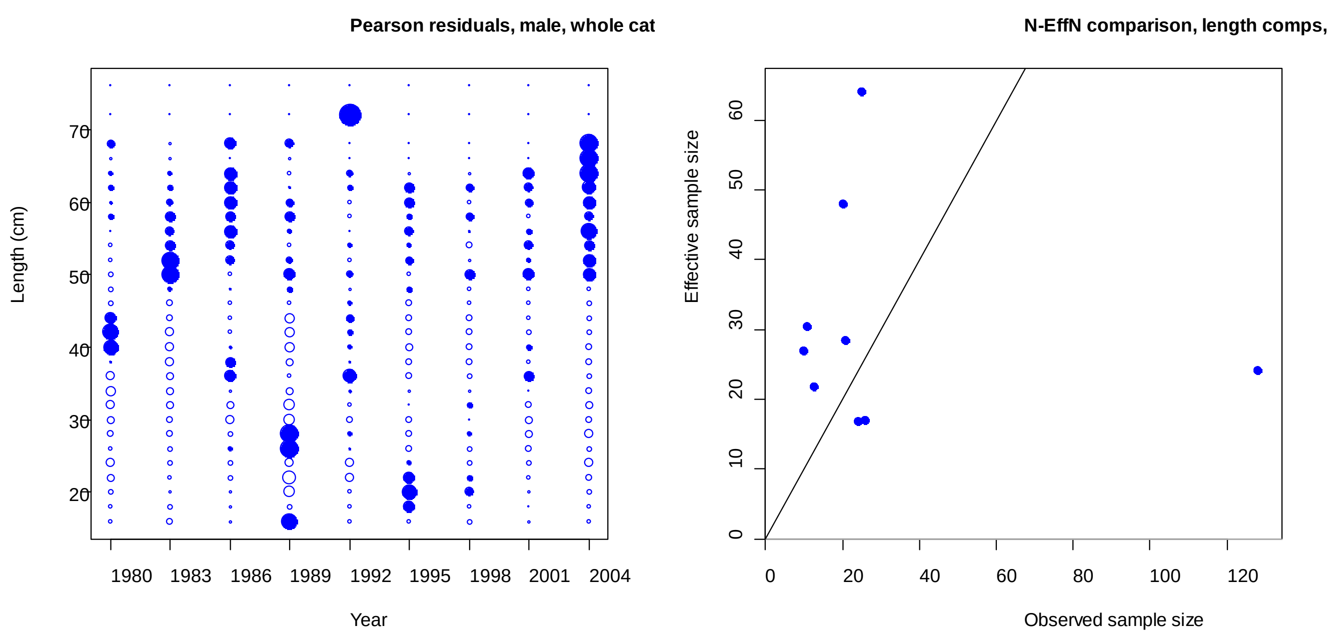




Figures 73b-c. Residuals and input versus effective sample sizes for the central California recreational fishery.



Figures 74a-b. Fits to female and male length frequency data for the triennial trawl survey.



Figures 74c-f. Residuals and input versus effective sample sizes for the triennial trawl survey length frequency data.

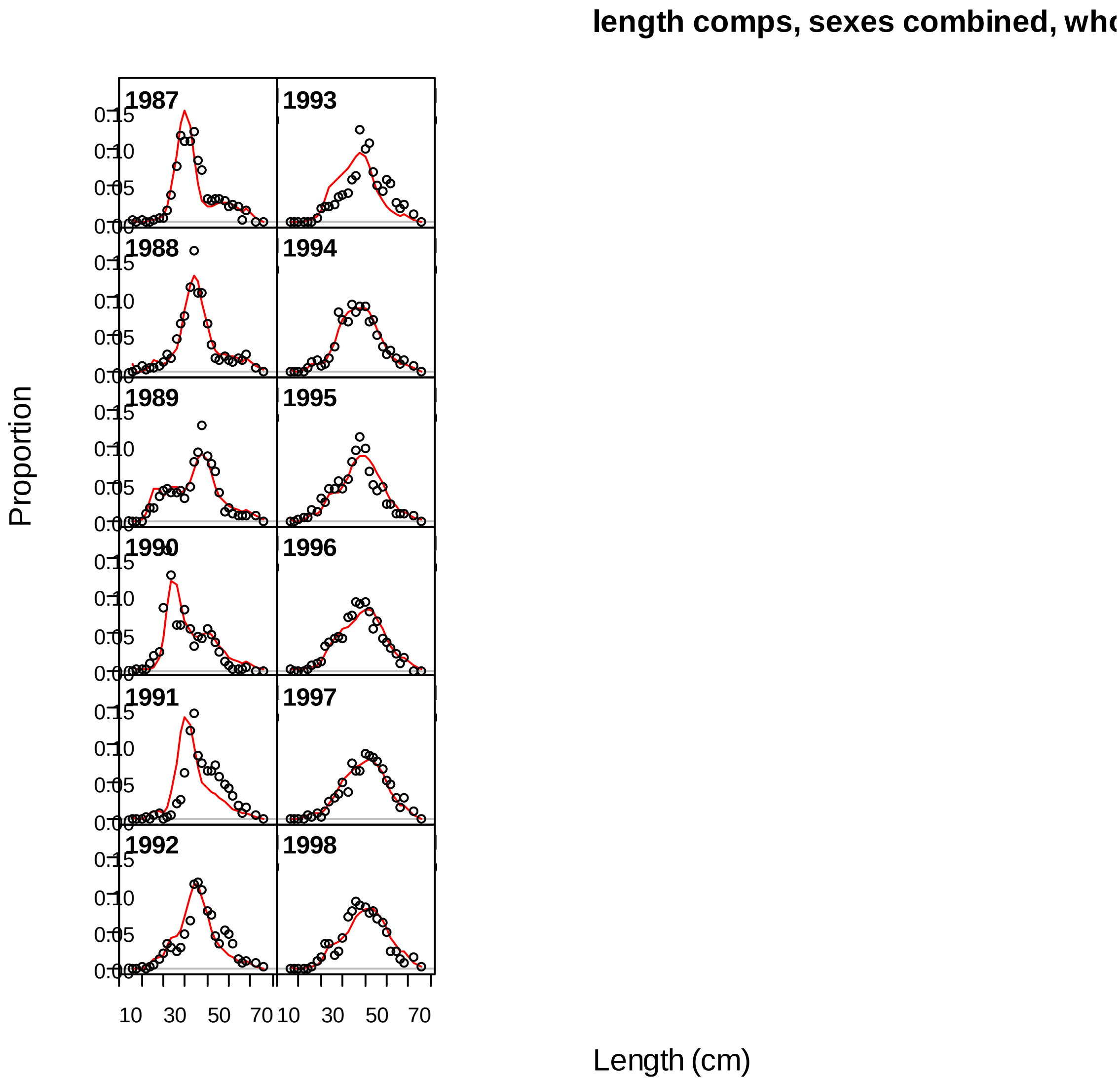
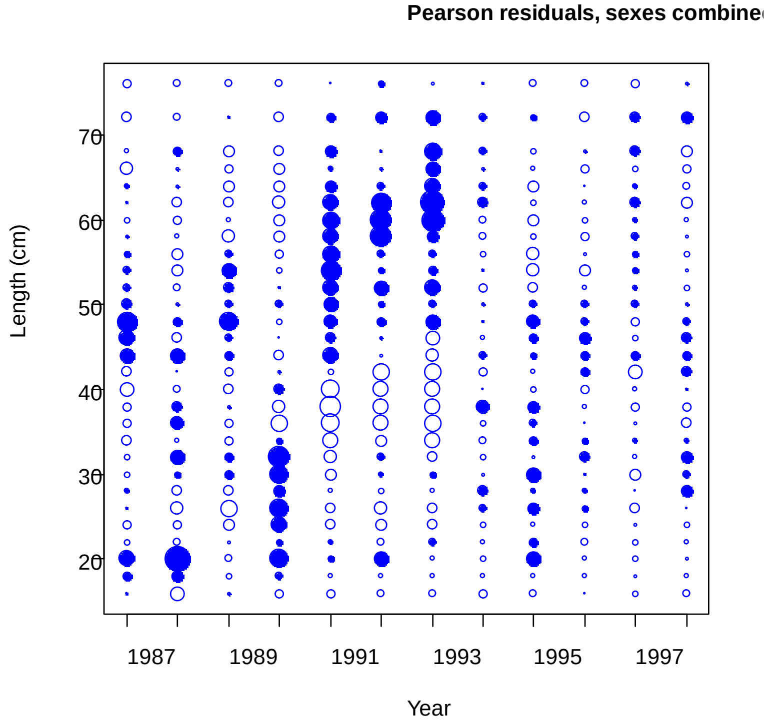


Figure 75a. Fits to combined sex length frequency data for the CDFG CPFV CPUE index.



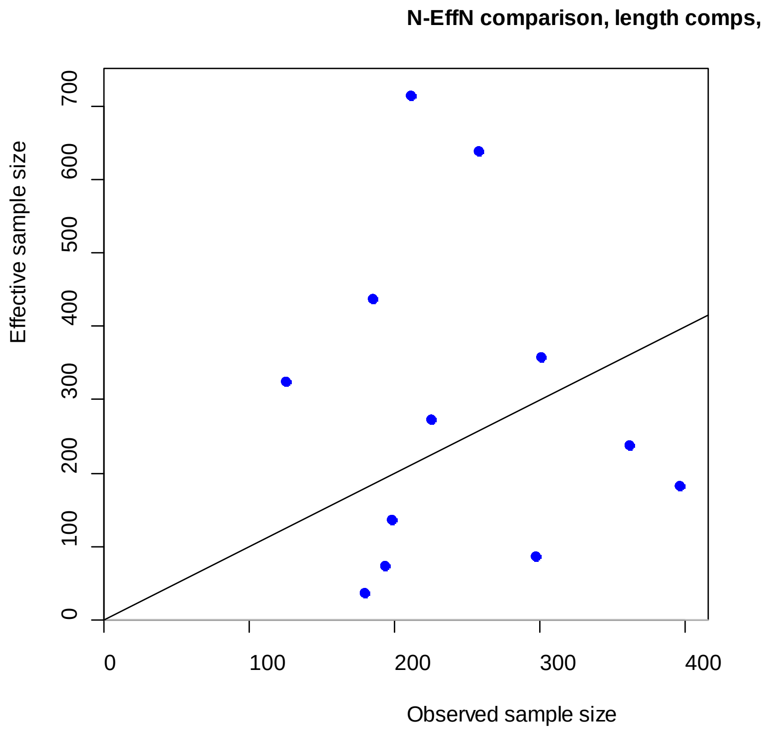
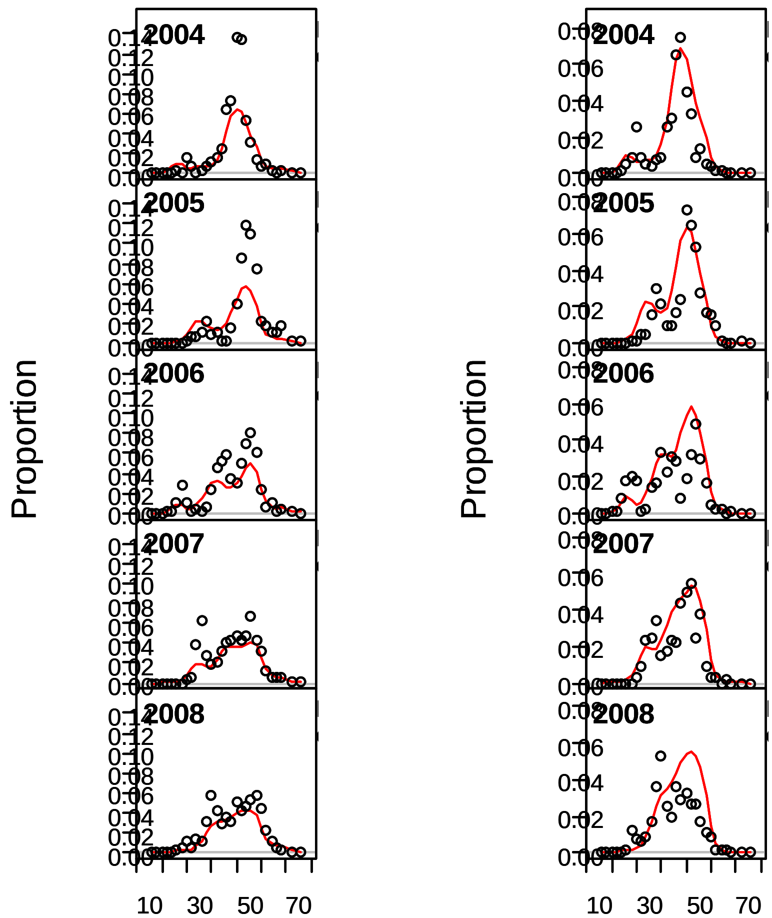
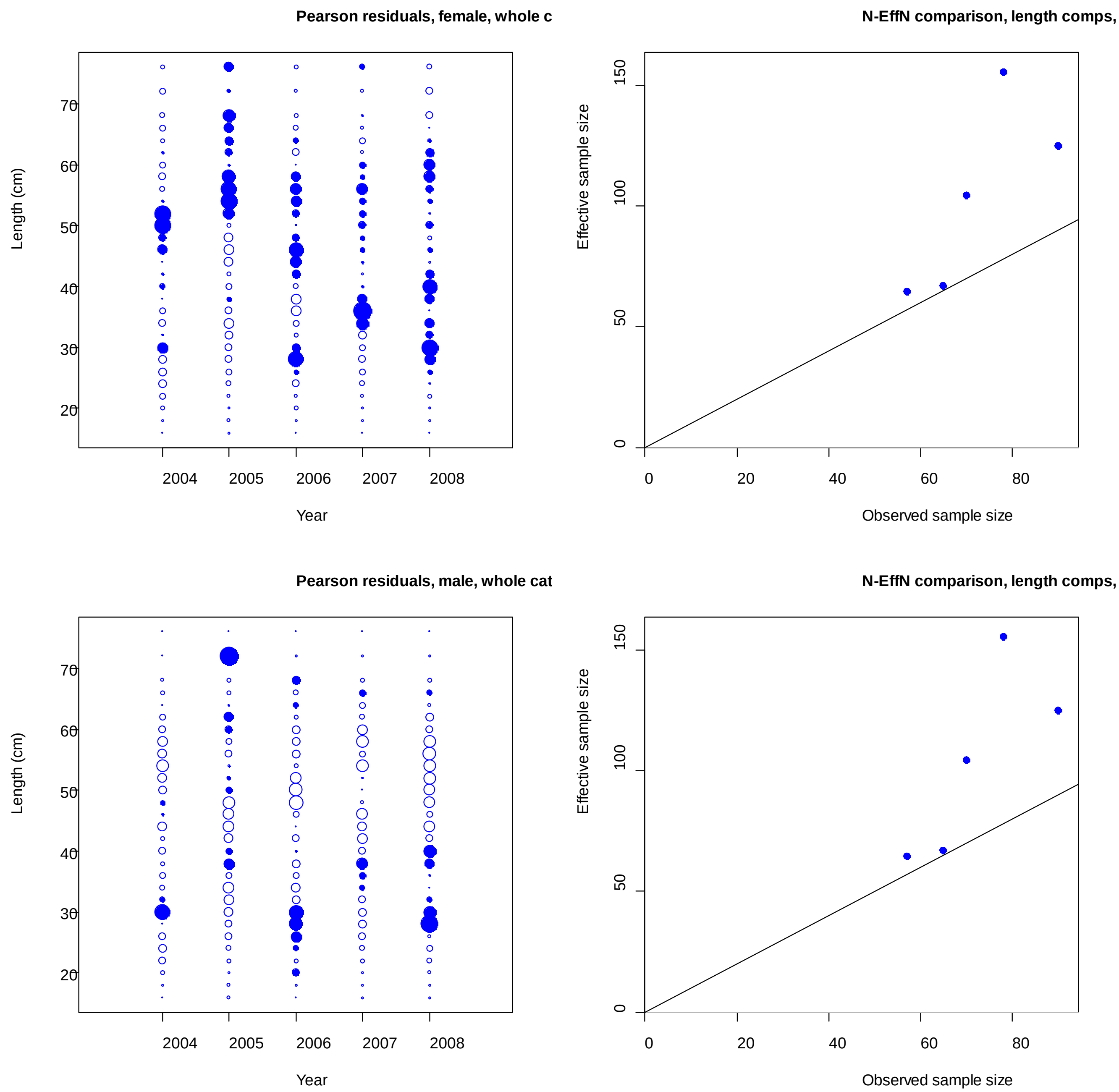


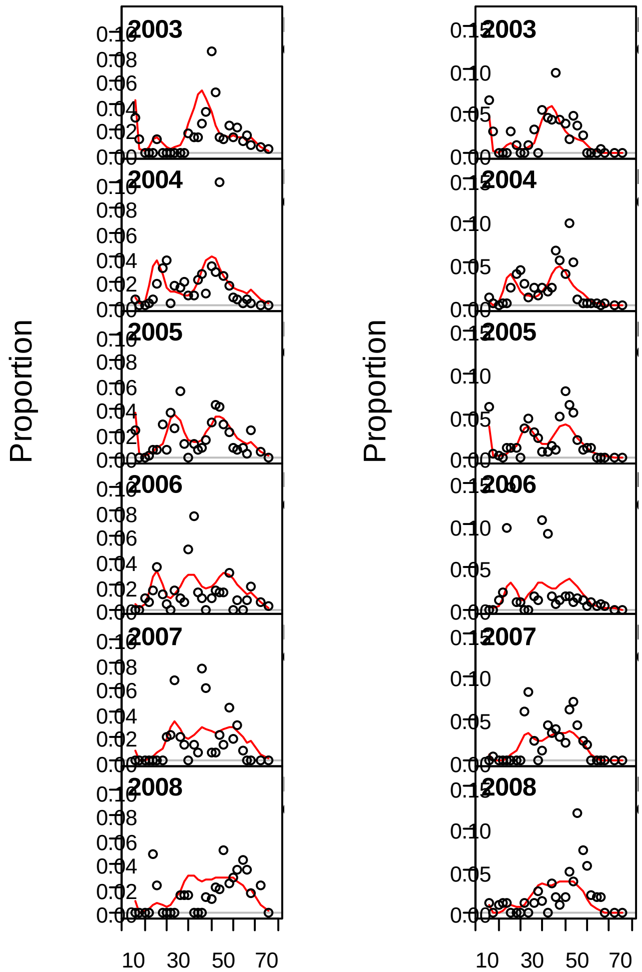
Figure 75b-c. Residuals and input versus effective sample sizes for CPFV survey.



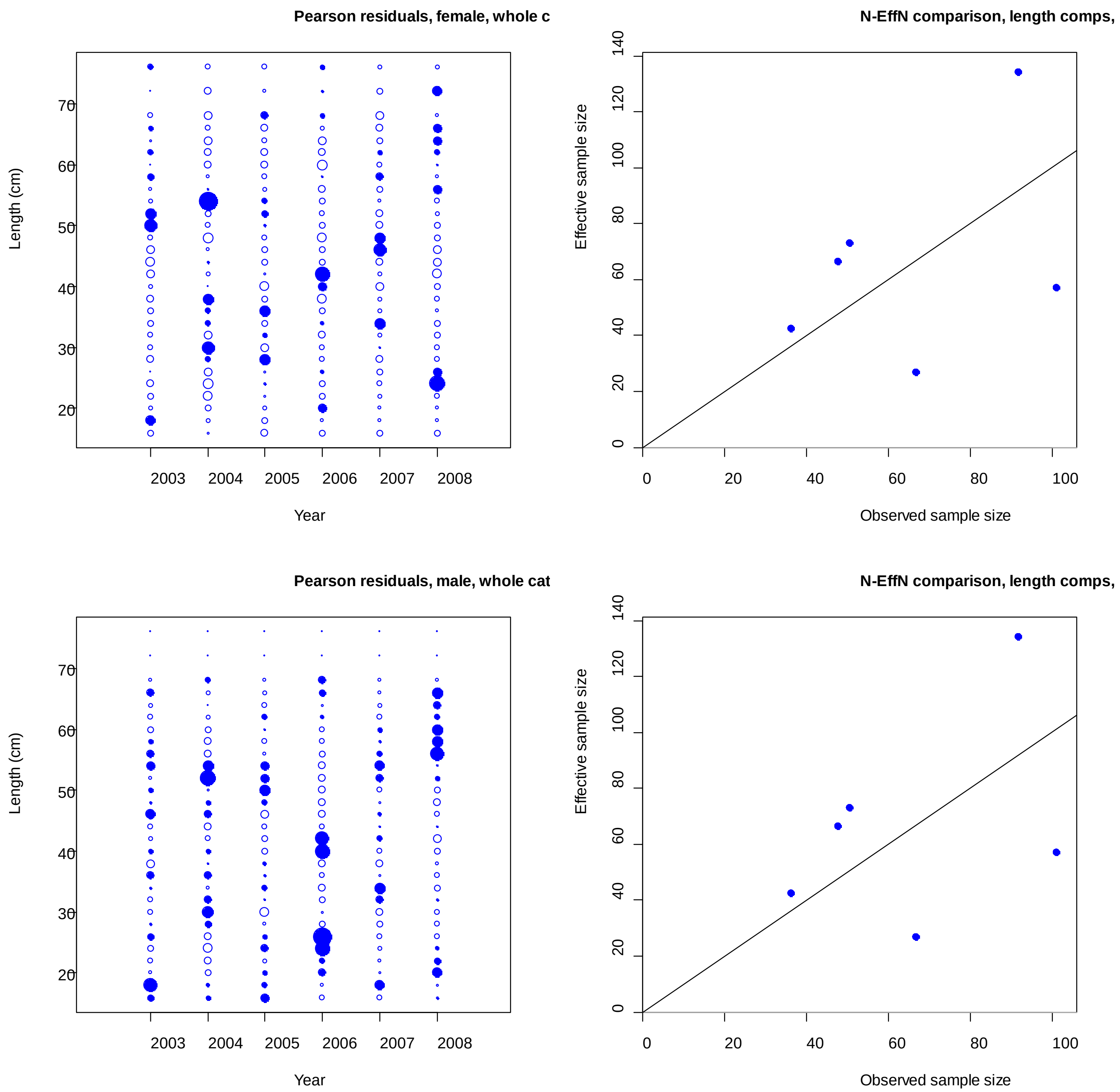
Figures 76a-b. Fits to sex-specific length frequency data for the CDFG CPFV CPUE index.



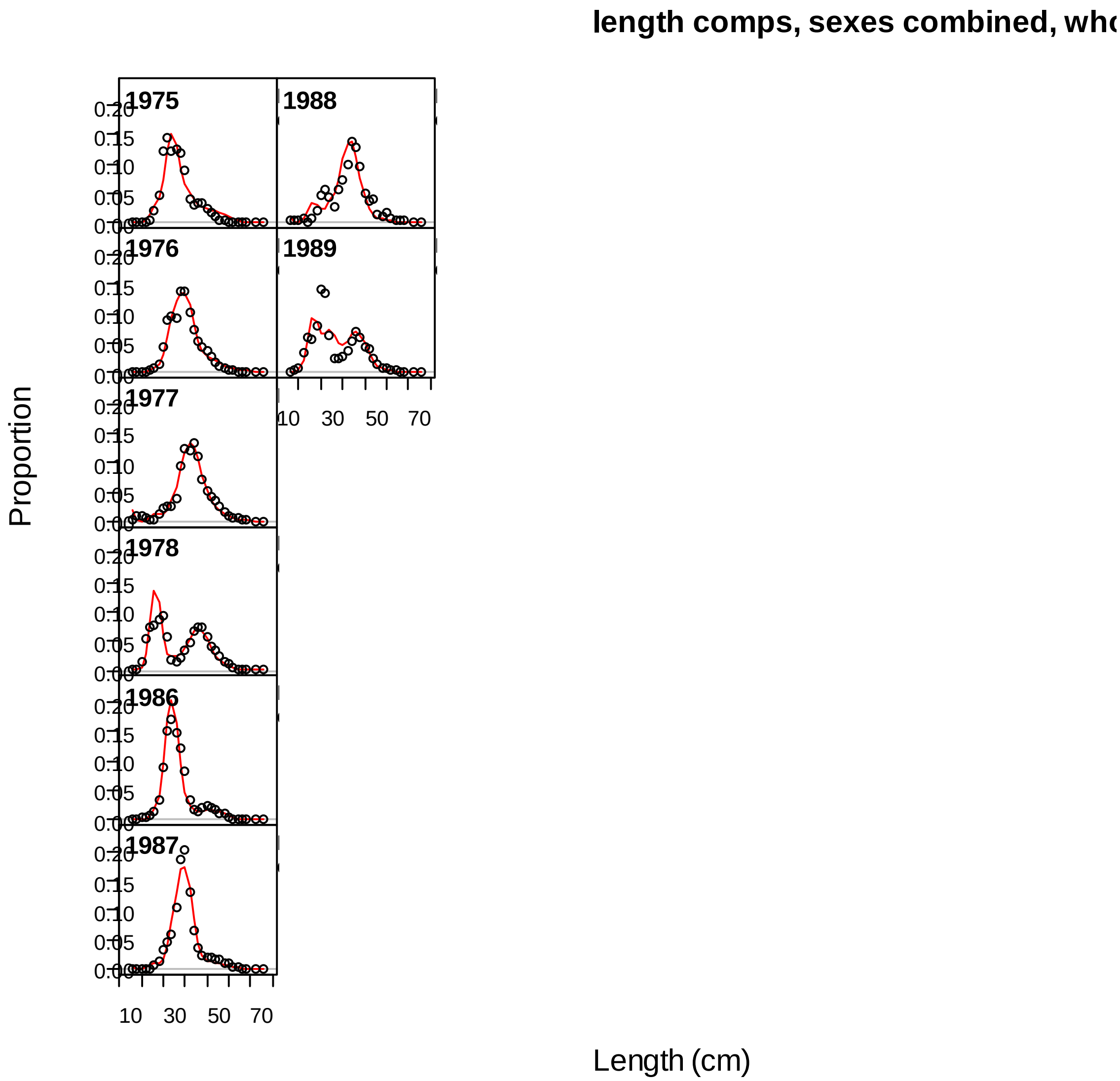
Figures 76c-f. Residuals and input versus effective sample sizes for the CPFV survey length frequency data.



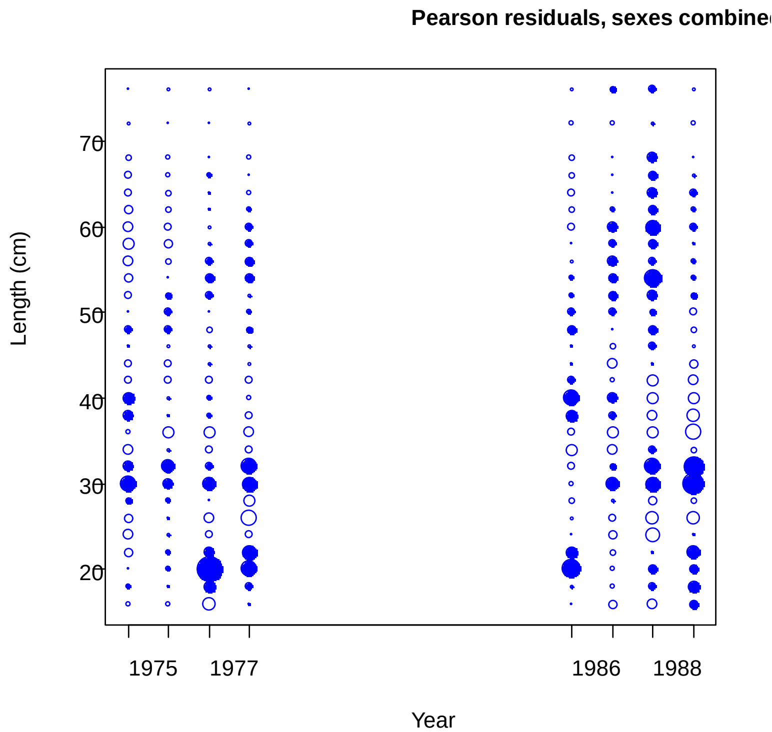
Figures 77a-b. Residuals and input versus effective sample sizes for the NWFSC combined trawl survey.

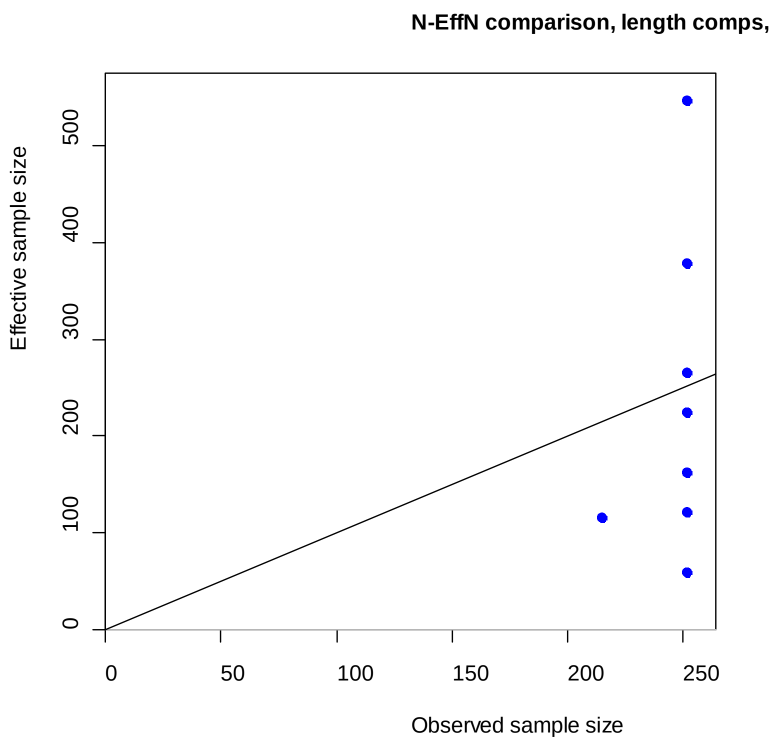


Figures 77c-f. Fits to sex-specific length frequency data for the NWFSC combined trawl survey.

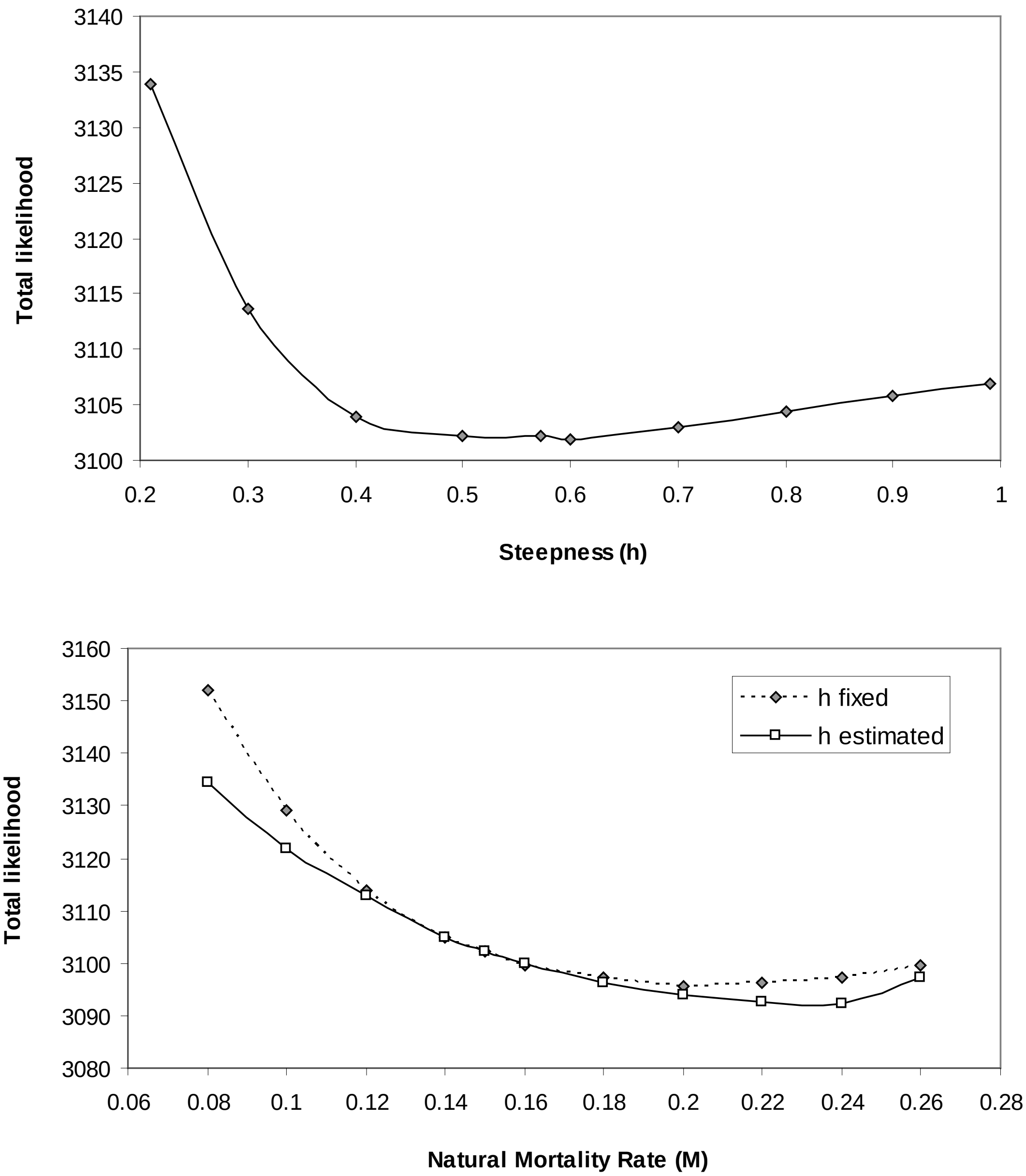


Figures 78a. Residuals and input versus effective sample sizes for the southern CPFV observer LF data

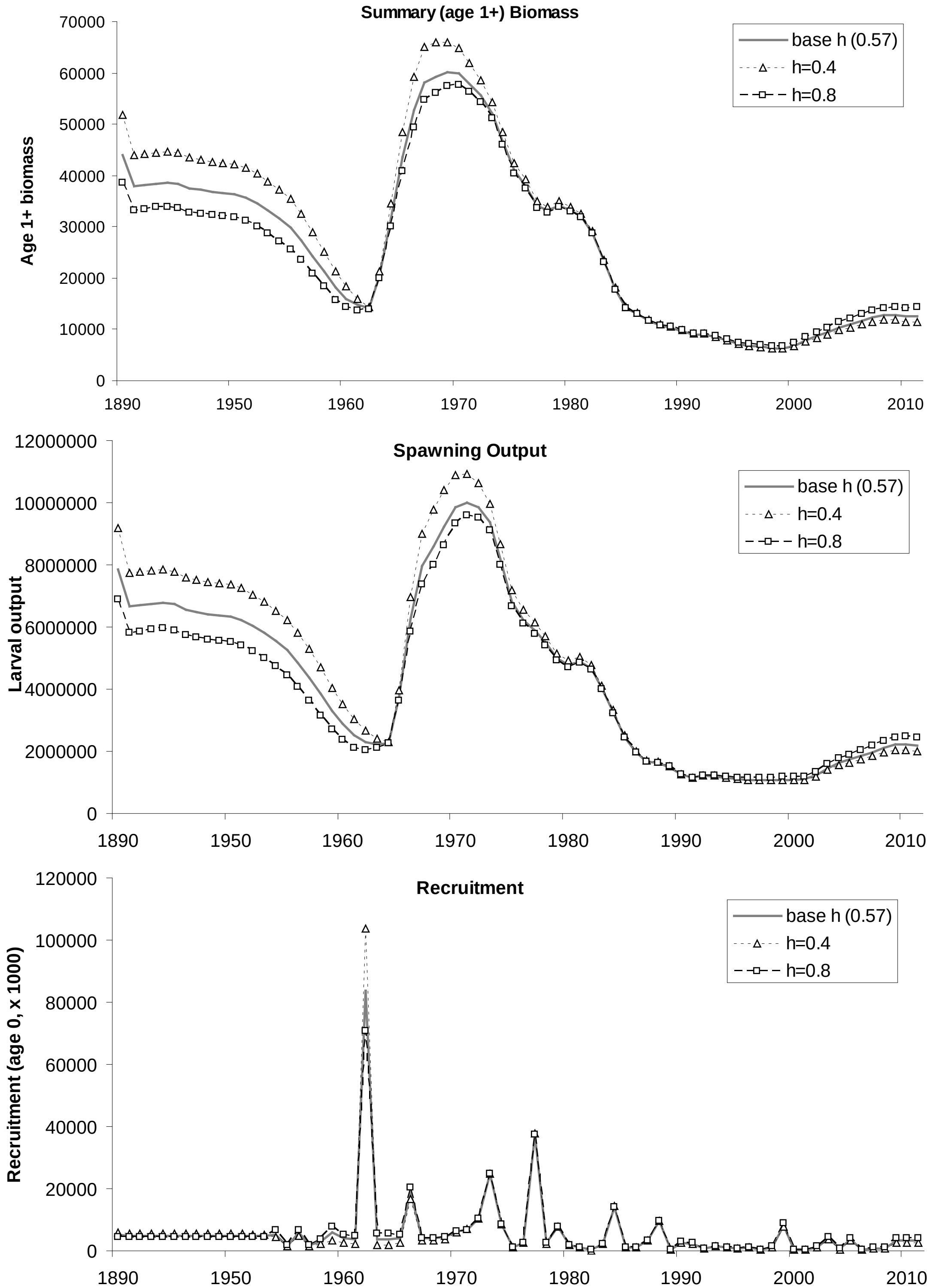




Figures 78b-c. Fits to sex-specific length frequency data for the Southern California CPFV observer LF data.



Figures 79a-b. Likelihood profiles over varying fixed values of steepness (h) and natural mortality (M).



Figures 80a-c. Model trajectories with varying values of steepness (h).

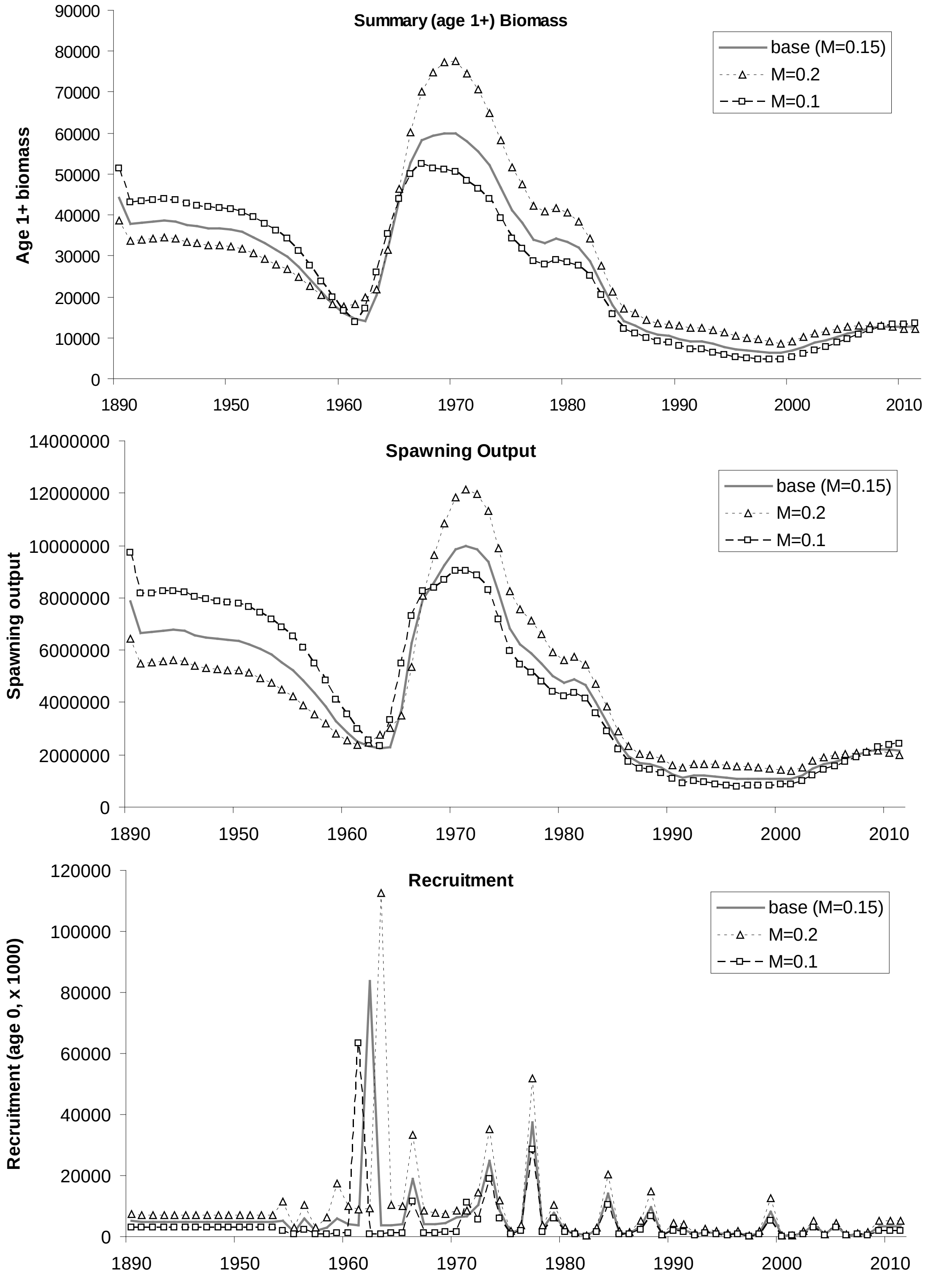
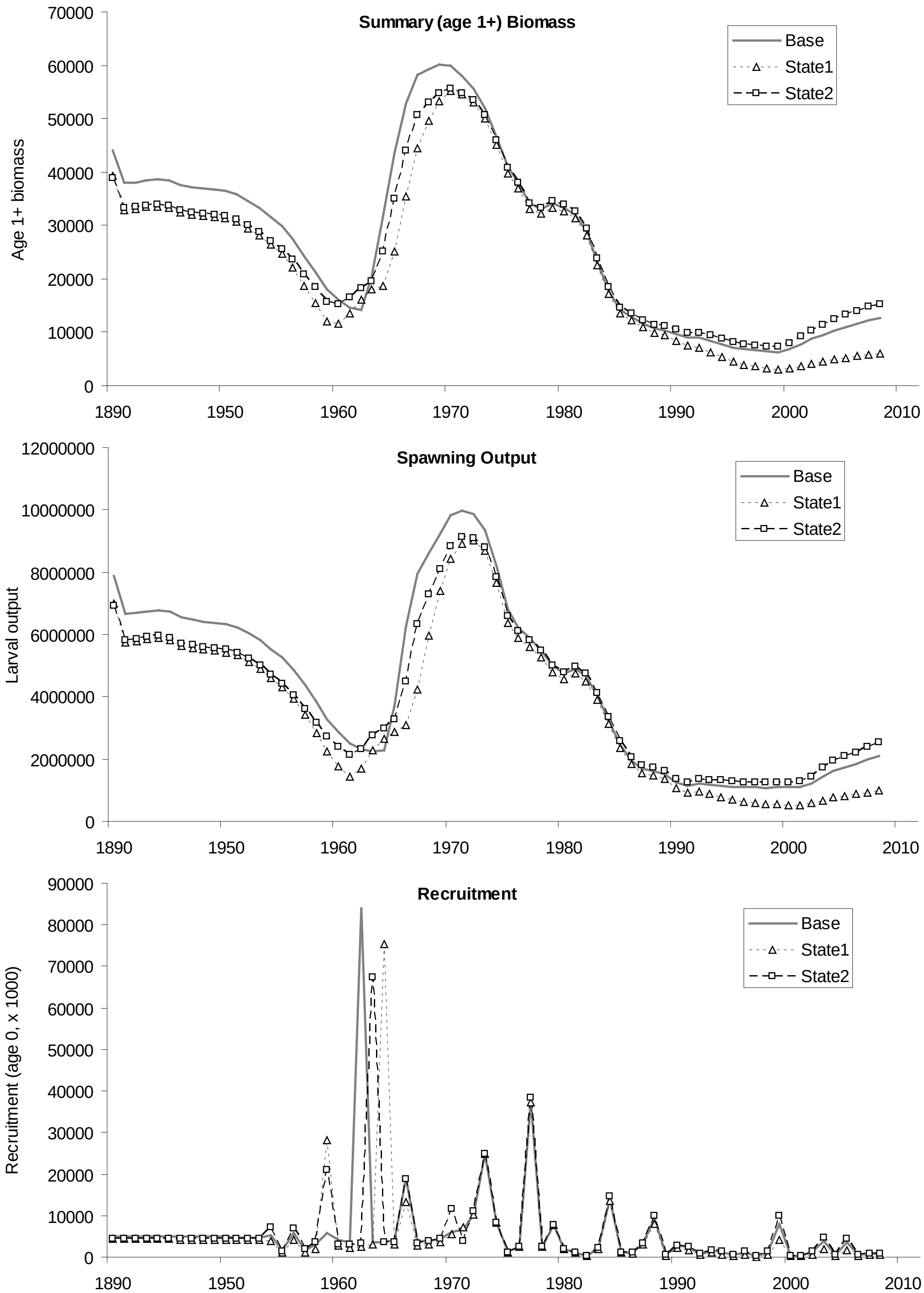
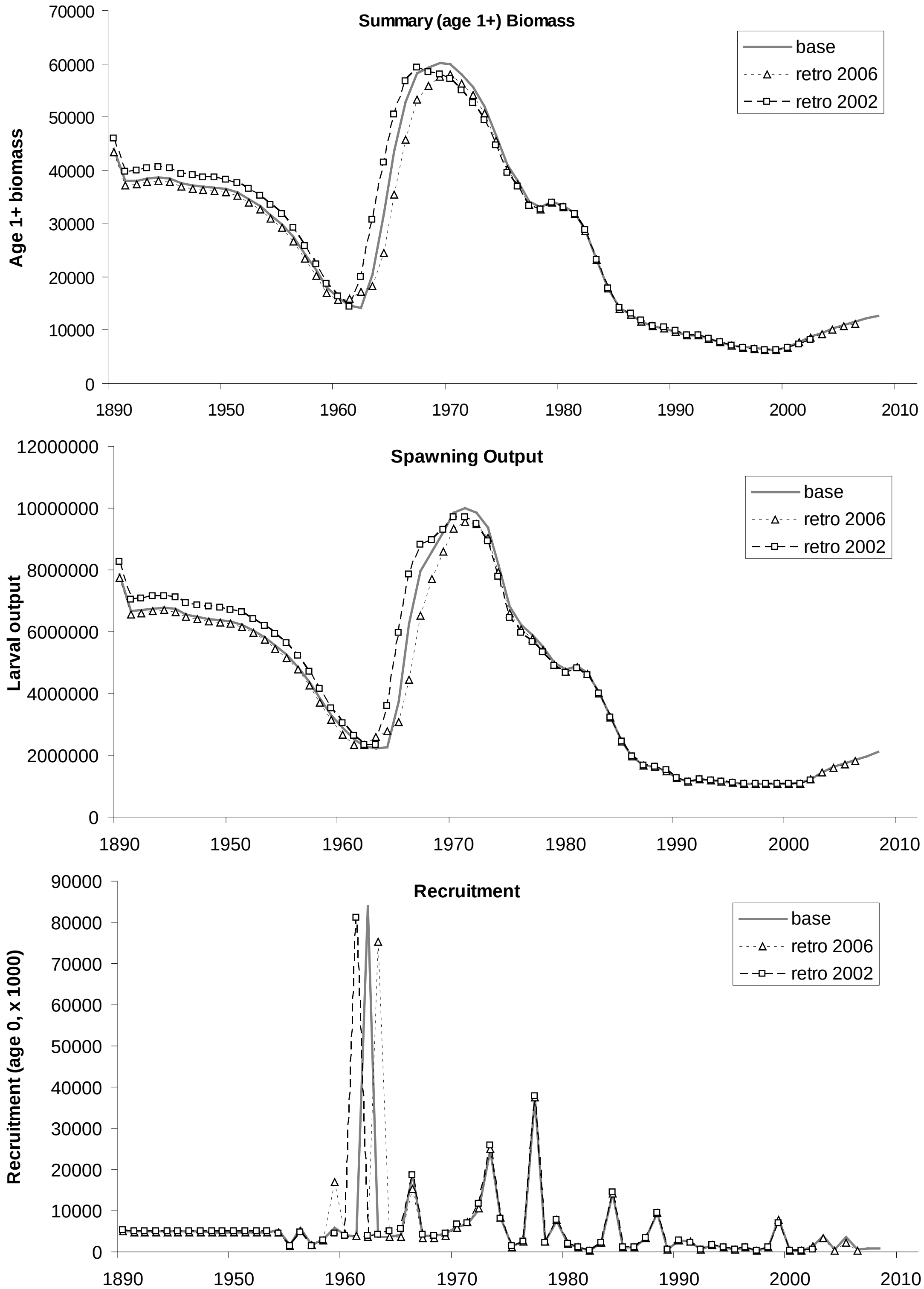


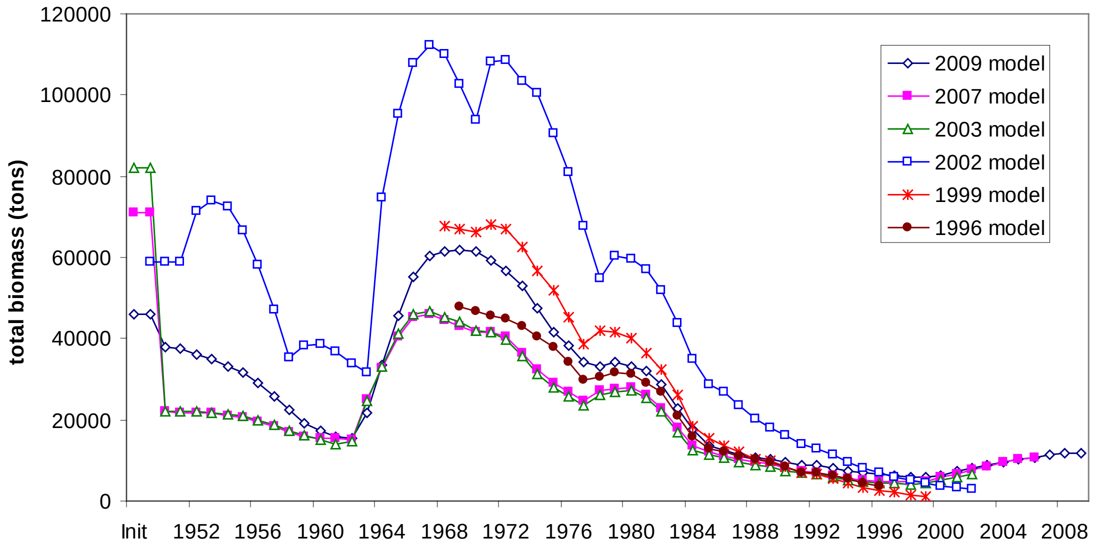
Figure 81a-c. Model trajectories with varying values of natural mortality (M).

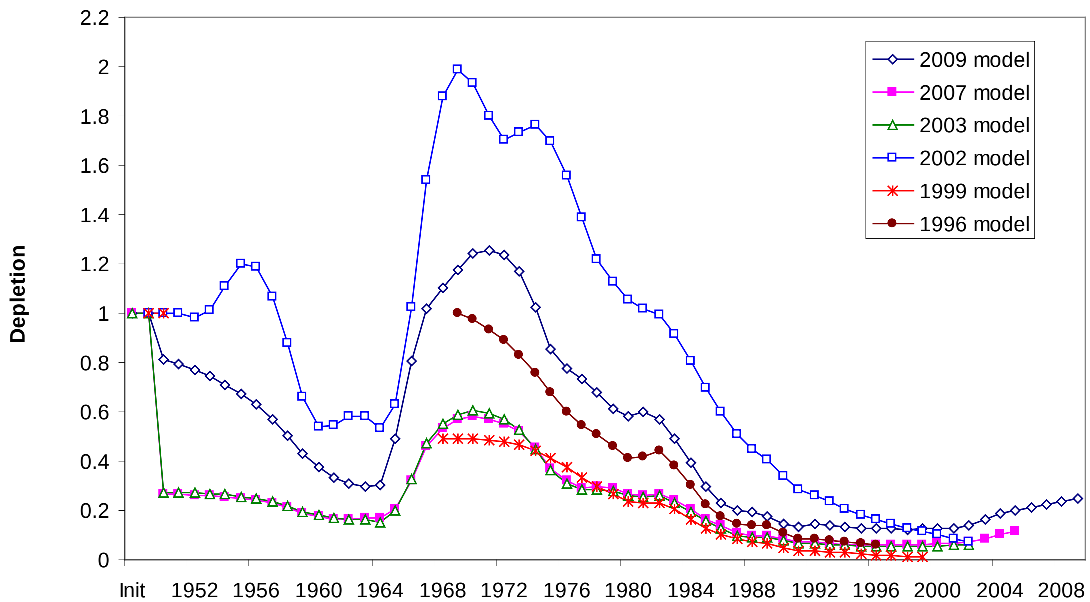


Figures 82a-c. Model trajectories with the two possible states of nature



Figures 83a-c. Model trajectories with the restrospective analysis





Figures 84a-b. Comparison of the base model from this assessment with past assessments (note that the 1996 model did not estimate an "unfished" biomass, thus the resulting "depletion" for that model is not a fair comparison to more recent models).

Bocaccio Draft Assessment: Appendix A. SS3 files for the base model (all files in SS3 version 3.03 format).

Starter File

```
#C starter comment here
Bocstar85.dat
Bocstar85.ctl
0   # 0=use init values in control file; 1=use ss3.par (takes last run's estimates as starting- much faster!!!)
0 # run display detail (0,1,2)
1 # detailed age-structured reports in REPORT.SSO (0,1)
0 # write detailed checkup.sso file (0,1)
0 # write parm values to ParmTrace.sso (0=no,1=good,active; 2=good,all; 3=every_iter,all_parms; 4=every,active)
1
0 # Include prior_like for non-estimated parameters (0,1)
1 # Use Soft Boundaries to aid convergence (0,1) (recommended)
3 # Number of bootstrap datafiles to produce
7 # Turn off estimation for parameters entering after this phase
10 # MCMC burn interval
2 # MCMC thin interval
#0.001 # jitter initial parm value by this fraction
0  # jitter off
-1 # min yr for sdreport outputs (-1 for styr)
-2 # max yr for sdreport outputs (-1 for endyr; -2 for endyr+Nforecastyrs
0 # N individual STD years
#vector of year values
# 1973 1976
0.0001 # final convergence criteria (e.g. 1.0e-04)
0 # retrospective year relative to end year (e.g. -4)
1 # min age for calc of summary biomass
1 # Depletion basis:  denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel X*B_styr
0.25 # Fraction (X) for Depletion denominator (e.g. 0.4)
3 # (1-SPR)_reporting:  0=skip; 1=rel(1-SPR); 2=rel(1-SPR_MSY); 3=rel(1-SPR_Btarget); 4=notrel
1 # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num); 3=sum(frates)
3 # F_report_basis: 0=raw; 1=rel Fspr; 2=rel Fmsy ; 3=rel Fbtgt
999 # check value for end of file
```

Data File

#_bootstrap file: 1
1892 #_styr
2008 #_endyr
1 #_nseas
12 #_months/season
1 #_spawn_seas
6 #_Nfleet
10 #_Nsurveys
1 #_N_areas
trawlsou%H&L%setnet%recSO%recCEN%trawlnor%CalCOFI%TRIENNIAL%CFGCPUE%NWFSChook%NWFSCtrawl%juvenile%pier_juv%60sLFs%free1%mirror_recSO
0.5 0.5 0.5 0.5 0.5 0.5 0.1 0.5 0.5 0.78 0.66 0.5 0.75 0.5 0.5 0.5 #_surveytiming_in_season
SCB hook and line, and NWFSC combo based on Julian days
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 #_area_assignments_for_each_fishery_and_survey
1 1 1 1 1 1 #_units of catch: 1=bio; 2=num
0.01 0.01 0.01 0.01 0.01 0.01 #_se of log(catch) only used for init_eq_catch and for Fmethod 2 and 3
2 #_Ngenders
21 #_Nages
0 152.72 0 0 0 0 #_init_equil_catch_for_each_fishery
117 #_N_lines_of_catch_to_read
#_catch_biomass(mtons):_columns_are_fisheries,year,season

#TWL	HKL	NET	RecSou	RecNor	ORWA_all	year	season
0	166.77	0	0	0	0	1892	1
0	157.4	0	0	0	0	1893	1
0	148.03	0	0	0	0	1894	1
0	138.66	0	0	0	0	1895	1
0	130.93	0	0	0	0	1896	1
0	123.2	0	0	0	0	1897	1
0	115.47	0	0	0	0	1898	1
0	107.73	0	0	0	0	1899	1
0	119.2	0	0	0	0	1900	1
0	130.66	0	0	0	0	1901	1
0	142.12	0	0	0	0	1902	1
0	153.59	0	0	0	0	1903	1
0	165.05	0	0	0	0	1904	1
0	176.36	0	0	0	0	1905	1
0	187.68	0	0	0	0	1906	1
0	198.99	0	0	0	0	1907	1
0	210.3	0	0	0	0	1908	1
0	236.64	0	0	0	0	1909	1
0	262.98	0	0	0	0	1910	1
0	289.32	0	0	0	0	1911	1
0	315.66	0	0	0	0	1912	1
0	342	0	0	0	0	1913	1
0	368.34	0	0	0	0	1914	1
0	394.68	0	0	0	0	1915	1
54.77	418.96	0	0	0	0.160	1916	1
85.57	661.43	0	0	0	0.320	1917	1
96.66	701.13	0	0	0	0.720	1918	1
66	463.1	0	0	0	0.160	1919	1
67.82	482.28	0	0	0	0.220	1920	1
56.38	406.03	0	0	0	0.330	1921	1
49.37	367.12	0	0	0	0.250	1922	1
55.07	434.14	0	0	0	0.080	1923	1
36.97	405.15	0	0	0	0.270	1924	1
29.85	474.63	0	0	0	0.870	1925	1
83.2	627.09	0	0	0	0.810	1926	1
111.29	497.26	0	0	0	1.500	1927	1
150.62	482.9	0	1.99	2.39	1.210	1928	1
119.43	441.16	0	3.99	4.79	28.040	1929	1

135.62	551	0	5.99	5.51	16.700	1930	1
45.59	578.08	0	7.99	7.34	49.580	1931	1
68.87	430.61	0	9.99	9.18	37.280	1932	1
89.53	257.34	0	11.98	11.02	59.260	1933	1
108.88	316.57	0	13.98	12.85	41.380	1934	1
90.51	369.17	0	15.98	14.69	43.190	1935	1
107.86	473.58	0	15.98	16.53	17.690	1936	1
91.98	408.44	0	27.51	19.59	41.130	1937	1
76.46	295.45	0	22.18	19.27	47.540	1938	1
49.95	200.11	0	19.63	16.85	86.170	1939	1
45.57	238.49	0	14.07	24.27	59.720	1940	1
32.44	187.35	0	13	22.43	53.070	1941	1
7.9	72.1	0	6.91	11.91	25.550	1942	1
7.56	70.44	0	6.6	11.39	196.130	1943	1
2.94	83.63	0	5.42	9.35	635.220	1944	1
55.17	127.08	0	7.23	12.47	1211.050	1945	1
111.53	122.33	0	12.45	21.47	611.940	1946	1
5.57	198.21	0	37.32	16.99	631.600	1947	1
81.94	150.23	0	102.08	33.9	397.440	1948	1
94	176.56	0	132.83	43.94	380.480	1949	1
303.66	327.61	0	156.82	53.55	374.730	1950	1
765.29	262.44	0	135.78	63.17	532.060	1951	1
1310.96	180.88	0	151.62	54.97	268.000	1952	1
1678.25	70.2	0	171.23	46.81	304.510	1953	1
1597.98	89.11	0	410.71	58.19	245.780	1954	1
1764.99	122.87	0	760.57	69.38	334.950	1955	1
2006.22	299.57	0	917.14	77.46	349.930	1956	1
2219.46	271.26	0	529.88	76.8	468.870	1957	1
2459.84	213.5	0	301.14	123.49	482.050	1958	1
2062.66	125.38	0	177.61	102.75	378.690	1959	1
1731.86	92.91	0	185.13	81.26	344.610	1960	1
1297.35	80.89	0	211.89	68.5	265.670	1961	1
1147.09	68.25	0	204.46	80.38	230.360	1962	1
1314.09	85.06	0	194.38	88.71	326.220	1963	1
942.79	70.17	0	244.36	74.98	190.470	1964	1
965.94	81.03	0	319.14	106.55	273.070	1965	1
2410.23	129.52	0	564.3	118.21	196.070	1966	1
4036.28	117.9	0	770.19	111.44	294.710	1967	1
1996.47	80.71	0	832.18	103.9	391.890	1968	1
1132.64	78.02	17.41	785	110.52	223.000	1969	1
1341.14	82.39	15.06	1039.41	117.87	250.090	1970	1
961.36	81.56	58.73	966.96	104.45	323.740	1971	1
1648.11	122.56	70.95	1308.7	123.08	379.600	1972	1
4537.05	151.53	167.3	1510.62	186.09	648.420	1973	1
5956.32	164.1	261.65	1892.59	200.89	525.550	1974	1
3316.02	158.13	285.36	1865.23	200.29	578.560	1975	1
3424.73	218.88	123.1	1489.03	215.7	705.480	1976	1
2381.4	188.75	158.08	1265.09	193.57	673.610	1977	1
1878.87	247.93	124.75	1174.03	195.63	745.440	1978	1
3299.31	351.15	235.32	1713.94	230.22	286.170	1979	1
3054.87	320.49	215.88	942.92	264.04	586.080	1980	1
1779.75	312.34	353.03	908.12	234.52	2164.520	1981	1
2323.84	392.92	387.01	1225.49	371.85	1897.440	1982	1
1914.02	238.56	588.49	265.96	310.65	2280.140	1983	1
1891.75	367.29	547.07	181.6	67.14	1621.380	1984	1
582.41	143.01	1091.66	324.48	67.93	654.150	1985	1
789.66	258.99	1085.78	433.75	175.84	376.540	1986	1
650.4	277.14	967.86	91.7	106.14	555.370	1987	1
590	496.55	371.48	106.54	44.32	695.430	1988	1
594.21	362.92	981.88	182.16	81.71	553.310	1989	1
681.56	458.67	793.27	160.27	68.02	462.620	1990	1
498.36	266.28	457.6	160.27	68.02	263.310	1991	1

362.09	468.03	640.31	160.27	68.02	133.250	1992	1
358.87	417.33	430.18	115.71	68.02	202.860	1993	1
377.01	193.06	262.64	243.9	68.02	149.530	1994	1
215.41	56.74	281.15	34.24	68.02	162.450	1995	1
225.84	66.23	91.83	68.36	32.22	62.910	1996	1
136.26	53.37	34.94	68.71	111.26	93.850	1997	1
41.16	39.38	39.21	33.53	25.87	31.970	1998	1
19.01	20.68	7.18	80.06	60.21	25.980	1999	1
13.48	7.01	0.73	58.24	74.42	6.570	2000	1
9.21	7.82	0.88	62.68	53.84	4.440	2001	1

total mortality reports- NWFSC total mort report for com fisheries 2002-2007
based on J. Budrick data for rec. fisheries 2004-2007, and scorecard estimates for all 2008 fisheries

#trl_s	hk_ln	setnet	Rec_S	Rec_N	trawl north		
28.04	0.13	0.01	35.88	4.93	20.67	2002	1
5.07	0	0	5.53	1.87	0.31	2003	1
13.86	1.84	0.21	63.43	2.27	3.52	2004	1
24.64	1.5	0.17	69.9	10.7	0.43	2005	1
16.09	2.25	0.25	29	11.8	0.31	2006	1
4.06	3.39	0.38	44.2	8.92	1.58	2007	1
28.73	13.4	0.5	30.3	3.59	1.58	2008	1

178 #_N_cpue_and_surveyabundance_observations
#_year seas index obs se(log)

1982	1	1	166.4	0.32	#areaweightedCPUEfromRalston
1983	1	1	73.1	0.32	#areaweightedCPUEfromRalston
1984	1	1	72.3	0.32	#areaweightedCPUEfromRalston
1985	1	1	30.7	0.32	#areaweightedCPUEfromRalston
1986	1	1	31.2	0.32	#areaweightedCPUEfromRalston
1987	1	1	44.4	0.32	#areaweightedCPUEfromRalston
1988	1	1	51.6	0.32	#areaweightedCPUEfromRalston
1989	1	1	35.8	0.32	#areaweightedCPUEfromRalston
1990	1	1	37.1	0.32	#areaweightedCPUEfromRalston
1991	1	1	26.9	0.32	#areaweightedCPUEfromRalston
1992	1	1	20.4	0.32	#areaweightedCPUEfromRalston
1993	1	1	19.7	0.32	#areaweightedCPUEfromRalston
1994	1	1	23.9	0.32	#areaweightedCPUEfromRalston
1995	1	1	15.2	0.32	#areaweightedCPUEfromRalston
1996	1	1	8.7	0.32	#areaweightedCPUEfromRalston

1980	1	4	3.401	0.071906949	#MRFsoCAL
1981	1	4	3.447	0.059646908	#MRFsoCAL
1982	1	4	3.173	0.073301426	#MRFsoCAL
1983	1	4	1.318	0.081365149	#MRFsoCAL
1984	1	4	1.034	0.084548676	#MRFsoCAL
1985	1	4	2.224	0.091706845	#MRFsoCAL
1986	1	4	1.91	0.105307369	#MRFsoCAL
1987	1	4	0.275	0.448819689	#MRFsoCAL
1988	1	4	0.169	0.387042386	#MRFsoCAL
1989	1	4	0.997	0.137842628	#MRFsoCAL
1993	1	4	1.631	0.255474245	#MRFsoCAL
1994	1	4	1.732	0.142670896	#MRFsoCAL
1995	1	4	0.448	0.358378941	#MRFsoCAL
1996	1	4	0.246	0.203184778	#MRFsoCAL
1997	1	4	0.395	0.38023361	#MRFsoCAL
1998	1	4	0.234	0.202021118	#MRFsoCAL
1999	1	4	0.566	0.091309348	#MRFsoCAL
2000	1	4	1.098	0.086438291	#MRFsoCAL
2001	1	4	1.28	0.113037949	#MRFsoCAL
2002	1	4	2.01	0.08355396	#MRFsoCAL

1980	1	5	0.917	0.118186092	#MRFnorth
1981	1	5	1.28	0.170552193	#MRFnorth
1982	1	5	1.326	0.131232941	#MRFnorth
1983	1	5	1.377	0.143163299	#MRFnorth
1984	1	5	0.388	0.126294711	#MRFnorth
1985	1	5	0.75	0.081166137	#MRFnorth
1986	1	5	1.39	0.07061189	#MRFnorth
1987	1	5	0.914	0.154768554	#MRFnorth
1988	1	5	0.294	0.1734864	#MRFnorth
1989	1	5	0.457	0.157321533	#MRFnorth
1993	1	5	0.202	0.345617372	#MRFnorth
1994	1	5	0.351	0.236456026	#MRFnorth
1995	1	5	0.482	0.197847986	#MRFnorth
1996	1	5	0.535	0.099354307	#MRFnorth
1997	1	5	0.42	0.125405334	#MRFnorth
1998	1	5	0.432	0.14513239	#MRFnorth
1999	1	5	0.802	0.066825326	#MRFnorth
2000	1	5	1.961	0.089420947	#MRFnorth
2001	1	5	2.022	0.115414586	#MRFnorth
2002	1	5	2.618	0.162618942	#MRFnorth

1951	1	7	0.80433779	0.2598427	#CalCOFIindex
1952	1	7	0.81633209	0.2195144	#CalCOFIindex
1953	1	7	1.07678184	0.1940405	#CalCOFIindex
1954	1	7	1.50849605	0.1584493	#CalCOFIindex
1955	1	7	1.21963136	0.1809103	#CalCOFIindex
1956	1	7	0.76244861	0.2581162	#CalCOFIindex
1957	1	7	1.62809823	0.2087456	#CalCOFIindex
1958	1	7	1.24526196	0.1865469	#CalCOFIindex
1959	1	7	0.40285729	0.2042333	#CalCOFIindex
1960	1	7	0.58397297	0.1791704	#CalCOFIindex
1961	1	7	0.69494994	0.2838339	#CalCOFIindex
1962	1	7	0.60138636	0.2459703	#CalCOFIindex
1963	1	7	0.99195987	0.2476998	#CalCOFIindex
1964	1	7	0.60958227	0.2540632	#CalCOFIindex
1965	1	7	0.80379947	0.2151925	#CalCOFIindex
1966	1	7	1.50196417	0.176161	#CalCOFIindex
1967	1	7	0.77217846	0.3476226	#CalCOFIindex
1968	1	7	2.70216315	0.2621446	#CalCOFIindex
1969	1	7	2.48439648	0.1406889	#CalCOFIindex
1970	1	7	0.75751541	0.4996026	#CalCOFIindex
1972	1	7	1.91939638	0.1446257	#CalCOFIindex
1975	1	7	2.06196014	0.1505552	#CalCOFIindex
1976	1	7	2.82888545	0.3382743	#CalCOFIindex
1978	1	7	1.04644442	0.212615	#CalCOFIindex
1981	1	7	0.96993804	0.2252523	#CalCOFIindex
1983	1	7	0.30179688	0.4327933	#CalCOFIindex
1984	1	7	1.00486872	0.2092068	#CalCOFIindex
1985	1	7	0.30053381	0.4627507	#CalCOFIindex
1986	1	7	0.42943603	0.4951728	#CalCOFIindex
1987	1	7	0.96144504	0.3670375	#CalCOFIindex
1988	1	7	0.72857066	0.2582412	#CalCOFIindex
1989	1	7	0.7744805	0.3958791	#CalCOFIindex
1990	1	7	0.49987268	0.3798154	#CalCOFIindex
1991	1	7	0.73391207	0.2941416	#CalCOFIindex
1992	1	7	0.7299093	0.2747813	#CalCOFIindex
1993	1	7	0.18050422	0.5705712	#CalCOFIindex
1994	1	7	0.26724335	0.3022706	#CalCOFIindex
1995	1	7	0.11122682	0.751706	#CalCOFIindex
1996	1	7	1.32795399	0.3012392	#CalCOFIindex
1997	1	7	0.28505355	0.3717163	#CalCOFIindex

1998	1	7	0.09616612	0.5342902	#CalCOFIindex
1999	1	7	0.27960981	0.451355 #CalCOFIindex	
2000	1	7	0.22851335	0.4078098	#CalCOFIindex
2001	1	7	0.11120509	0.4290012	#CalCOFIindex
2002	1	7	0.47653658	0.3639474	#CalCOFIindex
2003	1	7	0.52081887	0.2688129	#CalCOFIindex
2004	1	7	0.58379475	0.3752357	#CalCOFIindex
2005	1	7	0.63029617	0.3016986	#CalCOFIindex
2006	1	7	0.62487578	0.3083086	#CalCOFIindex
2007	1	7	0.53908393	0.3259584	#CalCOFIindex
2008	1	7	0.69476869	0.3225698	#CalCOFIindex

1980	1	8	2227.932433	0.149683111	#TRIENNIAL
1983	1	8	1849.416128	0.176692006	#TRIENNIAL
1986	1	8	723.6568073	0.159390796	#TRIENNIAL
1989	1	8	529.7149835	0.143672021	#TRIENNIAL
1992	1	8	319.1654707	0.228586262	#TRIENNIAL
1995	1	8	192.9998349	0.194757645	#TRIENNIAL
1998	1	8	56.92735471	0.301249017	#TRIENNIAL
2001	1	8	121.4857726	0.261983439	#TRIENNIAL
2004	1	8	439.3928644	0.214285691	#TRIENNIAL

1987	1	9	3.545	0.161148115	#VandenbergCPUE
1988	1	9	2.349	0.140405176	#VandenbergCPUE
1989	1	9	3.001	0.121154053	#VandenbergCPUE
1990	1	9	6.009	0.14611662	#VandenbergCPUE
1991	1	9	4.637	0.172508578	#VandenbergCPUE
1992	1	9	3.543	0.12570181	#VandenbergCPUE
1993	1	9	2.319	0.131726504	#VandenbergCPUE
1994	1	9	1.46	0.168399042	#VandenbergCPUE
1995	1	9	1.721	0.15083795	#VandenbergCPUE
1996	1	9	1.457	0.169280019	#VandenbergCPUE
1997	1	9	1.823	0.157419694	#VandenbergCPUE
1998	1	9	1.646	0.215088204	#VandenbergCPUE

2004	1	10	0.1673	0.210	#S_Cal_Hook_line
2005	1	10	0.1417	0.227	#S_Cal_Hook_line
2006	1	10	0.1613	0.217	#S_Cal_Hook_line
2007	1	10	0.1445	0.220	#S_Cal_Hook_line
2008	1	10	0.1229	0.2202	#S_Cal_Hook_line

2003	1	11	475	0.24	#	NWFSC Combo survey
2004	1	11	1857	0.23	#	NWFSC Combo survey
2005	1	11	673	0.20	#	NWFSC Combo survey
2006	1	11	1052	0.23	#	NWFSC Combo survey
2007	1	11	998	0.26	#	NWFSC Combo survey
2008	1	11	517	0.26	#	NWFSC Combo survey

2001	1	12	0.40	0.018	# Juvenile index
2002	1	12	0.59	0.018	# Juvenile index
2003	1	12	0.16	0.026	# Juvenile index
2004	1	12	0.39	0.017	# Juvenile index
2005	1	12	0.54	0.024	# Juvenile index
2006	1	12	0.09	0.017	# Juvenile index
2007	1	12	0.21	0.018	# Juvenile index
2008	1	12	0.23	0.018	# Juvenile index

# Pier Index	32	obs

1954	1	13	0.1	0.832
1955	1	13	0.01	1.085
1956	1	13	0.1	0.832
1957	1	13	0.01	1.085
1958	1	13	0.017	1.539
1966	1	13	0.849	0.74
1980	1	13	0.117	0.564
1981	1	13	0.018	0.712
1982	1	13	0.01	1.085
1983	1	13	0.01	1.085
1984	1	13	0.089	0.566
1985	1	13	0.059	0.609
1986	1	13	0.065	0.547
1987	1	13	0.079	0.539
1988	1	13	0.161	0.384
1989	1	13	0.039	0.897
1993	1	13	0.101	0.557
1994	1	13	0.01	1.085
1995	1	13	0.029	0.86
1996	1	13	0.01	1.085
1997	1	13	0.01	1.085
1998	1	13	0.01	1.085
1999	1	13	0.088	0.667
2000	1	13	0.01	1.085
2001	1	13	0.01	1.085
2002	1	13	0.01	1.085
2003	1	13	0.019	0.71
2004	1	13	0.01	1.085
2005	1	13	0.045	0.775
2006	1	13	0.01	1.085
2007	1	13	0.01	1.085
2008	1	13	0.01	1.085

2 #_discard_type (1=bio or num; 2=fraction)
0 #_N_discard_obs

0 #_N_meanbodywt_obs

2 # length bin method: 1=use databins; 2=generate from binwidth,min,max below; 3=read vector
2 # binwidth for population size comp
10 # minimum size in the population (lower edge of first bin and size at age 0.00)
94 # maximum size in the population (lower edge of last bin)

-1 #_comp_tail_compression
1e-007 #_add_to_comp
0 #_combine males into females at or below this bin number
29 #_N_LengthBins
16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 72 76

200 #_N_Length_obs
# trawl fishery south of 38	26	currently#fish	Female

Male

#Yr	Seas	Flt/Svy	Gender	Part	Stewart, max400		16	18	20	22	24	26
	28	30	32	34	36	38	40	42	44	46	48	50
	52	54	56	58	60	62	64	66	68	72	76	16

	18	20	22	24	26	28	30	32	34	36	38	40
	42	44	46	48	50	52	54	56	58	60	62	64
	66	68	72	76								
1978	1	1	3	0	196.8	0	0	0	0	0	4	20
	40	26	15	8	13	19	20	47	67	54	32	30
	19	26	17	15	12	8	10	6	3	1	0	0
	0	0	0	2	14	13	10	4	10	19	27	48
	80	60	60	23	22	23	17	10	3	4	0	0
	1	0	1									
1979	1	1	3	0	211.7	0	1	0	0	0	3	31
	55	64	75	66	42	27	20	17	29	41	48	52
	36	15	18	15	11	7	3	7	4	2	0	0
	1	0	0	1	4	3	16	26	19	18	12	17
	39	55	70	33	21	24	16	13	5	2	0	0
	1	0	0									
1980	1	1	3	0	244.8	0	0	0	0	0	0	0
	3	2	5	10	33	115	111	65	14	6	16	24
	30	20	17	13	10	11	9	15	6	5	0	0
	0	0	0	1	0	0	1	7	20	63	101	68
	23	23	33	24	27	20	16	7	9	7	1	0
	1	0	0									
1981	1	1	3	0	165	0	0	0	0	0	0	1
	6	7	2	2	4	9	35	87	80	32	8	4
	8	9	12	5	7	4	2	1	2	0	0	0
	0	0	0	0	0	3	3	4	8	6	26	79
	73	27	11	20	14	11	10	5	2	1	1	0
	0	0	0									
1982	1	1	3	0	342	0	0	0	0	0	0	1
	2	6	2	11	37	62	56	52	55	75	91	83
	47	19	18	27	26	20	18	7	5	9	0	0
	0	0	0	0	1	1	8	10	20	49	59	62
	91	162	116	58	40	42	27	20	12	4	4	0
	0	0	0									
1983	1	1	3	0	349	0	0	0	0	0	0	0
	0	1	1	6	11	16	33	70	74	71	73	142
	100	41	25	29	14	22	16	10	6	11	0	0
	0	0	0	0	1	2	1	3	9	11	25	66
	111	132	148	94	68	60	25	16	9	3	2	0
	0	0	0									
1984	1	1	3	0	400	0	0	0	0	0	0	0
	0	0	1	0	8	11	26	45	48	60	78	93
	97	110	71	47	26	27	20	16	12	13	0	0
	0	0	0	0	0	0	1	1	5	10	31	57
	94	134	155	165	133	100	53	23	16	9	3	2
	0	0	0									
1985	1	1	3	0	340.8	0	0	0	0	1	3	18
	22	35	15	1	5	8	8	15	31	43	40	58
	31	43	49	37	22	9	11	15	10	7	0	0
	0	0	0	6	9	12	21	7	3	3	11	33
	43	63	77	96	94	62	35	24	7	2	3	3
	0	0	0									
1986	1	1	3	0	369	0	0	0	0	0	0	1
	36	88	157	231	191	120	37	13	7	9	18	26
	28	16	24	24	15	8	4	2	3	0	0	0
	0	0	0	3	2	19	82	155	184	150	69	16
	11	13	20	35	23	22	18	6	3	1	1	0
	0	1	0									
1987	1	1	3	0	342.9	0	0	0	0	0	0	0
	0	5	30	53	83	173	227	173	64	6	11	9
	9	16	11	9	7	3	2	0	1	0	0	0
	0	0	0	0	1	5	17	42	59	124	215	203

	101	15	10	22	20	28	10	2	2	0	0	0
	0	0	0									
1988	1	1	3	0	258.3	0	0	0	0	0	1	1
	7	13	15	19	24	46	82	97	117	82	41	18
	10	8	7	9	5	7	3	2	1	0	0	0
	0	0	0	0	1	3	8	9	25	40	72	102
	152	83	36	9	15	18	5	2	1	0	0	1
	1	0	0									
1989	1	1	3	0	189.4	0	0	0	0	0	0	4
	13	15	27	43	27	16	15	22	28	25	42	28
	15	4	6	2	2	2	4	3	0	1	0	0
	0	0	0	2	4	11	22	27	29	28	29	28
	45	64	47	17	9	4	6	3	1	0	1	0
	0	0	0									
1990	1	1	3	0	314.4	0	0	0	0	0	0	2
	18	65	141	121	124	90	22	32	10	17	11	11
	24	13	8	7	2	0	4	2	1	0	0	0
	0	0	0	0	4	38	87	138	147	131	65	29
	23	22	31	19	15	10	6	5	1	0	0	0
	0	0	0									
1991	1	1	3	0	361.7	0	0	0	0	0	0	4
	8	5	7	24	95	194	211	133	71	40	20	16
	23	21	25	15	3	7	2	4	3	3	0	0
	0	0	0	2	6	10	5	10	49	156	259	181
	106	51	35	33	24	24	10	8	0	6	1	0
	1	0	0									
1992	1	1	3	0	260	0	0	0	0	0	1	2
	8	32	28	33	18	15	39	107	150	85	39	24
	14	22	20	22	15	10	6	2	3	2	0	0
	0	0	0	0	1	7	17	25	29	21	54	113
	149	89	49	46	19	20	10	13	4	5	2	0
	0	0	0									
1993	1	1	3	0	219.6	0	0	0	0	0	0	2
	15	30	19	17	53	57	43	51	55	56	48	28
	20	20	12	7	4	3	2	1	0	0	0	0
	0	0	0	0	1	8	22	19	31	46	60	71
	93	63	36	21	22	14	7	5	1	0	0	0
	0	0	0									
1994	1	1	3	0	94.1	0	0	0	0	0	0	0
	0	0	1	6	13	9	12	11	15	12	16	15
	8	4	0	4	1	2	1	0	1	1	0	0
	0	0	0	0	0	0	1	4	5	9	11	26
	29	43	22	9	9	8	0	2	1	1	1	0
	0	0	0									
1995	1	1	3	0	76.1	0	0	0	0	0	0	0
	0	0	0	0	0	2	4	5	13	13	8	27
	8	6	4	3	4	3	3	1	1	0	0	0
	0	0	0	0	0	0	0	1	1	1	4	9
	21	42	23	19	9	3	0	1	0	1	0	0
	0	0	0									
1996	1	1	3	0	82.1	0	0	0	0	0	0	0
	0	1	0	2	1	2	16	8	2	16	22	29
	18	17	14	10	5	1	0	1	0	0	0	0
	0	1	0	0	0	1	0	0	3	1	10	12
	19	30	59	21	9	11	4	2	1	0	0	0
	0	0	0									
1997	1	1	3	0	103.7	0	0	0	0	0	1	0
	0	0	0	2	2	3	3	8	12	13	20	31
	16	15	14	14	5	6	7	1	5	4	0	0
	0	0	0	0	0	0	0	1	1	7	8	14
	12	31	23	29	16	15	7	12	5	2	1	2
	0	0	0									

1998	1	1	3	0	59.7	0	0	0	0	0	0	0
	0	2	6	6	6	2	6	8	7	10	16	9
	10	13	9	8	3	2	8	1	0	0	0	0
	0	0	0	0	0	1	3	9	5	5	6	8
	9	19	23	27	10	13	8	0	2	0	0	1
	0	0	0									
1999	1	1	3	0	78.5	0	0	0	0	0	0	0
	0	0	0	4	17	27	16	10	8	13	15	15
	11	14	8	7	5	7	2	0	0	1	0	0
	0	0	0	0	0	1	1	5	4	22	17	16
	16	21	27	44	38	16	5	3	1	0	0	0
	0	0	0									
2000	1	1	3	0	25.2	0	0	0	0	0	0	0
	4	6	3	1	3	1	6	4	8	7	6	3
	1	0	3	0	1	1	0	0	0	0	0	0
	0	0	0	0	0	6	4	3	5	2	5	1
	7	6	4	1	1	0	0	0	0	0	0	0
	0	0	0									
2001	1	1	3	0	92.2	0	0	0	0	0	0	3
	10	39	31	17	34	15	9	2	9	15	12	17
	7	7	2	6	1	5	1	1	0	0	0	0
	0	0	0	0	2	15	42	23	21	19	6	7
	7	17	22	14	7	3	1	1	1	0	0	0
	0	0	0									
2002	1	1	3	0	38	0	0	0	0	0	0	0
	0	0	0	1	6	9	13	10	5	1	1	7
	7	6	3	3	6	6	0	0	0	1	0	0
	0	0	0	0	0	0	1	2	2	10	14	15
	5	6	4	8	5	2	1	0	0	0	0	0
	0	0	0									
#2003	1	1	3	0	1.2	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2004	1	1	3	0	33.2	0	0	0	0	0	0	1
	0	0	1	1	0	0	1	3	2	5	8	17
	18	13	1	6	2	4	0	1	0	0	0	0
	0	0	0	0	0	1	0	0	0	1	2	1
	3	3	9	8	5	1	0	0	0	0	0	0
	0	0	0									
#2005	1	1	3	0	1.5	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	1	0	0	0	0	0	0	0
	0	0	0									
#2007	1	1	3	0	5.3	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	1	0	0
	1	0	2	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	1	0	0	0	0	0	0
	0	0	0									
#2008	1	1	3	0	2.2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1	0
	0	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									

#

#Yr	Seas	Flt/Svy	Gender	Part	Stewart, max400		16	18	20	22	24	26
	28	30	32	34	36	38	40	42	44	46	48	50
	52	54	56	58	60	62	64	66	68	72	76	16
	18	20	22	24	26	28	30	32	34	36	38	40
	42	44	46	48	50	52	54	56	58	60	62	64
	66	68	72	76								
1979	1	2	3	0	5.3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	1	1
	1	0	0	0	0	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	1
	0	1	1	4	0	1	1	1	1	0	0	0
	0	0	0									
1980	1	2	3	0	18.9	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	1	0	0	0
	1	3	1	1	4	4	3	2	1	6	0	0
	0	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	1	1	1	4	6	4	3	1	0
	0	0	0									
1982	1	2	3	0	17.7	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	3	1
	0	2	2	1	2	1	0	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	1	0	2	0	0	0
	0	1	0									
1983	1	2	3	0	18.5	0	0	0	0	0	0	0
	0	0	0	0	0	2	0	1	3	1	2	5
	2	3	5	0	1	1	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1	3
	1	2	1	3	5	4	3	3	0	1	0	0
	0	0	0									
1984	1	2	3	0	22.4	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0	1
	2	3	3	0	3	2	2	1	2	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	1	2	5	7	5	4	0	2	0	0	0
	0	0	0									
1985	1	2	3	0	34.9	0	0	0	0	0	0	0
	0	0	1	0	3	2	2	6	9	4	5	9
	4	3	2	1	0	0	1	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	1	2	11
	2	5	3	5	7	3	2	0	0	0	0	0
	0	0	0									
1986	1	2	3	0	72.7	0	0	0	0	0	0	1
	0	0	2	1	4	6	4	2	3	17	9	14
	17	14	13	16	5	5	0	0	0	0	0	0
	0	0	0	0	0	1	3	4	3	2	3	3
	2	4	17	23	25	20	11	2	3	0	0	0
	0	0	0									
1987	1	2	3	0	56.3	0	0	0	0	0	0	0
	1	0	1	6	7	11	8	15	9	6	6	5
	11	5	6	3	1	2	0	0	0	0	0	0
	0	0	0	0	0	0	3	4	12	13	10	10
	13	6	16	12	6	6	3	4	3	0	1	1
	1	0	0									
1988	1	2	3	0	23.3	0	0	0	0	0	0	0
	0	0	0	0	2	1	1	8	5	9	9	4
	1	4	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	0	10

	7	5	3	5	2	1	0	1	0	0	0	0
	0	0	0									
1989	1	2	3	0	44.4	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	5	5	9	7	7
	10	4	7	1	3	0	1	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	2
	7	7	6	12	7	1	5	2	2	0	0	1
	0	0	0									
1990	1	2	3	0	23.3	0	0	0	0	0	0	0
	0	0	0	0	4	2	0	3	2	6	1	2
	7	0	2	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	3	4	4	3
	5	2	7	5	3	2	0	0	0	0	0	0
	0	0	0									
1991	1	2	3	0	49.8	0	0	0	0	0	0	0
	0	0	1	0	0	4	6	6	3	4	3	4
	3	6	7	4	5	1	0	2	0	1	0	0
	0	0	0	0	1	0	0	0	1	2	10	10
	4	8	1	3	8	6	3	1	1	0	2	1
	0	0	0									
1992	1	2	3	0	111.4	0	0	0	0	0	0	0
	0	0	5	8	8	2	10	25	46	37	15	5
	9	2	4	6	4	3	0	2	1	1	0	0
	0	0	0	0	0	0	0	1	9	2	4	16
	37	25	10	13	5	7	4	0	2	0	1	0
	0	0	0									
1993	1	2	3	0	109.9	0	0	0	0	0	0	0
	0	0	2	0	2	4	14	16	48	25	15	11
	5	3	4	1	2	2	0	0	0	0	0	0
	0	0	0	0	0	1	1	2	2	2	7	17
	19	11	10	8	3	0	2	0	0	0	0	0
	0	0	0									
1994	1	2	3	0	86.2	0	0	0	0	0	0	0
	0	0	0	0	0	4	2	10	13	8	21	28
	22	12	6	4	6	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	1	3	3
	9	14	19	8	10	4	1	2	0	0	0	0
	0	0	0									
1995	1	2	3	0	39.4	0	0	0	0	0	0	0
	0	0	0	0	0	0	3	5	1	3	11	10
	10	9	5	2	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	1	5
	2	10	5	2	1	0	0	2	1	0	0	0
	0	0	0									
1996	1	2	3	0	105.8	0	0	0	0	0	0	0
	0	0	1	1	0	7	10	10	15	24	33	26
	21	23	12	4	1	3	0	1	0	2	0	0
	0	0	0	0	0	0	0	2	4	2	9	12
	21	20	28	12	7	3	3	1	0	0	0	0
	0	0	0									
1997	1	2	3	0	76.5	0	0	0	0	0	0	0
	0	0	0	0	0	1	2	5	10	17	21	38
	44	25	17	10	5	2	2	3	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	1	5
	4	12	12	14	5	5	2	1	0	0	0	0
	0	0	0									
1998	1	2	3	0	58.3	0	0	0	0	0	0	0
	0	0	0	1	1	1	5	8	13	16	14	17
	17	10	11	3	1	0	2	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	1	3	5
	11	10	12	8	8	5	3	0	1	0	3	0
	0	0	0									

1999	1	2	3	0	23.5	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	2	2	6	8	6
	9	11	4	2	2	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0	0
	1	2	4	10	3	7	4	3	5	1	1	1
	0	0	0									
2000	1	2	3	0	16	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	1	1	1	2	2
	3	2	2	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1	0
	6	1	3	2	3	1	1	3	2	3	1	1
	0	0	0									
2001	1	2	3	0	40.9	0	0	0	0	0	0	0
	0	1	3	10	5	0	3	1	4	3	5	6
	11	5	8	4	5	3	2	0	2	0	0	0
	0	0	0	0	0	1	2	2	8	3	2	1
	3	7	3	6	6	7	5	5	7	3	0	0
	0	0	0									
2002	1	2	3	0	6.9	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	1	0	1	3	3
	2	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	0	0	0	0	0	0	0
	0	0	0									
#												

#Yr	Seas	Flt/Svy	Gender	Part	Stewart, max400		16	18	20	22	24	26
	28	30	32	34	36	38	40	42	44	46	48	50
	52	54	56	58	60	62	64	66	68	72	76	16
	18	20	22	24	26	28	30	32	34	36	38	40
	42	44	46	48	50	52	54	56	58	60	62	64
	66	68	72	76								
1978	1	3	3	0	19	0	0	0	0	0	0	0
	0	0	0	0	3	3	3	3	2	7	4	2
	2	2	1	1	1	1	1	1	2	1	0	0
	0	0	0	0	0	0	0	0	0	0	3	1
	4	9	5	4	1	2	1	1	0	0	1	0
	0	0	1									
#1979	1	3	3	0	3.7	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	2	0	0	0	0
	1	0	2	1	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	1
	2	2	3	1	0	1	0	0	0	0	0	0
	0	0	0									
#1982	1	3	3	0	2.2	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	1	0
	0	1	0	0	1	0	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1	0
	0	1	0	0	0	0	0	0	1	0	0	0
	0	0	0									
1983	1	3	3	0	41.2	0	0	0	0	0	0	0
	0	0	0	0	1	0	2	3	2	5	3	3
	5	3	1	0	0	3	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1	1
	4	5	1	4	2	5	1	2	0	0	0	0
	0	0	0									
1984	1	3	3	0	88.3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	2	4
	2	2	1	1	3	1	0	0	1	1	0	0

	0	0	0	0	0	0	0	0	0	0	0	0
	1	2	4	7	2	5	5	0	1	0	0	0
	0	0	0									
1985	1	3	3	0	348.5	1	1	2	2	1	0	0
	1	0	0	1	4	8	14	38	35	47	38	32
	22	28	25	17	12	14	7	3	3	5	0	2
	3	0	5	0	0	1	0	0	1	3	4	23
	63	88	103	60	42	32	24	15	11	3	7	1
	0	0	0									
1986	1	3	3	0	338.8	0	0	0	0	0	0	0
	0	2	1	0	2	7	7	4	8	28	56	67
	80	99	67	37	21	14	7	8	2	9	0	0
	0	0	0	0	0	0	0	0	1	9	3	8
	10	24	91	133	158	159	84	30	12	7	4	0
	0	1	0									
1987	1	3	3	0	263.7	0	0	0	0	0	0	0
	0	0	0	0	4	16	42	65	45	20	20	28
	57	44	48	35	17	11	5	4	2	3	0	0
	0	0	0	0	0	0	0	0	5	7	35	63
	42	36	45	67	107	93	43	26	7	3	3	1
	0	0	0									
1988	1	3	3	0	225.4	1	0	0	0	0	0	0
	0	1	1	0	2	5	24	61	105	111	62	38
	20	16	10	14	8	7	4	4	1	1	0	0
	0	0	0	0	0	0	1	0	2	2	13	34
	104	113	72	34	31	19	10	12	8	5	2	0
	2	0	0									
1989	1	3	3	0	323.3	0	0	0	0	0	0	0
	2	0	4	3	4	4	12	43	89	130	120	117
	84	45	30	6	8	9	5	4	3	1	0	0
	0	0	0	0	0	1	1	0	0	1	13	28
	90	165	155	100	50	26	21	12	8	5	0	1
	0	1	0									
1990	1	3	3	0	232.4	0	0	0	0	0	0	0
	0	1	2	7	33	49	24	45	60	41	58	53
	60	35	25	11	11	4	4	3	1	0	0	0
	0	0	0	1	0	0	0	1	12	16	28	23
	46	61	76	60	39	15	5	5	1	0	0	0
	0	0	0									
1991	1	3	3	0	89.9	0	0	0	0	0	0	0
	0	0	1	2	5	21	51	51	34	21	10	8
	6	5	4	4	2	0	1	2	0	1	0	0
	0	0	0	0	0	0	0	4	1	8	26	28
	24	16	14	15	11	4	3	0	1	0	0	0
	0	0	0									
1992	1	3	3	0	234.6	0	0	0	0	0	0	0
	0	0	3	6	8	7	20	83	151	164	106	50
	20	12	16	6	11	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	3	3	8	15	64
	147	145	66	29	22	13	4	2	1	0	0	0
	0	0	0									
1993	1	3	3	0	111.6	0	0	0	0	0	0	0
	3	5	0	7	3	8	9	41	69	51	29	12
	19	11	15	3	5	0	1	0	0	0	0	0
	0	0	0	0	0	0	3	1	1	3	6	33
	37	31	13	10	11	6	1	0	0	0	0	0
	0	0	0									
1994	1	3	3	0	80	0	0	0	0	0	0	0
	0	0	0	0	0	1	2	7	14	29	24	20
	10	0	1	2	2	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	2	5

	19	21	15	11	4	3	1	0	0	0	0	0
	0	0	0									
1995	1	3	3	0	70.1	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	6	3	12	16	31
	17	8	2	9	1	4	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1	6
	16	27	24	8	6	2	2	0	0	0	0	0
	0	0	0									
1996	1	3	3	0	43.6	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	3	10	12	19
	10	4	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	4	17	21	10	5	2	0	1	0	0	0	0
	0	0	0									
1997	1	3	3	0	24.5	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	2	0	7	6	8
	8	6	1	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1	1
	3	10	12	7	3	2	2	0	0	0	0	0
	0	0	0									
1998	1	3	3	0	33.5	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	1	6	4	16	16
	10	9	3	5	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	2	1
	5	6	13	16	6	4	0	0	0	1	0	0
	0	0	0									
#1999	1	3	3	0	4.5	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	1	4	5
	7	5	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	1	0	0	0	0	0	0	0	0
	0	0	0									
#2002	1	3	3	0	4.4	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	2	0	7	11	4	0	0	0	0	0	0
	0	0	0									
#2004	1	3	3	0	4.3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	1
	0	2	0	4	2	3	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	1	0	0	0	0	0	0
	0	0	0									

#Yr	Seas	Flt/Svy	Gender	Part	Neff	16	18	20	22	24	26	28
	30	32	34	36	38	40	42	44	46	48	50	52
	54	56	58	60	62	64	66	68	72	76	16	18
	20	22	24	26	28	30	32	34	36	38	40	42
	44	46	48	50	52	54	56	58	60	62	64	66
	68	72	76									
1980	1	4	0	0	400	4	2	3	20	30	63	64
	101	87	208	427	435	312	169	173	104	68	89	68
	52	64	33	15	5	4	5	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1981	1	4	0	0	400	1	1	2	7	13	31	74
	116	181	172	197	177	176	187	256	210	118	76	67
	60	45	31	18	6	6	1	1	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1982	1	4	0	0	386	0	0	0	0	3	5	16
	25	27	44	108	207	208	164	213	253	190	121	83
	59	51	18	11	4	5	1	2	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1983	1	4	0	0	196.4	0	0	0	1	0	0	3
	7	8	45	59	66	61	62	59	73	42	35	42
	38	45	19	10	9	12	2	7	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1984	1	4	0	0	262.9	23	17	35	29	9	2	8
	4	6	6	14	17	35	48	59	87	46	53	30
	23	17	11	4	4	5	0	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1985	1	4	0	0	330.6	1	10	27	74	126	96	94
	185	194	104	42	11	17	22	35	53	49	57	49
	35	26	11	12	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1986	1	4	0	0	298.2	5	5	5	13	36	47	52
	60	145	284	264	133	63	16	18	19	20	27	19
	21	25	3	9	5	3	0	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1987	1	4	0	0	50.2	0	0	2	3	5	7	11
	7	5	10	12	20	12	6	9	7	3	0	5
	4	3	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1988	1	4	0	0	49.9	0	0	0	1	3	4	3
	1	2	3	9	9	8	5	10	7	6	1	3
	3	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1989	1	4	0	0	117.4	0	0	3	8	18	19	37
	42	53	54	18	24	22	29	32	30	25	21	11
	9	5	9	5	4	4	3	1	2	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1993	1	4	0	0	24.3	0	0	0	0	0	0	1
	3	1	9	8	2	3	4	3	4	2	5	2
	2	2	1	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1994	1	4	0	0	34.8	0	0	0	0	0	1	0
	2	0	6	5	8	10	11	11	3	8	10	5
	2	2	1	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									

1995	1	4	0	0	21.8	0	0	0	0	0	0	0
	1	0	0	1	0	2	0	7	4	2	4	6
	3	2	2	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1996	1	4	0	0	51	0	0	0	1	1	3	3
	7	7	6	3	7	1	5	7	7	7	12	7
	11	11	4	2	1	0	1	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1997	1	4	0	0	22.3	0	0	0	0	0	0	1
	4	0	1	8	6	10	3	2	5	0	4	5
	0	1	0	2	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1998	1	4	0	0	53.4	0	0	0	0	0	1	0
	2	5	8	5	9	10	13	7	7	15	6	3
	4	5	3	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1999	1	4	0	0	181.4	7	13	11	8	3	0	2
	5	3	9	8	7	11	21	25	38	44	53	41
	50	33	28	19	12	1	3	3	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2000	1	4	0	0	167.5	0	0	2	2	20	43	58
	66	46	41	12	11	7	8	8	16	19	29	22
	35	24	19	16	11	7	4	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2001	1	4	0	0	109.4	0	0	0	1	0	6	18
	42	72	69	49	43	18	11	9	5	8	8	6
	3	3	3	2	2	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2002	1	4	0	0	201.3	0	0	0	0	0	0	3
	3	7	23	62	112	129	113	95	37	20	25	31
	18	12	11	13	2	1	1	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2003	1	4	0	0	36.8	0	0	0	0	0	2	0
	0	0	0	0	2	14	16	21	29	17	4	5
	6	0	3	1	1	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2004	1	4	0	0	325.8	1	3	5	14	8	17	27
	44	24	27	20	25	48	55	105	135	116	97	52
	37	21	8	8	5	4	2	2	0	2	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2005	1	4	0	0	399.9	0	2	0	0	3	6	20
	77	148	195	185	143	91	54	58	74	86	84	83

	68	34	17	8	6	3	3	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2006	1	4	0	0	400	1	0	1	2	8	17	28
	29	46	69	128	224	334	263	169	96	80	72	98
	82	56	28	13	6	2	4	2	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2007	1	4	0	0	400	2	3	0	5	5	18	44
	74	133	228	173	167	158	184	208	209	148	107	74
	68	58	38	24	3	6	0	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2008	1	4	0	0	400	0	0	0	0	7	15	23
	27	51	74	151	247	267	193	209	171	120	88	65
	31	25	20	12	11	2	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
#												

#"year	Seas	Flt/Svy	Gender	Part	Stewart, max400		16	18	20	22	24	26
	28	30	32	34	36	38	40	42	44	46	48	50
	52	54	56	58	60	62	64	66	68	72	76	16
	18	20	22	24	26	28	30	32	34	36	38	40
	42	44	46	48	50	52	54	56	58	60	62	64
	66	68	72	76								
1978	1	5	3	0	-98	0	0	0	0	2	4	2
	4	0	3	5	8	7	9	28	32	15	14	7
	3	9	13	10	4	8	11	20	9	2	1	0
	0	0	0	3	1	1	3	1	5	5	11	7
	19	18	20	16	22	19	17	14	12	12	13	3
	0	1	1									
1979	1	5	3	0	-22	0	0	0	0	0	3	1
	7	25	44	26	7	0	4	7	20	14	11	11
	7	9	11	17	18	12	23	32	13	12	0	0
	0	0	0	0	2	4	2	4	4	3	7	4
	14	10	22	14	16	17	26	34	34	35	16	13
	4	3	1									
1980	1	5	3	0	-86.7	0	0	0	0	0	0	1
	0	1	4	2	15	33	23	9	5	4	4	3
	8	6	3	7	5	2	8	7	6	0	0	0
	0	0	0	2	1	0	1	0	12	15	20	6
	6	3	8	4	4	5	8	5	4	8	4	3
	2	0	0									
1981	1	5	3	0	-59.3	0	0	0	0	0	0	1
	0	11	13	2	1	4	8	9	15	19	5	4
	6	4	6	2	2	3	5	3	2	1	0	0
	0	0	0	0	2	0	6	8	5	3	4	6
	17	11	8	7	8	4	9	6	7	1	3	1
	2	0	0									
1982	1	5	3	0	-63	0	0	0	0	0	1	0
	0	0	1	5	3	3	8	7	5	14	16	15
	9	6	6	10	3	3	2	7	2	2	0	0
	0	0	0	2	0	0	0	0	0	2	4	3

	5	14	20	8	7	7	5	7	6	2	1	2
	1	0	0									
1983	1	5	3	0	-40.7	0	0	0	0	0	0	0
	0	0	0	0	1	3	6	3	10	4	3	10
	7	8	4	2	2	4	4	1	0	1	0	0
	0	0	0	0	1	0	2	0	1	0	4	5
	5	11	9	3	12	7	8	4	2	1	5	1
	0	0	0									
1984	1	5	3	0	-20.7	0	0	0	0	0	0	0
	0	0	0	1	0	1	2	4	0	1	7	2
	3	2	10	4	2	1	3	2	0	1	0	0
	0	0	0	0	0	0	0	3	0	0	4	4
	2	3	3	3	4	5	2	4	3	2	0	1
	0	0	0									

#YEAR

1980	1	5	0	0	104.7	0	1	0	1	5	4	11
	2	3	3	14	11	28	16	14	15	21	13	15
	13	4	12	10	7	3	11	7	4	4	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1981	1	5	0	0	68.7	1	0	1	0	0	0	0
	1	3	8	4	8	9	28	25	41	23	9	7
	14	11	13	11	6	7	7	8	5	2	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1982	1	5	0	0	92.9	0	0	0	0	1	0	0
	0	3	3	7	7	14	15	11	38	38	49	46
	24	21	8	3	11	7	1	4	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1983	1	5	0	0	95.5	0	0	0	0	0	0	3
	1	4	3	5	2	4	9	19	26	37	42	55
	53	36	23	13	8	10	3	1	0	2	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1984	1	5	0	0	94.8	1	1	1	1	0	0	0
	2	3	5	7	9	8	13	15	13	17	16	18
	13	9	6	12	2	7	4	2	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1985	1	5	0	0	175.4	2	5	12	38	52	53	63
	65	24	15	7	7	13	13	15	13	20	19	19
	15	13	21	14	14	8	7	4	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1986	1	5	0	0	234.9	0	0	1	5	8	8	18
	29	72	190	204	142	66	18	4	5	7	13	21
	17	19	24	19	15	11	14	8	3	1	0	0

	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1987	1	5	0	0	68	0	0	0	0	1	0	3
	3	15	24	33	27	18	9	6	4	3	4	3
	4	6	9	9	12	9	5	10	6	2	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1988	1	5	0	0	42.6	0	0	0	0	0	1	1
	1	2	1	4	4	4	4	1	6	5	4	4
	1	0	1	2	0	1	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1989	1	5	0	0	52.4	0	0	0	0	1	3	0
	2	5	4	24	11	3	3	7	13	15	10	8
	3	3	0	0	1	1	0	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
#YEAR	16	18	20	22	168	26	28	30	32	34	36	38
	40	42	44	46	48	50	52	54	56	58	60	62
	64	66	68	72	76	16	18	20	22	24	26	28
	30	32	34	36	38	40	42	44	46	48	50	52
	54	56	58	60	62	64	66	68	72	76		
1993	1	5	0	0	37.7	1	0	0	0	0	0	0
	0	1	6	5	2	3	4	4	6	4	4	6
	3	1	1	2	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1994	1	5	0	0	32.9	0	0	1	0	0	4	5
	3	3	1	3	4	9	5	1	3	1	1	2
	2	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1995	1	5	0	0	38.3	0	0	1	0	0	0	0
	2	4	5	6	6	1	6	8	6	9	3	4
	3	0	1	1	0	1	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1996	1	5	0	0	109.6	0	0	0	2	2	1	3
	7	9	15	13	9	19	16	16	13	11	6	14
	19	12	13	4	7	8	4	1	2	3	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1997	1	5	0	0	216.6	0	0	0	1	5	4	4
	2	10	21	25	32	44	31	60	48	53	63	71
	55	49	84	37	29	22	11	20	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1998	1	5	0	0	152.5	0	0	0	0	0	3	8
	9	22	18	24	13	26	35	40	43	41	41	31
	35	29	27	24	14	6	8	2	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1999	1	5	0	0	212.9	2	0	0	0	0	3	1
	2	3	14	22	30	49	38	39	43	63	47	55
	47	40	25	44	17	20	6	7	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2000	1	5	0	0	85.2	0	0	0	0	3	10	25
	18	11	11	18	10	14	13	19	22	11	14	8
	2	9	5	14	8	13	10	5	0	4	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2001	1	5	0	0	82.9	0	0	1	0	1	1	2
	3	23	36	55	33	12	14	18	19	20	20	22
	14	11	11	3	2	1	0	2	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2002	1	5	0	0	42.8	0	0	0	0	0	0	0
	0	1	2	12	26	44	29	17	1	8	6	10
	9	5	3	4	1	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2004	1	5	0	0	60	0	0	0	0	0	0	1
	0	2	1	3	2	9	6	5	9	4	9	4
	8	2	6	1	2	2	1	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2005	1	5	0	0	138.7	0	0	1	1	0	0	1
	5	3	5	4	6	10	8	16	26	24	39	37
	26	14	14	5	7	3	1	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2006	1	5	0	0	162.5	0	0	0	0	0	1	1
	1	3	6	3	11	19	17	15	24	22	23	26
	17	24	11	12	13	7	5	11	5	2	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2007	1	5	0	0	174.1	0	0	0	0	0	2	0
	1	5	7	11	15	14	26	25	18	22	12	14
	23	12	18	9	11	8	3	5	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2008	1	5	0	0	109.3	1	0	0	0	0	0	0
	0	1	0	2	6	13	16	19	14	14	17	10
	12	13	8	8	4	3	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									

#

#year	Seas	Flt/Svy	Gender	Part	Stewart, max400		16	18	20	22	24	26
	28	30	32	34	36	38	40	42	44	46	48	50
	52	54	56	58	60	62	64	66	68	72	76	16
	18	20	22	24	26	28	30	32	34	36	38	40
	42	44	46	48	50	52	54	56	58	60	62	64
	66	68	72	76								
1978	1	6	3	0	179.5	0	0	0	0	1	1	0
	0	0	0	0	0	3	5	27	52	42	16	8
	4	15	15	16	9	17	18	19	12	5	0	0
	0	0	0	0	0	0	0	0	0	1	7	18
	51	53	19	12	24	23	37	27	14	9	3	1
	0	0	0									
1979	1	6	3	0	67.4	0	0	0	0	0	0	0
	1	2	5	1	0	1	0	1	1	7	8	11
	4	3	2	6	3	5	4	5	2	3	0	0
	0	0	0	0	0	1	2	4	2	0	1	0
	2	7	13	6	5	8	14	9	11	4	1	1
	0	2	2									
1980	1	6	3	0	220.9	0	0	0	0	0	0	0
	0	0	8	17	61	96	55	44	10	3	7	8
	11	10	6	2	2	6	4	1	4	5	0	0
	0	0	0	0	0	0	0	7	28	77	71	39
	14	4	9	9	13	12	4	4	12	0	3	0
	0	0	0									
1981	1	6	3	0	195.2	0	0	0	0	0	0	0
	0	1	0	0	4	12	35	83	104	65	24	2
	0	3	0	2	2	4	2	4	6	5	0	0
	0	0	0	0	0	0	0	0	7	12	24	73
	111	65	15	2	6	6	11	7	10	5	3	2
	2	0	0									
1982	1	6	3	0	243.8	0	0	0	0	0	0	0
	0	0	1	3	19	19	38	13	36	67	94	90
	49	15	2	4	6	4	1	2	5	9	0	0
	0	0	0	0	0	0	0	2	9	19	21	19
	38	98	97	39	18	8	8	19	20	6	5	2
	0	0	0									
1983	1	6	3	0	365.8	0	0	0	0	0	0	0
	0	0	0	2	9	16	39	36	46	41	50	54
	110	79	31	11	7	11	11	11	11	28	0	0
	0	0	0	0	0	0	1	0	1	4	16	36
	50	51	111	126	64	25	20	17	28	21	10	2
	1	0	0									
1984	1	6	3	0	245.7	0	0	0	0	0	0	0
	0	0	0	1	0	0	2	10	14	21	28	37
	34	78	68	33	13	9	12	10	6	36	0	0
	0	0	0	0	0	0	0	0	1	0	4	9
	16	28	64	105	108	54	23	16	26	22	6	3
	0	0	0									
1985	1	6	3	0	196.1	0	0	0	0	0	0	0
	0	0	0	1	0	3	0	1	6	2	18	23
	23	28	43	55	20	9	3	3	3	9	0	0
	0	0	0	0	0	0	0	0	0	2	0	3
	9	11	23	55	85	78	31	17	17	8	6	0
	0	0	0									
1986	1	6	3	0	167.2	0	0	0	0	0	0	0
	0	0	4	14	13	9	5	0	1	0	4	7
	11	20	20	38	29	26	9	4	4	3	0	0
	0	0	0	0	0	1	4	9	32	21	15	4
	0	0	5	22	36	78	50	19	11	9	6	1
	1	0	0									
1987	1	6	3	0	255.6	0	0	0	0	0	0	0
	0	0	2	7	27	64	118	101	50	16	2	2

	3	4	9	17	22	26	25	9	2	7	0	0
	0	0	0	0	0	1	1	1	12	65	113	112
	58	14	5	4	21	43	36	26	12	6	3	2
	0	0	0									
1988	1	6	3	0	178.3	0	0	0	0	0	0	0
	0	0	0	0	10	6	21	37	54	63	30	15
	3	1	1	3	8	10	10	3	3	3	0	0
	0	0	0	0	0	0	0	1	0	10	20	39
	89	101	26	13	6	11	31	17	6	7	3	1
	0	0	0									
1989	1	6	3	0	129.2	0	0	0	0	0	0	1
	1	2	3	1	0	1	1	6	15	27	26	25
	20	13	3	2	3	3	5	4	0	1	0	0
	0	0	0	0	0	0	2	3	2	3	1	5
	17	45	68	34	16	6	25	24	6	5	2	2
	0	0	0									
1990	1	6	3	0	160.1	0	0	0	0	0	0	0
	0	6	10	8	14	18	13	10	15	9	6	15
	14	21	13	5	1	1	5	10	4	4	0	0
	0	0	0	0	2	6	14	17	18	20	24	20
	16	21	20	44	36	26	21	20	10	8	5	2
	0	0	0									
1991	1	6	3	0	124	0	0	0	0	0	0	0
	0	0	4	1	5	28	39	45	21	22	8	4
	9	20	18	9	7	2	2	2	1	2	0	0
	0	0	0	0	1	0	0	3	2	22	49	68
	36	20	13	17	25	21	13	14	18	8	1	0
	0	0	0									
1992	1	6	3	0	45.9	0	0	0	0	0	0	0
	0	0	1	1	1	0	0	6	17	18	13	9
	13	1	4	9	5	3	2	2	2	3	0	0
	0	0	0	0	0	0	0	0	0	1	0	7
	8	19	18	6	5	10	9	5	8	2	1	1
	0	0	0									
1993	1	6	3	0	43.7	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	2	3	10	10	19
	10	2	4	6	6	2	1	2	2	0	0	0
	0	0	0	0	0	0	0	0	1	0	3	5
	7	24	31	17	29	12	3	7	3	6	1	0
	0	0	0									
1994	1	6	3	0	53.5	0	0	0	0	0	0	0
	0	0	0	0	1	2	1	6	3	6	6	5
	10	14	8	7	4	4	6	1	4	1	0	0
	0	0	0	0	0	0	0	0	0	3	2	11
	18	11	22	35	29	14	10	11	7	5	4	1
	0	0	0									
1995	1	6	3	0	40.2	0	0	0	0	0	0	0
	0	1	0	0	0	1	1	1	1	2	2	2
	1	1	6	3	5	5	9	4	0	4	0	0
	0	0	0	0	1	0	1	1	1	0	0	3
	2	0	1	10	14	9	7	13	12	16	8	2
	4	0	0									
1996	1	6	3	0	18.1	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	0	1	0	3	2
	3	3	4	4	0	0	2	3	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	2	1	0	2	3	8	5	4	2	1	1	1
	0	0	0									
1997	1	6	3	0	17.6	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0	0
	0	1	0	3	4	3	2	0	3	7	0	0
	0	0	0	0	0	0	0	0	0	0	1	0

	0	0	0	2	3	8	9	5	6	4	4	3
	1	0	0									
1998	1	6	3	0	21.6	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	2	3	9	9	5
	2	0	0	2	7	8	5	5	2	3	0	0
	0	0	0	0	0	0	0	0	0	0	0	1
	3	1	1	1	3	3	8	12	5	1	2	1
	0	0	0									
1999	1	6	3	0	7.8	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	1	1	0	0	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	2	1	4	2	4	1	0
	0	0	0									
2000	1	6	3	0	13.9	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	3	0	1	0
	0	1	3	2	0	10	5	5	1	4	0	0
	0	0	0	0	0	0	0	0	0	0	1	0
	1	5	5	3	0	2	4	3	1	1	3	1
	0	0	0									
2001	1	6	3	0	7.2	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	1	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	1	3	3	1	1	0
	1	0	0									
2002	1	6	3	0	23.7	0	0	0	0	0	0	0
	1	0	0	0	6	21	11	6	5	0	1	0
	1	0	0	0	1	0	3	3	1	1	0	0
	0	0	0	0	0	0	0	1	2	15	10	7
	2	1	1	2	0	0	0	0	3	1	1	0
	0	0	0									
#2005	1	6	3	0	1.2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1	0
	0	0	0									
#2007	1	6	3	0	2.2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1	0
	0	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
#2008	1	6	3	0	9.8	0	0	0	0	0	0	0
	0	0	0	0	0	0	2	3	4	1	0	0
	1	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	1
	2	0	1	0	2	1	1	0	0	0	1	0
	0	0	0									
#Yr	Seas	Flt/Svy	Gender	Part	Nsamp	16	18	20	22	24	26	28
	30	32	34	36	38	40	42	44	46	48	50	52
	54	56	58	60	62	64	66	68	72	76	16	18
	20	22	24	26	28	30	32	34	36	38	40	42
	44	46	48	50	52	54	56	58	60	62	64	66
	68	72	76									
#1977	1	8	3	0	163	0	0	0	0.001	0.001	0	0.001
	0.001	0.004	0.0071	0.0071	0.0307	0.0501	0.047	0.0409	0.0317	0.0358	0.0153	0.0143
	0.0266	0.0153	0.0225	0.0184	0.0255	0.0194	0.0174	0.0276	0.003	0.001	0	0
	0	0	0.002	0.001	0.004	0.002	0.0051	0.0081	0.0112	0.0225	0.0603	0.0552

	0.044	0.0327	0.0276	0.0358	0.0327	0.045	0.0307	0.045	0.0245	0.0276	0.0092	0.003
	0.004	0	0									
1980	1	8	3	0	81	0	0	0	0	0.0078	0.0216	0.0078
	0	0	0	0.0078	0.0451	0.1119	0.1375	0.1041	0.0176	0	0.0039	0.0039
	0.0058	0	0.0019	0.0019	0.0019	0	0	0	0	0	0	0
	0	0	0.0078	0.0353	0.0137	0.0019	0	0	0.0098	0.0648	0.1611	0.1335
	0.053	0.0039	0.0019	0.0019	0.0039	0.0019	0.0039	0.0078	0.0039	0.0039	0.0019	0
	0.0019	0	0									
1983	1	8	3	0	75	0	0	0	0	0	0	0
	0	0	0.002	0	0.002	0.0041	0.0062	0.0062	0.0083	0.0188	0.0167	0.0439
	0.0899	0.1087	0.0313	0.0062	0.0083	0.0083	0	0.0083	0.0062	0	0	0
	0	0	0	0	0	0	0	0	0.0041	0	0	0.0083
	0.0271	0.0271	0.0585	0.1778	0.1485	0.0606	0.0439	0.0376	0.0167	0.0083	0.0041	0
	0	0	0									
1986	1	8	3	0	39	0	0	0	0	0.019	0.0095	0.0047
	0.0047	0.019	0.0428	0.0523	0.0476	0.0238	0	0	0	0	0	0.0047
	0.0047	0	0.0095	0.0142	0.0333	0.0476	0.0285	0.0285	0	0.0047	0	0
	0	0	0.0047	0.038	0.0238	0	0.038	0.0761	0.1523	0.0761	0.0142	0
	0	0	0.0047	0	0.0238	0.0238	0.038	0.0238	0.0238	0.019	0.0142	0
	0.0047	0	0									
1989	1	8	3	0	400	0.0014	0	0	0.0044	0.0404	0.1596	0.1456
	0.0147	0.0066	0.0132	0.0206	0.0066	0.0007	0.0022	0.0007	0	0.0044	0.0103	0.0036
	0.0117	0.0036	0.0022	0.0014	0	0.0022	0.0014	0.0014	0	0	0.008	0.0007
	0	0.0103	0.0699	0.2008	0.142	0.0117	0.0044	0.011	0.0125	0.0044	0	0.0007
	0.0014	0.0095	0.0125	0.0183	0.0073	0.0014	0.0029	0.0051	0.0029	0.0007	0	0
	0.0007	0	0									
1992	1	8	3	0	78	0	0	0	0	0.0076	0.0329	0.0482
	0.0228	0.0228	0.0304	0.0203	0.0228	0.0101	0.0279	0.0609	0.0532	0.0507	0.0101	0
	0.005	0.0025	0.0076	0	0	0.0025	0.0025	0	0	0	0	0
	0.0025	0	0.0126	0.0532	0.0507	0.0152	0.0279	0.038	0.0964	0.0304	0.0406	0.0482
	0.0583	0.0304	0.0126	0.0203	0.0025	0.0076	0.0025	0	0	0.0025	0.0025	0
	0	0.0025	0									
1995	1	8	3	0	63	0	0	0.0178	0.0773	0.0952	0.0119	0.0178
	0.0238	0.0178	0.0178	0.0238	0	0	0	0.0059	0.0178	0.0178	0.0059	0.0119
	0.0059	0.0119	0.0297	0.0178	0.0119	0.0178	0	0.0178	0.0119	0	0	0.0178
	0.0476	0.0714	0.0535	0.0178	0.0178	0.0119	0.0357	0.0297	0.0119	0.0059	0	0.0059
	0.0059	0.0059	0.0357	0.0119	0.0357	0.0178	0.0297	0.0119	0.0178	0.0119	0	0
	0	0	0									
1998	1	8	3	0	31	0	0	0	0	0.0169	0	0
	0.0677	0.1525	0.1186	0.0508	0.0508	0	0	0	0.0338	0	0	0.0169
	0	0	0.0169	0	0.0169	0.0169	0	0.0169	0	0	0	0
	0.0169	0.0169	0	0	0.0338	0.0338	0.0677	0.0338	0.0169	0	0	0
	0	0.0169	0.0169	0.0847	0.0169	0	0.0169	0.0338	0	0.0169	0	0
	0	0	0									
2001	1	8	3	0	34	0	0.014	0.014	0.0281	0	0	0
	0.014	0.1267	0.0704	0.1267	0.014	0.014	0.014	0.014	0	0	0	0.014
	0	0	0.014	0	0	0	0	0.0281	0.014	0	0	0
	0	0	0	0	0	0.014	0.0563	0.0845	0.1408	0.014	0.0281	0
	0	0	0	0.0422	0.014	0.0281	0.014	0	0.014	0.014	0.014	0
	0	0	0									
2004	1	8	3	0	65	0.0045	0	0	0.0045	0.0273	0.0593	0.0045
	0	0	0	0	0	0	0.0091	0.0045	0.0182	0.0319	0.0228	0.0456
	0.073	0.0456	0.0273	0.0182	0.0182	0.0182	0.0136	0.0228	0.0091	0.0045	0	0
	0.0045	0.0182	0.0273	0.0547	0.0091	0.0045	0	0	0.0045	0	0	0.0091
	0.0091	0.0136	0.0136	0.073	0.0593	0.0319	0.0547	0.0182	0.0273	0.0228	0.0273	0.0182
	0.0136	0	0									

#CPFV observer LFs

#Year	Seas	Flt/Svy	Gender	Part	NSamp	16	18	20	22	24	26	28
	30	32	34	36	38	40	42	44	46	48	50	52
	54	56	58	60	62	64	66	68	72	76	16	18
	20	22	24	26	28	30	32	34	36	38	40	42

	44	46	48	50	52	54	56	58	60	62	64	66
	68	72	76									
1987	1	9	0	0	197.5	3	1	2	0	0	4	6
	6	16	33	69	107	101	101	111	76	65	29	26
	29	29	26	20	21	19	2	14	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1988	1	9	0	0	300.3	1	4	10	2	7	6	9
	16	30	22	54	78	92	140	198	129	130	80	44
	22	18	26	20	15	22	18	28	5	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1989	1	9	0	0	361	1	0	1	13	24	24	49
	57	63	55	55	59	45	65	114	133	186	126	111
	95	55	19	26	15	10	12	12	9	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1990	1	9	0	0	192.6	0	1	2	1	8	18	25
	83	157	124	58	58	80	53	31	44	42	55	47
	36	24	12	7	2	2	1	5	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1991	1	9	0	0	179.1	0	0	1	3	1	4	8
	1	3	6	18	24	54	103	123	75	66	57	57
	64	50	42	37	28	16	8	15	6	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1992	1	9	0	0	395.8	0	0	4	2	4	9	21
	34	59	50	41	49	78	109	191	196	181	132	122
	73	58	86	77	56	23	15	17	12	3	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1993	1	9	0	0	296.9	1	0	0	2	0	1	8
	21	25	25	28	41	43	45	66	72	143	113	122
	78	57	49	66	60	30	21	29	12	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1994	1	9	0	0	210.4	0	0	0	1	3	10	12
	6	8	13	25	57	50	48	66	58	63	63	49
	51	36	25	17	21	14	8	11	5	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1995	1	9	0	0	224.5	0	0	2	3	3	12	9
	22	18	32	33	41	32	42	60	72	84	73	50
	36	30	34	17	17	7	8	8	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1996	1	9	0	0	185	1	0	0	0	1	4	5
	7	18	22	24	26	24	41	43	53	51	53	45
	32	38	25	22	17	13	5	10	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									

1997	1	9	0	0	257.5	0	0	0	1	5	4	9
	3	12	24	29	33	49	35	75	63	63	86	83
	82	76	67	52	47	29	16	28	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1998	1	9	0	0	124.7	0	0	0	0	0	1	5
	7	15	15	8	10	18	30	33	39	37	36	32
	33	29	27	21	10	10	6	3	7	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									

#Year	Seas	Flt/Svy	Gender	Part	NSamp	16	18	20	22	24	26	28
	30	32	34	36	38	40	42	44	46	48	50	52
	54	56	58	60	62	64	66	68	72	76	16	18
	20	22	24	26	28	30	32	34	36	38	40	42
	44	46	48	50	52	54	56	58	60	62	64	66
	68	72	76									
2004	1	10	3	0	57	0	0	0	0	0	2	0
	13	5	1	2	5	9	12	20	50	57	108	106
	42	24	11	6	7	3	1	2	0	0	0	0
	0	0	1	4	7	20	7	4	3	6	7	20
	24	51	59	35	26	7	11	4	3	1	1	0
	0	0	0									
2005	1	10	3	0	65	0	0	0	0	0	0	0
	2	4	4	8	14	6	7	2	2	10	26	56
	79	72	50	14	11	8	7	11	2	2	0	0
	0	0	0	0	1	1	3	3	10	20	14	6
	6	11	16	48	43	35	18	11	10	6	1	0
	0	1	0									
2006	1	10	3	0	70	0	0	0	1	1	8	20
	7	2	3	1	5	18	33	38	44	25	22	37
	52	59	45	18	4	7	2	3	1	0	0	0
	1	1	6	13	15	13	1	2	10	12	25	17
	23	21	6	14	24	36	22	12	3	2	2	0
	1	0	0									
2007	1	10	3	0	78	0	0	0	0	0	0	0
	2	4	25	40	18	12	14	21	26	27	30	28
	30	43	27	20	8	3	3	4	1	1	0	0
	0	0	0	0	0	2	6	15	16	22	10	11
	15	14	28	32	35	16	24	6	2	2	0	1
	0	0	0									
2008	1	10	3	0	90	0	0	0	0	1	2	4
	8	4	9	8	21	39	28	20	24	21	34	28
	31	35	39	29	15	7	4	2	0	0	0	0
	0	0	0	1	8	5	4	6	11	24	35	17
	13	24	19	22	18	18	11	7	6	1	1	1
	0	0	0									

#year	Seas	Flt/Svy	Gender	Part	Nsamp	16	18	20	22	24	26	28
	30	32	34	36	38	40	42	44	46	48	50	52
	54	56	58	60	62	64	66	68	72	76	16	18
	20	22	24	26	28	30	32	34	36	38	40	42
	44	46	48	50	52	54	56	58	60	62	64	66
	68	72	76									
2003	1	11	3	0	50.386	27197	11383	0	0	0	11813	0
	0	0	0	0	0	15915	11915	12124	23276	32833	79821	48055
	11954	10989	21575	12509	20128	10050	14116	5828	4907	3832	60645	24947
	0	0	0	24446	10050	0	0	8614	26382	0	47745	40287
	37038	90203	37872	32505	15464	42155	32096	20064	0	0	0	5828
	0	0	0									

2004	1	11	3	0	101.034	40952	0	0	8393	42936	142187	242935
	284795	19247	128291	110985	154430	58923	66838	163055	200045	76111	249624	218763
	781530	189565	121889	53389	32236	10522	42466	11785	0	0	64788	12441
	0	21732	21795	164436	298166	322050	192814	68972	159780	86524	157021	126357
	158122	504012	422567	288074	762757	398354	49024	11306	10522	19952	20956	0
	18928	0	0									
2005	1	11	3	0	91.746	70603	0	0	5239	18024	19905	81266
	17306	114378	71886	167169	34903	0	34031	18501	21842	42470	89032	132638
	130974	83733	62020	25920	17441	26041	10022	69934	11926	0	182751	16181
	5239	0	37495	35278	34668	0	107986	145604	93804	72770	20401	18592
	41310	29922	146948	246914	190060	164801	60428	24711	32524	33144	0	0
	0	0	0									
2006	1	11	3	0	66.67	0	0	20589	10740	31866	76080	27333
	10422	0	32776	18325	11150	105043	165482	29012	20970	0	17655	32431
	31455	31455	64525	0	16465	0	16465	39661	13721	6462	0	0
	21480	42717	210063	316001	19216	20041	0	0	30842	21631	231122	196774
	32597	10485	20970	30818	32116	19442	25396	22068	7259	18957	5235	10342
	8442	0	0									
2007	1	11	3	0	47.562	0	0	0	0	0	0	0
	28511	30242	97493	28339	20631	0	20341	9901	110539	86822	10170	10170
	30313	20413	64968	27462	43878	11473	0	0	0	0	0	8918
	0	0	0	0	0	0	85902	119473	34810	0	18487	61023
	50119	54558	40681	30224	90747	104051	61897	35222	29778	0	0	0
	0	0	0									
2008	1	11	3	0	36.076	0	0	0	0	43321	20085	0
	0	0	0	12235	12235	12235	0	0	0	11455	9689	18989
	16558	46224	21916	26345	31822	38671	31710	14352	19467	0	9606	0
	7358	10043	10043	0	0	0	10043	0	10043	22278	12235	0
	31520	16949	7830	15660	44727	33702	106688	65828	49155	17977	15660	15660
	0	0	0									

this is the Gotshall and Miller LF data from Central California sampling programs

#year	Seas	Flt/Svy	Gender	Part	#_samp	16	18	20	22	24	26	28
	30	32	34	36	38	40	42	44	46	48	50	52
	54	56	58	60	62	64	66	68	72	76	16	18
	20	22	24	26	28	30	32	34	36	38	40	42
	44	46	48	50	52	54	56	58	60	62	64	66
	68	72	76									
1959	1	14	0	0	-10	9	0	0	0	0	0	0
	0	0	3	3	4	5	12	19	28	24	40	24
	24	15	14	5	4	6	3	1	0	3	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1960	1	14	0	0	-95	0	1	2	1	0	0	0
	0	1	5	4	5	25	42	121	123	166	122	103
	105	58	26	20	14	5	5	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1961	1	14	0	0	-25	0	0	0	0	0	0	0
	0	6	2	2	2	1	5	22	44	51	57	25
	10	13	2	6	3	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1966	1	14	0	0	-30	140	3	2	1	1	3	5
	2	10	28	40	35	14	6	1	10	12	28	30
	25	15	13	21	3	4	3	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									

this is the observer LF data

#Yr	Seas	Flt/Svy	Gender	Part	Neff	16	18	20	22	24	26	28
	30	32	34	36	38	40	42	44	46	48	50	52
	54	56	58	60	62	64	66	68	72	76	16	18
	20	22	24	26	28	30	32	34	36	38	40	42
	44	46	48	50	52	54	56	58	60	62	64	66
	68	72	76									
2002	1	15	0	0	24.38	0	0	0	0	0	0	0
	0	0	0	1	1	8	19	10	16	9	15	11
	11	7	7	3	3	1	0	3	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2003	1	15	0	0	8.83	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	3	5	6	4
	6	2	4	0	0	0	0	5	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2004	1	15	0	0	60.36	0	0	12	4	7	0	2
	0	0	0	0	0	2	3	7	9	24	28	45
	40	21	26	24	18	14	11	9	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2005	1	15	0	0	123.2	0	0	0	0	0	2	1
	0	0	2	6	8	5	8	21	34	49	66	85
	88	88	56	50	35	32	16	22	8	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2006	1	15	0	0	38.80	0	0	0	0	0	0	0
	0	0	0	1	2	5	11	20	19	13	10	14
	27	14	11	13	9	7	4	5	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2007	1	15	0	0	44.46	0	1	0	0	1	1	0
	1	0	1	2	1	1	0	3	2	8	23	13
	17	21	15	14	12	12	10	8	1	2	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
2008	1	15	0	0	2.828	0	0	0	0	1	2	0
	0	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	1	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									

#Yr	Seas	Flt/Svy	Gender	Part	Neff	16	18	20	22	24	26	28
	30	32	34	36	38	40	42	44	46	48	50	52
	54	56	58	60	62	64	66	68	72	76	16	18
	20	22	24	26	28	30	32	34	36	38	40	42
	44	46	48	50	52	54	56	58	60	62	64	66
	68	72	76									
1975	1	16	0	0	400	3	8	18	22	124	435	1059
	2645	3183	2660	2729	2587	1969	910	662	705	717	495	354
	236	129	69	57	41	19	10	12	7	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1976	1	16	0	0	400	7	5	9	35	91	160	381
	1136	2293	2505	2364	3574	3567	2634	1841	1329	1140	895	687
	463	292	154	131	87	43	31	31	14	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1977	1	16	0	0	400	35	86	114	66	36	48	126
	252	276	290	438	1081	1428	1372	1514	1256	815	587	485
	389	279	162	96	77	49	41	25	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1978	1	16	0	0	400	24	26	293	978	1346	1444	1622
	1729	1059	343	261	389	669	863	1218	1390	1348	1042	752
	625	464	295	189	106	41	34	21	6	2	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1986	1	16	0	0	400	3	1	17	23	25	60	139
	373	629	701	610	497	335	133	68	58	86	91	79
	72	47	38	13	8	2	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1987	1	16	0	0	400	1	0	0	1	3	15	36
	100	134	171	305	548	596	382	191	110	66	57	54
	48	45	31	29	13	6	3	3	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1988	1	16	0	0	341	7	6	7	14	1	17	38
	89	106	80	49	103	137	186	260	239	178	93	69
	73	26	22	30	12	11	7	8	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									
1989	1	16	0	0	400	9	11	33	167	289	286	390
	715	679	318	117	120	134	183	260	340	290	207	190
	113	65	33	33	16	16	7	4	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0									

21 #_N_age_bins
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
0 #_N_ageerror_definitions
0 #_N_Agecomp_obs
1 #_Lbin_method: 1=poplenbins; 2=datalenbins; 3=lengths
1 #_combine males into females at or below this bin number
#Yr Seas Flt/Svy Gender Part Ageerr Lbin_lo Lbin_hi Nsamp datavector(female-male)

0 #_N_MeanSize-at-Age_obs
#Yr Seas Flt/Svy Gender Part Ageerr Ignore datavector(female-male)

1 #_N_environ_variables
0 #_N_environ_obs
1 # N sizefreq methods to read

25 #Sizefreq N bins per method
1 #Sizetfreq units(bio/num) per method
1 #Sizefreq scale(kg/lbs/cm/inches) per method
1e-005 #Sizefreq mincomp per method
20 #Sizefreq N obs per method
#_Sizefreq bins

0.2	0.4	0.6	0.8	1	1.2	1.4	1.6	1.8	2	2.2	2.4	2.6
	2.8	3	3.2	3.4	3.6	3.8	4	4.5	5	5.5	6	6.5

#_Year season Fleet Partition Gender SampleSize <data>
southern California RecFIN

#	#Yr	Seas	Flt/Svy	Gender	Part	Nsamp	0.2	0.4	0.6	0.8	1	1.2
	1.4	1.6	1.8	2	2.2	2.4	2.6	2.8	3	3.2	3.4	3.6
	3.8	4	4.5	5	5.5	6	6.5	0.2	0.4	0.6	0.8	1
	1.2	1.4	1.6	1.8	2	2.2	2.4	2.6	2.8	3	3.2	3.4
	3.6	3.8	4	4.5	5	5.5	6	6.5				
1	1980	1	4	0	0	-176	253	258	821	536	209	121
	81	81	66	55	41	35	21	10	5	4	4	2
	0	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				
1	1981	1	4	0	0	-148	211	395	367	302	316	240
	110	72	58	60	31	33	16	8	3	3	4	0
	0	0	2	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				
1	1982	1	4	0	0	-135	40	82	313	320	268	306
	174	115	71	54	39	19	9	6	1	4	3	0
	1	2	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				
1	1983	1	4	0	0	-99	8	58	123	103	79	80
	41	39	36	42	33	17	7	12	3	9	8	0
	1	4	2	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				
1	1984	1	4	0	0	-181	127	13	30	63	79	102
	47	45	30	19	8	14	4	3	2	3	3	0
	0	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				
1	1985	1	4	0	0	-147	669	281	30	29	49	63
	55	50	42	26	21	8	13	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				
1	1986	1	4	0	0	-119	253	567	266	41	24	20
	32	16	18	20	21	2	7	2	5	2	1	0
	1	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				
1	1987	1	4	0	0	-32	37	20	33	10	12	6
	1	4	1	5	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				
1	1988	1	4	0	0	-39	12	12	13	11	12	8
	4	2	3	1	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				
1	1989	1	4	0	0	-50	139	105	42	41	49	28
	26	14	7	6	4	8	5	1	4	1	4	2

	0	1	0	2	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				

Northern California RecFIN

#use	YEAR	Seas	Flt/Svy	Gender	Part	Nsamp	0.2	0.4	0.6	0.8	1	1.2
	1.4	1.6	1.8	2	2.2	2.4	2.6	2.8	3	3.2	3.4	3.6
	3.8	4	4.5	5	5.5	6	6.5	0.2	0.4	0.6	0.8	1
	1.2	1.4	1.6	1.8	2	2.2	2.4	2.6	2.8	3	3.2	3.4
	3.6	3.8	4	4.5	5	5.5	6	6.5				
1	1980	1	5	0	0	-70	24	4	27	42	16	16
	22	14	11	14	3	6	9	6	3	3	5	1
	3	12	2	5	0	1	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				
1	1981	1	5	0	0	-34	2	12	12	16	46	48
	21	6	6	13	10	12	6	8	5	3	4	6
	1	4	7	2	1	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				
1	1982	1	5	0	0	-50	1	7	13	22	18	48
	44	50	31	26	15	7	4	5	7	4	4	1
	0	4	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				
1	1983	1	5	0	0	-46	3	9	6	11	21	33
	47	44	46	48	29	17	13	8	7	6	5	1
	2	1	0	0	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				
1	1984	1	5	0	0	-69	6	8	16	15	21	17
	18	17	16	9	8	5	6	9	1	5	2	1
	4	1	0	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				
1	1985	1	5	0	0	-99	301	37	13	21	21	20
	17	18	17	11	12	16	9	13	10	8	2	4
	1	3	3	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				
1	1986	1	5	0	0	-105	84	365	266	45	5	10
	12	14	16	18	14	19	16	17	6	6	10	7
	3	6	3	1	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				
1	1987	1	5	0	0	-37	9	55	50	19	8	5
	2	2	5	4	4	7	5	11	7	8	2	3
	5	6	4	2	0	0	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				
1	1988	1	5	0	0	-36	3	10	10	7	4	8
	5	3	1	1	0	1	2	0	0	1	0	0
	0	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				
1	1989	1	5	0	0	-36	8	17	27	3	11	14
	16	8	8	2	1	0	0	0	1	0	1	0
	0	1	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0				

0 # no tag data
0 # no morphcomp data

999

ENDDATA

Control File

#_data_and_control_files:
#_SS-V3.01-O-opt;_12/16/08;_Stock_Synthesis_by_Richard_Methot_(NOAA);_using_Otter_Research_ADMB_7.0.1
1 #_N_Growth_Patterns
1 #_N_Morphs_Within_GrowthPattern
#_Cond 1 #_Morph_between/within_stdev_ratio (no read if N_morphs=1)
#_Cond 1 #vector_Morphdist_(-1_in_first_val_gives_normal_approx)

#_Cond 0 # N recruitment designs goes here if N_GP*nseas*area>1
#_Cond 0 # placeholder for recruitment interaction request
#_Cond 1 1 1 # example recruitment design element for GP=1, seas=1, area=1

#_Cond 0 # N_movement_definitions goes here if N_areas > 1
#_Cond 1.0 # first age that moves (real age at begin of season, not integer) also cond on do_migration>0
#_Cond 1 1 1 2 4 10 # example move definition for seas=1, morph=1, source=1 dest=2, age1=4, age2=10

3 #_Nblock_Patterns
11 6 18 #_blocks_per_pattern
begin and end years of blocks
1975 1977
1978 1980
1981 1983
1984 1986
1987 1989
1990 1992
1993 1995
1996 1998
1999 2001
2002 2004
2005 2008

1970 1979
1980 1988
1989 1991
1992 1998
1999 2003
2004 2008

1973 1974
1975 1976
1977 1978
1979 1980
1981 1982
1983 1984
1985 1986
1987 1988
1989 1990
1991 1992
1993 1994
1995 1996
1997 1998
1999 2000

```
2001	2002
2003	2004
2005	2006
2007	2008


0.5 #_fracfemale
1 #_natM_type:_0=1Parm; 1=N_breakpoints;_2=Lorenzen;_3=agespecific;_4=agespec_withseasinterpolate
2 #_N_breakpoints
1 5 # age(real) at M breakpoints
1 # GrowthModel: 1=vonBert with L1&L2; 2=Richards with L1&L2; 3=not implemented; 4=not implemented
1.5 #_Growth_Age_for_L1
25 #_Growth_Age_for_L2 (999 to use as Linf)
0 #_SD_add_to_LAA (set to 0.1 for SS2 V1.x compatibility)
0 #_CV_Growth_Pattern:  0 CV=f(LAA); 1 CV=F(A); 2 SD=F(LAA); 3 SD=F(A)
1 #_maturity_option:  1=length logistic; 2=age logistic; 3=read age-maturity matrix by growth_pattern; 4=read age-fecundity
#_placeholder for empirical age-maturity by growth pattern
1 #_First_Mature_Age
1 #_fecundity option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b
0
1 #_parameter_offset_approach (1=none, 2= M, G, CV_G as offset from female-GP1, 3=like SS2 V1.x)
2 #_env/block/dev_adjust_method (1=standard; 2=with logistic trans to keep within base parm bounds)

#_growth_parms
#_LO	HI	INIT	PRIOR	PR_type	SD	PHASE	env-var	use_dev	dev_min	dev_max	dev_std	Block
	Blk_Fxn
0.05	0.25	0.15	0.16	0	0.8	-3	0	0	0	0	0.5	0
	0	#	NatM_p_1_Fem_GP:1
0.05	0.25	0.15	0.16	0	0.8	-3	0	0	0	0	0.5	0
	0	#	NatM_p_2_Fem_GP:1
1	45	26	27	0	10	-4	0	0	0	0	0.5	0
	0	#	L_at_Amin_Fem_GP_1
60	80	67.738	69	0	10	3	0	0	0	0	0.5	0
	0	#	L_at_Amax_Fem_GP_1
0.15	0.25	0.21958	0.21	0	0.8	3	0	0	1970	2008	0.5	3
	1	#	VonBert_K_Fem_GP_1
0.05	0.25	0.1	0.1	0	0.8	-6	0	0	0	0	0.5	0
	0	#	CV_young_Fem_GP_1
0.05	0.25	0.08	0.1	0	0.8	-3	0	0	0	0	0.5	0
	0	#	CV_old_Fem_GP_1
0.05	0.25	0.15	0.16	0	0.8	-3	0	0	0	0	0.5	0
	0	#	NatM_p_1_Mal_GP:1
0.05	0.25	0.15	0.16	0	0.8	-3	0	0	0	0	0.5	0
	0	#	NatM_p_2_Mal_GP:1
1	45	26	27	0	10	-4	0	0	0	0	0.5	0
	0	#	L_at_Amin_Mal_GP_1
50	70	58.9149	61	0	10	3	0	0	0	0	0.5	0
	0	#	L_at_Amax_Mal_GP_1
0.2	0.3	0.26418	0.2	0	0.8	3	0	0	1970	2008	0.5	3
	1	#	VonBert_K_Mal_GP_1
0.05	0.25	0.1	0.1	0	0.8	-6	0	0	0	0	0.5	0
	0	#	CV_young_Mal_GP_1
0.05	0.25	0.08	0.1	0	0.8	-3	0	0	0	0	0.5	0
	0	#	CV_old_Mal_GP_1
-3	3	7.355E-06		2.44E-06 0	0.8	-3	0	0	0	0	0.5
	0	0	#	Wtlen_1_Mal
-3	4	3.11359	3.34694	0	0.8	-3	0	0	0	0	0.5	0
	0	#	Wtlen_2_Mal
30	60	39.9	37.7	0	0.8	-3	0	0	0	0	0.5	0
	0	#	Mat50%_Fem
-3	3	-0.359	-0.2876	0	0.8	-3	0	0	0	0	0.5	0
	0	#	Mat_slope_Fem
```

#-3 3 0.22475 0.25 0 0.8 -3 0 0 0 0 0.5 0
0 # Eg/gm_inter_Fem
#-3 3 0.03657 0 0 0.8 -3 0 0 0 0 0.5 0
0 # Eg/gm_slope_wt_Fem
-3 3 192.5 190 0 0.8 -3 0 0 0 0 0.5 0
0 # Eg/gm_inter_Fem
-3 3 49.3 36.57 0 0.8 -3 0 0 0 0 0.5 0
0 # Eg/gm_slope_wt_Fem
-3 3 7.355E-06 2.44E-06 0 0.8 -3 0 0 0 0 0.5
0 0 # Wtlen_1_Mal
-3 4 3.11359 3.34694 0 0.8 -3 0 0 0 0 0.5 0
0 # Wtlen_2_Mal
0 0 0 0 -1 0 -4 0 0 0 0 0 0
0 # RecrDist_GP_1
0 0 0 0 -1 0 -4 0 0 0 0 0 0
0 # RecrDist_Area_1
0 0 0 0 -1 0 -4 0 0 0 0 0 0
0 # RecrDist_Seas_1
0 0 0 0 -1 0 -4 0 0 0 0 0 0
0 # CohortGrowDev

#_Cond 0 #custom_MG-env_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no MG-environ parameters

1 #_Cond 0 #custom_MG-block_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no MG-block parameters

#_LO	HI	INIT	PRIOR	PR_type	SD	PHASE
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4

-5	5	0	0	0	-5	-4
-5	5	0	0	0	-5	-4

#_seasonal_effects_on_biology_parms
0 0 0 0 0 0 0 0 0 0 #_femwtlen1,femwtlen2,mat1,mat2,fec1,fec2,Malewtlen1,malewtlen2,L1,K
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no seasonal MG parameters

#_Cond -4 #_MGparm_Dev_Phase

#_Spawner-Recruitment
3 #_SR_function
#_LO HI INIT PRIOR PR_type SD PHASE
6 15 9.5 9 0 10 1 # SR_R0
0.2 1 0.736 0.73 0 0.186 5 # SR_steep
0 2 1 0.95 0 0.8 -4 # SR_sigmaR
-5 5 0 0 0 1 -3 # SR_envlink
-5 5 0 0 0 1 -4 # SR_R1_offset
0 0 0 0 -1 0 -99 # SR_autocorr
0 #_SR_env_link
0 #_SR_env_target_0=none;1=devs;_2=R0;_3=steepness

1 #do_recdev: 0=none; 1=devvector; 2=simple deviations
1954 # first year of main recr_devs; early devs can preceed this era
2008 # last year of main recr_devs; forecast devs start in following year
2 #_recdev phase

1 # (0/1) to read 11 advanced options
0 #_recdev_early_start (0=none; neg value makes relative to recdev_start)
-4 #_recdev_early_phase
0 #_forecast_recruitment phase (incl. late recr) (0 value resets to maxphase+1)
1 #_lambda for prior_fore_recr occurring before endyr+1
1965 #_last_early_yr_nobias_adj_in_MPD
1975 #_first_yr_fullbias_adj_in_MPD
2008 #_last_yr_fullbias_adj_in_MPD
2009 #_first_recent_yr_nobias_adj_in_MPD
1.
0
-5 #min rec_dev
5 #max rec_dev
0 #_read_recdevs
#_end of advanced SR options
read specified recr devs
#_Yr Input_value

#Fishing Mortality info
0.26 # F ballpark for tuning early phases
1980 # F ballpark year (neg value to disable)
3 # F_Method: 1=Pope; 2=instan. F; 3=hybrid (hybrid is recommended)
2.9 # max F or harvest rate, depends on F_Method

#need these three lines when doing option 2
#0.1 # start F
#1   # overall phase
#0   # N detailed inputs
#5 # need this for Fmethod 3, number if tuning iterations in hybrid F, 4 or 5 usually good
5

no additional F input needed for Fmethod 1
read overall start F value; overall phase; N detailed inputs to read for Fmethod 2
read N iterations for tuning for Fmethod 3 (recommend 3 to 7)

#Fleet Year Seas F_value se phase (for detailed setup of F_Method=2)

#_initial_F_parms
#_LO HI INIT PRIOR PR_type SD PHASE
0 0.1 0 0.01 1 99 -2 # InitF_1FISHERY1
0.0001 0.05 0.007 0.007 0 99 2 # InitF_1FISHERY2
0 0.1 0 0.01 1 99 -2 # InitF_1FISHERY3
0 0.1 0 0.01 1 99 -2 # InitF_1FISHERY4
0 0.1 0 0.01 1 99 -2 # InitF_1FISHERY5
0 0.1 0 0.01 1 99 -2 # InitF_1FISHERY6

#_Q_setup
A=do power, B=env-var, C=extra SD, D=devtype(<0=mirror, 0/1=none, 2=cons, 3=rand, 4=randwalk); E=0=num/1=bio, F=err_type
#_A B C D E F
0 0 0 0 1 0 # 1 FISHERY1
0 0 0 0 1 0 # 1 FISHERY2
0 0 0 0 1 0 # 1 FISHERY3
0 0 0 0 1 0 # 1 FISHERY4
0 0 0 0 1 0 # 1 FISHERY5
0 0 0 0 1 0 # 1 FISHERY6
0 0 0 0 1 0 # 2 SURVEY1
0 0 0 0 1 0 # 3 SURVEY2
0 0 0 0 1 0 # 1 SURVEY3
0 0 0 0 1 0 # 1 SURVEY4
0 0 0 0 1 0 # 1 SURVEY5
0 0 0 0 1 0 # 1 SURVEY6
0 0 0 0 1 0 # 1 SURVEY7
0 0 0 0 1 0 # 1 SURVEY8
0 0 0 0 1 0 # 1 SURVEY9
0 0 0 0 1 0 # 1 SURVEY10

#_Cond 0 #_If q has random component, then 0=read one parm for each fleet with random q; 1=read a parm for each year of index
#_Q_parms(if_any)
LO HI INIT PRIOR PR_type SD PHASE

#_size_selex_types
#_Pattern Discard Male Special
24 0 0 0 # FISHERY1 trawl
24 0 0 0 # FISHERY2 hookline
24 0 0 0 # FISHERY3 gillnet
24 0 0 0 # FISHERY4 southrec
1 0 0 0 # FISHERY5 cenrec
1 0 0 0 # Fishery6 trawlnorth
30 0 0 0 # SURVEY1 calcofi
24 0 0 0 # SURVEY2 triennial
5 0 0 5 # SURVEY3 deb w-v
24 0 0 0 # SURVE4 hookline
1 0 0 0 # SURVEY5 nwc combo
33 0 0 0 # SURVEY6 juvenile survey
0 0 0 0 # SURVEY7 pier index
5 0 0 5 # SURVEY8 60s MBay rec LFs
5 0 0 1 # SURVEY9 mirror southern trawl to look at LFs from observer fleet
5 0 0 4 # SURVEY10 - mirror southern rec (for CPFV obs. LFs)

#_age_selex_types
#_Pattern ___ Male Special
11 0 0 0 # 1 FISHERY1
11 0 0 0 # 1 FISHERY2

```
11 0 0 0 # 1 FISHERY3
11 0 0 0 # 1 FISHERY4
11 0 0 0 # 1 FISHERY5
11 0 0 0 # 1 FISHERY6
11 0 0 0 # 2 SURVEY1
11 0 0 0 # 3 SURVEY2
11 0 0 0 # 3 SURVEY3
11 0 0 0 # 3 SURVEY4
11 0 0 0 # 3 SURVEY5
11 0 0 0 # 3 SURVEY6
11 0 0 0 # 3 SURVEY7
11 0 0 0 # 3 SURVEY8
11 0 0 0 # 3 SURVEY9
11 0 0 0 # 3 SURVEY10

#_LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
#_size_sel: trawl - try logistic-

15     60     45.5     46     0     20     3     0     0     0     0     0.5     0
       0      #        PEAK   value
-10    10     -4.822   5      0     10     -4    0     0     0     0     0.5     0
       0      #        TOP    logistic
1      15     4.296    3.5    0     10     -4    0     0     0     0     0.5     0
       0      #        WIDTH  exp
-1     9      4.76     2      0     10     -4    0     0     0     0     0.5     0
       0      #        WIDTH  exp
-15    9      -10.5    -4.5   0     10     -4    0     0     0     0     0.5     0
       0      #        INIT   logistic
-5     9      -0.766   2      0     10     -4    0     0     0     0     0.5     0
       0      #        FINAL  logistic

# size_se1: 1- male offsets- 4 lines
#1     60     16       20     0     100    -5    0     0     0     0     0.5     0
       0      #        size@dogleg
#-10   0      0        0      0     10     -5    0     0     0     0     0.5     0
       0      #        log(relmalesel)at minL
#-10   0      0        0      0     10     -5    0     0     0     0     0.5     0
       0      #        log(relmalesel)at dogleg
#-10   0      0        0      0     10     -5    0     0     0     0     0.5     0
       0      #        log(relmalesel) at maxL
# size_se1: 1- male offsets- 4 lines
# fishery 2
15     60     52.459   55     0     20     3     0     0     0     0     0.5     0
       0      #        PEAK   value
-10    10     -10      5      0     10     3     0     0     0     0     0.5     0
       0      #        TOP    logistic
1      15     4.096    3.5    0     10     3     0     0     0     0     0.5     0
       0      #        WIDTH  exp
-1     9      4.744    2      0     10     3     0     0     0     0     0.5     0
       0      #        WIDTH  exp
-15    9      -11.22   -4.5   0     10     3     0     0     0     0     0.5     0
       0      #        INIT   logistic
-5     9      -1       2      0     10     3     0     0     0     0     0.5     0
       0      #        FINAL  logistic
# fishery 3
15     60     50.713   55     0     20     3     0     0     0     0     0.5     0
       0      #        PEAK   value
-10    10     -9.8     -5     0     10     3     0     0     0     0     0.5     0
       0      #        TOP    logistic
1      15     3.008    3.5    0     10     3     0     0     0     0     0.5     0
       0      #        WIDTH  exp
```

-1 9 4.408 2 0 10 3 0 0 0 0 0.5 0 0 # WIDTH exp
-15 9 -11.22 -6 0 10 3 0 0 0 0 0.5 0 0 # INIT logistic
-5 9 -1.76 2 0 10 3 0 0 0 0 0.5 0 0 # FINAL logistic
#_size_sel: 4 double logistic-
15 60 36 40 0 20 3 0 0 0 0 0.5 0 0 # PEAK value
-10 10 -7 -5 0 10 3 0 0 0 0 0.5 0 0 # TOP logistic
1 15 4 3.5 0 10 3 0 0 0 0 0.5 0 0 # WIDTH exp
-1 9 5.2 5 0 10 3 0 0 0 0 0.5 0 0 # WIDTH exp
-15 9 -4 -4.5 0 10 3 0 0 0 0 0.5 0 0 # INIT logistic
-5 9 -3.28 -4 0 10 3 0 0 0 0 0.5 0 0 # FINAL logistic
size_sel fishery 5 cenrec double logistic
#15 80 54.68 55 0 20 3 0 0 0 0 0.5 0 0 # PEAK value
#-10 10 5.1 5 0 10 3 0 0 0 0 0.5 0 0 # TOP logistic
#1 15 6.1 3.5 0 10 3 0 0 0 0 0.5 0 0 # WIDTH exp
#-1 9 2.5 2 0 10 3 0 0 0 0 0.5 0 0 # WIDTH exp
#-15 9 -2.86 -4.5 0 10 3 0 0 0 0 0.5 0 0 # INIT logistic
#-5 9 1.25 2 0 10 3 0 0 0 0 0.5 0 0 # FINAL logistic
#_size_sel: cenRec - try logistic-
5 50 40 35 0 50 3 0 0 0 0 0 0 0 #
0.0001 35 10 15 0 10 3 0 0 0 0 0 0 0 #

size_sel fishery 6 trawlnorth double logistic
#13 80 54.68 55 0 20 3 0 0 0 0 0.5 0 0 # PEAK value
#-10 10 -9.792 5 0 10 3 0 0 0 0 0.5 0 0 # TOP logistic
#1 15 6.112 3.5 0 10 3 0 0 0 0 0.5 0 0 # WIDTH exp
#-1 9 5.56 2 0 10 3 0 0 0 0 0.5 0 0 # WIDTH exp
#-15 9 -2.86 -4.5 0 10 3 0 0 0 0 0.5 0 0 # INIT logistic
#-5 9 -1.25 2 0 10 3 0 0 0 0 0.5 0 0 # FINAL logistic

size sel for fishery 6- northern trawl
5 50 40 35 0 50 3 0 0 0 0 0 0 0 #
0.0001 35 10 5 0 10 3 0 0 0 0 0 0 0 #
#-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_1_SURVEY3 - min and max bins
#-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_2_SURVEY3 - min and max bins# sel survey 8 triennial
size selectivity survey 8 - triennial
#5 50 40 20 0 50 3 0 0 0 0 0 0 0 #

```
#0.0001 35 10 5 0 10 3 0 0 0 0 0 0
0 #

# sel survey 8 - triennial double logistic
15 80 24 25 0 20 -3 0 0 0 0 0.5 0
0 # PEAK value
-10 10 -9.792 5 0 10 -3 0 0 0 0 0.5 0
0 # TOP logistic3
1 15 6.112 3.5 0 10 -3 0 0 0 0 0.5 0
0 # WIDTH exp
-1 9 5.56 2 0 10 -3 0 0 0 0 0.5 0
0 # WIDTH exp
-15 9 -2.86 -4.5 0 10 -3 0 0 0 0 0.5 0
0 # INIT logistic
-5 9 -1.25 2 0 10 -3 0 0 0 0 0.5 0
0 # FINAL logistic
# size sel 9 cpfv, set to mirror northrec
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_1_SURVEY3 - min and max bins
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_2_SURVEY3 - min and max bins# sel survey 8 triennial


#_size_sel: 10 SCB hook line double logistic-
15 60 54 55 0 20 3 0 0 0 0 0.5 0
0 # PEAK value
-10 10 -3.9 -5 0 10 3 0 0 0 0 0.5 0
0 # TOP logistic
1 15 12.2 3.5 0 10 3 0 0 0 0 0.5 0
0 # WIDTH exp
-1 9 5.2 2 0 10 3 0 0 0 0 0.5 0
0 # WIDTH exp
-15 9 -1.7 -4.5 0 10 3 0 0 0 0 0.5 0
0 # INIT logistic
-5 9 -3.3 2 0 10 3 0 0 0 0 0.5 0
0 # FINAL logistic

# size sel. 11 - combo survey - mirror triennial
#-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_1_SURVEY3 - min and max bins
#-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_2_SURVEY3 - min and max bins# sel survey 8 triennial
5 50 30 25 0 50 3 0 0 0 0 0 0
0 #
0.0001 35 10 15 0 10 3 0 0 0 0 0 0
0 #
# size selectivity survey 11 - NWFSC combo survey
#13 60 28.52 55 0 20 3 0 0 0 0 0.5 0
0 # PEAK value
#-10 10 -1.23 5 0 10 3 0 0 0 0 0.5 0
0 # TOP logistic
#1 15 4.43 3.5 0 10 3 0 0 0 0 0.5 0
0 # WIDTH exp
#-2 9 -1.5 2 0 10 3 0 0 0 0 0.5 0
0 # WIDTH exp
#-15 9 -0.58 -4.5 0 10 3 0 0 0 0 0.5 0
0 # INIT logistic
#-5 9 -0.03 2 0 10 3 0 0 0 0 0.5 0
0 # FINAL logistic

# size selectivity survey 14 - 60s LFs from CenCal Rec fishery- mirror cen/north rec
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_1_SURVEY
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_2_SURVEY
# size sel. 15 bycatch LF data from observer program, link to southern trawl fishery
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_1_SURVEY
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_2_SURVEY
```

size sel. 16 mirror southern rec for LF data from CPFV observer program
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_1_SURVEY
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_2_SURVEY

0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_1_FISHERY1
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_2_FISHERY1
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_1_FISHERY2
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_2_FISHERY2
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_1_FISHERY3
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_2_FISHERY3
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_1_FISHERY4
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_2_FISHERY4
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_1_FISHERY5
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_2_FISHERY5
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_1_FISHERY6
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_2_FISHERY6
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_1_SURVEY1
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY1
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_1_SURVEY2
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY2
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY3
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY3
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY4
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY4
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY5
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY5
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY6
0 21 0 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_2_SURVEY6
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY7
0 21 0 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_2_SURVEY7
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY8
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY8
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY9
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY9
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY10
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY10

#_Cond 0 #_custom_sel-env_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no enviro fxns

Tag loss and Tag reporting parameters go next
0 # TG_custom: 0=no read; 1=read if tags exist
#_Cond -6 6 1 1 2 0.01 -4 0 0 0 0 0 0 0 #_placeholder if no parameters

1 #_Variance_adjustments_to_input_values
#_1 2 3
0.06 0 0 0.59 0.6 0 0.285 0.5 0.22 -0.06 0.25 0.96 0 0 0 0#_add_to_survey_CV
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 #_add_to_discard_stddev
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 #_add_to_bodywt_CV
0.76 1 0.81 0.63 0.83 0.485 1 0.32 1 1 1 1 1 1 1 0.63 #_mult_by_lencomp_N
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 #_mult_by_agecomp_N
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 #_mult_by_size-at-age_N
30 #_DF_for_discard_like
30 #_DF_for_meanbodywt_like

4 #_maxlambdaphase
0 #_sd_offset

3 # number of changes to make to default Lambdas (default value is 1.0)
Like_comp codes: 1=surv; 2=disc; 3=mnwt; 4=length; 5=age; 6=SizeFreq; 7=sizeage; 8=catch;
9=init_equ_catch; 10=recrdev; 11=parm_prior; 12=parm_dev; 13=CrashPen; 14=Morphcomp; 15=Tag-comp; 16=Tag-negbin
#like_comp fleet/survey phase value sizefreq_method

1 1 1 1 1
1 8 1 1 1
4 15 1 0.0001 1

lambdas (for info only; columns are phases)
0 # (0/1) read specs for more stddev reporting
runfaster using ss3 bat -nohess nox
R output viewer commands- after loading routines
#myreplist <- SSv3_output(dir='c:\\SS3ver3\\bocstar\\', covar=F)
#SSv3_plots(replist=myreplist,plot=1:7)
#
999

Forecast File

```
4 # Forecast: 0=none; 1=F(SPR); 2=F(MSY) 3=F(Btgt); 4=F(endyr); 5=Ave F (enter yrs); 6=read Fmult
# -4  # first year for recent ave F for option 5 (not yet implemented)
# -1  # last year for recent ave F for option 5 (not yet implemented)
# 0.74  # F multiplier for option 6 (not yet implemented
2001 # first year to use for averaging selex to use in forecast (e.g. 2004; or use -x to be rel endyr)
2001 # last year to use for averaging selex to use in forecast
1 # Benchmarks: 0=skip; 1=calc F_spr,F_btgt,F_msy
2 # MSY: 1= set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt); 4=set to F(endyr)
0.4 # SPR target (e.g. 0.40)
0.4 # Biomass target (e.g. 0.40)
12 # N forecast years
1 # read 10 advanced options
 0 # Do West Coast gfish rebuilder output (0/1)
 2000 # Rebuilder:  first year catch could have been set to zero (Ydecl)(-1 to set to endyear+1)
 2002 # Rebuilder:  year for current age structure (Yinit) (-1 to set to endyear+1)
 1 # Control rule method (1=west coast adjust catch; 2=adjust F)
 0.4 # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40)
 0.1 # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)
 1 # Control rule fraction of Flimit (e.g. 0.75)
 1 # basis for max forecast catch by seas and area (0=none; 1=deadbio; 2=retainbio; 3=deadnum; 4=retainnum)
 0 # 0= no implementation error; 1=use implementation error in forecast (not coded yet)
 0.1 # stddev of log(realized F/target F) in forecast (not coded yet)
# end of advanced options
# max forecast catch
# rows are seasons, columns are areas
 -1000
1 # fleet allocation (in terms of F) (1=use endyr pattern, no read; 2=read below)
#  0.000897327 0.000385902 0 0.00692334 0.000251874 0.000148217
0 # Number of forecast catch levels to input (rest calc catch from forecast F
# 1 # basis for input forecatch:  1=retained catch; 2=total dead catch
#Year Seas Fleet Catch


999 # verify end of input
```

Agenda Item E.2.a
Attachment 5
September 2009

BOCACCIO ROCKFISH

STAR Panel Report

July 13-17, 2009

Southwest Fisheries Science Center
110 Shaffer Road, Santa Cruz, CA 95060

Panel Reviewers

Martin Dorn	Panel Chair, Scientific and Statistical Committee (SSC) Representative
Chris Francis	Center for Independent Experts (CIE)
Vladlena Gertseva	NMFS, Northwest Fisheries Science Center (NWFSC)
J. J. Maguire	Center for Independent Experts (CIE)

Panel Advisors

John DeVore	Pacific Fishery Management Council
Gerry Richter	Groundfish Advisory Subpanel (GAP) Representative
John Budrick	Groundfish Management Team (GMT) Representative

Stock Assessment (STAT) Team members present

John Field	NMFS, Southwest Fisheries Science Center (SWFSC)
Alec MacCall	NMFS, Southwest Fisheries Science Center (SWFSC)
E. J. Dick	NMFS, Southwest Fisheries Science Center (SWFSC)

Overview

A draft assessment of bocaccio rockfish (*Sebastes paucispinis*) off the west coast of the United States, from the U.S.-Mexico border to Cape Blanco, Oregon (Conception, Monterey and Eureka INPFC areas) was reviewed by the STAR panel during July 13-17, 2009. The population is treated as a single stock within the assessment area. Although the range of the species extends considerably further north, there is some evidence that there are two population centers of bocaccio, one in southern California and another off the west coast of British Columbia, with a relative scarcity of bocaccio in the region between Cape Mendocino and the mouth of the Columbia River.

This assessment used the Stock Synthesis platform (version 3.03a) and incorporated a variety of data sources. Catch and length-frequency data from six fisheries were used in the assessment, including two trawl fisheries (north and south of 38º N), one hook-and-line fishery, one set net (gillnet) fishery and two recreational fisheries (south and north of Point Conception). Fishery-dependent relative abundance (CPUE) indices used in the model were calculated from the trawl fishery and the two recreational fisheries. The model also uses a recruitment (age-0) index based on recreational pier fishing. Fishery-independent data included the CalCOFI larval abundance time series, the triennial trawl survey index, the NWFSC shelf-slope survey index, the NWFSC Southern California Bight hook-and-line survey, and the coastwide pelagic juvenile survey. No age data were used in this model as it is notably difficult to determine the age of bocaccio in the assessment area.

The last full assessment of bocaccio rockfish was done in 2003, and it was subsequently updated in 2005 and 2007. Major changes made in this assessment, compared with the previous assessment include:

- Use of SS3 modeling framework instead of previously employed SS1;
- Extension of the north boundary of the assessment area from Point Mendocino to Point Blanco;
- Extension of period modeled from 1951 to 1892;
- Use of two trawl fisheries rather than one, as was used in the past;
- Use of a revised catch history based on Ralston et al. (2009)
- Addition of NWFSC shelf-slope trawl survey (referred to as NWFSC combined survey in the assessment report);
- Use of revised triennial trawl survey estimates using a GLMM approach (instead of area-swept approach previously used);
- Addition of NWFSC Southern California Bight hook and line survey;
- Use of revised juvenile indices (Pier index and juvenile trawl survey index).

The STAR panel concluded that the bocaccio rockfish assessment constitutes the best available scientific information on the status of bocaccio rockfish off the U.S. west coast and recommends that it be used for status determination and management in the Council process. The STAR panel thanks the STAT team members for their hard work and willingness to respond to panel requests.

Analyses requested by the STAR Panel

The Panel requests were addressed using a base model (Mod50) slightly different than that in the draft assessment. It included a corrected fecundity relationship and CPFV observer length composition data split from those from RecFIN. These changes made the assessment slightly more pessimistic (depletion 25% compared to 26% in draft base model).

1. Eliminate the recreational index north of Point Conception (recCEN)

Rationale: These data could be misleading because they may be more indicative of changes in the spatial pattern of the fishery than in the fish stock.

Response: Dropping the recCen index changed the depletion from 25% to 22%. This run was treated as an interim base model for comparison with the runs below.

2. Iteratively up-weight each informative index (adjust lambdas) to determine the major conflicts in the model; estimate current biomass and depletion under each scenario.

Rationale: To identify major conflicts amongst the biomass indices and determine which indices were optimistic and which were pessimistic.

Response: Because of time constraints, and because it was already reasonably clear which of the indices were optimistic or pessimistic (see request 3), the STAT only partially filled this request, and focused on addressing these points in request 3.

3. Re-weight optimistic indices and pessimistic indices

Rationale: To provide a useful pair of runs to bracket uncertainty.

Response: This analysis highlighted a conflict between two pessimistic indices – triennial survey and trawlsou (both of which show a steep decline in the 1980s), and two optimistic indices – recSO and CalCOFI (which show stronger rebuilding in the early 2000s). Upweighting both pessimistic indices resulted in a better fit to the 1980s decline and changed depletion to 16%. Upweighting the optimistic indices produced a better fit to the 2000s incearse and indicated less depletion (39% when recSO was upweighted; 36% when CalCOFI was upweighted).

4. **Evaluate the effect of the relative weighting of the biomass indices and the compositional data by down-weighting the compositional data**

   Rationale: To determine whether there are any conflicts between the biomass and compositional data.

   Response: Down-weighting the compositional data made a small change in the total likelihood for the indices (~7 points), showing that there was no strong conflict between the compositional data and the indices. The depletion changed from to 22% to 19%.

5. **Do a model run that incorporates all coastwide catches and mirrors selectivity of the northern trawl fishery**

6. **Do an additional model run that incorporates all coastwide catches *and* compositional data**

   Rationale: These two requests evaluate the effect of uncertainty about the northern boundary of the stock.

   Response: The main effect of including OR and WA catches was just to scale up the biomass trajectory. The estimated current status was slightly more pessimistic (23% depletion). When the compositional data were also included, the assessment became more optimistic (28% depletion) but it was unclear why. The length composition data were poorly fitted (most likely because the length bins were not well structured for the large fish that are caught in OR/WA but not elsewhere). Another unsatisfactory aspect of this run is that there is no index for OR/WA.

7. **Fix M for older fish at 0.1 and allow M to be estimated for younger fish.**

   Rationale: Based on the Hoenig method, an M of 0.1 is more consistent with the longevity data than the current value of 0.15. There are also indications that mortality of younger fish (before settlement to demersal habitat) is probably higher that that of older fish..
   Response: Runs were done in which natural mortality had a value of M_{young} (estimated) for ages ≤ 3, M_{old} (fixed at 0.1) for "old" fish, and was interpolated for intermediate ages. When "old" was defined as ≥ 8 y, M_{young} was 0.17 and the depletion was 20%; when it was ≥ 10 y, M_{young} was 0.21 and the depletion was 19%. In these runs, the overall fit degraded (by 25 and 20 points, respectively), with improvement of the fits to triennial survey and trawlsou CPUE indices and degradation to CalCOFI and recSO indices. It was agreed not to change the value of M used in the base model, since assessment is sensitive to the definition of "old" fish age, and there is not enough data to reliably estimate M for "young" fish.

8. **Include in the assessment report reference to the proposed listing of bocaccio in Georgia Basin as endangered (under the terms of the Endangered Species Act).**

Rationale: A proposed listing of a distinct population segment of bocaccio rockfish is important background information that managers may want to consider when developing management measures for rebuilding the southern bocaccio stock.

Response: A new section has been drafted for the assessment report.

9. Assess the effect of the maturity curve by doing alternative runs using the maturity curves of Love et al. (1990) and Wyllie Echeverria (1987).

Rationale: To evaluate the sensitivity of the assessment to previously published maturity curves.

Response: Changing the maturity curve had negligible effect on depletion. Goodness of fit was very similar for all three maturity curves (a range of less than 2 likelihood units), but the Love et al. (1990) version fitted slightly better.

10. Specify the area covered by the assessment in the title of the assessment report.

Rationale: To improved clarity since the entire US west coast was not assessed.

Response: The report title was amended to include the area assessed.

11. Include recCEN index back in the base model (Mod50).

Rationale: It seemed more reasonable that this index be downweighted, rather than removed, and the tuning procedure already does this downeighting.

Response: Reintroducing the recCEN index changed the depletion from 22% to 25%.

12. Conduct two runs to bracket the uncertainty in the assessment: one upweighting triennial and trawlsou indices, and the other upweighting the recSO and CalCOFI indices.

Rationale: To bracket the uncertainty.

Response: Upweighting an index was done by setting the associated $\lambda = 10$. The depletion changed from 25% to 14% when the trennial & trawlsou indices were upweighted, and to 38% when recSO and CalCOFI were upweighted.

13. Provide confidence intervals for model outputs, with and without delta method (McCall, in prep.) contributions for uncertainty in steepness, h, and natural mortality, M.

Rationale: For models in which h and M are fixed, the usual confidence intervals (based on the inverse Hessian) may substantially underestimate uncertainty.

Response: When uncertainty in both M and h was included in the calculation of standard errors, this made the changes caused by the two bracketing runs (see request 12) approximately equivalent to ± 1 s.e. in depletion as estimated by the base model.

14. For the base model use the revised CalCOFI index (presented to the Panel) that utilizes a cloglog link in the binomial part of the GLM (instead of the usual logit link).

Rationale: An alternative GLM, using a cloglog link in the binomial model, rather than the previously used logit link, fit the CALCOFI data better (AIC decreased by 20).

Response: This change had only a slight effect on the biomass trajectory, changing the depletion from 25% to 26%.

15. Conduct run in which catches N of 40° 10´ were removed.

Rationale: To evaluate the consequences of using the assessment to manage bocaccio fisheries south of 40° 10´.

Response: This change had only a slight effect on the biomass trajectory, changing the depletion from 26% to 27%. The catch north of 40° 10´ throughout the assessment period was approximately 6.7% of the total catch. The 2009 spawning biomass for the model excluding the catch north of 40° 10´ is 5.4% lower, while the summary biomass is 5.0% lower.

Description of base case model and alternative models to bracket uncertainty

Start year of the model =1892; discard incorporated into total catch;
M fixed at 0.15yr^{-1} for both females and males; h estimated (but with Dorn's prior); $\sigma_R = 1$;
Von Bertalanffy growth parameters - $L_{\min}$ fixed, others estimated for females and males.

Fisheries

- Trawl south of 38^{o} N
- Trawl north of 38^{o} N
- Hook and line
- Set net
- Recreational south of 34.5^{o} N (Point Conception)
- Recreational north of 34.5^{o} N (Point Conception)

Abundance indices:

- Trawl fishery CPUE, abbreviated as trawlsou (1982-1996)
- RecFIN CPUE south, abbreviated as recSO (1980-2002)
- RecFIN CPUE north, abbreviated as recCEN (1980-2002)
- CalCOFI (1951-2008)
- Triennial trawl survey (1980-2004)
- CPFV CPUE (1987-1998)

NWFSC Southern California Bight hook and line survey (2004-2008)
NWFSC shelf-slope survey (2003-2008)
Pelagic juvenile index (2001-2008)
Recreational pier fishing recruitment index (1954-2008)

Length frequencies:

Trawl fishery (1978-2004)
Hook and line fishery (1979-2002)
Set net fishery (1978 -1998)
Recreational south of 34.5^o N (1975-2008)
Recreational north of 34.5^o N (1978-2008)
Trawl north of 38^o N (1978-2002)
Triennial trawl survey (1980-2004)
CPFV (1987–1998)
NWFSC Southern California Bight hook and line survey (2004-2008)
NWFSC shelf-slope survey (2003-2008)

Uncertainty was bracketed by regarding two alternative sets of indices to be more reliable indicators of stock trends. The low biomass scenario was obtained by upweighting ($\lambda = 10$) the triennial and trawlsou indices, while the high biomass scenario was obtained by upweighting ($\lambda = 10$) the recSO and CalCOFI indices. These scenarios also provided useful contrast between stock trends north of Point Conception (where recovery is apparently slower and may depend on an influx of fish from further south), and south of Point Conception (where trend data indicate more rapid recovery).

Technical merits of the assessment

This is a very thorough assessment, with good use of recent research results and sensitivity runs to evaluate alternative model assumptions. Recommendations from previous STAR panels were considered in detail. Substantial improvements were made to both the CalCOFI index and the maturity curve parameters. While there remain unresolved problems with the assessment, progress on these problems is likely to be difficult and incremental. Based on these considerations the Panel recommends that the next bocaccio rockfish assessment be an update rather than a full assessment.

Explanation of areas of disagreement regarding STAR panel recommendations

A. Among STAR panel members (including concerns raised by the GAP and GMT representatives

There were no areas of disagreement among STAR panel members.

B. Between the STAR panel and the STAT team

There were no areas of disagreement between the STAR panel and the STAT team.

Unresolved problems and major sources of uncertainty

Stock structure is a major uncertainty and unresolved problem – particularly the location of the northern and southern stock boundaries, and the extent of mixing with adjacent stocks. The apparent northwards diffusion of fish as they grow older also presents a difficulty for bocaccio assessment. The use of area-specific selectivities is an attempt to model this situation, but this is an imperfect solution because diffusion is likely to be a complex process that occurs sporadically and/or exhibits density-dependent characteristics. But given the limited data available, it is hard to see any alternative to this approach.

The value of natural mortality used in the assessment appears inconsistent with information on bocaccio longevity.

Finally, the lack of age data is a substantial limitation in the assessment.

Management, data, or fishery issues raised by the GAP and the GMT representatives

GMT and GAP representatives pointed out that extending northern boundary of the assessment from Cape Mendocino to Cape Blanco in this assessment raises issues for the management of bocaccio rockfish. While scientific information is the over-riding consideration for stock structure decisions, such information may not be able to identify precise stock boundaries. In these situations, advice from resource managers should be requested to ensure that management measures are no more burdensome nor complicated than necessary.

From a management perspective, there are distinct advantages to restricting the assessment to California waters. Approximately 6% of the coastwide catch occurs between Cape Mendocino and Cape Blanco, while only approximately 1% of the coastwide catch is taken from the California/Oregon border to Cape Blanco. Ending the assessment at the California/Oregon border would allow Oregon to avoid being held to an extremely low harvest guideline that would need to be tracked with imprecise in-season catch estimates. California would not be required to enter into catch sharing agreements or allocation discussions with Oregon regarding bocaccio, although there would still be implications for the management of the California trawl fishery and trawl IQs. Given the uncertainties in stock structure and the low proportion of the coastwide catch north of Cape Mendocino, alternative model runs extending to Cape Mendocino, the California/Oregon border, and Cape Blanco could be presented to the Council for consideration in determining the geographic region that is managed using the assessment results.

Prioritized recommendations for future research and data collection

- The location of the northern and southern boundaries of this stock, and the extent to which it mixes with the Canadian and Mexican stocks, are major uncertainties in this assessment. Three approaches which might help reduce these uncertainties are otolith elemental analysis, parasitology, and co-operative research with Canadian and Mexican colleagues (e.g., evaluation of data from the Mexican analogue of the CalCOFI survey).

- The reliability of the recCEN index could be improved by an evaluation of the spatial distribution of fishing effort and fish size.

- The Panel endorses the continued processing of historical CalCOFI samples from the northern transects, which will produce additional data for this assessment.

- Neither the triennial nor the NWFSC shelf-slope surveys are well suited to bocaccio. Research to develop a survey methodology that is more appropriate for species like bocaccio could improve the assessment.

- SS3 implements new options for bias adjustment of stock recruit relationships that have been used with little or no peer review. Simulation testing is needed to confirm that bias adjustment is justified in all cases. Guidelines should be developed on how to configure bias adjustment settings to reflect the biological characteristics of the stock and the available assessment information.

- Develop methods to incorporate uncertainty in natural mortality and/or steepness in model configurations in which these parameters are fixed. The delta method for propagating uncertainty (McCall in prep.) is promising approach that warrants further evaluation.

- The Panel recognises the difficulty of developing a precise age estimation method for this species but notes that such a method could substantially improve the assessment.

- The Panel notes that there is no recent histology to confirm macroscopic staging for determination of proportion mature at length, but acknowledges that the assessment is not particularly sensitive to the values used.

Acknowledgements

The Panel thanks staff at the SWFSC Santa Cruz laboratory their exceptional support and provisioning during the STAR meeting.

References

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Agenda Item E.2.a
Attachment 6
September 2009

DRAFT: Status of the widow rockfish resource in 2009

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(Post STAR version)
August 26, 2009

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Table of Contents

Executive summary

Stock

This assessment applies to widow rockfish (*Sebastes entomelas*) located in the territorial waters of the U.S., including the Vancouver, Columbia, Eureka, Monterey, and Conception areas designated by the International North Pacific Fishery Commission (INPFC). The stock is assumed to be a single mixed stock and subject to four major fisheries.

Catches

The earliest records of landings of widow rockfish were in 1916. Major U.S. commercial catches of widow rockfish began in the late 1970s, peaking in 1981 (Figure ES1). Since the 1981 peak there has been a steady decline in the landings of widow rockfish to 52 mt in 2003 and to 254 mt in 2006 (Table ES1). Catches were mostly from commercial fisheries. Catches from recreational fisheries ranged from less than 2 mt in 2003 to 375 mt in 1982. The dominant gear type historically has been the midwater trawl. During the early 1990s, bottom trawl catches nearly matched the midwater trawl catches.

Table ES1. Recent catches (mt) of widow rockfish by four fisheries from 1999 to 2008.

Year	Vancouver, Columbia	Oregon Midwater Trawl	Oregon Bottom Trawl	Eureka, Monterey, and Conception	Total
1999	777	2016	923	1053	4768
2000	639	2665	18	1341	4664
2001	424	1220	45	590	2279
2002	65	310	7	50	432
2003	14	22	2	5	43
2004	32	34	10	26	101
2005	43	139	6	12	199
2006	45	155	3	13	215
2007	37	192	10	19	259
2008	97	106	2	38	243

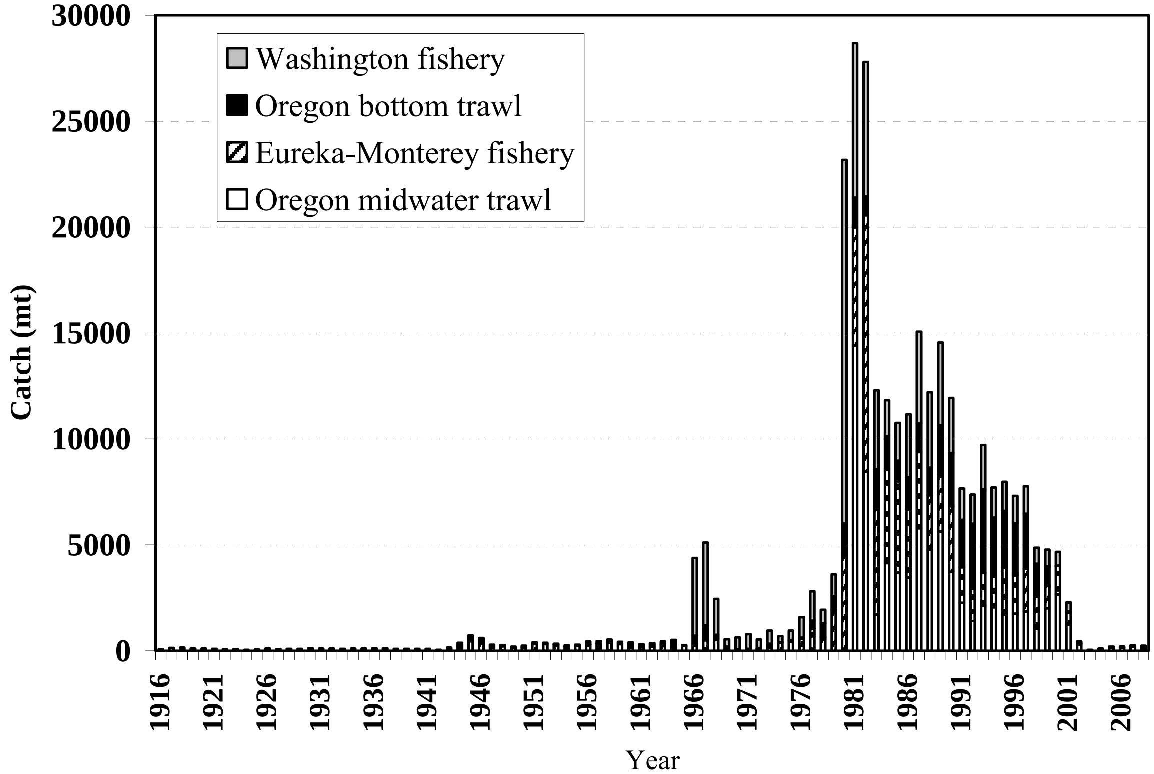

Figure ES1. Total catches of widow rockfish from 1916 to 2008.

Data and assessment

The last full assessment of widow rockfish was conducted in 2005 and was updated in 2007 using an age-based population model (written in AD Model Builder (ADMB), He et al. 2007a). The Stock Synthesis program (SS3) was used in this assessment. All fishery data, including landings, age composition, and logbook catch rates, were recently downloaded from the PacFIN, CALCOM, and NORPAC databases, or provided by state and federal agencies. Survey data, including the triennial survey and the Northwest Fisheries Science Center (NWFSC) combo survey, were also used in the assessment. Bycatch data from at-sea processing vessels were also included in the assessment.

Stock spawning output

Stock spawning output has shown a steady decline between 1980 and 2003, soon after major commercial fisheries for widow rockfish began. Since 2003, stock spawning output has shown an increasing trend. Table ES2 and Figure ES2 show time series of estimated spawning outputs, depletion, and their 95% confidence intervals from the base assessment model.

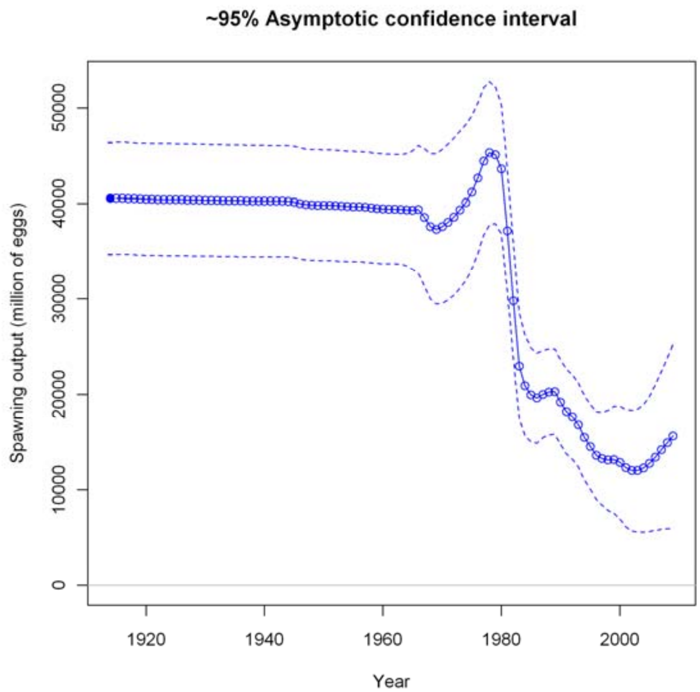

Figure ES2. Estimated spawning outputs of widow rockfish from 1916 to 2009 with 95% confidence intervals.

Table ES2. Estimated spawning outputs (million of eggs) and depletion levels of widow rockfish from 2000 to 2009. The 95% confidence intervals are also shown.

Year	Spawning output	Confidence interval (95%)	Depletion (%)	Confidence interval (95%)
2000	12852	6949-18755	31.7	17.8-45.6
2001	12294	6164-18425	30.3	15.7-44.9
2002	12000	5709-18290	29.6	14.5-44.7
2003	12024	5597-18452	29.7	14.1-45.2
2004	12259	5604-18914	30.2	14.0-46.5
2005	12735	5677-19794	31.4	14.0-48.8
2006	13403	2784-21021	33.1	14.1-52.0
2007	14171	5897-22445	34.9	14.3-55.6
2008	14908	5960-23856	36.8	14.2-59.3
2009	15625	5984-25266	38.5	14.2-62.9

Recruitment

The model estimated time series of recruitment of age-0 fish from 1958 to 2008. The highest recruitment occurred in 1970 (Figure ES3). Recruitments remained generally low in the early 1990s as well as since 2001 as compared to the long-term average (Figure ES3 and Table ES3). The 2007 assessment update indicated that the 2000 recruitment was strong, but this assessment does not confirm this is the case. As in the last assessments, uncertainties in estimation of recruitment remain high.

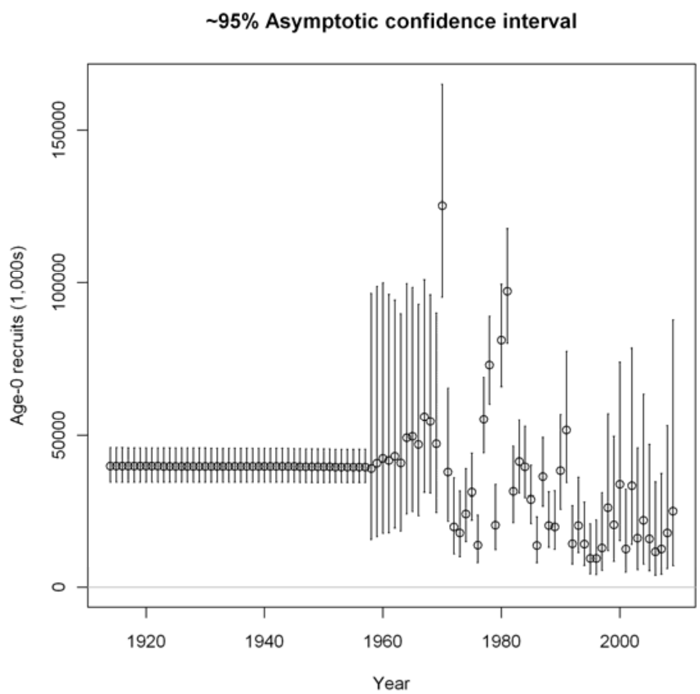

Figure ES3. Estimated recruitment of widow rockfish and 95% of asymptotic confidence intervals from 1916 to 2009.

Table ES3. Estimated recruitment with 95% confidence intervals from 2000 to 2009.

Year	Recruitment (*1000)	Confidence interval (95%)
2000	33828	15457-74031
2001	12686	5008-32140
2002	33395	14202-78523
2003	16309	5805-45818
2004	22192	7750-63549
2005	16046	5490-46901
2006	11746	3991-34575
2007	12698	4310-37408
2008	18038	6124-53125
2009	25135	7201-87732

Reference points

The spawning output in 2009 as a percentage of unfished spawning output is the population status (depletion). Depletion below 25% indicates an overfished stock, and depletion between 25% and 40% indicates a stock in the precautionary zone[1]. Depletion over 40% indicates a healthy stock. The estimated depletion in 2009 is 38.5% with 95% of confidence intervals of 14.2% and 62.9% (Table ES2 and Figure ES4). The management target for widow rockfish is 40% of unfished spawning output. The assessment estimates the unfished spawning output to be 40,547 million eggs, and 40% of the target to be 16,218 million eggs. A summary of reference points is listed in Table ES4.

[1] A stock that has declined to less than 25% of its unfished spawning output is considered "overfished" until it rebuilds to 40% of its unfished spawning output. Such a stock is managed under the rebuilding plan while it is in the precautionary zone and not under the normal control rules specified for a stock in the precautionary zone (i.e., the 40-10 rule).

Table ES4. Summary of reference points for widow rockfish from the base case model.

Reference term	Estimated value	Confidence interval (95%)
Unfished spawning output ($SB_{0,}$ millions of eggs)	40547	35108-46828
Unfished recruitment (*1000)	39790	34523-45860
Reference points based on $SB_{40\%}$		
MSY Proxy Spawning output ($SB_{40\%}$)	16218	14043-18731
SPR resulting in $B_{40\%}$ ($SPR_{SB40\%}$)	0.6193	0.4157-0.9227
Exploitation rate resulting in $SB_{40\%}$	0.0337	NA
Yield with $SPR_{SB40\%}$ at $SB_{40\%}$ (mt)	3518	1379-8972
Reference points based on SPR proxy for MSY		
Spawning output at SPR (SB_{SPR}) (millions of eggs)	8589	1335-55244
$SPR_{MSY\text{-}proxy}$	0.5	0.0479-0.0530
Exploitation rate corresponding to SPR	0.0504	NA
Yield with $SPR_{MSY\text{-}proxy}$ at SB_{SPR} (mt)	3031	472-19469
Reference points based on estimated MSY values		
Spawning output at *MSY* (SB_{MSY}) (millions of eggs)	15272	9698-23635
SPR_{MSY}	0.6045	0.3463-1.055
Exploitation Rate corresponding to SPR_{MSY}	0.0256	NA
MSY (mt)	3526	1353-9189

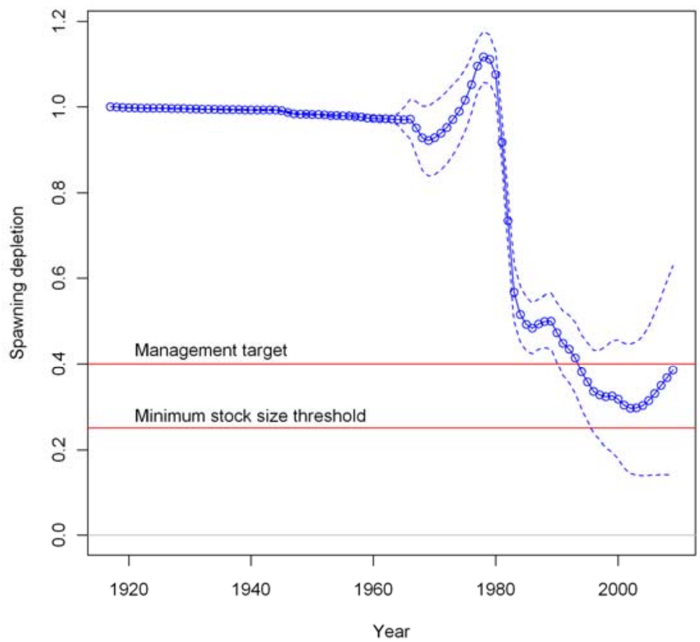

Figure ES4. Time series of depletion from 1916 to 2009 with 95% asymptotic intervals. Levels of management target and minimum stock size threshold are also shown.

Exploitation status

This assessment indicates that the widow rockfish population is at 38.5% of virgin spawning output in 2009 with an exploitation rate below 1% (Table ES5) and an equilibrium SPR of 95.7% (Figure ES5). However, the population is still below its target level of spawning output and is therefore still considered overfished (Figure ES6).

Table ES5. Time series of SPR (spawning potential ratio) and total exploitation rate of widow rockfish from 1999 to 2008.

Year	Spawning potential ratio (SPR)	Exploitation rate
1999	0.4881	0.0590
2000	0.4773	0.0602
2001	0.6536	0.0301
2002	0.9128	0.0057
2003	0.9905	0.0005
2004	0.9799	0.0012
2005	0.9648	0.0023
2006	0.9663	0.0024
2007	0.9627	0.0028
2008	0.9651	0.0026

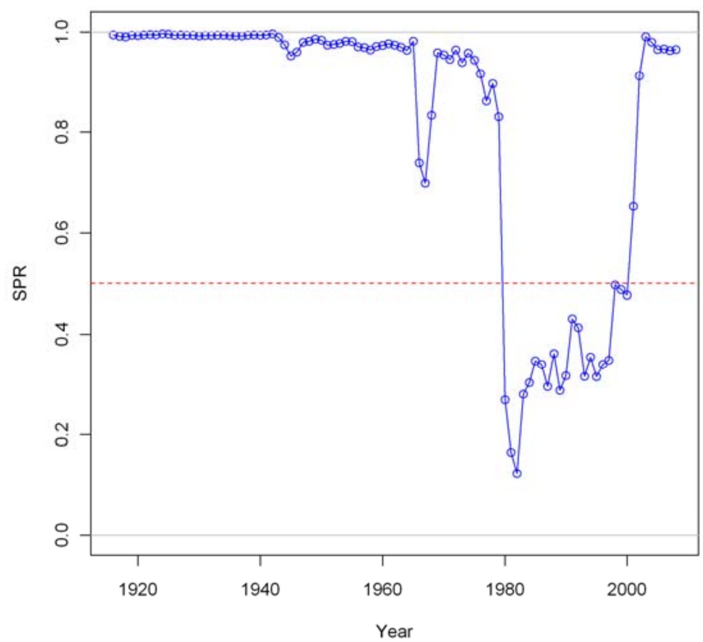

Figure ES5. Time series of estimated equilibrium spawning potential ratios (SPR) from 1916 to 2009. The target SPR level of 0.5 is also shown. Values below the target level indicate that overfishing occurred.

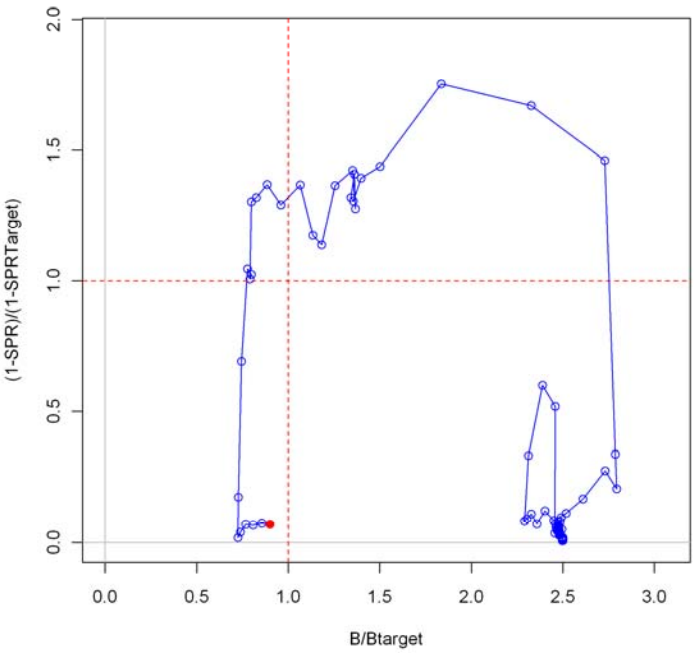

Figure ES6. Phase plot of estimated annual spawning potential ratios to the target of 0.5 and estimated spawning output relative to the target of SB40%. The last point on the lower-left quadrant corresponds to the estimated value in 2009.

Management performance
Widow rockfish was declared overfished in 2001. Optimal yield (OY), allowable biological catch (ABC), and catches of recent years are listed in Table ES6.

Table ES6. Management performance in obtaining the harvest guideline for widow rockfish. Harvest guideline and allowable biological catch (ABC) are taken from Council documents.

Year	Harvest Guideline or OY (mt)	Allowable Biological Catch (mt)	Catches (mt)
1999	5,090	5,750	4,136
2000	5,090	5,750	4,049
2001	2,300	3,727	1,989
2002	856	3,727	432
2003	832	3,871	43
2004	284	3,460	101
2005	285	3,218	199
2006	289	3,059	215
2007	368	5,334	258
2008	368	5,144	243
2009	522	7,728	
2010	509	6,937	

Unresolved problems and major uncertainties

1. The primary source of information on trends in abundance of widow rockfish is the Oregon bottom trawl logbook data, which is a questionable source of information for widow rockfish. In addition, no information after 1999 in the Oregon bottom trawl logbook data can be used in the assessment because the catch rates were very low due to trip limits and other management regulations. Based on a recommendation by the 2003 STAR panel, triennial survey indices have been used since 2005, but catches in the survey were low and the survey was discontinued in 2004. The NWFSC survey provided abundance indices in recent years, but the time series is short. Also, it is a bottom trawl survey, and does not adequately sample midwater habitat of widow rockfish.
2. Estimates of recruitment in recent years are highly uncertain and are key factors in determining how quickly the population will rebuild (He *et al*. 2003a, 2006b, 2007b). Age and length composition data from fisheries and surveys from the most recent years (2007 and 2008) suggest weak recruitment in 2002. This result contradicts the results in the 2007 assessment, which estimated the recruitment in 2002 to be a strong year class. More age and length data should be collected in 2009 and 2010 to resolve this issue.
3. As in the past assessments, there exist uncertainties in estimating the stock-recruitment relationship. These lead to greater uncertainties in the rebuilding analysis because it largely depends on how future recruitments are generated.
4. Stock structure issues, in particular the relationship to the Canadian stock, remain a source of uncertainty.

Forecasts
Widow rockfish was declared to be overfished in 2001. Forecasts will be provided as part of a forthcoming rebuilding analysis.

Decision table
As in the past assessments, there exist great uncertainties in estimating the stock-recruitment relationship. This is especially true for estimating recruitments in recent years, which are key factors in determing how quickly the population will rebuild. During the STAR Panel review, it was determined that a range of the steepness parameter (h) be used to bracket the recruitment uncertainties. Two alternative states of nature of h=0.25 and h=0.55 (versus h=0.406 in the base model) were chosen after a series of trial runs during the review. Future catch secenarios at F95% and F50% between 2011 and 2020 were used as alternative management decisions (Table ES7).

Table ES7. Decision table of 12-year projections for widow rockfish. Alternate states of nature and management options begin in 2011.

			State of nature					
			h = 0.25		Base case (h=0.4061)		*h* = 0.55	
Management decision	Year	Catch (mt)	Depletion(%)	Spawning output (mil eggs)	Depletion(%)	Spawning output (mil eggs)	Depletion(%)	Spawning output (mil eggs)
F95%	2009	522	25.2%	10949	38.5%	15625	48.6%	19238
	2010	509	25.4%	11029	39.9%	16178	50.9%	20118
	2011	359	25.4%	11006	40.9%	16580	52.6%	20812
	2012	342	25.1%	10887	41.4%	16801	53.7%	21259
	2013	324	24.6%	10672	41.5%	16838	54.2%	21453
	2014	317	24.0%	10421	41.4%	16797	54.4%	21530
	2015	327	23.6%	10239	41.6%	16863	54.9%	21720
	2016	346	23.4%	10175	42.2%	17120	55.9%	22118
	2017	366	23.5%	10205	43.2%	17533	57.3%	22682
	2018	383	23.7%	10286	44.5%	18032	59.0%	23329
	2019	399	23.9%	10387	45.8%	18570	60.7%	24012
	2020	411	24.2%	10494	47.2%	19123	62.5%	24705
F50%	2009	522	25.2%	10949	38.5%	15625	48.6%	19238
	2010	509	25.4%	11029	39.9%	16178	50.9%	20118
	2011	5210	25.4%	11006	40.9%	16580	52.6%	20812
	2012	4556	22.7%	9836	38.9%	15764	51.1%	20225
	2013	3963	20.0%	8680	36.7%	14865	49.3%	19484
	2014	3632	17.6%	7653	34.6%	14042	47.5%	18775
	2015	3598	15.8%	6841	33.2%	13462	46.3%	18311
	2016	3718	14.4%	6244	32.5%	13159	45.9%	18138
	2017	3854	13.3%	5778	32.2%	13046	45.9%	18164
	2018	3960	12.3%	5359	32.1%	13024	46.2%	18288
	2019	4016	11.4%	4932	32.1%	13027	46.6%	18450
	2020	4028	10.3%	4469	32.1%	13021	47.1%	18623

Research and data needs

1. There are increasingly fewer reliable abundance indices for widow rockfish. Recent management measures have undermined the ability to continue a fishery-dependent time series of relative abundance from the Oregon bottom trawl fishery and the Pacific whiting fishery since 1999. The constant flux of the management regime suggests that there is little likelihood that meaningful CPUE indices can be developed from these fisheries in the future. The NWFSC combo survey provides some useful information on abundance of widow rockfish, but catches from the survey have been generally very low in recent years. It is desirable that a trawl survey (including midwater trawls) that targets widow-like rockfish be initiated. A long-term hydroacoustic survey would also be very useful.
2. The long-term recruitment index is a key time series in the stock assessment. Continuation of the NMFS/PWCC midwater juvenile trawl survey should provide key information on the recruitment strength of widow rockfish.
3. Sample sizes for existing age-collection programs as well as length measurements (by fishery and survey) should be increased substantially.
4. Effort on ageing of widow rockfish should include collecting information on length-age keys and growth rates for both the northern and southern areas.
5. A single-area assessment model should be considered in the next assessment.
6. Conduct an interagency ageing comparison and comparative analysis of break and burn and surface ageing methods.
7. Develop methods to incorporate uncertainty in natural mortality and/or steepness in model configurations in which these parameters are fixed. The delta method for propagating uncertainty (MacCall in prep.) is a promising approach that warrants further evaluation.

1. Introduction

Widow rockfish (*Sebastes entomelas*) is an important commercial groundfish species belonging to the scorpionfish family (Scorpaenidae). It ranges from southeastern Alaska to northern Baja California, where it frequents rocky banks at depths of 25-370m (Eschemeyer *et al*. 1983, Wilkins 1986). In those habitats it feeds on small pelagic crustaceans and fishes, including especially *Sergestes similis*, myctophids, and euphausiids (Adams 1987). There is no evidence that separate genetic stocks of widow rockfish occur along the Pacific coast and the species has been treated as one stock with four separate fisheries (Hightower and Lenarz 1990; Rogers and Lenarz 1993; Ralston and Pearson 1997, Williams *et al*. 2002, Field and Ralston 2005).

A midwater trawl fishery for widow rockfish developed rapidly in the late 1970s and increased rapidly in 1980-82 (Gunderson 1984, Quirollo 1987, Figure 1). Large concentrations of widow rockfish had evidently gone undetected because aggregations of this species form at night and disperse at dawn, an atypical pattern for rockfish. Since the fishery first developed, substantial landings of widow rockfish have been made in all three west-coast states.

Management of the fishery began in 1982 when 75,000 lbs trip limits were introduced in an effort to curb the rapid expansion of the fishery (Appendix A). These were reduced to 30,000 lbs in 1983 and the fishery was managed by alteration of trip limits within the fishing season. A 10,500 mt/yr Allowable Biological Catch (ABC) for widow rockfish was instituted in 1983, but no harvest guideline was established. This form of management continued with alterations in ABC and trip limits until 1989 when a 12,100 mt/yr harvest guideline was implemented (Appendix A). From 1994 to 1997 the harvest guideline was changed to 6,500 mt and then reduced to 5,090 mt for 1998 to 2000. Based on the 2000 stock assessment, the population was declared overfished (Williams *et al*. 2000), and a series of management actions were taken by the Pacific Fisheries Management Council to protect the stock (Appendix A). As consequence, stock assessments for the population were conducted in 2002, 2004, and in 2006 along with rebuilding analyses of the stock (He *et al*. 2003a, 2003b, 2006, 2006b, 2007, and 2007a). Table 1 shows the management performance and harvest guidelines for widow rockfish from 1989 to 2010.

This assessment used an age-based population model similar to those used in previous assessments (Ralston and Pearson 1997, Williams *et al*. 2000, He *et al*. 2003b, He *et al*. 2006a, He et al. 2007a). Like the previous assessments, this assessment used a two-area model, delineated by 43^{o} N latitude (Figure 2). Unlike the previous assessments, which used ADMB software, this assessment used the Stock Synthesis program developed by Richard Methot (Version 3.03a, Methot 2009).

2. Assessment

2.1 Biological data

Growth in length for widow rockfish has been described using von Bertalanffy growth equations in two papers by Lenarz (1987) and Pearson and Hightower (1991). In their analyses it was determined that females attain a larger size than males and fish from the northern part of the range tend to be larger at age in comparison with those in the south. For these reasons we chose to use the sex-specific and area-specific estimates of length-at-age. Furthermore, we chose to use the estimates listed in Pearson and Hightower (1991). The growth parameters were then transformed in the format of Schnute parameters, expressed as *L1*, *L2*, and *K*, and shown below and in Figure 3, because they are from a more recent and comprehensive analysis of widow rockfish growth compared to the analysis by Lenarz (1987). In order to match the fisheries, we used the Columbia-Eureka INPFC area border (43^{o} N latitude) to delineate north from south.

Parameter	Females (north)	Males (north)	Females (south)	Males (south)
L1 (age=3)	22.7	28.5	22.3	23.2
L2 (age=18)	47.7	42.9	46.2	41.0
K	0.14	0.18	0.2	0.25

Sex-specific weight-at-age estimates were computed using the length-at-age estimates above in combination with sex-specific length-weight regressions for widow rockfish that were developed by Barss and Echeverria (1987). The length-weight regression equation is $W = \alpha L^{\beta}$, where *W* is the weight (g) and *L* is the length (cm). The sex-specific parameter values used in this assessment are listed below:

Parameter	Females	Males
α	0.00545	0.01188
β	3.28781	3.06631

Estimates of maturity and fecundity of female widow rockfish were obtained from Barss and Echeverria (1987) and Boehlert *et al*. (1982), respectively. Age-specific maturity estimates were taken directly from the literature instead of fitting a parametric model (Figure 4), while age-specific fecundity was computed using the weight-fecundity regression:

$$F = 605.71W - 261830.7$$

where *F* is fecundity (number of eggs) and *W* is weight (g). The weight-fecundity regression applied to the southern weight-at-age estimates resulted in negative values for ages 3 and 4. The weight-fecundity regression developed by Boehlert et al. (1982) was based on fish captured from Oregon and apparently does not apply to widow rockfish in the south. Recent work indicates that there is no significant relationship between body weight and weight specific fecundity in widow rockfish (Dick 2009). The maturity estimates indicate a substantial difference in maturity-at-age between the north and south, with the northern fish maturing at an older age. Lacking any other estimate of fecundity for the south, we applied the weight-fecundity regression from the north and modified the estimates for ages 3-5 to approximate an asymptote to 0.

2.2 Fishery-dependent data

2.2.1 Landings

All landings were summarized into four fisheries: (1) Vancouver-Columbia in Washington State (WAFishery1); (2) Oregon mid-water trawl (ORMWTraw); (3) Oregon bottom trawl (ORBTraw); and (4) Eureka, Monterey, and Conception (EMFishery) (Figure 1). Landings statistics used in this assessment were derived from six sources:

1. All commercial landings from 1981 were extracted from the PacFIN database. Landings from at-sea-processing (ASP) were not included in the assessment. They were replaced by the bycatch estimates (see #6 below).
2. The very small annual recreational take of widow rockfish from 1980 to 2008 was extracted from the Marine Recreational Fishing Statistics Survey (MRFSS) database. Because there were no estimates in the database between 1990 and 1992, catches for these three years were linearly interpolated.
3. All landings from 1966 to 1972, and some landings from 1973 to 1976 were directly taken from a summary table in Rogers (2003), who compiled summaries of foreign catches in the period.
4. Some landings from 1973 to 1976 and all landings from 1977 to 1979 were directly copied from the 2000 assessment (Williams *et al*. 2000).
5. Historical California catch data from 1916 to 1968 recently reconstructed by Ralston *et al*. (2009).
6. Historical Oregon bottom trawl catch data from 1938 to 1975 estimated from catch reports.
7. Bycatch estimates from 1991 to 2001 were provided by the NWFSC (Jim Hastie and Eliza Heery, personal communication).
8. Total catch (total mortality) between 2002 and 2007 were reconstructed from West Coast Groundfish Observer Program.

Summarized catches by year and fishery are presented in Table 2 and Figure 1. As in the past assessments of widow rockfish, the data were pooled over states into INPFC area blocks. These in turn were collapsed into northern and southern areas, representing the U.S. Vancouver and Columbia areas (WAFishery1, ORMWTraw, and ORBTraw) and the Eureka, Monterey, and Conception areas (EMFishery), respectively. The northern and southern areas are conveniently delineated by the 43^o N. latitude line. Within the southern area, widow rockfish landings were further condensed by summing over gears (i.e., trawl, other commercial, and recreational), providing annual estimates of landings from the southern area fishery. In the northern area, however, landings were partitioned into three separate fisheries: the Oregon midwater trawl fishery, the Oregon bottom trawl fishery, and the remaining catch of widow rockfish, referred to as the WAFishery1 (Vancouver-Columbia fishery). Because identification of gear types in Oregon (midwater or bottom trawl) did not begin until 1983, all landings in the northern area prior to that time were assigned to the Vancouver-Columbia "trawl" fishery. These fishery definitions are consistent with all previous widow rockfish stock assessments.

A revised approach for estimating historical catches of widow rockfish in Oregon and Washington fisheries was developed. Widow rockfish catches for the period from 1963 through 1975 are based on a dataset compiled by Jack Taggart (WDFW; unpublished manuscript 1975) from data reported in Barss and Niska (1978), DiDonato and Pattie (1968), Pattie (1973) and Tagart and Kimura (1982). We queried the total estimated catches of widow rockfish in this database for PMFC areas 2A through 3B (CA/OR border to the U.S./Canada border), and compared that to the total estimated catch of all rockfish in this region. We also compared the Tagart database estimates to those reported by Douglas (1998) for Oregon trawl fisheries, and found the results consistent with the Tagart estimated catches. These estimates suggest that widow made up a small fraction (35-370 mt per year, generally less than 5% of the total rockfish catch), although there seems to have been a large pulse of widow rockfish landings in 1967. For the period from 1938 through 1962, we compiled total rockfish catches from the "red book"

(Bureau of Commercial Fisheries) reports for 1938 through 1955, and from the Historical Annotated Database (Lynde 1984) for the period from 1956 through 1962. We then applied a ratio estimator based on the average fraction of total rockfish catch estimated to be widow rockfish from the Tagart database between 1963 and 1965 (2.4%) to these total landings. The resulting estimate was then used as the Oregon bottom trawl historical catches. As total rockfish catches were very modest prior to World War II (when balloon trawl fisheries developed), and most catches tended to be from fixed gear, we assume zero catches in Oregon and Washington prior to 1938. This method is intended to be a placeholder, until estimated historical catches by species are available from ongoing catch reconstruction efforts.

Recently estimated bycatch from at-sea processing (ASP) on widow rockfish from 1991 to 2001 were provided by the Northwest Fisheries Science Center and are included in the total landing estimates (Table 3) (Jim Hastie and Eliza Heery, NMFS Northwest Fisheries Science Center, personal communications). These landings were grouped into either the Vancouver-Columbia fishery or the Oregon mid-water trawl fishery, proportioned by number of hauls observed north or south of 43^{o}N latitude. Widow rockfish total catches between 2002 and 2007 were reconstructed from West Coast Groundfish Observer Program total mortality estimates and at-sea whiting fishery bycatch estimates, provided by the Northwest Fisheries Science Center. All Washington catches from the Groundfish Observer Program were assigned to the Washington fishery. Oregon midwater trawl catches were assigned to the Oregon midwater trawl fishery, and Oregon non-midwater trawl catches were assigned to the Oregon bottom trawl fishery. All California catches were assigned to the California fishery. Widow bycatch in the at-sea whiting fishery was added to the Oregon midwater trawl fishery. For 2008, landings data from PacFIN and the widow bycatch estimate in the at-sea whiting fishery were used, and no additional discard was added. The only 2008 discard information for widow rockfish available at the time of STAR Panel was the discard estimate from the PacFIN quota-species monitoring report, and this value was minimal.

2.2.2 Age composition data

Widow rockfish otolith samples collected coastwide since 1989 have been aged at the NMFS SWFSC Fisheries Ecology Division in Santa Cruz (formerly the Tiburon Laboratory) using the break-and-burn aging method (Pearson and Hightower 1991). Most fish were aged by Fisheries Ecology Division staff (Don Pearson) using the break-and-burn ageing technique. Prior to 1989, the ages of all Vancouver-Columbia fish were obtained by researchers in the State of Washington, who used surface readings. Prior to 1982, Oregon widow rockfish were aged by investigators in Oregon, who used the break-and-burn ageing method.

Age validation of widow rockfish was conducted by marginal increment analysis (Lenarz 1987). Hyaline-zone formation, the measure of annual growth, appears to occur between December and April (Pearson 1996). For convenience all widow rockfish are assumed to be born on January 1. Variation in the timing of hyaline-zone formation occurs between fish from Washington and California, which could affect age determination. Knowledge of this timing variation can be used to avoid mis-ageing and ultimately, variation in hyaline-zone formation is unlikely to result in major age discrepancies (Pearson 1996).

Washington provided ageing data from samples collected during commercial market sampling. The data were then expanded using relative catches from US Vancouver and Columbia areas. Oregon provided raw sample data which were expanded using methods described in Sampson and Crone (1997). California age data were extracted and expanded from the CALCOM database (Pearson and Erwin 1997). Summaries of age samples for four fisheries from 1978 to 2008 were presented in Table 4. Complete age compositions (proportion-at-age) of both sexes for the four fisheries from 1978 to 2008 are presented in Figures 5 to 8.

2.2.3 Oregon bottom trawl logbook

Oregon logbook data from 1984 to 1986 were provided by the Oregon Department of Fish and Wildlife, and data from 1987 to 2002 were extracted from the PacFIN database. Catch per unit effort (CPUE) was computed as pounds of fish caught per hour trawled. The data were filtered before the analysis. Only records meeting the following criteria were used in the analysis: (1) the fishing gear code corresponded to bottom trawl or roller gear, (2) hauls were conducted during the months of January, February, or March, and (3) the location of the reported haul fell in the range of 42°30' N to 46°30' N latitude and 124°36' W to 124°54' W longitude. In addition, records associated with any vessel code or spatial unit that had less than 1000 pounds of widow catch over the entire period (1984 to 2002) were also deleted. Data from 2000 to 2002 were not used in the analysis because widow catches in those three years were very low due to trip limits and other management regulations that had been implemented.

Annual CPUE indices were derived using the Delta-GLM (Generalized Linear Model) method with an additional factor (vessel) included:

$$\log(CPUE) = \mu + Y_i + V_j + L_k + \varepsilon_{ijkl}$$

where μ is the average $\log(CPUE)$, Y_i is a year effect, V_j is a vessel effect, L_k is a spatial (latitude and longitude) effect, and ε_{ijkl} is a normal error term with mean zero and variance σ_ε^2. The back-transformed year-specific CPUE, with bias-correction, was then calculated as:

$$CPUE_i = \exp\left(\mu + Y_i + \bar{V} + \bar{L} + \frac{\sigma_\varepsilon^2}{2}\right)\pi_i$$

where $\bar{V}$ and $\bar{L}$ are the mean effects of vessel and spatial unit, respectively, and π_i is a binomial coefficient:

$$\pi_i = \frac{\exp(\mu' + y_i' + \bar{V}' + \bar{L})}{1 + \exp(\mu' + y_i' + \bar{V}' + \bar{L})}$$

where μ' is the average, y' is year effect, $\bar{V}'$ is average vessel effect, and $\bar{L}$ is average spatial effect. Derived annual CPUE indices are presented in Table 5, which are identical to those used in the past assessments.

2.2.4. Pacific whiting bycatch indices

As in the previous assessments (Rogers and Lenarz 1993, Ralston and Pearson 1997, Williams et al. 2000), CPUE indices were computed that measured the incidental catch rate of widow rockfish in the at-sea Pacific whiting fishery. Data from the foreign fishery, joint-venture fishery and recent domestic fishery were extracted from the NORPAC database.

Full descriptions of how the CPUE indices were derived are in Appendix A of the 2005 Assessment (He *et al*. 2006a). An approach similar to the Delta-GLM analysis of Oregon bottom trawl logbook was used for estimation of the bycatch indices. Annual CPUE indices for bycatch in the foreign fishery, joint-venture fishery, and domestic fisheries are presented in Table 6. As recommended by the 2003 STAR Panel, annual CPUE indices from the domestic fishery after 1998 were excluded from the analysis because changes in management measures are expected to have more influence on the CPUE statistic than changes in stock size.

2.3 Fishery-independent data

2.3.1 Midwater trawl pelagic juvenile survey

Every year since 1983 the Groundfish Analysis Branch at NMFS Fisheries Ecology Division in Santa Cruz/Tiburon Laboratory has conducted a midwater trawl survey, which is designed to assess the reproductive success of rockfish spawning, including widow rockfish. Since 2001, the survey was expanded to a coastwide, combined industry and NMFS survey (PWCC/NWFSC: Pacific Whiting Conservation Cooperative and Northwest Fisheries Science Center) (Sakuma et al. 2006). An ANOVA analysis was used to fit all data from the combined survey (Steve Ralston, personal communication). Annual indices along with CVs from 2001 to 2008 are presented in Table 7. The index shows relatively high age-0 abundance in 2002.

2.3.2 Triennial trawl survey index

The AFSC/NWFSC triennial trawl survey index was not used in the 2003 assessment because of very limited widow catches by the survey and very poor fit of the index in the assessment model (He *et al*. 2003b). The 2003 STAR panel recommended the index be analyzed further and be considered for inclusion in the assessment. In the 2005 and 2007 assessments, the analysis of the triennial survey data uses the same Delta-GLM method as for the Pacific whiting bycatch indices. Detailed description of the analysis is in Appendix B of the 2005 assessment (He et al. 2006a). For this assessment, separate and distinct indices were developed for northern and southern areas, delineated by 43^{o} N latitude. The analysis was conducted using a GLMM method developed by staff at the NWFSC (John Wallace and Beth Horness, personal communication). The CVs were generated from MCMC sampling of 15 million runs. Derived index values and associated CVs are presented in Table 8.

Length frequency data from the triennial survey were also compiled and used in this assessment. The numbers of fish measured in length from 1980 to 2004 are presented in Table 9. Length composition (proportion-at-length) data of both sexes for the northern and southern areas are presented in Figures 9 and 10. Although the mean dates of the triennial survey changed from middle August between 1980 to 1992 to middle July between 1995 to 2004, this assessment assumes that it has no effect on the index and all data from 1980 to 2004 were treated as one continuous time series. This is because there is no evidence that indicates seasonal migration of widow rockfish. In addition, too few data, both in catches and length compositions, would be available if the time series were broken into two times series.

2.3.3 NWFSC trawl survey

Since 2003 NWFSC has conducted an annual shelf and slope trawl survey. This is the first time these trawl survey data are used in a widow rockfish assessment, since the survey now has a six-year time series. The survey is based on a stratified random-grid design, covering the coastal waters from a depth of 55 m to 1,280 m from Washington to California. Detailed survey information can be found in Keller *et al*. (2007).

As in the triennial survey, separate indices were developed for both the northern and southern areas, delineated by 43^{o} N latitude. The analysis was conducted using a GLMM method developed by the NWFSC staff (John Wallace and Beth Horness, personal communication). The CVs were generated from MCMC sampling of 15 million runs. Derived index values and associated CVs are presented in Table 10.

Age and length composition data were also compiled from the survey and were used in this assessment (Figures 11 to 14). Numbers of fish measured for length compositions and numbers of fish aged for age compositions from the survey are presented in Table 11. Note that sample sizes, in terms of numbers of fish measured, are very small in comparison to the commercial fisheries data.

2.4 History of modeling approaches

Previous assessments of widow rockfish were performed in 1989, 1990, 1993, 1997, 2000, 2003, 2005, and 2007 (Hightower and Lenarz 1989, 1990; Rogers and Lenarz 1993; Ralston and Pearson 1997, Williams *et al.* 2000, He *et al*. 2003b, He *et al*. 2006a, He *et al*. 2007). In 1989 the assessment involved the use of both cohort analysis and the Stock Synthesis program (Methot 1998). In 1993 and 1997, the age-based version of the stock synthesis program was used to assess the status of widow rockfish. In 2000, 2003, and 2005, the assessment of widow rockfish was implemented in ADMB software (Otter Research, Ltd. 2001), and applied an age-based analysis of the population with methods very similar to those used in the Stock Synthesis program. A full description of the ADMB model can be found in the previous assessment documents (He *et al*. 2003b and He *et al*. 2006a). In 2007, an update of the 2005 assessment was conducted (He *et al*. 2007a). The current assessment uses the Stock Synthesis program (SS3) (Version 3.03a, Methot 2009). A comparison between the ADMB-based assessment and an SS2-based model was conducted in November 2007, and it showed that the results between two programming approaches were very similar (He and Methot, Appendix B).

In the 2000 assessment, a starting year of 1968 was chosen based on the assumption that the 1965 year class was the earliest recruitment which could be reasonably estimated given a starting year of 1980 for the age composition information. The model tracked numbers and catches of male and female widow rockfish in age classes 3-20 (age 20 is an age-plus group). In the 2003 assessment, the starting year was extended backward to 1958 because the new landing data from 1966 to 1972 were added. Recruitment estimates prior to 1958 are assumed equal to the 1958 estimate in the model, so that the model is estimating recruitment at age 3 for the years 1958-1999. The same time frame was used in the 2005 and 2007 assessments.

2.4.1 Response to the 2002 STAR Panel recommendations

The last full assessment was reviewed by the STAR Panel in August 2005 (STAR Panel Report 2005). Generic recommendations and recommendations for future research are outlined below.

1. Find alternative indices. The recent trawl survey conducted by the NWFSC has been included in the assessment. Although it is not most suitable for widow rockfish, the survey has provided useful information on status of the population. The Panel also recommended hydro-acoustic surveys to be considered, but the technology and survey have not been fully developed.
2. Juvenile survey. As recommended by the STAR Panel and various workshops, the assessment uses the coast-wide surveys conducted by the SWFSC and PWCC/NWFSC vessels.

3. Increase age sample sizes. Sample sizes for widow rockfish ageing have been increased in the most recent years, most notably from the Oregon bottom trawl fishery.
4. Two-area assessment models. Given that there is no evidence that recruitments of widow rockfish between two areas were independent, this assessment still uses a two-area assessment model with linkage of recruitment.
5. Using and comparing the ADMB-based assessment with one done using the Stock Synthesis program. This assessment uses SS3 and comparisons between this assessment and the previous assessment are included in this report.
6. Priors for steepness. This assessment uses general priors developed by Martin Dorn for west coast rockfish. The steepness prior functions developed by He et al. (He *et al*. 2006) were used in the previous assessment. But it was not used in this assessment because it was not implemented in the current SS3 program.

2.4.2 Assessment update in 2007

An update assessment was conducted in 2007 and reviewed by the SCC. Depletion of the widow rockfish population was estimated to be 35.5% (He *et al*. 2007).

2.5 Model description

2.5.1 General

In this assessment, the population model begins in 1916 since the historical catch data from 1916 were provided by the California Reconstruction Project (Ralston *et al*., in review). The data used in this assessment that are also used in the previous assessments include four fishery catch-at-age compositions, landings in weight for each fishery, a midwater juvenile survey index, an Oregon bottom trawl logbook CPUE index, three whiting bycatch indices, and triennial survey indices. The new data sets, those not used in the previous assessments, include a NWFSC trawl survey index, length composition data from the triennial survey, and length and age composition data from the NWFSC survey.

Double-logistic selectivity functions by age were used to estimate female selectivities of each fishery. Selectivities for males were modeled as offsets of female selectivities. Double-normal selectivity was considered for age selectivity, but it was dropped from further consideration because no male offset function has been implemented in the current SS3 program. Experimental runs with no male offsets between double-logistic and double-normal selectivities indicated that the results were similar. Double-normal selectivity functions for length data were used to estimate female selectivities for both surveys along with male offsets.

A constant CV of 0.05 is assumed for catch estimates. Year-specific fishing mortalities are computed for each fishery for those years in which there are landings estimates available. In this assessment, a hybrid fishing mortality estimate was used for all fisheries (SS3 documentation, Methot 2009). Catchabilities for all indices, including fishery-dependent and -independent indices, were estimated in the model.

2.5.2 Natural mortality

Natural mortality (M) is assumed to be constant for all ages and in all years. In the 2003 assessment, the initial model estimated a slightly higher natural mortality for males than females based on the observation that there were more old females than males in the age data. The model was presented to the 2003 STAR Panel. It was noted that greater proportions of males at younger ages could be due to differences in selectivity by gender. The 2005 STAR Panel requested that natural mortality be estimated in the model. After a series of model runs, it was decided natural mortality should be fixed at 0.125 for the assessment model. In this assessment, the same natural mortality rate (0.125) was used.

2.5.3 Age compositions

The age data are modeled as multinomial random variables, with the year-specific sample sizes set equal to the number of samples collected, rather than the number of fish which often overstates the confidence of the data (Quinn and Deriso 1999). However, this assessment also examined an iterative reweighting method (model tuning) to determine the effective sample size in the likelihood functions (details in the model turning section).

The only information available for determination of ageing error was based on two point estimates of percent ageing agreement from the last two assessments (Rogers and Lenarz 1993; Ralston and Pearson 1997). From the previous assessments an estimate of 75% agreement for age 5 fish and 66% agreement for age 20 fish was modeled by assuming a linear relationship of percent agreement with age. These estimates of percent agreement at age were then fit to a set of age-specific normal distributions, which approximated the level of ageing agreement. The resulting matrix of true age versus reader age was then modeled in the past assessments:

$$A_t = EA_r$$

where A_t and A_r are n*n matrices for true age and reader age, respectively, n is number of age classes, and E is a n*n matrix for ageing error with the sum across each column equal to one.

Because the SS3 program does not accept ageing error matrices as inputs, standard deviations of ageing error for each age were computed from the ageing error matrix.

2.5.4 Proportion of recruitment to northern area

Since area-specific (north and south) growth and maturity is evident in widow rockfish, the population has been assessed using two-area models since 1989. The key component for the two-area model is how to allocate recruits of each year to each area. In all previous assessments, the proportions of recruitments to each area were determined by using averaged proportions of domestic landings by each area. Specifically, we used the sum of the domestic landings in the Vancouver-Columbia and both Oregon trawl fisheries relative to the total landings as an estimate of the proportion of recruitments to the northern area (He *et al*. 2006a). Figure 15 shows the proportions and moving averages of landings to the northern area that were used in the 2007 assessment.

In this assessment, the proportion of recruitment to the northern areas was estimated in the model. Annual deviations of the estimated proportion were also analyzed between 1978 and 2003 as a sensitivity analysis since age-composition data were available during that time period.

2.5.5 Discards and bycatch

The discards of widow rockfish are virtually unknown in most years. Age compositions of discards and landings can be very different (typically smaller fish are discarded) and can be important in determining discard rates (Williams *et al*. 1999). In the past assessments, a value of 6% of total weight was assumed for the years 1958-1982 and 16% of total weight for the years 1983-2006 (Hightower and Lenarz 1990, Williams *et al*. 2000, He *et al*. 2003b). The 16% estimate of discards is based on a dated study by Pikitch *et al*. (1988), which indicated most of the discards of widow rockfish were induced by regulations. The earlier 6% estimated is based on an ad hoc adjustment of the 16% estimate by previous assessment authors (Hightower and Lenarz 1990). The 16% assumed discard rate has likely become more uncertain in recent years due to changes in regulations.

Since the last assessment update in 2007, estimates of bycatch for the at-sea processing vessels (ASP) have been provided by the NWFSC (Table 3). Since no age or length composition data are available from these sources of bycatch, estimates of selectivities for these catches cannot be made. These bycatch amounts were added to the total catches of the two northern fleets (Vancouver-Columbia fishery and Oregon mid-water trawl).

2.5.6 Logbook and bycatch indices

The Oregon bottom trawl logbook indices and whiting bycatch indices are treated as biomass indices and are estimated in the model with a catchability parameter estimated for each index. Because there were no new data since the 2003 assessment, the same Oregon bottom trawl logbook indices from the 2002 assessment are used in this assessment. The whiting bycatch indices are recalculated according to the 2003 STAR panel recommendation. Details regarding the calculations of the whiting bycatch indices using Delta-GLM methods are in Appendix A of the 2005 Assessment.

2.5.7 Survey indices

Three survey indices are used in the assessment: the midwater juvenile trawl survey, the triennial trawl survey, and the NWFSC trawl survey. The CV for the midwater juvenile trawl survey was fixed during the tuning process and was set to equal to σ_R since the time period of the survey is short and it is the only data series that measures recruitment strength in recent years. The CVs for the other two surveys were set to equal to root mean squared errors (RMSEs) during the tuning process (see below). Time series of all indices (scaled to the mean of each index) were plotted in Figures 16 and 17.

2.5.8 Model tuning

An iterative weighting method was used in this assessment for model tuning. In addition, a downweighting of composition data developed by Francis was applied in this assessment (Appendix C). The initial sample sizes for age and length composition data were from actual sample sizes or numbers of fish measured, and the initial CVs for each index were derived externally to the model. The first step was to replace sample sizes of length and age composition data with effective sample sizes that include both sample trips and number of fished measured or aged. This method was developed by Ian Stewart of the NWFSC and has been used in other stock assessments. The second step repeated these same procedures. The last step involved applying Francis' method of down-weighting composition data (Appendix C).

Comparisons of time series of spawning outputs, recruitments and key parameters and model outputs are presented in Table 12 and Figures 18 and 19.

2.6 Model selection and evaluation

The initial model used untuned CVs for indices and the original sample sizes of age and length composition data. Many steps were taken during the model selection and evaluation process. These included selection of starting models that had few parameters, e.g. assuming the same selectivities for fisheries and surveys, and no male offsets in selectivities. Alternative definitions of periods of early recruitment and late recruitment were evaluated during the process. Different selectivity functions (such as double-logistic and/or double-normal functions) were also evaluated along with fixing some of the terminal selectivity parameters.

2.7 Responses to STAR panel requests

- Date Requests 1, 2, and 3: These requestes include splitting Oregon catches prior to 1983 out of the Washington fishery, providing new estimates for Vancouver-Columbia for 1916 to 1976, and providing discard rates by state and gears from the West Coast observer program for 2002 to 2008 and using total mortality estimates from the same program for 2007 to 2008. These requests were implemented during the Panel review with little effects on the modeling results.
- Date Request 4: Providing a graph of the abundance indices scaled to their own average for a common time period so that they are on a similar scale. The request was implemented in Figures 15 and 16.
- Modeling Request 5: Reset all effective Ns using Stewart's method with number of trips and number of fish for fisheries; for the surveys, use Stewart's method with the number of positive hauls. Do the re-tuning with effective N multipliers for the composition data sets, rather than adjusting each individual year. This request was implemented during the Panel review and used in the setup of the base model for this assessment.
- Modeling Request 6: Provide a run with one asymptotic length-based selectivity for all surveys, genders and areas combined. Also provide a run with separate asymptotic length-based selectivity curves for each survey, but combining genders and areas. The first part of this request deteriodrated the model fit and resulted in unreasonable selectivities. The second part of the request (one selectivity for each survey) resulted in more stable model and was used in the base model.
- Modeling Request 7: Provide a run with the abundance index for juveniles up-weighted and the age and length compositions down-weighted. This run resulted in a close fit to the juvenile abundance index. The down-weighting of the age and length composition data were later incoporated in the base model.
- Modeling Request 8: Provide a new base case using the Francis multipliers applied to the N-multipliers from the last re-weighted run. This request was implemented in the base model (also see Appendix C).
- Modeling Requests 9 to 11: These requests include using h=0.25 and h=0.55 to bracket the uncertainties, providing runs with the proportion of recruits to the northern area at 0.68 and 0.80, and providing a likelihood profile on steepness. These requests were conducted during the Panel review and included in this report.
- Modeling Request 12: Examine the contribution of age 1 male of Oregon mid-water trawl in 2007 to the total likelihood. Examining the model fit indicated relatively large likelihood value from this datum point (=0.71). This is because the Pearson residual tends to be large when expected values are near zero even with small observed values. In this case, one fish of age 1 was observed.
- Modeling Request 13: The original report presented to the STAR Panel shows stacked fishing mortalities by area. Provide different graphs for northern and southern areas. A new graph that shows fishing mortalities by area is included in this report.

- Provide a run with single area model re-combining the Triennial and NWFSC surveys into one series and the age compositions. If results are significantly different, try to explain the differences. This request will be examined in the next assessment.

2.8 Base case model results

Results from the base model run are presented in Tables 13 to 15 and Figures 20 to 52. Overall, time series patterns of biomass, spawning output, recruitment, and depletion are similar to those in the 2007 assessment. The trends were also very similar between the northern and southern areas (Figure 20). Spawning outputs showed steep decline in the early 1980s and almost continuous decline until the early 2000s (Figure 21). However, spawning outputs have shown an increasing trend in recent years. Depletion in recent years has been in the precautionary zone, with the lowest depletion of 27.39% in 2003 (Figure 22). The 95% confidence intervals of depletion for the most recent years were wide and ranged from below the overfished level to above the target biomass level of 40% of initial biomass (Figure 22). This suggests that there is high uncertainty in estimates of recent year depletion levels.

The stock-recruit relationship and recruitment deviations are presented in Table 14 and Figures 23 to 26. The input value of the standard deviation of log recruitment (σ_R) is 0.6, which is about 10% higher than the estimated RMSE value of 0.485 in the base model. Like many other rockfish species, recruitment of widow rockfish has been highly variable. The estimated steepness is 0.4061, suggesting this species is not very productive at low abundance. This value is low compared to the prior expected value of 0.721 compiled by Martin Dorn for west coast groundfish species (Martin Dorn, personal communication). It is also important to point out that recruitment of widow rockfish has been very low in recent years. The 2007 assessment indicated that there was a strong recruitment in 2000 (He *et al*. 2007a), which is not the case in this assessment. More discussion regarding estimation of recent year recruitments is in the section describing sensitivity analyses.

A time series of fishing mortalities is presented in Figure 27. Fishing mortalities were very high between 1980 and the early 2000s, and have been very low in recent years due to management regulations.

Model fits to indices are presented in Figures 28 to 36. The fits to these indices were generally good. The CVs for both the triennial and NWFSC surveys were large, mainly because few widow rockfish were caught in these surveys.

Estimated selectivity curves for four fisheries and all surveys are presented in Figures 37 to 42, and residuals from model fits to age and length compositions are presented in Figures 43 to 52. Patterns of age selectivity curves for four fisheries (Figures 37 to 40) were very similar to those in the past assessments, even though selectivities of male offsets were applied in this assessment. Residuals of the model fits to age composition data for these four fisheries showed no strong evidence of lack of fit to the data (Figures 43 to 48). Some residuals were large (e.g. male age 1 fit in 2007 of the Oregon mid-water trawl fishery in Figure 44). This is because the Pearson residual tends to be large when expected values are near zero even with small observed values. In this case, one fish of age 1 was observed. Estimated length selectivity curves for the triennial surveys in both northern and southern areas are plotted in Figures 41 to 42. Residuals of the model fits to the age and length composition data for all surveys fit relatively well (Figures 47 to 52). Model fits for all age and length composition data are provided as Appendix C.

2.9 Uncertainty and sensitivity analyses

2.9.1 Sensitivity analyses

A set of sensitivity analyses were performed to test model assumptions and to explore uncertainty in estimations of key model parameters (see also the likelihood profile section). During the model set up and the STAR review, the following three parameters to be included in sensitivity analyses: (1) recruitment distribution parameters to be estimated annually between 1978 to 2003, as compared to one parameter to be estimated in the base model; (2) using no *h* prior; and (3) CV for juvenile survey to be fixed at 0.2. Results of these sensitivity analyses are presented in Table 16 and Figures 53 and 54. Overall, model outputs from these runs were similar.

A detailed comparisons of key parameters and model outputs between the base model and two fixed proportions of recruitments to the northern area (0.6875 abd 0.75) were presented in Table 17 and Figures 55 and 56. It showed the importance of the recruitment distribution. With the range between 0.6875 abd 0.75, the stock was less depleted if less recruits were distributed to the northern area. More results of the recruitment distribution are presented in the profile run section.

2.9.2 Retrospective analysis

Retrospective analysis of the base model was performed by using the data only through 2007, 2006, and 2004 (Table 18 and Figures 57 to 58). The results indicated that data from the most recent years (2007 and 2008) had moderate effects on the model outputs. If data from the last two years (2007 and 2008) were not used, the model would show that the population is less depleted (depletion equals to 40.6% in 2007) with the steepness value of 0.535 (Table 18 and Figure 57). It also showed that recruitment in 2002 was higher than that estimated in the base model (Figure 58).

2.9.3 Likelihood profiles

Likelihood profiles for the proportion of recruitment to the northern area, steepness, and natural mortality were provided to investigate their effects on model outputs. These are important population parameters and, more importantly, these parameter estimates are highly uncertain in the assessment given the fact that no reliable abundance data exists in recent years for widow rockfish. Figures 59 to 61 show the likelihood profiles as well as effects of those parameters on the estimated depletion in 2009.

Figure 59 shows that when the proportion of recruitment to the northern area (PRNA) was at 0.75, the stock was most depleted. It is interesting to point out that the estimated PRNA value of 0.717 is very close to the proportions of landings in the northern area during the 1990s (Figure 15), which was used as the proportions of recruitments to the northern area in the previous assessments.

The profile on steepness showed that the stock was more depleted as steepness decreased (Figure 60). All previous stock assessments had shown that steepness of widow rockfish was low even with relatively high priors of steepness applied in the assessments (He *et al*. 2006a). This suggests that widow rockfish might be less productive than other rockfish species in west coast waters.

Figure 61 shows the profile of natural mortality (*M*) and related depletion of the stock in 2009. The likelihood profile indicates that natural mortality of widow rockfish, with current data and model settings, is most likely to be around 0.125, which was the assumed *M* in the assessment model. The stock was more depleted when *M* was assumed to be higher than 0.125 (most depleted at $M \approx 0.15$). This is because virgin biomass is estimated to be lower with higher *M* values. Consequently, virgin biomass is estimated to be higher with low *M* values.

2.9.4 Comparisons between this assessment and the past assessments

Comparisons of spawning outputs and recruitments between this assessment and the past assessments (2000, 2003, 2005, and 2009) are presented in Figures 62 and 63. Comparisons of key parameters between this assessment and the 2007 assessment are presented in Table 19. Overall, the patterns of time series of spawning outputs were similar among all assessments, which show steep declines in the early 1980s, and steady declines from the middle 1980s to early 2000s. Comparisons of the time series of recruitments estimated by all assessments also showed similar trends (Figure 63).

However, there some differences between this assessment and the 2007 assessment. For example, the 2007 assessment indicated much higher virgin spawning output than the current assessment (Figure 62). The higher virgin biomass in the 2007 assessment could have been the result of a relatively short catch history or that no recruitment bias-adjustment was applied in the assessment, or both. The 2007 assessment also indicated much higher recruitment in 2000 (Figure 63), which resulted in a projection of stock recovery within two years (see the rebuilding analysis, He *et al*. 2007b).

3 Rebuilding parameters

A separate rebuilding analysis will be conducted since the widow rockfish has been overfished**.**

4 Reference points

Virgin spawning output for widow rockfish is estimated to be 40,547 million eggs. The current depletion is 38.5% of the virgin spawning output. The management target for widow rockfish is 40% of virgin spawning output (16,218 million of eggs). The time series of estimated equilibrium spawning potential ratio (SPR) is shown in Figure 64. A phase plot of annual equilibrium SPR relative to its target and estimated spawning output relative its target is shown in Figure 65. An equilibrium yield curve is plotted in Figure 66.

5 Decision table

Decision table of 12-year projections with two alternate states of nature is presented in Table 20.

6 Management Recommendations

The stock has declined since fishing began in the late 1970s. The 2000 assessment showed that the spawning output in 1999 was just below 25% of unfished spawning output. This assessment shows that the spawning output in 2009 is within the precautionary zone and is yet to be rebuilt. Therefore, it is necessary to conduct a rebuilding analysis to determine harvest levels and related risks of not successfully rebuilding the stock by the target year in the rebuilding plan under alternative harvest levels.

7 Research needs

1. There are increasingly fewer reliable abundance indices for widow rockfish. Recent management measures have undermined the ability to continue a fishery-dependent time series of relative abundance from the Oregon bottom trawl fishery and the Pacific whiting fishery since 1999. The constant flux of the management regime suggests that there is little likelihood that meaningful CPUE indices can be developed from these fisheries in the future. The NWFSC combo survey provides some useful information on abundance of widow rockfish, but catches from the survey have been generally very low in recent years. It is desirable that a trawl survey (including midwater trawls) that targets widow like rockfish be initiated. A long-term hydroacoustic survey will also be very useful.
2. The long-term recruitment index is a key time series in the stock assessment. Continuation of the NMFS/PWCC midwater juvenile trawl survey should provide key information on the recruitment strength of widow rockfish.
3. Sample sizes for existing age-collection programs as well as length measurements (by fishery and survey) should be increased substantially.
4. Effort on ageing of widow rockfish should include collecting information on length-age keys and growth rates for both the northern and southern areas.
5. One area assessment model should be considered in the next assessment.
6. Conuduct an interagency ageing comparison and comparative analysis of break and burn and surface ageing methods.
7. Develop methods to incorporate uncertainty in natural mortality and/or steepness in model configurations in which these parameters are fixed. The delta method for propagating uncertainty (MacCall in prep.) is promising approach that warrants further evaluation.

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10 Tables

Table 1. Management performance in obtaining the harvest guideline for widow rockfish. Harvest guideline and allowable biological catch (ABC) are taken from Council documents.

Year	Harvest Guideline or OY (mt)	Allowable Biological Catch (mt)	Catches (mt)
1989	12,100	12,400	12,543
1990	12,400	8,900	10,293
1991	7,000	7,000	6,638
1992	7,000	7,000	6,400
1993	7,000	7,000	8,388
1994	6,500	6,500	6,679
1995	6,500	7,700	6,903
1996	6,500	7,700	6,327
1997	6,500	7,700	6,715
1998	5,090	5,750	4,230
1999	5,090	5,750	4,136
2000	5,090	5,750	4,049
2001	2,300	3,727	1,989
2002	856	3,727	432
2003	832	3,871	43
2004	284	3,460	101
2005	285	3,218	199
2006	289	3,059	215
2007	368	5,334	258
2008	368	5,144	243
2009	522	7,728	
2010	509	6,937	

Table 2. U.S. total catches (mt) of widow rockfish by four fisheries from 1916 to 2008.

Year	Vancouver, Columbia	Oregon Midwater Trawl	Oregon Bottom Trawl	Eureka, Monterey, and Conception	Total
1916	0	0	0	83	83
1917	0	0	0	129	129
1918	0	0	0	148	148
1919	0	0	0	102	102
1920	0	0	0	105	105
1921	0	0	0	87	87
1922	0	0	0	75	75
1923	0	0	0	83	83
1924	0	0	0	53	53
1925	0	0	0	66	66
1926	0	0	0	100	100
1927	0	0	0	83	83
1928	0	0	0	95	95
1929	0	0	0	93	93
1930	0	0	0	120	120
1931	0	0	0	108	108
1932	0	0	0	109	109
1933	0	0	0	95	95
1934	0	0	0	101	101
1935	0	0	0	109	109
1936	0	0	0	121	121
1937	0	0	0	114	114
1938	0	0	2	95	97
1939	0	0	2	85	86
1940	0	0	9	89	98
1941	0	0	16	72	88
1932	0	0	30	22	51
1943	0	0	99	54	153
1944	0	0	170	202	372
1945	0	0	271	451	721
1946	0	0	152	457	609
1947	0	0	86	209	294
1948	0	0	62	205	267
1949	0	0	57	146	203
1950	0	0	70	167	237
1951	0	0	48	344	392
1952	0	0	53	318	371
1953	0	0	39	293	333
1954	0	0	47	216	263
1955	0	0	48	232	280
1956	0	0	136	295	431

Table 2 (continued). U.S. total catches (mt) of widow rockfish by four fisheries from 1916 to 2008.

Year	Vancouver, Columbia	Oregon Midwater Trawl	Oregon Bottom Trawl	Eureka, Monterey, and Conception	Total
1957	0	0	130	324	454
1958	0	0	136	394	529
1959	0	0	104	320	424
1960	0	0	138	249	387
1961	0	0	152	171	323
1962	0	0	191	175	367
1963	0	0	150	289	438
1964	0	0	355	155	510
1965	0	0	36	230	266
1966	3670	0	391	318	4379
1967	3900	0	705	495	5100
1968	1693	0	169	586	2447
1969	356	0	115	80	550
1970	554	0	0	75	629
1971	701	0	22	62	785
1972	410	0	25	89	524
1973	621	0	14	314	949
1974	295	0	5	394	693
1975	465	0	10	483	958
1976	971	0	65	555	1591
1977	1397	0	367	1047	2811
1978	641	0	657	633	1931
1979	1024	0	646	1938	3608
1980	17161	0	1502	4505	23167
1981	7289	14390	1408	5592	28678
1982	6354	8453	885	12107	27799
1983	3739	1684	1726	5148	12296
1984	1686	4138	1548	4450	11821
1985	1786	3695	1010	4272	10763
1986	2969	3453	1358	3379	11159
1987	4318	5784	1353	3601	15056
1988	3572	4758	1300	2581	12211
1989	3920	5634	2289	2707	14550
1990	2599	3728	2514	3099	11940
1991	1474	2267	2245	1670	7657
1992	1378	1401	3053	1536	7368
1993	2089	2123	3928	1567	9706
1994	1421	2060	2764	1456	7701
1995	1376	1698	2663	2240	7977
1996	1274	1757	2479	1795	7305
1997	1289	1865	2604	1999	7757

Table 2 (continued). U.S. total catches (mt) of widow rockfish by four fisheries from 1916 to 2008.

Year	Vancouver, Columbia	Oregon Midwater Trawl	Oregon Bottom Trawl	Eureka, Monterey, and Conception	Total
1998	751	1045	1543	1527	4866
1999	777	2016	923	1053	4768
2000	639	2665	18	1341	4664
2001	424	1220	45	590	2279
2002	65	310	7	50	432
2003	14	22	2	5	43
2004	32	34	10	26	101
2005	43	139	6	12	199
2006	45	155	3	13	215
2007	37	192	10	19	259
2008	97	106	2	38	243

Table 3. Comparisons of annual catches (mt) from at-sea processing (ASP) retrieved from the PacFIN database and bycatch estimates (mt) provided by the Northwest Fisheries Science Center for widow rockfish from 1991 to 2001. Only bycatch estimates were included in the assessment.

Year	ASP Catch	Bycatch estimate
1991	150	272
1992	5	348
1993	4	151
1994	27	288
1995	33	195
1996	4	212
1997	3	205
1998	66	259
1999	33	186
2000	77	207
2001	50	173

Table 4. Number of samples collected for each year and fishery of age composition data used in the widow rockfish assessment.

	Vancouver-Columbia	Oregon midwater trawl	Oregon bottom trawl	Eureka-Conception
1978				7
1979				11
1980	18			26
1981	31			44
1982	40			149
1983	25			189
1984	22	32	27	169
1985	16	53	23	175
1986	27	56	22	154
1987	36	68	34	135
1988	20	39	33	127
1989	30	65	45	170
1990	41	61	49	155
1991	35	59	78	95
1992	31	43	82	55
1993	36	50	61	22
1994	28	22	63	28
1995	33	30	43	11
1996	27	32	27	35
1997	30	47	40	61
1998	22	41	30	37
1999	29	62	26	31
2000	21	55		17
2001	10	40		7
2002	12	17		14
2003	5			3
2004	20	4		7
2005	11			
2006	10	13		
2007	16	9	12	
2008	14	25	15	8

Table 5. Oregon bottom trawl logbook catch-per-unit-effort index from 1984 to 1999.

Year	CPUE (lbs./hr.)	CV
1984	331.47	0.2121
1985	100.88	0.1875
1986	227.08	0.2928
1987	169.08	0.2730
1988	93.97	0.2897
1989	164.10	0.1749
1990	78.49	0.1348
1991	73.59	0.1275
1992	83.16	0.1179
1993	53.58	0.1314
1994	100.34	0.1128
1995	109.96	0.1387
1996	94.81	0.1357
1997	97.23	0.1502
1998	56.56	0.1718
1999	84.46	0.1684

Table 6. Scaled indices of widow rockfish catches derived from bycatch in three sectors of the Pacific whiting fishery. Note that index values after 1998 were not used in this assessment.

Year	Index	CV
Foreign		
1977	0.770	0.115
1978	1.205	0.112
1979	0.703	0.119
1980	1.993	0.131
1981	0.728	0.126
1982	0.243	0.247
1984	2.937	0.125
1985	0.407	0.107
1986	1.111	0.103
1987	0.390	0.088
1988	0.513	0.124
Joint venture		
1983	2.889	0.120
1985	0.776	0.117
1986	0.823	0.081
1987	0.320	0.087
1988	0.659	0.077
1989	0.824	0.064
1990	0.710	0.074
Domestic		
1991	1.264	0.125
1992	0.781	0.125
1993	0.801	0.104
1994	1.465	0.068
1995	0.455	0.106
1996	1.018	0.082
1997	0.886	0.077
1998	1.330	0.079

Table 7. Yearly index estimates from the pelagic juvenile trawl survey, 2001 to 2008.

Year	Index value	CV
2001	3.79	0.06
2002	10.07	0.08
2003	4.57	0.06
2004	8.43	0.07
2005	3.52	0.06
2006	1.63	0.05
2007	1.69	0.05
2008	3.09	0.06

Table 8. Indices of widow rockfish catches derived from triennial surveys from 1980 to 2004 for northern and southern areas.

Year	Index	CV
Northern area		
1980	222.7	0.5728
1983	292.9	0.4399
1986	110.7	0.4980
1989	136.9	0.6483
1992	236.0	0.4800
1995	56.6	1.0350
1998	500.3	0.4280
2001	57.2	0.9266
2004	14.2	0.7726
Southern area		
1980	208.7	0.7360
1983	334.0	0.7464
1986	433.4	1.2778
1989	154.4	0.8178
1992	104.6	0.6392
1995	198.8	0.7360
1998	221.2	0.6677
2001	27.1	0.8978
2004	204.4	1.0286

Table 9. Number of fish measured for length compositions from the tri-annual survey that were used in the widow assessment model.

	Northern area	Southern area
1980	83	
1983	169	88
1986	67	82
1989	110	201
1992	48	281
1995	148	139
1998	203	245
2001	21	58
2004	7	116

Table 10. Indices of widow rockfish catches derived from the NWFSC surveys from 2003 to 2008 for northern and southern areas.

Year	Index	CV
Northern area		
2003	793.6	0.9087
2004	55.1	1.6844
2005	118.2	1.0357
2006	135.3	0.7991
2007	159.5	0.7115
2008	82.1	0.9918
Southern area		
2003	193.4	0.6723
2004	186.4	1.4798
2005	203.6	0.6365
2006	243.4	0.5484
2007	314.8	0.6416
2008	113.0	0.6931

Table 11. Number of fish measured for length compositions and number of fish aged for age compositions from the NWFSC survey that were used in the widow assessment model.

	Northern area length	Southern area length	Northern area age	Southern area age
2003	110	102	4	6
2004	8	172	8	50
2005	35	161	22	59
2006	98	74	29	60
2007	46	45	37	45
2008	10	16	10	10

Table 12 Comparisons of key parameters and model outputs between the reweighted post-STAR model (PostSTARRewet2), the final base model (PostSTARBase), and the pre-STAR base model (PreSTARBase).

Description	PostSTARRewet2	PostSTARBase	PreSTARBase
Management quantities			
B_0 (million of eggs)	38426	40547	39425
2007 depletion (%)	32.0	34.9	31.5
2009 depletion (%)	34.7	38.5	33.2
No. of parameters	115	115	127
Steepness (*h*)	0.3059	0.4061	0.3103
Proportion of recruits to north	0.7220	0.7170	0.7258

Table 13. Fixed and estimated parameter values with standard deviations for the base model.

Parameter	Estimated (yes/no).	value	Standard deviation	Note
Natual mortality all ages, all sexes, all area	No	0.125	NA	
L_at_Amin female north	No	27.72	NA	
L_at_Amax female north	No	47.74	NA	
K female north	No	0.14	NA	
L_at_Amin female south	No	22.32	NA	
L_at_Amax female south	No	46.29	NA	
K female south	No	0.2	NA	
L_at_Amin male north	No	28.54	NA	
L_at_Amax male north	No	42.96	NA	
L male north	No	0.18	NA	
L_at_Amin male south	No	23.22	NA	
L_at_Amax male south	No	41.07	NA	
L male south	No	0.25	NA	
Age growth CV, all ages, all sexes, all areas	No	0.1	NA	
Weight-length relationship parameter 1 female	No	5.45E-06	NA	
Weight-length relationship parameter 2 female	No	3.2878	NA	
Weight-length relationship parameter 1 male	No	1.19E-05	NA	
Weight-length relationship parameter 2 male	No	3.0663	NA	
Proportion of recruitment to northern area	Yes	-0.3612	0.0934	
R0	Yes	10.5914	0.0725	
Steepness	Yes	0.4061	0.1400	
Sigma R	No	0.6	NA	
Early_RecrDev_1958	Yes	-0.0103	0.4635	
Early_RecrDev_1959	Yes	0.0322	0.4596	
Early_RecrDev_1960	Yes	0.0719	0.4455	
Early_RecrDev_1961	Yes	0.0561	0.4325	
Early_RecrDev_1962	Yes	0.0878	0.4058	
Early_RecrDev_1963	Yes	0.0360	0.4058	
Early_RecrDev_1964	Yes	0.2229	0.3640	
Early_RecrDev_1965	Yes	0.2315	0.3533	

Table 13 (continued). Fixed and estimated parameter values with standard deviations for the base model.

Parameter	Estimated (yes/no).	value	Standard deviation	Note
Early_RecrDev_1966	Yes	0.1751	0.3516	
Early_RecrDev_1967	Yes	0.3621	0.3034	
Early_RecrDev_1968	Yes	0.3430	0.2958	
Early_RecrDev_1969	Yes	0.2016	0.3298	
Early_RecrDev_1970	Yes	1.1760	0.1583	
Early_RecrDev_1971	Yes	-0.0271	0.2828	
Early_RecrDev_1972	Yes	-0.6690	0.3071	
Early_RecrDev_1973	Yes	-0.7844	0.2950	
Early_RecrDev_1974	Yes	-0.4906	0.2509	
Early_RecrDev_1975	Yes	-0.2458	0.1904	
Early_RecrDev_1976	Yes	-1.0642	0.2736	
Early_RecrDev_1977	Yes	0.2953	0.1324	
RecrDev_1978	Yes	0.5700	0.1241	
RecrDev_1979	Yes	-0.6991	0.2653	
RecrDev_1980	Yes	0.6853	0.1256	
RecrDev_1981	Yes	0.9476	0.1053	
RecrDev_1982	Yes	-0.0660	0.1950	
RecrDev_1983	Yes	0.3501	0.1501	
RecrDev_1984	Yes	0.3793	0.1495	
RecrDev_1985	Yes	0.1161	0.1668	
RecrDev_1986	Yes	-0.5922	0.2587	
RecrDev_1987	Yes	0.3852	0.1472	
RecrDev_1988	Yes	-0.1748	0.1986	
RecrDev_1989	Yes	-0.1992	0.2095	
RecrDev_1990	Yes	0.4823	0.1522	
RecrDev_1991	Yes	0.8130	0.1301	
RecrDev_1992	Yes	-0.4431	0.2552	
RecrDev_1993	Yes	-0.0691	0.2006	
RecrDev_1994	Yes	-0.3728	0.2469	
RecrDev_1995	Yes	-0.7389	0.3053	

Table 13 (continued). Fixed and estimated parameter values with standard deviations for the base model.

Parameter	Estimated (yes/no).	value	Standard deviation	Note
RecrDev_1996	Yes	-0.6928	0.3260	
RecrDev_1997	Yes	-0.3716	0.3278	
RecrDev_1998	Yes	0.3369	0.2474	
RecrDev_1999	Yes	0.0915	0.3218	
RecrDev_2000	Yes	0.5986	0.2398	
RecrDev_2001	Yes	-0.3533	0.3312	
RecrDev_2002	Yes	0.6305	0.2766	
RecrDev_2003	Yes	-0.0875	0.3864	
RecrDev_2004	Yes	0.1718	0.3979	
RecrDev_2005	Yes	-0.2133	0.4143	
RecrDev_2006	Yes	-0.5940	0.4228	
RecrDev_2007	Yes	-0.5872	0.4276	
RecrDev_2008	Yes	-0.3034	0.4310	
Q juvenile survey north	Yes	-7.0729	0.5012	
Q Oregon bottom trawl CPUE	Yes	-5.8940	0.1852	
Q triennial survey	Yes	-5.6973	0.3619	
Q whiting bycatch foreign	Yes	-10.9010	0.2393	
Q whiting bycatch joint venture	Yes	-10.6780	0.3166	
Q whiting bycatch domestic	Yes	-10.1087	0.2180	
Q NWFSC survey north	Yes	-5.3063	0.8116	
Q NWFSC survey south	Yes	-3.9441	0.7936	
Q triennial survey south	Yes	-4.3767	0.3399	
SizeSel_7P_1_TriAnSurvey	Yes	52.9070	2.7939	Double-normal
SizeSel_7P_2_TriAnSurvey	Yes	-0.9080	107.4270	Double-normal
SizeSel_7P_3_TriAnSurvey	Yes	5.3739	0.3486	Double-normal
SizeSel_7P_4_TriAnSurvey	Yes	3.4957	123.2440	Double-normal
SizeSel_7P_5_TriAnSurvey	Yes	-3.4304	0.8262	Double-normal
SizeSel_7P_6_TriAnSurvey	Yes	0.6863	5.7837	Double-normal

Table 13 (continued). Fixed and estimated parameter values with standard deviations for the base model.

Parameter	Estimated (yes/no).	value	Standard deviation	Note
SizeSel_11P_1_NWFSCSvy	Yes	51.6943	20.1715	Double-normal
SizeSel_11P_2_NWFSCSvy	Yes	-1.0546	108.6770	Double-normal
SizeSel_11P_3_NWFSCSvy	Yes	5.1566	2.3827	Double-normal
SizeSel_11P_4_NWFSCSvy	Yes	3.4999	122.9960	Double-normal
SizeSel_11P_5_NWFSCSvy	Yes	-2.3625	1.6734	Double-normal
SizeSel_11P_6_NWFSCSvy	Yes	-4.5640	11.5979	Double-normal
AgeSel_1P_1_WAFishery1	Yes	5.6972	0.0854	Double-logistic
AgeSel_1P_2_WAFishery1	Yes	2.9282	0.3031	Double-logistic
AgeSel_1P_3_WAFishery1	Yes	0.0036	0.1168	Double-logistic
AgeSel_1P_4_WAFishery1	Yes	0.1574	0.0137	Double-logistic
AgeSel_1P_5_WAFishery1	No	2	NA	Double-logistic
AgeSel_1P_6_WAFishery1	No	0	NA	Double-logistic
AgeSelMale_1P_1_WAFishery1	No	2	NA	Double-logistic
AgeSelMale_1P_2_WAFishery1	Yes	-3.6748	173.8930	Double-logistic
AgeSelMale_1P_3_WAFishery1	Yes	-0.3823	0.1073	Double-logistic
AgeSelMale_1P_4_WAFishery1	Yes	1.5949	0.3029	Double-logistic

Table 13 (continued). Fixed and estimated parameter values with standard deviations for the base model.

Parameter	Estimated (yes/no).	value	Standard deviation	Note
AgeSel_2P_1_ORMWTraw	Yes	6.2801	0.1256	Double-logistic
AgeSel_2P_2_ORMWTraw	Yes	2.5797	0.3434	Double-logistic
AgeSel_2P_3_ORMWTraw	Yes	0.0285	0.8988	Double-logistic
AgeSel_2P_4_ORMWTraw	Yes	0.2455	0.0252	Double-logistic
AgeSel_2P_5_ORMWTraw	No	2	NA	Double-logistic
AgeSel_2P_6_ORMWTraw	No	0	NA	Double-logistic
AgeSelMale_2P_1_ORMWTraw	No	2	NA	Double-logistic
AgeSelMale_2P_2_ORMWTraw	Yes	0.0582	98.0188	Double-logistic
AgeSelMale_2P_3_ORMWTraw	Yes	-0.5704	0.1979	Double-logistic
AgeSelMale_2P_4_ORMWTraw	Yes	1.5755	0.6392	Double-logistic
AgeSel_3P_1_ORBTraw	Yes	5.9804	0.1557	Double-logistic
AgeSel_3P_2_ORBTraw	Yes	2.7635	0.4676	Double-logistic
AgeSel_3P_3_ORBTraw	Yes	6.9875	4.5277	Double-logistic
AgeSel_3P_4_ORBTraw	Yes	0.2172	0.0369	Double-logistic
AgeSel_3P_5_ORBTraw	No	2	NA	Double-logistic
AgeSel_3P_6_ORBTraw	No	0	NA	Double-logistic
AgeSelMale_3P_1_ORBTraw	No	2	NA	Double-logistic
AgeSelMale_3P_2_ORBTraw	Yes	-2.4644	195.3500	Double-logistic
AgeSelMale_3P_3_ORBTraw	Yes	-0.6698	0.1880	Double-logistic
AgeSelMale_3P_4_ORBTraw	Yes	2.2718	0.5286	Double-logistic
AgeSel_4P_1_EMFishery	Yes	5.6605	0.1327	Double-logistic
AgeSel_4P_2_EMFishery	Yes	2.6696	0.4486	Double-logistic
AgeSel_4P_3_EMFishery	Yes	28.4631	1.8110	Double-logistic
AgeSel_4P_4_EMFishery	Yes	0.7104	0.7538	Double-logistic
AgeSel_4P_5_EMFishery	No	2	NA	Double-logistic
AgeSel_4P_6_EMFishery	No	0	NA	Double-logistic
AgeSelMale_4P_1_EMFishery	No	2	NA	Double-logistic
AgeSelMale_4P_2_EMFishery	Yes	-2.9528	189.4150	Double-logistic
AgeSelMale_4P_3_EMFishery	Yes	0.1024	0.1806	Double-logistic
AgeSelMale_4P_4_EMFishery	Yes	-0.7016	0.5760	Double-logistic

Table 14 Estimated age 1+ biomass, spawning outputs, recruits, total catch, depletion, SPR and relative exploitation rate of widow rockfish from 1916 to 2008 from the base model.

Year	Total biomass (mt)	Spawning output (mil eggs)	Recruit (*1000)	Total catch (mt)	Depletion (%)	SPR	Relative exploitation rate
1916	220930	40547	39791	83	100.0	0.9946	0.0004
1917	220850	40528	39784	129	100.0	0.9916	0.0006
1918	220731	40498	39773	148	99.9	0.9904	0.0007
1919	220601	40465	39761	102	99.8	0.9933	0.0005
1920	220524	40445	39754	105	99.7	0.9931	0.0005
1921	220449	40426	39747	87	99.7	0.9943	0.0004
1922	220397	40413	39743	75	99.7	0.9950	0.0003
1923	220358	40404	39739	83	99.6	0.9945	0.0004
1924	220314	40394	39736	53	99.6	0.9965	0.0002
1925	220301	40392	39735	66	99.6	0.9956	0.0003
1926	220275	40387	39733	100	99.6	0.9934	0.0005
1927	220218	40375	39729	83	99.6	0.9945	0.0004
1928	220179	40366	39726	95	99.6	0.9937	0.0004
1929	220130	40355	39722	93	99.5	0.9939	0.0004
1930	220086	40345	39718	120	99.5	0.9921	0.0005
1931	220019	40329	39712	108	99.5	0.9928	0.0005
1932	219966	40316	39708	109	99.4	0.9928	0.0005
1933	219915	40304	39703	95	99.4	0.9937	0.0004
1934	219881	40296	39700	101	99.4	0.9933	0.0005
1935	219842	40287	39697	109	99.4	0.9928	0.0005
1936	219797	40277	39694	121	99.3	0.9920	0.0006
1937	219744	40265	39689	114	99.3	0.9924	0.0005
1938	219700	40255	39685	97	99.3	0.9935	0.0004
1939	219675	40249	39683	86	99.3	0.9942	0.0004
1940	219662	40246	39682	98	99.3	0.9934	0.0004
1941	219637	40241	39681	88	99.2	0.9940	0.0004
1942	219622	40239	39680	51	99.2	0.9964	0.0002
1943	219645	40245	39682	153	99.3	0.9891	0.0007
1944	219565	40226	39675	372	99.2	0.9745	0.0017
1945	219277	40156	39650	721	99.0	0.9522	0.0033
1946	218666	40006	39595	609	98.7	0.9601	0.0028
1947	218202	39886	39551	294	98.4	0.9799	0.0014
1948	218073	39849	39538	267	98.3	0.9819	0.0012
1949	217977	39824	39528	203	98.2	0.9860	0.0009
1950	217948	39818	39526	237	98.2	0.9837	0.0011

Table 14 (continued). Estimated age 1+ biomass, spawning outputs, recruits, total catch, depletion, SPR and relative exploitation rate of widow rockfish from 1916 to 2008 from the base assessment model.

Year	Total biomass (mt)	Spawning output (mil eggs)	Recruit (*1000)	Total catch (mt)	Depletion (%)	SPR	Relative exploitation rate
1951	217885	39807	39522	392	98.2	0.9742	0.0018
1952	217673	39761	39505	371	98.1	0.9754	0.0017
1953	217493	39721	39491	333	98.0	0.9778	0.0015
1954	217357	39691	39479	263	97.9	0.9821	0.0012
1955	217297	39678	39475	280	97.9	0.9810	0.0013
1956	217222	39662	39469	431	97.8	0.9706	0.0020
1957	217003	39612	39450	454	97.7	0.9692	0.0021
1958	216766	39557	39027	529	97.6	0.9644	0.0024
1959	216486	39487	40695	424	97.4	0.9712	0.0020
1960	216377	39446	42326	387	97.3	0.9731	0.0018
1961	216415	39415	41649	323	97.2	0.9772	0.0015
1962	216759	39402	42986	367	97.2	0.9741	0.0017
1963	217244	39380	40807	438	97.1	0.9698	0.0020
1964	217895	39342	49174	510	97.0	0.9637	0.0023
1965	218789	39303	49584	266	96.9	0.9819	0.0012
1966	220314	39364	46890	4379	97.1	0.7403	0.0199
1967	218660	38547	56088	5100	95.1	0.7000	0.0234
1968	216998	37604	54512	2447	92.7	0.8341	0.0113
1969	218628	37325	47187	550	92.1	0.9590	0.0025
1970	224145	37598	125384	629	92.7	0.9546	0.0028
1971	230232	38033	37811	785	93.8	0.9454	0.0034
1972	237641	38588	20010	524	95.2	0.9642	0.0022
1973	246299	39327	17956	949	97.0	0.9393	0.0039
1974	248909	40102	24264	693	98.9	0.9579	0.0028
1975	248657	41162	31291	958	101.5	0.9440	0.0039
1976	245744	42648	13980	1591	105.2	0.9168	0.0065
1977	241201	44432	55224	2811	109.6	0.8624	0.0117
1978	235198	45292	73166	1931	111.7	0.8971	0.0083
1979	230150	45073	20530	3608	111.2	0.8312	0.0157
1980	226845	43610	81040	23167	107.6	0.2697	0.1027
1981	206611	37174	97131	28678	91.7	0.1654	0.1399
1982	182878	29778	31453	27799	73.4	0.1236	0.1524
1983	165858	22991	41267	12296	56.7	0.2807	0.0744
1984	165473	20929	39579	11821	51.6	0.3033	0.0717
1985	162968	19978	29014	10763	49.3	0.3467	0.0662

Table 14 (continued). Estimated age 1+ biomass, spawning outputs, recruits, total catch, depletion, SPR and relative exploitation rate of widow rockfish from 1916 to 2008 from the base assessment model.

Year	Total biomass (mt)	Spawning output (mil eggs)	Recruit (*1000)	Total catch (mt)	Depletion (%)	SPR	Relative exploitation rate
1986	160753	19618	13833	11159	48.4	0.3398	0.0695
1987	156678	20019	36340	15056	49.4	0.2957	0.0965
1988	146582	20248	20421	12211	49.9	0.3614	0.0835
1989	137943	20288	19949	14550	50.0	0.2882	0.1057
1990	127119	19194	38273	11940	47.3	0.3174	0.0944
1991	118507	18185	51695	7657	44.8	0.4308	0.0651
1992	114655	17627	14465	7368	43.5	0.4128	0.0644
1993	112392	16799	20448	9706	41.4	0.3158	0.0866
1994	107715	15458	14368	7701	38.1	0.3545	0.0717
1995	103211	14507	9586	7977	35.8	0.3155	0.0774
1996	97841	13597	9639	7305	33.5	0.3402	0.0748
1997	92080	13266	13084	7757	32.7	0.3481	0.0844
1998	85244	13104	26364	4866	32.3	0.4968	0.0574
1999	81200	13149	20674	4768	32.4	0.4881	0.0590
2000	78036	12852	33828	4664	31.7	0.4773	0.0602
2001	75845	12294	12686	2279	30.3	0.6536	0.0301
2002	76752	12000	33395	432	29.6	0.9128	0.0057
2003	79983	12024	16309	43	29.7	0.9905	0.0005
2004	83281	12259	22192	101	30.2	0.9799	0.0012
2005	86937	12735	16046	199	31.4	0.9648	0.0023
2006	89536	13403	11746	215	33.1	0.9663	0.0024
2007	91678	14171	12698	259	34.9	0.9627	0.0028
2008	92871	14908	18038	243	36.8	0.9651	0.0026
2009	93509	15625	25135		38.5		

Table 15 Asymptotic standard deviations of estimated spawning output (million of eggs) and recruitment (*1000).

Year	Std dev Spawning output	Std dev Age 0 recruits	Year	Std dev Spawning output	Std dev Age 0 recruits	Year	Std dev Spawning output	Std dev Age 0 recruits
1916	2983	2886	1951	2952	2804	1986	2420	3754
1917	2983	2884	1952	2950	2799	1987	2343	5665
1918	2983	2881	1953	2947	2795	1988	2308	4542
1919	2983	2878	1954	2944	2791	1989	2291	4780
1920	2983	2876	1955	2941	2789	1990	2279	7827
1921	2982	2874	1956	2937	2786	1991	2274	10848
1922	2982	2872	1957	2934	2781	1992	2271	4716
1923	2982	2871	1958	2931	19002	1993	2263	6047
1924	2982	2870	1959	2927	19381	1994	2264	5083
1925	2982	2870	1960	2923	19465	1995	2280	3990
1926	2981	2869	1961	2920	18590	1996	2332	4313
1927	2981	2868	1962	2917	17938	1997	2463	6045
1928	2980	2867	1963	2927	17074	1998	2663	10823
1929	2979	2865	1964	2991	18296	1999	2857	9712
1930	2978	2864	1965	3162	17862	2000	3012	14075
1931	2977	2862	1966	3400	16836	2001	3128	6372
1932	2976	2861	1967	3657	17199	2002	3209	15289
1933	2975	2859	1968	3867	16067	2003	3279	9228
1934	2974	2858	1969	4011	15975	2004	3396	12824
1935	2973	2857	1970	4103	17755	2005	3601	9481
1936	2971	2855	1971	4162	10807	2006	3887	6993
1937	2970	2854	1972	4189	6130	2007	4222	7567
1938	2969	2852	1973	4185	5278	2008	4565	10746
1939	2968	2851	1974	4154	5975	2009	4919	17807
1940	2967	2851	1975	4097	5512			
1941	2965	2850	1976	4022	3881			
1942	2964	2849	1977	3937	6339			
1943	2963	2849	1978	3820	7313			
1944	2962	2847	1979	3662	5308			
1945	2961	2840	1980	3463	8494			
1946	2960	2826	1981	3263	9598			
1947	2958	2814	1982	3060	6274			
1948	2957	2810	1983	2850	6098			
1949	2955	2807	1984	2677	5918			
1950	2953	2806	1985	2538	4819			

Table 16 Comparisons of key parameters and model outputs between the base model and sensitivity model runs. All runs were converged and had maximum gradient component less than 0.001.

Description	Base case	Recruit distribution estimated (1978-2003)	No *h* prior	Juvenile survey CV=0.2
Management quantities				
B_0 (million of eggs)	40547	39102	41473	40671
2007 depletion (%)	34.9	32.0	30.2	32.3
2009 depletion (%)	38.5	35.4	32.7	38.0
No. of parameters estimated	115	140	115	115
Negative log-likelihoods				
Total	650.068	588.143	649.072	643.935
Catch	3.3E-10	3.3E-10	3.3E-10	3.3E-10
Indices	-5.080	-3.410	-5.403	-14.593
Length composition	84.483	79.486	84.049	84.403
Age composition	564.524	504.245	546.820	564.745
Recruitment	5.290	4.822	5.571	8.379
Priors	0.816	0.784	NA	0.966
Parameter soft bound	0.0394	0.0334	0.0341	0.0341
Other parameter values				
Steepness (*h*)	0.4061	0.4135	0.3360	0.3738
Proportion of recruits to north	0.7170	Variable	0.7226	0.7175

Table 17 Comparisons of key parameters and model outputs between the base model and two fix proportions of recruitment to the northern area (0.6875 and 0.7500). All runs were converged and had maximum gradient component less than 0.001.

Description	Proportion of recruitment to northern area = 0.6875	Base case (PropN=0.7170)	Proportion of recruitment to northern area = 0.7500
Management quantities			
B_0 (million of eggs)	38709	40547	44226
2007 depletion (%)	43.3	34.9	32.4
2009 depletion (%)	48.7	38.5	34.9
No. of parameters estimated	114	115	114
Negative log-likelihoods			
Total	651.097	650.068	651.801
Catch	3.3E-10	3.3E-10	3.3E-10
Indices	-4.466	-5.080	-5.521
Length composition	82.298	84.483	82.890
Age composition	563.499	564.524	567.935
Recruitment	5.395	5.290	5.170
Priors	0.333	0.816	1.292
Parameter soft bound	0.0372	0.0394	0.0331
Other parameter values			
Steepness (*h*)	0.5560	0.4061	0.3204
Proportion of recruits to north	0.6875	0.7170	0.7500

Table 18 Comparisons of key parameters and model outputs between the base model and retrospective analysis runs. All runs were converged and had maximum gradient component less than 0.001.

Description	Base case	Retrospective 1 year	Retrospective 2 year	Retrospective 4 year
Management quantities				
B_0 (million of eggs)	40547	40141	40401	40096
2007 depletion (%)	34.9	40.6	41.1	38.0
2009 depletion (%)	38.5	47.0	48.5	41.1
Other parameter values				
Steepness (*h*)	0.4061	0.5354	0.5374	0.4951
Proportion of recruits to north	0.7170	0.7159	0.7156	0.7128

Table 19. Comparisons of key parameters between this assessment (2009 base model) and the base model of the 2007 assessment (2007 base model).

Parameter and estimate	2007 base model	2009 model
Unfished spawning output (B_0) (millions of eggs)	50746	40547
Steepness (*h*)	0.2904	0.4061
2007 spawning output (B_t) (millions of eggs)	17999	14170
2009 spawning output (B_t) (millions of eggs)	NA	15625
2007 depletion ($100*B_t/B_0$)	35.47	34.9
2009 depletion ($100*B_t/B_0$)	Na	38.5
2007 standard deviation of depletion	6.32	10.55
2009 standard deviation of depletion	NA	12.43

Table 20. Decision table of 12-year projections for widow rockfish. Alternate states of nature and management options begin in 2011.

			State of nature					
			h = 0.25		Base case (h=0.4061)		*h* = 0.55	
Management decision	Year	Catch (mt)	Depletion(%)	Spawning output (mil eggs)	Depletion(%)	Spawning output (mil eggs)	Depletion(%)	Spawning output (mil eggs)
F95%	2009	522	25.2%	10949	38.5%	15625	48.6%	19238
	2010	509	25.4%	11029	39.9%	16178	50.9%	20118
	2011	359	25.4%	11006	40.9%	16580	52.6%	20812
	2012	342	25.1%	10887	41.4%	16801	53.7%	21259
	2013	324	24.6%	10672	41.5%	16838	54.2%	21453
	2014	317	24.0%	10421	41.4%	16797	54.4%	21530
	2015	327	23.6%	10239	41.6%	16863	54.9%	21720
	2016	346	23.4%	10175	42.2%	17120	55.9%	22118
	2017	366	23.5%	10205	43.2%	17533	57.3%	22682
	2018	383	23.7%	10286	44.5%	18032	59.0%	23329
	2019	399	23.9%	10387	45.8%	18570	60.7%	24012
	2020	411	24.2%	10494	47.2%	19123	62.5%	24705
F50%	2009	522	25.2%	10949	38.5%	15625	48.6%	19238
	2010	509	25.4%	11029	39.9%	16178	50.9%	20118
	2011	5210	25.4%	11006	40.9%	16580	52.6%	20812
	2012	4556	22.7%	9836	38.9%	15764	51.1%	20225
	2013	3963	20.0%	8680	36.7%	14865	49.3%	19484
	2014	3632	17.6%	7653	34.6%	14042	47.5%	18775
	2015	3598	15.8%	6841	33.2%	13462	46.3%	18311
	2016	3718	14.4%	6244	32.5%	13159	45.9%	18138
	2017	3854	13.3%	5778	32.2%	13046	45.9%	18164
	2018	3960	12.3%	5359	32.1%	13024	46.2%	18288
	2019	4016	11.4%	4932	32.1%	13027	46.6%	18450
	2020	4028	10.3%	4469	32.1%	13021	47.1%	18623

11 Figures

Figure 1. U.S. catches of widow rockfish by four fisheries from 1916 to 2008. Four fisheries are defined by area and gear type. Bycatches are included. Detail numbers are presented in Table 1.

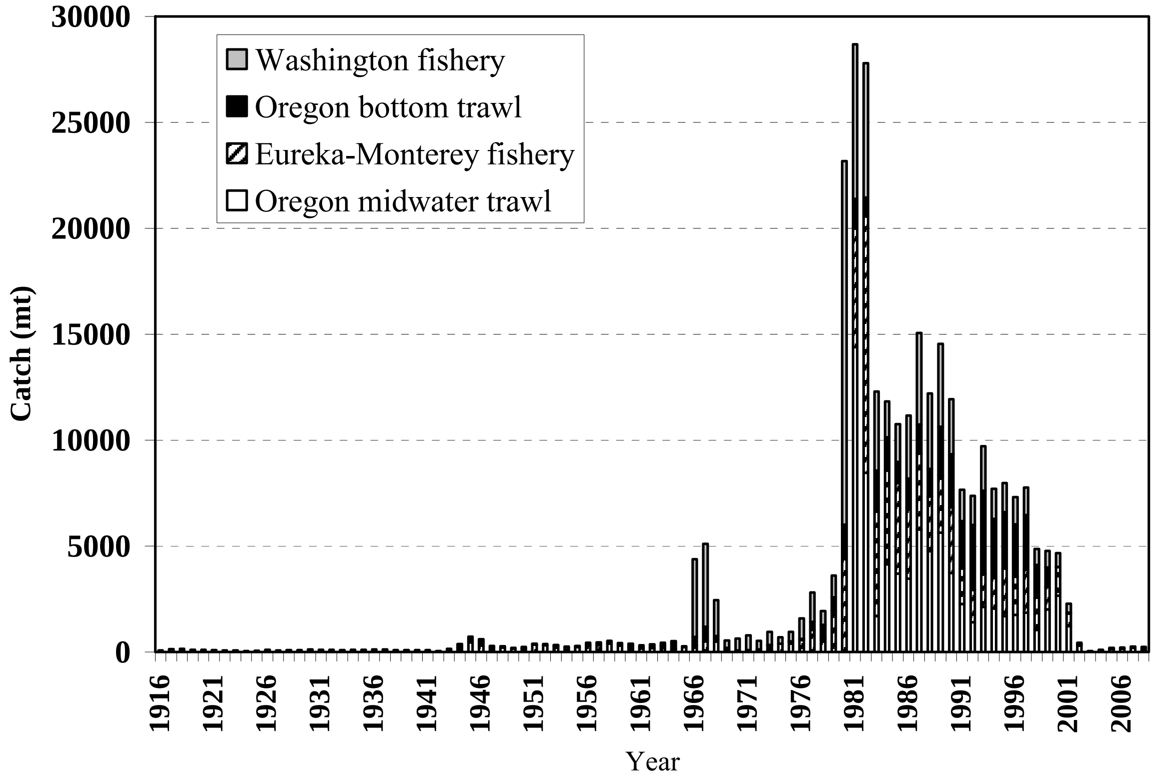


Figure 2. Area map that shows the northern and southern areas delineated by 43° N latitude.

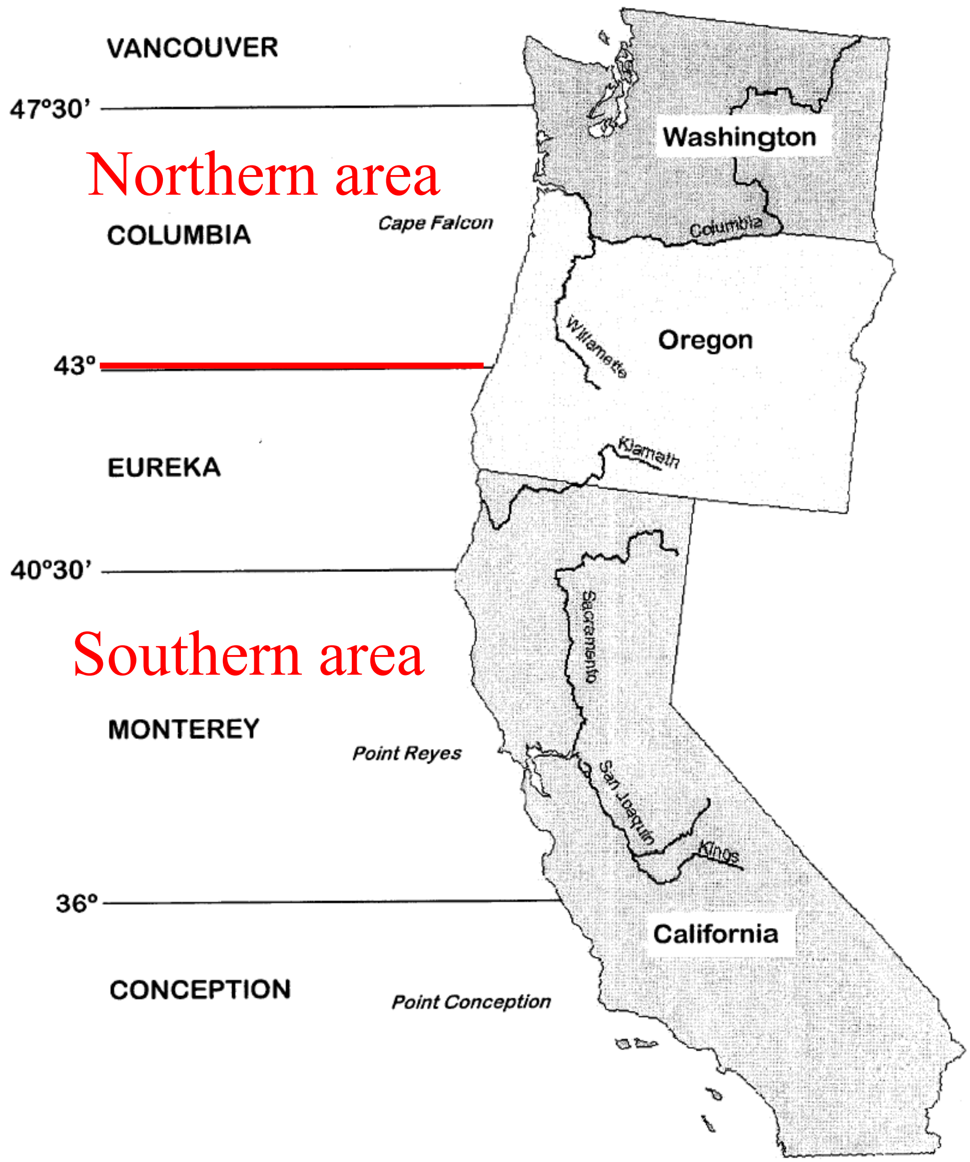
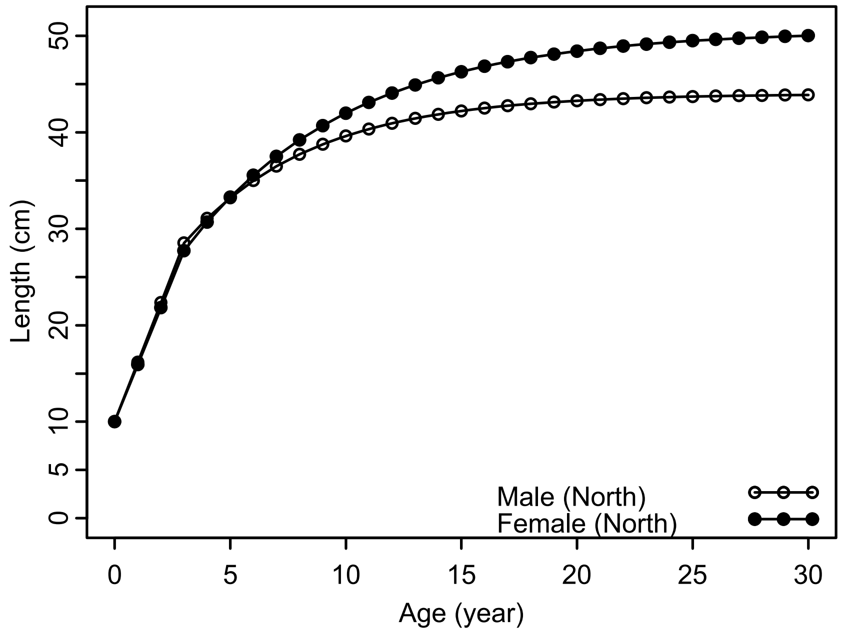


Figure 3. Growth functions for both sexes of widow rockfish for northern and southern areas.



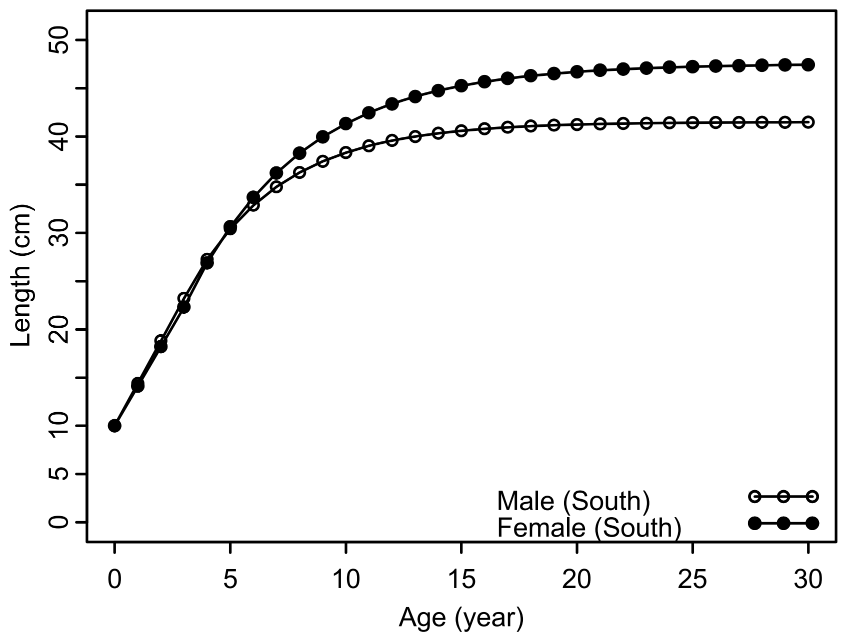


Figure 4. Fecundity of widow rockfish for northern and southern areas.

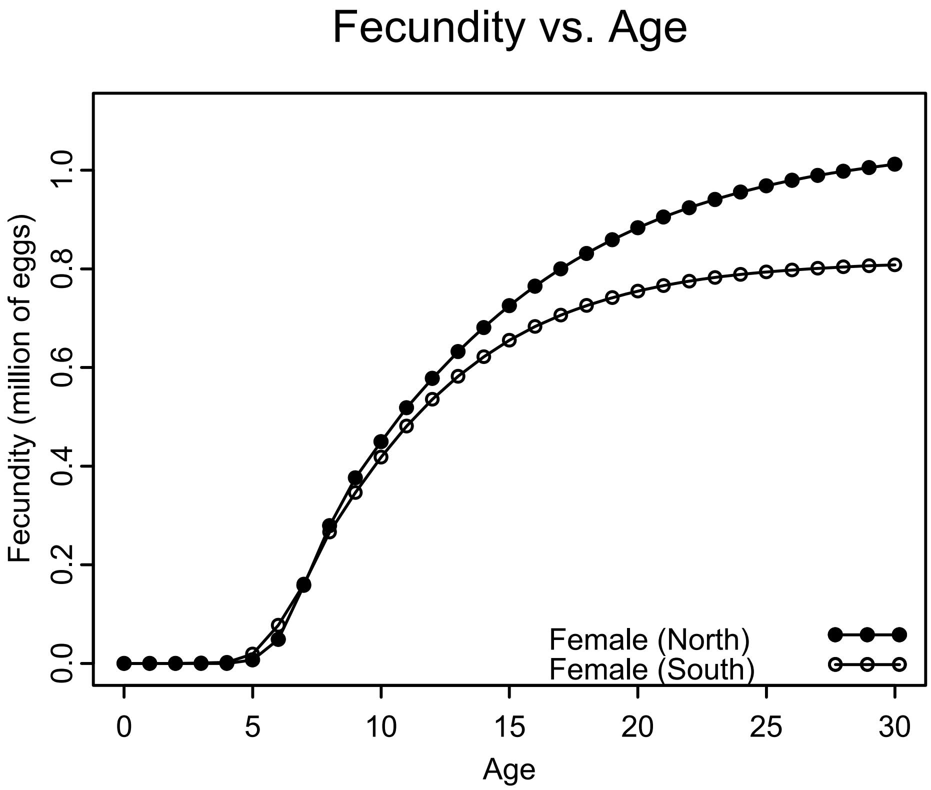


Figure 5. Age composition data from the Vancouver-Columbia fishery from 1980 to 2008.

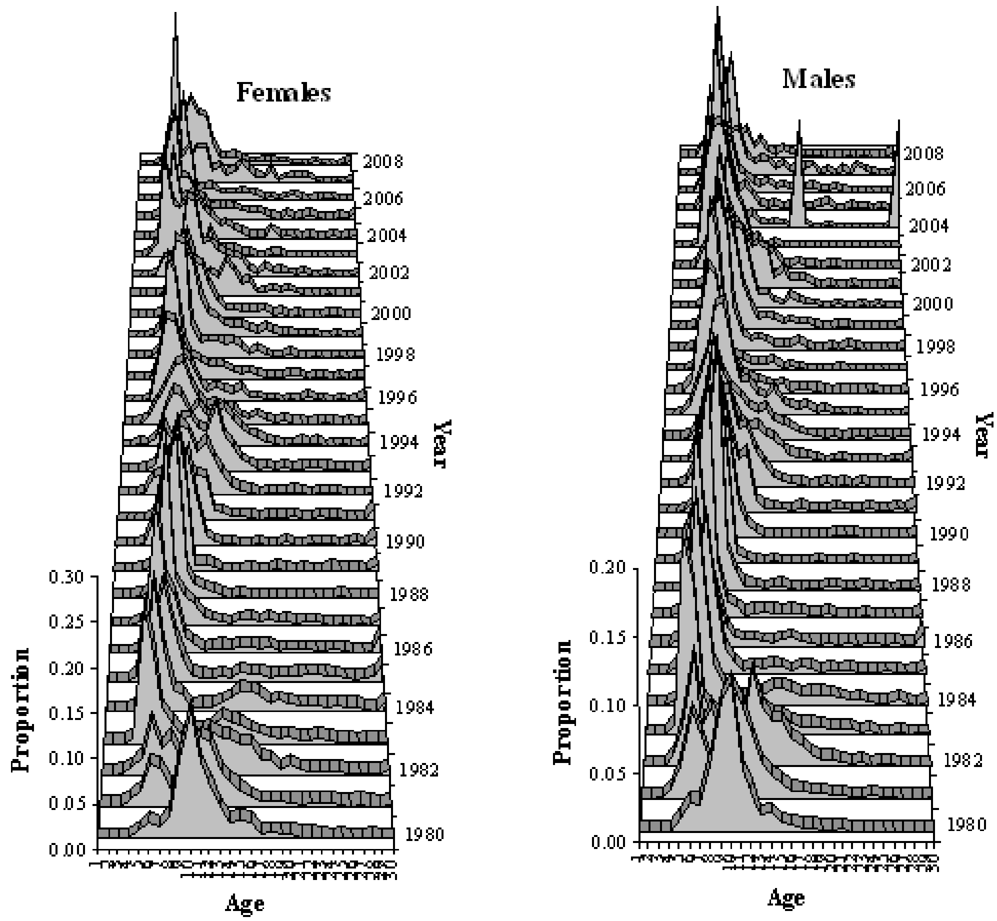


Figure 6. Age composition data from the Oregon mid-water trawl fishery from 1984 to 2008.

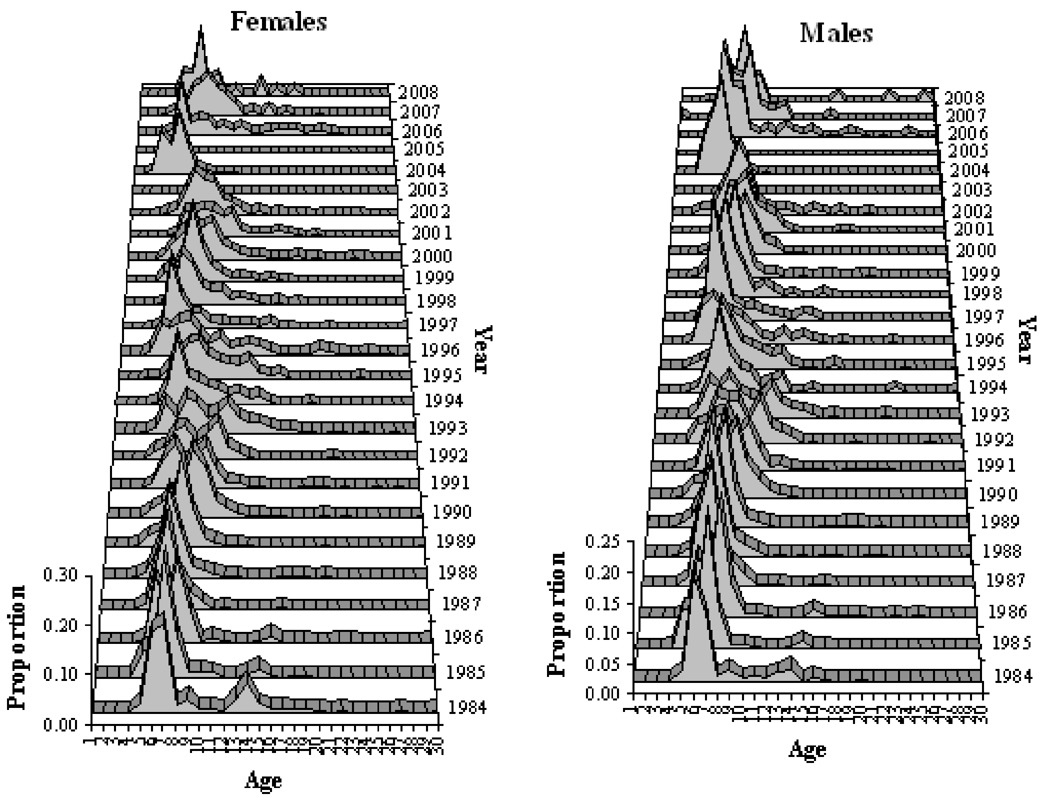


Figure 7. Female age composition data from the Oregon bottom trawl fishery from 1984 to 2008.

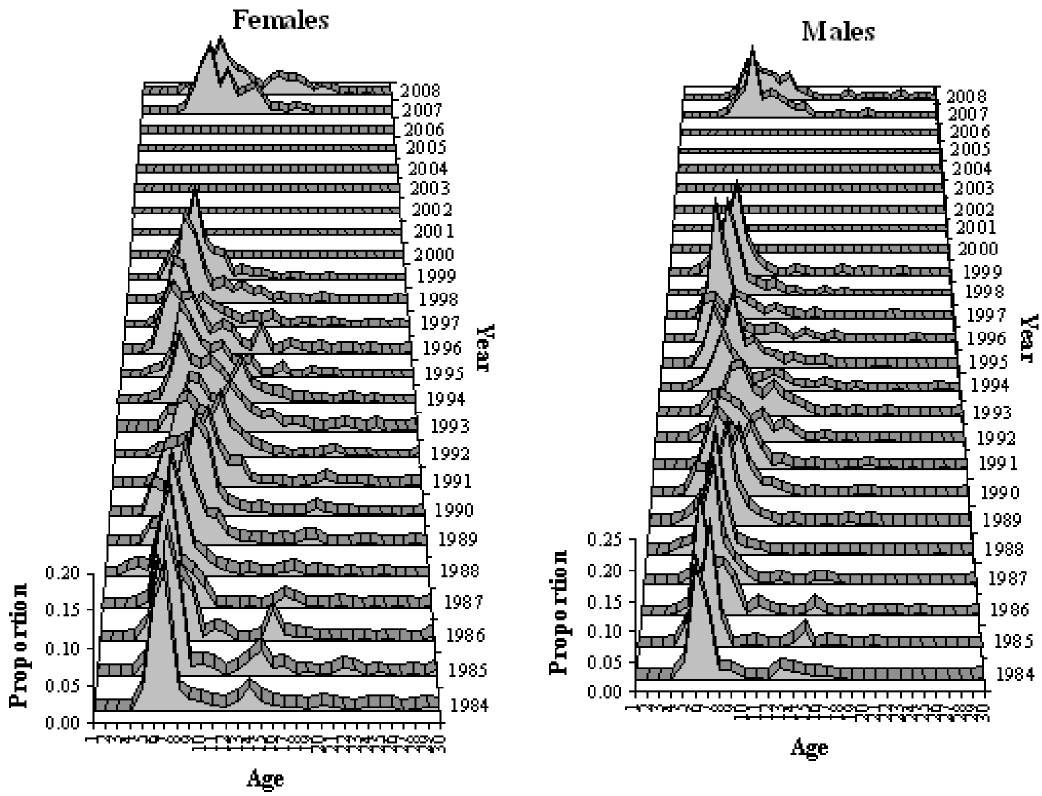
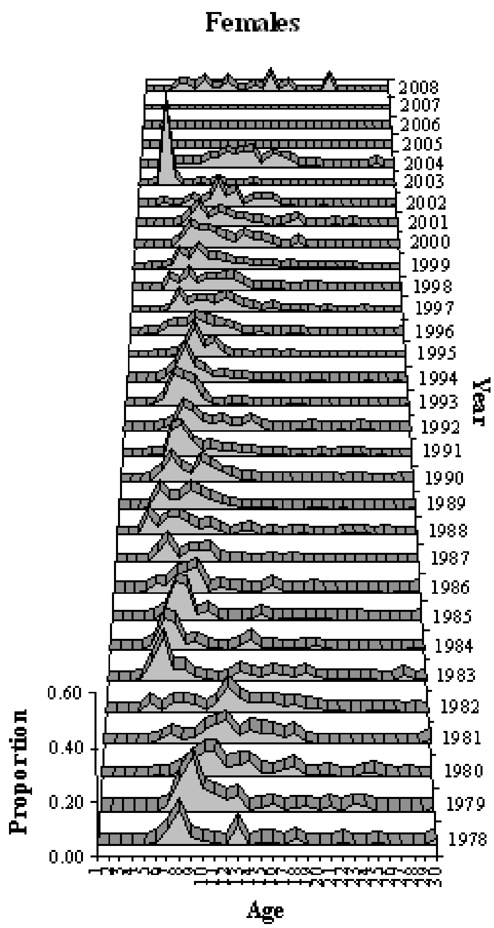


Figure 8. Age composition data from the Eureka-Conception fishery from 1978 to 2008.



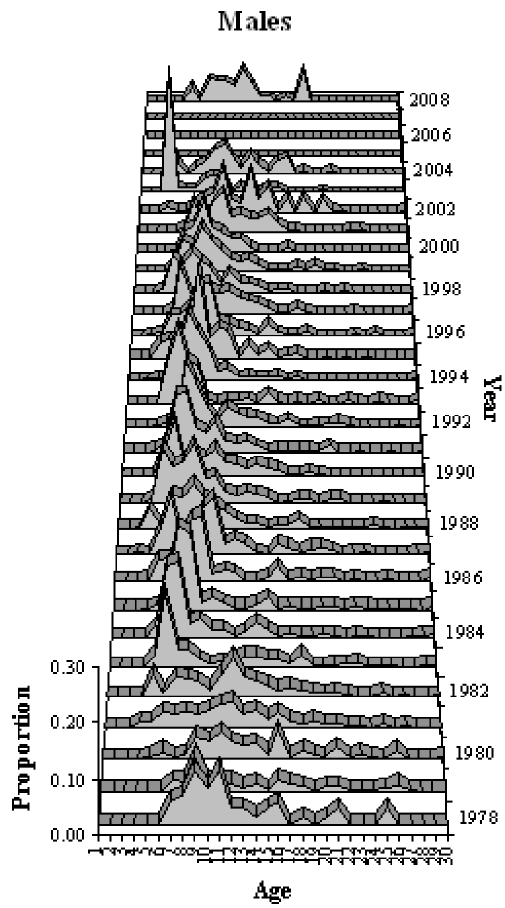


Figure 9. Length composition data from the northern area triennial suvery from 1980 to 2004.

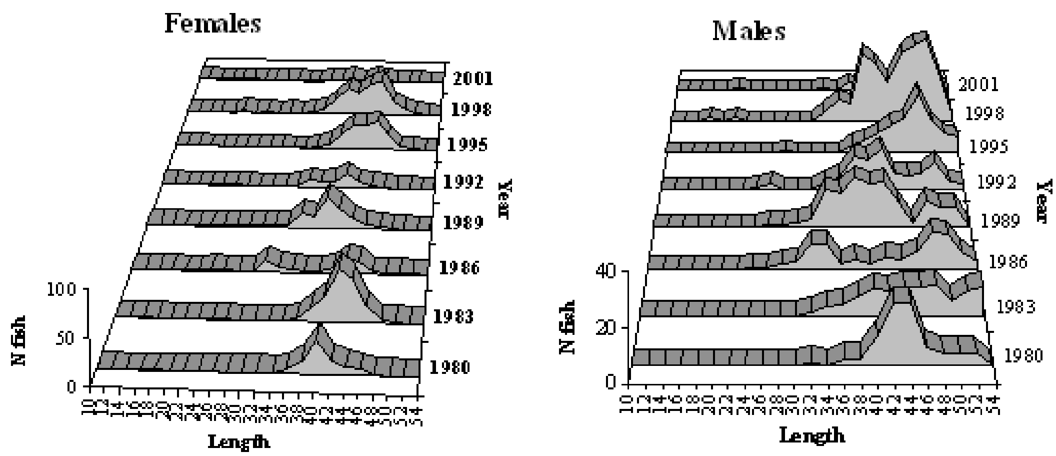


Figure 10. Length composition data for the southern area triennial survey from 1980 to 2004.

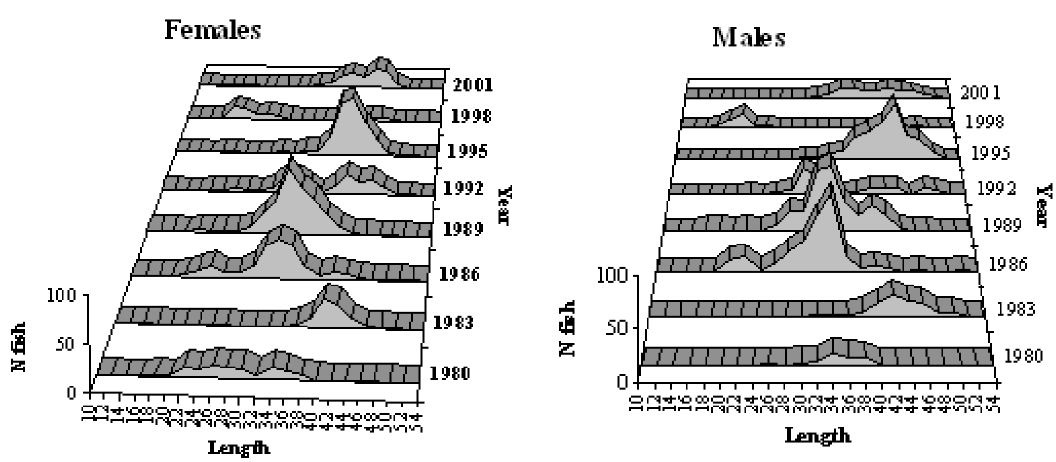


Figure 11. Age composition data from the NWFSC northern area survey from 2003 to 2008.

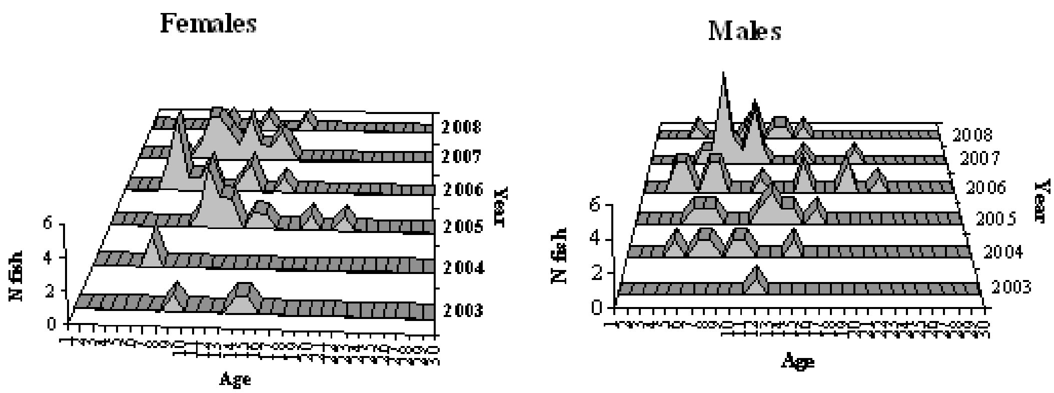


Figure 12. Age composition data from the NWFSC southern area survey from 2003 to 2008.

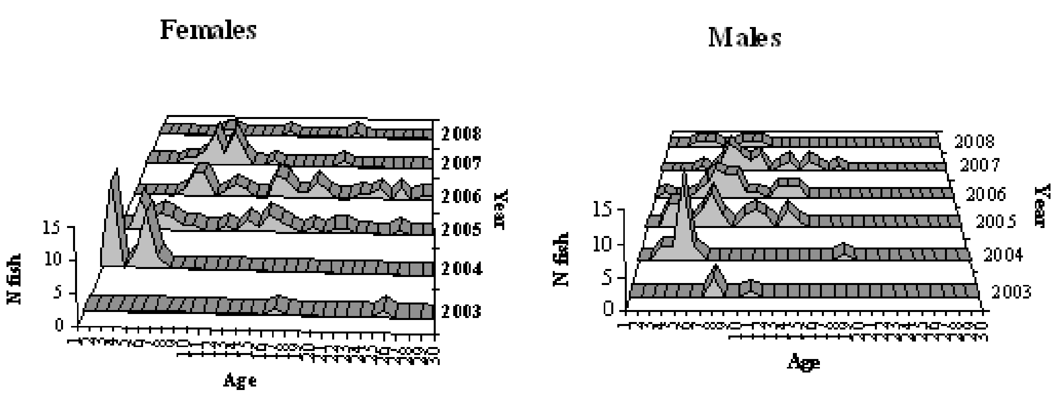


Figure 13. Length composition data from the NWFSC northern area survey from 2003 to 2008.

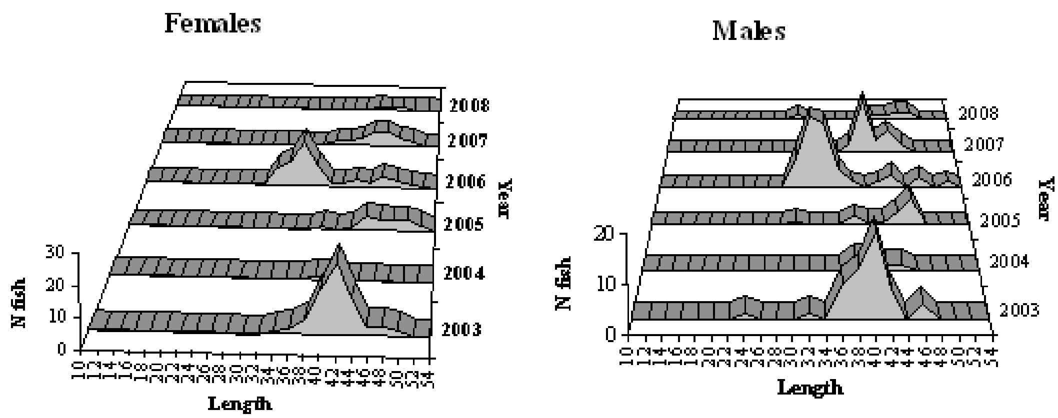


Figure 14. Length composition data from the NWFSC southern area survey from 2003 to 2008.

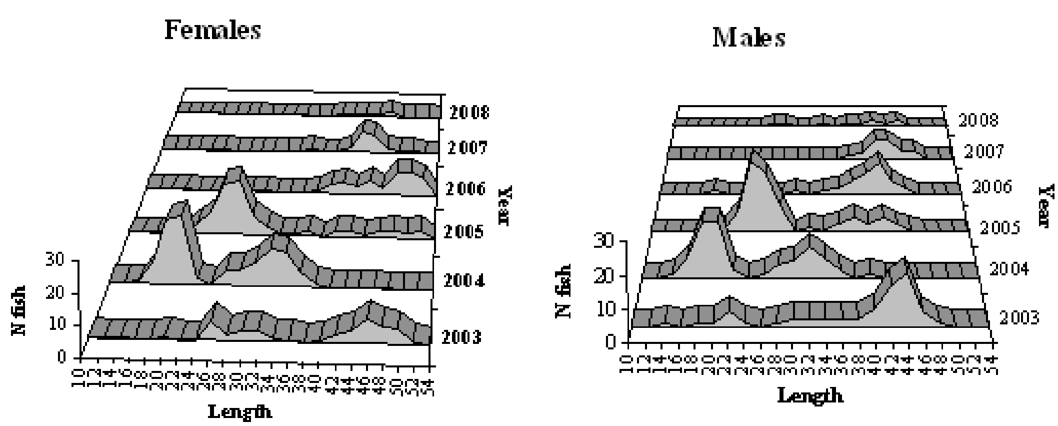


Figure 15. Fraction of landings in the north area, defined as the Vancouver-Columbia and Oregon trawl fisheries, with a 7-year moving average. Note that the fractions before 1977 were fixed at the value computed before the foreign landings (Rogers 2003) were added. This time series of fraction was used in the previous assessments as proportion recruits to the northern area.

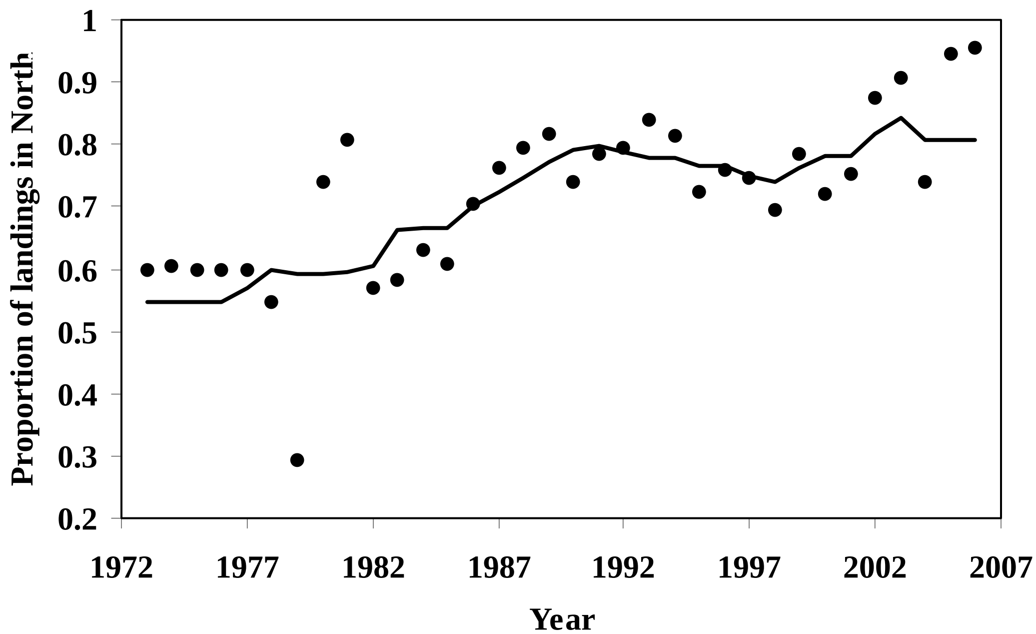


Figure 16. Time series of scaled abundance indicies of the Oregon bottom trawl logbook and triennial survey for the northern and southern areas.

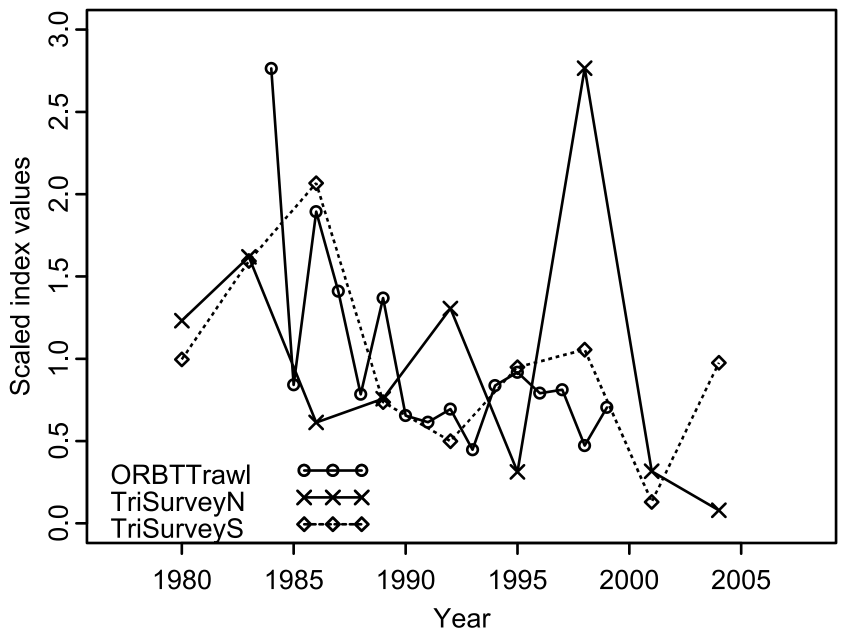


Figure 17. Time series of scaled abundance indicies of three whiting bycatch fisheries (foreign, joint venture, and domestic), and the NWFSC survey for the northern and southern areas.

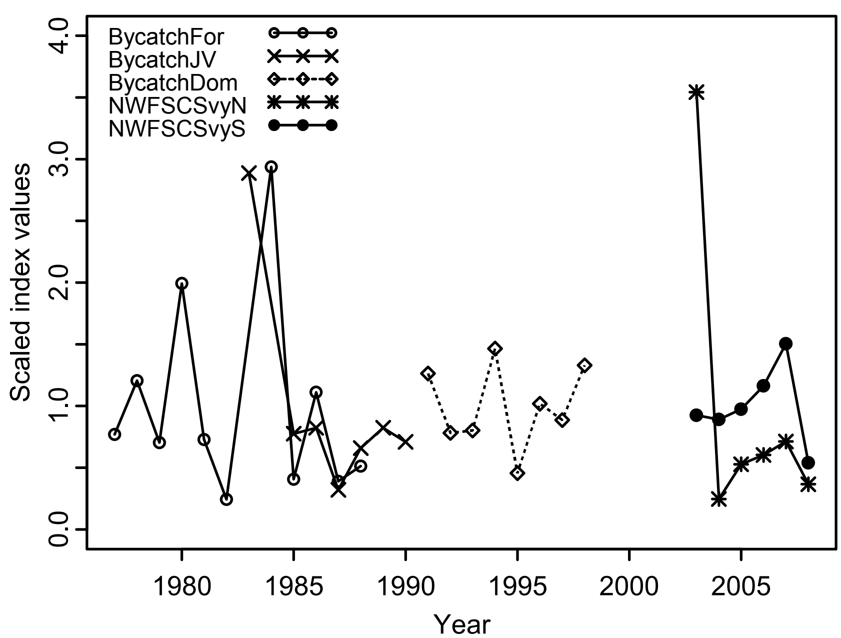


Figure 18. Comparisons of time series of spawning outputs between the reweighted post-STAR model (PostSTARRewet2), the final base model (PostSTARBase), and the pre-STAR base model (PreSTARBase).

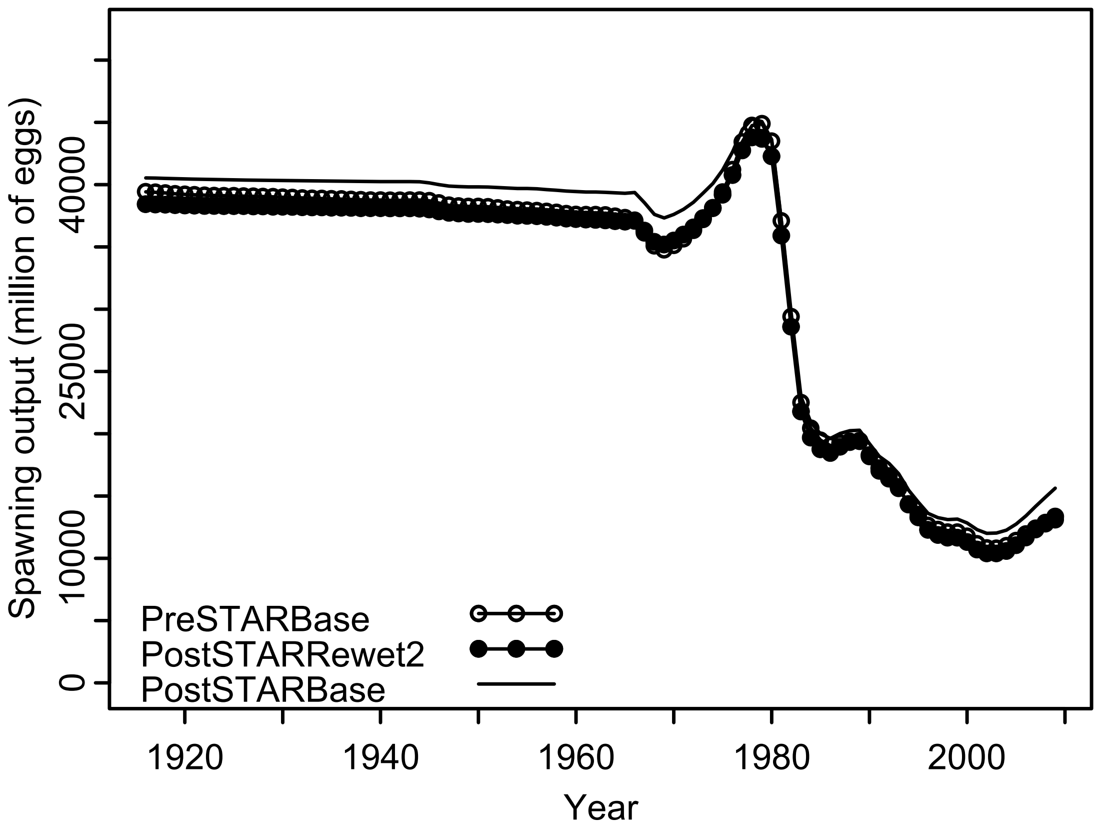


Figure 19. Comparisons of time series of recruitments between the reweighted post-STAR model (PostSTARRewet2), the final base model (PostSTARBase), and the pre-STAR base model (PreSTARBase).

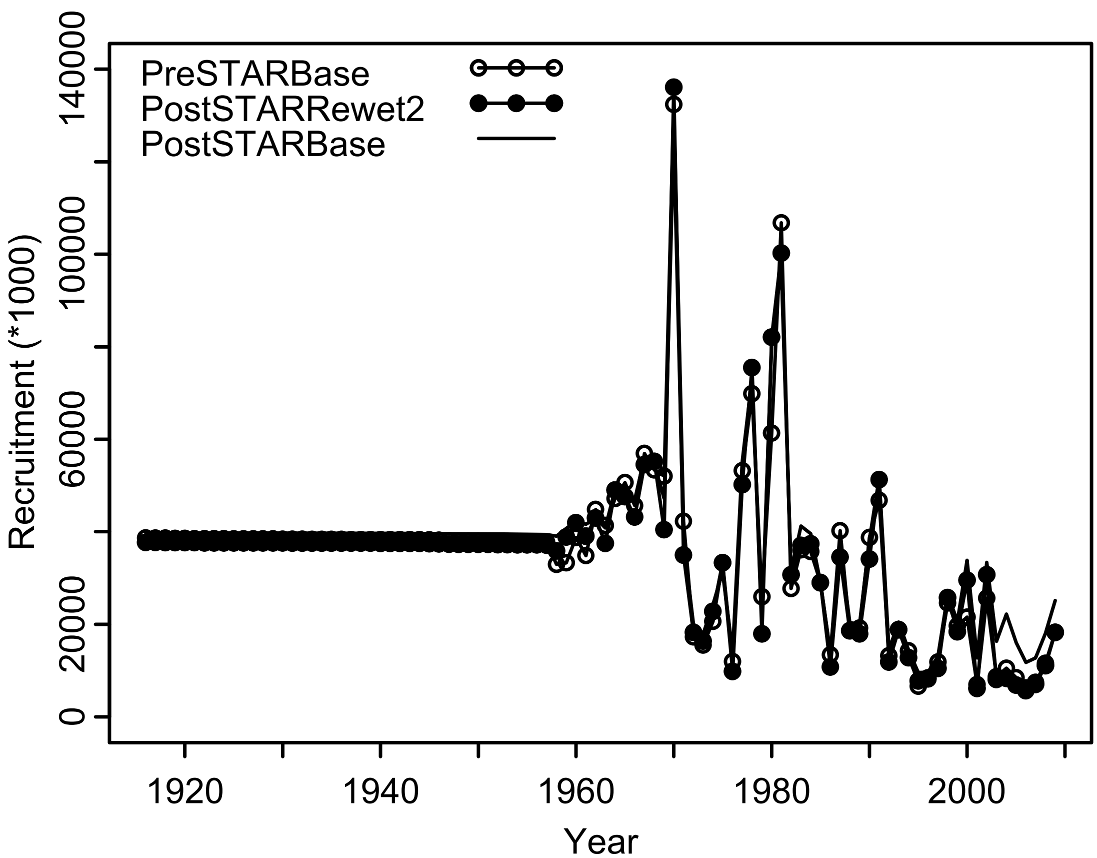


Figure 20. Time series of age spawning output from 1916 to 2009 estimated from the base model for two areas (area1 = northern area, area2 = southern area).

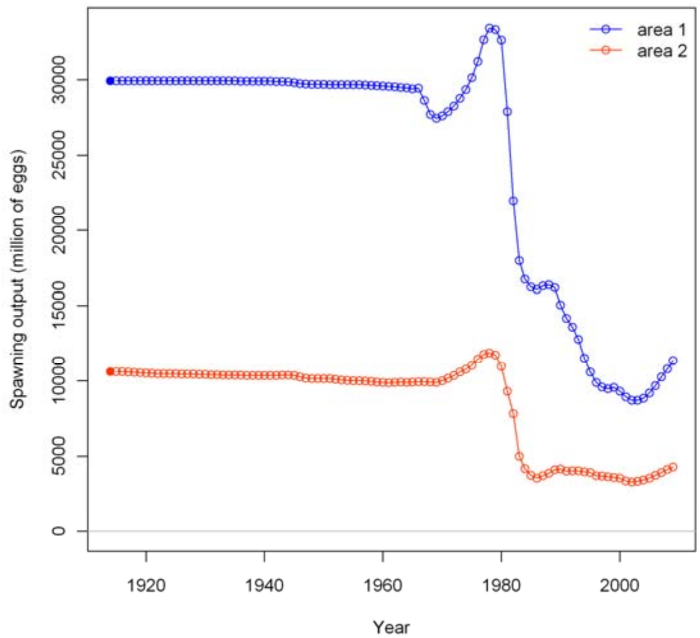


Figure 21. Time series of spawning outputs of the population from 1916 to 2009 with 95% asymptotic intervals estimated from the base model.

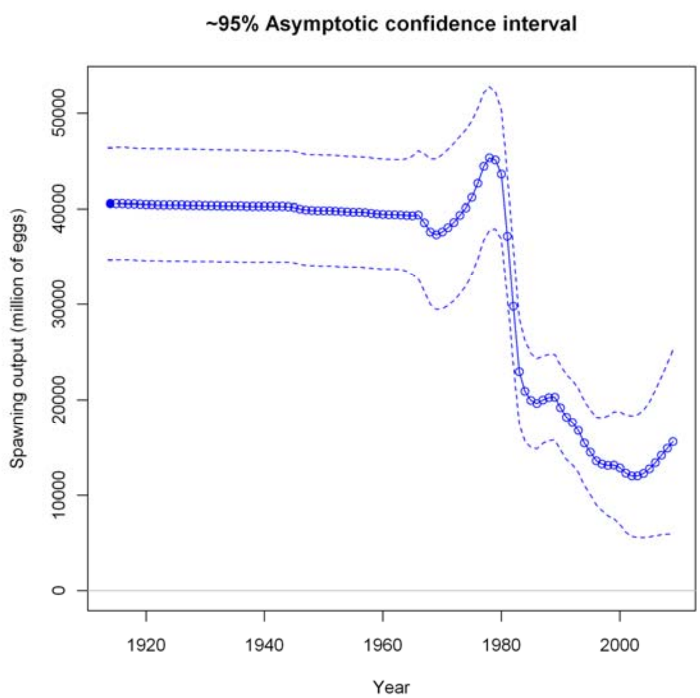


Figure 22. Time series of depletion from 1916 to 2009 with 95% asymptotic intervals estimated from the base model. Levels of management target and minimum stock size threshold are also shown.

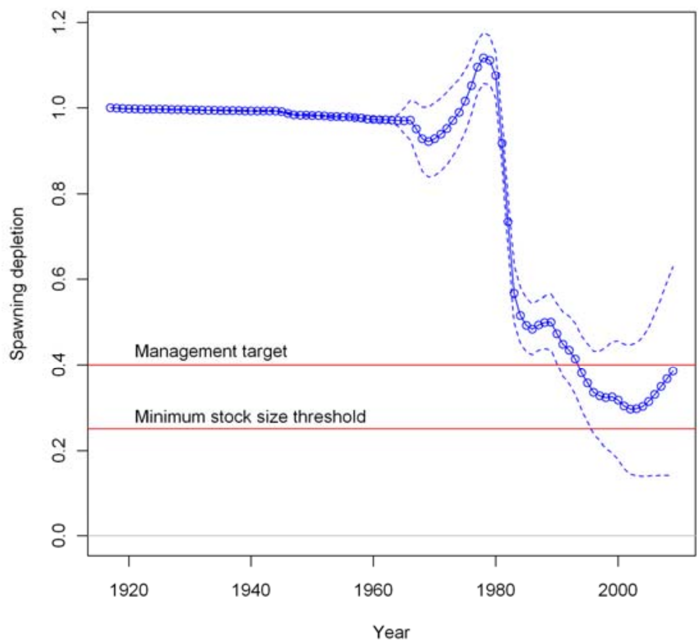


Figure 23. Estimated stock-recruit relationships from the base model (dark line). The expected recruits are bias-adjusted (green line). Open circles are actual recruitment.

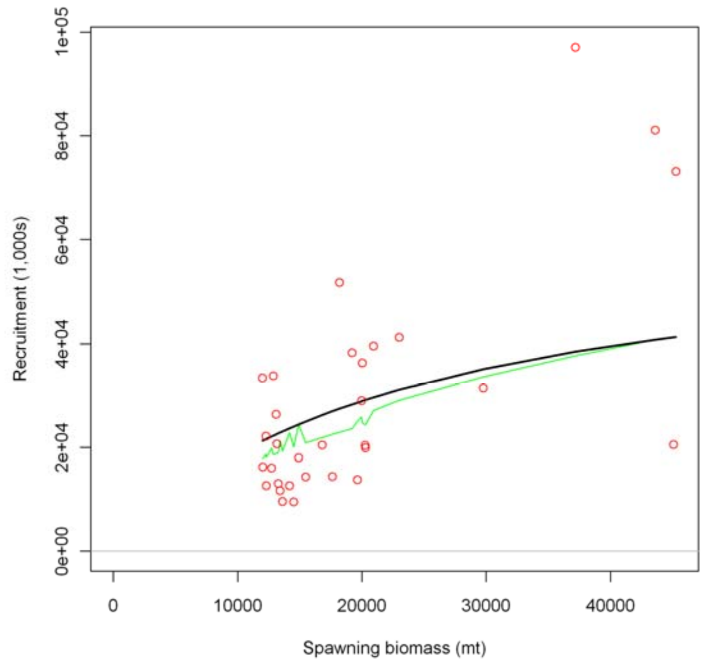


Figure 24. Estimated total recruitment and their 95% of asymptotic confidence intervals from 1916 to 2009 from the base model.

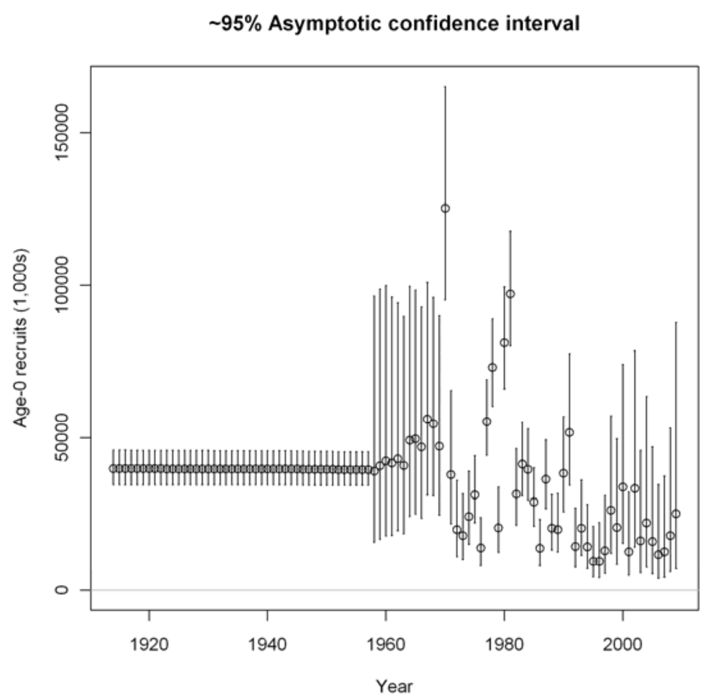


Figure 25. Time series of recruitment estimated from the base model from 1916 to 2009 along with virgin and initial recruitment and bias-adjusted values. Note that the y-axis is in log-scale.

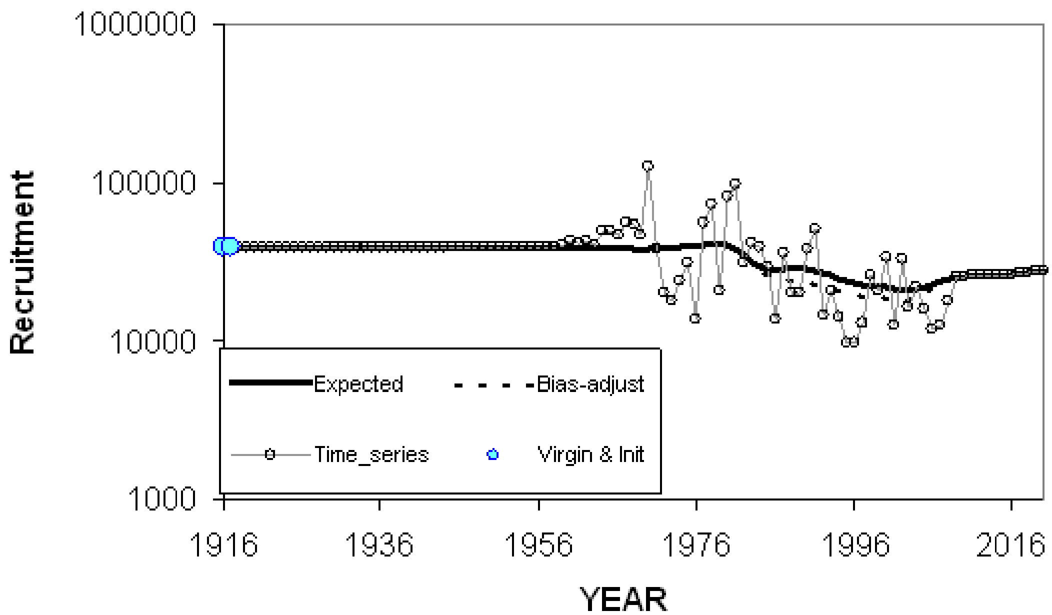


Figure 25. Time series of recruitment deviations estimated from the base model from 1958 to 2008.

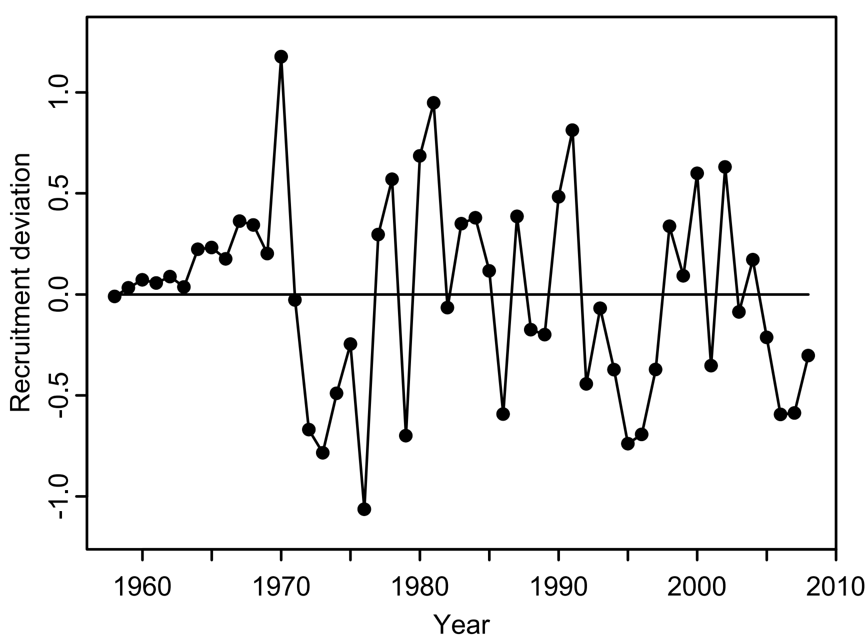
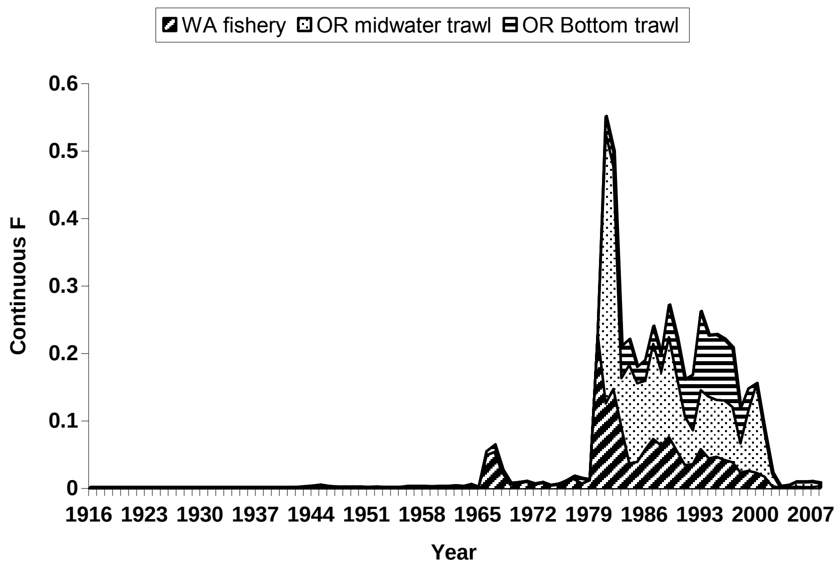


Figure 27. Time series of fishing mortalities for four fisheries in the northern area (top) and in the sourthern area (bottom) from 1916 to 2008.



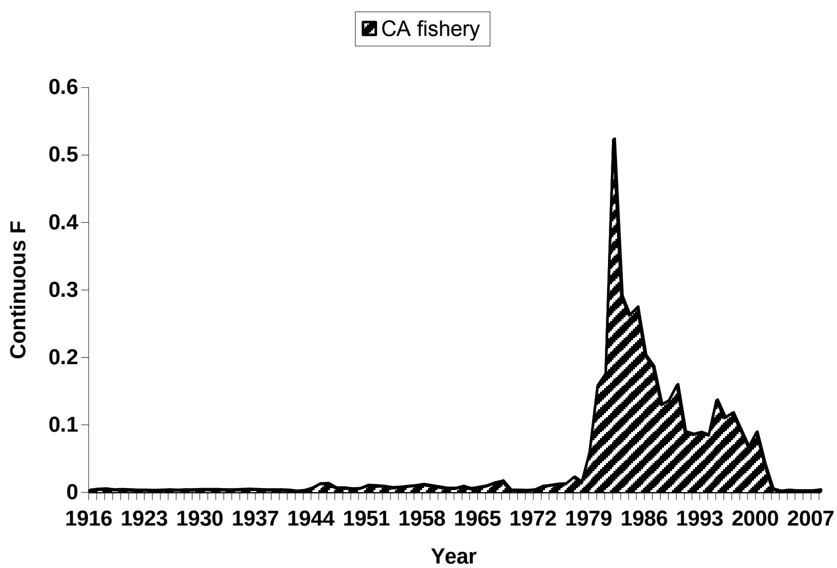


Figure 28. Model fit to the index of the juvenile fish survey from 2001 to 2008.

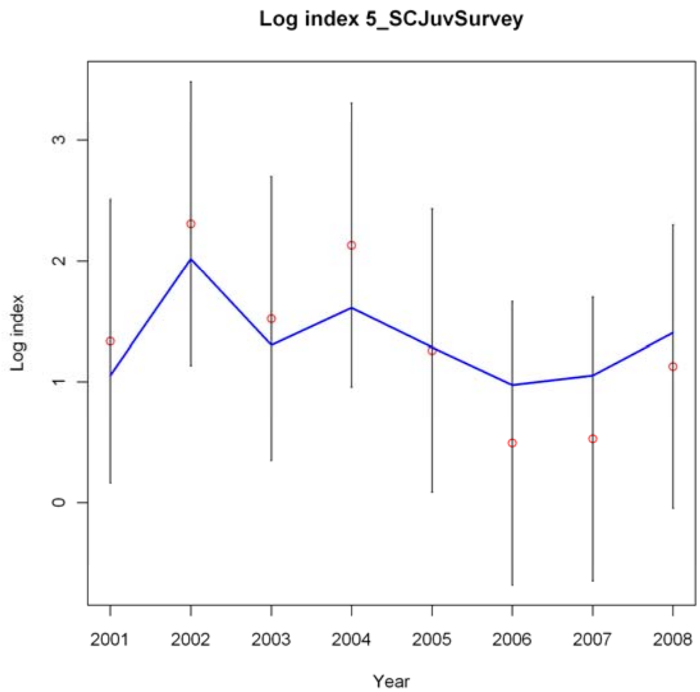


Figure 29. Model fits to the Oregon bottom trawl logbook index.

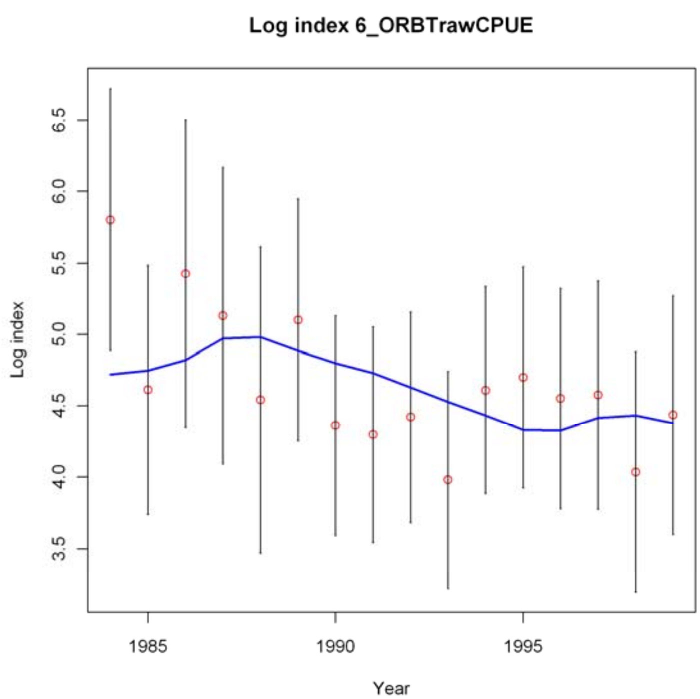


Figure 30. Model fits to the northern area triennial survey index

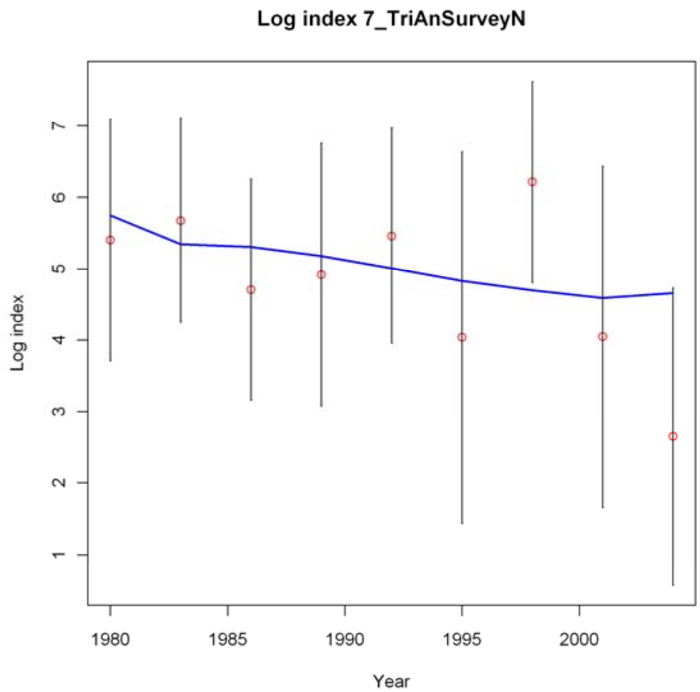


Figure 31. Model fits to the southern area triennial survey index.

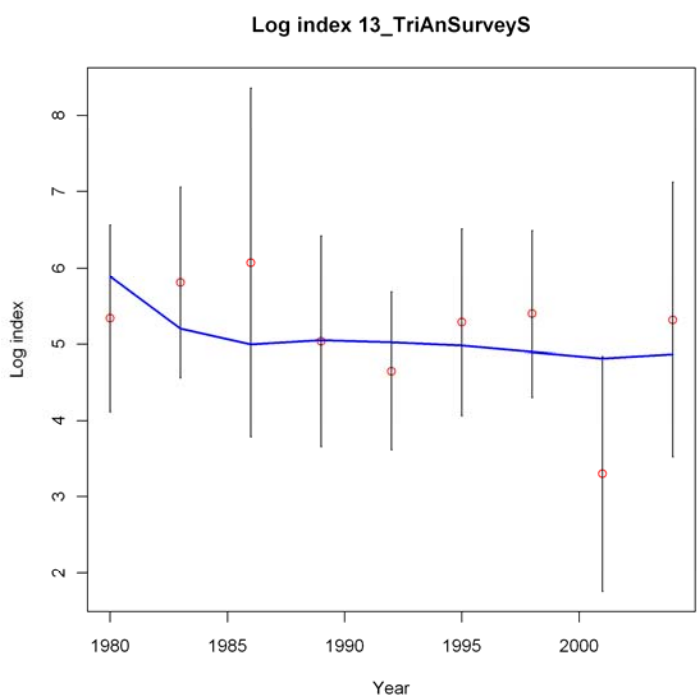


Figure 32. Model fits to the Pacific whiting foreign fishery bycatch index.

Figure 33. Model fits to the Pacific whiting joint venture fishery bycatch index.

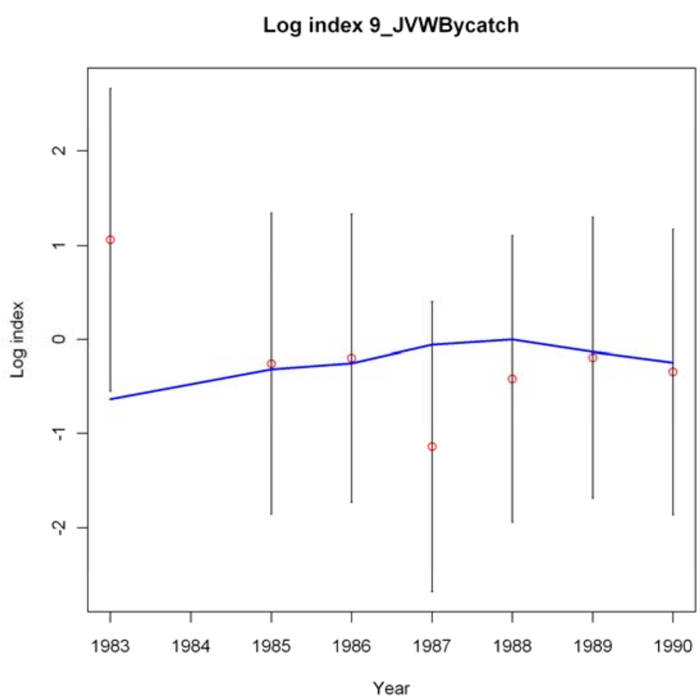


Figure 34. Model fits to the Pacific whiting domestic fishery bycatch index.

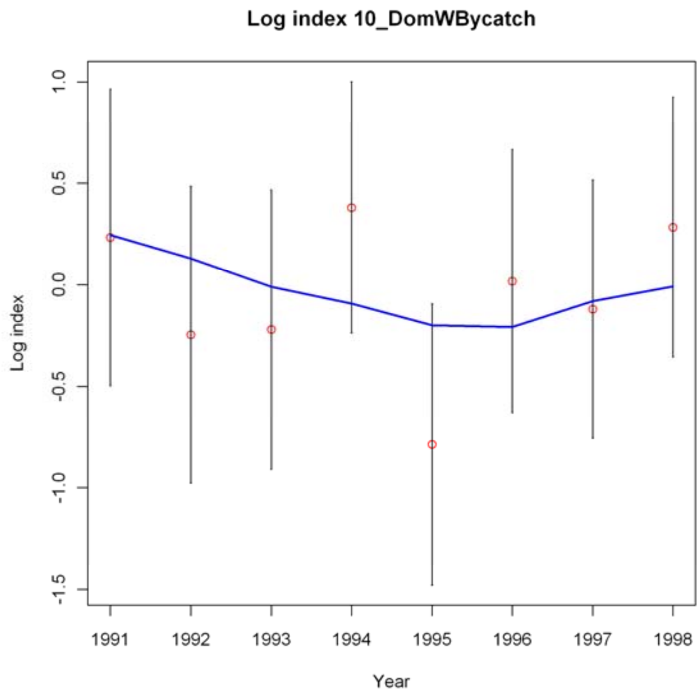


Figure 35. Model fits to the NWFSC northern area survey index.

Figure 36. Model fits to the NWFSC southern area survey index.

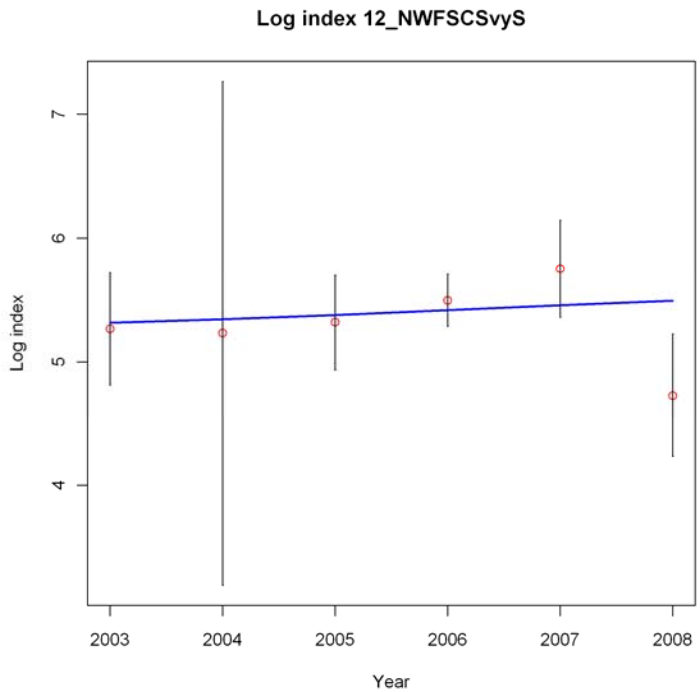
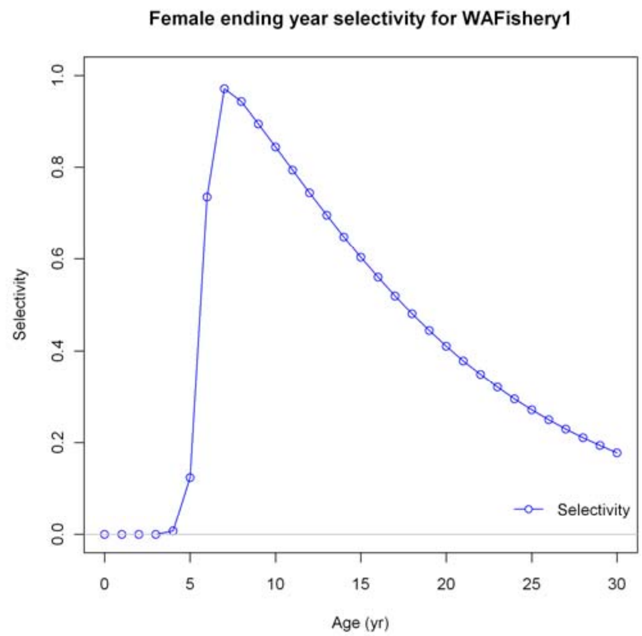


Figure 37. Estimated age selectivity curves for the Washington fishery for females (top) and males (bottom).



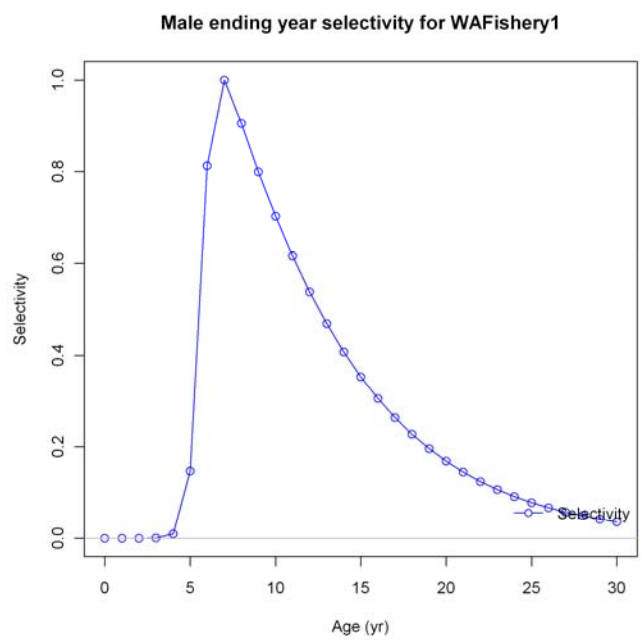
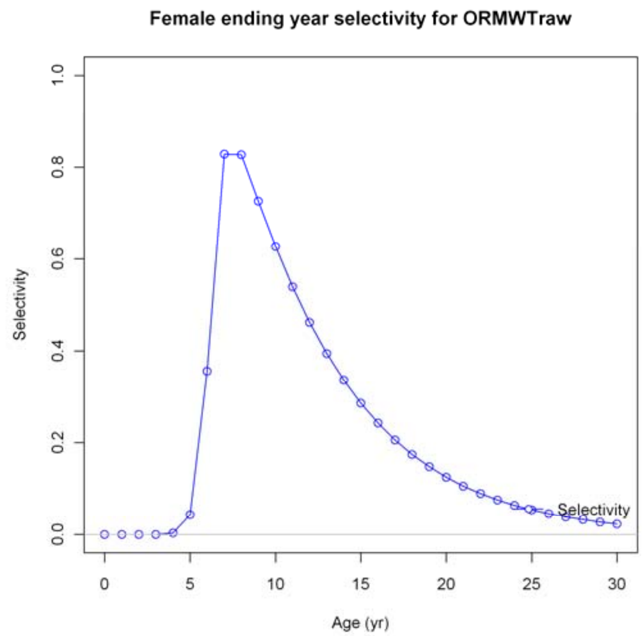


Figure 38. Estimated age selectivity curves for the Oregon mid-water trawl fisheries for females (top) and males (bottom).



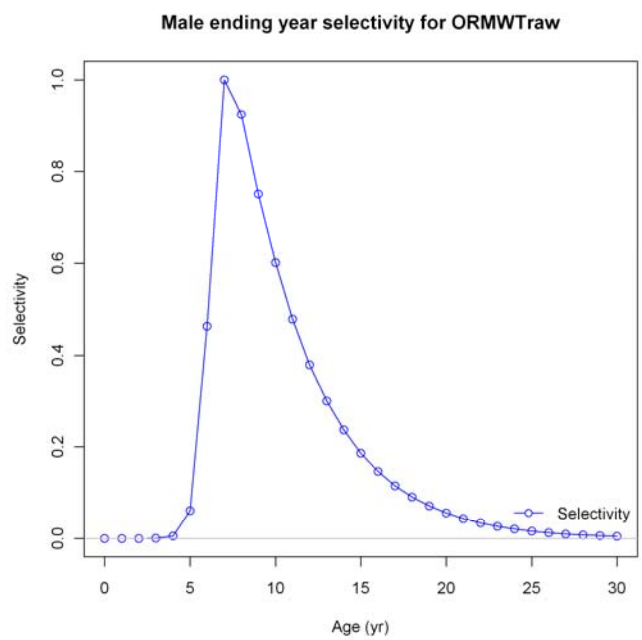
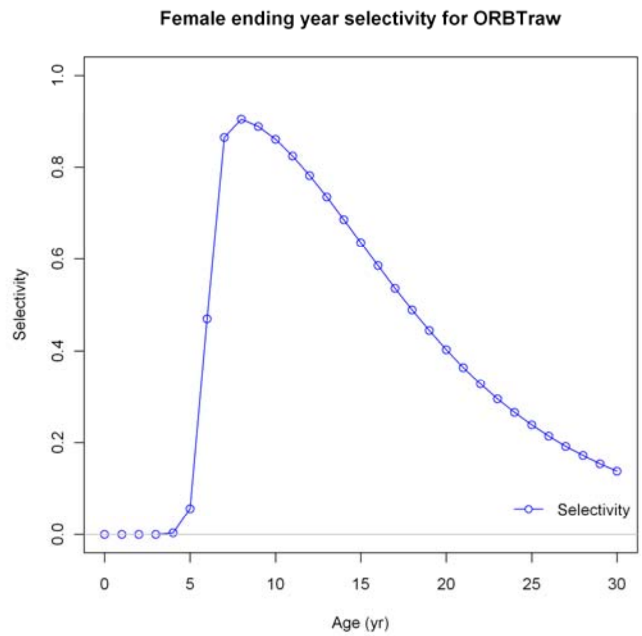


Figure 39. Estimated age selectivity curves for the Oregon bottom trawl fishery for females (top) and males (bottom).



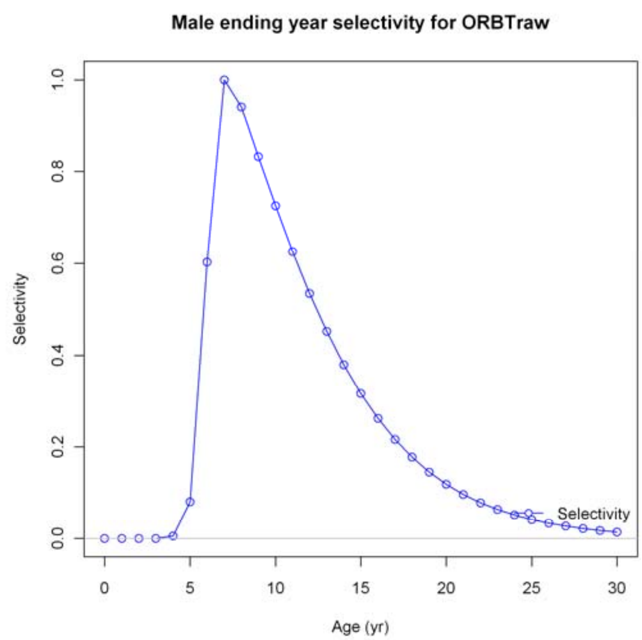


Figure 40. Estimated age selectivity curves for the Eureka-Conception fisheries for females (top) and males (bottom).

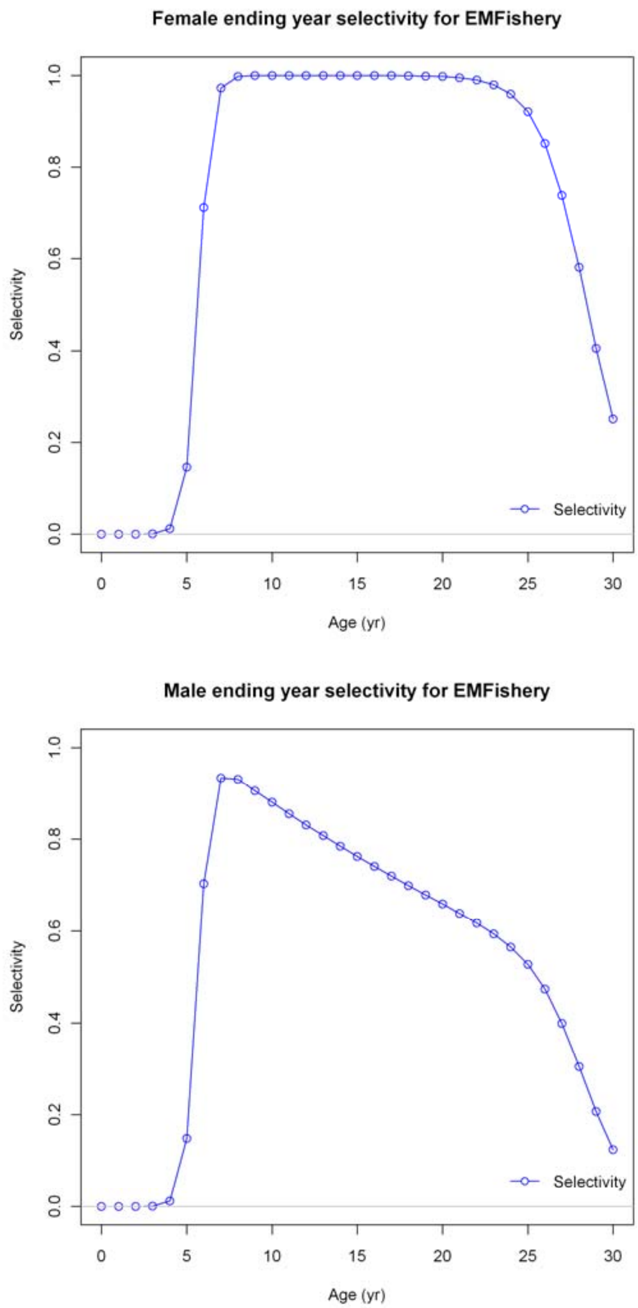


Figure 41. Estimated length selectivity curves for the triennial survey.

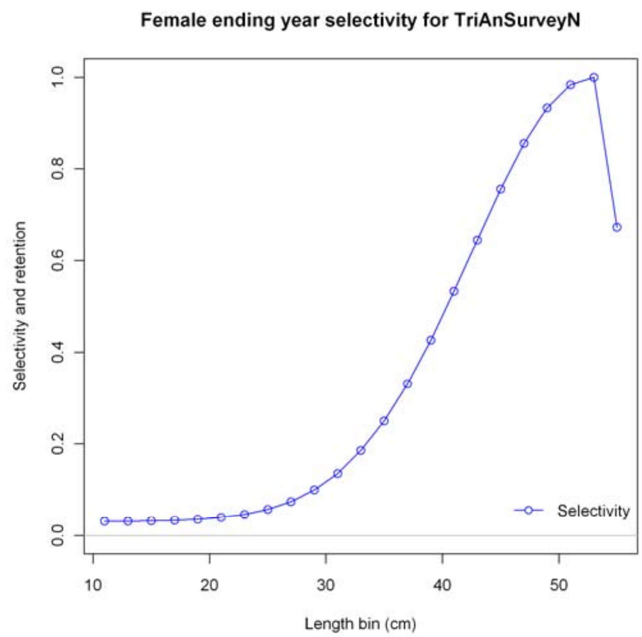


Figure 42. Estimated length selectivity curves for the NWFSC survey.

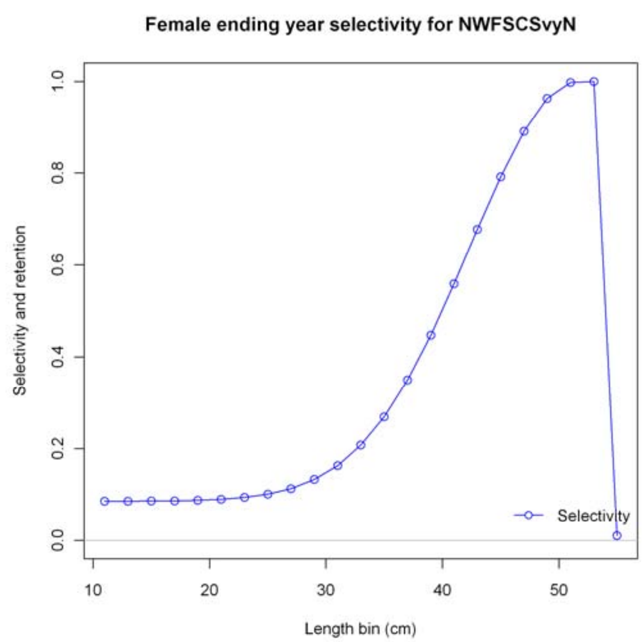
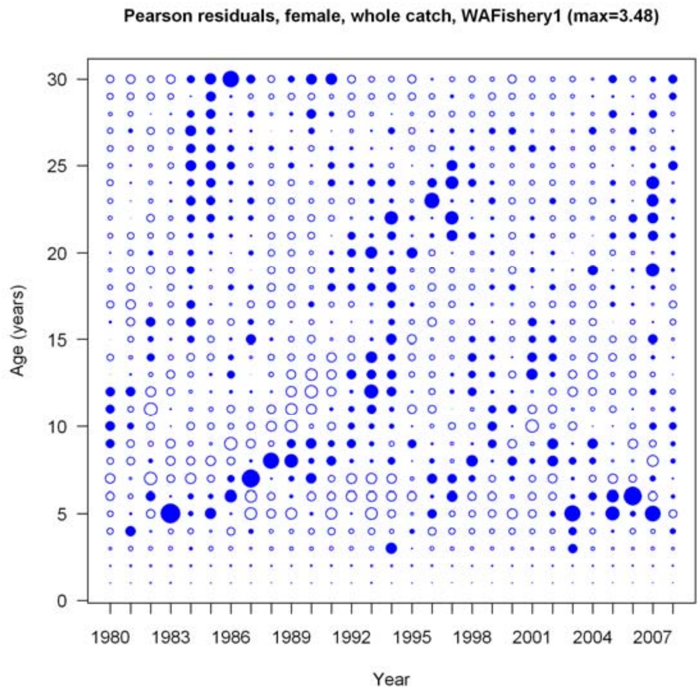


Figure 43. Age composition residuals of females (top) and male (bottom) for the Vancouver-Columbia fishery from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.



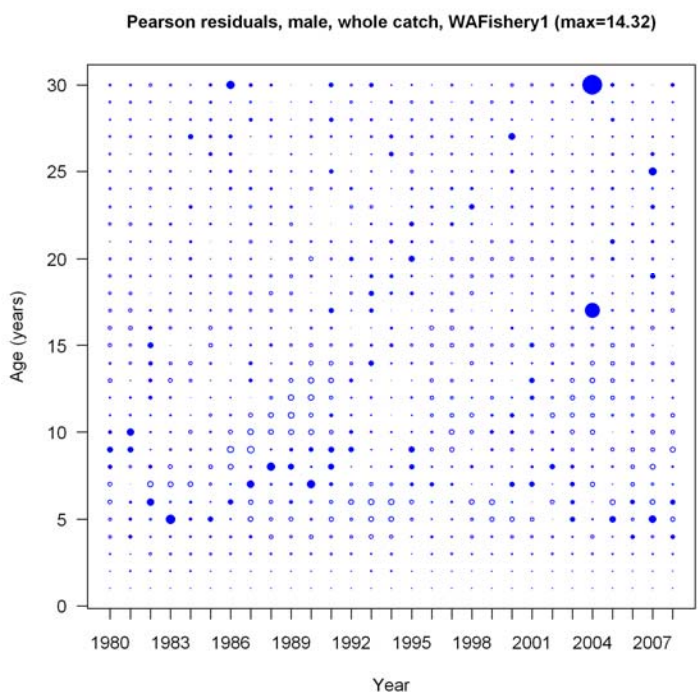


Figure 44. Age composition residuals of females (top) and male (bottom) for the Oregon mid-water trawl fishery from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.

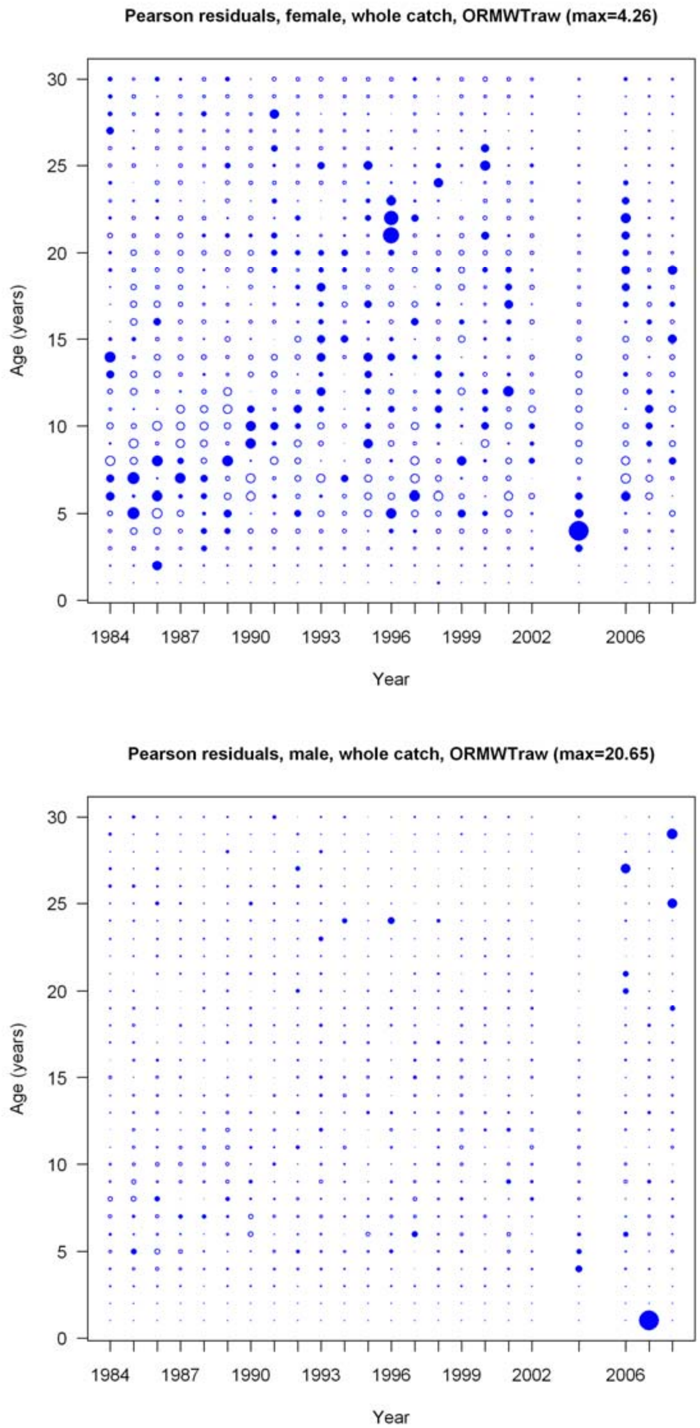
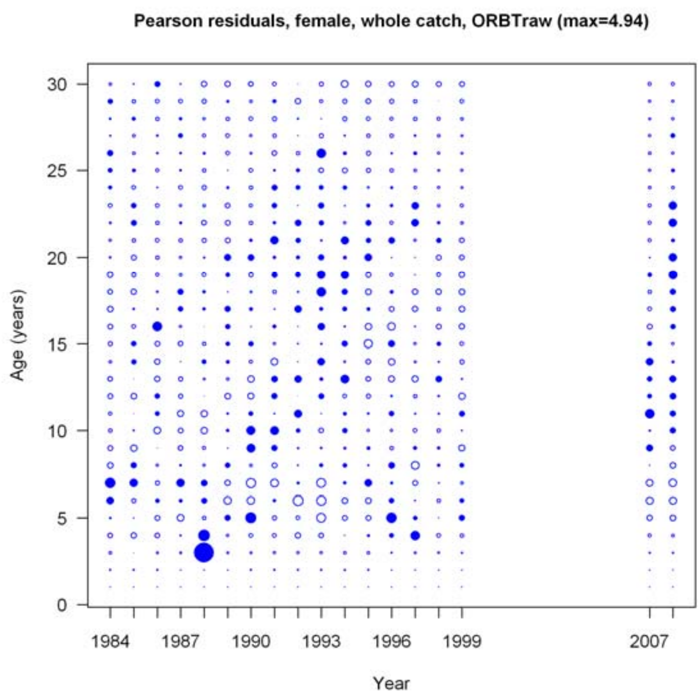


Figure 45. Age composition residuals of females (top) and males (bottom) for the Oregon bottom trawl fishery from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.



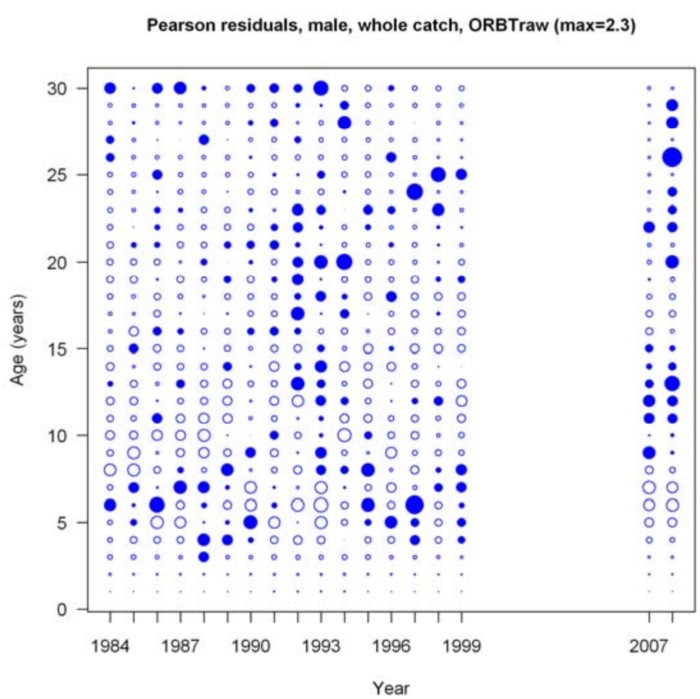
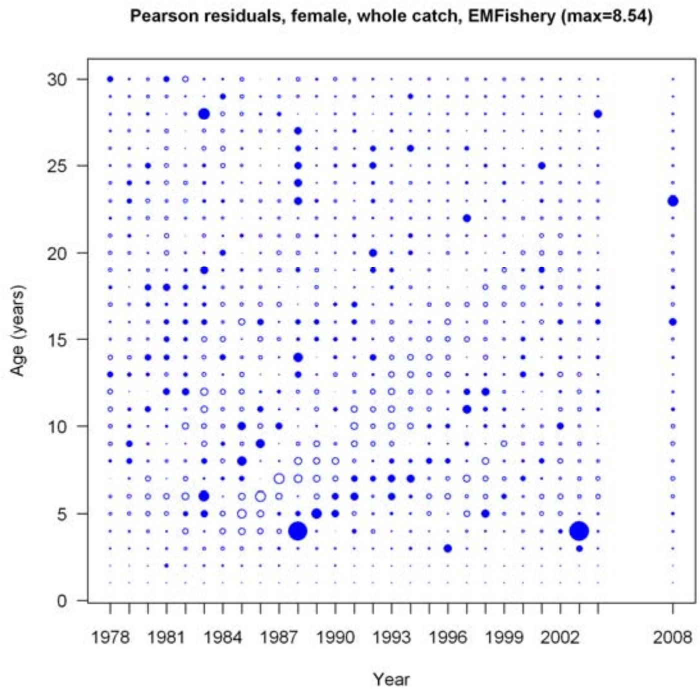


Figure 46. Age composition residuals of females (top) and males (bottom) for the Eureka-Conception fishery from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.



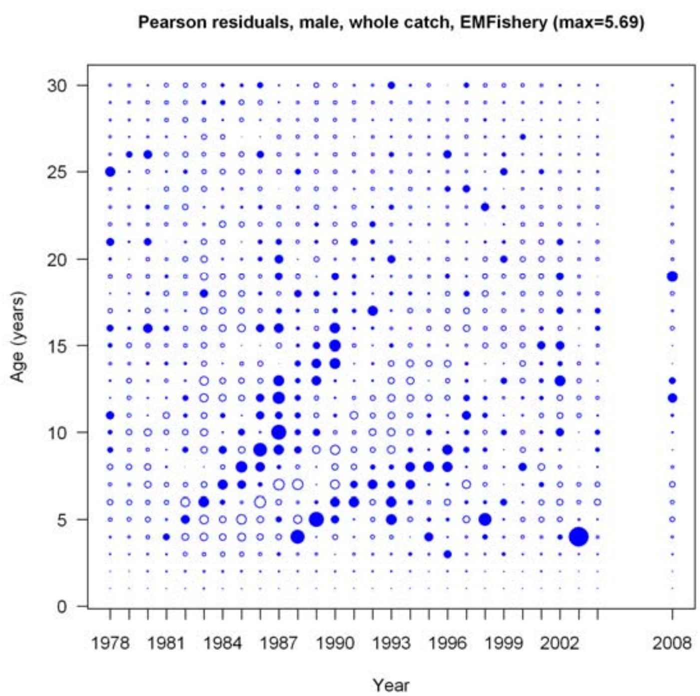
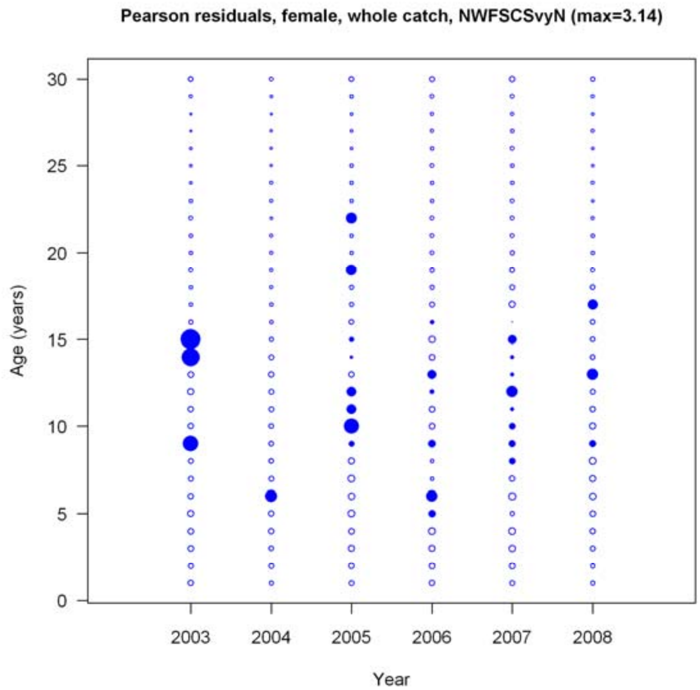


Figure 47. Age composition residuals of females (top) and males (bottom) for the NWFSC northern area survey from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.



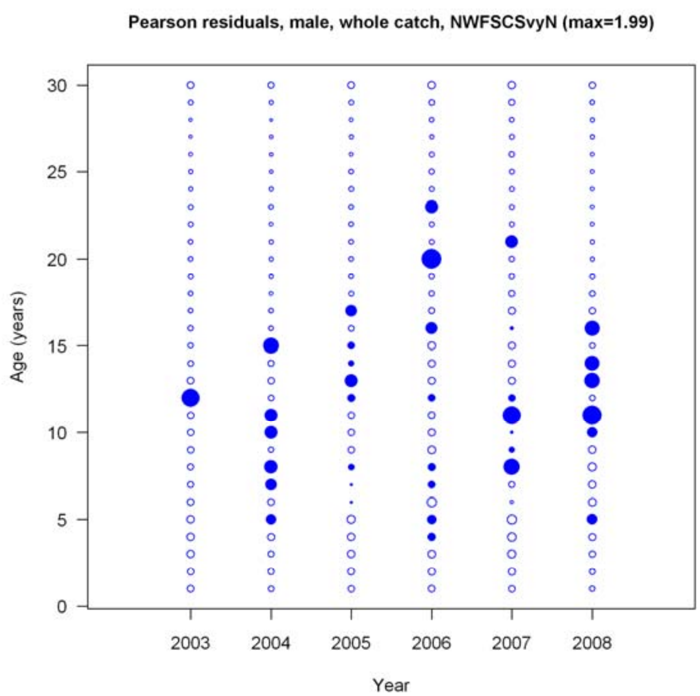
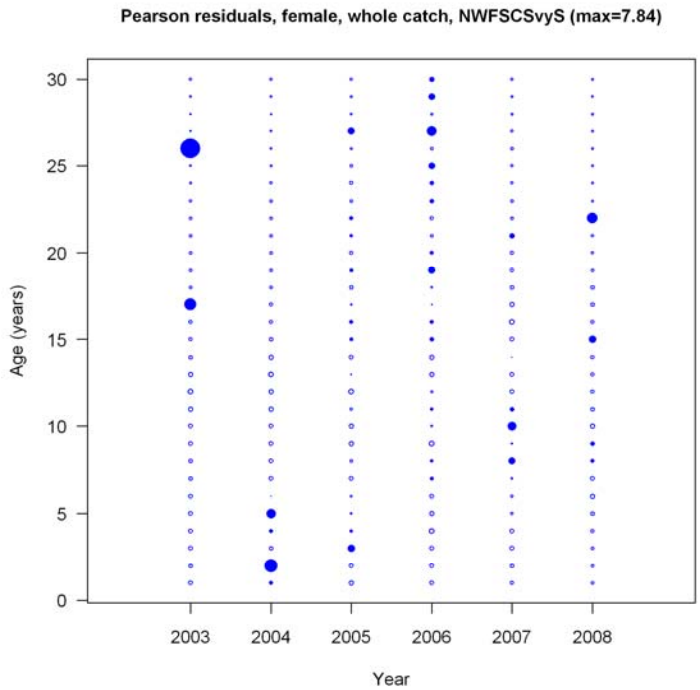


Figure 48. Age composition residuals of females (top) and males (bottom) for the NWFSC southern area survey from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.



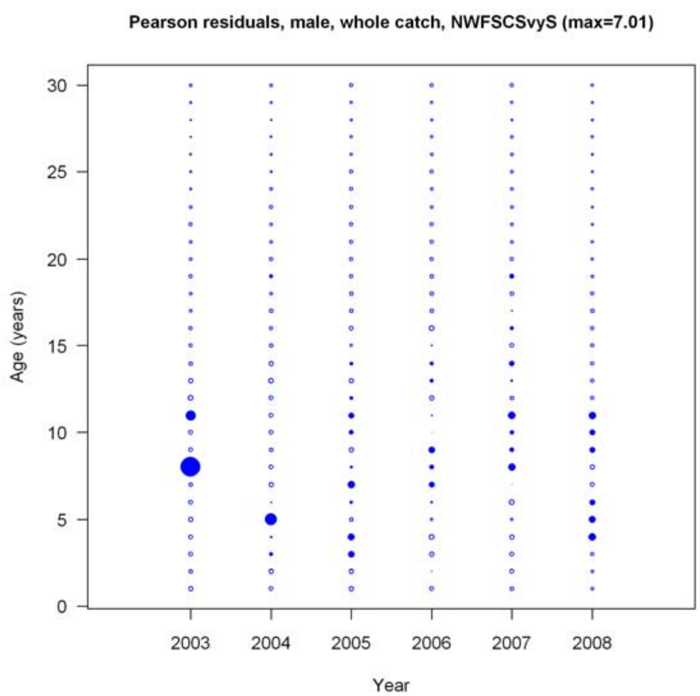
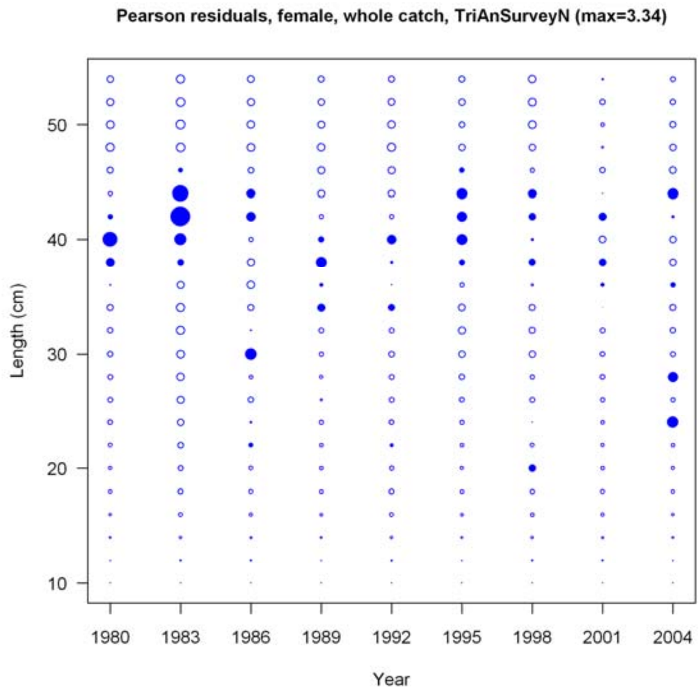


Figure 49. Length composition residuals of females (top) and males (bottom) for the northern area triennial survey from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.



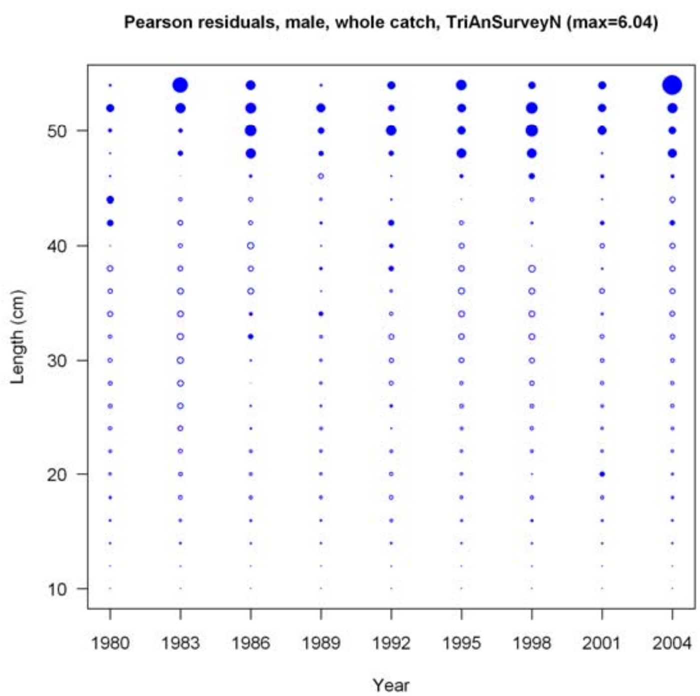
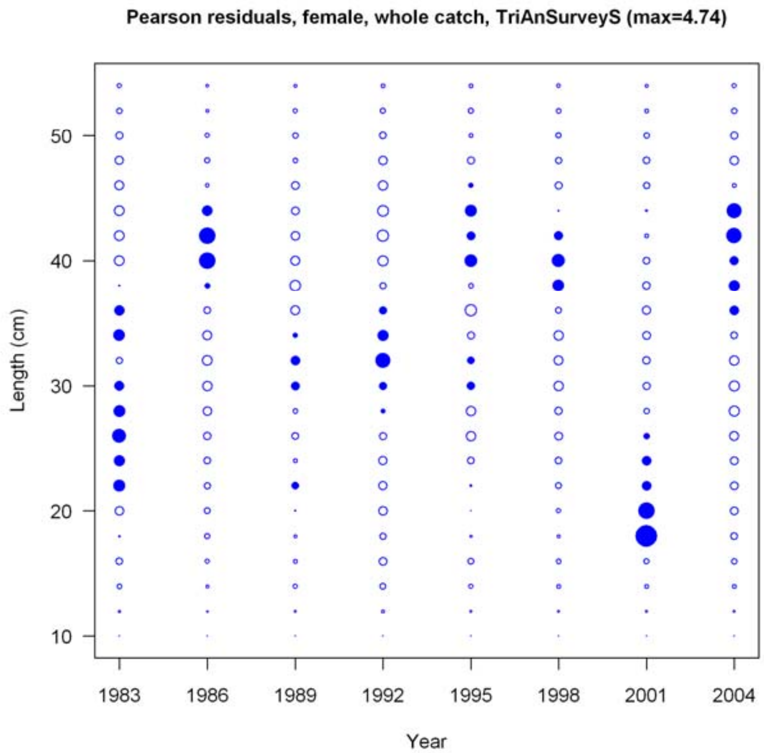


Figure 50. Length composition residuals of females (top) and males (bottom) for the southern area triennial survey from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.



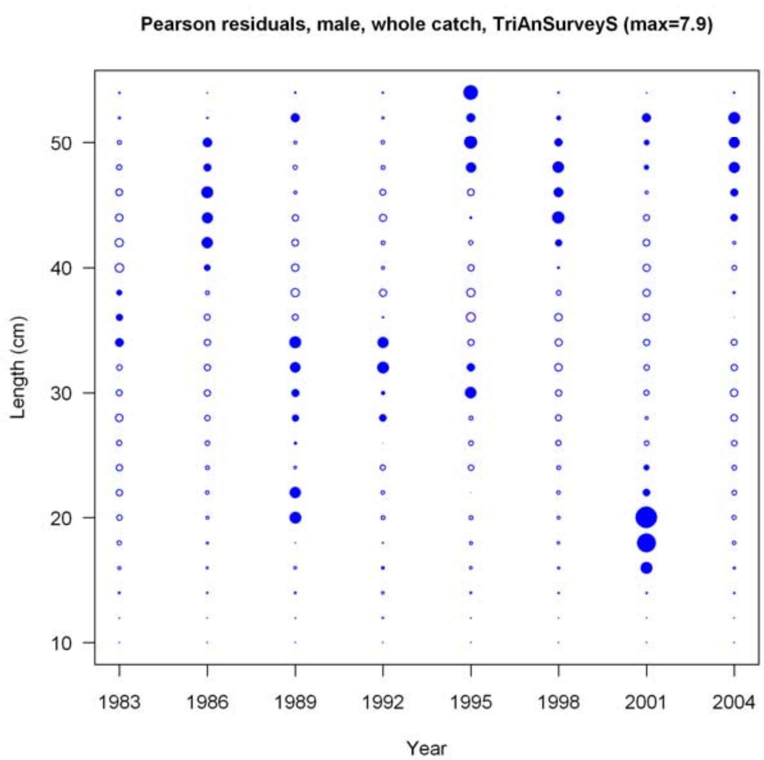
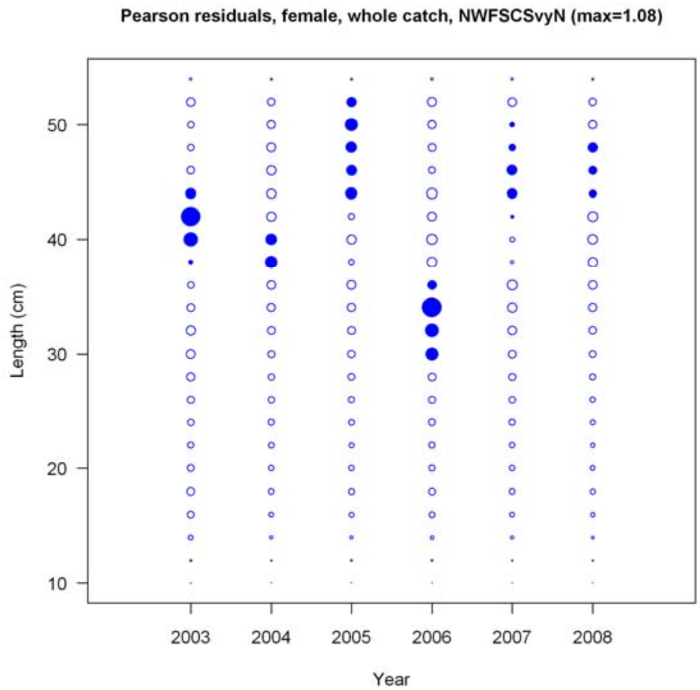


Figure 51. Length composition residuals of females (top) and males (bottom) for the NWFSC northern area survey from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.



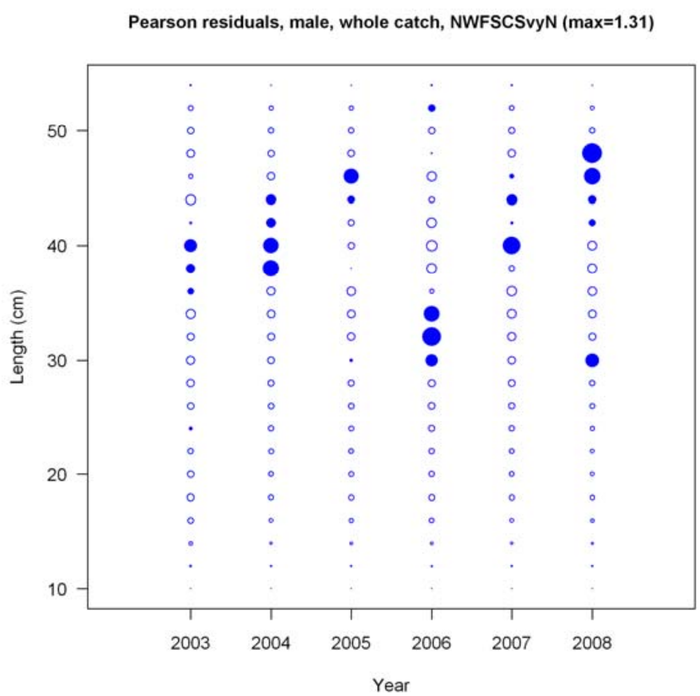
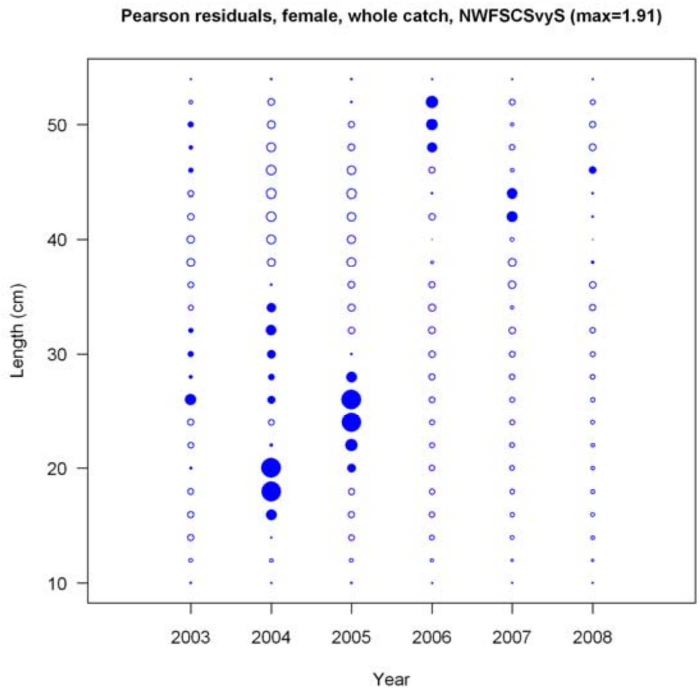


Figure 52. Length composition residuals of females (top)and males (bottom) for the NWFSC southern area survey from the base model. Residuals are standardized differences (observed – estimated). Dark circles are positive residuals and open circles are negative residuals.



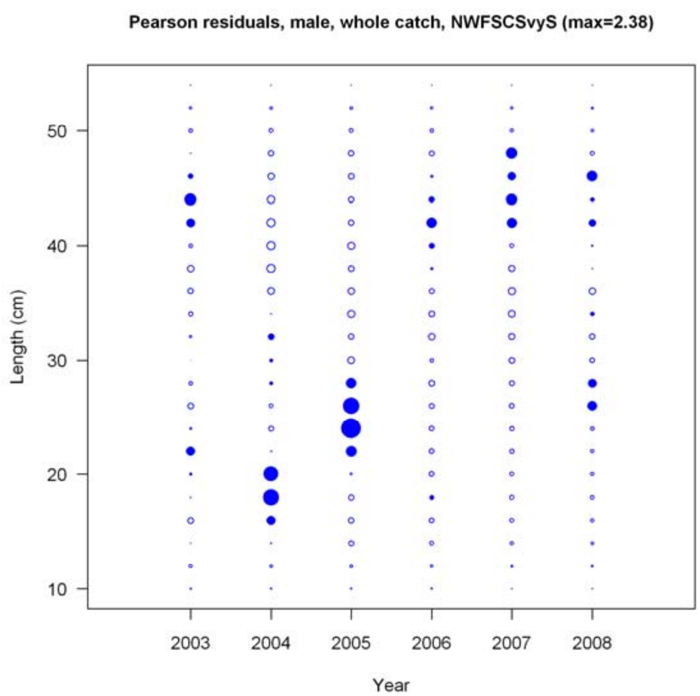


Figure 53. Comparisons of time series of spawning outputs between the base model and sensitivity runs.

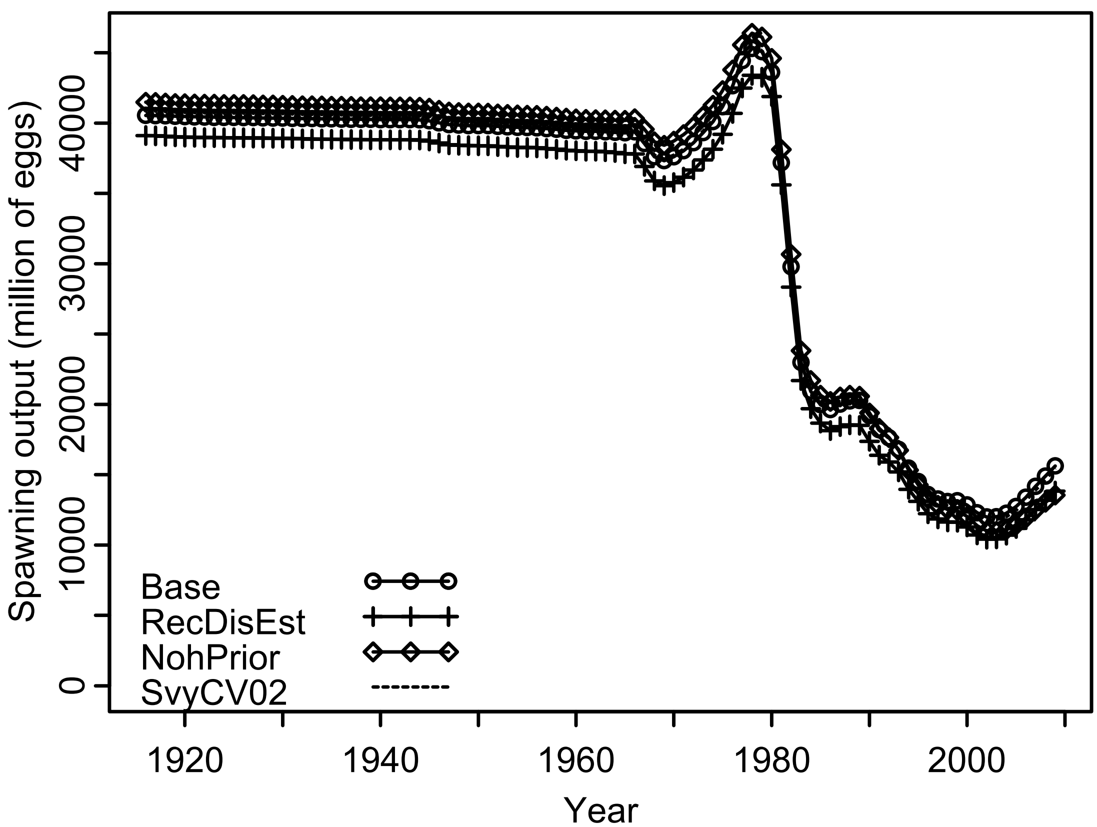


Figure 54. Comparisons of time series of recruitments between the base model and sensitivity runs.

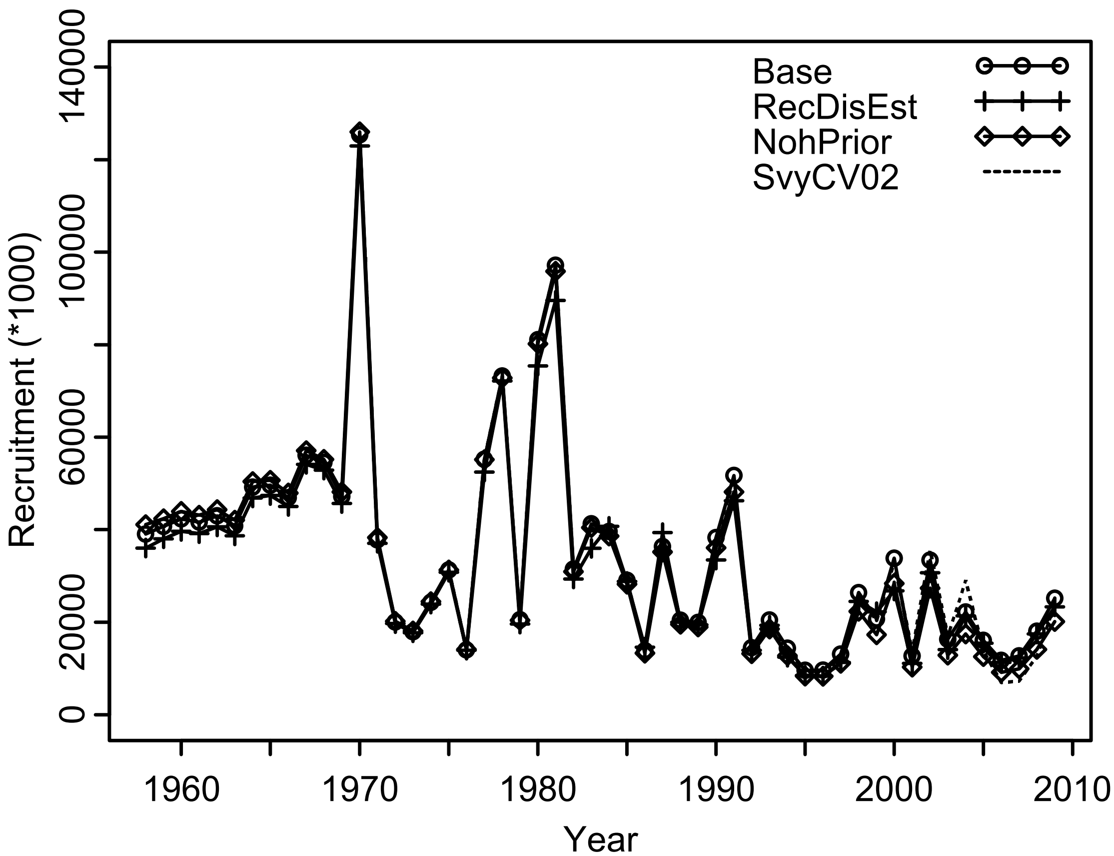


Figure 55. Comparisons of time series of spawning outputs between the base model and two fix proportions of recruitment to the northern area (0.6875 and 0.7500).

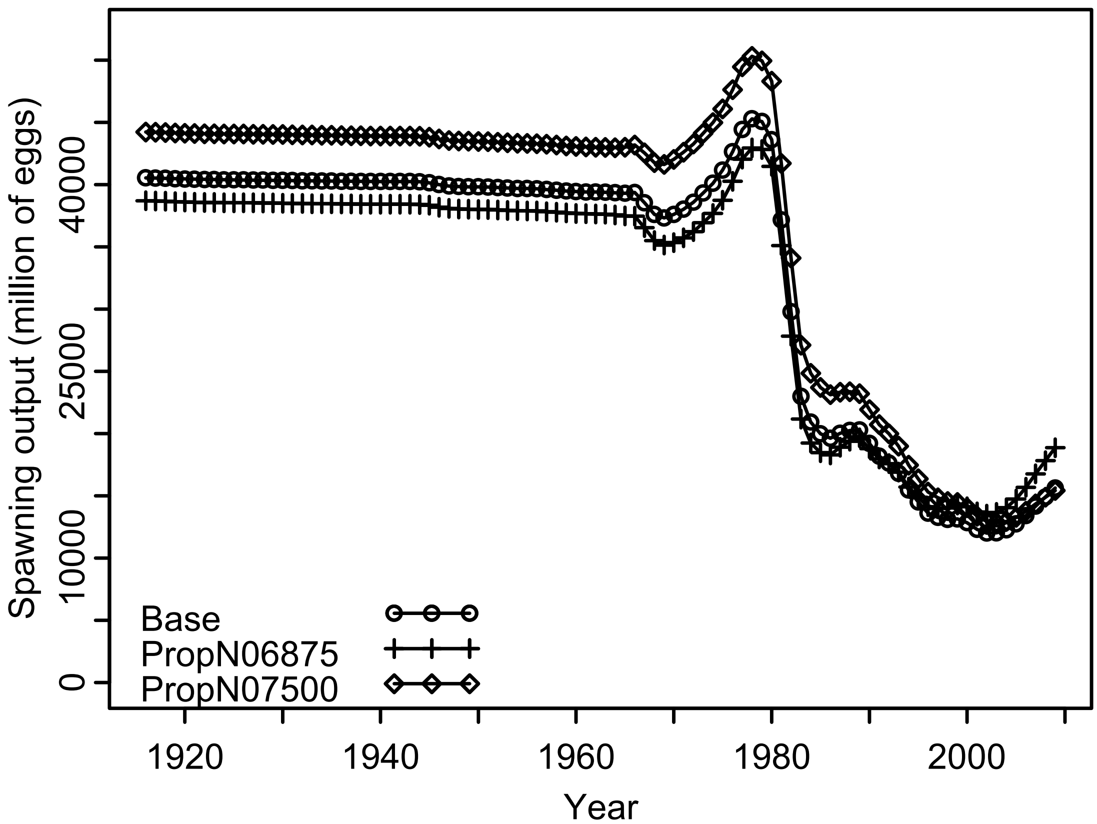


Figure 56. Comparisons of time series of recruitments between the base model and two fix proportions of recruitment to the northern area (0.6875 and 0.7500).

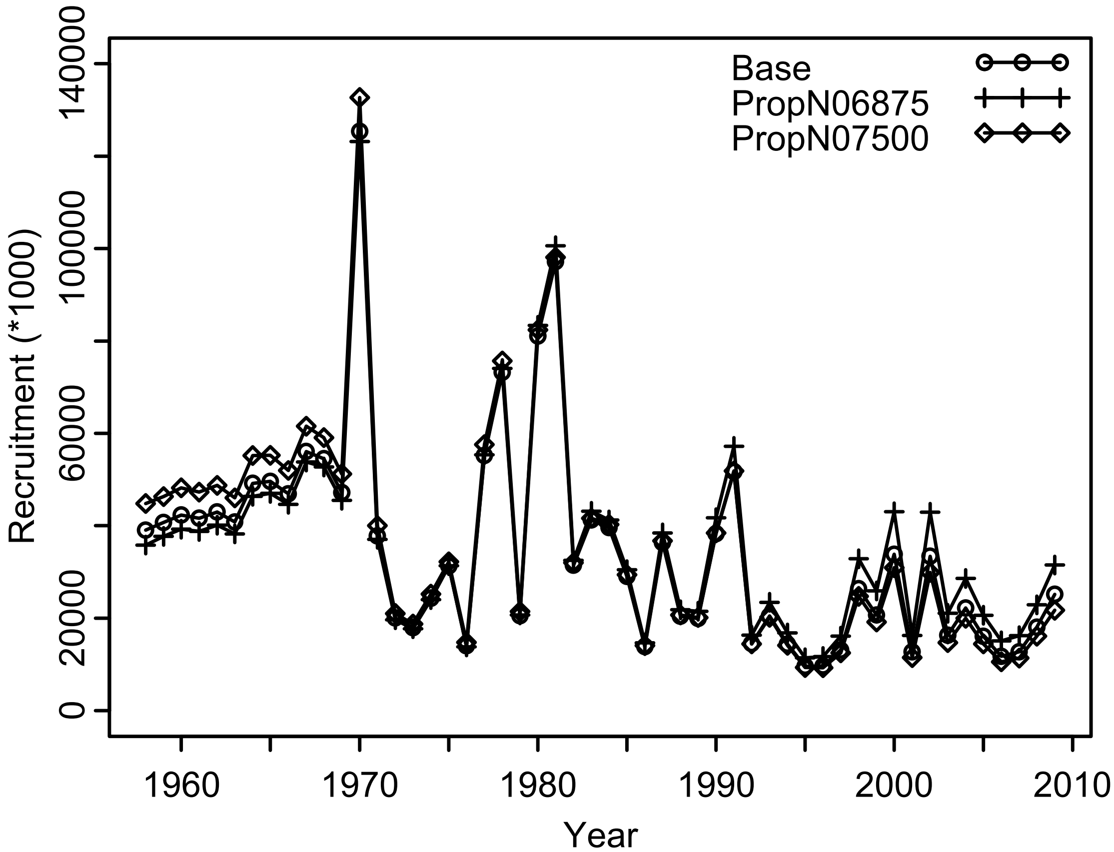


Figure 57. Comparisons of time series of spawning outputs between the base model and retrospective analysis runs.

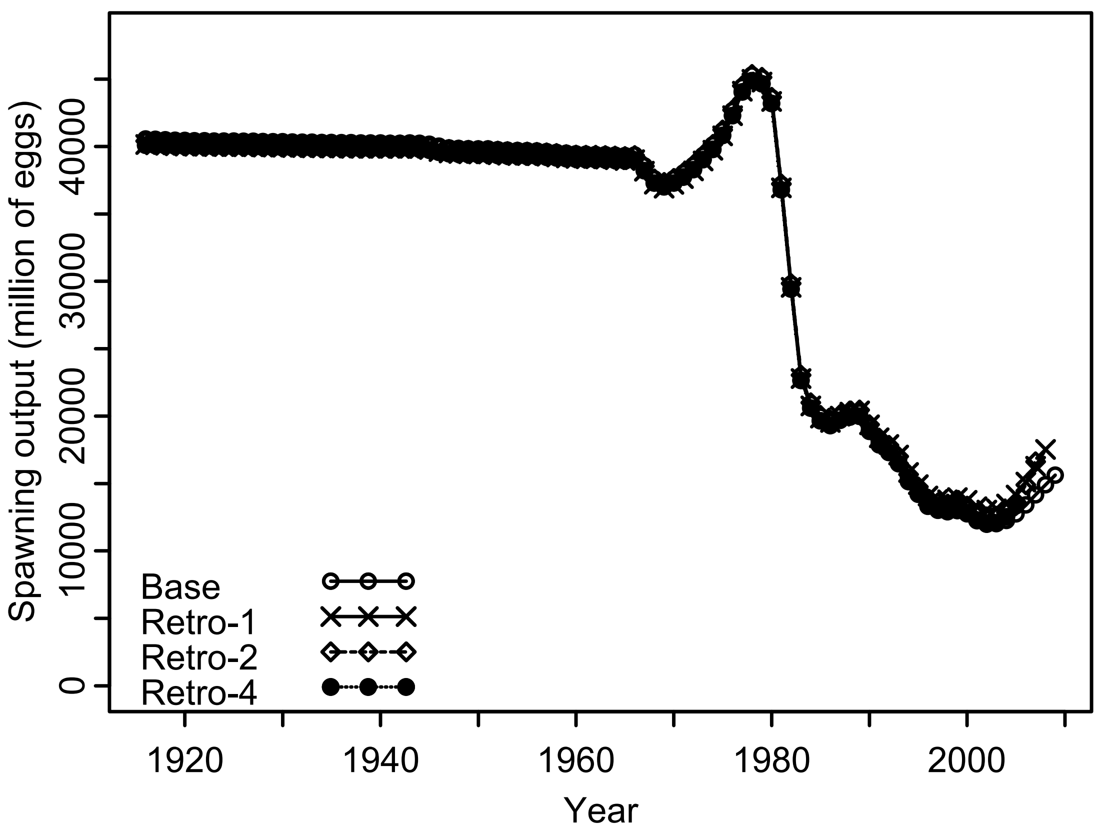


Figure 58. Comparisons of time series of recruitments between the base model and retrospective analysis runs.

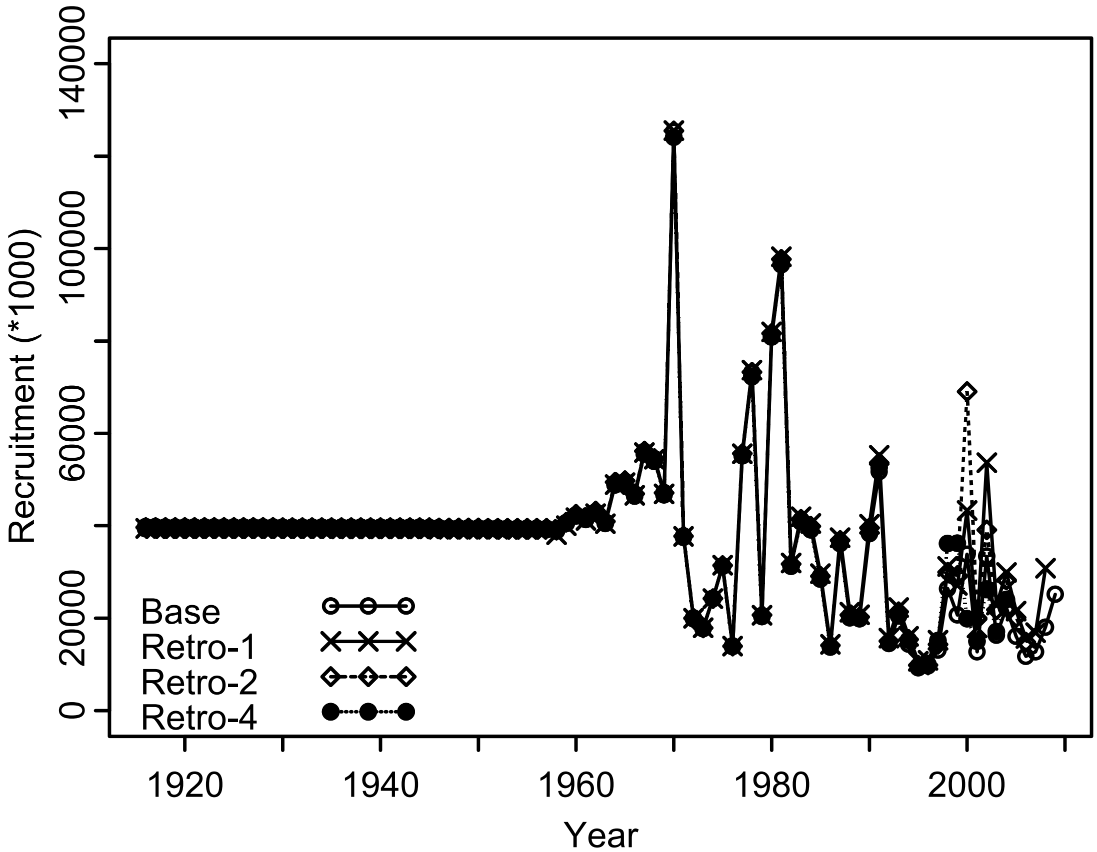
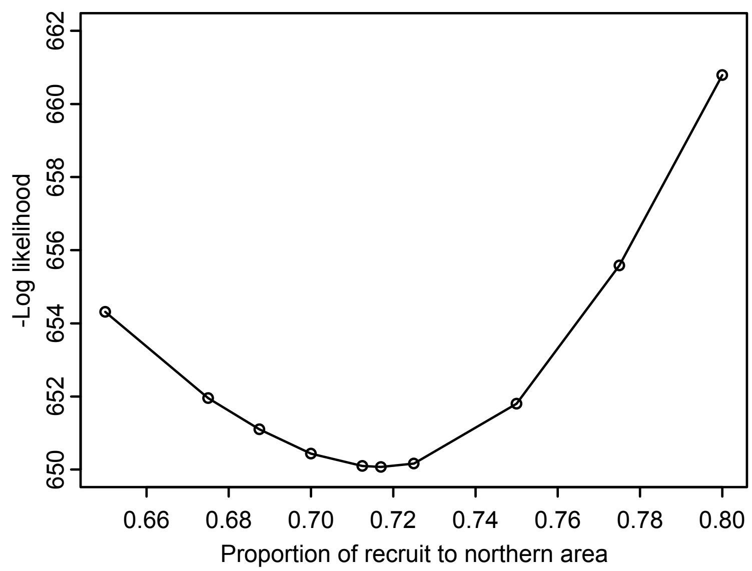


Figure 59. Likelihood profiles for the proportion of recruitment to northern area and associated depletion in 2009.



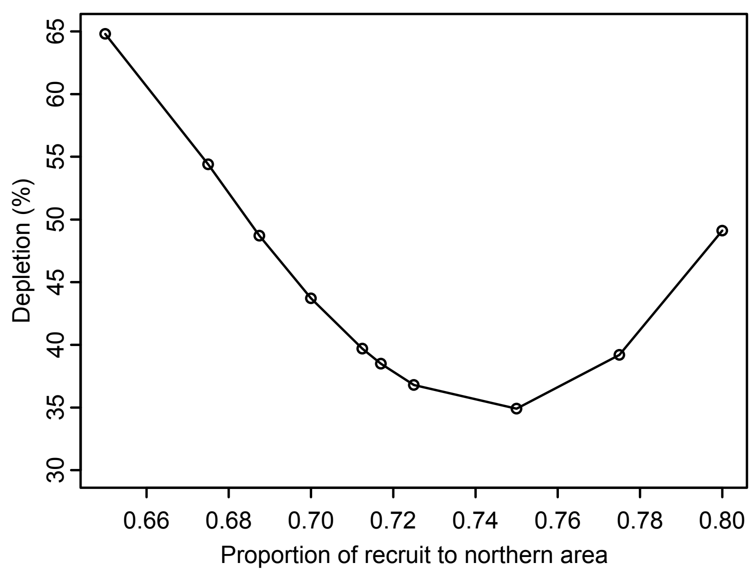
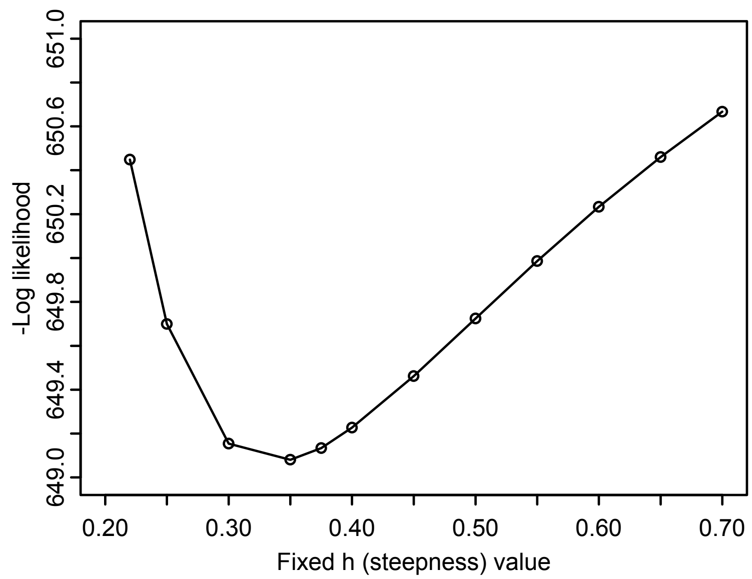


Figure 60. Likelihood profiles for steepness (*h*) and associated depletion in 2009.



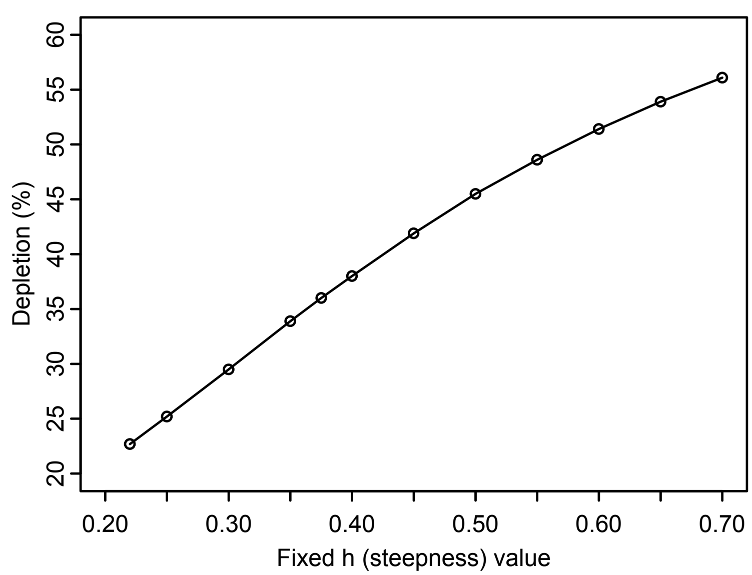


Figure 61. Likelihood profiles for natural mortality (*M*) and associated depletion in 2009.

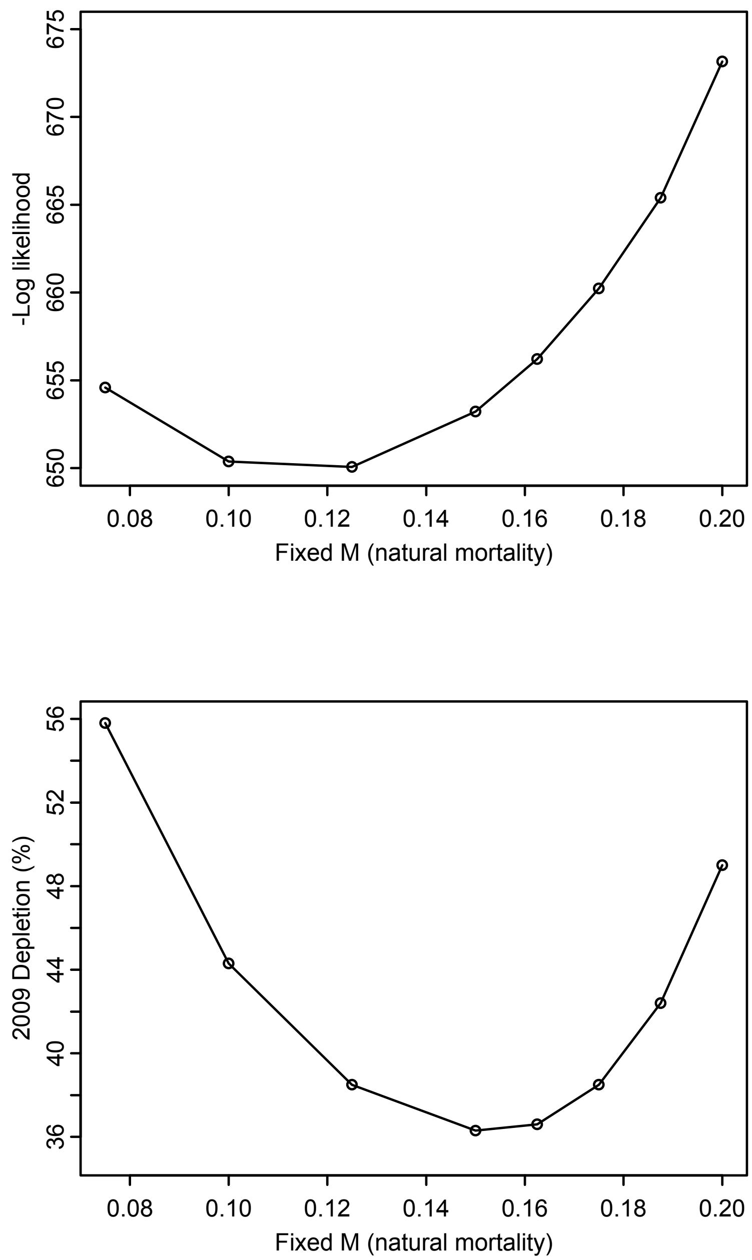


Figure 62. Comparisons of time series of spawning (*SO*) outputs between the 2009 base model and four previous assessments (2000, 2003, 2005, and 2007).

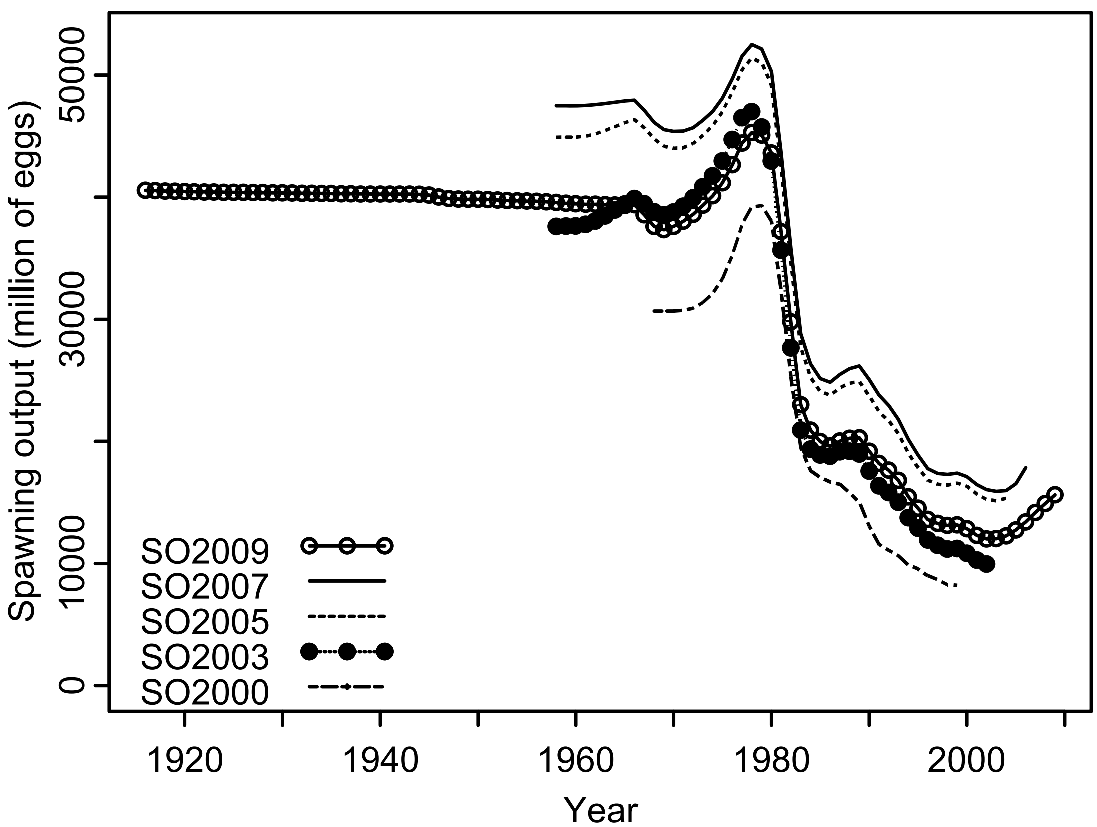


Figure 63. Comparisons of time series of recruitments between the 2009 base model and four previous assessments (2000, 2003, 2005, and 2007).

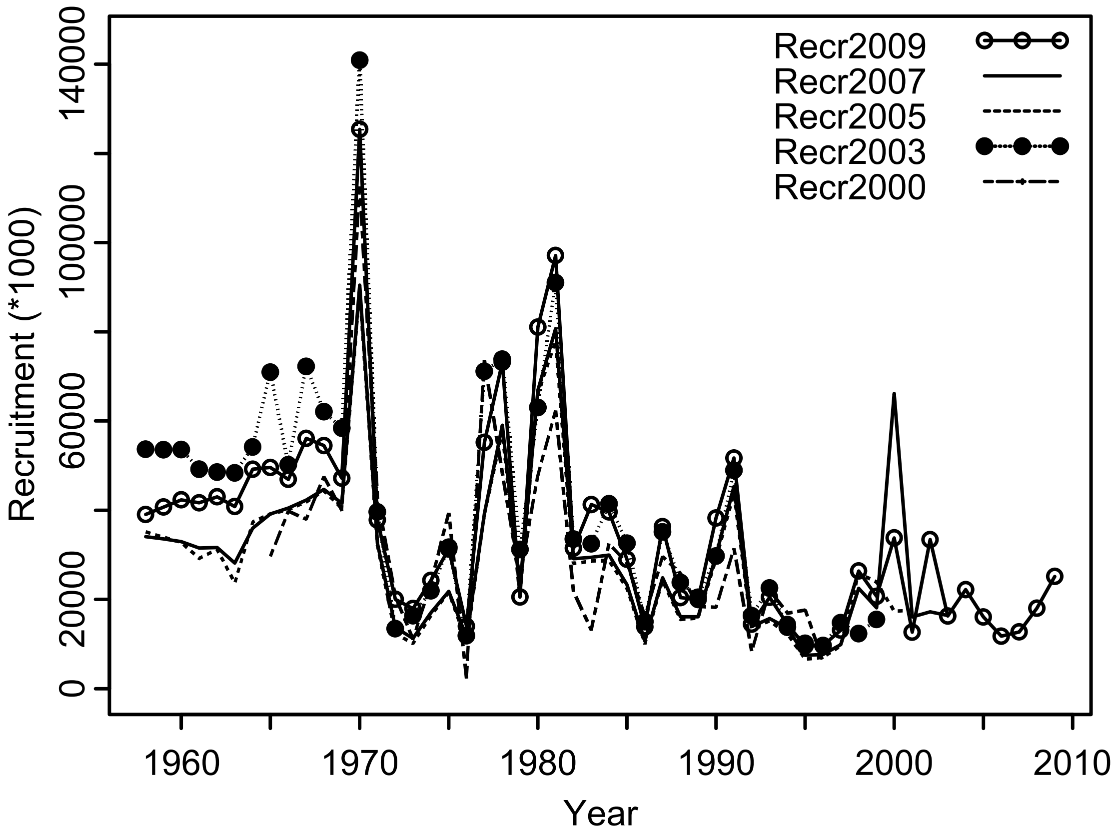


Figure 64. Estimated spawning potential ratio (SPR). The target SPR level of 0.4 (alternatively, the value could be 0.5) is also shown. Values below the target level indicates that overfishing occurred.

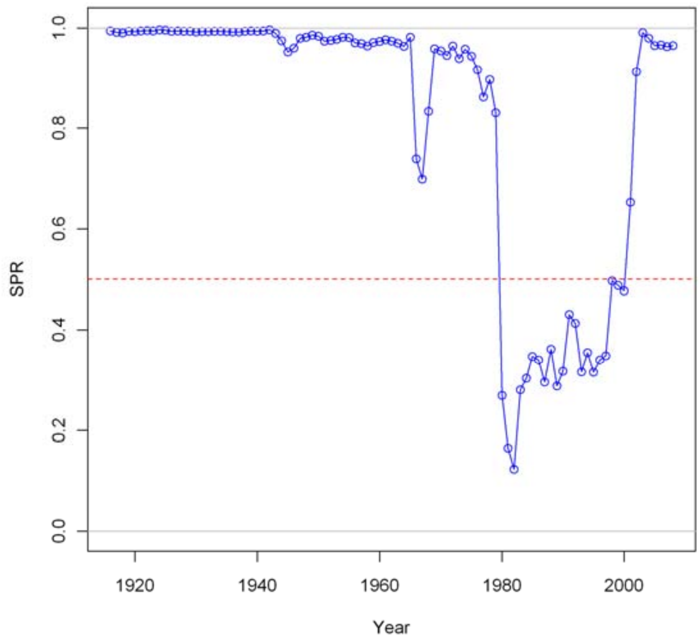


Figure 65. Phase plots of estimated spawning potential ratio to its target of 0.4 and estimated spawning output relative to its target of SB40%. The last point on the lower-left quarter corresponds to estimated value of 2009.

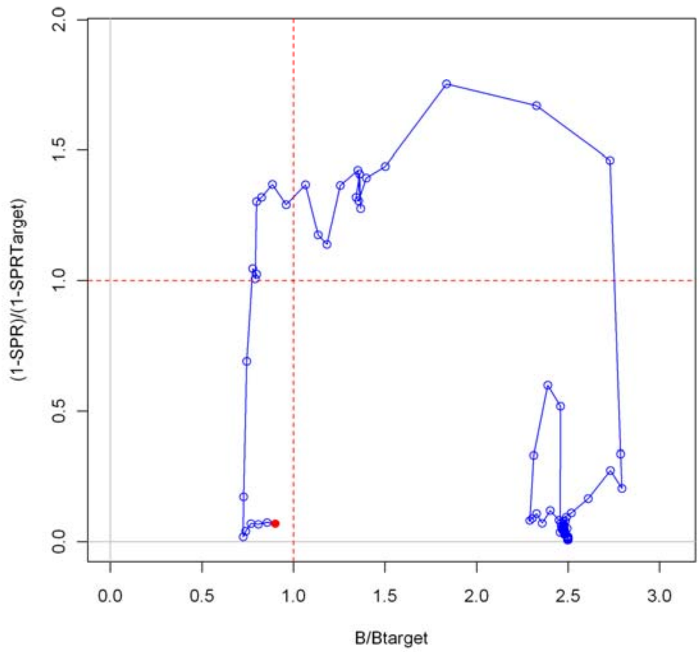
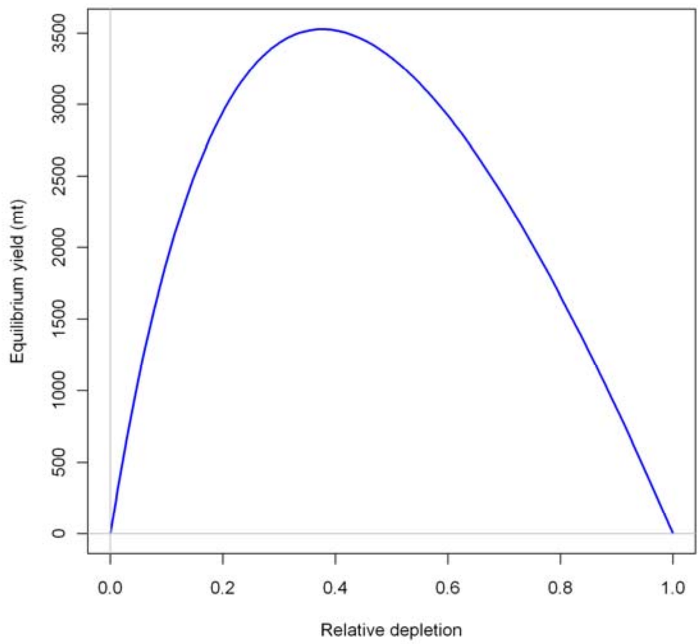


Figure 66. Equilibrium yield curve for the base model.



12 Appendix A. Chronology of the regulatory history of widow rockfish by the Pacific Fishery Management Council.

Date	Regulation
10/13/82	75,000 lb trip limit.
1/30/83	30,000 lb trip limit.
9/10/83	1,000 lb trip limit.
1/1/84	50,000 lb trip limit once per week.
5/6/84	40,000 lb trip limit once per week.
8/1/84	Closed fishery with 1,000 trip limit for incidental catch.
9/9/84	Closed fishery.
1/10/85	30,000 lb trip limit once a week or 60,000 lb trip limit once per two weeks, unlimited trips of less than 3,000 lbs.
4/28/85	Dropped 60,000 lb biweekly option.
7/21/85	3,000 lb trip limit, unlimited number of trips.
1/1/86	30,000 lb trip limit, only one weekly landing greater than 3,000 lbs.
9/28/86	3,000 lb trip limit, unlimited number of trips.
1/1/87	30,000 lb trip limit, only one weekly landing greater than 3000 lbs.
11/25/87	Closed fishery.
1/1/88	30,000 lb trip limit, only one weekly landing greater than 3000 lbs, unlimited number of trips less than 3,000 lbs.
9/21/88	3,000 lb trip limit, unlimited number of trips.
1/1/89	30,000 lb trip limit, only one weekly landing greater than 3,000 lbs.
4/26/89	10,000 lb trip limit once per week.
10/11/89	3,000 lb trip limit with unlimited number of trips.
1/1/90	15,000 lb trip limit once per week or 25,000 lb trip limit once per two weeks with only one landing greater than 3,000 lbs each week.
12/12/90	Closed fishery.
1/1/91	10,000 lb trip limit per week or 20,000 lb trip limit every two weeks with only one landing greater than 3,000 lbs per week.
9/25/91	3,000 lb trip limit with unlimited number of trips.
1/1/92	30,000 lbs cumulative landings every 4 weeks
5/9/92	Change from 3" mesh to 4.5" mesh in codend for roller gear north of Point Arena.
8/12/92	3,000 lb trip limit with unlimited number of trips.
12/2/92	30,000 lb cumulative trip limit per 4 weeks.
12/1/93	3,000 lb trip limit with unlimited number of trips.
1/1/94	30,000 lb cumulative limit per calendar month.
12/1/94	3,000 lb trip limit with unlimited number of trips.
1/1/95	30,000 lb cumulative limit per calendar month.

4/14/95	45,000 lb cumulative limit per calendar month.
9/8/95	4.5" mesh applies to entire net and bottom trawl.
1/1/96	70,000 lb cumulative limit per two months.
9/1/96	50,000 lb cumulative limit per two months.
11/1/96	25,000 lb cumulative limit per two months.
1/1/97	70,000 lb cumulative limit per two months.
5/1/97	60,000 lb cumulative limit per two months.
1/1/98	Limited entry: 25,000 lb cumulative per two month period.
	Open access: 12,500 lb cumulative per two month period.
5/1/98	Limited entry: 30,000 lb cumulative per two month period
7/1/98	Open access: 3,000 lb cumulative per month
10/1/98	Limited entry: 19,000 lb cumulative per month
1/1/99	Limited entry: cumulative limits: phase 1 - 70,000 lbs per period, phase 2 - 16,000 lbs per period, phase 3 - 30,000 lbs per period.
	Open access: 2,000 lbs per month.
5/1/99	Limited entry: decrease phase 2 and phase 3 limits to 11,000 lbs.
7/2/99	Open access: 8,000 lb cumulative limit per month.
10/1/99	Limited entry: vessels in Oregon and Washington using 30,000 lb cumulative monthly limit must have midwater trawl gear aboard or a state cumulative limit will be imposed.
1/1/00	Widow rockfish classified as a shelf species for regulatory purposes.
	Limited entry trawl: 30,000 lbs/2 months.
	Limited entry fixed gear: 3,000 lbs/month.
	Open access: 3,000 lbs/month.
1/1/01	Limited entry trawl: 20,000 lbs/2 months for months of Jan-Apr and Sep-Oct; otherwise 10,000 lbs/2 months for midwater trawls; 1,000 lbs/months for small footrope trawls.
	Limited entry fixed gear: 3,000 lbs/month.
	Open access: north - 3,000 lbs/month; south - 3,000 lbs per month with some monthly closures in some areas.
7/1/01	Limited entry midwater trawl in the north: 1,000 lbs/month.
10/1/01	Closed fishery for all except midwater, which may land 2,000 lbs/month in north for October, then 25,000 lbs/2 months.
1/1/02	Limited entry trawl in the north: closed through November to midwater trawl except for small bycatch in whiting fishery, in November 13,000 lbs/2 month with no more than 2 trips, small footrope trawl 1000 lbs/month through September, then closed Sept-Oct, then 500 lbs/month Nov-Dec.
	Limited entry trawl in the south: midwater closed year round except for a small bycatch in the whiting fishery; small footrope trawl 1,000 lbs/month through July, then closed.
1/1/03	Limited entry trawl RCA in the north: 75-200 fm during Jan-Aug, 50-200 fm during Sep-Oct, and shoreline to 200 fm (petrale areas open) during Nov-Dec.
	Limited entry trawl RCA in the south: between 34°27’ N. lat. and 40°10’ N. lat. - 60-

	200 fm during Jan-Oct, and shoreline to 200 fm (petrale areas open) during Nov-Dec; south of 34°27’ N. lat. - 100-200 fm during Jan-Oct, and shoreline to 200 fm (petrale areas open) during Nov-Dec.
	Limited entry and open access fixed gear RCA established as follows (seaward boundaries held static until Jan 2009; shoreward boundaries south of the OR-WA border vary): shoreline to 100 fm north of the OR-WA border (46°16' N. lat.) to the U.S.-Canada border; seaward boundary of 100 fm north of 40°10’ N. lat.; seaward boundary of 150 fm south of 40°10' N. lat.
	Limited entry trawl in the north: midwater trawl closed through November except for small amount of bycatch in whiting fishery, 12,000 lbs/2 months for Nov-Dec; small footrope trawl - 300 lbs/month Jan-Apr and Nov-Dec, 1000 lbs/month May-Oct.
	Limited entry fixed gear in the north: 200 lbs/month.
	Open access in the north: 200 lbs/month.
	Limited entry trawl in the south: same as north for midwater and small footrope trawl.
	Limited entry fixed gear in the south: closed Mar-Apr, then variable 100 lbs/2 months to 250 lbs/2 months.
	Open access in the south: same as limited entry fixed gear.
1/1/04	Limited entry trawl RCA in the north: 75-200 fm during Jan-Feb (petrale areas open), 60-200 fm during Mar-Apr, 60-150 fm during May-Jun, 75-150 fm during Jul-Sep, and shoreline to 250 fm during Oct-Dec.
	Limited entry trawl RCA in the south: 75-150 fm during Jan-Apr and Sep, and 100-150 fm May-Aug; between 38° N. lat. and 40°10’ N. lat. - shoreline to 250 fm during Oct-Dec; between 36° N. lat. and 38° N. lat. - shoreline to 200 fm during Oct-Dec; south of 36° N. lat. - shoreline to 150 fm during Oct-Dec.
	Limited entry trawl in the north: midwater trawl closed through November except for small amount of bycatch in whiting fishery (500 lbs/month during primary whiting season; combined widow and yellowtail trip limit of 500 lbs/trip with trips of at least 10,000 lbs of whiting), 12,000 lbs/2 months for Nov-Dec; small footrope trawl - 300 lbs/month Jan-Apr and Nov-Dec, 1000 lbs/month May-Oct.
	Limited entry fixed gear in the north: 200 lbs/month.
	Open access in the north: 200 lbs/month.
	Limited entry trawl in the south: closed.
	Limited entry fixed gear in the south: between 40°10’ and 34°27’ N lat. - 300 lbs/2 months Jan-Feb and Sep-Dec, closed Mar-Apr, 200 lbs/2 months May-Aug; south of 34°27’ N lat.: closed Jan-Feb, 2,000 lbs/2 months Mar-Dec.
	Open access in the south: between 40°10’ and 34°27’ N lat. - same as limited entry fixed gear; south of 34°27’ N lat. - closed Jan-Feb, 500 lbs/2 months Mar-Dec.
1/1/05 (regs. for 2005 and 2006)	Limited entry trawl RCA in the north: 75-200 fm during Jan-Feb and Nov-Dec (petrale areas open), and 100-200 fm during Mar-Oct.
	Selective flatfish trawls required shoreward of the RCA in the north (new permanent reg. implemented from 2005 to present).
	Limited entry trawl in the north: large and small footrope trawl- 300 lbs/2 months; midwater trawl- closed except for small amount of bycatch in whiting fishery (500

	lbs/month during primary whiting season; combined widow and yellowtail trip limit of 500 lbs/trip with trips of at least 10,000 lbs of whiting); selective flatfish trawl - 300 lbs/month Jan-Apr and Nov-Dec, 1,000 lbs/month May-Oct.
	Limited entry fixed gear in the north: 200 lbs/month.
	Open access in the north: 200 lbs/month.
	Limited entry trawl in the south: large footrope and midwater trawl- closed; small footrope trawl- 300 lbs/month.
	Limited entry fixed gear in the south: between 40°10' and 34°27' N lat. - 300 lbs/2 months Jan-Feb and Sep-Dec, closed Mar-Apr, 200 lbs/2 months May-Aug; south of 34°27' N lat.: 2,000 lbs/2 months Jan-Feb and May-Dec, closed Mar-Apr.
	Open access in the south: between 40°10' and 34°27' N lat. - same as limited entry fixed gear; south of 34°27' N lat. - 500 lbs/2 months Jan-Feb and May-Dec, closed Mar-Apr.
7/1/05	Limited entry fixed gear south of 34°27' N lat.: 3,000 lbs of shelf rockfish, shortbelly rockfish, and widow rockfish/2 months Jul-Dec.
	Open access south of 34°27' N lat.: 750 lbs of shelf rockfish, shortbelly rockfish, and widow rockfish /2 months Jul-Dec.
10/1/05	Limited entry trawl RCA north of 38° N lat. extended from shoreline to 250 fm; 36° N lat. to 38° N lat.: limited entry trawl RCA extended from shoreline to 200 fm; south of 36° N lat.: limited entry trawl RCA extended from 50 fm to 200 fm.
1/1/06	Limited entry fixed gear south of 34°27' N lat.: 3,000 lbs of shelf rockfish, shortbelly rockfish, and widow rockfish /2 months Jan-Feb.
	Open access south of 34°27' N lat.: 750 lbs of shelf rockfish, shortbelly rockfish, and widow rockfish /2 months Jan-Feb.
3/1/06	Limited entry fixed gear south of 34°27' N lat.: 3,000 lbs of shelf rockfish, shortbelly rockfish, and widow rockfish /2 months Mar.-Dec.
	Open access south of 34°27' N lat.: 750 lbs of shelf rockfish, shortbelly rockfish, and widow rockfish /2 months Mar.-Dec.
10/1/06	Widow bycatch cap in the non-tribal limited entry whiting trawl fishery increased from 200 mt to 220 mt.
1/1/07 (regs. for 2007 and 2008)	Widow bycatch cap of 200 mt adopted for the limited entry whiting trawl fishery.
	Limited entry trawl RCA: 75-250 fm in Jan-Apr and Nov-Dec; 75-200 fm in May-Jun and Sep-Oct; 100-200 fm in Jul-Aug.
	Limited entry trawl in the north: large and small footrope trawl- 300 lbs/2 months; midwater trawl- closed except for small amount of bycatch in whiting fishery (500 lbs/month during primary whiting season; combined widow and yellowtail trip limit of 500 lbs/trip with trips of at least 10,000 lbs of whiting; cumulative widow limit of 1,500 lbs/month); selective flatfish trawl - 300 lbs/month Jan-Apr and Nov-Dec, 1,000 lbs/month May-Oct.
	Limited entry fixed gear in the north: 200 lbs/month.
	Open access in the north: 200 lbs/month.
	Limited entry trawl in the south: large footrope and midwater trawl- closed; small footrope trawl- 300 lbs/month.
	Limited entry fixed gear in the south: between 40°10' and 34°27' N lat. - 300 lbs/2

	months Jan-Feb and Sep-Dec, closed Mar-Apr, 200 lbs/2 months May-Aug; south of 34°27’ N lat.: 3,000 lbs/2 months Jan-Feb and May-Dec, closed Mar-Apr.
	Open access in the south: between 40°10’ and 34°27’ N lat. - same as limited entry fixed gear; south of 34°27’ N lat. - 750 lbs/2 months Jan-Feb and May-Dec, closed Mar-Apr.
5/1/07	Widow bycatch cap in the limited entry whiting trawl fishery increased from 200 mt to 220 mt.
	Limited entry trawl in the north: RCA extended to the shore from Cape Alava (48°10’ N lat.) to U.S.-Canada border and from Cape Arago (43°20.83' N. lat.) to Humbug Mountain (42°40.50' N. lat.); the shoreward boundary of the trawl RCA is shifted shoreward to 60 fm from April 17 through October 31, 2007 between Leadbetter Point (46°38.17' N. lat.) and the Oregon/Washington border (46°16’ N. lat.); shoreward boundary of the trawl RCA shifted shoreward to 75 fm in all other areas through Dec.; the seaward boundary of the trawl RCA is shifted shoreward to 150 fm from the U.S.-Canada Border to Cascade Head (45°03.83’ N. lat.) from April 17 through August 31, 2007; the seaward boundary of the trawl RCA is shifted shoreward to 200 fm between Cascade Head (45°03.83’ N. lat.) and 40°10 N. lat. from April 17 through April 30, 2007.
7/26/07	Limited entry whiting trawl fishery closed due to attainment of 220 mt widow bycatch cap.
9/1/07	Limited entry fixed gear in the south between 40°10' N. lat. and 34°27' N. lat.: combined the trip limit for bocaccio and the trip limit for minor shelf rockfish, shortbelly rockfish, and widow rockfish into a single cumulative trip limit of 500 lb/2 months from Sep-Dec.
10/1/07	Limited entry trawl RCA north of Cape Alava (48°10’ N lat.) to U.S.-Canada border and from Cape Arago (43°20.83' N. lat.) to Humbug Mountain (42°40.50' N. lat.): shoreward boundary moved to the 75 fm line.
10/7/07	Limited entry whiting trawl fishery re-opened after widow bycatch cap is increased to 275 mt; shoreside whiting sector required to fish seaward of the 150 fm line; at-sea sectors voluntarily fish seaward of the 150 fm line.
1/1/08	Limited entry trawl RCA in the north: the seaward boundary north of 40□10’ N. lat. to the U.S.-Canada border is shifted to the modified petrale 200 fm line in Jan-Feb and Nov-Dec; the seaward boundary from the OR-WA border (46□16' N. lat.) to the U.S.-Canada border is shifted to 150 fm from May-Oct; all other areas and times will have a seaward boundary of 200 fm; the shoreward boundary is shifted to the shoreline from north of Cape Alava (48°10’ N lat.) to the U.S.-Canada border and from Cape Arago (43°20.83' N. lat.) to Humbug Mountain (42°40.50' N. lat.) for the entire year; the shoreward boundary from the OR-WA border (46□16' N. lat.) to Cape Alava shifted to 60 fm in Mar-Oct; all other times and areas will have a shoreward boundary of 75 fm for the year.
	Limited entry trawl RCA in the south: 100-150 fm for the year.
	Limited entry fixed gear in the south between 40°10' N. lat. and 34°27' N. lat.: modify the chilipepper rockfish limit of 2,000 lb/2 months by recombining it into a single combined cumulative limit with minor shelf rockfish, shortbelly, widow rockfish and bocaccio, and increase the trip limit from 500 lb/2 months to 2,500 lb/2 months of which no more than 500 lb/2 months may be any species other than chilipepper rockfish.
3/08	Widow bycatch cap of 275 mt adopted for the limited entry whiting trawl fishery.

5/1/08	Limited entry trawl RCA in the north: the seaward boundary is shifted to the 200 fm line from the OR-WA border (46°16' N. lat.) to Leadbetter Pt. (46°38.17' N. lat.) from May-Jun; the seaward boundary is shifted to the 150 fm line from Cape Falcon (45°46' N. lat.) to the OR-WA border from May-Aug; the shoreward boundary is shifted to the 60 fm line from north of Cape Alava (48°10' N lat.) to the U.S.-Canada border and from Cape Arago (43°20.83' N. lat.) to Humbug Mountain (42°40.50' N. lat.) from May-Oct; no other changes to the trawl RCA for all other times and areas.
	Darkblotched rockfish bycatch cap in the limited entry whiting trawl fishery increased to 40 mt to decrease impacts on widow rockfish.
8/19/08	Limited entry whiting trawl fishery closed due to attainment of 4.7 mt canary bycatch cap.
10/10/08	Limited entry trawl RCA in the north: the shoreward boundary of the is shifted from 60 fm to 75 fm, with the exception of the areas north of Cape Alava (48°10'N. lat.) and between Cape Arago (43°20.83' N. lat.) and Humbug Mountain (42°40.50'N. lat.).
10/12/08	Limited entry whiting trawl fishery reopened after the canary bycatch cap is increased from 4.7 mt to 6.4 mt and the widow bycatch cap is increased from 275 mt to 284 mt.
10/26/08	Canary bycatch cap in the limited entry whiting trawl fishery is increased from 6.4 mt to 6.7 mt.
11/1/08	Open access south of 34°27' N. lat.: shelf rockfish trip limit increased from 750 lb/2 months to 1,000 lb/2 months in period 6 (Nov-Dec).
1/1/09 (regs. for 2009 and 2010)	Sector-specific bycatch caps adopted for the limited entry whiting trawl fishery for canary, darkblotched, and widow rockfish distributed on a pro rata basis in relation to the sectors' whiting allocation. Additionally, NMFS has the authority to restrict fishing depths by sector of the limited entry whiting trawl fishery if a bycatch cap is attained inseason.
	Limited entry trawl RCA: north of Cape Alava (48°10'N. lat.) - shoreline to 200 fm during Jan-Mar (petrale areas open) and Sep-Dec (petrale areas open Nov-Dec), and shoreline to 150 fm during Apr-Aug; north of Cape Falcon (45°46' N. lat.) to Cape Alava - 75-200 fm during Jan-Apr (petrale areas open Jan-Mar) and Sep-Dec (petrale areas open Nov-Dec), and 75-150 fm during May-Aug; north of 40°10' N. lat. to Cape Falcon - 75-200 fm year-round (petrale areas open during Jan-Mar and Nov-Dec); south of 40°10' N. lat. - 100-150 fm year-round.
	Limited entry and open access fixed gear RCA: seaward boundary shifted from 100 fm to 125 fm between Cascade Head (45°03.83' N. lat.) and Cape Blanco (43° N. lat.), except on days when the directed fishery for Pacific halibut is open; otherwise, seaward boundary of 100 fm north of 40°10' N. lat. and 150 fm south of 40°10' N. lat.
	Limited entry trawl in the north (combined limits of widow, yelloweye, shortbelly, and minor shelf rockfish): large and small footrope trawl- 300 lbs/2 months; midwater trawl- closed except for small amount of bycatch in whiting fishery (500 lbs/month during primary whiting season; combined widow and yellowtail trip limit of 500 lbs/trip with trips of at least 10,000 lbs of whiting; cumulative widow limit of 1,500 lbs/month); selective flatfish trawl - 300 lbs/month Jan-Apr and Nov-Dec, 1,000 lbs/month of which no more than 200 lbs/month can be yelloweye during May-Oct.; multiple bottom trawl gear - 300 lbs/ month Jan-Apr and Nov-Dec, 300 lbs/2 months of which no more than

	200/lbs/month can be yelloweye during May-Oct.
	Limited entry trawl in the south: large footrope and midwater trawl - closed; small footrope trawl for minor shelf rockfish, shortbelly, widow, and yelloweye - 300 lbs/ month year-round.
	Limited entry and open access fixed gear in the north: 200 lbs/ month (combined limit for minor shelf rockfish, shortbelly, widow, and yellowtail) year-round.
	Limited entry fixed gear in the south: between 34□27’ N. lat. and 40□10’ N. lat. - 2,500 lbs/2 months (combined limit for minor shelf rockfish, shortbelly, widow, bocaccio, and chilipepper) of which no more than 500 lb/2 months may be any species but chilipepper; south of 34□27' N. lat. (combined limit for minor shelf rockfish, shortbelly, widow, and bocaccio) - 3,000 lbs/2 months during Jan-Feb and May-Dec, and closed during Mar-Apr.
	Open access in the south (combined limit for minor shelf rockfish, shortbelly, widow, and chilipepper):: between 34□27’ N. lat. and 40□10’ N. lat. - 300 lbs/2 months during Jan-Feb and Sep-Dec, closed during Mar-Apr, and 200 lbs/2 months during May-Aug; south of 34□27’ N. lat. - 750 lbs/2 months during Jan-Feb and May-Dec, and closed during Mar-Apr.
3/09	Widow bycatch caps for sectors of the limited entry whiting trawl fishery are adopted as follows: 105 mt to shoreside whiting, 85 mt to catcher-processors, and 60 mt to motherships.

13 Appendix B. Comparisons of widow rockfish stock assessment using direct ADMB code and SS2 interface software

Xi He and Richard Methot

November 2007

<u>**Important notice: Results shown in this report are solely for comparisons of widow rockfish assessments using ADMB software and Stock Synthesis (SS2) software. These results should NOT be used for management references or any other purposes.**</u>

Brief summary
This appendix compares the results of stock assessments for the widow rockfish population using two stock assessment programs. One uses programs written in ADMB code and another uses SS2 interface software. Both programs use the same data set. The results, including time series of spawning outputs and recruits as well as estimated key parameters, are very similar between two programs.

Introduction

The stock assessments for widow rockfish have been conducted using the ADMB software since 2000 (Williams et al. 2000, He et al. 2003, 2006, 2007). It is planned that for the next assessment for widow rockfish in 2009, the assessment will employ the stock synthesis program (SS2, developed by R. Methot, Methot 2007). This report compares the assessment results between these two programs. The same data set is used in both programs. A complete set of program codes and data used for both program are not printed on this report because they are too long (over 50 pages) to print but they are available upon request.

Models and methods

The ADMB program for the 2007 widow assessment was used in this exercise. To make it more comparable with SS2 software, one minor change was made in the ADMB program (wdw.tpl). In SS2, there is one parameter of fishing mortality each year for each fishery. In ADMB, there is an average fishing mortality for each fishery and then there is a deviation vector of fishing mortality for each fishery. The ADMB code was changed to have the same setup as in SS2. This change resulted in same numbers of estimated parameters in both programs, and had no effects on the ADMB outputs. The SS2 program version is 2.00j (dated August 25, 2007).

The same data set was in used in both programs. However, the data set was modified from the data set used in the 2007 widow assessment. The main reasons for this modification were that it simplified the SS2 program and it made possible for direct comparisons between two programs. The modifications of the data are listed below:

1. Change the widow assessment from two-area model to one-area model. That is, all widow are assumed to be in the northern area (Washington and Oregon). This is an easy change in the ADMB data by simply changing proportions of northern catches to 1.0.

Test runs showed that this change had very little effect (<2% of change in depletion rate) in the ADMB results.

2. Set both sexes to have the same length-weight relationship and the same growth function. This change makes conversions of growth in length and weigh by age much easier in the SS2 program because the SS2 program uses different methods in computing weight by age as in the ADMB program. The SS2 requires inputs of length bins, growth parameters, and length-weight relations to compute weight for each age, while the ADMB program directly computes weight for each age from given growth functions and length-weight relationships. Test run showed that this modification had very little effect (<1% of change in depletion rate) in the results.
3. No implicit priors were used in both programs. In the SS2 program, the lambda value for prior was set to zero. In the ADMB program, a prior function for the steepness parameter was removed. This modification had no effect on the results since the estimated steepness values in both program were much higher than those specified in the prior function used in the 2007 widow assessment.
4. Changes in ageing error inputs. In the ADMB, an ageing error matrix was used. In the SS2 program, a standard deviation is defined for each age group. To make it more comparable, it was assumed that there be no ageing error in the input data. The change in fact had the largest effects on the results. The depletion rate estimated by the ADMB program increased by about 5% as compared to the 2007 widow assessment. The main reason is that the assessment program estimates much stronger recruits in 2000 than those in the 2007 widow assessment.

All other estimation procedures for both programs were same, including uses of effective sample sizes for age samples and root mean square errors (RMSE) for each CPUE time series.

Results and discussions

Comparisons of main assessment results between two programs are presented in Table A1 and Figures A1 and A2. Plots of length at age and weight at age for both programs are presented in Figures A3 and A4.

Overall, the results are very similar between two programs. Time series of spawning outputs and recruits match each other very well. Both programs estimate a strong recruitment in 2000, which resulted in increasing trend of spawning outputs in recent years. The overall patterns of spawning output and recruitment are also very similar to those in the 2007 widow assessment (He et al. 2007). However, the depletion rates estimated by both programs are higher than that estimated in the 2007 widow assessment. As stated previously, this is mainly due to the assumption that there be no ageing errors in the current programs.

References

He, X., S.V. Ralston, A.D. MacCall, D.E. Pearson, and E.J. Dick. 2003. Status of the widow rockfish resource in 2003. Status of the Pacific coast groundfish fishery through 2003, stock assessment and fishery evaluation, Volume I. Pacific Fisheries Management Council, August 2003.

He, X., D.E. Person, E.J. Dick, J.C. Field, S.V. Ralston, and A.D. MacCall. 2006. Status of the widow rockfish resource in 2005. Status of the Pacific coast groundfish fishery through 2003, stock assessment and fishery evaluation, Volume III. Pacific Fisheries Management Council, April 2006.

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He, X., M. Mangel, and A.D. MacCall. 2006c. A prior for steepness in stock-recruitment relationships, based on an evolutionary persistence principle. Fishery Bulletin 104(3):428-433.

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Methot, R. 2007. User manual for the integrated analysis program stock synthesis (SS2). Model Version 2.00c. NOAA Fisheries Service, Seattle, WA.

Williams, E.H., A.D. MacCall, S. Ralston, and D.E. Pearson. 2000. Status of the widow rockfish resource in Y2K. *In*: Appendix to the status of the Pacific coast groundfish fishery through 2000 and recommended acceptable biological catches for 2001, stock assessment and fishery evaluation. Pacific Fishery Management Council, Portland, OR.

Table A1. Comparisons of key parameters between ADMB and SS2 models.

Parameter and estimate	ADMB	SS2
Number of parameters	203	203
Steepness (*h*)	0.6247	0.5743
Log(R_0)	10.2677	10.6497
Spawning output in 1958 (million of eggs)	43411	43674
Spawning output in 2006 (million of eggs)	19029	17626
Depletion (100*(SO in 1958)/*(SO in 2006))	43.84	40.38
Standard deviation of depletion	10.72	---

Figure A1. Time series of spawning outputs from 1958 to 2006 from ADMB and SS2.

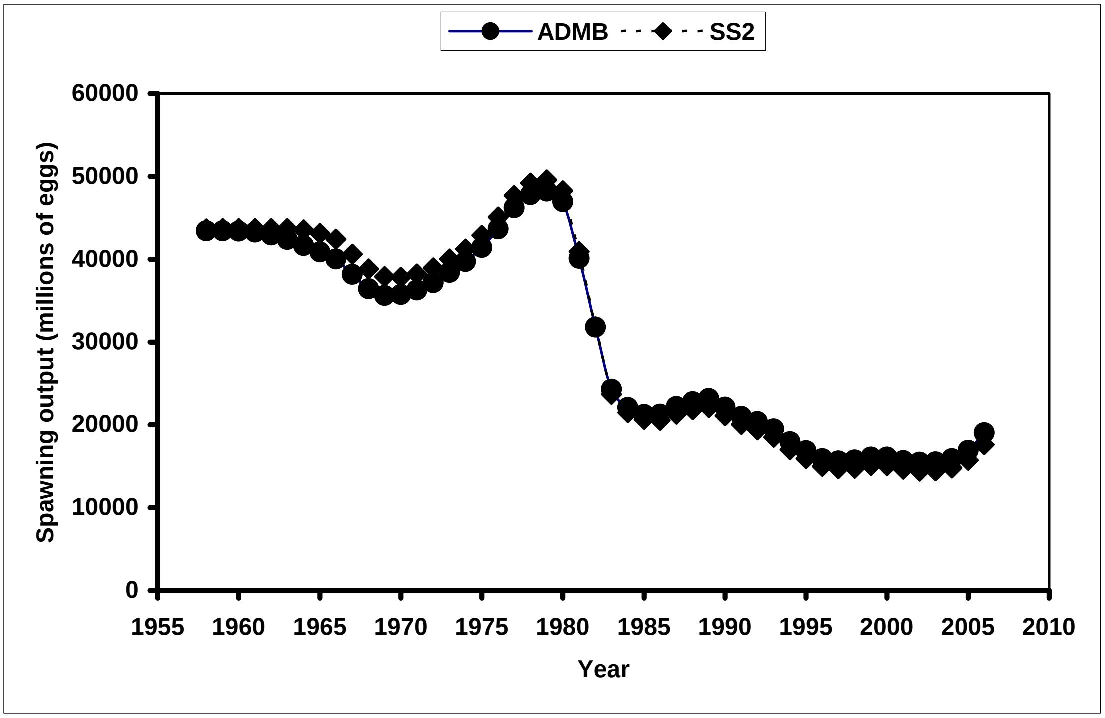


Figure A2. Time series of recruits from 1958 to 2006 from ADMB and SS2.

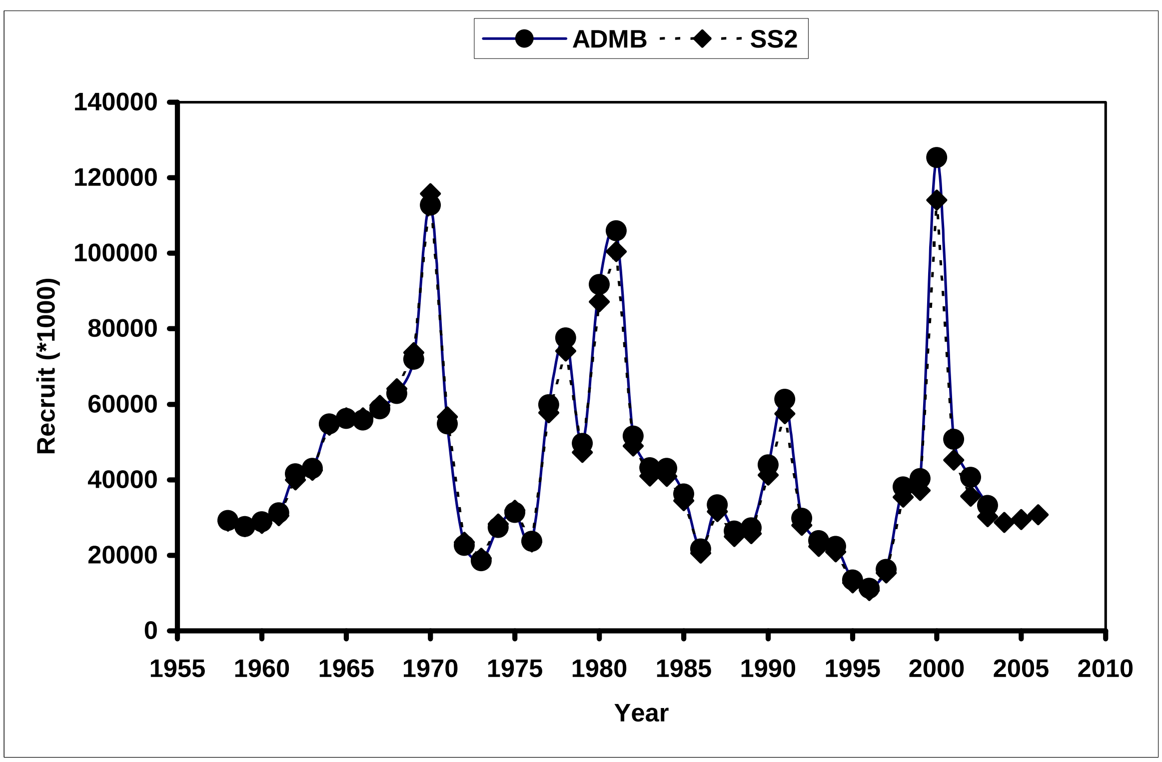


Figure A3. Age-length relationships used in ADMB and SS2.

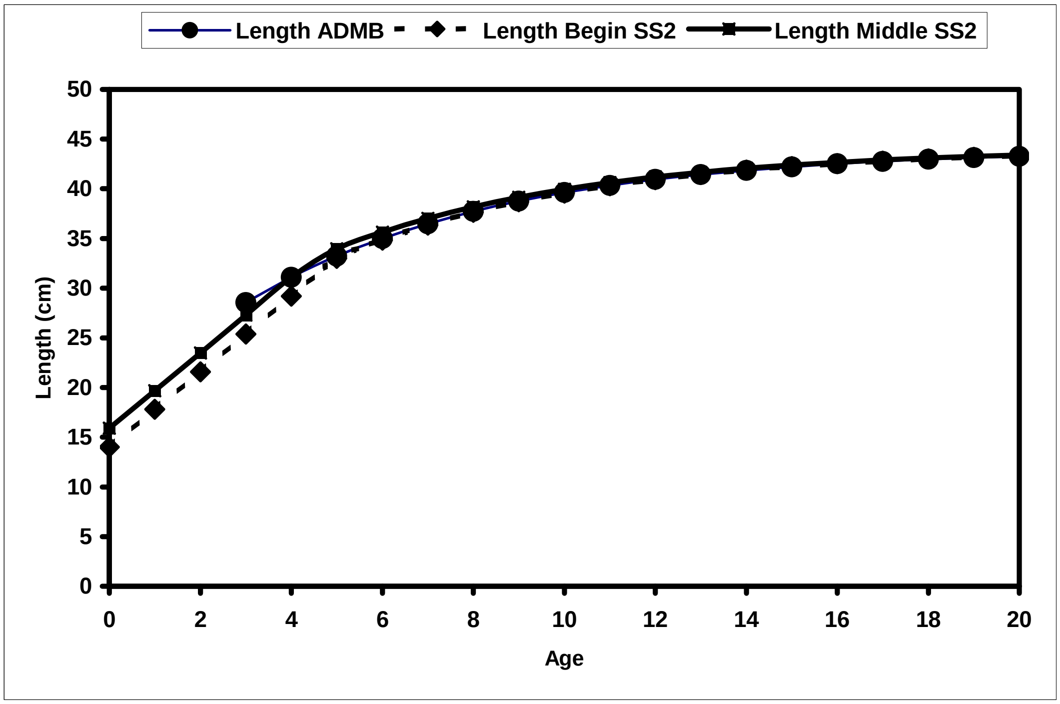
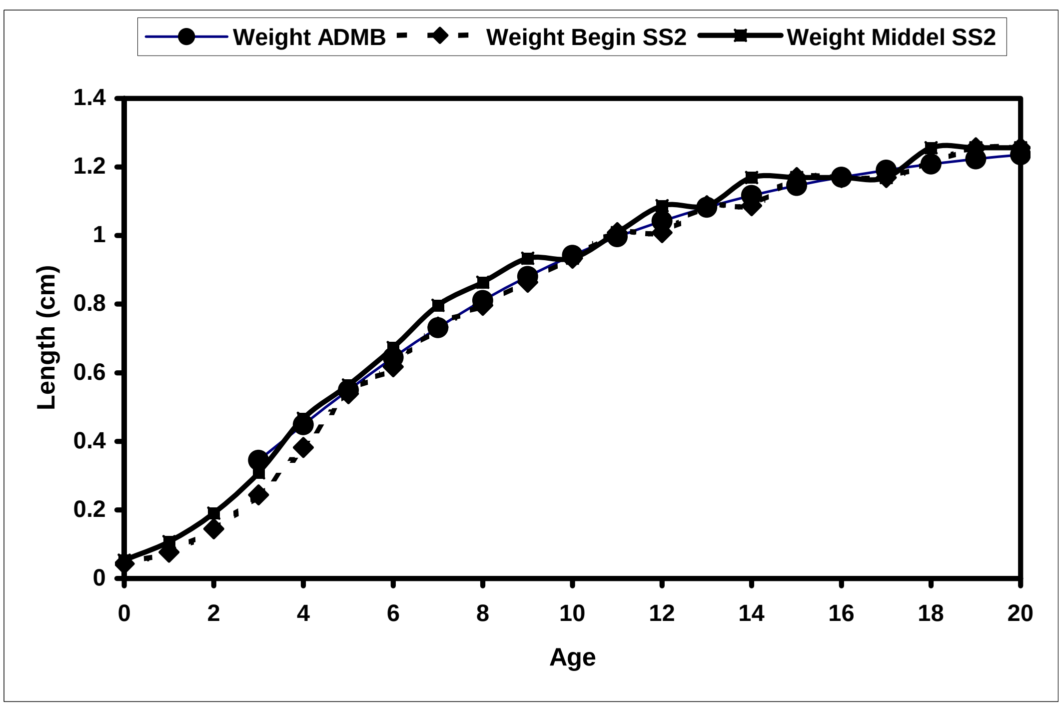


Figure A4. Age-weight relationships used in ADMB and SS2.



14 Appendix C. Multinomial sample sizes

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This Appendix describes the method that was used to correct the multinomial sample sizes for compositional data in the Widow assessment, shows the results of its application to these data, and provides a brief rationale for the use of thes method. The description that follows concerns age data, but the approach is exactly the same for lengths. Also, for simplicity, the following description ignores sex, but the extension to include sex is straightforward.

Suppose $p_{ay,\mathrm{obs}}$ is the observed proportion at age a in year y in a set of age composition data that is assumed to have a multinomial error structure, and let $N_{\mathrm{init},y}$ denote the initial sample sizes. We run our assessment model using these sample sizes and obtain, from the modwl fit, estimates of the expected proportions at age, $p_{ay,\mathrm{exp}}$. Our aim is to use the $p_{ay,\mathrm{obs}}$, $p_{ay,\mathrm{exp}}$, and $N_{\mathrm{init},y}$ to calculate a correction factor f so that the size of the model residuals is consistent with the corrected sample sizes, $N_{\mathrm{corr},y} = fN_{\mathrm{init},y}$.

This aim is the same as for the method currently used in SS3 to correct multinomial sample sizes. Where the two methods differ is that the SS3 method is based on the residuals for individual proportions, $r_{ay} = p_{ay,\mathrm{obs}} - p_{ay,\mathrm{exp}}$, whereas the present method is based on residuals for mean age, $r_y = (m_{y,\mathrm{obs}} - m_{y,\mathrm{exp}})$, where $m_{y,\mathrm{obs}} = \Sigma_a(a\ p_{ay,\mathrm{obs}})$, and $m_{y,\mathrm{exp}} = \Sigma_a(a\ p_{ay,\mathrm{exp}})$. The reason for using mean-age residuals is discussed below.

For the multinomial distribution, the expected variance of the mean age, $m_{y,\mathrm{obs}}$, and thus of the residual r_y, is $v_y/(fN_{\mathrm{init},y})$ [i.e., $v_y/N_{\mathrm{corr},y}$], where v_y is the variance of the age frequency in year y, given by $v_y = \Sigma_a(a^2\ p_{ay,\mathrm{obs}}) - m_{y,\mathrm{obs}}^2$. Therefore, the expected variance of $r_y(N_{\mathrm{init},y}/v_y)^{0.5}$ is $1/f$, and we estimate f as $1/\mathrm{Var}(r_y(N_{\mathrm{init},y}/v_y)^{0.5})$.

Figure 1 shows the application of this method to the Widow age and length composition data. In this application, the sample sizes, $N_{\mathrm{init},y}$, were those obtained after correction (or tuning) using the SS3 method. That is to say, the residuals for individual proportions, r_{ay}, should be consistent with the size expected given these sample sizes. What Figure 1 shows is that the mean-age residuals are still too large (note that many of the confidence intervals for the observed values do not overlap the expected values). Thus, according to the present method, the sample sizes are too large, and so the estimated f is less than 1 for all data sets (range 0.04 to 0.45).

The reason the mean-age residuals, r_y, can be too large, while the individual proportion residuals, r_{ay}, are not, is that there is substantial correlation between the individual residuals. This is shown in Figure 2, in which the observed age frequency flips from one side of the expected frequency to the other from one year to the next. Sideways movement of this magnitude would not be possible if the individual residuals were uncorrelated. This correlation could be caused by either observation or process error (or a combination of both). One explanation of how this could occur derives from the fact that size (and thus age) distribution of fish often varies spatially. We would get between-year sideways movements of age frequencies if the spatial distribution of fishing changed substantially from year to year. In a model like that for Widow, in which selectivities are assumed to be time-invariant, this would movement would add process error to the observations. If the spatial distribution of catch sampling varied from year to year, in a way that did not reflect the movement of fishing activity, this would produce observation error, with a correlation between individual proportions. More information on the generation of correlations in composition data are given by Hrafnkelsson & Stefánsson (2004) and section 3 of Francis (2006).

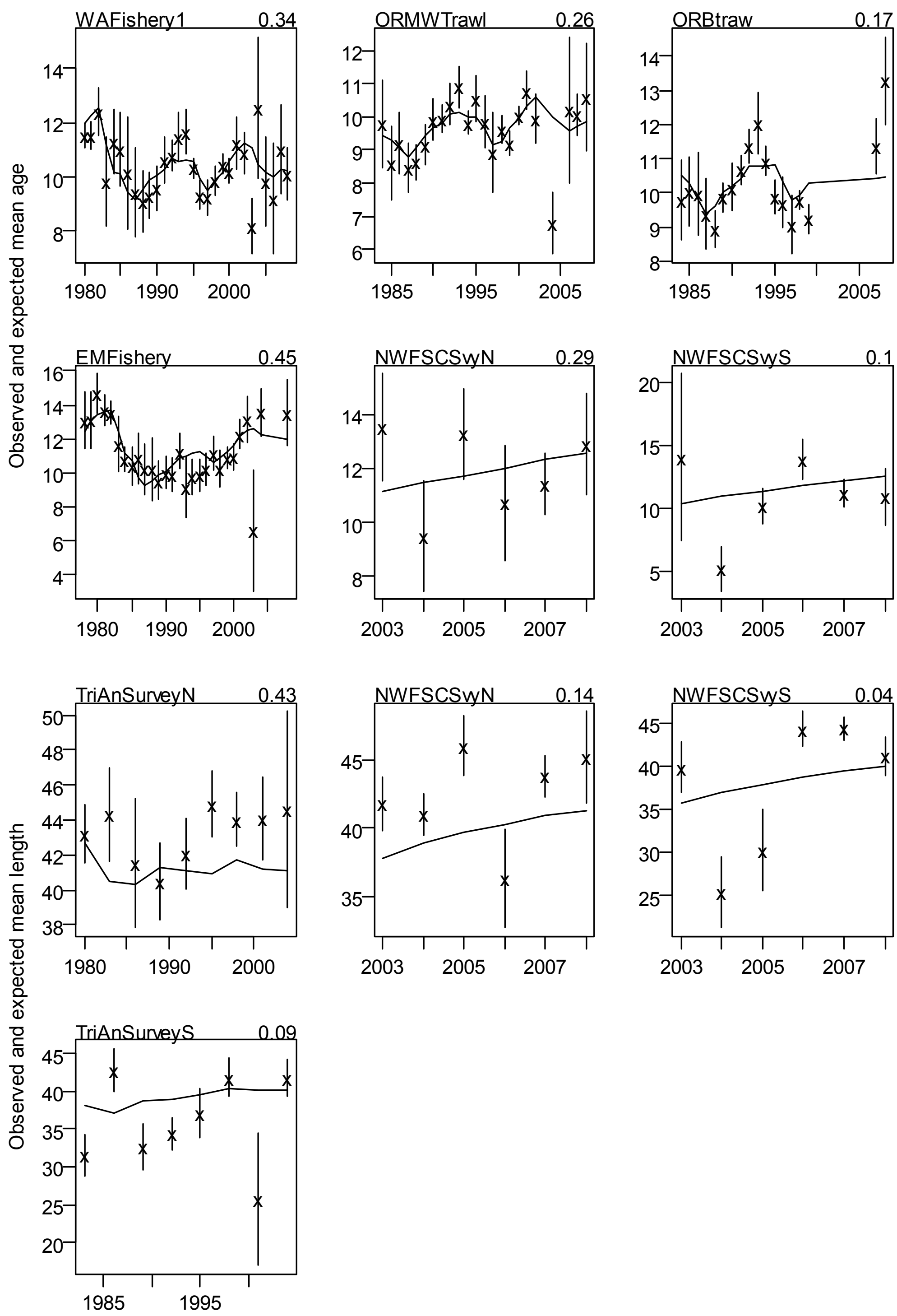


Figure 1: Observed & expected mean ages (upper panels) and lengths (lower panel) for the Widow comps in the (former) base case model. Vertical bars are approximate 95% confidence intervals based on the multinomial sample sizes used in that model. The number printed above each panel is the correction factor *f*, calculated as described above.

Note that there is no intention to suggest that mean age (or length) is a quantity of particular interest in stock assessments. The only reason mean age (or length) is used in calculating the correction factor is that it is sensitive to the sort of correlations shown in Figures 1 and 2. Because of these correlations the composition data are less informative than is suggested by the multinomial sample size correction method used in SS3 (which assumes no correlation). Ideally, we should include these correlations in the likelihood function for composition data. However, that is not straightforward to do. The method proposed here is a simpler pragmatic alternative approach which adjusts sample sizes to compensate for the correlations.

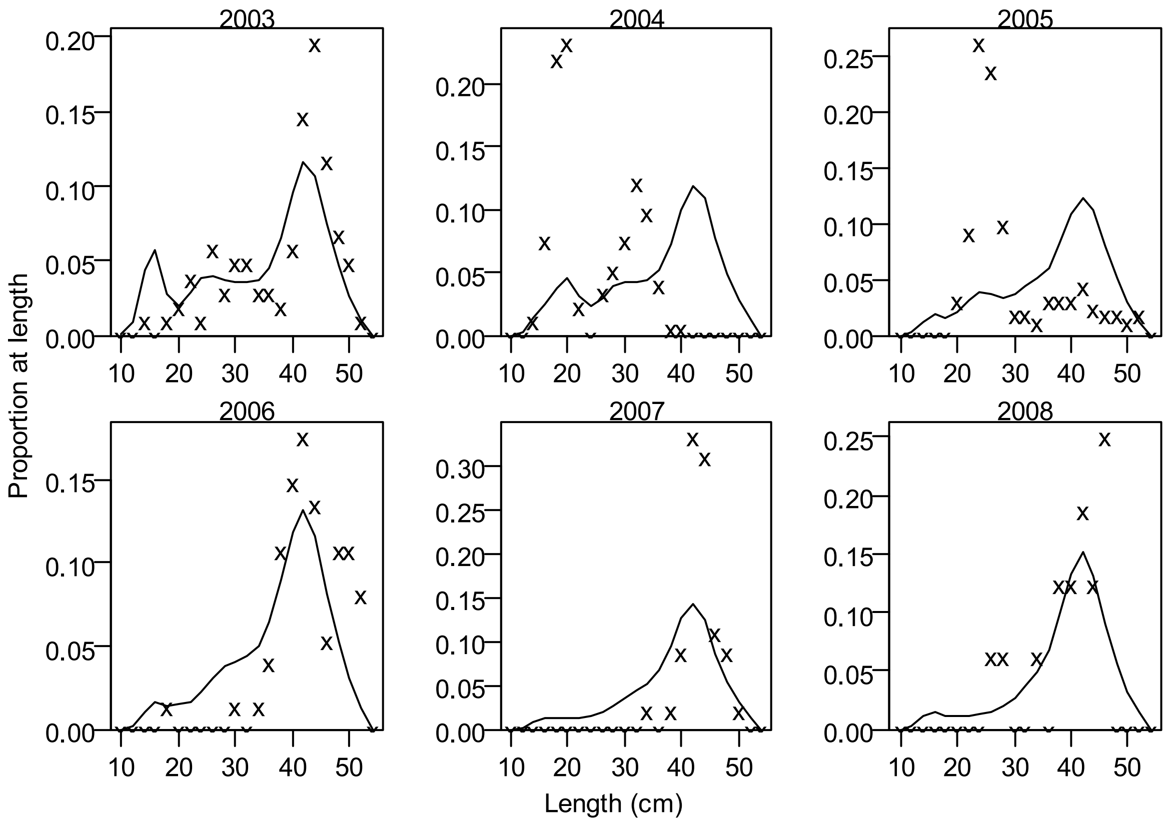


Figure 2: Observed ('x') and expected (line) proportions at length (sexes combined) for data set NWFSCSvyS.

References

Hrafnkelsson, B.; Stefánsson, G. (2004). A model for categorical length data from groundfish surveys. *Canadian Journal of Fisheries & Aquatic Sciences* 61: 1135-1142.

Francis, R.I.C.C. (2006). Some recent problems in New Zealand orange roughy assessments. *New Zealand Fisheries Assessment Report 2006/43.* 64 p.

15 Appendix D. Model fits to age and length composition data.

Figure D1. Model fits to the Washington fishery female age composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

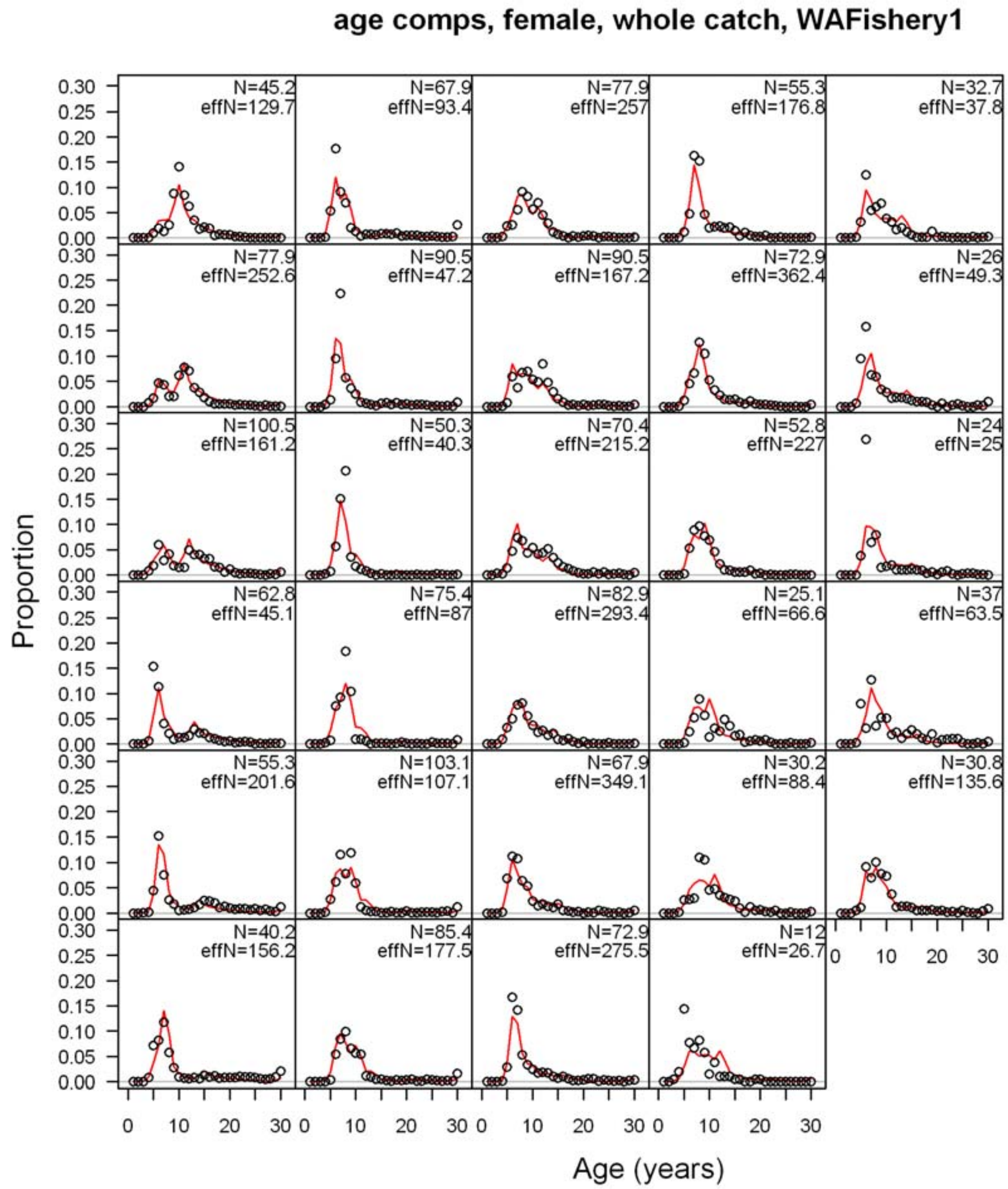


Figure D2. Model fits to the Washington fishery male age composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

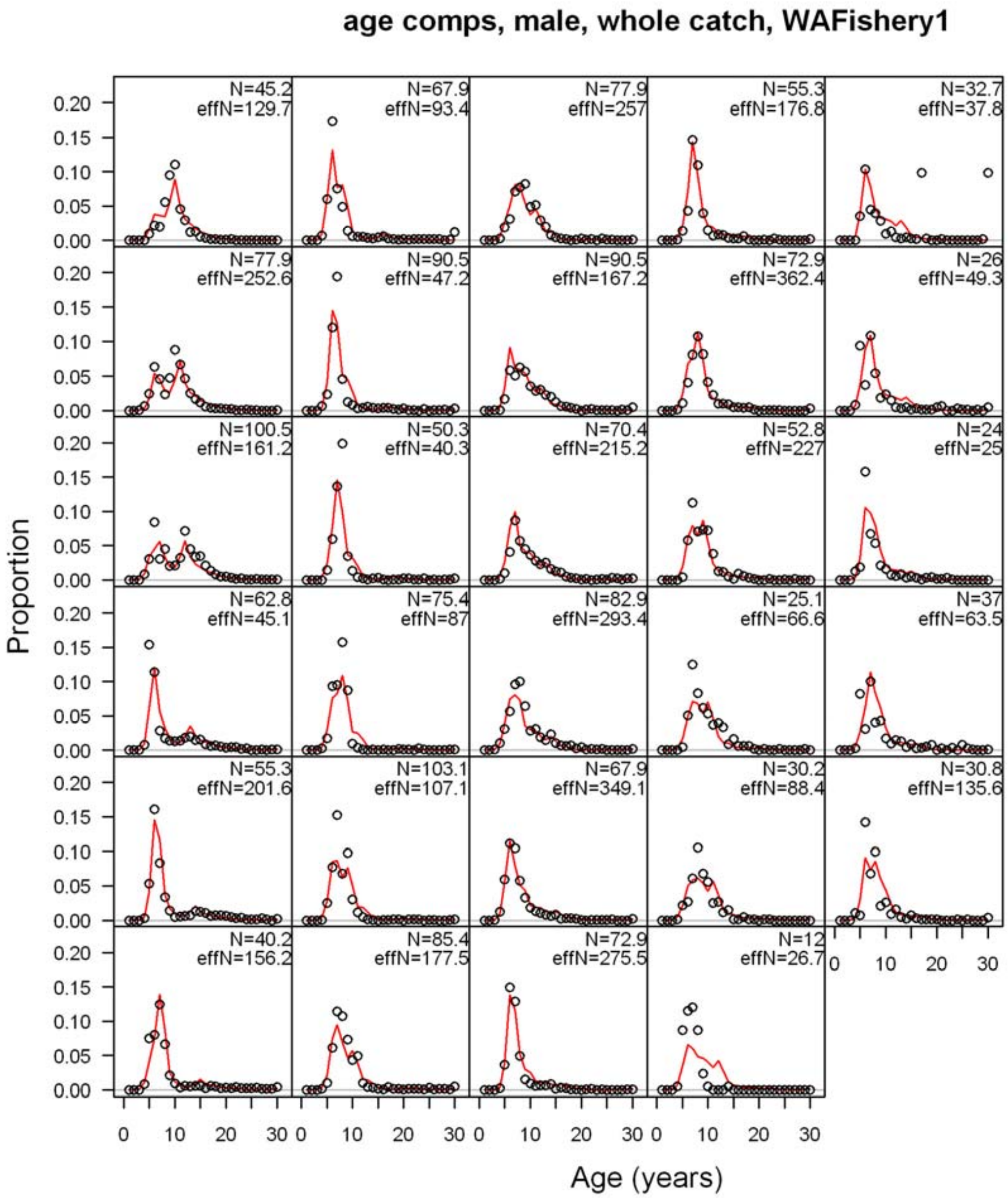


Figure D3. Model fits to the Oregon mid-water trawl fishery female age composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

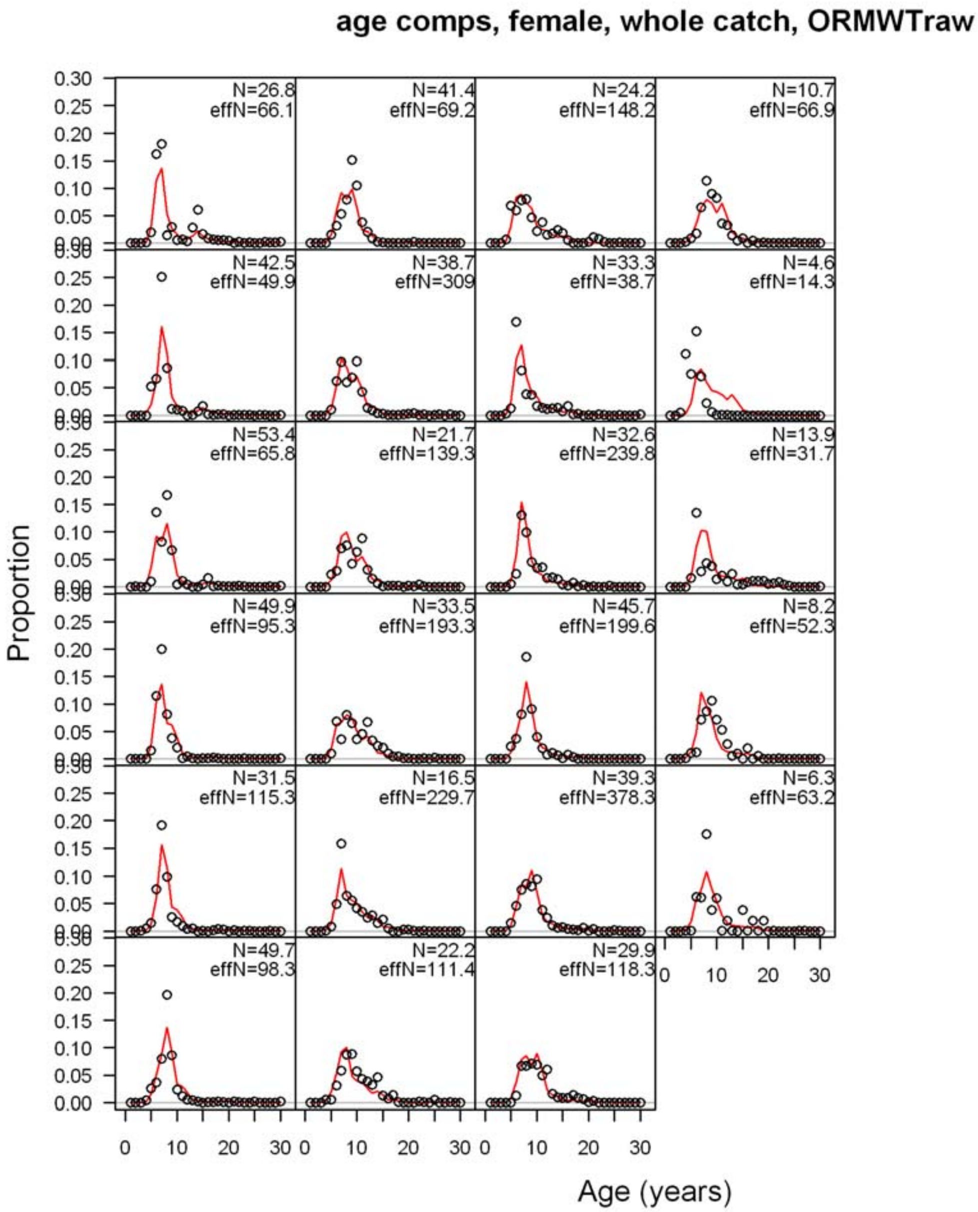


Figure D4. Model fits to the Oregon mid-water trawl fishery male age composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

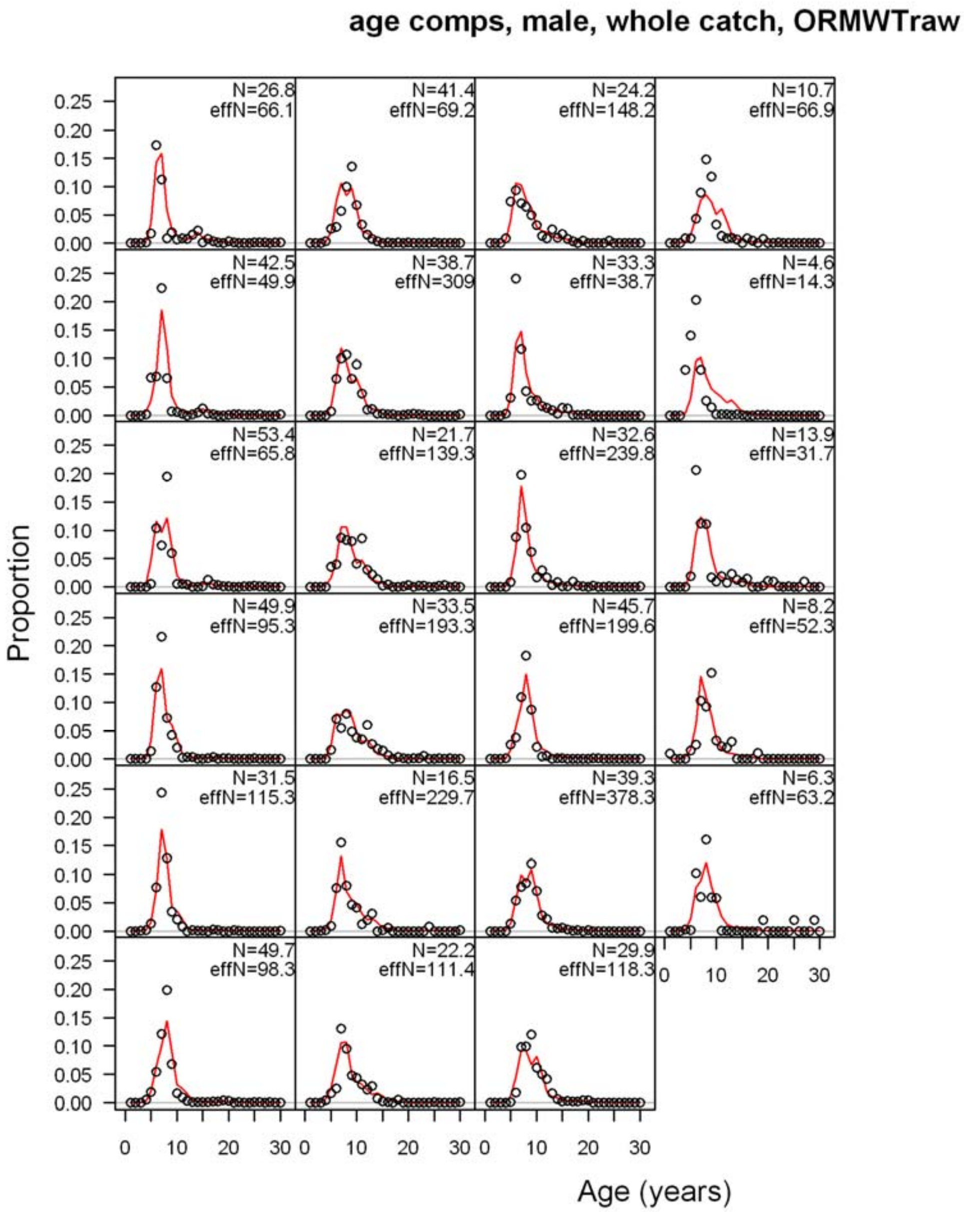


Figure D5. Model fits to the Oregon bottom trawl fishery female age composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

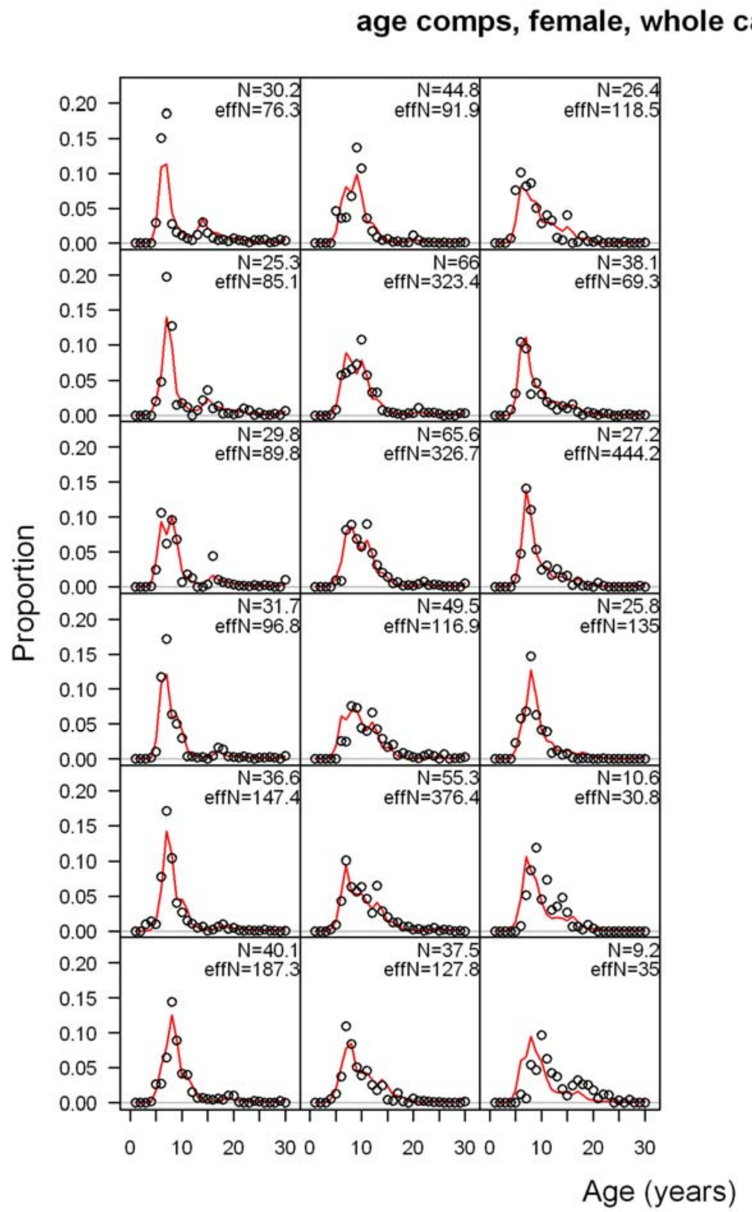


Figure D6. Model fits to the Oregon bottom trawl fishery male age composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

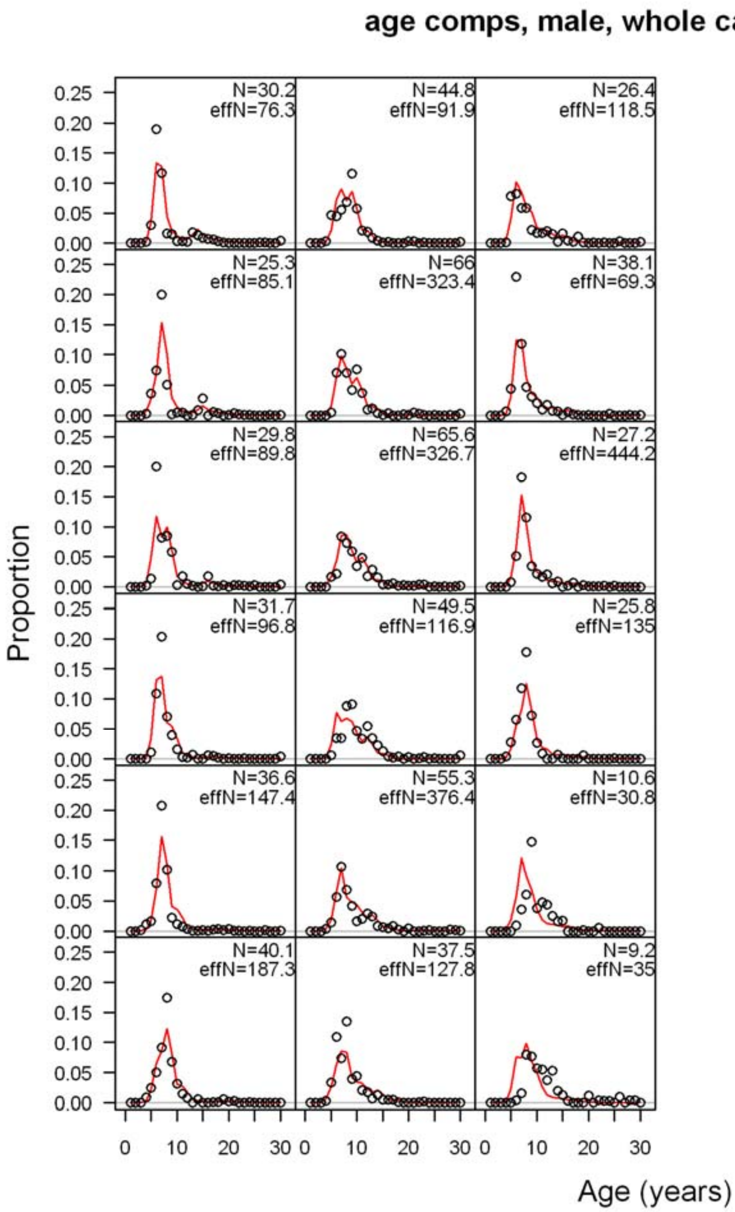


Figure D7. Model fits to the Eureka-Conception fishery female age composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

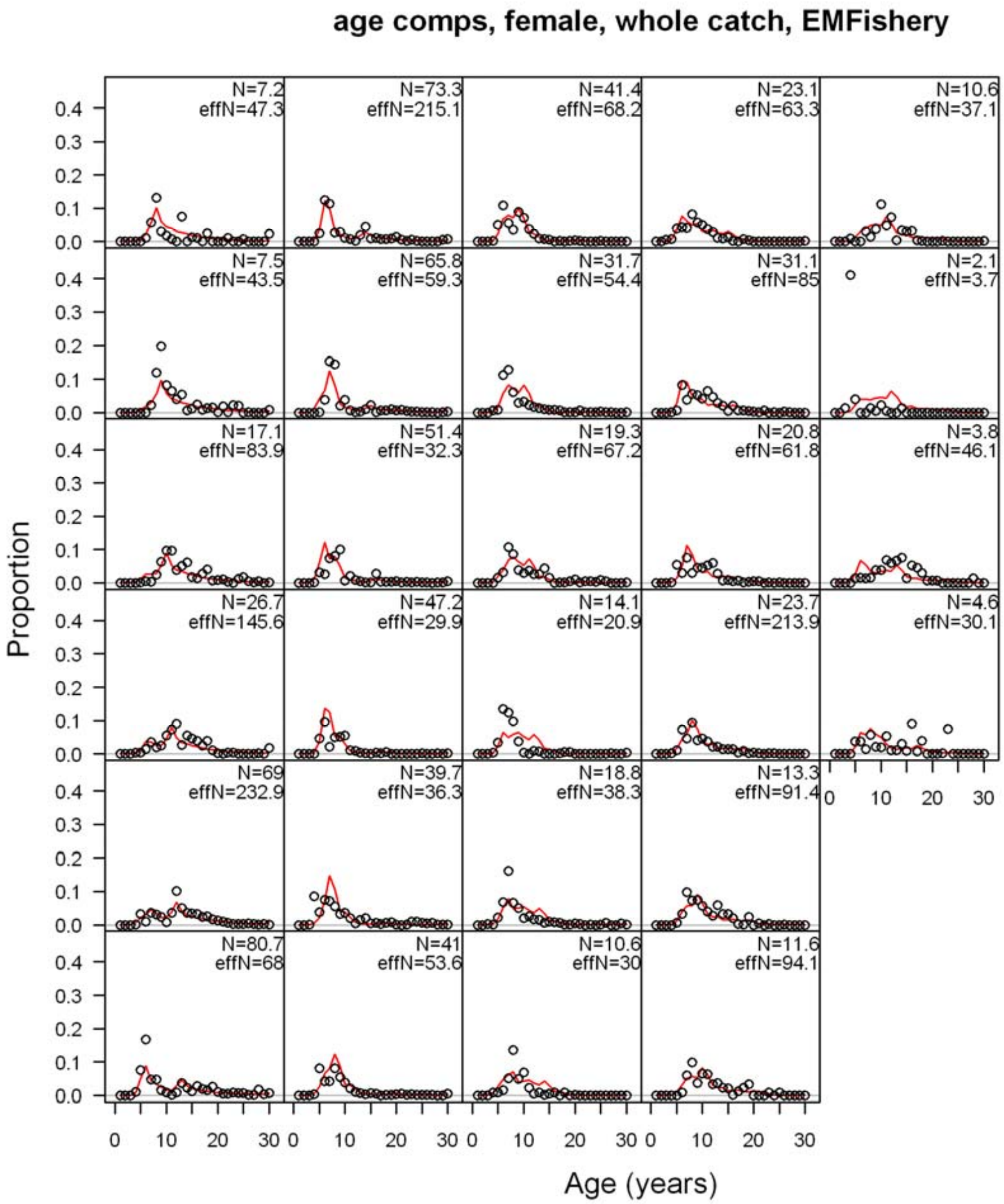


Figure D8. Model fits to the Eureka-Conception fishery male age composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

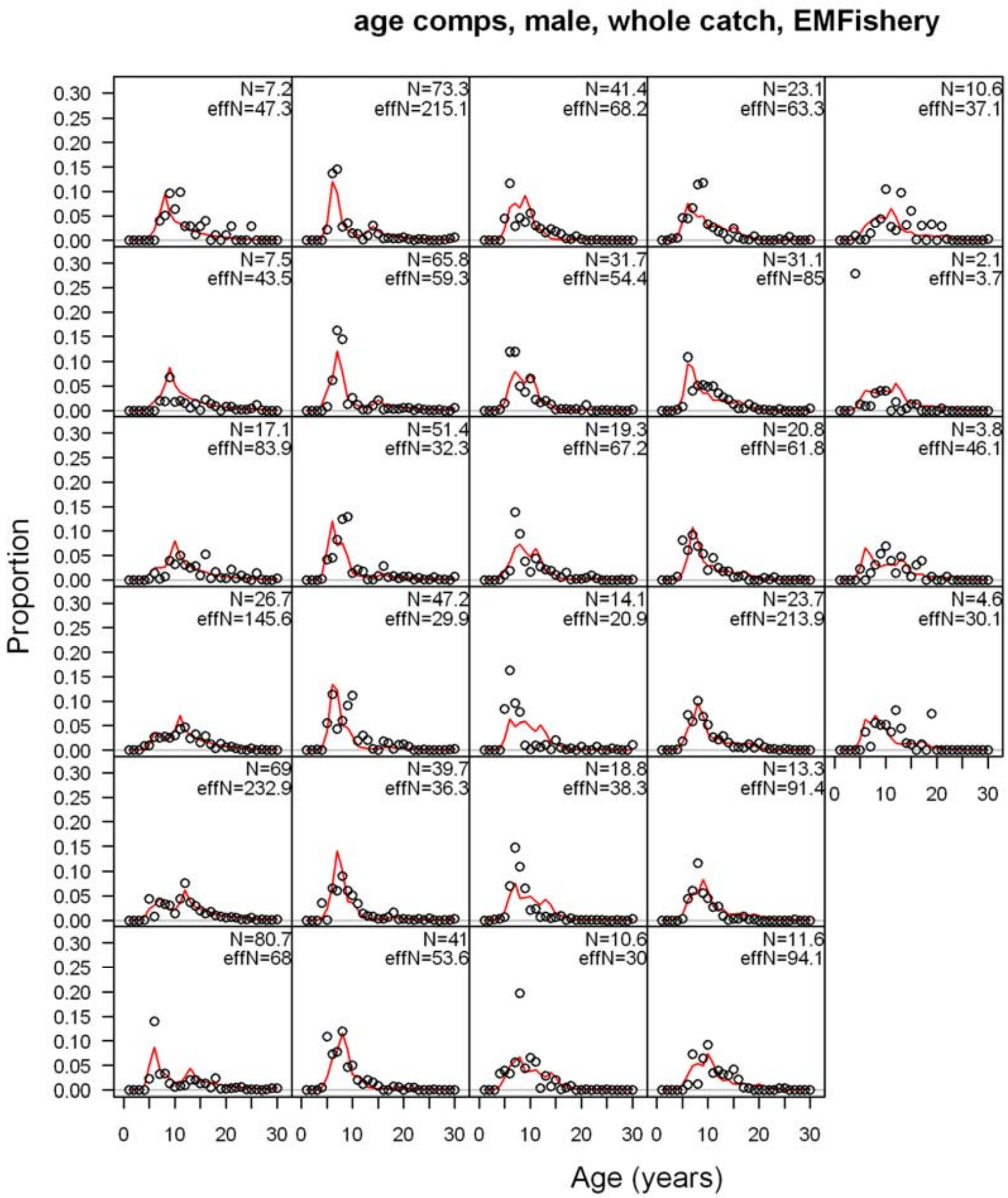


Figure D9. Model fits to the NWFSC northern area survey female age composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

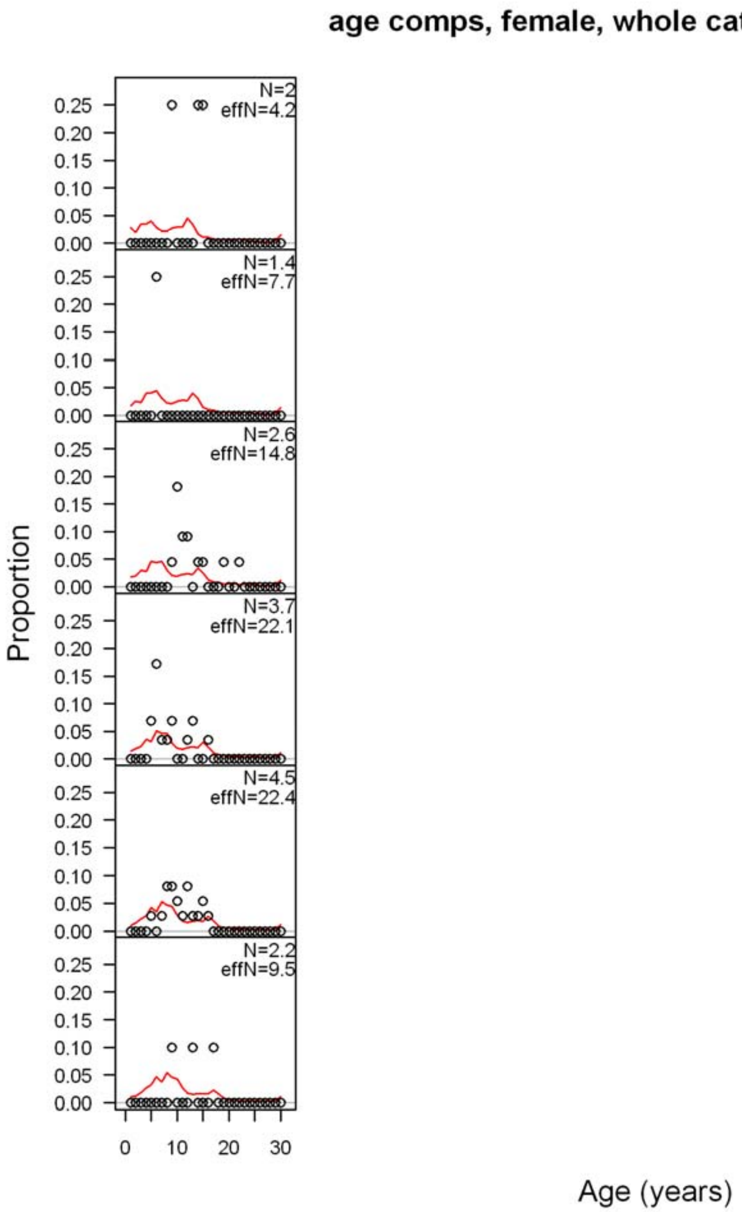


Figure D10. Model fits to the NWFSC northern area male age composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

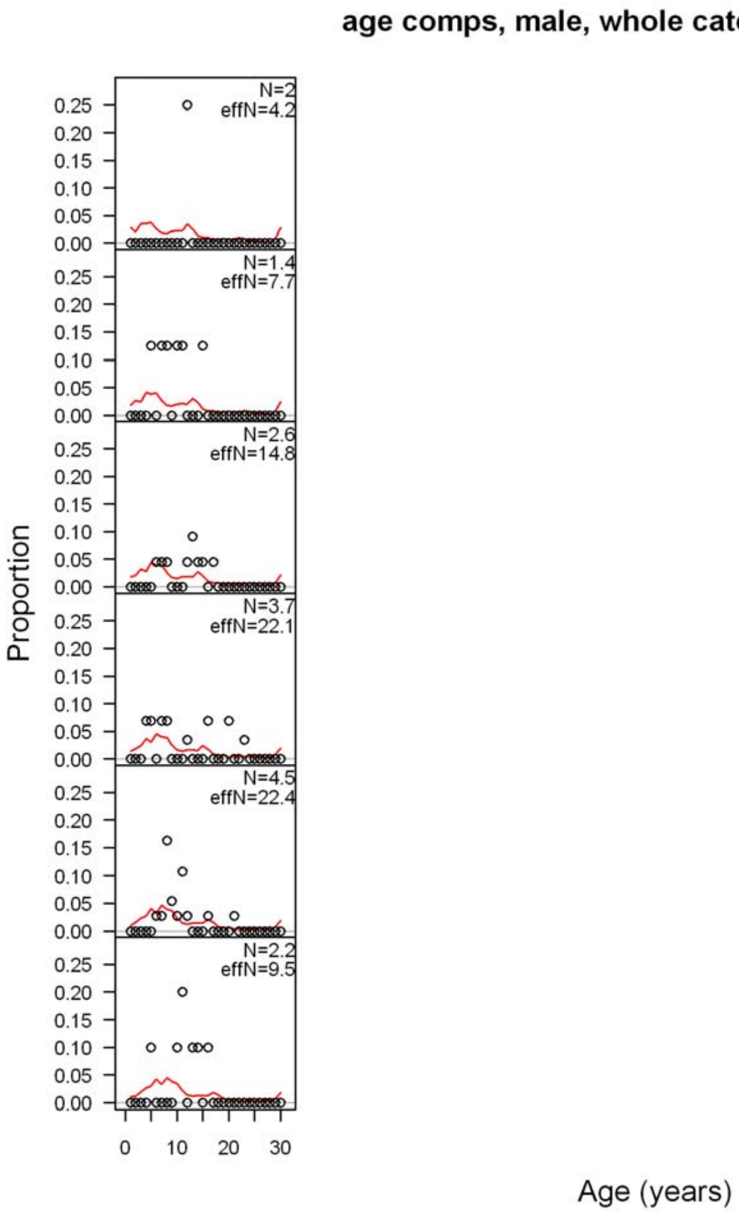


Figure D11. Model fits to the NWFSC southern area female age composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

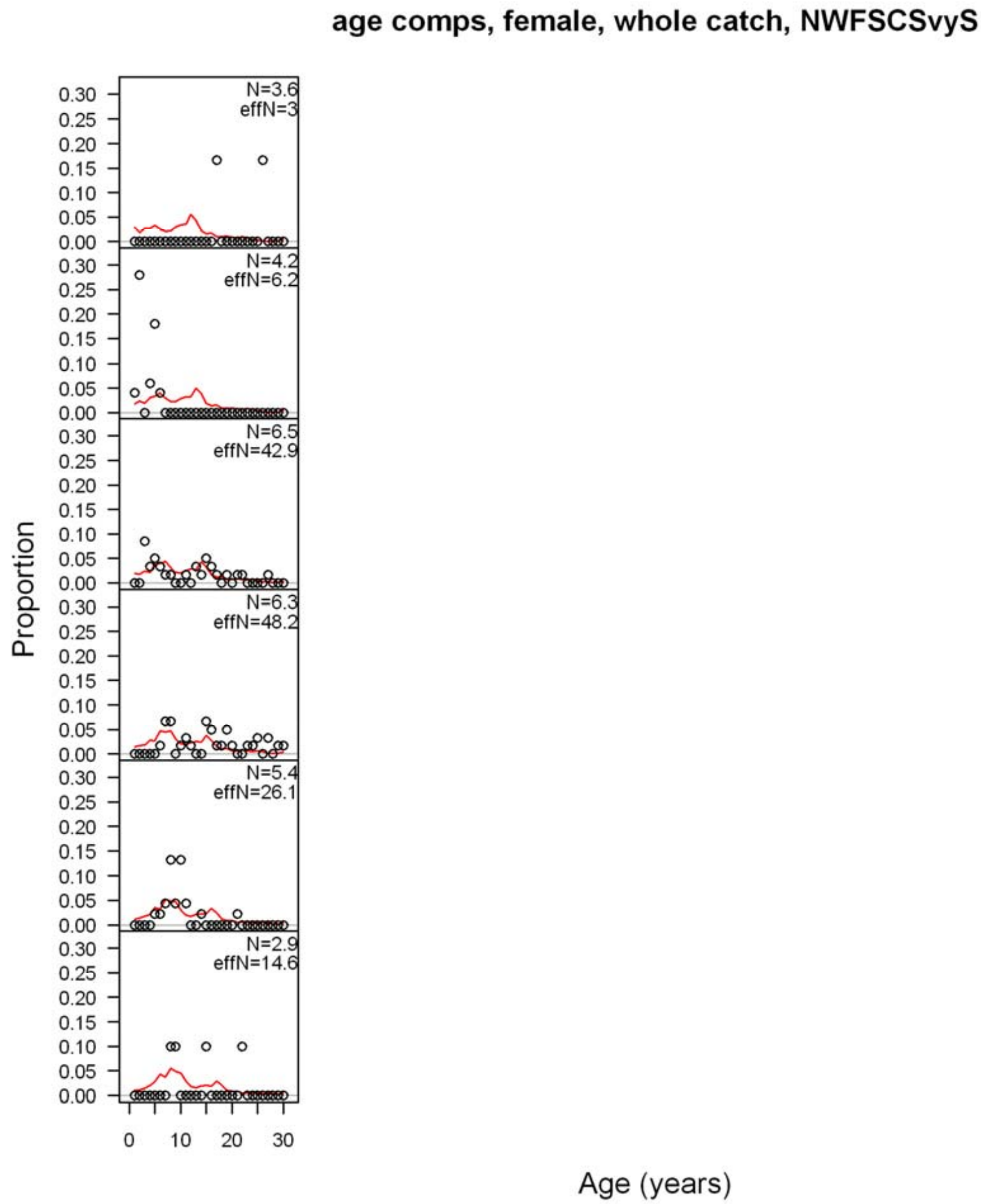


Figure D12. Model fits to the NWFSC southern area male age composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

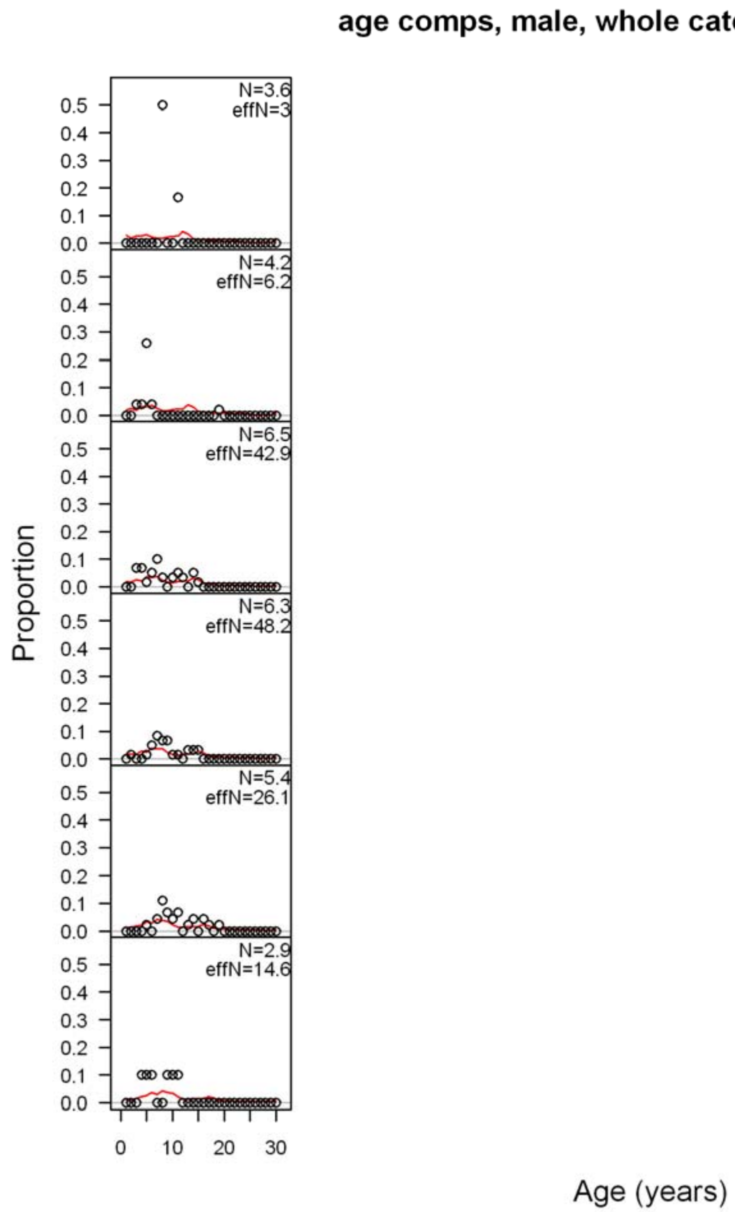


Figure D13. Model fits to the northern area triennial survey female length composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

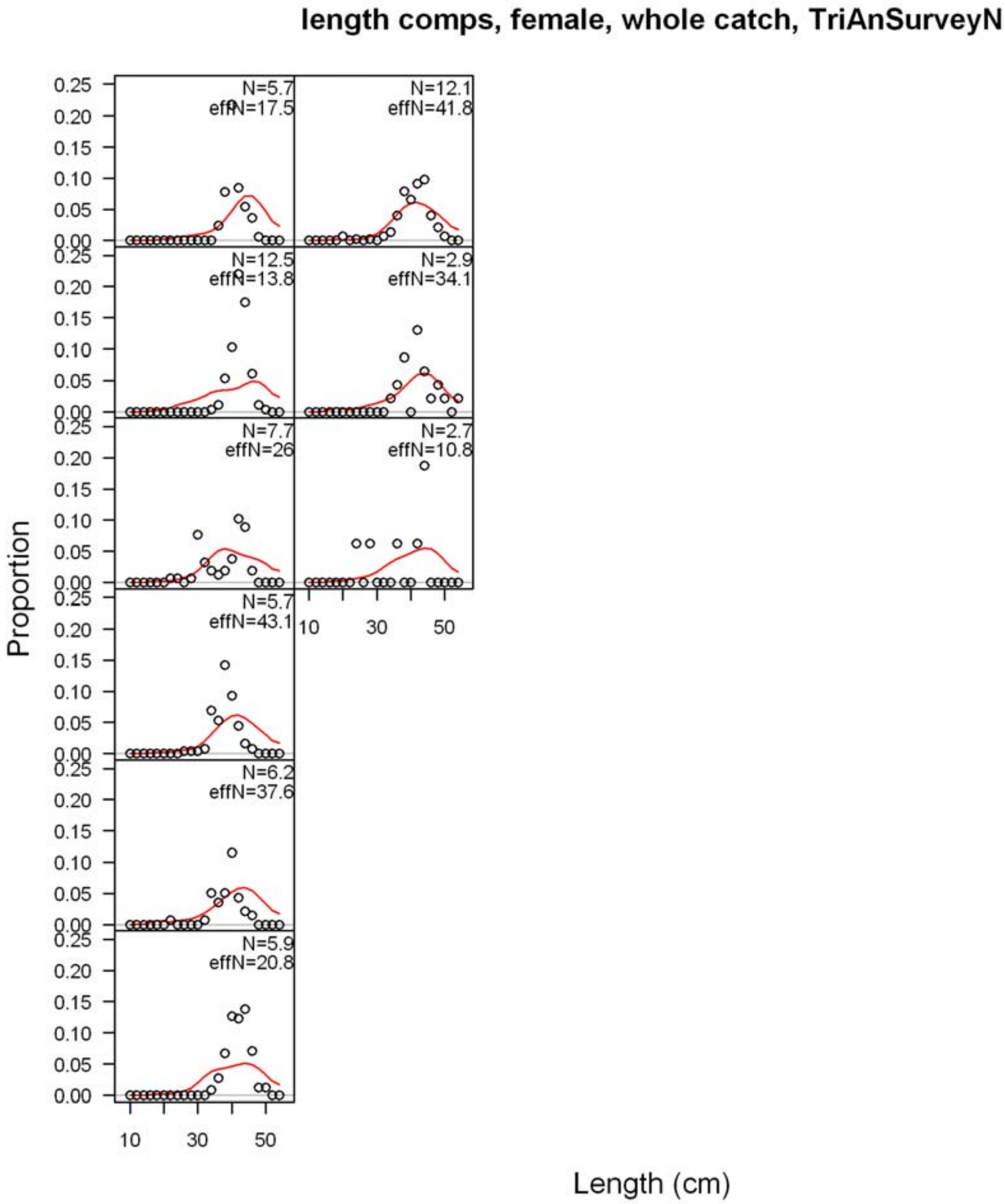


Figure D14. Model fits to the northern area triennial survey male length composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

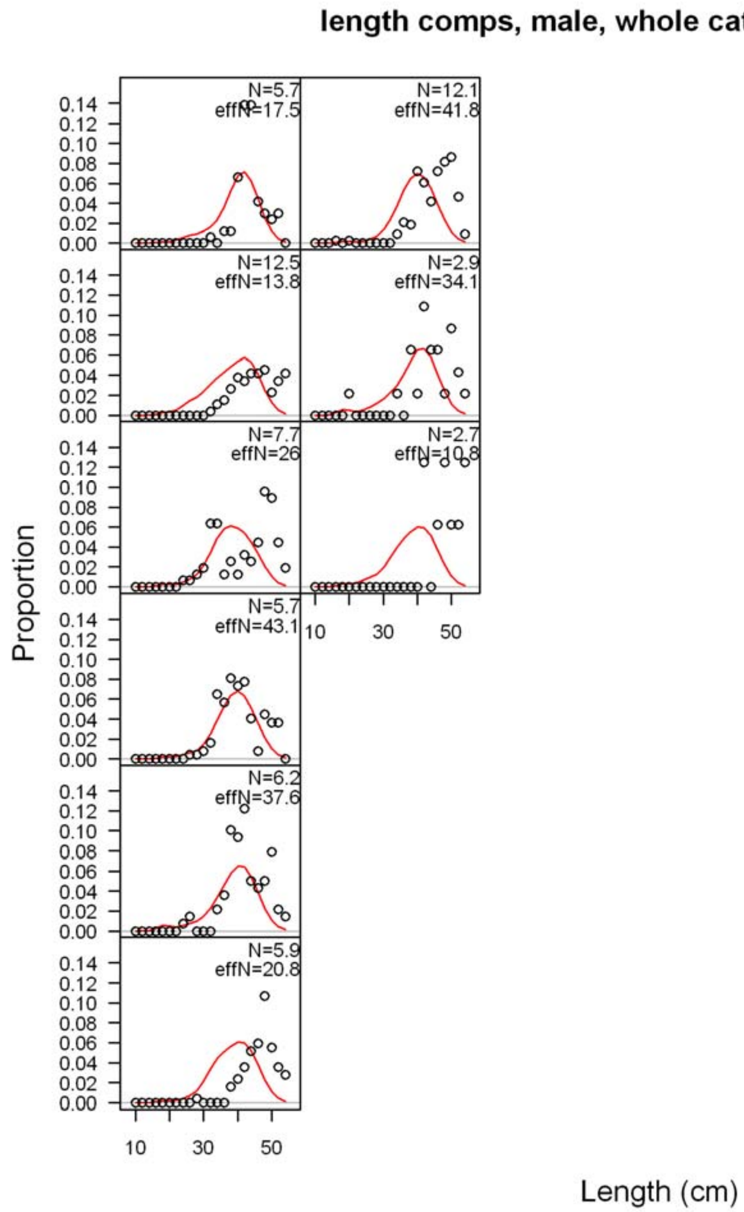


Figure D15. Model fits to the southern area triennial survey female length composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

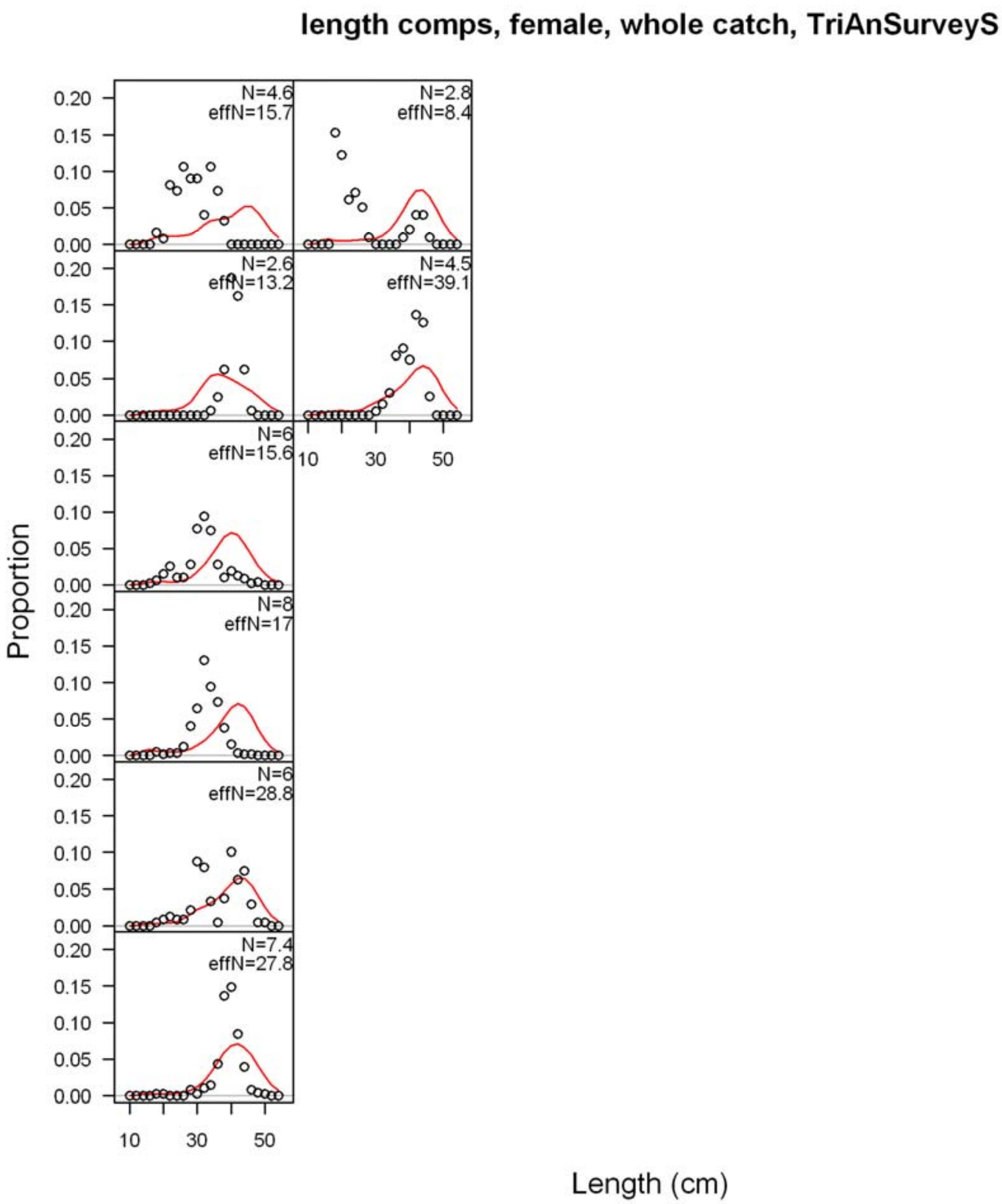


Figure D16. Model fits to the southern area triennial survey male length composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

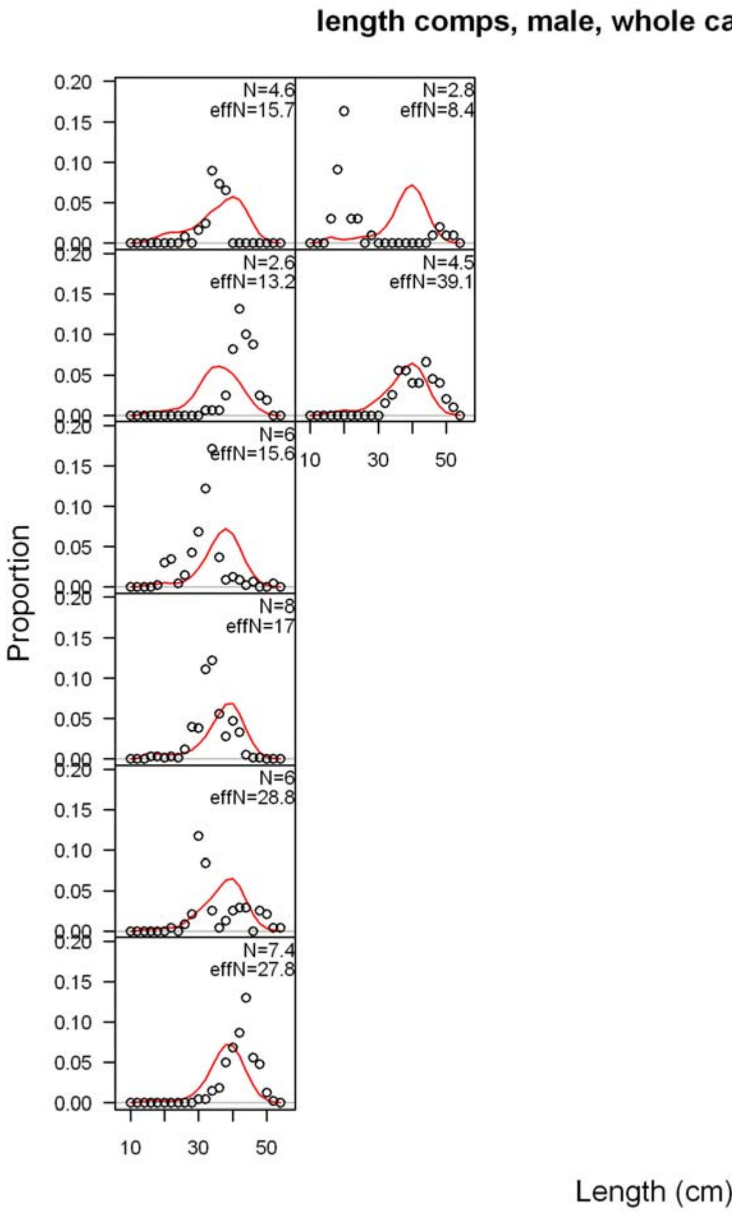


Figure D17. Model fits to the NWFSC northern area length female composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

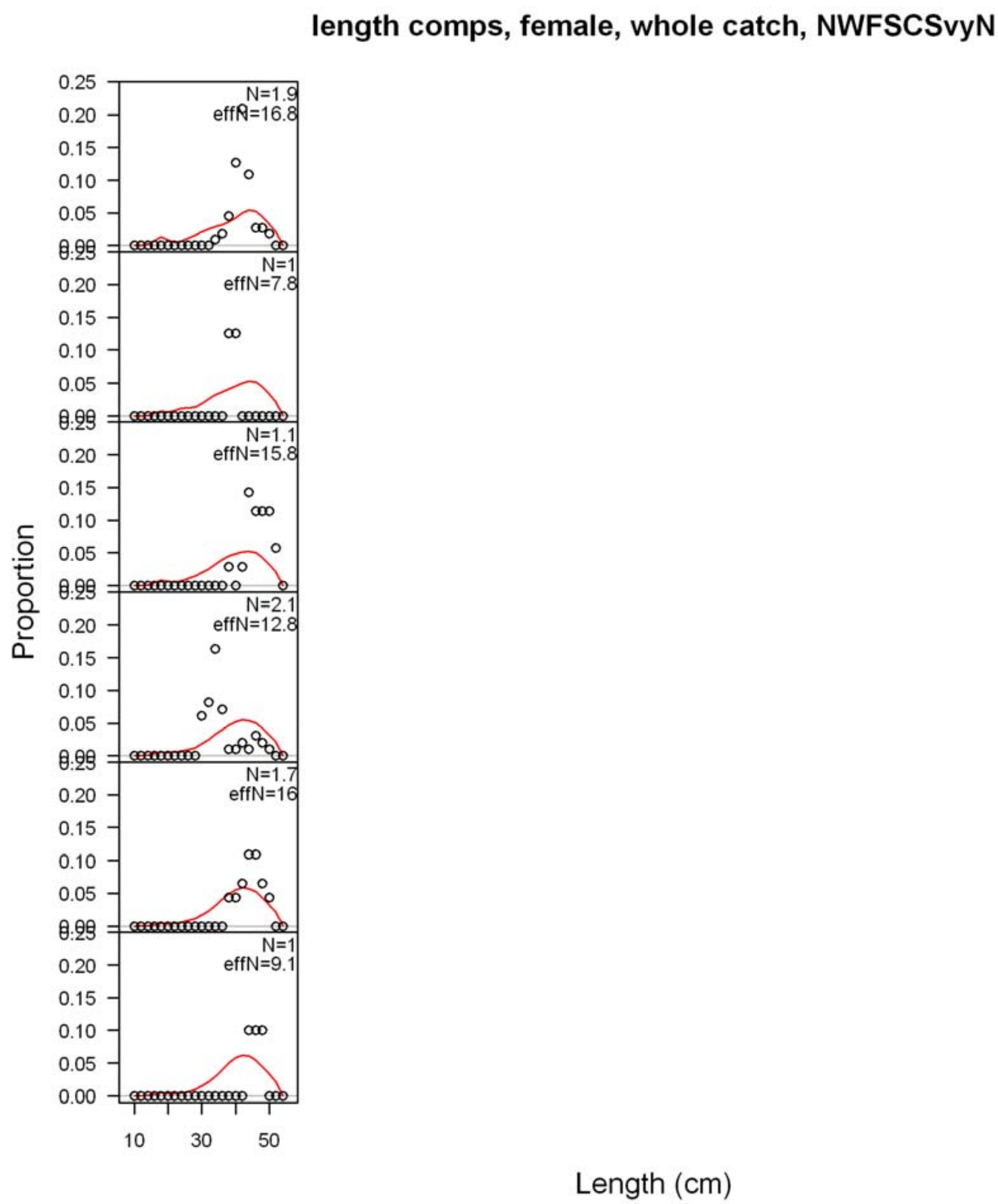


Figure D18. Model fits to the NWFSC northern area survey male composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

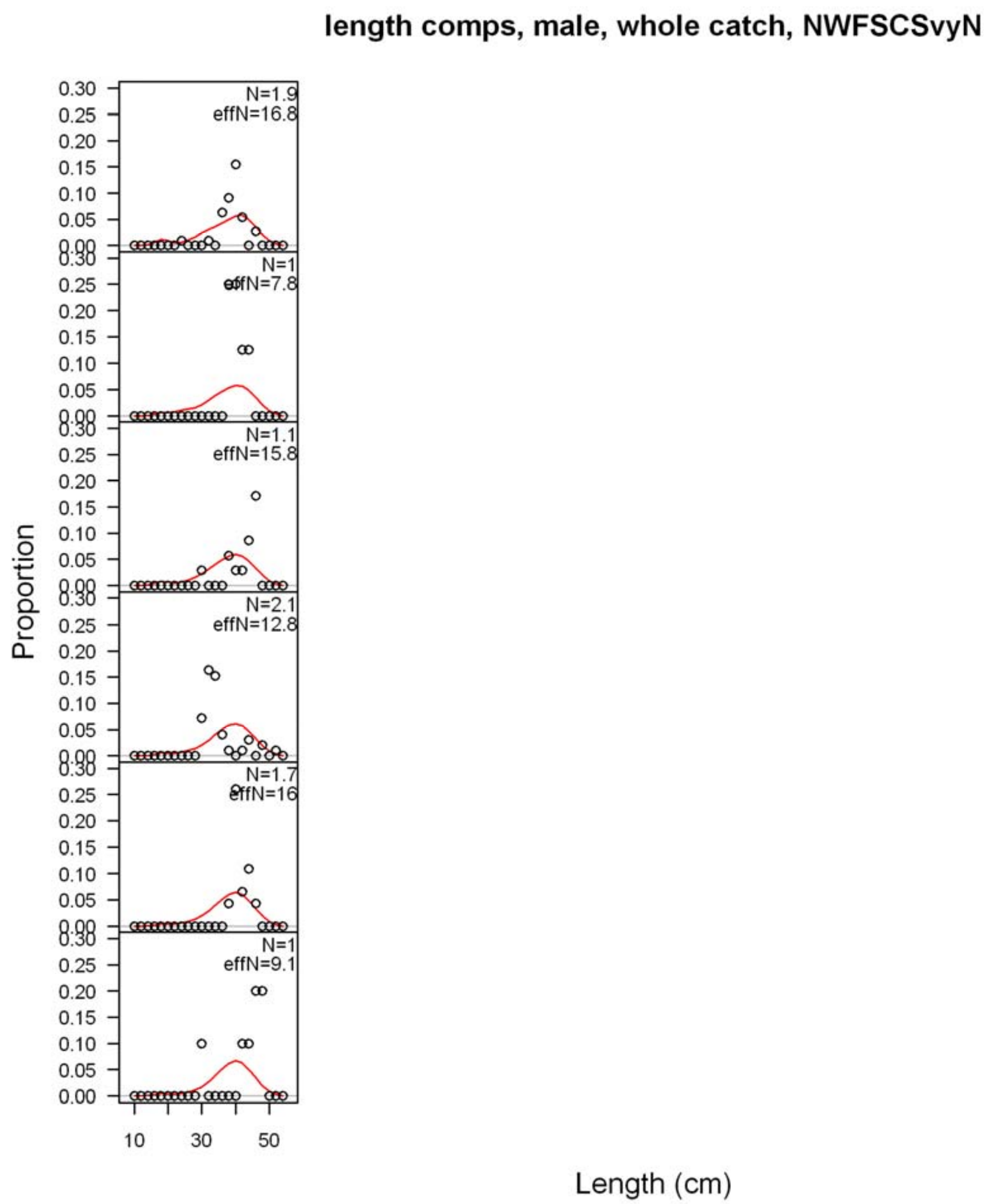


Figure D19. Model fits to the NWFSC southern area survey female composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.

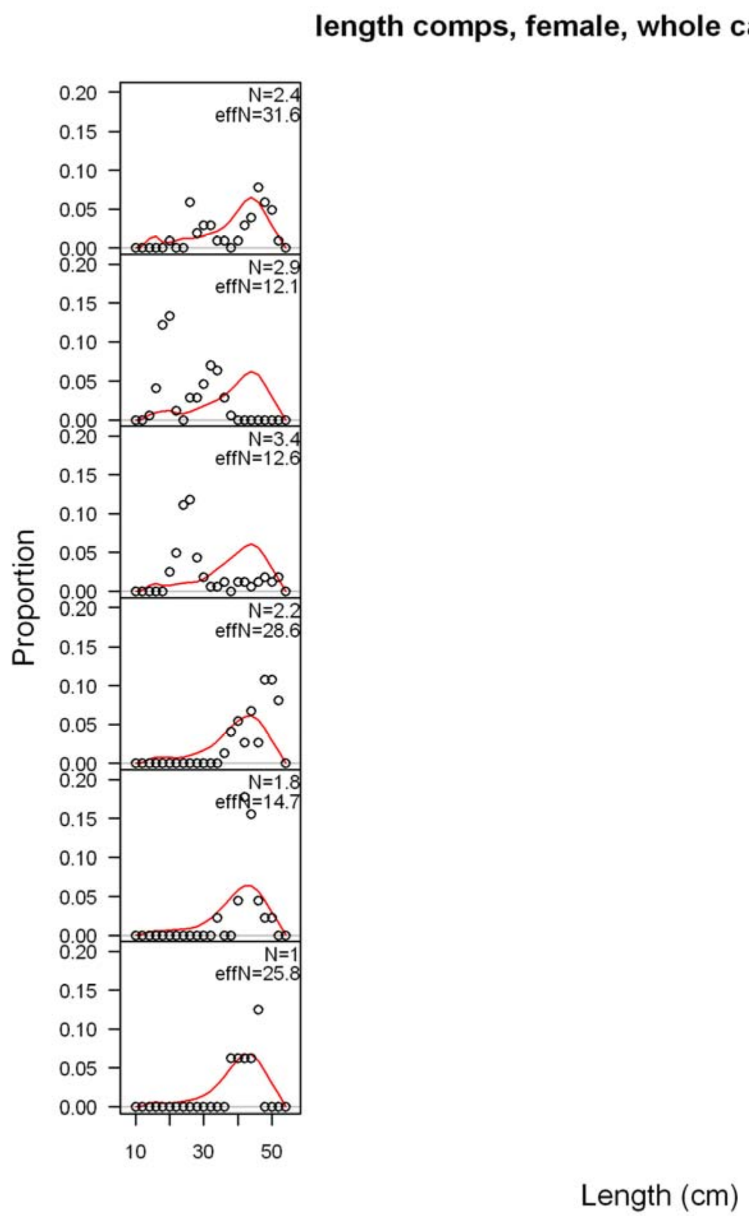
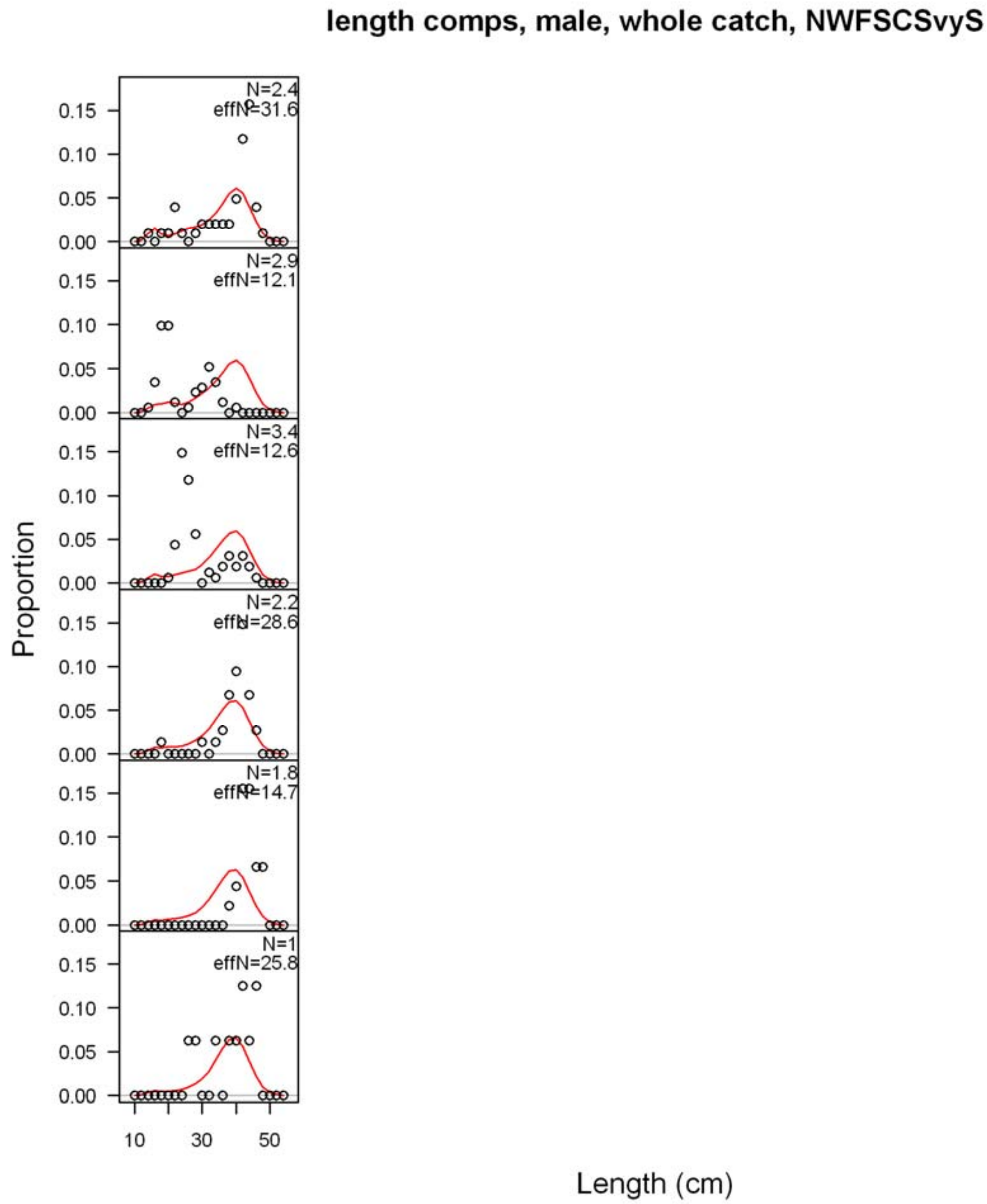


Figure D20. Model fits to the NWFSC southern area survey male composition data. Note that N is not the actual sample size, but the effective sample size from the previous iteration.



16 Appendix E. Input SS3 starter file (Starter.ss) for widow rockfish stock assessment base model.

```
#C 2009_Widow_rockfish_ stockassessment__Xi_He__NMFS_SWFSC__Santa_Cruz_CA
#_SS-V3.03a-opt;_05/11/09;_Stock_Synthesis_by_Richard_Methot_(NOAA);
_using_ADMB_7.0.1

wdw1.dat
wdw1.ctl

0             # 0=use init values in control file; 1=use ss2.par
1             # run display detail (0,1,2)
1             # detailed age-structured reports in SS2.rep (0,1)
0             # write detailed checkup.sso file (0,1)
1             # write parm values to ParmTrace.sso (0=no,1=good,active; 2=good,all;
3=every_iter,all_parms)
2             # write to cumreport.sso (0=no,1=like&timeseries; 2=add survey fits)
0             # Include prior_like for non-estimated parameters (0,1)
1             # Use Soft Boundaries to aid convergence (0,1) (recommended)
1             # Number of bootstrap datafiles to produce
9             # Turn off estimation for parameters entering after this phase
10            # MCMC burn interval
2             # MCMC thin interval
0.0001 # jitter initial parm value by this fraction
-1            # begin annual SD report in start year
-2            # end annual SD report in end year (-2=end of annual SD report in last
forecast year
0             # N individual STD years (0=none)

#vector of year values

0.0001 # final convergence criteria (e.g. 1.0e-04)
0             # retrospective year relative to end year (e.g. -4)
1             # min age for calc of summary biomass
1             # Depletion basis:  denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel
X*B_styr
1             # Fraction (X) for Depletion denominator (e.g. 0.4)
4             # (1-SPR)_reporting:  0=skip; 1=rel(1-SPR); 2=rel(1-SPR_MSY); 3=rel(1-
SPR_Btarget); 4=no denominator (report actural 1-SPR values)
1             # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num); 3=sum(frates)
0             # F_report_basis: 0=raw; 1=rel Fspr; 2=rel Fmsy ; 3=rel Fbtgt

999           # check value for end of file
```

17 Appendix F. Input SS3 forecast file (forecast.ss) for widow rockfish stock assessment base model.

```
#C 2009_Widow_rockfish_ stockassessment__Xi_He__NMFS_SWFSC__Santa_Cruz_CA
#_SS-V3.03a-opt;_05/11/09;_Stock_Synthesis_by_Richard_Methot_(NOAA);_using_ADMB_7.0.1

1            # Forecast: 0=none; 1=F(SPR); 2=F(MSY) 3=F(Btgt); 4=F(endyr); 5=Ave F
(enter yrs); 6=read Fmult
# -4  # first year for recent ave F for option 5 (not yet implemented)
# -1  # last year for recent ave F for option 5 (not yet implemented)
# 0.74  # F multiplier for option 6 (not yet implemented

2007  # first year to use for averaging selex to use in forecast (e.g. 2004; or use -
x to be rel endyr)
2008  # last year to use for averaging selex to use in forecast

1            # Benchmarks: 0=skip; 1=calc F_spr,F_btgt,F_msy
2            # MSY: 0=none; 1= set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt); 4=set
to F(endyr)
0.5          # SPR target (e.g. 0.40)
0.4          # Biomass target (e.g. 0.40)

12           # N forecast years with standard deviations

1            # read 10 advanced options
1            # Do West Coast gfish rebuilder output (0/1)

2000  # Rebuilder:  first year catch could have been set to zero (Ydecl)(-1 to set to
endyear+1)
2001  # Rebuilder:  year for current age structure (Yinit) (-1 to set to endyear+1)
1            # Control rule method (1=west coast adjust catch; 2=adjust F)
0.4          # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40)
0.1          # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)
1            # Control rule fraction of Flimit (e.g. 0.75)
-1           # maximum annual catch during forecast (not coded yet)
0            # 0= no implementation error; 1=use implementation error in forecast (not
coded yet)
0.1          # stddev of log(realized F/target F) in forecast (not coded yet)
# end of advanced options

1 # fleet allocation (in terms of F) (1=use endyr pattern, no read; 2=read below)
# rows are seasons, columns are fleets
#  0 0 0 0

48           # Number of forecast catch levels to input (rest calc catch from forecast
F
1            # basis for input forecatch:  1=retained catch; 2=total dead catch

#_Assuming 2009 and 2010 OYs are: 522mt and 509mt (John's email, May 13, 2009) see
Excel file: "Catch2009_2010 for forecast.xls"
#_Year Sea Fleet Catch
2009  1     1       97.1
2009  1     2      268.8
2009  1     3       36.9
2009  1     4      119.2
2010  1     1       94.7
2010  1     2      262.1
2010  1     3       36.0
2010  1     4      116.2
2011  1     1       94.7
2011  1     2      262.1
```

```
2011   1      3        36.0
2011   1      4       116.2
2012   1      1        94.7
2012   1      2       262.1
2012   1      3        36.0
2012   1      4       116.2
2013   1      1        94.7
2013   1      2       262.1
2013   1      3        36.0
2013   1      4       116.2
2014   1      1        94.7
2014   1      2       262.1
2014   1      3        36.0
2014   1      4       116.2
2015   1      1        94.7
2015   1      2       262.1
2015   1      3        36.0
2015   1      4       116.2
2016   1      1        94.7
2016   1      2       262.1
2016   1      3        36.0
2016   1      4       116.2
2017   1      1        94.7
2017   1      2       262.1
2017   1      3        36.0
2017   1      4       116.2
2018   1      1        94.7
2018   1      2       262.1
2018   1      3        36.0
2018   1      4       116.2
2019   1      1        94.7
2019   1      2       262.1
2019   1      3        36.0
2019   1      4       116.2
2020   1      1        94.7
2020   1      2       262.1
2020   1      3        36.0
2020   1      4       116.2

999 # verify end of input
```

18 Appendix G. Input SS3 control file (wdw1.ctl) for widow rockfish stock assessment base model.

```
#C 2009_Widow_rockfish_ stockassessment__Xi_He__NMFS_SWFSC__Santa_Cruz_CA
#C 2009_Widow_rockfish_ stockassessment__Xi_He__NMFS_SWFSC__Santa_Cruz_CA
#_SS-V3.03a-opt;_05/11/09;_Stock_Synthesis_by_Richard_Methot_(NOAA);_using_ADMB_7.0.1

#_data_and_control_files: wdw1.dat wdw1.ctl

2      #_N_Growth_Patterns
1      #_N_Morphs_Within_GrowthPattern

#_Recruit_Setup
2      # N recruitment designs goes here if N_GP*nseas*pop>1
0      # placeholder for recruitment interaction request

# GP seas area for each recruitment assignment
1 1 1
2 1 2

# 1 1 1  # example recruitment design element for GP=1, seas=1, pop=1

# N_movement_definitions goes here if pop > 1
0

# 0 # N_movement_definitions goes here if pop > 1
# 1.0 # first age that moves (real age at begin of season, not integer)
# 1 1 1 2 4 10 # example move definition for seas=1, morph=1, source=1 dest=2, age1=4,
age2=10

1      #_Nblock_Designs
3
1958 1977 1978 1995 1996 2008

0.5    #_fracfemale
1      #_natM_type:_0=1Parm;
1=N_breakpoints;_2=Lorenzen;_3=agespecific;_4=agespec_withseasinterpolate
2      #_N_breakpoints
4 5    # age(real) at M breakpoints
1      # GrowthModel: 1=vonBert with L1&L2; 2=vonBert with A0&Linf; 3=Richards;
4=readvector
3      #_Growth_Age_for_L1
18     #_Growth_Age_for_L2 (999 to use as Linf)
0      #_SD_add_to_LAA (set to 0.1 for SS2 V1.x compatibility)
1      #_CV_Growth_Pattern:  0 CV=f(LAA); 1 CV=F(A); 2 SD=F(LAA); 3 SD=F(A)
4      #_maturity_option:  1=length logistic; 2=age logistic; 3=read age-maturity for
each femlae GP; 4=read age-fecundity for each female GP

#_Age_Maturity by growth pattern (Muturity by age for GP1 and GP2)
#_For max age = 30, see 5_12_2009 Excel file "AgeLengthWeight maturity fecundity.xls"
0.00000      0.00000      0.00000      0.00000      0.00000      0.00723
       0.04882      0.15808      0.27915      0.37660      0.44940      0.51860
       0.57802      0.63218      0.68119      0.72530      0.76479      0.80001
       0.83130      0.85902      0.88351      0.90511      0.92411      0.94080
       0.95544      0.96828      0.97951      0.98933      0.99791      1.00541
       1.01195
0.00000      0.00000      0.00000      0.00065      0.00210      0.01920
       0.07750      0.16088      0.26640      0.34664      0.41835      0.48129
       0.53574      0.58234      0.62188      0.65520      0.68312      0.70642
       0.72579      0.74184      0.75512      0.76609      0.77513      0.78257
```

```
       0.78869      0.79371      0.79784      0.80123      0.80401      0.80629
       0.80816

0      #_First_Mature_Age
1      #_fecundity option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b !!! No used
if maturity_option = 4
0      # no gender Change
1      #_parameter_offset_approach (1=none, 2= M, G, CV_G as offset from female-GP1,
3=like SS2 V1.x)
2      #_env/block/dev_adjust_method (1=standard; 2=with logistic trans to keep within
base parm bounds)

#_growth_parms
#_LO   HI           INIT   PRIOR  PR_type      SD           PHASE  env    usdev  dminyr
       dmaxyr dev_std      Block  Block_Fxn
0.01   0.3          0.125  0.125  -1           0.8          -1            0      0
       0            0             0.5          0            0      # NatM_p_1_Fem_GP:1
0.01   0.3          0.125  0.125  -1           0.8          -1            0      0
       0            0             0.5          0            0      # NatM_p_2_Fem_GP:1
10            50           27.72  27.72  -1           10           -2            0
       0            0             0            0.5          0             0      #
L_at_Amin_Fem_GP_1
25            70           47.74  47.74  -1           10           -2            0
       0            0             0            0.5          0             0      #
L_at_Amax_Fem_GP_1
0.01   0.25   0.14  0.14   -1           0.8          -2            0      0
       0            0             0.5          0            0      #
VonBert_K_Fem_GP_1
0.01   0.2          0.10   0.10   -1           0.8          -1            0      0
       0            0             0.5          0            0      # CV_young_Fem_GP_1
0.01   0.2          0.10   0.10   -1           0.8          -1            0      0
       0            0             0.5          0            0      # CV_old_Fem_GP_1

0.01   0.3          0.125  0.125  -1           0.8          -1            0      0
       0            0             0.5          0            0      # NatM_p_1_Fem_GP:2
0.01   0.3          0.125  0.125  -1           0.8          -1            0      0
       0            0             0.5          0            0      # NatM_p_2_Fem_GP:2
10            50           22.32  22.32  -1           10           -2            0
       0            0             0            0.5          0             0      #
L_at_Amin_Fem_GP_2
25            70           46.29  46.29  -1           10           -2            0
       0            0             0            0.5          0             0      #
L_at_Amax_Fem_GP_2
0.01   0.25   0.20  0.20   -1           0.8          -2            0      0
       0            0             0.5          0            0      #
VonBert_K_Fem_GP_2
0.01   0.2          0.10   0.10   -1           0.8          -1            0      0
       0            0             0.5          0            0      # CV_young_Fem_GP_2
0.01   0.2          0.10   0.10   -1           0.8          -1            0      0
       0            0             0.5          0            0      # CV_old_Fem_GP_2

0.01   0.3          0.125  0.125  -1           0.8          -1            0      0
       0            0             0.5          0            0      #
NatM_p_1_Mal_GP:1_
0.01   0.3          0.125  0.125  -1           0.8          -1            0      0
       0            0             0.5          0            0      #
NatM_p_2_Mal_GP:1_
10            50           28.54  28.54  -1           10           -2            0
       0            0             0            0.5          0             0      #
L_at_Amin_Mal_GP_1_
25            70           42.96  42.96  -1           10           -2            0
       0            0             0            0.5          0             0      #
L_at_Amax_Mal_GP_1_
```

```
0.01   0.25   0.18   0.18   -1           0.8          -2           0      0
       0             0             0.5          0            0      #
VonBert_K_Mal_GP_1_
0.01   0.2           0.10   0.10   -1           0.8          -1           0      0
       0             0             0.5          0            0      #
CV_young_Mal_GP_1_
0.01   0.2           0.10   0.10   -1           0.8          -1           0      0
       0             0             0.5          0            0      # CV_old_Mal_GP_1_

0.01   0.3           0.125  0.125  -1           0.8          -1           0      0
       0             0             0.5          0            0      # NatM_p_1_Mal_GP:2
0.01   0.3           0.125  0.125  -1           0.8          -1           0      0
       0             0             0.5          0            0      # NatM_p_2_Mal_GP:2
10            50            23.22  23.22  -1           10           -2           0
       0             0             0            0.5          0            0      #
L_at_Amin_Mal_GP_2
25            70            41.07  41.07  -1           10           -2           0
       0             0             0            0.5          0            0      #
L_at_Amax_Mal_GP_2
0.01   0.5           0.25   0.25   -1           0.8          -2           0      0
       0             0             0.5          0            0      #
VonBert_K_Mal_GP_2
0.01   0.2           0.10   0.10   -1           0.8          -1           0      0
       0             0             0.5          0            0      # CV_young_Mal_GP_2
0.01   0.2           0.10   0.10   -1           0.8          -1           0      0
       0             0             0.5          0            0      # CV_old_Mal_GP_2

-3            3 0.00000545 0.00000545    -1           0.8          -1           0
       0             0             0            0.5          0            0      #
Wtlen1_Fem
-3            10            3.28781 3.28781     -1           0.8          -1
       0      0             0             0            0.5          0            0
       # Wtlen2_Fem
-3            50            7             7            -1           0.8          -1
       0      0             0             0            0.5          0            0
       # Mat50_Fem         !! ignored if maturity option=4
-3            3             -1            -1           -1           0.8          -1
       0      0             0             0            0.5          0            0
       # Mat_slope_Fem !! ignored if maturity option=4
0             1             1             1            -1           0.8          -1
       0      0             0             0            0.5          0            0
       # Eggs1_Fem         !! ignored if maturity option=4
0             1             0             0            -1           0.8          -1
       0      0             0             0            0.5          0            0
       # Eggs2_Fem         !! ignored if maturity option=4

-3            3 0.00001188 0.00001188    -1           0.8          -1           0
       0             0             0            0.5          0            0      #
Wtlen1_Mal
-3            10            3.06631 3.06631     -1           0.8          -1
       0      0             0             0            0.5          0            0
       # Wtlen2_Mal

-4      0    -0.32158  -0.32158 -1      99       6      0   0       0       0
0.5     0       0   # RecrDist_GP_1
-4      0    -1.29098  -1.29098 -1      99      -6      0   0      0      0       0.5
0       0   # RecrDist_GP_2

-4      4       0       0      -1      99      -3      0   0       0       0
0.5     0       0   # RecrDist_Area_1
-4      4       0       0      -1      99      -3      0   0       0       0
0.5     0       0   # RecrDist_Area_2
```

```
-4      4       0       0       -1      99      -3      0   0       0       0
0.5     0       0   # RecrDist_Seas_1

1             1             1             1             -1            99            -3
      0     0             0             0             0.5           0             0
      # CohortGrowDev

#########################################################################################
######################################
# Prop to North = 0.6
# -4      0    -0.51083  -0.51083 -1      99      -6      0   0       0       0
0.5     0       0   # RecrDist_GP_1
# -4      0    -0.91629  -0.91629 -1      99      -6      0   0           0      0
0.5     0       0   # RecrDist_GP_2

# Prop to North = 0.65
# -4      0    -0.43078  -0.43078 -1      99      -6      0   0       0       0
0.5     0       0   # RecrDist_GP_1
# -4      0    -1.04982  -1.04982 -1      99      -6      0   0           0      0
0.5     0       0   # RecrDist_GP_2

# Prop to North = 0.675
# -4      0    -0.39034  -0.39034 -1      99      -6      0   0       0       0
0.5     0       0   # RecrDist_GP_1
# -4      0    -1.12393  -1.12393 -1      99      -6      0   0           0      0
0.5     0       0   # RecrDist_GP_2

# Prop to North = 0.6875
# -4      0    -0.37469  -0.37469 -1      99      -6      0   0       0       0
0.5     0       0   # RecrDist_GP_1
# -4      0    -1.16315  -1.16315 -1      99      -6      0   0           0      0
0.5     0       0   # RecrDist_GP_2

# Prop to North = 0.70
# -4      0    -0.35667  -0.35667 -1      99      -6      0   0       0       0
0.5     0       0   # RecrDist_GP_1
# -4      0    -1.20397  -1.20397 -1      99      -6      0   0           0      0
0.5     0       0   # RecrDist_GP_2

# Prop to North = 0.7125
# -4      0    -0.33898  -0.33898 -1      99      -6      0   0       0       0
0.5     0       0   # RecrDist_GP_1
# -4      0    -1.24653  -1.24653 -1      99      -6      0   0           0      0
0.5     0       0   # RecrDist_GP_2

# Prop to North = 0.725
# -4      0    -0.32158  -0.32158 -1      99      -6      0   0       0       0
0.5     0       0   # RecrDist_GP_1
# -4      0    -1.29098  -1.29098 -1      99      -6      0   0           0      0
0.5     0       0   # RecrDist_GP_2

# Prop to North = 0.75
# -4      0    -0.28768  -0.28728 -1      99      -6      0   0       0       0
0.5     0       0   # RecrDist_GP_1
# -4      0    -1.38629  -1.38629 -1      99      -6      0   0           0      0
0.5     0       0   # RecrDist_GP_2

# Prop to North = 0.775
# -4      0    -0.25489  -0.25489 -1      99      -6      0   0       0       0
0.5     0       0   # RecrDist_GP_1
# -4      0    -1.49165  -1.49165 -1      99      -6      0   0           0      0
0.5     0       0   # RecrDist_GP_2
```

```
# Prop to North = 0.80
# -4      0    -0.22314  -0.22314 -1      99      -6      0   0       0       0
0.5     0       0   # RecrDist_GP_1
# -4      0    -1.60944  -1.60944 -1      99      -6      0   0          0      0
0.5     0       0   # RecrDist_GP_2
######################################################################################
######################################

######################################################################################
######################################
# Next two blocks for setting different recruit distributions to each area
# Note: if use Rick's distri devs, need to set # placeholder for #_MGparm_Dev_Phase to
1
# next two lines: no annual devs
# -4   4      -0.32158     -0.32158           -1           99           -3
      0     0            0            0            0.5          0            0
      # RecrDist_GP_1
# -4   4      -1.29098     -1.29098           -1           99           -3
      0     0            0            0            0.5          0            0
      # RecrDist_GP_1

# next two lines: edited by Rick
# -4   4      -0.32158     -0.32158           -1           99           -3
      0     0            0            0            0.5          0            0
      # RecrDist_GP_1
# -4   4      -1.29098     -1.29098           -1           99           -1
      0     2            1978 2003          0.8          0            0     #
RecrDist_GP_2
######################################################################################
######################################

# 0  #custom_MG-env_setup (0/1)
# -2 2 0 0 -1 99 -2 #_placeholder for no MG-environ parameters

# 1  #custom_MG-block_setup (0/1)
# -2 2 0 0 -1 99 6 #_placeholder for no MG-block parameters
# -2 2 0 0 -1 99 6 #_placeholder for no MG-block parameters
# -2 2 0 0 -1 99 6 #_placeholder for no MG-block parameters

#_seasonal_effects_on_biology_parms
#_femwtlen1  femwtlen2    mat1  mat2  fec1  fec2  Malewtlen1   malewtlen2   L1
      K
0                   0                   0            0            0            0
      0            0                  0      0

# -2 2 0 0 -1 99 -2 #_placeholder for no seasonal MG parameters
# -2 2 0 0 -1 99 -2 #_placeholder for no MG dev parameters
# if use Rick's recruit dist dev, active next line (phase for MGparm_dev)
#7  # placeholder for #_MGparm_Dev_Phase

#_Spawner-Recruitment
#_SR functions: 1=Beverton Holt with flat-top beyond Bzero; 2=Ricker; 3= Standard BH;
4=ingore steepness and no bias adjustment
3      #_SR_function

#_LO   HI     INIT   PRIOR  PR_type             SD           PHASE
1            20     10.0   10.0   -1                   0.8          1            #
SR_R0
0.2          1      0.721  0.721  2                    0.193  4            # SR_steep:
Martin's new prior (see email 6/2/2009)
0            2      0.6          0.6          -1                   100          -3
      # SR_sigmaR
```

```
-5          5     0           0           -1                1           -3
      # SR_envlink
-5          5     0           0           -1                1           -3
      # SR_R1_offset
0           0.5   0           0           -1                99          -2
      # SR_autocorr

0           #_SR_env_link
0           #_SR_env_target_0=none;1=devs;_2=R0;_3=steepness

1           # do_recdev:  0=none; 1=devvector; 2=simple deviations
1978  # first year of main recr_devs; early devs can preceed this era
2008  # last year of main recr_devs; forecast devs start in following year
5           #_recdev phase

1           # (0/1) to read 11 advanced options: Mark all lines in next section if =
0

#_start of advanced SR options
-20         #_recdev_early_start (0=none; neg value makes relative to recdev_start)
6           #_recdev_early_phase
0           #_forecast_recruitment phase (incl. late recr) (0 value resets to
maxphase+1)
1           #_lambda for forecast recr dev occurring before endyr+1
1980  #_last_early_yr_nobias_adj_in_MPD
1988  #_first_yr_fullbias_adj_in_MPD
2003  #_last_yr_fullbias_adj_in_MPD
2008  #_first_recent_yr_nobias_adj_in_MPD
1.0         # Max bias adjustment
0           # future use
-5          #min rec_dev
5           #max rec_dev
0           #_read_recdevs
#_end of advanced SR options

#Fishing Mortality info
0.05  # F ballpark for tuning early phases
1982  # F ballpark year
3           # F_Method:  1=Pope; 2=instan. F; 3=hybrid (hybrid is recommended)
2.9         # max F or harvest rate, depends on F_Method

# no additional F input needed for Fmethod 1
# read overall start F value; overall phase; N detailed inputs to read for Fmethod 2
# read N iterations for tuning for Fmethod 3 (recommend 3 to 7)

# if F_Method=2 (instan.), active next line
# 0.01 1     0     # overall start F value; overall phase; N detailed inputs to read

# Number of tuning iterations in hybrid F: 4 or 5 may be good - check how catches data
match estimated catches
# if F_Method=3 (hybrid), active next line
5

#Fleet Year Seas F_value se phase (for detailed setup of F_Method=2)

#_initial_F_parms
#_LO   HI    INIT   PRIOR  PR_type      SD    PHASE
0           0.5   0           0           -1    1000   1           #
InitF_1WAFishery1
0           0.5   0           0           -1    1000   -1          #
InitF_2ORMWTraw
0           0.5   0           0           -1    1000   -1          #
InitF_3ORBTraw
```

```
0            0.5    0            0            -1     1000   1            #
InitF_4EMFishery

#_Q_setup
# A=do power, B=env-var, C=extra SD, D=devtype(<0=mirror, 0/1=none, 2=cons, 3=rand,
4=randwalk); E=0=num/1=bio, F=err_type
#A B C D E F
 0 0 0 0 1 0  # 1 WAFishery1
 0 0 0 0 1 0  # 2 ORMWTraw
 0 0 0 0 1 0  # 3 ORBTraw
 0 0 0 0 1 0  # 4 EMFishery
 0 0 0 2 0 0  # 5 SCJuvSurvey
 0 0 0 2 1 0  # 6 ORBTrawCPUE
 0 0 0 2 1 0  # 7 TriAnSurveyN
 0 0 0 2 1 0  # 8 ForWBycatch
 0 0 0 2 1 0  # 9 JVWBycatch
 0 0 0 2 1 0  # 10 DomWBycatch
 0 0 0 2 1 0  # 11 NWFSCSvyN
 0 0 0 2 1 0  # 12 NWFSCSvyS
 0 0 0 2 1 0  # 13 TriAnSurveyS

# To turn-on SOI effects on qs for surveys: 2nd column indicats which env var to use
# 0 1 0 2 1 0# 7  TriAnSurveyN
# 0 1 0 2 1 0# 13 TriAnSurveyS
# 0 2 0 2 1 0# 11 NWFSCSvyN
# 0 2 0 2 1 0# 12 NWFSCSvyS
# And activate the following lines for Q_envlink parameter setups
# -10  10    0.0          0.0          -1                  10           6
      # Q_envlink_7_TriAnSurveyN
# -10  10    0.0          0.0          -1                  10           6
      # Q_envlink_13_TriAnSurveyS
# -10  10    0.0          0.0          -1                  10           6
      # Q_envlink_11_NWFSCSvyN
# -10  10    0.0          0.0          -1                  10           6
      # Q_envlink_12_NWFSCSvyS

# 0 #_0=read one parm for each fleet with random q; 1=read a parm for each year of
index
#_Q_parms(if_any)
# LO   HI     INIT   PRIOR  PR_type             SD            PHASE
 -25   0      -10           -10          -1                  10           2
      # Q_base_5_SCJuvSurvey
 -25   0      -10           -10          -1                  10           2
      # Q_base_6_ORBTrawCPUE
 -25   0      -10           -10          -1                  10           4
      # Q_base_7_TriAnSurveyN
 -25   0      -10           -10          -1                  10           4
      # Q_base_8_ForWBycatch
 -25   0      -10           -10          -1                  10           4
      # Q_base_9_JVWBycatch
 -25   0      -10           -10          -1                  10           4
      # Q_base_10_DomWBycatch
 -25   0      -10           -10          -1                  10           4
      # Q_base_11_NWFSCSvyN
 -25   0      -10           -10          -1                  10           4
      # Q_base_12_NWFSCSvyS
 -25   0      -10           -10          -1                  10           4
      # Q_base_7_TriAnSurveyS

#_size_selex_Setup
#_SelPattern Do_retain    Do_male      Special
 0 0 0 0     # 1 WAFishery1
 0 0 0 0     # 2 ORMWTraw
```

```
 0 0 0 0      # 3 ORBTraw
 0 0 0 0      # 4 EMFishery
 0 0 0 0      # 5 SCJuvSurvey
 0 0 0 0      # 6 ORBTrawCPUE
24 0 0 0      # 7 TriAnSurveyN
 0 0 0 0      # 8 ForWBycatch
 0 0 0 0      # 9 JVWBycatch
 0 0 0 0      # 10 DomWBycatch
24 0 0 0      # 11 NWFSCSvyN
 5 0 0 11     # 12 NWFSCSvyS
 5 0 0 7      # 13 TriAnSurveyS

#_age_selex_Setup
#_SelPattern Do_retain    Do_male      Special
 19 0 2 0     # 1 WAFishery1
 19 0 2 0     # 2 ORMWTraw
 19 0 2 0     # 3 ORBTraw
 19 0 1 0     # 4 EMFishery
 11 0 0 0     # 5 SCJuvSurvey
 15 0 0 3     # 6 ORBTrawCPUE
 10 0 0 0     # 7 TriAnSurveyN
 15 0 0 2     # 8 ForWBycatch
 15 0 0 2     # 9 JVWBycatch
 15 0 0 2     # 10 DomWBycatch
 10 0 0 0     # 11 NWFSCSvyN
 10 0 0 0     # 12 NWFSCSvyS
 10 0 0 0     # 7 TriAnSurveyN

#LO    HI     INI    PRIOR  PR_ty  SD           PHA          envar  usdev dvminyr
       dvmaxyr       devstdv       Block  Block_Fxn

14     53     45     45            -1           10           1            0 0 0 0 0.5 0
0             # SizeSel_7P_1_TriAnSurveyN
-6     4      0      0             -1           10           1            0 0 0 0 0.5 0
0             # SizeSel_7P_2_TriAnSurveyN
-2     9      5      5             -1           10           2            0 0 0 0 0.5 0
0             # SizeSel_7P_3_TriAnSurveyN
-2     9      5      5             -1           10           2            0 0 0 0 0.5 0
0             # SizeSel_7P_4_TriAnSurveyN
-10    1  -5  -5           -1           10           2            0 0 0 0 0.5 0 0
       # SizeSel_7P_5_TriAnSurveyN
-5     9      2      2             -1           10           2            0 0 0 0 0.5 0
0             # SizeSel_7P_6_TriAnSurveyN

14     53     45     45            -1           10           1            0 0 0 0 0.5 0
0             # SizeSel_7P_1_TriAnSurveyN
-6     4      0      0             -1           10           1            0 0 0 0 0.5 0
0             # SizeSel_7P_2_TriAnSurveyN
-2     9      5      5             -1           10           2            0 0 0 0 0.5 0
0             # SizeSel_7P_3_TriAnSurveyN
-2     9      5      5             -1           10           2            0 0 0 0 0.5 0
0             # SizeSel_7P_4_TriAnSurveyN
-10    1  -5  -5           -1           10           2            0 0 0 0 0.5 0 0
       # SizeSel_7P_5_TriAnSurveyN
-5     9      2      2             -1           10           2            0 0 0 0 0.5 0
0             # SizeSel_7P_6_TriAnSurveyN

-5     40     -1     -1            -1           10           -2           0 0 0 0 0.5 0
0             # SizeSel_12P_1_NWFSCSvyS
-5     40     -1     -1            -1           10           -2           0 0 0 0 0.5 0
0             # SizeSel_12P_2_NWFSCSvyS
```

```
-5     40     -1     -1            -1            10            -2            0 0 0 0 0.5 0
0             # SizeSel_12P_1_NWFSCSvyS
-5     40     -1     -1            -1            10            -2            0 0 0 0 0.5 0
0             # SizeSel_12P_2_NWFSCSvyS

#-------------------------------------------------------------# 1 WAFishery1
0      40     10     10            -1            10            1             0 0 0 0 0.5 0
0             # AgeSel_1_P_1_Ascending inflection age
0      10     5      5             -1            10            1             0 0 0 0 0.5 0
0             # AgeSel_1_P_2_Ascending slope
0      40     15     15            -1            10            3             0 0 0 0 0.5 0
0             # AgeSel_1_P_3_Descending inflection age
0      5      2      2             -1            10            3             0 0 0 0 0.5 0
0             # AgeSel_1_P_4_Descending slope
1      3      2      2             -1            10            -2            0 0 0 0 0.5 0
0             # AgeSel_1_P_5_Bin number for first bin with non-zero sel(must be integer
bin number)
0      1      0      0             -1            10            -2            0 0 0 0 0.5 0
0             # AgeSel_1_P_6_(=0 if P3 is independent of P1, =1 if P3 is offset from
P1)
#
                    #_Male selectivity (if Do_male=1, they are offsets)
1      30     2      2             -1            5             -1            0 0   0 0
       0.5    0 0           #_Age at which dogleg occurs (integer at a bin bound -
DONOT estimate!)
-15    15     0      0             -1            5             4             0 0   0 0
       0.5    0 0           #_log(relative male sel) at age=0
-15    15     0      0             -1            5             4             0 0   0 0
       0.5    0 0           #_log(relative male sel) at dogleg
-15    15     0      0             -1            5             4             0 0   0 0
       0.5    0 0           #_log(relative male sel) at max age
#=============================================================# 1 WAFishery1

#-------------------------------------------------------------# 2 ORMWTraw
0      40     10     10            -1            10            1             0 0 0 0 0.5 0
0             # AgeSel_2_P_1_AgeSel_1_P_1_Ascending inflection age
0      10     5      5             -1            10            1             0 0 0 0 0.5 0
0             # AgeSel_2_P_2_AgeSel_1_P_2_Ascending slope
0      40     15     15            -1            10            3             0 0 0 0 0.5 0
0             # AgeSel_2_P_3_AgeSel_1_P_3_Descending inflection age
0      5      2      2             -1            10            3             0 0 0 0 0.5 0
0             # AgeSel_2_P_4_AgeSel_1_P_4_Descending slope
1      3      2      2             -1            10            -2            0 0 0 0 0.5 0
0             # AgeSel_2_P_5_AgeSel_1_P_5_Bin number for first bin with non-zero
sel(must be integer bin number)
0      1      0      0             -1            10            -2            0 0 0 0 0.5 0
0             # AgeSel_2_P_6_AgeSel_1_P_6_(=0 if P3 is independent of P1, =1 if P3 is
offset from P1)
#
                    #_Male selectivity (if Do_male=1, they are offsets)
1      30     2      2             -1            5             -1            0 0   0 0
       0.5    0 0           #_Age at which dogleg occurs (integer at a bin bound -
DONOT estimate!)
-15    15     0      0             -1            5             4             0 0   0 0
       0.5    0 0           #_log(relative male sel) at age=0
-15    15     0      0             -1            5             4             0 0   0 0
       0.5    0 0           #_log(relative male sel) at dogleg
-15    15     0      0             -1            5             4             0 0   0 0
       0.5    0 0           #_log(relative male sel) at max age
#=============================================================# 2 ORMWTraw

#-------------------------------------------------------------# 3 ORBTraw
```

```
0      40     10     10           -1           10           1            0 0 0 0 0.5 0
0            # AgeSel_3_P_1_AgeSel_1_P_1_Ascending inflection age
0      10     5      5            -1           10           1            0 0 0 0 0.5 0
0            # AgeSel_3_P_2_AgeSel_1_P_2_Ascending slope
0      40     15     15           -1           10           3            0 0 0 0 0.5 0
0            # AgeSel_3_P_3_AgeSel_1_P_3_Descending inflection age
0      5      2      2            -1           10           3            0 0 0 0 0.5 0
0            # AgeSel_3_P_4_AgeSel_1_P_4_Descending slope
1      3      2      2            -1           10           -2           0 0 0 0 0.5 0
0            # AgeSel_3_P_5_AgeSel_1_P_5_Bin number for first bin with non-zero
sel(must be integer bin number)
0      1      0      0            -1           10           -2           0 0 0 0 0.5 0
0            # AgeSel_3_P_6_AgeSel_1_P_6_(=0 if P3 is independent of P1, =1 if P3 is
offset from P1)
#
                    #_Male selectivity (if Do_male=1, they are offsets)
1      30     2      2            -1           5            -1           0 0    0 0
       0.5    0 0           #_Age at which dogleg occurs (integer at a bin bound -
DONOT estimate!)
-15    15     0      0            -1           5            4            0 0    0 0
       0.5    0 0           #_log(relative male sel) at age=0
-15    15     0      0            -1           5            4            0 0    0 0
       0.5    0 0           #_log(relative male sel) at dogleg
-15    15     0      0            -1           5            4            0 0    0 0
       0.5    0 0           #_log(relative male sel) at max age
#==============================================================# 3 ORBTraw

#--------------------------------------------------------------# 4 EMFishery
0      40     10     10           -1           10           1            0 0 0 0 0.5 0
0            # AgeSel_4_P_1_AgeSel_1_P_1_Ascending inflection age
0      10     5      5            -1           10           1            0 0 0 0 0.5 0
0            # AgeSel_4_P_2_AgeSel_1_P_2_Ascending slope
0      40     15     15           -1           10           3            0 0 0 0 0.5 0
0            # AgeSel_4_P_3_AgeSel_1_P_3_Descending inflection age
0.5    5      2      2            -1           10           3            0 0 0 0 0.5 0
0            # AgeSel_4_P_4_AgeSel_1_P_4_Descending slope
1      3      2      2            -1           10           -2           0 0 0 0 0.5 0
0            # AgeSel_4_P_5_AgeSel_1_P_5_Bin number for first bin with non-zero
sel(must be integer bin number)
0      1      0      0            -1           10           -2           0 0 0 0 0.5 0
0            # AgeSel_4_P_6_AgeSel_1_P_6_(=0 if P3 is independent of P1, =1 if P3 is
offset from P1)
#
                    #_Male selectivity (if Do_male=1, they are offsets)
1      30     2      2            -1           5            -1           0 0    0 0
       0.5    0 0           #_Age at which dogleg occurs (integer at a bin bound -
DONOT estimate!)
-15    15     0      0            -1           5            4            0 0    0 0
       0.5    0 0           #_log(relative male sel) at age=0
-15    15     0      0            -1           5            4            0 0    0 0
       0.5    0 0           #_log(relative male sel) at dogleg
-15    15     0      0            -1           5            4            0 0    0 0
       0.5    0 0           #_log(relative male sel) at max age
#==============================================================# 4 EMFishery

#--------------------------------------------------------------# 5 SCJuvSurvey
0      6      0      0            -1           10           -2           0 0 0 0 0.5 0
0            # AgeSel_5_P_1_
0      6      0      0            -1           10           -2           0 0 0 0 0.5 0
0            # AgeSel_5_P_2_
#==============================================================# 5 SCJuvSurvey

# 0 #_custom_sel-env_setup (0/1)
```

```
# -2 2 0 0 -1 99 -2 #_placeholder when no enviro fxns

# 0 #_custom_sel-blk_setup (0/1)
# -2 2 0 0 -1 99 -2 #_placeholder when no block usage
# -2 2 0 0 -1 99 -2 #_placeholder when no selex devs
# -4 # placeholder for selparm_Dev_Phase
# 1 #_env/block/dev_adjust_method (1=standard; 2=logistic trans to keep in base parm
bounds)

# Tag loss and Tag reporting parameters go next
0  # TG_custom:  0=no read; 1=read if tags exist
# -6 6 1 1 2 0.01 -4 0 0 0 0 0 0 0  #_placeholder if no parameters

1             #_Variance_adjustments_to_input_values

#_1 2 3 4 5 6 7 8 9 10 11 12 13

#0 0 0 0 0 0 0 0 0 0 0 0 0 #_add_to_survey_CV
#0 0 0 0 0  0.24402 0.326978     0.585253     0.663288     0.253102     -0.156397
       -0.45105     -0.120197
0 0    0 0    0  0.256812  0.290071     0.603116     0.699583     0.247671     -
0.151165     -0.44092     -0.110509


  0 0 0 0 0 0 0 0 0 0 0 0 0 0      #_add_to_discard_CV
  0 0 0 0 0 0 0 0 0 0 0 0 0 0      #_add_to_bodywt_CV

#  1 1 1 1 1 1 1 1 1 1 1 1 1     #_mult_by_lencomp_N
#  1 1 1 1 1 1 0.6741 1 1 1 0.8382 0.9224 0.5033           #_mult_by_lencomp_N
#  1 1 1 1 1 1 0.6821 1 1 1 0.8281  0.9146  0.4840          #_mult_by_lencomp_N
   1 1 1 1 1 1 0.1705 1 1 1 0.08281 0.09146 0.1210          #_mult_by_lencomp_N

#  1 1 1 1 1 1 1 1 1 1 1 1 1     #_mult_by_agecomp_N
#  0.8580 0.71495 1.0113 0.8418 1 1 1 1 1 1 1.1596 1.4002 1 #_mult_by_agecomp_N
#  0.8900 0.7396 1.0920 0.8265 1 1 1 1 1 1 1.1690 1.4049 1  #_mult_by_agecomp_N
   0.3560 0.1627 0.2184 0.3306 1 1 1 1 1 1 0.2338 0.2809 1  #_mult_by_agecomp_N

  1 1 1 1 1 1 1 1 1 1 1 1 1 1      #_mult_by_size-at-age_N

30            #_DF_for_discard_like
30            #_DF_for_meanbodywt_like

1             #_maxlambdaphase
1             #_sd_offset

4             # number of changes to make to default Lambdas (default value is 1.0)
# Like_comp codes:  1=surv; 2=disc; 3=mnwt; 4=length; 5=age; 6=WtFreq; 7=sizeage;
8=catch;
# 9=init_equ_catch; 10=recrdev; 11=parm_prior; 12=parm_dev; 13=CrashPen; 14=Morphcomp;
15=Tag-comp; 16=Tag-negbin
#like_comp fleet/survey  phase  value  wtfreq_method
4 11 1 0.5 1  #_NWFSC survey length comps
4 12 1 0.5 1  #_NWFSC survey length comps
5 11 1 0.5 1  #_NWFSC survey age comps
5 12 1 0.5 1  #_NWFSC survey age comps

# lambdas (for info only; columns are phases)
#  0 #_CPUE/survey:_1
#  0 #_CPUE/survey:_2
#  0 #_CPUE/survey:_3
#  0 #_CPUE/survey:_4
#  0.5 #_CPUE/survey:_5
#  1 #_CPUE/survey:_6
```

```
#  1 #_CPUE/survey:_7
#  1 #_CPUE/survey:_8
#  1 #_CPUE/survey:_9
#  1 #_CPUE/survey:_10
#  1 #_agecomp:_1
#  1 #_agecomp:_2
#  1 #_agecomp:_3
#  1 #_agecomp:_4
#  0 #_agecomp:_5
#  0 #_agecomp:_6
#  0 #_agecomp:_7
#  0 #_agecomp:_8
#  0 #_agecomp:_9
#  0 #_agecomp:_10
#  0 #_init_equ_catch
#  0.5 #_recruitments
#  0 #_parameter-priors
#  0 #_parameter-dev-vectors
#  100 #_crashPenLambda
0
999
```

19 Appendix H. Input SS3 data file (wdw1.dat) for widow rockfish stock assessment base model.

```
#C 2009_Widow_rockfish_ stockassessment__Xi_He__NMFS_SWFSC__Santa_Cruz_CA
#_SS-V3.03a-opt;_05/11/09;_Stock_Synthesis_by_Richard_Methot_(NOAA);_using_ADMB_7.0.1
#C 2009_Widow_rockfish_ stockassessment__Xi_He__NMFS_SWFSC__Santa_Cruz_CA
#_SS-V3.03a-opt;_05/11/09;_Stock_Synthesis_by_Richard_Methot_(NOAA);_using_ADMB_7.0.1

1916   #_styr
2008   #_endyr
1            #_nseas
12           #_months/season
1            #_spawn_seas
4            #_Nfleet
9            #_Nsurveys
2            #_N_areas

#_SCJuvSurvey: assigned to area 1 or 2?
WAFishery1%ORMWTraw%ORBTraw%EMFishery%SCJuvSurvey%ORBTrawCPUE%TriAnSurveyN%ForWBycatch
%JVWBycatch%DomWBycatch%NWFSCSvyN%NWFSCSvyS%TriAnSurveyS

#WA    ORMWT  ORBT   EM     SJSurv ORBTCPUE     TriAnsurv     ForBy  JVBy   DomBy
       NWFSCSvyN     NWFSCSvyS     TriAnSurveyS
0.5    0.5           0.5           0.5    0.5          0.5                 0.5
       0.5           0.5           0.5          0.5                 0.5
       0.5           #_surveytiming_in_season
1      1             1             2      2            1                   1
       1             1             1            1                   2
       2             #_area_assignments_for_each_fishery_and_survey

#_Fishery information (4 Fisheries)
#      WA            ORMWT  ORBT   EM
       1             1             1            1            #_units of catch:  1=bio;
2=num
       0.05   0.05   0.05   0.05   #_stderr of log(catch)

2                    #_Ngenders
30                   #_Nages
0 0 0 0              #_init_equil_catch_for_each_fishery

93                   #_N_lines_of_catch_to_read

# Note: Number F_Rate parameters estimated = number of yearly non-zero catches
#_catch_biomass(mt):_columns_are_fisheries,year,season
#  Fish1   Fish2   Fish3   Fish4    Year  Season
       0.0       0.0       0.0      82.7    1916  1
       0.0       0.0       0.0     128.8    1917  1
       0.0       0.0       0.0     148.1    1918  1
       0.0       0.0       0.0     102.1    1919  1
       0.0       0.0       0.0     104.5    1920  1
       0.0       0.0       0.0      86.6    1921  1
       0.0       0.0       0.0      75.1    1922  1
       0.0       0.0       0.0      82.5    1923  1
       0.0       0.0       0.0      52.8    1924  1
       0.0       0.0       0.0      65.5    1925  1
       0.0       0.0       0.0      99.9    1926  1
       0.0       0.0       0.0      82.8    1927  1
       0.0       0.0       0.0      95.0    1928  1
       0.0       0.0       0.0      92.6    1929  1
       0.0       0.0       0.0     120.2    1930  1
       0.0       0.0       0.0     108.1    1931  1
```

0.0	0.0	0.0	109.3	1932	1
0.0	0.0	0.0	95.0	1933	1
0.0	0.0	0.0	101.3	1934	1
0.0	0.0	0.0	108.9	1935	1
0.0	0.0	0.0	121.2	1936	1
0.0	0.0	0.0	114.3	1937	1
0.0	0.0	1.8	94.9	1938	1
0.0	0.0	1.8	84.5	1939	1
0.0	0.0	8.9	89.2	1940	1
0.0	0.0	16.3	71.9	1941	1
0.0	0.0	29.5	21.6	1942	1
0.0	0.0	99.4	54.0	1943	1
0.0	0.0	170.4	201.7	1944	1
0.0	0.0	270.6	450.8	1945	1
0.0	0.0	152.0	457.4	1946	1
0.0	0.0	85.6	208.6	1947	1
0.0	0.0	61.6	205.2	1948	1
0.0	0.0	57.3	145.9	1949	1
0.0	0.0	69.9	166.8	1950	1
0.0	0.0	47.8	343.7	1951	1
0.0	0.0	53.1	317.5	1952	1
0.0	0.0	39.3	293.4	1953	1
0.0	0.0	47.0	216.4	1954	1
0.0	0.0	48.0	232.4	1955	1
0.0	0.0	136.0	294.8	1956	1
0.0	0.0	129.9	324.2	1957	1
0.0	0.0	135.5	393.9	1958	1
0.0	0.0	103.9	319.7	1959	1
0.0	0.0	138.2	249.1	1960	1
0.0	0.0	152.2	171.0	1961	1
0.0	0.0	191.4	175.4	1962	1
0.0	0.0	149.5	288.6	1963	1
0.0	0.0	355.1	154.9	1964	1
0.0	0.0	36.0	230.1	1965	1
3670.0	0.0	391.1	317.9	1966	1
3900.0	0.0	704.9	495.0	1967	1
1693.0	0.0	168.5	585.5	1968	1
356.0	0.0	114.5	79.6	1969	1
554.0	0.0	0.0	74.8	1970	1
701.0	0.0	22.3	61.8	1971	1
410.0	0.0	25.4	88.6	1972	1
621.2	0.0	13.8	314.4	1973	1
294.6	0.0	5.3	393.5	1974	1
465.3	0.0	9.5	482.9	1975	1
970.6	0.0	65.0	555.1	1976	1
1397.1	0.0	367.3	1046.6	1977	1
641.3	0.0	657.2	632.7	1978	1
1024.0	0.0	646.0	1938.4	1979	1
17161.4	0.0	1502.0	4505.0	1980	1
7288.5	14389.8	1408.2	5591.9	1981	1
6353.9	8452.9	885.3	12106.6	1982	1
3738.6	1684.3	1725.6	5147.7	1983	1
1685.6	4138.4	1547.6	4449.7	1984	1
1786.0	3694.6	1010.2	4271.8	1985	1
2969.0	3453.2	1358.0	3378.8	1986	1
4317.9	5783.6	1352.8	3601.2	1987	1
3572.0	4757.8	1300.3	2580.6	1988	1
3919.5	5634.0	2289.4	2707.3	1989	1
2599.1	3728.1	2513.8	3099.1	1990	1
1474.4	2267.4	2245.0	1670.2	1991	1
1378.0	1401.4	3052.8	1536.1	1992	1
2089.1	2122.7	3928.0	1566.5	1993	1
1421.3	2060.0	2763.7	1456.4	1994	1

```
    1376.0    1697.8    2662.7    2240.0    1995  1
    1274.1    1757.3    2478.7    1794.6    1996  1
    1288.9    1864.7    2603.8    1999.4    1997  1
     751.0    1044.7    1542.5    1527.3    1998  1
     776.7    2016.1     923.1    1052.5    1999  1
     639.4    2665.1      17.8    1341.3    2000  1
     424.0    1219.8      45.1     590.1    2001  1

64.8   309.6  6.8           50.4   2002 1
14.4   22.1   1.7           4.8           2003 1
31.6   33.5   10.1   25.5   2004 1
42.8   139.1  5.6           11.9   2005 1
44.9   154.6  3.0           12.6   2006 1
37.1   192.3  9.7           19.4   2007 1

      96.5     106.4       1.6      38.3    2008  1

#      PacFin data replaced by Jim Hastis (John DeVore) data 7-16-2009 from 2002 to
2007 (no discard rates applied)
#      97.2     312.8       6.5      61.9    2002  1
#      20.8      21.2       0.3       7.3    2003  1
#      37.6      34.0       2.8      46.9    2004  1
#      81.0     118.0       0.7      13.4    2005  1
#      68.7     141.0       2.3      19.5    2006  1
#     109.4     121.3       1.8      20.2    2007  1
#      96.5     106.4       1.6      38.3    2008  1

80 #_N_cpue_and_surveyabundance_observations
#_NO BLANK LINE ALLOWED IN cpue DATA and DO NOT delete this line
#_year seas index obs se(log)
 2001 1  5    3.7900    0.6000
 2002 1  5   10.0700    0.6000
 2003 1  5    4.5700    0.6000
 2004 1  5    8.4300    0.6000
 2005 1  5    3.5200    0.6000
 2006 1  5    1.6300    0.6000
 2007 1  5    1.6900    0.6000
 2008 1  5    3.0900    0.6000

 1984 1  6  331.4700    0.2121
 1985 1  6  100.8800    0.1875
 1986 1  6  227.0800    0.2928
 1987 1  6  169.0800    0.2730
 1988 1  6   93.9700    0.2897
 1989 1  6  164.1000    0.1749
 1990 1  6   78.4900    0.1348
 1991 1  6   73.5900    0.1275
 1992 1  6   83.1600    0.1179
 1993 1  6   53.5800    0.1314
 1994 1  6  100.3400    0.1128
 1995 1  6  109.9600    0.1387
 1996 1  6   94.8100    0.1357
 1997 1  6   97.2300    0.1502
 1998 1  6   56.5600    0.1718
 1999 1  6   84.4600    0.1684

 1980 1  7 222.72125       0.57279
 1983 1  7 292.85691       0.43993
 1986 1  7 110.74147       0.49796
 1989 1  7 136.85329       0.64833
 1992 1  7 235.95895       0.48000
 1995 1  7 56.64875        1.03495
 1998 1  7 500.26525       0.42801
```

```
 2001 1  7 57.21004        0.92661
 2004 1  7 14.18196        0.77262

 1977 1  8    0.7700    0.1153
 1978 1  8    1.2050    0.1118
 1979 1  8    0.7030    0.1186
 1980 1  8    1.9930    0.1311
 1981 1  8    0.7280    0.1257
 1982 1  8    0.2430    0.2467
 1984 1  8    2.9370    0.1254
 1985 1  8    0.4070    0.1074
 1986 1  8    1.1110    0.1027
 1987 1  8    0.3900    0.0881
 1988 1  8    0.5130    0.1243

 1983 1  9    2.8890    0.1202
 1985 1  9    0.7760    0.1165
 1986 1  9    0.8230    0.0809
 1987 1  9    0.3200    0.0875
 1988 1  9    0.6590    0.0774
 1989 1  9    0.8240    0.0635
 1990 1  9    0.7100    0.0740

 1991 1 10    1.2640    0.1251
 1992 1 10    0.7810    0.1251
 1993 1 10    0.8010    0.1038
 1994 1 10    1.4650    0.0685
 1995 1 10    0.4550    0.1057
 1996 1 10    1.0180    0.0824
 1997 1 10    0.8860    0.0767
 1998 1 10    1.3300    0.0786

 2003 1 11 793.62277       0.90865
 2004 1 11 55.06312        1.68436
 2005 1 11 118.20781       1.03570
 2006 1 11 135.25025       0.79912
 2007 1 11 159.54437       0.71148
 2008 1 11 82.10579        0.99182

 2003 1 12 193.38997       0.67226
 2004 1 12 186.39198       1.47981
 2005 1 12 203.55717       0.63651
 2006 1 12 243.38742       0.54841
 2007 1 12 314.77433       0.64160
 2008 1 12 113.03983       0.69314

 1980 1 13 208.70591       0.73604
 1983 1 13 333.99521       0.74636
 1986 1 13 433.38732       1.27783
 1989 1 13 154.39509       0.81778
 1992 1 13 104.63796       0.63924
 1995 1 13 198.83814       0.73597
 1998 1 13 221.24944       0.66769
 2001 1 13 27.11028        0.89781
 2004 1 13 204.42516       1.02858

1      #_discard_type
0      #_N_discard_obs

0      #_N_meanbodywt_obs

1      # length bin method: 1=use databins; 2=generate from width, min,max below;
3=read nbins, then vector
```

```
# 2    # length bin method: 1=use databins; 2=generate from width, min,max below;
3=read nbins, then vector
# 1 6 52
# no additional lines to read

-1     #_comp_tail_compression
0.0000001    #_add_to_comp
0      #_combine males into females at or below this bin number

#43    #_N_LengthBins
#12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39
40 41 42 43 44 45 46 47 48 49 50 51 52 53 54


23     #_N_LengthBins
10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54

29     #_N_Length_obs

#Note: Nsamp = effective N from earlier outputs
#year sea  Flt Gend Part Nsamp   12 to 54cm
#2003   1   11   3   0  16.8   0   0   0   0   0   0   0   0   0   0   0
0   0   0   0   0   0   0   0   0   0   1   0   1   1   2   3   7   7
10   13   9   3   2   1   1   2   2   0   0   0   0   0   0   0   0
0   0   0   0   0   0   0   0   0   1   0   0   0   0   0   0   0   1
0   0   0   7   5   5   6   11   3   3   0   0   1   2   0   0   0   0
0   0   0   0
#2004   1   11   3   0  6.4   0   0   0   0   0   0   0   0   0   0   0
0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   1   0   1
0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
0   0   0   0   2   1   1   1   0   0   1   0   0   0   0   0   0   0
0   0   0
#2005   1   11   3   0  13.1   0   0   0   0   0   0   0   0   0   0   0
0   0   0   0   0   0   0   0   0   0   0   0   0   0   1   0   0   0
0   1   3   2   0   4   4   0   3   1   2   0   0   0   0   0   0   0
0   0   0   0   0   0   0   0   0   0   0   0   0   1   0   0   0   0
0   0   0   2   0   1   0   0   1   1   2   4   2   0   0   0   0   0
0   0   0
#2006   1   11   3   0  15.3   0   0   0   0   0   0   0   0   0   0   0
0   0   0   0   0   0   1   5   2   6   10   6   6   1   1   0   0   1
1   1   0   1   2   1   0   2   1   0   0   0   0   0   0   0   0   0
0   0   0   0   0   0   0   0   0   0   0   0   0   1   6   7   9   5
10   2   2   0   1   0   0   1   0   1   2   0   0   1   1   0   0
0   1   0   0
#2007   1   11   3   0  18.7   0   0   0   0   0   0   0   0   0   0   0
0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   2   1   1
2   1   3   2   2   3   0   3   2   0   0   0   0   0   0   0   0   0
0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
0   0   0   1   1   6   6   2   1   2   3   1   1   0   0   0   0   0
0   0   0
#2008   1   11   3   0  6.2   0   0   0   0   0   0   0   0   0   0   0
0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
0   0   1   0   0   1   1   0   0   0   0   0   0   0   0   0   0   0
0   0   0   0   0   0   0   0   0   0   0   0   0   1   0   0   0   0
0   0   0   0   0   0   0   1   0   0   1   2   0   2   0   0   0   0
0   0   0
#2003   1   12   3   0  20.4   0   0   0   0   0   0   0   1   0   0   0
0   0   3   3   1   1   1   2   1   2   0   1   0   1   0   0   0   1
1   2   3   1   5   3   0   6   3   2   1   0   0   0   0   0   1   0
0   0   1   1   0   1   3   1   0   0   0   0   1   0   2   2   0   2
```

```
0 0 2 1 1 2 3 6 6 11 5 4 0 1 0 0 0 0
0 0 0
#2004 1 12 3 0 13.8 0 0 1 5 2 3 18 16 7 2 0
0 0 2 3 1 4 3 5 7 5 5 6 3 2 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3
3 5 12 13 4 1 1 0 0 1 0 3 1 4 1 6 3 5
1 2 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0
#2005 1 12 3 0 14.9 0 0 0 0 0 0 0 0 4 2 6
7 11 6 13 3 4 3 0 0 1 1 0 1 1 0 0 0 2
2 0 1 0 2 0 1 2 2 0 3 0 0 0 0 0 0 0
0 0 0 0 1 1 6 13 11 10 9 7 2 0 0 1 1 0
1 1 2 3 2 2 1 2 3 1 2 1 0 0 0 0 0 0
0 0 0
#2006 1 12 3 0 18.0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 1 2 2
0 2 3 2 1 1 4 4 4 4 6 0 0 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
1 2 0 3 2 3 4 4 7 1 4 2 0 0 0 0 0 0
0 0 0
#2007 1 12 3 0 13.4 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 1
4 4 3 4 2 0 0 1 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 0 2 3 4 4 3 1 2 3 0 0 0 0
0 0 0
#2008 1 12 3 0 18.6 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0
0 1 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 1
0 0 0 1 0 0 1 1 1 1 0 1 1 0 0 0 0 0
0 0 0

#New length comp groups: grouped by 2cm interval and length range 10 -54cm
#Year Seas Flt Gend Part NSmp 10 12 14 16
18 20 22 24 26 28 30 32 34 36 38
40 42 44 46 48 50 52 54 10 12
14 16 18 20 22 24 26 28 30 32 34
36 38 40 42 44 46 48 50 52 54
 1980 1 7 3 0 33.5 0 0 0 0
0 0 0 0 0 0 0 0 0 4 13
36 14 9 6 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 0 2
2 11 23 23 7 5 4 5 0
 1983 1 7 3 0 73.3 0 0 0 0
0 0 0 0 0 0 0 0 1 3 14
27 58 46 16 3 1 0 0 0 0 0
0 0 0 0 0 0 0 0 1 3 4
7 10 9 11 11 12 6 9 11
 1986 1 7 3 0 45.2 0 0 0 0
0 0 1 1 0 1 12 5 3 2 3
6 16 14 3 0 0 0 0 0 0 0
0 0 0 0 1 1 2 3 10 10 2
4 2 5 4 7 15 14 7 3
 1989 1 7 3 0 33.2 0 0 0 0
0 0 0 0 1 1 1 2 17 13 35
23 11 4 2 0 0 0 0 0 0 0
0 0 0 0 0 1 1 2 4 16 14
20 18 19 10 2 11 9 9 0
 1992 1 7 3 0 36.6 0 0 0 0
0 0 1 0 0 0 0 1 7 5 7
16 6 3 2 0 0 0 0 0 0 0
```

0	0	0	0	1	2	0	0	0	3	5
14	13	17	7	6	7	11	3	2		
	1995	1	7	3	0	34.4	0	0	0	0
0	0	0	0	0	0	0	0	2	7	17
32	31	35	18	3	3	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	0
4	6	9	13	15	27	14	9	7		
	1998	1	7	3	0	71.0	0	0	0	0
0	3	0	1	0	1	0	3	6	17	34
28	39	42	17	9	3	0	0	0	0	0
1	0	1	0	0	0	0	0	0	4	9
8	31	26	18	31	35	37	20	4		
	2001	1	7	3	0	16.9	0	0	0	0
0	0	0	0	0	0	0	0	1	2	4
0	6	3	1	2	1	0	1	0	0	0
0	0	1	0	0	0	0	0	0	1	0
3	1	5	3	3	1	4	2	1		
	2004	1	7	3	0	16.0	0	0	0	0
0	0	0	1	0	1	0	0	0	1	0
0	1	3	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	2	0	1	2	1	1	2		
	2003	1	11	3	0	23.2	0	0	0	0
0	0	0	0	0	0	0	0	1	2	5
14	23	12	3	3	2	0	0	0	0	0
0	0	0	0	1	0	0	0	1	0	7
10	17	6	0	3	0	0	0	0		
	2004	1	11	3	0	6.1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1
1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
2	2	1	1	0	0	0	0	0		
	2005	1	11	3	0	12.8	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1
0	1	5	4	4	4	2	0	0	0	0
0	0	0	0	0	0	0	1	0	0	0
2	1	1	3	6	0	0	0	0		
	2006	1	11	3	0	25.5	0	0	0	0
0	0	0	0	0	0	6	8	16	7	1
1	2	1	3	2	1	0	0	0	0	0
0	0	0	0	0	0	0	7	16	15	4
1	0	1	3	0	2	0	1	0		
	2007	1	11	3	0	20.3	0	0	0	0
0	0	0	0	0	0	0	0	0	0	2
2	3	5	5	3	2	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
2	12	3	5	2	0	0	0	0		
	2008	1	11	3	0	9.4	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	1	1	1	0	0	0	0	0	0
0	0	0	0	0	0	0	1	0	0	0
0	0	1	1	2	2	0	0	0		
	2003	1	12	3	0	26.1	0	0	0	0
0	1	0	0	6	2	3	3	1	1	0
1	3	4	8	6	5	1	0	0	0	1
0	1	1	4	1	0	1	2	2	2	2
2	5	12	16	4	1	0	0	0		
	2004	1	12	3	0	31.7	0	0	1	7
21	23	2	0	5	5	8	12	11	5	1
0	0	0	0	0	0	0	0	0	0	1

6	17	17	2	0	1	4	5	9	6	2
0	1	0	0	0	0	0	0	0		
	2005	1	12	3	0	37.2	0	0	0	0
0	4	8	18	19	7	3	1	1	2	0
2	2	1	2	3	2	3	0	0	0	0
0	0	1	7	24	19	9	0	2	1	3
5	3	5	3	1	0	0	0	0		
	2006	1	12	3	0	24.2	0	0	0	0
0	0	0	0	0	0	0	0	0	1	3
4	2	5	2	8	8	6	0	0	0	0
0	1	0	0	0	0	0	1	0	1	2
5	7	11	5	2	0	0	0	0		
	2007	1	12	3	0	19.2	0	0	0	0
0	0	0	0	0	0	0	0	1	0	0
2	8	7	2	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
1	2	7	7	3	3	0	0	0		
	2008	1	12	3	0	11.2	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1
1	1	1	2	0	0	0	0	0	0	0
0	0	0	0	0	1	1	0	0	1	0
1	1	2	1	2	0	0	0	0		

	1983	1	13	3	0	38.1	0	0	0	0
2	1	10	9	13	11	11	5	13	9	4
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	0	2	3	11	9
8	0	0	0	0	0	0	0	0		
	1986	1	13	3	0	21.3	0	0	0	0
0	0	0	0	0	0	0	0	1	4	10
30	26	10	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	1	1
4	13	21	16	14	4	3	0	0		
	1989	1	13	3	0	49.7	0	0	0	1
3	7	12	5	5	13	36	44	35	13	5
9	6	4	1	2	0	0	0	0	0	0
0	1	14	16	2	7	20	32	57	80	17
4	6	4	1	3	0	0	2	0		
	1992	1	13	3	0	65.8	0	0	0	0
3	1	2	2	7	23	37	75	54	42	22
9	2	1	1	0	0	0	0	0	0	0
2	2	1	2	1	7	23	22	64	70	32
16	27	19	3	1	1	0	0	0		
	1995	1	13	3	0	49.2	0	0	0	0
1	2	3	2	2	5	21	19	8	1	9
24	15	18	7	1	1	0	0	0	0	0
0	0	0	1	0	2	5	28	20	6	1
3	6	7	7	0	6	5	1	1		
	1998	1	13	3	0	60.8	0	0	0	0
1	1	0	0	0	4	1	5	7	21	66
72	41	19	4	2	1	0	0	0	0	0
0	0	0	0	0	0	0	2	2	7	9
24	33	42	63	27	23	6	1	0		
	2001	1	13	3	0	23.0	0	0	0	0
15	12	6	7	5	1	0	0	0	0	1
2	4	4	1	0	0	0	0	0	0	0
3	9	16	3	3	0	1	0	0	0	0
0	0	0	0	1	2	1	1	0		
	2004	1	13	3	0	37.0	0	0	0	0
0	0	0	0	0	0	1	3	6	16	18
15	27	25	5	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	3	5	11
11	8	8	13	9	8	4	2	0		

```
30     #_N_age_bins
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

1      #_N_ageerror_definitions
  0.5     1.5     2.5     3.5     4.5     5.5     6.5     7.5     8.5     9.5    10.5
11.5    12.5    13.5    14.5    15.5    16.5    17.5    18.5    19.5    20.5    21.5
22.5    23.5    24.5    25.5    26.5    27.5    28.5    29.5    30.5
0.515   0.519   0.523   0.527   0.531  0.5359  0.5408  0.5457  0.5506  0.5555  0.5604
0.5653  0.5702  0.5751    0.58  0.5849  0.5898  0.5947  0.5996  0.6045 0.61055  0.6166
0.62265  0.6287 0.63475  0.6408 0.64685  0.6529 0.65895   0.665   0.665


# 0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5 13.5 14.5 15.5 16.5 17.5 18.5
19.5 20.5 21.5 22.5 23.25 24.5 25.5 26.5 27.5 28.5 29.5 30.5
# 0.518       0.518  0.518  0.518  0.523  0.527  0.532  0.536  0.541  0.545  0.550  0.555
       0.560  0.565  0.570  0.575  0.580  0.585  0.590  0.595  0.600 0.600 0.600 0.600
0.600 0.600 0.600 0.600 0.600 0.600 0.600

# 0.518       0.518  0.518  0.518  0.523  0.527  0.532  0.536  0.541  0.545  0.550  0.555
       0.560  0.565  0.570  0.575  0.580  0.585  0.590  0.595  0.600
# 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35
0.35 0.35 0.35 0.35
# 0.55 0.55 0.55 0.55 0.55 0.55 0.55 0.55 0.55 0.55 0.55 0.55 0.55 0.55 0.55 0.55 0.55
0.55 0.55 0.55 0.55
# 1e-006 1e-006 1e-006 1e-006 1e-006 1e-006 1e-006 1e-006 1e-006 1e-006 1e-006 1e-006
1e-006 1e-006 1e-006 1e-006 1e-006 1e-006 1e-006 1e-006 1e-006
# 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
0.05 0.05 0.05 0.05

110    #_N_Agecomp_obs
2      #_Lbin_method: 1=poplenbins; 2=datalenbins; 3=lengths
0      #_combine males into females at or below this bin number

#_NO BLANK LINE ALLOWED IN AGE COMP DATA and DO NOT delete this line
#Yr Seas Flt/Svy Gend Part Agerr Lbin_lo Lbin_hi Nsamp datavector(female-male)
1980    1    1    3    0    1   -1   -1  127.1      0.00000   0.00000   0.00000
0.00000   0.00915   0.01848   0.01356   0.02572   0.08794   0.14181   0.08461
0.06275   0.03471   0.01774   0.02125   0.01851   0.00527   0.00702   0.00644
0.00585   0.00234   0.00253   0.00117   0.00019   0.00059   0.00000   0.00000
0.00059   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00936
0.02151   0.02034   0.05554   0.09555   0.11058   0.04602   0.02920   0.01189
0.01306   0.00585   0.00410   0.00234   0.00234   0.00117   0.00117   0.00176
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000
1981    1    1    3    0    1   -1   -1  218.9      0.00000   0.00000   0.00000
0.00749   0.01721   0.04658   0.04392   0.02038   0.02043   0.06235   0.07845
0.07129   0.03738   0.02832   0.01854   0.01016   0.00539   0.00578   0.00517
0.00489   0.00272   0.00472   0.00367   0.00339   0.00234   0.00083   0.00272
0.00067   0.00033   0.00100   0.00000   0.00000   0.00044   0.00661   0.02443
0.06374   0.04552   0.02404   0.04774   0.08777   0.06757   0.04708   0.02576
0.01710   0.01166   0.00533   0.00428   0.00339   0.00289   0.00211   0.00200
0.00033   0.00100   0.00145   0.00050   0.00061   0.00000   0.00000   0.00000
0.00050
1982    1    1    3    0    1   -1   -1  282.4      0.00000   0.00000   0.00031
0.00756   0.01837   0.05959   0.02884   0.04157   0.01882   0.01498   0.01468
0.04925   0.03998   0.04034   0.03274   0.03228   0.01656   0.01511   0.00593
0.01120   0.00511   0.00218   0.00349   0.00291   0.00255   0.00130   0.00016
0.00187   0.00084   0.00548   0.00000   0.00000   0.00016   0.00849   0.03050
0.08438   0.03069   0.04496   0.02057   0.02149   0.03265   0.07169   0.04494
0.03431   0.03486   0.02110   0.01407   0.00881   0.00547   0.00526   0.00302
0.00146   0.00255   0.00042   0.00084   0.00167   0.00042   0.00042   0.00042
0.00042
```

```
1983    1    1    3    0    1   -1   -1  176.5     0.00000   0.00000   0.00000
0.00557   0.15331   0.11397   0.04033   0.02055   0.00918   0.01352   0.01333
0.01629   0.02928   0.02280   0.02159   0.01315   0.01031   0.00688   0.00452
0.00639   0.00254   0.00361   0.00483   0.00380   0.00072   0.00163   0.00030
0.00193   0.00103   0.00103   0.00000   0.00000   0.00000   0.00757   0.15372
0.11349   0.02842   0.01747   0.01426   0.01310   0.01359   0.01836   0.02014
0.01478   0.01532   0.00881   0.00634   0.00669   0.00567   0.00361   0.00434
0.00434   0.00163   0.00247   0.00030   0.00030   0.00145   0.00000   0.00072
0.00072
1984    1    1    3    0    1   -1   -1  155.3      0.00000   0.00000   0.00106
0.00194   0.04400   0.15202   0.07538   0.02555   0.01816   0.00527   0.00650
0.00701   0.01138   0.01683   0.02513   0.02372   0.02010   0.01089   0.01354
0.01005   0.00742   0.00864   0.00901   0.00601   0.00850   0.00582   0.00707
0.00372   0.00282   0.01236   0.00000   0.00000   0.00000   0.00335   0.05370
0.16103   0.08334   0.03342   0.01385   0.00439   0.00560   0.00680   0.00752
0.01293   0.01279   0.01068   0.00680   0.00768   0.00768   0.00682   0.00474
0.00280   0.00386   0.00157   0.00104   0.00104   0.00317   0.00104   0.00000
0.00247
1985    1    1    3    0    1   -1   -1  113.0      0.00000   0.00000   0.00000
0.00830   0.07081   0.08146   0.11726   0.05756   0.02751   0.00857   0.00695
0.00532   0.00753   0.00546   0.01239   0.00959   0.01092   0.00722   0.00753
0.00796   0.00826   0.00988   0.00957   0.00884   0.00796   0.00589   0.00487
0.00589   0.00929   0.02093   0.00000   0.00000   0.00000   0.00830   0.07482
0.08042   0.12478   0.06645   0.02161   0.00947   0.00356   0.00591   0.00532
0.00605   0.00546   0.00266   0.00591   0.00472   0.00251   0.00325   0.00280
0.00384   0.00207   0.00207   0.00207   0.00295   0.00192   0.00133   0.00192
0.00413
1986    1    1    3    0    1   -1   -1  190.6     0.00000   0.00000   0.00000
0.00202   0.05331   0.17762   0.09124   0.06975   0.02015   0.01325   0.00395
0.00697   0.00765   0.00614   0.00888   0.00840   0.00772   0.00916   0.00350
0.00484   0.00494   0.00484   0.00322   0.00322   0.00449   0.00322   0.00161
0.00137   0.00247   0.02643   0.00000   0.00000   0.00000   0.00700   0.06018
0.17364   0.07517   0.04895   0.01438   0.00597   0.00529   0.00522   0.00346
0.00312   0.00463   0.00607   0.00322   0.00230   0.00154   0.00230   0.00161
0.00230   0.00171   0.00230   0.00213   0.00171   0.00189   0.00069   0.00086
0.01200
1987    1    1    3    0    1   -1   -1  254.2     0.00000   0.00000   0.00015
0.00447   0.01390   0.09509   0.22405   0.05680   0.03697   0.02557   0.00942
0.00674   0.00375   0.00196   0.00706   0.00754   0.00483   0.00752   0.00422
0.00527   0.00333   0.00407   0.00436   0.00272   0.00091   0.00183   0.00122
0.00196   0.00076   0.00894   0.00000   0.00000   0.00000   0.00626   0.02405
0.12001   0.19421   0.04619   0.01287   0.00853   0.00284   0.00419   0.00554
0.00421   0.00301   0.00405   0.00375   0.00211   0.00150   0.00314   0.00030
0.00061   0.00015   0.00194   0.00015   0.00046   0.00030   0.00105   0.00015
0.00299
1988    1    1    3    0    1   -1   -1  141.2     0.00000   0.00000   0.00000
0.00245   0.00735   0.05615   0.15087   0.20625   0.03527   0.01727   0.01207
0.00820   0.00296   0.00034   0.00262   0.00052   0.00034   0.00086   0.00017
0.00052   0.00017   0.00069   0.00000   0.00034   0.00052   0.00262   0.00103
0.00052   0.00034   0.00069   0.00000   0.00000   0.00000   0.00000   0.01486
0.06014   0.13687   0.19886   0.03497   0.01327   0.00455   0.00245   0.00086
0.00262   0.00314   0.00086   0.00017   0.00052   0.00069   0.00262   0.00279
0.00052   0.00052   0.00245   0.00017   0.00052   0.00000   0.00103   0.00052
0.00292
1989    1    1    3    0    1   -1   -1  211.8     0.00000   0.00000   0.00000
0.00256   0.00710   0.07590   0.09290   0.18362   0.10439   0.00897   0.00979
0.00582   0.00070   0.00105   0.00105   0.00151   0.00000   0.00093   0.00361
0.00128   0.00023   0.00151   0.00070   0.00023   0.00326   0.00198   0.00128
0.00151   0.00000   0.00802   0.00000   0.00000   0.00000   0.00256   0.01760
0.09336   0.09497   0.15702   0.08737   0.00920   0.00372   0.00116   0.00000
0.00128   0.00023   0.00093   0.00023   0.00046   0.00151   0.00093   0.00070
0.00000   0.00244   0.00093   0.00046   0.00023   0.00023   0.00046   0.00070
0.00139
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1990    1    1    3    0    1   -1   -1  289.5     0.00000   0.00000   0.00000
0.00144   0.02760   0.06205   0.11559   0.07780   0.11935   0.05906   0.01220
0.00551   0.00252   0.00293   0.00046   0.00103   0.00247   0.00098   0.00093
0.00407   0.00098   0.00051   0.00149   0.00149   0.00154   0.00051   0.00247
0.00355   0.00046   0.01225   0.00000   0.00000   0.00000   0.00046   0.02508
0.07734   0.15250   0.06807   0.09741   0.02997   0.01148   0.00453   0.00098
0.00046   0.00000   0.00046   0.00051   0.00098   0.00103   0.00000   0.00149
0.00144   0.00149   0.00000   0.00051   0.00051   0.00000   0.00000   0.00046
0.00154
1991    1    1    3    0    1   -1   -1  240.0     0.00000   0.00000   0.00000
0.00000   0.00381   0.05421   0.08411   0.09891   0.06548   0.05683   0.05378
0.01077   0.00936   0.00468   0.00417   0.00252   0.00063   0.00303   0.00240
0.00366   0.00429   0.00114   0.00114   0.00429   0.00354   0.00240   0.00126
0.00189   0.00126   0.01565   0.00000   0.00000   0.00000   0.00126   0.01012
0.06156   0.11387   0.10703   0.07369   0.04334   0.04963   0.01026   0.00393
0.00291   0.00165   0.00063   0.00405   0.00114   0.00114   0.00063   0.00189
0.00177   0.00126   0.00051   0.00315   0.00063   0.00126   0.00189   0.00063
0.00493
1992    1    1    3    0    1   -1   -1  218.9     0.00000   0.00000   0.00000
0.00303   0.02347   0.02534   0.05535   0.09135   0.08186   0.05667   0.06935
0.04588   0.02985   0.01169   0.00785   0.00442   0.00090   0.00360   0.00212
0.00360   0.00532   0.00343   0.00090   0.00311   0.00311   0.00221   0.00082
0.00000   0.00041   0.00131   0.00000   0.00000   0.00000   0.00262   0.01954
0.03090   0.07154   0.07726   0.08193   0.04874   0.05152   0.02944   0.01979
0.00793   0.00491   0.00270   0.00172   0.00000   0.00090   0.00270   0.00090
0.00221   0.00000   0.00270   0.00090   0.00090   0.00041   0.00000   0.00000
0.00090
1993    1    1    3    0    1   -1   -1  254.2     0.00000   0.00000   0.00000
0.00099   0.00824   0.05949   0.03773   0.06809   0.06964   0.05408   0.04986
0.08460   0.04758   0.02967   0.01536   0.00885   0.00291   0.00452   0.00192
0.00471   0.00155   0.00272   0.00452   0.00452   0.00235   0.00136   0.00155
0.00074   0.00099   0.00372   0.00000   0.00000   0.00019   0.00019   0.01642
0.05843   0.05075   0.06302   0.05670   0.03519   0.02906   0.03079   0.02292
0.02033   0.01221   0.00651   0.00533   0.00434   0.00198   0.00000   0.00118
0.00198   0.00037   0.00099   0.00056   0.00099   0.00000   0.00118   0.00099
0.00514
1994    1    1    3    0    1   -1   -1  197.7     0.00000   0.00000   0.00353
0.00266   0.01335   0.04676   0.07386   0.06785   0.04379   0.05439   0.04144
0.04327   0.05212   0.03475   0.02464   0.01604   0.01295   0.00759   0.00443
0.00176   0.00270   0.00626   0.00266   0.00579   0.00086   0.00180   0.00313
0.00133   0.00043   0.00403   0.00000   0.00000   0.00000   0.00133   0.01058
0.04137   0.08687   0.05705   0.04536   0.03712   0.02813   0.02280   0.02597
0.01647   0.01295   0.01115   0.00493   0.00360   0.00270   0.00090   0.00180
0.00000   0.00090   0.00180   0.00090   0.00313   0.00223   0.00090   0.00223
0.00270
1995    1    1    3    0    1   -1   -1  233.0     0.00000   0.00000   0.00069
0.00936   0.03205   0.05032   0.07765   0.08162   0.05547   0.03681   0.02349
0.02722   0.01720   0.02054   0.00968   0.00687   0.01075   0.00476   0.00157
0.00511   0.00069   0.00123   0.00035   0.00088   0.00246   0.00069   0.00000
0.00088   0.00000   0.00157   0.00000   0.00000   0.00069   0.01024   0.03093
0.05623   0.09619   0.09981   0.06392   0.02860   0.03060   0.01866   0.01498
0.02362   0.01041   0.00741   0.00614   0.00722   0.00246   0.00442   0.00123
0.00177   0.00088   0.00177   0.00000   0.00000   0.00000   0.00000   0.00000
0.00192
1996    1    1    3    0    1   -1   -1  190.6     0.00000   0.00000   0.00000
0.00158   0.06840   0.11204   0.10758   0.06432   0.05369   0.02393   0.01439
0.01827   0.01347   0.01113   0.01745   0.00477   0.00395   0.00158   0.00240
0.00000   0.00158   0.00079   0.00553   0.00237   0.00079   0.00000   0.00158
0.00000   0.00079   0.00560   0.00000   0.00000   0.00082   0.01211   0.05908
0.11182   0.10422   0.05758   0.03292   0.01834   0.01347   0.01037   0.00793
0.00635   0.00793   0.00237   0.00316   0.00319   0.00240   0.00082   0.00000
0.00079   0.00079   0.00079   0.00079   0.00158   0.00000   0.00000   0.00000
0.00237
```

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1997    1    1    3    0    1    -1   -1  204.7      0.00000   0.00000   0.00000
0.00066   0.02872   0.16724   0.14184   0.05282   0.03318   0.02357   0.01685
0.01800   0.01733   0.01004   0.00729   0.01061   0.00540   0.00199   0.00265
0.00274   0.00531   0.00531   0.00066   0.00332   0.00265   0.00133   0.00199
0.00000   0.00265   0.00332   0.00000   0.00000   0.00000   0.00283   0.03676
0.14894   0.12909   0.04963   0.01522   0.00955   0.00624   0.00681   0.00663
0.00814   0.00133   0.00332   0.00265   0.00066   0.00075   0.00000   0.00066
0.00133   0.00000   0.00066   0.00000   0.00000   0.00000   0.00000   0.00066
0.00066
1998    1    1    3    0    1    -1   -1  155.3      0.00000   0.00000   0.00000
0.00105   0.01201   0.04783   0.16346   0.15296   0.04678   0.02044   0.02276
0.02318   0.01981   0.02171   0.01433   0.00443   0.01138   0.00463   0.00253
0.00253   0.00548   0.00084   0.00084   0.00169   0.00084   0.00084   0.00105
0.00000   0.00105   0.00190   0.00000   0.00000   0.00000   0.00105   0.01433
0.04277   0.14603   0.10956   0.03982   0.01454   0.00716   0.00864   0.00780
0.00337   0.00253   0.00253   0.00675   0.00084   0.00000   0.00000   0.00084
0.00000   0.00253   0.00084   0.00000   0.00000   0.00000   0.00000   0.00000
0.00169
1999    1    1    3    0    1    -1   -1  204.7      0.00000   0.00000   0.00000
0.00123   0.01235   0.04592   0.06690   0.12636   0.10444   0.05266   0.03264
0.02281   0.01511   0.01327   0.01451   0.00865   0.00587   0.01143   0.00556
0.00401   0.00371   0.00278   0.00216   0.00093   0.00000   0.00000   0.00093
0.00000   0.00000   0.00401   0.00000   0.00000   0.00000   0.00185   0.01111
0.04101   0.08114   0.10695   0.08164   0.04128   0.02248   0.00985   0.00988
0.00927   0.00463   0.00524   0.00371   0.00463   0.00185   0.00000   0.00031
0.00093   0.00093   0.00031   0.00000   0.00000   0.00000   0.00000   0.00000
0.00278
2000    1    1    3    0    1    -1   -1  148.3      0.00000   0.00000   0.00000
0.00000   0.00176   0.05349   0.08833   0.09717   0.07705   0.06932   0.04611
0.02145   0.00985   0.00949   0.00633   0.00633   0.00633   0.00949   0.00211
0.00387   0.00000   0.00105   0.00000   0.00000   0.00000   0.00105   0.00105
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00458
0.05776   0.11266   0.07082   0.07327   0.07252   0.03838   0.01265   0.01232
0.00527   0.00211   0.00914   0.00633   0.00316   0.00211   0.00000   0.00000
0.00211   0.00000   0.00000   0.00105   0.00000   0.00211   0.00000   0.00000
0.00000
2001    1    1    3    0    1    -1   -1  70.6     0.00000   0.00000   0.00000
0.00000   0.00213   0.02436   0.05281   0.08862   0.05641   0.01406   0.03156
0.02534   0.04889   0.03597   0.01701   0.01913   0.00425   0.00621   0.00850
0.00621   0.00850   0.00425   0.00000   0.00000   0.00000   0.00213   0.00000
0.00000   0.00000   0.00213   0.00000   0.00000   0.00000   0.00000   0.00409
0.05101   0.12492   0.08322   0.06148   0.05347   0.03728   0.03990   0.03352
0.00850   0.01668   0.00638   0.00621   0.00638   0.00213   0.00000   0.00213
0.00000   0.00000   0.00213   0.00000   0.00000   0.00000   0.00000   0.00213
0.00000
2002    1    1    3    0    1    -1   -1  84.7     0.00000   0.00000   0.00000
0.00170   0.02555   0.02726   0.02896   0.11073   0.10562   0.04600   0.04770
0.03578   0.03066   0.02726   0.02385   0.01022   0.00170   0.01193   0.00511
0.00681   0.00341   0.00170   0.00511   0.00000   0.00000   0.00170   0.00000
0.00000   0.00000   0.00341   0.00000   0.00000   0.00000   0.00170   0.02215
0.02726   0.06133   0.10562   0.06814   0.05622   0.02555   0.02726   0.01193
0.01533   0.00170   0.00170   0.00511   0.00170   0.00170   0.00000   0.00170
0.00170   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000
2003    1    1    3    0    1    -1   -1  33.7     0.00000   0.00000   0.00481
0.01923   0.14423   0.07692   0.06731   0.08173   0.05769   0.01442   0.03846
0.00962   0.00962   0.00962   0.00481   0.00481   0.00000   0.00000   0.00481
0.00481   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00481   0.08654
0.11538   0.12019   0.08654   0.02404   0.00481   0.00000   0.00000   0.00000
0.00481   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000
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2004    1    1    3    0    1   -1   -1  91.8     0.00000   0.00000   0.00000
0.00167   0.03168   0.12504   0.05502   0.06168   0.06835   0.03834   0.03168
0.01667   0.02001   0.01167   0.00667   0.00167   0.00167   0.00167   0.01334
0.00167   0.00333   0.00167   0.00000   0.00167   0.00000   0.00000   0.00333
0.00000   0.00167   0.00333   0.00000   0.00000   0.00000   0.00000   0.03501
0.10336   0.04501   0.04001   0.02834   0.01000   0.01334   0.00500   0.00333
0.00500   0.00333   0.00167   0.09822   0.00333   0.00000   0.00000   0.00167
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00167
0.09822
2005    1    1    3    0    1   -1   -1  73.0     0.00000   0.00000   0.00000
0.00678   0.09555   0.15796   0.06274   0.05935   0.03391   0.02882   0.01696
0.01865   0.01865   0.01526   0.01187   0.01017   0.01017   0.00848   0.00339
0.00000   0.00678   0.00000   0.00339   0.00509   0.00170   0.00000   0.00000
0.00339   0.00170   0.01017   0.00000   0.00000   0.00000   0.00848   0.09386
0.03730   0.10835   0.05426   0.01865   0.02374   0.01526   0.00509   0.00339
0.00509   0.00170   0.00339   0.00170   0.00170   0.00170   0.00509   0.00678
0.00000   0.00000   0.00339   0.00170   0.00170   0.00000   0.00170   0.00000
0.00509
2006    1    1    3    0    1   -1   -1  67.5     0.00000   0.00000   0.00000
0.00000   0.03829   0.26882   0.06514   0.07979   0.01465   0.01762   0.01961
0.00992   0.00992   0.00992   0.01167   0.01091   0.00893   0.00397   0.00595
0.00099   0.00595   0.00793   0.00198   0.00000   0.00198   0.00298   0.00298
0.00099   0.00099   0.00000   0.00000   0.00000   0.00000   0.01243   0.01915
0.15790   0.06713   0.05393   0.02136   0.01663   0.00793   0.00595   0.00893
0.00298   0.00496   0.00298   0.00099   0.00298   0.00397   0.00198   0.00198
0.00298   0.00099   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000
2007    1    1    3    0    1   -1   -1  103.9     0.00000   0.00000   0.00000
0.00264   0.08002   0.03182   0.12753   0.03613   0.05204   0.05144   0.01856
0.02385   0.01220   0.01958   0.02858   0.01958   0.01165   0.00793   0.01958
0.00264   0.00793   0.00900   0.01058   0.01058   0.00264   0.00000   0.00000
0.00264   0.00000   0.00529   0.00000   0.00000   0.00000   0.00264   0.08212
0.03131   0.09993   0.04047   0.04252   0.01753   0.00955   0.01433   0.01322
0.00426   0.00900   0.00264   0.00371   0.00529   0.00793   0.00000   0.00264
0.00000   0.00371   0.00000   0.00793   0.00264   0.00107   0.00000   0.00000
0.00107
2008    1    1    3    0    1   -1   -1  86.5      0.00000   0.00000   0.00000
0.00573   0.01142   0.09153   0.07003   0.10133   0.07753   0.07325   0.03756
0.01192   0.01287   0.01383   0.01050   0.00477   0.00477   0.00573   0.00619
0.00428   0.00477   0.00191   0.00286   0.00095   0.00523   0.00191   0.00095
0.00000   0.00382   0.00859   0.00000   0.00000   0.00000   0.01047   0.00714
0.14245   0.06762   0.09942   0.02097   0.02621   0.00859   0.01616   0.00477
0.00191   0.00714   0.00332   0.00095   0.00095   0.00095   0.00095   0.00000
0.00000   0.00000   0.00095   0.00000   0.00095   0.00000   0.00000   0.00000
0.00382

1984    1    2    3    0    1   -1   -1  164.5    0.00000   0.00000   0.00000
0.00151   0.01993   0.16245   0.18135   0.01481   0.03002   0.00630   0.00668
0.00375   0.02817   0.06093   0.01643   0.00893   0.00685   0.00580   0.00588
0.00433   0.00000   0.00267   0.00048   0.00178   0.00000   0.00000   0.00278
0.00113   0.00144   0.00304   0.00000   0.00000   0.00000   0.00132   0.01759
0.17377   0.11264   0.00877   0.01943   0.00685   0.00868   0.00759   0.01552
0.02262   0.00185   0.00778   0.00354   0.00188   0.00080   0.00334   0.00098
0.00080   0.00000   0.00000   0.00103   0.00171   0.00125   0.00000   0.00151
0.00130
1985    1    2    3    0    1   -1   -1  261.1    0.00000   0.00000   0.00000
0.00000   0.05308   0.06657   0.25172   0.08572   0.01114   0.01069   0.00865
0.00000   0.00053   0.00703   0.01717   0.00193   0.00073   0.00131   0.00192
0.00000   0.00095   0.00074   0.00080   0.00080   0.00000   0.00067   0.00047
0.00000   0.00000   0.00075   0.00000   0.00000   0.00000   0.00212   0.06673
0.06913   0.22390   0.06543   0.00744   0.00565   0.00289   0.00000   0.00165
0.00463   0.01273   0.00251   0.00220   0.00000   0.00000   0.00088   0.00130
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0.00179   0.00037   0.00125   0.00080   0.00127   0.00000   0.00000   0.00000
0.00194
1986    1    2    3    0    1   -1   -1  328.4    0.00000   0.00061   0.00000
0.00000   0.00963   0.13649   0.08220   0.16773   0.06712   0.00443   0.01070
0.00441   0.00000   0.00038   0.00392   0.01632   0.00137   0.00233   0.00157
0.00098   0.00080   0.00190   0.00144   0.00009   0.00051   0.00009   0.00000
0.00055   0.00051   0.00209   0.00000   0.00000   0.00000   0.00000   0.00548
0.10421   0.07353   0.19508   0.05964   0.00499   0.00509   0.00375   0.00000
0.00045   0.00114   0.01277   0.00398   0.00275   0.00140   0.00149   0.00045
0.00000   0.00144   0.00070   0.00202   0.00070   0.00079   0.00000   0.00000
0.00000
1987    1    2    3    0    1   -1   -1  306.9    0.00000   0.00000   0.00000
0.00070   0.01582   0.11461   0.19987   0.08121   0.03794   0.02040   0.00145
0.00487   0.00182   0.00000   0.00094   0.00154   0.00292   0.00140   0.00018
0.00000   0.00000   0.00000   0.00094   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00119   0.00000   0.00000   0.00000   0.00000   0.01390
0.12748   0.21611   0.07281   0.04196   0.02035   0.00255   0.00349   0.00292
0.00043   0.00024   0.00175   0.00356   0.00000   0.00140   0.00134   0.00043
0.00000   0.00000   0.00000   0.00097   0.00000   0.00000   0.00000   0.00000
0.00051
1988    1    2    3    0    1   -1   -1  193.6     0.00000   0.00000   0.00098
0.00468   0.01449   0.07673   0.19225   0.09945   0.02565   0.01698   0.00884
0.00425   0.00447   0.00000   0.00105   0.00000   0.00137   0.00405   0.00269
0.00000   0.00218   0.00000   0.00080   0.00052   0.00000   0.00000   0.00000
0.00089   0.00000   0.00000   0.00000   0.00000   0.00046   0.00112   0.01360
0.07695   0.24403   0.12888   0.03382   0.02019   0.00774   0.00000   0.00144
0.00044   0.00085   0.00000   0.00263   0.00204   0.00000   0.00000   0.00179
0.00098   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00072
1989    1    2    3    0    1   -1   -1  305.5     0.00000   0.00000   0.00000
0.00435   0.02625   0.03642   0.07946   0.19705   0.08638   0.02376   0.01144
0.00562   0.00447   0.00183   0.00000   0.00075   0.00051   0.00158   0.00132
0.00000   0.00222   0.00121   0.00000   0.00000   0.00156   0.00000   0.00000
0.00000   0.00000   0.00184   0.00000   0.00000   0.00000   0.00558   0.01863
0.05435   0.12120   0.19905   0.06833   0.01619   0.00961   0.00281   0.00078
0.00059   0.00050   0.00068   0.00217   0.00217   0.00353   0.00276   0.00000
0.00121   0.00000   0.00000   0.00048   0.00059   0.00000   0.00079   0.00000
0.00000
1990    1    2    3    0    1   -1   -1  254.2    0.00000   0.00000   0.00000
0.00000   0.01598   0.03209   0.05384   0.07940   0.15178   0.10523   0.03784
0.02153   0.00869   0.00227   0.00194   0.00058   0.00085   0.00000   0.00000
0.00000   0.00240   0.00000   0.00070   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00086   0.00000   0.00000   0.00000   0.00330   0.02563
0.02839   0.05750   0.10001   0.13517   0.06793   0.03283   0.01515   0.00748
0.00358   0.00000   0.00097   0.00000   0.00181   0.00000   0.00148   0.00000
0.00000   0.00092   0.00000   0.00186   0.00000   0.00000   0.00000   0.00000
0.00000
1991    1    2    3    0    1   -1   -1  238.0     0.00000   0.00000   0.00000
0.00000   0.01031   0.06236   0.09702   0.06024   0.06874   0.09754   0.04339
0.01378   0.00906   0.00453   0.00323   0.00079   0.00049   0.00049   0.00192
0.00313   0.00423   0.00087   0.00185   0.00000   0.00092   0.00173   0.00000
0.00237   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00743
0.06494   0.10032   0.10690   0.06420   0.08944   0.03859   0.00985   0.01149
0.00319   0.00249   0.00169   0.00135   0.00000   0.00056   0.00143   0.00263
0.00137   0.00100   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00216
1992    1    2    3    0    1   -1   -1  133.3     0.00000   0.00000   0.00000
0.00000   0.02308   0.02960   0.07022   0.07532   0.04225   0.06364   0.08880
0.03100   0.01530   0.00650   0.00119   0.00198   0.00203   0.00222   0.00000
0.00183   0.00122   0.00380   0.00109   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.03595
0.03972   0.08705   0.08303   0.08042   0.04121   0.08571   0.03005   0.02192
0.01350   0.00202   0.00416   0.00000   0.00000   0.00119   0.00323   0.00000
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0.00222   0.00161   0.00000   0.00000   0.00162   0.00292   0.00000   0.00109
0.00032
1993    1    2    3    0    1   -1   -1  206.0     0.00000   0.00000   0.00000
0.00062   0.01007   0.06822   0.03608   0.08030   0.06495   0.03604   0.04612
0.06751   0.03409   0.02409   0.02042   0.01022   0.00433   0.00506   0.00179
0.00155   0.00008   0.00069   0.00122   0.00000   0.00261   0.00000   0.00000
0.00033   0.00000   0.00008   0.00000   0.00000   0.00000   0.00000   0.01618
0.07024   0.05489   0.08040   0.04894   0.03813   0.03458   0.05978   0.02626
0.01808   0.01491   0.00645   0.00000   0.00305   0.00115   0.00000   0.00130
0.00109   0.00565   0.00000   0.00000   0.00117   0.00000   0.00124   0.00000
0.00000
1994    1    2    3    0    1   -1   -1  101.5     0.00000   0.00000   0.00000
0.00006   0.00835   0.04872   0.15787   0.06418   0.05596   0.04144   0.03490
0.02470   0.02857   0.01496   0.02072   0.00454   0.00000   0.00000   0.00233
0.00279   0.00058   0.00000   0.00006   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00006   0.00166   0.00880
0.07589   0.15556   0.07973   0.04685   0.04146   0.01169   0.01983   0.03131
0.00000   0.00160   0.00538   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00767   0.00000   0.00000   0.00000   0.00000   0.00000
0.00181
1995    1    2    3    0    1   -1   -1  136.5     0.00000   0.00000   0.00000
0.00477   0.00548   0.03066   0.05861   0.08756   0.08890   0.05684   0.04252
0.03874   0.03244   0.04617   0.01259   0.00744   0.01404   0.00123   0.00015
0.00003   0.00001   0.00144   0.00101   0.00016   0.00527   0.00002   0.00014
0.00046   0.00001   0.00020   0.00000   0.00000   0.00003   0.00406   0.01684
0.02462   0.13092   0.09484   0.04828   0.04344   0.03201   0.02257   0.02955
0.00697   0.00139   0.00058   0.00020   0.00533   0.00010   0.00001   0.00000
0.00002   0.00006   0.00002   0.00079   0.00002   0.00000   0.00000   0.00000
0.00047
1996    1    2    3    0    1   -1   -1  149.0     0.00000   0.00000   0.00000
0.00730   0.06907   0.05968   0.07861   0.08053   0.04715   0.02216   0.03858
0.01571   0.01774   0.02393   0.01873   0.00598   0.00072   0.00090   0.00059
0.00291   0.01164   0.00755   0.00248   0.00037   0.00042   0.00102   0.00048
0.00025   0.00000   0.00015   0.00000   0.00000   0.00000   0.00844   0.07369
0.09389   0.07017   0.06449   0.04944   0.03229   0.01275   0.00832   0.02455
0.00954   0.01645   0.00830   0.00326   0.00000   0.00461   0.00003   0.00017
0.00000   0.00000   0.00444   0.00002   0.00003   0.00000   0.00000   0.00026
0.00020
1997    1    2    3    0    1   -1   -1  204.6    0.00000   0.00000   0.00000
0.00258   0.01243   0.16982   0.08156   0.03842   0.03768   0.01700   0.01426
0.01155   0.01303   0.01320   0.00687   0.01652   0.00147   0.00243   0.00000
0.00032   0.00000   0.00173   0.00034   0.00001   0.00000   0.00026   0.00001
0.00001   0.00001   0.00197   0.00000   0.00000   0.00000   0.00247   0.03111
0.24025   0.11610   0.04277   0.02606   0.02670   0.01613   0.01326   0.00879
0.00303   0.01383   0.01276   0.00024   0.00032   0.00063   0.00186   0.00000
0.00002   0.00004   0.00000   0.00005   0.00000   0.00001   0.00004   0.00004
0.00001
1998    1    2    3    0    1   -1   -1  200.6     0.00002   0.00002   0.00000
0.00004   0.00509   0.02427   0.13112   0.09960   0.04506   0.03505   0.03619
0.01658   0.01688   0.01363   0.00439   0.00215   0.00751   0.00088   0.00305
0.00005   0.00055   0.00046   0.00032   0.00169   0.00044   0.00021   0.00022
0.00033   0.00042   0.00041   0.00000   0.00000   0.00000   0.00000   0.00873
0.08754   0.19782   0.10462   0.06132   0.01649   0.02881   0.01694   0.00346
0.00827   0.00066   0.00094   0.00978   0.00253   0.00058   0.00034   0.00210
0.00011   0.00008   0.00097   0.00000   0.00012   0.00006   0.00025   0.00008
0.00078
1999    1    2    3    0    1   -1   -1  280.6     0.00000   0.00000   0.00000
0.00017   0.02291   0.03677   0.08148   0.18652   0.09122   0.04026   0.01950
0.00789   0.01141   0.00682   0.00093   0.00741   0.00386   0.00052   0.00001
0.00003   0.00002   0.00024   0.00027   0.00012   0.00001   0.00000   0.00000
0.00000   0.00000   0.00023   0.00000   0.00000   0.00000   0.00132   0.02541
0.03829   0.10881   0.18261   0.08676   0.02163   0.00499   0.00556   0.00035
0.00091   0.00118   0.00013   0.00071   0.00052   0.00003   0.00008   0.00090
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0.00112   0.00000   0.00001   0.00000   0.00009   0.00001   0.00000   0.00000
0.00000
2000    1    2    3    0    1   -1   -1  241.6     0.00000   0.00000   0.00000
0.00000   0.01479   0.04592   0.07534   0.08610   0.08149   0.09496   0.03885
0.02438   0.01057   0.00597   0.00695   0.00427   0.00310   0.00185   0.00618
0.00081   0.00434   0.00002   0.00001   0.00001   0.00182   0.00099   0.00001
0.00000   0.00001   0.00001   0.00000   0.00000   0.00000   0.00000   0.01289
0.05382   0.07849   0.08417   0.11875   0.07071   0.02832   0.02125   0.00546
0.00522   0.00609   0.00290   0.00027   0.00126   0.00001   0.00164   0.00000
0.00000   0.00000   0.00001   0.00001   0.00000   0.00000   0.00000   0.00000
0.00000
2001    1    2    3    0    1   -1   -1  183.9     0.00000   0.00000   0.00000
0.00000   0.00000   0.01272   0.06694   0.06687   0.07108   0.06857   0.04924
0.06006   0.01639   0.00951   0.00836   0.00806   0.01374   0.00827   0.00578
0.00053   0.00286   0.00012   0.00014   0.00001   0.00035   0.00000   0.00009
0.00012   0.00000   0.00012   0.00000   0.00000   0.00000   0.00000   0.00124
0.01810   0.09827   0.09923   0.12010   0.06175   0.05010   0.04210   0.01684
0.00598   0.00201   0.00315   0.00151   0.00155   0.00404   0.00393   0.00006
0.00009   0.00001   0.00000   0.00000   0.00003   0.00000   0.00000   0.00000
0.00001
2002    1    2    3    0    1   -1   -1   65.6    0.00000   0.00000   0.00000
0.00282   0.00917   0.01795   0.06540   0.11427   0.09058   0.08212   0.03644
0.03317   0.01468   0.00468   0.00940   0.00004   0.00464   0.00004   0.00156
0.00004   0.00000   0.00007   0.00002   0.00004   0.00150   0.00002   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00872   0.00881
0.04389   0.08995   0.14800   0.11790   0.03322   0.01302   0.00892   0.00960
0.00672   0.00000   0.00884   0.00471   0.00000   0.00746   0.00002   0.00000
0.00150   0.00000   0.00000   0.00000   0.00002   0.00000   0.00002   0.00000
0.00000
2004    1    2    3    0    1   -1   -1   28.2    0.00000   0.00000   0.00542
0.11051   0.07520   0.15198   0.07073   0.02258   0.00587   0.00056   0.00056
0.00056   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.08001   0.14015
0.20279   0.08066   0.02610   0.01455   0.00168   0.00224   0.00168   0.00112
0.00168   0.00112   0.00000   0.00000   0.00056   0.00112   0.00056   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000
2006    1    2    3    0    1   -1   -1   85.5    0.00000   0.00000   0.00000
0.00000   0.01624   0.13520   0.02794   0.04297   0.03728   0.01421   0.02105
0.00944   0.02370   0.00465   0.00418   0.00823   0.01052   0.01104   0.01103
0.00492   0.00616   0.00847   0.00429   0.00187   0.00032   0.00000   0.00032
0.00000   0.00032   0.00155   0.00000   0.00000   0.00000   0.00000   0.01851
0.20614   0.11221   0.11128   0.01657   0.00907   0.01924   0.00728   0.02350
0.01296   0.00810   0.01434   0.00000   0.00047   0.00187   0.01056   0.00958
0.00069   0.00000   0.00116   0.00000   0.00000   0.00990   0.00035   0.00000
0.00035
2007    1    2    3    0    1   -1   -1   50.4    0.00000   0.00000   0.00000
0.00095   0.01155   0.01196   0.07210   0.08650   0.10573   0.07188   0.05367
0.02753   0.00518   0.01010   0.00017   0.02020   0.00061   0.00593   0.00000
0.00000   0.00000   0.00122   0.00000   0.00017   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.01010   0.00000   0.00000   0.00000   0.01541
0.02511   0.10327   0.09252   0.15198   0.03322   0.02196   0.02020   0.03031
0.00000   0.00000   0.00017   0.00000   0.01027   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000
2008    1    2    3    0    1   -1   -1   38.5    0.00000   0.00000   0.00000
0.00024   0.00037   0.06196   0.06063   0.17576   0.03881   0.06018   0.00024
0.01928   0.00053   0.00000   0.03857   0.00053   0.01928   0.00053   0.01928
0.00000   0.00053   0.00000   0.00000   0.00000   0.00000   0.00053   0.00031
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00217   0.00136
0.10172   0.05989   0.16055   0.05964   0.05785   0.00053   0.00053   0.00000
0.00034   0.00000   0.00000   0.00000   0.00000   0.01928   0.00000   0.00000
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0.00000   0.00000   0.00000   0.01928   0.00000   0.00000   0.00000   0.01928
0.00000

1984    1    3    3    0    1   -1   -1  138.5     0.00000   0.00000   0.00000
0.00000   0.02920   0.15022   0.18548   0.02763   0.01579   0.01139   0.00717
0.00461   0.01242   0.02993   0.01503   0.00810   0.00463   0.00525   0.00265
0.00678   0.00437   0.00356   0.00143   0.00479   0.00469   0.00552   0.00118
0.00181   0.00515   0.00410   0.00000   0.00000   0.00000   0.00200   0.03045
0.18955   0.11708   0.01603   0.01532   0.00311   0.00344   0.00195   0.01819
0.01325   0.00969   0.00780   0.00612   0.00293   0.00101   0.00088   0.00000
0.00021   0.00018   0.00000   0.00000   0.00177   0.00138   0.00000   0.00000
0.00478
1985    1    3    3    0    1   -1   -1  115.7     0.00000   0.00000   0.00044
0.00000   0.01981   0.04830   0.19771   0.12666   0.01481   0.01739   0.01142
0.00008   0.00764   0.02203   0.03641   0.01021   0.01343   0.00271   0.00332
0.00173   0.00314   0.00979   0.00769   0.00048   0.00373   0.00079   0.00044
0.00267   0.00043   0.00627   0.00000   0.00000   0.00000   0.00250   0.03601
0.07461   0.20014   0.05117   0.00187   0.00466   0.00495   0.00000   0.00104
0.00836   0.02849   0.00000   0.00533   0.00354   0.00014   0.00040   0.00380
0.00146   0.00044   0.00034   0.00000   0.00000   0.00000   0.00036   0.00000
0.00084
1986    1    3    3    0    1   -1   -1  136.3     0.00000   0.00000   0.00000
0.00106   0.02477   0.10638   0.06224   0.09563   0.06764   0.00690   0.01763
0.01306   0.00026   0.00000   0.00372   0.04390   0.00991   0.00698   0.00466
0.00303   0.00210   0.00181   0.00083   0.00281   0.00067   0.00214   0.00171
0.00000   0.00018   0.00982   0.00000   0.00000   0.00000   0.00245   0.01391
0.20013   0.08138   0.08466   0.05842   0.00288   0.01819   0.00539   0.00211
0.00000   0.00145   0.01761   0.00203   0.00102   0.00284   0.00038   0.00337
0.00253   0.00220   0.00077   0.00255   0.00000   0.00026   0.00000   0.00006
0.00358
1987    1    3    3    0    1   -1   -1  145.2     0.00000   0.00000   0.00000
0.00158   0.01023   0.11740   0.17187   0.06347   0.05034   0.02997   0.00358
0.00369   0.00152   0.00306   0.00027   0.00472   0.01657   0.01358   0.00334
0.00310   0.00165   0.00401   0.00152   0.00021   0.00218   0.00176   0.00246
0.00152   0.00000   0.00437   0.00000   0.00000   0.00000   0.00000   0.01112
0.10902   0.20352   0.07008   0.03947   0.01580   0.00286   0.00243   0.00685
0.00000   0.00000   0.00594   0.00529   0.00199   0.00000   0.00151   0.00000
0.00004   0.00149   0.00000   0.00000   0.00000   0.00019   0.00004   0.00000
0.00443
1988    1    3    3    0    1   -1   -1  167.6     0.00000   0.00000   0.00961
0.01433   0.00940   0.07733   0.17131   0.10380   0.04062   0.02667   0.01516
0.01027   0.00462   0.00599   0.00083   0.00248   0.00636   0.01015   0.00276
0.00450   0.00103   0.00029   0.00127   0.00004   0.00034   0.00185   0.00025
0.00034   0.00000   0.00011   0.00000   0.00000   0.00187   0.01103   0.01663
0.07952   0.20751   0.10242   0.02183   0.01134   0.00741   0.00305   0.00049
0.00011   0.00114   0.00018   0.00244   0.00351   0.00127   0.00343   0.00012
0.00025   0.00000   0.00016   0.00000   0.00000   0.00155   0.00000   0.00000
0.00102
1989    1    3    3    0    1   -1   -1  183.4     0.00000   0.00000   0.00000
0.00124   0.02582   0.02702   0.06466   0.14456   0.08892   0.04154   0.03995
0.01492   0.00673   0.00645   0.00508   0.00396   0.00538   0.00380   0.00966
0.01011   0.00037   0.00021   0.00019   0.00272   0.00178   0.00000   0.00000
0.00000   0.00246   0.00025   0.00000   0.00000   0.00000   0.00883   0.02465
0.05000   0.09206   0.17404   0.06781   0.03135   0.01489   0.00804   0.00000
0.00609   0.00020   0.00002   0.00127   0.00067   0.00609   0.00197   0.00304
0.00000   0.00000   0.00067   0.00008   0.00000   0.00024   0.00000   0.00000
0.00021
1990    1    3    3    0    1   -1   -1  205.1     0.00000   0.00000   0.00000
0.00035   0.04598   0.03582   0.03713   0.06784   0.13738   0.10725   0.03600
0.01722   0.00866   0.00488   0.00661   0.00226   0.00249   0.00117   0.00133
0.01120   0.00491   0.00126   0.00142   0.00086   0.00044   0.00102   0.00057
0.00000   0.00102   0.00154   0.00000   0.00000   0.00000   0.00358   0.04661
0.04482   0.05600   0.06843   0.11596   0.05795   0.02082   0.01954   0.00958
```

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0.00448   0.00131   0.00266   0.00000   0.00000   0.00000   0.00332   0.00375
0.00000   0.00133   0.00000   0.00000   0.00053   0.00000   0.00053   0.00000
0.00218
1991    1    3    3    0    1   -1   -1  302.1      0.00000   0.00000   0.00000
0.00028   0.00856   0.05737   0.06122   0.06597   0.07310   0.10781   0.05780
0.03271   0.03294   0.00701   0.00461   0.00437   0.00210   0.00053   0.00330
0.00356   0.01117   0.00394   0.00426   0.00429   0.00209   0.00012   0.00043
0.00000   0.00301   0.00301   0.00000   0.00000   0.00000   0.00015   0.00419
0.07028   0.10083   0.07052   0.04213   0.07631   0.03765   0.00948   0.01179
0.00321   0.00107   0.00358   0.00018   0.00000   0.00119   0.00047   0.00459
0.00243   0.00058   0.00000   0.00069   0.00000   0.00000   0.00085   0.00000
0.00228
1992    1    3    3    0    1   -1   -1  300.3      0.00000   0.00000   0.00000
0.00000   0.00975   0.00814   0.08154   0.08880   0.06877   0.05756   0.08995
0.04799   0.03177   0.01996   0.01444   0.00492   0.00645   0.00144   0.00251
0.00202   0.00433   0.00778   0.00275   0.00357   0.00280   0.00065   0.00119
0.00099   0.00000   0.00520   0.00000   0.00000   0.00000   0.00021   0.01710
0.02151   0.08374   0.07280   0.05904   0.03436   0.04817   0.01754   0.02880
0.01589   0.00421   0.00415   0.00598   0.00157   0.00267   0.00230   0.00163
0.00419   0.00407   0.00037   0.00066   0.00000   0.00082   0.00014   0.00063
0.00220
1993    1    3    3    0    1   -1   -1  226.7      0.00000   0.00000   0.00000
0.00000   0.00030   0.02528   0.02526   0.07564   0.07331   0.04433   0.04017
0.06633   0.04284   0.02874   0.01732   0.02064   0.00572   0.00884   0.00562
0.00279   0.00130   0.00406   0.00711   0.00413   0.00009   0.00724   0.00000
0.00123   0.00114   0.00279   0.00000   0.00000   0.00000   0.00000   0.00585
0.03525   0.03455   0.08824   0.09109   0.04652   0.03337   0.05433   0.03456
0.02281   0.01352   0.00429   0.00213   0.00394   0.00046   0.00342   0.00031
0.00115   0.00361   0.00000   0.00165   0.00000   0.00000   0.00000   0.00051
0.00622
1994    1    3    3    0    1   -1   -1  253.3      0.00000   0.00000   0.00000
0.00222   0.00882   0.04298   0.10046   0.06335   0.05690   0.06328   0.04604
0.02631   0.06474   0.02854   0.01985   0.01248   0.01245   0.00657   0.00601
0.00181   0.00339   0.00046   0.00184   0.00436   0.00008   0.00223   0.00114
0.00000   0.00062   0.00002   0.00000   0.00000   0.00000   0.00307   0.01428
0.05666   0.10709   0.06869   0.04228   0.01670   0.02076   0.02899   0.02374
0.00823   0.00620   0.00452   0.00874   0.00241   0.00000   0.00468   0.00000
0.00000   0.00058   0.00120   0.00000   0.00000   0.00000   0.00255   0.00158
0.00014
1995    1    3    3    0    1   -1   -1  171.6      0.00000   0.00000   0.00000
0.00485   0.01257   0.03707   0.10914   0.08421   0.05083   0.03891   0.04541
0.02556   0.01745   0.02488   0.00395   0.00200   0.01307   0.00161   0.00000
0.00553   0.00254   0.00231   0.00152   0.00105   0.00046   0.00000   0.00017
0.00000   0.00000   0.00117   0.00000   0.00000   0.00000   0.00298   0.03365
0.10893   0.07374   0.13537   0.03906   0.04434   0.02091   0.01793   0.00707
0.01226   0.00470   0.00500   0.00516   0.00034   0.00000   0.00000   0.00000
0.00072   0.00159   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000
1996    1    3    3    0    1   -1   -1  121.0      0.00000   0.00000   0.00010
0.00727   0.07601   0.10163   0.08202   0.08610   0.05074   0.02826   0.04065
0.03227   0.00839   0.00432   0.03989   0.00000   0.00177   0.01013   0.00289
0.00172   0.00419   0.00000   0.00101   0.00095   0.00000   0.00221   0.00000
0.00000   0.00000   0.00095   0.00000   0.00000   0.00000   0.00155   0.07862
0.08223   0.05886   0.05838   0.02230   0.01735   0.01686   0.02035   0.01550
0.00211   0.01665   0.00469   0.00198   0.01089   0.00092   0.00000   0.00097
0.00000   0.00095   0.00000   0.00000   0.00313   0.00000   0.00000   0.00000
0.00223
1997    1    3    3    0    1   -1   -1  174.3     0.00000   0.00000   0.00000
0.00804   0.03084   0.10388   0.09444   0.03040   0.04672   0.03063   0.01910
0.01481   0.00814   0.01302   0.00974   0.01609   0.00470   0.00059   0.00504
0.00331   0.00063   0.00353   0.00255   0.00000   0.00000   0.00137   0.00163
0.00000   0.00059   0.00021   0.00000   0.00000   0.00000   0.00626   0.04409
0.22977   0.11812   0.04712   0.03146   0.02055   0.00928   0.01750   0.00734
```

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0.00633   0.00069   0.00568   0.00195   0.00021   0.00000   0.00069   0.00000
0.00000   0.00000   0.00253   0.00000   0.00000   0.00000   0.00021   0.00000
0.00021
1998    1    3    3    0    1   -1   -1  124.7      0.00000   0.00000   0.00000
0.00000   0.01161   0.04732   0.14057   0.11045   0.05376   0.02424   0.03026
0.01730   0.02568   0.01321   0.01573   0.00285   0.00801   0.00187   0.00137
0.00000   0.00555   0.00174   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00170   0.00000   0.00000   0.00000   0.00000   0.00000   0.00805
0.05130   0.18253   0.11576   0.03458   0.02184   0.01712   0.02033   0.00622
0.00903   0.00004   0.00181   0.00722   0.00000   0.00303   0.00128   0.00137
0.00070   0.00240   0.00000   0.00219   0.00000   0.00000   0.00000   0.00000
0.00000
1999    1    3    3    0    1   -1   -1  118.2      0.00000   0.00000   0.00000
0.00000   0.02336   0.05768   0.06775   0.14678   0.06262   0.04208   0.03937
0.00864   0.01188   0.00620   0.00762   0.00211   0.00000   0.00139   0.00114
0.00016   0.00000   0.00106   0.00000   0.00016   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00441   0.02819
0.06578   0.11762   0.17742   0.07207   0.02716   0.00866   0.00026   0.00000
0.00704   0.00139   0.00037   0.00014   0.00026   0.00666   0.00000   0.00058
0.00058   0.00000   0.00000   0.00139   0.00000   0.00000   0.00000   0.00000
0.00000
2007    1    3    3    0    1   -1   -1   48.6     0.00000   0.00000   0.00000
0.00000   0.00000   0.00687   0.05147   0.08682   0.11844   0.04536   0.07380
0.03038   0.03531   0.04767   0.02640   0.00645   0.00633   0.00185   0.00874
0.00405   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00905   0.03556   0.06093   0.14795   0.03797   0.04811   0.04347   0.02535
0.01636   0.01768   0.00000   0.00000   0.00000   0.00185   0.00000   0.00000
0.00579   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000
2008    1    3    3    0    1   -1   -1   41.9     0.00000   0.00000   0.00000
0.00000   0.00000   0.01184   0.00588   0.05438   0.04646   0.09646   0.06231
0.04266   0.03753   0.01965   0.01016   0.02420   0.03243   0.02626   0.02512
0.01765   0.00566   0.01202   0.01064   0.00000   0.00283   0.00000   0.00370
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00424   0.01547   0.07965   0.07685   0.05730   0.05481   0.03683   0.05281
0.01980   0.01272   0.00283   0.00000   0.00000   0.00000   0.01154   0.00000
0.00424   0.00283   0.00323   0.00000   0.00960   0.00000   0.00370   0.00370
0.00000

1978    1    4    3    0    1   -1   -1  21.8     0.00000   0.00000   0.00000
0.00000   0.00013   0.01219   0.05735   0.13228   0.03156   0.01912   0.00851
0.00000   0.07505   0.00025   0.01232   0.01219   0.00000   0.02463   0.00013
0.00000   0.00000   0.01219   0.00000   0.00007   0.00826   0.00013   0.00000
0.00000   0.00000   0.02317   0.00000   0.00000   0.00000   0.00000   0.00000
0.00007   0.03992   0.05103   0.09615   0.06438   0.09887   0.02944   0.02889
0.01232   0.02896   0.03975   0.00013   0.01086   0.00032   0.01086   0.02913
0.00000   0.00034   0.00000   0.02889   0.00000   0.00000   0.00000   0.00000
0.00017
1979    1    4    3    0    1   -1   -1  22.7     0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.02318   0.11903   0.19699   0.08239   0.06537
0.04040   0.05493   0.00722   0.01269   0.02365   0.00760   0.01283   0.01603
0.00179   0.01822   0.00089   0.02261   0.01988   0.00000   0.00075   0.00000
0.00000   0.00000   0.00905   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.01997   0.01856   0.06760   0.01788   0.02035   0.01557   0.00616
0.01382   0.00113   0.02206   0.01419   0.00867   0.00001   0.00753   0.00819
0.00225   0.00152   0.00165   0.00441   0.01205   0.00089   0.00000   0.00000
0.00002
1980    1    4    3    0    1   -1   -1  51.8     0.00000   0.00000   0.00000
0.00000   0.00096   0.00565   0.00370   0.02415   0.06337   0.09760   0.09741
0.03950   0.05137   0.06189   0.01753   0.01350   0.02912   0.04035   0.00678
0.00889   0.01104   0.00272   0.00005   0.01220   0.01756   0.00548   0.00128
0.00530   0.00000   0.00173   0.00000   0.00000   0.00000   0.00000   0.00182
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0.01406   0.00292   0.00664   0.03952   0.03231   0.05084   0.03128   0.02539
0.02879   0.00984   0.05279   0.00375   0.01624   0.00465   0.00323   0.02100
0.00303   0.00925   0.00393   0.00000   0.01429   0.00089   0.00050   0.00000
0.00390
1981    1    4    3    0    1   -1   -1  80.8      0.00000   0.00051   0.00000
0.00332   0.00486   0.01377   0.03572   0.01938   0.02490   0.05469   0.07273
0.09072   0.02676   0.05571   0.04581   0.03900   0.02538   0.03965   0.01080
0.00295   0.00108   0.00378   0.00378   0.00062   0.00000   0.00101   0.00007
0.00235   0.00098   0.01841   0.00000   0.00000   0.00080   0.00836   0.01000
0.02705   0.02502   0.02770   0.02556   0.03020   0.04292   0.04668   0.02382
0.03282   0.01591   0.02886   0.01230   0.00437   0.01354   0.00582   0.00692
0.00334   0.00200   0.00075   0.00434   0.00007   0.00144   0.00000   0.00000
0.00066
1982    1    4    3    0    1   -1   -1  208.7      0.00000   0.00000   0.00000
0.00030   0.03215   0.00908   0.03545   0.03110   0.02421   0.00784   0.03601
0.10164   0.05117   0.03645   0.03426   0.03231   0.02329   0.02493   0.01669
0.01265   0.00955   0.00668   0.00313   0.00320   0.00355   0.00443   0.00341
0.00161   0.00315   0.00096   0.00000   0.00000   0.00000   0.00011   0.04365
0.00734   0.03696   0.03348   0.03032   0.01354   0.04316   0.07627   0.03598
0.02955   0.01965   0.01377   0.01696   0.01042   0.00809   0.00534   0.00666
0.00490   0.00167   0.00141   0.00579   0.00059   0.00220   0.00006   0.00077
0.00216
1983    1    4    3    0    1   -1   -1  244.2     0.00000   0.00000   0.00000
0.00959   0.07535   0.16741   0.04727   0.04811   0.01505   0.00882   0.00231
0.00804   0.03732   0.02182   0.01205   0.02824   0.01969   0.01613   0.02575
0.01023   0.00488   0.00489   0.00783   0.00672   0.00616   0.00081   0.00114
0.01781   0.00389   0.00683   0.00000   0.00000   0.00000   0.00009   0.02289
0.14035   0.03192   0.03322   0.01280   0.00538   0.00774   0.00947   0.01969
0.02003   0.01247   0.01245   0.00471   0.02325   0.00212   0.00174   0.00290
0.00496   0.00573   0.00143   0.00148   0.00139   0.00022   0.00074   0.00373
0.00295
1984    1    4    3    0    1   -1   -1  221.7      0.00000   0.00000   0.00000
0.00000   0.02540   0.12438   0.11309   0.02675   0.02946   0.01160   0.00714
0.00334   0.01995   0.04521   0.00956   0.01060   0.00694   0.00713   0.01024
0.01505   0.00673   0.00332   0.00648   0.00278   0.00025   0.00008   0.00062
0.00000   0.00685   0.00798   0.00000   0.00000   0.00000   0.00000   0.02218
0.13687   0.14488   0.02753   0.03580   0.01445   0.01381   0.00172   0.01016
0.03036   0.01416   0.00413   0.00505   0.00381   0.00425   0.00635   0.00315
0.00052   0.00332   0.00294   0.00052   0.00109   0.00040   0.00174   0.00386
0.00601
1985    1    4    3    0    1   -1   -1  199.1     0.00000   0.00000   0.00000
0.00015   0.00156   0.03865   0.15256   0.14410   0.01994   0.03876   0.00648
0.00196   0.00298   0.01013   0.02275   0.00172   0.00637   0.00668   0.00945
0.00614   0.00813   0.00412   0.00230   0.00265   0.00139   0.00138   0.00095
0.00017   0.00044   0.00303   0.00000   0.00000   0.00000   0.00023   0.00862
0.06224   0.16279   0.14485   0.01274   0.02543   0.01133   0.00227   0.00257
0.01016   0.02167   0.00227   0.00480   0.00306   0.00326   0.00537   0.00515
0.00112   0.00453   0.00234   0.00033   0.00037   0.00170   0.00012   0.00000
0.00573
1986    1    4    3    0    1   -1   -1  155.6     0.00000   0.00000   0.00000
0.00109   0.03235   0.02704   0.07344   0.08185   0.10038   0.00709   0.02113
0.00935   0.00476   0.00177   0.00155   0.02771   0.00334   0.00377   0.00363
0.00510   0.00172   0.00383   0.00094   0.00288   0.00162   0.00129   0.00008
0.00171   0.00239   0.00476   0.00000   0.00000   0.00000   0.00267   0.04161
0.04581   0.08210   0.12392   0.12913   0.01376   0.02179   0.01739   0.00102
0.00089   0.00846   0.02910   0.00558   0.00866   0.00371   0.00734   0.00696
0.00155   0.00485   0.00059   0.00101   0.00584   0.00138   0.00076   0.00004
0.00754
1987    1    4    3    0    1   -1   -1  142.7     0.00000   0.00000   0.00118
0.00010   0.04721   0.09536   0.02129   0.05076   0.05089   0.05541   0.01145
0.01017   0.00402   0.00234   0.00079   0.00449   0.00282   0.00599   0.00087
0.00014   0.00109   0.00108   0.00059   0.00089   0.00145   0.00089   0.00012
0.00213   0.00016   0.00270   0.00000   0.00000   0.00118   0.00015   0.05500
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0.11420   0.04355   0.05967   0.09087   0.11202   0.01994   0.02995   0.02110
0.00284   0.00000   0.01867   0.01465   0.00281   0.01109   0.01229   0.00698
0.00047   0.00073   0.00174   0.00000   0.00020   0.00000   0.00016   0.00097
0.00238
1988    1    4    3    0    1   -1   -1  120.1     0.00000   0.00000   0.00014
0.08584   0.03747   0.07596   0.07187   0.05526   0.03250   0.03714   0.02121
0.00390   0.01422   0.01974   0.00423   0.00685   0.00358   0.00600   0.00881
0.00023   0.00006   0.00153   0.00988   0.00923   0.00665   0.00423   0.00565
0.00073   0.00019   0.00025   0.00000   0.00000   0.00004   0.03538   0.00033
0.06556   0.06058   0.09021   0.06070   0.05113   0.03440   0.01418   0.00884
0.00788   0.00343   0.00359   0.00649   0.01614   0.00150   0.00290   0.00133
0.00087   0.00283   0.00008   0.00423   0.00032   0.00000   0.00016   0.00032
0.00324
1989    1    4    3    0    1   -1   -1  124.0     0.00000   0.00000   0.00000
0.00341   0.08176   0.04260   0.04242   0.08150   0.05370   0.03781   0.02124
0.00970   0.00758   0.00380   0.00634   0.00554   0.00000   0.00065   0.00130
0.00385   0.00415   0.00078   0.00373   0.00169   0.00086   0.00062   0.00100
0.00048   0.00053   0.00480   0.00000   0.00000   0.00000   0.00492   0.10881
0.07299   0.07796   0.11901   0.04630   0.05007   0.01974   0.01168   0.02042
0.01573   0.00821   0.00000   0.00034   0.00720   0.00582   0.00001   0.00420
0.00420   0.00007   0.00000   0.00000   0.00047   0.00000   0.00000   0.00000
0.00000
1990    1    4    3    0    1   -1   -1  125.1     0.00000   0.00000   0.00001
0.00319   0.05082   0.10891   0.05629   0.03677   0.08872   0.07083   0.03706
0.02435   0.00983   0.00849   0.00622   0.00120   0.00335   0.00121   0.00217
0.00341   0.00219   0.00121   0.00020   0.00042   0.00261   0.00000   0.00019
0.00019   0.00063   0.00060   0.00000   0.00000   0.00020   0.00001   0.04523
0.11616   0.02949   0.04657   0.03773   0.05602   0.02994   0.02464   0.01628
0.02298   0.01900   0.01426   0.00372   0.00247   0.00838   0.00344   0.00000
0.00041   0.00124   0.00000   0.00019   0.00000   0.00000   0.00000   0.00000
0.00060
1991    1    4    3    0    1   -1   -1  95.9      0.00000   0.00000   0.00023
0.00712   0.00813   0.11290   0.12817   0.06071   0.03023   0.03311   0.02324
0.01698   0.01308   0.01096   0.00817   0.00817   0.00685   0.00073   0.00169
0.00099   0.00650   0.00070   0.00211   0.00198   0.00279   0.00048   0.00184
0.00000   0.00000   0.00066   0.00000   0.00000   0.00000   0.00244   0.01549
0.11903   0.11958   0.04945   0.03784   0.06509   0.02207   0.01639   0.02012
0.01238   0.00161   0.00354   0.00366   0.00259   0.00278   0.00142   0.01158
0.00000   0.00000   0.00117   0.00058   0.00000   0.00096   0.00000   0.00000
0.00172
1992    1    4    3    0    1   -1   -1  58.4      0.00000   0.00000   0.00000
0.00023   0.01534   0.03112   0.10817   0.08648   0.03906   0.03031   0.03740
0.02619   0.02578   0.04386   0.01502   0.00049   0.00145   0.00139   0.00589
0.01037   0.00105   0.00445   0.00554   0.00361   0.00841   0.00541   0.00075
0.00035   0.00042   0.00141   0.00000   0.00000   0.00000   0.00111   0.01130
0.01884   0.13832   0.09489   0.03772   0.01674   0.04400   0.02777   0.02134
0.01936   0.01110   0.00546   0.01602   0.00105   0.00185   0.00249   0.00519
0.01010   0.00323   0.00000   0.00000   0.00000   0.00000   0.00109   0.00000
0.00109
1993    1    4    3    0    1   -1   -1  42.8      0.00000   0.00000   0.00000
0.00421   0.03343   0.13516   0.12358   0.09695   0.03669   0.00444   0.00114
0.00952   0.00761   0.00133   0.00078   0.00097   0.00136   0.00516   0.00519
0.00014   0.00015   0.00010   0.00046   0.00000   0.00010   0.00000   0.00210
0.00000   0.00010   0.00368   0.00000   0.00000   0.00000   0.00000   0.08459
0.16331   0.09553   0.07773   0.00997   0.00173   0.00930   0.00688   0.01072
0.00092   0.02099   0.00471   0.00186   0.00406   0.00063   0.00774   0.00000
0.00000   0.00785   0.00040   0.00000   0.00406   0.00142   0.00015   0.00000
0.01106
1994    1    4    3    0    1   -1   -1  57.0      0.00000   0.00000   0.00188
0.00172   0.02248   0.06742   0.16134   0.06637   0.05077   0.01964   0.02589
0.01692   0.01507   0.00685   0.00937   0.00755   0.00629   0.00023   0.00172
0.00485   0.00342   0.00000   0.00012   0.00005   0.00157   0.00701   0.00003
0.00003   0.00481   0.00112   0.00000   0.00000   0.00188   0.00357   0.00711
```

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0.07028   0.14803   0.10959   0.06474   0.02123   0.02352   0.00682   0.00788
0.00474   0.00637   0.00851   0.00088   0.00481   0.00030   0.00062   0.00043
0.00023   0.00023   0.00012   0.00000   0.00000   0.00011   0.00000   0.00000
0.00350
1995    1    4    3    0    1   -1   -1  32.1      0.00000   0.00000   0.00000
0.00813   0.00909   0.01550   0.05015   0.13655   0.04976   0.06834   0.02326
0.00458   0.00773   0.00203   0.00506   0.00765   0.00000   0.00770   0.00000
0.00101   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.03349   0.03914
0.03379   0.05644   0.19687   0.04462   0.06603   0.05778   0.00316   0.02823
0.00677   0.02052   0.00101   0.00442   0.00809   0.00005   0.00000   0.00101
0.00000   0.00101   0.00000   0.00101   0.00000   0.00000   0.00000   0.00000
0.00000
1996    1    4    3    0    1   -1   -1  70.0      0.00000   0.00000   0.00532
0.00750   0.03965   0.04283   0.04183   0.08143   0.05803   0.04960   0.03762
0.02950   0.01078   0.00995   0.01224   0.00258   0.00143   0.00721   0.00489
0.00000   0.00000   0.00034   0.00009   0.00000   0.00000   0.00050   0.00000
0.00000   0.00000   0.00264   0.00000   0.00000   0.00354   0.00565   0.04606
0.04505   0.06664   0.11433   0.11778   0.03313   0.02666   0.01843   0.01539
0.00301   0.02493   0.00685   0.00239   0.00203   0.00882   0.00000   0.00022
0.00000   0.00000   0.00264   0.00000   0.00821   0.00000   0.00000   0.00022
0.00203
1997    1    4    3    0    1   -1   -1  94.0      0.00000   0.00000   0.00008
0.00101   0.00726   0.08297   0.03778   0.05579   0.05298   0.04154   0.06483
0.04776   0.03035   0.02026   0.00476   0.02109   0.00639   0.00695   0.00542
0.00255   0.00058   0.00669   0.00029   0.00108   0.00006   0.00237   0.00064
0.00005   0.00000   0.00009   0.00000   0.00000   0.00000   0.00163   0.00836
0.10829   0.04073   0.05108   0.05212   0.04842   0.04954   0.03587   0.02688
0.02293   0.01251   0.00503   0.00403   0.01243   0.00630   0.00257   0.00166
0.00035   0.00003   0.00299   0.00000   0.00000   0.00000   0.00000   0.00000
0.00461
1998    1    4    3    0    1   -1   -1  62.9      0.00000   0.00000   0.00000
0.00169   0.05395   0.02943   0.07570   0.02968   0.04599   0.04531   0.05263
0.06036   0.02818   0.00791   0.00962   0.00615   0.00661   0.00198   0.00334
0.00456   0.00466   0.00065   0.00145   0.00014   0.00136   0.00000   0.00000
0.00000   0.00000   0.00052   0.00000   0.00000   0.00000   0.00771   0.08175
0.06062   0.09268   0.06898   0.05385   0.02054   0.04544   0.02503   0.01826
0.01773   0.00546   0.00746   0.00945   0.00031   0.00000   0.00017   0.00428
0.00104   0.00539   0.00000   0.00052   0.00000   0.00000   0.00145   0.00000
0.00000
1999    1    4    3    0    1   -1   -1  71.8       0.00000   0.00000   0.00019
0.00161   0.01023   0.07363   0.04598   0.09364   0.04161   0.04705   0.03816
0.02215   0.02113   0.01529   0.01432   0.01416   0.00398   0.00861   0.00184
0.00429   0.00221   0.00116   0.00247   0.00195   0.00106   0.00010   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00079   0.00130   0.01854
0.07214   0.05925   0.10060   0.06900   0.05139   0.02678   0.02208   0.02956
0.01627   0.00603   0.00580   0.00562   0.01201   0.00498   0.01455   0.00605
0.00308   0.00233   0.00060   0.00308   0.00105   0.00000   0.00000   0.00028
0.00000
2000    1    4    3    0    1   -1   -1  40.2       0.00000   0.00000   0.00000
0.00000   0.00682   0.03281   0.09860   0.07333   0.07504   0.05679   0.03949
0.02742   0.05920   0.03256   0.03299   0.02113   0.00236   0.00056   0.02363
0.00000   0.00471   0.00000   0.00236   0.00000   0.00000   0.00022   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00353
0.04391   0.06088   0.11621   0.05522   0.04438   0.02728   0.02824   0.00939
0.00035   0.00287   0.00306   0.00824   0.00236   0.00215   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00194   0.00000   0.00000
0.00000
2001    1    4    3    0    1   -1   -1  35.0      0.00000   0.00000   0.00000
0.00000   0.00000   0.00819   0.06009   0.09860   0.03698   0.06524   0.06364
0.03241   0.03763   0.02260   0.02086   0.00094   0.01265   0.02253   0.03378
0.00000   0.00000   0.00000   0.00894   0.00000   0.00894   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00017   0.00000
```

```
0.01041   0.07264   0.01207   0.06449   0.09240   0.03459   0.03962   0.03238
0.03008   0.04197   0.02113   0.00409   0.00326   0.00000   0.00000   0.00000
0.00000   0.00000   0.00326   0.00326   0.00000   0.00000   0.00000   0.00000
0.00017
2002    1    4    3    0    1   -1   -1  32.2     0.00000   0.00000   0.00000
0.01026   0.00160   0.00140   0.03111   0.01471   0.03821   0.11190   0.04871
0.07365   0.00409   0.03396   0.03075   0.03340   0.00377   0.00337   0.00000
0.00040   0.00040   0.00337   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00337   0.00000   0.00000   0.00000   0.01026   0.00160
0.00168   0.01528   0.03496   0.04386   0.10417   0.02863   0.02081   0.09759
0.03171   0.06070   0.00160   0.03019   0.00000   0.03256   0.00000   0.02879
0.00337   0.00040   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00337
2003    1    4    3    0    1   -1   -1  6.5    0.00000   0.00000   0.01327   0.41150
0.03982   0.00000   0.00000   0.01327   0.00442   0.02212   0.00442   0.00000
0.00000   0.01327   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.27876   0.01327   0.00885
0.00885   0.03540   0.03982   0.03982   0.00000   0.01770   0.00000   0.00442
0.01327   0.01327   0.00000   0.00000   0.00000   0.00000   0.00442   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
2004    1    4    3    0    1   -1   -1  11.4     0.00000   0.00000   0.00000
0.00000   0.01493   0.01580   0.01493   0.01580   0.03819   0.03819   0.06848
0.05970   0.06673   0.07550   0.01449   0.05268   0.04653   0.03073   0.00746
0.00746   0.00746   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.01449   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.02327
0.00000   0.01493   0.03073   0.05399   0.06980   0.03907   0.01493   0.04741
0.02327   0.00746   0.03161   0.03907   0.00000   0.00746   0.00000   0.00000
0.00746   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.00000
2008    1    4    3    0    1   -1   -1  13.9     0.00000   0.00000   0.00000
0.00000   0.03743   0.03751   0.01516   0.05785   0.02185   0.02063   0.05326
0.01065   0.01065   0.02972   0.00872   0.09010   0.00720   0.03920   0.00000
0.00008   0.00000   0.00185   0.07486   0.00000   0.00000   0.00000   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
0.03751   0.00712   0.05545   0.05212   0.05216   0.03802   0.08121   0.04408
0.01457   0.01280   0.00000   0.01271   0.00000   0.07486   0.00059   0.00000
0.00000   0.00000   0.00000   0.00000   0.00000   0.00008   0.00000   0.00000
0.00000

2003    1   11    3    0    1   -1   -1   8.6     0    0    0    0    0    0    0
0    1    0    0    0    0    1    1    0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    1    0
0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
2004    1   11    3    0    1   -1   -1   6.1     0    0    0    0    0    2    0
0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    1    0    1    1    0    1    1    0    0
0    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
2005    1   11    3    0    1   -1   -1  11.0     0    0    0    0    0    0    0
0    1    4    2    2    0    1    1    0    0    0    1    0    0    1    0    0    0
0    0    0    0    0    0    0    0    0    0    1    1    1    0    0    0    1    2
1    1    0    1    0    0    0    0    0    0    0    0    0    0    0    0    0
2006    1   11    3    0    1   -1   -1  16.0    0    0    0    0    2    5    1    1
2    0    0    1    2    0    0    1    0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    2    2    0    2    2    0    0    0    1    0    0
0    2    0    0    0    2    0    0    1    0    0    0    0    0    0    0
2007    1   11    3    0    1   -1   -1  19.1     0    0    0    0    1    0    1
3    3    2    1    3    1    1    2    1    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    0    1    1    6    2    1    4    1    0
0    0    1    0    0    0    0    1    0    0    0    0    0    0    0    0    0
2008    1   11    3    0    1   -1   -1   9.4    0    0    0    0    0    0    0    0
1    0    0    0    1    0    0    0    1    0    0    0    0    0    0    0    0    0
```

```
0    0    0    0    0    0    0    0    1    0    0    0    0    1    2    0    1    1
0    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0

2003    1   12    3    0    1   -1   -1   12.8    0    0    0    0    0    0    0
0    0    0    0    0    0    0    0    0    1    0    0    0    0    0    0    0    0
1    0    0    0    0    0    0    0    0    0    0    0    3    0    0    1    0    0
0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
2004    1   12    3    0    1   -1   -1   14.9    2   14    0    3    9    2    0
0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
0    0    0    0    0    0    0    2    2   13    2    0    0    0    0    0    0    0
0    0    0    0    0    1    0    0    0    0    0    0    0    0    0    0    0
2005    1   12    3    0    1   -1   -1   23.1    0    0    5    2    3    2    1
1    0    0    1    0    2    1    3    2    1    0    1    0    1    1    0    0    0
0    1    0    0    0    0    0    4    4    1    3    6    2    0    2    3    2    0
3    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
2006    1   12    3    0    1   -1   -1   22.3    0    0    0    0    0    1    4
4    0    1    2    1    0    0    4    3    1    1    3    1    0    0    1    1    2
0    2    0    1    1    0    1    0    0    1    3    5    4    4    1    1    0    2
2    2    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
2007    1   12    3    0    1   -1   -1   19.2    0    0    0    0    1    1    2
6    2    6    2    0    0    1    0    0    0    0    0    0    1    0    0    0    0
0    0    0    0    0    0    0    0    0    1    0    2    5    3    2    3    0    1
2    0    2    1    0    1    0    0    0    0    0    0    0    0    0    0    0
2008    1   12    3    0    1   -1   -1   10.4    0    0    0    0    0    0    0
1    1    0    0    0    0    0    1    0    0    0    0    0    0    1    0    0    0
0    0    0    0    0    0    0    0    1    1    1    0    0    1    1    1    0    0
0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0

-1            #_N_MeanSize-at-Age_obs

2             #_N_environ_variables
15            #_N_environ_obs

#_Year Variable      Value
 1980  1                   0.724518629
 1983  1                   1.236554728
 1986  1                   0.305533679
 1989  1                   -0.526410321
 1992  1                   1.078178166
 1995  1                   0.718825954
 1998  1                   0.529870997
 2001  1                   -0.260982852
 2004  1                   -0.126751988
 2003  2                   0.255464922
 2004  2                   -0.126751988
 2005  2                   0.112851373
 2006  2                   -0.118002192
 2007  2                   -0.576076484
 2008  2                   -0.362683828

0 # no wtfreq data

0 # no tag data

0 # no morphcomp data

999

ENDDATA
```

20 Appendix I. Spatial distribution of widow rockfish catch by the West Coast Groundfish Observer program. These figures were provided by Marlene Bellman of the NWFSC.

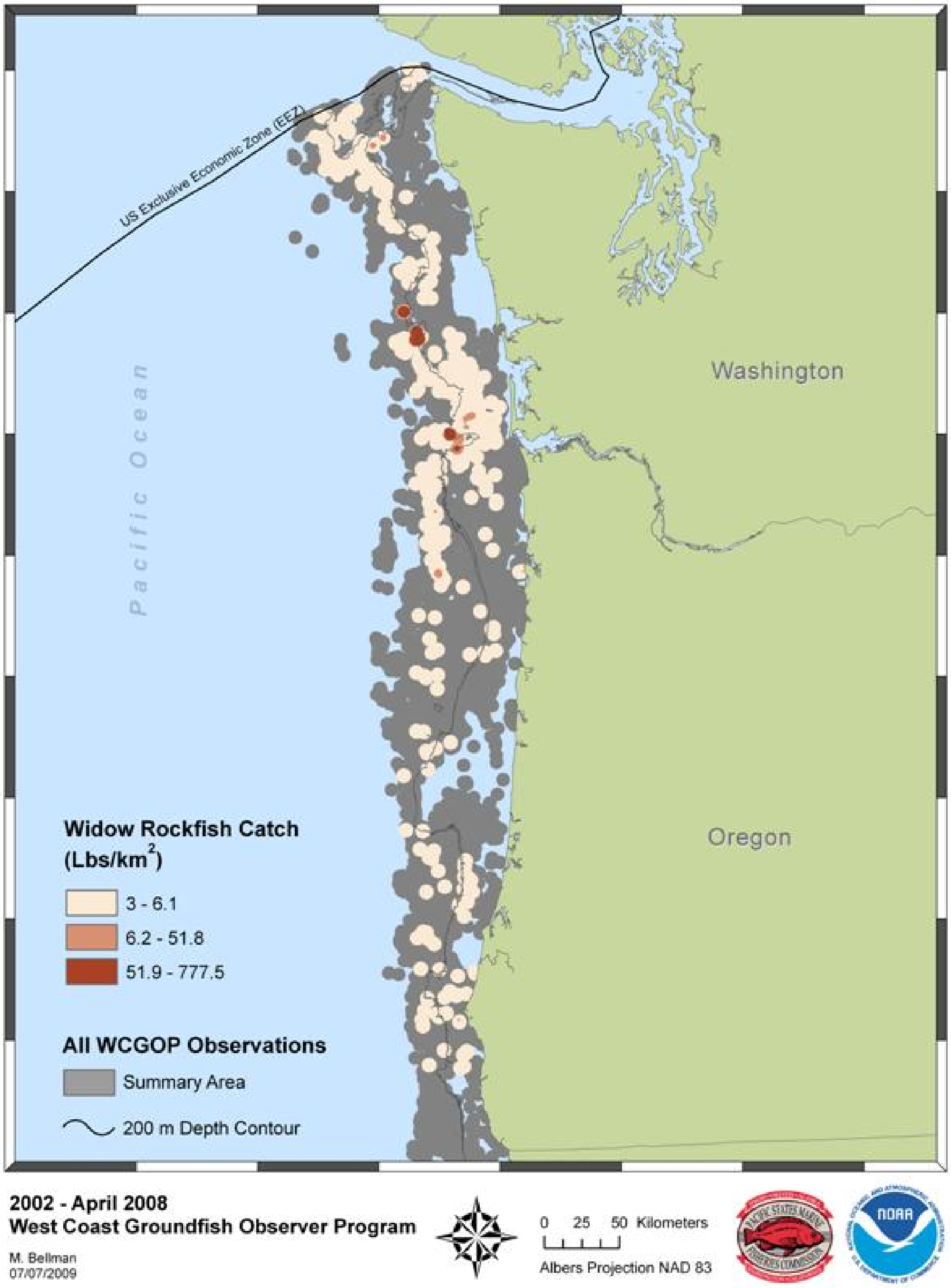

Figure I1. Spatial distribution of widow rockfish catch (lbs/km^2) observed by the West Coast Groundfish Observer Program from 2002 to April 2008 and the summary area of all observed fishing events off of Washington and Oregon. Note that this figure does not include midwater trawls from the at-sea whiting fishery.

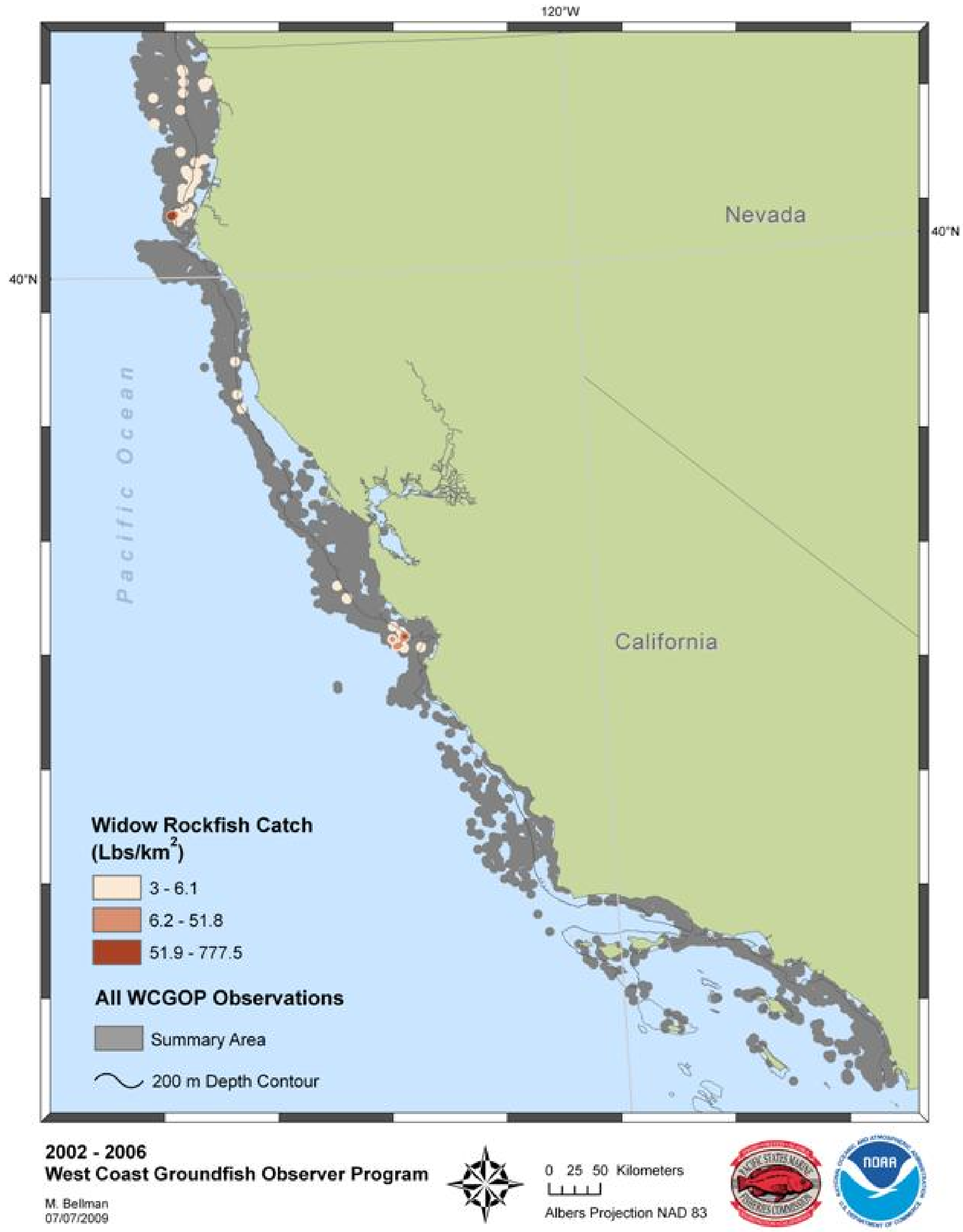

Figure I2. Spatial distribution of widow rockfish catch (lbs/km^2) observed by the West Coast Groundfish Observer Program from 2002 to April 2008 and the summary area of all observed fishing events off California. Note that this figure does not include midwater trawls from the at-sea whiting fishery.

Agenda Item E.2.a
Attachment 7
September 2009

WIDOW ROCKFISH

STAR Panel Report

July 13-17, 2009

Southwest Fisheries Science Center
110 Shaffer Road, Santa Cruz, CA 95060

Panel Reviewers

Martin Dorn	Panel Chair, Scientific and Statistical Committee (SSC) Representative
Chris Francis	Center for Independent Experts (CIE)
Vladlena Gertseva	NMFS, Northwest Fisheries Science Center (NWFSC)
J. J. Maguire	Center for Independent Experts (CIE)

Panel Advisors

John DeVore	Pacific Fishery Management Council
Gerry Richter	Groundfish Advisory Subpanel (GAP) Representative
John Budrick	Groundfish Management Team (GMT) Representative

Stock Assessment (STAT) Team members present

Xi He	NMFS, Southwest Fisheries Science Center (SWFSC)
Alec MacCall	NMFS, Southwest Fisheries Science Center (SWFSC)
Stephen Ralston	NMFS, Southwest Fisheries Science Center (SWFSC)
John Field	NMFS, Southwest Fisheries Science Center (SWFSC)
E. J. Dick	NMFS, Southwest Fisheries Science Center (SWFSC)

Overview

A draft assessment of widow rockfish (*Sebastes entomelas*) off the United States West Coast was reviewed by the STAR panel during July 13-17, 2009. The assessment assumes a single coastwide stock given that there is currently no biological or genetic information to suggest the presence of multiple stocks. Northern and southern areas are modeled with different growth in each area. Recruits are produced from a common pool of spawners, and are assigned to each area according to year-invariant proportion (estimated by the model). No mixing is assumed to occur post recruitment.

This assessment uses the Stock Synthesis platform (version 3.03a) and incorporates a variety of data sources into the base model. Catch and age-frequency data from four fisheries are used in the assessment, including Washington and California fisheries (all gears combined), and Oregon midwater and bottom trawl fisheries. A fishery-dependent relative abundance (CPUE) index calculated from Oregon trawl fishery data was used in the model, and three bycatch indices were estimated from foreign, joint-venture and domestic Pacific whiting fisheries. Fishery-independent data included the midwater trawl pelagic juvenile survey, the triennial trawl survey and the NWFSC shelf-slope survey. In addition to survey indices, length-frequency data were available from the triennial and NWFSC shelf-slope surveys, and age data from the NWFSC shelf-slope survey.

The last full assessment of widow rockfish was conducted in 2005, and it was subsequently updated in 2007. Major changes made in this assessment, compared with the previous assessment include:

- Use of SS3 modeling framework instead of previously employed direct ADMB code;
- Extension of period modeled from 1958 to 1916;
- Use of revised catch history based on Lynde (1986), Tagart (1985) and Ralston et al. (2009);
- Addition of NWFSC shelf-slope trawl survey (referred to as NWFSC combo survey in the assessment report);
- Use of revised triennial survey estimates using a GLMM approach (instead of area-swept approach previously used);

The STAR panel concluded that the widow rockfish assessment constitutes the best available scientific information on the status of widow rockfish off the U.S. west coast and recommends that it be used for status determination and management in the Council process. The base model developed during the Panel meeting is considered reasonably well investigated. However further model evaluation and exploration of alternative model configurations is a priority for widow rockfish. There was insufficient time to accomplish this during the STAR Panel meeting because of difficulties in developing a suitable base model. The STAR panel thanks the STAT team members for their hard work and willingness to respond to panel requests.

Analyses requested by the STAR panel

A total of 14 requests were made by the STAR panel. While data and modeling requests were fulfilled in an order different than that in which they were made, data requests are discussed first in the list below, followed by modelling requests. The requests have been grouped and re-ordered for readability.

Data requests

1. **Split Oregon catches for midwater and bottom trawl fisheries prior to 1983 out of the Washington fishery.**
   Rationale: The draft assessment models four fisheries: a) Vancouver – Columbia, b) Oregon midwater trawl, c) Oregon bottom trawl, d) Eureka, Monterey and Conception. Because there was no age composition data prior to 1983, catches for the OR MWT and BT for 1983 and prior years, when widow catches were substantial, were lumped with the Vancouver – Columbia (Washington) catches. This is inaccurate in terms of fishery history and could result in model misspecification. Information is available for years prior to 1983 to partition Oregon catches into bottom trawl and midwater trawl and the panel requested that it be done.
   Response: Available information was used to parse OR MWT and BT out of the Vancouver-Columbia fishery, into OR MWT and BT, with little effects on the modeling results.
2. **Provide new estimates for catches in Vancouver – Columbia for 1916 to 1976.**
   Rationale: Some catches are known to have occurred prior to the late 1970s, but as there were no estimates, the draft assessment assumed that catches in Vancouver – Columbia for 1916 to 1976 were the same as in the Eureka, Monterey and Conception commercial fisheries for the same years. This seemed highly unlikely and the panel requested that real data be used or that catches in those years without information be assumed to be zero.
   Response: Widow rockfish catches were estimated from a spreadsheet prepared by Tagart (1985), total rockfish catches by state from 1938 to 1955 published in the Bulletin of Commercial Fisheries (red books), an Alaska Fisheries Science Center report on catch reconstruction (Lynde 1986) for 1956 to 1980, and on the percent widow rockfish in the total rockfish category. This should be seen as provisional reconstruction that should be re-evaluated in the next assessment. These new landings were assigned to the OR bottom trawl fishery for modeling as opposed to the Vancouver – Columbia fishery. This was not expected to make a large difference, but was felt to correspond more to reality.
3. **Provide discard rates by State and gears from the West Coast observer program for 2002-2008. Review Pikitch data to see if there is information on discard rates by gear (bottom vs midwater trawl). If the discard rates are different, total removals**

should be adjusted accordingly. For foreign fleets, remove the discards as discards are not believed to have occurred. Report what discard rates had been applied to what fishery in what year.

Rationale: It was unclear what discard rates had been used in the draft assessment. The panel asked that what had actually been done be documented and potentially revised using sources of information that might not have been used.

Response: No discard was applied to the foreign fishery, since Rogers (2003) indicates that the large capacity foreign vessels did not discard fish based on either size or species. For all domestic fisheries, discards were assumed to be 6% until 1981, and 19% from 1982-2001 (Pikitch study did not show significant differences in discard rates between bottom and midwater trawl fisheries for widow rockfish). Between 2002 and 2007, total catches (landings plus discard) were reconstructed from West Coast Groundfish Observer Program total mortality estimates and at-sea whiting fishery bycatch estimates, provided by the Northwest Fisheries Science Center. The only 2008 discard information for widow rockfish available at the time of STAR Panel was the discard estimate from the PacFIN quota-species monitoring report, and this value was minimal, therefore for 2008 landing data from PacFIN and the widow bycatch estimate in the at-sea whiting fishery were used, and no discard was added.

4. **Provide a graph of the abundance indices scaled to their own average for a common time period so that they are on a similar scale.**

   Rationale: A close examination of the abundance indices should be standard practice into assessments before any modeling takes place to identify what story the indices are telling if any.

   Response: As this request was not seen as high priority, there was insufficient time during the panel meeting to provide this graph. Such a graph should be included in the final assessment report.

Modeling requests

5. **Reset all effective Ns using Stewart's method with number of trips and number of fish for fisheries; for the surveys, use Stewart's method with the number of positive hauls. Do the re-tuning with effective N multipliers for the composition data sets, rather than adjusting each individual year.**

   Rationale: The draft assessment appears to have tuned each individual year of each data source rather than use a single weight by source of data. This is not appropriate, and single weight per series should be used rather than individual weights for each data point of each data series.

   Response: This was done, but the multipliers were used as new weights rather than as multipliers for the original weights. A new run was requested where the multipliers are used to modify the original weights rather than used as new estimates for the weights. This resulted in more stable model with a higher Bcurrent to B0 ratio (depletion).

6. **Provide a run with one asymptotic length-based selectivity for all surveys, genders and areas combined. Also provide a run with separate asymptotic length-based selectivity curves for each survey, but combining genders and areas.**
   Rationale: The draft assessment estimated selectivities by gender for each of the survey (2), genders (2) and areas (2) for a total of 8 selectivities. The resulting estimates showed strange patterns and were based on few observations.
   Response: Estimating a single selectivity for the 2 surveys, the 2 genders and the 2 areas deteriorated the fit and resulted in unreasonable selectivities. It seemed more sensible to estimate one selectivity per survey with genders combined. This improved the fit, but the results were counterintuitive in that the two survey curves shifted substantially to the left of the combined survey selectivity seen earlier. This indicates the survey selectivities are not well estimated, which is not surprising given the sparseness of the survey length composition data. There could also be issues associated with forcing the survey selectivities to be asymptotic.
   The Panel thought that taking two steps to change these selectivities should have been done one at a time. The panel requested two survey selectivity curves and allowing these curves to be dome-shaped using a double-normal function. These curves were more reasonable and the panel considered this configuration to be suitable for the base case model.
7. **Provide a run with the abundance index for juveniles up-weighted and the age and length compositions down-weighted.**
   Rationale: As a result of management measures, age and length compositions have become increasingly sparse since the early 2000s. In addition, length and age compositions provide only indirect evidence on the size of year-classes while the juvenile index does provide direct evidence.
   Response: As expected, a closer fit to the juvenile abundance index was obtained, and this model appeared to be more stable in comparison to other model configurations.
8. **Provide a new base case using the Francis multipliers applied to the N-multipliers from the last re-weighted run (Reweight 2). For the age compositions, four Francis weights will be used: 1) average WA and EM fisheries = 0.4 , 2) average for the ORM and ORB trawl fisheries = 0.22, and 3) average for north and south NWFSC survey = 0.20. For the length compositions, use 0.25 for the triennial survey and 0.10 for the NWFSC survey.**
   Rationale: The panel considered that the weights given to age and length compositions is too high because of autocorrelation in the compositions. A method was proposed to estimate appropriate weights (see Appendix) and a subjective judgement, based on the results, was made for the weights to be applied to each age and length composition data source.

Response: The panel considered this model to be an improvement given concerns about overweighting age and length composition data. The STAR panel and the STAT team agreed that this model was appropriate as a base case.

9. **For the new base case with the Francis weights, use h=0.30 and h=0.50 to bracket uncertainties. If these provide too narrow a range to bracket the uncertainties, use h=0.25 and h=0.55.**
   Rationale: Steepness is poorly known and changes in steepness results in substantial changes in depletion and recent population trends.
   Response: Runs with the four steepness were provided and the panel concluded that those with steepness of 0.25 and 0.55 were bracketing the uncertainties in this assessment.
10. **Provide spawning output trends for proportion of recruits in northern area at 0.68 and 0.80 and a table of the key parameters. Provide a graph of spawning output as depletion for the two areas to better see what is happening in the two areas for all three scenarios, including base case.**
    Rationale: The panel questioned the estimate of the proportion of recruitment in the north (0.72). The estimated coastwide depletion varies substantially as that proportion of northern recruitment varies, and the depletion was the greatest when the proportion was at the estimated value. The panel requested sensitivity analyses where the recruitment proportion in the north is fixed at lower (0.68) and higher (0.80) values.
    Response: When profiling on proportion of recruits in the north with the final base case (estimated propN = 0.717), steepness was near one when the proportion north was 0.65. The panel asked that the final assessment report provide runs with the proportion north of 0.6875, 0.717 and 0.75 with the requested graphs and key parameters.
11. **Provide a likelihood profile on steepness to be completed after the meeting.**
    Rationale: Steepness has considerable influence on the assessment results, particularly on recruitment and depletion estimates. It is important to know if the steepness used in the assessment is optimal in terms of likelihood.
    Response: Because of the time required to sort out the landings and discard data, and the time devoted to finding an acceptable model configuration, there was insufficient time during the panel meeting to complete this request. This request should be addressed in the final assessment report.
12. **Examine the contribution of age 1 male of OR MWT in 2007 to the total likelihood.**
    Rationale: This observation had a large residual and the panel was concerned that it could have a large influence on the total likelihood.
    Response: Because of the time required to sort out the landings and discard data, and the time devoted to finding an acceptable model configuration, there was insufficient time during the panel meeting to complete this request. This request should be addressed in the final assessment report.

13. **Slide 26 of the original widow rockfish presentation on July 14 shows stacked fishing mortalities by area. Provide different graphs for northern and southern areas.**
    Rationale: These data were from a two area model and the fishing mortality in the two areas are not additive.
    Response: Because of the time required to sort out the landings and discard data, and the time devoted to finding an acceptable model configuration, there was insufficient time during the panel meeting to complete this request. This request should be addressed in the final assessment report.
14. **Provide a run with single area model, re-combining the Triennial and NWFSC surveys into one series each with corresponding age composition data. If results are significantly different, try to explain the differences.**
    Rationale: The draft assessment used two-areas mostly because of difference in growth. As the assessment is largely age-based, difference in growth are less important than the reduction in sample size of stock size indices and composition information caused by having to break the series in two areas.
    Response: Because of the time required to sort out the landings and discard data, and the time devoted to finding an acceptable model configuration, there was insufficient time during the panel meeting to complete this request. This request should be addressed in the next assessment.

Description of base case model and alternative models to bracket uncertainty

Start year of the model =1916; two area model with time-invariant proportion of recruits assigned to each area; discard incorporated into total catches;
M fixed at 0.125yr^{-1} for both females and males; h estimated (but with Dorn's prior); $\sigma_R = 0.6$;
Von Bertalanffy growth parameters - all fixed for females and males.

Fisheries

- Washington fishery (all gears combined)
- Oregon midwater trawl fishery
- Oregon bottom trawl fishery
- California fishery (all gears combined)

Abundance indices:

- Oregon trawl CPUE (1984-1999)
- Foreign Pacific whiting fishery bycatch CPUE (1977-1988)
- Joint-venture Pacific whiting fishery bycatch CPUE (1983-1990)
- Domestic Pacific whiting fishery bycatch CPUE (1991-1998)
- Midwater trawl pelagic juvenile survey (2001-2008)
- Triennial trawl survey south of 43^o N (1980-2004)
- Triennial trawl survey north of 43^o N (1980-2004)

NWFSC shelf-slope trawl survey south of 43° N (2003-2008)
NWFSC shelf-slope trawl survey north of 43° N (2003-2008)

Age frequencies:

Washington fishery (all gears combined) (1980-2008)
Oregon midwater trawl fishery (1984-2008)
Oregon bottom trawl fishery (1984-2008)
California fishery (all gears combined) (1978-2008)
NWFSC shelf-slope trawl survey north of 43° N (2003-2008)
NWFSC shelf-slope trawl survey south of 43° N (2003-2008)

Length frequencies:

Triennial trawl survey index north of 43° N (1980-2004)
Triennial trawl survey index south of 43° N (1983-2004)
NWFSC shelf-slope trawl survey north of 43° N (2003-2008)
NWFSC shelf-slope trawl survey south of 43° N (2003-2008)

Uncertainty was bracketed by fixing steepness at 0.25 (low biomass) and at 0.55 (high biomass) to contrast with the base model where steepness was estimated to be 0.4.

Technical merits of the assessment

There were problems with the data and structure of the model in the draft document. Through fruitful interchanges between the STAT and the STAR Panel, considerable improvements in both model structure and data were achieved. The base case available at the end of the Panel meeting is considered reasonably well investigated and a substantial improvement on the original base case. There remain problems, however, particularly with the sharply-peaked selectivity patterns. Because the panel spent time trying to reconstruct catch history and because an inappropriate tuning algorithm had been used, there was insufficient time to fully examine models fits and model results. Because of these concerns, the Panel recommends that the next widow rockfish assessment be a full assessment rather than an update.

Explanation of areas of disagreement regarding STAR panel recommendations

A. Among STAR panel members (including concerns raised by the GAP and GMT representatives

There were no areas of disagreement among STAR panel members.

B. Between the STAR panel and the STAT team

There were no areas of disagreement between the STAR panel and the STAT team.

Unresolved problems and major sources of uncertainty

Whether it is preferable to do a single area stock assessment or a two area assessment remains one of the major unresolved problems for the widow rockfish assessment. There also remain problems with age determination and the reliability of age readings which needs to be better evaluated. As a result of substantially lower allowable catch due to fisheries management measures, the widow rockfish assessment has moved from being relatively data rich to being data poor because low allowable catches have resulted in sparse age and length compositions, and have rendered useless fishery-dependent stock size indices that were used in previous assessments. Furthermore, there is no reliable fishery independent monitoring.

Management, data, or fishery issues raised by the GAP and the GMT representatives

GAP and the GMT representatives (as well as representatives of fishing industry attending the meeting) provided assistance in identifying appropriate discard rates to apply to different fisheries in different time periods.

Prioritized recommendations for future research and data collection

- For the next assessment of widow rockfish, reconsider the overall structure of the model including the definition of fisheries, assignment of catches, age or size based selectivities, one or two area model. Development of a one area model (at least for comparative purposes) should be a priority. Estimates of growth, maturity, and fecundity used in a one area model should be representative of widow rockfish throughout its range off the West Coast.

- Do an interagency aging comparison to more reliably estimate the aging error matrix for widow rockfish, possibly using the Punt et al. (2008) aging error program.

- Do a comparative analysis of break and burn and surface age reading of otoliths to evaluate the reliability of ages in the early years of the assessment. If the comparative analysis indicates that age composition estimates can be improved, re-read the otoliths using the best available method.

- Low allowable catches have resulted in sparse age and length compositions in recent years. Sampling protocols for widow rockfish should be re-evaluated to ensure that adequate samples are obtained.

- There is currently no effective monitoring program for this stock. There is a need for the development of alternative survey methods for widow rockfish.

- Investigate the usefulness of blocking time periods into presumptive environmental regimes as indicated by the PDO (Pacific Decadal Oscillation) to reflect possible climate effect.

- Bias adjustment of stock recruitment relationship in SS3 seems to have been widely implemented with little or no peer review. Simulation testing is needed to confirm that bias adjustment is justified in all cases, and guidelines are needed on how to configure bias adjustment settings to reflect the information available and the biological characteristics of the stock.

- Develop methods to incorporate uncertainty in natural mortality and/or steepness in model configurations in which these parameters are fixed. The delta method for propagating uncertainty (McCall in prep.) is promising approach that warrants further evaluation.

Acknowledgements

The Panel thanks staff at the SWFSC Santa Cruz laboratory their exceptional support and provisioning during the STAR meeting.

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Appendix: Multinomial sample sizes

This Appendix describes the method that was used to correct the multinomial sample sizes for compositional data in the widow rockfish assessment, shows the results of its application to these data, and provides a brief rationale for the use of this method. The description that follows concerns age data, but the approach is exactly the same for length data. Also, for simplicity, the following description ignores sex, but the extension to include sex is straightforward.

Suppose $p_{ay,\mathrm{obs}}$ is the observed proportion at age a in year y in a set of age composition data that is assumed to have a multinomial error structure, and let $N_{\mathrm{init},y}$ denote the initial sample sizes. We run our assessment model using these sample sizes and obtain, from the model fit, estimates of the expected proportions at age, $p_{ay,\mathrm{exp}}$. Our aim is to use the $p_{ay,\mathrm{obs}}$, $p_{ay,\mathrm{exp}}$, and $N_{\mathrm{init},y}$ to calculate a correction factor f so that the size of the model residuals is consistent with the corrected sample sizes, $N_{\mathrm{corr},y} = fN_{\mathrm{init},y}$.

This aim is the same as for the method currently used in SS3 to correct multinomial sample sizes. Where the two methods differ is that the SS3 method is based on the residuals for individual proportions, $r_{ay} = p_{ay,\mathrm{obs}} - p_{ay,\mathrm{exp}}$, whereas the present method is based on residuals for mean age, $r_y = (m_{y,\mathrm{obs}} - m_{y,\mathrm{exp}})$, where $m_{y,\mathrm{obs}} = \Sigma_a(a\, p_{ay,\mathrm{obs}})$, and $m_{y,\mathrm{exp}} = \Sigma_a(a\, p_{ay,\mathrm{exp}})$. The reason for using mean-age residuals is discussed below.

For the multinomial distribution, the expected variance of the mean age, $m_{y,\mathrm{obs}}$, and thus of the residual r_y, is $v_y/(fN_{\mathrm{init},y})$ [i.e., $v_y/N_{\mathrm{corr},y}$], where v_y is the variance of the age frequency in year y, given by $v_y = \Sigma_a(a^2\, p_{ay,\mathrm{obs}}) - m_{y,\mathrm{obs}}^2$. Therefore, the expected variance of $r_y(N_{\mathrm{init},y}/v_y)^{0.5}$ is $1/f$, and we estimate f as $1/\mathrm{Var}(r_y(N_{\mathrm{init},y}/v_y)^{0.5})$.

Figure 1 shows the application of this method to the widow rockfish age and length composition data. In this application, the sample sizes, $N_{\mathrm{init},y}$, were those obtained after correction (or tuning) using the SS3 method. That is to say, the residuals for individual proportions, r_{ay}, should be consistent with the size expected given these sample sizes. What Figure 1 shows is that the mean-age residuals are still too large (note that many of the confidence intervals for the observed values do not overlap the expected values). Thus, according to the present method, the sample sizes are too large, and so the estimated f is less than 1 for all data sets (range 0.04 to 0.45).

The reason the mean-age residuals, r_y, can be too large, while the individual proportion residuals, r_{ay}, are not, is that there is substantial correlation between the individual residuals. This is shown in Figure 2, in which the observed age frequency flips from one side of the expected frequency to the other from one year to the next. Lateral shifts of this magnitude would not be possible if the individual residuals were uncorrelated. This correlation could be caused by either observation or process error (or a combination of both). One explanation of how this could occur derives from the fact that size (and thus age) distribution of fish often varies spatially. Between-year lateral shifts in age frequencies could occur if the spatial distribution of fishing changes substantially from year to year. In a model like that for widow rockfish, in which selectivities are assumed to be time-invariant, changes in the spatial pattern of fishing would add process error to the observations. If the spatial distribution of catch sampling varied from year to year, in a way that did not reflect the movement of fishing activity, this would produce observation error, with a correlation between individual proportions. More information on the generation of correlations in composition data are given by Hrafnkelsson & Stefánsson (2004) and section 3 of Francis (2006).

Note that there is no intention to suggest that mean age (or length) is a quantity of particular interest in stock assessments. The only reason mean age (or length) is used in calculating the correction factor is that it is sensitive to the sort of correlations shown in Figures 1 and 2. Because of these correlations the composition data are less informative than is suggested by the multinomial sample size correction method used in SS3 (which assumes no correlation). Ideally, we should include these correlations in the likelihood function for composition data. However, that is not straightforward to do. The method proposed here is a simpler pragmatic alternative approach which adjusts sample sizes to compensate for the correlations.

Appendix References

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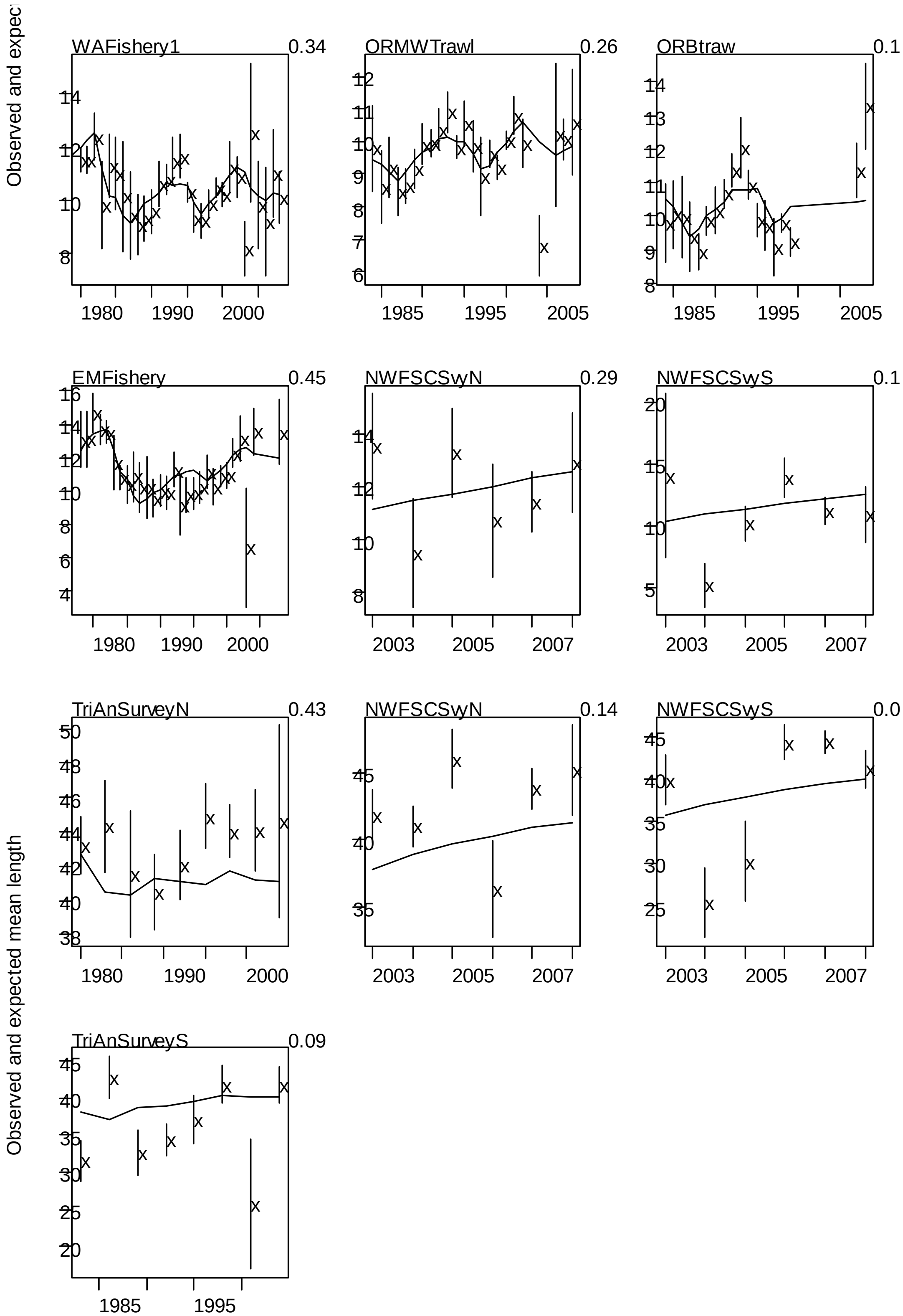

Figure 1. Observed and expected mean ages (upper panels) and lengths (lower panel) for the widow rockfish composition data in the (former) base case model. Vertical bars are approximate 95% confidence intervals based on the multinomial sample sizes used in that model. The number printed above each panel is the correction factor *f*, calculated as described above.

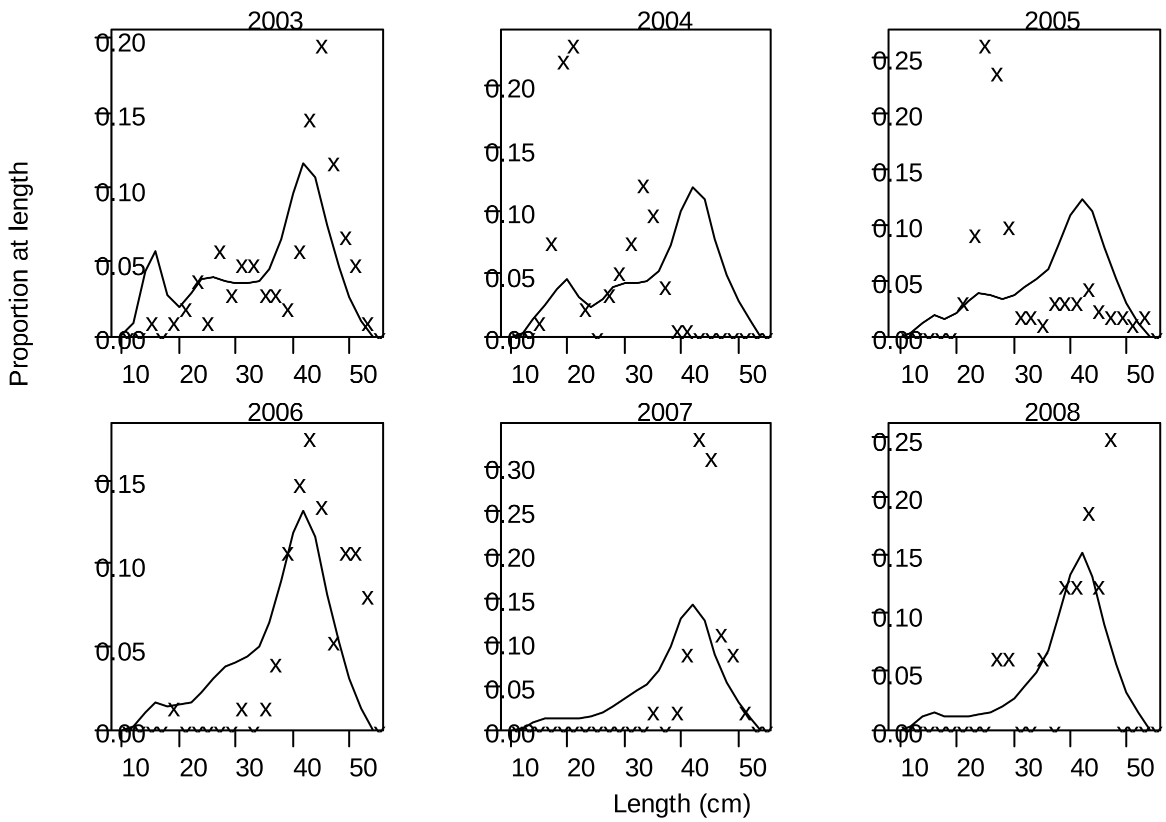

Figure 2. Observed ('x') and expected (line) proportions at length (sexes combined) for data set NWFSCSvyS.

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Status and Future Prospects for Lingcod in Waters off Washington, Oregon, and California as Assessed in 2009

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Status and Future Prospects for Lingcod in Waters off Washington, Oregon, and California as Assessed in 2009

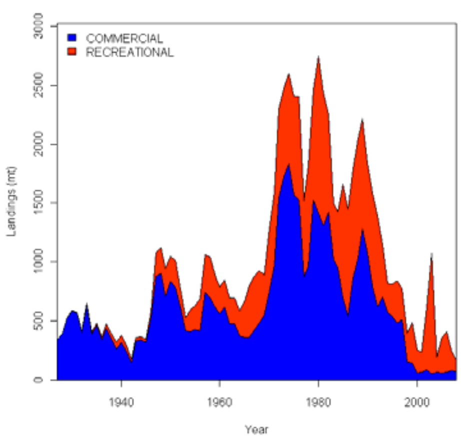
This assessment applies to lingcod (*Ophiodon elongatus*) off the West Coast of the United States, and is conducted as two separate assessments of (1) Lingcod off of Washington and Oregon (the North stock), and lingcod off of California (the South stock).

For each stock, two fisheries are modeled: the commercial fishery and the recreational fishery. Landings are included from 1928-2008, with equilibrium landings estimated for the commercial fisheries prior to 1928. Since the fishery off of California developed earlier, the equilibrium catches are an order of magnitude higher there (341 metric tons (mt) in California vs. 36 mt for Washington/Oregon).

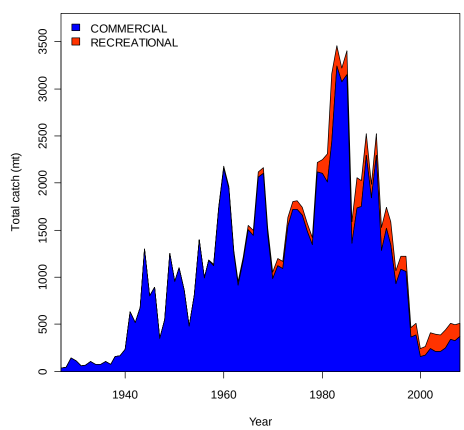
The largest landings off California were 2749 mt in 1980 (nearly equally divided between the commercial and recreational fleets). For Washington/Oregon, the largest landings were 3443 mt in 1983 (with over 90% of the landings coming from the commercial fleet). Landings exceeded 1400 mt for the years 1971-1991 in the South and the years 1973-1994 in the North. Landings have declined significantly over the past two decades, with the average landings over the past 10 years being 298 mt in the North and 405 mt in the South.

Landings history from 1928-2008

South



North



Year	S. Commercial	S. Recreational	N. Commercial	N. Recreational	Total
1999	142	342	216	125	825
2000	56	199	90	80	425
2001	63	170	93	92	418
2002	81	534	124	166	905
2003	51	1,021	107	189	1,368
2004	63	130	115	171	479
2005	61	299	140	190	690
2006	62	348	197	174	781
2007	79	174	190	168	611
2008	69	102	216	134	521

Landings (MT) for the last 10 years.

Catch (total mortality) is similar to landings for most of the time series. However, discard rates and therefore estimates of mortality due to discard for the commercial fishery have been quite high relative to landed catch in recent years due to regulations.

This assessment used the Stock Synthesis (SS) model, version 3.03a. Lingcod has been modeled using various age-structured forward-projection models since the mid-1990s. The previous assessment was conducted in 2005 in SS2 (Jagielo et al. 1995). Data used in the base models for the current assessment include the following: Commercial and Recreational landings data from 1928-2008, with information on prior catch informing the "equilibrium" landings level; Commercial discard rates from 2002-2007; Triennial survey indices for the years 1980-2004 (every 3rd year); NWFSC survey indices for the years 2003-2008; commercial logbook CPUE indices for the years 1976-1997 (North) or 1978-1997 (South); PSMFC Dockside (recreational) boat survey index 1980-1989, 1993-1997 (South); Commercial length composition data for 1965-2008 (North) or 1978-2008 (South); Commercial discard length composition data for 2003-2007 (North) and 2004-2007 (South); Recreational length composition data for 1993-2008 (North) or 1987-2008 (South); Triennial length composition data for 1986-2004 (North) or 1989-2004 (South); NWFSC length composition data for 2003-2008.

Age data were available and used in sensitivities but not in the base models due to issues with outliers and possible aging bias. The data used in sensitivities include: Commercial conditional age-at-length data for 1980-2008 (North) and 1987-2008 (South); Recreational conditional age-at-length data for1999-2008 (North); Triennial conditional age-at-length data for 1992-2004 (North) or 1995-2004 (South); NWFSC survey conditional age-at-length data for 2003-2008.

A number of sources of uncertainty were explicitly included in this assessment. There were also other sources of uncertainty that were not included in the current model, including the degree of connection between the two lingcod stocks and also between the northern stock and the stock off British Columbia; the effect of the PDO, ENSO and other climatic variables on recruitment, growth and survival of lingcod.

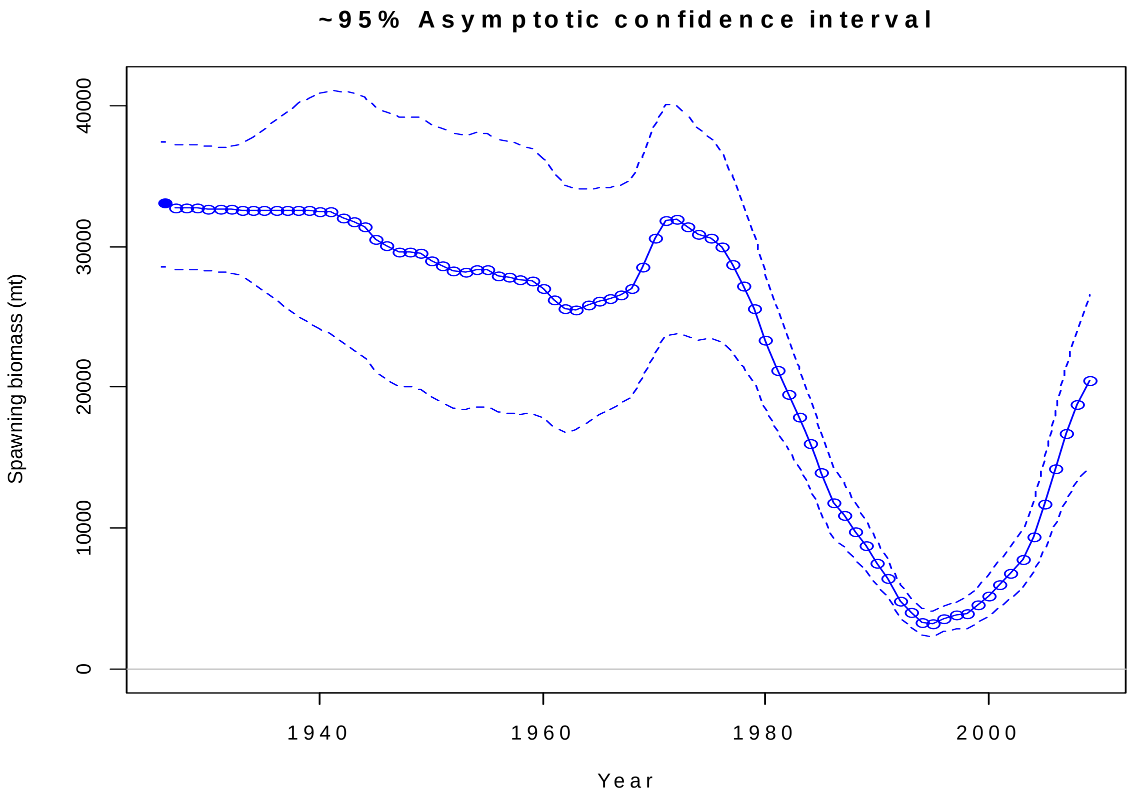
A reference case was selected based on extensive model testing and an attempt was made to balance the sources of uncertainty. In addition, an attempt was made to make the North and South models as equivalent as possible. In this regard, fixed and estimated parameters are largely the same for the two assessments. Natural mortality (M) is fixed at 0.18 for females and 0.32 for males in both assessments, while stock-recruitment steepness (h) is fixed at 0.8. Size at age 1 is estimated along with all other growth parameters except size at age 20. In the North, male and female size at age 20 is estimated within a model which includes conditional age-at-length data and then fixed in the base model. In the South, estimating Lmax resulted in unrealistically large values (possibly due to bias in ageing); therefore size at age 20 was fixed at the values used in the 2005 assessment. In both models there is a single block for commercial selectivity and retention changes, occurring in 1998 (to present) reflecting the increased regulation and areal limitations which have come into place over that period. That same block is used to model changes in recreational selectivity, reflecting changes in minimum size limits. In the North, male and female selectivities are estimated separately for the recreational fishery, whereas data to do so is lacking in the South.

Combined models:

The point estimate for the depletion of the spawning output (= spawning biomass) at the start of 2009 is 61.9% for the North, 73.7% for the South, and 67.0% coastwide. For West Coast groundfish, a stock is considered overfished when it is below 25% of virgin spawning biomass, and recovered when it reaches 40% of virgin spawning biomass. The current assessment indicates that coastwide; the stock is recovered, as are both stocks, off of Washington and Oregon and off of California. Overfishing is considered to be occurring when catch exceeds the ABC specified for a particular year. Overfishing last occurred in 2003, although there is some dispute about the magnitude of recreational fishery catch off of California for that year.

North Model:

The base model indicates that the lingcod female spawning biomass off of Washington and Oregon declined rapidly in the 1980s and early 1990's, hitting a low of 3,217 mt in 1995, and has subsequently recovered to 21,264 mt, which is over 60% of the virgin level. The 95% confidence interval in the current depletion for the North ranges from 48-76%.



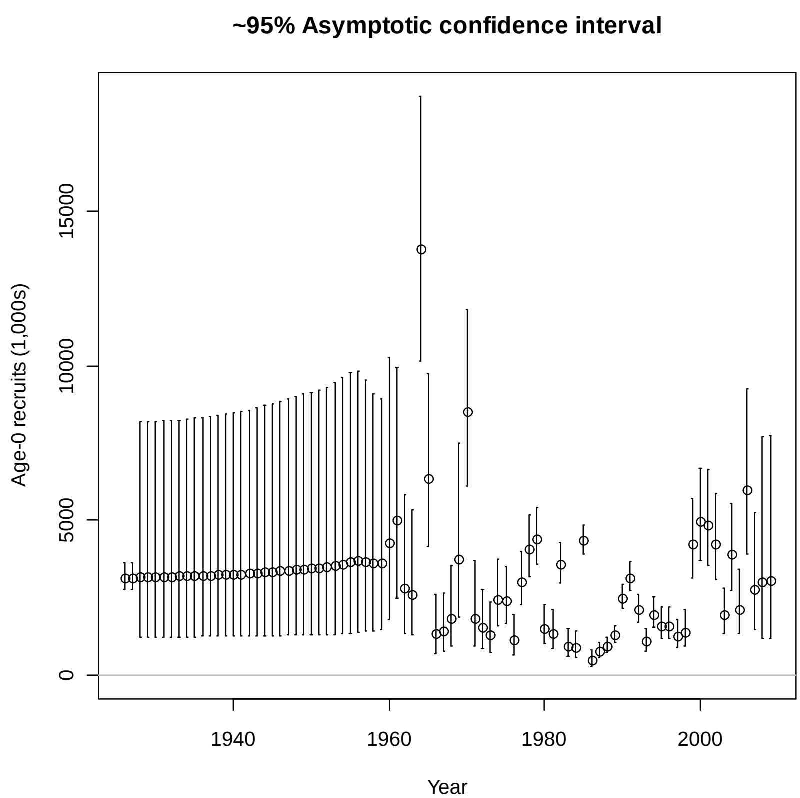
Year	Total biomass (mt)	Age 2+ biomass (mt)	Female spawning biomass (mt)	~95% confidence interval	Estimated depletion	~95% confidence interval
1999	8,743	8,508	4,610	3,362-5,859	13.9%	11-17%
2000	9,824	9,176	5,244	3,805-6,682	15.9%	12-19%
2001	11,776	11,023	6,030	4,388-7,672	18.2%	14-22%
2002	14,364	13,635	6,840	4,980-8,699	20.7%	16-25%
2003	17,283	16,655	7,837	5,694-9,980	23.7%	19-29%
2004	20,215	19,903	9,437	6,859-12,015	28.5%	23-35%
2005	23,078	22,498	11,689	8,489-14,888	35.3%	28-43%
2006	25,551	25,198	14,271	10,321-18,220	43.1%	34-52%
2007	27,979	27,093	16,710	11,993-21,426	50.5%	40-61%
2008	30,235	29,813	18,774	13,360-24,187	56.8%	44-69%
2009	32,222	31,764	20,484	14,449-26,520	61.9%	48-76%

Recruitment

Recruitments in the North were estimated from 1928-2007, with bias correction ramping in from 1950 to 1964 as data becomes informative. The base model indicates a very strong recruitment event in 1964, a secondary event in 1970, and recent relatively strong recruitments in 1999-2002, with fairly high recruitment in 2006 as well. Recruitments subsequent to 2007 are drawn exclusively from the stock-recruit curve, with correspondingly high levels of uncertainty.

Recent estimated trend in lingcod recruitment in the North.

Year	Estimated recruitment	~95% confidence interval
1999	4,235	2,955-5,514
2000	4,972	3,490-6,454
2001	4,836	3,304-6,368
2002	4,256	2,883-5,628
2003	1,960	1,237-2,683
2004	3,908	2,520-5,296
2005	2,138	1,114-3,162
2006	6,004	3,379-8,629
2007	2,771	937-4,605
2008	3,018	28-6,008

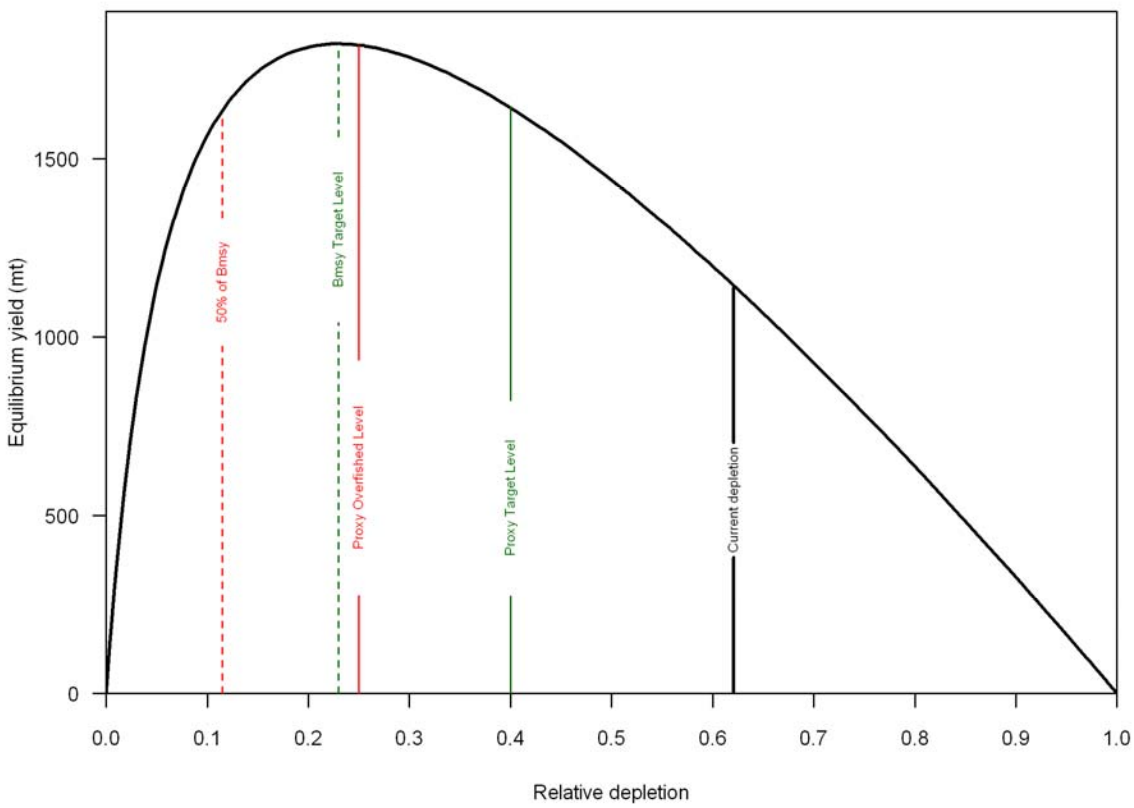


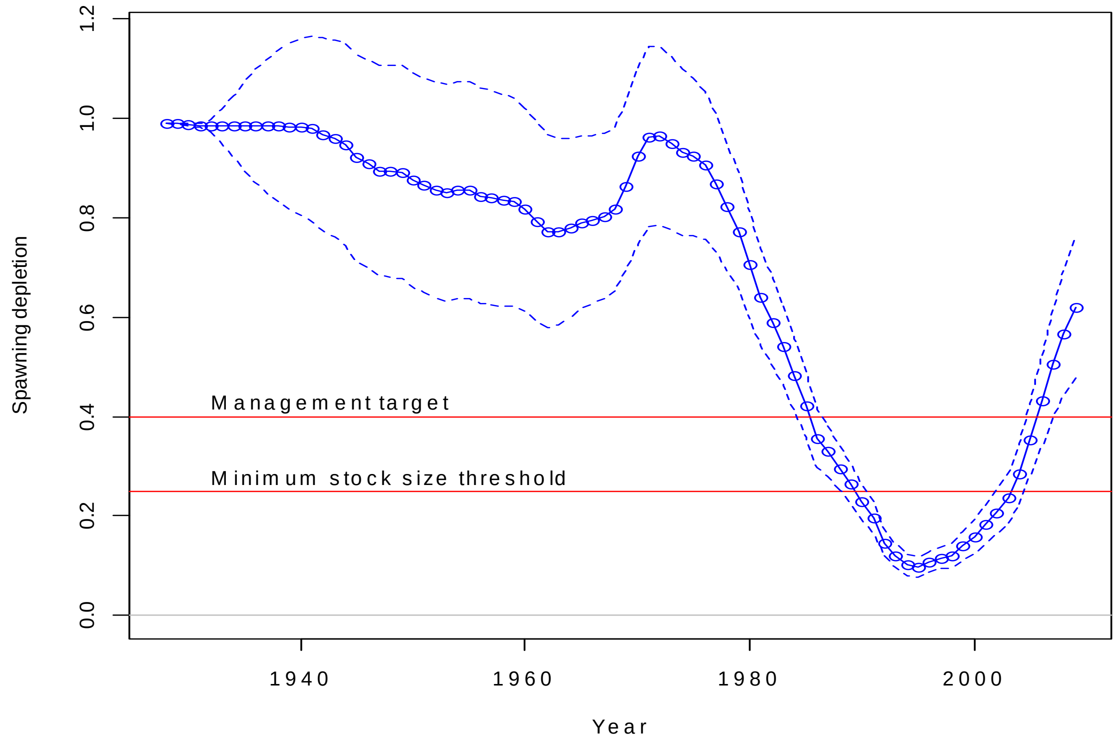
Reference points

For the North, lingcod unfished spawning biomass (SBzero) is estimated to have been 33,075 mt (~95% confidence interval: 28,661-37,489 mt) with an expected mean recruitment of 3.162 million age-0 recruits (~95% confidence interval: 2.728-3.595).

Reference points

	F_{msy}=F_{spr} (0.45)	F_{msy} = F_{Btarg}(B_{40})	Calculated F_{msy}
SPR	**0.45**	**0.438**	**0.283**
Exploitation Rate	**0.082**	**0.085**	**0.143**
MSY (mt - catch)	**1,710**	**1,734**	**1,909**
SB_0	**33,075**	**33,075**	**33,075**
SB $_{msy}$	**13,671**	**13,230**	**7,781**
SB/SB_0	**0.413**	**0.4**	**0.235**
Age 2+ Biomass	**20,827**	**20,285**	**18,309**

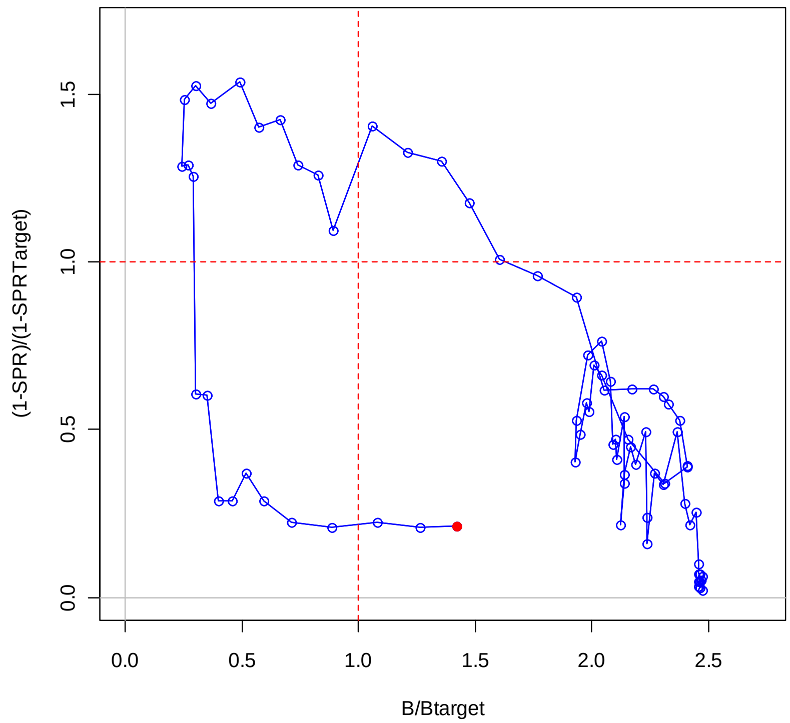




The spawning potential ratio (SPR) for lingcod in the North has been above the proxy target of 45% (indicating fishing mortality rates below the target) since 1998, and in recent years has been far above that level. The full exploitation history in terms of both biomass and relative SPR ((1-SPR)/(1-$SPR_{45\%}$)) is portrayed graphically via a phase plot below.

Recent trend in relative spawning potential ratio (1-SPR/1-$SPR_{Target=0.45}$)

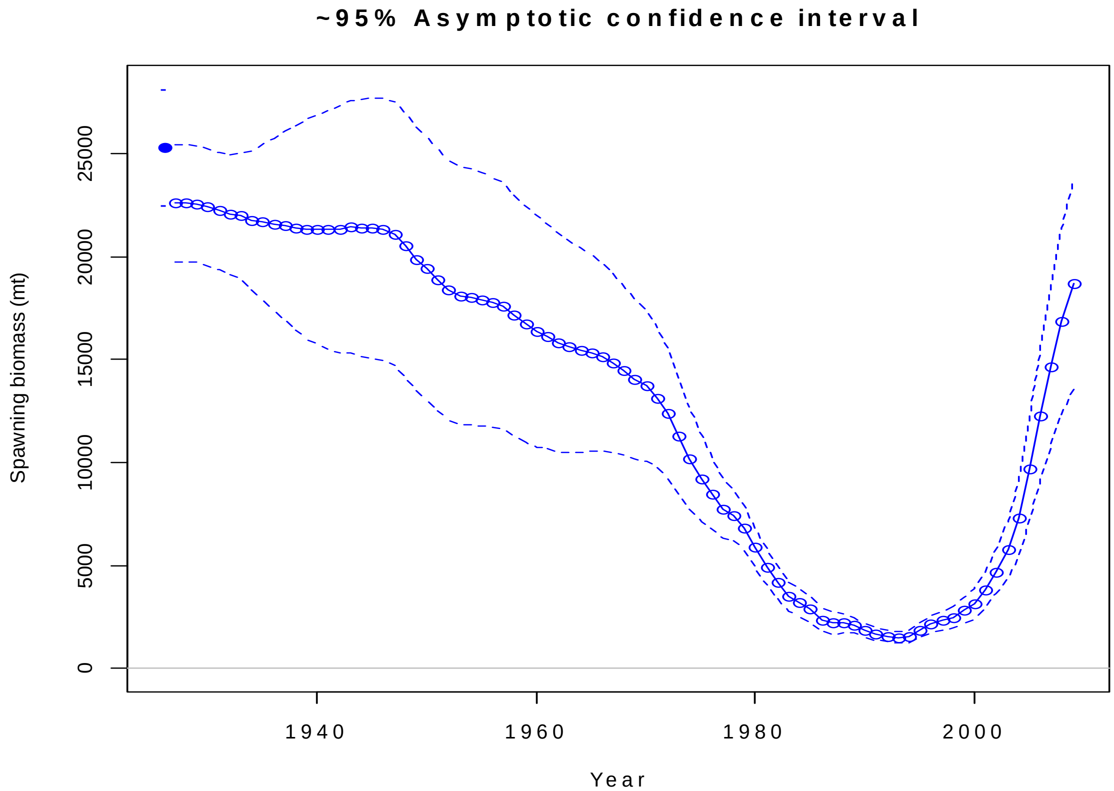
Year	Relative SPR ratio	~95% confidence interval
1999	0.66	0.52-0.79
2000	0.32	0.24-0.39
2001	0.31	0.24-0.39
2002	0.40	0.31-0.50
2003	0.31	0.23-0.39
2004	0.24	0.18-0.31
2005	0.23	0.17-0.29
2006	0.24	0.18-0.31
2007	0.23	0.16-0.29
2008	0.23	0.16-0.30



South Model:

The base model indicates that the lingcod female spawning biomass off of California declined rapidly in the 1970s and early 1980's, reaching a low point of 2,320 mt in 1998, and has subsequently recovered to 13,466 mt, which is over 70% of the virgin level.

Year	Total biomass (million mt)	Age 2+ biomass (million mt)	Female spawning biomass (million mt)	~95% confidence interval	Estimated depletion	~95% confidence interval
1999	6,686	6,426	2,809	2,195-3,423	11.1%	9-14%
2000	8,130	7,043	3,157	2,428-3,886	12.5%	10-15%
2001	10,581	9,878	3,809	2,926-4,692	15.0%	12-18%
2002	13,718	12,917	4,693	3,601-5,786	18.5%	14-23%
2003	16,652	16,229	5,788	4,390-7,186	22.9%	18-28%
2004	19,341	18,576	7,278	5,414-9,142	28.8%	22-35%
2005	22,448	22,224	9,699	7,217-12,181	38.3%	30-47%
2006	24,822	24,565	12,233	9,051-15,416	48.3%	37-59%
2007	26,488	26,240	14,652	10,757-18,546	57.9%	45-71%
2008	28,779	27,201	16,861	12,314-21,408	66.6%	51-82%
2009	31,266	30,875	18,656	13,581-23,731	73.7%	57-91%

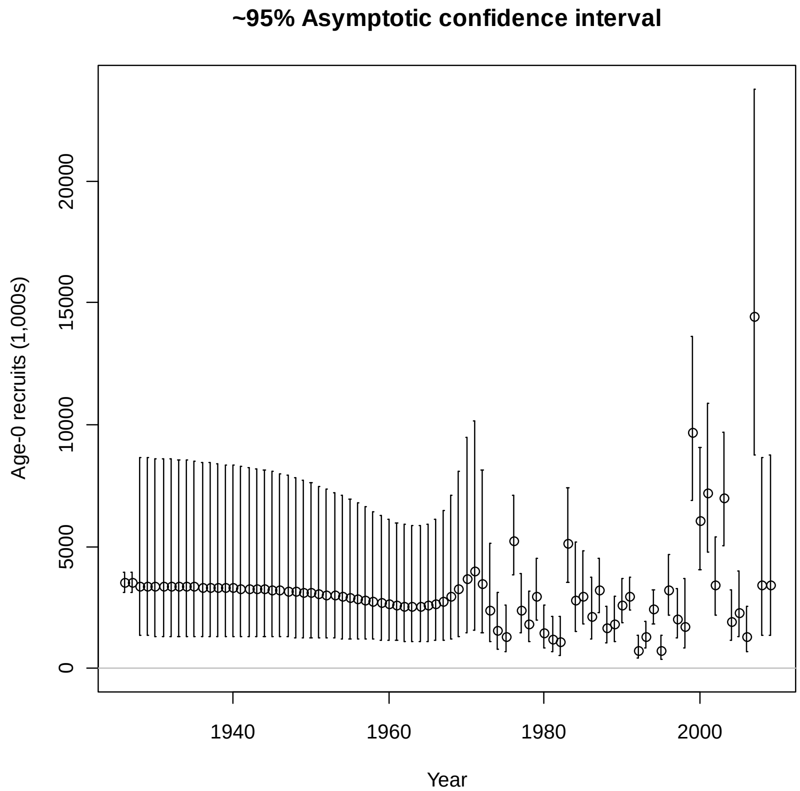


Recruitment

Recruitments in the South were estimated from 1928-2007, with bias correction ramping in from 1960 to 1974 as data becomes informative. The base model indicates relatively strong recruitment events in 1976, 1983 and in 1999-2003, similar to the period of increased recruitment in the North, with a very high but uncertain recruitment in 2007. Recruitments subsequent to 2007 are drawn exclusively from the stock-recruit curve, with correspondingly high levels of uncertainty.

Recent estimated trend in Lingcod recruitment in the South.

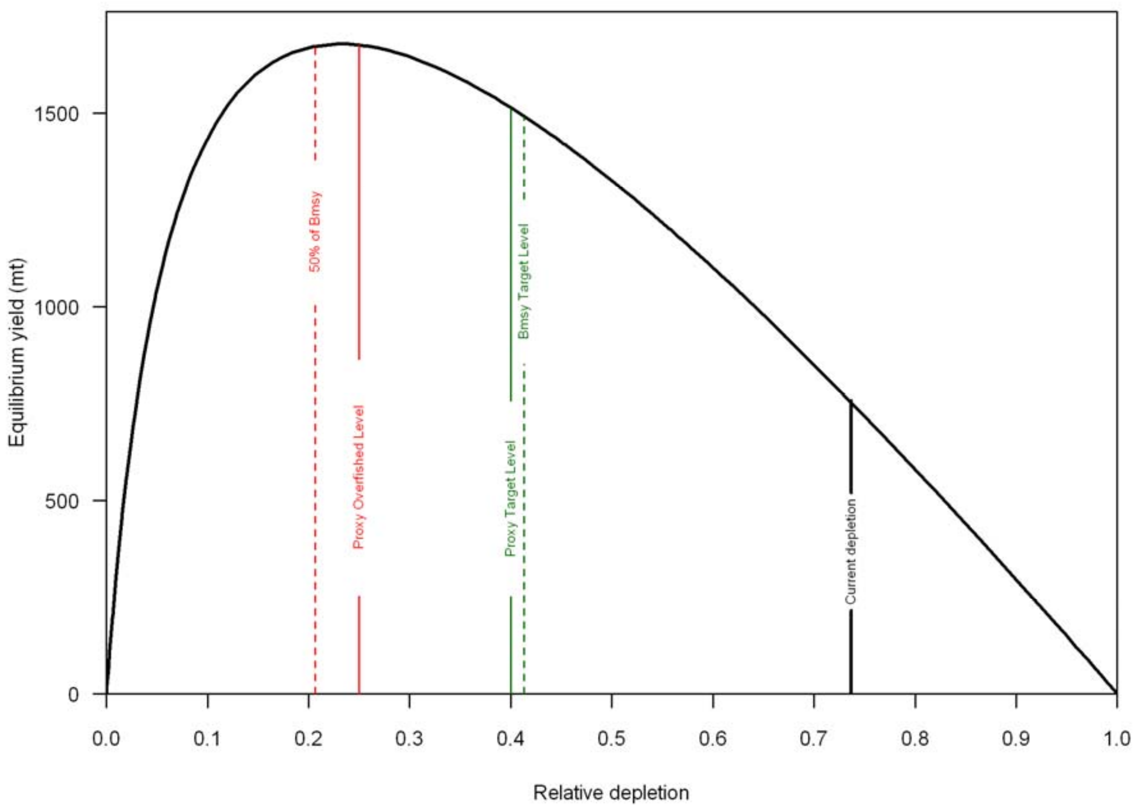
Year	Estimated recruitment	~95% confidence interval
1999	9,703	6,387-13,108
2000	6,049	3,588-8,509
2001	7,217	4,209-10,225
2002	3,452	1,878-5,027
2003	6,988	4,684-9,293
2004	1,926	934-2,918
2005	2,305	1,006-3,603
2006	1,298	388-2,208
2007	14,459	7,138-21,780
2008	3,411	42-6,780



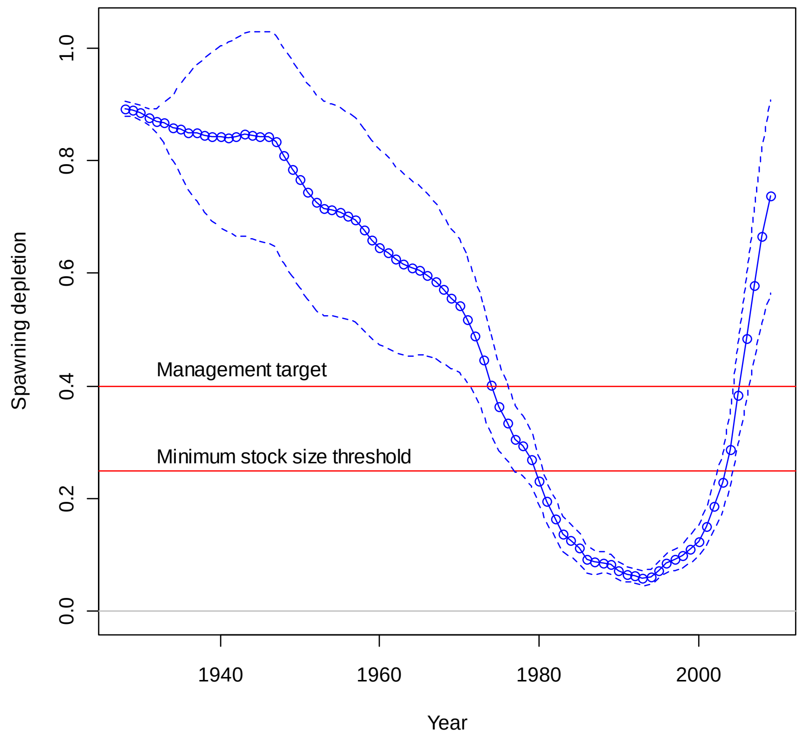
Reference points

For the South, lingcod unfished spawning biomass (SBzero) is estimated to have been 25,311 mt (~95% confidence interval: 22,485-28,136 mt) with an expected mean recruitment of 3.518 million age-0 recruits (~95% confidence interval: 3.100-3.935).

	F_{msy}=F_{spr} (0.45)	F_{msy} = F_{Btarg}(B_{40})	Calculated F_{msy}
SPR	**0.45**	**0.438**	**0.279**
Exploitation Rate	**0.084**	**0.088**	**0.103**
MSY (mt - catch)	**1,492**	**1,514**	**1,678**
SB_0	**25,311**	**25,311**	**25,311**
SB_{msy}	**10,462**	**10,124**	**5,856**
SB/SB_0	**0.413**	**0.400**	**0.231**
Age 2+ Biomass	**17,712**	**17,288**	**14,508**

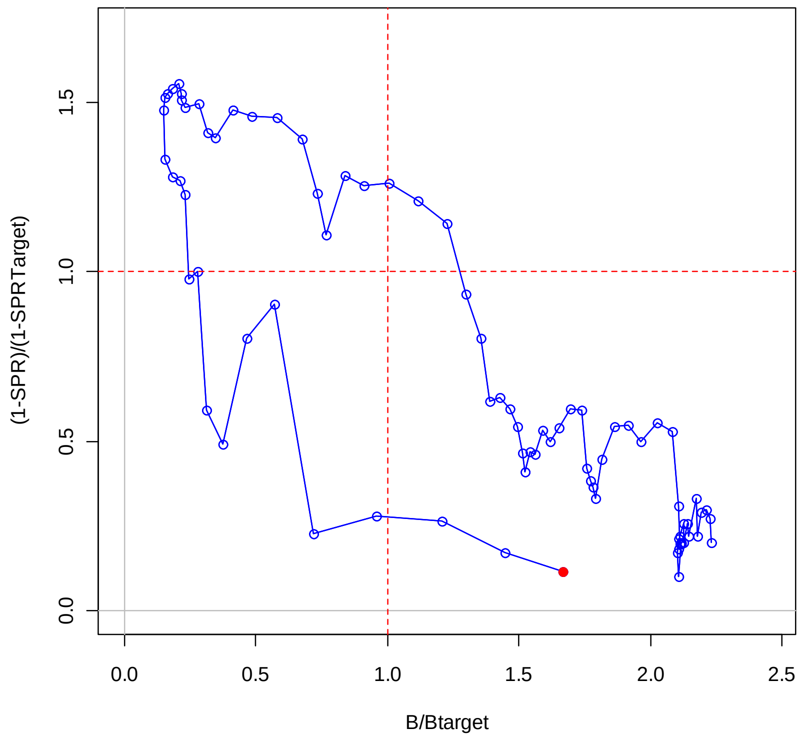


The relative spawning potential ratio (1-SPR) for lingcod in the South has been below the proxy target of 45% since 2001, and in recent years has been far below that level. The full exploitation history in terms of both biomass and F targets is portrayed graphically via a phase plot below



Recent trend in relative spawning potential ratio (1-SPR/1-SPR$_{Target=0.45}$)

Year	Relative SPR ratio	~95% confidence interval
1999	1.07	0.96-1.18
2000	1.09	0.97-1.21
2001	0.64	0.54-0.75
2002	0.54	0.44-0.64
2003	0.88	0.74-1.01
2004	0.99	0.85-1.13
2005	0.25	0.19-0.31
2006	0.30	0.23-0.37
2007	0.29	0.22-0.36
2008	0.19	0.14-0.23



Summary Tables for North and South

Catch in the following table reflect mortality associated with discard from the trawl fleet, where a 50% discard mortality rate is applied. Discard mortality in the recreational fleet, where only a 5% discard morality rate is applied, is minimal and is included in the landings estimates.

Coastwide recent trends (the coastwide SB_0 is estimated to be 58,386 mt)

Year	Landings	Catch	ABC	OY	SSB (mt)	Depletion	Recruitment
1999	825	1,098	960	730	7,420	12.7%	13,937
2000	425	539	700	378	8,400	14.4%	11,020
2001	418	549	1,120	611	9,839	16.9%	12,053
2002	905	1,097	745	577	11,533	19.8%	7,708
2003	1,368	1,513	841	651	13,625	23.3%	8,948
2004	479	627	1,385	735	16,716	28.6%	5,834
2005	690	840	2,922	2,414	21,388	36.6%	4,443
2006	781	962	2,716	2,414	26,504	45.4%	7,303
2007	611	794	6,706	6,706	31,361	53.7%	17,230
2008	521	718	5,853	5,853	35,635	61.0%	6,429
2009			5,278	5,278	39,140	67.0%	

SPR rates in North and South

Year	North SPR	South SPR
1999	0.64 (0.56-0.71)	0.41 (0.35-0.47)
2000	0.83 (0.78-0.87)	0.40 (0.33-0.47)
2001	0.83 (0.78-0.87)	0.65 (0.59-0.70)
2002	0.78 (0.72-0.83)	0.70 (0.65-0.76)
2003	0.83 (0.79-0.87)	0.52 (0.44-0.59)
2004	0.87 (0.83-0.90)	0.46 (0.38-0.54)
2005	0.87 (0.84-0.91)	0.86 (0.83-0.90)
2006	0.87 (0.83-0.90)	0.83 (0.79-0.87)
2007	0.88 (0.84-0.91)	0.84 (0.80-0.88)
2008	0.87 (0.83-0.91)	0.90 (0.87-0.92)

Unresolved Problems and Major Uncertainties

There are a number of issues that could be improved upon in future assessments. The proper break points for separate assessments have not been fully discerned. The break used here, between California and Oregon, is convenient in terms of data, although a break at Cape Mendocino would be likely more biologically accurate. The other artificial break, the U.S./Canada border, is also of concern, which could be alleviated with a bi-national assessment. Estimation of growth is a concern which we had hoped to address via the use of conditional age-at-length compositions. However it is not clear that this was achieved, and in fact we were forced to fix growth in the South due to much higher that expected length at age 20. This may be due to bias in ageing in any or all of the data sets or years, and should be more fully explored. The inability of either the North or South models to fit the NWFSC survey data is of concern, although it is not an ideal survey for lingcod. The overall scale of the assessment relative to the NWFSC indices appears plausible, in any case.

Decision Tables

For both the North and South models, the major axis of uncertainty used for the decision table was natural mortality (M). The base model use an M of 0.18 for females and 0.32 for males. The “Low M” alternatives use M = 0.16 and 0.285, and the “High M” alternatives use M = 0.20 and 0.355. Commercial catch projections include discard. The three levels of catch are from forecasts from the model runs with the three levels of M.

NORTH:

Catch levels	Year	Comm. Catch	Rec. Catch	Low M Depletion	Low M Spawning Biomass	Base M Depletion	Base M Spawning Biomass	High M Depletion	High M Spawning Biomass
Low Catch – From Low M Model	2009	3257	625	54.5%	18,595	61.9%	20,484	67.8%	21,868
	2010	2855	562	52.8%	18,019	60.0%	19,857	65.5%	21,135
	2011	2512	504	51.3%	17,509	58.4%	19,310	63.6%	20,504
	2012	2231	445	49.6%	16,926	56.5%	18,682	61.4%	19,798
	2013	2021	399	47.6%	16,233	54.3%	17,948	58.9%	19,003
	2014	1866	368	45.5%	15,514	52.0%	17,202	56.5%	18,228
	2015	1759	349	43.4%	14,825	49.9%	16,508	54.4%	17,535
	2016	1690	336	41.6%	14,190	48.0%	15,889	52.5%	16,943
	2017	1644	328	39.9%	13,607	46.4%	15,341	51.0%	16,441
	2018	1593	318	38.3%	13,073	44.9%	14,858	49.7%	16,018
Base Catch – From Base Model	2009	3795	716	54.5%	18,595	61.9%	20,484	67.8%	21,868
	2010	3270	635	51.6%	17,606	58.8%	19,447	64.3%	20,727
	2011	2836	558	49.0%	16,728	56.1%	18,541	61.2%	19,746
	2012	2499	487	46.3%	15,817	53.2%	17,602	58.1%	18,742
	2013	2259	437	43.5%	14,841	50.2%	16,608	54.9%	17,708
	2014	2090	404	40.7%	13,879	47.3%	15,646	51.9%	16,741
	2015	1978	384	38.0%	12,978	44.6%	14,768	49.3%	15,890
	2016	1907	372	35.6%	12,146	42.3%	13,984	47.0%	15,160
	2017	1861	363	33.3%	11,377	40.2%	13,284	45.1%	14,534
	2018	1801	352	31.2%	10,661	38.3%	12,657	43.4%	13,997
High Catch – From High M Model	2009	4296	798	54.5%	18,595	61.9%	20,484	67.8%	21,868
	2010	3652	698	50.5%	17,223	57.6%	19,067	63.1%	20,349
	2011	3137	603	46.9%	16,008	53.9%	17,832	59.1%	19,047
	2012	2756	525	43.4%	14,796	50.2%	16,607	55.1%	17,771
	2013	2496	472	39.7%	13,554	46.5%	15,367	51.2%	16,511
	2014	2319	440	36.2%	12,358	42.9%	14,195	47.6%	15,356
	2015	2205	420	32.9%	11,242	39.7%	13,130	44.5%	14,341
	2016	2133	407	29.9%	10,206	36.8%	12,171	41.7%	13,461
	2017	2074	396	27.1%	9,236	34.2%	11,303	39.4%	12,694
	2018	2003	383	24.4%	8,329	31.8%	10,521	37.3%	12,032

SOUTH:

Catch levels	Year	Comm. Catch	Rec. Catch	Low M Depletion	Low M Spawning Biomass	Base M Depletion	Base M Spawning Biomass	High M Depletion	High M Spawning Biomass
Low Catch – From Low M Model	2009	2436	1884	66.6%	18,752	73.7%	18,656	82.9%	19,392
	2010	2221	1606	62.0%	17,457	67.4%	17,070	75.1%	17,565
	2011	2120	1548	58.3%	16,425	62.5%	15,817	69.3%	16,208
	2012	2094	1591	56.5%	15,908	59.8%	15,147	66.2%	15,491
	2013	2022	1539	54.9%	15,472	57.4%	14,539	63.0%	14,726
	2014	1895	1417	52.5%	14,776	54.0%	13,666	58.4%	13,649
	2015	1751	1283	49.2%	13,866	49.8%	12,616	53.2%	12,442
	2016	1618	1166	45.8%	12,898	45.7%	11,564	48.3%	11,301
	2017	1503	1072	42.5%	11,977	41.9%	10,607	44.1%	10,315
	2018	1403	996	39.6%	11,157	38.7%	9,790	40.6%	9,506
Base Catch – From Base Model	2009	2680	2063	66.6%	18,752	73.7%	18,656	82.9%	19,392
	2010	2371	1706	60.9%	17,148	66.2%	16,761	73.8%	17,255
	2011	2224	1634	56.5%	15,925	60.5%	15,324	67.2%	15,721
	2012	2161	1654	54.2%	15,278	57.4%	14,534	63.7%	14,896
	2013	2044	1567	52.4%	14,763	54.7%	13,857	60.1%	14,069
	2014	1881	1420	49.9%	14,042	51.2%	12,969	55.5%	12,985
	2015	1716	1275	46.7%	13,154	47.2%	11,953	50.5%	11,821
	2016	1572	1155	43.5%	12,240	43.3%	10,963	46.0%	10,751
	2017	1453	1064	40.4%	11,388	39.8%	10,082	42.1%	9,846
	2018	1324	997	37.8%	10,639	36.9%	9,339	39.0%	9,116
High Catch – From High M Model	2009	2994	2240	66.6%	18,752	73.7%	18,656	82.9%	19,392
	2010	2594	1851	59.6%	16,791	64.8%	16,403	72.2%	16,895
	2011	2415	1816	54.3%	15,290	58.1%	14,696	64.6%	15,101
	2012	2300	1810	51.1%	14,388	54.0%	13,667	60.1%	14,051
	2013	2112	1654	48.6%	13,683	50.6%	12,817	55.8%	13,059
	2014	1899	1460	45.7%	12,862	46.8%	11,845	50.9%	11,902
	2015	1710	1300	42.4%	11,947	42.7%	10,820	45.9%	10,745
	2016	1560	1182	39.2%	11,047	39.0%	9,860	41.6%	9,721
	2017	1418	1076	36.3%	10,223	35.6%	9,022	37.9%	8,873
	2018	1297	989	33.9%	9,537	33.0%	8,353	35.2%	8,225

Research and Data needs

1) Validation of the ageing of lingcod to verify lack of bias or show bias in ageing.
2) Development of an expanded assessment for the North including British Columbia.
3) Investigate the effect of the year when recruitment is estimated on the estimates of B0 and of current status.
4) Investigation of the large survey estimate for lingcod in the 2003 NWFSC survey showed that catches from only three tows made up 63.5% of the total lingcod catch in the survey. The second and third large tows also had large catches of dogfish and the catches were subsampled for counts and detailed sampling. As a result only 2 lingcod were actually measured in the second largest tow (one male and one female) but these measurements were expanded to the whole catch. It is difficult and inappropriate to try to correct such estimates after the fact during the assessments. Instead onboard sampling procedures need to be developed to ensure that a proper and informative subsample of fish be measured during the survey.
5) The sensitivity run with no abundance indices produced a similar fit to the base case suggesting that there was little trend information in the abundance indices used in the base case. Can it be determined if the NWFSC survey is fishing in the right places for lingcod? Are there other survey techniques that can be used (e.g., longline, combined lingcod/sablefish pot survey, trap surveys)?
6) Investigate the suitability of using catches of lingcod in the IPHC survey as an alternate abundance index.
7) Re-examine the usefulness of the Washington tagging data for next assessment.
8) There was confusion over whether SS3 was using mid-year or beginning of year length at age resulting in larger than expected mean length at age for age 0 and 1. The method for setting the correct mean length at age for the younger ages needs to be clarified before the next assessment.
9) Further investigation of the age and length data needs to be done to understand if seasonal or area differences or some other causes are behind the outliers observed in the length-at-age data.
10) Look at environmental covariates for recruitment and time-varying growth and availability inshore.
11) The fact that lingcod males are nest-guarders was ignored when determining reproductive output. A cursory look at the proportion of sex ratio in the catch did not appear to indicate any serious changes for either species in recent years. However, we do not know what kind of change in sex ratio would indicate a serious change in reproductive success. The impact of nest-guarding on reproductive output should be investigated.
12) Many rockfish assessments use CPUE data from the CPFV fishery as an index of population abundance. The CPFV fishery is focused primarily on marketing a successful "fishing experience" that is related to the desirability of the species caught, quantity, body size, and fighting characteristics. The default assumption of proportionality between CPUE and abundance has not been evaluated for a fishery with these characteristics. Simulation modeling of fleet dynamics in a multi-species context is one possible way to address these issues.

Contents

1. Introduction

The assessment utilized data from the entire West Coast of the contiguous United States (waters off of Washington, Oregon and California). The lingcod (*Ophiodon elongatus*) population in these areas was modeled as two stocks in two separate assessment models. The two areas are (1) waters off of Oregon and Washington and (2) waters off of California. These areas were chosen due to a number of factors including: lack of demographic connectivity at moderate to large scales (~100-1000 km) along the coast despite general genetic similarities (Marko et al. 2007); data availability which restricts the number of areas it is possible to model, and which makes this split more feasible than others; evidence from comparison of length compositions and survey indices that the Eureka INPFC area is somewhat more like the areas to its north than those to its south, suggesting that the previously used division which grouped the Eureka area with the Southern area was less than optimal.

Range
Lingcod are found along the coast of the northeast Pacific Ocean from the Aleutian Islands to Baja California with the center of abundance off of British Columbia and Washington state (Hart 1973). They are most abundant in waters less than 100 fathoms (183 m) in depth, but are occasionally found at depths exceeding 200 fathoms (366 m) (Smith and Forrester 1973, Jagielo 1988). Lingcod are demersal on the continental shelf, display a patchy distribution and are most abundant in areas of hard bottom with rocky relief (Rickey 1991).

Life History
Lingcod are top order predators of the family Hexagrammidae. Among the Hexagrammidaes, the genus Ophiodon is ecologically intermediate between the more littoral genera Hexagrammos, Agrammus and Oxylebius and the more pelagic Pleurogrammus (Rutenberg 1962). Larval lingcod hatch in the late winter or early spring and become epipelagic. Analysis of genetic variation indicates that lingcod are genetically similar throughout their range

Movement
Lingcod are generally considered non-migratory, though some tagged individuals have moved exceptional distances, and indirect evidence suggests a seasonal onshore movement associated with spawning (Jagielo 1995). U.S. and Canadian tagging studies have demonstrated movement between coastal areas off Washington and southwest Vancouver Island. However, there is little interchange between these areas and the inland marine waters of Puget Sound and the Strait of Georgia (Cass et al. 1990, Jagielo 1990). Most fish recovered in tagging studies are found near the point of release, but some exceptional movements have been reported. Cass et al. (1990) found that 95% of fish recovered from a tagging study off the west coast of Vancouver Island were recaptured near the point of release. One fish tagged as a juvenile was recovered 510 km to the south in Oregon. At Cape Flattery, Washington, Jagielo (1990) reported that only 19% of recoveries were further than 10km from the release point. However, recaptures came from as far north as Queen Charlotte sound (195 km) and as far south as Cape Falcon (120 km).

Stock differentiation/Spatial structure
There are no clear stock delineations for lingcod in U.S. waters. No distinct breaks are seen in the fishery landings and catch distributions (Figure 1). Survey catches imply a continuous distribution over most of the range, with the largest catches occurring over a swath of latitude and depth. Genetic studies have found coastal lingcod populations to be genetically similar throughout their range (Jagielo et al. 1996). Recent analyses indicate some genetic changes in the stock along the coast, but no distinct stock breaks. Marko et al. (2007) found surprisingly little

connectivity between stocks at moderate (~10 km) to large (~1000 km) ranges, indicating the need for regional assessment and management.

Spawning and Nest Guarding

In the late fall, male lingcod aggregate and become territorial in areas suitable for spawning. The proportion of male lingcod sampled from offshore trawl landings declines in the late fall, suggesting a pre-spawning departure of males from the trawl grounds (Miller and Geibel 1973 (California), Cass et al. 1990 (British Columbia), Jagielo 1994 (Washington)). Males are in spawning condition earlier in the year than females, and it appears that larger and older females spawn first (Cass et al. 1990). Mature females are rarely seen at the spawning grounds and appear to move into spawning areas for only a brief period to deposit eggs (Giorgi 1981). The observed timing of peak spawning activity has ranged from January (Wilby 1937) to early March (La Riviere et al. 1981).

Nest deposition typically occurs in rock crevices, on rock ledges, or under boulders in areas of swift current flow. Ambient oxygen levels are critical to egg survival (Giorgi 1981). Salinity and temperature affect egg survival as well (Cook et al. 2005). Spawning behaviour has been reported from the intertidal zone to a depth of 126 m (Giorgi 1981, O'Connell 1993).

Males remain territorial throughout the period of egg incubation, and appear to be more effective at guarding the nest from predation by vertebrates than by invertebrates (La Riviere et al. 1981, Low and Beamish 1928). Fish predators include greenling, seaperch, sculpins, rockfish and cabezon; invertebrate predators include sea urchins, starfish, anemone, gastropods, starfish and crab (Cass et al. 1990). In experiments where males were removed from nests, new males sometimes assumed a guardian role, but in one removal experiment, 4 of 7 nests were lost to predators within 22 days (Low and Beamish, 1978).

Early life

Hatching occurs over 1 to 7 days and between January and June (Jewell 1968, Low and Beamish 1978). Larval lingcod hatch at a length of 6-12 mm, and become epipelagic (Phillips and Barraclough 1977, Cass et al. 1990). Larvae in the Strait of Georgia first appear in the plankton in late February. Numbers peak in late April. Larvae were concentrated in the upper 3 m of the water column by day and disperse or migrate to deeper depths at night. Larvae begin to disappear from the upper water column by late May to early June and become demersal at about 70-80 mm and at about 3 months of age. Epipelagic larvae feed on small copepods and copepod eggs, shifting to larger copepods and fish larvae as they grow (Phillips and Barraclough 1977).

When about 3 months old, juveniles settle on sandy bottom areas near eelgrass or kelp beds. By age 1 or 2, lingcod move into rocky habitats similar to those occupied as adults, but shallower. Fishery and survey data indicate that male lingcod tend to be more abundant than females in shallow waters, and the size of both sexes increase with depth (Jagielo 1994). Newly settled juveniles have been sampled nearshore in June on sandy bottom areas near eelgrass or kelp beds (Buckley et al. 1984), and have been found at depth ranging from 20m in Canada (Phillips and Barraclough1977) to 55 m in California (Miller and Geibel, 1973). In Washington, juveniles have been collected from the mouth of the Pysht River in the Strait of Juan de Fuca, from Grays Harbor and Willapa Bay, and from coastal waters nearshore to these embayments (Buckley et al. 1984, Jagielo 1994). Coley et al. (1986) found juvenile lingcod in Grays Harbor in October, over hard bottom shell-cobble habitat near rocks in 9-15 m of water.

Miller and Geibel (1973) reported that juvenile lingcod in California are about 35 cm in length (1 year old) when they first move into nearshore rocky areas typical of adult habitat. Surveys off the west coast of Vancouver Island suggest that juveniles move from inshore areas to a wider range of flat bottom areas by September (Cass et al. 1990), and begin to move into habitats of similar relief and substrate as adult lingcod by age 2, but remain at shallower depths. Juvenile lingcod feed on small fishes including herring (*Clupea pallasii*), Pacific sand lance (*Ammondytes hexapterus*), flatfish (*Pleuronectidae*), shiner perch (*Cymatogaster aggregate*), and walleye pollock (*Theragra chalcogramma*), and an assortment of invertebrates including shrimp (*Neomysis macrops*) and prawns (*Pandalus danae*) (Cass et al. 1990).

Growth
Lingcod display sexually dimorphic growth. Females grow faster than and reach larger sizes than males.

Phillips and Barraclough (1977) estimated that young-of-the-year (YOY) growth was approximately 1.3 mm/day. Buckley et al. (1984) reported YOY growth from Jun to September in the Strait of Juan de Fuca also averaged 1.3mm/day. Samples from the mouth of the Pysht River averaged 96 mm in June, 135 mm in July, 173 mm in August and 200 mm in September (Jagielo 1994).

Jagielo (1994) estimated growth using a fixed length at age 1 of 30 cm, and estimated L_∞ for males of 93.21 cm and females of 131.05 cm, and k of 0.1694 for males and 0.1137 for females. He also found that the average length for YOY lingcod was 11.99 cm and for age 2 (48.1 cm) for Washington samples, and that growth trajectories diverge considerably by sex after age 3, as female lingcod tend to grow faster and live longer than male lingcod, while male lingcod mature at that age.

Maturation
Richards et al. (1990) examined coastwide trends in lingcod maturity and observed that male lingcod mature at a smaller size and age than female lingcod. They also noted that size at maturity increases with latitude (distance from the equator). Size at 50% maturity was estimated to be 63.6 cm for females and 57.1 cm for males (ages 3.9 and 3.5) off of Vancouver Island, whereas Miller and Geibel (1973) found size at 50% maturity to be 58.8 cm and 39.8 cm (and ages 5 and 2) for females and males off of California. Jagielo (1994) found ages of 50% maturity of 3.4 years for males and 4.6 years for females off Washington.

Fecundity
Hart (1967) reported the relationship between length and weight as $W = 0.000282406 \cdot L^{3.011}$. The fecundity exponent is not significantly different than the length-weight exponent, and is therefore essentially equivalent of a constant relationship between weight and egg number.

Natural mortality
Jagielo 1994 estimated M for male and female lingcod using three empirical models based on life history parameters (Hoenig 1983, Alverson and Carney 1975, and Pauly 1980). Estimates of M for male lingcod ranged from 0.23 to 0.39, while estimates for female lingcod range from 0.16 to 0.19. The averages of the estimates were 0.18 for females and 0.32 for males.

Starr et al. 2005 estimated natural mortality rates from a short term tag-recapture study and came up with ranges of 0.24-0.34 for females and 0.13-0.23 for males. However, these estimates do not take into account variation in M across the year (or between years), especially for males during nest-guarding.

History of the fishery

The fishery for lingcod has a very long history. Lingcod was among the species found in remains from 51 archaeological sites representing the period between 6200 BC and 1830 AD on the central California coast from San Mateo to San Luis Obispo (Gobalet and Jones 1995). More recently, the commercial fishery off of California dates back more than a century, and the fishery off of Washington and Oregon dates back nearly as far.

Prior to 1977, Lingcod stocks in the northeast Pacific were managed by the Canadian Government within its waters, and by the individual states in waters (out to three miles) off of the United States. With implementation of the Magnuson Fishery Conservation and Management Act (MFCMA) in 1977, primary responsibility for management of the groundfish stocks off Washington, Oregon and California shifted from the states to the Pacific Fishery Management Council (PFMC). The ABC for lingcod off of these states was set at 7,000 mt, and catch was consistently below this level. In 1994, a harvest guideline (HG) of 4,000 mt was set. In 1995, both the ABC and HG were dropped to 2,400 mt. Trip limits on commercial Lingcod catch were first instituted in 1995, when a 20,000 lb/month limit was imposed, and a minimum size was imposed for recreational fisheries of 22 inches. In 1998 to present, individual year ABC and OY levels were set, commercial trip limits became much more restrictive (starting at 1,000 mt/2 months in 1998), and recreational bag limit were set at 2 (or 1) lingcod with minimum sizes ranging from 22 to 30 inches (Tables 1-4).

Surveys

Research surveys have been undertaken to provide fishery-independent information about the abundance, distribution, and biological characteristics of groundfish. A coast–wide Shelf Survey was conducted in 1977 (Gunderson and Sample 1980) and was repeated every three years (thus referred to as the “Triennial” survey) through 2004. A cooperative survey conducted using commercial fishing vessels was undertaken on the slope in 1998 and expanded to cover the shelf beginning in 2003.

2. Data

2.1. Removals and regulations

Lingcod landings were estimated for the fishery off the West Coast of the continental United States from 1928 through 2008 (Figure 2; Table 5), with low-level “equilibrium” removals estimated for the period prior to 1928.

New reconstructed estimates of California commercial landings from 1931-2008 were obtained from Don Pearson, and the values from 1931-1980 were used in the (Southern area) assessment. California commercial landings from 1916-1930 were obtained from the 2004 assessment and were used to estimate the “equilibrium” landings level and 1928-1930 landings. Washington historical catches were obtained from Washington State (Farron Wallace, Pers. Comm.) and used for the years 1929-1979, with 1928 assigned the average of the following 9 years. Oregon Commercial catches were taken from Cleaver (1951) for the years 1928-1949 and from Smith (1956) for the years 1950-1953. Commercial landings data were not available for the years 1954 and 1955, and, consequently, those years were assigned values reflecting the surrounding years (130 mt and 120 mt). For 1956-1968, Oregon commercial landings were taken from Lynde (1986), while for 1969-1979, landings were provided by Oregon (Troy Buell, Pers. comm.).

Commercial landings for 1980 for Washington/Oregon were taken from Lynde (1986). PacFIN estimates of commercial landings were used for 1981-2008 for both the Washington/Oregon and California areas.

California recreational landings were obtained from John Field for the years 1928-1980. Washington and Oregon recreational landings prior to 1980 were taken from the previous assessment, and were below 100 mt prior to 1980 and were 0 prior to 1957. RecFIN estimates were used for the years 1980-1989 and 1993-2007 for Washington/Oregon and 1981-1989 and 1993-2007 for California, with GMT scorecard values used for both areas for 2008. Recreational catch for 1990-1993 were taken from the previous assessment.

In California, a 5-fish bag limit was enacted in 1980 followed by a 22 inch size limit in 1981. These regulations remained in effect for 17 years. In March 1998, the bag limit was reduced from 5 to 3 fish and concurrently the size limit was increased to 24 inches. The bag limit was lowered again from 3 fish to 2 fish with in January 1999. In January 2000, the size limit increased from 24 to 26 in. and a seasonal closure (January through February) was implemented from the U.S.-Mexico border north to Lopez Point (36˚ N., Monterey County), and for March through April from Lopez Point north to Cape Mendocino (40˚10' N., Humboldt County) The bag limit remained at 2 fish. A gear restriction was also enacted at this time limiting the number of hooks to 3, although this was primarily directed toward rockfish effort.

Discards

Annual discard amount/rates for 2003 through 2007 were provided by the West Coast Groundfish Observer Program (Table 6 provides estimate of the percent of total lingcod mortalities in the commercial fishery due to discarding). Since these data are provided with a break point at 40° 10' N rather than the Oregon/California border (42° N), and the majority of the data is from the North, including the area between 40° 10' N and 42° N, and the values are similar for most years between the two areas, a single time series of discard proportion was used for both area assessments.

Fishery Length compositions

Commercial fishery landed length compositions (Tables 7-9; Figures 3-5 and 27-28) were estimated from PacFIN for the years 1965-2008 for the North and 1978-1990 and 1992-2008 for the South. These data were sex-specific for the years 1976-2008.

Commercial fishery length compositions were constructed using BDS data retrieved from PacFIN on 6/18/2009. Length, age and sex data were acquired at the trip level, and then aggregated. Since trip level landings were not available for 80% of the length data, each length was treated as an individual sample. The input N for each year and area was calculated via Stewart's Method (Ian Stewart, pers. Comm.), which for fisheries is:

$$N_{effective} = N_{trips} + 0.138 N_{fish} \quad \text{if } N_{fish}/N_{trips} < 44$$
$$N_{effective} = 7.06 N_{trips} \quad \text{if } N_{fish}/N_{trips} \geq 44$$

The length compositions of discards in more recent years (2003-2007) were calculated with observer data from boats using bottom trawl gear (Figures 6 and 29). Although there were discards observed from fixed gear as well, discard mortality from that fishery is minimal for lingcod, and therefore is not representative of the discard mortalities which are modeled here. Individual lengths were scaled up by a straight expansion factor to the total discard for each observed tow.

Input N values for commercial trawl discard length compositions were calculated via Stewart's Method, but capped at the greater of the number of tows or 200 (Table 9).

Recreational length-composition data were retrieved as individual lengths from Oregon and California from RecFIN for the years 1993-2008. Additional length data from central California were obtained from John Field from the central/northern California CPFV monitoring program from 1987-1998. Input n values were set at 1/10th the number of fish, and for those years where both sources were combined for California (1993-1998), the total sample size was reduced by an additional 25% (Table 8). The recreational length compositions are shown in Figures 11-13 and 32.

Fishery conditional age-at-length compositions

Conditional age-at-length compositions were constructed from age and length data available from PacFIN for the years 1980-2008 for the North and for 1993-1998 and 2001-2004 for the South. Since most data did not include total trip catch amounts, each age was considered an individual sample (Table 7, Figures 7-10 and 30-31).

For the recreational fishery, conditional age-at-length compositions were constructed from age and length data available from Oregon for the years 1999-2008 (Figures 14-15). Again each sample was considered an individual observation (Table 8).

These age data were not used in the final base or bracketing models, but were used in sensitivity analyses.

Fishery catch-per-unit-effort indices

Three fishery catch-per-unit-effort (CPUE) indices were used in this assessment. Commercial CPUE indices were developed by Jagielo et al. (2000, 2003). They were constructed from Washington, Oregon and California trawl fishery logbook and fish ticket data dating back to 1976 (Table 10, Figures 16 and 33). Skipper's tow-by-tow estimates of retained catch were reconciled with fish ticket data (landing receipts). The adjusted catch and the skipper's estimate of tow duration was used to compute lingcod CPUE (lbs/hour). Following data verification and screening, a total of 490,971 tows in the northern area and 474,946 tows in the southern area were used in the analysis (Jagielo and Wallace, 2005). Because of significant changes in management beginning in 1998 both the northern and southern time series were truncated after 1997. Furthermore, the 1976 and 1977 tow data from the southern area were deemed of insufficient sample size and were dropped from the time series used in the assessment model. Tow-by-tow catch rates (CPUE) were fitted in a two-stage model process using a delta-lognormal GLM procedure to predict abundance indices across the time series for each area. The model included a year, month, depth, and location (PFMC area) effect. A bootstrap procedure was previously used to estimate the standard errors of the year by year index values; however, the previous STAT Star Panel concluded that the bootstrap estimates of standard errors were unrealistically low and recommended using an assumed annual CV of 0.20 in both the southern and northern index in the 2003 assessment (Jagielo et al. 2003). The northern trawl logbook index trend shows a sharply declining stock since 1976, and the southern trawl logbook index indicates a declining stock since 1979.

The third CPUE index used in this assessment is a dockside recreational CPUE index (Table 10, Figure 34) for California developed by Tom Wadsworth (Appendix 1). As with the commercial

CPUE indices, data beyond 1997 was not used in the assessment due to changes in management regulations.

2.2. Surveys

NMFS Cruises

The results from two fishery-independent surveys are used in this assessment:

1. The NWFS Triennial Shelf Survey that was conducted every third year from 1980-2004
2. The NWFSC Survey for the years 2003-2008.

The 1977 Triennial Shelf Survey was not used due to concerns about the first year of the survey's implementation.

Indices

Indices of abundance were derived from each of the above surveys and years using a generalized linear mixed model (GLMM) for each survey (John Wallace, pers. comm.). The GLMM models occurrence of lingcod in a survey haul as a binomial process and the size of the non-zero catches with a gamma model. Coefficients of variation (CVs) about the indices were produced from the GLMM as well. The GLMMs utilized three latitudinal strata, Washington/Oregon, California north of around Point Conception (34.5 degrees north) and California south of 34.5. There were also two depth strata (55-183 m and 183-400m), covering the usual extent of observation of lingcod. These six strata represent the four areas of different sampling densities in the NWFSC survey (and the Triennial survey since it did not sample in the Southern California Bight), and they also include the division between the North and South assessment areas at 42˚N (Table 11, Figures 17, 22, 35 and 40).

Central California Indices

Thomas Wadsworth developed several indices of abundance for lingcod and other species from various surveys, observer programs, and other fishery monitoring programs for central California (between Point Conception and Point Mendocino). These included SCUBA surveys, spearfish tournaments, Commercial Party Fishing Vessel logbooks and observer programs, and recreational dockside monitoring. All indices were based on the number of fish (rather than biomass) caught, landed or observed. This data was received by the lead author of this assessment on June 26, 2009, and year-by-year length compositions were not available for any of the data sets. Therefore, only the dockside boat survey index was included in the South assessment, as only that index can be tied directly to the selectivity of a fishery: the California recreational fishery. A complete description of all the potential indices is included in Appendix 1.

Length compositions

Length compositions were derived for the Triennial survey for the years 1986-2004 in the North (Figures 18-19) and 1989-2004 in the South (Figures 36-37). Length compositions were derived for the NWFSC survey for 2003-2008 for both the North (Figures 23-24) and South (Figures 41-42).

Length, age, and sex data were acquired at the tow level for both surveys and then aggregated within the area and depth strata. For each tow, the length composition of the sampled individuals was scaled up to represent the length composition of the trip landings through use of an expansion factor. In this assessment, the expansion factor was calculated as:

$$\text{Expansion Factor} = (WT_{total}/WT_{sampled})$$

with total weight divided by sample weight being the equivalent of total estimated number over sampled number. No down-weighting exponent was used for the NWFSC survey, as the survey data are collected at the tow level rather than the trip level. However, since for nearly all of the Triennial tows, all lingcod were lengthed, a power of 0.8 was used to downweight the expansion factors for those few tows that were not fully sampled. The initial effective N (input N) was calculated via Stewart's Method (Ian Stewart, pers. Comm.), which for surveys is

$$N_{effective} = N_{trips}+0.0707N_{fish} \quad \text{if } N_{fish}/N_{trips} < 55$$
$$N_{effective} = 4.89N_{trips} \quad \text{if } N_{fish}/N_{trips} \geq 55$$

where N_{fish} is the total number of fish sampled across all trips (Table 12).

Conditional-age-at length compositions

Conditional age-at-length compositions were constructed from age and length data using the same methods as for survey length compositions in the case of the NWFSC survey, and via the same methods as for the commercial fishery for the Triennial survey. These compositions were constructed for the Triennial survey for 1992-2004 in the North (Figures 21-22), and 1996-2004 in the South (Figures 38-39); and for the NWFSC survey from 2003-2008 (Figures 25-26 and 43-44).

These age data were not used in the final base or bracketing models, but were used in sensitivity analyses. A summary of data sources and years is given in Table 13.

2.3. Biology and life history

Natural mortality

Jagielo 1994 estimated M for male and female lingcod using three empirical models based on life history parameters (Hoenig 1983, Alverson and Carney 1975, and Pauly 1980). Estimates of M for male lingcod ranged from 0.23 to 0.39, while estimates for female lingcod ranged from 0.16 to 0.19. The average of the estimates was 0.18 for females and 0.32 for males. Those estimates continue to be used in the current assessment.

Sex ratio, maturation and fecundity

In this assessment, the sex ratio at birth is assumed to be 1:1. Maturity-at-length for females was taken from the last assessment with 50% maturity occurring at 68 cm in the north and 60 cm in the south. (Figures 45 and 94).

Fecundity was assumed to be proportional to weight (figures 46 and 95). Hart (1967) found fecundity to be essentially proportional to length cubed.

Length-weight relationship

The length-weight relationship was estimated by Jagielo (1994) using available survey data. The equation was fit to mean weight at length measured in the West Coast survey.
For males the relationship is:

$$W = 0.000003953\ L^{3.2149}$$

For females, the relationship is:

$$W = 0.00000176\ L^{3.3978}$$

where W is weight (k) and L is fork length (cm).

Ageing error

Aging error (Figure 47) was derived using the double reads done by Washington State using a program designed for that purpose (Punt et al. 2008). This, of course, only accounts for the precision of age reading, not accuracy. While McFarlane and King (2001) did validate that the observed annuli are generally annual marks, via a mark-recapture study which used oxytetracycline (OTC) injections to leave a distinct mark on the otoliths that could be observed upon recapture of the fish and extraction of the otoliths, their results did find some error in ageing (>5% mis-aged) even for a single year at large, and under research settings, which generally have higher precision than under production ageing conditions. More work needs to be done to identify potential biases in production ageing of lingcod. One of the sources of error in ageing lingcod is that the first and second annuli can be re-absorbed as the fish ages. Beamish and Chilton (1977) developed a method that used mean annual diameter measurement to locate the position of the first and second annuli and thus minimize, but not eliminate, error due to this re-absorption.

Age data were not used in the base or bracketing models, but this ageing error matrix was used for the sensitivity analyses which included age data.

2.4 Changes in data from the 2005 assessment

Changes in data for this assessment include a new point of geographic division of the assessments (the Oregon/California border), expansion of the time period of the assessment back to 1928 (from 1956), updated landings and length composition data across time periods, fisheries and surveys; use of conditional age at length data, inclusion of the NWFSC survey data and discard data from the West Coast Groundfish Observer Program, and addition of the California dockside recreational CPUE index.

3. Assessment model

3.1 History of Modeling approaches

There have been six assessments of lingcod since 1986 covering part or all of the West Coast of the United States.

Adams (1986) conducted a yield per recruit analysis. Jagielo (1994) conducted an age-structured assessment of the status of the lingcod stock between Cape Falcon in Northern Oregon to 49 ˚N (off of southwest Vancouver Island in British Columbia - PMFC areas 3A, 3B, and 3C, including

Canada), using the Stock Synthesis program (Methot, 1990). Data included trawl and recreational catch from 1979-1993 with equilibrium catch before then, triennial shelf survey and trawl cpue indices, and length and age composition data. The final spawning output levels were estimated to be about 20% of pristine levels, and catch level recommendations ranged between 2500 and 3000 mt based on F40% to F20%.

The 1997 assessment (Jagielo et al.1997) expanded the area south to Cape Blanco (42°50' N), and retained the northern boundary of 49°00'N and the use of the Stock Synthesis model. Depletion in spawning output in this model was below 10% for 1997.

Adams et al. (1999) conducted a length-based, age-structured population model implemented in AD Model Builder (ADMB, Fournier 1996) for the southern area which had not yet been assessed (Eureka, Monterey, and Conception INPFC areas).

Jagielo et al. (2000) conducted age structured models in ADMB for two areas of the US: US Vancouver-Columbia (no longer including Canadian waters) and Eureka, Monterey, Conception INPFC areas. Jagielo et al. (2003) conducted age structured assessments for the two areas using Coleraine. Finally, Jagielo et al. (2005) conducted age structured assessments for the two areas using Stock Synthesis 2 (SS2). They found that the northern stock had recovered substantially from a low point in the 1990s was at 87% depletion, while the southern area had not recovered as well as was at 24% depletion, with a 64% coastwide depletion.

3.2 Current Model

Model

This assessment uses SS version 3.03a. While there are still two separate assessments for the north and south areas, the two areas are now defined by state boundaries – the Northern area being Washington and Oregon, and the southern area being California. This choice was made due to data availability and evidence that the Eureka area is somewhat more connected to the areas to the north than to those to its south. In the current division, the Eureka area is split in half as well. The parameters for the base models, both those that were estimated and those that were fixed, are given in Tables 14 and 15.

Length and age bins

The same length frequency bins were used as in the 2005 assessment. The first bin contained all fish less than 28 cm, followed 2-cm length bins up to 108 cm, with a maximum bin of all fish ≥ 110 cm in length.

Age bins included single year bins from age 1 to 13 and a plus group at 14 years of age and older.

Ageing error

Aging error was derived using the double reads from Washington State using a program designed for that purpose (Punt et al. 2008). The results used are shown in Figure 47.

Growth

Many growth parameters were estimated within both models for both males and females, including the von Bertalanffy growth rate parameters (k) and the CVs of length at ages 1 and 20.

The size at age 20 is also estimated in the North model, with the size at age 1 fixed at 30 cm in both models and the size at age 20 fixed in the South model. The estimated growth trajectories are shown in Figures 48 and 96.

Recruitment, stock-recruitment steepness and natural mortality

R_0 is estimated in both models, along with recruitment deviations from 1928 through 2007, with bias correction ramping I 1from 1950 to 1964 (North) and 1960 to 1974 (South), with $\sigma_r = 0.5$. Natural mortality is set at 0.18 for females and 0.32 for males in both models, which are the values used in the 1994-2005 assessments and which balances the estimates from various meta-analyses. In the previous assessment, steepness was set in the final model at 0.9. In the current assessment h is set to be 0.8; this lower value is intended to reflect, to some extent, multiple minimally connected stocks, with different levels of depletion, within each assessment area.

Selectivity and Retention

In initial runs, all 6 parameters of the double normal selectivity function were estimated for the fishery and each survey, along with the inflection point and slope of the logistic retention function. Various blocking schemes on fishery selectivity were tested in an effort to account for changes in depth of fishing and codend mesh size. However, only two time blocks are used in the base models, reflecting the large-scale changes in regulations for both the commercial and recreational fisheries up and down the coast over the past decade or so. Changes in both commercial and recreational selectivities, and in commercial discard rates are allowed in 1998.

All selectivities were allowed to be, and were domed shaped, with the exception of the southern Commercial fishery which was essentially asymptotic when fit. The selectivity pattern for the Triennial survey in the South was ill-defined, and so it was forced to be the same as the base model triennial selectivity in the North. Selectivities and retention patterns are shown in Figures 49-57 and 97-103. Modeled and observed discards are shown in Figures 58-59 and 104-105.

Likelihood contributions

The objective function, which was minimized to obtain the point estimates of the model parameters, included contributions by the data (survey and fishery biomass indices, fishery and survey length and conditional age-at-length composition data) and well as priors (essentially non-informative).

4. Results

4.1. Reference model results

Figures 60-66 and 106-112 show the time trajectories of the estimates of summary biomass, fishery exploitation rate, recruitment, and depletion in spawning output (see Tables 16-17 as well). The fits to the stock-recruitment relationships (Figures 63 and 119) indicate a substantial amount of variability. Figures 67-91 and 113-132 show the fits to the indices and compositional data for the North and South models, respectively. In both the North and the South there appears to be a variability in either growth or ageing, and likely the latter, as the fit to the conditional age-at-length data varies over time and between data sources. Figures 92-93 and 133-134 show management quantities: equilibrium yield plots and time series of surplus production for the two areas.

For both the North and South base models, catchability (q) for the NWFSC survey is between 0.5 and 1.0 (for the most highly selected lengths), indicating a plausible estimate of recent biomass. Although the catchability values are plausible, the actual fits to the NWFSC survey data are rather poor, especially in the South where the last two points are down but the modeled biomass and expected survey index continue to trend up. In fact, as seen by the retrospective analyses (below, Figures 135-136), the NWFSC survey index has very little influence on the results. While the survey is not ideal for lingcod, which tend to be found in higher densities in rocky areas (Jagielo et al. 2003), one would not necessarily expect such a divergence of index and trend, although it is possible that availability changes substantially from year to year.

4.2. Retrospective analysis

Retrospective analyses were conducted as if the assessment were carried out in the years from 2008 down to 2004 (without the last 1-5 years of data). No consistent retrospective pattern was seen in either the North or the South (Figures 135-136). In fact, these are remarkably stable in both models.

4.3 Pre-STAR Sensitivity Analyses

A number of sensitivities were done for each of the two modeled areas prior to the STAR panel. In both pre-STAR base models, as is usually the case, a few selectivity parameters were fixed in order to avoid issues with bounds. The first comparison in each case, therefore, is to a model with those parameters estimated. The result is nearly the same as the base but with a few more estimated parameters. The rest of the models are direct comparisons to the freed up model in each case. There are two general types of sensitivities. The first involves the removal or down-weighting of data. For these, a direct comparison of likelihood is not possible, but differences in the results are noted. The second involves changing the value of fixed parameters, or changing what is estimated. In these cases, likelihood comparisons are easier.

For the North, the sensitivity runs are as follows:

1) Base model with selectivity parameters freed up ("likebase").
2) Model without CPUE index data ("noCPUE").
3) Model without Triennial survey (index, length and age) data ("noTri").
4) Model without NWFSC survey (index, length and age) data ("noNW").
5) Model with size at age 1 increased from 30 to 32 cm ("Lmin32").
6) Model without age data (size at age 20 fixed at base model estimates) ("noAge").
7) Model without age data (size at age 20 fixed below 2004 model estimates) ("noAgealt").
8) Model with female M fixed at 0.2 instead of 0.18 ("Mfem.2").
9) Model with female M fixed at 0.23 instead of 0.18 ("Mfem.23").
10) Model with steepness (h) = 0.75 instead of 0.8 ("h.75").
11) Model with steepness (h) =0.85 instead of 0.8 ("h.85").
12) Model with commercial selectivity forced asymptotic pre-1998 ("Asym").
13) Model with discard fraction data CV at 0.5 instead of 0.1 ("Disc.5").

For the South, the sensitivity runs are as follows:
1) Base model with selectivity parameters freed up ("likebase").
2) Model without (commercial or recreational) CPUE index data ("noCPUE").
3) Model without Triennial survey (index, length and age) data ("noTri").

4) Model without NWFSC survey (index, length and age) data ("noNW").
5) Model with size at age 1 increased from 30 to 35 cm ("Lmin35").
6) Model with size at age 20 estimated for both females and males ("estLmax").
7) Model without age data ("noAge").
8) Model with female M fixed at 0.2 instead of 0.18 ("Mfem.2").
9) Model with female M fixed at 0.23 instead of 0.18 ("Mfem.23").
10) Model with steepness (h) = 0.7 instead of 0.8 ("h.7").
11) Model with steepness (h) =0.9 instead of 0.8 ("h.9").
11) Model with commercial selectivity forced asymptotic pre-1998 ("Asym").
13) Model with discard fraction data CV at 0.5 instead of 0.1 ("Disc.5").

The results from all of the sensitivities are displayed in Tables 18 and 19. In general, the results from the North indicate a much more stable model than do the results form the South.

4.4 STAR modifications

The major change in data use following the STAR panel was the removal of the age data. Outliers and inconsistent ageing appeared to be causing the age data to be more confounding than informative, especially for this fast growing species for which individual year classes are fairly well defined from the length data alone. Another major change was estimating recruitment back to 1928 (with bias correction ramping in mid-century or later). This allows for better accounting of the uncertainty in Bzero, and in the case of the North model, included a large recruitment in 1964.

4.5 Post-STAR Sensitivity Analysis

Post-STAR sensitivities for both North and South (Table 20 and 21) included:

1) Natural mortality = 0.16 (females) and 0.285 (males)
2) Natural mortality = 0.20 (females) and 0.355 (males)
3) Natural mortality = 0.22 (females) and 0.39 (males)
4) Stock recruitment steepness = 0.7.
5) Stock recruitment steepness = 0.9.

5. Future research

1) Validation of the ageing of lingcod to verify lack of bias or show bias in ageing.
2) Development of an expanded assessment for the North including British Columbia.
3) Investigate the effect of the year when recruitment is estimated on the estimates of B0 and of current status.
4) Investigation of the large survey estimate for lingcod in the 2003 NWFSC survey showed that catches from only three tows made up 63.5% of the total lingcod catch in the survey. The second and third large tows also had large catches of dogfish and the catches were subsampled for counts and detailed sampling. As a result only 2 lingcod were actually measured in the second largest tow (one male and one female) but these measurements were expanded to the whole catch. It is difficult and inappropriate to try to correct such estimates after the fact during the assessments. Instead onboard sampling procedures need to be developed to ensure that a proper and informative subsample of fish be measured during the survey.

5) The sensitivity run with no abundance indices produced a similar fit to the base case suggesting that there was little trend information in the abundance indices used in the base case. Can it be determined if the NWFSC survey is fishing in the right places for lingcod? Are there other survey techniques that can be used (e.g., longline, combined lingcod/sablefish pot survey, trap surveys)?
6) Investigate the suitability of using catches of lingcod in the IPHC survey as an alternate abundance index.
7) Re-examine the usefulness of the Washington tagging data for next assessment.
8) There was confusion over whether SS3 was using mid-year or beginning of year length at age resulting in larger than expected mean length at age for age 0 and 1. The method for setting the correct mean length at age for the younger ages needs to be clarified before the next assessment.
9) Further investigation of the age and length data needs to be done to understand if seasonal or area differences or some other causes are behind the outliers observed in the length-at-age data.
10) Look at environmental covariates for recruitment and time-varying growth and availability inshore.
11) The fact that lingcod males are nest-guarders was ignored when determining reproductive output. A cursory look at the proportion of sex ratio in the catch did not appear to indicate any serious changes for either species in recent years. However, we do not know what kind of change in sex ratio would indicate a serious change in reproductive success. The impact of nest-guarding on reproductive output should be investigated.
12) Many rockfish assessments use CPUE data from the CPFV fishery as an index of population abundance. The CPFV fishery is focused primarily on marketing a successful "fishing experience" that is related to the desirability of the species caught, quantity, body size, and fighting characteristics. The default assumption of proportionality between CPUE and abundance has not been evaluated for a fishery with these characteristics. Simulation modeling of fleet dynamics in a multi-species context is one possible way to address these issues.

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Table 1. History of PFMC lingcod Acceptable Biological Catches (ABCs), Harvest Guidelines (HGs) or Optimum Yields (OYs), landings and estimated total catch (i.e. total fishing related mortalities).

Year	ABC	HG or OY	Landings	Catch
1983-1993	7,000		<7,000	<7,000
1994	7,000	4,000	2,399	2,416
1995	2,400	2,400	1,874	1,889
1996	2,400	2,400	2,061	2,074
1997	2,400	2,400	1,992	2,007
1998	1,532	838	696	934
1999	960	730	824	1,060
2000	700	378	425	525
2001	1,120	611	418	533
2002	745	577	905	1,070
2003	841	651	1,368	1,493
2004	1,385	735	479	611
2005	2,922	2,414	691	819
2006	2,716	2,414	781	929
2007	6,706	6,706	611	760
2008	5,853	5,853	521	676
2009	5,278	5,278		

Table 2. History of lingcod commercial trawl trip limits (thousand lbs.). Note, starting in 1996, trawl gear was allowed retention of 100lbs. at size less than minimum size limit (Commercial size limit of 22' from 1995-1997 and 24" thereafter).

		Jan/Feb	Mar/Apr	May/Jun	Jul/Aug	Sep/Oct	Nov/Dec
<1995					None		
1995					20,000 lb/month		
1996					40,000 lb/2 months		
1997					40,000 lb/2 months		
1998					1,000 lb/2 months		
1999		1,500lb/3months	1,500lb/3months	1,500lb/3months	1,000lb/3months	1,000lb/3months..500lb/month	500lbs/month
2000		Prohibited	Prohibited	400lb/month	400lb/month	400lb/month..500lb/month	Prohibited
2001	Small footrope	No retention	No retention	400 lb/mo.	400 lb/mo.	**Sept:** 400 lb/mo. **Oct:** 500lb/mo	No retention
2002 North	Small footrope	800 lb/2 mo.	800 lb/2 mo.	1,000 lb/2 mo.	1,000 lb/2 mo.	**CLOSED**	**CLOSED**
2002 South	Small footrope	800 lb/2 mo.	800 lb/2 mo.	1,000 lb/2 mo.	**CLOSED**	**CLOSED**	**CLOSED**
2003 North		800lb/2 month	800lb/2 month	1000lb/2 month	1000lb/2 month	**Sept:** 1000lb/2M **Oct:** 800lb/2M	800lb/2 month
2003 South		800lb/2 months	800lb/2 months	1000lb/2 months	1000lb/2 months	800lb/2 months	800lb/2 months
2004 North	Large footrope		Closed	Closed	Closed	500lbs/2 months	500lbs/2 months
	Small footrope		800lb/2 month	800lb/2 month	1000lb/2 months	1000lb/2 months	800lb/2 month
2004 South	Large footrope	Closed	Closed	Closed	500lb/2 months	500lb/2 months	500lb/2 months
	Midwater or Small footrope	800lb/2 month	800lb/2 month	1000lb/2 month	1000lb/2 month	**Sept:** 800lb/2 month **Oct:** 500lb/2 months	500lb/2 months
2005 North	large and small footrope gear	500 lb/ 2 months	500 lb/ 2 months	500 lb/ 2 months	500 lb/ 2 months	500 lb/ 2 months	500 lb/ 2 months
	selective flatfish trawl gear	800 lb / 2 months	800 lb / 2 months	1000 lb / 2 months	1000 lb / 2 months	800 lb / 2 months	800 lb / 2 months
	multiple bottom trawl gear[8]	500 lb/ 2 months	500 lb/ 2 months	500 lb/ 2 months	500 lb/ 2 months	500 lb/ 2 months	500 lb/ 2 months
2005 South	Large footrope or midwater trawl	500lb/2 months	500lb/2 months	500lb/2 months	500lb/2 months	500lb/2 months	500lb/2 months
	Small footrope trawl	800lb/2 month	800lb/2 month	1000lb/2 month	1000lb/2 month	800lb/2 month	800lb/2 month
2006 North	large and small footrope gear	600 lb/ months	600 lb/ months	1200 lb/ 2 months	1200 lb/ 2 months	1200 lb/ 2 months	
	selective flatfish trawl gear	600 lb/ months	600 lb/ months	1200 lb/ 2 months	1200 lb/ 2 months	1200 lb/ 2 months	
	multiple bottom trawl gear[8]	600 lb/ months	600 lb/ months	1200 lb/ 2 months	1200 lb/ 2 months	1200 lb/ 2 months	
2006 South	Large footrope or midwater trawl	600lb/ months	600lb/ months	1200 lb/2 months	1200 lb/2 months	1200 lb/2 months	
	Small footrope trawl	600lb/ months	600lb/ months	1200 lb/2 months	1200 lb/2 months	1200 lb/2 months	
2007 North	large & small footrope	1,200lbs/2 months	1,200lbs/2 months	4,000lbs/2 months	4,000lbs/2 months	4,000lbs/2 months	4,000lbs/2 months
	selective flatfish trawl gear	1,200lbs/2 months	1,200lbs/2 months	1,200lbs/2 months	1,200lbs/2 months	1,200lbs/2 months	1,200lbs/2 months
	multiple bottom trawl gear[8]	1,200lbs/2 months	1,200lbs/2 months	1,200lbs/2 months	1,200lbs/2 months	1,200lbs/2 months	1,200lbs/2 months
2007 South	large footrope or midwater trawl	1,200lbs/2 months	1,200lbs/2 months	4,000lbs/2 months	4,000lbs/2 months	4,000lbs/2 months	4,000lbs/2 months
	small footrope	1,200lbs/2 months	1,200lbs/2 months	1,200lbs/2 months	1,200lbs/2 months	1,200lbs/2 months	1,200lbs/2 months

Table 3. History of recreational lingcod bag limit and size limits (inches):

State	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	Daily Bag Limits															
Washington	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	
Oregon	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	
California	5	5	5	5	3	2	2	2	2	2	2/1	2	2	2	2	2
	Size limit (inches)															
Washington	none	22	22	22	24	24	24	24	24	24	24	24	24	22	22	
Oregon	none	22	22	22	24	24	24	24	24	24	24	24	24	22	22	
California	none	22	22	22	24	24	26	26	24	24	24/30	24	24	24	24	24

Table 4. Summary of California Recreational Management Measures Affecting Lingcod
Created: June 22, 2009
(Note: italics indicate in season changes)

Year	Description	Effective Date
1996	Statewide recreational bag limit: 5 lingcod Min Size:22 inches	3/1/1996
1998	Statewide recreational bag limit: 3 lingcod Min Size:24 inches	3/1/1998
1999	Statewide recreational bag limit: 2 lingcod Min Size:24 inches	3/1/1999
2000	Bag and Size Limits: o Statewide recreational bag limit: 2 lingcod Min Size:26 inches Management Area Seasons: o Open to all anglers south of Lopez Point, Monterey County (36° 00') from March to December. o Open to all anglers north of Lopez Point, Monterey County (36° 00') to near Cape Mendocino(40° 10'), Humboldt County January to February & May to December Recreational gear restriction: o No more than 3 hooks per line *Inseason closure for boat based anglers fishing for lingcod Statewide – closed November and December.*	3/1/2000 *11/1/2000*
2001	Management Area Seasons: o Recreational Management Areas created with seasonal closures: Northern Management Area (Near Cape Mendocino(40° 10') to Point Conception (34° 27')) Open to all anglers January to February & July to December. o Southern Management Area (Point Conception (34° 27') to U.S./Mexico border) Open to all anglers March to December. Recreational gear restriction: o No more than 2 hooks per line *Inseason closure for lingcod for all waters south of Cape Mendocino November to December*	3/1/2001 *11/1/2001*
2002	Bag and Size Limits: o Statewide recreational bag limit: 2 lingcod Min Size:24 inches Management Area Seasons: Recreational Management Areas redefined with seasonal closures o Northern Management Area (Oregon/California border to Near Cape Mendocino(40° 10')) no season closure. o Central Management Area (Near Cape Mendocino(40° 10') to Point Conception (34° 27')) Open to all anglers January to February & July to August. o Southern Management Area (Point Conception (34° 27') to U.S./Mexico border) Open to all anglers from March to October. Note: During rockfish/lingcod season closures no lingcod may be taken or possessed in waters deeper than 20 fathoms. *Inseason closure for lingcod for the waters deeper than 20 fathoms for all boat based anglers south of near Cape Mendocino (40° 10') July to December*	3/1/2002 *7/1/2002*
2003	Management Area Seasons and depth restrictions: o Northern Management Area: Lingcod may not be taken or possessed in waters greater than 27 fathoms.	3/1/2003

	- Central and Southern Management Areas: Open to all anglers from February to November. Note: During closure periods, lingcod may not be taken or possessed in waters greater than 20 fathoms. *Inseason closure for lingcod statewide for all boat-based anglers*	*12/8/2003*
2004	Management Area Seasons and depth restrictions: - Central Management Area: January and February open only in waters less than 30 fathoms, May to August open in waters less than 20 fathoms, waters of the Cordell Bank (Marin County) closed to fishing - Southern Rockfish Management Area: March to December open in waters less than 60 fathoms *Bag and Size Limits:* *Statewide recreational bag limit: 1 lingcod Min Size:30 inches* *Management Area Seasons:* *Recreational Management Areas redefined with seasonal closures* - *Northern Management Area (Oregon/California border to Near Cape Mendocino(40° 10')) Open to all anglers January to October. Lingcod may not be retained in waters greater that 30 fathoms.* - *North-Central Management Area (Near Cape Mendocino(40° 10') to Point Lopez (36° 00')) Open for boat based anglers from January to February & August to October in waters less that 20 fathoms. Shore based anglers and divers open from June to October.* - *South Central Management Area (Point Lopez (36° 00') to Point Conception (34° 27')) Open for boat based anglers June & August to October. Shore based anglers and divers open from June to October. In June and August boat based anglers and divers may only take lingcod in waters less that 30 fathoms. From September to October boat based anglers and divers may only take lingcod in waters less that 20 fathoms.* - *Southern Management Area (Point Conception (34° 27') to U.S./Mexico border) Open to all anglers from June to October. June to August lingcod may only be taken in water less than 60 fathoms. September to October lingcod may only be taken in water less than 30 fathoms.*	1/1/2004 *5/1/2004*
2005	Bag and Size Limits: - Statewide recreational bag limit: 2 lingcod Min Size:24 inches. Management Area Seasons and depth restrictions: - Northern Management Area: Boat based anglers open July to October in water less that 40 fathoms. Shore based anglers and divers open April to November. - North-Central Management Area **redefined** (Near Cape Mendocino(40° 10') to Pigeon Point (37° 11)) Boat based anglers and divers open July to November in water less that 20 fathoms. Shore based anglers open April to November. - Monterey South Central Management Area (Pigeon Point (37° 11) to Lopez Point (36° 00')) Open for boat based anglers July to November in waters less than 20 fathoms. Shore based anglers and divers open from April to November. - Morro Bay South Central Management Area (Lopez Point (36° 00') to Point conception (34° 27')) Open for boat based anglers May to September in waters less than 20 fathoms. Shore based anglers and divers open from April to November. - South Central Management Area (Point Conception (34° 27') to U.S./Mexico border) Open for boat based anglers April to September in waters between 30 and 60 fathoms from April to June then from July to September waters less than 40 fathoms. Shore based anglers and divers open from April to November. *Management Area Seasons:*	3/1/2005

	o *Northern Management Area: Boat based anglers open May to November in water less that 30 fathoms.* o *Morro Bay South Central Management open for boat based anglers May to September in waters less than 40 fathoms.* o *South Central Management Area open for boat based anglers April to November in waters less than 60 fathoms from April to August & November then from September to October waters less than 30 fathoms.*	*6/1/2005*
2006	<u>Management Area Seasons and depth restrictions:</u> o South Central Management Area (Point Conception (34° 27') to U.S./Mexico border) Boat based anglers open April to September. Lingcod may only be taken or possessed in waters between 40 and 60 fathoms from April to June. Lingcod may only be taken or possessed in waters less than 40 fathoms from July to September.	3/1/2006
2007	<u>Management Area Seasons and depth restrictions:</u> o Northern Management Area: Boat based anglers open May to November in water less that 30 fathoms. o North-Central Management Area boat based anglers open June to November in waters less that 30 fathoms. o Monterey South Central Management Area open for boat based anglers May to November in waters less than 40 fathoms. o Morro Bay South Central Management Area open for boat based anglers May to November in waters less than 40 fathoms. o South Central Lingcod Management Area open for all anglers April to November in waters less that 60 fathoms. *Inseason Changes: The Northern and North Central Management Areas Closed in October for all anglers*	3/1/2007 *10/1/2007*
2008	<u>Management Area Seasons and depth restrictions:</u> o Northern Management Area: Boat based anglers open May to November in water less that 20 fathoms. *Inseason Changes:* o *North Central Management Area split into two Management Areas.* o *North Central North of Point Arena Management Area (Near Cape Mendocino(40° 10') to Point Arena (38° 57.5')) and North Central South of Point Arena Management Area (Point Arena (38° 57.5') to Pigeon Point (37° 11)).* o *The Northern and North Central North of Point Arena Management Areas Closed in September for all groundfish anglers.*	1/8/2002 *9/2/2008*
2009	<u>Management Area Seasons and depth restrictions:</u> o North Central North of Point Arena Management Area open for boat based anglers May 15 to September 15 in waters less than 20 fathoms. o North Central North of Point Arena Management Area open for boat based anglers May 15 to August 15 in waters less than 20 fathoms. o North Central South of Point Arena Management Area open for boat based anglers June 13 to October 30 in waters less than 30 fathoms. o Monterey South Central Lingcod Management Area open for boat based anglers May to November 15 in waters less than 40 fathoms. o Morro Bay South Central Lingcod Management Area open for boat based anglers May to November 15 in waters less than 40 fathoms.	3/1/2009

Table 5. Estimated landings for 1928-2008.

	Commercial OR/WA	Recreational OR/WA	Commercial CA	Recreational CA	Total
1928	46	0	387	0	433
1929	142	0	529	3	674
1930	113	0	584	6	703
1931	61	0	558	9	628
1932	68	0	400	12	480
1933	104	0	636	14	754
1934	76	0	389	17	483
1935	72	0	461	20	554
1936	104	0	343	23	470
1937	75	0	440	36	550
1938	158	0	351	43	552
1939	163	0	262	60	484
1940	232	0	313	63	608
1941	628	0	241	58	927
1942	517	0	143	31	691
1943	676	0	327	29	1033
1944	1296	0	339	24	1659
1945	801	0	317	32	1150
1946	889	0	525	56	1469
1947	348	0	880	201	1430
1948	546	0	903	220	1669
1949	561	0	708	239	1508
1950	487	0	833	215	1535
1951	512	0	788	222	1522
1952	335	0	613	158	1107
1953	207	0	415	117	739
1954	311	0	406	188	905
1955	556	0	424	201	1181
1956	426	0	414	274	1114
1957	466	5	744	317	1532
1958	570	10	693	349	1622
1959	500	15	616	275	1406
1960	873	20	558	230	1681
1961	761	25	618	227	1631
1962	633	30	476	221	1361
1963	486	35	476	221	1217
1964	593	40	368	215	1216
1965	597	45	357	313	1312
1966	594	50	359	438	1442
1967	807	55	418	463	1743
1968	1113	60	483	447	2103
1969	869	65	545	347	1827
1970	680	70	749	532	2030
1971	1067	75	973	619	2734
1972	1053	80	1539	756	3429
1973	1451	85	1721	753	4011
1974	1563	90	1834	769	4255

Table 5. (Continued) Estimated landings for 1928-2008.

	Commercial OR/WA	Recreational OR/WA	Commercial CA	Recreational CA	Total
1975	1715	94	1569	841	4220
1976	1658	78	1527	881	4145
1977	1487	85	875	647	3095
1978	1343	78	961	862	3244
1979	2114	96	1529	936	4675
1980	1145	144	1414	1335	4039
1981	2002	301	1304	1133	4740
1982	2429	727	1425	829	5410
1983	3230	213	1020	484	4947
1984	3071	140	952	477	4640
1985	3142	257	969	963	5332
1986	1354	225	541	908	3028
1987	1726	323	863	931	3843
1988	1747	274	1030	1019	4070
1989	2285	232	1280	940	4738
1990	1839	145	1072	765	3822
1991	2279	233	791	795	4097
1992	1270	244	619	772	2905
1993	1509	216	703	442	2871
1994	1336	243	572	248	2399
1995	928	135	542	269	1874
1996	1080	137	482	361	2061
1997	1059	160	510	263	1992
1998	200	98	151	247	696
1999	216	125	142	342	824
2000	90	80	56	199	425
2001	93	92	63	170	418
2002	124	166	81	534	905
2003	107	189	51	1021	1368
2004	115	171	63	130	479
2005	140	190	61	299	691
2006	197	174	62	348	781
2007	190	168	79	174	611
2008	216	134	69	102	521

Table 6. Discard rate estimates used in the assessment.

Year	Discard%	CV
2002	56	0.1
2003	45	0.1
2004	40	0.1
2005	61	0.1
2006	52	0.1
2007	32	0.1

Table 7. Number of trips and fish and input N for commercial fishery length composition, and total number of fish used for commercial fishery conditional age-at-length.

OR/WA Commercial Fishery

		Lengths		*Ages*
Year	Trips	Fish	Input N	Fish
1965	4	572	28	
1966	3	730	21	
1967	5	1,034	35	
1968	38	10,037	268	
1969	16	4,463	113	
1970	20	4,562	141	
1971	14	3,661	99	
1972	4	907	28	
1973	3	561	21	
1974	6	1,421	42	
1975	16	4,083	113	
1976	2	483	14	
1977	1	262	7	
1978	33	1,037	176	
1979	27	1,074	175	
1980	39	2,381	275	2045
1981	21	1,628	148	1540
1982	80	3,278	532	691
1983	25	890	148	516
1984	21	795	131	434
1985	22	912	148	458
1986	46	1,294	225	1022
1987	50	1,184	213	1077
1988	48	1,163	208	966
1989	55	1,621	279	1184
1990	53	1,292	231	1091
1991	51	1,228	220	1194
1992	91	2,495	435	2423
1993	92	2,754	472	2613
1994	80	3,247	528	1834
1995	72	1,887	332	1694
1996	58	1,489	263	1373
1997	73	1,734	312	953
1998	63	1,374	253	854
1999	66	1,533	278	850
2000	87	936	216	508
2001	110	1,129	266	716
2002	139	1,144	297	729
2003	122	1,122	277	852
2004	165	1,182	328	593
2005	71	846	188	595
2006	104	1,063	251	503
2007	181	1,938	448	481
2008	136	1,610	358	496

CA Commercial Fishery

		Lengths		*Ages*
Year	Trips	Fish	Input N	Fish
1978	25	139	44	
1979	33	253	68	
1980	59	1,616	282	
1981	2	3	2	
1982	27	311	70	
1983	38	383	91	
1984	17	238	50	
1985	11	70	21	
1986	9	85	21	
1987	14	146	34	
1988	30	261	66	
1989	17	118	33	
1990	2	3	2	
1991	0	0	0	
1992	2	2	2	
1993	86	1,326	269	816
1994	36	759	141	607
1995	52	535	126	270
1996	96	663	187	334
1997	98	1,164	259	873
1998	42	364	92	257
1999	113	617	198	
2000	40	261	76	
2001	75	387	128	182
2002	41	346	89	248
2003	25	172	49	98
2004	42	335	88	153
2005	24	175	48	
2006	45	348	93	
2007	99	568	177	
2008	83	494	151	

Table 8. Number of fish and input N for recreational fishery length composition, and total number of fish used for recreational fishery conditional age-at-length.

OR/WA Recreational Fishery

	Lengths		*Ages*
Year	Fish	Input N	Fish
1993	574	57.4	
1994	537	53.7	
1995	287	28.7	
1996	415	41.5	
1997	325	32.5	
1998	198	19.8	
1999	1,727	172.7	687
2000	2,276	227.6	801
2001	1,467	146.7	645
2002	863	86.3	860
2003	818	81.8	805
2004	694	69.4	650
2005	539	53.9	499
2006	1,045	104.5	799
2007	995	99.5	788
2008	1,664	166.4	738

1999-2007 data from Oregon - with sex data
Other years from RecFIN without sex data

CA Recreational Fishery

	Lengths		
Year	Recfin	Cent. CA	Input N
1987		284	28.4
1988		1072	107.2
1989		1070	107
1990		223	22.3
1991		359	35.9
1992		718	71.8
1993	538	566	82.8
1994	377	589	72.5
1995	363	952	98.6
1996	766	1091	139.3
1997	1,147	1290	182.8
1998	710	424	85.1
1999	699		69.9
2000	235		23.5
2001	147		14.7
2002	840		84.0
2003	1,407		140.7
2004	1,131		113.1
2005	4,472		447.2
2006	4,264		426.4
2007	3,221		322.1
2008	2,547		254.7

Table 9. Raw numbers of fish and hauls sampled and input Ns used for discard length composition data

	OR/WA			CA		
Year	Tows	Fish	Input N	Tows	Fish	Input N
2003	2	4	3			
2004	432	1881	432	77	546	152
2005	498	2949	498	139	486	200
2006	221	819	221	25	43	31
2007	95	327	140	24	72	34

Table 10. Fishery-based indices of abundance used in the assessment.

North Commercial Logbook GLM			South Commercial Logbook GLM		
Year	*Index*	*CV*	*Year*	*Index*	*CV*
1976	20.33	0.2			
1977	16.16	0.2			
1978	10.79	0.2	1978	5.8	0.2
1979	11.37	0.2	1979	11.8	0.2
1980	11.32	0.2	1980	9.6	0.2
1981	13.33	0.2	1981	7.3	0.2
1982	9.29	0.2	1982	7.4	0.2
1983	9.32	0.2	1983	8.9	0.2
1984	6.99	0.2	1984	7.6	0.2
1985	6.26	0.2	1985	3.6	0.2
1986	3.58	0.2	1986	3.1	0.2
1987	4.24	0.2	1987	5.4	0.2
1988	4.56	0.2	1988	5.6	0.2
1989	5.45	0.2	1989	7.3	0.2
1990	4.36	0.2	1990	6.2	0.2
1991	3.94	0.2	1991	3.8	0.2
1992	2.23	0.2	1992	3.1	0.2
1993	2.74	0.2	1993	3.8	0.2
1994	2.82	0.2	1994	3.6	0.2
1995	2.47	0.2	1995	3.9	0.2
1996	2.54	0.2	1996	3.1	0.2
1997	2.36	0.2	1997	3.3	0.2

PSMFC Dockside Recreational Interview Data (CA)

Year	*Index*	*CV*
1980	0.0932	0.1408
1981	0.0925	0.2680
1982	0.0362	0.1570
1983	0.0243	0.1640
1984	0.0361	0.1713
1985	0.0338	0.1243
1986	0.0315	0.1196
1987	0.0460	0.1793
1988	0.0334	0.1543
1989	0.0341	0.1523
1990		
1991		
1992		
1993	0.0461	0.0829
1994	0.0387	0.1000
1995	0.0482	0.0884
1996	0.0457	0.0732
1997	0.0522	0.0823

Table 11. GLMM-based biomass indices used in the lingcod assessment models.

A. Triennial Shelf Survey

	Washington/Oregon				Total	
	55-183 m		183-400 m		Biomass	
Year	**Median**	**CV**	**Median**	**CV**	**Median**	**CV**
1980	4,088	0.35	870	0.60	4,957	0.30
1983	6,119	0.28	1,512	0.33	7,631	0.23
1986	4,591	0.30	270	0.72	4,860	0.29
1989	3,457	0.31	1,358	0.45	4,814	0.26
1992	2,856	0.31	287	0.52	3,143	0.28
1995	1,522	0.30	257	0.48	1,779	0.26
1998	1,735	0.32	1,873	0.49	3,608	0.30
2001	2,208	0.35	3,721	0.41	5,930	0.29
2004	9,678	0.29	3,256	0.41	12,934	0.24

	California N of Pt. Conception				Total	
	55-183 m		183-400 m		Biomass	
Year	**Median**	**CV**	**Median**	**CV**	**Median**	**CV**
1980	1,278	0.40	599	0.67	1,877	0.35
1983	1,854	0.34	255	0.75	2,109	0.31
1986	826	0.38	267	1.45	1,093	0.45
1989	2,227	0.31	393	0.62	2,620	0.28
1992	747	0.34	230	1.20	977	0.39
1995	440	0.34	350	0.55	790	0.31
1998	634	0.32	82	0.57	716	0.29
2001	1,041	0.35	199	0.54	1,240	0.31
2004	2,125	0.31	1,499	0.41	3,624	0.25

B. NWFSC Shelf Survey

	Washington/Oregon				Total	
	55-183 m		183-400 m		Biomass	
Year	**Median**	**CV**	**Median**	**CV**	**Median**	**CV**
2003	26,804	0.31	1,596	0.47	28,400	0.29
2004	9,201	0.37	1,129	0.53	10,330	0.34
2005	6,265	0.34	2,547	0.49	8,812	0.28
2006	18,806	0.33	2,376	0.40	21,181	0.30
2007	8,235	0.31	1,273	0.48	9,508	0.27
2008	6,482	0.32	6,539	0.46	13,021	0.28

	California N of Pt. Conception				California S of Pt. Conception				Total	
	183-299 m		300-567 m		183-299 m		300-567 m		Biomass	
Year	**Median**	**CV**	**Median**	**CV**	**Median**	**CV**	**Median**	**CV**	**Median**	**CV**
2003	4,639	0.30	2,170	0.41	218	0.44	602	0.78	7,630	0.23
2004	11,670	0.36	2,378	0.52	299	0.85	1,706	1.09	16,054	0.30
2005	6,893	0.33	4,444	0.46	240	0.45	1,483	1.39	13,060	0.28
2006	11,308	0.39	1,171	0.68	661	0.77	197	1.93	13,338	0.34
2007	6,829	0.38	535	0.96	513	0.56	213	2.44	8,090	0.33
2008	1,406	0.35	856	0.59	243	0.63	67	1.23	2,571	0.28

Table 12. Number of trips (fishery) or hauls, number of fish, and total input Ns for conditional age-at-length and age compositions used in the assessment.

OR/WA Triennial survey

Lengths

Year	Trawls	Fish	Input N
1986	32	203	46
1989	111	514	147
1992	92	658	139
1995	121	622	165
1998	135	565	175
2001	165	1018	237
2004	91	507	127

Conditional age-at-length

Year	Trawls	Fish	Total Input N
1992	126	207	141
1995	389	565	430
1998	337	418	367
2001	465	653	512
2004	357	424	388

CA Triennial survey

Lengths

Year	Trawls	Fish	Original Input N*
1989	406	72	101
1992	190	32	45
1995	252	55	73
1998	246	64	81
2001	515	102	138
2004	474	90	124

Conditional age-at-length

Year	Trawls	Fish	Total Input N
1995	123	173	136
1998	123	188	137
2001	136	181	149
2004	278	334	303

OR/WA NWFSC survey

Lengths

Year	Trawls	Fish	Input N
2003	91	670	122
2004	89	568	127
2005	98	511	116
2006	119	687	157
2007	116	449	148
2008	113	539	110

Conditional age-at-length

Year	Trawls	Fish	Total Input N
2003	82	415	396
2004	86	420	400
2005	96	444	440
2006	119	485	491
2007	91	326	328
2008	109	431	391

CA NWFSC survey

Lengths

Year	Trawls	Fish	Input N
2003	99	711	129
2004	91	868	145
2005	109	670	114
2006	54	335	67
2007	55	201	59
2008	79	625	93

Conditional age-at-length

Year	Trawls	Fish	Total Input N
2003	94	499	340
2004	85	462	386
2005	98	460	377
2006	54	222	207
2007	54	161	146
2008	77	410	123

*Southern Triennial length data were re-weighted in the final model by a factor of 0.7.

Table 13. Data sources and years included in the Base Model.

Indices	Years
Triennial	1980 1983 1986 19891992 1995 1998 2001 2004
NWFSC	2003-2008
CommercialCPUE	1976-2007 (N) 1978-2007 (S)
RecreationalCPUE	(S Only): 1980-1989, 1993-1997
Comm. Discard	2002-2007
Length Comps	
Comm. Fishery	1965-2008 (N), 1978-2008 (S)
Rec. Fishery	1993-2008 (N), 1987-2008 (S)
Comm. Discard	2003-2007 (N), 2004-2007 (S)
Triennial Shelf	1986 (N only) 1989 1992 1995 1998 2001 2004
NWFSC Shelf	2003-2008
Age-at-length	*Not used in base model*
Comm. Fishery	*1980-2008 (N), 1993-1998, 2001-2004 (S)*
Rec. Fishery	*1999-2008 (N)*
Triennial	*1992 (N only) 1995 1998 2001*
NWFSC	*2003-2008*

Table 14. Parameters in the North base model.

Label	Value	Estimated	Min	Max	Init	Prior	Pr_SD	Like	SD
NatM_p_1_Fem_GP_1	0.18	NO	0.05	0.25	0.18	0.19	99	0.000	_
NatM_p_2_Fem_GP_1	0.18	NO	0.05	0.25	0.18	0.19	99	0.000	_
L_at_Amin_Fem_GP_1	28.10	1	10	60	30.00	42.50	99	0.011	0.342
L_at_Amax_Fem_GP_1	118.00	NO	40	140	118.00	120.00	99	0.000	_
VonBert_K_Fem_GP_1	0.13	2	0.01	0.5	0.10	0.11	99	0.000	0.002
CV_young_Fem_GP_1	0.09	3	0.01	0.5	0.06	0.06	99	0.000	0.005
CV_old_Fem_GP_1	0.04	4	0.01	0.5	0.09	0.07	0.8	0.001	0.008
NatM_p_1_Mal_GP_1	0.32	NO	0.15	0.4	0.32	0.32	99	0.000	_
NatM_p_2_Mal_GP_1	0.32	NO	0.15	0.4	0.32	0.32	99	0.000	_
L_at_Amin_Mal_GP_1	29.73	5	10	60	30.00	42.50	99	0.008	0.439
L_at_Amax_Mal_GP_1	86.00	NO	40	140	86.00	90.00	99	0.000	_
VonBert_K_Mal_GP_1	0.22	6	0.01	1	0.15	0.15	99	0.000	0.005
CV_young_Mal_GP_1	0.09	7	0.01	0.5	0.05	0.05	99	0.000	0.006
CV_old_Mal_GP_1	0.06	8	0.01	0.5	0.09	0.07	0.8	0.000	0.006
Wtlen_1_Fem	0.00	NO	-3	3	0.00	0.00	99	0.000	_
Wtlen_2_Fem	3.40	NO	-3	5	3.40	3.40	99	0.000	_
Mat50%_Fem	68.06	NO	-3	100	68.06	0.16	99	0.000	_
Mat_slope_Fem	-0.16	NO	-5	5	-0.16	68.06	99	0.000	_
Eg/gm_inter_Fem	1.00	NO	-3	3	1.00	1.00	99	0.000	_
Eg/gm_slope_wt_Fem	0.00	NO	-3	3	0.00	0.00	99	0.000	_
Wtlen_1_Mal	0.00	NO	-3	3	0.00	0.00	99	0.000	_
Wtlen_2_Mal	3.21	NO	-5	5	3.21	3.21	99	0.000	_
RecrDist_GP_1	1.00	NO	0	999	1.00	1.00	0.8	0.000	_
RecrDist_Area_1	1.00	NO	0	999	1.00	1.00	0.8	0.000	_
RecrDist_Seas_1	1.00	NO	0	999	1.00	1.00	0.8	0.000	_
CohortGrowDev	1.00	NO	-1	1	1.00	1.00	99	0.000	_
SR_R0	8.06	9	5	20	8.23	7.62	99	0.000	0.070
SR_steep	0.80	NO	0.2	5	0.80	0.90	99	0.000	_
SR_sigmaR	0.50	NO	0	20	0.50	0.50	99	0.000	_
RecrDev_1928	0.008	10	_	_	_	_	_	_	0.498
RecrDev_1929	0.009	11	_	_	_	_	_	_	0.499
RecrDev_1930	0.010	12	_	_	_	_	_	_	0.499
RecrDev_1931	0.012	13	_	_	_	_	_	_	0.499
RecrDev_1932	0.013	14	_	_	_	_	_	_	0.500
RecrDev_1933	0.015	15	_	_	_	_	_	_	0.500
RecrDev_1934	0.017	16	_	_	_	_	_	_	0.500
RecrDev_1935	0.019	17	_	_	_	_	_	_	0.501
RecrDev_1936	0.021	18	_	_	_	_	_	_	0.502
RecrDev_1937	0.024	19	_	_	_	_	_	_	0.502
RecrDev_1938	0.027	20	_	_	_	_	_	_	0.503
RecrDev_1939	0.030	21	_	_	_	_	_	_	0.504
RecrDev_1940	0.034	22	_	_	_	_	_	_	0.505
RecrDev_1941	0.039	23	_	_	_	_	_	_	0.506
RecrDev_1942	0.044	24	_	_	_	_	_	_	0.507
RecrDev_1943	0.050	25	_	_	_	_	_	_	0.509
RecrDev_1944	0.057	26	_	_	_	_	_	_	0.510
RecrDev_1945	0.064	27	_	_	_	_	_	_	0.512
RecrDev_1946	0.072	28	_	_	_	_	_	_	0.514
RecrDev_1947	0.080	29	_	_	_	_	_	_	0.515
RecrDev_1948	0.087	30	_	_	_	_	_	_	0.517
RecrDev_1949	0.093	31	_	_	_	_	_	_	0.518
RecrDev_1950	0.100	32	_	_	_	_	_	_	0.518
RecrDev_1951	0.113	33	_	_	_	_	_	_	0.520
RecrDev_1952	0.131	34	_	_	_	_	_	_	0.523
RecrDev_1953	0.151	35	_	_	_	_	_	_	0.526

RecrDev_1954	0.176		36	_	_	_	_	_	_	0.529
RecrDev_1955	0.201		37	_	_	_	_	_	_	0.530
RecrDev_1956	0.222		38	_	_	_	_	_	_	0.525
RecrDev_1957	0.226		39	_	_	_	_	_	_	0.512
RecrDev_1958	0.218		40	_	_	_	_	_	_	0.494
RecrDev_1959	0.228		41	_	_	_	_	_	_	0.483
RecrDev_1960	0.406		42	_	_	_	_	_	_	0.465
RecrDev_1961	0.573		43	_	_	_	_	_	_	0.362
RecrDev_1962	0.003		44	_	_	_	_	_	_	0.383
RecrDev_1963	-0.049		45	_	_	_	_	_	_	0.363
RecrDev_1964	1.613		46	_	_	_	_	_	_	0.149
RecrDev_1965	0.842		47	_	_	_	_	_	_	0.218
RecrDev_1966	-0.714		48	_	_	_	_	_	_	0.338
RecrDev_1967	-0.654		49	_	_	_	_	_	_	0.319
RecrDev_1968	-0.402		50	_	_	_	_	_	_	0.341
RecrDev_1969	0.308		51	_	_	_	_	_	_	0.352
RecrDev_1970	1.121		52	_	_	_	_	_	_	0.188
RecrDev_1971	-0.406		53	_	_	_	_	_	_	0.363
RecrDev_1972	-0.592		54	_	_	_	_	_	_	0.308
RecrDev_1973	-0.752		55	_	_	_	_	_	_	0.309
RecrDev_1974	-0.124		56	_	_	_	_	_	_	0.219
RecrDev_1975	-0.134		57	_	_	_	_	_	_	0.199
RecrDev_1976	-0.890		58	_	_	_	_	_	_	0.277
RecrDev_1977	0.087		59	_	_	_	_	_	_	0.154
RecrDev_1978	0.390		60	_	_	_	_	_	_	0.137
RecrDev_1979	0.475		61	_	_	_	_	_	_	0.128
RecrDev_1980	-0.583		62	_	_	_	_	_	_	0.218
RecrDev_1981	-0.690		63	_	_	_	_	_	_	0.229
RecrDev_1982	0.292		64	_	_	_	_	_	_	0.117
RecrDev_1983	-1.016		65	_	_	_	_	_	_	0.240
RecrDev_1984	-1.064		66	_	_	_	_	_	_	0.237
RecrDev_1985	0.531		67	_	_	_	_	_	_	0.091
RecrDev_1986	-1.630		68	_	_	_	_	_	_	0.266
RecrDev_1987	-1.161		69	_	_	_	_	_	_	0.167
RecrDev_1988	-0.924		70	_	_	_	_	_	_	0.139
RecrDev_1989	-0.596		71	_	_	_	_	_	_	0.116
RecrDev_1990	0.084		72	_	_	_	_	_	_	0.086
RecrDev_1991	0.350		73	_	_	_	_	_	_	0.082
RecrDev_1992	0.036		74	_	_	_	_	_	_	0.106
RecrDev_1993	-0.566		75	_	_	_	_	_	_	0.155
RecrDev_1994	0.093		76	_	_	_	_	_	_	0.116
RecrDev_1995	-0.091		77	_	_	_	_	_	_	0.138
RecrDev_1996	-0.134		78	_	_	_	_	_	_	0.141
RecrDev_1997	-0.407		79	_	_	_	_	_	_	0.152
RecrDev_1998	-0.309		80	_	_	_	_	_	_	0.176
RecrDev_1999	0.744		81	_	_	_	_	_	_	0.112
RecrDev_2000	0.864		82	_	_	_	_	_	_	0.110
RecrDev_2001	0.797		83	_	_	_	_	_	_	0.122
RecrDev_2002	0.637		84	_	_	_	_	_	_	0.125
RecrDev_2003	-0.170		85	_	_	_	_	_	_	0.152
RecrDev_2004	0.482		86	_	_	_	_	_	_	0.142
RecrDev_2005	-0.158		87	_	_	_	_	_	_	0.220
RecrDev_2006	0.846		88	_	_	_	_	_	_	0.193
RecrDev_2007	0.052		89	_	_	_	_	_	_	0.319
InitF_1COMM	0.001		101	0	1	0.0009	0.009	99	0.000	0.000
InitF_2REC	0.000	NO		0	1	0	0.009	99	0.000	_
SizeSel_1P_1_COMM	75.913		102	35	100	45	75	50	0.000	1.492

SizeSel_1P_2_COMM	-0.475		103	-6	4	0	0	50	0.000	0.143
SizeSel_1P_3_COMM	5.845		104	-1	9	4	4	50	0.001	0.125
SizeSel_1P_4_COMM	5.192		105	-1	9	5	5.5	50	0.000	0.233
SizeSel_1P_5_COMM	-2.931		106	-5	9	-2	-2	50	0.000	0.171
SizeSel_1P_6_COMM	-2.983		107	-5	9	9	5	50	0.013	0.571
Retain_1P_1_COMM	40.000	NO		31	100	40	55	50	0.000	_
Retain_1P_2_COMM	2.000	NO		0.1	10	2	1	99	0.000	_
Retain_1P_3_COMM	1.000	NO		0.001	1	1	1	99	0.000	_
Retain_1P_4_COMM	0.000	NO		0	0	0	0	99	0.000	_
SizeSel_2P_1_REC	54.906		108	35	100	50	75	50	0.081	0.794
SizeSel_2P_2_REC	-5.900	NO		-6	4	-5.9	0	50	0.000	_
SizeSel_2P_3_REC	3.256		109	-1	9	4	4	50	0.000	0.145
SizeSel_2P_4_REC	6.074		110	-1	9	5	5.5	50	0.000	0.172
SizeSel_2P_5_REC	-4.900	NO		-5	9	-4.9	-2	50	0.000	_
SizeSel_2P_6_REC	-4.900	NO		-5	9	-4.9	5	50	0.000	_
SizeSelMale_2P_1_REC	51.418		111	30	100	58	60	99	0.004	4.140
SizeSelMale_2P_2_REC	-0.990	NO		-1	1	-0.99	0	99	0.000	_
SizeSelMale_2P_3_REC	-1.990	NO		-2	1	-1.99	-0.5	99	0.000	_
SizeSelMale_2P_4_REC	1.641		112	-2	2	1.2	-0.2	99	0.000	0.605
SizeSel_3P_1_TRI	70.000	NO		35	100	70	75	50	0.000	_
SizeSel_3P_2_TRI	-0.550	NO		-6	4	-0.55	0	50	0.000	_
SizeSel_3P_3_TRI	5.340	NO		-1	9	5.34	4	50	0.000	_
SizeSel_3P_4_TRI	5.200	NO		-1	9	5.2	5.5	50	0.000	_
SizeSel_3P_5_TRI	-1.140	NO		-5	9	-1.14	-2	50	0.000	_
SizeSel_3P_6_TRI	-4.900	NO		-5	9	-4.9	5	50	0.000	_
SizeSel_4P_1_NWFSC	65.137		113	35	100	40	75	50	0.019	2.605
SizeSel_4P_2_NWFSC	-1.204		114	-6	4	-5.9	0	50	0.000	0.397
SizeSel_4P_3_NWFSC	5.137		115	-1	9	4	4	50	0.000	0.463
SizeSel_4P_4_NWFSC	5.479		116	-1	9	5	5.5	50	0.000	0.472
SizeSel_4P_5_NWFSC	-1.039		117	-5	9	-2	-2	50	0.000	0.218
SizeSel_4P_6_NWFSC	-4.900	NO		-5	9	-4.9	5	50	0.000	_
SizeSel_5P_1_CPUE	-1.000	NO		-2	0	-1	0	50	0.000	_
SizeSel_5P_2_CPUE	-1.000	NO		-2	0	-1	0	50	0.000	_
SizeSel_1P_1_COMM_BLK	70.879		118	35	100	45	75	50	0.003	1.161
SizeSel_1P_2_COMM_BLK	-1.349		119	-6	4	0	0	50	0.000	0.203
Retain_1P_1_COMM_BLK	58.507		120	31	100	40	55	99	0.001	0.275
Retain_1P_3_COMM_BLK	0.628		121	0.1	1	0.9	0.9	99	0.000	0.020
SizeSel_2P_1_REC_BLK	63.257		122	35	100	45	75	50	0.028	0.425

Table 15. Parameters in the South Base Model

Label	Value	Estimated	Min	Max	Init	Prior	Pr_SD	Like	SD
NatM_p_1_Fem_GP_1	0.18	NO	0.05	0.25	0.18	0.19	99	0.000	_
NatM_p_2_Fem_GP_1	0.18	NO	0.05	0.25	0.18	0.19	99	0.000	_
L_at_Amin_Fem_GP_1	26.90	1	10	60	30.00	32.50	99	0.002	0.438
L_at_Amax_Fem_GP_1	108.00	NO	40	140	108.00	120.00	99	0.000	_
VonBert_K_Fem_GP_1	0.11	2	0.01	0.5	0.10	0.11	99	0.000	0.008
CV_young_Fem_GP_1	0.11	3	0.01	0.5	0.06	0.06	99	0.000	0.014
CV_old_Fem_GP_1	0.12	4	0.01	0.5	0.09	0.07	0.8	0.002	0.019
NatM_p_1_Mal_GP_1	0.32	NO	0.15	0.4	0.32	0.32	99	0.000	_
NatM_p_2_Mal_GP_1	0.32	NO	0.15	0.4	0.32	0.32	99	0.000	_
L_at_Amin_Mal_GP_1	25.98	5	10	60	30.00	32.50	99	0.002	0.432
L_at_Amax_Mal_GP_1	81.00	NO	40	140	81.00	90.00	99	0.000	_
VonBert_K_Mal_GP_1	0.23	6	0.01	1	0.15	0.15	99	0.000	0.009
CV_young_Mal_GP_1	0.07	7	0.01	0.5	0.05	0.05	99	0.000	0.009
CV_old_Mal_GP_1	0.14	8	0.01	0.5	0.09	0.07	0.8	0.004	0.012
Wtlen_1_Fem	0.00	NO	-3	3	0.00	0.00	99	0.000	_
Wtlen_2_Fem	3.40	NO	-3	5	3.40	3.40	99	0.000	_
Mat50%_Fem	60.60	NO	-3	100	60.60	60.00	99	0.000	_
Mat_slope_Fem	-0.16	NO	-5	5	-0.16	0.10	99	0.000	_
Eg/gm_inter_Fem	1.00	NO	-3	3	1.00	1.00	99	0.000	_
Eg/gm_slope_wt_Fem	0.00	NO	-3	3	0.00	0.00	99	0.000	_
Wtlen_1_Mal	0.00	NO	-3	3	0.00	0.00	99	0.000	_
Wtlen_2_Mal	3.21	NO	-5	5	3.21	3.21	99	0.000	_
RecrDist_GP_1	1.00	NO	0	999	1.00	1.00	0.8	0.000	_
RecrDist_Area_1	1.00	NO	0	999	1.00	1.00	0.8	0.000	_
RecrDist_Seas_1	1.00	NO	0	999	1.00	1.00	0.8	0.000	_
CohortGrowDev	1.00	NO	-1	1	1.00	1.00	99	0.000	_
SR_R0	8.17	9	1	100	8.23	7.62	99	0.000	0.061
SR_steep	0.80	NO	0.2	5	0.80	0.90	99	0.000	_
SR_sigmaR	0.50	NO	0	20	0.50	0.50	99	0.000	_
SR_envlink	0.00	NO	-5	5	0.00	0.00	99	0.000	_
SR_R1_offset	0.00	NO	-5	5	0.00	0.00	99	0.000	_
SR_autocorr	0.00	NO	0	2	0.00	1.00	50	0.000	_
RecrDev_1928	-0.03	10	_	_	_	_	_	_	0.495
RecrDev_1929	-0.03	11	_	_	_	_	_	_	0.495
RecrDev_1930	-0.03	12	_	_	_	_	_	_	0.494
RecrDev_1931	-0.03	13	_	_	_	_	_	_	0.494
RecrDev_1932	-0.03	14	_	_	_	_	_	_	0.494
RecrDev_1933	-0.03	15	_	_	_	_	_	_	0.493
RecrDev_1934	-0.04	16	_	_	_	_	_	_	0.493
RecrDev_1935	-0.04	17	_	_	_	_	_	_	0.493
RecrDev_1936	-0.04	18	_	_	_	_	_	_	0.492
RecrDev_1937	-0.04	19	_	_	_	_	_	_	0.491
RecrDev_1938	-0.05	20	_	_	_	_	_	_	0.491
RecrDev_1939	-0.05	21	_	_	_	_	_	_	0.490
RecrDev_1940	-0.05	22	_	_	_	_	_	_	0.489
RecrDev_1941	-0.05	23	_	_	_	_	_	_	0.489
RecrDev_1942	-0.06	24	_	_	_	_	_	_	0.488
RecrDev_1943	-0.06	25	_	_	_	_	_	_	0.487
RecrDev_1944	-0.07	26	_	_	_	_	_	_	0.486
RecrDev_1945	-0.07	27	_	_	_	_	_	_	0.484
RecrDev_1946	-0.08	28	_	_	_	_	_	_	0.483
RecrDev_1947	-0.09	29	_	_	_	_	_	_	0.482
RecrDev_1948	-0.09	30	_	_	_	_	_	_	0.480
RecrDev_1949	-0.10	31	_	_	_	_	_	_	0.478
RecrDev_1950	-0.11	32	_	_	_	_	_	_	0.476

RecrDev_1951	-0.12	33	_	_	_	_	_	_	0.474
RecrDev_1952	-0.13	34	_	_	_	_	_	_	0.472
RecrDev_1953	-0.14	35	_	_	_	_	_	_	0.469
RecrDev_1954	-0.15	36	_	_	_	_	_	_	0.466
RecrDev_1955	-0.17	37	_	_	_	_	_	_	0.463
RecrDev_1956	-0.18	38	_	_	_	_	_	_	0.460
RecrDev_1957	-0.20	39	_	_	_	_	_	_	0.456
RecrDev_1958	-0.21	40	_	_	_	_	_	_	0.453
RecrDev_1959	-0.23	41	_	_	_	_	_	_	0.449
RecrDev_1960	-0.25	42	_	_	_	_	_	_	0.446
RecrDev_1961	-0.26	43	_	_	_	_	_	_	0.444
RecrDev_1962	-0.26	44	_	_	_	_	_	_	0.444
RecrDev_1963	-0.26	45	_	_	_	_	_	_	0.444
RecrDev_1964	-0.25	46	_	_	_	_	_	_	0.445
RecrDev_1965	-0.23	47	_	_	_	_	_	_	0.448
RecrDev_1966	-0.19	48	_	_	_	_	_	_	0.454
RecrDev_1967	-0.14	49	_	_	_	_	_	_	0.463
RecrDev_1968	-0.06	50	_	_	_	_	_	_	0.477
RecrDev_1969	0.05	51	_	_	_	_	_	_	0.497
RecrDev_1970	0.19	52	_	_	_	_	_	_	0.519
RecrDev_1971	0.28	53	_	_	_	_	_	_	0.514
RecrDev_1972	0.16	54	_	_	_	_	_	_	0.464
RecrDev_1973	-0.19	55	_	_	_	_	_	_	0.408
RecrDev_1974	-0.60	56	_	_	_	_	_	_	0.363
RecrDev_1975	-0.75	57	_	_	_	_	_	_	0.350
RecrDev_1976	0.64	58	_	_	_	_	_	_	0.162
RecrDev_1977	-0.13	59	_	_	_	_	_	_	0.265
RecrDev_1978	-0.38	60	_	_	_	_	_	_	0.281
RecrDev_1979	0.11	61	_	_	_	_	_	_	0.226
RecrDev_1980	-0.56	62	_	_	_	_	_	_	0.303
RecrDev_1981	-0.70	63	_	_	_	_	_	_	0.302
RecrDev_1982	-0.79	64	_	_	_	_	_	_	0.349
RecrDev_1983	0.83	65	_	_	_	_	_	_	0.190
RecrDev_1984	0.26	66	_	_	_	_	_	_	0.341
RecrDev_1985	0.36	67	_	_	_	_	_	_	0.255
RecrDev_1986	0.10	68	_	_	_	_	_	_	0.305
RecrDev_1987	0.54	69	_	_	_	_	_	_	0.196
RecrDev_1988	-0.13	70	_	_	_	_	_	_	0.232
RecrDev_1989	-0.01	71	_	_	_	_	_	_	0.242
RecrDev_1990	0.42	72	_	_	_	_	_	_	0.167
RecrDev_1991	0.59	73	_	_	_	_	_	_	0.129
RecrDev_1992	-0.76	74	_	_	_	_	_	_	0.305
RecrDev_1993	-0.18	75	_	_	_	_	_	_	0.203
RecrDev_1994	0.42	76	_	_	_	_	_	_	0.123
RecrDev_1995	-0.87	77	_	_	_	_	_	_	0.311
RecrDev_1996	0.55	78	_	_	_	_	_	_	0.167
RecrDev_1997	0.05	79	_	_	_	_	_	_	0.230
RecrDev_1998	-0.13	80	_	_	_	_	_	_	0.372
RecrDev_1999	1.55	81	_	_	_	_	_	_	0.142
RecrDev_2000	1.03	82	_	_	_	_	_	_	0.174
RecrDev_2001	1.15	83	_	_	_	_	_	_	0.211
RecrDev_2002	0.35	84	_	_	_	_	_	_	0.211
RecrDev_2003	1.00	85	_	_	_	_	_	_	0.143
RecrDev_2004	-0.33	86	_	_	_	_	_	_	0.251
RecrDev_2005	-0.20	87	_	_	_	_	_	_	0.274
RecrDev_2006	-0.81	88	_	_	_	_	_	_	0.344
RecrDev_2007	1.58	89	_	_	_	_	_	_	0.240

ForeRecr_2008	0.00		90	_	_	_	_	_	_	0.500
ForeRecr_2009	0.00		91	_	_	_	_	_	_	0.500
ForeRecr_2010	0.00		92	_	_	_	_	_	_	0.500
ForeRecr_2011	0.00		93	_	_	_	_	_	_	0.500
ForeRecr_2012	0.00		94	_	_	_	_	_	_	0.500
ForeRecr_2013	0.00		95	_	_	_	_	_	_	0.500
ForeRecr_2014	0.00		96	_	_	_	_	_	_	0.500
ForeRecr_2015	0.00		97	_	_	_	_	_	_	0.500
ForeRecr_2016	0.00		98	_	_	_	_	_	_	0.500
ForeRecr_2017	0.00		99	_	_	_	_	_	_	0.500
ForeRecr_2018	0.00		100	_	_	_	_	_	_	0.500
InitF_1COMM	0.01		101	0	1	0.0039	0.09	99	0.000	0.001
InitF_2REC	0.00	NO		0	1	0	0.09	99	0.000	_
SizeSel_1P_1_COMM	63.21		102	35	100	45	75	50	0.028	1.381
SizeSel_1P_2_COMM	-5.00	NO		-6	4	-5	0	50	0.000	_
SizeSel_1P_3_COMM	4.75		103	-1	9	4	4	50	0.000	0.236
SizeSel_1P_4_COMM	0.00	NO		-1	9	0	5.5	50	0.000	_
SizeSel_1P_5_COMM	-1.46		104	-5	9	-2	-2	50	0.000	0.144
SizeSel_1P_6_COMM	9.00	NO		-5	9	9	5	50	0.000	_
Retain_1P_1_COMM	40.00	NO		31	100	40	55	50	0.000	_
Retain_1P_2_COMM	2.00	NO		0.1	10	2	1	99	0.000	_
Retain_1P_3_COMM	1.00	NO		0.001	1	1	1	99	0.000	_
Retain_1P_4_COMM	0.00	NO		0	0	0	0	99	0.000	_
SizeSel_2P_1_REC	58.88		105	35	100	50	75	50	0.052	0.396
SizeSel_2P_2_REC	-5.90	NO		-6	4	-5.9	0	50	0.000	_
SizeSel_2P_3_REC	3.06		106	-1	9	4	4	50	0.000	0.124
SizeSel_2P_4_REC	7.67		107	-1	9	5	5.5	50	0.001	0.620
SizeSel_2P_5_REC	-4.90	NO		-5	9	-4.9	-2	50	0.000	_
SizeSel_2P_6_REC	-4.18		108	-5	9	-4.9	5	50	0.017	12.389
SizeSel_3P_1_TRI	70.00	NO		35	100	70	75	50	0.000	_
SizeSel_3P_2_TRI	-0.55	NO		-6	4	-0.55	0	50	0.000	_
SizeSel_3P_3_TRI	5.34	NO		-1	9	5.34	4	50	0.000	_
SizeSel_3P_4_TRI	5.20	NO		-1	9	5.2	5.5	50	0.000	_
SizeSel_3P_5_TRI	-1.14	NO		-5	9	-1.14	-2	50	0.000	_
SizeSel_3P_6_TRI	-4.90	NO		-5	9	-4.9	5	50	0.000	_
SizeSel_4P_1_NWFSC	70.57		109	35	100	40	75	50	0.004	4.625
SizeSel_4P_2_NWFSC	-1.43		110	-6	4	0	0	50	0.000	1.209
SizeSel_4P_3_NWFSC	5.40		111	-1	9	4	4	50	0.000	0.499
SizeSel_4P_4_NWFSC	5.34		112	-1	9	-0.99	5.5	50	0.000	1.339
SizeSel_4P_5_NWFSC	-1.23		113	-5	9	-2	-2	50	0.000	0.229
SizeSel_4P_6_NWFSC	-4.00	NO		-5	9	-4	5	50	0.000	_
SizeSel_5P_1_CPUE	-1.00	NO		-2	0	-1	0	50	0.000	_
SizeSel_5P_2_CPUE	-1.00	NO		-2	0	-1	0	50	0.000	_
SizeSel_6P_1_Dock	-1.00	NO		-2	0	-1	0	50	0.000	_
SizeSel_6P_2_Dock	-1.00	NO		-2	0	-1	0	50	0.000	_
SizeSel_1P_1_COMM_BLK	69.87		114	35	100	45	60	50	0.019	1.617
Retain_1P_1_COMM_BLK	56.94		115	31	100	40	55	99	0.000	0.528
Retain_1P_3_COMM_BLK	0.66		116	0.1	1	0.9	0.9	99	0.000	0.023
SizeSel_2P_1_REC_BLK	63.26		117	35	100	45	75	50	0.028	0.314

Table 16. Time series of total and summary biomass, spawning biomass, depletion, recruitment and Fs for Washington and Oregon.

Year	Total Biomass	Summary Biomass	Spawning Biomass	Depletion	Recruitment	Commercial F	Recreational F
1928	44,190	43,711	32,760	99.0%	3,185	0.0017	0.0000
1929	44,184	43,701	32,753	99.0%	3,189	0.0051	0.0000
1930	44,088	43,604	32,671	98.8%	3,192	0.0041	0.0000
1931	44,031	43,547	32,611	98.6%	3,196	0.0022	0.0000
1932	44,036	43,552	32,595	98.5%	3,200	0.0025	0.0000
1933	44,044	43,559	32,583	98.5%	3,206	0.0038	0.0000
1934	44,024	43,538	32,553	98.4%	3,212	0.0027	0.0000
1935	44,042	43,555	32,553	98.4%	3,219	0.0026	0.0000
1936	44,072	43,583	32,563	98.5%	3,226	0.0038	0.0000
1937	44,077	43,588	32,555	98.4%	3,235	0.0027	0.0000
1938	44,120	43,629	32,576	98.5%	3,245	0.0057	0.0000
1939	44,088	43,596	32,538	98.4%	3,256	0.0059	0.0000
1940	44,063	43,569	32,501	98.3%	3,269	0.0084	0.0000
1941	43,981	43,485	32,418	98.0%	3,283	0.0227	0.0000
1942	43,522	43,024	32,035	96.9%	3,298	0.0189	0.0000
1943	43,207	42,707	31,743	96.0%	3,316	0.0249	0.0000
1944	42,773	42,270	31,347	94.8%	3,336	0.0483	0.0000
1945	41,766	41,260	30,497	92.2%	3,354	0.0307	0.0000
1946	41,329	40,820	30,051	90.9%	3,376	0.0344	0.0000
1947	40,872	40,360	29,591	89.5%	3,399	0.0136	0.0000
1948	41,027	40,512	29,599	89.5%	3,423	0.0211	0.0000
1949	41,037	40,518	29,524	89.3%	3,444	0.0482	0.0000
1950	40,391	39,869	28,960	87.6%	3,463	0.0373	0.0000
1951	40,104	39,579	28,650	86.6%	3,473	0.0432	0.0000
1952	39,730	39,203	28,275	85.5%	3,502	0.0340	0.0000
1953	39,657	39,126	28,127	85.0%	3,541	0.0188	0.0000
1954	40,021	39,484	28,322	85.6%	3,598	0.0312	0.0000
1955	40,105	39,559	28,327	85.6%	3,658	0.0539	0.0000
1956	39,644	39,089	27,913	84.4%	3,697	0.0388	0.0000
1957	39,653	39,093	27,820	84.1%	3,681	0.0457	0.0008
1958	39,533	38,976	27,633	83.5%	3,614	0.0438	0.0016
1959	39,499	38,951	27,527	83.2%	3,619	0.0673	0.0024
1960	38,884	38,330	27,012	81.7%	4,280	0.0851	0.0033
1961	37,968	37,313	26,206	79.2%	4,999	0.0788	0.0042
1962	37,516	36,775	25,576	77.3%	2,796	0.0517	0.0051
1963	37,776	37,354	25,506	77.1%	2,632	0.0374	0.0057
1964	38,303	37,821	25,819	78.1%	13,763	0.0466	0.0061
1965	39,773	37,741	26,144	79.0%	6,368	0.0580	0.0070
1966	41,759	40,831	26,320	79.6%	1,345	0.0547	0.0077
1967	43,764	43,559	26,575	80.3%	1,428	0.0740	0.0064
1968	44,469	44,249	27,045	81.8%	1,842	0.0693	0.0062
1969	44,199	43,905	28,557	86.3%	3,760	0.0448	0.0072

Table 16 (Continued). Time series of total and summary biomass, spawning biomass, depletion, recruitment and Fs for Washington and Oregon.

Year	Total Biomass	Summary Biomass	Spawning Biomass	Depletion	Recruitment	Commercial F	Recreational F
1970	43,945	43,339	30,565	92.4%	8,512	0.0300	0.0093
1971	44,383	43,142	31,867	96.3%	1,855	0.0348	0.0119
1972	44,561	44,282	31,906	96.5%	1,539	0.0351	0.0134
1973	44,408	44,176	31,424	95.0%	1,311	0.0504	0.0124
1974	43,234	43,027	30,845	93.3%	2,454	0.0567	0.0132
1975	41,444	41,072	30,543	92.3%	2,428	0.0593	0.0156
1976	39,351	38,993	29,962	90.6%	1,139	0.0624	0.0154
1977	37,053	36,866	28,749	86.9%	3,014	0.0618	0.0190
1978	34,944	34,479	27,181	82.2%	4,066	0.0613	0.0190
1979	33,314	32,695	25,579	77.3%	4,405	0.1048	0.0256
1980	31,403	30,757	23,343	70.6%	1,518	0.1161	0.0388
1981	29,684	29,455	21,209	64.1%	1,353	0.1209	0.0733
1982	27,908	27,686	19,510	59.0%	3,581	0.1531	0.1618
1983	25,395	24,872	17,905	54.1%	960	0.2186	0.0538
1984	22,474	22,329	16,006	48.4%	903	0.2347	0.0419
1985	19,612	19,449	13,992	42.3%	4,371	0.2760	0.0823
1986	16,838	16,204	11,778	35.6%	491	0.1411	0.0871
1987	15,928	15,852	10,937	33.1%	775	0.1872	0.1379
1988	14,496	14,377	9,793	29.6%	964	0.2056	0.1069
1989	12,978	12,830	8,782	26.6%	1,310	0.2857	0.0997
1990	10,893	10,685	7,560	22.9%	2,506	0.2716	0.0815
1991	9,496	9,111	6,479	19.6%	3,152	0.4070	0.1631
1992	7,954	7,484	4,835	14.6%	2,119	0.3126	0.2023
1993	7,763	7,449	3,996	12.1%	1,089	0.3953	0.1444
1994	7,474	7,302	3,349	10.1%	1,970	0.3390	0.1281
1995	7,362	7,066	3,217	9.7%	1,612	0.2106	0.0663
1996	7,714	7,470	3,559	10.8%	1,607	0.2113	0.0677
1997	7,876	7,635	3,825	11.6%	1,257	0.1948	0.0799
1998	7,953	7,761	3,992	12.1%	1,407	0.0631	0.0445
1999	8,743	8,508	4,610	13.9%	4,235	0.0607	0.0509
2000	9,824	9,176	5,244	15.9%	4,972	0.0236	0.0305
2001	11,776	11,023	6,030	18.2%	4,836	0.0228	0.0330
2002	14,364	13,635	6,840	20.7%	4,256	0.0274	0.0534
2003	17,283	16,655	7,837	23.7%	1,960	0.0189	0.0468
2004	20,215	19,903	9,437	28.5%	3,908	0.0154	0.0315
2005	23,078	22,498	11,689	35.3%	2,138	0.0149	0.0279
2006	25,551	25,198	14,271	43.1%	6,004	0.0181	0.0226
2007	27,979	27,093	16,710	50.5%	2,771	0.0165	0.0214
2008	30,235	29,813	18,774	56.8%	3,018	0.0183	0.0171
2009	32,222	31,764	20,484	61.9%	3,045		

Table 17. Time series of total and summary biomass, spawning biomass, depletion, recruitment and Fs for California.

Year	Total Biomass	Summary Biomass	Spawning Biomass	Depletion	Recruitment	Commercial F	Recreational F
1928	32,394	31,991	22,579	89.2%	3,396	0.0132	0.0000
1929	32,334	31,944	22,542	89.1%	3,392	0.0181	0.0002
1930	32,120	31,731	22,398	88.5%	3,386	0.0201	0.0003
1931	31,841	31,453	22,210	87.7%	3,380	0.0193	0.0005
1932	31,583	31,195	22,037	87.1%	3,373	0.0140	0.0007
1933	31,476	31,089	21,974	86.8%	3,367	0.0223	0.0008
1934	31,138	30,751	21,725	85.8%	3,358	0.0138	0.0010
1935	31,046	30,661	21,657	85.6%	3,351	0.0164	0.0012
1936	30,884	30,500	21,532	85.1%	3,342	0.0123	0.0014
1937	30,839	30,455	21,496	84.9%	3,333	0.0158	0.0021
1938	30,687	30,304	21,379	84.5%	3,323	0.0126	0.0025
1939	30,618	30,237	21,326	84.3%	3,313	0.0095	0.0036
1940	30,618	30,238	21,330	84.3%	3,302	0.0113	0.0037
1941	30,561	30,182	21,292	84.1%	3,291	0.0087	0.0034
1942	30,575	30,197	21,312	84.2%	3,279	0.0052	0.0018
1943	30,704	30,328	21,424	84.6%	3,266	0.0118	0.0017
1944	30,642	30,267	21,394	84.5%	3,251	0.0122	0.0014
1945	30,566	30,193	21,353	84.4%	3,233	0.0115	0.0019
1946	30,495	30,124	21,316	84.2%	3,214	0.0190	0.0033
1947	30,191	29,822	21,099	83.4%	3,191	0.0322	0.0121
1948	29,398	29,032	20,501	81.0%	3,161	0.0340	0.0136
1949	28,593	28,231	19,877	78.5%	3,129	0.0274	0.0152
1950	27,993	27,634	19,398	76.6%	3,097	0.0330	0.0140
1951	27,325	26,970	18,863	74.5%	3,062	0.0320	0.0147
1952	26,726	26,374	18,379	72.6%	3,025	0.0254	0.0107
1953	26,389	26,042	18,099	71.5%	2,987	0.0174	0.0080
1954	26,298	25,956	18,019	71.2%	2,949	0.0171	0.0128
1955	26,140	25,802	17,908	70.8%	2,906	0.0180	0.0138
1956	25,944	25,611	17,780	70.2%	2,861	0.0177	0.0189
1957	25,672	25,344	17,605	69.6%	2,811	0.0321	0.0221
1958	25,026	24,704	17,147	67.7%	2,756	0.0307	0.0249
1959	24,401	24,085	16,700	66.0%	2,705	0.0280	0.0201
1960	23,931	23,620	16,364	64.7%	2,656	0.0258	0.0172
1961	23,562	23,257	16,106	63.6%	2,608	0.0291	0.0172
1962	23,132	22,833	15,806	62.4%	2,571	0.0228	0.0170
1963	22,842	22,547	15,616	61.7%	2,550	0.0231	0.0172
1964	22,545	22,252	15,421	60.9%	2,549	0.0181	0.0170
1965	22,354	22,061	15,303	60.5%	2,575	0.0177	0.0249
1966	22,074	21,778	15,112	59.7%	2,637	0.0180	0.0354
1967	21,680	21,376	14,816	58.5%	2,750	0.0214	0.0383
1968	21,245	20,928	14,451	57.1%	2,941	0.0253	0.0378
1969	20,840	20,500	14,057	55.5%	3,251	0.0293	0.0300

Table 17 (Continued). Time series of total and summary biomass, spawning biomass, depletion, recruitment and Fs for California.

Year	Total Biomass	Summary Biomass	Spawning Biomass	Depletion	Recruitment	Commercial F	Recreational F
1970	20,598	20,222	13,715	54.2%	3,693	0.0409	0.0467
1971	20,141	19,715	13,134	51.9%	3,996	0.0549	0.0559
1972	19,599	19,144	12,398	49.0%	3,475	0.0903	0.0704
1973	18,540	18,149	11,272	44.5%	2,392	0.1078	0.0737
1974	17,349	17,081	10,189	40.3%	1,566	0.1224	0.0782
1975	15,918	15,740	9,209	36.4%	1,319	0.1123	0.0885
1976	14,502	14,321	8,486	33.5%	5,233	0.1176	0.0967
1977	13,243	12,663	7,739	30.6%	2,385	0.0751	0.0782
1978	12,941	12,671	7,442	29.4%	1,844	0.0871	0.1127
1979	12,344	12,123	6,831	27.0%	2,975	0.1472	0.1329
1980	11,172	10,842	5,864	23.2%	1,468	0.1492	0.1984
1981	9,662	9,496	4,922	19.4%	1,219	0.1586	0.1892
1982	8,298	8,159	4,174	16.5%	1,074	0.2011	0.1595
1983	6,978	6,824	3,476	13.7%	5,117	0.1694	0.1064
1984	6,643	6,072	3,187	12.6%	2,802	0.1748	0.1143
1985	6,592	6,269	2,862	11.3%	2,976	0.1407	0.2659
1986	6,508	6,173	2,358	9.3%	2,130	0.1170	0.2797
1987	6,743	6,491	2,198	8.7%	3,215	0.1718	0.2421
1988	6,717	6,360	2,186	8.6%	1,646	0.1996	0.2446
1989	6,298	6,108	2,100	8.3%	1,814	0.2621	0.2357
1990	5,535	5,320	1,832	7.2%	2,621	0.2497	0.2190
1991	5,077	4,773	1,669	6.6%	2,975	0.2017	0.2435
1992	4,896	4,571	1,572	6.2%	743	0.1707	0.2597
1993	4,787	4,697	1,495	5.9%	1,295	0.1986	0.1605
1994	4,790	4,632	1,559	6.2%	2,429	0.1516	0.0822
1995	5,083	4,817	1,853	7.3%	730	0.1297	0.0784
1996	5,275	5,173	2,139	8.4%	3,215	0.1105	0.0992
1997	5,530	5,170	2,316	9.2%	2,012	0.1141	0.0725
1998	5,922	5,693	2,485	9.8%	1,740	0.0622	0.0722
1999	6,686	6,426	2,809	11.1%	9,703	0.0526	0.0915
2000	8,130	7,043	3,157	12.5%	6,049	0.0184	0.0471
2001	10,581	9,878	3,809	15.0%	7,217	0.0172	0.0335
2002	13,718	12,917	4,693	18.5%	3,452	0.0182	0.0876
2003	16,652	16,229	5,788	22.9%	6,988	0.0088	0.1244
2004	19,341	18,576	7,278	28.8%	1,926	0.0083	0.0118
2005	22,448	22,224	9,699	38.3%	2,305	0.0061	0.0208
2006	24,822	24,565	12,233	48.3%	1,298	0.0051	0.0206
2007	26,488	26,240	14,652	57.9%	14,459	0.0057	0.0092
2008	28,779	27,201	16,861	66.6%	3,411	0.0045	0.0051
2009	31,266	30,875	18,656	73.7%	3,441		

Table 18. Pre-STAR North Model sensitivity analyses.

North Model	Base	likebase	noCPUE	noTri	noNW	Lmin32	noAgebase	noAgealt
Estimated parameters	83	91	91	91	91	91	89	89
Final gradient	0.00016	31.9155	3.36313	3.99032	4.7776	0.00223	1.92E+00	0.44095
Negative log-likelihoods								
Total	14,503.00	14,500.60	14,526.20	13,258.90	13,272.20	14,902.90	1,833.41	1,733.68
Indices	-31.55	-27.01	-0.77	-21.29	-31.36	-26.64	-24.49	-25.88
Length-frequency data	2,218.69	2,211.71	2,211.79	1,995.31	2,065.97	2,311.34	1,853.89	1,755.23
Age-frequency data	12,326.40	12,326.10	12,325.50	11,297.00	11,246.20	12,628.10	0	0
Discard	-2.89	-2.77	-2.81	-3.69	-2.04	-1.97	-5.81	-4.51
Recruitment	-7.84	-7.69	-7.72	-8.63	-6.78	-8.19	9.59	8.53
Priors	0.15	0.23	0.23	0.2	0.19	0.31	0.22	0.31
Select parameters								
Stock-recruit, productivity								
Rzero	8.03	8.04	8.03	8.02	8.05	8.01	8.1	8.04
Steepness (h)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Sigma r out	0.49	0.5	0.5	0.48	0.51	0.49	0.69	0.68
Female M	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
Male M	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Survey catachability							9999	9999
Triennial survey q	0.78	0.77	0.78	0.6	0.77	0.66	0.64	0.56
NWFSC survey q	0.83	0.8	0.83	0.87	0.85	0.87	0.61	0.56
Growth parameters								
Female length at age 1	30	30	30	30	30	32	30	30
Female length at age 20	126.64	126.68	126.66	126.47	126.65	129.85	126.6	115
Female von Bertalanffy k	0.09	0.09	0.09	0.09	0.09	0.08	0.1	0.14
F L-at-age SD age 1	0.14	0.14	0.14	0.14	0.14	0.13	0.09	0.1
F L-at-age SD age 20	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03
Male length at age 1	30	30	30	30	30	32	30	30
Male length at age 20	97.61	97.7	97.64	98.1	98.11	102.47	97.6	85
Male von Bertalanffy k	0.13	0.13	0.13	0.13	0.13	0.11	0.15	0.23
M L-at-age SD age 1	0.12	0.12	0.12	0.12	0.12	0.12	0.09	0.09
M L-at-age SD age 20	0.06	0.06	0.06	0.06	0.06	0.06	0.03	0.07
Management quantities								
SBzero	34,253	34,496	34,177	33,661	34,766	34,106	38,367	31,030
SB2009	21,264	21,813	21,106	19,976	20,773	19,891	29,624	26,310
2009 Depletion	62%	63%	62%	59%	60%	58%	77%	85%
F 2008	0.20473	0.19997	0.20625	0.21846	0.20783	0.2226	0.14245	0.13912
SSB msy	7,869	7,915	7,839	7,728	7,969	7,781	9,019	7,310
1-spr MSY	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Fmsy	0.14	0.14	0.14	0.14	0.14	0.13	0.14	0.15
2009 %BMSY	270%	276%	269%	258%	261%	256%	328%	360%
MSY catch	1,821	1,832	1,817	1,792	1,842	1,772	2,033	1,962

Table 18 (Continued). North Model sensitivity analyses.

North Model	Base	likebase	Mfem.2	Mfem.23	h.75	h.85	Asym	Disc.5
Estimated parameters	83	91	91	91	91	91	90	91
Final gradient	0.00016	31.9155	4.18614	7.00E-04	4.1873	59.4968	0.00206	1.06878
Negative log-likelihoods								
Total	14,503	14,500.6	14,845.7	14,611.9	14,525.7	14,503.8	14,656.8	14,514.5
Indices	-31.55	-27.01	-24.36	-25.1	-28.99	-27.4	-9.49	-27.23
Length-frequency data	2,218.69	2,211.71	2,471.16	2,287.88	2,247.13	2,213.71	2,334.2	2,230.23
Age-frequency data	12,326.4	12,326.1	12,410.3	12,359.8	12,315.4	12,327.6	12,339	12,326.6
Discard	-2.89	-2.77	-3.2	-3.97	-1.07	-2.72	-2.87	-7.05
Recruitment	-7.84	-7.69	-8.55	-6.87	-7.19	-7.66	-4.33	-8.3
Priors	0.15	0.23	0.3	0.22	0.39	0.23	0.3	0.29
Select parameters								
Stock-recruit, productivity								
Rzero	8.03	8.04	8.06	8.33	8.05	8.01	7.64	8.01
Steepness (h)	0.8	0.8	0.8	0.8	0.75	0.85	0.8	0.8
Sigma r out	0.49	0.5	0.48	0.51	0.5	0.5	0.54	0.49
Female M	0.18	0.18	0.2	0.23	0.18	0.18	0.18	0.18
Male M	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Survey catachability								
Triennial survey	0.78	0.77	0.77	0.79	0.76	0.76	1.15	0.78
NWFSC survey	0.83	0.8	0.99	0.73	0.75	0.75	2.78	0.85
Growth parameters								
Female length at age 1	30	30	30	30	30	30	30	30
Female length at age 20	126.64	126.68	124.61	125.17	126.54	126.63	123.68	126.52
Female von Bertalanffy k	0.09	0.09	0.1	0.09	0.09	0.09	0.1	0.09
F L-at-age SD age 1	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
F L-at-age SD age 20	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.04
Male length at age 1	30	30	30	30	30	30	30	30
Male length at age 20	97.61	97.7	97.29	98.25	97.76	97.69	95.44	96.85
Male von Bertalanffy k	0.13	0.13	0.14	0.13	0.13	0.13	0.14	0.14
M L-at-age SD age 1	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
M L-at-age SD age 20	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Management quantities								
SBzero	34,253	34,496	26,113	23,376	34,856	33,651	22,373	33,564
SB2009	21,264	21,813	15,133	18,147	20,673	23,347	5,566	20,642
2009 Depletion	62%	63%	58%	78%	59%	69%	25%	61%
F 2008	0.20473	0.19997	0.23633	0.15698	0.2122	0.18646	0.7308	0.19612
SSB msy	7,869	7,915	6,062	5,301	8,782	6,892	5,270	7,758
1-spr MSY	0.72	0.72	0.72	0.72	0.69	0.76	0.72	0.72
Fmsy	0.14	0.14	0.15	0.17	0.12	0.16	0.14	0.14
2009 %BMSY	270%	276%	250%	342%	235%	339%	106%	266%
MSY catch	1,821	1,832	1730	2041	1720	1920	1251	1787

Table 19. Pre-STAR South Model sensitivity analyses.

South Model	Base	likebase	noCPUE	noTri	no NW	Lmin35	estLmax	noAge
Estimated parameters	77	81	81	81	81	81	83	81
Final gradient	0.0441	0.00102	0.01562	0.01883	0.00105	0.00268	1.00E-04	0.00019
Negative log-likelihoods								
Total	4,059.96	4,057.61	3,996.5	3,402.37	2,861.76	4,535.26	3,919.42	1,277.37
Indices	22.18	19.71	22.19	21.23	-7.47	-0.81	9.17	-5.83
Length-frequency data	1,307.19	1,306.37	1,319.02	1,159.95	1,119.41	1,506.63	1,302.1	1,289.43
Age-frequency data	2,730.16	2,731.21	2,657.39	2,221.41	1,755.96	3,033.66	2,605.81	0
Discard	-7.25	-7.27	-7.03	-7	-7.79	-7.82	-7.7	-7.96
Recruitment	7.45	7.35	4.64	6.59	1.45	3.03	9.69	1.28
Priors	0.23	0.23	0.28	0.19	0.2	0.57	0.36	0.45
Select parameters								
Stock-recruit, productivity								
Rzero	8.13	8.14	8	8.15	8.19	8.11	9.39	8.09
Steepness (h)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Sigma r out	0.71	0.71	0.66	0.7	0.61	0.64	0.74	0.61
male M	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
male M	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Survey catachability								
Triennial survey	0.26	0.32	0.46	0.44	0.31	0.26	0.05	0.2
NWFSC survey	0.89	0.88	2.86	0.91	0.89	0.66	0.11	0.44
Growth parameters								
Female length at age 1	30	30	30	30	30	35	30	30
Female length at age 20	108	108	108	108	108	108	140	108
Female von Bertalanffy k	0.11	0.11	0.1	0.11	0.1	0.09	0.05	0.15
F L-at-age SD age 1	0.12	0.12	0.12	0.11	0.1	0.14	0.13	0.16
F L-at-age SD age 20	0.09	0.09	0.1	0.1	0.1	0.07	0.07	0.08
Male length at age 1	30	30	30	30	30	35	30	30
Male length at age 20	81	81	81	81	81	81	96.2	81
Male von Bertalanffy k	0.18	0.18	0.17	0.18	0.17	0.15	0.11	0.26
M L-at-age SD age 1	0.11	0.11	0.11	0.09	0.11	0.14	0.12	0.15
M L-at-age SD age 20	0.12	0.12	0.13	0.12	0.12	0.09	0.1	0.11
Management quantities								
SBzero	25,795	26,058	22,284	26,230	25,741	24,214	136,980	30,895
SB2009	13,420	13,912	5,131	13,712	15,602	16,142	151,704	23,286
2009 Depletion	52%	53%	23%	52%	61%	67%	11%	75%
F 2008	0.13747	0.13307	0.31152	0.13547	0.11919	0.11328	0.01848	0.08397
SSB msy	10,662	10,770	9,210	10,842	10,640	10,008	56,618	12,770
1-spr MSY	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Fmsy	0.08	0.08	0.09	0.08	0.08	0.08	0.06	0.08
2009 %BMSY	126%	129%	056%	126%	147%	161%	268%	182%
MSY catch	1,438	1,448	1,350	1,451	1,403	1,378	4,889	1,590

Table 19 continued. South Model sensitivity analyses.

South Model	Base	likebase	Mfem.2	Mfem.23	h.7	h.9	Asym	Disc.5
Estimated parameters	77	81	81	81	81	81	80	81
Final gradient	0.0441	0.00102	0.00336	0.00082	0.0012	0.00087	0.00018	0.00331
Negative log-likelihoods								
Total	4,059.96	4,057.61	4,030.36	3,998.31	4,068.22	4,052.78	4,225.32	4,017.15
Indices	22.18	19.71	21.16	15.25	15.33	20.91	-1.15	9.03
Length-frequency data	1,307.19	1,306.37	1,290.03	1,272.21	1,305.39	1,307.44	1,438.4	1,320.18
Age-frequency data	2,730.16	2,731.21	2,718.55	2,708.88	2,746.48	2,723.3	2,779.41	2,680.75
Discard	-7.25	-7.27	-7.25	-7.41	-7.43	-7.3	5.56	4.91
Recruitment	7.45	7.35	7.65	9.15	8.2	8.18	2.72	2.03
Priors	0.23	0.23	0.22	0.23	0.24	0.24	0.37	0.25
Select parameters								
Stock-recruit, productivity								
Rzero	8.13	8.14	8.24	8.5	8.24	8.08	8.17	8.13
Steepness (h)	0.8	0.8	0.8	0.8	0.7	0.9	0.8	0.8
Sigma r out	0.71	0.71	0.71	0.73	0.72	0.72	0.63	0.62
male M	0.18	0.18	0.2	0.23	0.18	0.18	0.18	0.18
male M	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Survey catachability								
Triennial survey q	0.26	0.32	0.36	0.25	0.27	0.31	0.25	0.32
NWFSC survey q	0.89	0.88	0.81	0.62	0.78	0.7	0.52	2.57
Growth parameters								
Female length at age 1	30	30	30	30	30	30	30	30
Female length at age 20	108	108	108	108	108	108	108	108
Female von Bertalanffy k	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
F L-at-age SD age 1	0.12	0.12	0.12	0.12	0.12	0.12	0.13	0.11
F L-at-age SD age 20	0.09	0.09	0.09	0.09	0.09	0.09	0.07	0.11
Male length at age 1	30	30	30	30	30	30	30	30
Male length at age 20	81	81	81	81	81	81	81	81
Male von Bertalanffy k	0.18	0.18	0.18	0.17	0.18	0.18	0.19	0.18
M L-at-age SD age 1	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.11
M L-at-age SD age 20	0.12	0.12	0.12	0.12	0.12	0.12	0.1	0.12
Management quantities								
SBzero	25,795	26,058	22,086	19,805	29,024	24,317	27,303	25,414
SB2009	13,420	13,912	13,732	18,012	13,523	17,093	17,586	4,431
2009 Depletion	52%	53%	62%	91%	47%	70%	64%	17%
F 2008	0.13747	0.13307	0.11636	0.07424	0.13976	0.10694	0.12115	1.37654
SSB msy	10,662	10,770	9,129	8,186	11,145	10,561	11,285	10,504
1-spr MSY	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Fmsy	0.08	0.08	0.09	0.1	0.08	0.08	0.08	0.08
2009 %BMSY	126%	129%	150%	220%	121%	162%	156%	42%
MSY catch	1,438	1,448	1,474	1,670	1,474	1,436	1,380	1,456

Table 20. North Model sensitivity analyses.

North Model	NBASE	NM.16.285	N.2.355	N.22.39	Nh.7	Nh.9
Estimated parameters	122	122	122	122	122	122
Final gradient	0.00186	14.2868	0.00079	0.00035	0.00075	0.00028
Negative log-likelihoods						
Total	1,608.25	1,614.77	1,612.76	1,626.69	1,608.55	1,608.92
Indices	-26.47	-26.39	-25.87	-24.9	-26.45	-26.44
Length-frequency data	1,632.60	1,640.63	1,634.13	1,644.42	1,632.84	1,632.40
Age-frequency data	0	0	0	0	0	0
Discard	-6.23	-6.24	-6.19	-6.12	-6.24	-6.23
Recruitment	8.16	6.6	10.51	13.12	8.22	9.01
Priors	0.17	0.17	0.17	0.16	0.17	0.17
Select parameters						
Stock-recruit, productivity						
Rzero	8.06	7.82	8.29	8.5	8.13	8
Steepness (h)	0.8	0.8	0.8	0.8	0.7	0.9
Sigma r out	0.52	0.51	0.53	0.55	0.52	0.52
Female M	0.18	0.16	0.2	0.22	0.18	0.18
male M	0.32	0.28	0.36	0.39	0.32	0.32
Survey catachability						
Triennial survey	0.64	0.72	0.58	0.53	0.65	0.64
NWFSC survey	0.82	0.94	0.74	0.68	0.86	0.79
Female length at age 1 (or 0)	28.1	28.2	27.97	27.83	28.1	28.1
Female length at age 20	118	118	118	118	118	118
Female von Bertalanffy k	0.13	0.13	0.13	0.13	0.13	0.13
F L-at-age SD age 1	0.09	0.09	0.09	0.1	0.09	0.09
F L-at-age SD age 20	0.04	0.05	0.04	0.04	0.04	0.04
Male length at age 1	29.73	29.82	29.7	29.75	29.74	29.73
Male length at age 20	86	86	86	86	86	86
Male von Bertalanffy k	0.22	0.21	0.23	0.23	0.22	0.22
M L-at-age SD age 1	0.09	0.08	0.09	0.09	0.09	0.09
M L-at-age SD age 20	0.06	0.07	0.06	0.05	0.06	0.06
Management quantities						
Sbzero	33,075	34,130	32,254	31,722	35,498	31,320
SB2009	20,484	18,594	21,868	23,030	19,539	21,413
2009 Depletion	0.62	0.54	0.68	0.73	0.55	0.68
F 2008	0.20685	0.2545	0.17514	0.15129	0.2171	0.19794
SSB msy	7,781	8,147	7,488	7,275	9,850	5,755
1-spr MSY	0.72	0.71	0.72	0.72	0.65	0.79
Fmsy	0.14	0.13	0.16	0.17	0.11	0.19
2009 %BMSY	2.63	2.28	2.92	3.17	1.98	3.72
MSY catch	1,909	1,701	2,132	2,380	1,778	2,072

Table 21. South Model sensitivity analyses.

South Model	SBASE	SM.16.285	SM.2.355	SM.22.39	Sh.7	Sh.9
Estimated parameters	117	117	117	117	117	117
Final gradient	0.01007	0.02206	0.00712	0.00145	0.00094	0.00078
Negative log-likelihoods						
Total	1,249.65	1,257.37	1,248.80	1,331.21	1,262.15	1,296.19
Indices	7.95	10.2	8.08	0.39	6.7	6.64
Length-frequency data	1,243.81	1,245.11	1,246.42	1,329.39	1,254.98	1,295.70
Age-frequency data	0	0	0	0	0	0
Discard	-7.59	-7.55	-7.73	3.71	-7.81	-5.84
Recruitment	5.32	9.44	1.88	-2.86	8.1	-0.59
Priors	0.16	0.17	0.15	0.58	0.18	0.29
Select parameters						
Stock-recruit, productivity						
Rzero	8.17	8	8.3	8.39	8.24	7.98
Steepness (h)	0.8	0.8	0.8	0.8	0.7	0.9
Sigma r out	0.46	0.48	0.43	0.4	0.48	0.41
Female M	0.18	0.16	0.2	0.22	0.18	0.18
male M	0.32	0.28	0.36	0.39	0.32	0.32
Survey catachability						
Triennial survey	0.32	0.33	0.3	0.27	0.3	0.31
NWFSC survey	0.55	0.53	0.46	0.43	0.49	0.43
Female length at age 1 (or 0)	26.9	27.05	26.49	26.18	26.34	26.11
Female length at age 20	108	108	108	108	108	108
Female von Bertalanffy k	0.11	0.1	0.12	0.14	0.12	0.14
F L-at-age SD age 1	0.11	0.11	0.11	0.12	0.12	0.12
F L-at-age SD age 20	0.12	0.11	0.08	0.04	0.07	0.05
Male length at age 1	25.98	26.24	25.54	24.46	25.52	24.84
Male length at age 20	81	81	81	81	81	81
Male von Bertalanffy k	0.23	0.21	0.25	0.3	0.25	0.27
M L-at-age SD age 1	0.07	0.07	0.08	0.09	0.08	0.08
M L-at-age SD age 20	0.14	0.15	0.14	0.13	0.15	0.13
Management quantities						
Sbzero	25,311	28,168	23,390	21,633	29,078	23,819
SB2009	18,656	18,752	19,392	18,418	18,739	20,153
2009 Depletion	0.74	0.67	0.83	0.85	0.64	0.85
F 2008	0.09267	0.10093	0.08093	0.08838	0.09287	0.08753
SSB msy	10,462	11,643	9,668	8,942	11,166	10,344
1-spr MSY	0.55	0.55	0.55	0.55	0.55	0.55
Fmsy	0.08	0.08	0.09	0.1	0.09	0.09
2009 %BMSY	1.78	1.61	2.01	2.06	1.68	1.95
MSY catch	1,492	1,463	1,568	1,531	1,569	1,436

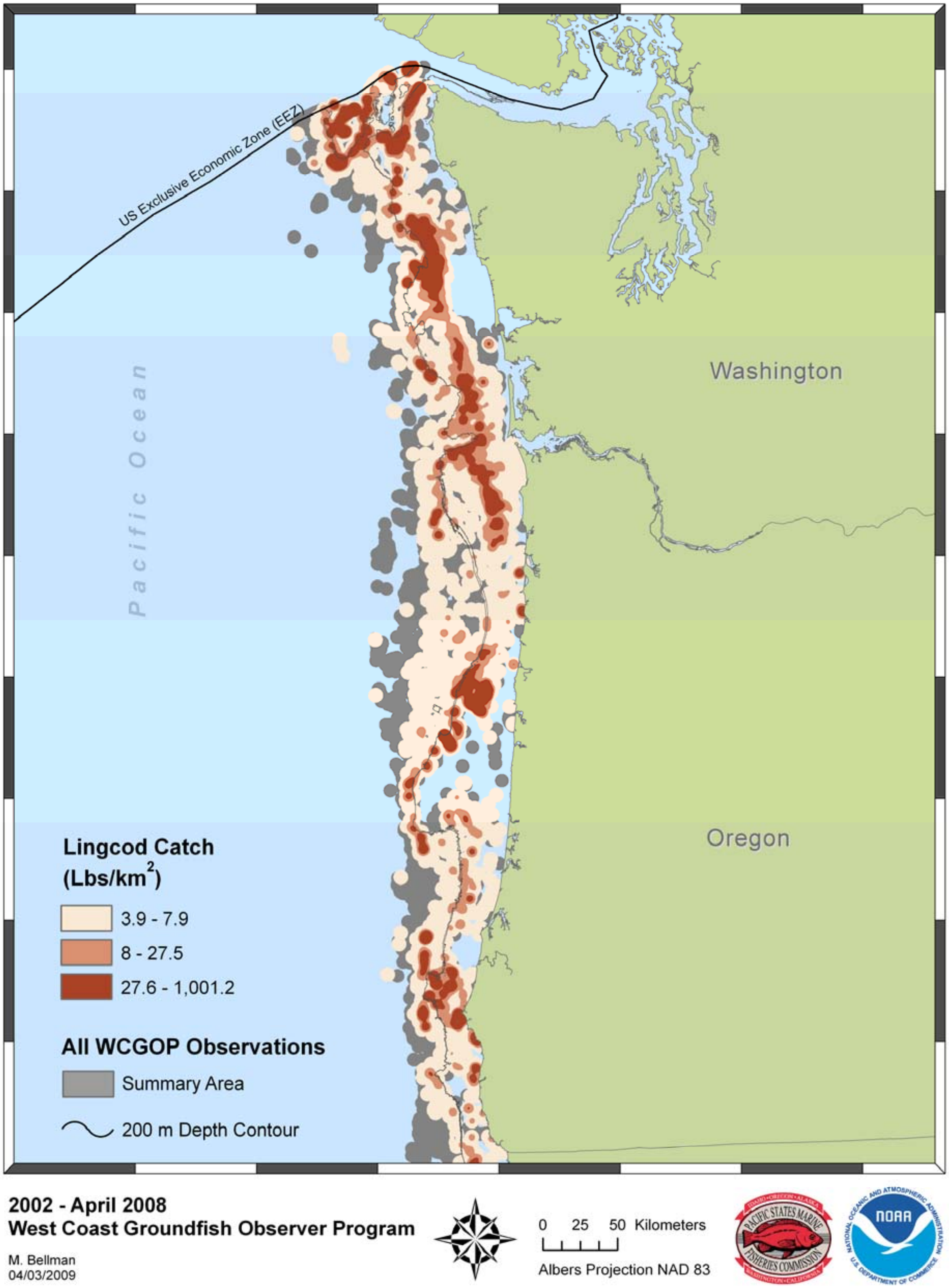

US Exclusive Economic Zone (EEZ)
Pacific Ocean
Washington
Oregon
Lingcod Catch
(Lbs/km2)
3.9 - 7.9
8 - 27.5
27.6 - 1,001.2
All WCGOP Observations
Summary Area
200 m Depth Contour
2002 - April 2008
West Coast Groundfish Observer Program
M. Bellman
04/03/2009
0 25 50 Kilometers
Albers Projection NAD 83

Figure 1. Map of density of occurrence of Lingcod in the observed fishery off of (A) Washington and Oregon and (B) California (next page),.

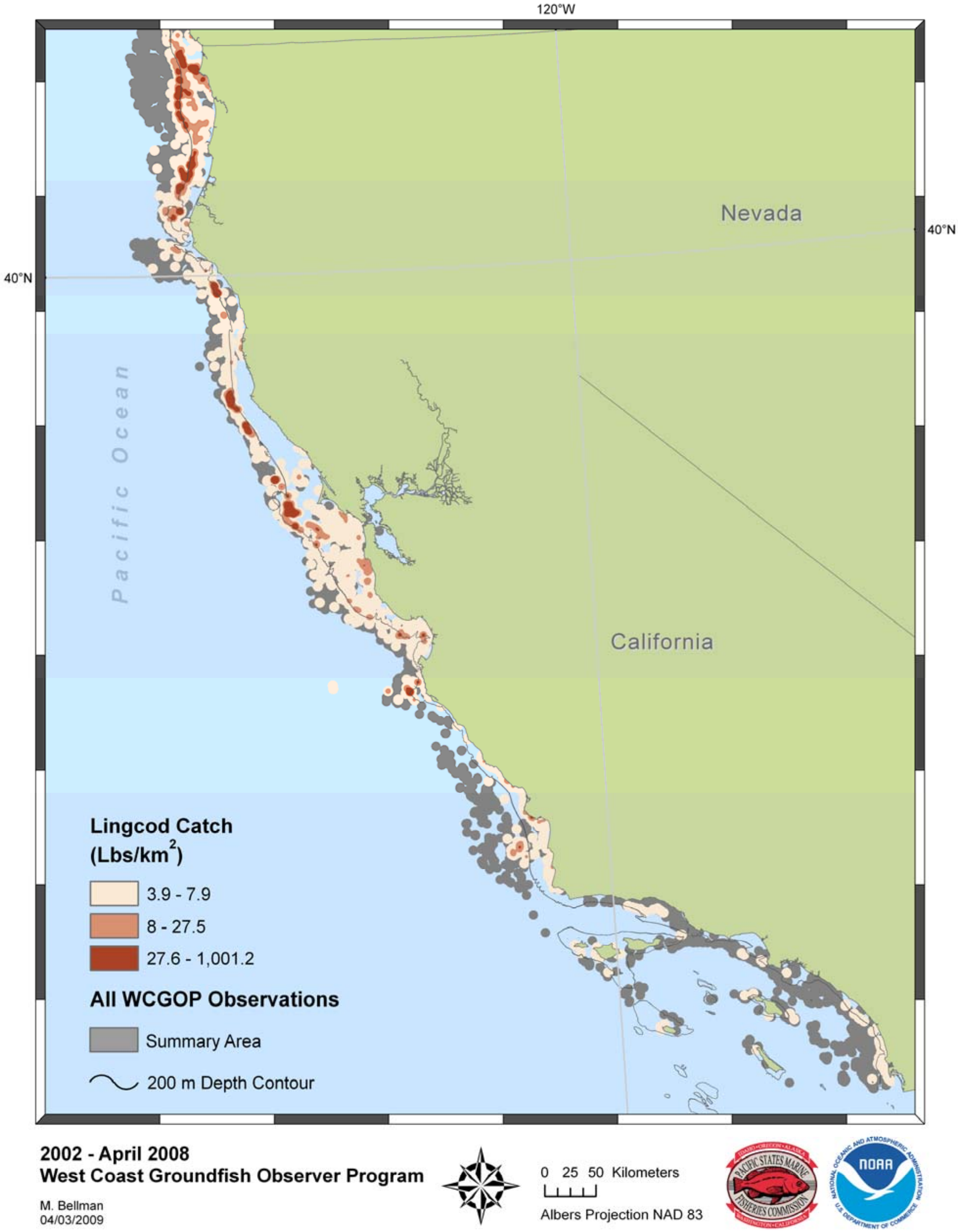
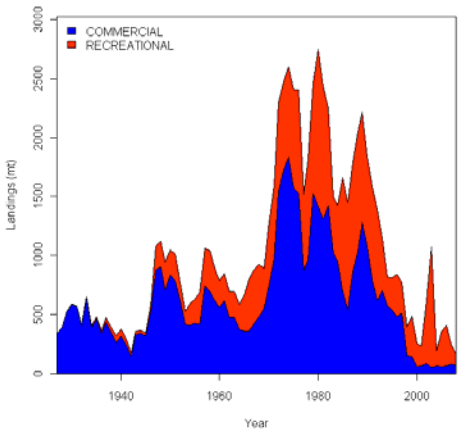


Figure 1 (cont.

California



Washington/Oregon

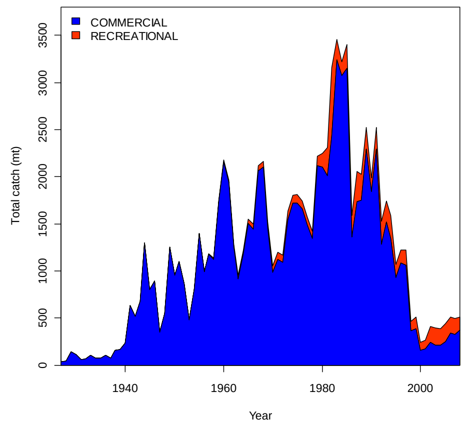


Figure 2. Time series of estimated fishery landings.

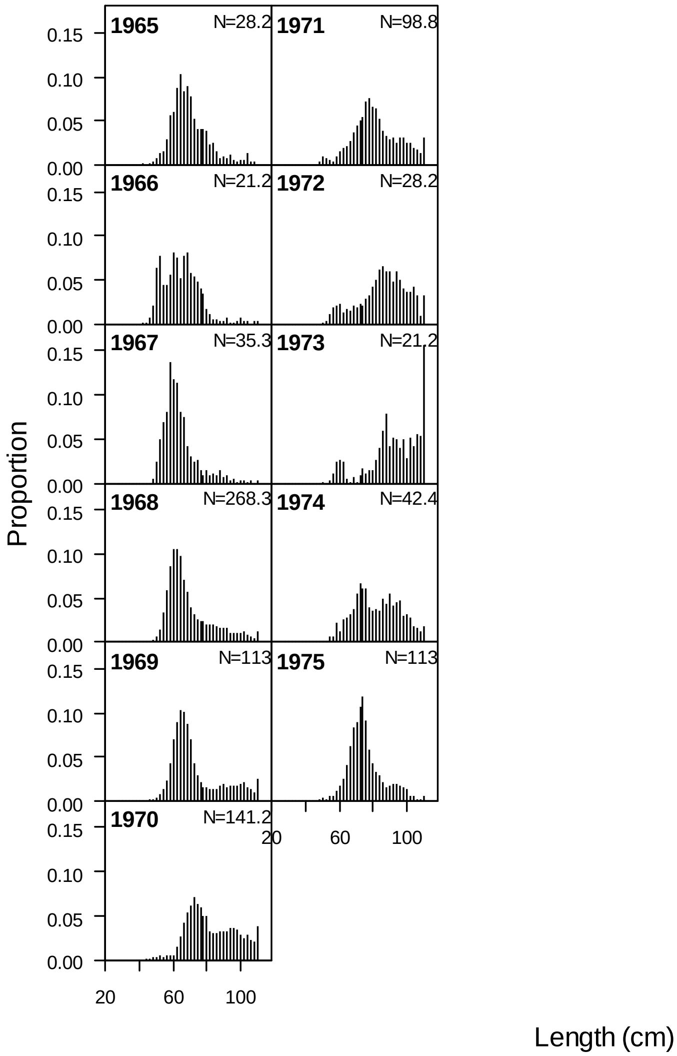


Figure 3. Washington/Oregon commercial retained combined-sex length compositions 1965-1975.

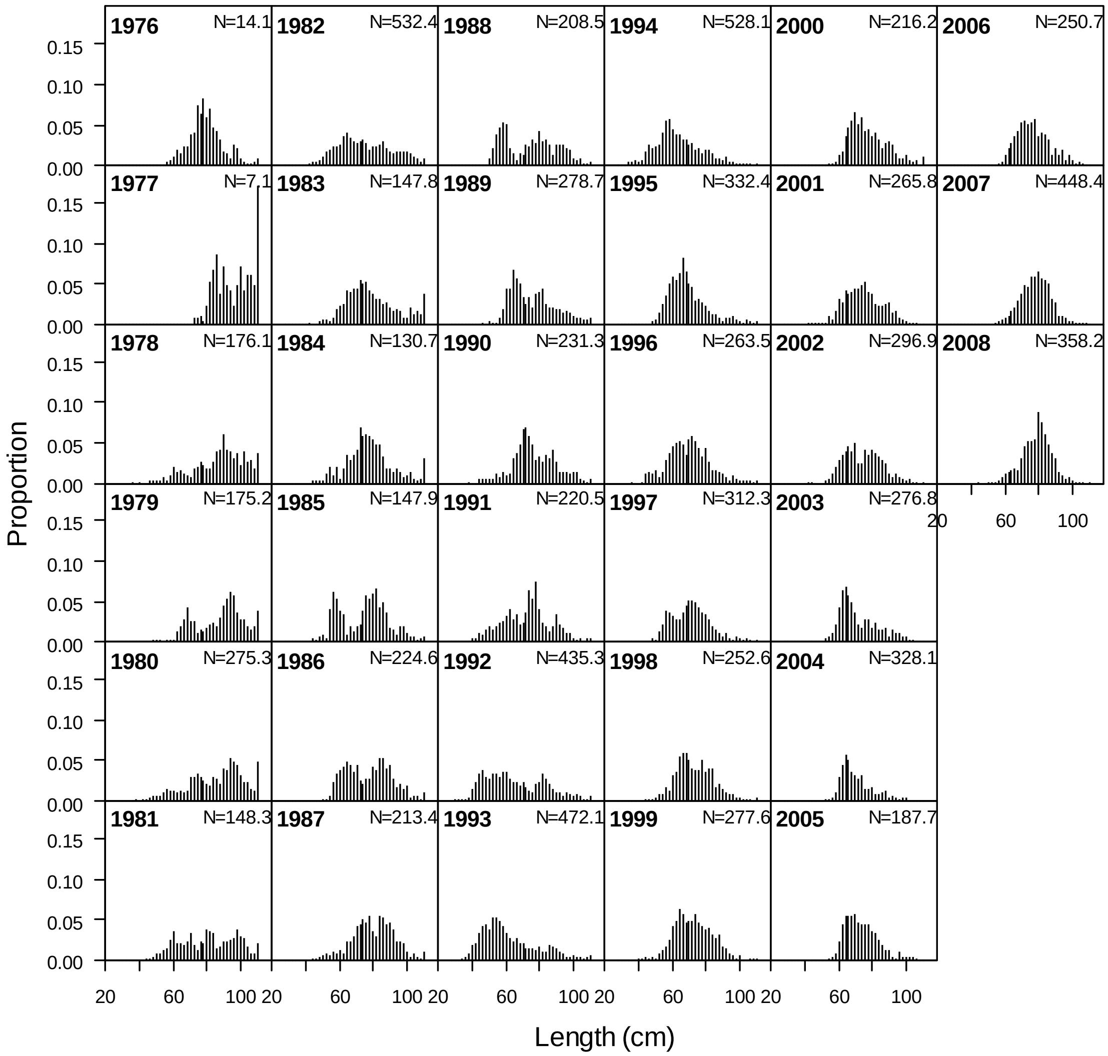


Figure 4. Washington/Oregon commercial retained female length compositions 1976-2008.

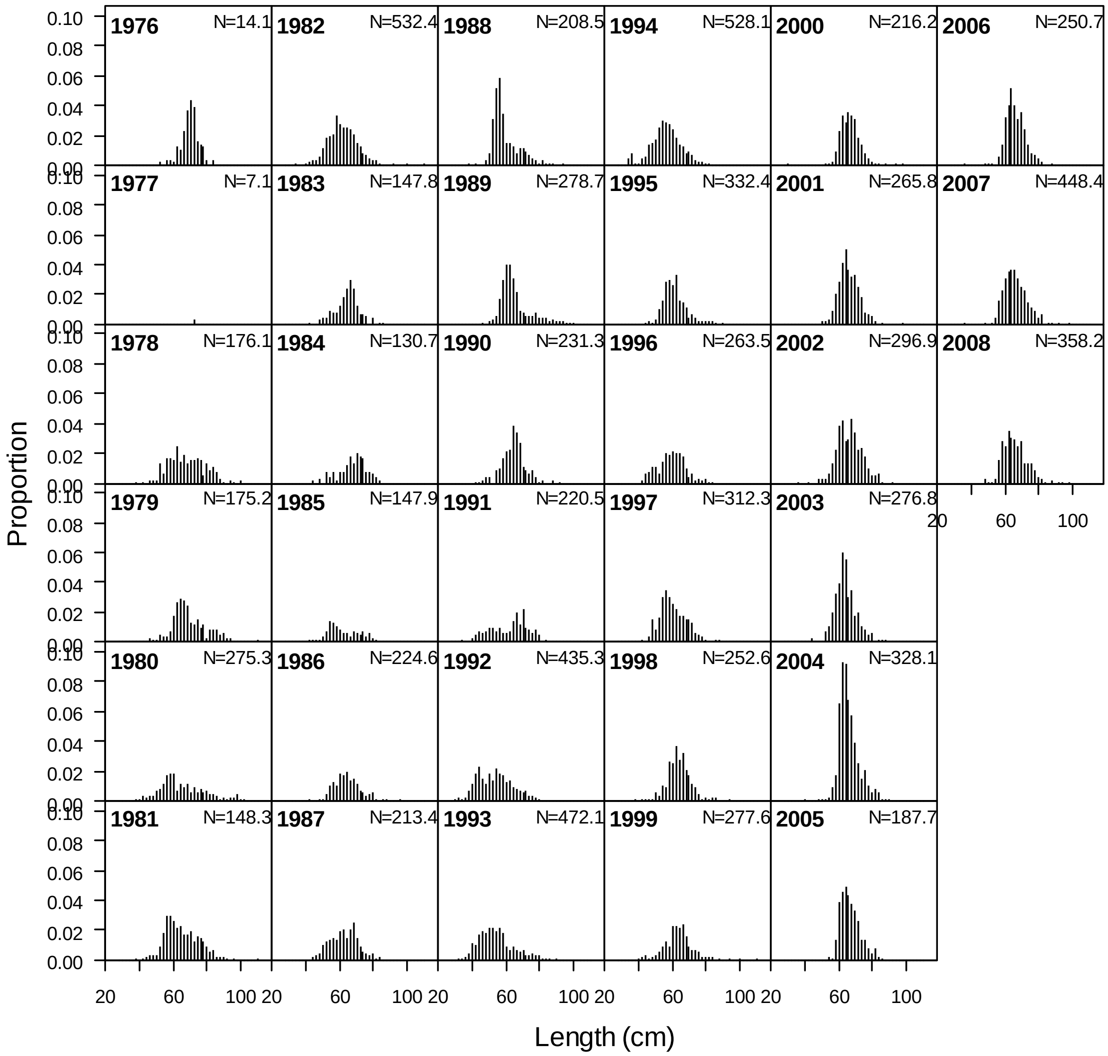


Figure 5. Washington/Oregon commercial retained male length compositions 1976-2008.

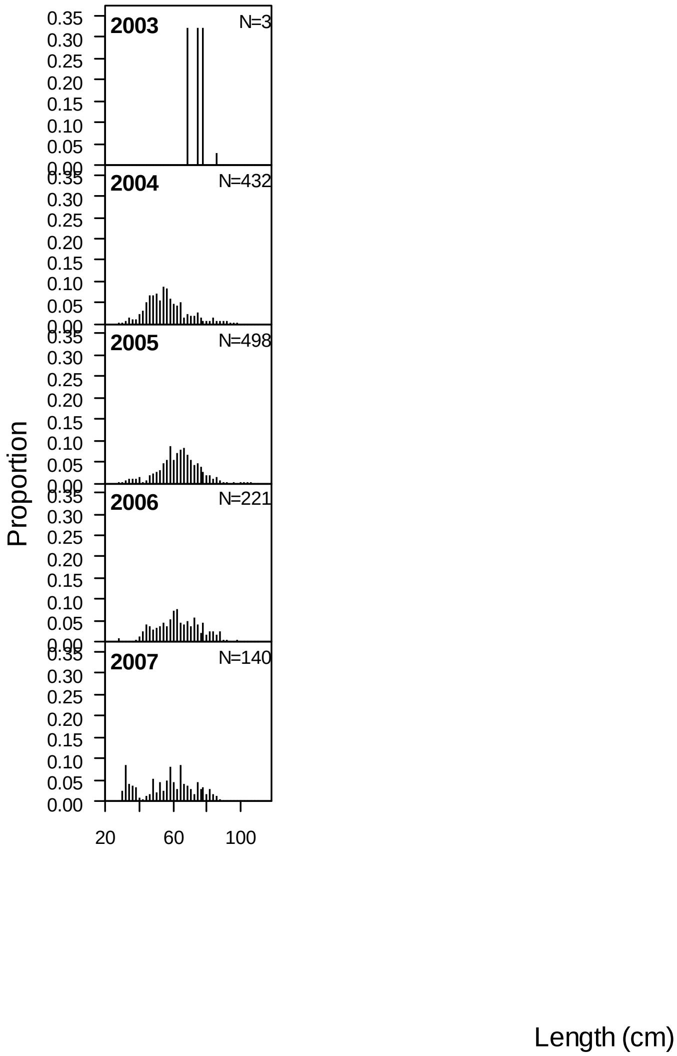


Figure 6. Washington/Oregon commercial discard combined-sex length compositions 2003-2007.

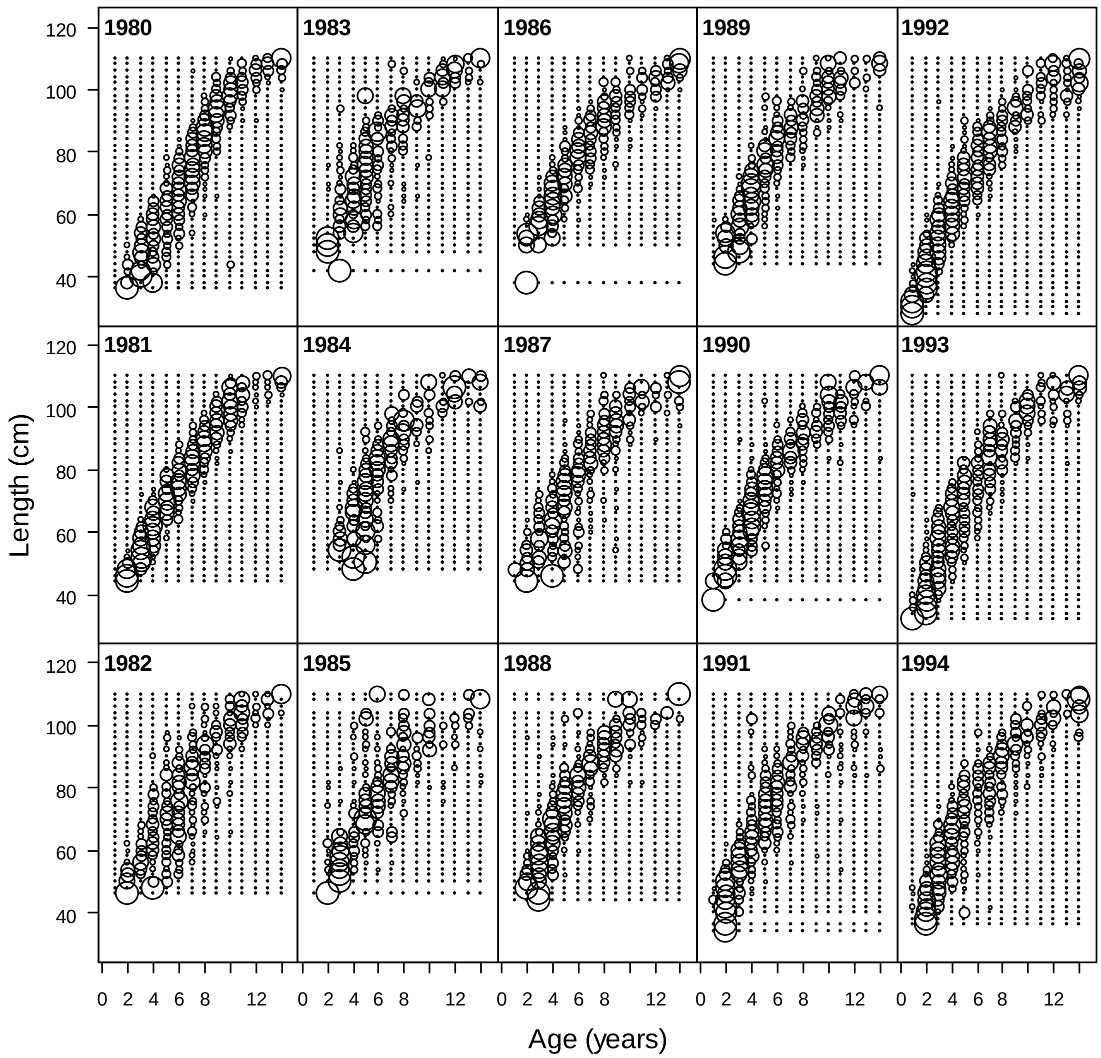


Figure 7. Washington/Oregon commercial retained female conditional age-at-length compositions 1980-1994.

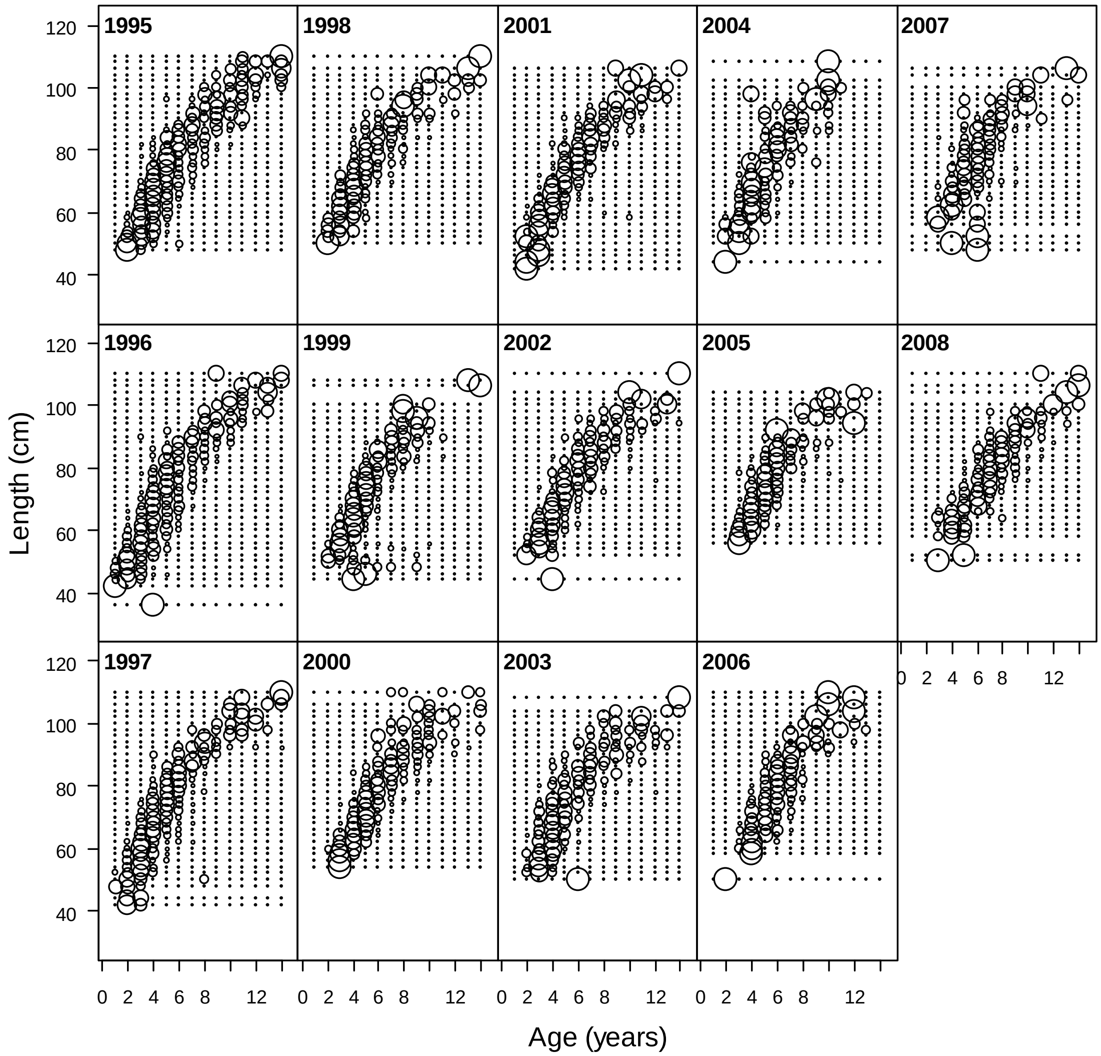


Figure 8. Washington/Oregon commercial retained female conditional age-at-length compositions 1995-2008.

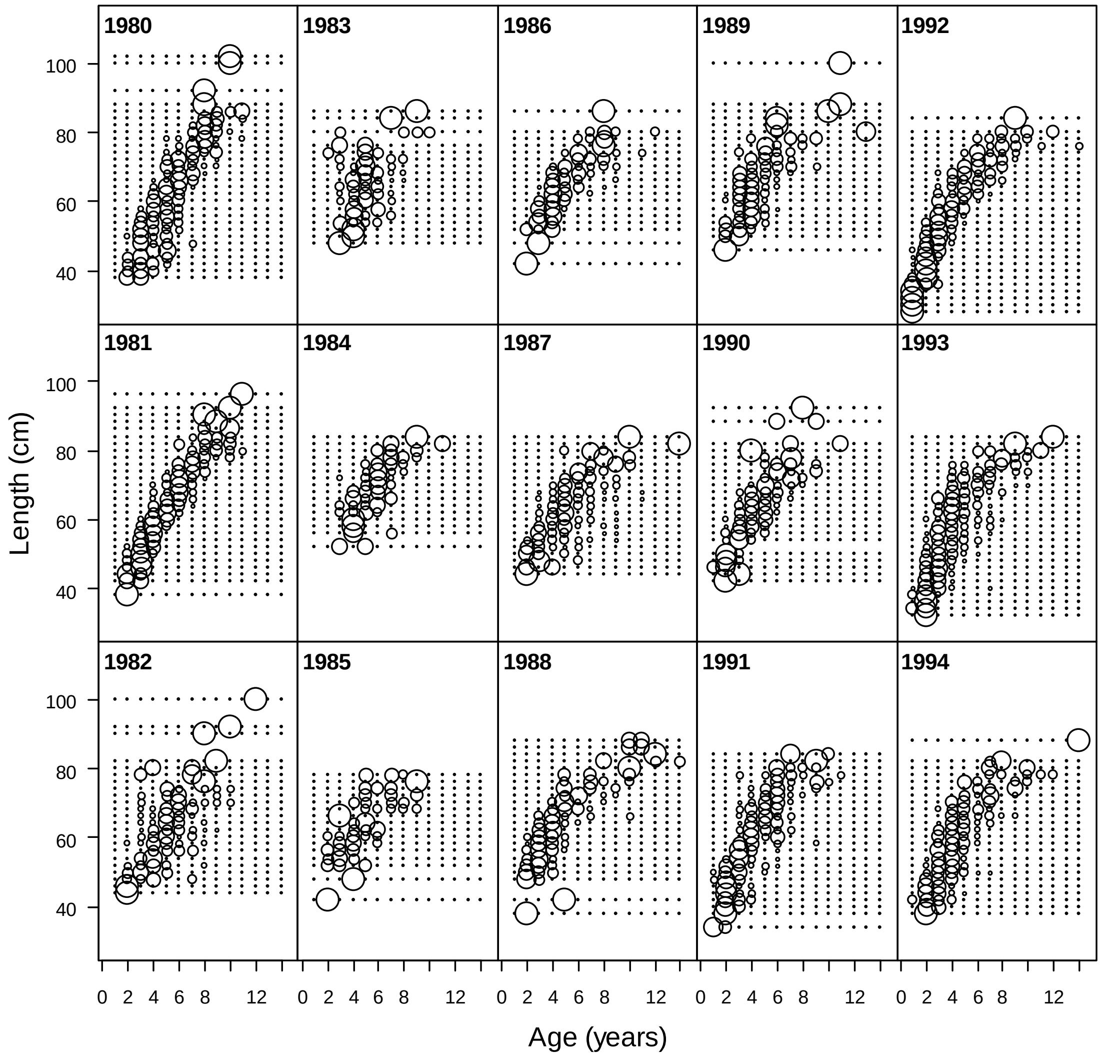


Figure 9. Washington/Oregon commercial retained male conditional age-at-length compositions 1980-1994.

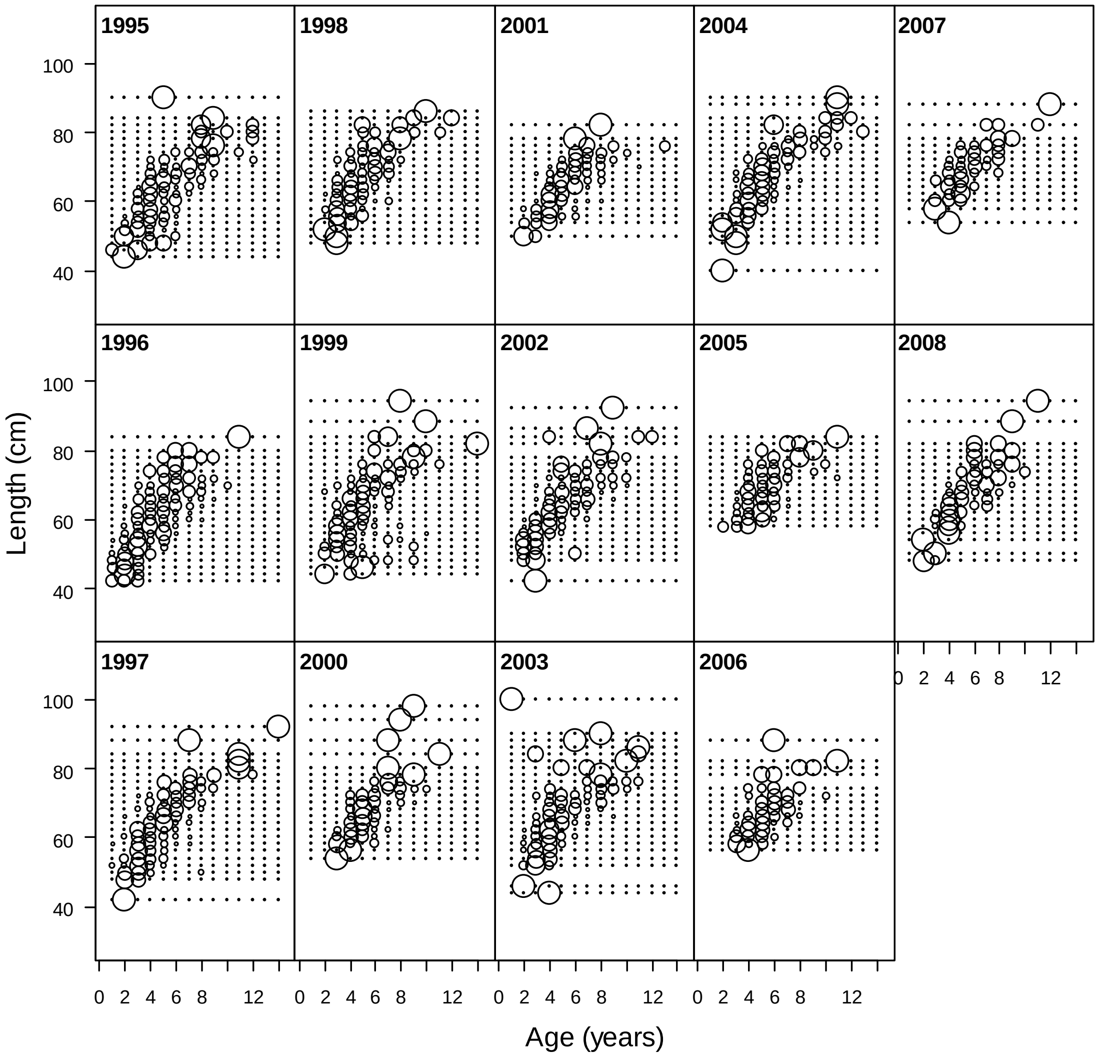


Figure 10. Washington/Oregon commercial retained male conditional age-at-length compositions 1995-2008.

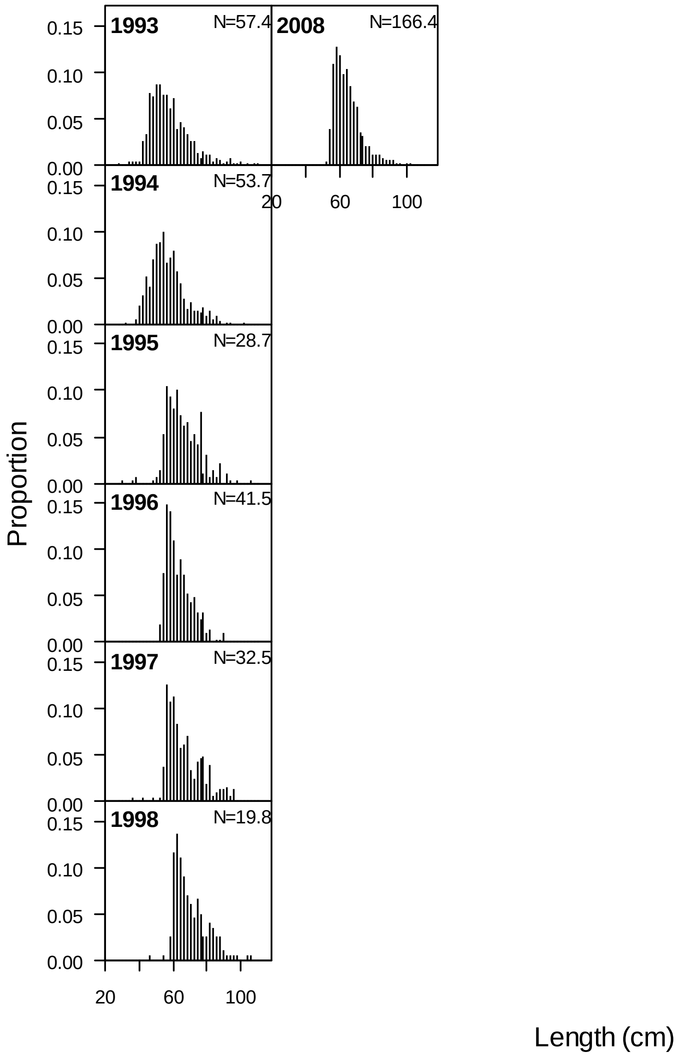


Figure 11. Washington/Oregon recreational combined-sex landings 1993-1998 and 2008.

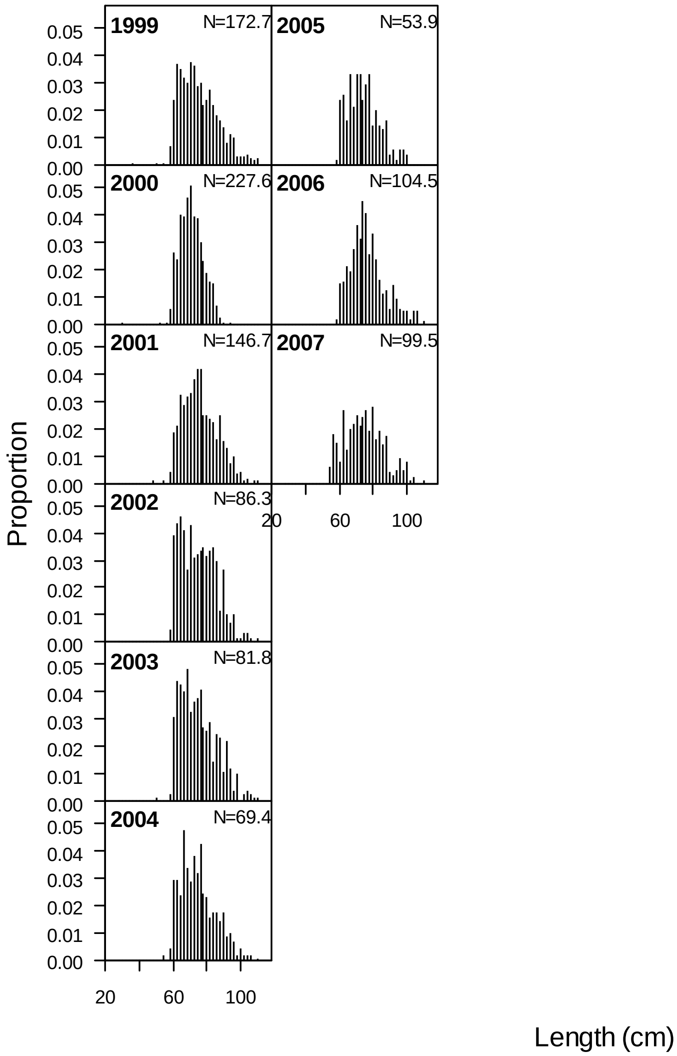


Figure 12. Washington/Oregon recreational female length compositions 1993-2007.

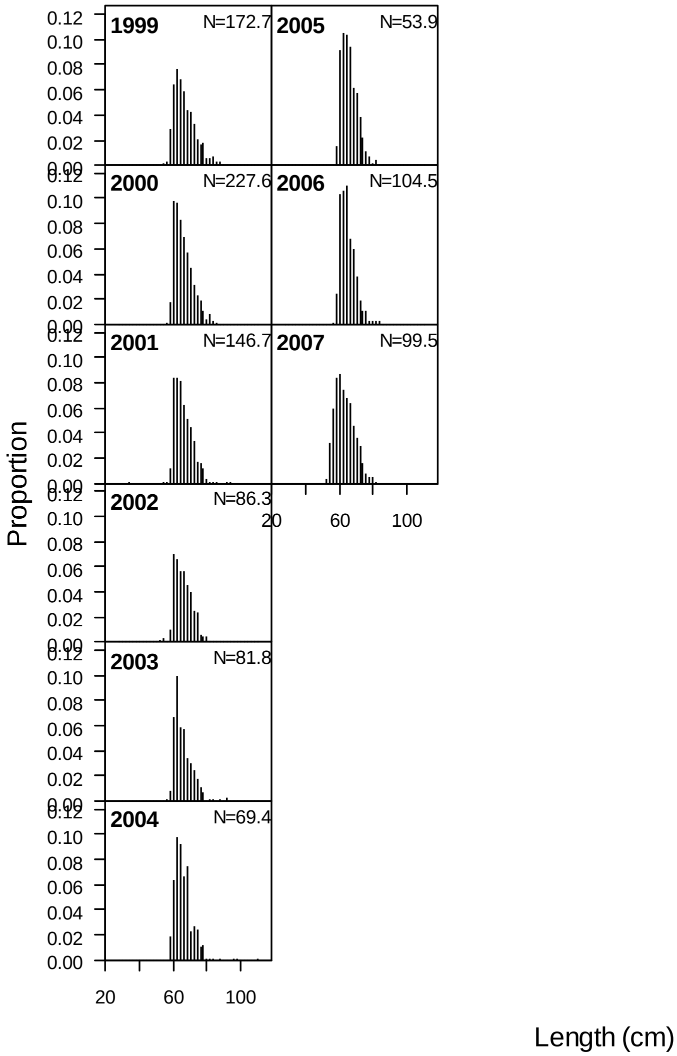


Figure 13. Washington/Oregon recreational male length compositions 1999-2007.

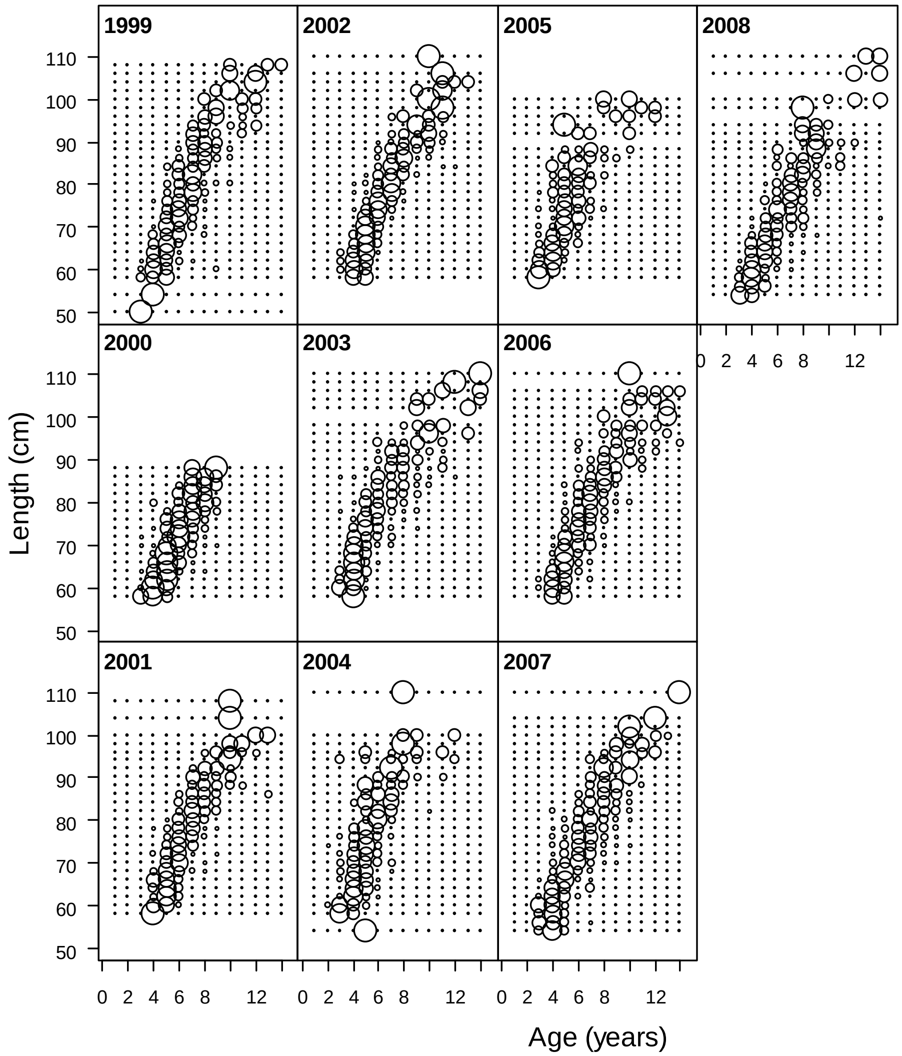


Figure 14. Washington/Oregon recreational female conditional age-at-length compositions 1999-2007.

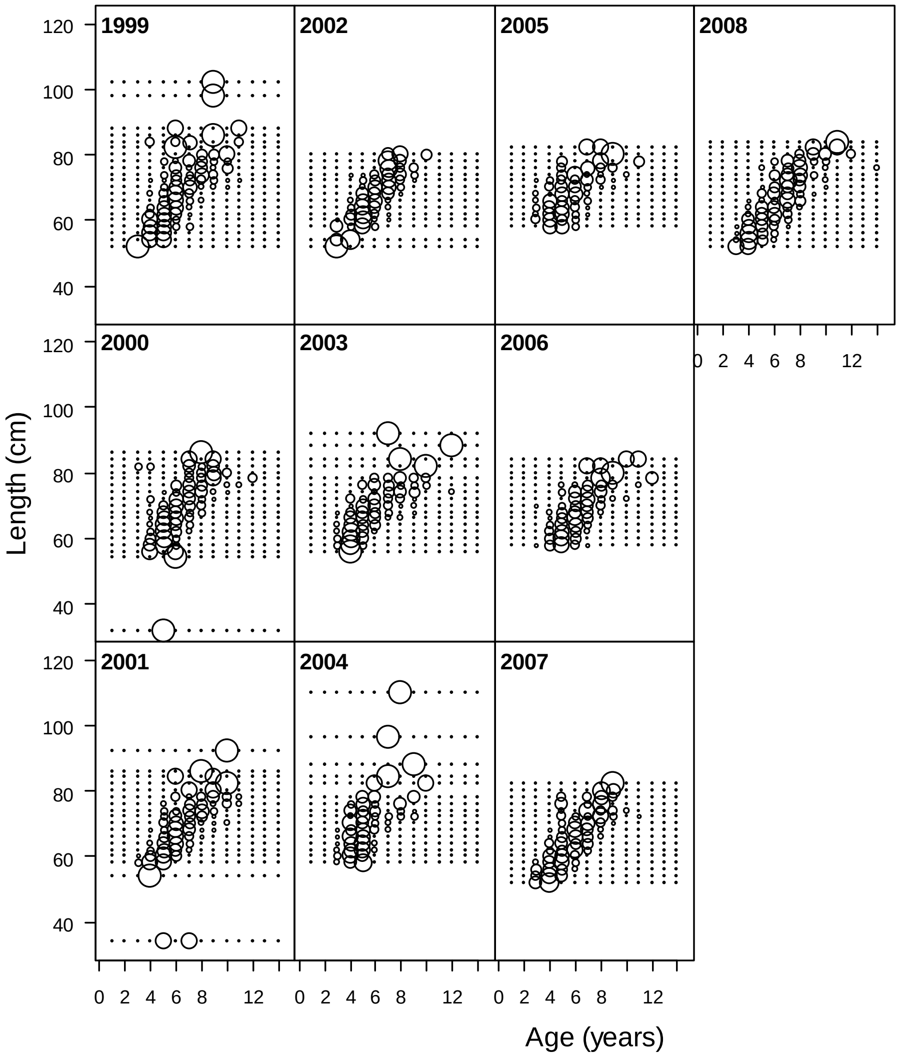


Figure 15. Washington/Oregon recreational male conditional age-at-length compositions 1999-2007.

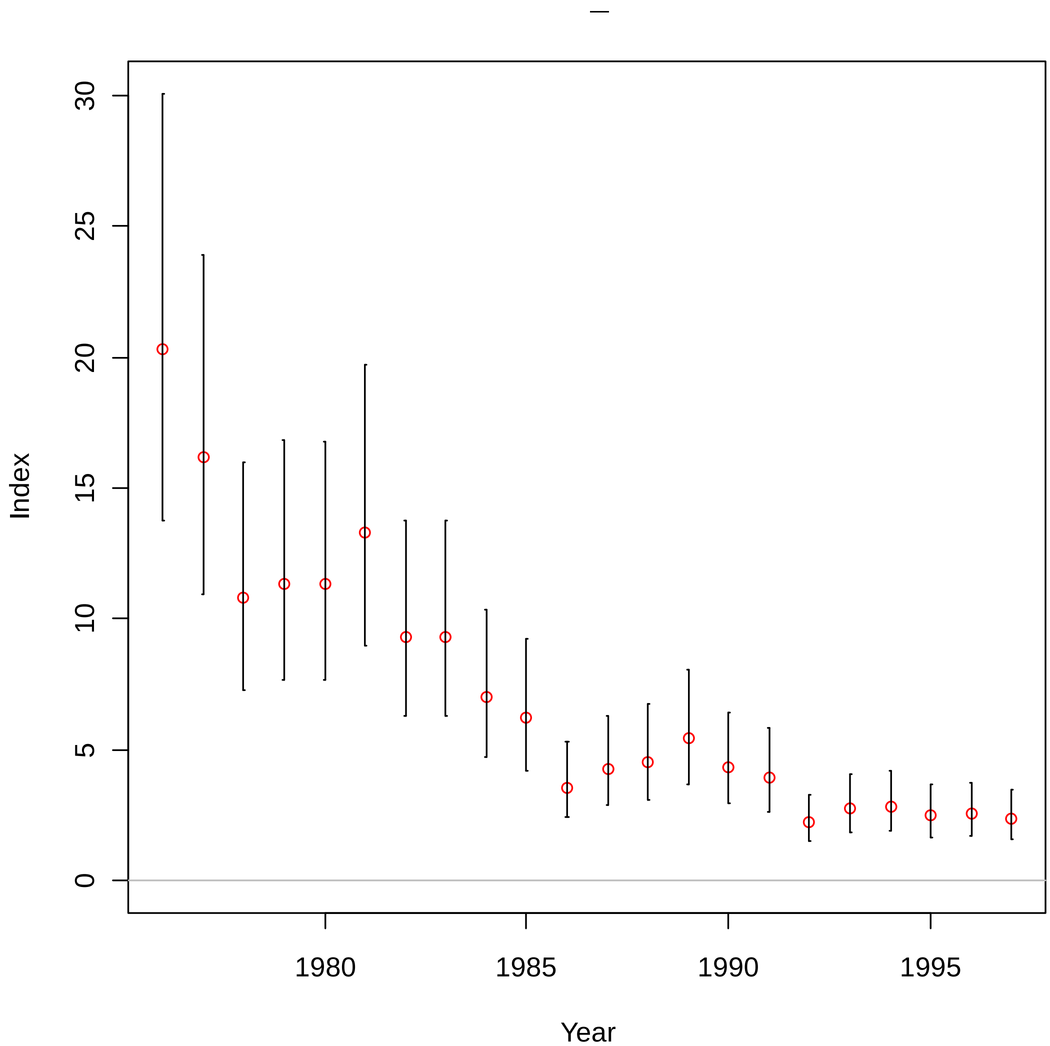


Figure 16. Northern commercial CPUE series for Washington/Oregon assessment.

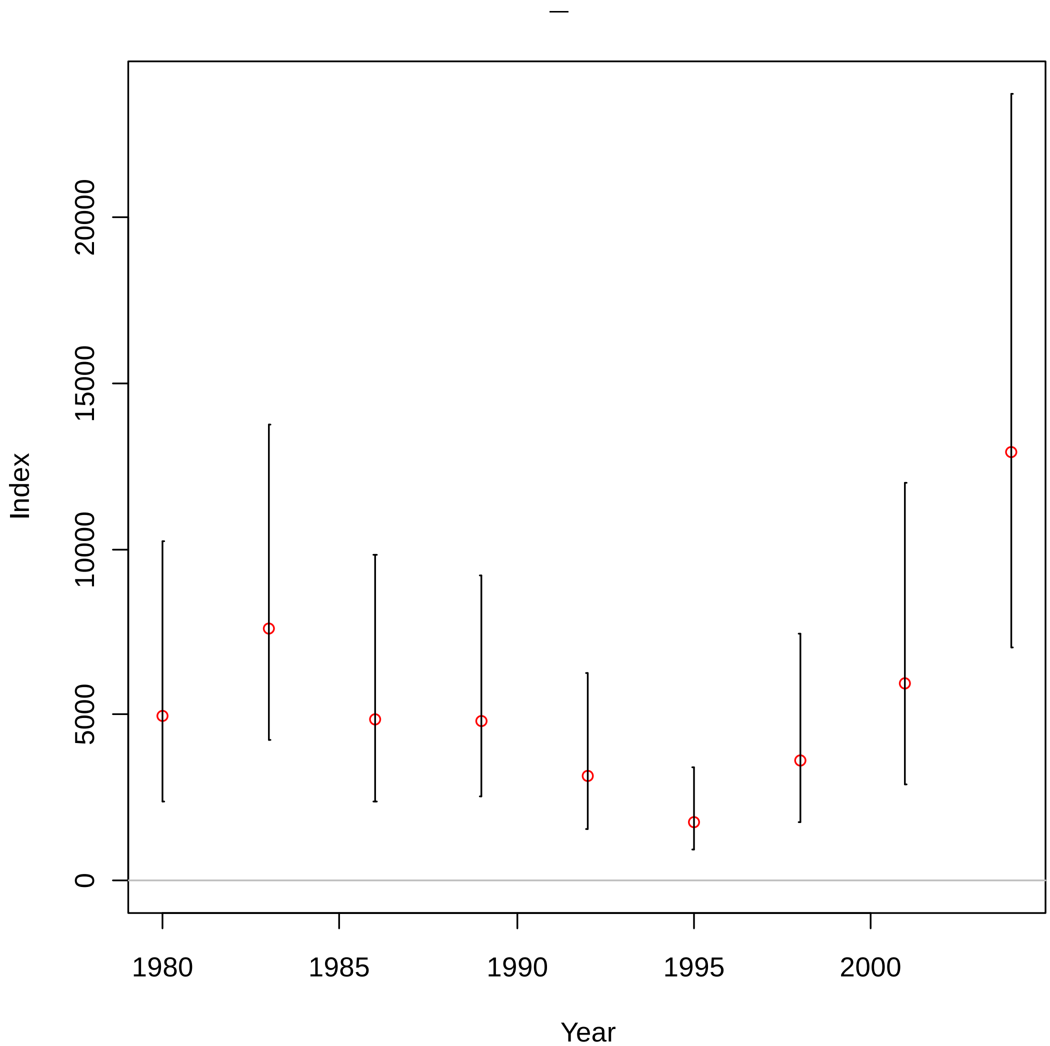


Figure 17. Washington/Oregon Triennial Survey Time Series.

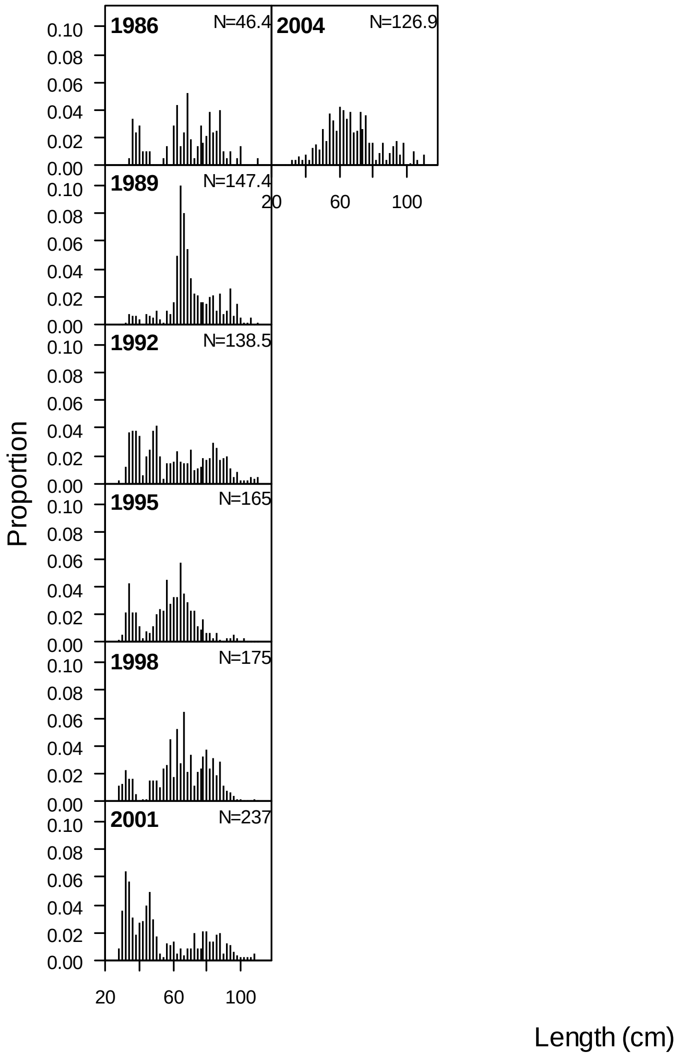


Figure 18. Washington/Oregon Triennial survey female length compositions 1986-2004.

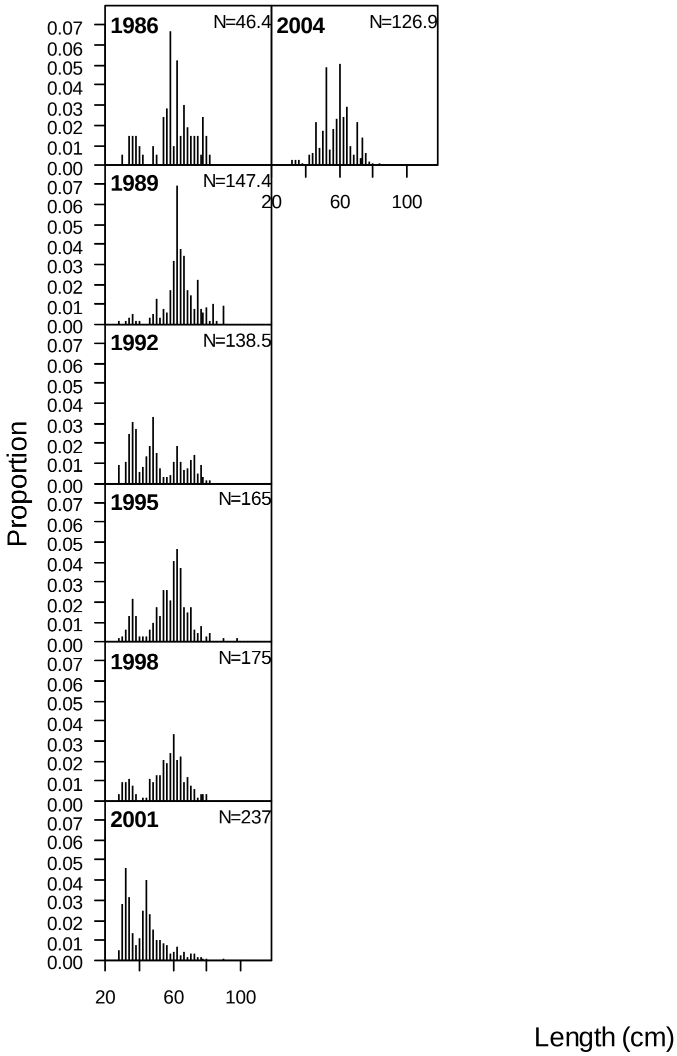


Figure 19. Washington/Oregon Triennial survey male length compositions 1986-2004.

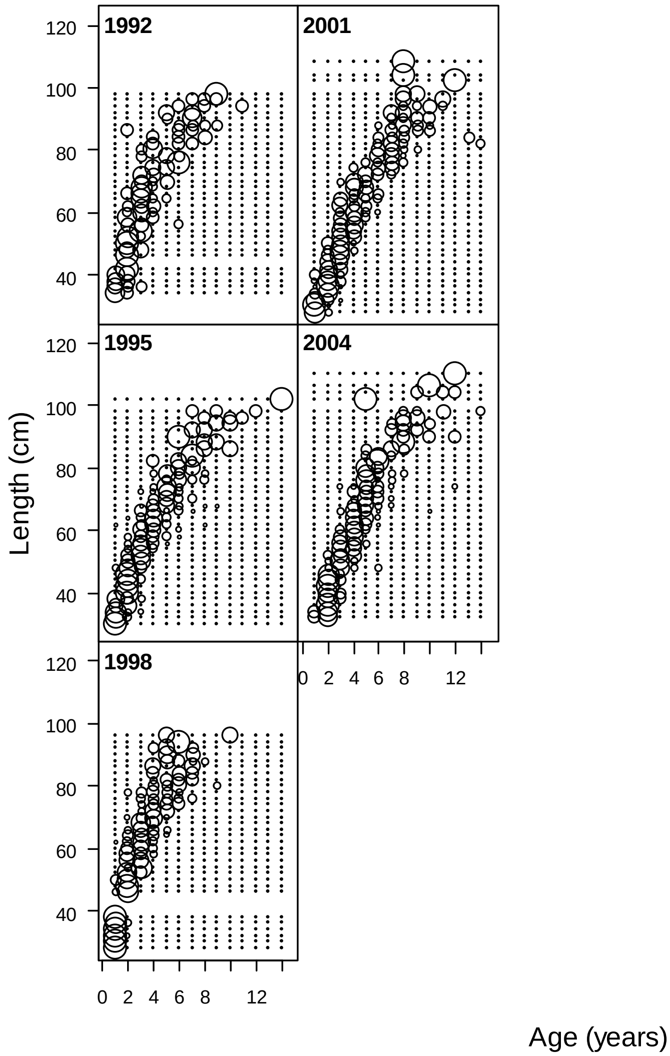


Figure 20. Washington/Oregon Triennial female conditional age-at-length compositions 1999-2007.

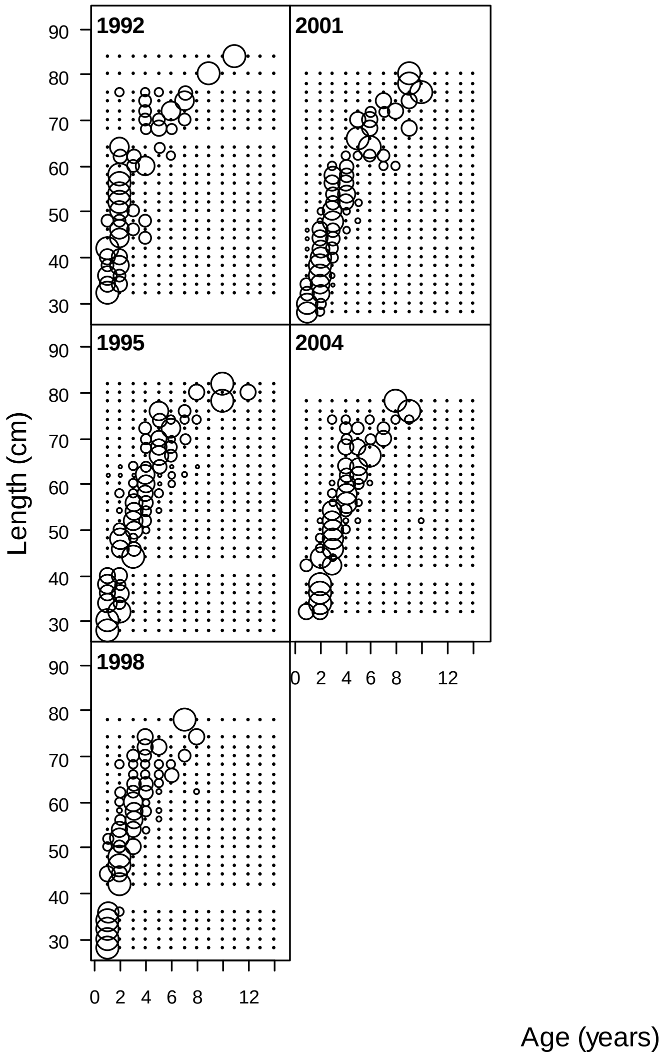


Figure 21. Washington/Oregon Triennial male conditional age-at-length compositions 1999-2007.

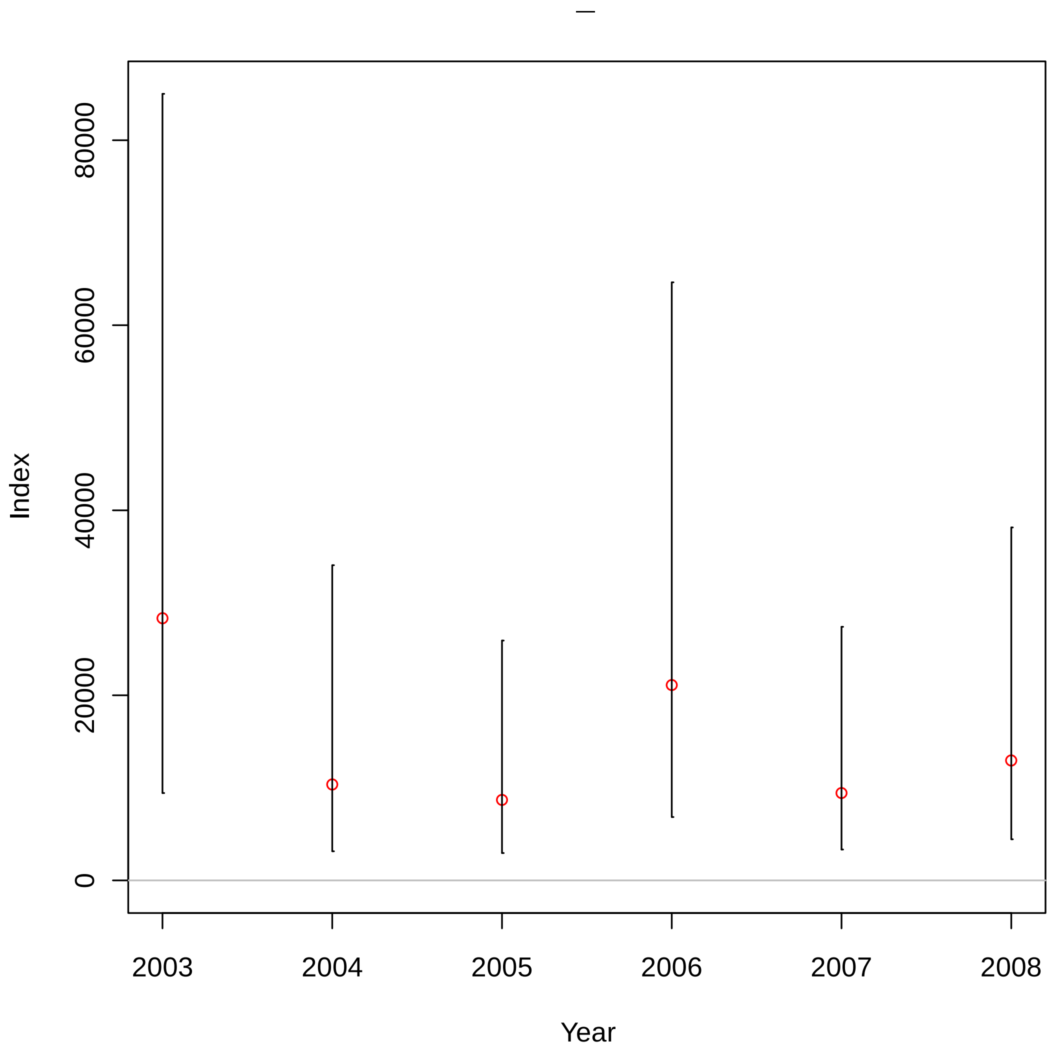


Figure 22. Washington/Oregon NWFSC Survey Time Series.

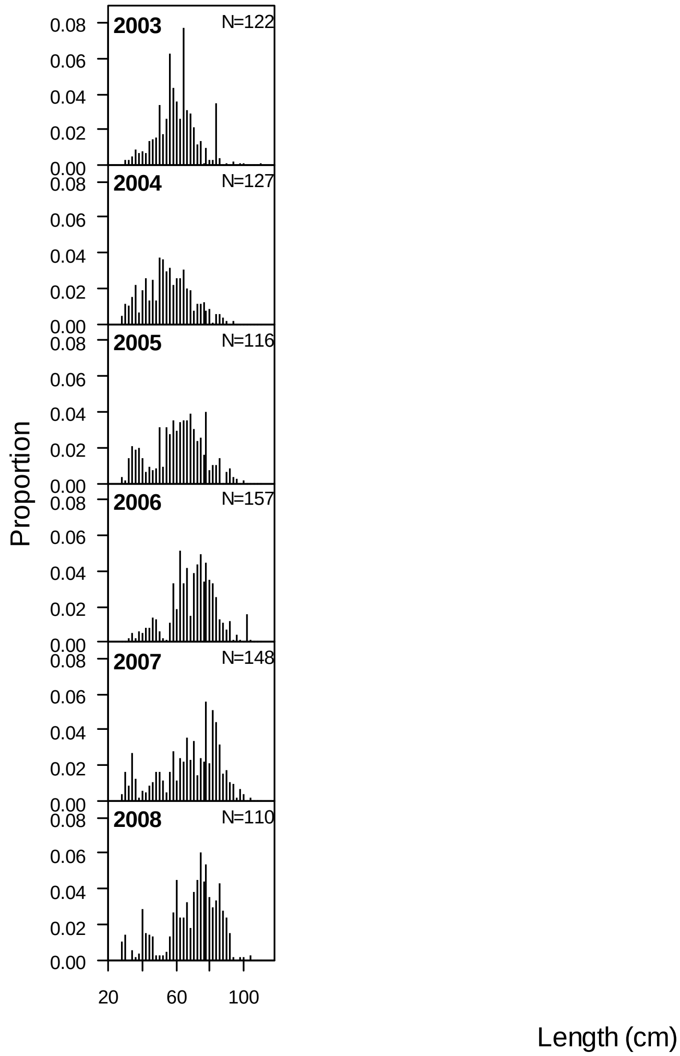


Figure 23. Washington/Oregon NWFSC survey female length compositions 2003-2008.

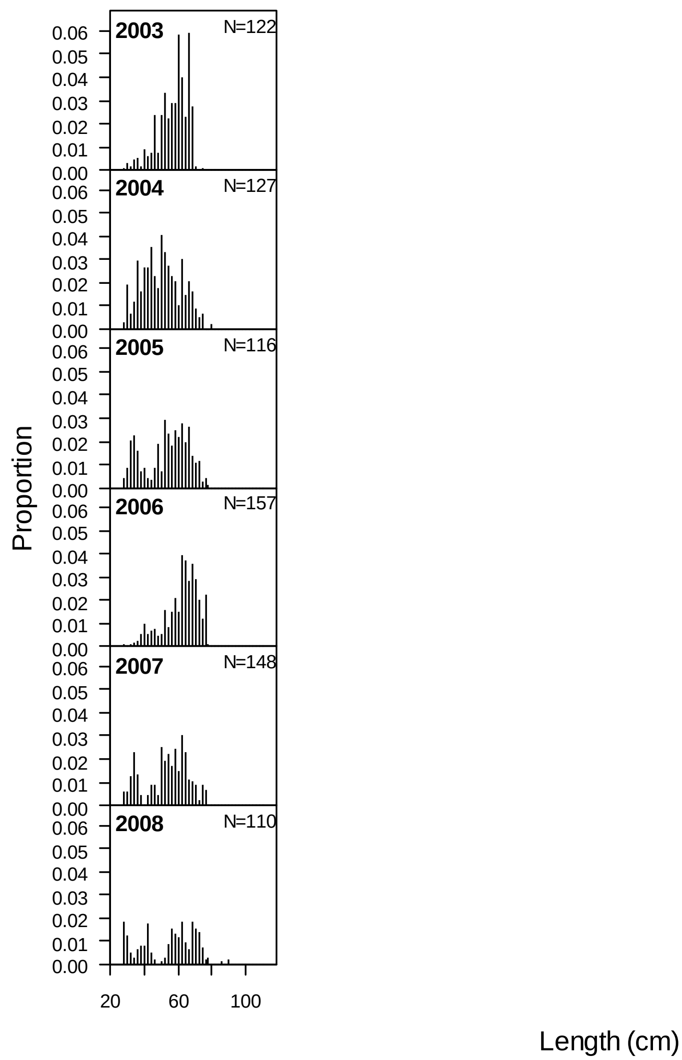


Figure 24. Washington/Oregon NWFSC survey male length compositions 2003-2008.

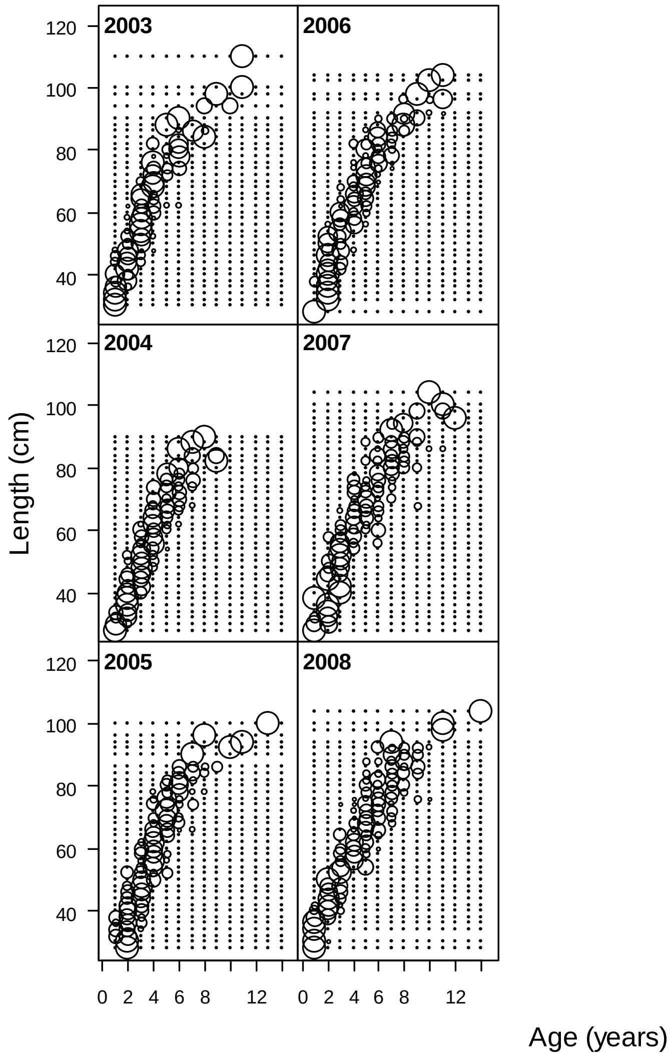


Figure 25. Washington/Oregon NWFSC female conditional age-at-length compositions 2003-2008.

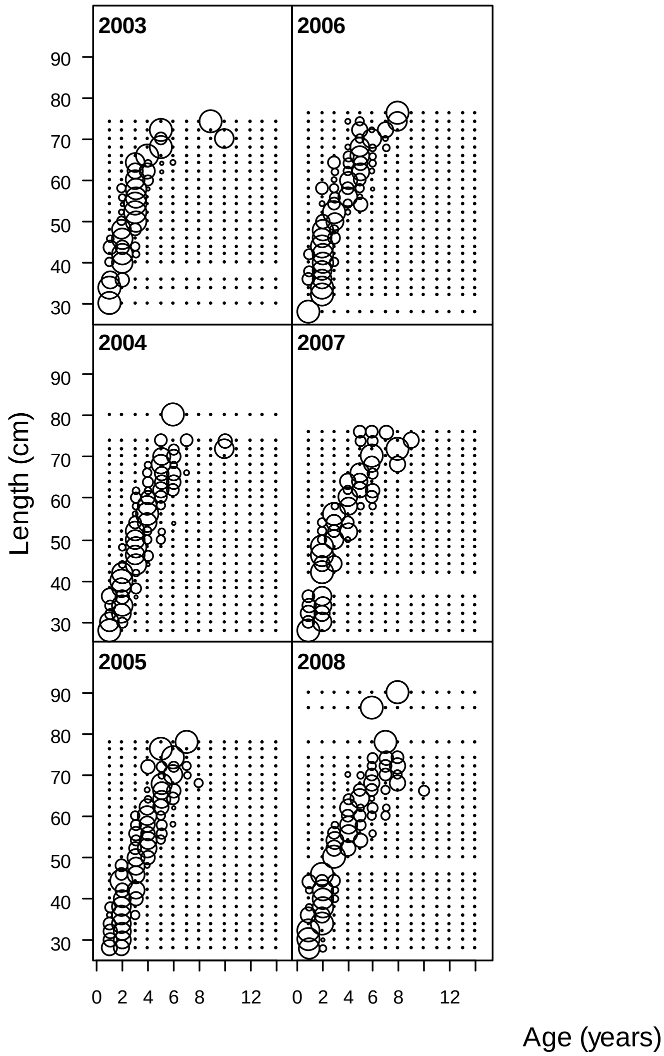


Figure 26. Washington/Oregon NWFSC male conditional age-at-length compositions 2003-2008.

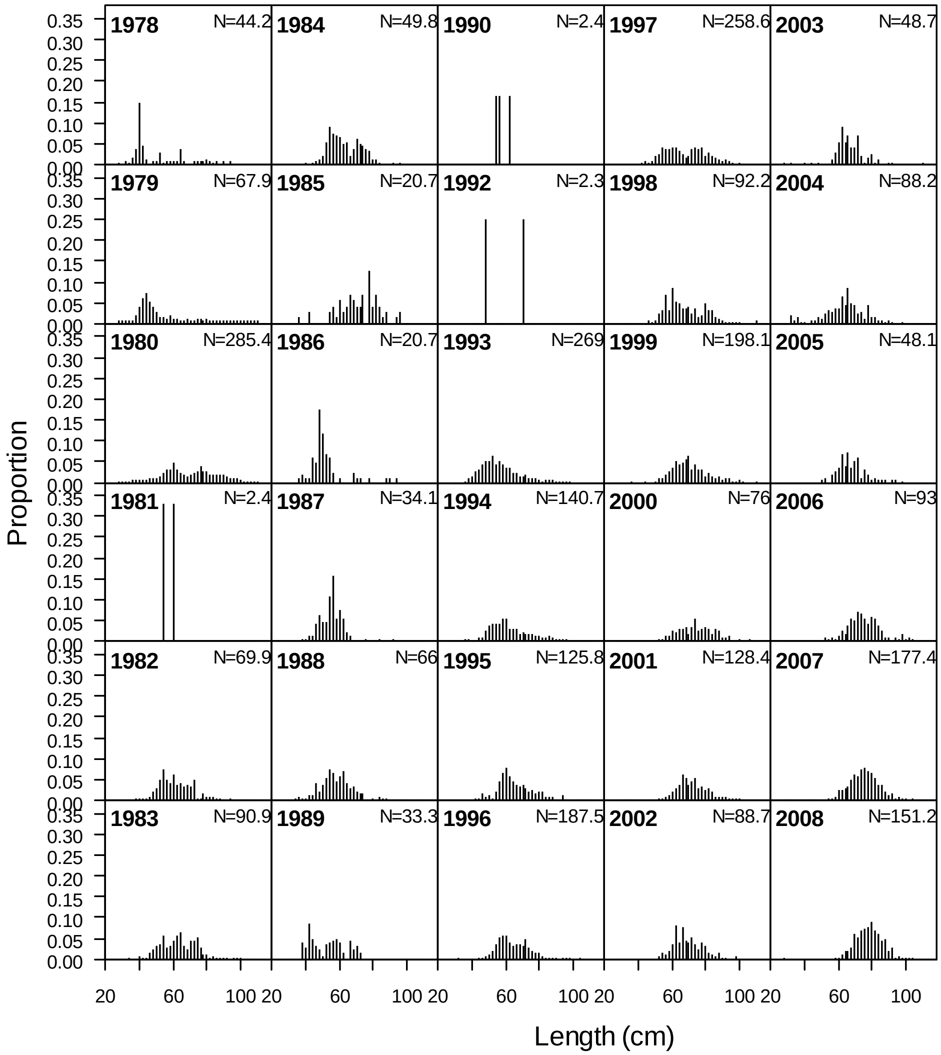


Figure 27. California commercial retained female length compositions 1978-2008.

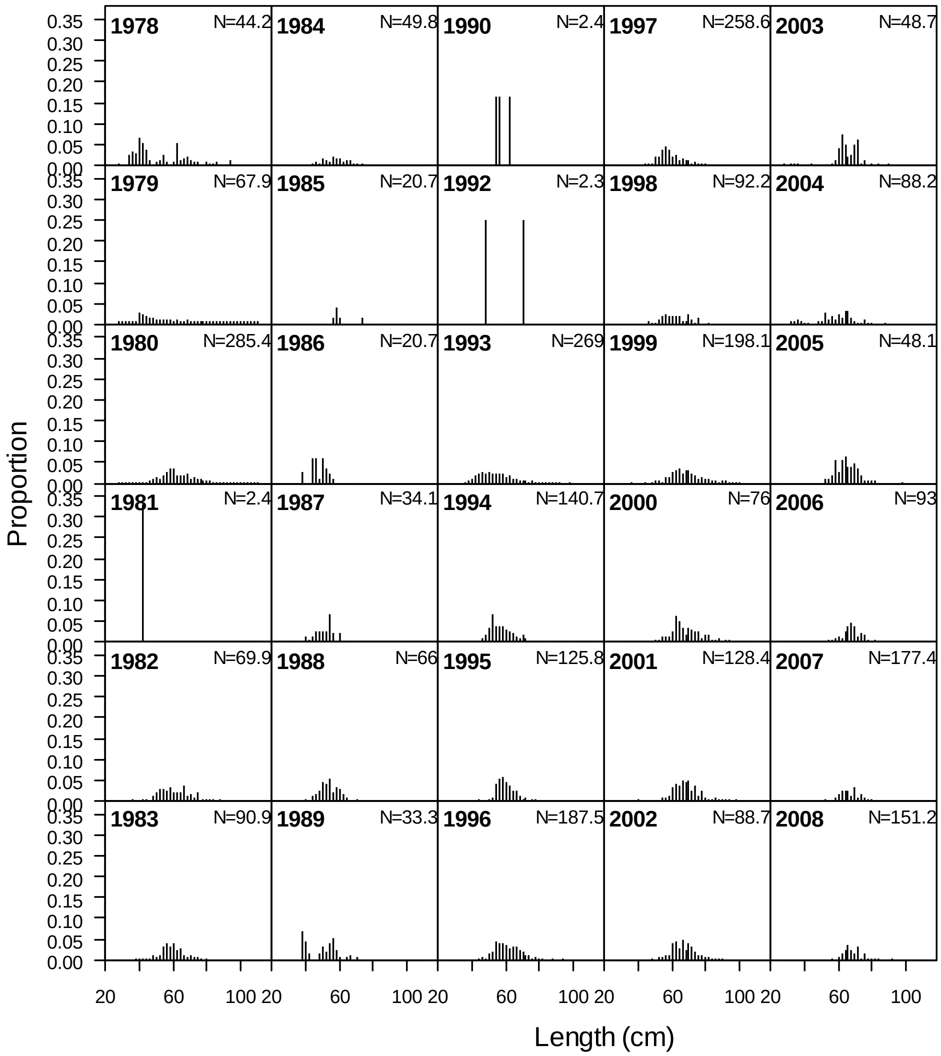


Figure 28. California commercial retained male length compositions 1976-2008.

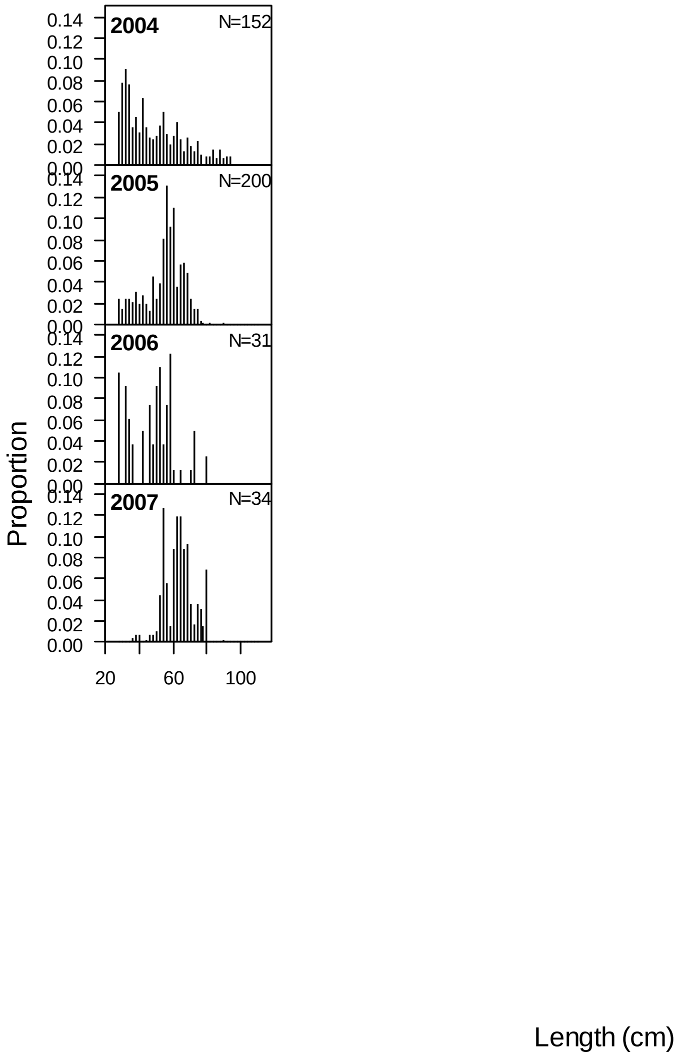


Figure 29. California commercial discard combined-sex length compositions 2004-2007.

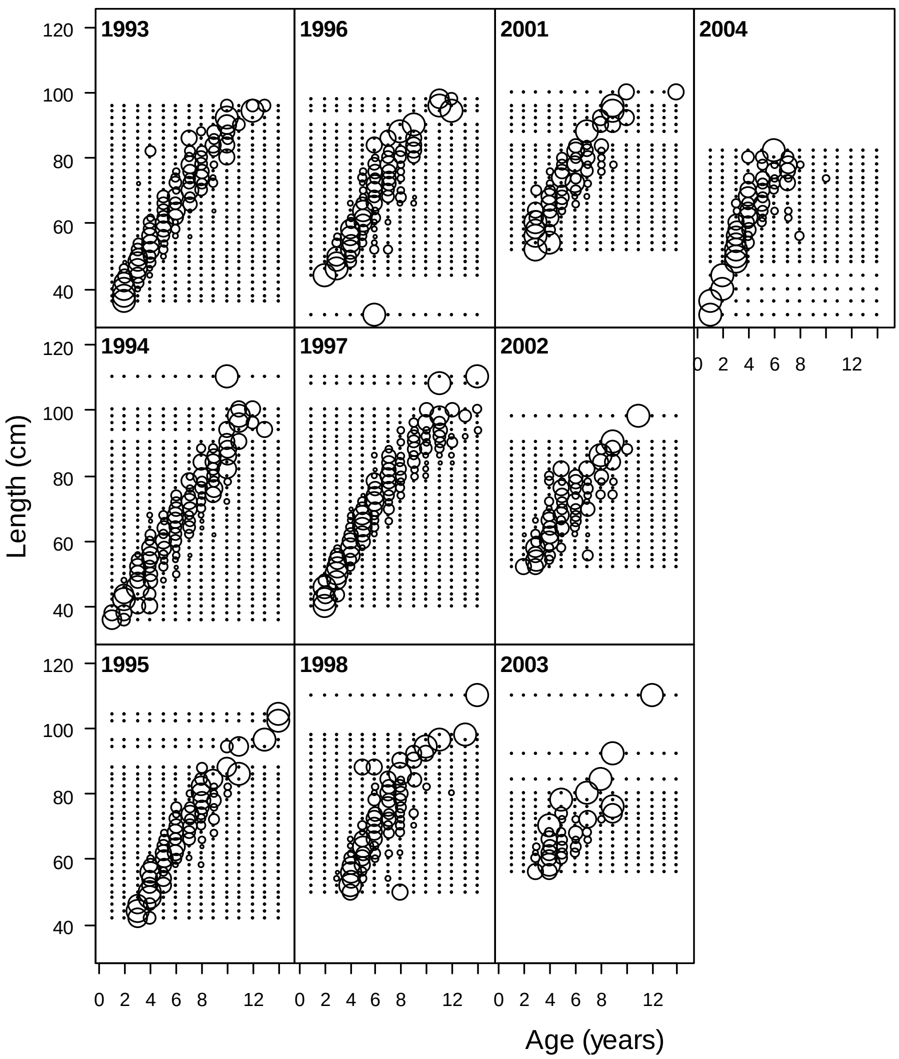


Figure 30. California commercial retained female conditional age-at-length compositions 1987-2004.

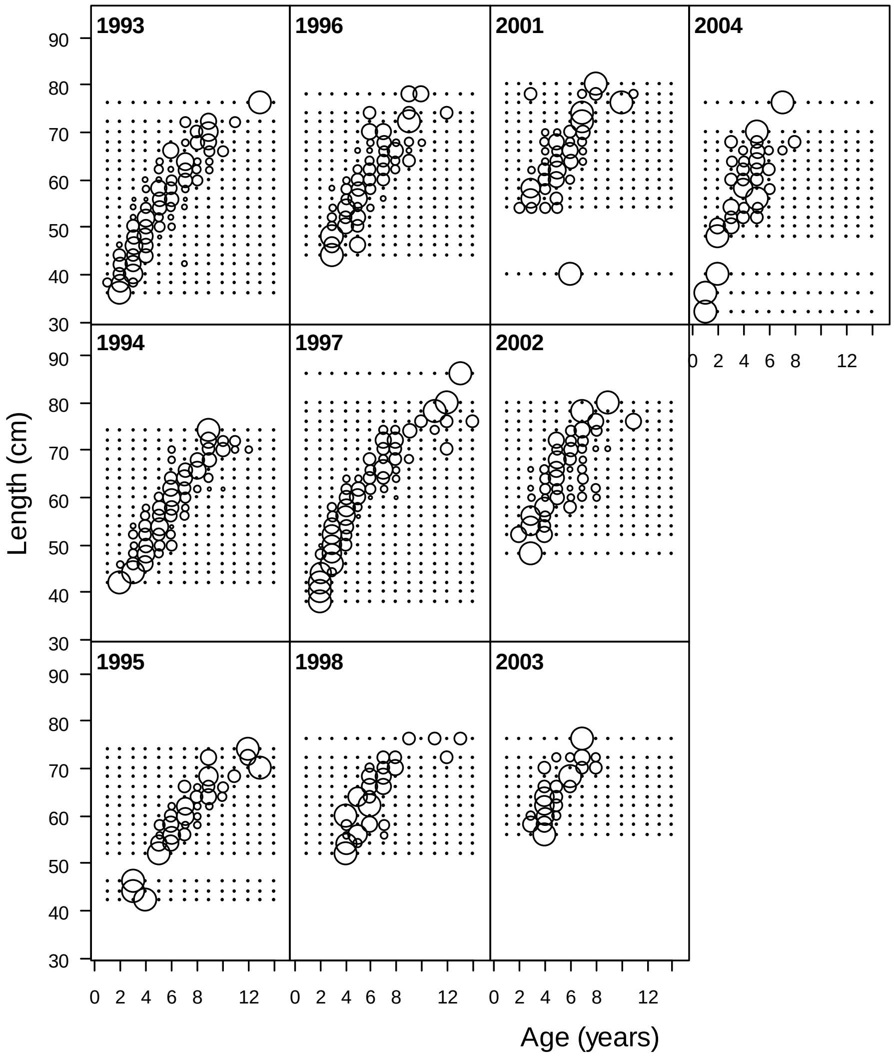


Figure 31. California commercial retained male conditional age-at-length compositions 1987-2004.

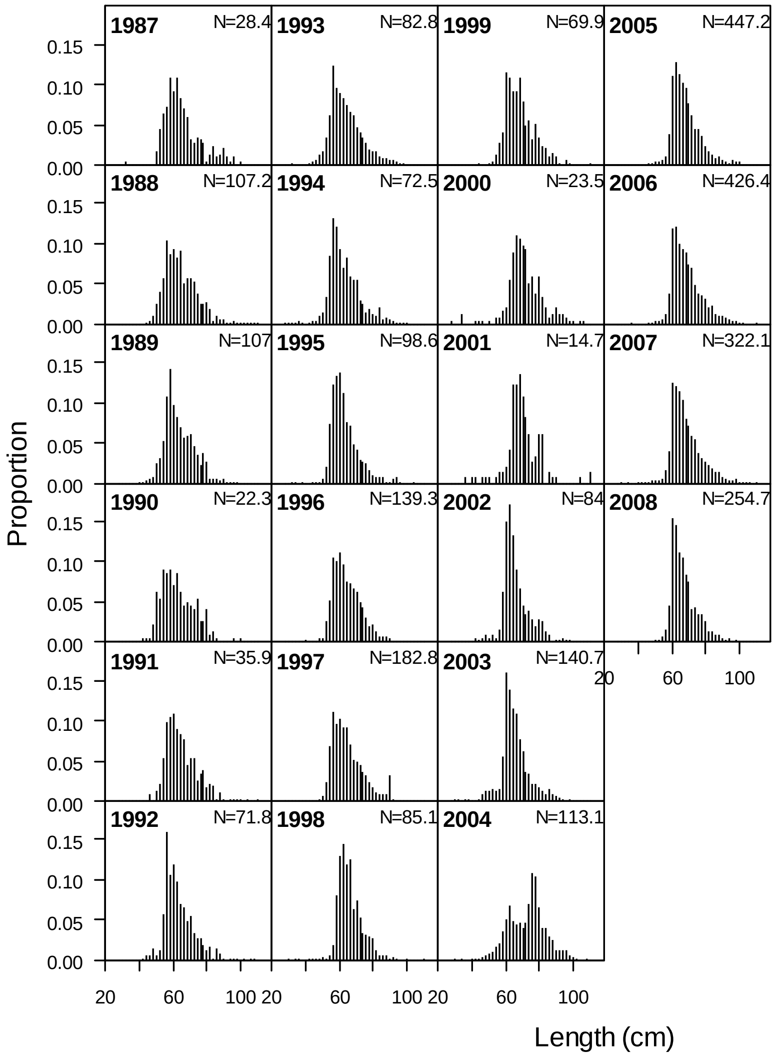


Figure 32. California recreational combined-sex length compositions 1987-2008.

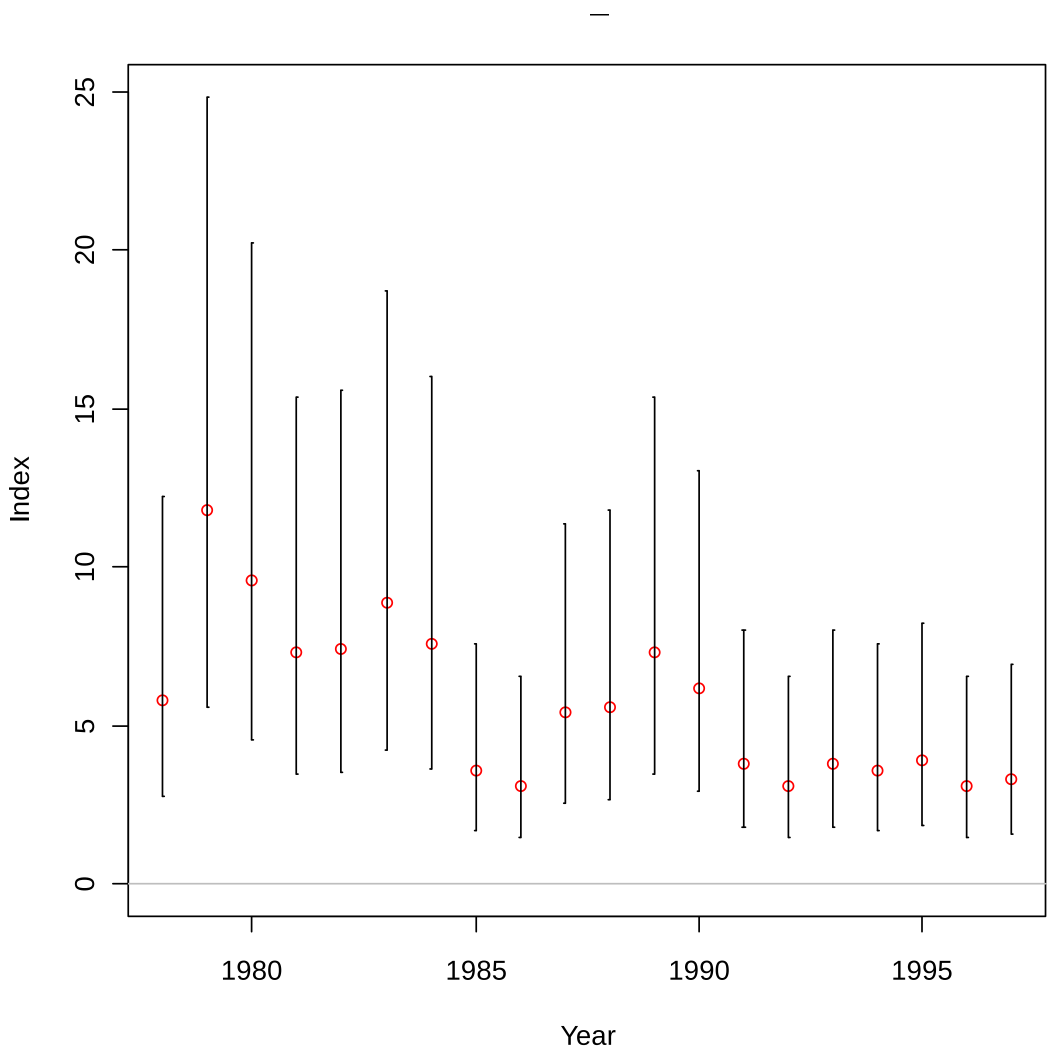


Figure 33. Southern commercial CPUE series for California assessment.

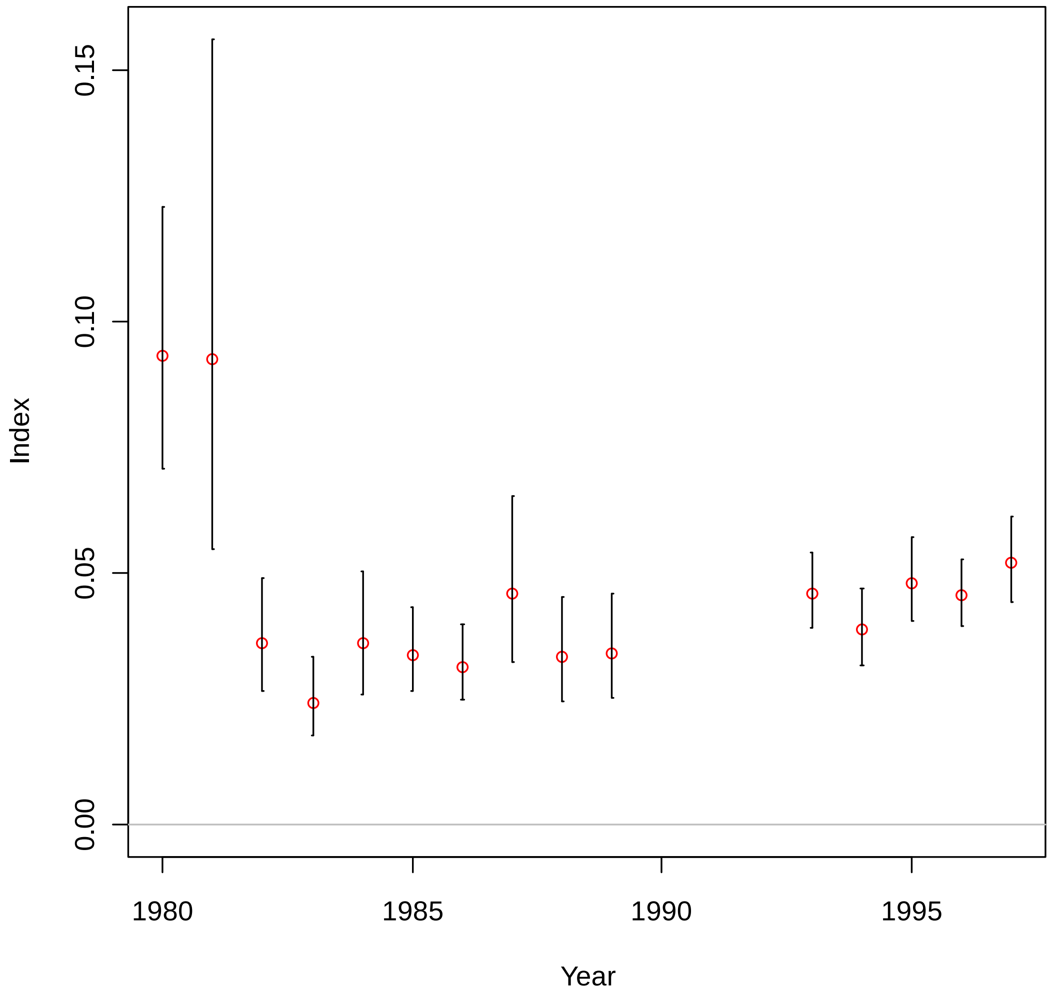


Figure 34. Southern recreational CPUE series for California assessment

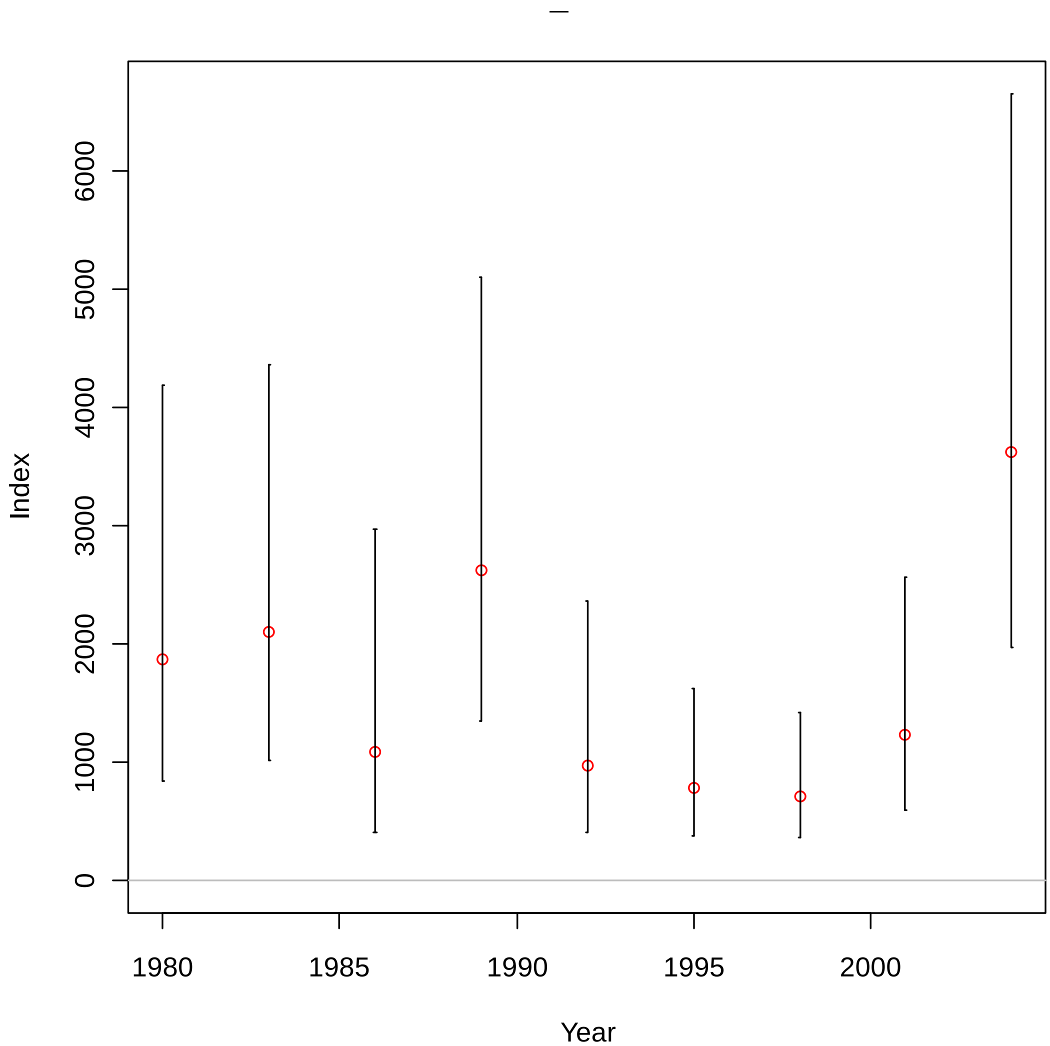


Figure 35. California Triennial Survey Time Series.

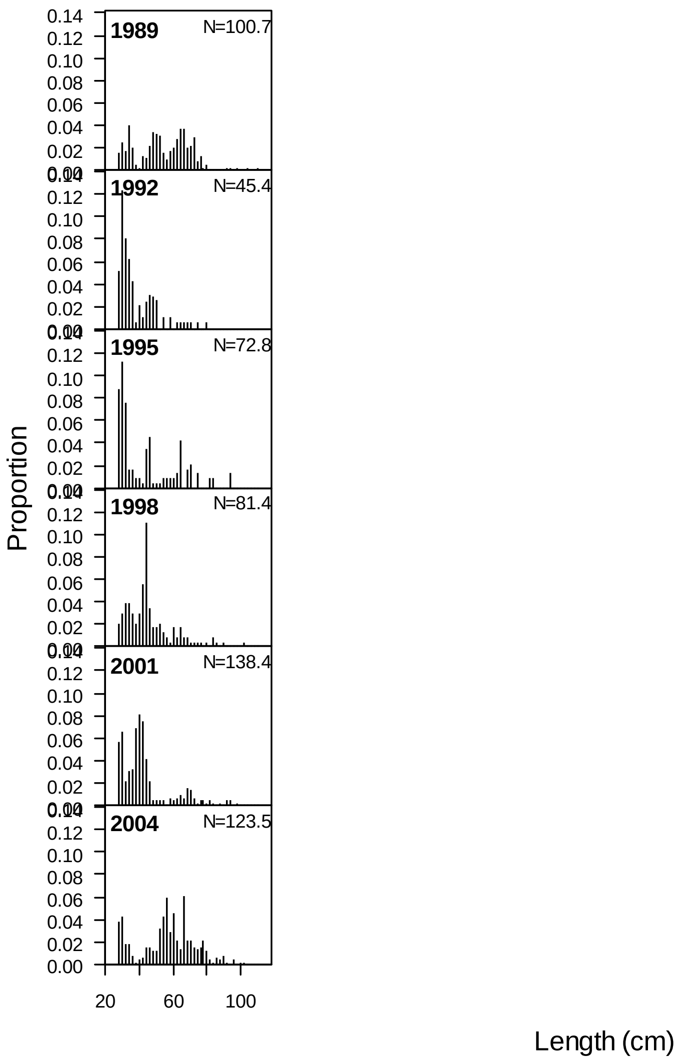


Figure 36. California Triennial survey female length compositions 1989-2004.

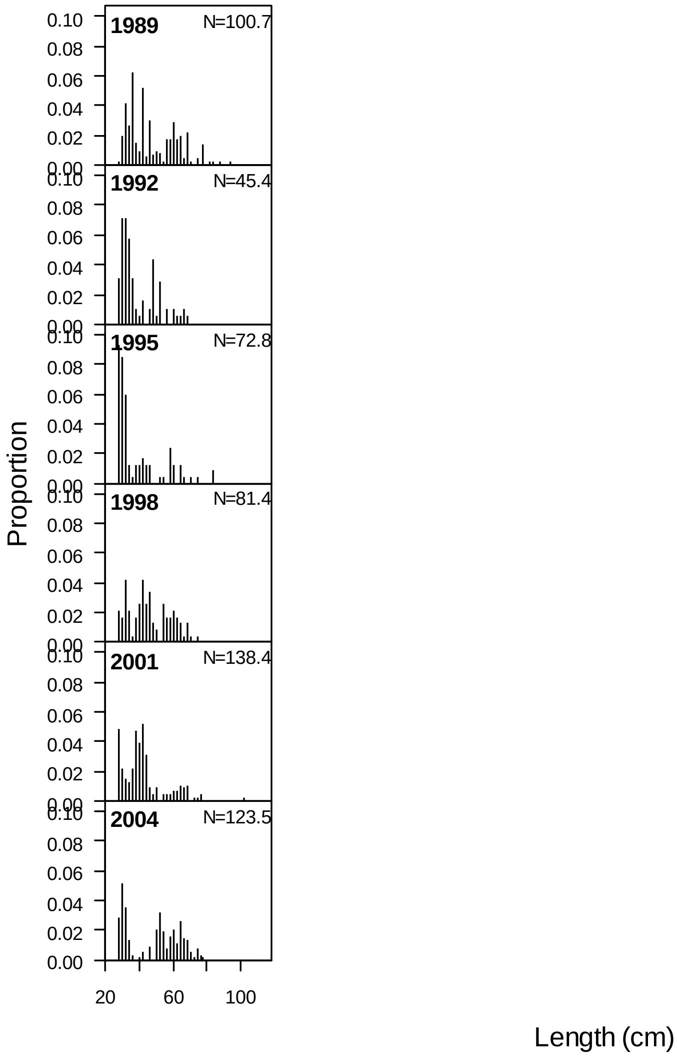


Figure 37. California Triennial survey male length compositions 1989-2004.

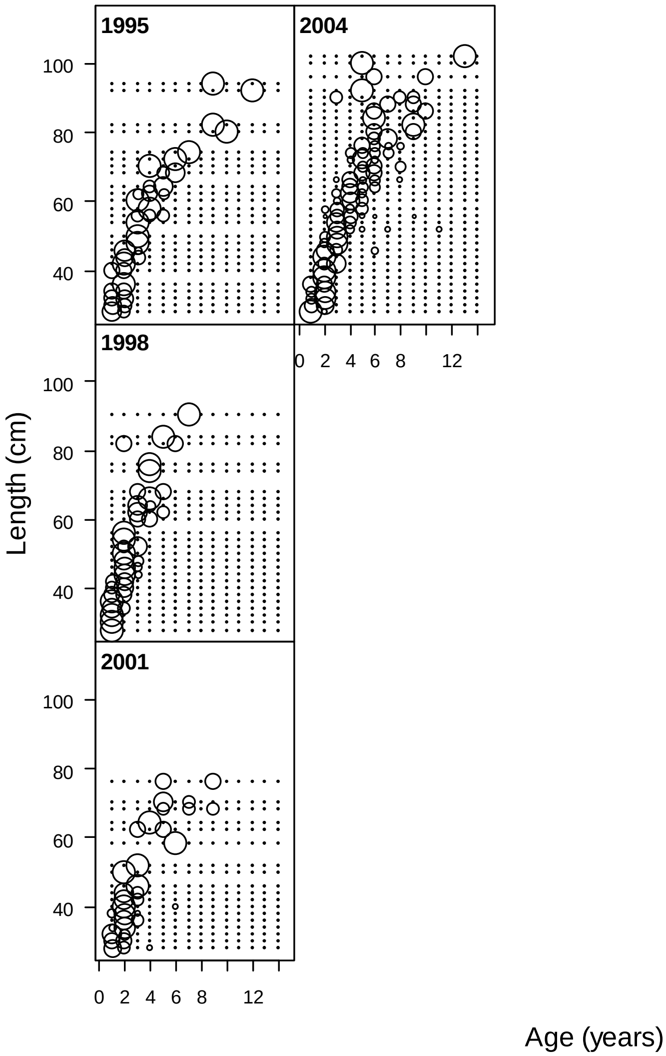


Figure 38. California Triennial female conditional age-at-length compositions 1995-2004.

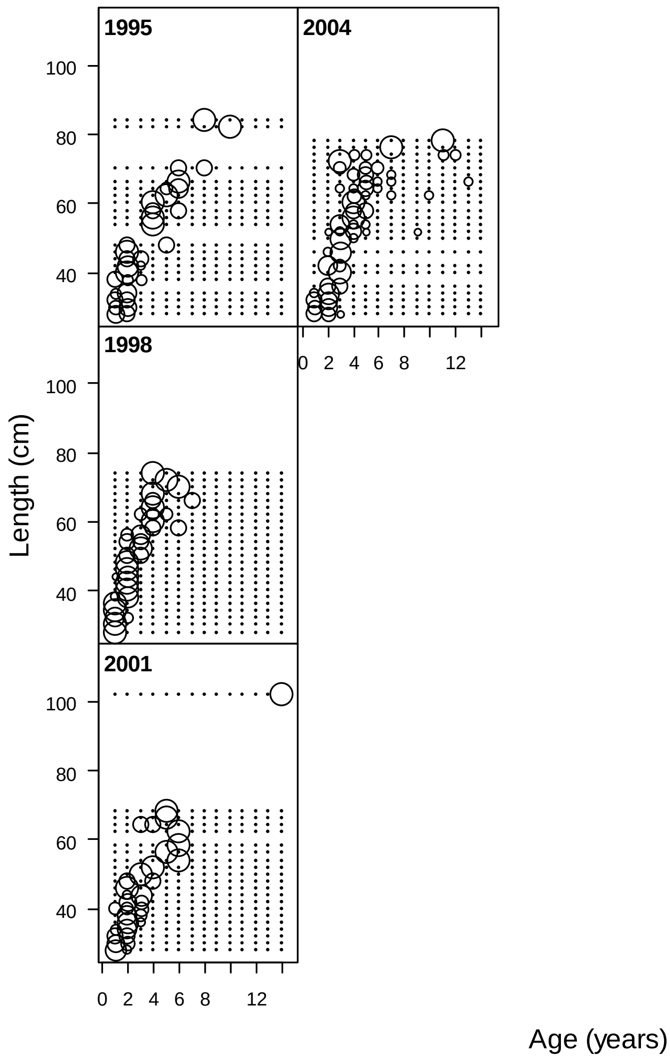


Figure 39. California Triennial male conditional age-at-length compositions 1989-2004.

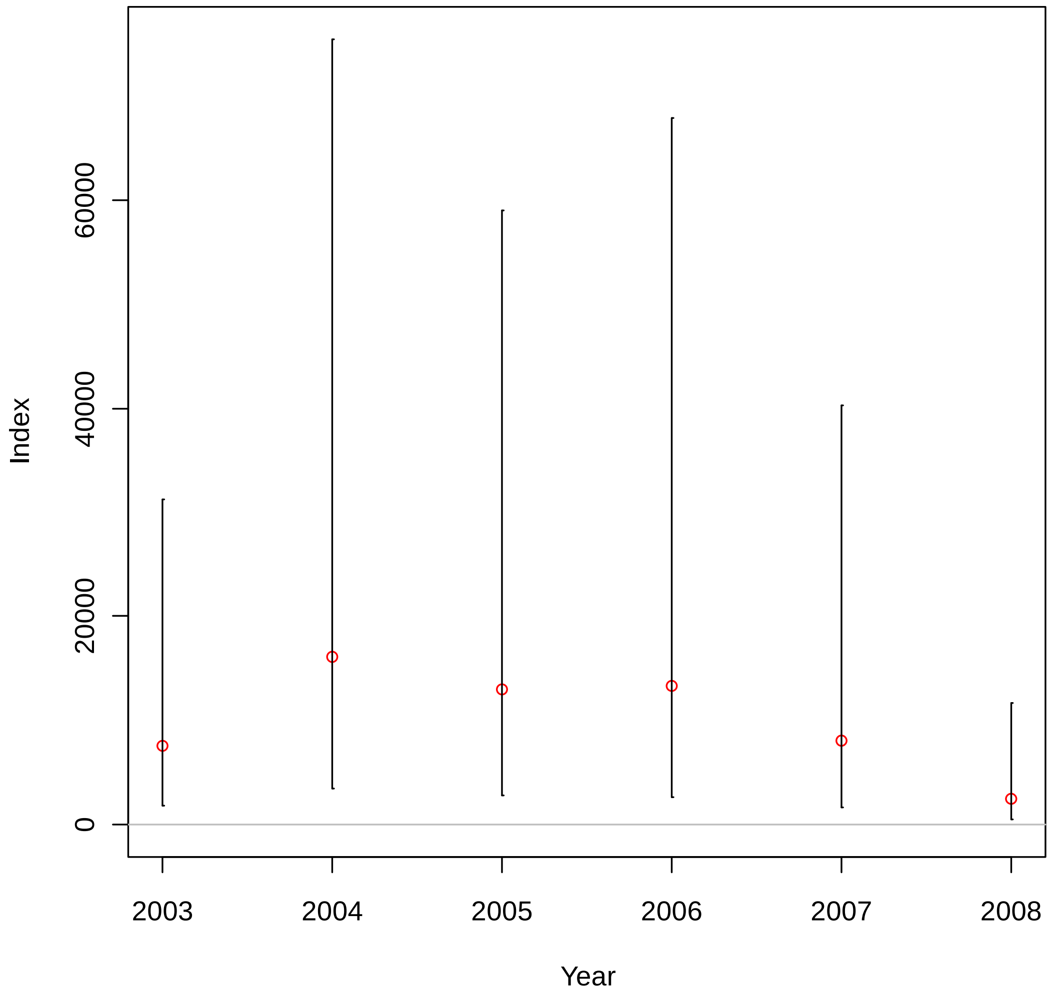


Figure 40. California NWFSC Survey Time Series.

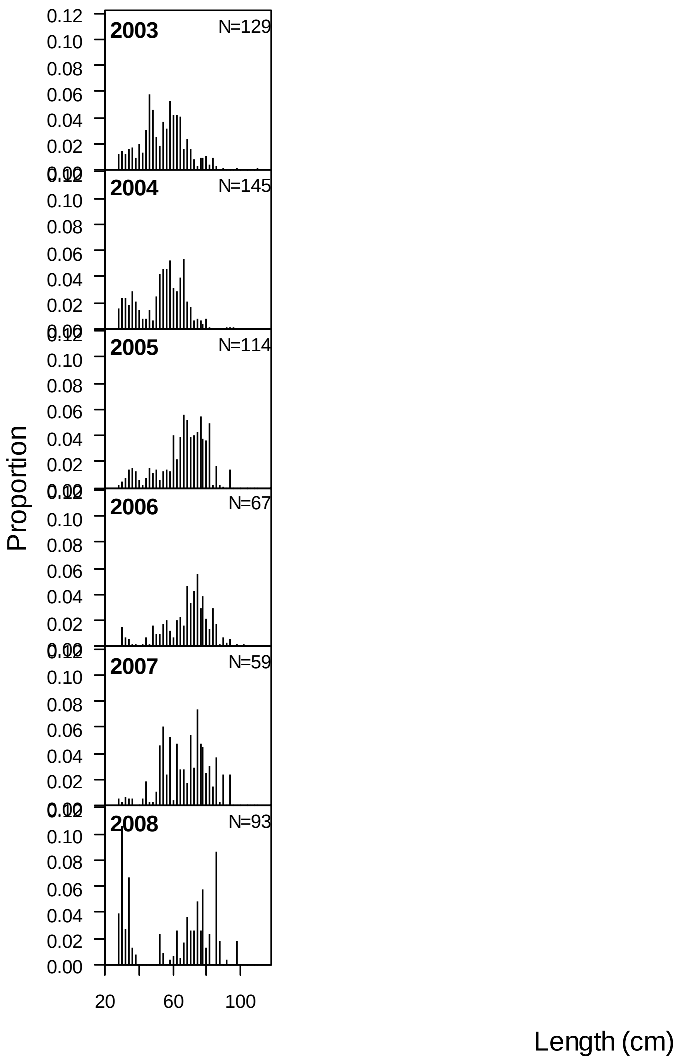


Figure 41. California NWFSC survey female length compositions 2003-2008.

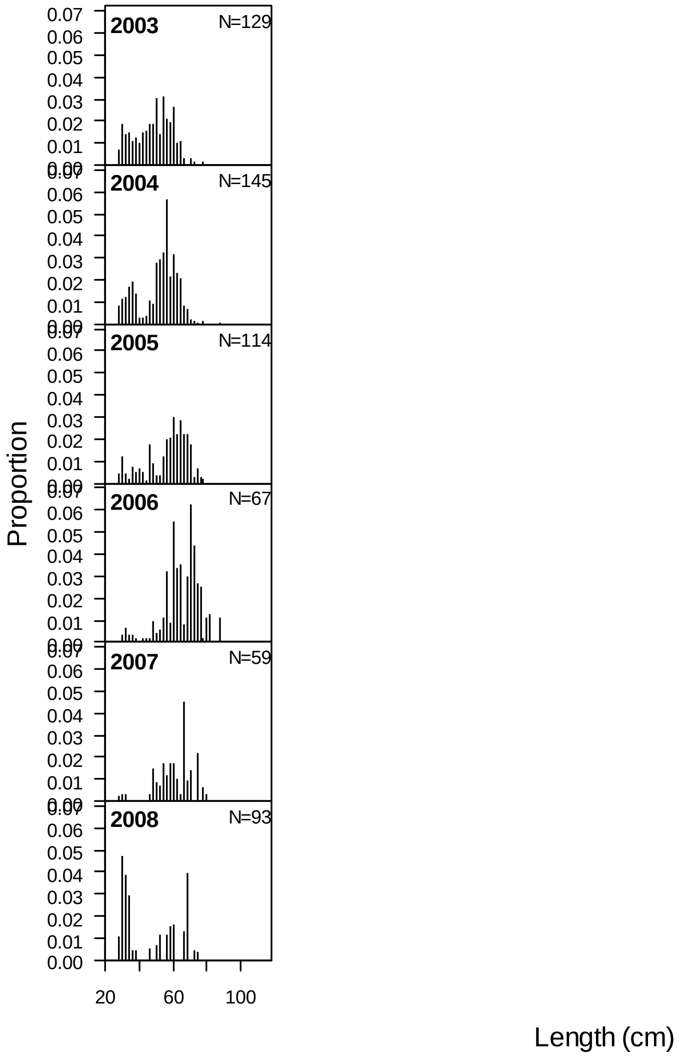


Figure 42. California NWFSC survey male length compositions 2003-2008.

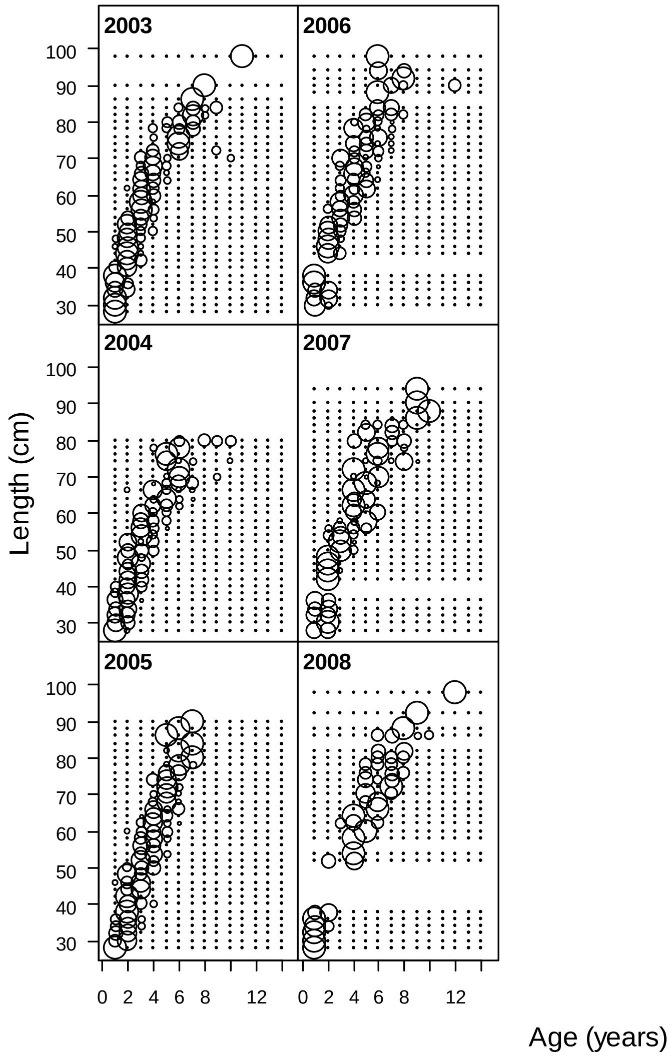


Figure 43. California NWFSC female conditional age-at-length compositions 2003-2008.

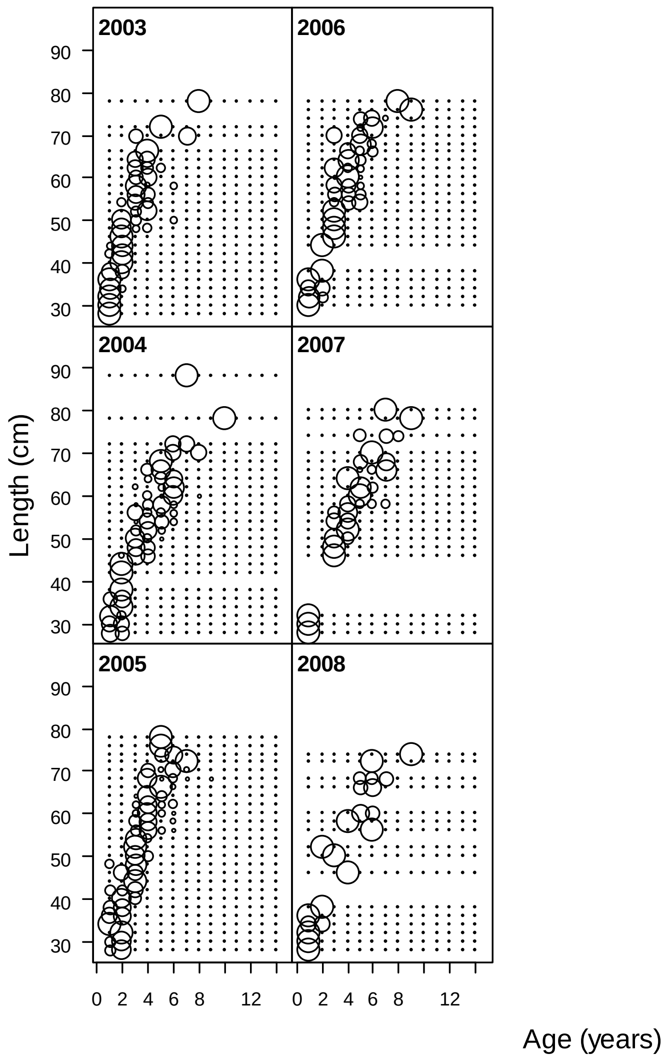


Figure 44. California NWFSC male conditional age-at-length compositions 2003-2008.

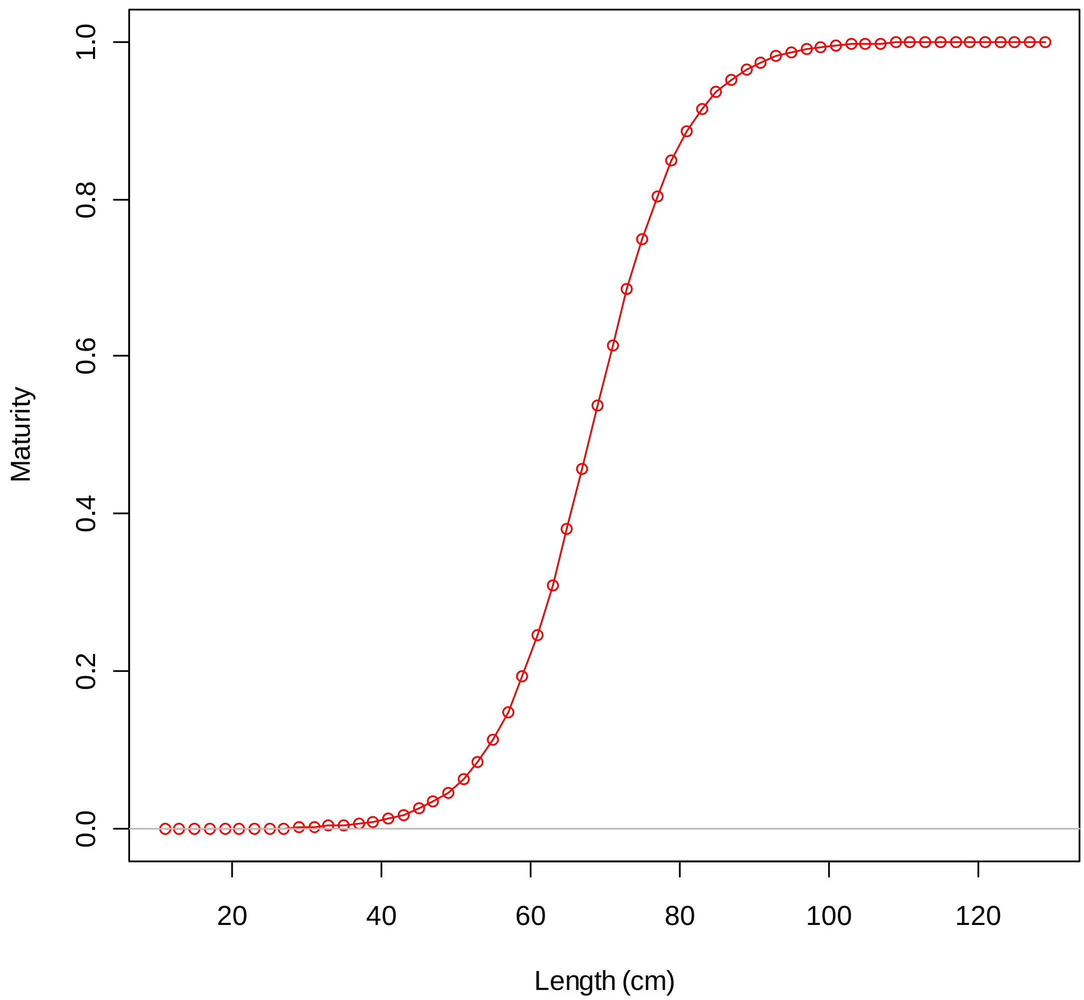


Figure 45. Maturity ogive for female lingcod in Washington/Oregon.

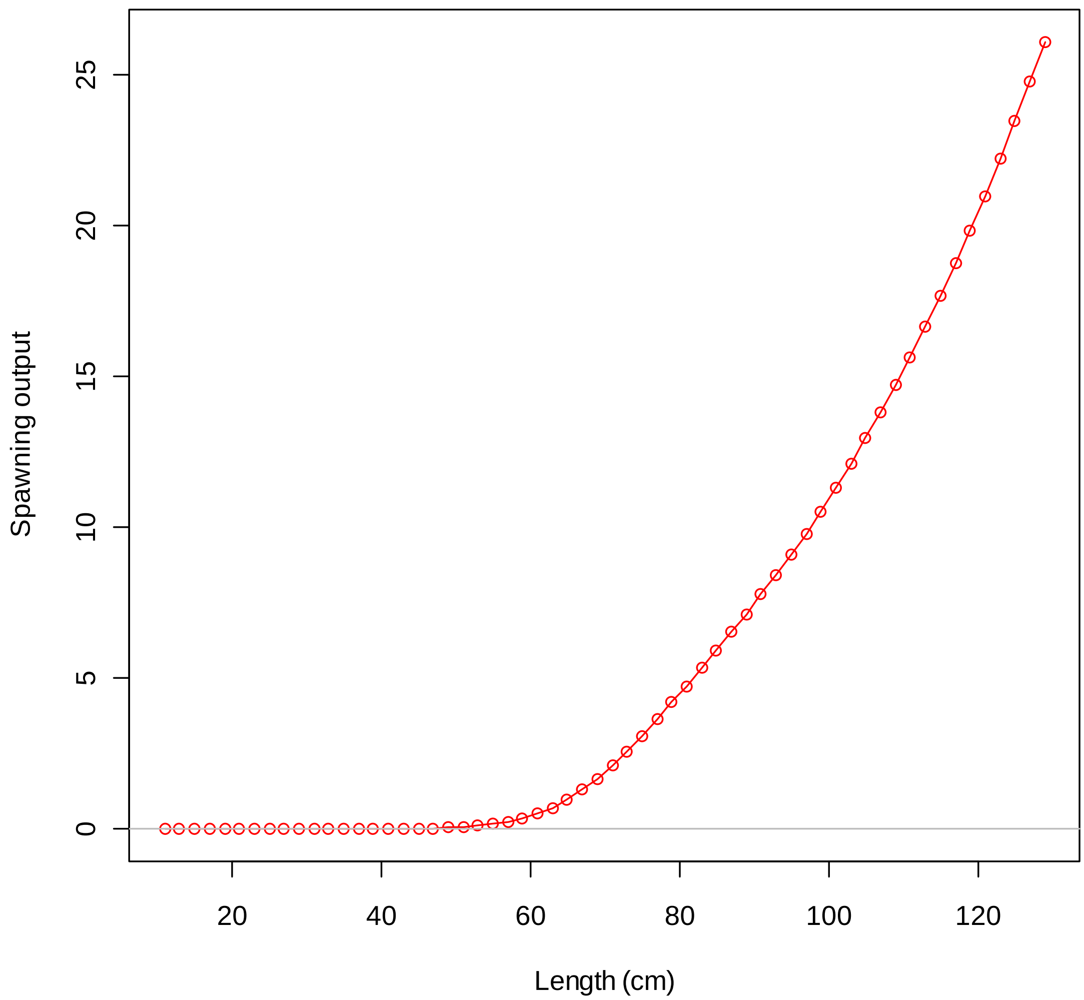


Figure 46. Length to spawning output relationship in Washington/Oregon.

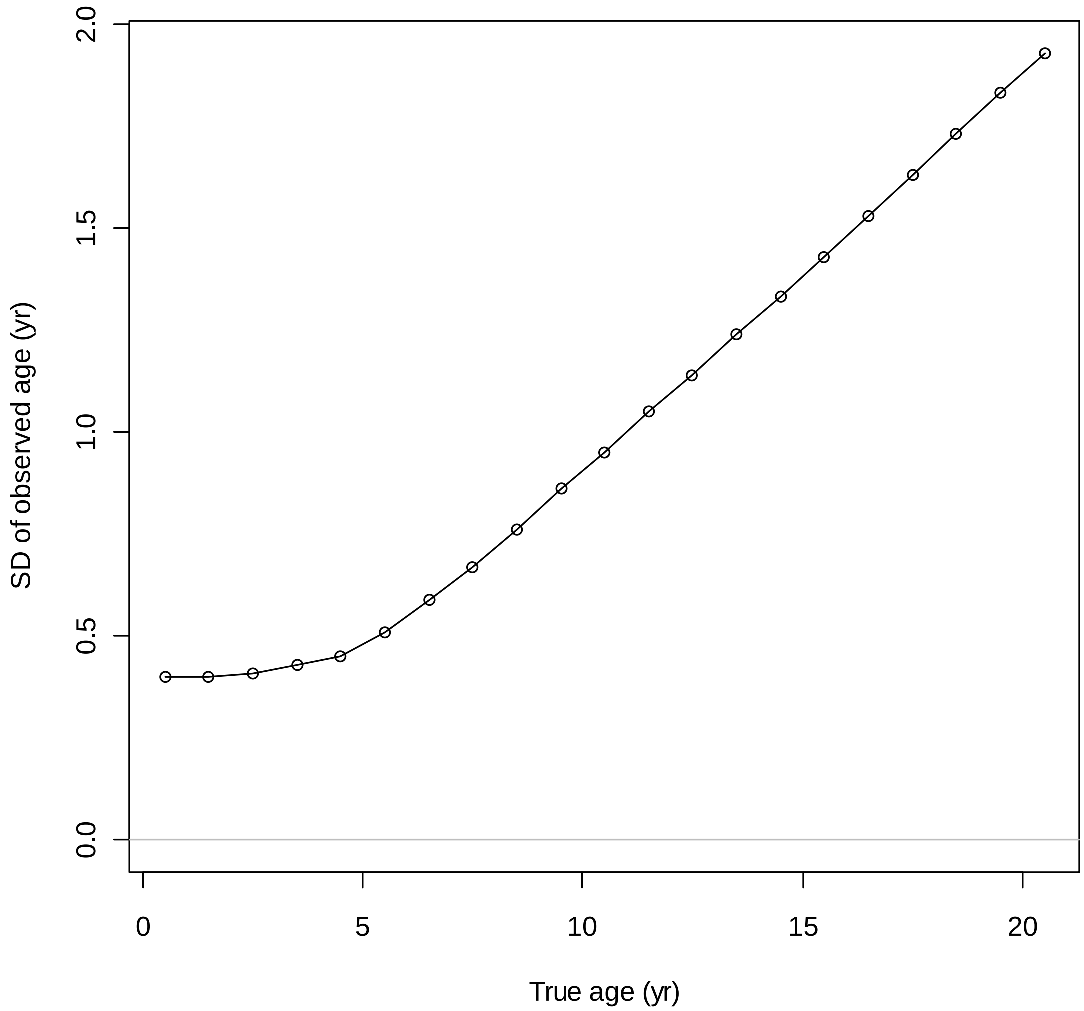


Figure 47. Ageing error assumed for both North and South lingcod assessments (no bias assumed).

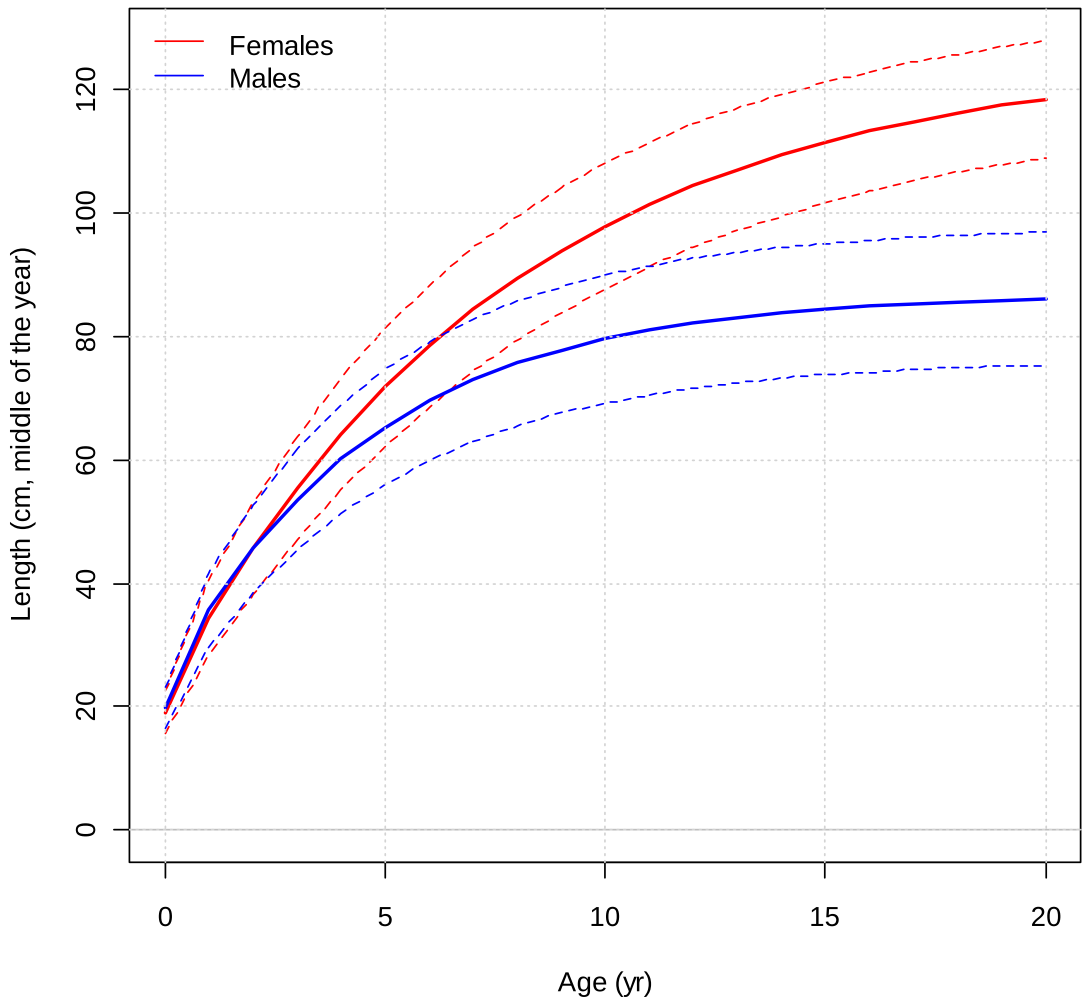


Figure 48. Growth curve for female (upper) and male (lower) lingcod estimated in the Washington/Oregon model.

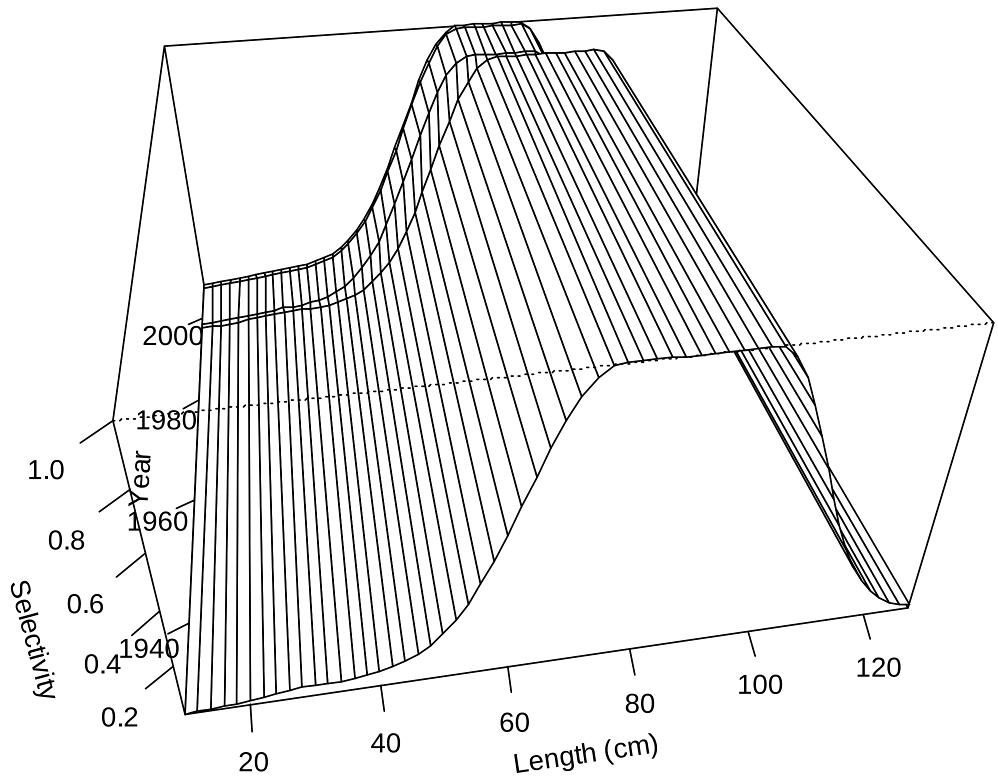


Figure 49. Time varying selectivity for the Washington/Oregon commercial fishery.

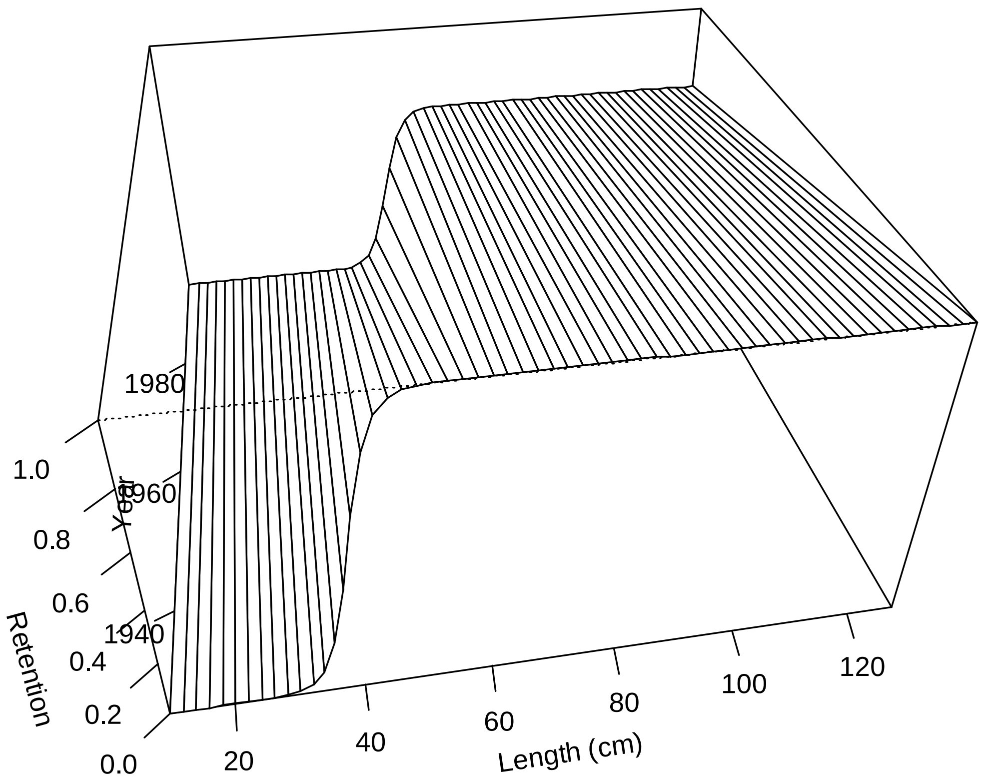


Figure 50. Time varying retention for the Washington/Oregon commercial fishery.

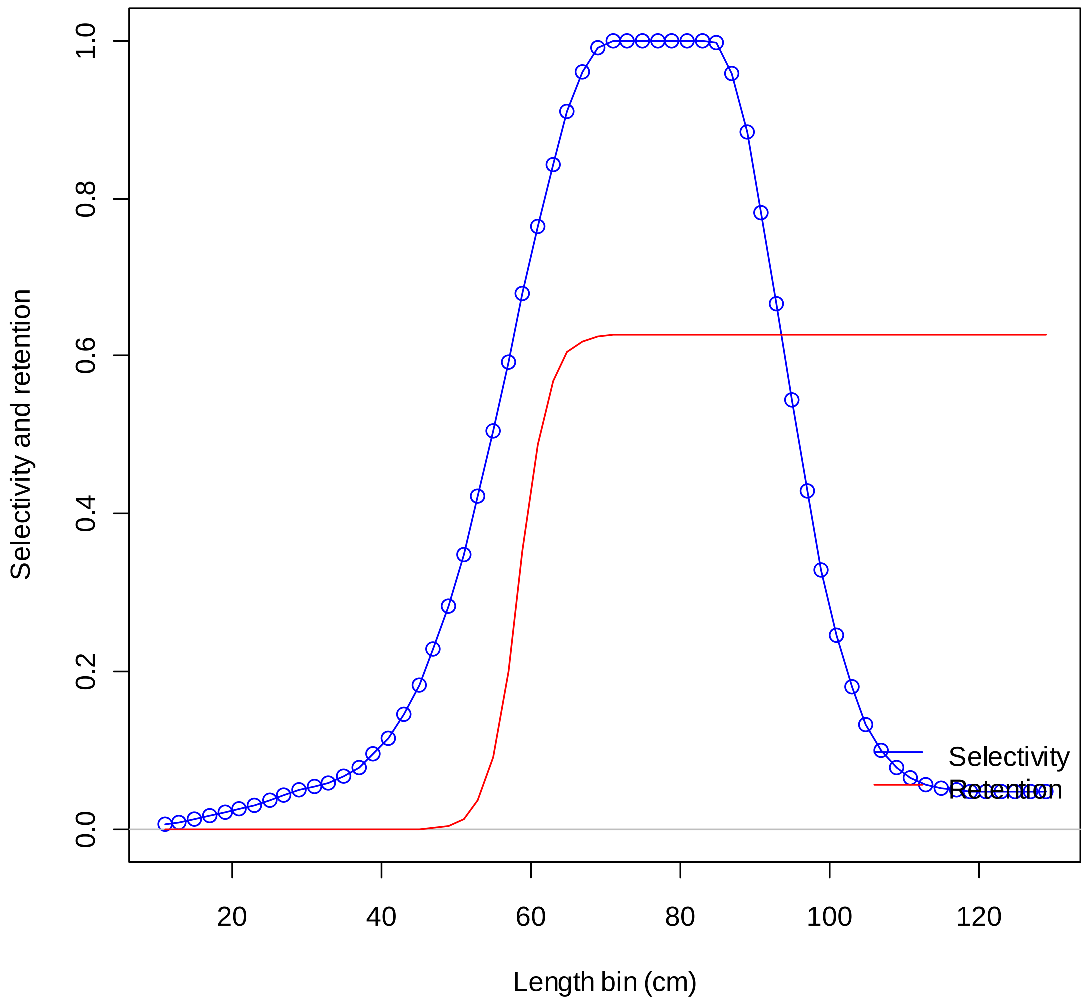


Figure 51. Washington/Oregon 1998-2008 commercial fishery selectivity and retention (as the proportion retained at length).

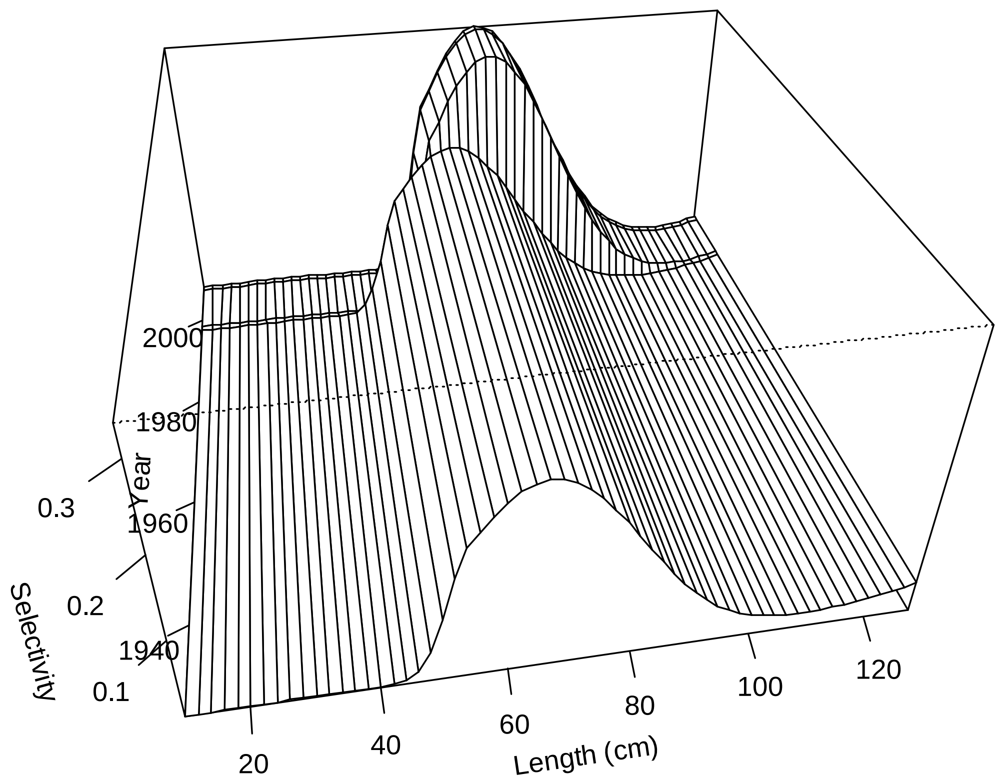


Figure 52. Female time-varying selectivity for the Washington/Oregon recreational fishery. Note the scale is far below 1.0, indicating less selection of females vs. males (at least at peak selectivity).

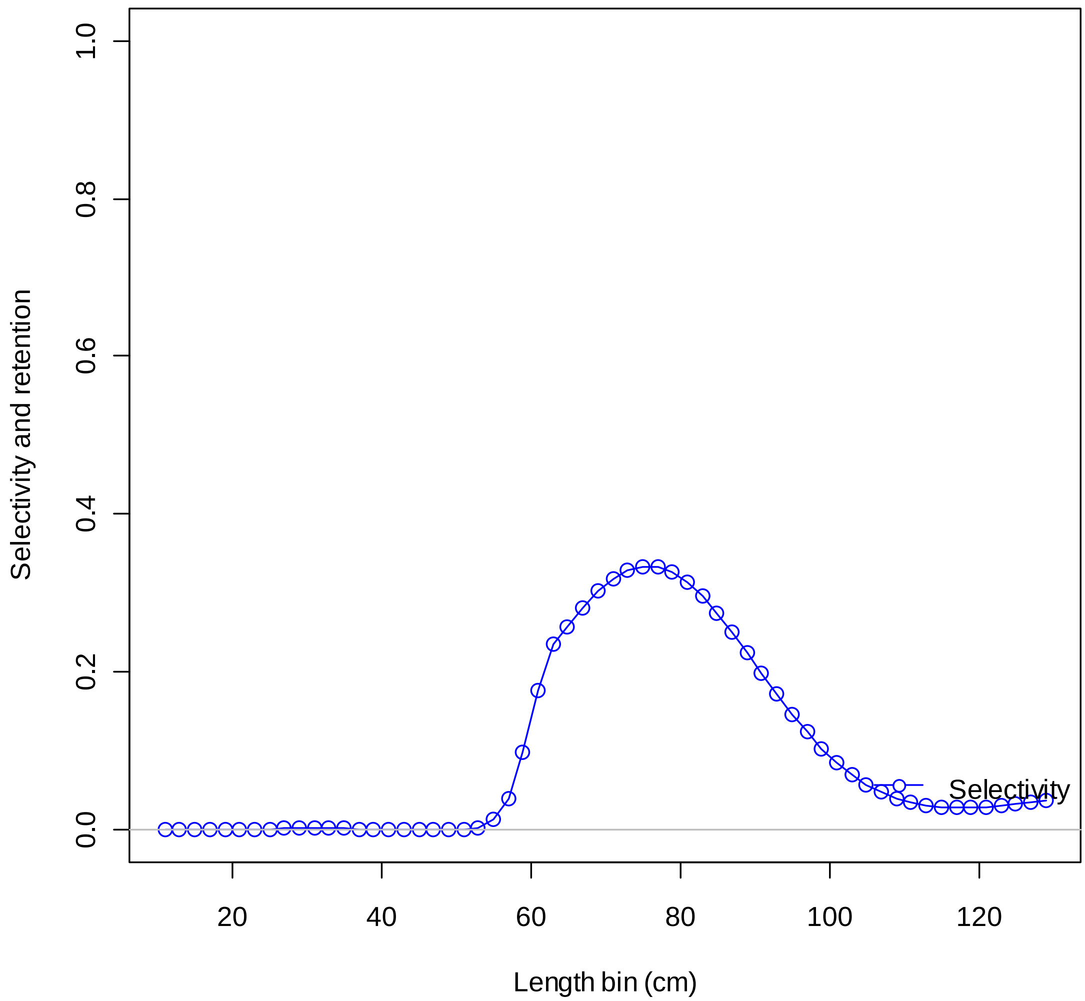


Figure 53. Female ending year selectivity (1998-2008) for the Washington/Oregon recreational fishery.

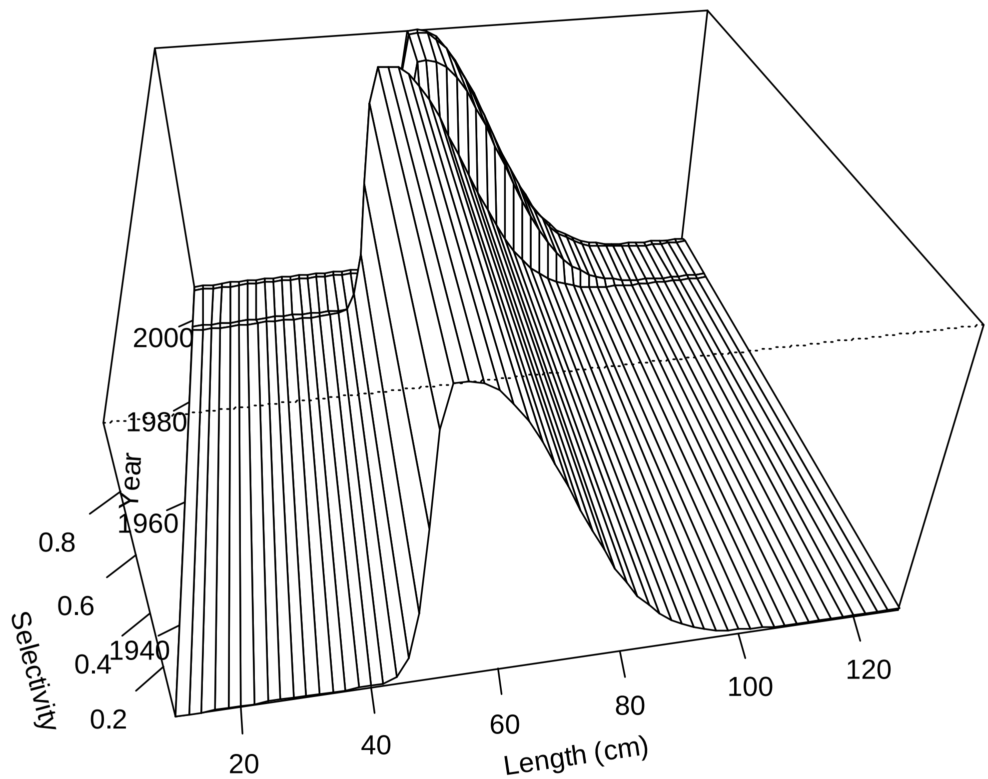


Figure 54. Male time-varying selectivity for the Washington/Oregon recreational fishery.

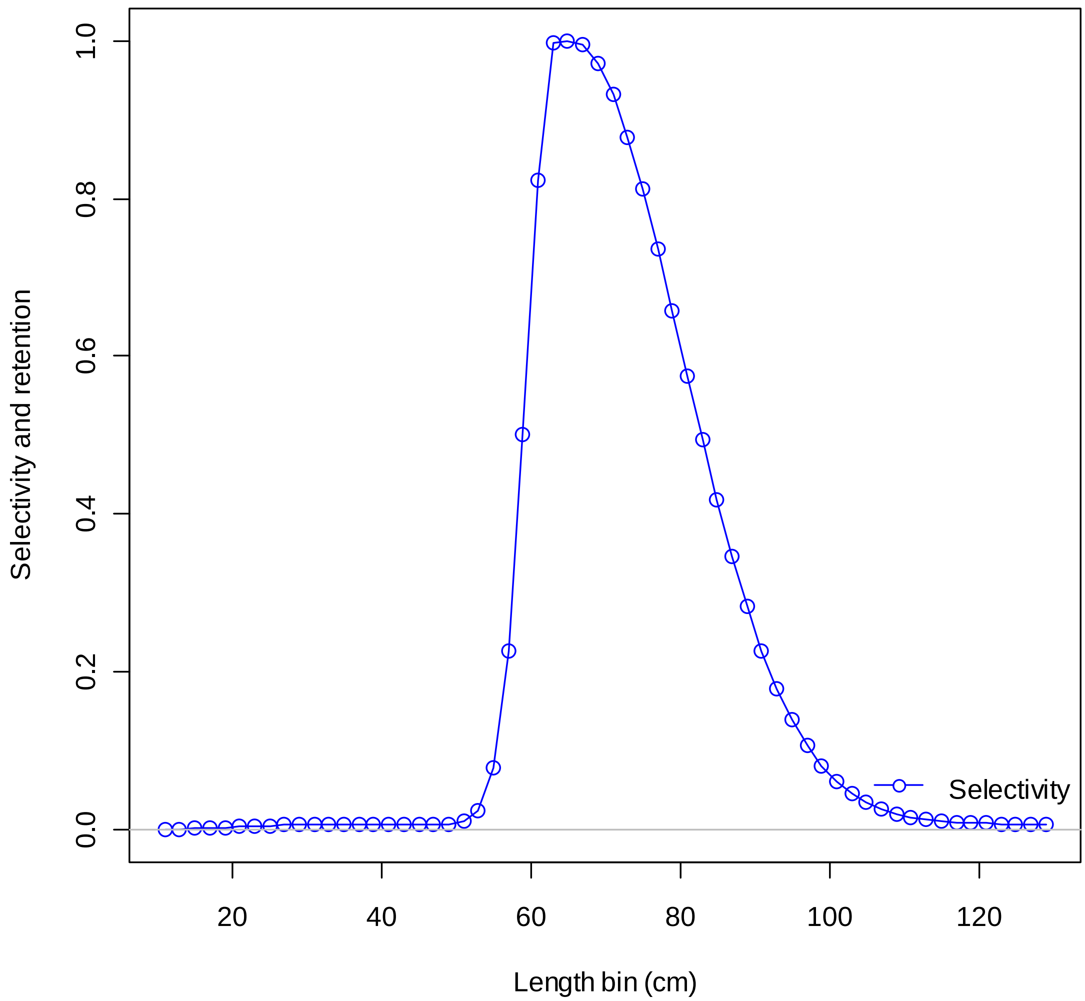


Figure 55. Male ending years selectivity (1998-2008) for the Washington/Oregon recreational fishery.

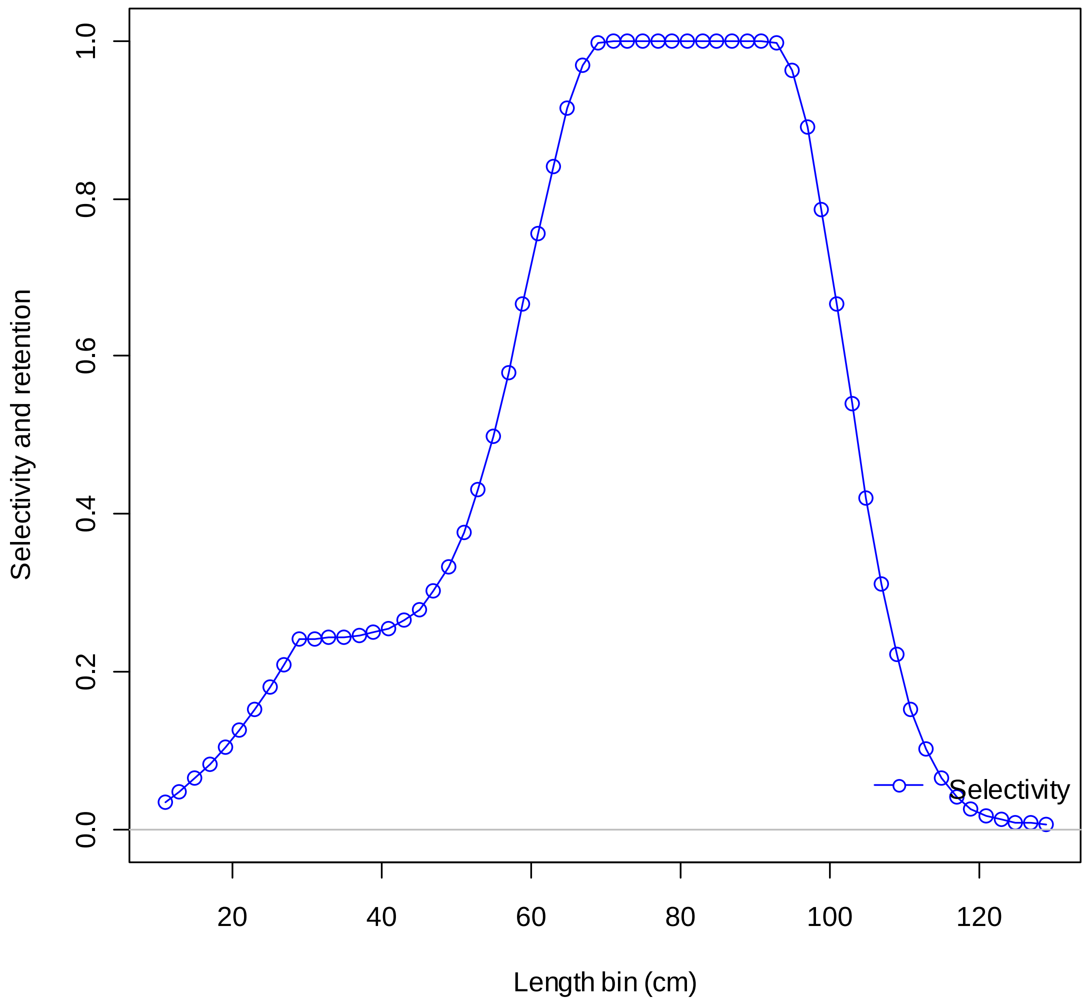


Figure 56. Triennial survey selectivity for the Washington/Oregon assessment.

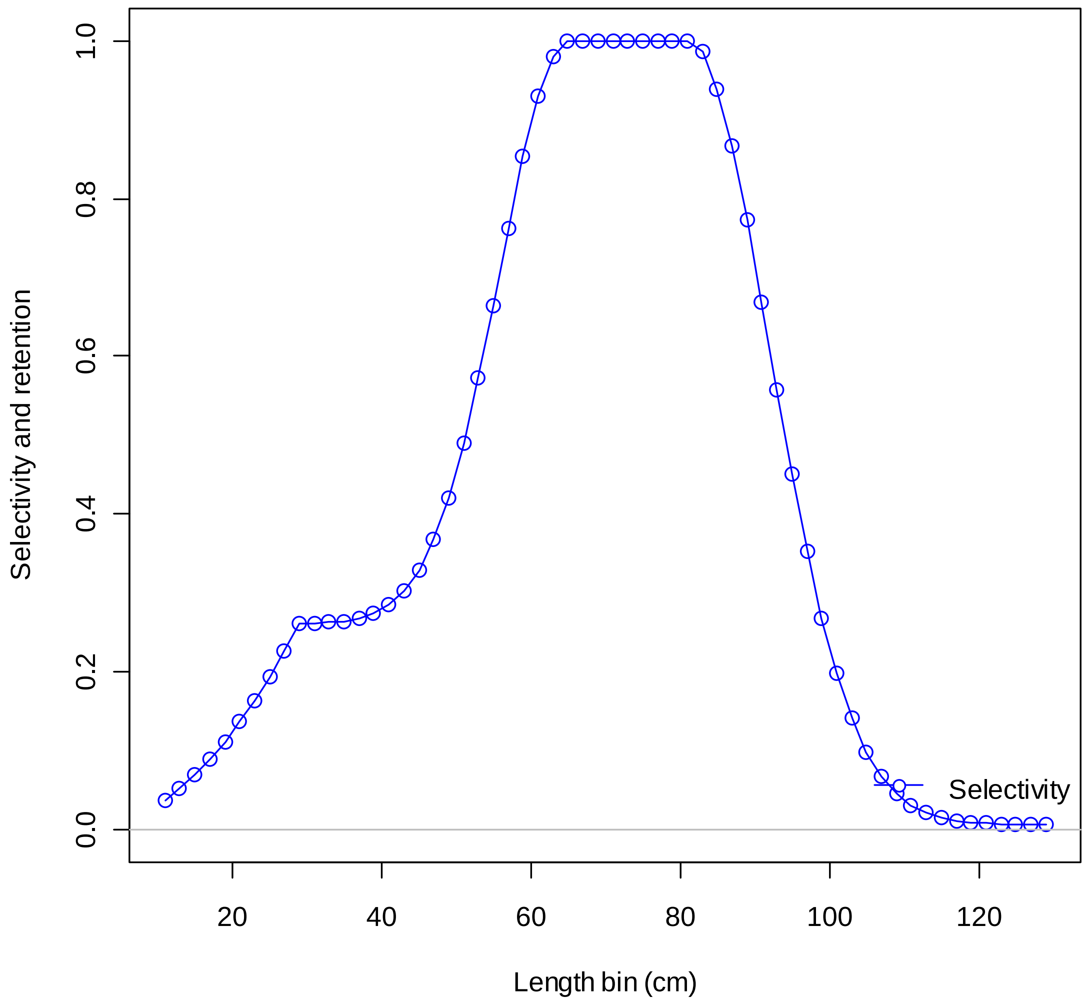


Figure 57. NWFSC survey selectivity for the Washington/Oregon assessment.

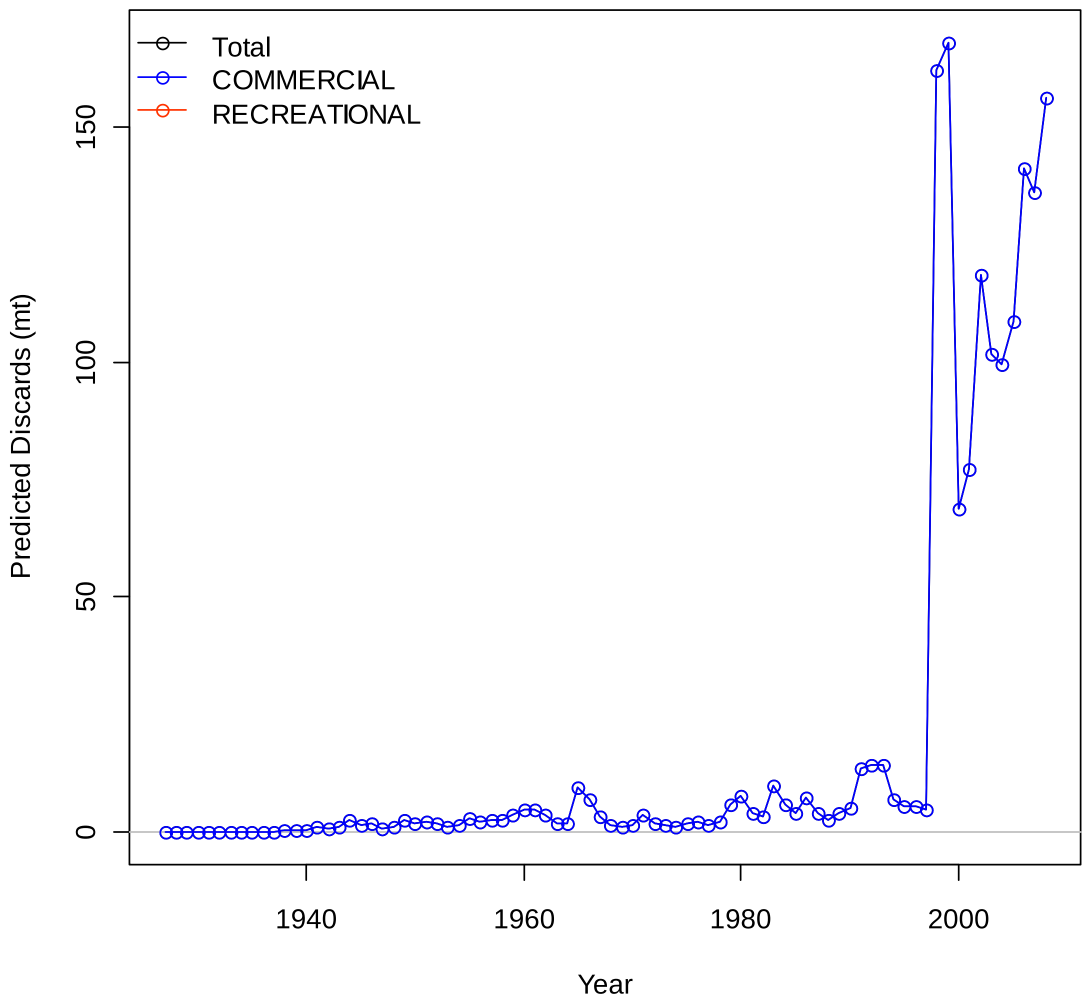


Figure 58. Time series of estimated discard mortalities from Washington/Oregon assessment.

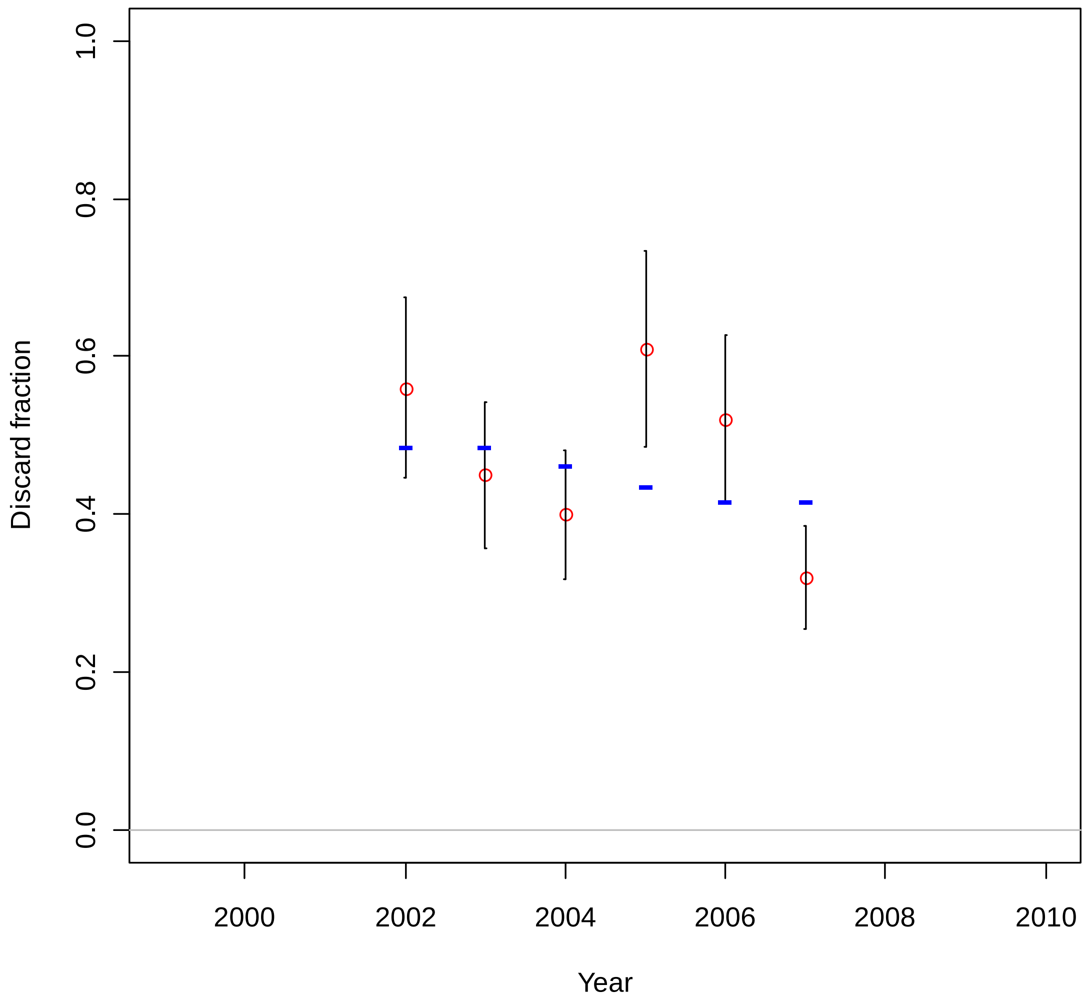


Figure 59. Fit to discard fraction data for Washington/Oregon.

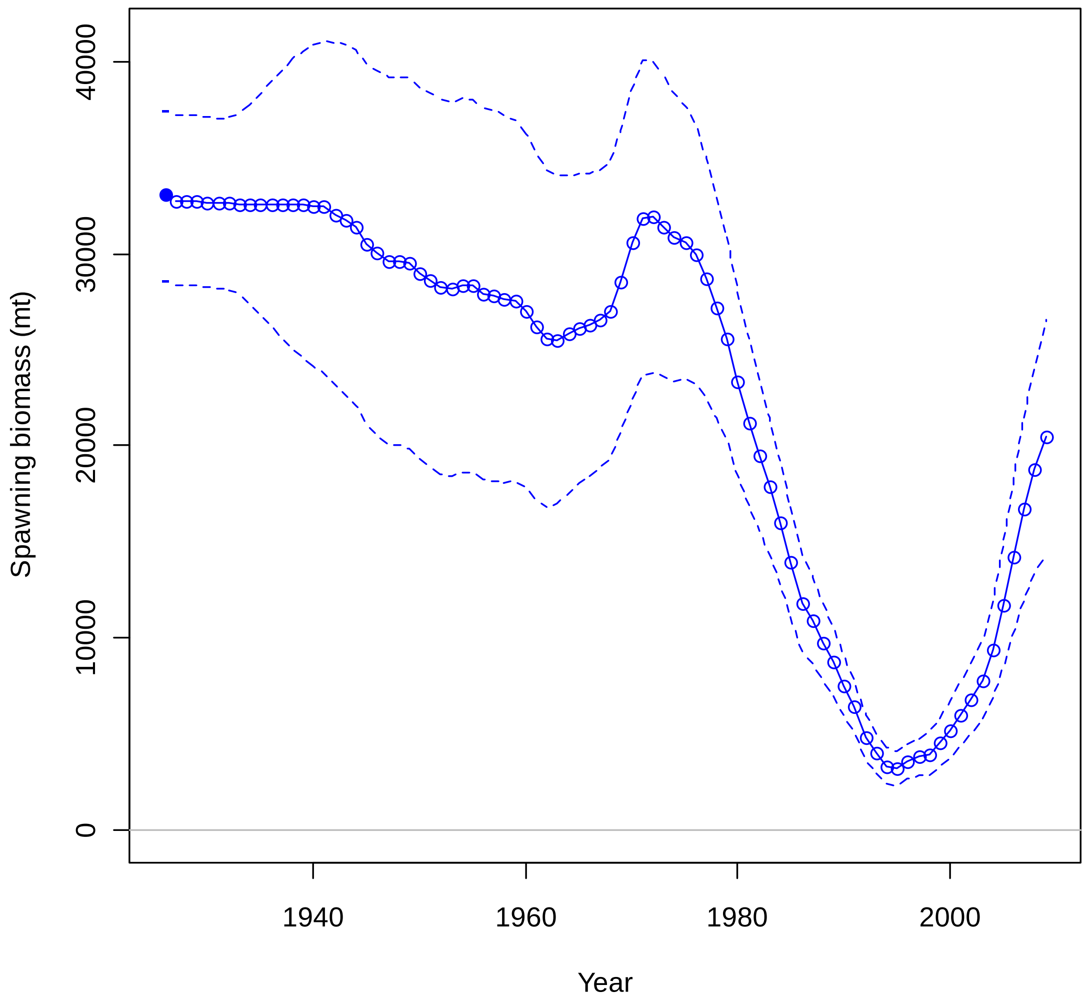


Figure 60. Time series of summary (2+) biomass for Washington/Oregon.

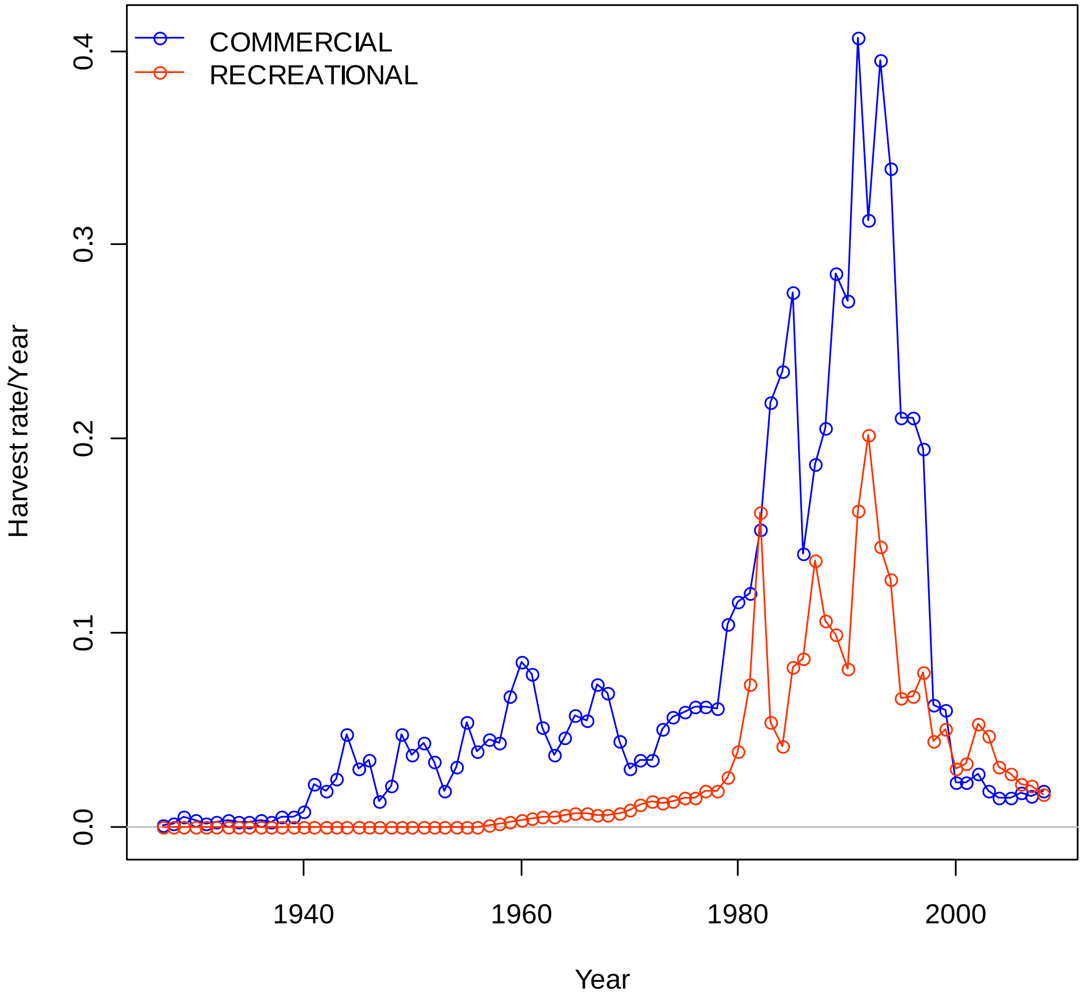


Figure 61. Time series of exploitation rate (catch/summary biomass) for Washington/Oregon.

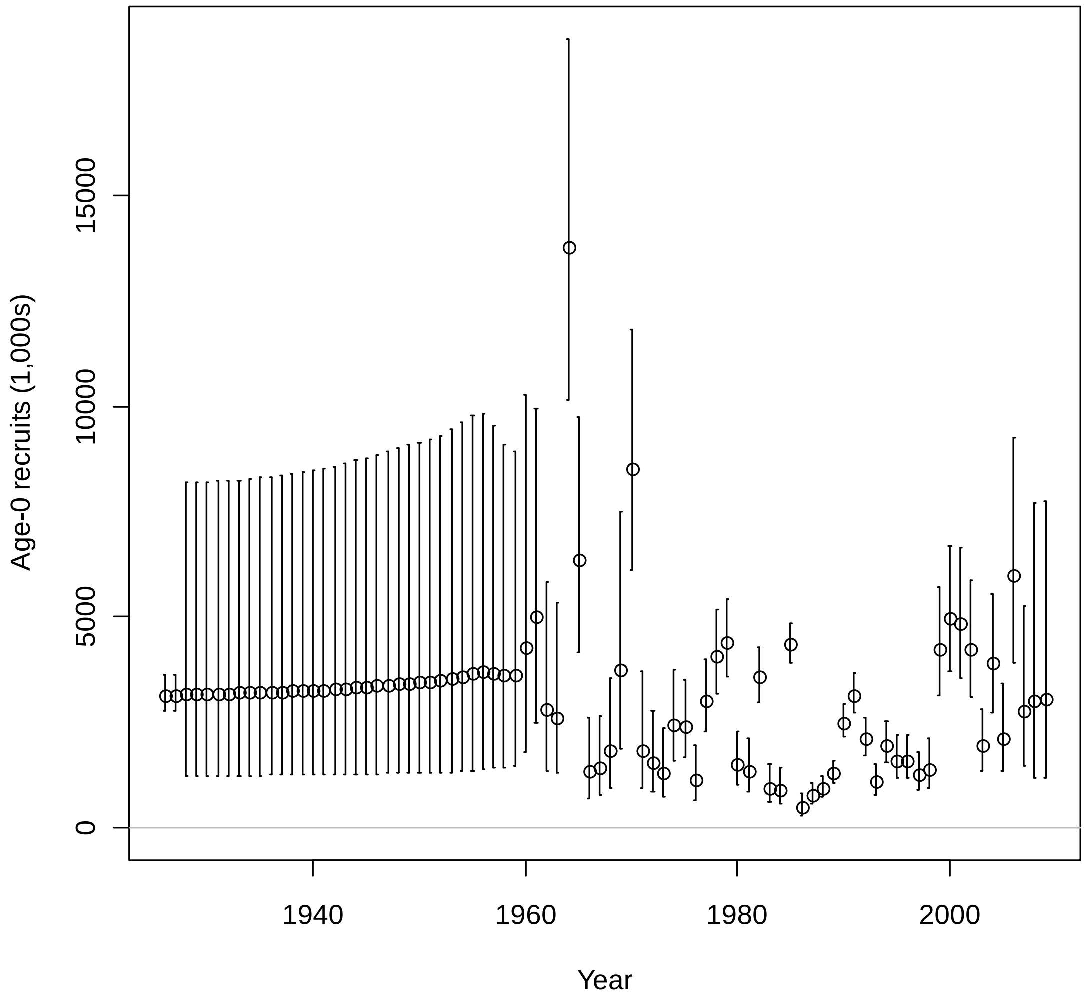


Figure 62. Time series of recruitment for Washington/Oregon.

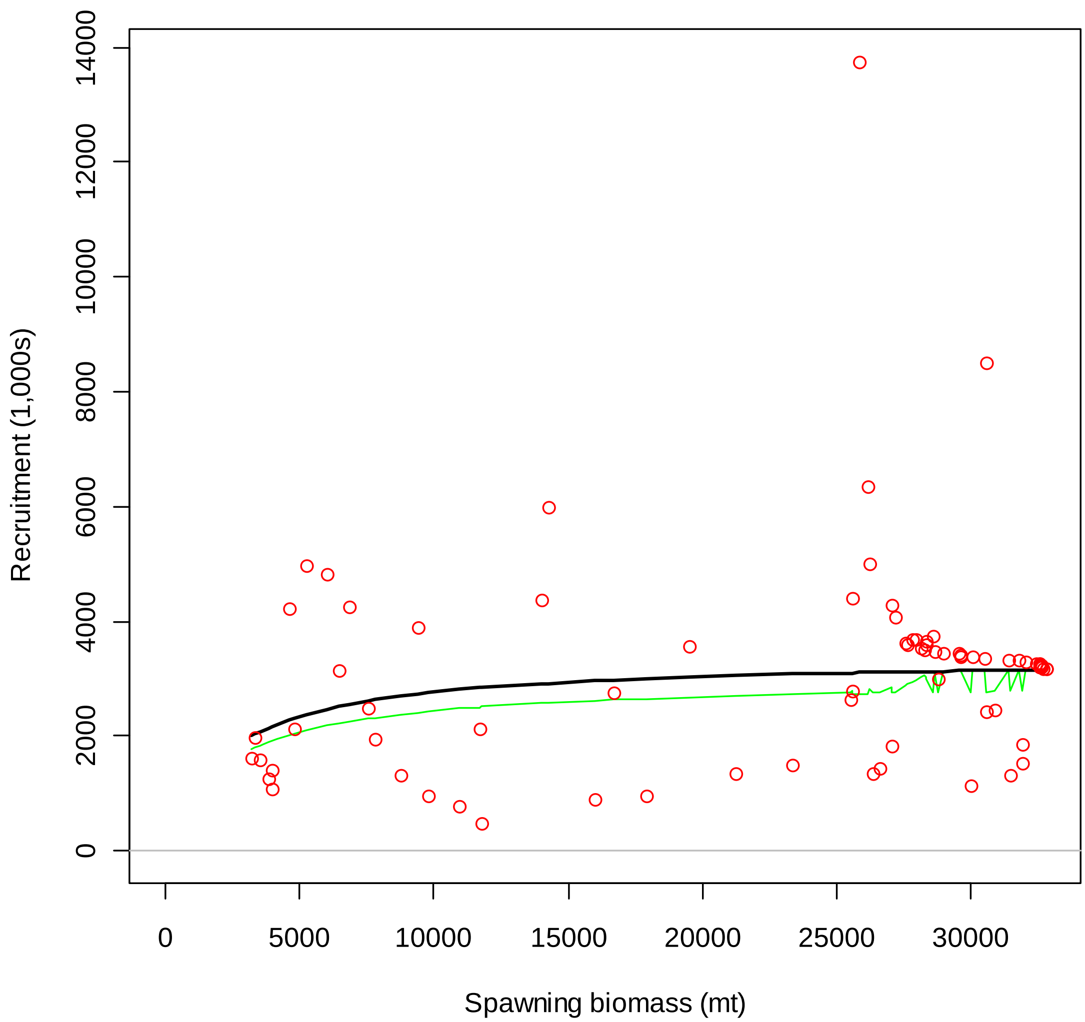


Figure 63. Fit to stock-recruitment relationship for Washington/Oregon.

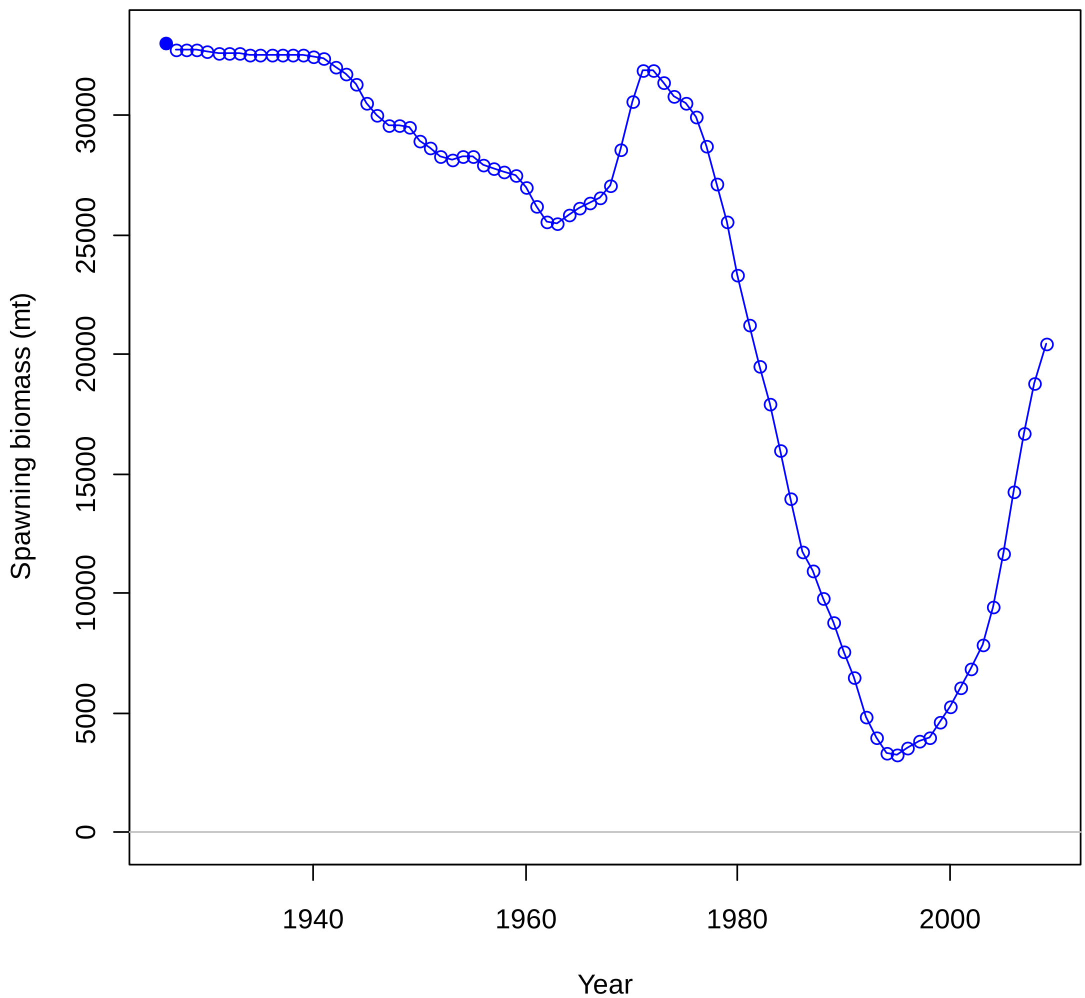


Figure 64. Time series of spawning biomass for Washington/Oregon.

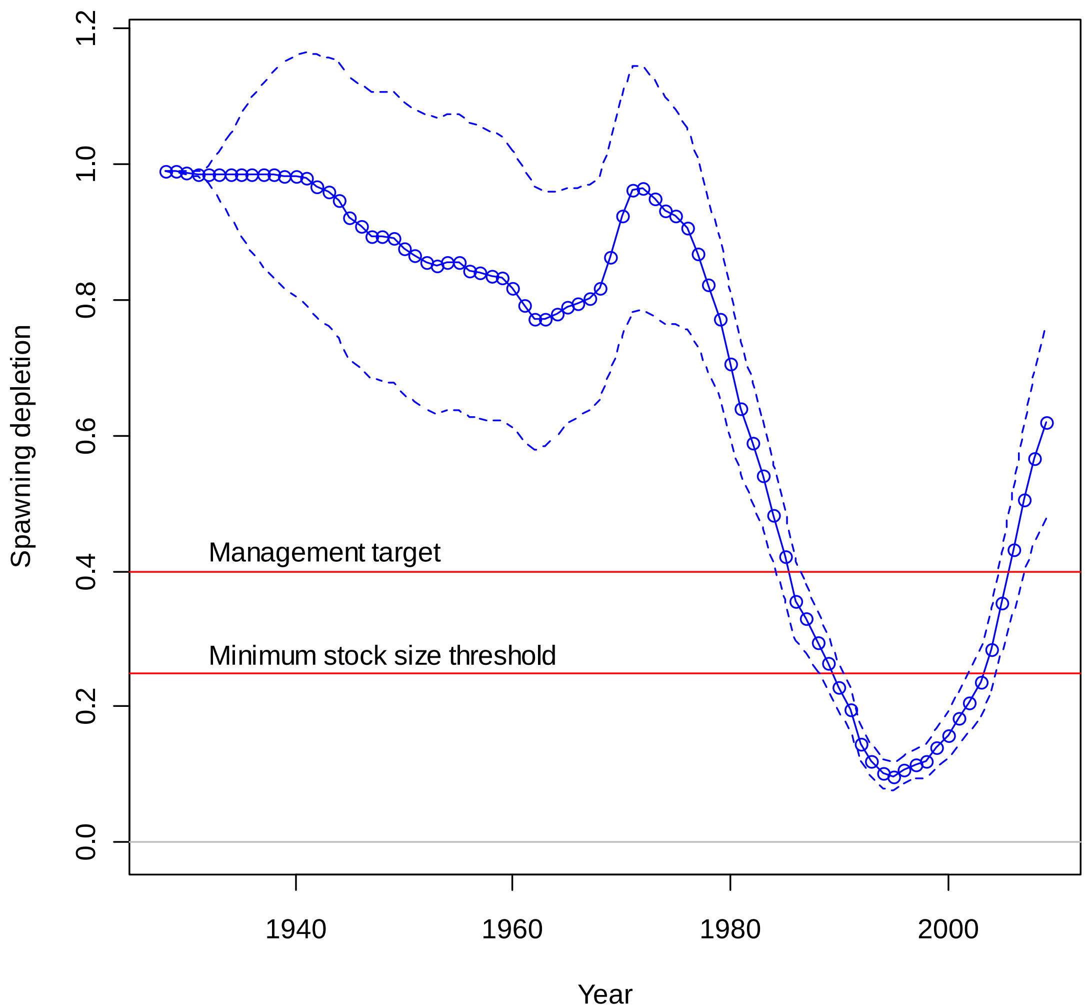


Figure 65. Time series of spawning depletion for Washington/Oregon.

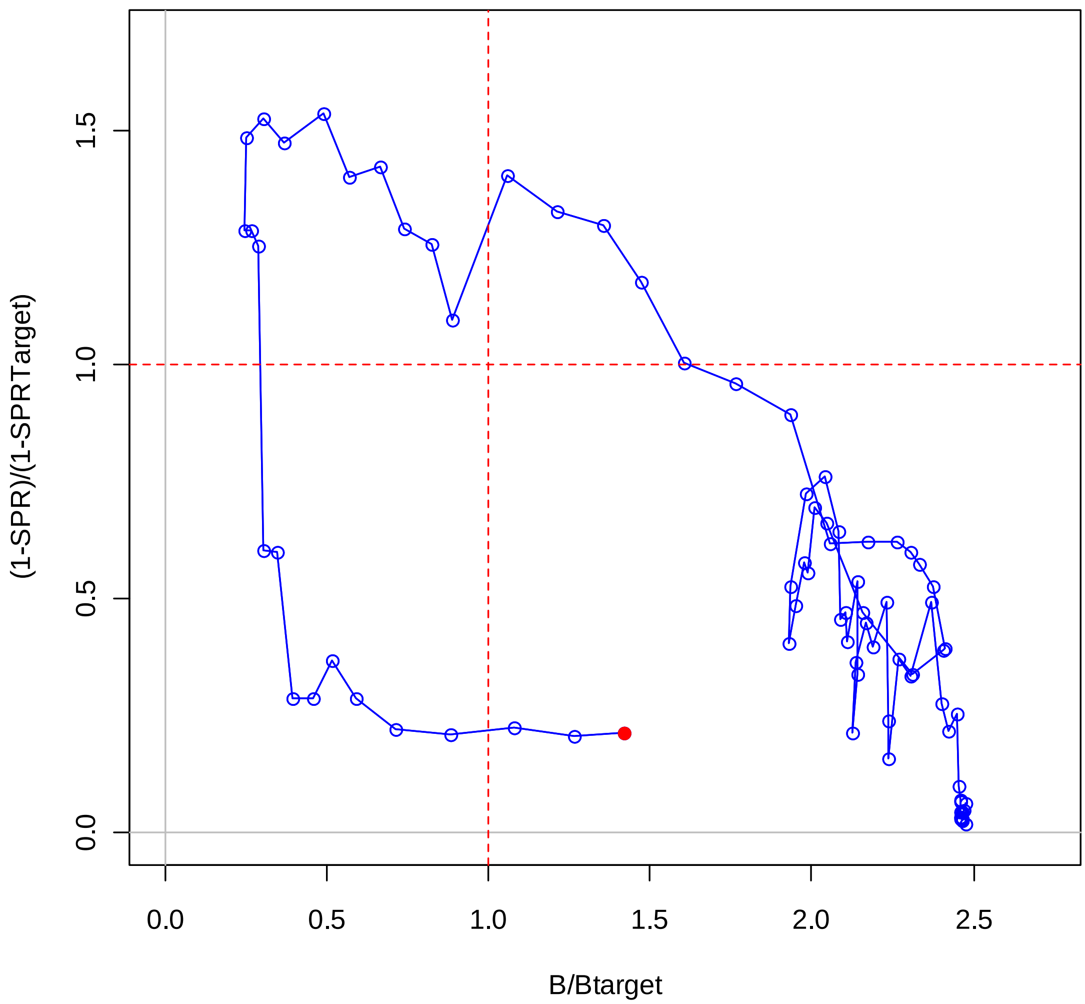


Figure 66. Time series of relative harvest rate (1-SPR) vs. relative spawning biomass.

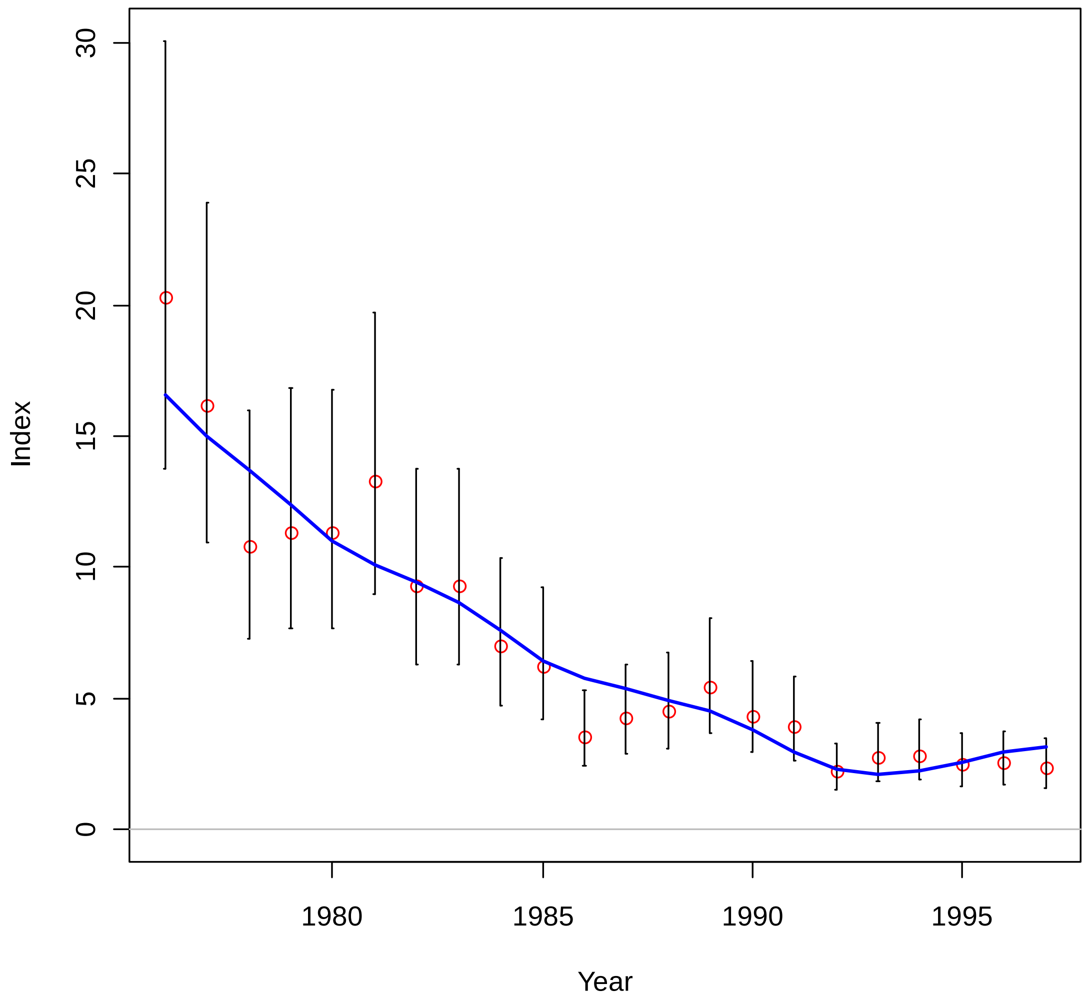


Figure 67. North model fit to commercial CPUE index.

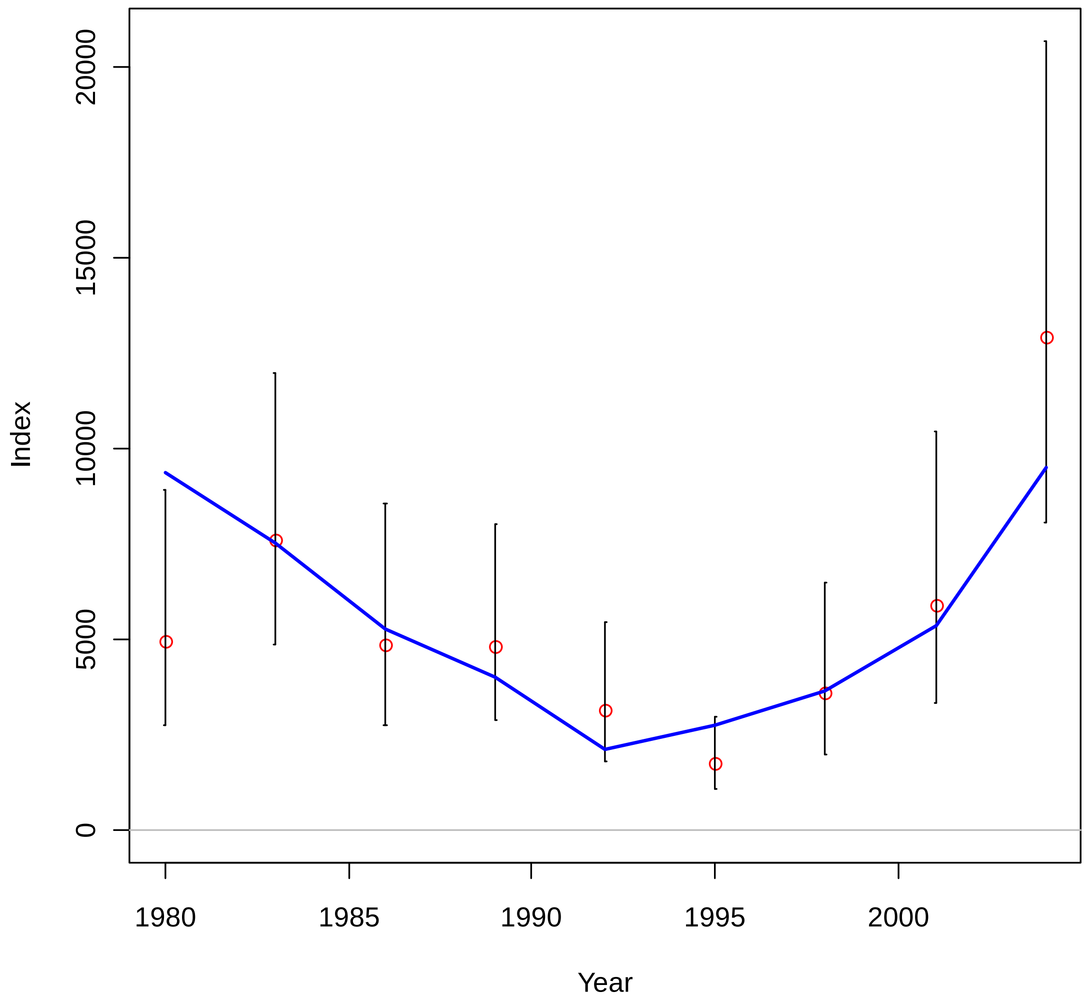


Figure 68. Washington/Oregon model fit to Triennial survey index.

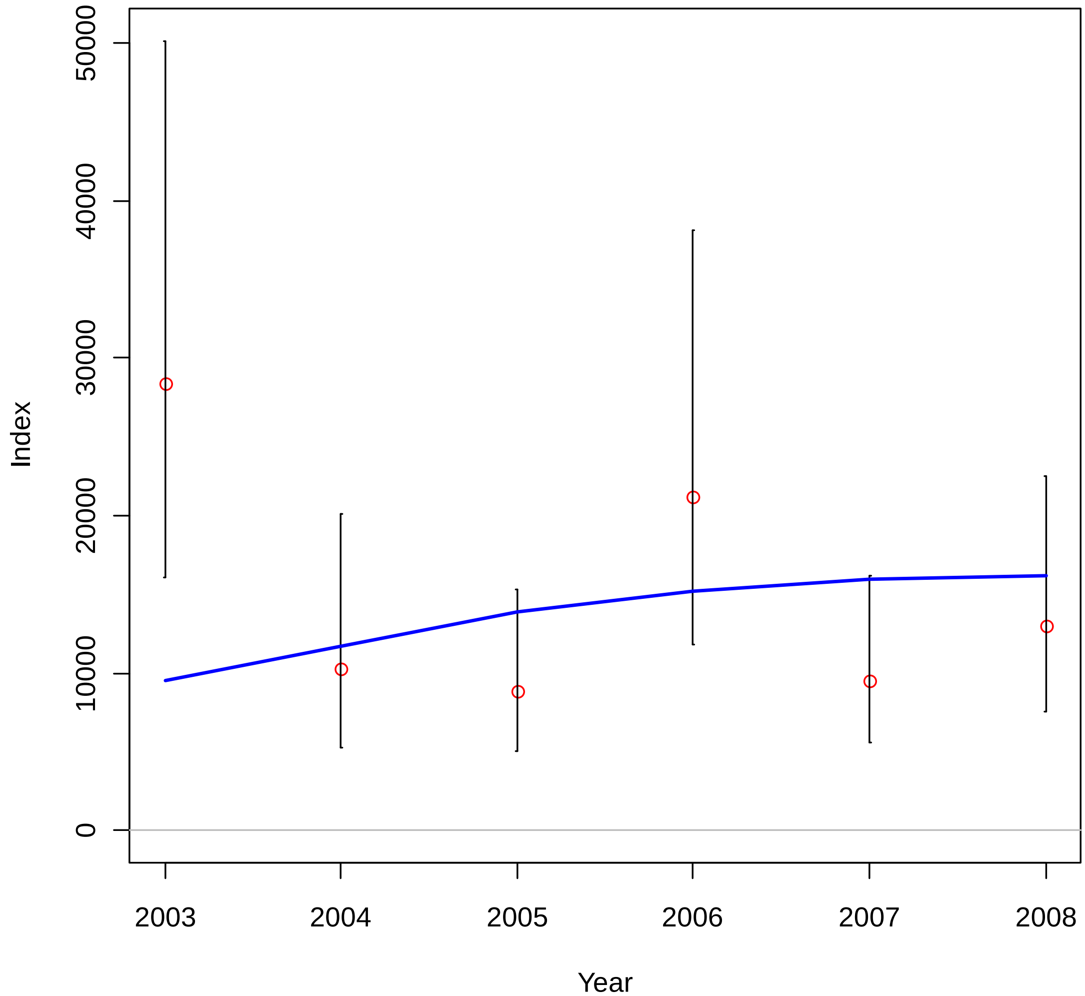


Figure 69. Washington/Oregon model fit to NWFSC survey index.

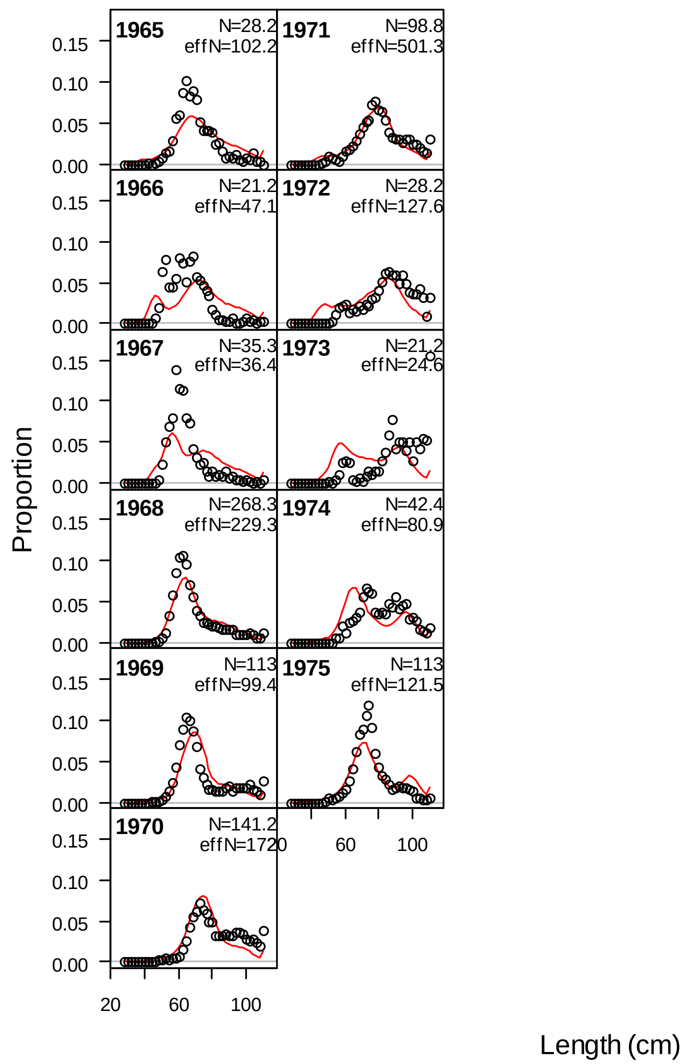


Figure 70. Model fits to commercial retained combined-sex length compositions for Washington/Oregon for 1965-1975.

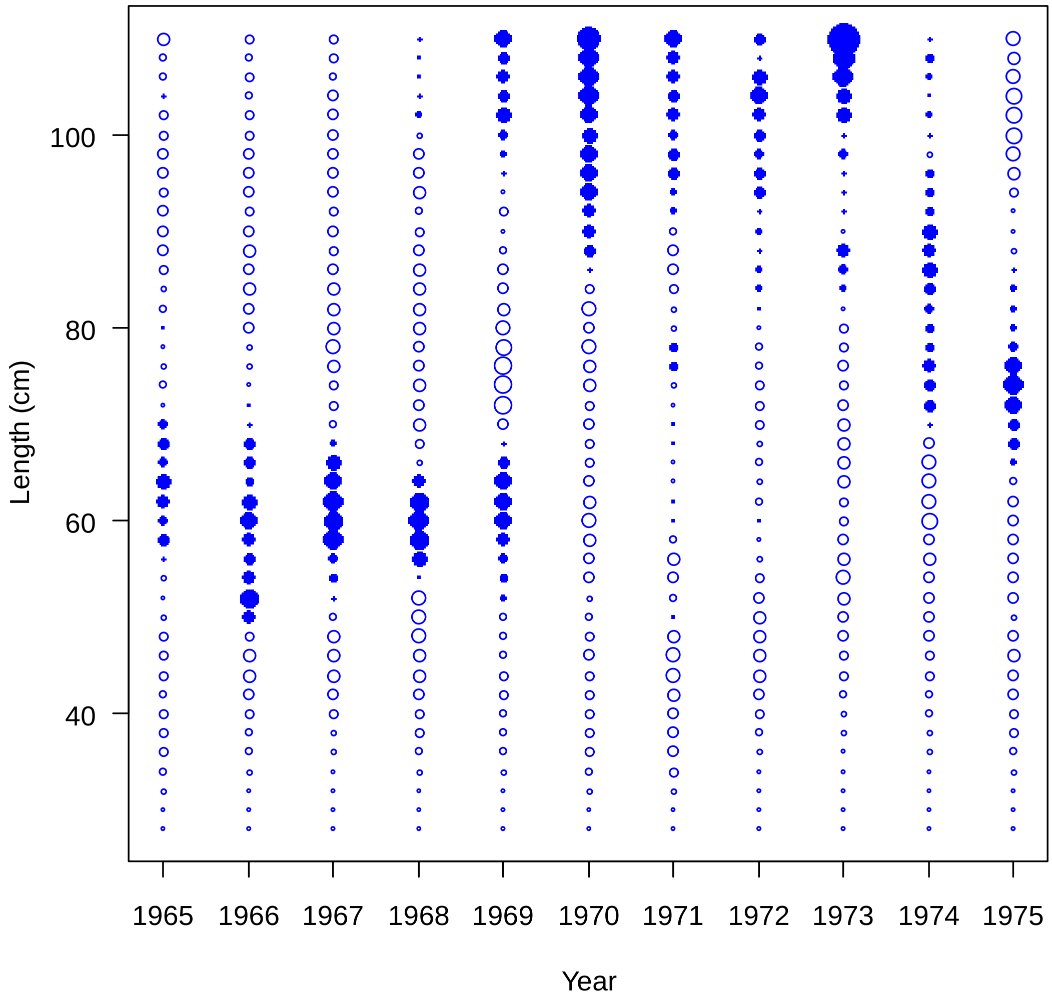


Figure 71. Pearson residuals for fits to commercial retained combined-sex length compositions for Washington/Oregon (max = 5.35) for 1965-1975.

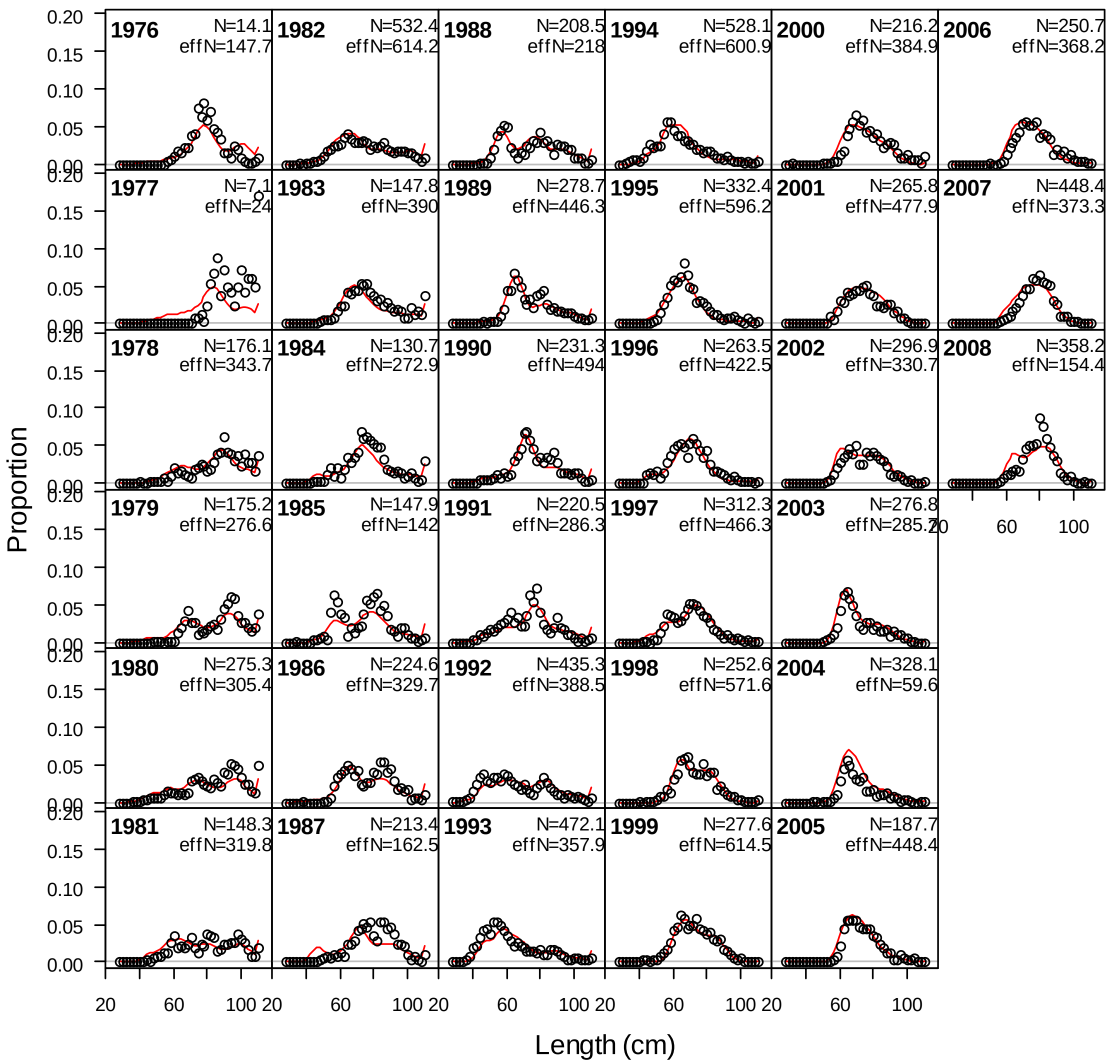


Figure 72. Fits to commercial retained female length compositions for Washington/Oregon for 1976-2008.

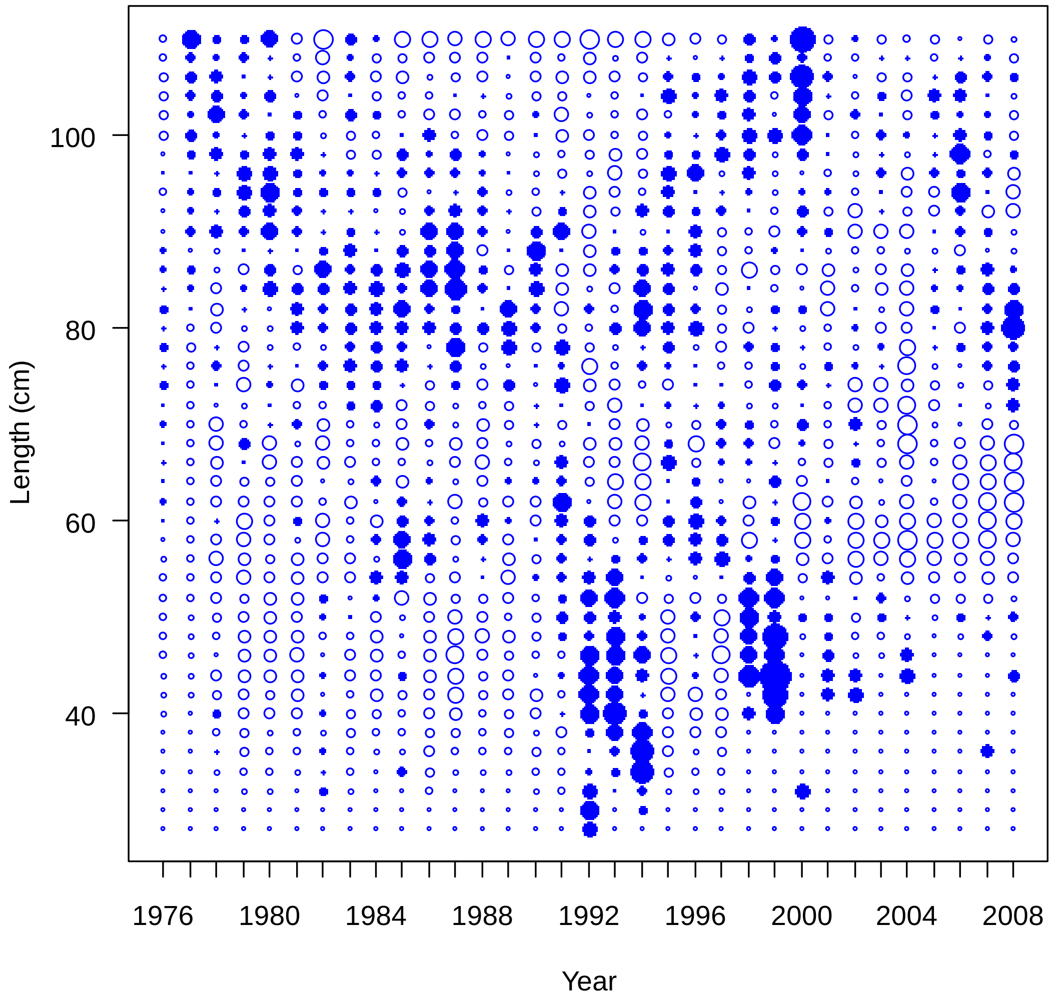


Figure 73. Pearson residuals for fits to commercial retained female length compositions for Washington/Oregon (max = 6.58) for 1976-2008.

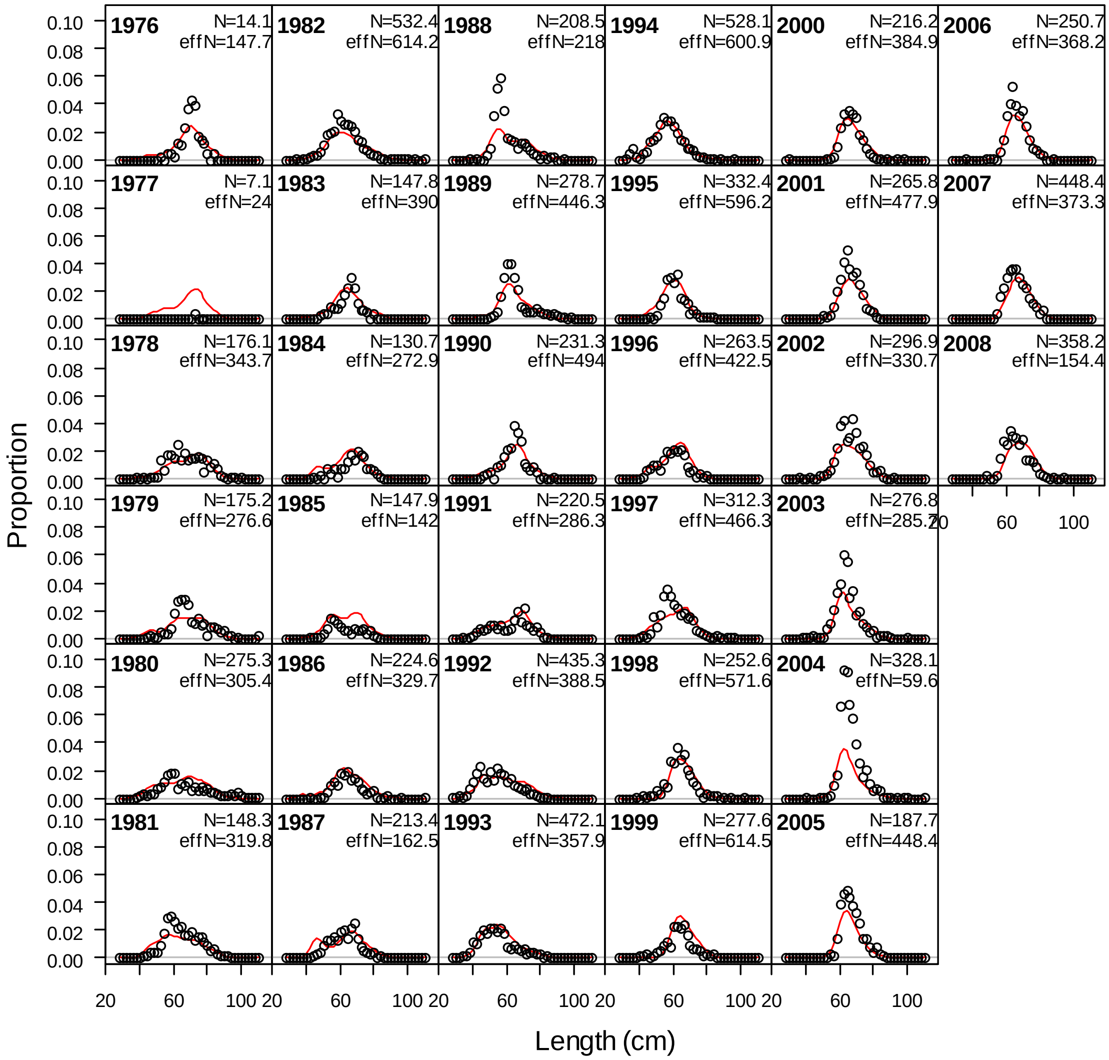


Figure 74. Fits to commercial retained male length compositions for Washington/Oregon for 1976-2008.

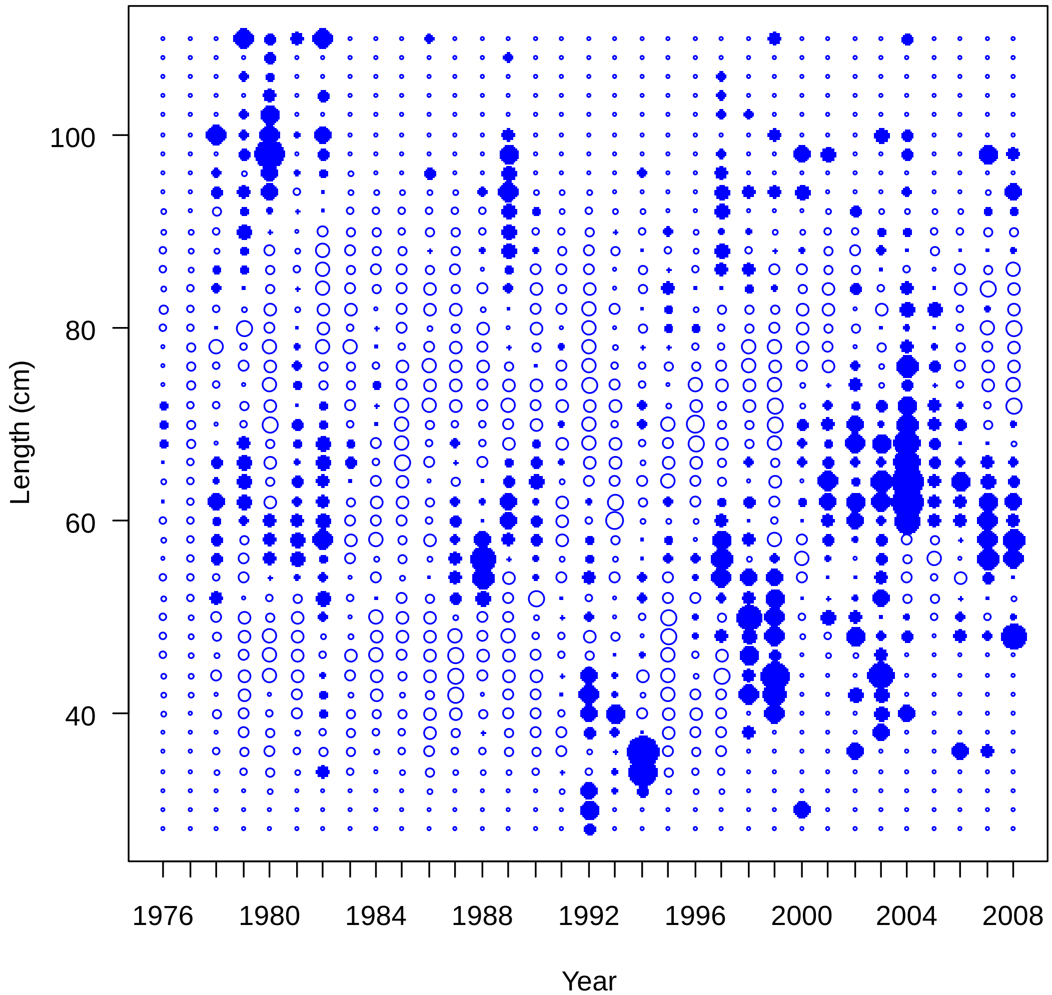


Figure 75. Pearson residuals for fits to commercial retained male length compositions for Washington/Oregon (max = 5.71) for 1976-2008.

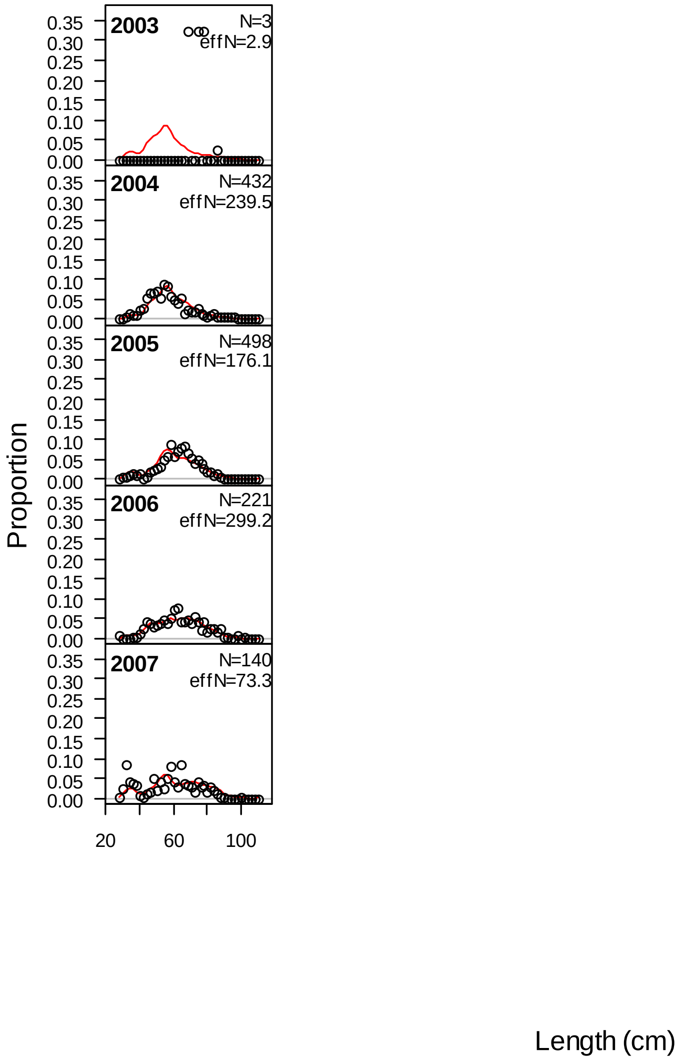


Figure 76. Fits to commercial discarded combined-sex length compositions for Washington/Oregon for 2003-2007.

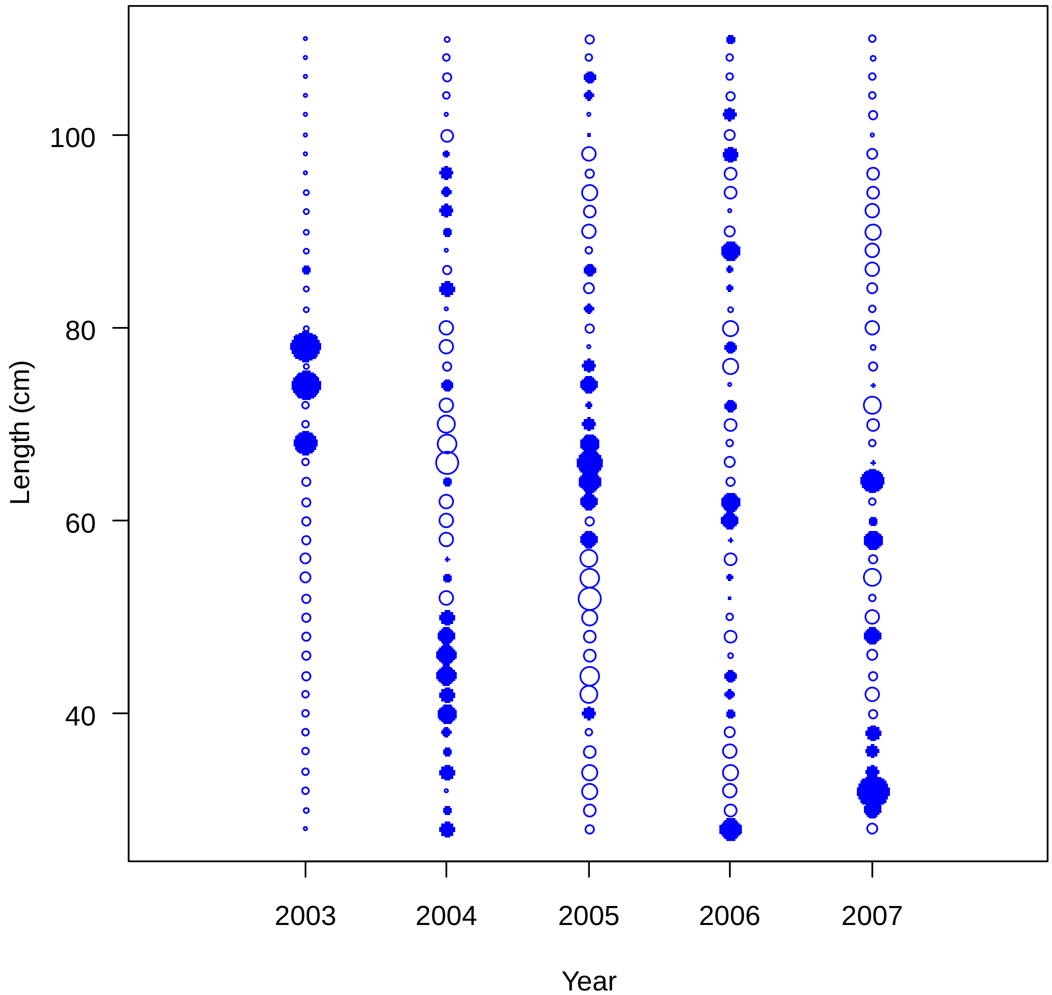


Figure 77. Pearson residuals for fits to commercial discarded combined-sex length compositions for Washington/Oregon (max = 5.72) for 2003-2007.

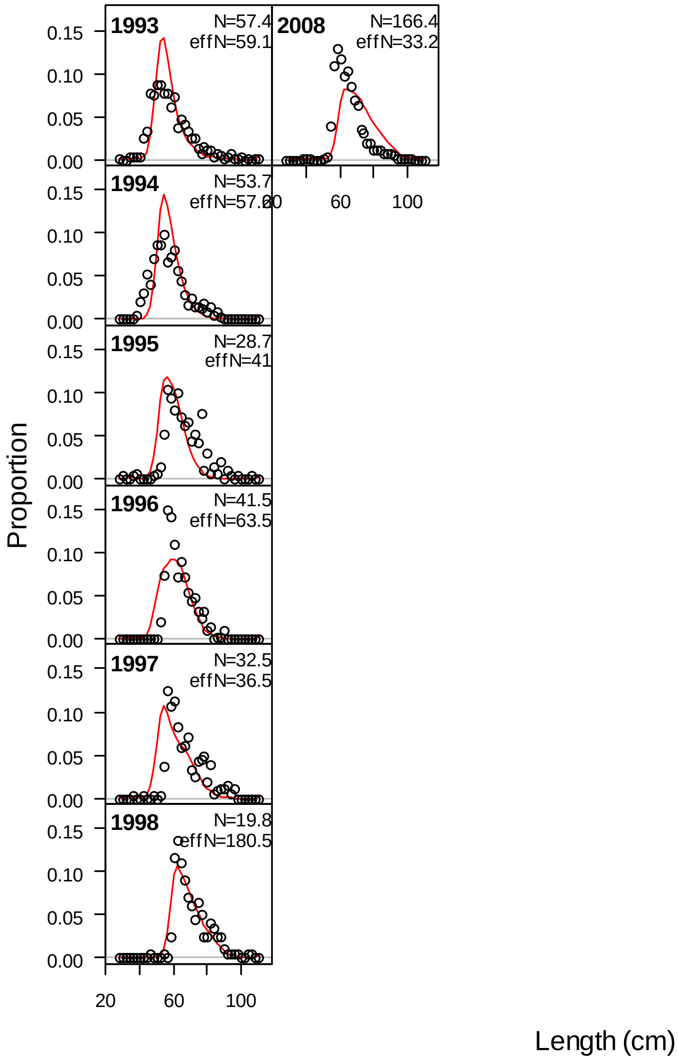


Figure 78. Fits to recreational combined-sex length compositions for Washington/Oregon.

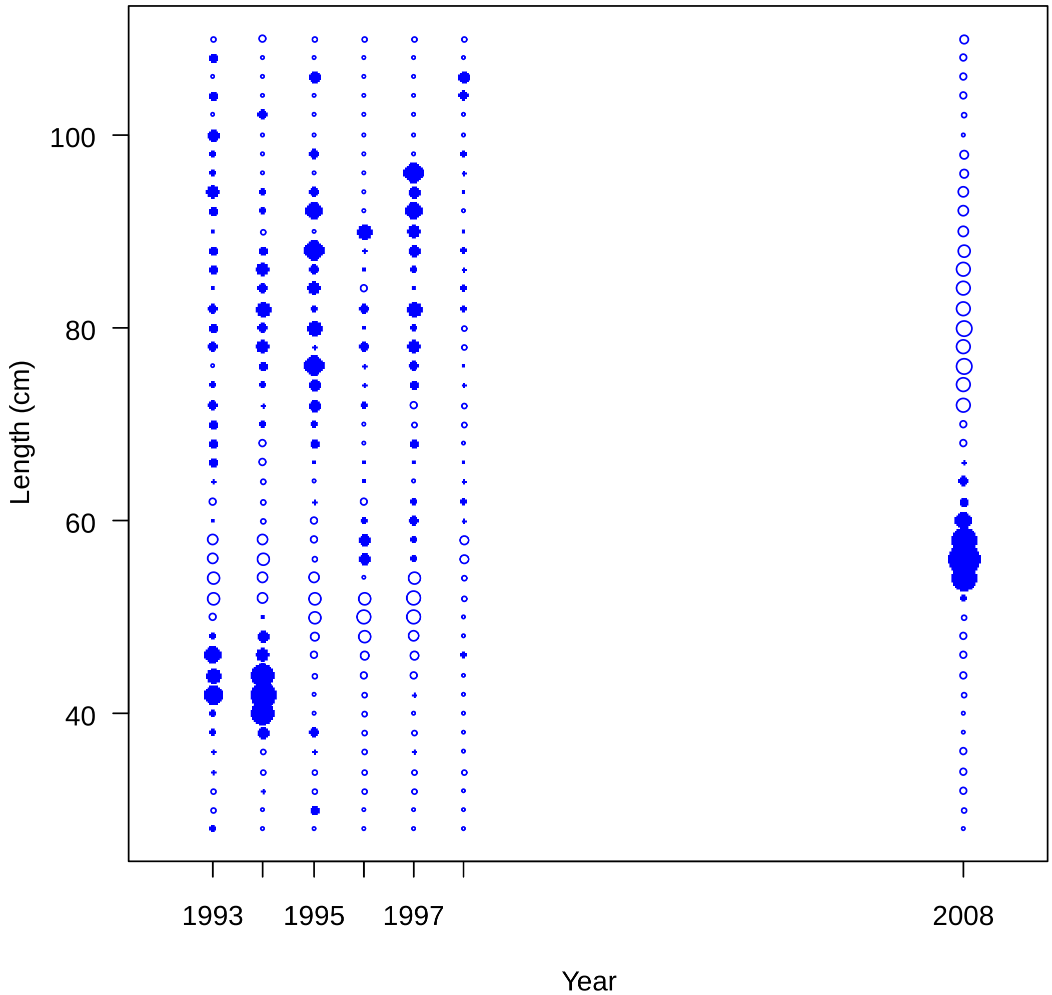


Figure 79. Pearson residuals for fits to commercial discarded combined-sex length compositions for Washington/Oregon (max = 9.1).

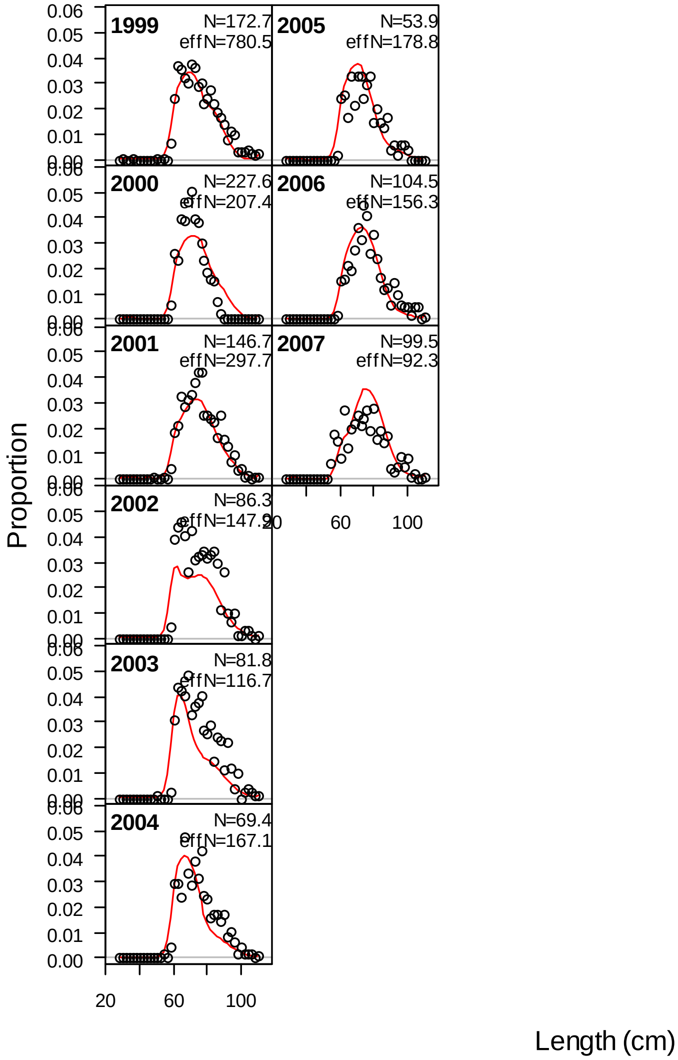


Figure 80. Fits to recreational female length compositions for Washington/Oregon.

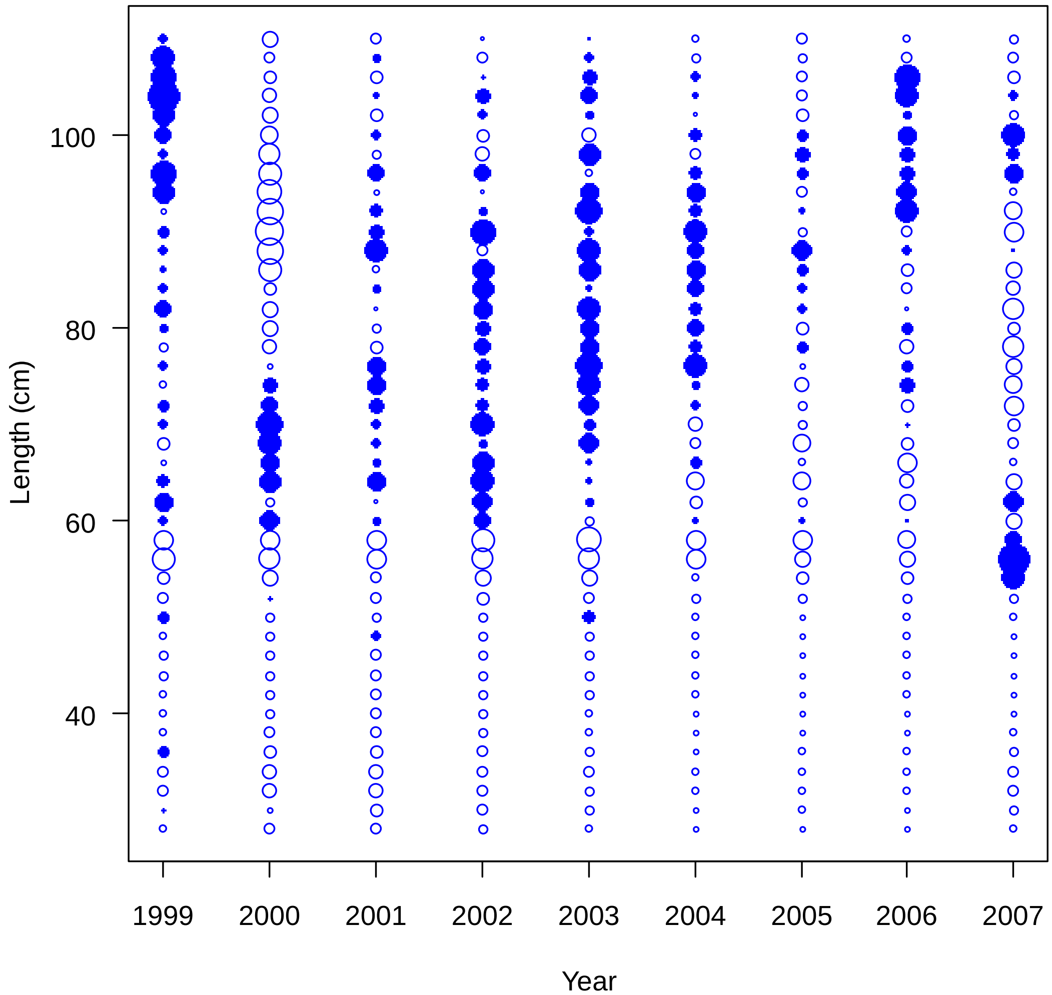


Figure 81. Pearson residuals for fits to recreational female length compositions for Washington/Oregon (max = 2.14).

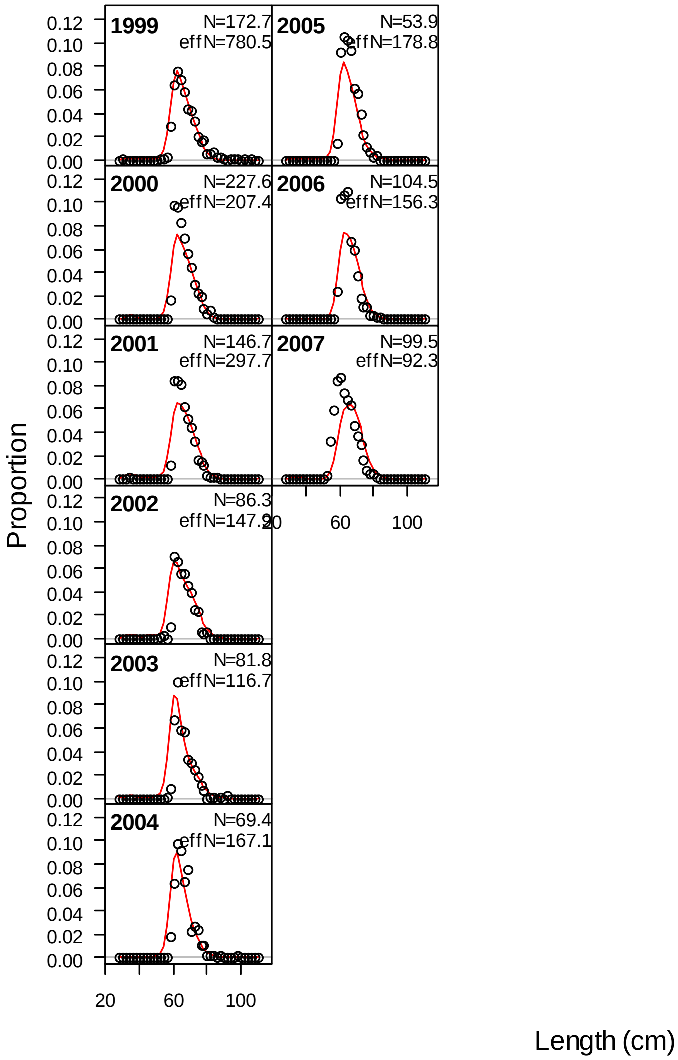


Figure 82. Fits to recreational male length compositions for Washington/Oregon.

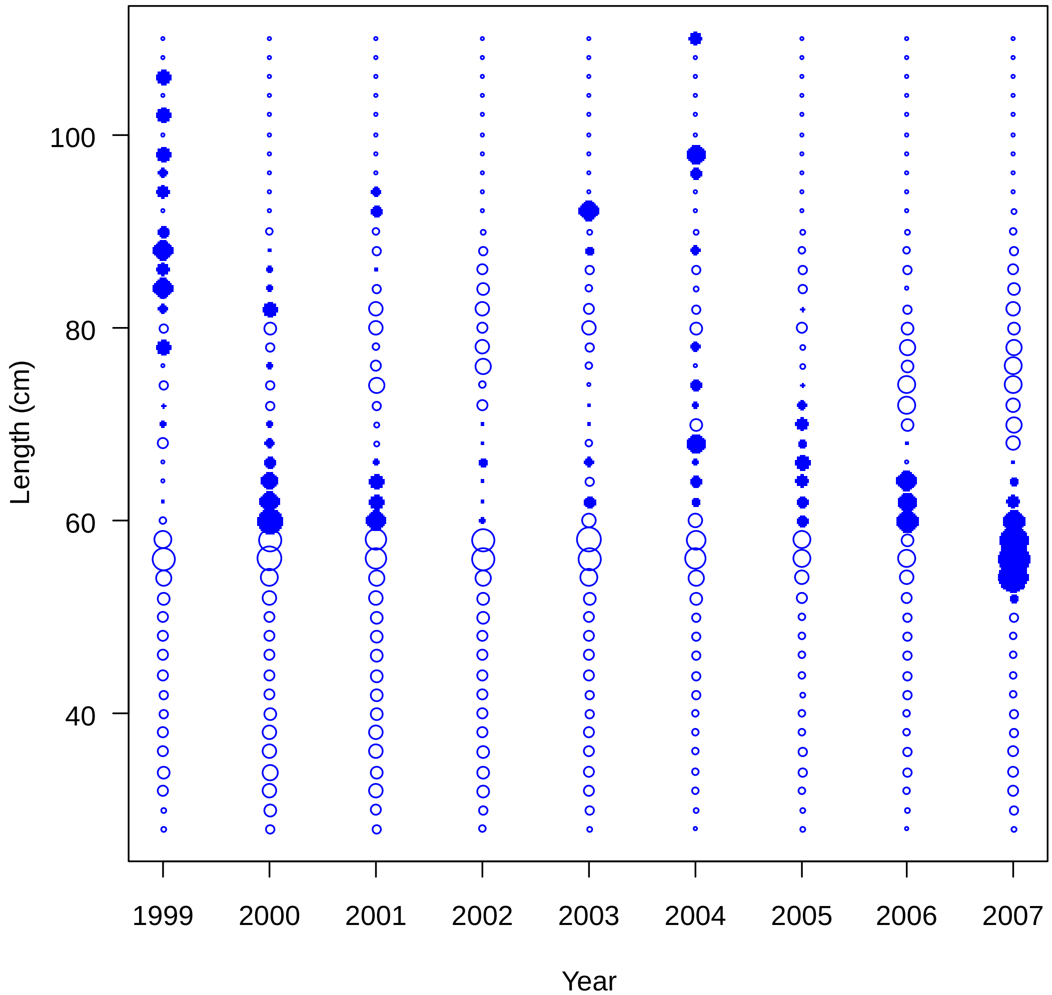


Figure 83. Pearson residuals for fits to recreational male length compositions for Washington/Oregon (max =3.63).

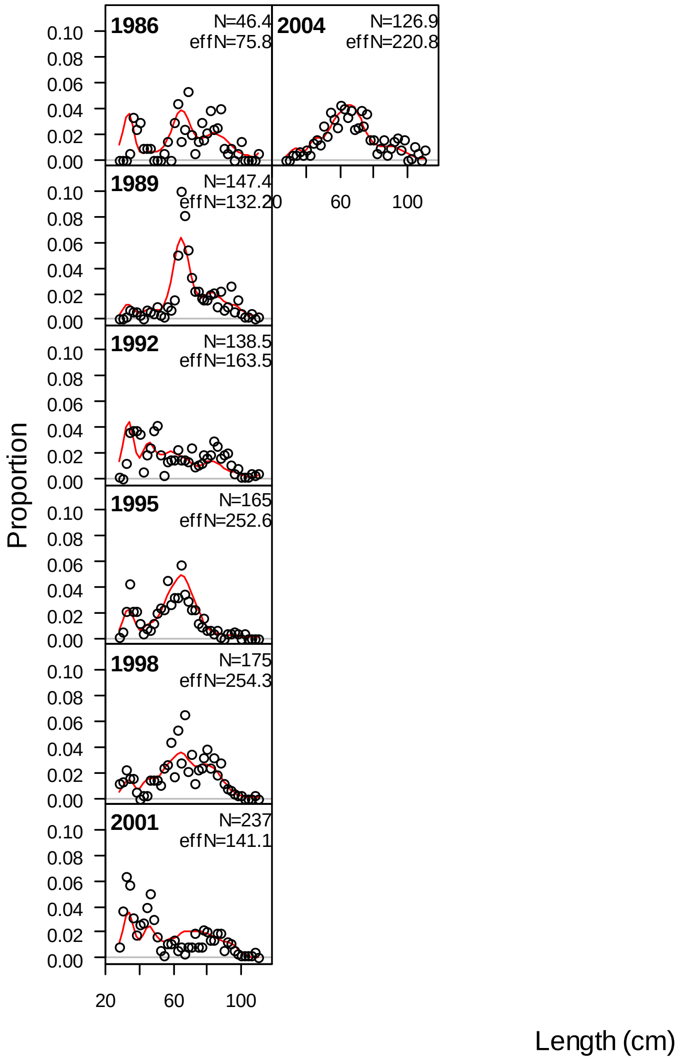


Figure 84. Fits to triennial female length compositions for Washington/Oregon.

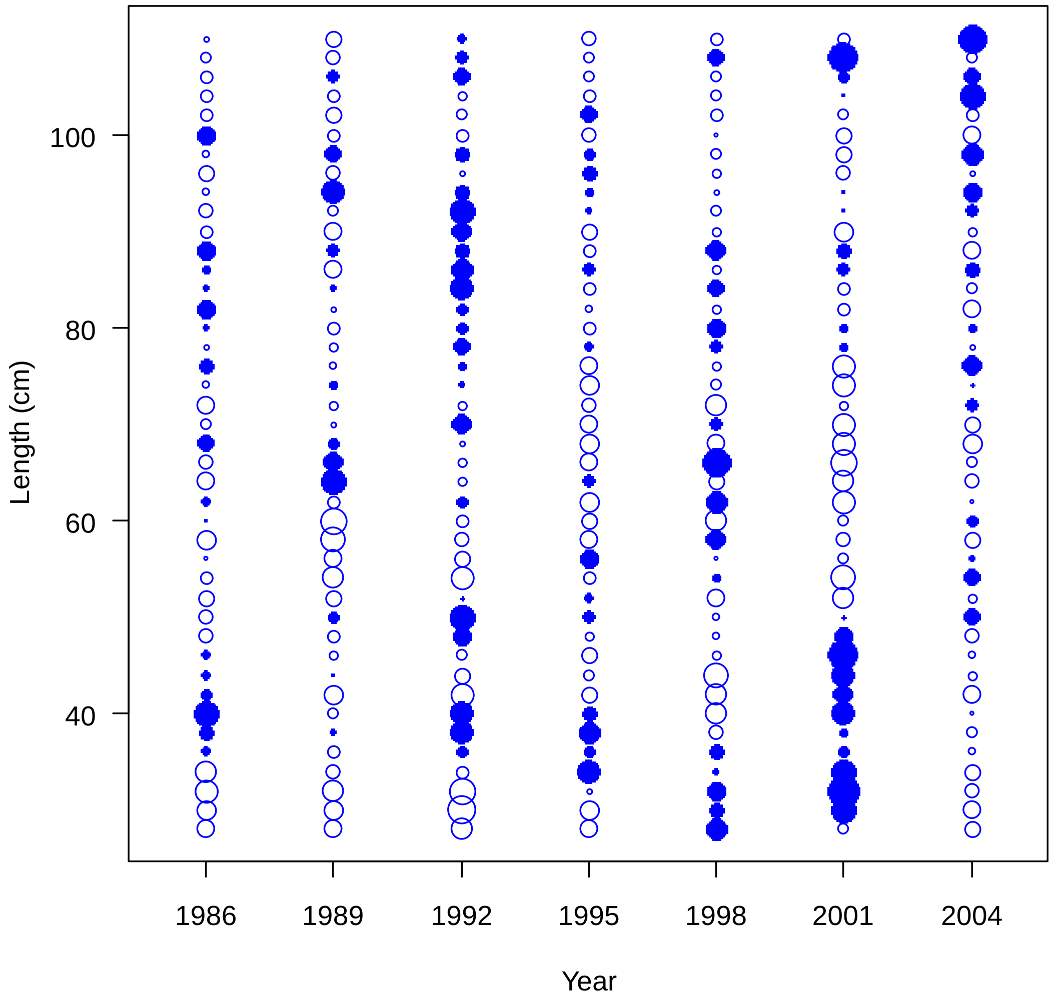


Figure 85. Pearson residuals for fits to triennial survey female length compositions for Washington/Oregon (max = 2.75).

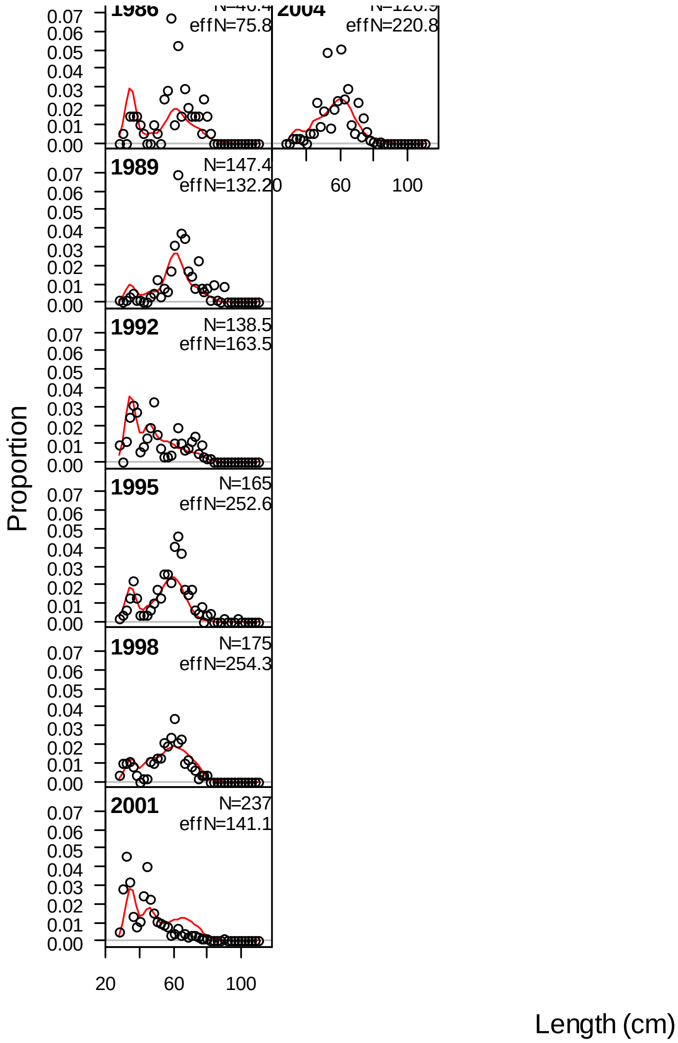


Figure 86. Fits to triennial survey male length compositions for Washington/Oregon.

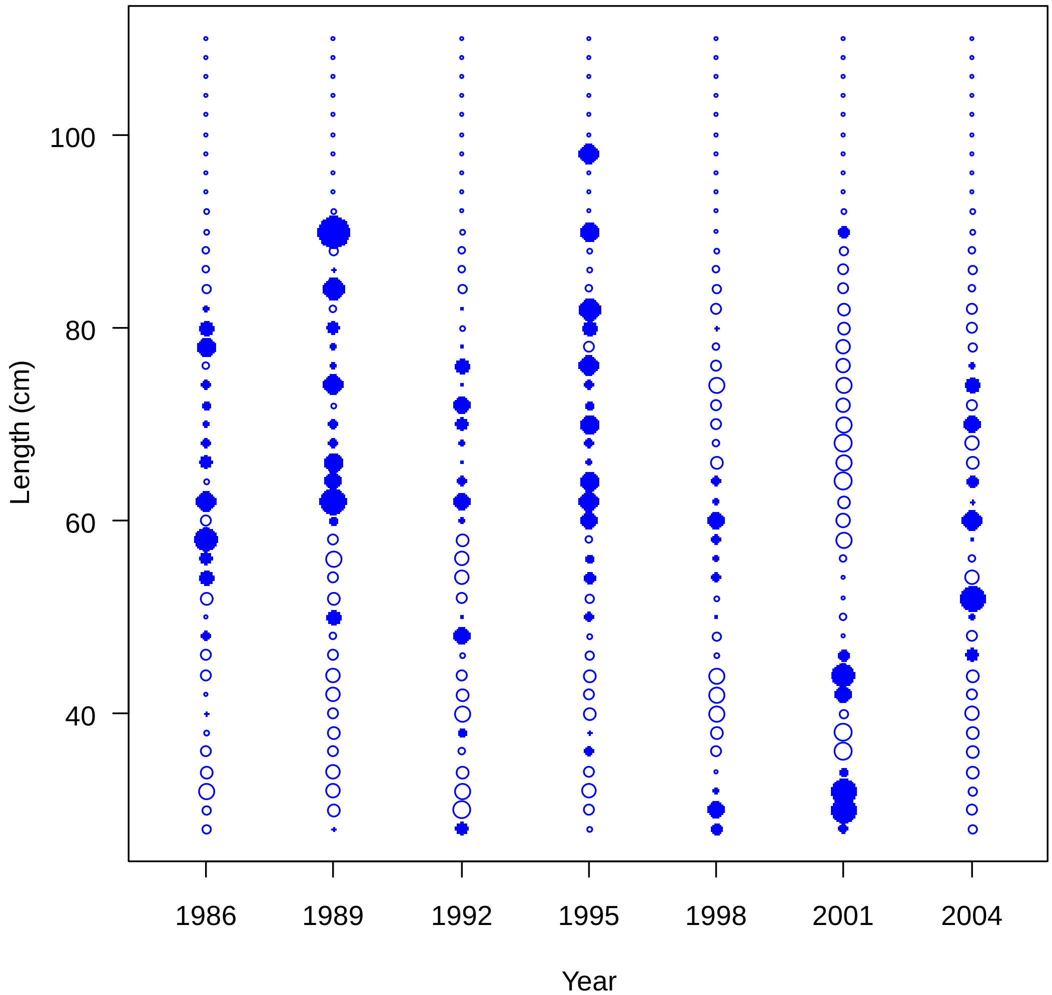


Figure 87. Pearson residuals for fits to triennial survey male length compositions for Washington/Oregon (max = 4.73).

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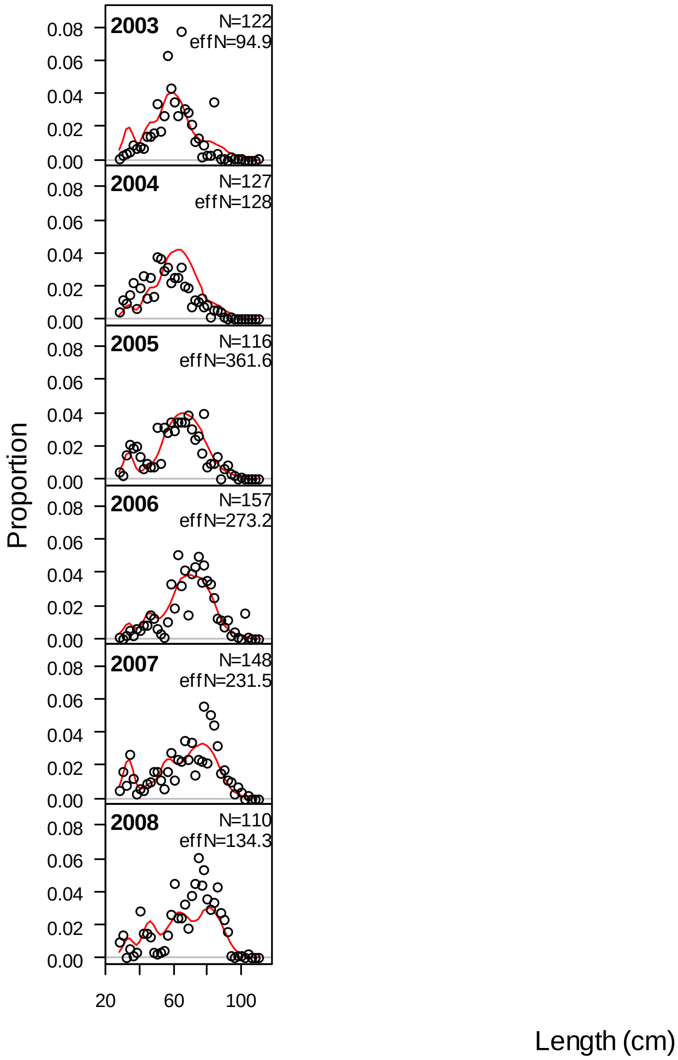

Figure 88. Fits to NWFSC survey female length compositions for Washington/Oregon..

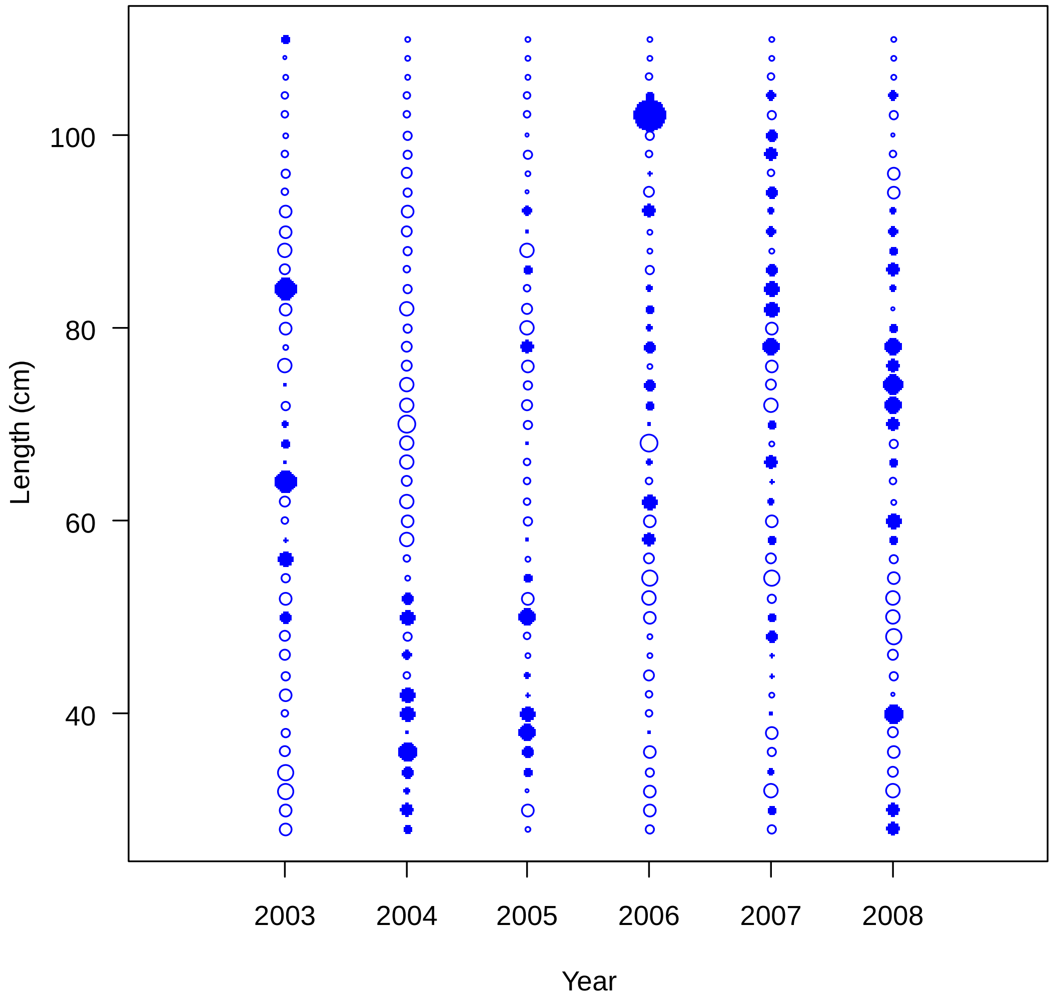

Figure 89. Pearson residuals for fits to NWFSC survey female length compositions for Washington/Oregon (max = 5.71).

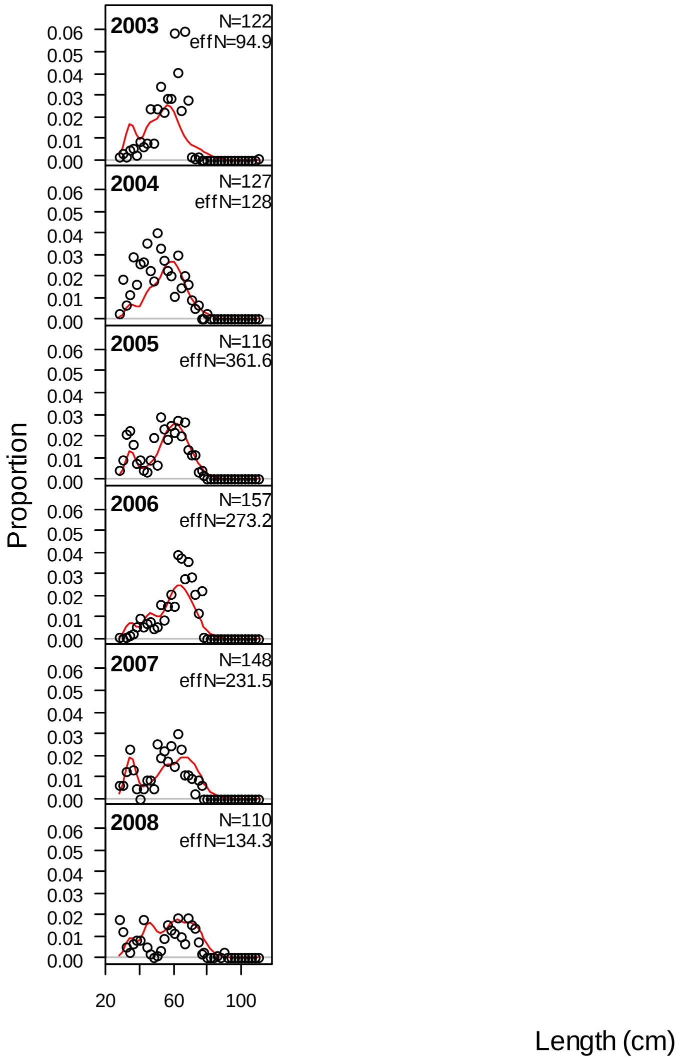

Figure 90. Fits to NWFSC survey male length compositions for Washington/Oregon.

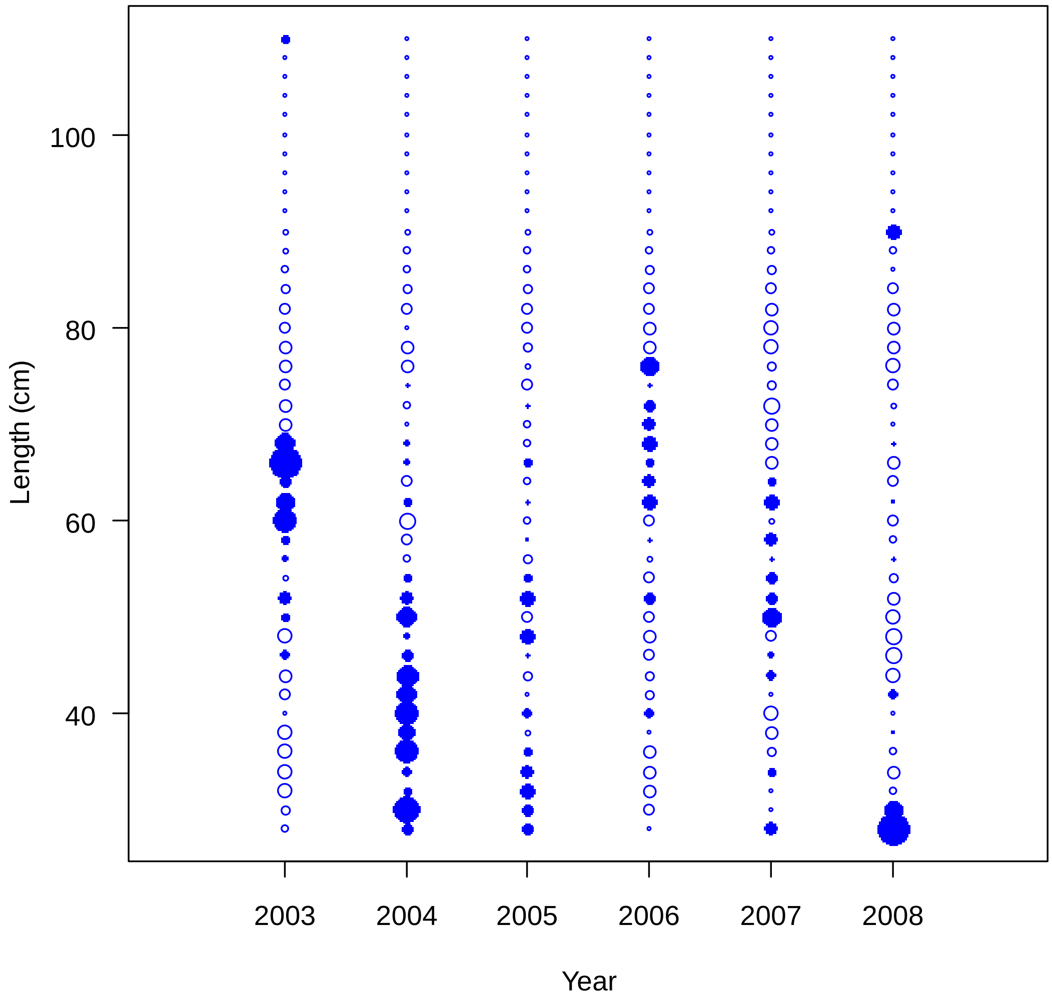

Figure 91. Pearson residuals for fits to NWFSC survey male length compositions for Washington/Oregon (max = 5.21).

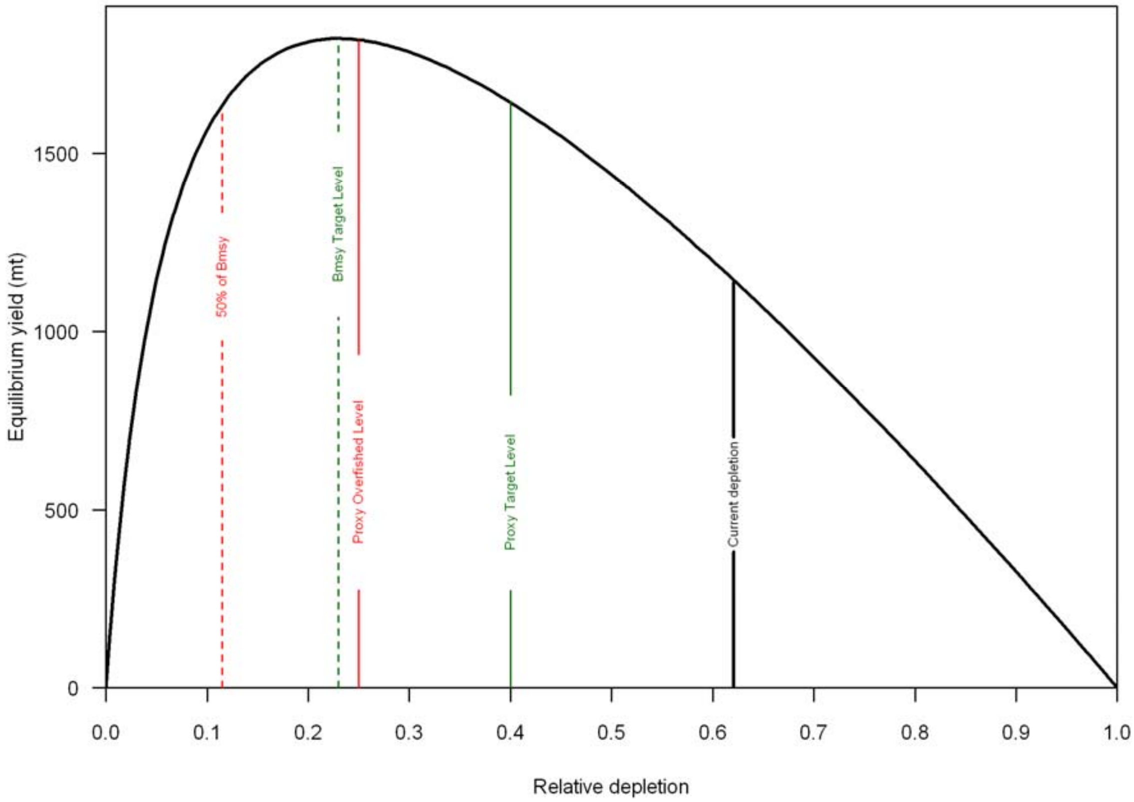

Figure 92. Equilibrium yield plot for Washington/Oregon

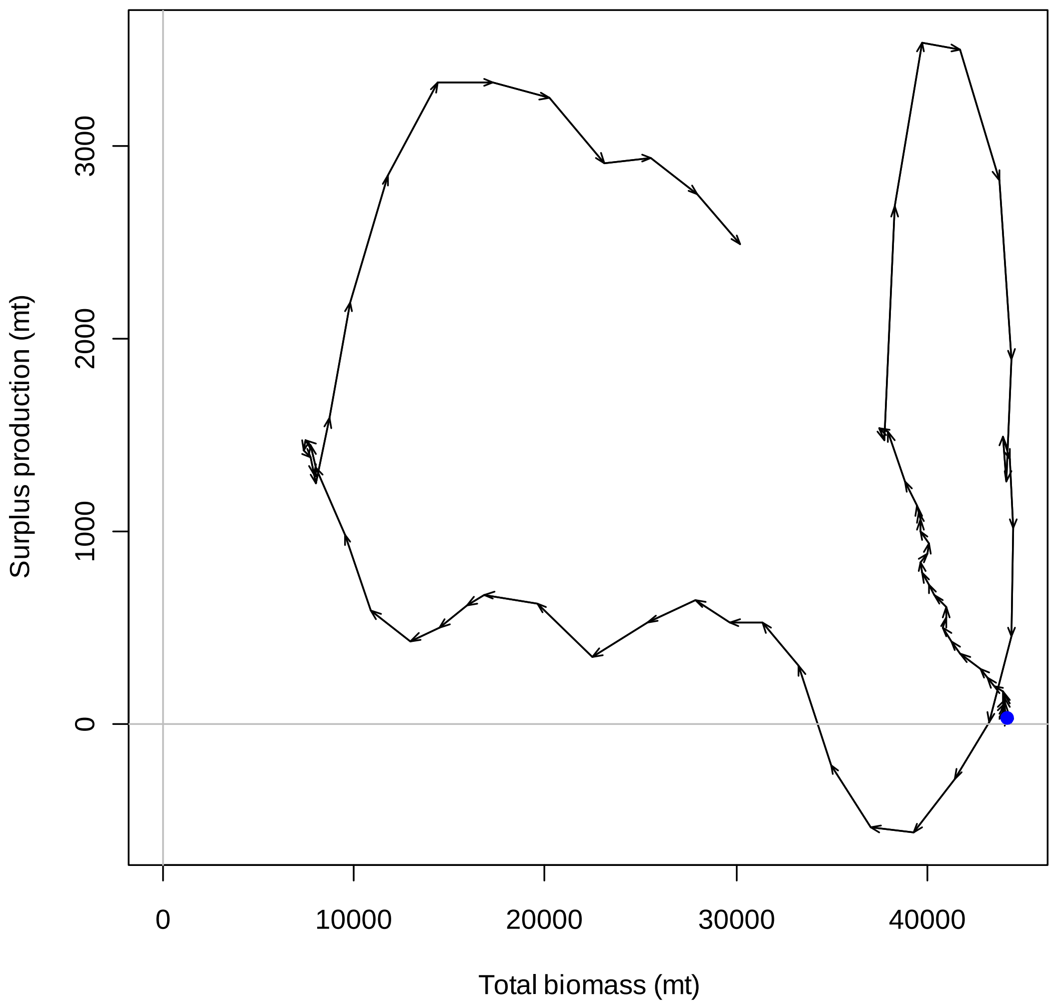

Figure 93. Time series of surplus production for Washington/Oregon

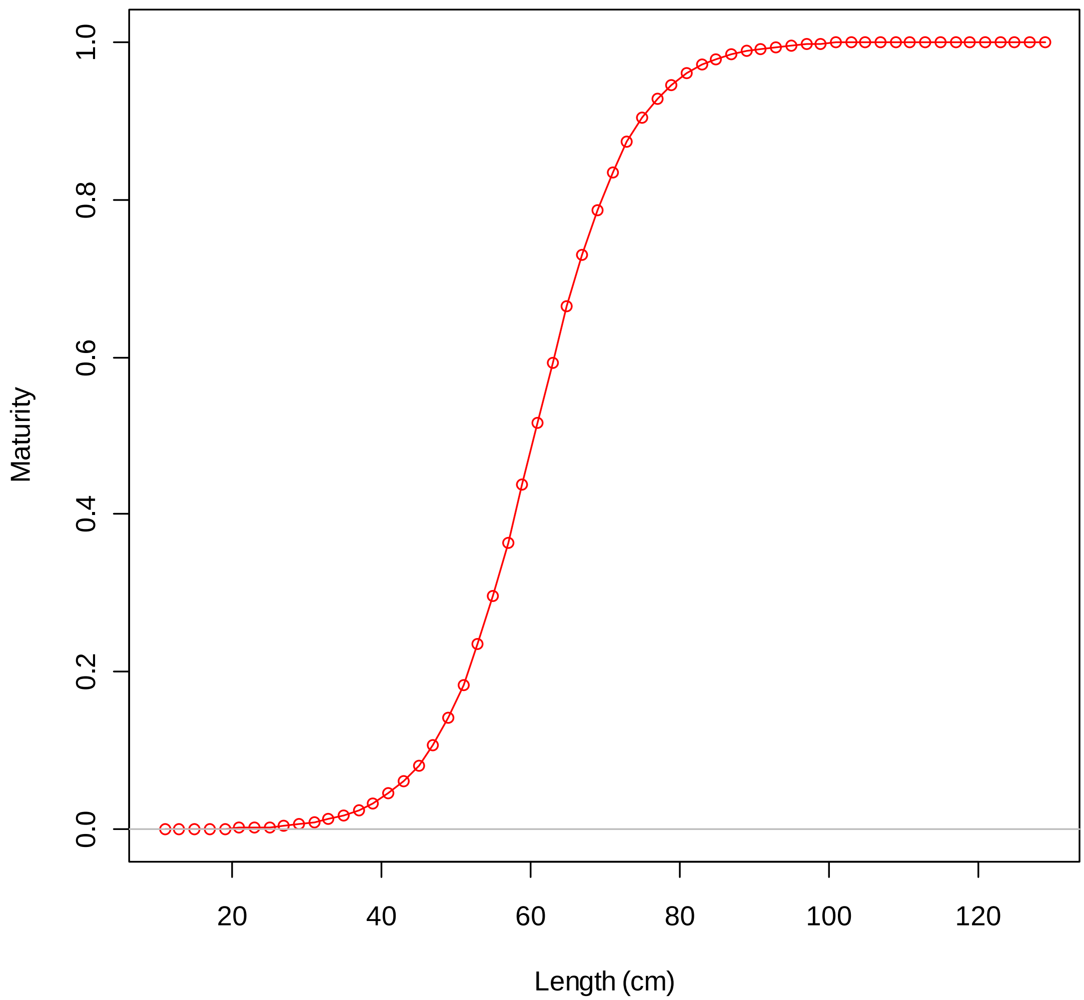

Figure 94. Maturity ogive for female lingcod in California

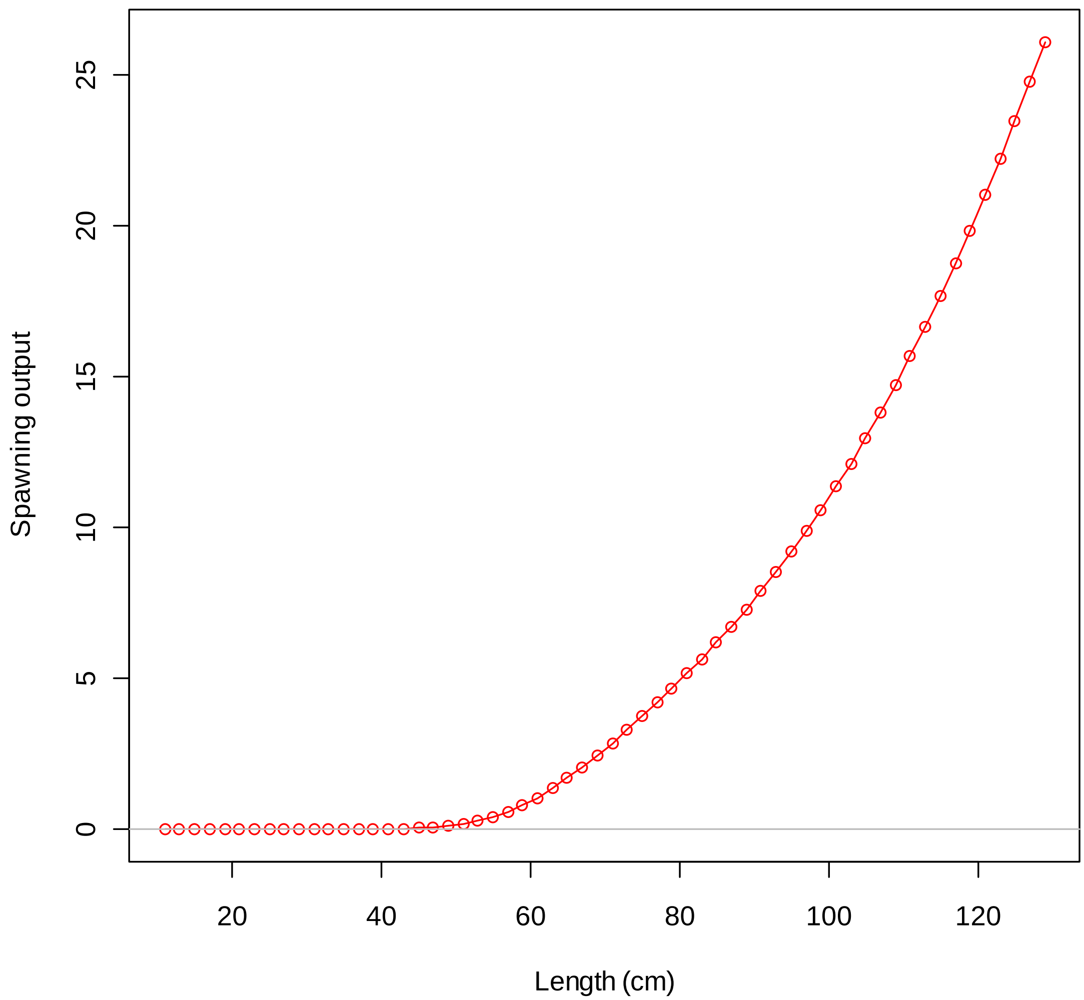

Figure 95. Length to spawning output relationship in California.

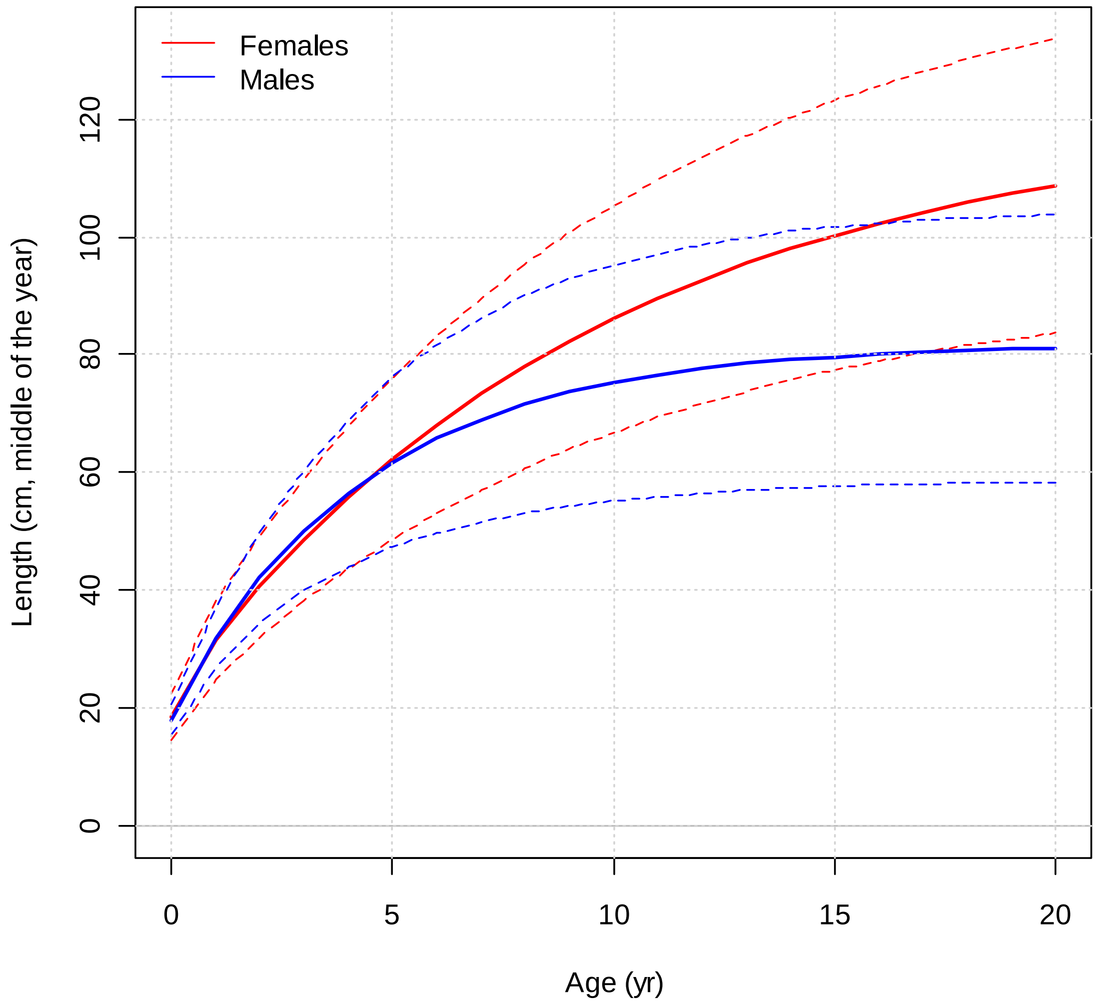

Figure 96. Growth curve for female (upper) and male (lower) lingcod estimated in the California model (length at age 1 and 20 is fixed, but k and cvs are estimated).

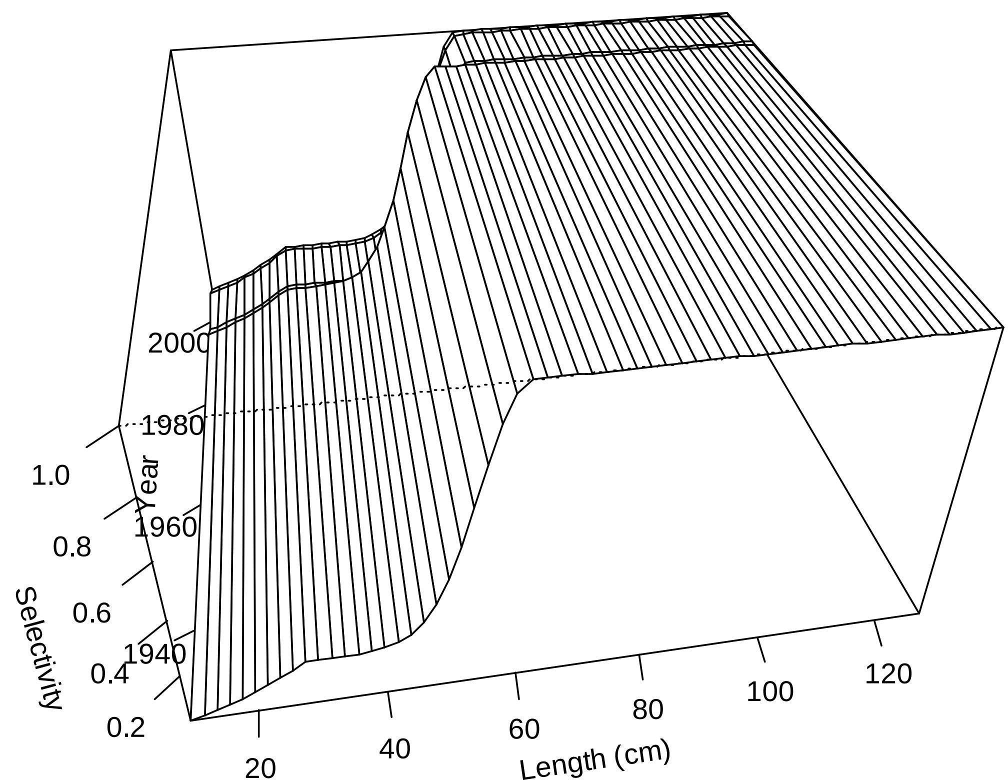

Figure 97. Time varying selectivity for the California commercial fishery.

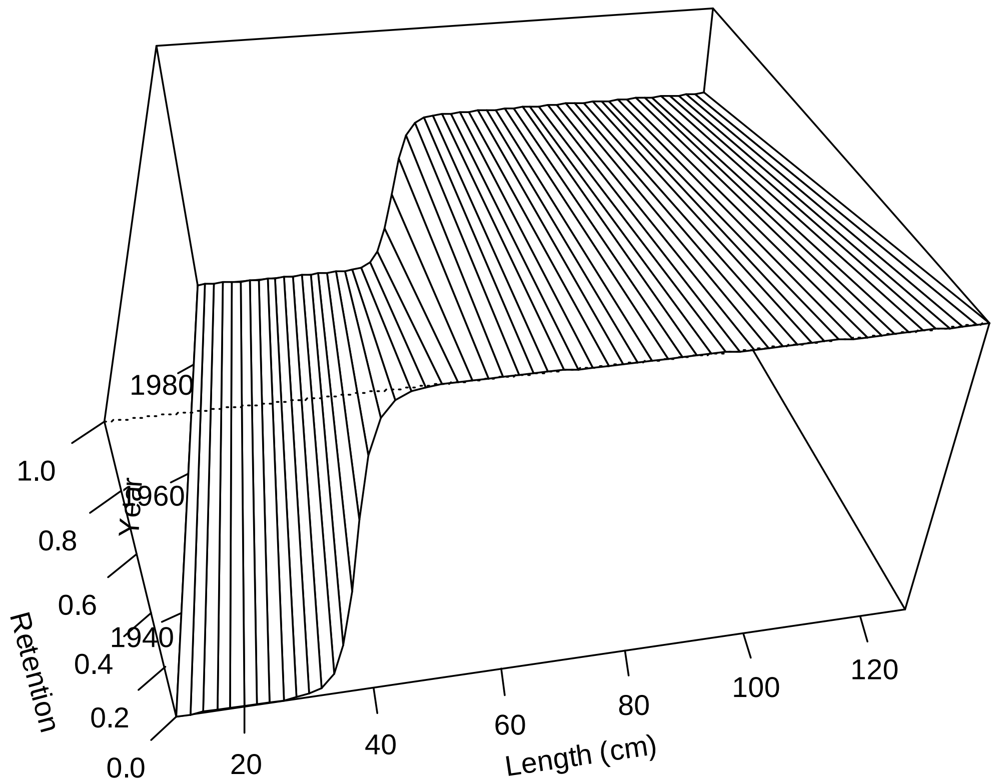

Figure 98. Time varying retention for the California commercial fishery.

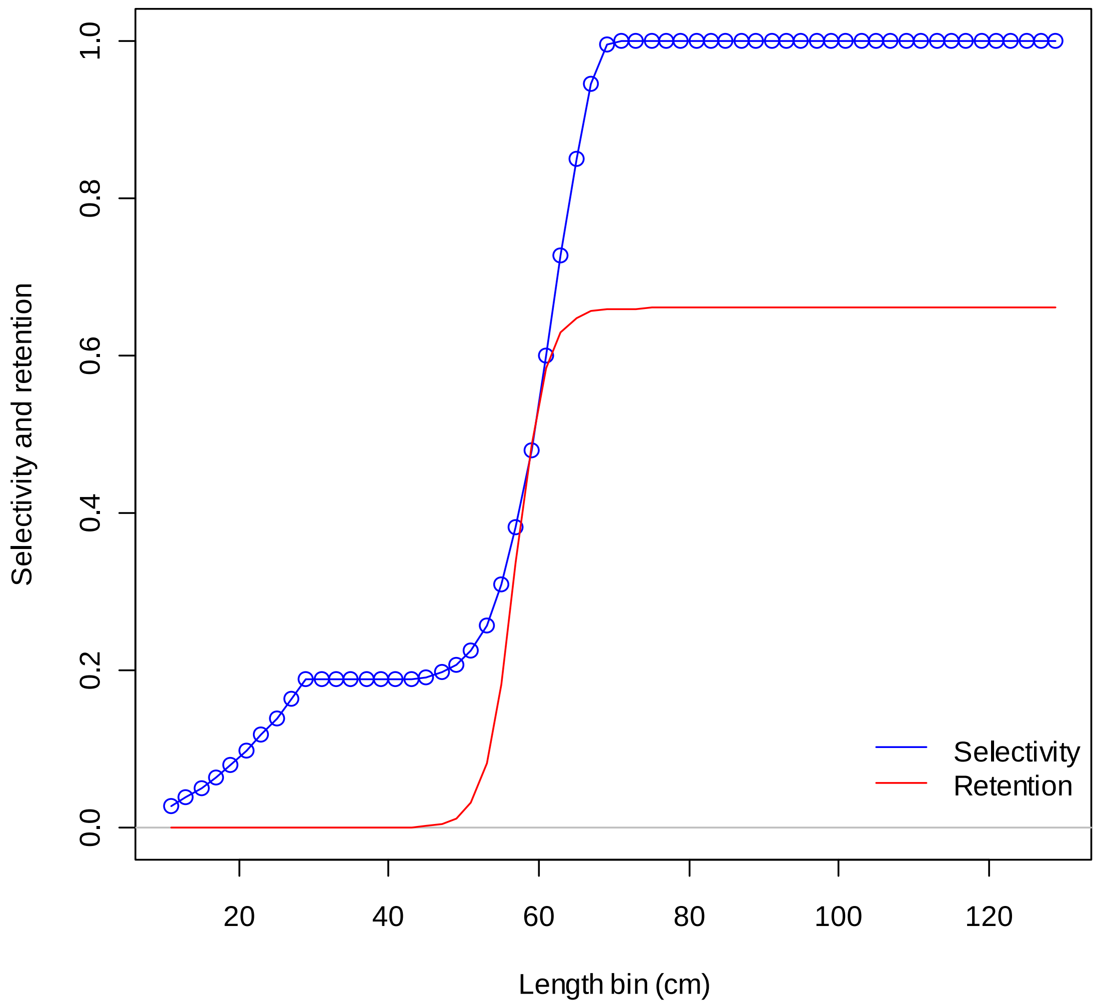

Figure 99. California 1998-2008 commercial fishery selectivity and retention (as the proportion retained at length).

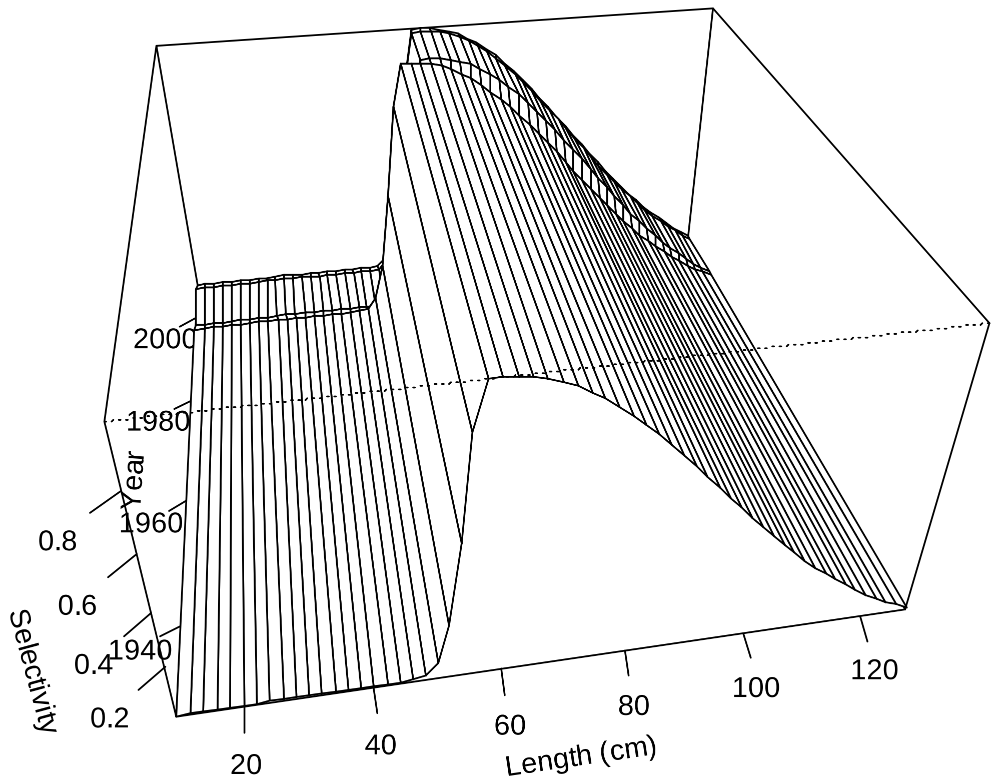

Figure 100. Combined-sex time-varying selectivity for the California recreational fishery.

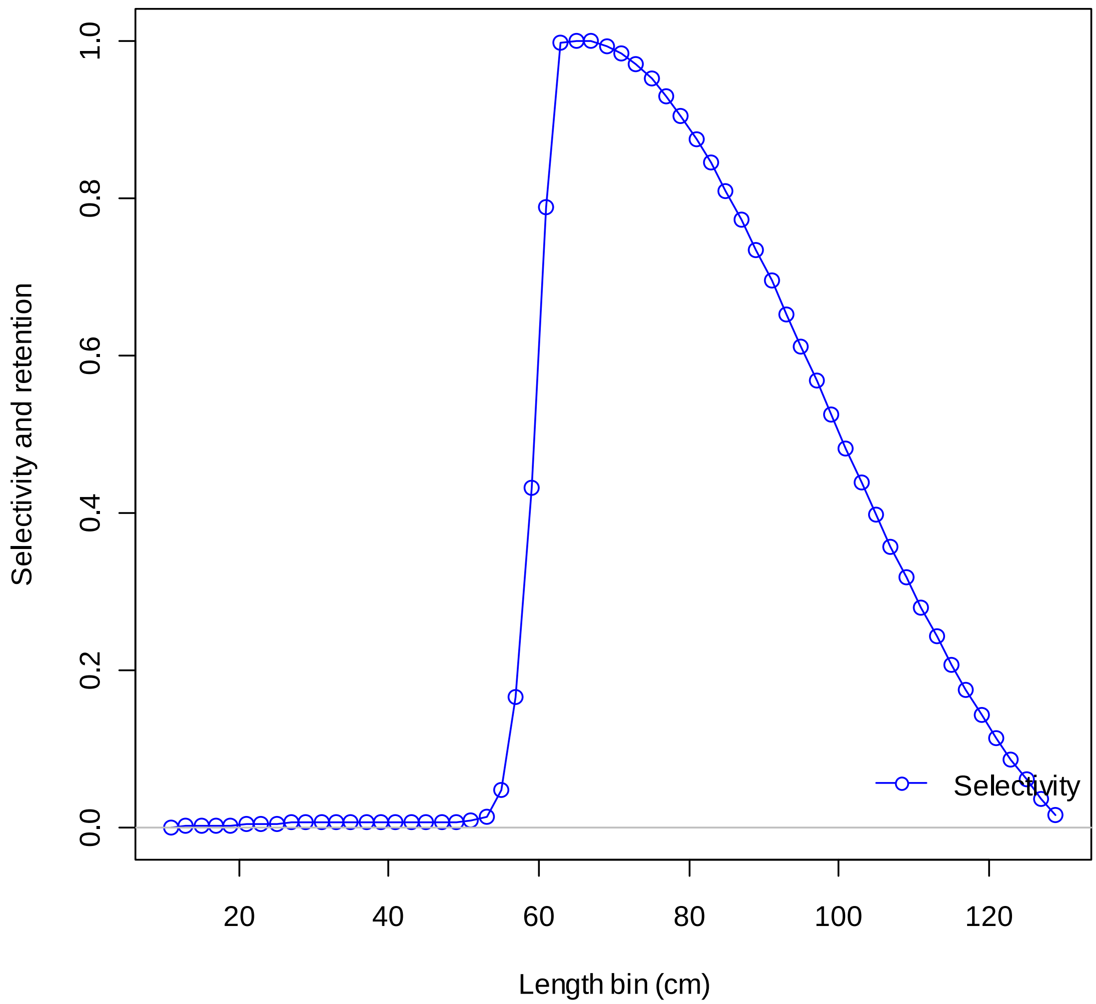

Figure 101.. Ending year selectivity (1998-2008) for the California recreational fishery.

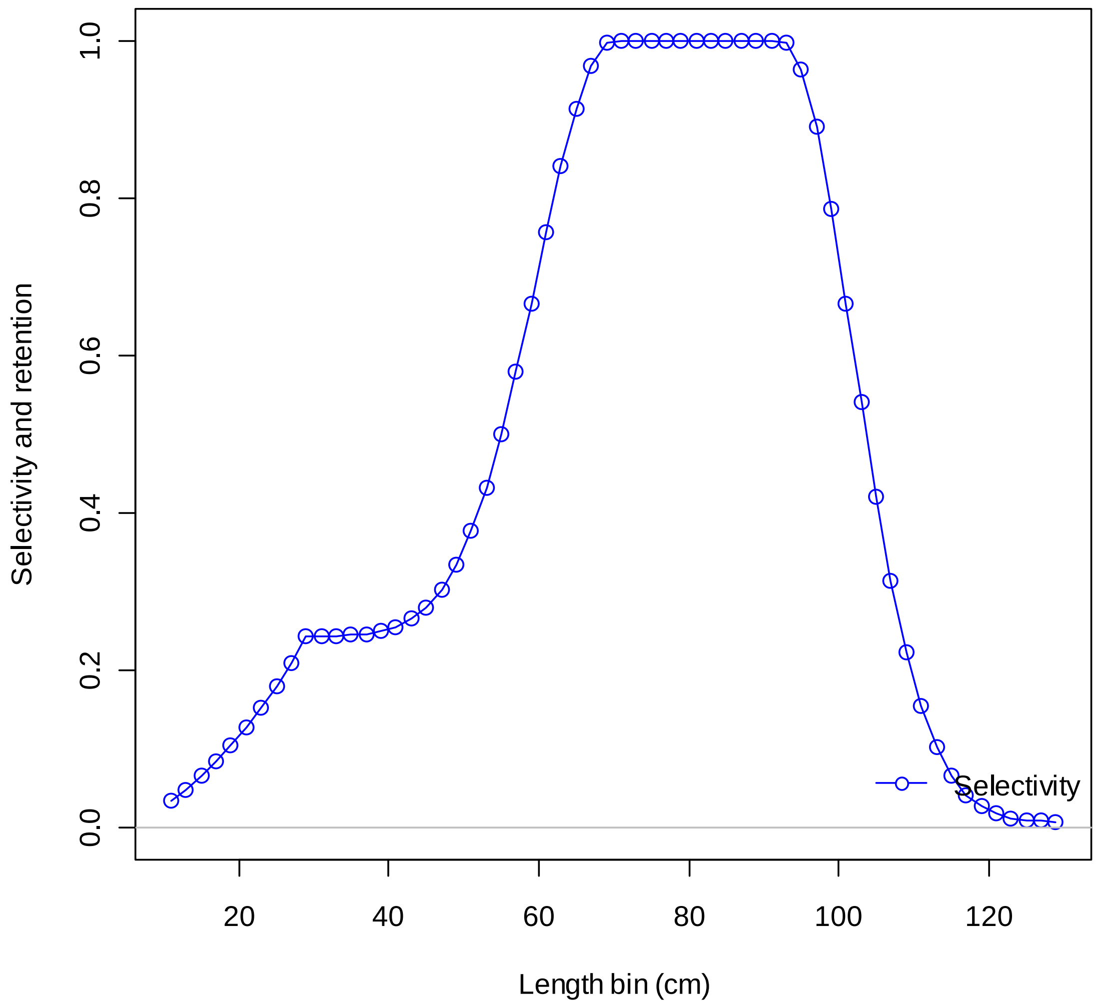

Figure 102. Triennial survey selectivity for the California assessment (forced to mimic the triennial survey selectivity for the North).

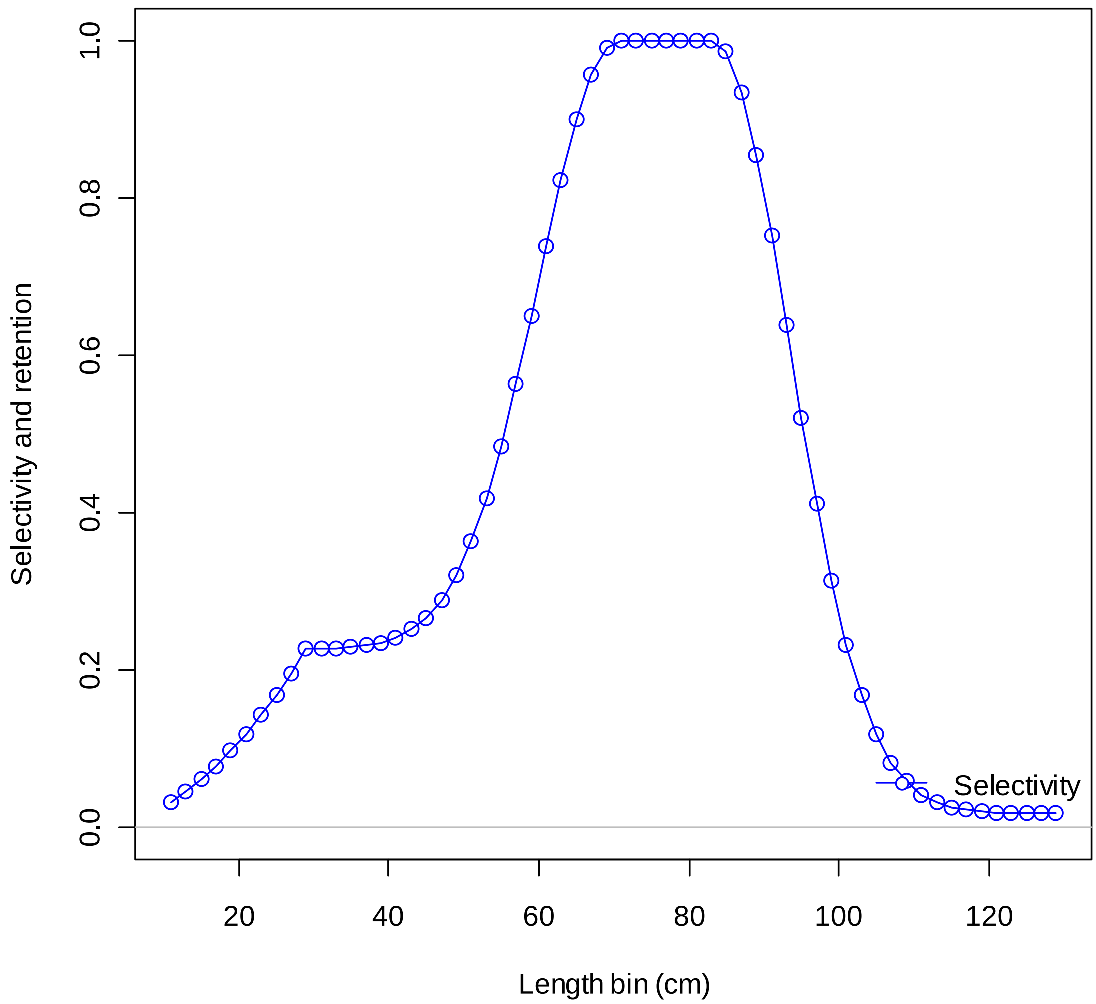

Figure 103. NWFSC survey selectivity for the California assessment.

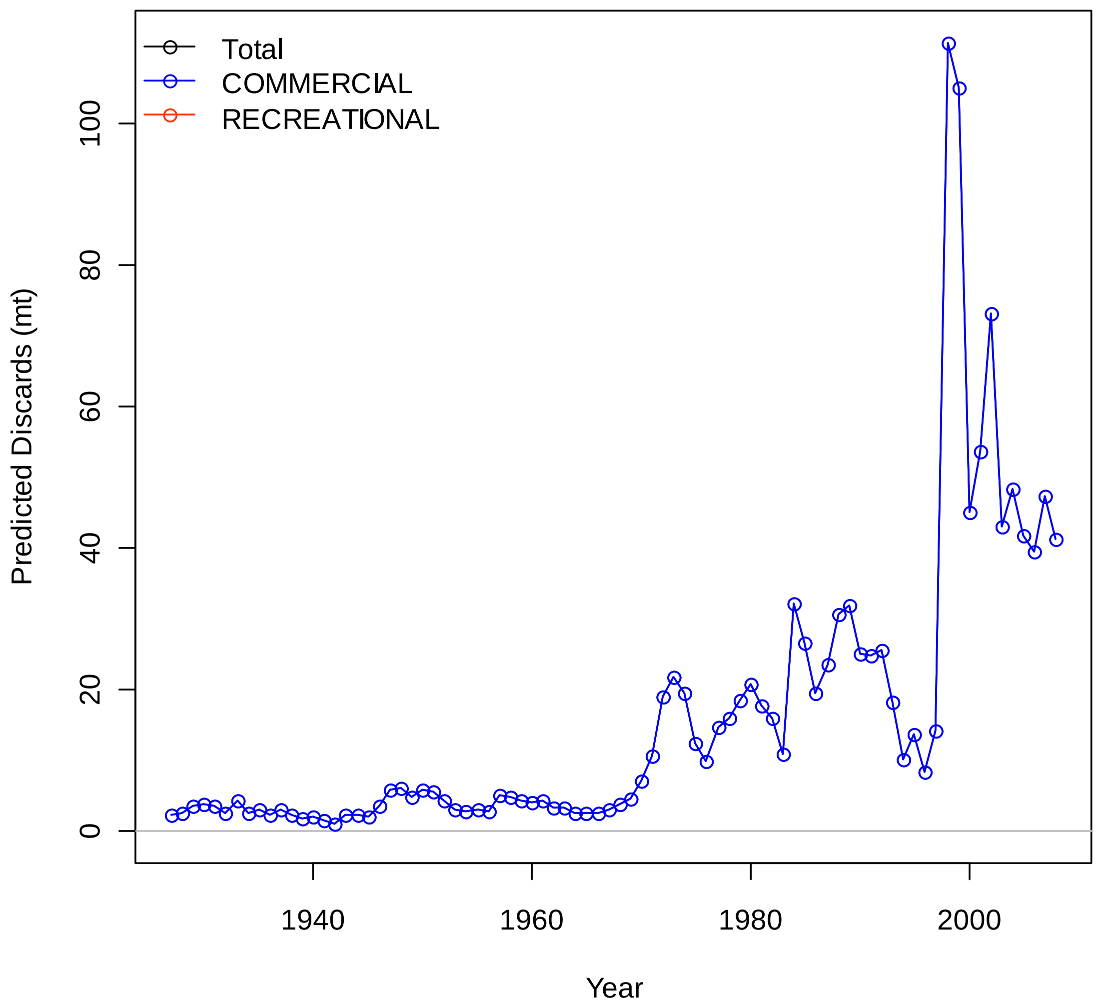

Figure 104. Time series of estimated discard mortalities for California assessment.

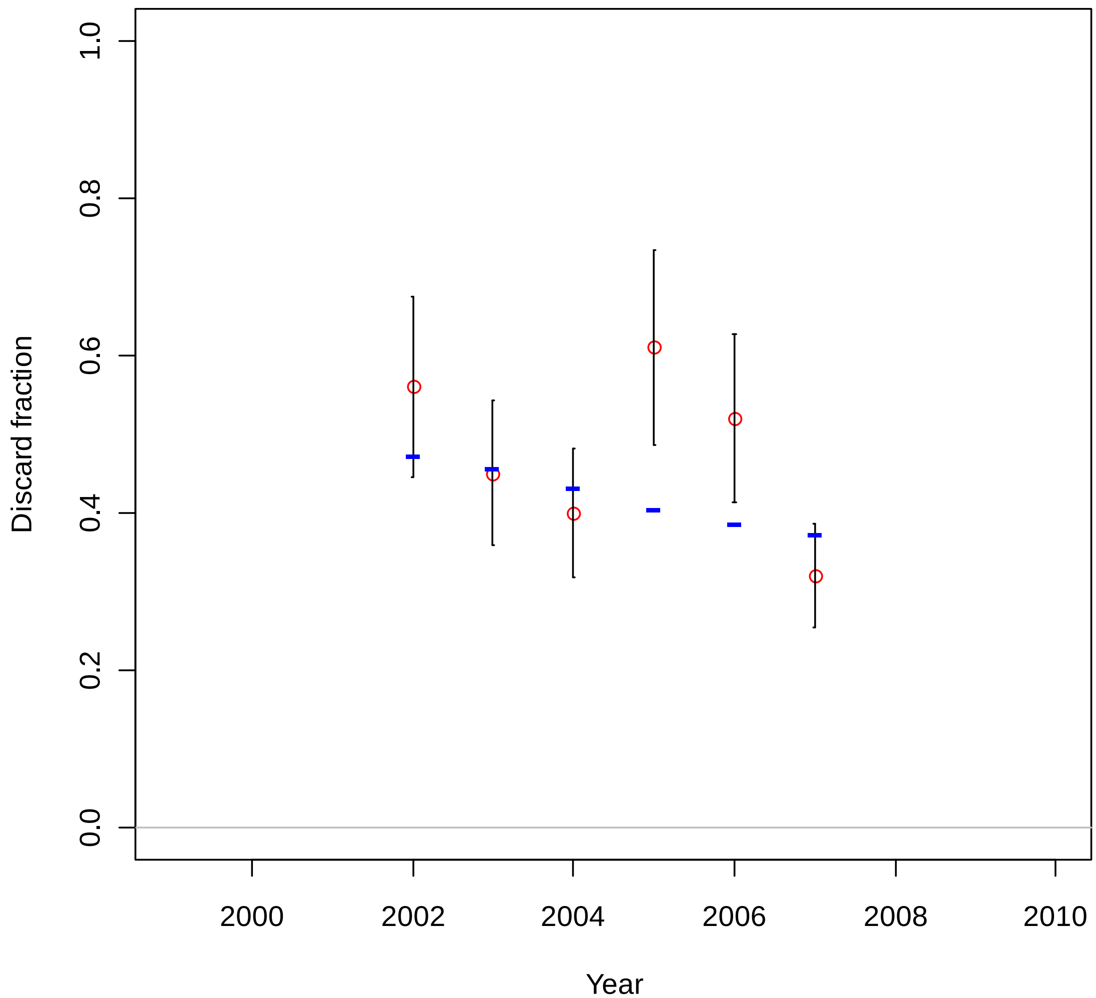

Figure 105. Fit to discard fraction data for California.

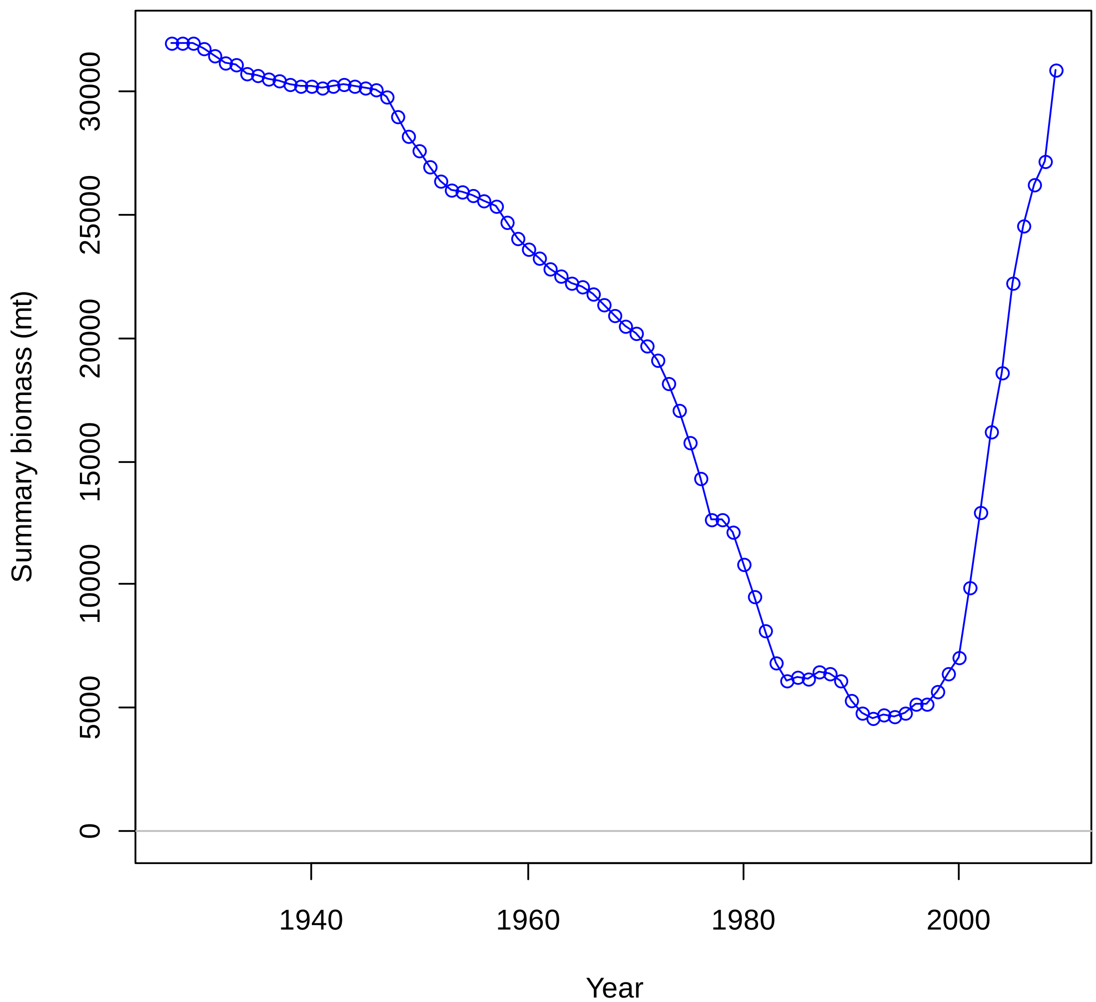

Figure 106. Time series of summary (2+) biomass for California.

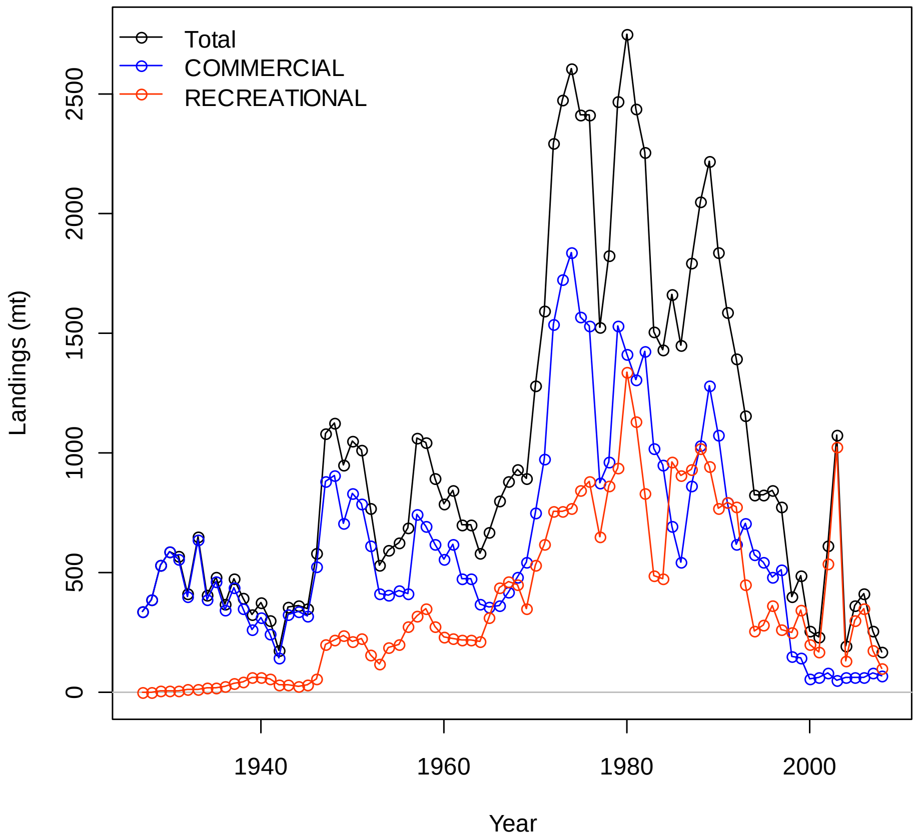

Figure 107. Time series of exploitation rate (catch/summary biomass) for California.

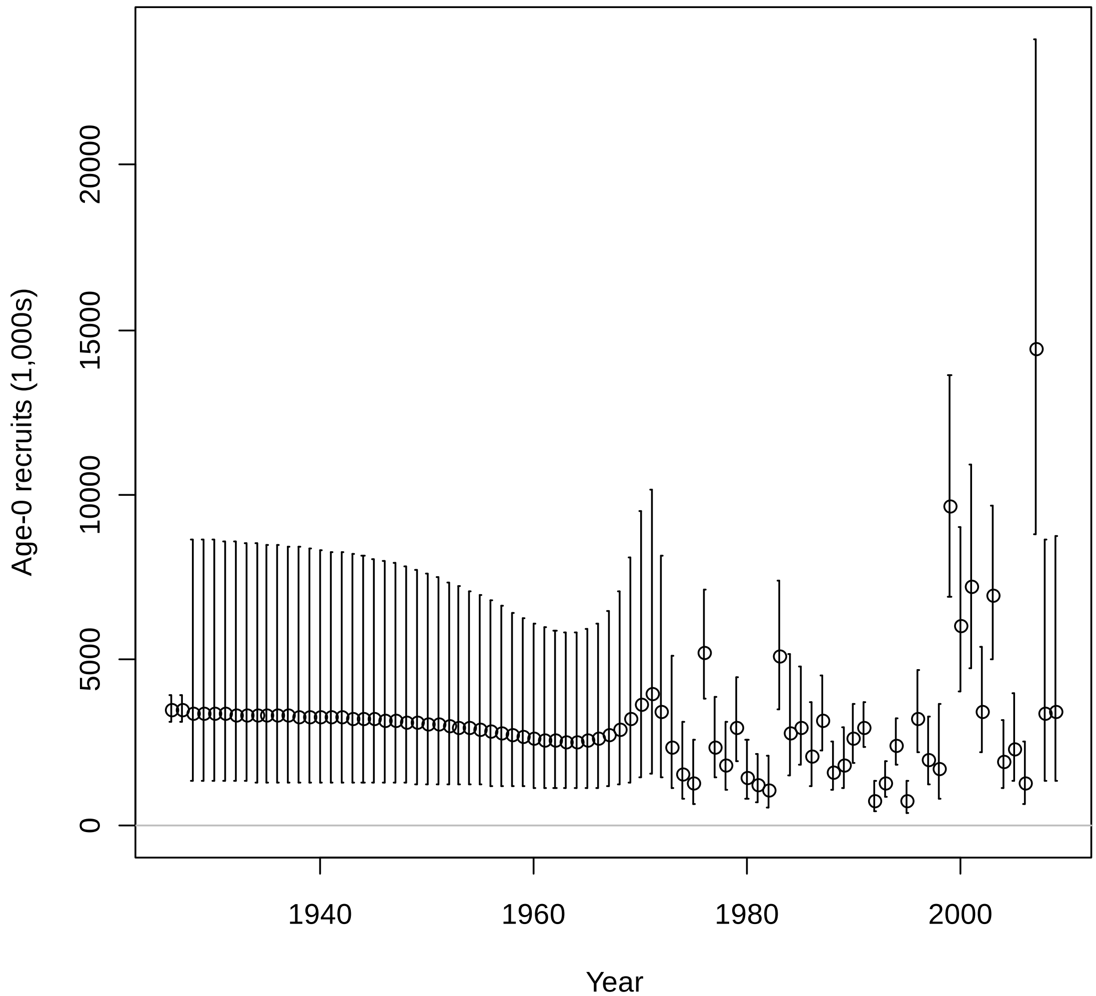

Figure 108. Time series of recruitment for California.

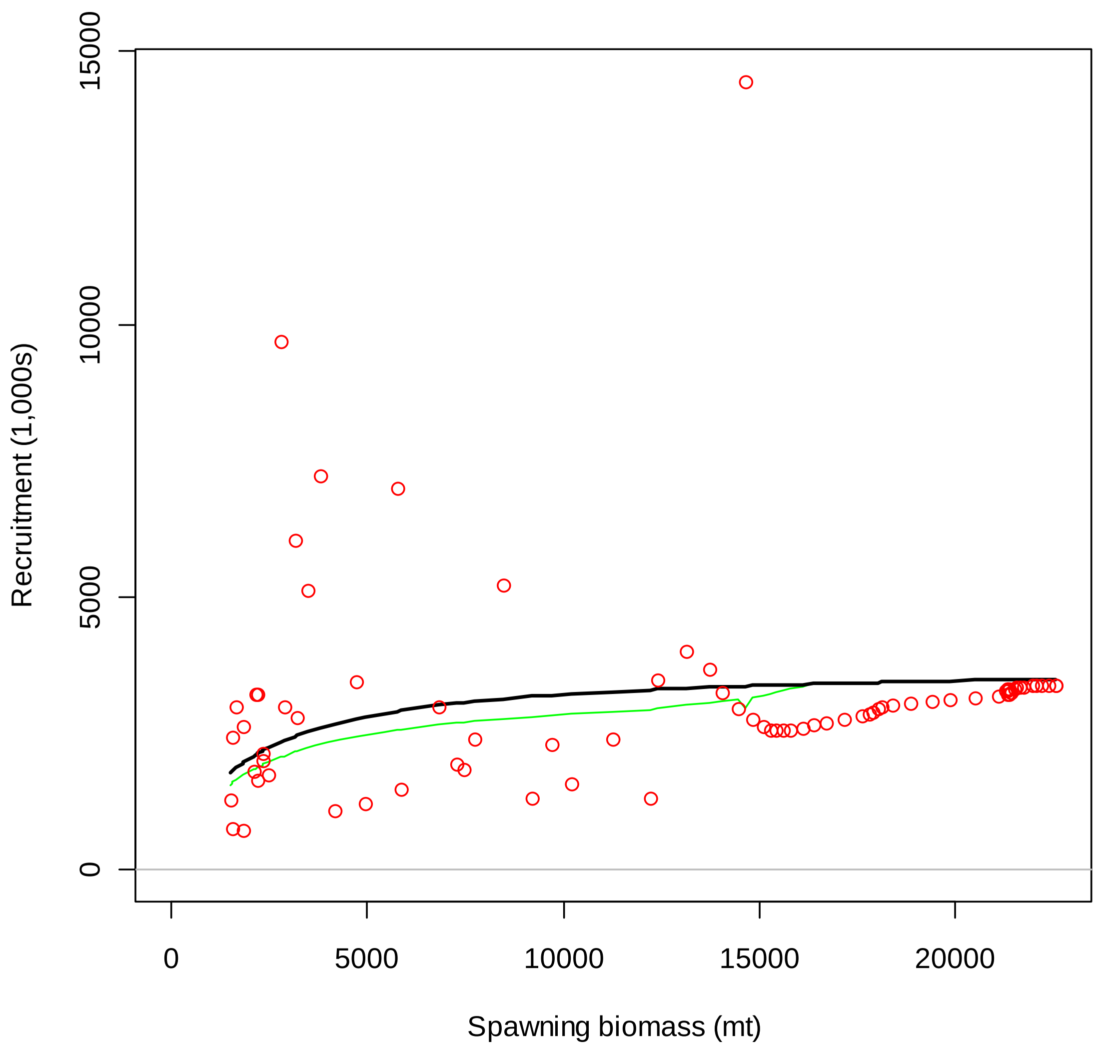

Figure 109. Fit to stock-recruitment relationship for California.

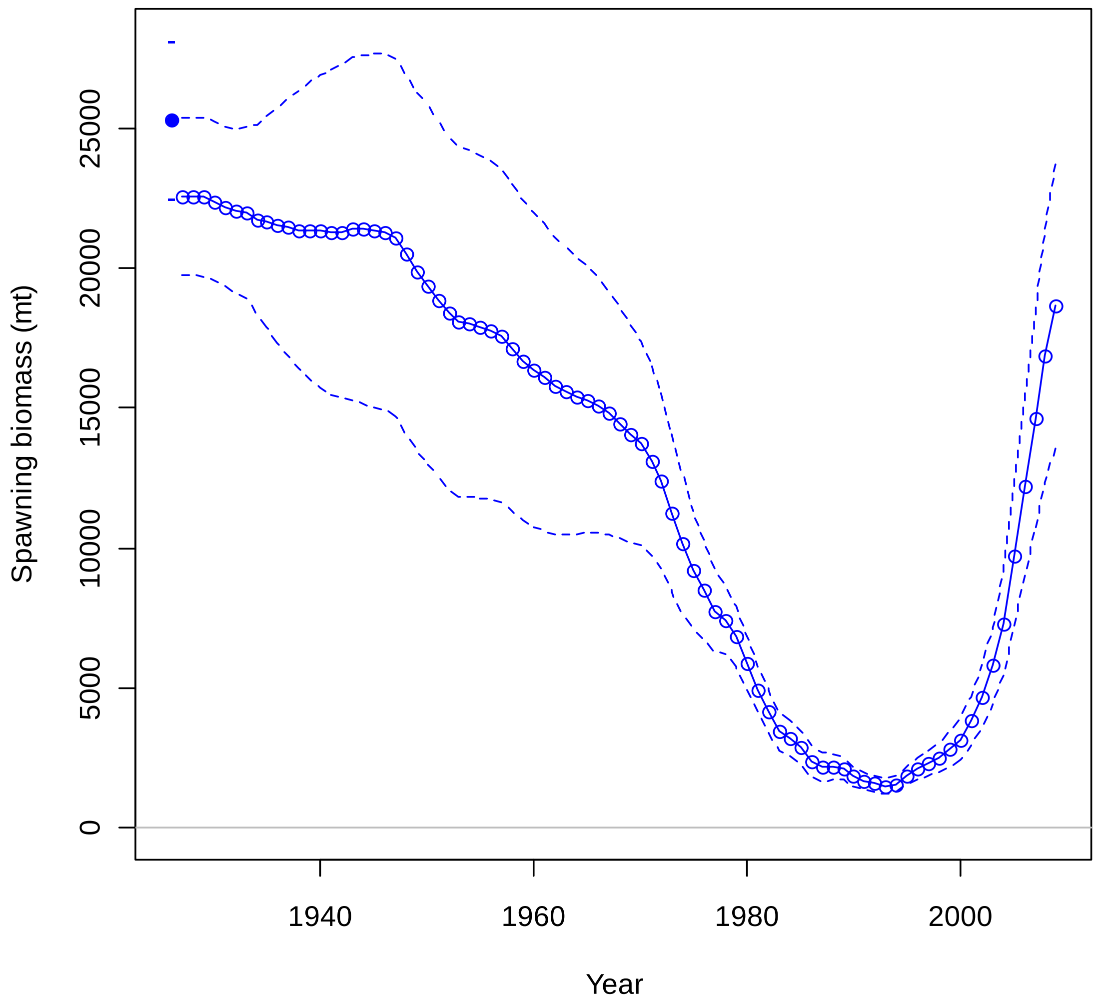

Figure 110. Time series of spawning biomass for California.

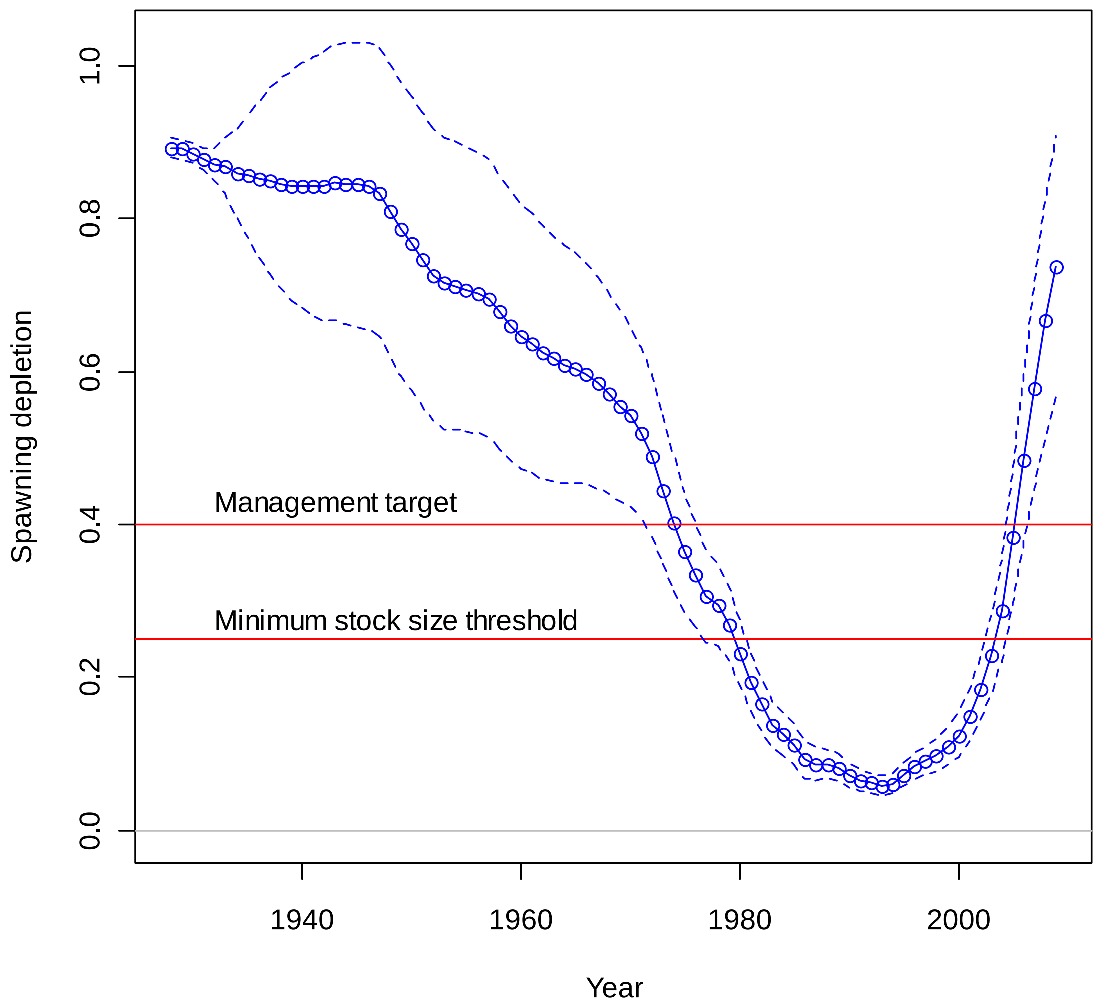

Figure111. Time series of spawning depletion for California.

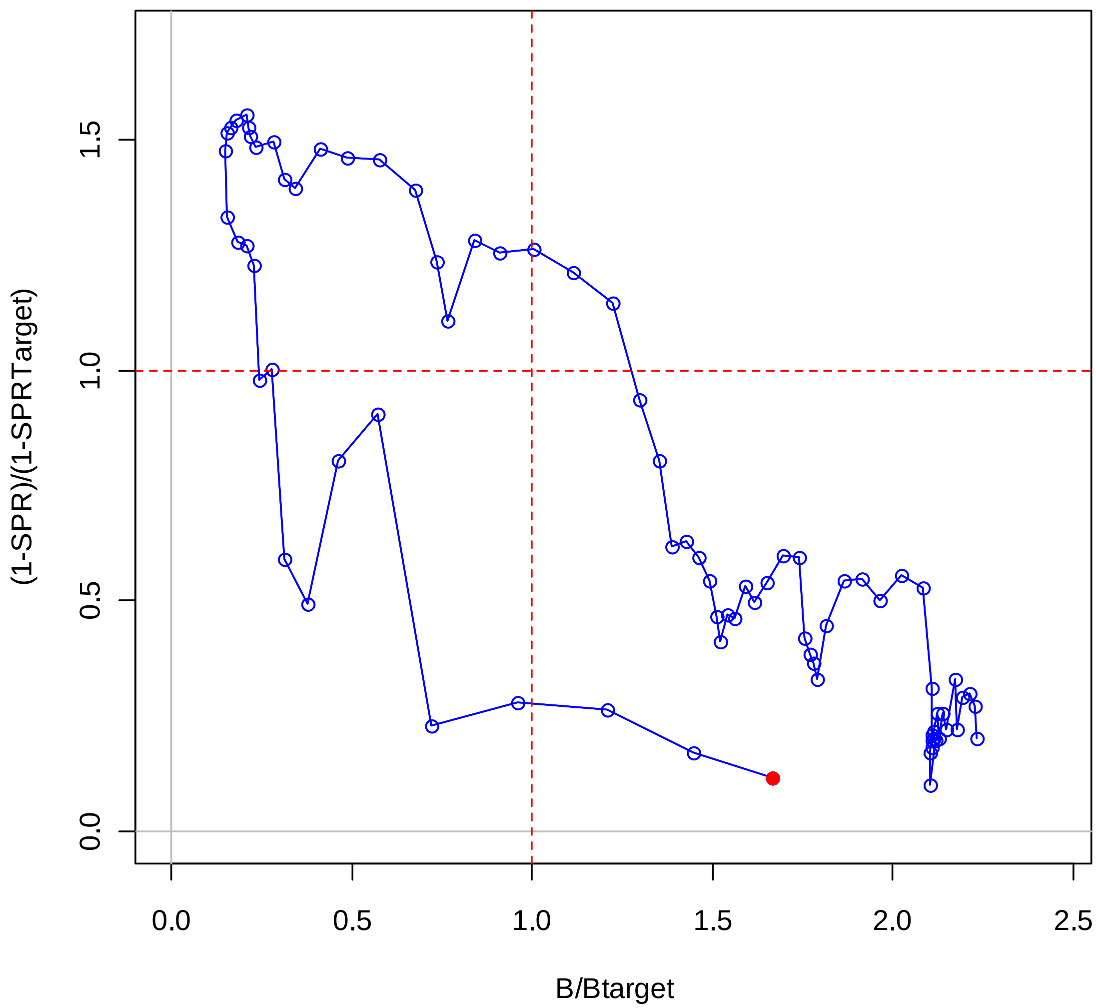

Figure 112. Time series of relative harvest rate (1-SPR) vs. relative spawning biomass.

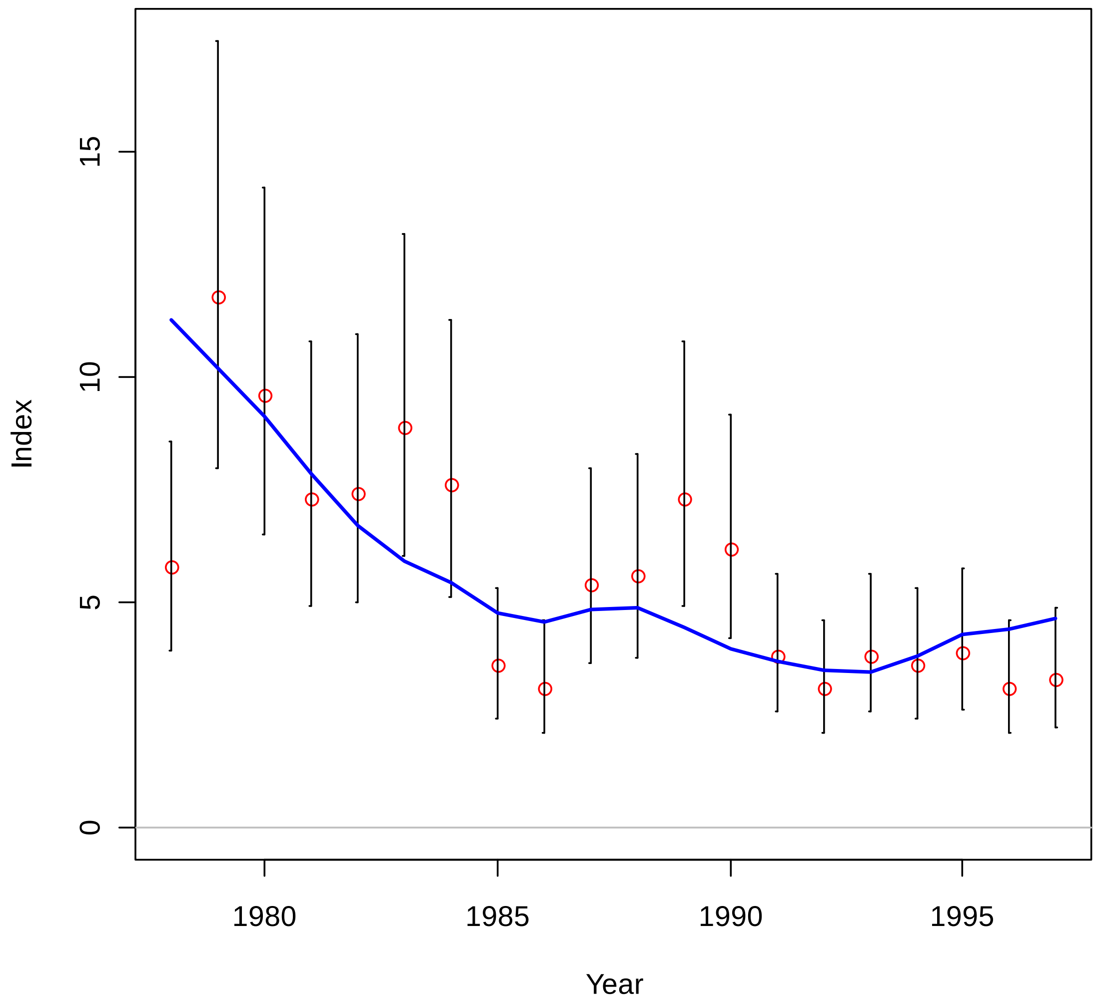

Figure 113. Model fit to commercial CPUE index for California.

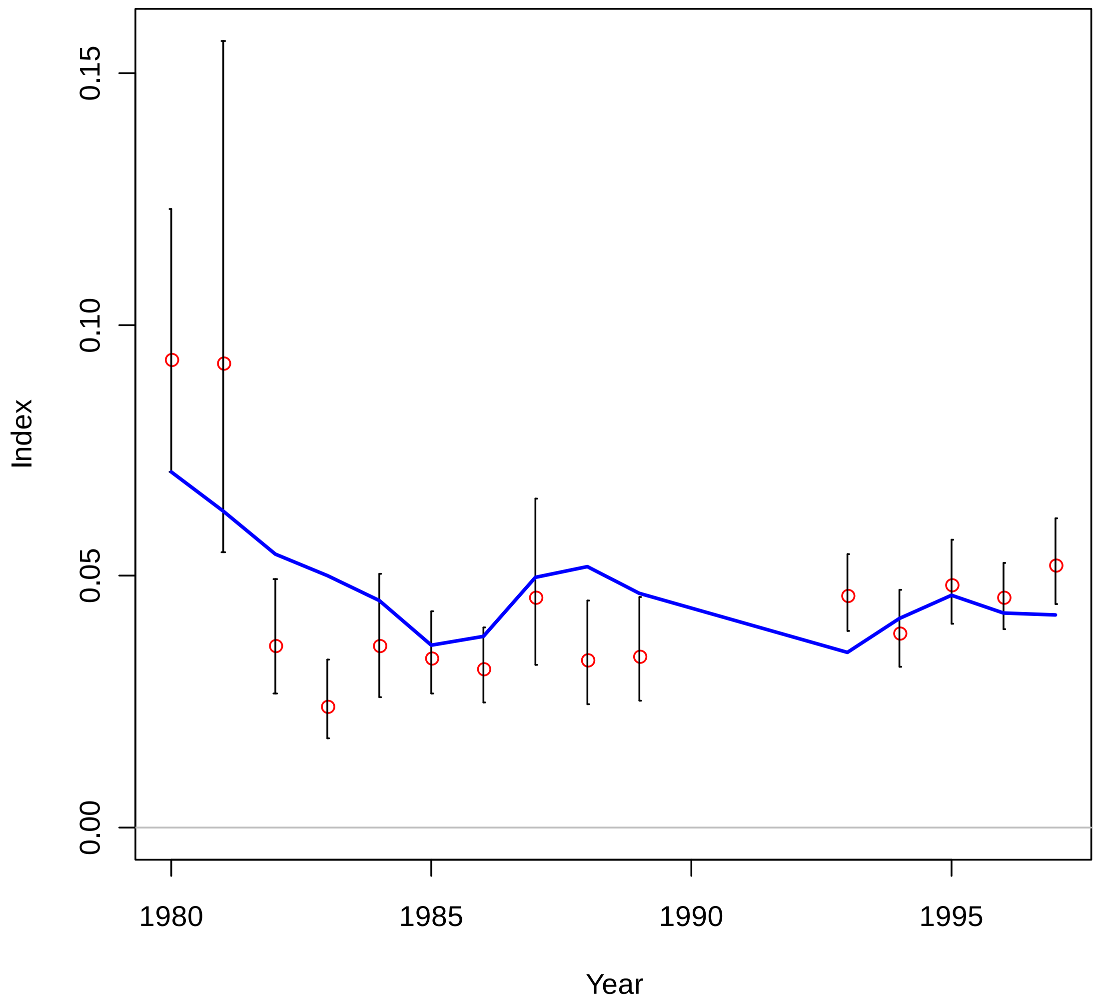

Figure 114. Model fit to recreational CPUE index for California.

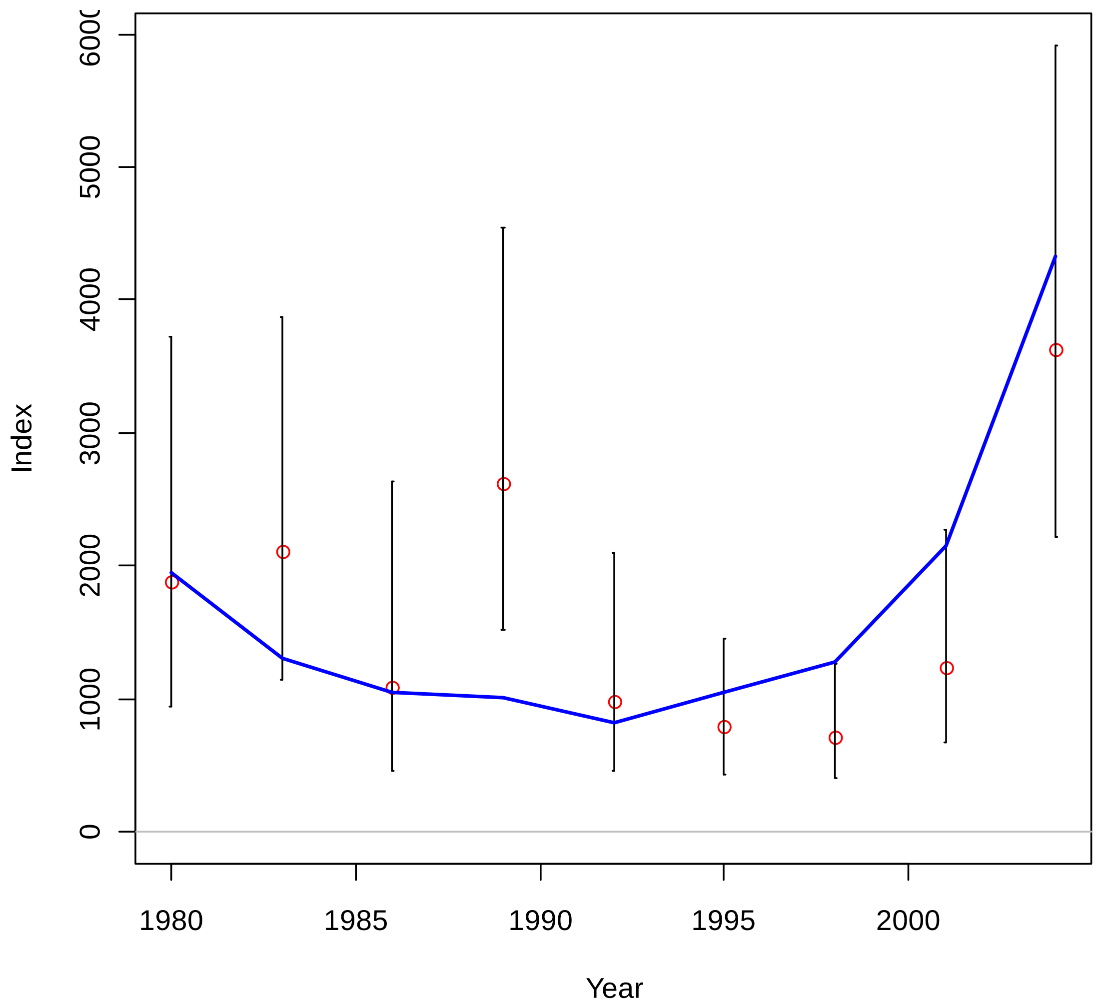

Figure 115. California model fit to Triennial survey index.

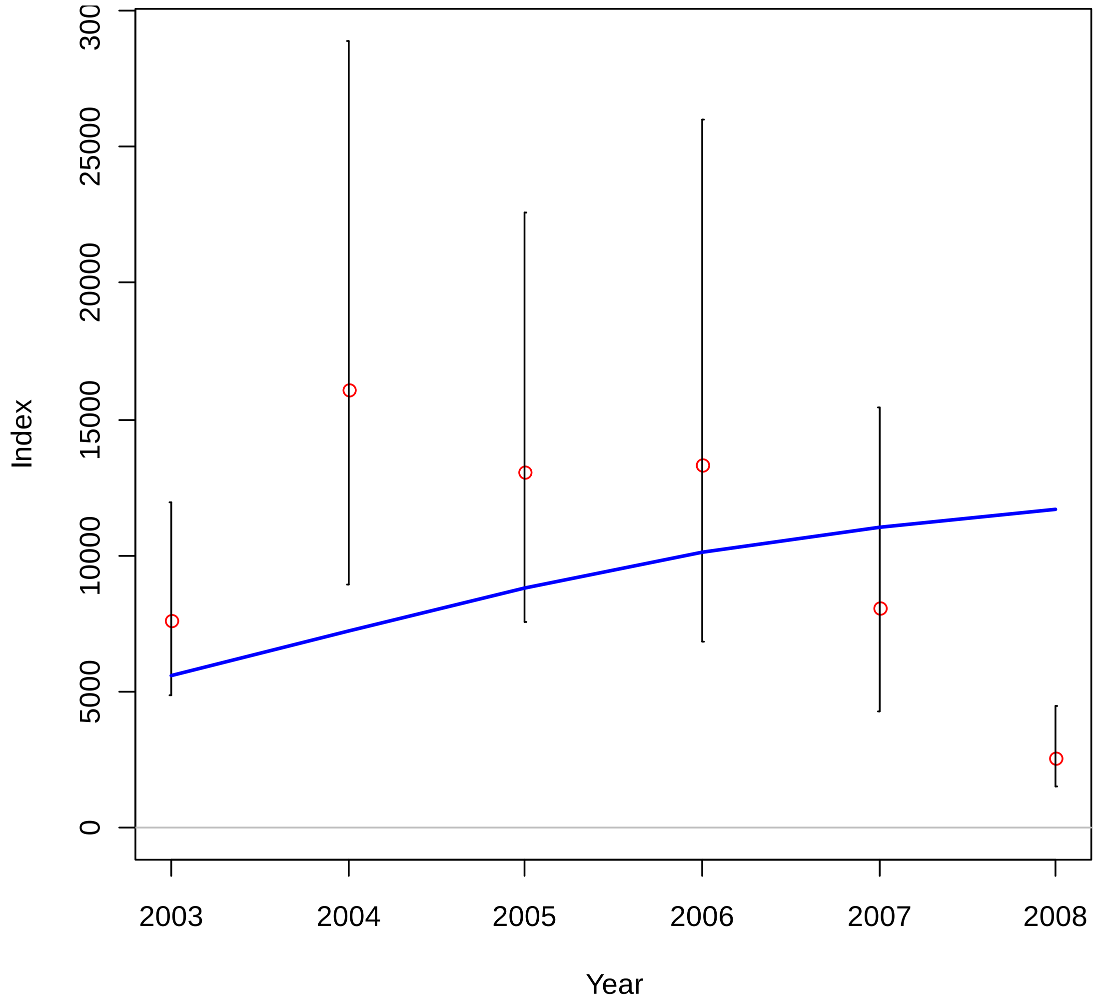

Figure116. California model fit to NWFSC survey index.

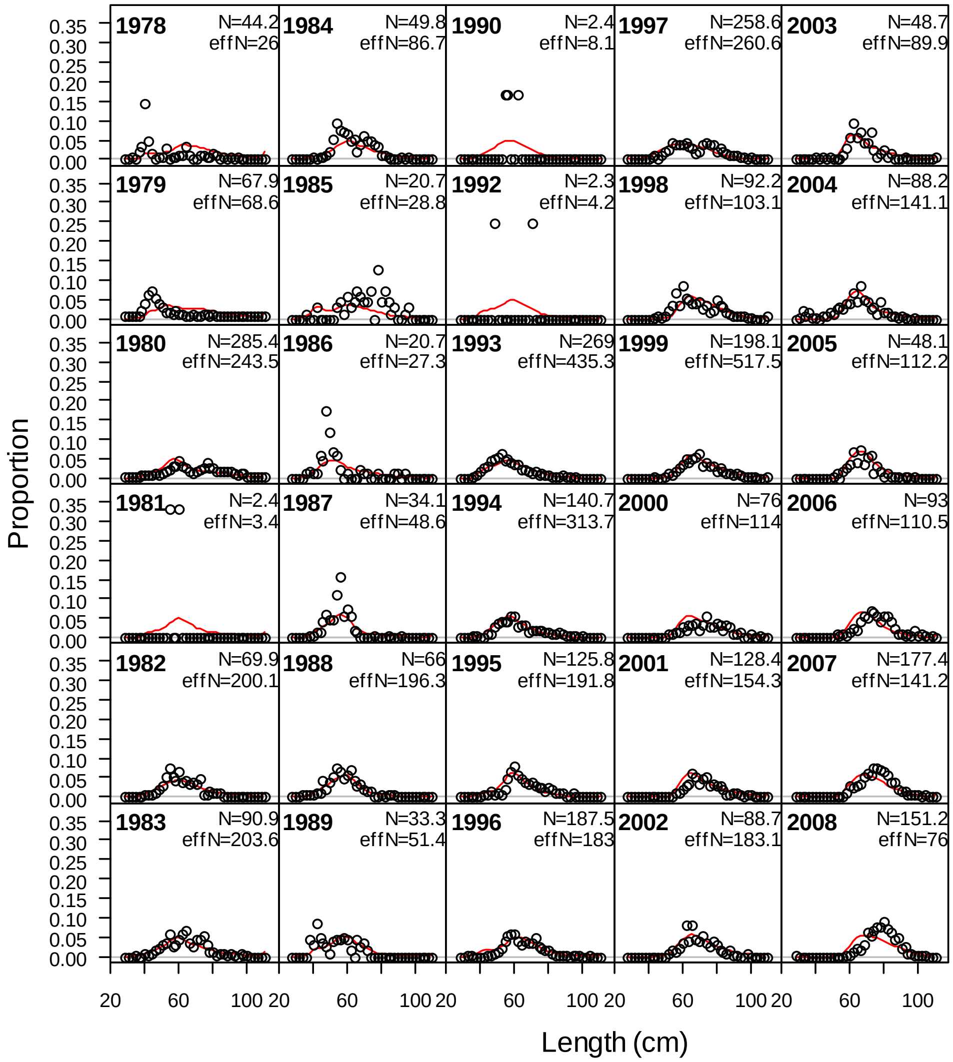

Figure 117. Fits to commercial retained female length compositions for California for 1978-1990 and 1992-2008.

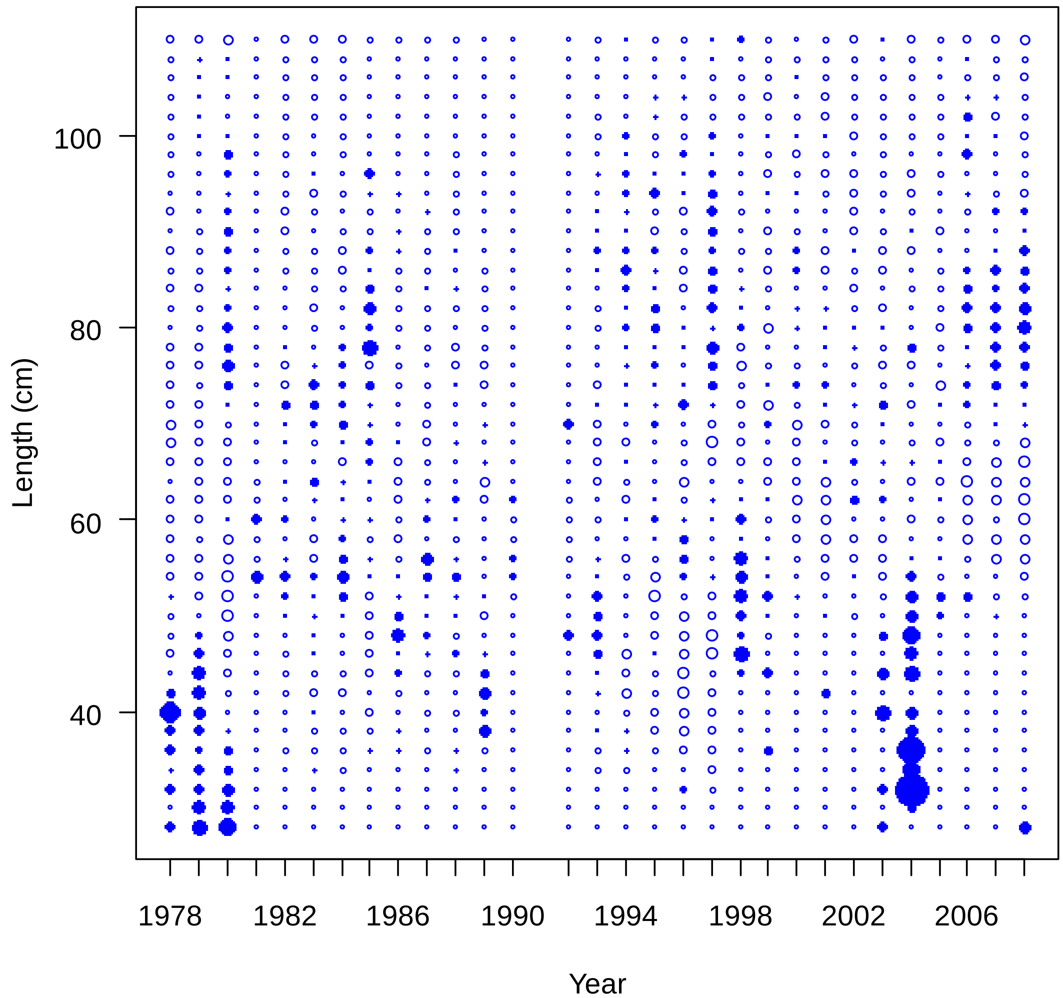

Figure 118. Pearson residuals for fits to commercial retained female length compositions for California (max = 18.13) for 1978-2008.

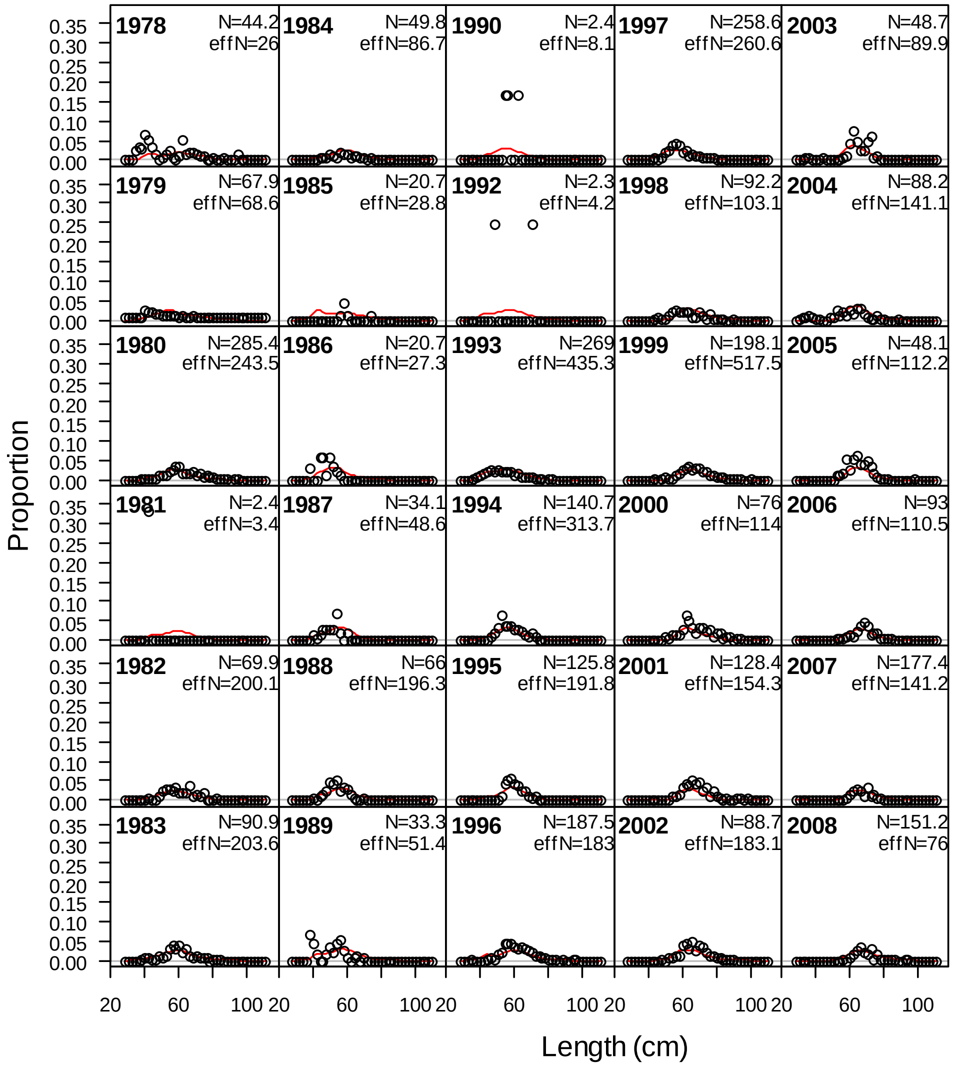

Figure 119. Fits to commercial retained male length compositions for California for 1978-1990 and 1992-2008.

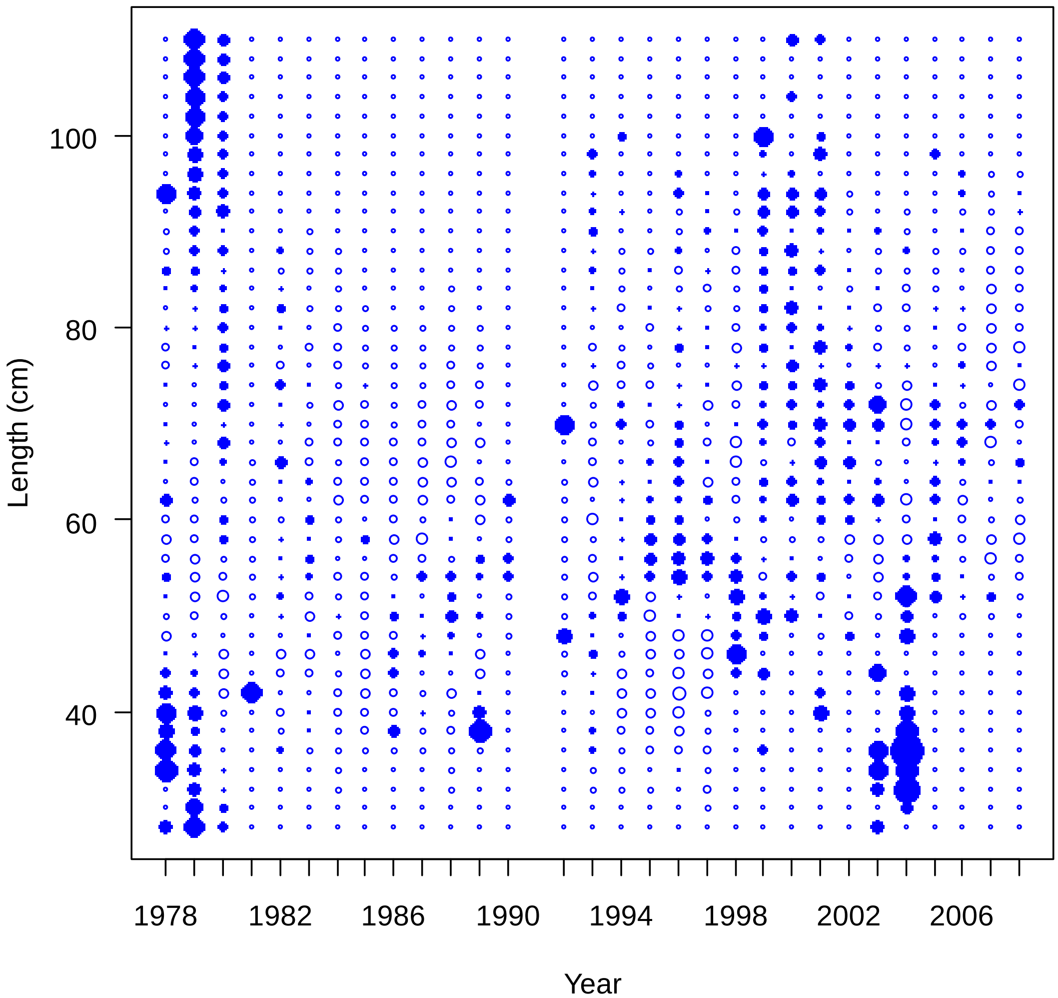

Figure 120. Pearson residuals for fits to commercial retained male length compositions for California (max = 11.14) for 1978-2008.

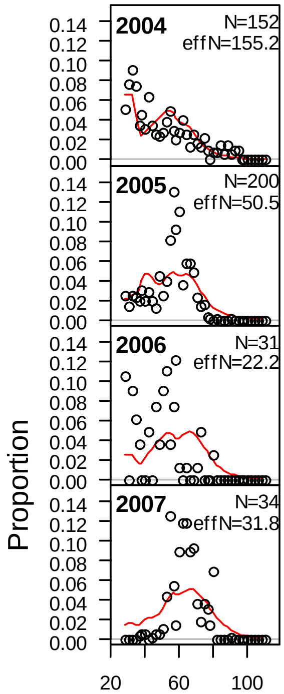

Figure 121. Fits to commercial discarded combined-sex length compositions for California for 2004-2007.

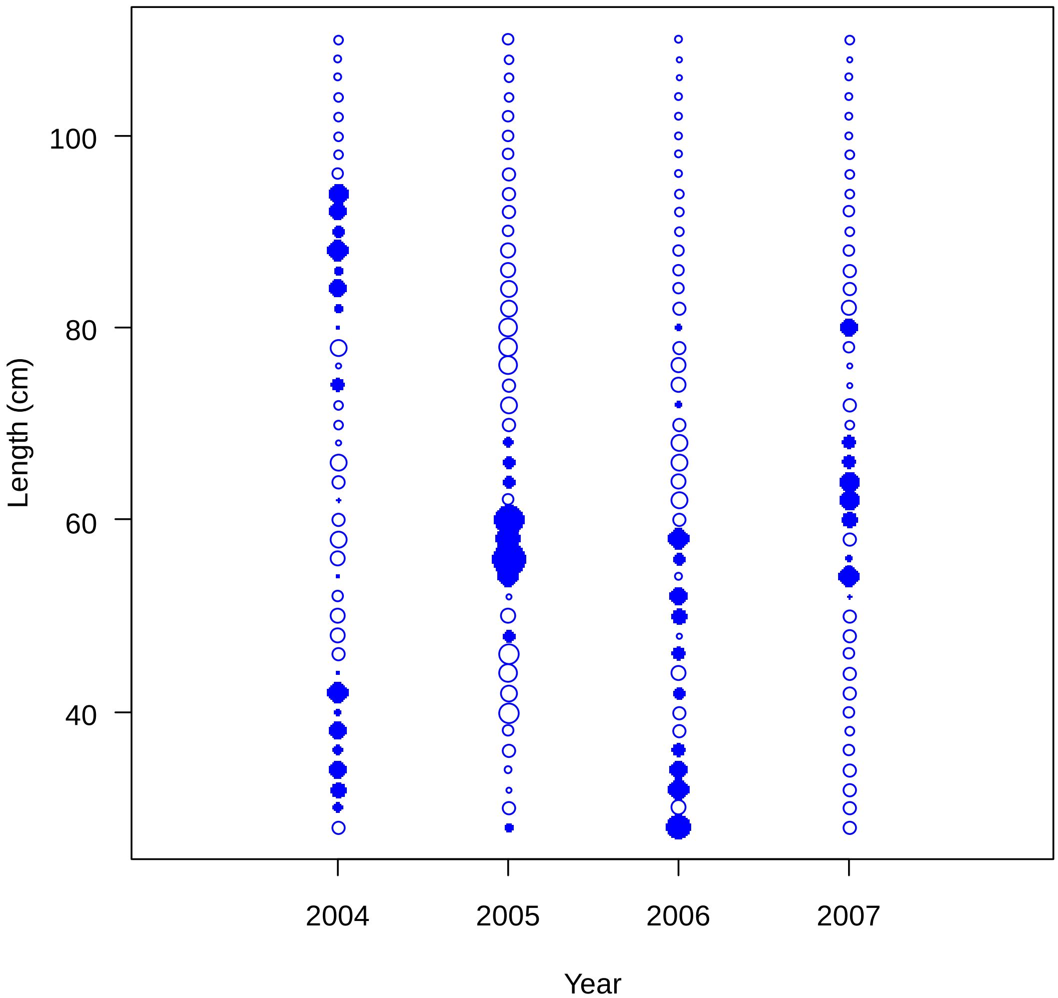

Figure 122. Pearson residuals for fits to commercial discarded combined-sex length compositions for California (max = 5.49) for 2003-2007.

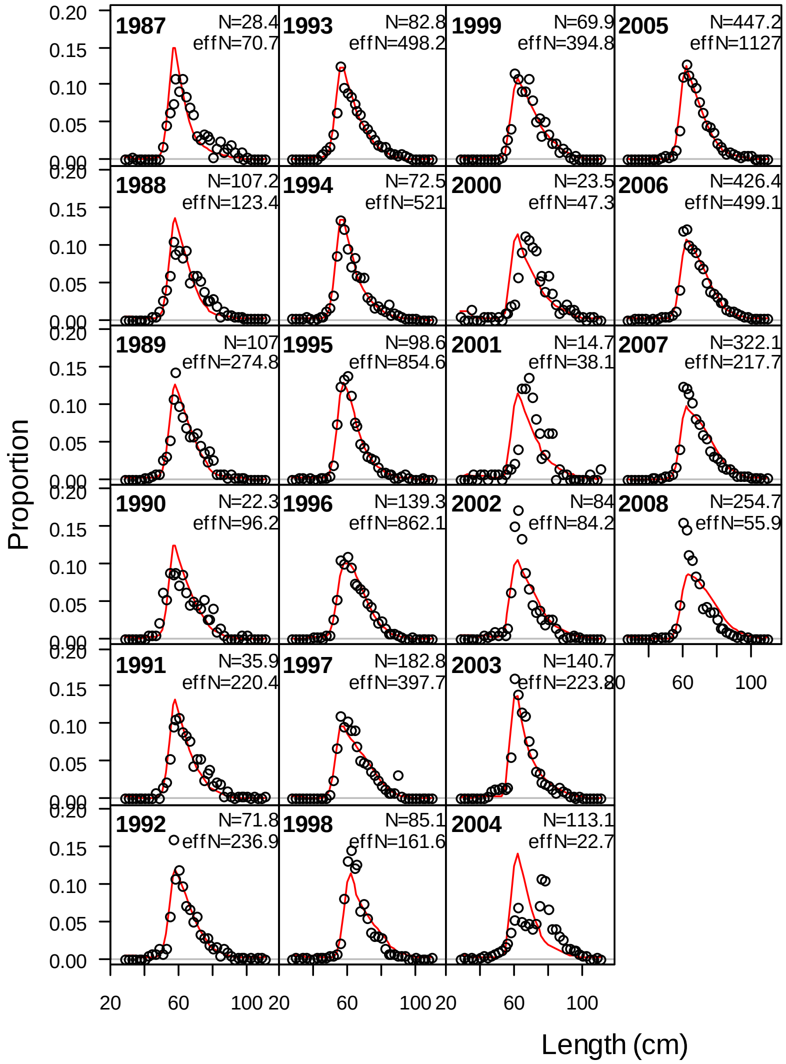

Figure 123. Fits to recreational combined-sex length compositions for California.

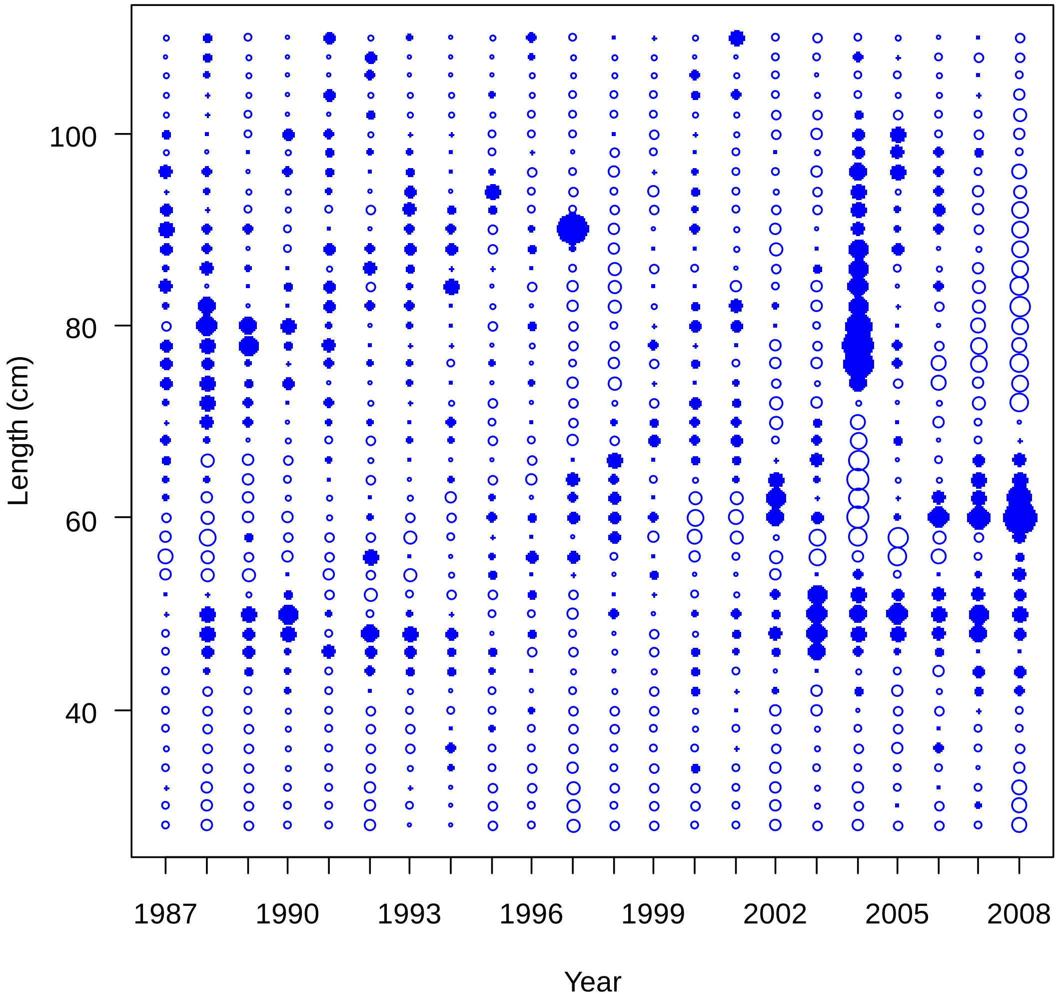

Figure 124. Pearson residuals for fits to commercial discarded combined-sex length compositions for California (max = 5.83).

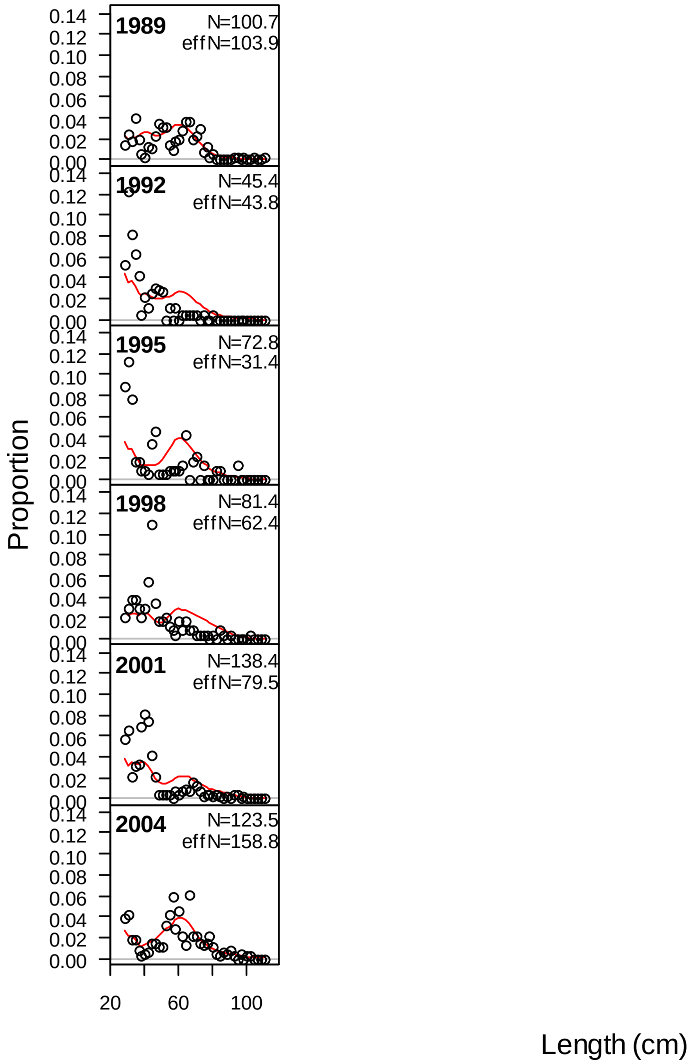

Figure 125. Fits to triennial female length compositions for California.

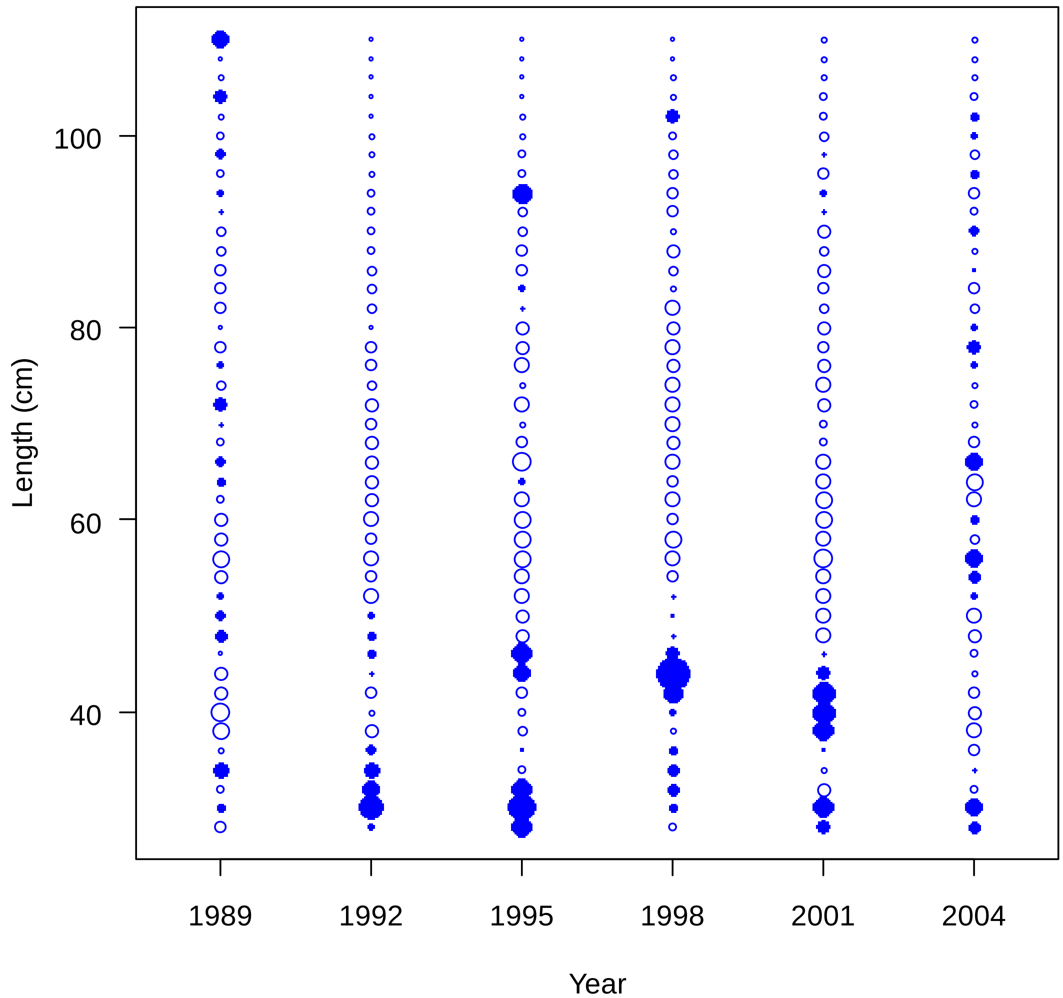

Figure 126. Pearson residuals for fits to triennial survey female length compositions for California (max = 5.76).

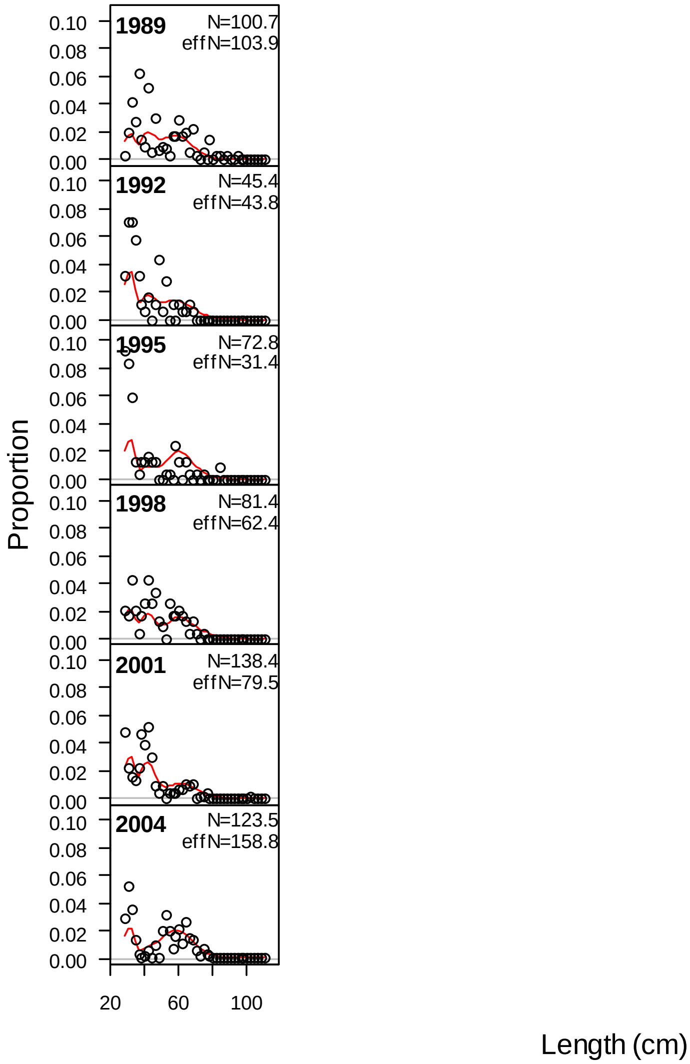

Figure 127. Fits to triennial survey male length compositions for California.

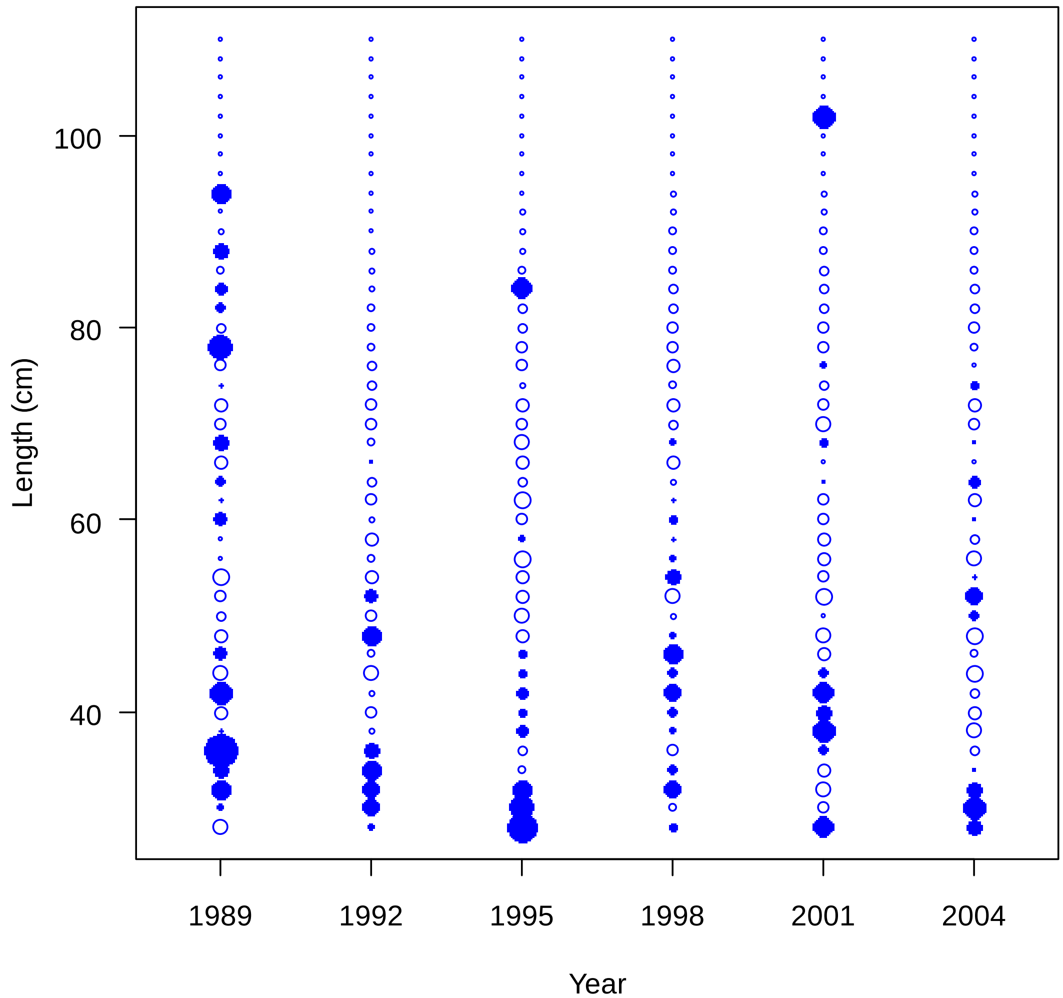

Figure 128. Pearson residuals for fits to triennial survey male length compositions for California (max = 5.02).

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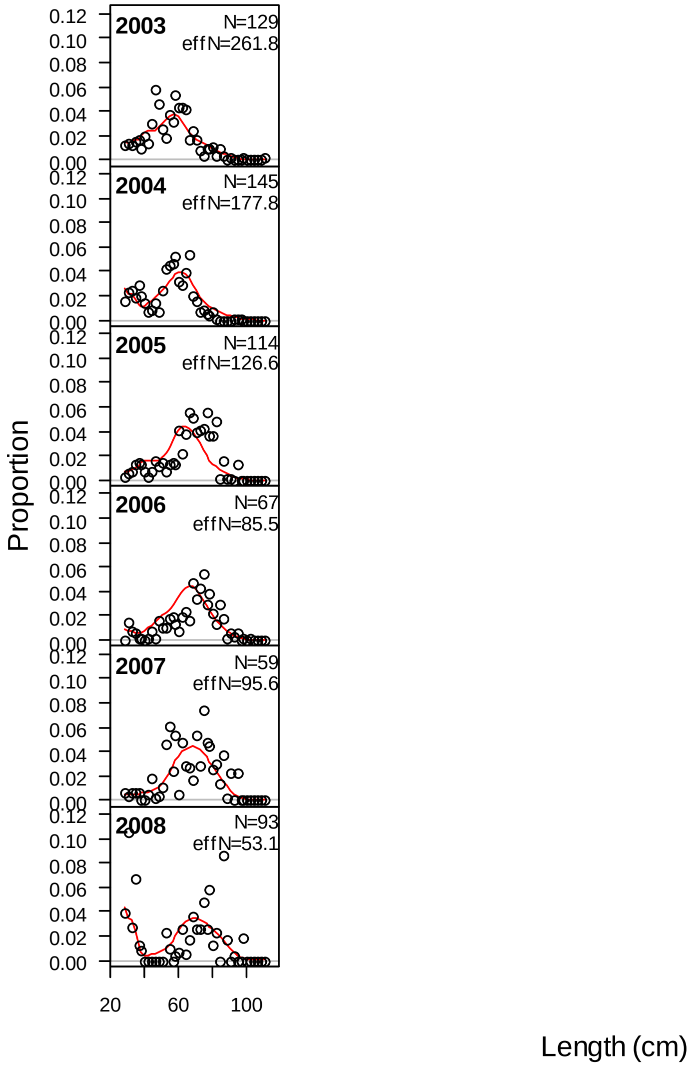


Figure 129. Fits to NWFSC survey female length compositions for California..

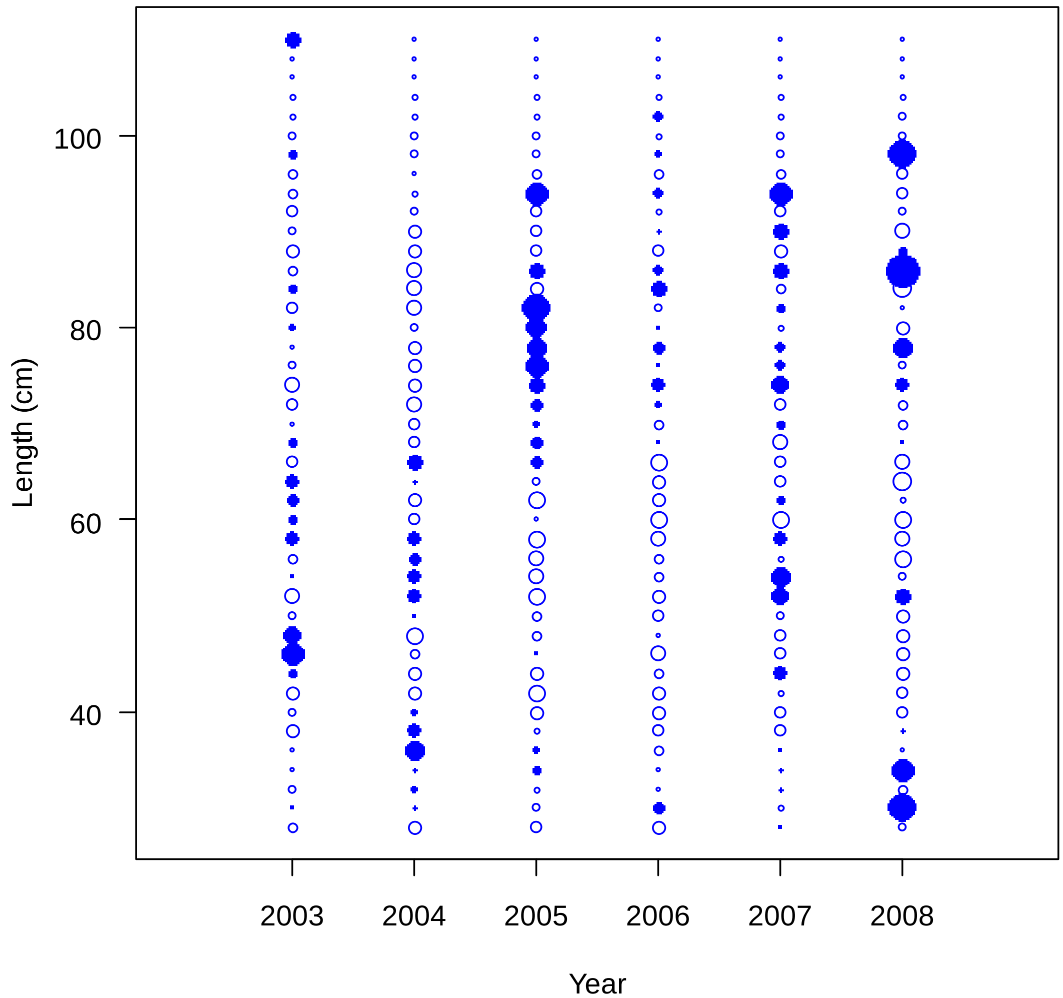


Figure 130. Pearson residuals for fits to NWFSC survey female length compositions for California (max = 5.3).

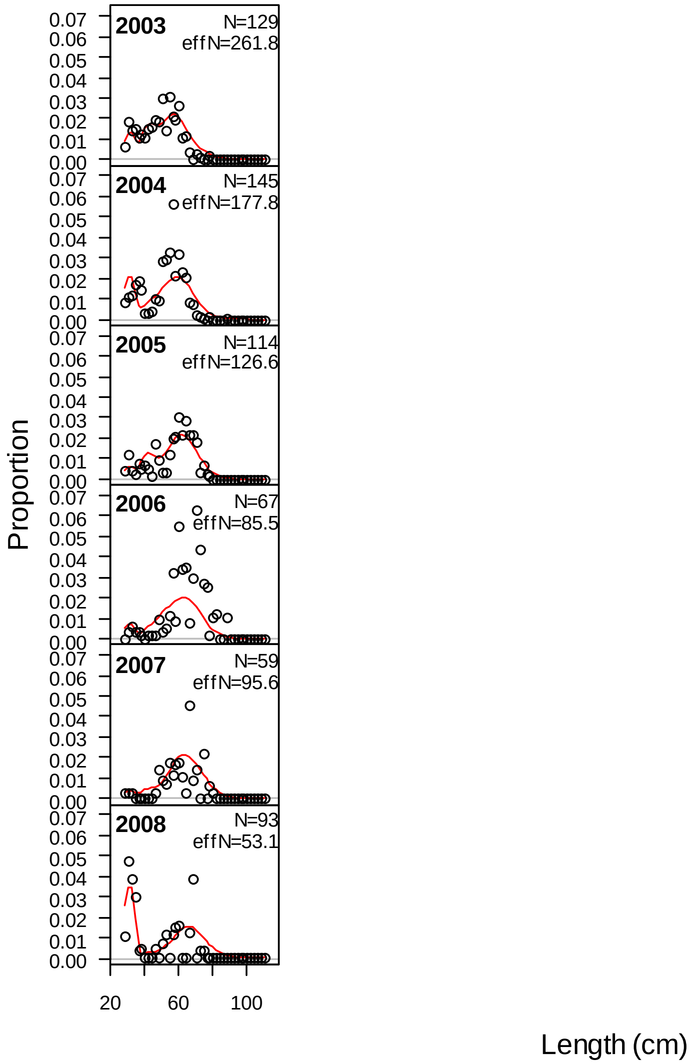


Figure 131. Fits to NWFSC survey male length compositions for California.

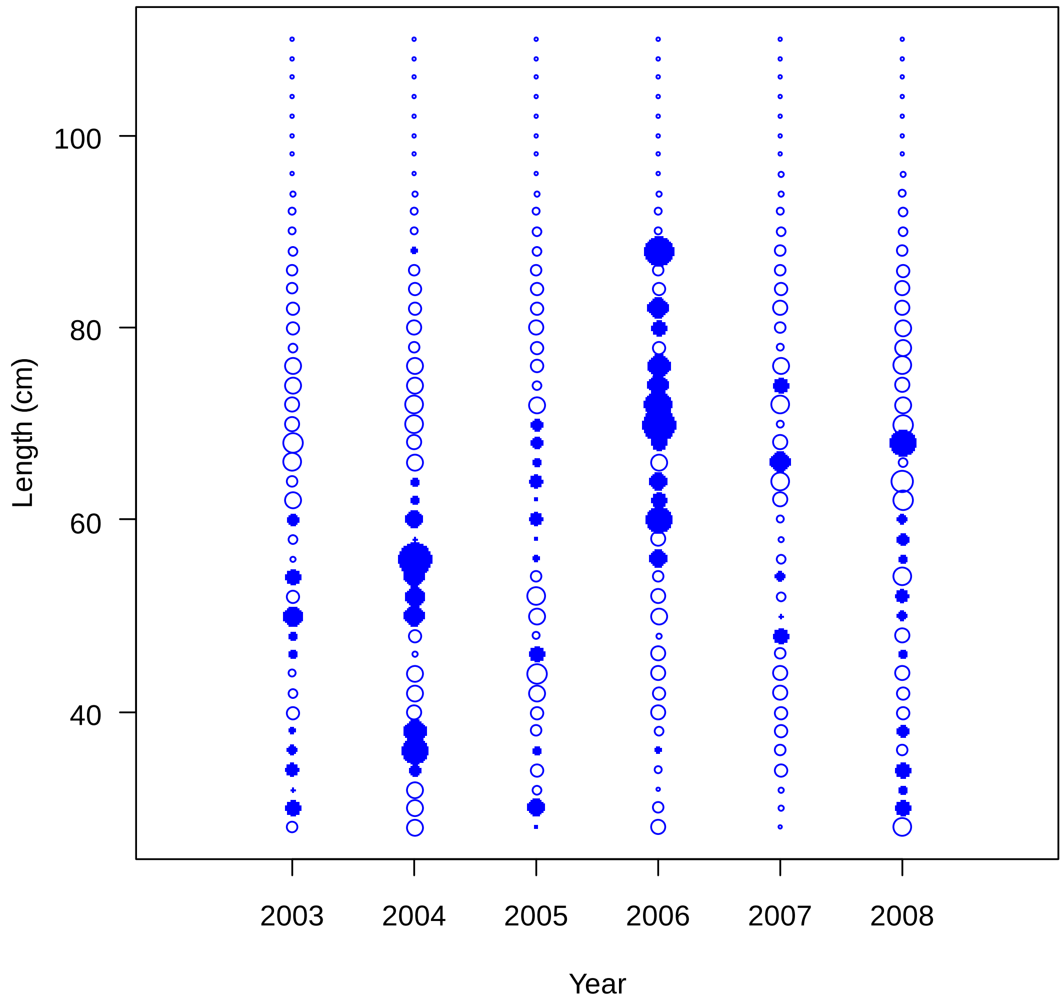


Figure 132. Pearson residuals for fits to NWFSC survey male length compositions for California (max = 3.13).

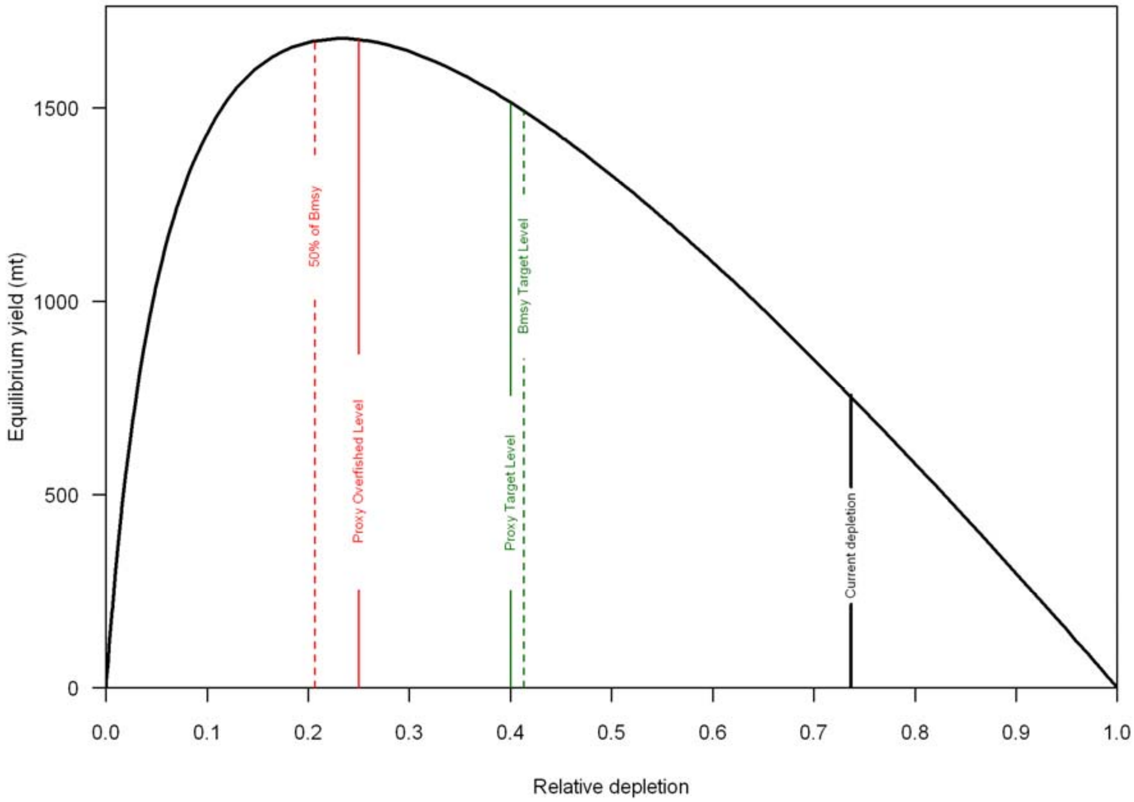


Figure 133. Equilibrium yield plot for California

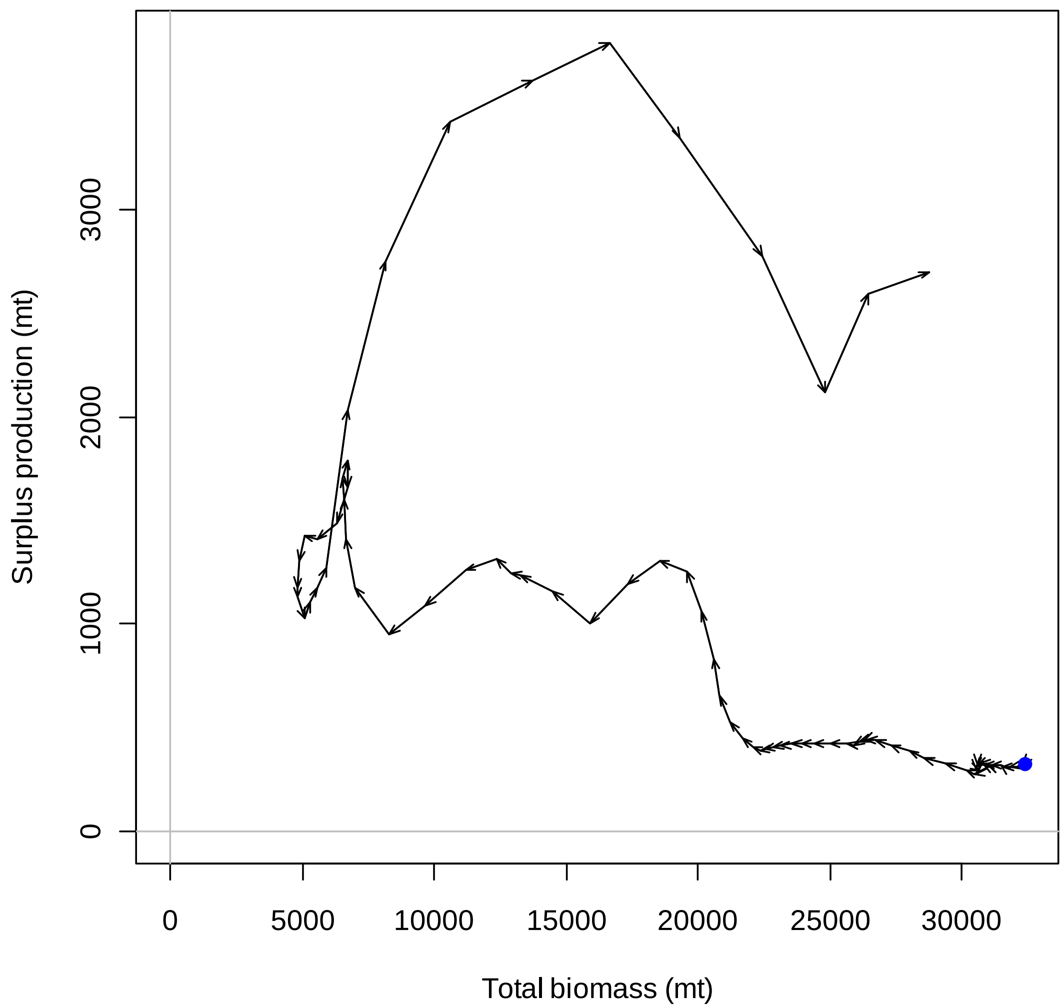


Figure 134. Time series of surplus production for California

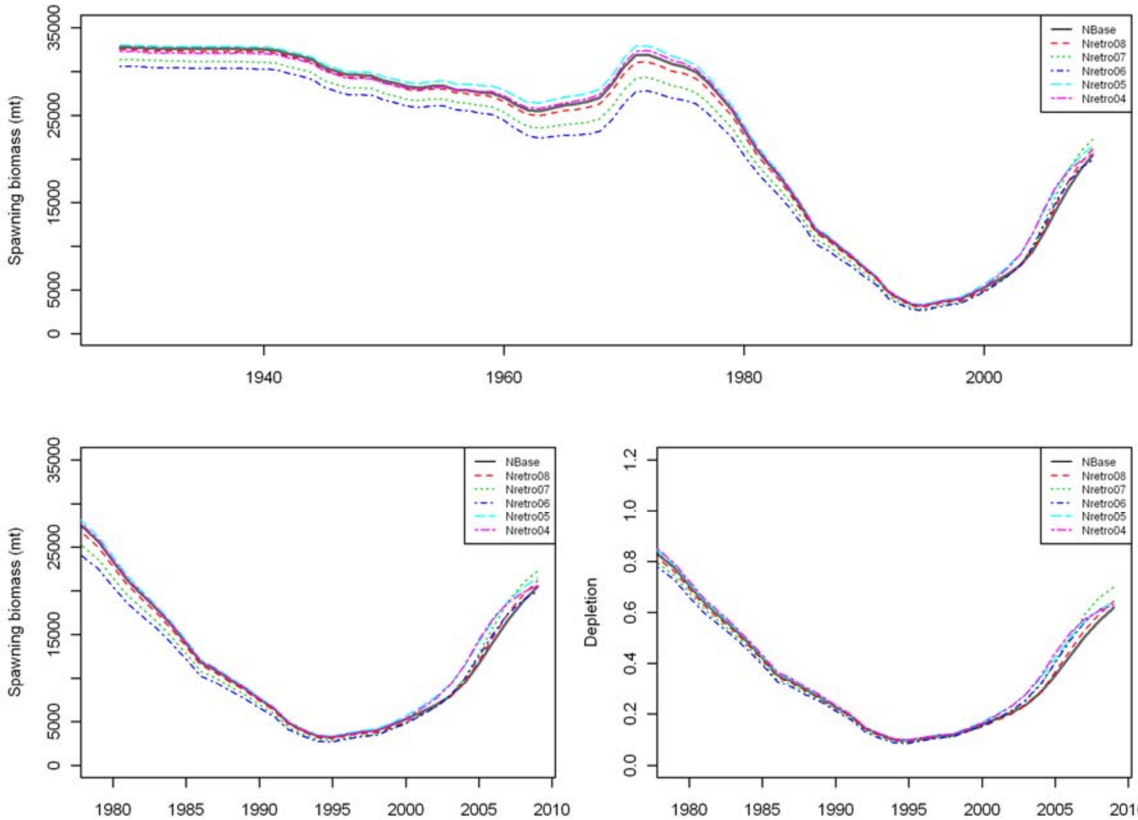


Figure 135. Retrospective analysis for North Model.

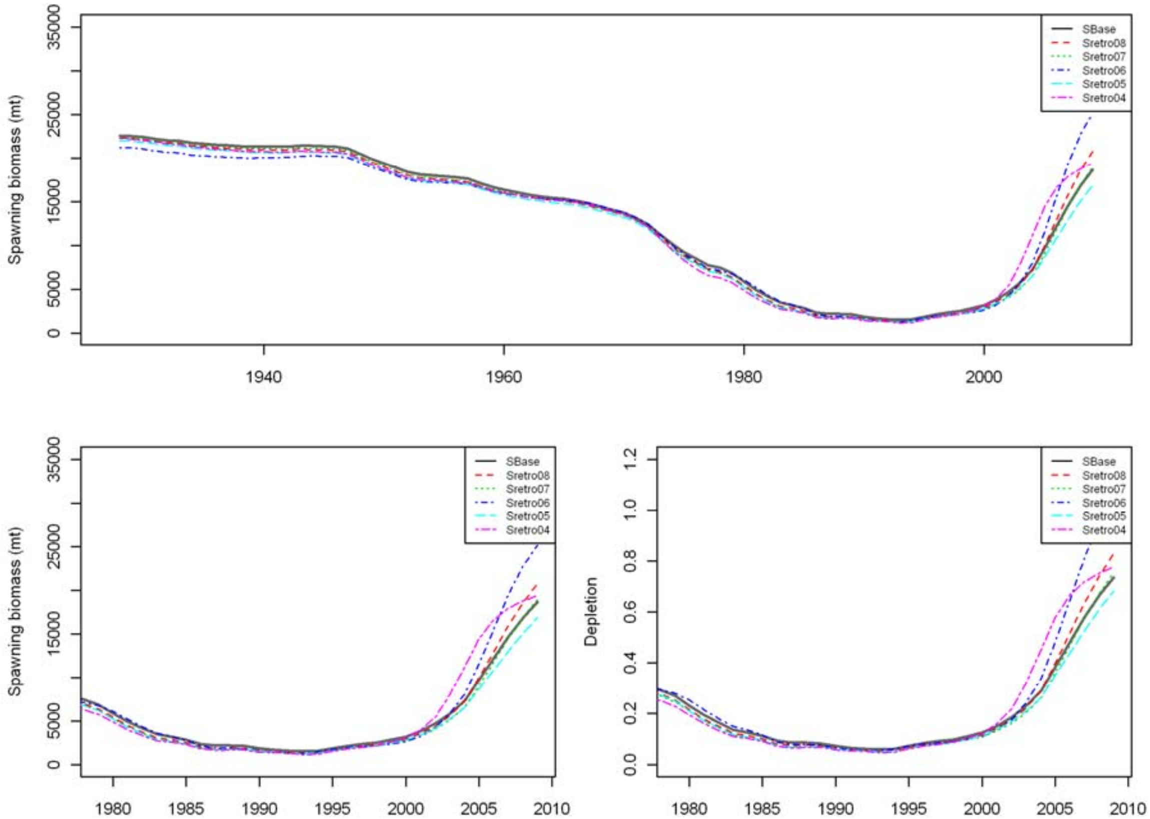


Figure 136. Retrospective analysis for South Model.

Appendix 1. Indices of Abundance for Central California.

Thomas Wadsworth

1.1. Study area

The study area extended from Cape Mendocino (40°38 N, 124°35' W) southward to Point Conception (34°27' N, 120°28' W) (Fig. 1). This area, often designated as 'central California', is used commonly for management by the Pacific Fishery Management Council. The nearshore marine environment has been defined by the CDFG California Nearshore Fishery Management Plan (2002) as beginning at the high-tide line and extending to 120 feet (~37 m). However, my study area begins at the low tide line, therefore only including the subtidal nearshore areas. The study area was further defined as including all rocky reef habitats in the nearshore environment and some deeper reefs where some surveys collect data on nearshore rocky reef fishes. This habitat is defined as areas of consolidated hard rock covering the seafloor as opposed to sand or mud substrate (Allen 2006).

1.3. Abundance surveys

1.3.1. Survey selection

Determining which current or historic surveys to include in this study required employing several criteria. Survey datasets had to: 1) include abundance measurements in the form of count and effort for at least one of the study species; 2) collect at least two samples each year within the boundaries of central California; 3) conduct at least some sampling in nearshore rocky reef habitats; and 4) contain at least four years of data using the same methodology. Abundance data spanning less than a few years does not provide enough information to satisfactorily depict a population trend for species living multiple years (Edward Dick, National Marine Fisheries Service, pers. comm.). Most nearshore rocky reef species require at least a few years to recruit to the fishery (Allen 2006). Therefore, a minimum criterion of at least four years of data was set for an abundance survey to be analyzed in this study, enough time to assess the impact of a few years of recruitment pulses on the stock.

I initially identified 35 surveys of abundance that collected data on nearshore rocky reef species in central California (Appendix 1). Many of these surveys consolidated their datasets into centralized databases, the California Commercial Port Sampling Program (CALCOM) and Recreational Fisheries Information Network (RecFIN). Several surveys were not included in this study because: 1) data were not yet digitized; 2) permission for use could not be obtained; 3) effort data were not consistently collected; or 4) they did not sample study species within the study area. Of the 35 surveys I reviewed, nine fit the necessary criteria to be analyzed in this study (Table 2).

1.3.2. Survey Data Organization

For each survey used in analyses, data were organized by excluding all species, samples and explanatory variables that did not fit the criteria for my study. Stephens and MacCall (2004) refer to this process as 'subsetting' the data, or determining what information is useful for the project. Some records or entire survey years within the dataset were removed prior to analysis because a record: 1) did not have sufficient effort data; 2) was collected outside the spatial boundaries of the study; 3) did not have data on one or more of the explanatory variables chosen to include in models; 4) was collected in a variable level with little or no intra-annual replication (e.g. all winter records were removed if only a few samples were collected across the entire survey time-series); or 5) was the only sample for that respective year (only years with more than one sample were used to allow for precision analysis).

Catch and effort data were sorted separately from one another. For fishing surveys, every distinct site recorded was considered a sample. Some surveys recorded catch at several sites fished by a given boat in one day, in others only the port location was recorded and a single trip was a sample. Each transect was considered a sample for SCUBA surveys. For each sample, a positive or zero count (catch or observation) was included for a given species. Effort data often had to be re-formatted before analysis could proceed. All fishing time that was recorded in boat hours at a given site was converted to decimal hours and multiplied by the number of anglers actively fishing to calculate fish catch-per-angler-hour. An assumption of the model was that the amount of sampling effort alone did not change the probability of counting a fish species. In surveys where researchers did not record the number of anglers fishing at each site, it was assumed that all anglers fished the entire trip. The volume of water surveyed in each SCUBA transect was determined in order to calculate fish count density. Once the final set of samples was identified for each dataset, I calculated the proportion of total samples where each study species was counted at least once.

I also selected categorical explanatory variables to include in analysis, based on information contained in each survey database. Only those variables that I deemed likely to influence the abundance count of a given survey were considered. I created categories for 'year' and 'season' based on sampling dates in all cases. Season was based on calendar dates: winter (December 22nd – March 20th), spring (March 21st – June 21st), summer (June 22nd – September 21st) or fall (September 22nd – December 21st). I grouped survey sampling locations into 'subregions' in most cases, due to the lack of appropriate replication at the more specific sampling sites recorded by the survey. Each additional variable (if applicable) was divided into 2-4 categories, defined with regard to the distribution of samples among levels. In some cases, categories were already chosen by samplers, and these were preserved. In all cases, variables (aside from year, season and location) were only considered for inclusion in models if they were regularly recorded by a given survey. In some cases where a small percentage of samples did not have information on a given explanatory variable, those samples were removed from analysis so that each sample had information on all categories.

Orthogonality in sampling was assessed for each survey dataset by creating tables of sample distributions across explanatory variable levels. I considered sampling to be orthogonal if all data cells for explanatory variable level combinations had at least five samples (e.g. every location in every year must have at least five samples in all seasons sampled). Samples from variable levels were not removed unless the number of samples was extremely small (< 10 samples) across all years. If sampling was non-orthogonal for an explanatory variable in a given year, all data for that year was removed only if sampling was very unbalanced (i.e. many samples in one level, few or none in other levels) *and* the time-series was not broken (e.g. it was the first year of a time-series). It was assumed that if sampling was non-orthogonal for a given explanatory variable, any results indicating differences in densities among levels could be incorrect due to missing information. In some cases, sampling was orthogonal for some or all variable pairs (e.g. all locations sampled in all years) but not for multiple variable combinations.

The sections below describe the nine surveys analyzed in this survey (and the one dataset I created by combining two surveys). Each section summarizes information on: the groups responsible for collecting data, survey methodologies, survey timespan and how I organized data for each to be analyzed.

1.4.3. CDFG Marine Reserve Fish Density and Habitat Associations (CDFG SCUBA)

The CDFG SCUBA survey was a fishery-independent study by CDFG personnel during 7 years from 1992 to 98. However, only the years 1995-98 (4 years total) were used for my analyses because variable methodologies were used in early years. Samples were collected using different types of SCUBA transects from Monterey to Lopez Pt. (Big Sur). Only samples collected using the 30 m transect method were used for analysis. The 30 m transects were not conducted in the years 1992-94, so those years were removed from analysis. In 30 m transects, dive buddy pairs swam the length of a benthic transect (near the bottom) and counts for each species were *combined* for the two divers (for detailed methods, see VenTresca et al. 2001). The measure of effort for this survey was the 360 m^3 volume surveyed.

Explanatory variables included in models of species for the CDFG SCUBA survey (if significant) were: ‘Year’, ‘Season’, ‘Subregion’, ‘Depth Zone’ and ‘Visibility.’ Sampling season were assigned in models as: summer or fall. Study sites were all rocky reef habitats (as defined by side-scan sonar) and transects were located at random within these areas. Sampling sites were grouped into subregions, assigned in the models as:

Monterey Peninsula, Pt. Lobos Ecological Reserve (PLER), Pt. Sur-North BCER border, BCER, or South BCER Border-Lopez Point. Depth zones were: deep (15.0-23.0 m), medium (12.0-14.99 m), or shallow (4.0-11.99 m). Visibility was: good (6.6-12.2 m), low (0.9-3.99 m), or moderate (4.0-6.5 m). Sampling was non-orthogonal across all levels for variable pairs, so interactions were not tested.

1.4.4. PISCO Collaborative Central Coast Abundance Surveys (PISCO SCUBA)

The PISCO SCUBA survey is an ongoing fishery-independent study by University of California personnel. Data for 1999-2007 were used in my study (9 years total) from Santa Cruz County to Pt. Conception. The Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) utilizes SCUBA surveys to collect data on nearshore fishes following their protocols (http://www.piscoweb.org/). Individual divers swam transects 30 m long by 2 m wide by 2 m high and counted all fish (including juveniles), but only fish above 15 cm were included in this study. The measure of effort for this survey was the 120 m^3 volume surveyed.

Explanatory variables included in the models of species for the PISCO SCUBA survey (if significant) were: ‘Year’, ‘Season’, ‘Subregion’, ‘Level/Depth Zone’, ‘Visibility’ and ‘Transect Replicate.’ Sampling season was assigned in modelS as: summer and fall. Study sites were all rocky reef habitats and transects were located at random within these areas. Sampling sites were grouped into subregions, assigned in the models as: Santa Cruz County, Monterey Peninsula, South PLER Border-North BCER border, BCER, or Pt. Buchon-Pt. Conception. Depth was recorded for each benthic or midwater transect, I split these into the transect level (benthic or midwater) and the depth zones within which the measurements fell. Level/depth zones were assigned as: Bottom (2.0-10.99 m), Bottom (11-25 m), Midwater (1.0-7.99 m), or Midwater (8.0-19 m). Visibility was recorded in meters for each transect, I categorized measurements as: poor (0-2.99 m), medium (3.0-5.99 m), or good (6.0-26 m). 'Transect Replicate' was a category to indicate whether a given SCUBA transect sample was conducted first or subsequently (i.e. second or higher) for a given date, site and level/depth zone. Transect replicates were included as: 1st transect or repeat transect. Sampling was orthogonal only for the variable pair 'Year' and 'Season', therefore this was the only interaction tested.

1.4.5. TENERA Inc. Diablo Canyon Nearshore Reef SCUBA Survey (TENERA SCUBA)

This ongoing fishery-independent survey, was designed and carried out by Tenera Environmental, Inc. The survey utilized SCUBA survey methods (CRANE 2004), and was limited to a small cove near Diablo Canyon, California. Data from 1976-2007 were included in my study (32 years total). Survey methodology consisted of two divers surveying a single 50 m x 2 m x 2 m (200 m^3) transect at the same time but starting at opposite ends. A sample consisted of the total fish count for both divers on each transect.

Explanatory variables included in models of species for the TENERA SCUBA survey (if significant) were: 'Year', 'Season', and 'Transect Replicate'. Sampling 'Season' was assigned in models as: winter, spring, summer and fall. 'Transect Replicate' was: 1st Transect or Repeat Transect. Depth ranges of transects were recorded but not included in models for this survey because ranges overlapped and differed very little. A location variable was not included in the model for this survey, since transects were all within the same small cove. Sampling was non-orthogonal across all levels for all variable pairs, so interactions were not tested.

1.4.6. CDFG Central California Marine Sportfish Hook-and-Line Survey (CDFG H&L)

This fishery-independent survey chartered fishing vessels to take scientists to fishing locations as directed from Monterey to Pt. Estero (north of Morro Bay). All fish were identified, measured and counted by scientists aboard fishing vessels. Effort was recorded by CDFG personnel as the number of minutes and anglers fishing at a given site during a trip. The survey was conducted during 17 years: 1978-82, 1985, 1987-89, 1991-94 and 1995-98. Only samples from 1978-82 and 1995-98 were included in my analyses, because other years did not include effort data. All samples without effort were removed from the dataset, including every sample from 1985-94 and some samples for 1995-98. This survey was split into two different datasets for analysis: 1978-82 (5 years) and 1979-82; 1995-98 (8 years). During 1978-82 samples were taken in all seasons from Monterey to Pt. Estero (Big Sur), while during 1995-98 sampling was only during fall months in Big Creek Ecological Reserve (BCER). Therefore, the time-series 1979-98 represents trends only within BCER (1978 was not included because only one sample was taken in BCER).

Explanatory variables included in models of species for the CDFG H&L 1978-82 time-series (if significant) were: ‘Year’, ‘Season’ and ‘Subregion.’ Season of sampling was assigned in models as: winter, spring, summer, or fall. Sampling sites recorded by the survey were grouped into subregions, included in models as: Monterey, Pt. Pinos-Carmel, Pt. Lobos-Soberanes, BCER, Lopez, Pt. Sur-Partington Pt., Jade Cove-Ragged

Point or Pt. Sierra Nevada-Pt. Estero. Sampling was non-orthogonal across all levels for variable combinations, meaning interactions between variables were not assessed. The model for the 1979-98 time-series did not include 'Subregion' or 'Season' as variables.

1.4.7. CDFG Creel Survey of CENCAL Spearfish Tournaments (CDFG CENCAL)

The Central California Council of Diving Clubs (known as CENCAL) organized several annual recreational spearfishing tournaments for decades from Cape Mendocino to Pismo Beach. California Department of Fish and Game (CDFG) personnel identified, counted and measured all fishes caught at CENCAL tournaments since 1958, and the survey was ongoing as of 2007. However, several years were not included in my analysis because one or zero samples were taken. A few other years could not be used because the survey did not record all variables included in the final model for this survey. In summary, years included in analyses were 1959-68, 1973, 1975-77, 1980-96, 1998-2006 (40 years total).   Individual spearfisher effort expended was the number of hours divers spent searching for and spearing fish. All individual effort times was summed to find the total effort for the meet. A sample for this survey was defined as a single tournament. All of these tournaments required that divers capture fish using the free diving method. Most divers employ kayaks (or other human-powered boats) to aid in searching for fish during the tournament time limit. Prizes are awarded to divers with the largest, most numerous and most diverse fish catches.

Explanatory variables included in models of species in the CDFG CENCAL survey (if significant) were: 'Year', 'Season', 'Subregion' and 'Water Conditions.' Sampling season was assigned in models as: spring, summer or fall. Only 2 samples were collected from winter months and these were removed because any assumptions made on so few samples for this season across 40 years would be statistically unsupportable. The tournament locations were grouped into subregions to increase the very low replication rate, and were included in models as: north (Fort Bragg-San Francisco Bay), central (San Francisco-Carmel), or south (Pt. Lobos-Pismo Beach). 'Water Conditions' was a qualitative rating combining visibility and surge, defined by divers as: poor (low visibility, high surge), fair (moderate visibility and surge), or good (high visibility, low surge). Sampling was non-orthogonal across all levels for variable combinations, meaning interactions between variables were not assessed.

1.4.8. CDFG Commercial Party Fishing Vessel Logbooks (CPFV Logbooks)

The commercial party fishing vessel (CPFV) fishery includes not only the nearshore, but also deeper waters within a few hours boat ride from California harbors. Fish were identified and recorded in logbooks by CPFV crew. The total of kept and released fish was used as a measure of catch by species for analysis. Effort was recorded by CPFV crew as the total number of minutes spent fishing for an entire trip and total number of anglers onboard.

Logbooks were compiled and digitized by CDFG personnel for 1980-2007 (28 years). However, only two nearshore rocky reef species (*O. elongatus* and *S. marmoratus)* were recorded to the species-level before 2001. Therefore, only data for 2001-07 were used for analysis (7 years total). Data for unused years (1980-2001) were grouped under the category 'rockfish' for rockfish species, whereas all sea perches were recorded as 'surfperch. ' In 2001, three species of nearshore rockfish (*S. mystinus*, *S.*

carnatus and *S. pinniger*) as well as *H. decagrammus*, were added as categories on the logbook forms. In 2005, *S. melanops* was added as a category, however, three years of data collection (2005-07) was not enough to include this species in my analysis. Although the category 'rockfish' still remained in logbooks, the assumption was that CPFV crew recorded fish to the species-level where these categories existed.

Explanatory variables included in models for the CPFV Logbooks survey (if significant) were: 'Year', 'Season' and 'Subregion.' The season of the sample was assigned in models as: winter, spring, summer, or fall. Subregions were constructed using block numbers recorded by CPFV crew indicating where the majority of fishing occurred. Subregions used for this survey were: Cape Mendocino-Pt. Reyes, Pt. Reyes-Pillar Pt., Pillar Pt.-Santa Cruz Lighthouse, Santa Cruz Lighthouse-Pt. Sur, Pt. Sur-Pt. Buchon, or Pt. Buchon-Pt. Conception. Sampling was orthogonal across all levels for variable pairs, but not for 'Year', 'Season' and 'Subregion' together. Interactions between the 'Year' and 'Season', 'Year' and 'Subregion', and 'Season' and 'Subregion' were tested.

1.4.9. PSMFC MRFS / CRFS Dockside Boat Survey (PSMFC Dockside)

In this survey, the Pacific States Marine Fisheries Commission (PSMFC) interviewed recreational anglers at harbors throughout the study area for 1980-2007 (25 years total). Each interview of a Commercial Party Fishing Vessel (CPFV) or private fishing boat was considered a sample for my analyses. Shore based fishing data was collected by this survey, but not included in my analyses due to the low likelihood of catching study species from shore. The recreational boat fishery covers nearshore waters, but also deeper areas within a few hours boat ride from California harbors. When fishing for rocky reef species, both private and CPFV anglers primarily used similar methods of anchoring or drifting (not trolling) and jigging baits or lures. CPFV trips typically have 20-80 passengers, whereas passenger vessels have 2-5 anglers, both vessel types may fish for up to 8 hours in a day. Effort was recorded by CDFG personnel as the number of minutes and anglers fishing for an entire trip (as reported by interviewees). Only fish kept by anglers and identified by PSMFC interviewers were used to calculate catch per hour for a sample. Released fish were not included in catch totals because this information was reliant on angler identifications. Samples were included in analyses if the primary or secondary target species or group (i.e. rockfish) reported to interviewers was any study species or 'group.' A small percentage of anglers told interviewers they were fishing for anything they could catch, often recorded by PSFMC as 'unidentified.' These trips were included for analysis, although anglers could have been fishing in locations unlikely to contain nearshore rocky reef species.

The Marine Recreational Fisheries Statistical Survey (MRFSS) covered the years 1980-89 and 1993-2003, whereas the California Recreational Fisheries Survey (CRFS) extended from 2004-2007. Both monitored the same fishery, but the CRFS program sampled more sites, more regularly. Whereas the MRFSS survey recorded the effort of anglers in hours, the CRFS survey used anglers per trip as a measure of effort at high traffic sites and angler hours at less popular sites. To combine these two programs into one survey, I used all sites surveyed by the MRFSS program and only the lower traffic sites (that recorded angler hours) from the CRFS program.

Explanatory variables included in models of species for the PSMFC Dockside survey (if significant) were: 'Year', 'Season', 'Subregion', 'Distance From Shore' and 'Boat Type.' Sampling season was assigned in models as: winter, spring, summer and fall. The location of each dockside sample was recorded by this survey, but not the location of fishing. Samples were split into several subregions based on the dockside interview location, included in models as: Cape Mendocino-Pt. Reyes, Pt. Reyes-South San Francisco, Pacifica-Capitola, Moss Landing-Ragged Pt., or Pt. Piedras Blancas-Pt. Conception. The distance from shore fished during the majority of a boat trip was included in models as: less than three miles or more than three miles. The type of fishing boat was: private or charter (CPFV). Sampling for the PSMFC Dockside survey was orthogonal for year and all variable levels, but not for multiple variable combinations (e.g. all subregions and seasons were sampled in 1989, but not all seasons were sampled in the subregion Moss Landing-Ragged Pt.). Therefore, I tested for interactions between 'Year' and 'Season', 'Year' and 'Subregion', and 'Season' and 'Subregion'.

1.4.10. CDFG CPFV On-Board Sampling Program (CDFG Observers)

The CDFG Observers survey was based on the observations of CDFG personnel while onboard CPFVs from 1987-1998. Data for 1987 were not included in my analyses due to non-orthogonality in sampling, leaving a time-series of 11 years. Trips were chosen to carry observers at random for each of the major ports in the state. CPFV trips included nearshore waters, but also deeper areas within a few hours' boat ride from California harbors. Although CPFV trips targeted many different species, the CDFG Observers survey only monitored trips targeting rocky reef species. Therefore, all samples inside the latitudinal range of central California were included in analysis. General fishing methods mirrored those defined for CPFV vessels in the PSFMC Dockside survey. However, effort was recorded by observers, as the number of minutes and anglers fishing at a given site during a trip. In addition, observers recorded, identified and counted any fish caught and returned to the ocean, as well as those kept by anglers. In many cases, only a portion of the anglers were observed on each trip. The sum of released and kept fish for observed anglers was used to determine the catch rate of each sample.

Explanatory variables included in models of species for the CDFG Observers survey (if significant) were: 'Year', 'Season', 'Subregion' and 'Depth Zone.' Sampling season was assigned in models as: winter, spring, summer, or fall. Locations were recorded by the PSFMC Observers survey as sites with coordinates. I grouped these locations into the same subregions as the CPFV Logbooks survey. The depth range fished was recorded by observers as a maximum and minimum depth for each site, but this could not be included in models because the time fished at each depth was not recorded. However, observers also recorded whether most fishing occurred deeper or shallower than 40 fathoms (~73 meters) for each sample. This 'Depth Zone' category was included as: less than 73 meters or more than 73 meters. The depth range of samples used for this survey was 3-275 meters, however only 3% were over 150 meters. Sampling was non-orthogonal across all levels for variable combinations except for 'Year' and 'Subregion', therefore only these interactions were tested.

1.4.11. PSMFC MRFSS/CRFS CPFV Observers Survey (PSMFC Observers)

The PSMFC Observers survey was based on the observations of PSMFC personnel onboard CPFVs across California. The Marine Recreational Fisheries Statistical Survey (MRFSS) covered the years 1999-2003, while the California Recreational Fisheries Survey (CRFS) extended from 2004-present. Together, the MRFS and CRFS observer surveys spanned a total of 9 years. Both monitored the same fishery, but the CRFS program sampled more CPFV trips in a given year. The survey was basically an extension of the CDFG Observers survey, using similar methods except in choosing samples to include. Unlike the CDFG Observers survey, all types of CPFV trips were observed by PSMFC. These included trips targeting salmon (*Oncorhynchus* spp.), tuna (family Scombridae), flatfish (order Pleuronectiformes) as well as nearshore and shelf rocky reef species. Because observers did not record the target group for the trips, it was difficult to sort out the trips focusing on the rocky reef assemblage. All trolling trips were removed, which accounted for most the salmon and tuna trips. Any trip that did not catch at least one species of nearshore rocky reef species was eliminated.

Explanatory variables included in the models for this survey (if significant) were: ‘Year’, ‘Season’ and ‘Subregion’. Variables were collected and categories defined using the same methods as for the CDFG CPFV Observers survey. The depth range of samples used for this survey was 5-340 meters, however only ~0.4% of samples were at depths over 150 meters. Sampling was non-orthogonal across all levels for variable combinations except for ‘Year and ‘Season’, therefore only interactions between those variables were tested.

1.4.12. CDFG/PSFMC CPFV Observers dataset (All Observers)

I created the All Observers survey by combined data from the CDFG and PSMFC CPFV surveys into a single dataset (1988-2007). The close similarities in all aspects of methods for the two surveys make it reasonable to analyze all 20 years of data together. Results did not replace either original (separated) Observers survey, instead results were compared with original surveys and other surveys that sampled the same time-span. The explanatory variables used for this GLM (if significant) were: 'Year', 'Season' and 'Subregion' (defined in CDFG Observers description). This time-series was non-orthogonal for all variable pairs.

1.5. Analysis

The error distribution used in GLMs can be continuous (e.g. normal or Gaussian, log-normal, gamma) or discrete (e.g. Poisson, binomial or negative binomial) (Dick 2004). I chose a discrete distribution, the negative binomial (NB), for all GLMs. A primary reason for choosing the NB distribution is its usefulness for datasets containing few or many zero counts to be analyzed (Maunder and Punt 2004). Zero fish counts were present or common for all of the abundance surveys used in this project (often 40% or more). If not included in the model, zero records may invalidate assumptions of the analysis as well as creating difficulties in computations (Lambert 1992, Maunder and Punt 2004). Using the normal or most other distributions requires ignoring zero records when analyzing abundance survey data may, which can bias the resulting index in a positive direction (Maunder and Punt 2004). Therefore, zero records were included in calculating an index value for each year of the time series. However, some distributions that allow for zeros, do not function correctly if the number of zeros is very low (e.g.

binomial) (Edward Dick pers. comm.). The NB distribution is not negatively affected by data with few zeros.

Discrete distributions such as the NB and the Poisson are useful if the dependent variable is a count of fish caught or observed as opposed to a continuous measurement (e.g. fish weight) (Maunder and Punt 2004). The NB and Poisson distributions are useful for modeling count data of relatively rare phenomena. Data overdispersion may occur if intra-annual sample variance is greater than the mean. This was another key reason for using the negative binomial distribution, because this distribution reflects the overdispersion not captured by the Poisson (which assumes variance equals the mean) (Seavy et al. 2005). It is also useful to employ the Akaike's information criterion (AIC) or other model selection criteria to compare the fit of models with different distributions to the same data. The AIC was used to compare models of the same data using the negative binomial and Poisson distributions, and the NB distribution proved to have the lower AIC values. The NB distribution, for the purposes of this analysis, can be viewed as a Poisson distribution with a mean that follows the gamma distribution (Hilborn and Mangel 1997).

A link function can be used to relate the linear sum of explanatory variable effects (i.e. the linear predictor term) to the mean value of the response variable (Crawley 1993). The log link, commonly accepted for use with the NB distribution (McCullagh and Nelder 1989), was used in all GLMs. This link function restricts GLM index values to positive numbers, applicable for working with abundance survey data (Agresti 2002).

An abundance survey sample (*i*) can be modeled by a GLM with negative binomial distribution and log link as:

$$\log(\mu) = x_i\beta$$

Where x = design matrix composed of all observations and explanatory variables, β = all coefficients - or levels - for each variable (e.g. spring, summer, fall for the season variable) and μ = the true mean response (Dick 2004). Fitted model values are found by: $\mu_i = \mu D_i$, where D is an error term drawn at random from the NB distribution (Dick 2004). To extract the 'year effect' from this model, the index of abundance for each year of a given study (μ_y) was calculated by the equation:

$$\mu_y = \exp(\alpha + \beta_y)$$

where α is the model intercept and β_y is the regression coefficient for the 'year' variable both back-transformed to display original data scale measurements (Ralston and Dick 2003).

To design a GLM model that best fits a given abundance survey dataset, variable selection analysis was completed for each species. This process compared models of the same dataset using different combinations of explanatory variables (e.g. years, season, location, etc.). Including factors with large fish count variation among levels in a GLM will reduce model variance, evidenced by lower AIC scores. However, when non-significant explanatory variables are incorporated in the model, variance may increase due to unnecessary complexity, creating a less precise index (Maunder and Punt 2004). Analysis of Variance (ANOVA), Akaike Information Criteria (AIC) and Bayesian Information Criteria (BIC) can all be used to evaluate these competing models. The AIC is useful for variable selection in datasets with at least 40 data points (Burnham and Anderson 2002). The BIC may provide results with less bias for large sample sizes (n >

1000) (Burnham and Anderson 2002). To create a model with only those variables that explain a significant amount of fluctuation in data, a 'penalty' term is employed for both AIC and BIC (Hilborn and Mangel 1997). The BIC is calculated similarly to the AIC, but includes a penalty term that increases with sample size, while the penalty term for AIC remains constant. Use of the BIC can reduce the chance of selecting unneeded explanatory variables for GLMs in surveys with large sample sizes.

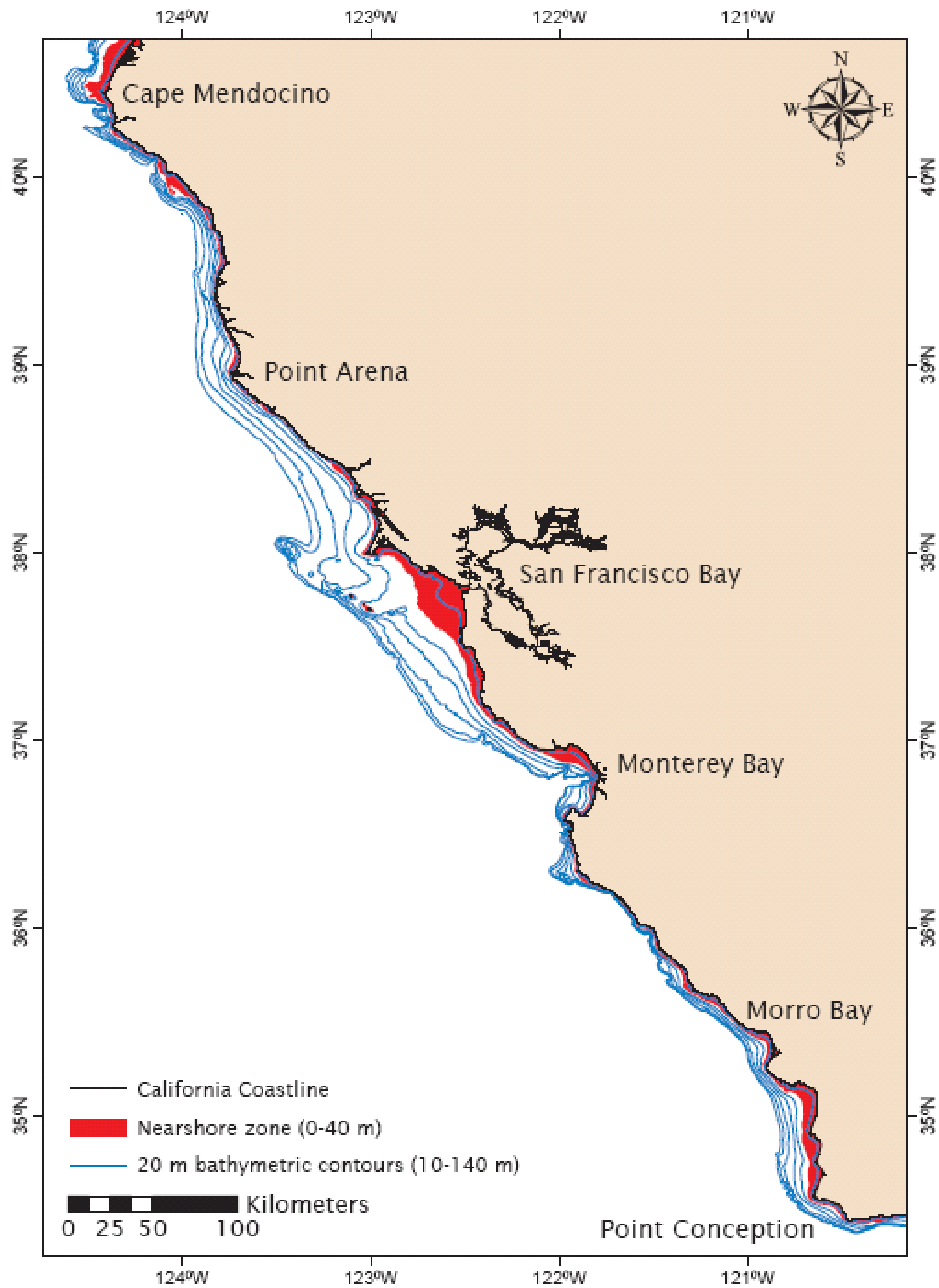
The GLMs used in my analysis tested 'main effects' only. Interaction terms were not used in GLMs in my study, but they were tested where appropriate (i.e. when sampling was orthogonal across factor levels). ANOVAs were used to test the significance of explanatory variables in GLMs with an F-test ($\alpha < 0.05$). Every significant variable was included in the final GLM for each species in a given survey (non-significant factors were not included). The only exception is that I included the variable 'Year' in all GLMs. This is because the purpose of using GLMs in my study was to detect a trend in abundance data over a time-series. Interaction models were also tested using ANOVAs, indicating whether interaction terms were significant. BIC was employed in addition to ANOVAs for testing interactions when sample sizes were greater than 1000 to compare results.

The intra-annual precision of fish count and effort samples was characterized in this study for each species in each survey using a coefficient of variation (CV). If a given year had less than two associated survey samples it was not included in analysis, because with no annual variability a CV could not be calculated (Dick 2004). The log-transformed yearly index values resulting from each negative binomial GLM were back-transformed to the original data format to compute the yearly CV. This step exponentiates the GLM values, allowing the variability of the original data to be analyzed (Edward Dick pers. comm.). In order to calculate the CV for each year of a given dataset, I used a jackknife procedure, which has been used in existing stock assessments (e.g. Ralston and Dick 2003). CVs were calculated for each year using standard errors derived from a jackknife process. The jackknife (Tukey 1958) is a specialized form of the bootstrap technique, which estimates standard errors for the GLM index values using the same number of iterations as data points (Efron and Tibshirani 1993).

The downloadable statistical program, R (http://www.r-project.org/), was used for selecting data distributions and explanatory variables and computing GLMs. I created a generic R-script that was tailored to suit each survey's dependent and explanatory variables in calculating the yearly index values and CVs based on original survey data for each species. ANOVAs (as well as AIC and BIC) were computed in R to evaluate the significance of explanatory variables and interaction terms. Each GLM was run in R and output was organized into yearly abundance index and CV values.

Table A1.1. The nine historical and ongoing abundance surveys of nearshore rocky reef fishes within central California used in my study. Survey time-span indicates the range of years for data included in my analysis. The first 4 surveys listed were fishery-independent, the final 5 surveys were fishery-dependent.

Short Survey Name	CDFG SCUBA	PISCO SCUBA	TENERA SCUBA	CDFG H&L	CDFG CENCAL	CPFV Logbooks	PSMFC Dockside	CDFG Observers	PSMFC Observers
Research Body/Data Managers	CDFG / Ventresca and Osorio	UCSC / Carr and Malone	TENERA / Jay Carroll	CDFG / VenTresca and Lea	CDFG / Ventresca	CDFG/ Dunlap-Harding	PSMFC / Van Buskirk	CDFG / Wilson-Vandenberg	PSMFC / Van Buskirk
Dataset/Study Title	Marine reserve fish density monitoring and habitat associations	PISCO Collaborative Central Coast Abundance SCUBA Surveys	Diablo Canyon Nearshore Reef SCUBA Survey	Central California Marine Sportfish Hook-and-Line Survey	Spearfish Tournaments Creel Survey (CENCAL)	Commercial Party Fishing Vessel Logbooks	Marine Recreational Fishery Statistical Survey / California Recreational Fisheries Survey - dockside boat surveys	CPFV On-Board Sampling Program	Marine Recreational Fishery Statistical Survey / California Recreational Fisheries Survey - onboard observers survey
Survey time-span	1995-1998	1999-2007*	1976-2007*	1978-82 ; 1995-1998	1959 - 2006 (most years)*	2001-2007*	MRFSS 1980-2003 (most years) / CRFS 2004-2007*	1988-1998	MRFSS 1999-2003 / CRFS 2004-2007 *
Occurrence	0.161	0.042	0.266	0.591	0.537	0.980	0.633	0.260	0.587
Mean CV	0.424	0.391	ND	0.435	0.591	0.460	0.035	0.112	0.123
Years included in analysis	4	9	32	5	8	40	7	25	11
Survey sample size (total)	483	6398	508	245	54	126	21657	43253	4462
Average samples/year	120.8	710.9	15.9	49.0	6.75	3.2	3094.0	1730.1	405.6



GIS map by Lee Murai.

Figure A1.1. The project study area, central California nearshore (3-40 meters), is highlighted in red. The rocky reef habitats comprise a portion of these depths. Deeper areas are included in some of the surveys analyzed here if they sample the correct species assemblage. The region extends from Cape Mendocino (N40°38 W124°35') at the north end to Point Conception (N34°26' W120°35') at the south end. Important landmarks in the region and 20-meter ocean bathymetry lines are included.

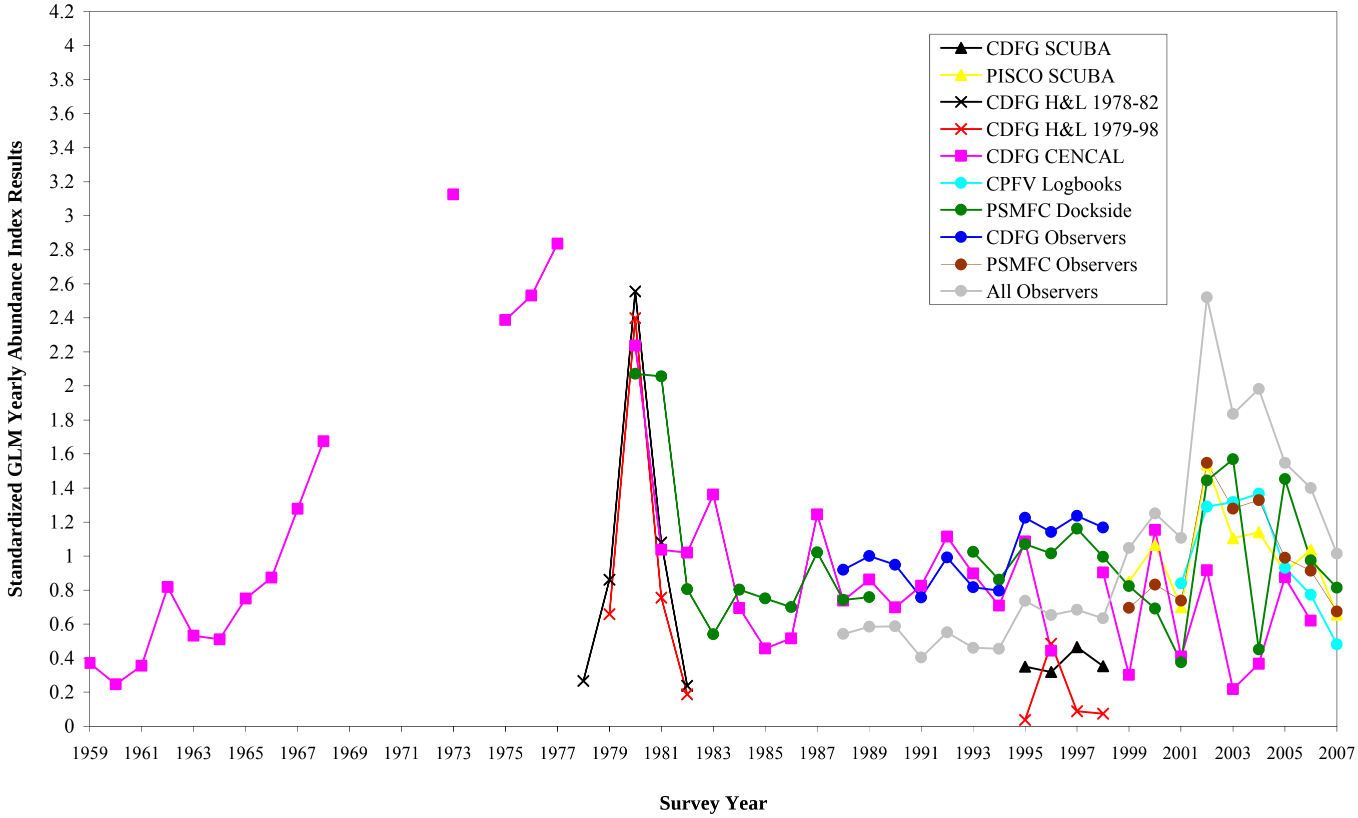


Figure A1.2 Standardized yearly index GLM model results for Ophiodon elongatus, as sampled by all surveys in the study except the TENERA SCUBA survey. Each set of yearly index values were standardized by dividing each value by the average of all values for a given survey resulting in a distribution with mean of 1, enabling comparisons among surveys with different index value magnitudes, but still displaying yearly variability.

Appendix 2. Input files for Stock Synthesis.

A. North Model

Starter File
lingcod starter file for SS v3.x
North Model

LingN_data.SS # Data file
LingN_ctl.SS # Control file

0 # Read initial values from .par file: 0=no,1=yes
1 # DOS display detail: 0,1,2
2 # Report file detail: 0,1,2
0 # Detailed checkup.sso file (0,1)
0 # Write parameter iteration trace file during minimization
2 # Write cumulative report: 0=skip,1=short,2=full
0 # Include prior likelihood for non-estimated parameters
0 # Use Soft Boundaries to aid convergence (0,1) (recommended)
0 # N bootstrap datafiles to create
25 # Last phase for estimation
1 # MCMC burn-in
1 # MCMC thinning interval
0 # Jitter initial parameter values by this fraction
-1 # Min year for spbio sd_report (neg val = styr-2, virgin state)
-2 # Max year for spbio sd_report (-1=endyr+1, -2=entire forecast)
0 # N individual SD years
0.0001 # Ending convergence criteria
0 # Retrospective year relative to end year
2 # Min age for summary biomass
1 # Depletion basis: denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel X*B_styr
1.0 # Fraction (X) for Depletion denominator (e.g. 0.4)
1 # (1-SPR)_reporting: 0=skip; 1=rel(1-SPR); 2=rel(1-SPR_MSY); 3=rel(1-SPR_Btarget); 4=notrel
1 # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num); 3=sum(frates)
1 # F_report_basis: 0=raw; 1=rel Fspr; 2=rel Fmsy ; 3=rel Fbtgt

999 # end of file marker

Forecast File
Forecast specifications
lingcod in SS v3.x
North Model

2 # Forecast: 0=none; 1=F(SPR); 2=F(MSY) 3=F(Btgt); 4=F(endyr); 5=Ave F (enter yrs); 6=read Fmult
2000 # First year for averaging selex to use in forecast (e.g. 2004; or use -x to be rel endyr)
2008 # Last year for averaging selex to use in forecast
1 # Benchmarks:0=skip, 1=calc Fspr, Fbtgt, Fmsy
2 # MSY: 0=none,1=F(SPR),2=calc F(MSY),3=F(Btgt),4=set to F(endyr)

```
0.45                                  # SPR target (e.g. 0.40)
0.40                                  # Biomass target (e.g. 0.40)
10                                    # Number of forecast years
1    # Read advanced options add indents below if 1
0                                     # Puntalyzer output: 0=no,1=yes
1999              # Rebuilder:  first year catch could have been set to zero (Ydecl)
2009                      # Rebuilder:  year for current age structure (Yinit)
1                  # Control rule method (1=west coast adjust catch; 2=adjust F)
0.4           # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40)
0.1                # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)
1                           # Control rule fraction of Flimit (e.g. 0.75)
-1                      # maximum annual catch during forecast (not coded yet)
0      # 0= no implementation error; 1=use implementation error in forecast (not coded yet)
0.1                 # stddev of log(realized F/target F) in forecast (not coded yet)
2           # fleet allocation (in terms of F) (1=use endyr pattern, no read; 2=read below)
1.0 1.0          # relative F for forecast when using F;  seasons; fleets within season
0 # Number of manual forecast catches to input
# basis for forecatch:  1=retained catch; 2=total dead catch (if line above > 0)
# Year Seas Fleet Catch

999 # end of forecast file
```

Data File

```
# data file for Lingcod in SS v3.x 2008
# Northern Area = Washington and Oregon
# June 28, 2009

### Global model specifications ###
1928    # Start year
2008    # End year
1       # N seasons per year
12      # Months per season
1       # Spawning Season
2       # N fishing fleets
3       # N surveys
1       # Number of areas
COMMERCIAL%RECREATIONAL%TRIENNIAL%NWFSC%CPUE #Names divided by "%"
0.5  0.5  0.7  0.6  0.5 #Timing of each fishery/survey (.42 POP)
1 1 1 1 1       # Area of each fleet
1 1     # Units for catch by fishing fleet: 1=Biomass(mt),2=Numbers(1000s)
0.01  0.01      # SE of log(catch) by fleet for equilibrium and continuous options
2       # Number of Genders
20      # Accumulator age

### Catch section ###
# Initial equilibrium catch (landings + discard) by fishing fleet
36   0  # Fleet 1,2

81 # Number of lines catch data
# Landed catch (only) time series by fleet
# Catch(by fleet) Year Season
46      0       1928    1
142     0       1929    1
113     0       1930    1
61      0       1931    1
68      0       1932    1
104     0       1933    1
76      0       1934    1
72      0       1935    1
104     0       1936    1
75      0       1937    1
158     0       1938    1
```

163	0	1939	1
232	0	1940	1
628	0	1941	1
517	0	1942	1
676	0	1943	1
1296	0	1944	1
801	0	1945	1
889	0	1946	1
348	0	1947	1
546	0	1948	1
1251	0	1949	1
955	0	1950	1
1100	0	1951	1
860	0	1952	1
478	0	1953	1
803	0	1954	1
1397	0	1955	1
993	0	1956	1
1173	5	1957	1
1122	10	1958	1
1729	15	1959	1
2151	20	1960	1
1937	25	1961	1
1247	30	1962	1
913	35	1963	1
1174	40	1964	1
1498	45	1965	1
1439	50	1966	1
2061	55	1967	1
2103	60	1968	1
1452	65	1969	1
985	70	1970	1
1118	75	1971	1
1089	80	1972	1
1545	85	1973	1
1714	90	1974	1
1715	94	1975	1
1658	78	1976	1
1487	85	1977	1
1343	78	1978	1
2114	96	1979	1
2095	144	1980	1
2002	301	1981	1
2429	727	1982	1
3230	213	1983	1
3071	140	1984	1
3142	257	1985	1
1354	225	1986	1
1726	323	1987	1
1747	274	1988	1
2285	232	1989	1
1839	145	1990	1
2279	233	1991	1
1270	244	1992	1
1509	216	1993	1
1336	243	1994	1
928	135	1995	1
1080	137	1996	1
1059	160	1997	1
200	98	1998	1
216	125	1999	1
90	80	2000	1
93	92	2001	1
124	166	2002	1
107	189	2003	1
115	171	2004	1
140	190	2005	1
197	174	2006	1
190	168	2007	1
216	134	2008	1

```
37   # number of Survey data points
# Triennial
1980    1       3       4957    0.30
1983    1       3       7631    0.23
1986    1       3       4860    0.29
1989    1       3       4814    0.26
1992    1       3       3143    0.28
1995    1       3       1779    0.26
1998    1       3       3608    0.30
2001    1       3       5930    0.29
2004    1       3       12934   0.24
 #NWFSC combo
2003    1       4       28400   0.29
2004    1       4       10330   0.34
2005    1       4       8812    0.28
2006    1       4       21181   0.30
2007    1       4       9508    0.27
2008    1       4       13021   0.28
#Logbook        GLM
1976    1       5       20.33   0.2
1977    1       5       16.16   0.2
1978    1       5       10.79   0.2
1979    1       5       11.37   0.2
1980    1       5       11.32   0.2
1981    1       5       13.33   0.2
1982    1       5       9.29    0.2
1983    1       5       9.32    0.2
1984    1       5       6.99    0.2
1985    1       5       6.26    0.2
1986    1       5       3.58    0.2
1987    1       5       4.24    0.2
1988    1       5       4.56    0.2
1989    1       5       5.45    0.2
1990    1       5       4.36    0.2
1991    1       5       3.94    0.2
1992    1       5       2.23    0.2
1993    1       5       2.74    0.2
1994    1       5       2.82    0.2
1995    1       5       2.47    0.2
1996    1       5       2.54    0.2
1997    1       5       2.36    0.2



2   # Discards Type 1 = biomass(mt), 2 = fraction of total
6   # Discards N observations
2002  1  1  0.56  0.1
2003  1  1  0.45  0.1
2004  1  1  0.40  0.1
2005  1  1  0.61  0.1
2006  1  1  0.52  0.1
2007  1  1  0.32  0.1
0   # Mean Body Weight

## Population size structure
3  # Length bin method: 1=Use data bins,
  # 2=generate from min/max/width read below
  # 3=Read count and vector below
60 # Count of population bins
# Lower edge of bins
10      12      14      16      18      20      22      24      26      28      30      32
        34      36      38      40      42      44      46      48      50      52      54
        56      58      60      62      64      66      68      70      72      74      76
        78      80      82      84      86      88      90      92      94      96      98
        100     102     104     106     108     110     112     114     116     118     120
        122     124     126     128

-1      # Minimum proportion for compressing tails of observed compositional data
0.0001  # Constant added to expected frequencies
```

```
0      # Combine males and females at and below this bin number

42 # Number of Length Bins

28     30     32     34     36     38     40     42     44     46     48     50
       52     54     56     58     60     62     64     66     68     70     72
       74     76     78     80     82     84     86     88     90     92     94
       96     98     100    102    104    106    108    110

78   # Length Composition Observations
#Year  Seas   Fleet  Gender Part   effn
#Commercial 44 years, first 11 combined sex
1965   1      1      0      2      28.2   0      0      0      0      0      0
       0      1      0      1      2      5      8      9      17     32     35
       50     59     48     51     45     30     24     24     24     22     14
       15     9      5      6      5      7      3      2      4      3      8
       2      2      0      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0
       0
1966   1      1      0      2      21.2   0      0      0      0      0      0
       0      1      1      6      15     47     57     33     33     41     59
       55     38     56     60     42     39     35     30     26     13     8
       4      4      2      2      5      1      1      2      5      2      3
       0      2      2      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0
       0
1967   1      1      0      2      35.3   0      0      0      0      0      0
       0      0      0      0      5      25     52     72     84     143    121
       117    83     77     43     32     25     27     16     9      15     10
       11     9      15     7      10     4      5      2      4      3      1
       3      0      4      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0
       0
1968   1      1      0      2      268.3  0      0      0      0      0      0
       1      0      4      11     18     63     135    338    597    859    1058
       1067   978    713    564    405    327    256    243    232    199    199
       194    177    171    170    162    108    107    107    112    123    94
       69     54     122    0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0
       0
1969   1      1      0      2      113.0  0      0      0      0      0      0
       0      0      3      8      10     14     38     64     109    195    312
       396    464    451    391    311    188    134    97     72     73     63
       65     61     82     87     66     80     82     77     84     96     70
       61     44     115    0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0
       0
1970   1      1      0      2      141.2  0      0      0      0      0      0
       0      2      6      5      12     18     24     16     26     26     29
       71     123    193    249    279    327    295    277    225    228    145
       144    143    153    149    151    165    163    161    128    116    133
       108    94     178    0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0
       0
1971   1      1      0      2      98.8   0      0      0      0      0      0
       0      0      0      2      13     37     26     20     12     37     57
       70     79     103    134    167    188    201    265    279    242    234
       195    147    119    110    114    97     117    112    92     93     74
       63     50     112    0      0      0      0      0      0      0      0
```

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1972	1	1	0	2	28.2	0	0	0	0	0	0
	0	0	0	0	0	1	3	10	18	19	21
	12	16	14	20	17	21	19	27	29	38	46
	57	59	54	54	44	54	45	36	33	34	39
	30	8	29	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1973	1	1	0	2	21.2	0	0	0	0	0	0
	0	0	0	0	0	1	0	2	6	14	15
	14	3	1	4	1	5	9	6	8	8	15
	22	33	44	24	29	28	23	28	16	29	24
	31	30	88	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1974	1	1	0	2	42.4	0	0	0	0	0	0
	0	0	0	0	0	0	1	8	9	31	18
	37	39	45	54	79	95	88	86	55	51	53
	51	69	62	79	60	64	67	43	45	40	25
	22	18	27	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1975	1	1	0	2	113.0	0	0	0	0	0	0
	0	0	0	1	6	19	11	23	28	50	69
	106	168	255	343	364	437	484	372	243	178	138
	119	90	65	70	79	78	75	64	53	27	22
	12	11	23	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1976	1	1	3	2	14.1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	3	5
	9	7	11	11	19	20	36	31	40	29	34
	23	21	16	8	7	4	12	10	4	2	1
	1	2	4	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	2	2	1	6	5
	11	18	21	19	8	7	6	2	0	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1977	1	1	3	2	7.1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	2	3	1	6	14
	18	23	10	19	13	11	6	13	19	11	16
	16	13	45	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1978	1	1	3	2	176.1	0	0	0	0	1	0
	2	0	0	3	3	3	3	7	3	10	22
	14	17	13	10	8	19	21	27	24	18	20
	28	40	44	64	44	41	32	38	24	42	28
	29	18	38	0	0	0	0	0	1	0	1
	0	2	2	2	14	7	18	18	16	26	15
	20	14	16	16	17	16	5	14	9	12	8
	3	1	0	2	1	0	2	0	0	0	0
	0										
1979	1	1	3	2	175.2	0	0	0	0	0	0
	0	1	0	1	2.5	2.5	3.5	0.5	3.5	3	3.5
	15.5	22	31	46	28.5	28.5	11.5	17	14.5	18.5	23.5
	27	20.5	33.5	49	57.5	66.5	63	40	29.5	29.5	21

	16.5	21	41	0	0	0	0	0	0	0	0
	1	3	1.5	1.5	5.5	3.5	4.5	8	19.5	29.5	31
	30	26	13.5	12.5	16.5	10	12.5	2.5	9.5	9	8.5
	5.5	7	2.5	2.5	0	1	0.5	0.5	0	0.5	0
	2										
1980	1	1	3	2	275.3	0	0	0	0	1	3
	2	8	8	13	16	16	15	25	34	33	30
	28	33	24	29	71	73	80	72	59	53.5	48
	73.5	65	51.5	94.5	93	125.5	118.5	106.5	78	57	58.5
	37.5	31	117	0	0	0	0	0	2	4	9
	5	8	9	16	20	28	41	44	44	16	27
	22	29	15	21	15	19	13	16.5	11	11.5	8
	3.5	5.5	4	6.5	4.5	10.5	4	3	1.5	0.5	1
	1										
1981	1	1	3	2	148.3	0	0	0	0	0	0
	0	0	4	2	8	13	13	20	22	42	57.5
	33	35.5	32	39	54	30	19	38.5	33.5	61	59.5
	53.5	24	28.5	37.5	38	41	44	62	48.5	43	28
	12	14	32.5	0	0	0	0	0	1	0	2
	3	6	6	6	14	29	48	49	42.5	35	36.5
	27	28	32	21	25	24.5	19.5	14	9.5	10.5	4
	3.5	2.5	2	0	1	0	0.5	0	0	0	0
	1.5										
1982	1	1	3	2	532.4	0	0	1	1	2	1
	4.5	6	14	15.5	19	38.5	60	63	78.5	77.5	87.5
	117.5	132	113.5	96	94	98	104.5	94	64	77.5	74.5
	82.5	96	69	57.5	52.5	55.5	56.5	57.5	53.5	49	39
	28	15	31.5	0	0	0	3	0	1	4.5	8
	11	11.5	18	36.5	61	63	67.5	109.5	92.5	84.5	83
	78.5	68	49	43	27.5	23	14	11.5	10.5	4.5	1
	0	1.5	2.5	1.5	1.5	1.5	2.5	0	1	0	0
	3.5										
1983	1	1	3	2	147.8	0	0	0	0	0	0
	0	1	0	0	3	5	6	4	7	16	21
	22	37	35	40	40	49	45	48	37	34	28
	29	22	25	19	15	17	15	8	8	19	12
	15	11	33	0	0	0	0	0	0	0	1
	0	0	3	4	4	8	7	7	11	16	21
	27	21	11	6	6	5	0	4	0	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0										
1984	1	1	3	2	130.7	0	0	0	0	0	0
	0	0	3	2	3	3	10	17	8	16	5
	15	28	23	28	34	56	47	49	46	43	38
	38	26	15	14	11	14	12	6	7	12	5
	3	4	24	0	0	0	0	0	0	0	0
	1	0	2	0	6	3	6	1	6	6	10
	14	11	16	14	13	6	6	5	3	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1985	1	1	3	2	147.9	0	0	0	1	0	0
	0	0	5	3	6	9	5	37	58	50	35
	31	9	18	12	18	20	36	53	49	56	61
	40	46	34	17	14	8	18	19	10	6	6
	2	4	7	0	0	0	0	0	0	0	1
	1	1	1	3	7	13	12	10	8	6	6
	3	7	6	5	7	3	6	2	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1986	1	1	3	2	224.6	0	0	0	0	0	1
	0	0	0	0	0	3	3	9	30	43	50
	56	65	58.5	48	57	33	28	36	35	54	50
	70	69	52	59	37	23	27	19	24	6	8
	8	4	13.5	0	0	0	0	0	0	0	1
	0	0	1	1	6	13	16	13	24	22	26
	17.5	19	15	9	8	4	6	7	1	0	1
	2	0	0	0	1	0	0	0	0	0	0
	0.5										
1987	1	1	3	2	213.4	0	0	0	0	0	0
	0	0	2	2	3.5	6.5	10	7	12	10	14.5
	9	27	28	34.5	51	53	60	55	65	42	34

	64	63	52	55	44	27	28	26	11	5	9
	4	2	12	0	0	0	0	0	0	0	0
	2	4	5.5	11.5	15	16	18	16	22.5	24	17
	25	29.5	17	10	6	5	4	5	1	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1988	1	1	3	2	208.5	0	0	0	0	0	0
	0	0	1	1	1	11	24	44	54	62	59
	26	17	9	18	16	29	27	38	33	50	34
	38	29	16	31	30	29	24	22	10	9	10
	3	2	6	0	0	0	0	0	1	0	1
	0	0	4	10	37	60	69	41	18	17	15
	10	14	14	11	8	5	4	1	4	1	2
	2	0	0	1	0	0	0	0	0	0	0
	0										
1989	1	1	3	2	278.7	0	0	0	0	0	0
	0	0	1	4	1	5	4	4.5	15	30	71
	71.5	110	94.5	81.5	55	41.5	53.5	35.5	62.5	65	73.5
	42.5	33	35	29	29	23.5	25.5	24	16	13	12
	10	8.5	14	0	0	0	0	0	0	0	0
	0	1	0	3	5	8.5	27	49	66	65.5	50
	35.5	15.5	13	8.5	8.5	9.5	12.5	8	6.5	7.5	4
	6	4	3	3.5	1.5	2	1	0	0	0	0.5
	0										
1990	1	1	3	2	231.3	0	0	0	0	0	1
	0	0	6	6	6	6	8	15	10	17	13
	16.5	40	48	61	87	90	75	61	38	44	36
	46	41	53	36	19	19	18	16	17	17	8
	4	3	6	0	0	0	0	0	0	0	1
	1	3	5	6	0	11	13	22	27	28.5	50
	44	35	15	12	8	11	6	1	2	0	0
	2	0	1	0	0	0	0	0	0	0	0
	0										
1991	1	1	3	2	220.5	0	0	0	0.5	1	0
	5	5	13	11	18	23.5	20	25.5	29.5	33.5	39
	50	34	42.5	28	29	45	79	67	91.5	50	30
	23.5	16	25	43	26	22	15	14	7	4	7
	2	6	7	0	0	0	1.5	0	1	3	6
	9	8	9	12.5	12	8.5	12.5	7.5	8	9	17
	24.5	15	27	12	11	7	10.5	6	1	1.5	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1992	1	1	3	2	435.3	2	4	6	5	7.5	13.5
	37	61.5	87	97	72.5	69.5	85	84.5	73	93.5	89.5
	70.5	61	56.5	46	61	45.5	34.5	25	51	61	86.5
	69	51	38	27	25	18	27	22	18	20	18
	8	6	14	1	3	5	2	6.5	18.5	29	46.5
	59	37	29.5	47.5	34	54.5	45	43.5	31.5	35.5	23
	19.5	17	14	16.5	9.5	9	6	3	0.5	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1993	1	1	3	2	472.1	0	0	1	4	9	21.5
	50.5	59	90	114.5	122.5	105.5	146	146	133.5	117.5	94.5
	77	62	73	59.5	56	38	38	38.5	35	48.5	29
	26	50	46	39	28	21	9	11	15	13	10
	6	9	16	0	0	1	3	6	12.5	30.5	28
	46	54.5	50.5	58.5	61	53	60.5	49.5	23.5	19	26
	18	14.5	17	8	10	10.5	9	7.5	2	3	2
	0	1	0	0	0	0	0	0	0	0	0
	0										
1994	1	1	3	2	528.1	0	1	2	12	18	19
	13.5	25	58	85	73	80.5	81.5	133	182.5	188	149
	127	123	104	105	86	90	65	68	47	60	60
	46	31	26	20	36	18	14	10	10	5	10
	5	3	10	0	0	2	15	27	5	4.5	16
	19	45	49	55.5	84.5	99	92.5	90	78	62	46
	42	28	29	22	10	7	8	3	4	1	0
	1	0	0	0	1	0	0	0	0	0	0
	0										
1995	1	1	3	2	332.4	0	0	0	0	0	0
	0	0	0	0	6	10	29	48	68	96	111

	106	119	155	123	95	90	56	58	52	45	32
	25	22	15	9	15	17	18	11	8	4	13
	7	4	6	0	0	0	0	0	0	0	0
	1	3	2	6	20	30	54	57	50	62	30
	28	22	9	12	8	3	4	4	3	4	1
	0	1	0	0	0	0	0	0	0	0	0
	0										
1996	1	1	3	2	263.5	0	0	0	0	1	0
	0	1	17	20	19	23	12	21	42	55	69
	76	79	72	53	80	89	79	67	51	66	40
	23	25	21	17	10	6	14	7	5	5	4
	4	2	4	0	0	0	0	0	0	0	3
	9	11	16	16	9	21	30	28	32	30	31
	27	14	7	9	3	5	3	4	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1997	1	1	3	2	312.3	0	0	0	0	0	0
	0	3	2	1	8.5	6.5	24	39.5	68.5	65.5	58
	48.5	51	64.5	80.5	91.5	91	87	76	64	59.5	49
	33.5	29	21.5	13.5	18.5	10.5	6	13.5	8	5.5	7.5
	3.5	3	5	0	0	0	0	0	0	1	3
	1	6	27.5	15.5	29	53.5	61.5	53.5	44	39.5	30
	31.5	26.5	27.5	23	11	8	6	3.5	1	1.5	3
	2.5	0.5	1.5	1.5	1	0.5	0	0.5	0.5	0.5	0
	0										
1998	1	1	3	2	252.6	0	0	0	0	0	0
	1	0	3	2	3	6	12	13	23	17	44
	51.5	77	82	83	70	56	52	54	70.5	49	55
	55	23.5	30	20.5	16	11	11	6	6	3.5	2
	3	1	6	0	0	0	0	0	1	0	2
	1	2	2	8	5	15	12	37	35	50.5	38
	44	28	24	16	13	6	1.5	4	2	3	3.5
	0	0.5	0	1	0	0	0	0.5	0	0	0
	0										
1999	1	1	3	2	277.6	0	0	0	0	0	0
	2	4	6.5	3	6.5	3.5	12.5	19.5	24.5	40	63.5
	73	96	88	70	75	74	88	70	65	57	60
	49	43	49	26	21	14	8	4	9	1	0
	2	2	3	0	0	0	0	0	0	2	3
	4.5	1	3.5	5.5	8.5	14.5	18.5	13	34.5	35	34
	37	25	14	10	10	9	3	4	3	4	0
	1	0	0	1	0	0	1	0	0	0	0
	1										
2000	1	1	3	2	216.2	0	0	1	0	0	0
	0	0	0	0	0	1	1	2	3	4	13
	17	35	44	52.5	62	48	55.5	41	43	34	38
	30	20	26	28	25	15	8	9	13	6	5
	6	1	11	0	1	0	0	0	0	0	0
	0	0	0	0	1	1	2	9	22	31	27
	34	31.5	29	17	13.5	8	4	2	1	1	0
	1	0	0	1	0	1	0	0	0	0	0
	0										
2001	1	1	3	2	265.8	0	0	0	0	0	0
	0	1	1	1	1	2	2	11	7	19	35
	32	47	44	46	51	50	56	59	46	44	28
	27	25	29	31	16	19	10	8	5	1	2
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	2	4	10	23	33	47	57
	41	36	38	29	21	9	8	6	2	0	1
	0	0	0	0	0	1	0	0	0	0	0
	0										
2002	1	1	3	2	296.9	0	0	0	0	0	0
	0	1	1	0	0	0	4	6	13	24	33
	40.5	46	52	46.5	58	29	29.5	48	41.5	47.5	42
	37	34	28	14	10	13	10	7	4	6	1
	1	0	2	0	0	0	0	1	0	0	1
	0	0	3	3	4	8	15	26	44	48.5	32
	34	49.5	39	26	27.5	20	11.5	6.5	6	7	1
	0	0	1	0	0	0	0	0	0	0	0
	0										

2003	1	1	3	2	276.8	0	0	0	0	0	0
	0	0	0	0	0	2	6	8	13	24	49
	73	77	66	56	42	25	20.5	32	32	20	26
	18	18	20	9	17	12	12	7	7	3	3
	0	1	0	0	0	0	0	0	1	1	1
	3	1	1	1	8	12	23	37	44	68	63
	34	39	20	22	12.5	10	6	7	1	2	2
	2	1	0	0	0	0	1	0	0	0	0
	0										
2004	1	1	3	2	328.1	0	0	0	0	0	0
	0	0	1	1	0	1	2	2	6	12	34.5
	54	68	60	44	37	34	39	17	18	20	11
	11.5	13	16	6	9	6.5	2	4.5	4.5	1	0
	0	1	0.5	0	0	0	0	0	0	1	0
	0	0	1	1	1	3	11	20	78.5	110	109
	81	69	46	30	18	25	13	7	9	6.5	1
	1	1	0	0.5	0	0.5	0.5	0	0	0	0
	0.5										
2005	1	1	3	2	187.7	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	3	6	19
	38	47	47	47	48	40	38	38	37	30	29
	21	16	10	10	3	2	8	4	3	3	4
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	1	12	33	39	42
	37	32	28	22	12	12	7	4	7	2	1
	0	0	0	0	0	0	0	0	0	0	0
	0										
2006	1	1	3	2	250.7	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	2	4	14.5
	23	30	39.5	46.5	58	60	55	56	61	39	44
	42	35	15	22	15	20	8	15	7	3	4
	3	1	1	0	0	0	0	1	0	0	0
	0	0	1	1	1	0	6	15	34.5	43	56
	42.5	33.5	38	26	15	9	7	5	3	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0										
2007	1	1	3	2	448.4	0	0	0	0	1	0
	0	0	0	0	1	1	1	2	7.5	11.5	17.5
	20.5	33	40	56	75.5	92.5	92	117	114	126	110
	106	99	62	53	21	21	18	7	8	5	3
	4	2	1	0	0	0	0	1	0	0	0
	0	0	1	0	2	9	31.5	44.5	59.5	68.5	71
	72	59	48.5	45.5	29	23	17	8	12	0	2
	2	0	1	0	0	2	0	0	0	0	0
	0										
2008	1	1	3	2	358.2	0	0	0	0	0	0
	0	0	1	0	0	2	1	1	6	12	19
	21	26	29.5	26	51	74.5	83	83	86.5	143	122
	98	79	61	49	22	15	9	14	4	2	2
	3	0	2	0	0	0	0	0	0	0	0
	0	0	5	1	1	4	25	45	41	57	50
	48.5	40	46	21.5	22	21	14.5	6	5	2	0
	3	0	1	2	0	1	0	0	0	0	0
	0										

#Recreational 16 years Note these are from RECfin and Oregon data which has sex info fpr 1999-2007

1993	1	2	0	2	57.4	1	0	0	2	2	2
	2	15	19	45	43	50	50	44	44	35	42
	22	27	24	19	15	15	8	4	9	6	6
	2	4	3	1	2	4	1	1	2	0	1
	0	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1994	1	2	0	2	53.7	0	0	1	0	0	3
	11	17	28	22	38	46	47	53	36	39	43
	31	24	15	9	13	8	8	7	10	5	8
	3	5	2	0	1	1	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1995	1	2	0	2	28.7	0	1	0	0	1	2
	0	0	0	0	1	2	4	15	30	27	23
	29	21	18	19	13	15	12	22	3	9	2
	4	2	6	0	3	1	0	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1996	1	2	0	2	41.5	0	0	0	0	0	0
	0	0	0	0	0	0	8	31	62	59	46
	30	37	30	22	18	20	13	10	13	4	6
	0	1	1	4	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1997	1	2	0	2	32.5	0	0	0	0	1	0
	0	1	0	0	1	0	1	12	41	35	37
	27	19	20	23	11	8	14	15	16	6	13
	2	3	4	4	5	2	4	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1998	1	2	0	2	19.8	0	0	0	0	0	0
	0	0	0	1	0	0	0	1	0	5	23
	27	22	18	14	12	9	13	10	5	5	8
	7	5	5	2	1	1	1	1	0	0	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1999	1	2	3	2	172.7	0	0.5	0	0	1	0
	0	0	0	0	0	1	0	1	0	11.5	41.5
	64.5	61.5	56	52.5	65	63.5	50	52.5	38.5	42	47.5
	38	32	28.5	24	14	20	17.5	5	5	5	7
	4	3	4	0	0.5	0	0	0	0	0	0
	0	0	0	0	1	3	4	49.5	111.5	133.5	118.5
	102	75.5	74	57.5	36	28.5	30.5	9	9.5	11	4
	4.5	1	0	1	0.5	1	0	1	0	1	0
	0										
2000	1	2	3	2	227.6	0	1	0	0	0	0
	0	0	0	0	0	0	1	0	1	13	59.5
	54	91	89.5	106.5	115.5	90.5	88	69	53	43	36
	34	16	5	1	0	1	0	0	0	0	0
	0	0	0	0	0	1	0	1	0	0	0
	0	0	0	0	0	1	2	39	225.5	222	191
	159.5	130.5	102.5	70.5	53	44	23	10	18	6	3
	1	0	0	0	0	0	0	0	0	0	0
	0										
2001	1	2	3	2	146.7	0	0	0	0	0	0
	0	0	0	0	1	0	0	1	0	6	27
	31.5	48	42.5	46.5	49	56	62	62	37	37	35
	33	24	37	23	19	10.5	14	5	6	1	2
	0	1	1	0	0	0	2	0	0	0	0
	0	0	0	0	0	1	1	17	124	123.5	120
	92.5	75.5	65	49	25	23	18	5	2	2	2
	0	0	1	0.5	0	0	0	0	0	0	0
	0										
2002	1	2	3	2	86.3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	4	34
	38	40	35.5	23	37	27	28	29	30	27.5	29
	30	26	10	23	9	6	9	1	1	3	3

	1	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	1	3	0	9	61	57	49
	48.5	39	35	22	20	5	4	4.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
2003	1	2	3	2	81.8	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	2	25.5
	36	35	33	40	27	30	31	33.5	22	21	24
	12	20	19	9	18	10	3	8	0	2	3
	2	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	7	55.5	82	48
	47	28	25	20	15	9.5	6	0	1	1	0
	1	0	2	0	0	0	0	0	0	0	0
	0										
2004	1	2	3	2	69.4	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	3	20.5
	20.5	16.5	33	23.5	20	26.5	22	29.5	17	16	11
	12	12	10	12	6	7	4.5	1	3	1	1
	1	0	0.5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	13	44.5	68.5	64.5
	46	52.5	16	18.5	17	7.5	8	1	1	1	0
	1	0	0	0	0.5	1	0	0	0	0	0
	0.5										
2005	1	2	3	2	53.9	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	13
	14	9	18	11.5	18	18	13	16	18	8	11
	8	7	9	2	3	1	3	3	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	8	50	57	56
	51	33.5	31	21	12	6	4	1	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
2006	1	2	3	2	104.5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	16
	16.5	22.5	20	29	38	33	47	43	27	35	25
	17	12	13	6	15	10	6	5	5	2	5
	5	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	25	109	111.5	115.5
	71	63	40	20	11	11	3	3	2	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
2007	1	2	3	2	99.5	0	0	0	0	0	0
	0	0	0	0	0	0	0	6	18	15	8
	27	12	20	22	25	21	24	27	19	28	16
	19	14	17	4	3	5	9	5	8	1	2
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	3	32	60	84	87	74	68
	64	46	37	30	16	7	5	5	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
2008	1	2	0	2	166.4	0	0	0	0	0	1
	1	1	0	0	0	1	6	66	183	214	197
	163	173	142	116	106	60	52	33	34	20	18
	18	12	11	11	10	4	4	1	4	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										

Discard 5 years

2003	1	1	0	1	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.324324324		0	0	0.324324324		0	
	0.324324324		0	0	0	0.027027027		0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

```
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0
2004    1       1       0       1       432     0.004121729     0.004211333     0.006182595
        0.014566944     0.010828501     0.011448079     0.023654473     0.030243413
        0.053309271     0.067026003     0.066101288     0.072320805     0.055136548
        0.086935948     0.084909846     0.059315654     0.048716073     0.042101663
        0.053159577     0.016005663     0.022101351     0.020147789     0.020142295
        0.028479448     0.016510803     0.008692442     0.006230756     0.009640331
        0.014333631     0.006146814     0.006744372     0.007426473     0.00827994
        0.005591216     0.005466892     0.002372235     0       0.000860187     0.000268808
        0       0       0.000268808     0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0
2005    1       1       0       1       498     0.001863424     0.003437508     0.005550459
        0.00933437      0.012234273     0.010303187     0.013047708     0.002599616
        0.005708499     0.017459185     0.024139033     0.028705762     0.029180208
        0.048278593     0.056463841     0.088354388     0.055281823     0.071994421
        0.07988554      0.085028377     0.067060329     0.053503101     0.041140112
        0.047919382     0.038090035     0.025083526     0.017578296     0.019503452
        0.009879778     0.013131421     0.006471289     0.001885059     0.002262616
        0.000429689     0.001967832     0.000107422     0.001506016     0.000907478
        0.001375003     0.001347948     0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0
2006    1       1       0       1       221     0.008736678     0.000620638     0.001025036
        0.001468048     0.002339329     0.005035117     0.014943051     0.02680891
        0.041116714     0.037034538     0.028054534     0.033589718     0.038149362
        0.046159669     0.037942985     0.052811633     0.072018483     0.077968509
        0.044670172     0.043396936     0.047781978     0.038240829     0.057756796
        0.041706826     0.020903909     0.044019498     0.016184337     0.025260309
        0.02453224      0.019199496     0.027375985     0.004678667     0.005913107
        0.000907087     0       0.006779255     0       0.00338964      0       0       0
        0.001479984     0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
2007    1       1       0       1       140     0.001103        0.023188891     0.085095743
        0.041066176     0.036897031     0.033089986     0.008493096     0.003625385
        0.012574195     0.01720567      0.052077398     0.020299227     0.044130924
        0.02450231      0.049654943     0.081685973     0.044193089     0.030479577
        0.086683237     0.03960648      0.034836401     0.028388611     0.015358238
        0.042871768     0.029935035     0.033200309     0.015300848     0.027023488
        0.018240223     0.010982614     0.005011438     0.001654499     0       0       0
        0       0.001544199     0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0

#Triennial 7 years
1986    1       3       3       0       46.35763581     0       0       0       1       7
        5       6       2       2       2       0       0       0       1       3       0
        6       9       3       5       11      4       1       3       6       3.383161867
        4.383161867     8       5       5.191669106     8.191669106     2       1       2
        0       1       3       0       0       0       0       1       0       1       0
        3       3       3       2       1       0       0       2       1       0       5
        6       14      2       11      3       6.191669106     4       3       3       3
        1       5       3       1       0       0       0       0       0       0       0
        0       0       0       0       0       0       0
1989    1       3       3       0       147.3538168     0       0       1       5       4
        4       2       0       5       4       3       6       2       1       6.488169816
        5       10      32      64.04155        51.64055662     34.84137759     21
        13.82248415     13.72023493     10.27161463     9.920688793     9.488169816
        12.48816982     13.58138302     6       13.97633963     4.488169816     6.488169816
        16.27130694     4       9.783137122     3       1       1       3       0       1
        1       0       1       2       3       1       1       0       0       2       3
        7.920688793     2       5       4       11      20.05590264     44.27161463
```

```
        23.92068879     21.99184955     10.92068879     9       5       14.19230342     5
        4       5.271614627     1       6.299546135     1       0       5.799546135     0
        0       0       0       0       0       0       0       0       0
1992    1       3       3       0       138.5385437     1       0       8       24.03143313
        24.99414405     24.657031       22.58138302     3.5     12.24110113     16.03143313
        24.99258343     27.15989852     12.74110113     2       9.081383019     9.746291714
        10      15      10      9.5     9       15.5    6       7.246291714     7.741101127
        12      11      12      19.08138302     17      11      12      13      7       3
        5       1       1       1       3       2       3       6.062866266     0
        7.081383019     16.03143313     19.8813279      17.657031       3.5     5.5     8.5
        12.03143313     21.5    9.819616629     5       2       2       2.5     7       12
        7       4.241101127     5       7.5     9.031433133     3       6       2       1
        1       0       0       0       0       0       0       0       0       0       0
        0       0       0       0
1995    1       3       3       0       164.9923619     1       3       13      26.40822469
        13      13      7       2       5       4       7       12.74110113     15      14
        28.40822469     17      20      20      35.74110113     22      18      14.48220225
        14      7       6       10      4       4       2       4       1       0       2
        2       3       2       0       2       0       0       0       0       1       2
        4       8       13.74110113     8       2       2       2       4       6       11
        8       16      16      13      25      29      23      11      9       11      4
        3       5       0       2       3       0       0       0       1       0       0
        0       1       0       0       0       0       0       0
1998    1       3       3       0       174.9609076     7       8       14      10      10
        3       0       1       1       9       9       9       6       15.1349555
        16.1349555      27.70243325     10.56747775     32.83738875     17.1349555
        40.59624257     13      21.1349555      7       13.56747775     14.56747775
        20.1349555      23.56747775     14.56747775     19.70243325     11.56747775
        17.56747775     7       5       4       2       1       1       0       0       0
        1       0       2       6       6       7       5       2       0       1       1
        7       6       8       8       13.1349555      12      15      21.1349555      13
        14      6       7.567477751     5       4       1       2       2       2       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0
2001    1       3       3       0       237.0003609     10      41      72.60659995
        64.01649988     35.07106663     20.80329998     30.26776666     31.53553332
        44.87436661     56.24671809     33.67766659     19.26776666     6       2
        13.26776666     13      15.26776666     6       9.527901542     4       9.527901542
        10      22.00204391     9.209169643     10.13248636     24.42536063     23.10662873
        15.89745909     15.21619099     21.57872719     21.74409253     6.055803083
        13.94624083     12.52292411     7.313754464     4.209169643     2.527901542
        2.527901542     2.104584821     2       5.209169643     0       6       32.26776666
        52.07106663     36.33883329     15.53553332     9       12      27.80329998
        45.33883329     25.80329998     17      11.53553332     11      10      9       4
        5       8       3       5       2       4       4       2       1.5     1       1
        0       0       0       0       1       0       0       0       0       0       0
        0       0       0       0
2004    1       3       3       0       126.8587259     0       0       3       3
        4.827594605     3       5.827594605     3       10.03769562     11.9989253      9
        20.74629171     13.94859379     28.72322219     25.15259841     19.25218531
        33.46454757     30.92203623     25.88470692     29.96208154     18.75218531
        19.49328644     30.23746877     20.9564054      28.46122429     12.5    12.25263358
        3.478202699     6.5     12.23083628     3       6.478202699     10.98257332
        13.70903898     5.478202699     12.23083628     0       1       7.752633585
        3.478202699     0       5.752633585     0       0       2       2       2       1
        0       3.741101127     4.413797302     17.14822168     7       13.25263358
        38.3096322      6       14.03143313     17.99590998     39.81764655     18.93312041
        23.00526717     7.743276394     4       17.08359814     3       10.79954613
        4.75218531      1.5     0.5     0       0.5     0       0       0       0       0
        0       0       0       0       0       0       0       0

#NWFSC 6 years
2003    1       4       3       0       122     9.9     86.2    97.1    139.2   258.1   184.1
        219.6   183.7   399.8   404.9   455.3   962.1   484.3   754.2   1801.0  1249.0  1010.7
        756.6   2214.2  873.0   823.3   608.3   322.6   383.8   35.0    271.1   92.0    79.1
        996.6   120.7   9.2     18.1    0.0     55.7    13.6    20.4    19.2    0.0     0.0
        0.0     0.0     18.8    30.7    77.1    39.8    129.2   157.6   49.7    248.0   168.2
        222.2   687.1   213.2   675.2   962.1   633.9   819.0   820.6   1673.3  1144.2  650.2
        1701.1  780.0   36.6    11.5    29.0    0.0     0.0     0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        9.6
```

```
2004    1       4       3       0       127     46.3    121.8   104.3   155.5   226.7   65.4
        196.2   270.0   137.6   260.1   140.7   392.6   379.0   304.6   323.9   227.1   268.8
        263.9   323.2   206.4   198.4   83.0    120.2   113.4   131.0   81.5    86.6    12.6
        57.4    58.3    43.0    13.6    0.0     20.0    0.0     0.0     0.0     0.0     0.0
        0.0     0.0     0.0     26.5    194.8   71.0    120.4   304.5   167.5   272.3   273.9
        368.7   237.6   183.5   417.7   340.9   282.9   237.5   210.5   107.4   313.3   149.4
        212.3   166.8   93.2    52.7    67.2    0.0     0.0     24.1    0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        0.0
2005    1       4       3       0       116     34.6    17.3    127.2   181.6   170.0   178.1
        121.5   55.5    79.6    64.0    69.5    275.0   84.4    279.4   247.5   307.7   260.6
        301.1   308.3   309.1   346.7   266.3   209.7   230.4   138.3   353.7   63.9    87.2
        87.0    125.3   0.0     57.2    72.9    30.7    17.8    0.0     11.3    0.0     0.0
        0.0     0.0     0.0     34.7    78.8    183.6   201.4   142.4   64.6    76.3    35.9
        27.8    76.2    167.2   60.7    258.5   208.5   161.1   218.1   194.6   243.7   176.3
        232.4   123.5   97.5    100.5   25.6    39.5    12.3    0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        0.0
2006    1       4       3       0       157     15.5    0.0     40.0    112.9   39.0    130.0
        110.0   179.5   164.8   297.4   271.1   131.5   56.0    17.9    223.7   703.5   391.0
        1083.5  693.6   883.6   313.4   827.7   924.1   1055.2  728.1   939.2   749.2   704.5
        538.5   270.5   230.3   158.5   246.6   32.5    79.5    18.3    0.0     338.1   28.6
        0.0     0.0     0.0     15.5    0.0     18.4    37.1    55.8    115.1   202.7   111.7
        145.2   162.0   93.9    111.3   340.0   179.8   313.7   439.0   326.5   835.6   794.4
        597.0   764.0   612.9   436.3   256.2   471.8   18.3    0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        0.0
2007    1       4       3       0       148     41.3    158.7   80.2    253.9   117.7   22.9
        56.5    45.2    85.9    100.4   158.8   157.5   108.4   50.8    154.1   269.1   107.5
        228.6   215.7   338.5   225.0   324.5   135.6   225.9   213.4   535.1   202.9   484.9
        426.5   304.2   147.5   169.9   104.4   94.6    23.1    61.8    36.8    0.0     18.4
        0.0     0.0     0.0     60.0    54.9    122.8   218.9   126.3   41.9    0.0     45.8
        84.3    83.7    42.6    241.4   181.6   211.3   162.3   233.2   143.5   286.8   219.9
        104.6   102.0   87.2    22.9    83.8    60.2    0.0     0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        0.0
2008    1       4       3       0       110     129.6   182.6   0.0     68.4    21.3    46.1
        373.7   197.6   192.4   170.1   40.4    28.8    39.0    64.7    175.7   347.6   589.8
        317.2   311.3   426.4   232.4   498.5   589.8   795.8   572.1   701.2   462.3   387.1
        435.2   563.2   356.6   306.4   204.5   20.1    0.0     20.6    24.9    0.0     28.7
        0.0     0.0     0.0     234.9   159.4   64.7    39.0    85.4    106.2   102.9   230.8
        62.9    25.3    0.0     18.5    40.2    115.7   204.1   169.0   148.8   242.1   128.0
        87.7    239.8   204.1   184.0   98.2    25.2    36.4    0.0     0.0     0.0     14.3
        0.0     30.7    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        0.0


14 # Number of Age Bins
1  2  3  4  5  6  7  8  9  10  11  12  13  14

1 # Number of Aging Error Matrices
0.5     1.5     2.5     3.5     4.5     5.5     6.5     7.5     8.5     9.5     10.5    11.5
        12.5    13.5    14.5    15.5    16.5    17.5    18.5    19.5    20.5
0.4     0.4     0.41    0.43    0.45    0.51    0.59    0.67    0.76    0.86    0.95    1.05
        1.14    1.24    1.33    1.43    1.53    1.63    1.73    1.83    1.93

2618  # Number of age comp observations using restricted length ranges ***
2   # Length bin refers to: 1=population length bin indices; 2=data length bin indices;
3= actual pop? data? lengths match bins?
0 #_combine males into females at or below this bin number
# Year  Seas    Fleet   Gender  Part
# Commerical 1554 lines
1980    1       1       1       0       1       5       5       1       0       1       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0
1980    1       1       1       0       1       6       6       3       0       1       0
        2       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0
```

1980	1	1	1	0	1	7	7	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	8	8	8	0	1	6
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	9	9	8	0	2	1
	3	1	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	10	10	12	0	1	5
	4	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	11	11	15	0	0	9
	3	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	12	12	15	0	1	6
	4	2	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	13	13	15	0	0	4
	6	4	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	14	14	23	0	0	7
	6	3	5	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	15	15	33	0	0	8
	13	8	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	16	16	33	0	0	2
	11	11	8	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	17	17	29	0	0	0
	9	8	9	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	18	18	25	0	0	0
	6	8	7	4	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	19	19	30	0	0	0
	8	9	12	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	20	20	21	0	0	0
	1	5	6	7	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	21	21	25	0	0	0
	0	8	9	7	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	22	22	66	0	0	0
	1	5	21	35	3	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	23	23	69	0	0	0
	0	5	25	31	8	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	24	24	69	0	0	0
	0	7	19	34	7	1	1	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	25	25	59	0	0	0
	0	3	24	24	8	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	26	26	53	0	0	0
	0	4	12	24	12	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	27	27	44	0	0	0
	0	0	5	14	19	5	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	28	28	43	0	0	0
	0	0	2	14	22	5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	29	29	66	0	0	0
	0	0	3	19	31	11	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	30	30	55	0	0	0
	0	0	0	13	30	10	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	31	31	46	0	0	0
	0	0	0	5	25	10	4	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	32	32	79	0	0	0
	0	0	0	4	28	32	9	3	3	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	33	33	80	0	0	0
	0	0	0	1	17	38	20	2	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	34	34	106	0	0	0
	1	0	0	0	15	64	19	6	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	35	35	102	0	0	0
	0	0	0	1	13	39	35	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	36	36	78	0	0	0
	0	0	0	0	5	24	35	13	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	37	37	64.5	0	0	0
	0	0	0	0	0	13	25.5	14	9	1	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	38	38	49	0	0	0
	0	0	0	0	0	7	18	14	7	2	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	39	39	51	0	0	0
	0	0	0	0	0	8	11	8	13	5	6
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	40	40	31	0	0	0
	0	0	0	1	0	0	4	4	9	8	5
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	1	0	1	41	41	21	0	0	0
	0	0	0	0	0	0	0	4	5	7	5
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1980	1	1	1	0	1	42	42	105	0	0	0
	0	0	0	0	0	0	4	3	8	20	70
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	2	0	1	6	6	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	1	0	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	2	0	1	7	7	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	2	1	0	0	0	0	0	0	0
	0	0	0								
1980	1	1	2	0	1	8	8	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	3	3	1	0	0	0	0	0	0
	0	0	0								
1980	1	1	2	0	1	9	9	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	2	0	1	0	0	0	0	0	0
	0	0	0								
1980	1	1	2	0	1	10	10	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	3	0	0	0	0	0	0
	0	0	0								
1980	1	1	2	0	1	11	11	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	4	1	2	0	1	0	0	0	0
	0	0	0								
1980	1	1	2	0	1	12	12	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	8	2	5	0	0	0	0	0	0
	0	0	0								
1980	1	1	2	0	1	13	13	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	10	4	3	2	0	0	0	0	0
	0	0	0								
1980	1	1	2	0	1	14	14	28	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	8	9	6	5	0	0	0	0	0
	0	0	0								
1980	1	1	2	0	1	15	15	37	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	8	8	14	6	1	0	0	0	0
	0	0	0								
1980	1	1	2	0	1	16	16	43	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	4	18	13	7	1	0	0	0	0
	0	0	0								
1980	1	1	2	0	1	17	17	41	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	15	11	13	1	1	0	0	0
	0	0	0								
1980	1	1	2	0	1	18	18	15	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	4	7	4	0	0	0	0	0
	0	0	0								
1980	1	1	2	0	1	19	19	24	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	11	9	1	0	0	0	0
	0	0	0								
1980	1	1	2	0	1	20	20	21	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	2	13	5	0	0	0	0
	0	0	0								
1980	1	1	2	0	1	21	21	25	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	11	10	1	0	0	0
	0	0	0								
1980	1	1	2	0	1	22	22	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	5	4	2	1	1	0	0
	0	0	0								
1980	1	1	2	0	1	23	23	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	4	9	5	0	1	0	0
	0	0	0								
1980	1	1	2	0	1	24	24	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	1	5	2	4	0	0
	0	0	0								
1980	1	1	2	0	1	25	25	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	7	6	1	0	0
	0	0	0								
1980	1	1	2	0	1	26	26	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	1	1	6	1	0	1
	0	0	0								
1980	1	1	2	0	1	27	27	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	3	6	4	1	0
	0	0	0								
1980	1	1	2	0	1	28	28	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	6	3	0	0
	0	0	0								
1980	1	1	2	0	1	29	29	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	3	3	0	1
	0	0	0								
1980	1	1	2	0	1	30	30	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	1	2
	0	0	0								
1980	1	1	2	0	1	31	31	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
1980	1	1	2	0	1	33	33	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
1980	1	1	2	0	1	37	37	0.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0.5	0
	0	0	0								
1980	1	1	2	0	1	38	38	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0								
1981	1	1	1	0	1	9	9	4	0	4	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	10	10	2	0	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	11	11	7	0	5	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	12	12	11	0	3	7
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	13	13	12	0	1	10
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1981	1	1	1	0	1	14	14	19	0	1	14
	4	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	15	15	22	0	0	13
	9	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	16	16	40	0	0	19
	18	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	17	17	52	0	0	22
	27	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	18	18	33	0	0	7
	25	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	19	19	33	0	0	3
	17	8	5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	20	20	32	0	0	0
	14	16	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	21	21	38	0	0	0
	19	15	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	22	22	53	0	0	0
	11	31	8	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	23	23	29	0	0	1
	1	14	11	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	24	24	19	0	0	0
	1	5	10	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	25	25	38	0	0	0
	0	11	17	8	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	26	26	33	0	0	0
	0	12	7	12	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	27	27	58	0	0	0
	1	5	22	18	11	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	28	28	54	0	0	0
	0	0	15	26	10	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	29	29	52	0	0	0
	0	1	14	24	11	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	30	30	22	0	0	0
	0	0	2	8	9	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	31	31	27	0	0	0
	0	0	4	7	13	3	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	32	32	37	0	0	0
	0	0	1	4	17	12	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	33	33	38	0	0	0
	0	0	0	4	13	16	4	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	34	34	40	0	0	0
	0	0	0	4	10	12	11	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	35	35	44	0	0	0
	0	0	0	0	7	17	16	3	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	36	36	61	0	0	0
	0	0	0	0	6	20	23	11	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	37	37	47	0	0	0
	0	0	0	0	1	14	19	10	2	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	38	38	43	0	0	0
	0	0	0	0	0	11	20	7	3	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	39	39	27	0	0	0
	0	0	0	0	0	2	9	10	1	4	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	40	40	12	0	0	0
	0	0	0	0	0	0	6	2	1	1	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	41	41	14	0	0	0
	0	0	0	0	0	0	3	5	1	1	4
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	1	0	1	42	42	28	0	0	0
	0	0	0	0	0	0	1	0	4	5	18
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	2	0	1	6	6	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	2	0	1	8	8	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	1	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	2	0	1	9	9	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	1	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	2	0	1	10	10	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	5	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	2	0	1	11	11	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	5	0	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	2	0	1	12	12	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	4	1	0	0	0	0	0	0	0
	0	0	0								

1981	1	1	2	0	1	13	13	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	7	6	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	2	0	1	14	14	28	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	15	13	0	0	0	0	0	0	0
	0	0	0								
1981	1	1	2	0	1	15	15	48	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	15	31	1	0	0	0	0	0	0
	0	0	0								
1981	1	1	2	0	1	16	16	47	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	9	31	7	0	0	0	0	0	0
	0	0	0								
1981	1	1	2	0	1	17	17	42	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	20	18	1	0	0	0	0	0
	0	0	0								
1981	1	1	2	0	1	18	18	34	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	9	19	5	1	0	0	0	0
	0	0	0								
1981	1	1	2	0	1	19	19	35	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	9	13	11	2	0	0	0	0
	0	0	0								
1981	1	1	2	0	1	20	20	27	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	11	11	3	0	0	0	0
	0	0	0								
1981	1	1	2	0	1	21	21	27	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	4	4	15	4	0	0	0	0
	0	0	0								
1981	1	1	2	0	1	22	22	31	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	5	19	5	0	0	0	0
	0	0	0								
1981	1	1	2	0	1	23	23	21	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	4	12	4	1	0	0	0
	0	0	0								
1981	1	1	2	0	1	24	24	18	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	6	7	4	0	0	0
	0	0	0								
1981	1	1	2	0	1	25	25	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	6	8	3	0	0	0
	0	0	0								
1981	1	1	2	0	1	26	26	12	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	5	4	1	2	0
	0	0	0								
1981	1	1	2	0	1	27	27	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	2	2	3	2	1
	0	0	0								
1981	1	1	2	0	1	28	28	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	0	2	2	3	0
	0	0	0								
1981	1	1	2	0	1	29	29	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	3	2	2	0
	0	0	0								
1981	1	1	2	0	1	30	30	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	1	0	2	0
	0	0	0								
1981	1	1	2	0	1	31	31	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
1981	1	1	2	0	1	32	32	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
1981	1	1	2	0	1	33	33	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0								
1981	1	1	2	0	1	35	35	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0								
1982	1	1	1	0	1	10	10	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	11	11	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	12	12	4	0	2	0
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	13	13	5	0	2	1
	0	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	14	14	16	0	7	5
	1	1	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	15	15	15	0	1	7
	1	3	2	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	16	16	16	0	0	4
	3	3	5	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	17	17	29	0	1	7
	9	6	5	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	18	18	25	0	2	6
	8	5	3	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	19	19	32	0	0	2
	7	4	15	3	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	20	20	22	0	0	2
	4	3	7	4	1	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	21	21	18	0	0	2
	5	4	6	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	22	22	17	0	0	0
	3	5	5	2	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1982	1	1	1	0	1	23	23	13	0	0	0
	2	5	4	1	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	24	24	19	0	0	0
	4	4	5	3	2	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	25	25	9	0	0	0
	1	1	5	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	26	26	11	0	0	0
	3	2	3	1	1	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	27	27	20	0	0	0
	2	4	6	2	5	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	28	28	17	0	0	0
	0	0	7	8	1	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	29	29	17	0	0	0
	0	5	6	5	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	30	30	27	0	0	0
	0	2	3	13	7	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	31	31	21	0	0	0
	0	2	7	6	5	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	32	32	22	0	0	0
	2	0	3	7	6	2	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	33	33	15	0	0	0
	0	1	2	2	4	4	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	34	34	9	0	0	0
	0	0	0	1	5	0	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	35	35	20	0	0	0
	0	2	1	3	2	4	4	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	36	36	17	0	0	0
	0	1	0	2	1	6	3	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	37	37	13	0	0	0
	0	0	0	0	1	2	4	4	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	38	38	20	0	0	0
	0	0	0	0	2	0	8	5	4	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	39	39	13	0	0	0
	0	0	0	0	0	1	1	6	1	3	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	40	40	15	0	0	0
	0	0	0	1	2	1	3	5	2	1	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	41	41	6	0	0	0
	0	0	0	0	0	0	1	3	0	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	1	0	1	42	42	12	0	0	0
	0	0	0	0	0	0	0	1	1	1	9
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	2	0	1	9	9	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	2	0	1	10	10	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	3	0	0	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	2	0	1	11	11	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	1	2	0	0	1	0	0	0	0
	0	0	0								
1982	1	1	2	0	1	12	12	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	4	0	2	0	0	0	0	0	0
	0	0	0								
1982	1	1	2	0	1	13	13	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	3	7	3	0	0	1	0	0	0
	0	0	0								
1982	1	1	2	0	1	14	14	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	7	0	0	0	0	0	0	0
	0	0	0								
1982	1	1	2	0	1	15	15	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	1	1	0	0	0	0
	0	0	0								
1982	1	1	2	0	1	16	16	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	1	6	5	2	0	1	0	0	0
	0	0	0								
1982	1	1	2	0	1	17	17	18	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	4	8	1	3	0	0	0	0
	0	0	0								
1982	1	1	2	0	1	18	18	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	4	4	4	2	1	1	0	0
	0	0	0								
1982	1	1	2	0	1	19	19	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	6	4	0	1	0	0	0
	0	0	0								
1982	1	1	2	0	1	20	20	15	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	8	4	1	0	0	0	0
	0	0	0								
1982	1	1	2	0	1	21	21	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	4	4	4	0	0	0	0
	0	0	0								
1982	1	1	2	0	1	22	22	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	4	1	1	1	1	0
	0	0	0								
1982	1	1	2	0	1	23	23	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	2	4	0	0	1	0	0
	0	0	0								

1982	1	1	2	0	1	24	24	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	1	0	1	1	1	0
	0	0	0								
1982	1	1	2	0	1	25	25	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
1982	1	1	2	0	1	26	26	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	2	0	0	0	0
	0	0	0								
1982	1	1	2	0	1	27	27	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	1	0	0	0	0
	0	0	0								
1982	1	1	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
1982	1	1	2	0	1	32	32	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
1982	1	1	2	0	1	33	33	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0								
1982	1	1	2	0	1	37	37	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0								
1983	1	1	1	0	1	8	8	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	11	11	2	0	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	12	12	2	0	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	13	13	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	14	14	3	0	0	1
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	15	15	6	0	0	2
	2	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	16	16	10	0	0	2
	6	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	17	17	13	0	0	5
	2	3	2	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	18	18	16	0	0	6
	6	3	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	19	19	17	0	0	3
	8	4	1	0	1	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	20	20	21	0	0	1
	9	6	3	0	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	21	21	25	0	1	6
	7	6	4	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	22	22	22	0	1	2
	8	5	3	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	23	23	28	0	0	1
	14	11	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	24	24	25	0	0	3
	5	11	5	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	25	25	28	0	1	2
	3	14	6	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	26	26	16	0	0	1
	3	7	2	2	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	27	27	22	0	0	1
	2	8	5	2	4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	28	28	11	0	0	1
	1	4	0	3	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	29	29	10	0	0	0
	0	3	3	2	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	30	30	10	0	0	0
	0	2	7	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	31	31	10	0	0	0
	0	1	1	3	3	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	32	32	9	0	0	0
	0	1	2	2	3	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	33	33	7	0	0	0
	0	0	1	3	2	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	34	34	10	0	0	1
	0	0	0	1	1	6	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	35	35	7	0	0	0
	0	0	0	0	3	2	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	36	36	2	0	0	0
	0	1	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1983	1	1	1	0	1	37	37	2	0	0	0
	0	0	0	0	0	0	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	38	38	11	0	0	0
	0	0	0	0	0	1	2	3	3	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	39	39	9	0	0	0
	0	0	0	0	0	0	2	4	2	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	40	40	10	0	0	0
	0	0	0	0	1	0	0	3	5	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	41	41	7	0	0	0
	0	0	0	1	0	0	0	1	4	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	1	0	1	42	42	25	0	0	0
	0	0	0	0	0	0	0	1	1	4	19
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	2	0	1	11	11	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	2	0	1	12	12	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	2	0	1	13	13	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	0	0	0	0	0	0	0
	0	0	0								
1983	1	1	2	0	1	14	14	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	1	1	1	0	0	0	0	0
	0	0	0								
1983	1	1	2	0	1	15	15	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	1	0	1	0	0	0	0
	0	0	0								
1983	1	1	2	0	1	16	16	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	0	2	0	0	0	0	0
	0	0	0								
1983	1	1	2	0	1	17	17	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	2	4	0	1	0	0	0	0
	0	0	0								
1983	1	1	2	0	1	18	18	12	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	3	4	3	1	0	0	0	0
	0	0	0								
1983	1	1	2	0	1	19	19	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	6	3	5	0	0	0	0	0
	0	0	0								
1983	1	1	2	0	1	20	20	21	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	10	6	3	1	1	0	0	0
	0	0	0								
1983	1	1	2	0	1	21	21	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	6	4	1	1	0	0	0
	0	0	0								
1983	1	1	2	0	1	22	22	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	1	1	6	0	1	0	0	0	0
	0	0	0								
1983	1	1	2	0	1	23	23	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	2	0	1	1	0	0	0
	0	0	0								
1983	1	1	2	0	1	24	24	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	2	1	0	0	0	0	0
	0	0	0								
1983	1	1	2	0	1	25	25	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	0	2	0	0	0	0	0	0
	0	0	0								
1983	1	1	2	0	1	27	27	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	1	1	1	0
	0	0	0								
1983	1	1	2	0	1	29	29	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0								
1983	1	1	2	0	1	30	30	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
1984	1	1	1	0	1	11	11	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	12	12	1	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	13	13	2	0	0	0
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	14	14	6	0	0	6
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	15	15	3	0	0	1
	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	16	16	8	0	0	3
	3	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	17	17	3	0	0	1
	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	18	18	6	0	0	1
	2	1	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	19	19	15	0	0	2
	4	7	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	20	20	6	0	0	0
	3	2	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	21	21	11	0	0	1
	7	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1984	1	1	1	0	1	22	22	15	0	0	0
	5	8	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	23	23	37	0	0	1
	11	18	3	3	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	24	24	21	0	0	0
	4	9	5	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	25	25	17	0	0	1
	1	8	6	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	26	26	23	0	0	0
	0	10	8	5	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	27	27	26	0	0	0
	2	10	12	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	28	28	24	0	0	0
	0	5	11	7	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	29	29	27	0	0	0
	0	4	14	6	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	30	30	16	0	0	1
	0	1	5	5	3	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	31	31	13	0	0	0
	0	0	3	6	3	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	32	32	9	0	0	0
	0	1	1	4	2	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	33	33	6	0	0	0
	0	1	0	1	3	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	34	34	9	0	0	0
	0	0	1	2	2	3	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	35	35	9	0	0	0
	0	0	0	1	7	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	36	36	5	0	0	0
	0	0	0	2	1	0	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	37	37	3	0	0	0
	0	0	0	0	0	1	0	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	38	38	8	0	0	0
	0	0	0	0	0	2	0	1	3	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	39	39	4	0	0	0
	0	0	0	0	1	0	1	0	2	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	40	40	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	41	41	2	0	0	0
	0	0	0	0	0	0	1	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	1	0	1	42	42	16	0	0	0
	0	0	0	0	0	0	0	1	4	7	4
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	2	0	1	13	13	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	1	0	0	0	0	0	0
	0	0	0								
1984	1	1	2	0	1	15	15	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	0	0	1	0	0	0	0
	0	0	0								
1984	1	1	2	0	1	16	16	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	2	0	1	17	17	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	0	0	0	0	0	0	0
	0	0	0								
1984	1	1	2	0	1	18	18	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	2	1	0	0	0	0	0
	0	0	0								
1984	1	1	2	0	1	19	19	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	1	3	0	0	0	0	0
	0	0	0								
1984	1	1	2	0	1	20	20	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	1	0	2	0	0	0	0
	0	0	0								
1984	1	1	2	0	1	21	21	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	2	3	0	0	0	0	0
	0	0	0								
1984	1	1	2	0	1	22	22	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	6	2	0	0	0	0
	0	0	0								
1984	1	1	2	0	1	23	23	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	2	7	1	0	0	0	0
	0	0	0								
1984	1	1	2	0	1	24	24	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	5	1	1	0	0	0
	0	0	0								
1984	1	1	2	0	1	25	25	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	2	2	1	0	0	0
	0	0	0								
1984	1	1	2	0	1	26	26	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	3	2	1	0	0
	0	0	0								
1984	1	1	2	0	1	27	27	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	0	1	0	0
	0	0	0								

1984	1	1	2	0	1	28	28	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	1
	0	0	0								
1984	1	1	2	0	1	29	29	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
1985	1	1	1	0	1	10	10	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	12	12	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	13	13	2	0	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	14	14	17	0	2	12
	2	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	15	15	29	0	2	22
	3	1	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	16	16	30	0	0	25
	3	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	17	17	24	0	1	15
	6	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	18	18	16	0	3	6
	3	3	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	19	19	4	0	0	2
	1	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	20	20	8	0	0	1
	2	1	2	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	21	21	4	0	0	0
	0	3	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	22	22	3	0	0	0
	0	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	23	23	9	0	0	0
	2	3	3	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	24	24	14	0	1	0
	1	6	5	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	25	25	21	0	0	1
	1	6	8	3	1	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	26	26	24	0	0	0
	0	7	12	3	2	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	27	27	22	0	1	0
	0	3	7	7	2	0	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	28	28	28	0	1	0
	1	0	5	15	3	1	0	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	29	29	22	0	0	0
	0	2	3	11	4	1	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	30	30	21	0	0	1
	1	1	3	4	6	3	0	0	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	31	31	25	0	0	0
	0	2	2	9	9	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	32	32	10	0	0	0
	1	0	0	4	3	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	33	33	11	0	0	0
	0	1	1	2	1	1	4	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	34	34	7	0	0	0
	0	1	0	0	3	0	1	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	35	35	13	0	0	0
	1	1	1	0	2	3	4	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	36	36	11	0	0	0
	0	1	0	2	4	0	3	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	37	37	8	0	0	0
	1	0	0	0	2	0	2	1	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	38	38	5	0	0	0
	0	2	0	0	1	0	0	0	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	39	39	4	0	0	0
	0	1	0	0	1	0	1	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	41	41	3	0	0	0
	0	0	0	0	0	0	1	0	0	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	1	0	1	42	42	4	0	0	0
	0	0	2	0	1	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	2	0	1	8	8	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	2	0	1	11	11	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								

1985	1	1	2	0	1	13	13	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	1	0	1	0	0	0	0	0	0
	0	0	0								
1985	1	1	2	0	1	14	14	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	2	1	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	2	0	1	15	15	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	2	2	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	2	0	1	16	16	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	3	0	1	0	0	0	0	0
	0	0	0								
1985	1	1	2	0	1	17	17	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	1	2	1	1	0	0	0	0	0
	0	0	0								
1985	1	1	2	0	1	18	18	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	2	0	0	0	0	0
	0	0	0								
1985	1	1	2	0	1	19	19	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	3	0	0	0	0	0	0
	0	0	0								
1985	1	1	2	0	1	20	20	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
1985	1	1	2	0	1	21	21	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	1	1	1	1	0	0
	0	0	0								
1985	1	1	2	0	1	22	22	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	0	1	1	0	0	0
	0	0	0								
1985	1	1	2	0	1	23	23	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	1	0	1	0	0
	0	0	0								
1985	1	1	2	0	1	24	24	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	1	1	0	0	0	0
	0	0	0								
1985	1	1	2	0	1	25	25	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
1985	1	1	2	0	1	26	26	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	0	2	1	0	0	0
	0	0	0								
1986	1	1	1	0	1	6	6	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	12	12	2	0	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	13	13	2	0	1	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	14	14	5	0	4	0
	1	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	15	15	23	0	0	16
	7	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	16	16	31	0	2	19
	7	2	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	17	17	42	0	2	16
	23	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	18	18	47	0	0	19
	21	5	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	19	19	55	0	0	12
	31	10	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	20	20	50	0	0	2
	29	18	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	21	21	39	0	0	2
	24	6	6	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	22	22	46	0	0	1
	22	17	4	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	23	23	27	0	0	1
	8	13	3	1	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	24	24	25	0	0	0
	3	11	5	5	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	25	25	30	0	0	0
	2	12	8	6	0	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	26	26	28	0	0	0
	2	4	13	7	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	27	27	45	0	0	0
	0	5	23	11	6	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	28	28	37	0	0	0
	0	8	15	6	4	2	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	29	29	55	0	0	0
	1	3	21	14	10	3	2	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	30	30	59	0	0	0
	1	3	14	24	9	6	0	0	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	31	31	40	0	0	0
	0	2	2	10	19	4	1	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1986	1	1	1	0	1	32	32	45	0	0	0
	0	0	5	13	16	7	2	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	33	33	31	0	0	0
	0	0	1	7	12	5	5	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	34	34	18	0	0	0
	0	0	1	2	6	3	3	2	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	35	35	22	0	0	0
	0	0	0	1	8	6	6	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	36	36	14	0	0	0
	0	0	0	0	2	4	3	2	3	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	37	37	22	0	0	0
	0	0	0	0	1	3	6	5	5	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	38	38	5	0	0	0
	0	0	0	0	1	1	0	0	1	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	39	39	8	0	0	0
	0	0	0	0	0	0	0	2	3	2	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	40	40	8	0	0	0
	0	0	0	0	0	0	1	1	2	1	3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	41	41	4	0	0	0
	0	0	0	0	0	0	0	0	0	1	3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	1	0	1	42	42	11	0	0	0
	0	0	0	0	0	0	1	0	0	1	9
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	2	0	1	8	8	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	2	0	1	11	11	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	2	0	1	13	13	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	1	3	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	2	0	1	14	14	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	4	2	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	2	0	1	15	15	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	4	7	0	0	0	0	0	0	0
	0	0	0								
1986	1	1	2	0	1	16	16	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	5	5	1	0	0	0	0	0	0
	0	0	0								
1986	1	1	2	0	1	17	17	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	4	7	5	0	0	0	0	0	0
	0	0	0								
1986	1	1	2	0	1	18	18	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	9	6	0	1	0	0	0	0
	0	0	0								
1986	1	1	2	0	1	19	19	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	9	4	4	0	1	0	0	0
	0	0	0								
1986	1	1	2	0	1	20	20	15	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	6	5	3	0	0	1	0	0
	0	0	0								
1986	1	1	2	0	1	21	21	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	2	4	1	0	0	0	0
	0	0	0								
1986	1	1	2	0	1	22	22	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	4	1	1	2	1	0	0
	0	0	0								
1986	1	1	2	0	1	23	23	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	1	0	0	0
	0	0	0								
1986	1	1	2	0	1	24	24	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	4	0	0	1	0	1
	0	0	0								
1986	1	1	2	0	1	25	25	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	0	0	0
	0	0	0								
1986	1	1	2	0	1	26	26	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	3	0	0	0
	0	0	0								
1986	1	1	2	0	1	27	27	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	2	1	0	0
	1	0	0								
1986	1	1	2	0	1	30	30	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
1987	1	1	1	0	1	9	9	2	0	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	10	10	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	11	11	2.5	1	1	0
	0	0	0.5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	12	12	5	0	2	1.5
	0	1.5	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	13	13	8	0	2	3.5
	1.5	0.5	0.5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	14	14	7	0	2	0
	1.5	2.5	0.5	0	0	0.5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1987	1	1	1	0	1	15	15	11	0	2	3
	1.5	3	1.5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	16	16	9	0	0	5
	2	1.5	0	0	0	0.5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	17	17	14.5	0	2	2
	5	1.5	3.5	0.5	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	18	18	9	0	0	2
	4	1.5	1	0.5	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	19	19	26	0	1	4
	15	2	1	1	1.5	0.5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	20	20	26	0	0	7
	6	9	2	1.5	0	0.5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	21	21	31.5	0	0	5
	10	14	1	0	0	1.5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	22	22	46	0	0	4
	14	15	6	4	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	23	23	43	0	0	6
	5	23	3	6	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	24	24	53	0	0	1
	11	24	10	3	1	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	25	25	51	0	0	0
	4	27	15	4	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	26	26	62	0	0	0
	4	23	28	6	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	27	27	39	0	0	0
	0	9	17	4	4	3	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	28	28	33	0	0	0
	1	6	8	13	3	0	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	29	29	56	0	0	0
	0	7	12	19	14	2	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	30	30	56	0	0	0
	0	3	6	19	16	9	0	1	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	31	31	46	0	0	0
	0	2	8	11	19	3	2	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	32	32	50	0	0	0
	0	1	6	12	15	6	6	1	2	0	1

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	33	33	43	0	0	0
	0	0	2	11	15	13	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	34	34	25	0	0	0
	0	0	1	2	8	10	3	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	35	35	28	0	0	0
	0	1	0	2	7	10	8	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	36	36	22	0	0	0
	0	0	0	3	6	7	2	2	0	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	37	37	9	0	0	0
	0	0	0	0	0	3	2	1	2	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	38	38	5	0	0	0
	0	0	0	0	1	0	1	2	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	39	39	7	0	0	0
	0	0	0	0	1	1	2	1	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	40	40	4	0	0	0
	0	0	0	0	0	0	1	2	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	41	41	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	1	0	1	42	42	12	0	0	0
	0	0	0	0	1	0	0	0	0	1	10
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	2	0	1	9	9	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	2	0	1	10	10	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	1	0	0	0	0	0	0	0
	0	0	0								
1987	1	1	2	0	1	11	11	2.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	0	0	0.5	0	0	0	0	0
	0	0	0								
1987	1	1	2	0	1	12	12	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	4	2.5	0	1.5	0	0	0	0	0	0
	0	0	0								
1987	1	1	2	0	1	13	13	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	6	4.5	1.5	0.5	1.5	0	0	0	0	0
	0	0	0								
1987	1	1	2	0	1	14	14	15	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	5	2.5	2.5	1.5	1	0	0.5	0	0
	0	0	0								
1987	1	1	2	0	1	15	15	18	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	9	3.5	3	0.5	0	1	1	0	0
	0	0	0								

1987	1	1	2	0	1	16	16	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	4	3	6.5	1	0	1	0.5	0	0
	0	0	0								
1987	1	1	2	0	1	17	17	22.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	7	7.5	2.5	2.5	0	1	0	0
	0	0	0								
1987	1	1	2	0	1	18	18	24	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	5	13.5	0	1.5	0	1	0	0
	0	0	0								
1987	1	1	2	0	1	19	19	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	4	6	3	2	0.5	0.5	0	0
	0	0	0								
1987	1	1	2	0	1	20	20	24	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	3	9	4	2.5	1	1.5	0	1
	0	0	0								
1987	1	1	2	0	1	21	21	25.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	3	9	6	4	1	0.5	0	1
	0	0	0								
1987	1	1	2	0	1	22	22	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	5	2	1	2	2	0	0
	0	0	0								
1987	1	1	2	0	1	23	23	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	3	3	0	1	0	0
	0	0	0								
1987	1	1	2	0	1	24	24	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	3	1	1	0	0	0
	0	0	0								
1987	1	1	2	0	1	25	25	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	2	1	0
	0	0	0								
1987	1	1	2	0	1	26	26	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	0	1	0
	0	0	0								
1987	1	1	2	0	1	27	27	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	3	1	0	0	0
	0	0	0								
1987	1	1	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1								
1987	1	1	2	0	1	29	29	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	0
	0	0	0								
1988	1	1	1	0	1	9	9	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	10	10	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	11	11	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	12	12	11	0	6	5
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	13	13	23	0	7	10
	5	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	14	14	43	0	11	24
	8	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	15	15	49	0	6	30
	11	0	1	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	16	16	54	0	8	38
	6	1	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	17	17	49	0	2	29
	13	3	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	18	18	21	0	0	10
	11	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	19	19	14	0	0	7
	5	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	20	20	7	0	0	1
	4	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	21	21	13	0	0	1
	6	5	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	22	22	14	0	0	0
	10	3	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	23	23	21	0	1	2
	7	8	2	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	24	24	17	0	0	1
	3	8	3	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	25	25	27	0	0	0
	3	14	7	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	26	26	25	0	0	1
	3	13	7	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	27	27	36	0	1	1
	3	14	13	2	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	28	28	27	0	0	0
	1	7	9	5	3	0	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	29	29	29	0	0	0
	1	8	13	5	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1988	1	1	1	0	1	30	30	18	0	0	0
	0	3	3	7	3	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	31	31	10	0	0	0
	0	0	1	6	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	32	32	24	0	0	1
	0	0	1	7	7	7	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	33	33	25	0	0	0
	0	0	2	4	9	9	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	34	34	22	0	0	0
	1	1	0	2	7	4	5	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	35	35	17	0	1	0
	1	0	0	2	7	4	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	36	36	18	0	0	0
	0	0	1	2	7	5	2	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	37	37	6	0	0	0
	0	0	0	0	0	2	2	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	38	38	8	0	0	0
	0	1	0	0	0	1	2	1	2	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	39	39	6	0	0	0
	0	0	1	0	0	0	2	1	0	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	41	41	2	0	0	0
	0	0	0	0	0	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	1	0	1	42	42	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	2	0	1	6	6	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	2	0	1	8	8	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0								
1988	1	1	2	0	1	11	11	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	3	1	0	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	2	0	1	12	12	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	4	3	2	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	2	0	1	13	13	36	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	10	19	6	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	2	0	1	14	14	57	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	14	34	7	1	0	0	1	0	0	0
	0	0	0								
1988	1	1	2	0	1	15	15	64	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	11	29	20	4	0	0	0	0	0	0
	0	0	0								
1988	1	1	2	0	1	16	16	37	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	19	12	4	0	0	0	0	0	0
	0	0	0								
1988	1	1	2	0	1	17	17	15	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	6	5	2	0	0	0	0	0	0
	0	0	0								
1988	1	1	2	0	1	18	18	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	6	10	0	0	0	0	0	0	0
	0	0	0								
1988	1	1	2	0	1	19	19	15	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	4	8	2	1	0	0	0	0	0
	0	0	0								
1988	1	1	2	0	1	20	20	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	5	1	0	1	0	0	1	0
	0	0	0								
1988	1	1	2	0	1	21	21	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	5	4	1	0	0	0	0
	0	0	0								
1988	1	1	2	0	1	22	22	12	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	8	1	0	1	0	0	0
	0	0	0								
1988	1	1	2	0	1	23	23	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	6	0	1	1	0	0
	0	0	0								
1988	1	1	2	0	1	24	24	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	0	2	0	1	0	0
	0	0	0								
1988	1	1	2	0	1	25	25	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	2	1	0	1	0
	0	0	0								
1988	1	1	2	0	1	26	26	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	1	0	0	1	0
	0	0	0								
1988	1	1	2	0	1	27	27	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0								
1988	1	1	2	0	1	28	28	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	0	0	0
	1	0	1								
1988	1	1	2	0	1	29	29	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0								
1988	1	1	2	0	1	30	30	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	1
	0	0	0								
1988	1	1	2	0	1	31	31	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	1
	0	0	0								

1989	1	1	1	0	1	9	9	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	10	10	4	0	4	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	11	11	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	12	12	5	0	2	3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	13	13	4	0	2	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	14	14	4	0	3	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	15	15	12	0	3	7
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	16	16	23	1	2	9
	9	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	17	17	59	0	1	31
	22	4	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	18	18	61	0	0	24
	28	7	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	19	19	92	0	1	26
	52	11	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	20	20	81.5	0	0	21
	43	11.5	4	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	21	21	69	0	1	7
	45	13	2	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	22	22	42	0	0	2
	29	8	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	23	23	28	0	0	2
	15	8	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	24	24	34	0	0	0
	14	15	5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	25	25	20	0	0	0
	2	12	5	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	26	26	34	0	0	1
	4	9	10	7	2	0	1	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	27	27	37	0	0	0
	1	18	11	4	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	28	28	46	0	0	0
	3	15	12	9	5	1	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	29	29	20.5	0	0	0
	0	1	9.5	7	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	30	30	15	0	0	0
	0	1	6	4	2	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	31	31	22	0	0	0
	0	1	6	9	4	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	32	32	19	0	0	0
	0	0	5	5	6	1	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	33	33	14	0	0	0
	0	0	1	4	2	6	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	34	34	14	0	0	0
	0	1	1	1	3	6	1	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	35	35	17	0	0	0
	0	0	3	2	5	4	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	36	36	10	0	0	0
	0	1	0	0	0	3	4	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	37	37	12	0	0	0
	0	0	0	0	1	3	4	3	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	38	38	9	0	0	0
	0	0	0	0	0	1	3	3	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	39	39	10	0	0	0
	0	0	0	0	0	2	3	4	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	40	40	7	0	0	0
	0	0	0	0	1	1	1	1	1	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	41	41	2	0	0	0
	0	0	0	0	0	0	1	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	1	0	1	42	42	14	0	0	0
	0	0	0	0	0	1	1	4	2	2	4
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	2	0	1	10	10	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								

1989	1	1	2	0	1	12	12	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	2	0	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	2	0	1	13	13	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	2	1	0	0	0	0	0	0	0
	0	0	0								
1989	1	1	2	0	1	14	14	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	2	2	1	0	0	0	0	0	0
	0	0	0								
1989	1	1	2	0	1	15	15	25	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	6	14	5	0	0	0	0	0	0
	0	0	0								
1989	1	1	2	0	1	16	16	46	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	14	23	7	2	0	0	0	0	0
	0	0	0								
1989	1	1	2	0	1	17	17	59	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	5	19	29	5	1	0	0	0	0	0
	0	0	0								
1989	1	1	2	0	1	18	18	61	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	3	25	23	10	0	0	0	0	0	0
	0	0	0								
1989	1	1	2	0	1	19	19	47	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	18	19	5	4	0	1	0	0	0
	0	0	0								
1989	1	1	2	0	1	20	20	33.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	12	13	5.5	3	0	0	0	0	0
	0	0	0								
1989	1	1	2	0	1	21	21	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	6	3	3	1	1	0	0	0	0
	0	0	0								
1989	1	1	2	0	1	22	22	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	2	2	2	0	1	0	0
	0	0	0								
1989	1	1	2	0	1	23	23	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	2	2	1	0	0	0	0
	0	0	0								
1989	1	1	2	0	1	24	24	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	2	1	1	0	0	0	0
	0	0	0								
1989	1	1	2	0	1	25	25	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	1	0	1	0	0	0
	0	0	0								
1989	1	1	2	0	1	26	26	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	2	1	2	0	0
	0	0	0								
1989	1	1	2	0	1	27	27	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	2	0								
1989	1	1	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0								
1989	1	1	2	0	1	29	29	0.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0.5	0	0	0	0	0
	0	0	0								
1989	1	1	2	0	1	30	30	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0								
1989	1	1	2	0	1	31	31	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0								
1989	1	1	2	0	1	37	37	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0								
1990	1	1	1	0	1	6	6	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	9	9	6	3	3	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	10	10	5	0	5	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	11	11	6	0	6	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	12	12	6	0	3	3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	13	13	8	0	4	4
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	14	14	13	0	6	4
	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	15	15	9	0	1	5
	2	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	16	16	14	0	3	8
	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	17	17	10	0	1	4
	5	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	18	18	12	0	0	4
	7	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	19	19	36	0	0	10
	21	4	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	20	20	46	0	0	8
	31	6	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	21	21	56	0	0	7
	29	16	3	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1990	1	1	1	0	1	22	22	81	0	0	4
	42	26	7	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	23	23	83	0	0	1
	28	36	13	4	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	24	24	66	0	0	1
	27	30	5	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	25	25	48	0	0	1
	12	26	5	2	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	26	26	29	0	0	0
	6	16	6	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	27	27	32	0	0	0
	3	9	13	4	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	28	28	23	0	0	0
	0	4	7	7	3	0	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	29	29	27	0	0	0
	1	4	9	8	3	0	1	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	30	30	26	0	0	0
	0	1	6	15	4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	31	31	30	0	0	0
	1	1	8	6	9	4	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	32	32	25	0	0	1
	0	0	3	8	6	4	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	33	33	13	0	0	0
	0	0	0	2	5	4	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	34	34	15	0	0	0
	0	0	1	0	3	4	4	2	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	35	35	13	0	0	0
	0	0	0	1	4	1	2	3	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	36	36	15	0	0	0
	0	0	0	0	3	3	4	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	37	37	15	0	0	0
	0	0	0	0	1	2	4	4	1	3	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	38	38	14	0	0	0
	0	1	0	0	0	0	5	5	2	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	39	39	5	0	0	0
	0	0	0	0	0	0	3	1	1	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	40	40	4	0	0	0
	0	0	0	0	0	0	0	0	2	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	41	41	2	0	0	0
	0	0	0	0	0	0	1	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	1	0	1	42	42	4	0	0	0
	0	0	0	0	0	0	0	0	1	0	3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	2	0	1	8	8	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	2	0	1	9	9	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	2	0	1	10	10	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	2	0	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	2	0	1	11	11	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	4	1	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	2	0	1	12	12	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	5	1	0	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	2	0	1	14	14	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	7	2	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	2	0	1	15	15	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	7	2	2	0	0	0	0	0	0
	0	0	0								
1990	1	1	2	0	1	16	16	22	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	8	9	4	0	0	0	0	0	0
	0	0	0								
1990	1	1	2	0	1	17	17	27	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	7	7	11	0	0	0	0	0	0
	0	0	0								
1990	1	1	2	0	1	18	18	28	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	7	9	10	2	0	0	0	0	0
	0	0	0								
1990	1	1	2	0	1	19	19	49	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	8	21	15	4	1	0	0	0	0
	0	0	0								
1990	1	1	2	0	1	20	20	42	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	18	11	7	4	0	0	0	0
	0	0	0								
1990	1	1	2	0	1	21	21	34	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	5	10	9	8	2	0	0	0	0
	0	0	0								
1990	1	1	2	0	1	22	22	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	8	2	2	1	0	0	0
	0	0	0								

1990	1	1	2	0	1	23	23	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	0	6	2	0	0	0
	0	0	0								
1990	1	1	2	0	1	24	24	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	4	1	0	2	0	0
	0	0	0								
1990	1	1	2	0	1	25	25	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	3	3	0	2	0	0
	0	0	0								
1990	1	1	2	0	1	26	26	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	4	0	0	0	0
	0	0	0								
1990	1	1	2	0	1	27	27	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
1990	1	1	2	0	1	28	28	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	1
	0	0	0								
1990	1	1	2	0	1	31	31	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	1	0	0
	0	0	0								
1990	1	1	2	0	1	33	33	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
1991	1	1	1	0	1	4	4	0.5	0	0.5	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	5	5	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	7	7	5	0	4	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	8	8	5	0	5	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	9	9	13	2	9	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	10	10	11	0	7	3.5
	0.5	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	11	11	17	1	13	2
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	12	12	23.5	0	18	2.5
	2	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	13	13	19	0	6	10
	2	0.5	0.5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	14	14	24.5	0	5	15
	3	0	0.5	0	0	0	0	1	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	15	15	28.5	0	4	16
	5	2	0.5	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	16	16	33.5	0	0	19
	12	0	0	1	0	1.5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	17	17	37	0	0	19
	11	3	3	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	18	18	50	0	2	13
	15	16	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	19	19	34	0	1	5
	13	7	4	3	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	20	20	40.5	0	0	5
	15	10.5	10	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	21	21	28	0	0	2
	7	11	5	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	22	22	29	0	0	0
	7	11	3	6	1	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	23	23	44	0	0	1
	8	17	9	4	1	2	0	0	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	24	24	79	0	0	2
	8	29	26	8	3	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	25	25	67	0	0	1
	11	27	21	4	2	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	26	26	90.5	0	0	1
	5	39	28.5	7	7	1	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	27	27	49	0	0	0
	1	13	17	14	1	1	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	28	28	28	0	0	0
	0	6	12	5	4	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	29	29	22.5	0	0	0
	3	5	5	4	2	0	1.5	0	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	30	30	14	0	0	0
	1	2	3	2	2	0	0	1	1	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	31	31	22	0	0	0
	0	2	3	10	2	4	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1991	1	1	1	0	1	32	32	43	0	0	0
	0	2	4	10	13	7	2	3	0	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	33	33	24	0	0	0
	0	2	2	3	3	6	5	1	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	34	34	20	0	0	0
	0	0	0	3	6	6	2	1	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	35	35	14	0	0	0
	0	0	0	1	5	3	4	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	36	36	12	0	0	0
	1	0	0	1	3	2	2	1	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	37	37	7	0	0	0
	0	0	0	1	0	1	5	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	38	38	4	0	0	0
	1	0	0	0	0	0	1	0	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	39	39	5	0	0	0
	0	0	0	0	0	0	2	1	0	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	40	40	2	0	0	0
	0	0	0	0	0	0	0	0	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	41	41	5	0	0	0
	0	0	0	0	0	0	0	1	2	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	1	0	1	42	42	6	0	0	0
	0	0	0	0	0	0	0	0	1	2	3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	2	0	1	4	4	1.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0.5	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	2	0	1	6	6	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	2	0	1	7	7	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	1	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	2	0	1	8	8	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	3	2	1	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	2	0	1	9	9	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	7	1	1	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	2	0	1	10	10	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	7	0.5	0.5	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	2	0	1	11	11	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	1	5	2	0	0	0	0	0	0	0	0
	0	0	0								
1991	1	1	2	0	1	12	12	12.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	4	6.5	0	1	0	0	0	0	0	0
	0	0	0								
1991	1	1	2	0	1	13	13	12	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	5	4	1	1.5	0.5	0	0	0	0	0
	0	0	0								
1991	1	1	2	0	1	14	14	8.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	6	1	0	0.5	0	0	0	0	0
	0	0	0								
1991	1	1	2	0	1	15	15	12.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	9	3	0	0.5	0	0	0	0	0
	0	0	0								
1991	1	1	2	0	1	16	16	7.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	3	0	1	0	0	0.5	0	0
	0	0	0								
1991	1	1	2	0	1	17	17	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	4	1	3	0	0	0	0	0
	0	0	0								
1991	1	1	2	0	1	18	18	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	4	2	1	1	0	0	0	0
	0	0	0								
1991	1	1	2	0	1	19	19	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	5	6	5	0	0	0	0	0
	0	0	0								
1991	1	1	2	0	1	20	20	24.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	6	10.5	3	3	0	0	0	0
	0	0	0								
1991	1	1	2	0	1	21	21	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	4	4	4	0	0	0	0	0
	0	0	0								
1991	1	1	2	0	1	22	22	27	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	3	10	11	2	0	0	0	0
	0	0	0								
1991	1	1	2	0	1	23	23	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	3	5	1	1	0	0	0
	0	0	0								
1991	1	1	2	0	1	24	24	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	3	4	1	0	2	0	0
	0	0	0								
1991	1	1	2	0	1	25	25	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	1	0	3	1	0
	0	0	0								
1991	1	1	2	0	1	26	26	9.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	1	3.5	2	1	0	0	1
	0	0	0								
1991	1	1	2	0	1	27	27	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	3	1	1	1	0	0
	0	0	0								
1991	1	1	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								

1991	1	1	2	0	1	29	29	1.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0.5	0
	0	0	0								
1992	1	1	1	0	1	1	1	2	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	2	2	4	4	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	3	3	6	6	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	4	4	4	2	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	5	5	7	1	6	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	6	6	13.5	2	11.5	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	7	7	35	2	33	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	8	8	59.5	4	49	6
	0.5	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	9	9	86	3	56.5	25
	1.5	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	10	10	96.5	1	54	40.5
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	11	11	71	2	34	32.5
	1	0.5	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	12	12	67	0	28	33
	5	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	13	13	82.5	1	27	37.5
	15	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	14	14	83	0	10	43
	30	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	15	15	71.5	0	1	30.5
	34	5	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	16	16	91	0	3	41
	33	12	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	17	17	86	0	3	32
	41	6	3	1	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	18	18	68.5	0	2	16
	36.5	9	2	1	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	19	19	58	0	0	9
	27	13	9	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	20	20	56	0	0	5
	20	19	9	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	21	21	45	0	0	1
	12	14	15	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	22	22	60	0	0	3
	17	16	17	5	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	23	23	45	0	0	0
	8	17	15	4	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	24	24	33	0	0	0
	2	10	11	10	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	25	25	24	0	0	0
	2	7	5	7	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	26	26	50	0	0	0
	2	15	17	8	6	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	27	27	61	0	0	0
	1	4	15	25	14	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	28	28	84	0	0	0
	3	5	25	34	12	5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	29	29	69	0	0	0
	1	7	18	21	17	3	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	30	30	50	0	0	0
	0	2	8	26	8	4	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	31	31	36	0	0	0
	0	2	7	11	6	10	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	32	32	27	0	0	0
	0	3	1	3	7	6	3	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	33	33	25	0	0	0
	0	0	0	3	6	3	7	2	2	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	34	34	17	0	0	0
	0	0	0	1	2	9	2	0	2	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1992	1	1	1	0	1	35	35	27	0	0	1
	0	0	0	0	3	7	5	1	4	4	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	36	36	21	0	0	0
	0	0	0	0	0	3	4	4	3	6	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	37	37	18	0	0	0
	0	0	0	0	1	1	4	3	2	1	6
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	38	38	20	0	0	0
	0	0	0	0	0	0	0	5	2	2	11
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	39	39	17	0	0	0
	0	0	0	0	0	1	0	3	7	2	4
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	40	40	8	0	0	0
	0	0	0	0	0	0	2	0	2	1	3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	41	41	6	0	0	0
	0	0	0	0	0	0	0	1	3	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	1	0	1	42	42	13	0	0	0
	0	0	0	0	0	0	0	0	2	1	10
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	1	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	2	2	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	3	3	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	4	4	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	5	5	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	3	2	1	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	6	6	18.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	3	15.5	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	7	7	28	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	28	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	8	8	45.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	2	42	1	0.5	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	9	9	58	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	2	44.5	10	1.5	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	10	10	36.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	3	19	14.5	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	11	11	29	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	12	14.5	2	0.5	0	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	12	12	44	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	13	26	5	0	0	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	13	13	33.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	8	18.5	5	1	0	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	14	14	53	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	11	25	15	2	0	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	15	15	43.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	24.5	15	4	0	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	16	16	42	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	11	19	12	0	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	17	17	30	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	11	13	5	1	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	18	18	33.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	6	4.5	13	7	2	1	0	0	0
	0	0	0								
1992	1	1	2	0	1	19	19	21	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	4	8	7	0	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	20	20	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	4	3	5	5	2	0	0	0
	0	0	0								
1992	1	1	2	0	1	21	21	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	3	5	2	3	0	0	0	0
	0	0	0								
1992	1	1	2	0	1	22	22	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	6	5	0	3	0	0	0
	0	0	0								
1992	1	1	2	0	1	23	23	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	5	5	3	1	0	0
	0	0	0								
1992	1	1	2	0	1	24	24	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	4	1	1	1	0	0
	0	0	0								
1992	1	1	2	0	1	25	25	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	3	2	0	1
	0	0	1								
1992	1	1	2	0	1	26	26	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	1	1	1	0
	0	0	0								
1992	1	1	2	0	1	27	27	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	1	0
	1	0	0								

1992	1	1	2	0	1	29	29	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
1993	1	1	1	0	1	3	3	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	4	4	4	0	4	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	5	5	9	1	8	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	6	6	21	3	17	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	7	7	50	4	37	9
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	8	8	58	1	35	21
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	9	9	87	0	41	43
	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	10	10	111.5	2	35	56.5
	15	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	11	11	118	4	35	62.5
	13.5	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	12	12	102	2	40	34.5
	18.5	6	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	13	13	143	3	28	48
	44	16	3	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	14	14	144	3	14	58
	56	11	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	15	15	131.5	0	13	51
	48	17.5	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	16	16	113.5	0	5	56
	26	17.5	7	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	17	17	93	0	3	39
	20	23	8	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	18	18	74	0	2	28
	15	19	9	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	19	19	57	1	3	17
	15	12	8	0	1	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	20	20	67	0	2	10
	25	14	13	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	21	21	58	1	1	6
	28	10	7	5	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	22	22	52	0	0	1
	16	16	9	7	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	23	23	35	2	0	1
	10	10	8	2	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	24	24	37	0	0	0
	7	11	9	8	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	25	25	36	0	0	0
	4	14	7	9	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	26	26	35	0	0	0
	1	13	8	10	2	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	27	27	43.5	0	0	0
	1	8	10	14	10	0	0.5	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	28	28	28	0	0	0
	0	8	9	1	8	1	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	29	29	24	0	0	0
	0	1	3	12	3	4	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	30	30	43	0	0	1
	0	1	6	14	13	7	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	31	31	42	0	0	0
	0	1	6	16	11	6	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	32	32	35	0	0	0
	0	0	1	13	14	4	1	0	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	33	33	25	0	0	0
	0	0	2	8	6	6	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	34	34	21	0	0	0
	0	0	0	8	2	5	3	0	2	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	35	35	8	0	0	0
	0	0	0	0	0	3	2	1	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	36	36	8	0	0	0
	0	0	0	1	1	0	4	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1993	1	1	1	0	1	37	37	15	0	0	0
	0	0	0	0	0	4	8	1	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	38	38	11	0	0	0
	0	0	0	0	0	1	5	2	1	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	39	39	9	0	0	0
	0	0	0	0	0	0	2	0	2	4	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	40	40	5	0	0	0
	0	0	0	0	0	0	0	1	0	2	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	41	41	7	0	0	0
	0	0	0	0	0	0	0	1	3	0	3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	42	42	12	0	0	0
	0	0	0	0	1	0	0	1	1	0	9
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	3	3	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	4	4	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	2	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	5	5	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	6	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	6	6	12	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	2	9	1	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	7	7	30	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	15	11	2	0	0	1	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	8	8	27	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	12	14	1	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	9	9	44	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	17	22	4	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	10	10	51.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	16	28.5	5	1	0	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	11	11	48	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	15	20.5	9.5	2	0	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	12	12	56	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	11	24.5	12.5	5	2	0	1	0	0	0
	0	0	0								
1993	1	1	2	0	1	13	13	60	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	8	24	21	6	1	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	14	14	52	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	4	18	14	9	6	1	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	15	15	58.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	27	19	7.5	1	2	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	16	16	47.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	18	14	6.5	3	5	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	17	17	21	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	2	6	4	3	3	1	0	0	0
	0	0	0								
1993	1	1	2	0	1	18	18	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	8	4	1	1	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	19	19	23	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	12	3	4	1	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	20	20	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	5	6	4	1	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	21	21	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	5	3	3	1	2	0	0	0
	0	0	0								
1993	1	1	2	0	1	22	22	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	4	2	6	3	0	1	1	0
	0	0	0								
1993	1	1	2	0	1	23	23	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	2	1	2	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	24	24	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	2	2	0	1	1	0
	0	0	0								
1993	1	1	2	0	1	25	25	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	0	2	3	2	0	0
	0	0	0								
1993	1	1	2	0	1	26	26	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	3	1	1	0
	0	0	0								
1993	1	1	2	0	1	27	27	4.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	0	0	0.5	2
	0	0	0								
1993	1	1	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
1993	1	1	2	0	1	29	29	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0								
1994	1	1	1	0	1	5	5	3	0	3	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	6	6	2	0	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1994	1	1	1	0	1	7	7	7.5	0	5	0.5
	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	8	8	24	2	14	7
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	9	9	49	1	31	16.5
	0	0.5	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	10	10	71	3	32	34
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	11	11	64	4	24	26
	7.5	2.5	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	12	12	59.5	1	17.5	22
	13.5	5.5	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	13	13	50.5	0	4	29
	9.5	6	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	14	14	74	0	11	32
	23	7	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	15	15	86.5	0	4	44
	31	5.5	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	16	16	83	0	4	40
	31	5	2	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	17	17	76	0	1	40
	20	11	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	18	18	76	0	2	34
	24	11	5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	19	19	76	0	0	18
	39	12	4	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	20	20	67	0	0	9
	32	15	9	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	21	21	68	0	0	11
	37	10	4	6	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	22	22	49	0	0	2
	17	12	7	10	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	23	23	49	0	0	0
	12	15	7	9	3	2	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	24	24	40	0	0	2
	9	15	5	7	2	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	25	25	41	0	0	0
	4	13	7	9	6	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	26	26	31	0	0	0
	1	6	6	10	7	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	27	27	30	0	0	0
	2	9	4	6	6	1	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	28	28	34	0	0	0
	0	12	8	9	2	2	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	29	29	25	0	0	0
	0	6	6	5	5	1	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	30	30	18	0	0	0
	0	0	4	5	6	2	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	31	31	19	0	0	0
	0	2	2	6	6	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	32	32	16	0	0	0
	0	0	0	2	8	3	1	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	33	33	23	0	0	0
	0	0	1	2	10	6	3	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	34	34	12	0	0	0
	0	0	0	0	3	6	1	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	35	35	10	0	0	0
	0	0	0	0	2	1	3	2	0	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	36	36	8	0	0	0
	0	0	1	0	1	2	1	2	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	37	37	6	0	0	0
	0	0	0	0	0	1	2	2	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	38	38	4	0	0	0
	0	0	0	0	0	1	0	1	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	39	39	7	0	0	0
	0	0	0	0	0	0	0	1	1	1	4
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	40	40	5	0	0	0
	0	0	0	0	0	0	1	0	2	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	41	41	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1994	1	1	1	0	1	42	42	10	0	0	0
	0	0	0	0	0	0	0	1	1	2	6
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	6	6	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	7	7	3.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	1.5	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	8	8	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	2	4	3	2	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	9	9	12	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	6	4.5	1	0.5	0	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	10	10	32	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	17	12	3	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	11	11	26	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	8	9	8.5	0.5	0	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	12	12	32.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	3.5	11	10.5	5.5	1	1	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	13	13	46.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	3	20	18.5	5	0	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	14	14	47	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	20	21	4	0	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	15	15	42.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	21	15	6.5	0	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	16	16	32	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	6	14	10	2	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	17	17	38	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	13	15	6	3	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	18	18	33	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	8	11	11	2	1	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	19	19	21	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	8	7	2	3	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	20	20	15	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	5	3	2	3	1	1	0	0
	0	0	0								
1994	1	1	2	0	1	21	21	15	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	4	5	4	1	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	22	22	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	5	6	1	5	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	23	23	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	1	6	0	1	0	0
	0	0	0								
1994	1	1	2	0	1	24	24	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	0	2	0	0
	0	0	0								
1994	1	1	2	0	1	25	25	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	1	0	0	1	1	0
	0	0	0								
1994	1	1	2	0	1	26	26	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	1	0	1	1
	1	0	0								
1994	1	1	2	0	1	27	27	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	1	0
	0	0	0								
1994	1	1	2	0	1	28	28	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	3	0	0	0
	0	0	0								
1994	1	1	2	0	1	31	31	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1								
1995	1	1	1	0	1	11	11	6	0	5	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	12	12	10	0	6	2
	1	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	13	13	28	0	7	13
	8	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	14	14	47	0	9	17
	19	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	15	15	62	0	4	32
	23	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	16	16	85	0	6	47
	21	9	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	17	17	97	0	4	38
	36	17	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	18	18	96	0	2	26
	42	21	4	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	19	19	109	0	1	28
	45	28	6	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	20	20	146	0	0	21
	77	32	14	1	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1995	1	1	1	0	1	21	21	119	0	0	12
	58	26	19	4	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	22	22	89	0	0	5
	35	22	21	6	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	23	23	82	0	0	2
	27	31	13	9	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	24	24	52	0	0	0
	19	20	5	7	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	25	25	51	0	0	0
	6	28	7	5	5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	26	26	45	0	0	2
	3	23	7	5	5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	27	27	39	0	0	0
	2	11	14	7	4	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	28	28	29	0	0	1
	2	3	12	5	4	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	29	29	23	0	0	0
	1	7	6	5	4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	30	30	18	0	0	0
	0	1	5	5	2	4	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	31	31	12	0	0	0
	0	0	2	5	0	3	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	32	32	7	0	0	0
	0	0	0	1	1	2	0	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	33	33	13	0	0	0
	0	0	0	4	1	4	4	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	34	34	14	0	0	0
	0	0	0	1	3	5	3	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	35	35	17	0	0	0
	0	1	0	1	2	8	0	4	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	36	36	10	0	0	0
	0	0	0	0	3	1	3	2	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	37	37	7	0	0	0
	0	0	0	0	1	1	1	2	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	38	38	4	0	0	0
	0	0	0	0	0	0	1	1	1	0	1

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	39	39	13	0	0	0
	0	0	0	0	0	2	0	2	5	1	3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	40	40	5	0	0	0
	0	0	0	0	0	0	1	1	0	0	3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	41	41	4	0	0	0
	0	0	0	0	0	0	0	1	1	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	42	42	5	0	0	0
	0	0	0	0	0	0	0	1	0	0	4
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	2	0	1	9	9	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	2	0	1	10	10	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	2	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	2	0	1	11	11	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	0	0	0	0	0	0
	0	0	0								
1995	1	1	2	0	1	12	12	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	4	0	1	0	1	0	0	0	0	0
	0	0	0								
1995	1	1	2	0	1	13	13	20	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	5	10	4	1	0	0	0	0	0	0
	0	0	0								
1995	1	1	2	0	1	14	14	27	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	4	9	8	5	1	0	0	0	0	0
	0	0	0								
1995	1	1	2	0	1	15	15	52	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	12	22	14	2	0	0	0	0	0
	0	0	0								
1995	1	1	2	0	1	16	16	48	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	15	19	7	7	0	0	0	0	0
	0	0	0								
1995	1	1	2	0	1	17	17	42	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	8	14	6	12	1	1	0	0	0
	0	0	0								
1995	1	1	2	0	1	18	18	53	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	9	23	9	7	4	1	0	0	0
	0	0	0								
1995	1	1	2	0	1	19	19	24	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	11	5	1	4	2	0	0	0
	0	0	0								
1995	1	1	2	0	1	20	20	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	4	9	3	0	3	0	0	0
	0	0	0								
1995	1	1	2	0	1	21	21	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	4	3	4	5	1	2	0	0
	0	0	0								

1995	1	1	2	0	1	22	22	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	1	4	1	0	0	0
	0	0	0								
1995	1	1	2	0	1	23	23	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	2	0	0	2	2	0	0
	1	0	0								
1995	1	1	2	0	1	24	24	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	2	1	0	1
	0	0	0								
1995	1	1	2	0	1	25	25	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
1995	1	1	2	0	1	26	26	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	0	0	0
	1	0	0								
1995	1	1	2	0	1	27	27	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	1	0
	1	0	0								
1995	1	1	2	0	1	28	28	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	0	0	0
	1	0	0								
1995	1	1	2	0	1	29	29	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
1995	1	1	2	0	1	32	32	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	5	5	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	8	8	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	9	9	17	2	12	3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	10	10	20	3	8	7
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	11	11	19	4	10	4
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	12	12	23	3	15	5
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	13	13	12	0	6	3
	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	14	14	20	0	4	6
	8	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	15	15	40	0	8	20
	10	2	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	16	16	52	0	9	22
	10	10	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	17	17	66	0	7	23
	10	22	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	18	18	67	0	3	27
	20	12	5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	19	19	70	0	3	17
	26	17	6	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	20	20	66	0	3	15
	22	15	11	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	21	21	50	0	0	5
	23	8	12	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	22	22	72	0	0	6
	37	15	12	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	23	23	78	0	0	4
	30	23	16	4	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	24	24	71	0	2	2
	15	32	8	11	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	25	25	63	0	0	1
	12	27	13	7	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	26	26	48	0	0	2
	8	26	6	5	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	27	27	59	0	0	1
	6	25	17	7	2	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	28	28	37	0	0	0
	1	17	6	7	4	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	29	29	22	0	0	0
	2	3	7	5	4	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	30	30	23	0	0	0
	2	5	7	3	4	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	31	31	19	0	0	0
	0	1	6	6	2	2	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	32	32	16	0	0	1
	0	0	0	8	3	2	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1996	1	1	1	0	1	33	33	9	0	0	0
	0	1	0	2	1	4	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	34	34	5	0	0	0
	0	0	0	0	2	1	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	35	35	14	0	0	0
	0	0	0	0	3	4	5	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	36	36	7	0	0	0
	0	0	0	0	2	0	1	1	1	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	37	37	4	0	0	0
	0	0	0	0	0	1	2	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	38	38	4	0	0	0
	0	0	0	0	0	0	2	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	39	39	4	0	0	0
	0	0	0	0	0	0	0	1	0	3	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	40	40	2	0	0	0
	0	0	0	0	0	0	0	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	41	41	2	0	0	0
	0	0	0	0	0	0	0	0	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	42	42	4	0	0	0
	0	0	0	0	0	2	0	0	0	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	8	8	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	1	1	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	9	9	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	7	2	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	10	10	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	3	5	3	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	11	11	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	3	9	4	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	12	12	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	6	5	4	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	13	13	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	6	0	1	0	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	14	14	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	3	9	2	4	0	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	15	15	27	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	3	7	4	12	1	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	16	16	27	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	5	12	6	2	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	17	17	29	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	10	8	6	2	2	1	0	0	0
	0	0	0								
1996	1	1	2	0	1	18	18	23	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	8	5	7	2	1	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	19	19	31	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	7	9	9	4	1	0	0	0
	0	0	0								
1996	1	1	2	0	1	20	20	25	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	6	6	5	4	1	2	1	0	0
	0	0	0								
1996	1	1	2	0	1	21	21	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	4	1	4	2	0	0	0
	0	0	0								
1996	1	1	2	0	1	22	22	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	0	3	0	1	0	1	0
	0	0	0								
1996	1	1	2	0	1	23	23	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	2	3	1	1	0	0
	0	0	0								
1996	1	1	2	0	1	24	24	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	1	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	25	25	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	2	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	26	26	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	1	1	0	0
	0	0	0								
1996	1	1	2	0	1	27	27	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	29	29	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0								
1997	1	1	1	0	1	8	8	3	0	2	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	9	9	2	0	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	11	11	2.5	1	1	0.5
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	12	12	3	0	1.5	1
	0	0	0	0	0.5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1997	1	1	1	0	1	13	13	12.5	1	3	6
	2.5	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	14	14	22.5	0	3.5	15.5
	2.5	0.5	0	0	0.5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	15	15	40	0	8	26
	2.5	3.5	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	16	16	40	0	7	19
	12.5	1.5	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	17	17	40	1	3	28
	6.5	1.5	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	18	18	32	0	2	18
	7.5	1.5	2	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	19	19	31.5	0	0	10
	14.5	4.5	2.5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	20	20	37.5	0	0	9
	19.5	6.5	2.5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	21	21	47.5	0	2	12
	20	9.5	2.5	1.5	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	22	22	50	0	0	10
	21	15	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	23	23	46	0	0	6.5
	15	16	7	1.5	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	24	24	43	0	0	4
	14	17	6	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	25	25	35	0	0	2
	12	15	5	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	26	26	32.5	0	0	0
	6	13	10	1	2	0	0	0	0.5	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	27	27	35.5	0	0	0
	5	14	13	2	1	0	0	0.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	28	28	33	0	0	0
	3	10	16	3	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	29	29	20.5	0	0	0
	0	5	11	3	1	0	0	0.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	30	30	18	0	0	0
	1	4	7	5	1	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	31	31	10	0	0	0
	0	0	2	6	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	32	32	10	0	0	0
	1	0	3	1	3	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	33	33	12.5	0	0	0
	0	0	2	4	2	2	1	0	1	0	0.5
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	34	34	5	0	0	0
	0	0	0	0	4	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	35	35	3	0	0	0
	0	0	0	0	1	0	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	36	36	6	0	0	0
	0	0	0	1	0	1	1	2	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	37	37	4	0	0	0
	0	0	0	0	0	1	1	0	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	38	38	4	0	0	0
	0	0	0	0	0	0	0	2	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	39	39	4	0	0	0
	0	0	0	0	0	0	2	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	40	40	3	0	0	0
	0	0	0	0	0	0	1	0	0	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	41	41	2	0	0	0
	0	0	0	0	0	0	0	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	42	42	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	8	8	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	3	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	11	11	6.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	4	2.5	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	12	12	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2.5	3	1	0	0	0	0.5	0	0	0
	0	0	0								
1997	1	1	2	0	1	13	13	15.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	1	10	2.5	1	0	0	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	14	14	23.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	3.5	9.5	5.5	4.5	0	0	0.5	0	0	0
	0	0	0								

1997	1	1	2	0	1	15	15	32	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	20	7.5	4.5	0	0	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	16	16	25	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	11	8.5	2.5	1	1	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	17	17	24	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	8	6.5	4.5	2	1	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	18	18	24	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	11	7.5	3.5	2	0	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	19	19	15.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	4.5	8.5	1.5	1	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	20	20	17.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	2.5	8.5	4.5	1	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	21	21	16.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	6.5	6.5	0.5	1	0	0	0
	0	0	0								
1997	1	1	2	0	1	22	22	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	2	4	6	2	0	0	0
	0	0	0								
1997	1	1	2	0	1	23	23	15	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.5	1	5	4	4.5	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	24	24	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	2	1	1	0	0
	0	0	0								
1997	1	1	2	0	1	25	25	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	0	2	1	0	0	0
	0	0	0								
1997	1	1	2	0	1	26	26	2.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	1	0	0
	0.5	0	0								
1997	1	1	2	0	1	27	27	0.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0.5
	0	0	0								
1997	1	1	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0								
1997	1	1	2	0	1	29	29	0.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0.5
	0	0	0								
1997	1	1	2	0	1	31	31	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	33	33	0.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.5								
1998	1	1	1	0	1	12	12	2	0	2	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	13	13	4	0	1	3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	14	14	3	0	1	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	15	15	14	0	5	9
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	16	16	9	0	2	3
	3	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	17	17	24	0	0	13
	9	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	18	18	34	0	1	19
	13	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	19	19	59	0	1	28
	20	10	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	20	20	63	0	0	17
	35	10	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	21	21	61	0	0	16
	39	6	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	22	22	51	0	0	7
	24	16	2	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	23	23	43	0	0	9
	12	11	7	4	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	24	24	35	0	1	1
	10	14	7	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	25	25	41	0	0	0
	10	17	5	6	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	26	26	52	0	0	1
	7	18	20	4	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	27	27	35	0	0	1
	4	13	8	3	6	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	28	28	37	0	0	0
	3	13	11	7	2	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	29	29	38	0	0	0
	2	3	18	9	2	2	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1998	1	1	1	0	1	30	30	11	0	0	0
	1	2	3	3	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	31	31	16	0	0	0
	0	3	2	8	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	32	32	10	0	0	0
	0	0	1	6	1	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	33	33	9	0	0	0
	0	1	1	2	0	2	2	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	34	34	4	0	0	0
	0	0	0	0	4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	35	35	7	0	0	0
	0	0	0	0	4	2	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	36	36	3	0	0	0
	0	0	1	0	0	1	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	37	37	4	0	0	0
	0	0	0	0	0	1	2	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	38	38	3	0	0	0
	0	0	0	0	0	0	0	0	1	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	39	39	2	0	0	0
	0	0	0	0	0	0	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	40	40	1	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	42	42	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	11	11	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	12	12	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	13	13	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	14	14	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	2	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	15	15	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	4	1	2	0	0	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	16	16	21	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	3	10	6	2	0	0	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	17	17	18	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	6	6	3	1	2	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	18	18	28	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	5	15	7	0	0	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	19	19	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	4	8	5	2	0	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	20	20	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	5	7	3	3	1	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	21	21	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	2	3	7	4	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	22	22	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	4	1	6	3	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	23	23	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	2	3	1	1	0	0	0
	0	0	0								
1998	1	1	2	0	1	24	24	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	1	3	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	25	25	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	2	1	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	26	26	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
1998	1	1	2	0	1	27	27	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	1	0	0	1	0	1
	0	0	0								
1998	1	1	2	0	1	28	28	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	1	0	0	0
	0	0	0								
1998	1	1	2	0	1	29	29	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	1	0	0								
1998	1	1	2	0	1	30	30	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0								
1999	1	1	1	0	1	9	9	0.5	0	0	0
	0.5	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	10	10	1	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	11	11	2.5	0	0	0
	1	0	0.5	0.5	0	0.5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1999	1	1	1	0	1	12	12	2.5	0	1	0.5
	0.5	0.5	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	13	13	10.5	0	4	3
	2	0.5	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	14	14	11.5	0	0	9
	1	0	0	1	0.5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	15	15	13.5	0	2	10
	0	0.5	0.5	0	0	0	0.5	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	16	16	22	0	0	12
	9	0	0.5	0	0.5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	17	17	34.5	0	0	18
	13	3	0	0.5	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	18	18	45	0	0	7
	35	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	19	19	55	0	0	9
	39	5	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	20	20	49	0	0	2
	31	12	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	21	21	50	0	0	3
	24	20	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	22	22	39	0	0	1
	20	16	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	23	23	46	0	0	1
	11	26	8	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	24	24	58	0	0	1
	9	39	6	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	25	25	40	0	0	0
	5	25	7	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	26	26	39	0	1	0
	4	17	12	4	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	27	27	34	0	0	0
	0	14	7	9	3	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	28	28	31	0	0	0
	0	4	17	4	4	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	29	29	23	0	0	0
	0	2	6	4	9	1	0	1	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	30	30	21	0	0	0
	0	0	12	4	4	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	31	31	26	0	0	0
	0	1	2	10	6	6	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	32	32	10	0	0	0
	0	0	0	4	4	1	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	33	33	10	0	0	0
	0	0	0	3	2	4	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	34	34	3	0	0	0
	0	0	0	0	1	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	35	35	4	0	0	0
	0	0	0	0	0	4	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	36	36	2	0	0	0
	0	0	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	37	37	3	0	0	0
	0	0	0	0	2	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	40	40	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	1	0	1	41	41	1	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	2	0	1	9	9	1.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0.5	0	0	0	0	0	0	0
	0	0	0								
1999	1	1	2	0	1	10	10	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0								
1999	1	1	2	0	1	11	11	2.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0.5	0.5	0	0.5	0	0
	0	0	0								
1999	1	1	2	0	1	12	12	3.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	1.5	0.5	0.5	0	0	0	0	0	0
	0	0	0								
1999	1	1	2	0	1	13	13	6.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	2	2	0.5	0	0	0	1	0	0
	0	0	0								
1999	1	1	2	0	1	14	14	6.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	2	0	0	1	0.5	0	0	0
	0	0	0								
1999	1	1	2	0	1	15	15	8.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	5	2	0.5	0.5	0	0	0	0.5	0
	0	0	0								

1999	1	1	2	0	1	16	16	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	1	1	0.5	0	0.5	0	0	0
	0	0	0								
1999	1	1	2	0	1	17	17	22.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	6	10	5	1	0.5	0	0	0	0
	0	0	0								
1999	1	1	2	0	1	18	18	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	8	6	0	0	0	0	0	0
	0	0	0								
1999	1	1	2	0	1	19	19	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	4	7	1	2	0	0	0	0
	0	0	0								
1999	1	1	2	0	1	20	20	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	9	6	0	2	0	0	0	0
	0	0	0								
1999	1	1	2	0	1	21	21	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	1	5	2	4	0	0	0	0
	0	0	0								
1999	1	1	2	0	1	22	22	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	3	2	1	0	0	0	0
	0	0	0								
1999	1	1	2	0	1	23	23	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	1	4	1	0	0	0
	0	0	0								
1999	1	1	2	0	1	24	24	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	4	0	2	1	0	0
	0	0	0								
1999	1	1	2	0	1	25	25	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	1	2	1	0	1
	0	0	0								
1999	1	1	2	0	1	26	26	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
1999	1	1	2	0	1	27	27	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	1	1	0
	0	0	0								
1999	1	1	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1								
1999	1	1	2	0	1	29	29	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	2	0	0	0	0
	0	0	0								
1999	1	1	2	0	1	31	31	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0								
1999	1	1	2	0	1	34	34	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
2000	1	1	1	0	1	14	14	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	15	15	2	0	0	2
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	16	16	4	0	0	3
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	17	17	8	0	1	4
	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	18	18	9	0	0	3
	4	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	19	19	19	0	0	6
	7	5	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	20	20	26	0	0	1
	14	10	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	21	21	25	0	0	1
	9	14	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	22	22	32	0	0	0
	9	19	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	23	23	28	0	0	0
	7	18	2	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	24	24	27	0	0	1
	5	9	11	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	25	25	22	0	0	0
	1	12	6	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	26	26	26	0	0	0
	1	11	10	3	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	27	27	17	0	0	0
	0	4	9	4	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	28	28	21	0	0	0
	0	4	7	5	3	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	29	29	15	0	0	0
	1	2	2	7	2	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	30	30	9	0	0	0
	0	1	2	4	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	31	31	17	0	0	0
	0	0	4	5	5	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	32	32	14	0	0	0
	0	0	0	4	4	3	2	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2000	1	1	1	0	1	33	33	17	0	0	0
	0	0	3	1	6	4	2	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	34	34	8	0	0	0
	0	0	0	1	1	2	3	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	35	35	5	0	0	0
	0	0	2	0	0	1	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	36	36	5	0	0	0
	0	0	0	1	1	1	1	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	37	37	5	0	0	0
	0	0	0	1	2	0	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	38	38	4	0	0	0
	0	0	0	0	0	1	1	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	39	39	3	0	0	0
	0	0	0	0	0	0	1	0	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	40	40	4	0	0	0
	0	0	0	0	0	2	1	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	1	0	1	42	42	6	0	0	0
	0	0	0	1	1	0	0	1	0	2	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	2	0	1	14	14	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	2	0	1	15	15	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
2000	1	1	2	0	1	16	16	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	1	0	1	0	0	0	0	0
	0	0	0								
2000	1	1	2	0	1	17	17	12	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	5	4	1	0	0	0	0	0
	0	0	0								
2000	1	1	2	0	1	18	18	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	6	4	1	1	0	0	0	0
	0	0	0								
2000	1	1	2	0	1	19	19	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	5	9	3	0	0	0	0	0
	0	0	0								
2000	1	1	2	0	1	20	20	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	10	5	0	0	0	0	0
	0	0	0								
2000	1	1	2	0	1	21	21	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	13	2	1	0	0	0	0
	0	0	0								
2000	1	1	2	0	1	22	22	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	3	5	5	1	2	1	0	0
	0	0	0								
2000	1	1	2	0	1	23	23	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	2	2	0	1	0	0	0
	0	0	0								
2000	1	1	2	0	1	24	24	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	3	3	1	1	0
	0	0	0								
2000	1	1	2	0	1	25	25	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	3	1	0	0	0
	0	0	0								
2000	1	1	2	0	1	26	26	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
2000	1	1	2	0	1	27	27	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0								
2000	1	1	2	0	1	29	29	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0								
2000	1	1	2	0	1	31	31	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0								
2000	1	1	2	0	1	34	34	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
2000	1	1	2	0	1	36	36	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
2001	1	1	1	0	1	8	8	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	9	9	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	10	10	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	11	11	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	12	12	2	0	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	13	13	2	0	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	14	14	9	0	1	6
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	15	15	7	0	0	6
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2001	1	1	1	0	1	16	16	16	0	1	9
	4	1	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	17	17	27	0	0	13
	11	2	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	18	18	24	0	1	5
	14	4	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	19	19	32	0	0	6
	14	10	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	20	20	35	0	0	2
	26	5	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	21	21	29	0	0	1
	14	11	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	22	22	35	0	0	0
	11	15	8	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	23	23	39	0	0	2
	2	19	13	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	24	24	41	0	0	0
	2	13	15	11	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	25	25	47	0	0	1
	2	17	22	4	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	26	26	36	0	0	0
	1	7	18	9	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	27	27	31	0	0	0
	0	9	12	7	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	28	28	16	0	0	0
	1	1	5	6	2	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	29	29	22	0	0	0
	0	1	4	12	5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	30	30	20	0	0	0
	0	1	2	7	6	1	2	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	31	31	21	0	0	0
	0	0	3	6	8	2	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	32	32	15	0	0	0
	0	1	1	3	3	2	5	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	33	33	13	0	0	0
	0	0	0	3	2	4	3	1	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	34	34	13	0	0	0
	0	0	0	1	2	3	4	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	35	35	5	0	0	0
	0	0	0	0	0	3	0	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	36	36	2	0	0	0
	0	0	0	0	0	0	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	37	37	3	0	0	0
	0	0	0	0	0	0	1	0	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	38	38	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	39	39	1	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	40	40	2	0	0	0
	0	0	0	0	0	1	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	12	12	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	1	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	14	14	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	1	2	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	15	15	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	4	1	1	0	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	16	16	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	4	10	0	1	0	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	17	17	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	8	5	1	1	1	0	0	0
	0	0	0								
2001	1	1	2	0	1	18	18	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	12	7	0	0	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	19	19	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	6	9	1	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	20	20	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	10	3	2	2	0	0	0
	0	0	0								
2001	1	1	2	0	1	21	21	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	2	3	6	3	2	0	0	0
	0	0	0								
2001	1	1	2	0	1	22	22	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	5	6	3	3	0	0	1
	0	0	0								

2001	1	1	2	0	1	23	23	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	4	2	2	1	0	0
	0	0	0								
2001	1	1	2	0	1	24	24	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	3	2	2	0	1	0
	0	0	0								
2001	1	1	2	0	1	25	25	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	2	0	1	0	0
	0	1	0								
2001	1	1	2	0	1	26	26	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	0	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
2002	1	1	1	0	1	9	9	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	13	13	3	0	2	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	14	14	5	0	1	3
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	15	15	10	0	1	8
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	16	16	19	0	2	11
	6	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	17	17	27	0	0	14
	9	4	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	18	18	24	0	0	9
	10	3	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	19	19	35	0	1	11
	18	5	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	20	20	35	0	0	4
	23	5	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	21	21	37	0	0	1
	18	13	3	1	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	22	22	34	0	0	1
	15	13	5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	23	23	21	0	0	0
	2	13	3	1	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	24	24	17	0	0	1
	0	8	3	5	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	25	25	30	0	0	0
	3	15	9	2	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	26	26	31	0	0	0
	6	11	6	8	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	27	27	32	0	0	0
	0	3	13	12	3	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	28	28	30	0	0	0
	0	6	14	7	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	29	29	23	0	0	0
	1	0	7	9	5	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	30	30	25	0	0	0
	0	0	7	9	4	4	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	31	31	21	0	0	0
	0	0	3	4	8	4	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	32	32	10	0	0	0
	0	1	2	3	2	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	33	33	9	0	0	0
	0	0	0	2	3	2	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	34	34	11	0	0	0
	0	0	0	1	1	1	3	3	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	35	35	8	0	0	0
	0	0	1	1	1	2	1	0	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	36	36	5	0	0	0
	0	0	0	0	1	2	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	37	37	3	0	0	0
	0	0	0	0	0	0	1	0	0	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	38	38	3	0	0	0
	0	0	0	0	0	0	0	2	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	39	39	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	42	42	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	8	8	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								

2002	1	1	2	0	1	11	11	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	2	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	12	12	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	1	0	0	1	0	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	13	13	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	2	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	14	14	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	1	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	15	15	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	7	3	1	0	0	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	16	16	21	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	7	10	3	0	0	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	17	17	28	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	9	12	4	0	2	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	18	18	22	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	10	7	4	0	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	19	19	20	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	6	8	3	3	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	20	20	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	4	2	4	7	0	1	0	0
	0	0	0								
2002	1	1	2	0	1	21	21	29	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	5	11	6	6	1	0	0	0
	0	0	0								
2002	1	1	2	0	1	22	22	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	2	4	5	2	2	1	0
	0	0	0								
2002	1	1	2	0	1	23	23	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	2	1	2	2	2	0
	0	0	0								
2002	1	1	2	0	1	24	24	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	2	1	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	25	25	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	0	1	1	1	0	0
	0	0	0								
2002	1	1	2	0	1	26	26	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	3	2	1	0
	0	0	0								
2002	1	1	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
2002	1	1	2	0	1	29	29	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	1	0	0	0	0	0	0	1
	1	0	0								
2002	1	1	2	0	1	30	30	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	33	33	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
2003	1	1	1	0	1	12	12	1	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	13	13	5	0	1	3
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	14	14	7	0	1	5
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	15	15	12	0	0	8
	4	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	16	16	23	0	4	10
	9	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	17	17	40	0	1	11
	26	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	18	18	58	0	1	18
	30	7	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	19	19	69	0	4	14
	28	21	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	20	20	56	0	1	13
	33	5	3	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	21	21	49	0	0	9
	24	14	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	22	22	30	0	0	2
	12	12	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	23	23	20	0	0	5
	6	8	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	24	24	17	0	0	2
	5	3	5	1	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	25	25	21	0	0	1
	8	8	3	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	26	26	23	0	0	0
	1	10	6	3	1	1	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2003	1	1	1	0	1	27	27	17	0	0	1
	3	3	3	6	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	28	28	20	0	0	0
	2	6	5	4	2	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	29	29	14	0	0	0
	0	2	5	4	0	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	30	30	17	0	0	0
	2	1	6	5	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	31	31	16	0	0	0
	1	1	0	6	4	1	1	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	32	32	7	0	0	0
	0	1	0	2	0	3	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	33	33	13	0	0	0
	0	0	1	3	2	2	1	2	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	34	34	8	0	0	0
	0	0	2	0	2	1	2	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	35	35	9	0	0	0
	0	0	0	1	1	2	0	1	1	3	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	36	36	6	0	0	0
	0	0	0	1	0	1	1	2	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	37	37	6	0	0	0
	0	0	0	0	1	2	0	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	38	38	3	0	0	0
	0	0	0	0	1	0	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	39	39	3	0	0	0
	0	0	0	0	0	1	0	0	0	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	41	41	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	2	0	1	9	9	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	2	0	1	10	10	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	2	0	1	13	13	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	4	1	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	2	0	1	14	14	12	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	7	5	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	2	0	1	15	15	23	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	12	9	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	2	0	1	16	16	35	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	3	9	18	4	1	0	0	0	0	0
	0	0	0								
2003	1	1	2	0	1	17	17	29	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	6	15	5	2	0	0	0	0	0
	0	0	0								
2003	1	1	2	0	1	18	18	39	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	8	26	2	1	0	0	0	0	0
	0	0	0								
2003	1	1	2	0	1	19	19	41	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	6	11	16	4	2	1	0	0	0
	0	0	0								
2003	1	1	2	0	1	20	20	21	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	7	8	1	1	0	1	0	0
	0	0	0								
2003	1	1	2	0	1	21	21	26	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	10	4	9	1	2	0	0	0
	0	0	0								
2003	1	1	2	0	1	22	22	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	4	3	1	3	0	0	0
	0	0	0								
2003	1	1	2	0	1	23	23	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	3	2	1	2	0	0	0
	0	0	0								
2003	1	1	2	0	1	24	24	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	0	0	1	2	2	1	0
	0	0	0								
2003	1	1	2	0	1	25	25	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	2	1	1	1
	0	0	0								
2003	1	1	2	0	1	26	26	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
2003	1	1	2	0	1	27	27	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	1	0	0	0	0
	0	0	0								
2003	1	1	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0								
2003	1	1	2	0	1	29	29	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	1
	0	0	0								
2003	1	1	2	0	1	30	30	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0								
2003	1	1	2	0	1	31	31	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0								

2003	1	1	2	0	1	32	32	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
2003	1	1	2	0	1	37	37	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	9	9	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	12	12	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	13	13	2	0	1	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	14	14	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	15	15	6	0	2	4
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	16	16	12	0	1	5
	3	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	17	17	23	0	0	4
	15	3	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	18	18	42	0	0	11
	23	7	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	19	19	51	0	0	10
	27	12	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	20	20	43	0	0	7
	25	9	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	21	21	31	0	0	3
	18	6	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	22	22	22	0	0	0
	17	4	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	23	23	24	0	0	2
	8	9	5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	24	24	13	0	0	0
	2	9	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	25	25	6	0	0	0
	4	0	0	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	26	26	7	0	0	0
	1	3	2	1	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	27	27	5	0	0	0
	0	1	3	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	28	28	5	0	0	0
	0	0	3	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	29	29	6	0	0	0
	0	1	3	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	30	30	8	0	0	0
	0	1	3	1	1	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	31	31	7	0	0	0
	0	0	1	3	2	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	32	32	3	0	0	0
	0	1	0	1	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	33	33	6	0	0	0
	0	2	0	3	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	34	34	5	0	0	0
	0	0	1	1	1	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	35	35	1	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	36	36	2	0	0	0
	1	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	37	37	4	0	0	0
	0	0	0	0	1	0	2	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	38	38	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	41	41	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	7	7	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	11	11	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	12	12	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	13	13	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								

2004	1	1	2	0	1	14	14	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	0	1	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	15	15	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	4	4	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	16	16	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	5	5	4	0	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	17	17	33	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	18	9	2	1	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	18	18	37	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	4	13	14	5	0	1	0	0	0
	0	0	0								
2004	1	1	2	0	1	19	19	38	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	18	14	3	2	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	20	20	31	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	10	14	4	0	1	0	0	0
	0	0	0								
2004	1	1	2	0	1	21	21	33	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	7	17	7	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	22	22	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	10	4	2	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	23	23	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	2	1	2	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	24	24	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	1	2	0	1	0
	0	0	0								
2004	1	1	2	0	1	25	25	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	1	3	0	1	0	1
	0	0	0								
2004	1	1	2	0	1	26	26	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	3	1	2	0
	0	0	0								
2004	1	1	2	0	1	27	27	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	1	0
	0	1	0								
2004	1	1	2	0	1	28	28	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	0	0	0	0	1
	0	0	0								
2004	1	1	2	0	1	29	29	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	1
	1	0	0								
2004	1	1	2	0	1	31	31	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0								
2004	1	1	2	0	1	32	32	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	1
	0	0	0								
2005	1	1	1	0	1	15	15	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	16	16	3	0	0	2
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	17	17	11	0	0	5
	6	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	18	18	28	0	0	9
	13	5	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	19	19	39	0	1	8
	21	8	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	20	20	40	0	0	4
	21	13	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	21	21	38	0	0	0
	19	11	7	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	22	22	40	0	0	2
	14	15	8	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	23	23	32	0	0	0
	7	18	7	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	24	24	35	0	0	0
	11	13	10	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	25	25	29	0	0	0
	4	13	10	0	1	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	26	26	31	0	0	2
	6	14	7	0	1	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	27	27	30	0	0	0
	2	8	12	8	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	28	28	25	0	0	0
	0	5	12	5	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	29	29	18	0	0	0
	1	3	9	3	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	30	30	15	0	0	0
	0	2	7	4	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	31	31	9	0	0	0
	0	0	2	2	3	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2005	1	1	1	0	1	32	32	7	0	0	0
	0	1	1	4	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	33	33	2	0	0	0
	0	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	34	34	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	35	35	8	0	0	0
	0	0	0	0	2	4	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	36	36	4	0	0	0
	0	0	0	0	2	0	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	37	37	3	0	0	0
	0	0	0	0	0	1	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	38	38	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	1	0	1	39	39	4	0	0	0
	0	0	0	0	0	0	1	0	2	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	2	0	1	16	16	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	1	2	0	0	0	0	0	0	0
	0	0	0								
2005	1	1	2	0	1	17	17	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	4	5	1	0	0	0	0	0
	0	0	0								
2005	1	1	2	0	1	18	18	18	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	4	12	0	0	0	0	0	0
	0	0	0								
2005	1	1	2	0	1	19	19	20	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	7	5	5	1	0	0	0	0
	0	0	0								
2005	1	1	2	0	1	20	20	24	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	7	7	8	1	0	0	0	0
	0	0	0								
2005	1	1	2	0	1	21	21	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	10	5	3	0	0	0	0	0
	0	0	0								
2005	1	1	2	0	1	22	22	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	3	5	0	0	0	0	0
	0	0	0								
2005	1	1	2	0	1	23	23	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	3	3	2	0	0	0	1
	0	0	0								
2005	1	1	2	0	1	24	24	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	2	2	1	0	1	0	0
	0	0	0								
2005	1	1	2	0	1	25	25	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	1	1	1	1	0	0	1	0
	0	0	0								
2005	1	1	2	0	1	26	26	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	2	0	0	0
	0	0	0								
2005	1	1	2	0	1	27	27	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	2	0	0
	0	0	0								
2005	1	1	2	0	1	28	28	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	1	0	0	0
	0	0	0								
2005	1	1	2	0	1	29	29	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0								
2006	1	1	1	0	1	12	12	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	16	16	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	17	17	5	0	0	1
	4	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	18	18	11	0	0	1
	9	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	19	19	16	0	0	0
	8	7	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	20	20	21	0	0	3
	7	5	5	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	21	21	23	0	0	1
	10	10	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	22	22	32	0	0	0
	7	17	6	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	23	23	34	0	0	0
	14	10	5	4	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	24	24	33	0	0	0
	6	10	14	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	25	25	24	0	0	0
	3	8	8	3	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	26	26	35	0	0	0
	3	8	15	9	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	27	27	28	0	0	0
	1	7	11	8	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2006	1	1	1	0	1	28	28	26	0	0	0
	0	5	10	7	4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	29	29	25	0	0	0
	0	4	12	7	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	30	30	18	0	0	0
	0	1	7	9	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	31	31	7	0	0	0
	0	1	3	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	32	32	14	0	0	0
	0	2	2	8	1	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	33	33	12	0	0	0
	0	0	1	4	2	2	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	34	34	11	0	0	0
	0	0	0	1	4	4	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	35	35	2	0	0	0
	0	0	0	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	36	36	6	0	0	0
	0	0	0	1	0	1	0	3	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	37	37	4	0	0	0
	0	0	0	0	1	1	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	38	38	3	0	0	0
	0	0	0	0	0	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	39	39	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	40	40	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	41	41	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	1	0	1	42	42	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	2	0	1	15	15	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	0	0	0	0	0	0	0
	0	0	0								
2006	1	1	2	0	1	16	16	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	5	1	2	0	0	0	0	0	0
	0	0	0								
2006	1	1	2	0	1	17	17	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	2	2	2	1	0	0	0	0	0
	0	0	0								
2006	1	1	2	0	1	18	18	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	4	3	0	0	0	0	0	0
	0	0	0								
2006	1	1	2	0	1	19	19	25	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	9	9	2	4	0	0	0	0
	0	0	0								
2006	1	1	2	0	1	20	20	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	2	5	3	1	1	0	0	0
	0	0	0								
2006	1	1	2	0	1	21	21	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	2	3	0	0	0	0
	0	0	0								
2006	1	1	2	0	1	22	22	18	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	5	7	5	1	0	0	0
	0	0	0								
2006	1	1	2	0	1	23	23	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	3	2	0	0	1	0
	0	0	0								
2006	1	1	2	0	1	24	24	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	2	0	2	0	0	0
	0	0	0								
2006	1	1	2	0	1	26	26	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	1	0	0	0	0	0
	0	0	0								
2006	1	1	2	0	1	27	27	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	1	0	0
	0	0	0								
2006	1	1	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0								
2006	1	1	2	0	1	31	31	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	11	11	1	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	12	12	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	13	13	1	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	15	15	2	0	0	1
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	16	16	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	17	17	2	0	0	0
	1	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2007	1	1	1	0	1	18	18	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	19	19	12	0	0	1
	5	5	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	20	20	11	0	0	0
	7	3	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	21	21	16	0	0	1
	4	7	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	22	22	30	0	0	0
	10	6	9	2	2	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	23	23	29	0	0	0
	2	12	10	5	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	24	24	23	0	0	0
	4	11	6	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	25	25	34	0	0	1
	2	11	13	6	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	26	26	37	0	0	0
	1	12	14	7	1	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	27	27	43	0	0	0
	3	10	15	10	3	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	28	28	40	0	0	0
	1	10	15	11	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	29	29	38	0	0	2
	0	4	10	13	6	1	0	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	30	30	39	0	0	0
	0	3	18	12	3	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	31	31	28	0	0	0
	0	4	7	8	7	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	32	32	14	0	0	0
	0	0	1	6	4	0	0	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	33	33	7	0	0	0
	0	2	0	1	3	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	34	34	3	0	0	0
	0	0	0	0	1	0	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	35	35	4	0	0	0
	0	1	0	1	1	0	0	0	0	1	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	36	36	2	0	0	0
	0	0	0	0	0	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	37	37	2	0	0	0
	0	0	0	0	0	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	39	39	2	0	0	0
	0	0	0	0	0	0	0	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	1	0	1	40	40	1	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	2	0	1	14	14	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	2	0	1	16	16	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	1	2	0	1	17	17	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	1	0	0	0	0	0	0
	0	0	0								
2007	1	1	2	0	1	18	18	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	3	0	0	0	0	0	0
	0	0	0								
2007	1	1	2	0	1	19	19	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	5	3	2	0	0	0	0	0
	0	0	0								
2007	1	1	2	0	1	20	20	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	2	0	0	0	0	0	0
	0	0	0								
2007	1	1	2	0	1	21	21	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	2	1	0	1	0	0	0
	0	0	0								
2007	1	1	2	0	1	22	22	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	2	1	0	0	0	0
	0	0	0								
2007	1	1	2	0	1	23	23	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	2	1	2	0	0	0
	0	0	0								
2007	1	1	2	0	1	24	24	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	1	0	1	0	0	0
	0	0	0								
2007	1	1	2	0	1	25	25	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	1	2	2	0	0	0
	0	0	0								
2007	1	1	2	0	1	26	26	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	1	0	0
	0	0	0								
2007	1	1	2	0	1	28	28	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	1	0	0	1
	0	0	0								

2007	1	1	2	0	1	31	31	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0								
2008	1	1	1	0	1	12	12	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	13	13	1	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	16	16	6	0	0	1
	3	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	17	17	8	0	0	0
	5	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	18	18	11	0	0	1
	6	4	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	19	19	10	0	0	3
	5	1	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	20	20	9	0	0	1
	3	3	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	21	21	11	0	0	0
	0	4	7	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	22	22	17	0	0	0
	3	3	8	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	23	23	22	0	0	0
	1	6	7	6	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	24	24	33	0	0	0
	1	6	9	13	3	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	25	25	29	0	0	0
	0	1	9	13	3	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	26	26	22	0	0	0
	0	1	6	7	5	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	27	27	44	0	0	0
	0	2	6	18	9	7	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	28	28	39	0	0	0
	0	2	3	13	14	6	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	29	29	28	0	0	0
	0	0	3	8	13	2	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	30	30	27	0	0	0
	0	0	6	5	10	5	0	1	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	31	31	22	0	0	0
	0	0	1	3	7	7	3	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	32	32	17	0	0	0
	0	0	0	3	6	6	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	33	33	9	0	0	0
	0	0	0	1	0	3	4	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	34	34	8	0	0	0
	0	0	0	0	0	4	2	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	35	35	3	0	0	0
	0	0	0	0	0	0	2	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	36	36	10	0	0	0
	0	0	0	1	0	2	2	2	1	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	37	37	3	0	0	0
	0	0	0	0	0	0	0	0	2	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	39	39	1	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	40	40	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	1	0	1	42	42	2	0	0	0
	0	0	0	0	0	0	0	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	2	0	1	11	11	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	4	1	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	2	0	1	12	12	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	2	0	1	14	14	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	2	0	1	15	15	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	2	0	1	16	16	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	8	2	0	0	0	0	0	0
	0	0	0								
2008	1	1	2	0	1	17	17	12	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	10	0	0	0	0	0	0	0
	0	0	0								
2008	1	1	2	0	1	18	18	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	5	3	0	0	0	0	0	0
	0	0	0								

```
2008    1       1       2       0       1       19      19      12      0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       7       0       2       3       0       0       0       0
        0       0       0
2008    1       1       2       0       1       20      20      8       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       3       3       0       2       0       0       0       0
        0       0       0
2008    1       1       2       0       1       21      21      7       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       1       3       1       1       1       0       0       0
        0       0       0
2008    1       1       2       0       1       22      22      13      0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       1       3       2       6       0       1       0       0
        0       0       0
2008    1       1       2       0       1       23      23      2       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       1       0       1       0       0       0
        0       0       0
2008    1       1       2       0       1       24      24      4       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       1       1       1       0       0       1       0
        0       0       0
2008    1       1       2       0       1       25      25      6       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       1       1       1       3       0       0
        0       0       0
2008    1       1       2       0       1       26      26      2       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       1       0       1       0       0       0
        0       0       0
2008    1       1       2       0       1       27      27      2       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       1       0       0       1       0       0
        0       0       0
2008    1       1       2       0       1       28      28      2       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       1       0       1       0       0       0
        0       0       0
2008    1       1       2       0       1       31      31      3       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       3       0       0
        0       0       0
2008    1       1       2       0       1       34      34      1       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       1
        0       0       0


# Recreational 406 lines
1999    1       2       1       0       1       12      12      1       0       0       1
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0
1999    1       2       1       0       1       14      14      1       0       0       0
        1       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0
1999    1       2       1       0       1       16      16      6       0       0       1
        2       3       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0
1999    1       2       1       0       1       17      17      14      0       0       1
        8       4       0       0       0       1       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0
1999    1       2       1       0       1       18      18      23      0       0       1
        10      8       3       1       0       0       0       0       0       0       0
```

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	19	19	23	0	0	0
	10	12	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	20	20	24	0	0	0
	5	15	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	21	21	16	0	0	0
	3	5	7	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	22	22	24	0	0	0
	1	13	5	4	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	23	23	25	0	0	0
	0	7	15	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	24	24	17	0	0	0
	0	4	8	4	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	25	25	22	0	0	0
	1	6	8	6	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	26	26	18	0	0	0
	0	2	4	10	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	27	27	14	0	0	0
	0	2	3	6	1	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	28	28	14	0	0	0
	0	0	4	10	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	29	29	18	0	0	0
	0	2	6	4	6	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	30	30	14	0	0	0
	0	0	2	3	6	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	31	31	15	0	0	0
	0	0	1	4	6	3	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	32	32	8	0	0	0
	0	0	0	3	3	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	33	33	5	0	0	0
	0	0	0	2	1	1	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	34	34	9	0	0	0
	0	0	0	2	3	0	1	1	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	35	35	8	0	0	0
	0	0	0	0	3	4	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1999	1	2	1	0	1	36	36	4	0	0	0
	0	0	0	0	0	2	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	37	37	3	0	0	0
	0	0	0	0	1	0	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	38	38	3	0	0	0
	0	0	0	0	0	1	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	39	39	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	40	40	2	0	0	0
	0	0	0	0	0	0	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	1	0	1	41	41	3	0	0	0
	0	0	0	0	0	0	1	0	0	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	2	0	1	13	13	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
1999	1	2	2	0	1	14	14	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	0	0	0	0	0	0
	0	0	0								
1999	1	2	2	0	1	15	15	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	0	0	0	0	0	0
	0	0	0								
1999	1	2	2	0	1	16	16	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	6	6	2	2	0	0	0	0
	0	0	0								
1999	1	2	2	0	1	17	17	38	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	19	14	4	0	0	0	0	0
	0	0	0								
1999	1	2	2	0	1	18	18	51	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	9	21	18	3	0	0	0	0
	0	0	0								
1999	1	2	2	0	1	19	19	50	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	7	18	20	4	1	0	0	0
	0	0	0								
1999	1	2	2	0	1	20	20	45	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	12	22	6	4	0	0	0
	0	0	0								
1999	1	2	2	0	1	21	21	26	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	5	14	5	0	0	0	0
	0	0	0								
1999	1	2	2	0	1	22	22	30	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	11	11	2	2	1	0
	0	0	0								
1999	1	2	2	0	1	23	23	30	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	8	8	6	4	1	1
	0	0	0								
1999	1	2	2	0	1	24	24	18	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	2	4	2	7	3	0	0
	0	0	0								
1999	1	2	2	0	1	25	25	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	4	1	4	1	3	0
	0	0	0								
1999	1	2	2	0	1	26	26	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	1	4	3	2	2	0
	0	0	0								
1999	1	2	2	0	1	27	27	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	1	2	0
	0	0	0								
1999	1	2	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0								
1999	1	2	2	0	1	29	29	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	1	2	0	0	0	1
	0	0	0								
1999	1	2	2	0	1	30	30	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	0	0
	0	0	0								
1999	1	2	2	0	1	31	31	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	1
	0	0	0								
1999	1	2	2	0	1	36	36	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
1999	1	2	2	0	1	38	38	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
2000	1	2	1	0	1	16	16	6	0	0	2
	3	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	2	1	0	1	17	17	23	0	0	1
	15	7	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	2	1	0	1	18	18	17	0	0	0
	7	10	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	2	1	0	1	19	19	33	0	0	1
	9	18	3	1	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	2	1	0	1	20	20	33	0	0	0
	6	18	8	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	2	1	0	1	21	21	47	0	0	0
	2	29	10	6	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	2	1	0	1	22	22	34	0	0	1
	1	14	12	4	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	2	1	0	1	23	23	35	0	0	1
	0	6	22	5	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2000	1	2	1	0	1	24	24	28	0	0	0
	1	8	12	5	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	2	1	0	1	25	25	26	0	0	0
	0	5	10	9	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	2	1	0	1	26	26	21	0	0	0
	0	2	6	8	3	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	2	1	0	1	27	27	15	0	0	0
	1	0	2	4	6	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	2	1	0	1	28	28	14	0	0	0
	0	0	3	7	4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	2	1	0	1	29	29	13	0	0	0
	0	0	1	5	4	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	2	1	0	1	30	30	5	0	0	0
	0	0	0	2	2	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	2	1	0	1	31	31	3	0	0	0
	0	0	0	1	0	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2000	1	2	2	0	1	3	3	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0								
2000	1	2	2	0	1	14	14	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0								
2000	1	2	2	0	1	15	15	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	1	0	0	0	0	0
	0	0	0								
2000	1	2	2	0	1	16	16	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	6	1	0	0	0	0	0
	0	0	0								
2000	1	2	2	0	1	17	17	75	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	19	45	8	1	0	0	0	0
	0	0	0								
2000	1	2	2	0	1	18	18	66	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	8	35	15	5	1	1	0	0
	0	0	0								
2000	1	2	2	0	1	19	19	70	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	5	34	23	7	1	0	0	0
	0	0	0								
2000	1	2	2	0	1	20	20	67	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	25	25	12	2	0	0	0
	0	0	0								
2000	1	2	2	0	1	21	21	48	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	14	17	6	7	1	0	0
	0	0	0								
2000	1	2	2	0	1	22	22	33	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	1	6	13	7	6	0	0	0
	0	0	0								
2000	1	2	2	0	1	23	23	18	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	0	7	6	2	1	0	0
	0	0	0								
2000	1	2	2	0	1	24	24	21	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	3	7	7	2	1	0
	0	0	0								
2000	1	2	2	0	1	25	25	15	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	4	5	4	0	1	1
	0	0	0								
2000	1	2	2	0	1	26	26	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	1	3	0	0
	1	0	0								
2000	1	2	2	0	1	27	27	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	1	2	1	0
	0	0	0								
2000	1	2	2	0	1	28	28	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	0	0	2	1	2	0	0
	0	0	0								
2000	1	2	2	0	1	29	29	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	1	0	0
	0	0	0								
2000	1	2	2	0	1	30	30	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
2001	1	2	1	0	1	16	16	2	0	0	0
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	17	17	16	0	0	0
	7	8	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	18	18	17	0	0	0
	2	12	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	19	19	25	0	0	0
	5	15	5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	20	20	11	0	0	0
	4	5	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	21	21	21	0	0	0
	3	10	5	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	22	22	20	0	0	0
	0	7	12	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	23	23	28	0	0	0
	2	9	15	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	24	24	34	0	0	0
	0	6	18	9	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2001	1	2	1	0	1	25	25	36	0	0	0
	1	5	14	11	3	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	26	26	19	0	0	0
	1	2	6	8	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	27	27	21	0	0	0
	0	1	7	9	4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	28	28	17	0	0	0
	0	0	2	8	4	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	29	29	17	0	0	0
	0	0	3	5	6	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	30	30	10	0	0	0
	0	0	1	3	3	2	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	31	31	19	0	0	0
	0	0	0	3	6	5	3	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	32	32	11	0	0	0
	0	0	0	4	2	2	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	33	33	8	0	0	0
	0	0	0	1	3	3	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	34	34	2	0	0	0
	0	0	0	0	0	0	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	35	35	10	0	0	0
	0	0	0	0	1	3	3	2	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	36	36	2	0	0	0
	0	0	0	0	0	0	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	37	37	2	0	0	0
	0	0	0	0	0	0	0	0	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	39	39	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	1	0	1	41	41	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	2	0	1	4	4	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	1	0	0	0	0
	0	0	0								
2001	1	2	2	0	1	14	14	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
2001	1	2	2	0	1	16	16	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	1	4	4	0	0	0	0	0	0
	0	0	0								
2001	1	2	2	0	1	17	17	42	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	11	19	9	1	0	0	0	0
	0	0	0								
2001	1	2	2	0	1	18	18	49	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	7	21	16	3	1	1	0	0
	0	0	0								
2001	1	2	2	0	1	19	19	40	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	14	17	5	1	0	0	0
	0	0	0								
2001	1	2	2	0	1	20	20	36	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	9	17	6	2	0	1	0
	0	0	0								
2001	1	2	2	0	1	21	21	28	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	3	13	9	1	1	0	0
	0	0	0								
2001	1	2	2	0	1	22	22	26	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	4	10	7	2	1	2	0
	0	0	0								
2001	1	2	2	0	1	23	23	22	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	7	6	5	1	0	0
	0	0	0								
2001	1	2	2	0	1	24	24	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	1	3	4	1	0	0
	0	0	0								
2001	1	2	2	0	1	25	25	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	3	3	1	2	1
	0	0	0								
2001	1	2	2	0	1	26	26	12	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	1	2	4	2	1
	0	0	0								
2001	1	2	2	0	1	27	27	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	1	0	0
	0	0	0								
2001	1	2	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0								
2001	1	2	2	0	1	29	29	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	1	0	0
	0	0	0								
2001	1	2	2	0	1	30	30	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
2001	1	2	2	0	1	33	33	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0								
2002	1	2	1	0	1	16	16	4	0	0	0
	2	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	17	17	34	0	0	4
	19	10	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2002	1	2	1	0	1	18	18	38	0	0	4
	17	16	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	19	19	40	0	0	4
	12	22	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	20	20	35.5	0	0	1
	8	21	5.5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	21	21	23	0	0	0
	4	15	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	22	22	37	0	0	0
	1	26	9	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	23	23	27	0	0	0
	0	14	12	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	24	24	28	0	0	0
	1	7	16	4	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	25	25	29	0	0	0
	0	4	16	8	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	26	26	30	0	0	0
	1	1	9	17	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	27	27	27.5	0	0	0
	1	2	6	18.5	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	28	28	29	0	0	0
	0	1	8	9	9	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	29	29	30	0	0	0
	0	0	4	16	8	0	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	30	30	26	0	0	0
	0	0	2	6	15	1	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	31	31	10	0	0	0
	0	0	1	3	3	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	32	32	23	0	0	0
	0	0	1	2	5	7	6	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	33	33	9	0	0	0
	0	0	0	1	2	1	4	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	34	34	6	0	0	0
	0	0	0	0	0	4	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	35	35	9	0	0	0
	0	0	0	1	3	0	3	2	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	36	36	1	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	37	37	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	38	38	3	0	0	0
	0	0	0	0	0	1	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	39	39	3	0	0	0
	0	0	0	0	0	0	0	1	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	40	40	1	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	1	0	1	42	42	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	2	0	1	13	13	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	2	0	1	14	14	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	2	0	0	0	0	0	0	0
	0	0	0								
2002	1	2	2	0	1	16	16	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	1	4	1	0	0	0	0	0
	0	0	0								
2002	1	2	2	0	1	17	17	60	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	17	33	5	2	0	0	0	0
	0	0	0								
2002	1	2	2	0	1	18	18	57	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	13	31	10	2	0	0	0	0
	0	0	0								
2002	1	2	2	0	1	19	19	49	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	5	23	17	3	1	0	0	0
	0	0	0								
2002	1	2	2	0	1	20	20	48.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	3	19	21.5	4	0	0	0	0
	0	0	0								
2002	1	2	2	0	1	21	21	38	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	13	11	11	2	0	0	1
	0	0	0								
2002	1	2	2	0	1	22	22	35	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	15	13	4	0	0	0
	0	0	0								
2002	1	2	2	0	1	23	23	22	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	5	9	4	1	0	0
	0	0	0								
2002	1	2	2	0	1	24	24	20	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	3	6	7	2	0	0
	0	0	0								

2002	1	2	2	0	1	25	25	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	3	1	1	0	0
	0	0	0								
2002	1	2	2	0	1	26	26	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	2	1	0	0	0
	0	0	0								
2002	1	2	2	0	1	27	27	4.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1.5	2	0	1	0
	0	0	0								
2003	1	2	1	0	1	16	16	2	0	0	0
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	17	17	25.5	0	0	13
	11.5	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	18	18	36	0	0	6
	28	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	19	19	33	0	0	5
	18	9	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	20	20	31	0	0	0
	24	6	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	21	21	39	0	0	1
	26	12	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	22	22	26	0	0	0
	16	6	2	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	23	23	30	0	0	0
	13	8	6	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	24	24	31	0	0	0
	6	14	7	3	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	25	25	33.5	0	0	0
	3	16.5	11	1	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	26	26	22	0	0	1
	0	5	10	3	1	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	27	27	21	0	0	0
	1	7	5	5	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	28	28	24	0	0	0
	0	5	6	6	4	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	29	29	12	0	0	0
	0	0	4	3	3	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	30	30	20	0	0	1
	1	0	8	3	3	2	1	0	1	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	31	31	18	0	0	0
	0	1	1	6	5	1	1	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	32	32	9	0	0	0
	0	0	1	2	3	2	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	33	33	18	0	0	0
	0	0	1	7	6	1	2	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	34	34	10	0	0	0
	0	0	2	1	1	4	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	35	35	3	0	0	0
	0	0	0	0	0	0	2	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	36	36	8	0	0	0
	0	0	0	0	1	2	2	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	38	38	2	0	0	0
	0	0	0	0	0	1	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	39	39	3	0	0	0
	0	0	0	0	0	1	1	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	40	40	2	0	0	0
	0	0	0	0	0	0	0	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	41	41	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	1	0	1	42	42	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	2	0	1	15	15	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
2003	1	2	2	0	1	16	16	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	5	1	0	0	0	0	0	0
	0	0	0								
2003	1	2	2	0	1	17	17	55.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	6	31.5	16	1	0	1	0	0	0
	0	0	0								
2003	1	2	2	0	1	18	18	80	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	6	44	23	5	1	1	0	0	0
	0	0	0								
2003	1	2	2	0	1	19	19	47	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	19	13	10	1	1	0	0	0
	0	0	0								
2003	1	2	2	0	1	20	20	46	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	14	13	13	3	3	0	0	0
	0	0	0								

2003	1	2	2	0	1	21	21	27	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	5	9	7	4	0	1	0	0
	0	0	0								
2003	1	2	2	0	1	22	22	25	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	9	8	4	1	2	0	0
	0	0	0								
2003	1	2	2	0	1	23	23	20	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	2	7	3	4	1	0	0
	0	0	0								
2003	1	2	2	0	1	24	24	15	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	4	5	4	0	0
	1	0	0								
2003	1	2	2	0	1	25	25	9.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1.5	3	2	1	1	1	0
	0	0	0								
2003	1	2	2	0	1	26	26	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	2	1	1	0
	0	0	0								
2003	1	2	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0								
2003	1	2	2	0	1	29	29	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
2003	1	2	2	0	1	31	31	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0								
2003	1	2	2	0	1	33	33	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	2	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	14	14	1	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	16	16	3	0	0	2
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	17	17	20.5	0	2	9.5
	6.5	2.5	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	18	18	20.5	0	0	2
	15	2.5	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	19	19	16.5	0	0	0
	9.5	6	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	20	20	31	0	0	3
	15.5	11.5	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	21	21	22.5	0	0	3
	9.5	9	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	22	22	20	0	0	2
	6	7	3	2	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	23	23	25.5	0	0	2
	9.5	10	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	24	24	22	0	1	0
	5	13	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	25	25	29.5	0	0	2
	7	13	5	2	0.5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	26	26	17	0	0	0
	4	9	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	27	27	16	0	0	0
	0	2	12	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	28	28	9	0	0	0
	0	2	3.5	3	0	0	0.5	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	29	29	9	0	0	0
	1	4	0	4	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	30	30	11	0	0	0
	0	3	4	4	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	31	31	6	0	0	0
	0	3	1	1	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	32	32	9	0	0	0
	0	0	2	2	3	1	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	33	33	4	0	0	0
	0	0	0	4	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	34	34	6	0	0	1
	0	1	0	1	1	1	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	35	35	3.5	0	0	0
	0	1	0	0.5	0	1	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	36	36	1	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	37	37	3	0	0	0
	0	0	0	0	1	1	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	1	0	1	42	42	0.5	0	0	0
	0	0	0	0	0.5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	2	2	0	1	16	16	12	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	4	7	0	0	0	0	0	0
	0	0	0								

2004	1	2	2	0	1	17	17	40.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	4.5	21.5	12.5	1	1	0	0	0	0
	0	0	0								
2004	1	2	2	0	1	18	18	68.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	6	26	31.5	5	0	0	0	0	0
	0	0	0								
2004	1	2	2	0	1	19	19	61.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	24.5	28	5	1	0	0	0	0
	0	0	0								
2004	1	2	2	0	1	20	20	44	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	20.5	19.5	1	1	0	0	0	0
	0	0	0								
2004	1	2	2	0	1	21	21	52.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	14.5	22	10	4	0	0	0	0
	0	0	0								
2004	1	2	2	0	1	22	22	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	7	4	2	1	0	0	0	0
	0	0	0								
2004	1	2	2	0	1	23	23	15.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1.5	6	2	2	2	2	0	0
	0	0	0								
2004	1	2	2	0	1	24	24	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	6	4	4	0	2	1	0	0
	0	0	0								
2004	1	2	2	0	1	25	25	7.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	3	1	0	2.5	0	0	0
	0	0	0								
2004	1	2	2	0	1	26	26	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	2	0	0	2	0	0
	0	0	0								
2004	1	2	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0.5	0	0	0	0.5	0
	0	0	0								
2004	1	2	2	0	1	29	29	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0								
2004	1	2	2	0	1	31	31	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
2004	1	2	2	0	1	35	35	0.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0.5	0	0	0	0
	0	0	0								
2004	1	2	2	0	1	42	42	0.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0.5	0	0	0
	0	0	0								
2005	1	2	1	0	1	16	16	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	17	17	12	0	0	7
	5	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	18	18	13	0	0	4
	8	1	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	19	19	8	0	0	2
	5	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	20	20	17	0	0	2
	9	3	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	21	21	11	0	0	1
	4	5	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	22	22	15	0	0	1
	2	10	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	23	23	18	0	0	0
	1	9	7	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	24	24	13	0	0	1
	1	6	2	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	25	25	15	0	0	0
	1	6	6	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	26	26	17	0	0	1
	4	6	6	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	27	27	7	0	0	0
	1	2	2	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	28	28	10	0	0	0
	1	3	4	1	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	29	29	6	0	0	0
	2	0	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	30	30	7	0	0	0
	0	2	1	2	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	31	31	7	0	0	0
	0	1	1	3	1	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	33	33	3	0	0	0
	0	0	1	1	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	34	34	1	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	35	35	3	0	0	0
	0	0	0	0	0	1	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	1	0	1	36	36	3	0	0	0
	0	0	0	0	1	0	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2005	1	2	1	0	1	37	37	2	0	0	0
	0	0	0	0	1	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	2	2	0	1	16	16	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	3	1	0	0	0	0	0
	0	0	0								
2005	1	2	2	0	1	17	17	43	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	8	18	11	5	0	0	0	0	0
	0	0	0								
2005	1	2	2	0	1	18	18	54	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	5	16	25	6	2	0	0	0	0
	0	0	0								
2005	1	2	2	0	1	19	19	56	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	7	16	22	9	2	0	0	0	0
	0	0	0								
2005	1	2	2	0	1	20	20	49	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	4	18	13	8	5	1	0	0	0
	0	0	0								
2005	1	2	2	0	1	21	21	31	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	1	12	13	3	0	0	0	0
	0	0	0								
2005	1	2	2	0	1	22	22	29	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	5	10	9	3	1	1	0	0
	0	0	0								
2005	1	2	2	0	1	23	23	18	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	2	3	3	5	3	1	0	0
	0	0	0								
2005	1	2	2	0	1	24	24	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	5	1	1	0	1	0
	0	0	0								
2005	1	2	2	0	1	25	25	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	2	1	1	0	0
	0	0	0								
2005	1	2	2	0	1	26	26	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	2	0	0	1
	0	0	0								
2005	1	2	2	0	1	27	27	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
2005	1	2	2	0	1	28	28	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	1	0	0	0
	0	0	0								
2006	1	2	1	0	1	16	16	2	0	0	0
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	17	17	13	0	0	1
	8	4	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	18	18	15	0	0	1
	7	6	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	19	19	20	0	0	0
	8	10	2	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	20	20	16	0	0	0
	1	12	2	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	21	21	21	0	0	0
	2	15	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	22	22	32	0	0	0
	1	9	12	9	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	23	23	27	0	0	0
	1	11	9	4	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	24	24	42	0	0	0
	1	6	21	12	1	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	25	25	43	0	0	0
	0	6	18	12	6	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	26	26	25	0	0	0
	0	3	9	9	3	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	27	27	30	0	0	0
	0	1	6	14	5	2	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	28	28	23	0	0	0
	0	1	6	11	4	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	29	29	14	0	0	0
	0	1	3	4	5	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	30	30	9	0	0	0
	0	0	0	2	5	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	31	31	10	0	0	0
	0	0	1	1	4	3	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	32	32	7	0	0	0
	0	0	0	1	2	0	3	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	33	33	14	0	0	0
	0	0	1	0	3	5	2	1	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	34	34	8	0	0	0
	0	0	1	0	0	2	2	1	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	35	35	6	0	0	0
	0	0	0	0	1	1	3	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	36	36	4	0	0	0
	0	0	0	0	0	1	1	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2006	1	2	1	0	1	37	37	3	0	0	0
	0	0	0	0	1	0	0	0	0	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	38	38	2	0	0	0
	0	0	0	0	0	0	1	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	39	39	3	0	0	0
	0	0	0	0	0	0	1	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	40	40	4	0	0	0
	0	0	0	0	0	0	0	1	1	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	1	0	1	42	42	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	2	2	0	1	16	16	20	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	5	9	4	1	0	0	0	0
	0	0	0								
2006	1	2	2	0	1	17	17	74	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	18	37	18	1	0	0	0	0
	0	0	0								
2006	1	2	2	0	1	18	18	76	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	15	32	21	6	0	0	0	0
	0	0	0								
2006	1	2	2	0	1	19	19	81	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	10	27	35	9	0	0	0	0
	0	0	0								
2006	1	2	2	0	1	20	20	51	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	13	25	11	0	0	0	0
	0	0	0								
2006	1	2	2	0	1	21	21	31	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	7	10	10	2	0	0	0
	0	0	0								
2006	1	2	2	0	1	22	22	29	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	4	8	10	6	0	0	0
	0	0	0								
2006	1	2	2	0	1	23	23	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	5	7	2	1	1	0
	0	0	0								
2006	1	2	2	0	1	24	24	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	2	2	2	0	0	0
	0	0	0								
2006	1	2	2	0	1	25	25	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	1	3	3	2	0	1
	0	0	0								
2006	1	2	2	0	1	26	26	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	0	0	0
	1	0	0								
2006	1	2	2	0	1	27	27	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	0	0
	0	0	0								
2006	1	2	2	0	1	28	28	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	1	1	0	0	0
	0	0	0								
2006	1	2	2	0	1	29	29	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	1
	0	0	0								
2007	1	2	1	0	1	14	14	6	0	0	1
	4	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	15	15	19	0	0	7
	8	3	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	16	16	16	0	0	3
	10	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	17	17	9	0	0	4
	4	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	18	18	27	0	0	2
	14	9	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	19	19	12	0	0	0
	6	4	0	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	20	20	21	0	0	1
	4	13	2	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	21	21	22	0	0	0
	3	13	4	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	22	22	27	0	0	0
	3	6	13	3	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	23	23	24	0	0	0
	1	4	10	7	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	24	24	24	0	0	0
	2	4	9	5	2	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	25	25	28	0	0	0
	2	1	10	10	4	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	26	26	21	0	0	0
	1	3	6	5	4	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	27	27	30	0	0	0
	0	2	5	15	5	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	28	28	15	0	0	0
	1	0	4	2	4	3	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	29	29	21	0	0	0
	0	0	3	6	7	3	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2007	1	2	1	0	1	30	30	15	0	0	0
	0	0	2	3	5	4	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	31	31	16	0	0	0
	0	0	0	3	6	6	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	32	32	4	0	0	0
	0	0	0	1	1	0	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	33	33	3	0	0	0
	0	0	0	0	2	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	34	34	5	0	0	0
	0	0	0	1	1	0	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	35	35	9	0	0	0
	0	0	0	0	1	3	0	2	3	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	36	36	5	0	0	0
	0	0	0	0	0	2	1	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	37	37	8	0	0	0
	0	0	0	0	0	0	5	0	2	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	38	38	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	39	39	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	1	0	1	42	42	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	2	0	1	13	13	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	2	0	0	0	0	0	0	0
	0	0	0								
2007	1	2	2	0	1	14	14	27	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	5	13	9	0	0	0	0	0	0
	0	0	0								
2007	1	2	2	0	1	15	15	33	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	9	13	8	3	0	0	0	0	0
	0	0	0								
2007	1	2	2	0	1	16	16	54	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	5	16	25	7	1	0	0	0	0
	0	0	0								
2007	1	2	2	0	1	17	17	45	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	17	19	8	1	0	0	0	0
	0	0	0								
2007	1	2	2	0	1	18	18	48	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	7	11	24	5	1	0	0	0
	0	0	0								
2007	1	2	2	0	1	19	19	45	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	9	14	11	10	1	0	0	0
	0	0	0								
2007	1	2	2	0	1	20	20	40	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	9	15	11	3	0	0	0
	0	0	0								
2007	1	2	2	0	1	21	21	27	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	3	13	8	2	0	0	0
	0	0	0								
2007	1	2	2	0	1	22	22	27	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	8	10	5	1	0	0
	0	0	0								
2007	1	2	2	0	1	23	23	18	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	2	2	8	2	0	1
	0	0	0								
2007	1	2	2	0	1	24	24	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	7	2	2	1	0
	0	0	0								
2007	1	2	2	0	1	25	25	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	0	1	4	0	0	0
	0	0	0								
2007	1	2	2	0	1	26	26	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	1	2	1	0	0
	0	0	0								
2007	1	2	2	0	1	27	27	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	3	2	0	0
	0	0	0								
2007	1	2	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
2008	1	2	1	0	1	14	14	7	0	0	4
	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	15	15	12	0	0	3
	5	4	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	16	16	18	0	0	3
	13	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	17	17	25	0	0	2
	16	4	2	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	18	18	29	0	0	1
	11	12	4	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	19	19	24	0	0	0
	7	12	4	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	20	20	27	0	0	0
	8	13	5	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	21	21	20	0	0	0
	2	8	7	1	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2008	1	2	1	0	1	22	22	23	0	0	0
	1	6	8	5	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	23	23	18	0	0	0
	1	4	4	4	4	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	24	24	14	0	0	0
	0	0	8	4	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	25	25	19	0	0	0
	0	3	3	10	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	26	26	18	0	0	0
	0	0	3	11	2	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	27	27	23	0	0	0
	0	1	4	11	4	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	28	28	11	0	0	0
	0	0	0	4	5	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	29	29	11	0	0	0
	0	0	2	1	4	1	1	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	30	30	12	0	0	0
	0	0	1	3	3	3	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	31	31	4	0	0	0
	0	0	1	0	0	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	32	32	8	0	0	0
	0	0	0	0	1	4	1	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	33	33	4	0	0	0
	0	0	0	0	2	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	34	34	6	0	0	0
	0	0	0	0	3	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	36	36	1	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	37	37	5	0	0	0
	0	0	0	0	0	0	1	0	2	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	40	40	2	0	0	0
	0	0	0	0	0	0	0	0	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	1	0	1	42	42	2	0	0	0
	0	0	0	0	0	0	0	0	0	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	2	2	0	1	13	13	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

```
        0       0       1       1       0       0       0       0       0       0       0
        0       0       0
2008    1       2       2       0       1       14      14      23      0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       2       14      5       2       0       0       0       0       0
        0       0       0
2008    1       2       2       0       1       15      15      52      0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       3       29      13      7       0       0       0       0       0
        0       0       0
2008    1       2       2       0       1       16      16      46      0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       2       18      16      8       2       0       0       0       0
        0       0       0
2008    1       2       2       0       1       17      17      45      0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       1       14      14      10      5       1       0       0       0
        0       0       0
2008    1       2       2       0       1       18      18      38      0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       1       3       11      16      6       1       0       0       0
        0       0       0
2008    1       2       2       0       1       19      19      57      0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       5       18      20      10      4       0       0       0
        0       0       0
2008    1       2       2       0       1       20      20      38      0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       2       3       5       18      9       1       0       0
        0       0       0
2008    1       2       2       0       1       21      21      21      0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       4       6       7       3       1       0       0
        0       0       0
2008    1       2       2       0       1       22      22      17      0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       1       4       6       5       0       1       0
        0       0       0
2008    1       2       2       0       1       23      23      13      0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       8       4       0       1       0
        0       0       0
2008    1       2       2       0       1       24      24      14      0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       3       4       5       2       0       0
        0       0       0
2008    1       2       2       0       1       25      25      13      0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       1       0       3       7       0       1       0
        0       0       1
2008    1       2       2       0       1       26      26      7       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       1       2       2       1       1       0
        0       0       0
2008    1       2       2       0       1       27      27      6       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       1       2       2       0
        1       0       0
2008    1       2       2       0       1       28      28      2       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       1       0       1
        0       0       0
2008    1       2       2       0       1       29      29      1       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       1
        0       0       0


# Triennial 301 lines
```

1992	1	3	1	0	1	4	4	5.436362		0.666666667	
	0.333333333		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
1992	1	3	1	0	1	5	5	3.290908		0.5	0.25
	0.25	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	6	6	6.72727	0.6	0.4	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1992	1	3	1	0	1	7	7	4.654543		0.555555556	
	0.444444444		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
1992	1	3	1	0	1	8	8	1.072727		0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	10	10	1.072727		0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	11	11	4.436362		0	0.5
	0.5	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	12	12	2.145454		0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	13	13	3.363635		0	0.8
	0.2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	14	14	1.145454		0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	15	15	3.363635		0	0.4
	0.4	0	0	0.2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	16	16	3.218181		0	
	0.666666667		0	0.333333333		0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
1992	1	3	1	0	1	17	17	2.363635		0	0.2
	0.6	0.2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	18	18	5.799997		0	
	0.272727273		0.363636364		0.363636364		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			
1992	1	3	1	0	1	19	19	4.436362		0	0
	0.666666667		0.166666667		0.166666667		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
1992	1	3	1	0	1	20	20	3.218181		0	
	0.333333333		0.666666667		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
1992	1	3	1	0	1	21	21	3.363635		0	0
	0.8	0.2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	22	22	3.363635		0	0
	0.4	0.2	0.4	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	23	23	3.363635		0	0
	0.6	0.4	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	24	24	2.145454		0	0
	0	0.5	0.5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	25	25	2.145454		0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	26	26	2.290908		0	0
	0.25	0	0.5	0.25	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	27	27	1.290908		0	0
	0.25	0.75	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	28	28	2.436362		0	0
	0	0.333333333		0	0.333333333		0.333333333		0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
1992	1	3	1	0	1	29	29	2.509089		0	0
	0	0.285714286		0	0.285714286		0	0.428571429		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
1992	1	3	1	0	1	30	30	2.218181		0	
	0.333333333	0	0	0		0.333333333		0.333333333		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			
1992	1	3	1	0	1	31	31	3.290908		0	0
	0	0	0	0.25	0.25	0.25	0.25	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	32	32	3.290908		0	0
	0	0	0.25	0	0.75	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	33	33	1.290908		0	0
	0	0	0.5	0	0.5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	1	0	1	34	34	1.218181		0	0
	0	0	0	0.333333333		0	0.333333333		0	0	
	0.333333333		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			
1992	1	3	1	0	1	35	35	1.218181		0	0
	0	0	0	0	0.333333333		0.333333333		0.333333333		0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
1992	1	3	1	0	1	36	36	1.072727		0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	2	0	1	3	3	1.072727		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	2	0	1	4	4	1.145454		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.5	0.5	0	0	0	0	0	0	0	0
	0	0	0	0							
1992	1	3	2	0	1	5	5	2.436362		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.666666667		0.333333333		0	0	0	0	0	0
	0	0	0	0	0	0					

1992 1 3 2 0 1 6 6 2.436362 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0.333333333 0.666666667 0 0 0 0 0 0
0 0 0 0 0 0
1992 1 3 2 0 1 7 7 1.145454 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0.5 0.5 0 0 0 0 0 0 0 0
0 0 0 0
1992 1 3 2 0 1 8 8 1.072727 0 0
0 0 0 0 0 0 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 0
0 0 0 0
1992 1 3 2 0 1 9 9 2.218181 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0.666666667 0 0.333333333 0 0 0 0
0 0 0 0 0 0
1992 1 3 2 0 1 10 10 1.218181 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0.666666667 0.333333333 0 0 0 0 0
0 0 0 0 0 0
1992 1 3 2 0 1 11 11 2.218181 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0.333333333 0.333333333 0 0.333333333 0 0 0
0 0 0 0 0 0 0
1992 1 3 2 0 1 12 12 2.218181 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0.666666667 0.333333333 0 0 0 0 0
0 0 0 0 0 0
1992 1 3 2 0 1 13 13 1.072727 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0
0 0 0 0
1992 1 3 2 0 1 14 14 1.072727 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0
0 0 0 0
1992 1 3 2 0 1 15 15 1.072727 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0
0 0 0 0
1992 1 3 2 0 1 16 16 1.072727 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0
0 0 0 0
1992 1 3 2 0 1 17 17 2.218181 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0.333333333 0.666666667 0 0 0 0
0 0 0 0 0 0
1992 1 3 2 0 1 18 18 4.363635 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0.4 0.4 0 0 0.2 0 0 0 0
0 0 0 0
1992 1 3 2 0 1 19 19 3.290908 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0.75 0 0 0.25 0 0 0 0 0
0 0 0 0
1992 1 3 2 0 1 21 21 4.290908 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0.25 0.5 0.25 0 0 0 0
0 0 0 0
1992 1 3 2 0 1 22 22 2.218181 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0.333333333 0.333333333 0 0.333333333
0 0 0 0 0 0 0
1992 1 3 2 0 1 23 23 3.218181 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0.333333333 0 0.666666667 0 0
0 0 0 0 0 0
1992 1 3 2 0 1 24 24 2.218181 0 0
0 0 0 0 0 0 0 0 0 0 0

0 0 0 0 0.333333333 0 0 0.666666667 0
0 0 0 0 0 0
1992 1 3 2 0 1 25 25 3.363635 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0.2 0 0.2 0.2 0 0.4 0 0 0
0 0 0 0
1992 1 3 2 0 1 27 27 1.072727 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1 0
0 0 0 0
1992 1 3 2 0 1 29 29 1.072727 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
1 0 0 0
1995 1 3 1 0 1 2 2 3.218181 1 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1995 1 3 1 0 1 3 3 10.72727 0.8 0.2
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1995 1 3 1 0 1 4 4 14.672721 0.782608696
0.130434783 0.086956522 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
1995 1 3 1 0 1 5 5 9.872724 0.416666667
0.583333333 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0
1995 1 3 1 0 1 6 6 10.163632 0.5625 0.3125
0.125 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1995 1 3 1 0 1 7 7 5.509089 0 1
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1995 1 3 1 0 1 8 8 1.072727 0 1
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1995 1 3 1 0 1 9 9 4.363635 0 0.8
0.2 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1995 1 3 1 0 1 10 10 1.218181 0 1
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1995 1 3 1 0 1 11 11 4.509089 0.142857143
0.571428571 0.285714286 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
1995 1 3 1 0 1 12 12 7.509089 0
0.428571429 0.571428571 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
1995 1 3 1 0 1 13 13 10.72727 0 0.3
0.7 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1995 1 3 1 0 1 14 14 12.236359 0
0.117647059 0.705882353 0.176470588 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1995 1 3 1 0 1 15 15 16.036356 0
0.142857143 0.5 0.321428571 0.035714286 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0

1995	1	3	1	0	1	16	16	14.45454	0	0.1	
	0.35	0.3	0.2	0.05	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	1	0	1	17	17	11.163632	0	0	
	0.5	0.4375	0	0.0625	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	1	0	1	18	18	17.45454	0.05	0	
	0.25	0.45	0.2	0	0	0.05	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	1	0	1	19	19	16.327264	0	0.03125	
	0.15625	0.625	0.1875	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	1	0	1	20	20	17.745448	0	0	
	0.291666667	0.416666667	0.083333333	0.166666667	0.041666667	0					
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0		
1995	1	3	1	0	1	21	21	12.309086	0	0	
	0.055555556	0.277777778	0.444444444	0.111111111	0	0.055555556					
	0.055555556	0	0	0	0	0	0	0	0	0	
	0	0	0	0	0	0	0	0	0	0	
1995	1	3	1	0	1	22	22	13.945451	0	0	
	0	0.230769231	0.461538462	0.153846154	0.153846154	0	0				
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			
1995	1	3	1	0	1	23	23	7.799997	0	0	
	0.090909091	0.090909091	0.636363636	0.181818182	0	0	0				
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			
1995	1	3	1	0	1	24	24	6.581816	0	0	
	0	0.125	0.75	0.125	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	1	0	1	25	25	6.436362	0	0	
	0	0	0.166666667	0.5	0.166666667	0.166666667	0	0			
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
1995	1	3	1	0	1	26	26	9.654543	0	0	
	0	0.111111111	0.555555556	0.222222222	0	0.111111111	0				
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			
1995	1	3	1	0	1	27	27	2.145454	0	0	
	0	0	0	0.5	0.5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	1	0	1	28	28	6.436362	0	0	
	0	0.333333333	0	0.5	0.166666667	0	0	0	0		
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
1995	1	3	1	0	1	29	29	2.145454	0	0	
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	1	0	1	30	30	2.145454	0	0	
	0	0	0	0	0	0.5	0	0.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	1	0	1	31	31	1.145454	0	0	
	0	0	0	0	0	0.5	0.5	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	1	0	1	32	32	1.072727	0	0	
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	1	0	1	33	33	2.145454	0	0	
	0	0	0	0	0.5	0.5	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	1	0	1	34	34	2.145454		0	0
	0	0	0	0	0	0	0.5	0.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	1	0	1	35	35	2.218181		0	0
	0	0	0	0	0	0.333333333		0	0.333333333		
	0.333333333		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			
1995	1	3	1	0	1	36	36	3.218181		0	0
	0	0	0	0	0.333333333		0	0.333333333		0	0
	0.333333333		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
1995	1	3	1	0	1	38	38	1.072727		0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	2	0	1	1	1	1.072727		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	2	0	1	2	2	3.218181		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	2	0	1	3	3	1.072727		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	2	0	1	4	4	3.436362		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.666666667		0.333333333		0	0	0	0	0	0
	0	0	0	0	0	0					
1995	1	3	2	0	1	5	5	7.799997		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.454545455		0.545454545		0	0	0	0	0	0
	0	0	0	0	0	0					
1995	1	3	2	0	1	6	6	5.581816		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.75	0.25	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	2	0	1	7	7	2.145454		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.5	0.5	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	2	0	1	9	9	1.072727		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	2	0	1	10	10	5.363635		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.6	0.4	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	2	0	1	11	11	4.363635		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.8	0.2	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	2	0	1	12	12	9.72727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.3	0.6	0.1	0	0	0	0	0	0	0
	0	0	0								
1995	1	3	2	0	1	13	13	7.509089		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.714285714		0.285714286		0	0	0	0
	0	0	0	0	0	0					
1995	1	3	2	0	1	14	14	11.163632		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.0625	0.625	0.25	0.0625	0	0	0	0	0
	0	0	0	0							

1995 1 3 2 0 1 15 15 7.72727 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0.6 0.4 0 0 0 0 0 0 0
0 0 0
1995 1 3 2 0 1 16 16 11.872724 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0.166666667 0.166666667 0.5 0.166666667 0 0
0 0 0 0 0 0 0
1995 1 3 2 0 1 17 17 14.963629 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0.185185185 0.62962963 0.037037037 0.148148148
0 0 0 0 0 0 0 0
1995 1 3 2 0 1 18 18 14.18181 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0.033333333 0.033333333 0.033333333 0.666666667 0.033333333
0.133333333 0.066666667 0 0 0 0 0 0 0
1995 1 3 2 0 1 19 19 11.236359 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0.058823529 0.176470588 0.235294118 0.411764706
0.058823529 0 0.058823529 0 0 0 0 0 0
1995 1 3 2 0 1 20 20 6.509089 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0.714285714 0.285714286 0 0
0 0 0 0 0 0
1995 1 3 2 0 1 21 21 7.654543 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0.222222222 0.444444444 0.333333333 0
0 0 0 0 0 0 0
1995 1 3 2 0 1 22 22 6.654543 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0.222222222 0.444444444 0.111111111
0.222222222 0 0 0 0 0 0 0
1995 1 3 2 0 1 23 23 3.218181 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0.333333333 0 0.666666667 0 0
0 0 0 0 0 0
1995 1 3 2 0 1 24 24 2.363635 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0.4 0.2 0.2 0.2 0 0
0 0 0 0
1995 1 3 2 0 1 25 25 3.218181 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0.666666667 0 0.333333333 0
0 0 0 0 0 0
1995 1 3 2 0 1 26 26 1.072727 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 1
0 0 0 0
1995 1 3 2 0 1 27 27 2.145454 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0.5 0 0
0 0.5 0 0
1995 1 3 2 0 1 28 28 2.145454 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 1
0 0 0 0
1998 1 3 1 0 1 1 1 6.436362 1 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1998 1 3 1 0 1 2 2 6.436362 1 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1998 1 3 1 0 1 3 3 10.945451 0.923076923
0.076923077 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0
1998 1 3 1 0 1 4 4 10.872724 1 0
0 0 0 0 0 0 0 0 0 0 0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	3	1	0	1	5	5	6.581816		0.875	0.125
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	3	1	0	1	6	6	2.145454		1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	3	1	0	1	10	10	6.581816		0.125	0.875
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	3	1	0	1	11	11	7.509089		0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	3	1	0	1	12	12	7.581816		0.25	0.75
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	3	1	0	1	13	13	6.436362		0	
	0.666666667		0.333333333		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
1998	1	3	1	0	1	14	14	8.654543		0	
	0.111111111		0.888888889		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
1998	1	3	1	0	1	15	15	10.945451		0	
	0.538461538		0.461538462		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
1998	1	3	1	0	1	16	16	15.236359		0	
	0.529411765		0.352941176		0.117647059		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			
1998	1	3	1	0	1	17	17	8.72727	0	0.3	0.5
	0.2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	18	18	15.599994		0.045454545	
	0.181818182		0.590909091		0.181818182		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			
1998	1	3	1	0	1	19	19	10.799997		0	
	0.272727273		0.363636364		0.272727273		0.090909091		0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0		
1998	1	3	1	0	1	20	20	12.381813		0	
	0.105263158		0.526315789		0.263157895		0.105263158		0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0		
1998	1	3	1	0	1	21	21	8.945451		0	0
	0.692307692		0.307692308		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
1998	1	3	1	0	1	22	22	11.018178		0	
	0.071428571		0.214285714		0.642857143		0.071428571		0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0		
1998	1	3	1	0	1	23	23	6.581816		0	0
	0.125	0.5	0.375	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	3	1	0	1	24	24	7.654543		0	0
	0.111111111		0.222222222		0.333333333		0.333333333		0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			

1998 1 3 1 0 1 25 25 9.872724 0 0
0.166666667 0.25 0.25 0.166666667 0.166666667 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
1998 1 3 1 0 1 26 26 8.654543 0
0.111111111 0.222222222 0.333333333 0.222222222 0.111111111 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
1998 1 3 1 0 1 27 27 8.654543 0 0
0 0.222222222 0.222222222 0.444444444 0 0 0.111111111
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1998 1 3 1 0 1 28 28 7.509089 0 0
0 0.142857143 0.285714286 0.285714286 0.285714286 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1998 1 3 1 0 1 29 29 5.72727 0 0 0
0.3 0 0.4 0.3 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0
1998 1 3 1 0 1 30 30 2.145454 0 0
0 0.5 0 0 0.5 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1998 1 3 1 0 1 31 31 5.509089 0 0
0 0 0.428571429 0.285714286 0.142857143 0.142857143 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1998 1 3 1 0 1 32 32 5.363635 0 0
0 0 0.6 0 0.4 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1998 1 3 1 0 1 33 33 4.290908 0 0
0 0.25 0.5 0 0.25 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1998 1 3 1 0 1 34 34 1.072727 0 0
0 0 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1998 1 3 1 0 1 35 35 2.145454 0 0
0 0 0.5 0 0 0 0 0.5 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1998 1 3 2 0 1 1 1 1.072727 0 0
0 0 0 0 0 0 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 0
0 0 0 0
1998 1 3 2 0 1 2 2 4.290908 0 0
0 0 0 0 0 0 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 0
0 0 0 0
1998 1 3 2 0 1 3 3 4.290908 0 0
0 0 0 0 0 0 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 0
0 0 0 0
1998 1 3 2 0 1 4 4 6.654543 0 0
0 0 0 0 0 0 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 0
0 0 0 0
1998 1 3 2 0 1 5 5 6.436362 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0.833333333 0.166666667 0 0 0 0 0 0
0 0 0 0 0 0
1998 1 3 2 0 1 8 8 1.072727 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0
0 0 0 0
1998 1 3 2 0 1 9 9 2.145454 0 0
0 0 0 0 0 0 0 0 0 0 0

	0	0.5	0.5	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	3	2	0	1	10	10	3.218181		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	3	2	0	1	11	11	1.072727		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	3	2	0	1	12	12	5.436362		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.166666667		0.333333333		0.5	0	0	0	0	0
	0	0	0	0	0	0					
1998	1	3	2	0	1	13	13	4.290908		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.25	0.75	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	3	2	0	1	14	14	6.654543		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.444444444		0.444444444		0.111111111		0	0	0
	0	0	0	0	0	0	0				
1998	1	3	2	0	1	15	15	8.799997		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.272727273		0.636363636		0	0.090909091		0	0
	0	0	0	0	0	0	0				
1998	1	3	2	0	1	16	16	8.799997		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.090909091		0.545454545		0.272727273		0.090909091		0
	0	0	0	0	0	0	0	0			
1998	1	3	2	0	1	17	17	8.72727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.2	0.7	0.1	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	18	18	14.018178		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.214285714		0.285714286		0.357142857		0.071428571		0
	0	0.071428571		0	0	0	0	0	0		
1998	1	3	2	0	1	19	19	12.090905		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.4	0.4	0.2	0	0	0	0	0
	0	0	0	0							
1998	1	3	2	0	1	20	20	5.363635		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.2	0.2	0.2	0.4	0	0	0	0
	0	0	0	0							
1998	1	3	2	0	1	21	21	5.363635		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.2	0.2	0.2	0.2	0.2	0	0	0	0
	0	0	0	0							
1998	1	3	2	0	1	22	22	3.218181		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.333333333		0.333333333		0	0	0.333333333	
	0	0	0	0	0	0	0				
1998	1	3	2	0	1	23	23	2.145454		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.5	0.5	0	0	0	0	0
	0	0	0	0							
1998	1	3	2	0	1	24	24	2.145454		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.5	0	0	0	0.5	0	0
	0	0	0	0							
1998	1	3	2	0	1	26	26	1.072727		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0							
2001	1	3	1	0	1	1	1	7.654543		0.888888889	
	0.111111111		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					

2001 1 3 1 0 1 2 2 15.672721 0.956521739
0.043478261 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0
2001 1 3 1 0 1 3 3 17.109083 0.620689655
0.344827586 0.034482759 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
2001 1 3 1 0 1 4 4 24.545445 0.257142857
0.714285714 0.028571429 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
2001 1 3 1 0 1 5 5 20.745448 0.041666667
0.916666667 0.041666667 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
2001 1 3 1 0 1 6 6 10.872724 0.083333333
0.666666667 0.25 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0
2001 1 3 1 0 1 7 7 15.527267 0.238095238
0.619047619 0.142857143 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
2001 1 3 1 0 1 8 8 15.45454 0 0.6
0.4 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2001 1 3 1 0 1 9 9 15.890902 0
0.538461538 0.461538462 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
2001 1 3 1 0 1 10 10 19.963629 0
0.296296296 0.703703704 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
2001 1 3 1 0 1 11 11 14.309086 0
0.166666667 0.722222222 0.111111111 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2001 1 3 1 0 1 12 12 12.945451 0
0.307692308 0.615384615 0.076923077 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2001 1 3 1 0 1 13 13 4.363635 0 0
0.6 0.4 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2001 1 3 1 0 1 14 14 3.290908 0 0
0.5 0.5 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2001 1 3 1 0 1 15 15 7.799997 0 0
0.363636364 0.636363636 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0
2001 1 3 1 0 1 16 16 7.72727 0 0 0.4
0.4 0.2 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0
2001 1 3 1 0 1 17 17 9.799997 0 0
0.181818182 0.545454545 0.181818182 0.090909091 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2001 1 3 1 0 1 18 18 4.290908 0 0
0.5 0.25 0.25 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2001 1 3 1 0 1 19 19 5.363635 0 0
0.4 0.2 0.2 0.2 0 0 0 0 0 0 0

```
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0
2001	1	3	1	0	1	20	20	4.290908	0	0
	0	0.25	0.5	0.25	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0
2001	1	3	1	0	1	21	21	5.363635	0	0
	0	0.6	0.4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0
2001	1	3	1	0	1	22	22	7.509089	0	0
	0.142857143	0.571428571	0.285714286	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
2001	1	3	1	0	1	23	23	4.436362	0	0
	0	0	0.5	0.333333333	0.166666667	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0
2001	1	3	1	0	1	24	24	4.363635	0	0
	0	0.2	0	0.4	0.4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0
2001	1	3	1	0	1	25	25	5.363635	0	0
	0	0	0.2	0.2	0.4	0.2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0
2001	1	3	1	0	1	26	26	8.799997	0	0
	0	0	0	0.454545455	0.454545455	0.090909091	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
2001	1	3	1	0	1	27	27	5.581816	0	0
	0	0	0	0.375	0.375	0.125	0.125	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0
2001	1	3	1	0	1	28	28	4.436362	0	0
	0	0	0	0.166666667	0.5	0.166666667	0	0	0
	0	0	0.166666667	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
2001	1	3	1	0	1	29	29	3.290908	0	0
	0	0	0	0.25	0.25	0.25	0	0	0	0	0.25
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0
2001	1	3	1	0	1	30	30	5.654543	0	0
	0	0	0	0	0.333333333	0.222222222	0.222222222
	0.222222222	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
2001	1	3	1	0	1	31	31	6.654543	0	0
	0	0	0	0.111111111	0.111111111	0.444444444	0.222222222
	0.111111111	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
2001	1	3	1	0	1	32	32	4.436362	0	0
	0	0	0	0	0.166666667	0.166666667	0.333333333
	0.333333333	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
2001	1	3	1	0	1	33	33	1.145454	0	0
	0	0	0	0	0.5	0.5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0
2001	1	3	1	0	1	34	34	2.363635	0	0
	0	0	0	0	0	0.2	0.2	0.4	0.2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0
2001	1	3	1	0	1	35	35	1.145454	0	0
	0	0	0	0	0	0.5	0	0	0.5	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0
2001	1	3	1	0	1	36	36	1.145454	0	0
	0	0	0	0	0	0.5	0.5	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0
```

2001	1	3	1	0	1	38	38	1.072727		0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	3	1	0	1	39	39	1.072727		0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	3	1	0	1	41	41	1.072727		0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	3	2	0	1	1	1	4.436362		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.833333333		0.166666667		0	0	0	0	0	0
	0	0	0	0	0	0					
2001	1	3	2	0	1	2	2	13.890902		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.769230769		0.230769231		0	0	0	0	0	0
	0	0	0	0	0	0					
2001	1	3	2	0	1	3	3	22.545445		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.428571429		0.542857143		0.028571429		0	0	0	0
	0	0	0	0	0	0	0				
2001	1	3	2	0	1	4	4	16.963629		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.296296296		0.666666667		0.037037037		0	0	0	0
	0	0	0	0	0	0	0				
2001	1	3	2	0	1	5	5	10.799997		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.909090909		0.090909091		0	0	0	0	0
	0	0	0	0	0	0					
2001	1	3	2	0	1	6	6	4.290908		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	3	2	0	1	7	7	7.654543		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.777777778		0.222222222		0	0	0	0	0
	0	0	0	0	0	0					
2001	1	3	2	0	1	8	8	17.236359		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.058823529		0.647058824		0.294117647		0	0	0	0
	0	0	0	0	0	0	0				
2001	1	3	2	0	1	9	9	18.745448		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.041666667		0.541666667		0.416666667		0	0	0	0
	0	0	0	0	0	0	0				
2001	1	3	2	0	1	10	10	14.309086		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.055555556		0.444444444		0.388888889		0.111111111		0	0
	0	0	0	0	0	0	0	0			
2001	1	3	2	0	1	11	11	10.945451		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.076923077		0.846153846		0	0.076923077		0	0
	0	0	0	0	0	0	0				
2001	1	3	2	0	1	12	12	6.509089		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.142857143		0.714285714		0.142857143		0	0	0
	0	0	0	0	0	0	0				
2001	1	3	2	0	1	13	13	8.581816		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.375	0.5	0.125	0	0	0	0	0
	0	0	0	0							
2001	1	3	2	0	1	14	14	5.363635		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.4	0.6	0	0	0	0	0	0
	0	0	0	0							
2001	1	3	2	0	1	15	15	4.290908		0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0.5	0.5	0	0	0	0	0	0
	0	0	0	0							
2001	1	3	2	0	1	16	16	6.509089		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.571428571		0.428571429		0	0	0	0
	0	0	0	0	0	0					
2001	1	3	2	0	1	17	17	5.363635		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.2	0.4	0	0	0.2	0.2	0	0
	0	0	0	0							
2001	1	3	2	0	1	18	18	6.436362		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.166666667		0.166666667		0.333333333		
	0.333333333		0	0	0	0	0	0	0		
2001	1	3	2	0	1	19	19	1.072727		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0							
2001	1	3	2	0	1	20	20	1.072727		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0							
2001	1	3	2	0	1	21	21	2.145454		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0.5	0	0	0.5	0
	0	0	0	0							
2001	1	3	2	0	1	22	22	2.145454		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0.5	0.5	0	0	0	0
	0	0	0	0							
2001	1	3	2	0	1	23	23	3.290908		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0.25	0.25	0.5	0	0
	0	0	0	0							
2001	1	3	2	0	1	24	24	2.145454		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0.5	0	0.5	0
	0	0	0	0							
2001	1	3	2	0	1	25	25	1.072727		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0							
2001	1	3	2	0	1	26	26	1.072727		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0							
2001	1	3	2	0	1	27	27	1.072727		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0							
2004	1	3	1	0	1	3	3	2.218181		0.333333333	
	0.666666667		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	3	1	0	1	4	4	3.218181		0.333333333	
	0.666666667		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	3	1	0	1	5	5	3.218181		0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	1	0	1	6	6	2.218181		0	
	0.666666667		0.333333333		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2004	1	3	1	0	1	7	7	4.290908		0	0.75
	0.25	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

2004	1	3	1	0	1	8	8	3.218181	0	1	
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	1	0	1	9	9	6.7227255	0		
	0.769230769	0.230769231	0	0	0	0	0	0	0		
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2004	1	3	1	0	1	10	10	5.363635	0	0.8	
	0.2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	1	0	1	11	11	6.509089	0		
	0.142857143	0.571428571	0.142857143	0	0.142857143	0	0				
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0		
2004	1	3	1	0	1	12	12	16.236359	0		
	0.117647059	0.764705882	0.117647059	0	0	0	0	0			
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			
2004	1	3	1	0	1	13	13	7.72727	0	0.2	0.4
	0.4	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	14	14	14.309086	0	0	
	0.555555556	0.444444444	0	0	0	0	0	0	0		
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	3	1	0	1	15	15	14.163632	0	0	
	0.5	0.375	0.125	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	1	0	1	16	16	9.018178	0	0	
	0.357142857	0.642857143	0	0	0	0	0	0	0		
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	3	1	0	1	17	17	21.0318115	0	0	
	0.204081633	0.632653061	0.163265306	0	0	0	0	0			
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2004	1	3	1	0	1	18	18	17.45454	0	0	
	0	0.65	0.3	0.05	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	1	0	1	19	19	12.090905	0	0	
	0	0.533333333	0.4	0.066666667	0	0	0	0	0		
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	3	1	0	1	20	20	18.309086	0	0	
	0.111111111	0.444444444	0.333333333	0.055555556	0	0	0				
	0.055555556	0	0	0	0	0	0	0	0	0	
	0	0	0	0	0	0	0	0	0		
2004	1	3	1	0	1	21	21	12.018178	0	0	
	0	0.285714286	0.5	0.142857143	0.071428571	0	0	0			
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2004	1	3	1	0	1	22	22	12.018178	0	0	
	0	0.142857143	0.5	0.285714286	0.071428571	0	0	0			
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2004	1	3	1	0	1	23	23	12.018178	0	0	
	0	0.285714286	0.428571429	0.285714286	0	0	0	0			
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2004	1	3	1	0	1	24	24	9.945451	0	0	
	0.076923077	0.076923077	0.384615385	0.307692308	0.076923077	0					
	0	0	0	0.076923077	0	0	0	0	0	0	
	0	0	0	0	0	0	0	0	0	0	
2004	1	3	1	0	1	25	25	14.090905	0	0	
	0	0	0.8	0.066666667	0.133333333	0	0	0	0		

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	3	1	0	1	26	26	7.654543	0	0	
	0	0	0.555555556	0.222222222	0.111111111	0.111111111	0				
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			
2004	1	3	1	0	1	27	27	5.436362	0	0	
	0	0	0.666666667	0.333333333	0	0	0	0	0		
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	3	1	0	1	28	28	1.072727	0	0	
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	1	0	1	29	29	5.363635	0	0	
	0	0	0.2	0.6	0.2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	1	0	1	30	30	4.290908	0	0	
	0	0	0.25	0	0.5	0.25	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	1	0	1	31	31	1.072727	0	0	
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	1	0	1	32	32	3.218181	0	0	
	0	0	0	0	0	0.333333333	0	0.333333333	0		
	0.333333333	0	0	0	0	0	0	0	0	0	
	0	0	0	0	0	0	0				
2004	1	3	1	0	1	33	33	2.218181	0	0	
	0	0	0	0	0.333333333	0.333333333	0.333333333	0			
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2004	1	3	1	0	1	34	34	3.290908	0	0	
	0	0	0	0	0.25	0.5	0	0.25	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	1	0	1	35	35	2.145454	0	0	
	0	0	0	0	0	0.5	0.5	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	1	0	1	36	36	5.363635	0	0	
	0	0	0	0	0	0.2	0.2	0	0.4	0	0
	0.2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	1	0	1	38	38	1.072727	0	0	
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	1	0	1	39	39	3.218181	0	0	
	0	0	0	0	0	0	0.333333333	0	0.333333333		
	0.333333333	0	0	0	0	0	0	0	0	0	
	0	0	0	0	0	0	0				
2004	1	3	1	0	1	40	40	1.072727	0	0	
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	1	0	1	42	42	1.072727	0	0	
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	2	0	1	3	3	2.145454	0	0	
	0	0	0	0	0	0	0	0	0	0	0
	0	0.5	0.5	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	2	0	1	4	4	2.145454	0	0	
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0							

2004	1	3	2	0	1	5	5	1.145454		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	2	0	1	6	6	1.072727		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	2	0	1	8	8	3.218181		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.333333333		0	0.666666667		0	0	0	0	0
	0	0	0	0	0	0					
2004	1	3	2	0	1	9	9	3.5045445		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.857142857		0.142857143		0	0	0	0	0
	0	0	0	0	0	0					
2004	1	3	2	0	1	10	10	6.436362		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.166666667		0.833333333		0	0	0	0	0
	0	0	0	0	0	0					
2004	1	3	2	0	1	11	11	5.436362		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.166666667		0.833333333		0	0	0	0	0
	0	0	0	0	0	0					
2004	1	3	2	0	1	12	12	5.363635		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.8	0.2	0	0	0	0	0	0
	0	0	0	0							
2004	1	3	2	0	1	13	13	12.945451		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.076923077		0.692307692		0.076923077		0.076923077		0
	0	0	0	0.076923077		0	0	0	0		
2004	1	3	2	0	1	14	14	5.436362		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.666666667		0.333333333		0	0	0	0
	0	0	0	0	0	0					
2004	1	3	2	0	1	15	15	10.72727		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.1	0.8	0.1	0	0	0	0	0
	0	0	0	0							
2004	1	3	2	0	1	16	16	6.436362		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.166666667		0.833333333		0	0	0	0
	0	0	0	0	0	0					
2004	1	3	2	0	1	17	17	11.3045415		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.068965517		0.586206897		0.275862069		0.068965517	
	0	0	0	0	0	0	0	0			
2004	1	3	2	0	1	18	18	5.363635		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.4	0.6	0	0	0	0	0
	0	0	0	0							
2004	1	3	2	0	1	19	19	8.654543		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.444444444		0.555555556		0	0	0
	0	0	0	0	0	0					
2004	1	3	2	0	1	20	20	3.218181		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0							
2004	1	3	2	0	1	21	21	3.290908		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.5	0.5	0	0	0	0	0
	0	0	0	0							
2004	1	3	2	0	1	22	22	4.290908		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.25	0	0.25	0.5	0	0	0
	0	0	0	0							
2004	1	3	2	0	1	23	23	3.218181		0	0
	0	0	0	0	0	0	0	0	0	0	0

```
        0       0       0       0       0.333333333     0.333333333     0       0.333333333
        0       0       0       0       0       0       0
2004    1       3       2       0       1       24      24      5.363635        0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0.2     0.2     0       0.2     0       0.2     0.2     0
        0       0       0       0
2004    1       3       2       0       1       25      25      1.072727        0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       1       0
        0       0       0       0
2004    1       3       2       0       1       26      26      1.072727        0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       1       0       0
        0       0       0       0


# NWFSC 357 lines
2003    1       4       1       0       1       2       2       1.072727        1       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0
2003    1       4       1       0       1       3       3       2.145454        1       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0
2003    1       4       1       0       1       4       4       1.072727        1       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0
2003    1       4       1       0       1       5       5       7.581816        0.876681913
        0.123318087     0       0       0       0       0       0       0       0       0
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2003    1       4       1       0       1       14      14      22.599994       0
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2005	1	4	2	0	1	10	10	4.290908		0	0
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2005	1	4	2	0	1	12	12	4.290908		0	0
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2005	1	4	2	0	1	15	15	11.799997		0	0
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2005	1	4	2	0	1	21	21	6.436362		0	0
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2005	1	4	2	0	1	23	23	4.290908		0	0
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2005	1	4	2	0	1	25	25	1.072727		0	0
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2005	1	4	2	0	1	26	26	1.072727		0	0
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2006	1	4	1	0	1	1	1	1.072727		1	0
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2006	1	4	1	0	1	5	5	1.145454		0	1
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2006	1	4	1	0	1	7	7	5.363635		0	1
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2006	1	4	1	0	1	8	8	5.436362		0	
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2006	1	4	1	0	1	10	10	6.436362		0	1
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2006	1	4	2	0	1	16	16	12.945451		0	0
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	0.053810893		0	0	0	0	0	0	0	0	
2006	1	4	2	0	1	17	17	10.72727		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.077675756		0.588341681		0.333982564		0	0
	0	0	0	0	0	0	0				
2006	1	4	2	0	1	18	18	18.309086		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.101709058		0.161931143		0.640709819		0.09564998	
	0	0	0	0	0	0	0	0			
2006	1	4	2	0	1	19	19	13.018178		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.296750085		0.213212892		0.368897569		0.121139454	
	0	0	0	0	0	0	0	0			
2006	1	4	2	0	1	20	20	8.72727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.225754944		0.668618223		0.105626833		0	0
	0	0	0	0	0	0					
2006	1	4	2	0	1	21	21	8.654543		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.062678018		0.6894582		0.12448204		
	0.123381741		0	0	0	0	0	0	0		
2006	1	4	2	0	1	22	22	10.72727		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.022758755		0.168721128		0.727142081		
	0.081378035		0	0	0	0	0	0	0		
2006	1	4	2	0	1	23	23	5.436362		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0.447626838		0.084700802		0.46767236	
	0	0	0	0	0	0	0				
2006	1	4	2	0	1	24	24	4.290908		0	0
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	0	0	0	0	0.082393622		0.162232323		0	0	
	0.755374055		0	0	0	0	0	0			
2006	1	4	2	0	1	25	25	1.072727		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0							
2007	1	4	1	0	1	1	1	1.072727		1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	4	1	0	1	2	2	6.509089		0.445491126	
	0.554508874		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2007	1	4	1	0	1	3	3	3.218181		0.274853801	
	0.725146199		0	0	0	0	0	0	0	0	0
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2007	1	4	1	0	1	4	4	6.581816		0	1
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	0	0	0	0							
2007	1	4	1	0	1	5	5	3.290908		0	1
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	4	1	0	1	6	6	1.072727		1	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	4	1	0	1	7	7	1.072727		0	0
	1	0	0	0	0	0	0	0	0	0	0

```
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0
2007    1       4       1       0       1       8       8       1.072727        0       0
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        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0
2007    1       4       1       0       1       9       9       3.218181        0       1
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        0       0       0       0
2007    1       4       1       0       1       10      10      3.218181        0
        0.480639264     0.519360736     0       0       0       0       0       0       0
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2007    1       4       1       0       1       11      11      7.509089        0
        0.238440716     0.761559284     0       0       0       0       0       0       0
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        0       0       0       0       0       0       0
2007    1       4       1       0       1       12      12      4.363635        0
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        0       0       0       0       0       0       0
2007    1       4       1       0       1       13      13      4.290908        0       0
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        0       0       0       0
2007    1       4       1       0       1       14      14      3.218181        0       0
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2007    1       4       1       0       1       15      15      7.509089        0       0
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2007    1       4       1       0       1       16      16      8.654543        0
        0.223989096     0.25757151      0.518439394     0       0       0       0       0
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        0       0       0       0       0       0       0       0
2007    1       4       1       0       1       17      17      4.290908        0       0
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        0       0       0       0       0       0       0       0
2007    1       4       1       0       1       18      18      6.509089        0       0
        0.271251207     0.605801466     0.122947327     0       0       0       0       0
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        0       0       0       0       0       0       0
2007    1       4       1       0       1       19      19      8.581816        0       0
        0       0.494646624     0.392825675     0.112527701     0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0
2007    1       4       1       0       1       20      20      9.799997        0       0
        0.067042801     0.388677712     0.282674699     0.261604788     0       0       0
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2007    1       4       1       0       1       21      21      8.581816        0       0
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2007    1       4       1       0       1       22      22      12.945451       0       0
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2007    1       4       1       0       1       24      24      8.581816        0       0
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	0	0	0	0	0	0					
2007	1	4	2	0	1	8	8	2.145454		0	0
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	0	0	0	0							
2007	1	4	2	0	1	9	9	4.290908		0	0
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	0	0	0	0	0	0					
2007	1	4	2	0	1	10	10	2.145454		0	0
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	0	0	0	0							
2007	1	4	2	0	1	11	11	1.072727		0	0
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	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	4	2	0	1	12	12	7.581816		0	0
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2007	1	4	2	0	1	13	13	5.363635		0	0
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	0	0	0	0	0	0	0				
2007	1	4	2	0	1	14	14	6.509089		0	0
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2007	1	4	2	0	1	15	15	7.509089		0	0
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	0	0	0	0							
2007	1	4	2	0	1	16	16	7.509089		0	0
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2007	1	4	2	0	1	17	17	5.363635		0	0
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2007	1	4	2	0	1	18	18	10.72727		0	0
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2007	1	4	2	0	1	19	19	7.509089		0	0
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2007	1	4	2	0	1	20	20	3.218181		0	0
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2007	1	4	2	0	1	21	21	3.218181		0	0
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	0	0	0	0	0	0					
2007	1	4	2	0	1	22	22	2.145454		0	0
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	0	0	0	0							
2007	1	4	2	0	1	23	23	1.072727		0	0
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	0	0	0	0							

2007	1	4	2	0	1	24	24	3.218181		0	0
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2007	1	4	2	0	1	25	25	3.218181		0	0
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2008	1	4	1	0	1	1	1	2.218181		1	0
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2008	1	4	1	0	1	2	2	5.7954525		0.940893158	
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2008	1	4	1	0	1	5	5	1.072727		1	0
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2008	1	4	1	0	1	7	7	15.236359		0.18703204	
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2008	1	4	1	0	1	10	10	5.363635		0	
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	0	0	0	0	0	0	0	0	0	0	0
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0 0 0 0 0 0 0 0 0
2008 1 4 1 0 1 25 25 14.090905 0 0
0 0.050678317 0.084668889 0.421510692 0.283335249 0
0.123430674 0.036376178 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
2008 1 4 1 0 1 26 26 16.5227225 0 0
0 0 0.270496182 0.22036473 0.383216386 0.125922703 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2008 1 4 1 0 1 27 27 11.945451 0 0
0 0 0.280280318 0.182020399 0.246788028 0.290911255 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2008 1 4 1 0 1 28 28 7.509089 0 0
0 0 0.12152258 0.492858034 0.385619386 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
2008 1 4 1 0 1 29 29 7.509089 0 0
0 0 0.101022499 0.116458804 0.236599852 0.322570914
0.223347931 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
2008 1 4 1 0 1 30 30 9.0136335 0 0
0 0 0 0.024548427 0.411054196 0.148452481 0.415944896
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2008 1 4 1 0 1 31 31 9.654543 0 0
0 0 0.123231641 0.119586933 0.196571274 0.560610151 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2008 1 4 1 0 1 32 32 6.509089 0 0
0 0 0 0 0.545645823 0.21850841 0.235845767 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
2008 1 4 1 0 1 33 33 6.436362 0 0
0 0 0 0.344702035 0.102194703 0.212738939 0.241293672
0.099070651 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
2008 1 4 1 0 1 34 34 1.072727 0 0
0 0 0 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0

2008 1 4 1 0 1 36 36 1.072727 0 0
0 0 0 0 0 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2008 1 4 1 0 1 37 37 1.072727 0 0
0 0 0 0 0 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2008 1 4 1 0 1 39 39 1.072727 0 0
0 0 0 0 0 0 0 0 0 0 0
1 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2008 1 4 2 0 1 1 1 8.654543 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0.889746956 0.110253044 0 0 0 0 0 0
0 0 0 0 0 0
2008 1 4 2 0 1 2 2 6.7227255 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0.942746 0.057254 0 0 0 0 0 0
0 0 0 0 0 0
2008 1 4 2 0 1 3 3 2.218181 0 0
0 0 0 0 0 0 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 0
0 0 0 0
2008 1 4 2 0 1 4 4 2.145454 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0
0 0 0 0
2008 1 4 2 0 1 5 5 4.290908 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0.525550855 0.474449145 0 0 0 0 0 0
0 0 0 0 0 0
2008 1 4 2 0 1 6 6 4.363635 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0.127982157 0.872017843 0 0 0 0 0 0
0 0 0 0 0 0
2008 1 4 2 0 1 7 7 3.290908 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0.866303788 0.133696212 0 0 0 0 0
0 0 0 0 0 0
2008 1 4 2 0 1 8 8 7.654543 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0.120497168 0.779558537 0.099944295 0 0 0 0
0 0 0 0 0 0 0
2008 1 4 2 0 1 9 9 3.218181 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0.401852374 0.303282152 0.294865474 0 0 0 0
0 0 0 0 0 0 0
2008 1 4 2 0 1 10 10 1.072727 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0
0 0 0 0
2008 1 4 2 0 1 12 12 1.072727 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 1 0 0 0 0 0 0 0
0 0 0 0
2008 1 4 2 0 1 13 13 2.145454 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0.511041357 0.488958643 0 0 0 0
0 0 0 0 0 0
2008 1 4 2 0 1 14 14 3.218181 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0.605523285 0 0.394476715 0 0 0
0 0 0 0 0 0
2008 1 4 2 0 1 15 15 9.72727 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0.337008951 0.559331664 0 0.103659385 0 0
0 0 0 0 0 0
2008 1 4 2 0 1 16 16 8.8681795 0 0
0 0 0 0 0 0 0 0 0 0 0

```
        0       0       0       0.11097036      0.627393181     0.261636459     0       0
        0       0       0       0       0       0       0
2008    1       4       2       0       1       17      17      6.7227255       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0.354597358     0.339952136     0.152169829
        0.153280677     0       0       0       0       0       0       0
2008    1       4       2       0       1       18      18      9.72727 0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0.576076365     0.10063183      0.220522439     0.102769366
        0       0       0       0       0       0       0
2008    1       4       2       0       1       19      19      3.8272715       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0.221221069     0.717201638     0.061577293     0
        0       0       0       0       0       0       0
2008    1       4       2       0       1       20      20      4.5772715       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0.305189094     0.279827954     0.187684486
        0       0       0.227298466     0       0       0       0
2008    1       4       2       0       1       21      21      6.436362        0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0.489598252     0       0.510401748
        0       0       0       0       0       0
2008    1       4       2       0       1       22      22      9.0136335       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0.061245658     0.105198317     0.349845776
        0.277661776     0.206048473     0       0       0       0       0       0
2008    1       4       2       0       1       23      23      4.290908        0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0.202763178     0.334443462
        0.46279336      0       0       0       0       0       0
2008    1       4       2       0       1       24      24      4.290908        0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0.274302829     0.431562418
        0.294134752     0       0       0       0       0       0
2008    1       4       2       0       1       26      26      0.2863635       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       1       0       0       0
        0       0       0       0
2008    1       4       2       0       1       30      30      0.2863635       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       1       0       0       0       0
        0       0       0       0
2008    1       4       2       0       1       32      32      1.072727        0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       1       0       0
        0       0       0       0

0   # Mean Size at Age Observations
0       # Total number of environmental variables
0       # Total number of environmental observations
0       # No Weight frequency data
0       # No tagging data
0       # No morph composition data

999 # End data file
```

Control File

```
# Lingcod control file North
# for SS v3.x
#July15, 2009
#catch data from washington updated

# Morph setup
1       # Number of growth patterns
1       # N sub morphs within growth patterns

1 # Blocks
1  # blocks in each design
```

```
#1973  1982  1983 1992  1993 1997  1998 2002 2003 2008
1998  2008

# Mortality and growth specifications
0.5     # Fraction female at birth
1       # M setup: 0=single
Par,1=N_breakpoints,2=Lorenzen,3=agespecific;_4=agespec_withseasinterpolate
2       # Number of M breakpoints
11 13   # Ages at M breakpoints
1        # Growth model: 1=VB with L1 and L2, 2=VB with A0 and Linf, 3=Richards, 4=Read
vector of L@A
1       # Age for growth Lmin
20      # Age for growth Lmax or 999 = Linf
0.0     # SD constant added to LAA (0.1 mimics v1.xx for compatibility only)
0       # Variability about growth: 0=CV~f(LAA) [mimic v1.xx], 1=CV~f(A), 2=SD~f(LAA),
3=SD~f(A)
1       # Maturity option: 1=length logistic, 2=age logistic, 3=read age-maturity matrix
by growth_pattern
1       # First age allowed to mature
1        # fecundity option - ?
0        # hermaphro
1       # mg parm offset option:
#old key: 1=direct assignment, 2=each pat. x gender offset from pat. 1 gender 1,
3=offsets as SS2 V1.xx with M old and CV old offset from young values
#new key: 1=none, 2= M, G, CV_G as offset from female-GP1, 3=like SS2 V1.x)

1       # mg parm adjust method 1=do V1.23 approach, 2=use logistic transform between
bounds approach

# Maturity & Growth Parameters
# min   max   init     prior pr_type  sd      phase   env     UseDev  Minyr   Maxyr   DevSD
        use_bl bl_type
0.05    0.25    0.18    0.19    0       99      -3      0       0       0       0       0.5
        0       0       #M1_natM_young
0.05    0.25    0.18    0.19    0       99      -4      0       0       0       0       0.5
        0       0       #M1_natM_old
10      60      30      42.5    0       99      2       0       0       0       0       0.5
        0       0       #M1_Lmin
40      140     118     120     0       99      -2      0       0       0       0       0.5
        0       0       #M1_Lmax
0.01    0.5     0.1041  0.105   0       99      3       0       0       0       0       0.5
        0       0       #M1_VBK
0.01    0.5     0.0633  0.0633  0       99      2       0       0       0       0       0.5
        0       0       #M1_CV-young
0.01    0.5     0.085   0.07    0       0.8     3       0       0       0       0       0
        0       0       # CV old
0.15    0.40    0.32    0.32    0       99      -3      0       0       0       0       0.5
        0       0       #M2_natM_young
0.15    0.40    0.32    0.32    0       99      -4      0       0       0       0       0.5
        0       0       #M2_natM_old
10      60      30      42.5    0       99      3       0       0       0       0       0.5
        0       0       #M2_Lmin
40      140     86      90      0       99      -3      0       0       0       0       0.5
        0       0       #M2_Lmax
0.01    1       0.149   0.15    0       99      3       0       0       0       0       0.5
        0       0       #M2_VBK
0.01    0.5     0.05    0.05    0       99      2       0       0       0       0       0.5
        0       0       #M2_CV-young
0.01    0.5     0.085   0.07    0       0.8     3       0       0       0       0       0
        0       0       # Male cv old

# Add 2+2*gender lines to read the wt-Len and mat-Len parameters
# Female length-weight
#       LO      HI      INIT            PRIOR   PR_type SD      PHASE
        -3      3       0.00000176  0.00000176 0       99      -3      0       0       0
        0       0.5     0       0       #Female wt-len-1 a
        -3      5       3.39780     3.39780    0       99      -3      0       0       0
        0       0.5     0       0       #Female wt-len-2 b
# Female maturity
        -3      100     68.059  0.1577  0       99      -3      0       0       0       0
        0.5     0       0       #Female mat-len-infl
```

```
	-5	5	-0.1577	68.059	0	99	-3	0	0	0	0
	0.5	0	0	#Female mat-len-slope
# Female fecundity - Same as biomass if intercept = 1 and slope = 0
	-3	3	1.	1.	0	99	-3	0	0	0	0
	0.5	0	0	#Female eggs/gm intercept
	-3	3	0.	0.	0	99	-3	0	0	0	0
	0.5	0	0	#Female eggs/gm slope
# Male length-weight
	-3	3	0.000003953	0.000003953	0	99	-3	0	0
	0	0	0.5	0	0	#Male wt-len-1
	-5	5	3.2149		3.2149		0	99	-3	0	0
	0	0	0.5	0	0	#Male wt-len-2
# Distribute recruitment among growth pattern x area x season
0	999	1	1	0	0.8	-3	0	0	0	0	0.5
	0	0	# GP 1
0	999	1	1	0	0.8	-3	0	0	0	0	0.5
	0	0	# Area 1
0	999	1	1	0	0.8	-3	0	0	0	0	0.5
	0	0	# Season 1
# Cohort growth (K) deviation parameter
-1	1	1	1	0	99	-3	0	0	1980	1983	0.5
	0	0
# Seasonal effects on biology parameters (0=none)
 0 0 0 0 0 0 0 0 0 0
# Spawner-recruit parameters

1	# SR_fxn:  1=Beverton-Holt

#LO	HI	INIT	PRIOR	Pr_type	SD	PHASE
5	20	8.22947	7.6187	0	99	2	#Ln(R0)
0.2	5	0.8	0.9	0	99	-4	#steepness
0	20	0.5	0.5	0	99	-3	#SD_recruitments
-5	5	0	0	0	99	-3	#Env_link
-5	5	0	0	0	99	-5	#_ln(init_eq_R_multiplier)
 0	2	0	1	0	50	-50		# Autocorrelation placeholder
(Future implementation)
0 # index of environmental variable to be used
0 # env target parameter: 1=rec devs, 2=R0, 3=steepness
1 # rec dev type: 0=none, 1=devvector (zero-sum), 2=simple deviations (no sum constraint)

# Recruitment residuals
1928	# Start year recruitment residuals
2007	# End year recruitment residuals
3	# Phase

1 # Read 11 advanced recruitment options: 0=no, 1=yes
0	# first year for early rec devs
-4	# phase for early rec devs
5	# Phase for forecast recruit deviations
1	# Lambda for forecast recr devs before endyr+1
1950	#_last_yr_nobias_adj_in_MPD
1964	# first year of full bias correction (linear ramp up from this year minus the
plus-age to this year)
2007	# last year for full bias correction in_MPD
2008	#_first_recent_yr_nobias_adj_in_MPD
1.0	 # Max bias correction
0	# placeholder
-15	# Lower bound rec devs
15	# Upper bound rec devs
0	 # read intitial values for rec devs

# Fishing mortality setup
0.1	# F ballpark for tuning early phases
1999	# F ballpark year
1	# F method:  1=Pope's; 2=Instan. F; 3=Hybrid (recommended)
0.9	# max F or harvest rate, depends on F_Method

#init_F_setupforeachfleet

#LO	HI	INIT	PRIOR	PR_type	SD	PHASE
0	1	0.0009	0.009	0	99	1
```

```
0	1	0.0000	0.009	0	99	-1

# Catchability (Q) setup
# A=do power: 0=skip, survey is prop. to abundance, 1= add par for non-linearity
# B=env. link: 0=skip, 1= add par for env. effect on Q
# C=extra SD: 0=skip, 1= add par. for additive constant to input SE (in ln space)
# D=type: <0=mirror lower abs(#) fleet, 0=no par Q is median unbiased, 1=no par Q is mean
unbiased, 2=estimate par for ln(Q)
#          3=ln(Q) + set of devs about ln(Q) for all years. 4=ln(Q) + set of devs about Q
for indexyr-1
# E=Units: 0=numbers, 1=biomass
# F=err_type 0=lognormal, >0=T-dist. DF=input value
# A B C D E F
  0 0 0 0 1 0 #Com_1
  0 0 0 0 1 0 #Rec_2
  0 0 0 0 1 0 #Tri_3
  0 0 0 0 1 0 #NWFSC_4
  0 0 0 0 1 0 #Logbk_5

# Selectivity Specification
#Type	Retent	Moffset	Special
#_SELEX_&_RETENTION_PARAMETERS

#Selex_type Do_retention(0/1) Do_male Mirrored_selex_number

#Length Selectivity
24	1	0	0	#Com_1
24	0	2	0	#Rec_2
24	0	0	0	#Tri_3
24	0	0	0	#NWFSC_4
5	0	0	1	#Logbk_5
#_Age	selectivity

10	0	0	0	#Com_1
10	0	0	0	#Rec_2
10	0	0	0	#Tri_3
10	0	0	0	#NWFSC_4
10	0	0	0	#Logbk_5

# Selectivity Parameter

#Low	High	Init	Prior	PrType	SD	Phase	env	usedev	minyr	maxyear	sd
	block	blswitch # 1 means that parm’ = baseparm + blockparm # 2 means that parm’
= blockparm
#Comm
35	100	45	75	0	50	2	0	0	0	0	0.5
	1	2	# Peak
-6	4	0	0	0	50	2	0	0	0	0	0.5
	1	2	# Top width
-1	9	4	4	0	50	3	0	0	0	0	0
	0	0	# Ascending width
-1	9	5	5.5	0	50	3	0	0	0	0	0
	0	0	# Descending width
-5	9	-2	-2	0	50	2	0	0	0	0	0
	0	0	# inital value
-5	9	9	5	0	50	3	0	0	0	0	0
	0	0	# Final

#retention
31	100	40	55	0	50	-2	0	0	0	0	0.5
	1	2	# Inflection
0.1	10	2	1	0	99	-2	0	0	0	0	0.5
	0	0	# Slope
0.001	1	1	1	0	99	-3	0	0	0	0	0.5
	1	2	# Asymptotic retention
0	0	0	0	0	99	-3	0	0	0	0	0.5
	0	0	# male arithmetic offset to inflection

##Recreational
```

```
35	100	50	75	0	50	2	0	0	0	0	0.5
	1	2	# Peak
-6	4	-5.9	0	0	50	-2	0	0	0	0	0
	0	0	# Top width
-1	9	4	4	0	50	3	0	0	0	0	0
	0	0	# Ascending width
-1	9	5	5.5	0	50	3	0	0	0	0	0
	0	0	# Descending width
-5	9	-4.9	-2	0	50	-2	0	0	0	0	0
	0	0	# inital value
-5	9	-4.9	5	0	50	-3	0	0	0	0	0
	0	0	# Final

30	100	58	60	0	99	2	0	0	0	0	0
	0	0	#dogleg female vs. male rec
-1	1	-.99	0	0	99	-3	0	0	0	0	0
	0	0	#log min length select relative to male
-2	1	-1.99	-.5	0	99	-3	0	0	0	0	0
	0	0	#log relative select at dogleg
-2	2	1.2	-.2	0	99	3	0	0	0	0	0
	0	0	#log relative select at maxlength # fixed since hitting bound
#Triennial
35	100	70	75	0	50	-2	0	0	0	0	0.5
	0	0	# Peak
-6	4	-0.55	0	0	50	-2	0	0	0	0	0
	0	0	# Top width
-1	9	5.34	4	0	50	-2	0	0	0	0	0
	0	0	# Ascending width
-1	9	5.2	5.5	0	50	-2	0	0	0	0	0
	0	0	# Descending width
-5	9	-1.14	-2	0	50	-2	0	0	0	0	0
	0	0	# inital value
-5	9	-4.9	5	0	50	-3	0	0	0	0	0
	0	0	# Final
#NWFSC
35	100	40	75	0	50	2	0	0	0	0	0.5
	0	0	# Peak
-6	4	-5.9	0	0	50	2	0	0	0	0	0
	0	0	# Top width
-1	9	4	4	0	50	3	0	0	0	0	0
	0	0	# Ascending width
-1	9	5	5.5	0	50	3	0	0	0	0	0
	0	0	# Descending width
-5	9	-2	-2	0	50	2	0	0	0	0	0
	0	0	# inital value
-5	9	-4.9	5	0	50	-3	0	0	0	0	0
	0	0	# Final
#logbook mirror
-2	0	-1	0	0	50	-2	0	0	0	0	0
	0	0
-2	0	-1	0	0	50	-3	0	0	0	0	0
	0	0

#Ages pattern 11
# 0	1	0.1	0.1	0	50	-2	0	0	0	0	0
	0	0
# 1	14	14	14	0	50	-3	0	0	0	0	0
	0	0

# 0	1	0.1	0.1	0	50	-2	0	0	0	0	0
	0	0
# 1	14	14	14	0	50	-3	0	0	0	0	0
	0	0

# 0	1	0.1	0.1	0	50	-2	0	0	0	0	0
	0	0
# 1	14	14	14	0	50	-3	0	0	0	0	0
	0	0

# 0	1	0.1	0.1	0	50	-2	0	0	0	0	0
	0	0
```

```
# 1    14     14     14     0     50     -3     0     0     0     0     0
       0      0

# 0    1      0.1    0.1    0     50     -2     0     0     0     0     0
       0      0
# 1    14     14     14     0     50     -3     0     0     0     0     0
       0      0

1      # Selex block setup: 0=Read one line apply all, 1=read one line each parameter
# Lo   Hi     Init   Prior  P_type SD    Phase
35     100    45     75     0      50    2
-6     4      0      0      0      50    3
31     100    40     55     0      99    3
0.1    1      0.9    0.9    0      99    3
35     100    45     75     0      50    3

1 #_env/block/dev_adjust_method (1=standard; 2=logistic trans to keep in base parm
bounds)
0 # Tagging flag: 0=none,1=read parameters for tagging

### Likelihood related quantities ###
# variance/sample size adjustment by fleet
1 # Do variance adjustments
0  0  0  0  0   # const added to survey cv
0  0  0  0  0   # const added to discard sd
0  0  0  0  0   # const added to body weight sd
1  1  1  1  1   # mult scalar for length comps
.5  .5  1  1  1   # mult scalar for age comps
1  1  1  1  1   # mult scalar for length at age obs

30     # DF discard fraction data t-distribution
30     # DF mean body weight data t-distribution

1      # Max N lambda phases: read this N values for each item below
1      # SD offset (CPUE, discard, mean body weight, recruitment devs): 0=omit log(s)
term, 1=include

5 # N changes to default Lambdas = 1.0
# Component codes:
#  1=survey
#  2=discard
#  3=mean body weight
#  4=length frequency
#  5=age frequency
#  6=Weight frequency
#  7=size at age
#  8=catch
#  9=initial equilibrium catch
#  10=rec devs
#  11=parameter priors
#  12=parameter deviations
#  13=Crash penalty
#  14=Morph composition
#  15=Tag composition
#  16=Tag return
# Component fleet/survey  phase  value  wtfreq_method
5      1      1      0      1
5      2      1      0      1
5      3      1      0      1
5      4      1      0      1
5      5      1      0      1

0 # extra SD pointer

999 # end of control file
```

B. South Model

Starter File

lingcod starter file for SS v3.x
South Model
LingS_data.SS # Data file
LingS_ctl.SS # Control file

0 # Read initial values from .par file: 0=no,1=yes
1 # DOS display detail: 0,1,2
2 # Report file detail: 0,1,2
0 # Detailed checkup.sso file (0,1)
0 # Write parameter iteration trace file during minimization
2 # Write cumulative report: 0=skip,1=short,2=full
0 # Include prior likelihood for non-estimated parameters
0 # Use Soft Boundaries to aid convergence (0,1) (recommended)
0 # N bootstrap datafiles to create
25 # Last phase for estimation
1 # MCMC burn-in
1 # MCMC thinning interval
0 # Jitter initial parameter values by this fraction
-1 # Min year for spbio sd_report (neg val = styr-2, virgin state)
-2 # Max year for spbio sd_report (-1=endyr+1, -2=entire forecast)
0 # N individual SD years
0.0001 # Ending convergence criteria
0 # Retrospective year relative to end year
2 # Min age for summary biomass
1 # Depletion basis: denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel X*B_styr
1.0 # Fraction (X) for Depletion denominator (e.g. 0.4)
1 # (1-SPR)_reporting: 0=skip; 1=rel(1-SPR); 2=rel(1-SPR_MSY); 3=rel(1-SPR_Btarget); 4=notrel
1 # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num); 3=sum(frates)
1 # F_report_basis: 0=raw; 1=rel Fspr; 2=rel Fmsy ; 3=rel Fbtgt

999 # end of file marker

Forecast File

Forecast specifications
lingcod in SS v3.x
#South Model
1 # Forecast: 0=none; 1=F(SPR); 2=F(MSY) 3=F(Btgt); 4=F(endyr); 5=Ave F (enter yrs); 6=read Fmult
2000 # First year for averaging selex to use in forecast (e.g. 2004; or use -x to be rel endyr)
2008 # Last year for averaging selex to use in forecast
1 # Benchmarks:0=skip, 1=calc Fspr, Fbtgt, Fmsy
1 # MSY: 0=none,1=F(SPR),2=calc F(MSY),3=F(Btgt),4=set to F(endyr)

0.45 # SPR target (e.g. 0.40)
0.40 # Biomass target (e.g. 0.40)
10 # Number of forecast years
1 # Read advanced options add indents below if 1
0 # Puntalyzer output: 0=no,1=yes
1999 # Rebuilder: first year catch could have been set to zero (Ydecl)
2009 # Rebuilder: year for current age structure (Yinit)
1 # Control rule method (1=west coast adjust catch; 2=adjust F)
0.4 # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40)
0.1 # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)
1 # Control rule fraction of Flimit (e.g. 0.75)
-1 # maximum annual catch during forecast (not coded yet)
0 # 0= no implementation error; 1=use implementation error in forecast (not coded yet)
0.1 # stddev of log(realized F/target F) in forecast (not coded yet)
2 # fleet allocation (in terms of F) (1=use endyr pattern, no read; 2=read below)
1.0 1.0 # relative F for forecast when using F; seasons; fleets within season
0 # Number of manual forecast catches to input
basis for forecatch: 1=retained catch; 2=total dead catch (if line above > 0)
Year Seas Fleet Catch

999 # end of forecast file

Data File

```
# data file for Lingcod in SS v3.x 2008
# Southern area = California
#June 28, 2009

### Global model specifications ###
1928     # Start year
2008     # End year
1        # N seasons per year
12       # Months per season
1        # Spawning Season
2        # N fishing fleets
4        # N surveys
1        # Number of areas
COMMERCIAL%RECREATIONAL%TRIENNIAL%NWFSC%CPUE%Dock #Names divided by "%"
0.5  0.5  0.7  0.6  0.5 0.5 #Timing of each fishery/survey (REDO for Tom Ws later)
1 1 1 1 1 1          # Area of each fleet
1 1      # Units for catch by fishing fleet: 1=Biomass(mt),2=Numbers(1000s)
0.01  0.01# SE of log(catch) by fleet for equilibrium and continuous options
2        # Number of Genders
20       # Accumulator age

### Catch section ###
# Initial equilibrium catch (landings + discard) by fishing fleet
341   0  # Fleet 1,2

81 # Number of lines catch data
# Landed catch (only) time series by fleet
# Catch(by fleet) Year          Season
387      0       1928    1
529      3       1929    1
584      6       1930    1
558      9       1931    1
400      12      1932    1
636      14      1933    1
```

389	17	1934	1
461	20	1935	1
343	23	1936	1
440	36	1937	1
351	43	1938	1
262	60	1939	1
313	63	1940	1
241	58	1941	1
143	31	1942	1
327	29	1943	1
339	24	1944	1
317	32	1945	1
525	56	1946	1
880	201	1947	1
903	220	1948	1
708	239	1949	1
833	215	1950	1
788	222	1951	1
613	158	1952	1
415	117	1953	1
406	188	1954	1
424	201	1955	1
414	274	1956	1
744	317	1957	1
693	349	1958	1
616	275	1959	1
558	230	1960	1
618	227	1961	1
476	221	1962	1
476	221	1963	1
368	215	1964	1
357	313	1965	1
359	438	1966	1
418	463	1967	1
483	447	1968	1
545	347	1969	1
749	532	1970	1
973	619	1971	1
1539	756	1972	1
1721	753	1973	1
1834	769	1974	1
1569	841	1975	1
1527	881	1976	1
875	647	1977	1
961	862	1978	1
1529	936	1979	1
1414	1335	1980	1
1304	1133	1981	1
1425	829	1982	1
1020	484	1983	1
952	477	1984	1
696	963	1985	1
541	908	1986	1
863	931	1987	1
1030	1019	1988	1
1280	940	1989	1
1072	765	1990	1
791	795	1991	1
619	772	1992	1
703	451	1993	1
572	254	1994	1
542	281	1995	1
482	361	1996	1
510	263	1997	1
151	247	1998	1
142	342	1999	1
56	199	2000	1
63	170	2001	1
81	534	2002	1
51	1021	2003	1

63	130	2004	1
61	299	2005	1
62	348	2006	1
79	174	2007	1
69	102	2008	1

50 # number of Survey data points
Triennial 9 points

1980	1	3	1877	0.35
1983	1	3	2109	0.31
1986	1	3	1093	0.45
1989	1	3	2620	0.28
1992	1	3	977	0.39
1995	1	3	790	0.31
1998	1	3	716	0.29
2001	1	3	1240	0.31
2004	1	3	3624	0.25

#NWFSC combo 6 points

2003	1	4	7630	0.23
2004	1	4	16054	0.30
2005	1	4	13060	0.28
2006	1	4	13338	0.34
2007	1	4	8090	0.33
2008	1	4	2571	0.28

#Logbook GLM 20 points

1978	1	5	5.8	0.2
1979	1	5	11.8	0.2
1980	1	5	9.6	0.2
1981	1	5	7.3	0.2
1982	1	5	7.4	0.2
1983	1	5	8.9	0.2
1984	1	5	7.6	0.2
1985	1	5	3.6	0.2
1986	1	5	3.1	0.2
1987	1	5	5.4	0.2
1988	1	5	5.6	0.2
1989	1	5	7.3	0.2
1990	1	5	6.2	0.2
1991	1	5	3.8	0.2
1992	1	5	3.1	0.2
1993	1	5	3.8	0.2
1994	1	5	3.6	0.2
1995	1	5	3.9	0.2
1996	1	5	3.1	0.2
1997	1	5	3.3	0.2

#PSMFC Dockside 15 points (last 10 after changes in regulations)

1980	1	6	0.0932	0.1408
1981	1	6	0.0925	0.2680
1982	1	6	0.0362	0.1570
1983	1	6	0.0243	0.1640
1984	1	6	0.0361	0.1713
1985	1	6	0.0338	0.1243
1986	1	6	0.0315	0.1196
1987	1	6	0.0460	0.1793
1988	1	6	0.0334	0.1543
1989	1	6	0.0341	0.1523
1993	1	6	0.0461	0.0829
1994	1	6	0.0387	0.1000
1995	1	6	0.0482	0.0884
1996	1	6	0.0457	0.0732
1997	1	6	0.0522	0.0823
#1998	1	6	0.0448	0.0880
#1999	1	6	0.0371	0.0680
#2000	1	6	0.0311	0.0895
#2001	1	6	0.0169	0.1105
#2002	1	6	0.0650	0.0678

```
#2003	1	6	0.0706	0.0549
#2004	1	6	0.0203	0.0748
#2005	1	6	0.0653	0.0613
#2006	1	6	0.0439	0.0578
#2007	1	6	0.0366	0.0636

2   # Discards Type 1 = biomass(mt), 2 = fraction of total
6   # Discards N observations
2002  1  1  0.56  0.1
2003  1  1  0.45  0.1
2004  1  1  0.40  0.1
2005  1  1  0.61  0.1
2006  1  1  0.52  0.1
2007  1  1  0.32  0.1
0   # Mean Body Weight

## Population size structure
3  # Length bin method: 1=Use data bins,
  # 2=generate from min/max/width read below
  # 3=Read count and vector below
60 # Count of population bins
# Lower edge of bins
10	12	14	16	18	20	22	24	26	28	30	32
	34	36	38	40	42	44	46	48	50	52	54
	56	58	60	62	64	66	68	70	72	74	76
	78	80	82	84	86	88	90	92	94	96	98
	100	102	104	106	108	110	112	114	116	118	120
	122	124	126	128

-1	# Minimum proportion for compressing tails of observed compositional data
0.0001	# Constant added to expected frequencies

0	# Combine males and females at and below this bin number

42 # Number of Length Bins

28	30	32	34	36	38	40	42	44	46	48	50
	52	54	56	58	60	62	64	66	68	70	72
	74	76	78	80	82	84	86	88	90	92	94
	96	98	100	102	104	106	108	110

68   # Length Composition Observations
#Year	Seas	Fleet	Gender	Part	effn
#Commercial 30 years, 78-08 missing 1991
1978	1	1	3	2	44.182	0.5	0	1	0.5	2.5	5
	20.5	6.5	2	0	1	1	4	0.5	1	1	1.5
	1.5	5	1.5	0	0	1.5	1.5	1	1	2	1.5
	0.5	1	0	1	0	1	0	0	0	0	0
	0	0	0	0.5	0	0	3.5	4.5	4	9.5	7.5
	5	2	0	1	2	3.5	1	0	1.5	7.5	2
	2.5	3	2	1.5	1.5	0	0	1	0.5	0.5	1
	0	0	0	2	0	0	0	0	0	0	0
	0
1979	1	1	3	2	67.914	3	3	3	4.5	3	10
	20.5	31.5	36.5	27	20.5	14.5	8.5	9	5.5	11	5
	6.5	4	4	6	4	4.5	6.5	5.5	4	5	4
	3	3	3	3	3	3	3	3	3	3	3
	3	3	3	3	3	3	3.5	4	4	13.5	11.5
	10.5	9	7.5	5.5	5.5	6	5.5	5	4	5.5	3
	3	5	4	3.5	3.5	4.5	3	3	3	3	3
	3	3	3	3	3	3	3	3	3	3	3
	3
1980	1	1	3	2	285.388	8	8	8	9	12	13
	13	16	17	22.5	20.5	24.5	32	48	64	66	96
	63	51	35	28	36	45	59	79	54	59	40
	37	38	35	36	29	21	23	23	12	8	8
	8	8	8	2	2	2	3	2	4	6	5
	9	11.5	24.5	30.5	25	41	54	74	71	40	36
	38	45	23	32	20	23	14	16	10	8	5
```

	7	2	7	4	3	3	2	2	2	2	2
	2										
1981	1	1	3	2	2.414	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1982	1	1	3	2	69.918	0	0	0	0	0	1
	2	2	2	3	6	9	16	23	16	13	20
	12	13	10	12	10	15	2	2	5	3	3
	3	1	1	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	2
	1	0	4	7	9	9	8	10	6	6	6
	12	4	5	3	6	0	1	1	2	1	0
	1	0	0	0	0	0	0	0	0	0	0
	0										
1983	1	1	3	2	90.854	0	0	0	1	0	0
	3	1	2	6	8.5	12.5	13.5	22.5	10.5	12	17.5
	22.5	25	13	10	17	17.5	20	11	5	4	1.5
	2.5	2	1	2	1	0	2	1	1	0	0
	0	0	0	0	0	0	0	0	1	2	2
	1	1	4.5	2.5	4.5	12.5	15.5	12	15.5	8.5	11
	4	3	4	2.5	3	2	0	1	0.5	0.5	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1984	1	1	3	2	49.844	0	0	0	0	0	0
	1	0	1	2	3	5	13	22	18	17	16
	12	13	5	9	15	12	11	9	8	3	3
	1	0	0	0	1	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	2	1	4	3	2	5	4	4	2	3
	3	1	1	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1985	1	1	3	2	20.66	0	0	0	0	1	0
	0	2	0	0	0	0	0	2	3	1	4
	2	3	5	4	3	3	5	0	9	3	5
	3	1	2	0	0	1	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	3	1	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1986	1	1	3	2	20.73	0	0	0	0	1	1.5
	1	1	5	4	15	10	6	5	2	0	1
	0	0	0	2	1	1	0	0	1	0	0
	0	0	1	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	2.5	0	0
	5	5	1	5	3	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1987	1	1	3	2	34.148	0	0	0	0	0	1
	1	2	2	6	9	7	7	16	23	8	11
	8	3	2	0	0	0	0	1	0	0	0
	1	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	1
	2	4	4	4	4	10	3	0	3	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1988	1	1	3	2	66.018	0	0	0	1	2	1
	1	3	3	11	5	10	14	20	17	12	15
	18	11	8	9	5	4	4	0	0	1	0
	2	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0

	3	4	7	12	11	14	6	9	8	4	2
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1989	1	1	3	2	33.284	0	0	0	0	0	5
	3.5	10	6	4	3	1	4.5	5	5.5	6	5
	2	0	5.5	3	4	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	8	5.5	2
	0	0	2	4	2.5	5	6.5	3	1	0	1
	1.5	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1990	1	1	3	2	2.414	0	0	0	0	0	0
	0	0	0	0	0	0	0	0.5	0.5	0	0
	0.5	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0.5	0.5	0	0	0.5	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1992	1	1	3	2	2.276	0	0	0	0	0	0
	0	0	0	0	0.5	0	0	0	0	0	0
	0	0	0	0	0.5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.5	0	0	0	0	0	0	0	0
	0	0	0.5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1993	1	1	3	2	268.988	0	0	0	0	3	13.5
	21	38	40	58.5	67.5	71.5	84.5	58.5	68	56	48.5
	48	31.5	29.5	21.5	18	26	14	16	12	8.5	6
	6.5	7	9	4.5	3	1.5	3.5	1	0	0	0
	0	0	0	0	0	0	0	4	9.5	15	25
	31	35.5	29.5	36.5	29.5	28.5	31	31	19.5	26	13.5
	12.5	10.5	9	7	3	7	1	2.5	3	1.5	2
	1	1.5	1	0.5	0.5	1	0	0	0	0	0
	0										
1994	1	1	3	2	140.742	0	0	0	0	3	4
	2	1.5	6	7	21	28.5	32	31.5	31	41	42
	23	23.5	24.5	12.5	16	14.5	13	14.5	10	12	7
	8	12	7	3	3.5	4	3	1	2.5	0	0
	0	0	1	0	0	0	0	0	0	0	1.5
	2	9	13	26.5	50	28.5	28	29	22	21	17.5
	10.5	8.5	14	7.5	1	0.5	1	1	0	0	0
	0	0	0.5	0	0	0	0.5	0	0	0	0
	0										
1995	1	1	3	2	125.83	0	0	0	0.5	0	0
	0	3	3	8	4	6.5	3	10.5	25	35	43
	30.5	25	21	17.5	20	16	12	12.5	8.5	12	11
	4.5	4.5	5	0	0	6	1	0	0	1	1
	0	0	0	0	0	0	0.5	0	0	0	1
	2	1	1	1.5	5	22.5	28	31	24	19.5	14
	13	6.5	3	5	1	1.5	1.5	0	1	0.5	0.5
	0	0	0	0	0	0	0	0	0	0	0
	0										
1996	1	1	3	2	187.494	0	0	1	0.5	0	0
	0	0	1.5	2	5	6.5	13.5	25.5	36	39	38
	27.5	21	25.5	23.5	22	33.5	17.5	13.5	11.5	10	6
	2.5	2	2	1	0	2	1.5	3	0	0	1
	0	0	0	0	0	0	0.5	0	0	0	0
	2.5	5	3	9.5	12.5	29.5	28	28	23	19.5	22
	21.5	16.5	14	8.5	6.5	3.5	5.5	3	2	0.5	0
	1	0	0	1	0.5	0	0	0	0	0	0
	0										
1997	1	1	3	2	258.632	0	0	0	0	0	0
	2	6	12.5	3.5	10.5	22.5	29	50	43.5	42.5	47
	50	40	32	20	26	42.5	48	43.5	47	25.5	35

	24.5	18.5	14	12.5	13.5	9.5	6	3	5	0	0
	0	1	2	0	0	0	1	0	1	3	1
	5.5	3.5	6.5	25.5	27	45	52.5	43.5	26	31	15
	19	13	13	5.5	10	7.5	6	4.5	2	0.5	2.5
	1	1.5	0.5	0.5	0	0	0	0	0	0	0
	0										
1998	1	1	3	2	92.232	0	0	0	0	0	0
	0	0	0.5	2.5	1	3	8.5	12	25	12.5	32
	19.5	18	14	14	15.5	9	13.5	6.5	7.5	17.5	12
	11.5	6	4	3.5	2	2	2	1	1	0	0
	0	0	3	0	0	0	0	0	0	0	0
	0.5	2.5	1	1	4.5	7	9	7.5	8	7.5	7
	3	3	8.5	4	1.5	5.5	0.5	0.5	1	0.5	0
	0	0.5	0	0	0	0	0	0	0	0	0
	0										
1999	1	1	3	2	198.146	0	0	0	0	0.5	0
	0	0	1	0	0	1.5	7	6.5	12	17	22
	32	26.5	30.5	35	39	18.5	26	19	20.5	10	15.5
	10.5	7.5	8.5	5	7	6	1.5	1.5	3.5	1	0
	0	0	1	0	0	0	0	0.5	0	0	0
	1	0	1	4.5	3	2.5	9	10	18	20	22.5
	15.5	20	20	13.5	13	8	8.5	6	5.5	4.5	3.5
	2.5	3	3	2	0.5	0.5	2.5	0	0	0	0
	0										
2000	1	1	3	2	76.018	0	0	0	0	0	0
	0	0	0	0	0	0	2	2	4	4	7
	5.5	8	8	9.5	4.5	9	14.5	7	7.5	9.5	8
	5	8	7	2.5	2.5	3.5	0.5	0	2	0	0.5
	1	0	0.5	0	0	0	0	0	0	0	0
	0	0	0	2	1	4	4	4	7	16.5	13
	9	4.5	8.5	8	6.5	7	2.5	4.5	5	1	2
	3	0.5	1.5	1.5	0.5	0	0	0	0.5	0	0
	0.5										
2001	1	1	3	2	128.406	0	0	0	0	0	0
	0	0.5	0	0	0	0.5	1	1	3.5	4.5	7.5
	11	14	24.5	21	14	18	21	12	12.5	10.5	11
	8	3	3	4	3.5	2.5	1	1.5	2.5	0	0
	0	0	0.5	0	0	0	0	0	0	1	0.5
	0	0	0	0.5	0	4	3.5	5.5	13.5	16	15
	19.5	17	19	9	14	5	9.5	3.5	2	1	3
	1	1	1.5	1.5	0	1.5	0.5	0	0	0	0
	0.5										
2002	1	1	3	2	88.748	0	0	0	0	0	0
	0	0	0	0	0	0	2	5	4	7	12.5
	28	14.5	27.5	15	14	18.5	12.5	8.5	14.5	11	6
	3.5	3	5.5	1.5	1	0	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	2	3	4	4	13.5	16	10.5
	17.5	9	14	11.5	7.5	3.5	4.5	3	2	0.5	1
	0.5	0.5	0	0	0	0	0	0	0	0	0
	0										
2003	1	1	3	2	48.736	0.5	0	0.5	0	0	0
	1	0	1	0	1	0	0	0	2	5	9.5
	16	9.5	12	7.5	7.5	12	4	1	3	4.5	1
	2.5	0	0	0.5	1	0	0	0	0	0	0
	0	0	1	0.5	0	0.5	1	1	0	0	0
	1	0	0	0	0	0	1	2	7.5	13	8.5
	4	4.5	8.5	11	1	2	0	0.5	0	0.5	0
	0	0.5	0	0	0	0	0	0	0	0	0
	0										
2004	1	1	3	2	88.23	0	0.5	6.5	2	5	1
	1	0	2	2	5	4	8	11	9	13	13
	22.5	15	29	17	15	8	10	4	15	6	5
	3	3	1	3	1	0	0	1	0	0	0
	0	0	0	0	0.5	2.5	2	4	2	1	1
	0	0	2	2	9	4	7	4	8	5.5	11
	11	6	2	1	1	4	1	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0										

2005	1	1	3	2	48.15	0	0	0	0	0	0
	0	0	0	0	0	1	2	0	3.5	5	6
	12	7	13	6	9.5	10.5	2	5.5	3	1	2
	1	1	1	0	1	1	0	0.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	2	3.5	10	5	10	11
	7	7	8.5	6.5	3	1.5	1	1	1	0	0
	0	0	0	0	0	0.5	0	0	0	0	0
	0										
2006	1	1	3	2	93.024	0	0	0	0	0	0
	0	0	0	0	0	0	3	1.5	3	1.5	5
	8.5	6.5	14	19.5	17.5	25	23	19.5	14.5	20	19.5
	14	8.5	4	3.5	1	3.5	1.5	6	2	4	2
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	1.5	2	3.5	5	3.5	8.5
	13	16.5	13.5	5	7	6.5	1.5	1	2.5	1	0.5
	0	0.5	0	0.5	0.5	0	0	0	0	0	0
	0										
2007	1	1	3	2	177.384	0	0	0	0	0	0
	0	0	0	0	0	1	0	2	2	6	15.5
	14.5	16.5	18.5	29.5	35	32	43.5	44	41	37.5	31.5
	21	22.5	11	8	10	3	4	3	3	0	3
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	2	1	0	4	9.5	13.5	15.5
	13.5	6.5	19	6	8.5	4	3	1.5	0.5	0	0.5
	0	0	0	0	0	0	0	0	0	0	0
	0										
2008	1	1	3	2	151.172	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	2
	5	10.5	9	14.5	30	27	34	37	38	44	35
	31	22.5	24	10	13	2.5	3	2	1	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	3	8	12.5
	18	11.5	8	16	2	7	1	2	2	1	0.5
	0	0	1	0.5	0	0	0	0	0	0	0
	0										

#Recreational 22 years Note these are from Field (1987-1992) combined (1993-1998 - with 3/4th of combined sample size) and from RECFIN 1999-2008 and no sex info

1987	1	2	0	2	28.4	0	0	1	0	0	0
	0	0	0	0	0	5	13	18	21	31	26
	31	24	20	17	9	8	10	9	8	1	4
	7	3	4	6	3	1	3	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1988	1	2	0	2	107.2	0	0	0	0	0	0
	0	0	3	5	11	28	43	62	111	94	100
	90	99	54	62	62	56	41	27	27	30	20
	5	11	7	6	3	3	4	1	1	1	1
	1	1	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1989	1	2	0	2	107	0	0	0	0	0	0
	1	1	4	6	8	27	33	57	115	153	104
	88	75	60	62	65	49	37	25	40	28	7
	6	6	3	6	1	1	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1990	1	2	0	2	22.3	0	0	0	0	0	0
	0	1	1	1	5	14	12	20	19	20	16
	19	14	10	11	10	9	12	6	6	9	2

	3	1	0	0	0	0	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1991	1	2	0	2	35.9	0	0	0	0	0	0
	0	0	0	3	0	5	8	19	35	38	39
	32	30	28	16	19	19	9	12	14	6	8
	7	1	4	1	0	1	1	1	1	0	1
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1992	1	2	0	2	71.8	0	0	0	0	0	0
	0	2	4	5	10	5	9	41	114	76	85
	70	51	47	35	40	24	20	20	13	9	12
	2	10	6	2	0	1	1	1	0	1	0
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1993	1	2	0	2	82.8	1	0	2	1	0	0
	1	2	5	8	15	19	39	69	137	106	99
	93	82	73	68	51	45	37	30	22	19	19
	11	10	10	7	8	6	3	2	1	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1994	1	2	0	2	72.5	1	1	1	2	3	1
	0	1	3	4	10	15	32	83	128	117	91
	68	81	58	54	54	28	25	15	18	12	10
	21	6	9	6	4	1	1	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1995	1	2	0	2	98.6	0	0	1	1	0	2
	0	0	2	3	2	6	26	98	163	175	181
	147	100	95	64	55	39	36	34	22	12	11
	9	9	2	1	6	9	3	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1996	1	2	0	2	139.3	0	0	0	0	1	1
	5	3	3	0	8	10	48	97	195	186	206
	179	140	135	124	116	91	81	56	39	43	25
	13	14	15	11	3	2	0	3	0	0	0
	0	1	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1997	1	2	0	2	182.8	1	1	0	0	0	0
	0	1	2	1	4	14	59	166	271	234	252
	224	226	173	126	121	110	87	79	59	43	28
	20	19	21	80	6	3	2	3	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										

1998	1	2	0	2	85.1	0	1	0	1	1	0
	0	2	2	1	1	4	3	8	22	92	148
	164	136	142	73	84	61	39	35	33	30	15
	8	7	7	3	4	3	0	0	2	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
1999	1	2	0	2	69.9	0	0	0	0	0	0
	0	0	1	0	0	1	3	9	19	29	81
	76	64	64	76	56	35	39	23	36	24	16
	15	7	10	7	2	0	4	1	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
2000	1	2	0	2	23.5	1	0	0	3	0	0
	0	1	1	1	0	1	0	2	2	4	5
	13	21	26	25	23	22	12	14	9	14	8
	5	2	3	5	3	3	2	1	1	0	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
2001	1	2	0	2	14.7	0	0	0	0	1	0
	1	1	0	1	1	1	0	1	2	2	3
	6	18	18	20	16	12	9	4	5	9	9
	0	2	1	1	0	0	0	0	0	0	1
	0	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
2002	1	2	0	2	84	0	1	0	0	0	0
	0	5	3	5	8	5	8	4	13	52	126
	144	112	75	56	39	30	32	23	17	23	22
	12	7	1	2	3	4	2	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
2003	1	2	0	2	140.7	0	2	2	1	2	2
	0	0	4	13	18	17	22	19	21	78	226
	196	162	154	108	86	50	49	30	29	25	17
	11	22	13	10	5	3	0	3	0	0	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
2004	1	2	0	2	113.1	0	1	0	1	0	0
	1	3	1	4	7	10	11	18	23	40	57
	76	55	50	52	45	52	79	121	118	75	45
	44	33	29	15	15	13	13	7	5	3	0
	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0										
2005	1	2	0	2	447.2	0	3	2	2	0	2
	3	2	3	7	14	21	17	26	52	174	495
	574	503	461	431	343	278	205	201	159	105	82
	59	41	51	33	25	15	27	20	20	2	3
	1	3	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

```
        0       0       0       0       0       0       0       0       0       0       0
        0
2006    1       2       0       2       426.4   0       0       3       1       4       2
        0       2       0       7       12      14      18      26      50      167     505
        520     429     399     385     317     295     207     161     152     131     93
        95      56      44      45      38      27      21      16      5       4       3
        2       1       4       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0
2007    1       2       0       2       322.1   0       2       0       1       0       0
        2       3       5       2       9       12      11      18      49      130     400
        389     370     333     258     234     190     174     123     99      88      73
        56      48      43      26      15      11      11      15      4       3       5
        3       0       4       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0
2008    1       2       0       2       254.7   0       0       0       1       0       0
        0       3       4       1       4       6       7       18      39      118     395
        371     285     267     212     191     106     111     90      89      66      35
        34      26      21      14      8       11      2       8       2       0       0
        1       0       1       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0

# Discard 4 years
2004    1       1       0       1       152     0.051076333     0.078050103     0.091679001
        0.075888051     0.036106281     0.046484134     0.031695693     0.063855026
        0.035457665     0.026809454     0.024214991     0.028128306     0.038291395
        0.05030376      0.029794604     0.019862058     0.027423684     0.040070044
        0.025261631     0.013779483     0.025625271     0.017334105     0.012885834
        0.023396708     0.00985896      0       0.00766808      0.0082158       0.014941433
        0.006053748     0.015373844     0.006120258     0.009147132     0.009147132     0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0
2005    1       1       0       1       200     0.02456214      0.014632765     0.024446008
        0.02360305      0.020131665     0.030376114     0.018811545     0.028052314
        0.0193768       0.012040094     0.044634243     0.024836352     0.039605793
        0.081803699     0.130995341     0.092815288     0.111113343     0.035632483
        0.057117859     0.057622101     0.04794124      0.023768412     0.013875455
        0.014889512     0.003658191     0.001219397     0       0.001219397     0       0
        0       0.001219397     0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
2006    1       1       0       1       31      0.105166241     0       0.09140665
        0.061381074     0.036828645     0       0       0.049104859     0       0.073657289
        0.036828645     0.09140665      0.110485934     0.036828645     0.073657289
        0.122762148     0.012276215     0       0.012276215     0       0       0.012276215
        0.049104859     0       0       0       0.02455243      0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0
2007    1       1       0       1       34      0       0       0       0       0.003331029
        0.00624568      0.00624568      0       0.002081893     0.00624568      0.00624568
        0.010409467     0.044552518     0.126853926     0.055378363     0.014573253
        0.088688657     0.1190843       0.1190843       0.089105036     0.093268822
        0.036224944     0.017487904     0.037057702     0.031644779     0.015406011
        0.068702481     0       0       0       0       0.002081893     0       0       0
```

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

#Triennial 6 years

1989.0	1	3	3	0	100.7	6.0	10.0	7.0	16.0	8.0	2.0
	1.0	5.0	4.5	9.0	13.8	13.0	12.4	6.0	4.0	7.0	8.0
	11.0	15.0	15.0	8.0	9.0	12.0	3.0	5.0	1.0	2.0	0.0
	0.0	0.0	0.0	0.0	1.0	1.0	0.0	1.0	0.0	0.0	1.0
	0.0	0.0	1.0	1.0	8.0	16.8	11.0	25.2	6.0	4.0	21.2
	2.5	12.0	3.0	4.0	3.5	1.0	7.0	7.0	11.9	7.0	8.0
	2.0	8.9	1.0	0.0	2.0	0.0	5.8	0.0	1.0	1.0	0.0
	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0										
1992.0	1	3	3	0	45.4	10.0	23.5	15.5	12.0	8.0	1.0
	4.0	2.0	4.7	5.7	5.4	5.0	0.0	2.0	0.0	2.0	0.0
	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0	0.0	1.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	6.0	13.5	13.5	11.0	6.0	2.0	1.0	3.0
	0.0	2.0	8.4	1.0	5.4	0.0	2.0	0.0	2.0	1.0	1.0
	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0										
1995.0	1	3	3	0	72.8	21.0	26.7	18.0	4.0	4.0	2.0
	2.0	1.0	8.0	10.8	1.0	1.0	1.0	2.0	2.0	2.0	2.0
	3.0	10.1	0.0	4.0	5.0	0.0	3.0	0.0	0.0	0.0	2.0
	2.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	22.0	20.0	14.0	3.0	1.0	3.0	3.0	4.0
	3.0	3.0	0.0	0.0	1.0	1.0	0.0	5.7	3.0	0.0	3.0
	1.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	2.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0										
1998.0	1	3	3	0	81.4	5.0	7.0	9.0	9.0	7.0	5.0
	7.0	13.0	26.0	8.0	4.0	4.0	5.0	3.0	2.0	1.0	4.0
	2.0	4.0	2.0	2.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
	2.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
	0.0	0.0	0.0	5.0	4.0	10.0	5.0	1.0	4.0	6.0	10.0
	6.0	8.0	3.0	2.0	0.0	6.0	4.0	4.0	5.0	4.0	3.0
	1.0	3.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0										
2001.0	1	3	3	0	138.4	26.0	30.0	10.0	14.0	15.0	31.5
	37.0	34.0	19.0	10.0	2.0	2.0	2.0	2.0	0.0	3.0	2.0
	3.0	4.0	3.0	7.0	6.0	3.0	1.0	2.0	2.0	1.0	2.0
	1.0	0.0	1.0	0.0	2.0	2.0	0.0	1.0	0.0	0.0	0.0
	0.0	0.0	0.0	22.0	10.0	7.0	6.0	10.0	21.5	18.0	24.0
	14.0	4.0	2.0	4.0	0.0	2.0	2.0	2.0	3.0	3.0	5.0
	4.0	5.0	0.0	1.0	1.0	2.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
	0.0										
2004.0	1	3	3	0	123.5	20.5	22.5	10.0	10.0	4.0	1.0
	2.0	3.5	7.7	8.0	6.0	6.0	17.0	22.7	31.5	15.5	24.4
	11.2	7.0	32.2	11.0	11.0	8.0	7.2	8.0	11.0	6.0	2.0
	1.0	3.0	2.0	4.0	1.0	0.0	2.0	0.0	1.0	1.0	0.0
	0.0	0.0	0.0	15.5	27.7	18.7	7.0	2.0	0.0	1.0	3.0
	0.0	5.0	0.0	11.0	17.2	10.5	4.0	8.7	11.2	6.0	14.0
	8.0	7.0	3.0	1.0	4.0	2.0	1.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0										

#NWFSC 6 years

2003	1	4	3	0	129	92.3	110.8	96.1	117.8	128.0	75.9
	151.7	106.0	231.6	449.0	354.4	193.4	140.4	285.8	245.3	406.3	326.6
	328.5	318.5	124.3	185.7	125.9	65.7	24.1	70.0	76.4	84.4	31.6
	70.5	26.3	0.0	12.9	0.0	0.0	0.0	12.7	0.0	0.0	0.0
	0.0	0.0	11.4	51.7	144.2	106.6	114.4	84.5	97.8	80.6	115.4
	120.5	146.2	143.7	233.0	110.3	238.7	163.3	149.4	205.6	81.1	87.1

	27.2	0.0	23.6	11.4	0.0	0.0	13.2	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0										
2004	1	4	3	0	145	249.6	369.5	384.6	294.3	453.7	330.4
	229.5	117.0	128.2	237.3	97.5	405.9	685.2	735.2	741.0	851.9	501.6
	464.0	638.2	859.4	330.4	262.7	111.0	124.9	92.7	59.7	113.9	16.7
	0.0	0.0	0.0	0.0	22.1	16.7	16.7	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	137.9	182.1	193.9	276.8	307.9	229.3	53.6	44.6
	64.5	169.0	146.2	456.3	473.2	532.1	914.7	352.6	509.4	371.3	334.3
	133.8	116.6	38.6	24.3	12.0	0.0	25.5	0.0	0.0	0.0	0.0
	11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0										
2005	1	4	3	0	114	33.2	69.3	95.3	179.8	196.9	166.4
	86.9	35.0	98.4	201.5	149.0	186.5	87.4	168.9	185.5	170.2	535.2
	279.7	503.9	733.5	680.2	513.1	531.3	565.3	722.8	485.6	478.6	644.1
	21.2	213.0	24.9	12.4	0.0	176.4	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	59.7	158.8	58.9	27.7	99.8	68.2	87.9	63.1
	15.0	230.2	120.8	48.4	42.4	159.1	262.9	271.8	394.5	289.5	375.8
	287.7	289.0	233.6	38.9	85.2	36.7	22.8	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0										
2006	1	4	3	0	67	0.0	198.6	96.4	78.9	24.3	18.5
	0.0	26.4	98.1	25.0	222.5	134.7	137.7	229.4	263.5	170.9	92.9
	265.0	308.5	216.8	623.6	450.4	569.2	738.9	395.2	520.9	291.8	173.2
	392.3	234.8	22.2	87.9	38.6	79.5	0.0	26.9	0.0	21.2	0.0
	0.0	0.0	0.0	0.0	47.5	87.1	42.5	49.4	22.4	0.0	27.0
	22.2	22.2	131.2	51.9	74.0	153.9	432.7	121.3	733.6	457.2	470.8
	104.7	403.2	841.9	585.8	363.6	339.6	23.6	144.2	165.4	0.0	0.0
	144.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0										
2007	1	4	3	0	59	46.9	23.5	49.6	45.7	45.7	0.0
	0.0	41.8	152.2	18.0	22.2	85.8	373.0	495.9	193.8	431.3	36.0
	386.3	226.9	221.3	136.0	433.5	231.2	600.8	384.4	364.9	201.5	243.4
	114.3	303.1	19.4	188.2	0.0	188.2	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	20.5	24.5	26.1	0.0	0.0	0.0	0.0	0.0
	0.0	22.6	117.4	72.7	59.3	140.5	96.3	140.2	141.8	83.5	24.5
	368.6	76.1	116.7	0.0	179.8	0.0	50.0	23.7	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0										
2008	1	4	3	0	93	100.0	273.6	71.5	172.0	33.2	20.8
	0.0	0.0	0.0	0.0	0.0	0.0	58.9	24.0	0.0	10.4	16.1
	66.5	11.7	43.9	93.5	66.0	66.4	125.5	66.6	149.6	34.0	58.9
	0.0	222.4	45.7	0.0	10.9	0.0	0.0	46.5	0.0	0.0	0.0
	0.0	0.0	0.0	28.7	123.3	100.9	77.0	10.9	12.3	0.0	0.0
	0.0	12.9	0.0	18.6	29.6	0.0	30.4	39.7	42.5	0.0	0.0
	33.1	101.5	0.0	10.9	9.8	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0										

14 # Number of Age Bins
1 2 3 4 5 6 7 8 9 10 11 12 13 14

1 # Number of Aging Error Matrices

0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5
	12.5	13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5		
0.4	0.4	0.41	0.43	0.45	0.51	0.59	0.67	0.76	0.86	0.95	1.05
	1.14	1.24	1.33	1.43	1.53	1.63	1.73	1.83	1.93		

923 # Number of age comp observations using restricted length ranges ***
2 # Length bin refers to: 1=population length bin indices; 2=data length bin indices; 3= actual pop? data? lengths match bins?
0 #_combine males into females at or below this bin number
#Year Seas Fleet Gender Part

#Commerical 422 lines 1993 - 1998,2001-2004

1993	1	1	1	0	1	5	5	2	0	2	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	6	6	8	0	8	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	7	7	12	0	11	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	8	8	24	0	18	6
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	9	9	27.5	0	12	13.5
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	10	10	48	0	9	33
	4	1	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	11	11	50	0	3	34
	11	1	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	12	12	49	0	1	30
	15	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	13	13	59	0	0	17
	33	9	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	14	14	44	0	0	10
	28	6	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	15	15	48	0	0	1
	23	17	4	2	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	16	16	39	0	0	1
	12	20	6	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	17	17	33	0	0	1
	10	18	3	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	18	18	33	0	0	0
	4	11	16	1	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	19	19	19	0	0	0
	0	6	11	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	20	20	10	0	0	0
	0	3	3	4	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	21	21	13	0	0	0
	0	4	6	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	22	22	9	0	0	0
	0	0	1	5	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1993	1	1	1	0	1	23	23	18	0	0	1
	0	0	5	5	4	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	24	24	11	0	0	0
	0	0	2	3	5	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	25	25	7	0	0	0
	0	0	1	3	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	26	26	7	0	0	0
	0	0	0	4	2	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	27	27	6	0	0	0
	0	0	0	1	2	0	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	28	28	4	0	0	0
	1	0	0	1	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	29	29	2	0	0	0
	0	0	0	0	0	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	30	30	4	0	0	0
	0	0	0	2	0	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	31	31	5	0	0	0
	0	0	0	0	1	2	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	32	32	3	0	0	0
	0	0	0	0	0	0	2	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	33	33	2	0	0	0
	0	0	0	0	0	0	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	34	34	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	1	0	1	35	35	3	0	0	0
	0	0	0	0	0	0	1	0	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	5	5	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	3	0	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	6	6	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	3	1	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	7	7	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	4	0	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	8	8	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	6	7	0	0	0	1	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	9	9	13.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	4	4.5	5	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	10	10	22	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	12	8	0	0	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	11	11	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	7	9	1	0	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	12	12	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	6	7	4	2	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	13	13	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	7	2	1	0	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	14	14	15	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	4	6	3	1	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	15	15	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	7	7	1	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	16	16	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	8	5	2	0	0	0	0
	0	0	0								
1993	1	1	2	0	1	17	17	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	3	5	3	0	0	0
	0	0	0								
1993	1	1	2	0	1	18	18	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	1	7	3	2	0	0
	0	0	0								
1993	1	1	2	0	1	19	19	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	4	1	1	0	0
	0	0	0								
1993	1	1	2	0	1	20	20	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	0	0	1	1	0
	0	0	0								
1993	1	1	2	0	1	21	21	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	3	4	0	0
	0	0	0								
1993	1	1	2	0	1	22	22	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	2	0	0
	0	0	0								
1993	1	1	2	0	1	23	23	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	2	0	1
	0	0	0								
1993	1	1	2	0	1	25	25	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0								
1994	1	1	1	0	1	5	5	3	2	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	6	6	4	2	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1994	1	1	1	0	1	7	7	2	0	0	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	8	8	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	9	9	3	0	2	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	10	10	4.5	0	0	4.5
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	11	11	15	0	1	7
	6	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	12	12	19	0	0	10
	7	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	13	13	27	0	0	13
	8	5	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	14	14	29	0	0	9
	14	4	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	15	15	29	0	0	2
	16	6	4	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	16	16	36	0	0	0
	16	15	4	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	17	17	33	0	0	0
	5	16	11	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	18	18	20	0	0	0
	5	4	6	4	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	19	19	21	0	0	0
	0	8	6	6	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	20	20	22	0	0	0
	1	3	11	6	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	21	21	12	0	0	0
	1	2	6	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	22	22	15	0	0	0
	0	0	6	6	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	23	23	11	0	0	0
	0	0	3	5	2	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	24	24	9	0	0	0
	0	0	2	2	1	4	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	25	25	7	0	0	0
	0	0	0	1	2	4	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	26	26	9	0	0	0
	0	0	0	4	2	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	27	27	10	0	0	0
	0	0	0	1	6	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	28	28	3	0	0	0
	0	0	0	0	0	1	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	29	29	6	0	0	0
	0	0	0	0	3	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	30	30	5	0	0	0
	0	0	0	0	0	2	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	31	31	5	0	0	0
	0	0	0	0	1	1	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	32	32	2	0	0	0
	0	0	0	0	0	0	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	34	34	2	0	0	0
	0	0	0	0	0	0	1	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	35	35	3	0	0	0
	0	0	0	0	0	0	0	2	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	36	36	1	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	37	37	2	0	0	0
	0	0	0	0	0	0	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	1	0	1	42	42	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	8	8	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	9	9	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	10	10	7.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	2.5	4	0	0	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	11	11	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	6	2	0	0	0	0	0	0
	0	0	0								

1994	1	1	2	0	1	12	12	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	6	4	4	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	13	13	44	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	7	15	14	8	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	14	14	27	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	9	15	1	0	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	15	15	26	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	5	9	8	4	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	16	16	26	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	10	10	3	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	17	17	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	10	4	0	0	0	0
	0	0	0								
1994	1	1	2	0	1	18	18	18	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	9	5	2	1	1	0
	0	0	0								
1994	1	1	2	0	1	19	19	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	4	7	0	2	0	0
	0	0	0								
1994	1	1	2	0	1	20	20	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	3	4	0	0	0
	0	0	0								
1994	1	1	2	0	1	21	21	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	3	3	0	0
	0	0	0								
1994	1	1	2	0	1	22	22	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	3	4	1
	1	0	0								
1994	1	1	2	0	1	23	23	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	1	1
	0	0	0								
1994	1	1	2	0	1	24	24	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
1995	1	1	1	0	1	8	8	3	0	0	2
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	9	9	3	0	0	3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	10	10	7	0	0	5
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	11	11	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	12	12	3	0	0	0
	3	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	13	13	2	0	0	0
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	14	14	2	0	0	0
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	15	15	5	0	0	0
	4	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	16	16	14	0	0	0
	6	6	1	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	17	17	23	0	0	0
	3	13	5	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	18	18	17	0	0	0
	0	9	8	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	19	19	17	0	0	0
	0	6	10	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	20	20	17	0	0	0
	0	4	6	5	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	21	21	10	0	0	0
	0	1	5	3	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	22	22	15	0	0	0
	0	0	6	6	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	23	23	12	0	0	0
	0	0	4	3	2	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	24	24	10	0	0	0
	0	0	1	6	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	25	25	8	0	0	0
	0	0	2	2	3	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	26	26	5	0	0	0
	0	0	0	0	3	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	27	27	10	0	0	0
	0	0	0	1	7	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	28	28	8	0	0	0
	0	0	0	0	6	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	29	29	3	0	0	0
	0	0	0	0	1	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1995	1	1	1	0	1	30	30	1	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	31	31	4	0	0	0
	0	0	0	0	1	0	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	34	34	3	0	0	0
	0	0	0	0	0	0	1	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	35	35	1	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	38	38	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	1	0	1	39	39	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	2	0	1	8	8	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	2	0	1	9	9	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	2	0	1	10	10	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	1	2	0	1	13	13	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0								
1995	1	1	2	0	1	14	14	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	3	0	0	0	0	0
	0	0	0								
1995	1	1	2	0	1	15	15	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	5	3	0	0	0	0
	0	0	0								
1995	1	1	2	0	1	16	16	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	4	1	1	0	0	0
	0	0	0								
1995	1	1	2	0	1	17	17	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	4	1	0	0	0
	0	0	0								
1995	1	1	2	0	1	18	18	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	5	1	1	0	0
	0	0	0								
1995	1	1	2	0	1	19	19	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	3	1	0
	0	0	0								
1995	1	1	2	0	1	20	20	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	3	1	3	2	0
	0	0	0								
1995	1	1	2	0	1	21	21	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	2	0	1
	0	0	0								
1995	1	1	2	0	1	22	22	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0								
1995	1	1	2	0	1	23	23	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	1	0	0								
1995	1	1	2	0	1	24	24	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0								
1996	1	1	1	0	1	3	3	1	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	9	9	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	10	10	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	11	11	3	0	0	2
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	12	12	3	0	0	2
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	13	13	6	0	0	0
	4	0	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	14	14	11	0	0	2
	6	2	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	15	15	24	0	0	3
	16	4	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	16	16	22	0	0	0
	15	5	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	17	17	22	0	0	0
	6	12	2	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	18	18	14	0	0	0
	2	9	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	19	19	7	0	0	0
	0	6	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	20	20	15	0	0	0
	1	5	7	0	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	21	21	9.5	0	0	0
	0	1	3	3	2	0.5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1996	1	1	1	0	1	22	22	10	0	0	0
	0	1	5	3	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	23	23	22	0	0	0
	0	2	12	8	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	24	24	15	0	0	0
	0	3	4	6	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	25	25	10	0	0	0
	0	1	4	4	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	26	26	7	0	0	0
	0	0	2	4	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	27	27	7	0	0	0
	0	0	1	2	2	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	28	28	4	0	0	0
	0	0	0	1	1	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	29	29	2	0	0	0
	0	0	1	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	30	30	2	0	0	0
	0	0	0	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	31	31	1	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	32	32	1	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	34	34	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	35	35	1	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	1	0	1	36	36	3	0	0	0
	0	0	0	0	0	0	0	2	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	9	9	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	10	10	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	0	2	0	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	11	11	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	12	12	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	1	3	2	0	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	13	13	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	2	3	0	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	14	14	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	10	3	2	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	15	15	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	9	0	1	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	16	16	12	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	3	5	3	0	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	17	17	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	3	3	3	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	18	18	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	2	2	1	0	0	0
	0	0	0								
1996	1	1	2	0	1	19	19	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	2	1	2	0	0
	0	0	0								
1996	1	1	2	0	1	20	20	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	1	3	5	1	0	0
	0	0	0								
1996	1	1	2	0	1	21	21	7.5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	3	1	1.5	1	0
	0	0	0								
1996	1	1	2	0	1	22	22	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	0	0	0	0
	0	0	0								
1996	1	1	2	0	1	23	23	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
1996	1	1	2	0	1	24	24	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	1	0	0
	1	0	0								
1996	1	1	2	0	1	26	26	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	1	0
	0	0	0								
1997	1	1	1	0	1	7	7	2	0	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	8	8	6	0	6	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	9	9	11	0	7	4
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	10	10	2	0	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1997	1	1	1	0	1	11	11	6	0	2	4
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	12	12	16	0	0	16
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	13	13	25	0	0	21
	4	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	14	14	38	0	0	24
	13	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	15	15	31	0	0	12
	19	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	16	16	34	0	0	5
	25	3	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	17	17	38	0	0	1
	20	16	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	18	18	38	0	0	0
	15	19	3	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	19	19	30	0	0	0
	5	20	5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	20	20	24	0	0	0
	2	15	4	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	21	21	15	0	0	0
	2	10	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	22	22	21	0	0	0
	1	7	8	5	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	23	23	36	0	0	0
	0	6	24	5	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	24	24	41	0	0	0
	0	2	24	10	5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	25	25	34	0	0	0
	0	0	14	13	6	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	26	26	38	0	0	0
	0	0	18	15	4	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	27	27	22	0	0	0
	0	0	2	10	5	3	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	28	28	27	0	0	0
	0	0	1	11	9	4	2	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	29	29	20	0	0	0
	0	0	0	8	3	6	1	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	30	30	15	0	0	0
	0	0	1	6	2	3	1	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	31	31	10	0	0	0
	0	0	0	1	0	4	3	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	32	32	9	0	0	0
	0	0	0	0	1	3	1	2	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	33	33	12	0	0	0
	0	0	0	0	0	4	2	4	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	34	34	7	0	0	0
	0	0	0	0	1	1	1	3	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	35	35	6	0	0	0
	0	0	0	0	0	1	3	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	36	36	3	0	0	0
	0	0	0	0	0	0	0	2	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	37	37	5	0	0	0
	0	0	0	0	0	0	2	0	2	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	41	41	1	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	1	0	1	42	42	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	6	6	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	7	7	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	3	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	8	8	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	9	9	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	4	1	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	10	10	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	0	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	11	11	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	3	0	0	0	0	0	0	0	0
	0	0	0								

1997	1	1	2	0	1	12	12	18	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	12	5	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	13	13	23	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	17	6	0	0	0	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	14	14	36	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	19	14	1	1	0	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	15	15	41	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	11	28	2	0	0	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	16	16	35	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	6	20	7	1	1	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	17	17	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	7	10	1	0	1	0	0	0
	0	0	0								
1997	1	1	2	0	1	18	18	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	5	8	4	2	0	0	0	0
	0	0	0								
1997	1	1	2	0	1	19	19	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	3	3	1	0	0	0
	0	0	0								
1997	1	1	2	0	1	20	20	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	6	1	0	0	0
	0	0	0								
1997	1	1	2	0	1	21	21	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	1	2	1	0	0
	0	0	0								
1997	1	1	2	0	1	22	22	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	1	0	0	0
	1	0	0								
1997	1	1	2	0	1	23	23	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	1	0	0	0
	0	0	0								
1997	1	1	2	0	1	24	24	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	1	2	0	1
	0	0	0								
1997	1	1	2	0	1	25	25	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	1	0	1								
1997	1	1	2	0	1	26	26	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0								
1997	1	1	2	0	1	27	27	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0								
1997	1	1	2	0	1	30	30	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0								
1998	1	1	1	0	1	12	12	2	0	0	0
	1	0	0	0	1	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	13	13	7	0	0	0
	7	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	14	14	11	0	0	1
	7	2	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	15	15	22	0	0	1
	17	4	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	16	16	9	0	0	0
	5	4	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	17	17	24	0	0	0
	8	13	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	18	18	14	0	0	0
	2	6	3	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	19	19	13	0	0	0
	1	10	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	20	20	11	0	0	0
	1	5	5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	21	21	13	0	0	0
	0	1	7	3	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	22	22	13	0	0	0
	0	2	6	2	2	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	23	23	8	0	0	0
	0	0	4	3	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	24	24	11	0	0	0
	0	0	4	3	2	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	25	25	4	0	0	0
	0	0	0	3	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	26	26	7	0	0	0
	0	0	2	3	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	27	27	14	0	0	0
	0	0	1	7	5	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	28	28	7	0	0	0
	0	0	1	3	2	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	29	29	10	0	0	0
	0	0	0	5	1	4	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1998	1	1	1	0	1	30	30	3	0	0	0
	0	0	0	0	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	31	31	2	0	0	0
	0	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	32	32	2	0	0	0
	0	0	0	0	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	33	33	2	0	0	0
	0	0	0	0	0	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	34	34	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	35	35	1	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	36	36	1	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	1	0	1	42	42	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	13	13	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	14	14	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	4	1	0	0	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	15	15	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	5	0	1	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	16	16	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	2	1	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	17	17	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	18	18	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	3	0	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	19	19	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	1	0	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	20	20	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	21	21	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	0	0	0	0
	0	0	0								
1998	1	1	2	0	1	22	22	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	1	2	3	0	0	0
	0	0	0								
1998	1	1	2	0	1	23	23	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	1	0	0	0
	1	0	0								
1998	1	1	2	0	1	25	25	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	1
	0	1	0								
2001	1	1	1	0	1	13	13	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	14	14	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	15	15	2	0	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	16	16	4	0	0	3
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	17	17	3	0	0	3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	18	18	5	0	0	2
	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	19	19	8	0	0	4
	3	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	20	20	15	0	0	0
	8	5	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	21	21	11	0	0	0
	5	4	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	22	22	4	0	0	1
	1	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	23	23	7	0	0	0
	1	0	5	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	24	24	8	0	0	0
	0	6	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	25	25	7	0	0	0
	1	3	0	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	26	26	9	0	0	0
	0	2	4	1	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	27	27	8	0	0	0
	0	2	2	3	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2001	1	1	1	0	1	28	28	9	0	0	0
	0	0	5	3	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	29	29	5	0	0	0
	0	0	2	1	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	31	31	1	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	32	32	2	0	0	0
	0	0	0	0	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	33	33	2	0	0	0
	0	0	0	0	1	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	34	34	1	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	35	35	1	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	1	0	1	37	37	2	0	0	0
	0	0	0	0	0	0	1	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	7	7	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	14	14	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	1	1	1	0	0	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	15	15	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	0	1	0	0	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	16	16	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	1	0	0	0	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	17	17	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	3	1	0	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	18	18	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	3	6	0	0	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	19	19	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	2	3	1	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	20	20	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	2	4	1	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	21	21	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	3	1	1	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	22	22	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	1	1	2	3	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	23	23	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	24	24	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	2	0	0	0	0
	0	0	0								
2001	1	1	2	0	1	25	25	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0								
2001	1	1	2	0	1	26	26	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	0	0	0	1	2	0	0	1
	0	0	0								
2001	1	1	2	0	1	27	27	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
2002	1	1	1	0	1	13	13	2	0	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	14	14	5	0	0	4
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	15	15	4	0	0	2
	1	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	16	16	6	0	0	4
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	17	17	11	0	0	3
	8	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	18	18	23	0	1	4
	14	1	2	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	19	19	10	0	0	0
	4	4	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	20	20	22	0	0	2
	10	4	6	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	21	21	9	0	0	0
	3	4	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	22	22	11	0	0	0
	1	3	3	4	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	23	23	15	0	0	0
	3	4	7	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	24	24	10	0	0	0
	0	4	1	1	2	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2002	1	1	1	0	1	25	25	8	0	0	0
	0	4	2	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	26	26	10	0	0	0
	2	1	4	1	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	27	27	5	0	0	0
	1	0	2	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	28	28	2	0	0	0
	0	1	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	29	29	2	0	0	0
	0	0	0	0	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	30	30	2	0	0	0
	0	0	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	31	31	4	0	0	0
	0	0	0	0	1	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	32	32	1	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	1	0	1	36	36	1	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	11	11	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	13	13	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	1	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	14	14	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	1	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	15	15	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	1	0	0	0	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	16	16	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	0	1	0	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	17	17	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	4	1	2	1	0	0	0
	0	0	0								
2002	1	1	2	0	1	18	18	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	3	3	1	1	2	0	0	0
	0	0	0								
2002	1	1	2	0	1	19	19	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	2	0	1	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	20	20	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	1	2	5	1	2	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	21	21	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	4	2	1	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	22	22	12	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	5	2	1	1	0	0
	0	0	0								
2002	1	1	2	0	1	23	23	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	4	2	2	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	24	24	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	2	1	0	0	0
	0	0	0								
2002	1	1	2	0	1	25	25	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	1
	0	0	0								
2002	1	1	2	0	1	26	26	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0								
2002	1	1	2	0	1	27	27	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
2003	1	1	1	0	1	15	15	2	0	0	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	16	16	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	17	17	6	0	0	1
	3	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	18	18	11	0	0	1
	5	3	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	19	19	8	0	0	1
	3	2	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	20	20	8	0	0	0
	4	2	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	21	21	5	0	0	0
	1	1	2	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	22	22	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	23	23	7	0	0	0
	0	1	1	4	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	24	24	3	0	0	0
	0	1	0	0	0	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2003	1	1	1	0	1	25	25	1	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	26	26	1	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	27	27	2	0	0	0
	0	0	0	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	29	29	1	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	33	33	1	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	1	0	1	42	42	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	2	0	1	15	15	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	2	0	1	16	16	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	0	0	0	0	0	0	0
	0	0	0								
2003	1	1	2	0	1	17	17	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	3	1	0	0	0	0	0	0
	0	0	0								
2003	1	1	2	0	1	18	18	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	7	3	0	0	0	0	0	0
	0	0	0								
2003	1	1	2	0	1	19	19	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	5	2	0	0	0	0	0	0
	0	0	0								
2003	1	1	2	0	1	20	20	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	1	0	0	0	0	0
	0	0	0								
2003	1	1	2	0	1	21	21	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0								
2003	1	1	2	0	1	22	22	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	1	1	0	0	0
	0	0	0								
2003	1	1	2	0	1	23	23	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	1	3	1	0	0	0
	0	0	0								
2003	1	1	2	0	1	25	25	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	3	3	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	5	5	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	7	7	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	9	9	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	11	11	3	0	0	3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	12	12	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	13	13	4	0	0	4
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	14	14	6	0	0	4
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	15	15	6	0	0	4
	1	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	16	16	5	0	0	3
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	17	17	6	0	0	3
	2	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	18	18	8	0	0	0
	6	1	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	19	19	9	0	0	1
	4	2	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	20	20	12	0	0	2
	4	6	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	21	21	8	0	0	0
	6	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	22	22	11	0	0	0
	5	4	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	23	23	4	0	0	0
	0	1	1	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	24	24	8	0	0	0
	2	3	1	1	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	25	25	2	0	0	0
	0	0	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2004	1	1	1	0	1	26	26	9	0	0	0
	0	2	1	5	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	27	27	3	0	0	0
	1	1	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	1	0	1	28	28	1	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	3	3	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	5	5	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	7	7	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	11	11	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	12	12	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	1	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	13	13	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	1	0	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	14	14	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	1	1	0	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	15	15	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	0	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	16	16	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	0	1	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	17	17	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	2	2	0	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	18	18	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	1	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	19	19	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	2	0	0	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	20	20	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	2	1	1	0	0	0	0
	0	0	0								
2004	1	1	2	0	1	21	21	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	1	0	0	1	0	0	0
	0	0	0								
2004	1	1	2	0	1	22	22	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

0 0 0 0 1 0 0 0 0 0 0
0 0 0
2004 1 1 2 0 1 25 25 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 1 0 0 0 0
0 0 0

Recreational 0 lines

Triennial 192 lines
1995 1 3 1 0 1 1 1 9.95454 0.7 0.3 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0
1995 1 3 1 0 1 2 2 11.527267 0.619047619
0.380952381 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0
1995 1 3 1 0 1 3 3 7.799997 0.454545455
0.545454545 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0
1995 1 3 1 0 1 4 4 2.145454 0.5 0.5 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0
1995 1 3 1 0 1 5 5 1.072727 0 1 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0
1995 1 3 1 0 1 7 7 2.145454 0.5 0.5 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0
1995 1 3 1 0 1 8 8 1.072727 0 1 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0
1995 1 3 1 0 1 9 9 4.509089 0 0.571428571
0.428571429 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
1995 1 3 1 0 1 10 10 4.509089 0 0.857142857
0.142857143 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
1995 1 3 1 0 1 11 11 1.072727 0 0 1
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0
1995 1 3 1 0 1 12 12 1.072727 0 0 1
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0
1995 1 3 1 0 1 14 14 1.072727 0 0 1
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0
1995 1 3 1 0 1 15 15 3.218181 0 0
0.333333333 0.333333333 0.333333333 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
1995 1 3 1 0 1 16 16 1.072727 0 0 0
1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0
1995 1 3 1 0 1 17 17 1.072727 0 0 1
0 0 0 0 0 0 0 0 0 0 0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	3	1	0	1	18	18	2.290908	0	0	0.25
	0.5	0.25	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	3	1	0	1	19	19	3.218181	0	0	0
	0.333333333		0.666666667		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1995	1	3	1	0	1	21	21	2.218181	0	0	0
	0	0.333333333		0.666666667		0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1995	1	3	1	0	1	22	22	1.072727	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	3	1	0	1	23	23	1.072727	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	3	1	0	1	24	24	1.072727	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	3	1	0	1	27	27	1.072727	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	3	1	0	1	28	28	1.072727	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	3	1	0	1	33	33	1.072727	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	3	1	0	1	34	34	1.072727	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	3	2	0	1	1	1	9.299997	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.545454545		0.454545455		0	0	0	0	0	0	0
	0	0	0	0	0						
1995	1	3	2	0	1	2	2	10.163632		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.4375	0.5625	0	0	0	0	0	0	0	0
	0	0	0	0							
1995	1	3	2	0	1	3	3	10.945451		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.461538462		0.538461538		0	0	0	0	0	0
	0	0	0	0	0	0					
1995	1	3	2	0	1	4	4	2.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.25	0.75	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	3	2	0	1	6	6	4.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.25	0.25	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	3	2	0	1	7	7	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	3	2	0	1	8	8	6.436362	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.833333333		0.166666667		0	0	0	0	0	0
	0	0	0	0	0						

1995	1	3	2	0	1	9	9	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.5	0.5	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	3	2	0	1	10	10	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1995	1	3	2	0	1	11	11	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.5	0	0	0.5	0	0	0	0	0	0
	0	0	0								
1995	1	3	2	0	1	14	14	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
1995	1	3	2	0	1	15	15	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
1995	1	3	2	0	1	16	16	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.5	0	0.5	0	0	0	0	0
	0	0	0								
1995	1	3	2	0	1	17	17	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
1995	1	3	2	0	1	18	18	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0								
1995	1	3	2	0	1	19	19	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.333333333		0.666666667		0	0	0
	0	0	0	0	0						
1995	1	3	2	0	1	20	20	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0								
1995	1	3	2	0	1	22	22	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0.5	0	0.5	0	0	0
	0	0	0								
1995	1	3	2	0	1	28	28	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0								
1995	1	3	2	0	1	29	29	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
1998	1	3	1	0	1	1	1	3.290908	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	2	2	3.290908	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	3	3	6.509089	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	4	4	2.436362	0.666666667		
	0.333333333		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
1998	1	3	1	0	1	5	5	5.654543	1	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	6	6	2.290908	0.5	0.5	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	7	7	4.72727	0.3	0.7	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	8	8	4.090905	0.4	0.6	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	9	9	3.018178	0	0.857142857	
	0.142857143		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	3	1	0	1	10	10	3.436362	0	0.833333333	
	0.166666667		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	3	1	0	1	11	11	2.290908	0	0.75	0.25
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	12	12	3.290908	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	13	13	2.218181	0	0.333333333	
	0.666666667		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	3	1	0	1	14	14	1.145454	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	15	15	1.072727	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	17	17	2.145454	0	0	0.5
	0.5	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	18	18	3.218181	0	0	
	0.666666667		0	0.333333333		0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
1998	1	3	1	0	1	19	19	4.290908	0	0	0.75
	0.25	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	20	20	1.072727	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	21	21	2.145454	0	0	0.5
	0	0.5	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	24	24	1.072727	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	25	25	1.072727	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

1998	1	3	1	0	1	28	28	2.145454	0	0.5	0
	0	0	0.5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	29	29	1.072727	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	1	0	1	32	32	1.072727	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	1	1	4.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	2	2	4.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	3	3	4.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.75	0.25	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	4	4	4.581816	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	5	5	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	6	6	2.363635	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.2	0.8	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	7	7	5.436362	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	8	8	5.436362	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	9	9	6.654543	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.111111111		0.888888889		0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	3	2	0	1	10	10	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	11	11	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	12	12	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.5	0.5	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	13	13	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	14	14	2.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.5	0.5	0	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	15	15	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0.333333333		0.666666667		0	0	0	0	0	0
	0	0	0	0	0						
1998	1	3	2	0	1	16	16	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.5	0	0.5	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	17	17	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	18	18	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.333333333		0.333333333		0.333333333		0	0	0
	0	0	0	0	0	0					
1998	1	3	2	0	1	19	19	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	20	20	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.5	0	0	0.5	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	21	21	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	22	22	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	23	23	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0								
1998	1	3	2	0	1	24	24	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	1	0	1	1	1	9.945451	0.615384615		
	0.307692308		0	0.076923077		0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2001	1	3	1	0	1	2	2	8.872724	0.5	0.5	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	1	0	1	3	3	4.290908	0.75	0.25	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	1	0	1	4	4	4.654543	0.111111111		
	0.888888889		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2001	1	3	1	0	1	5	5	7.509089	0	0.714285714	
	0.285714286		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	3	1	0	1	6	6	7.945451	0.153846154		
	0.769230769		0.076923077		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2001	1	3	1	0	1	7	7	8.872724	0	0.916666667	
	0	0	0	0.083333333		0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	3	1	0	1	8	8	6.72727	0	0.7	0.3
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2001	1	3	1	0	1	9	9	5.436362	0	0.666666667	
	0.333333333		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	3	1	0	1	10	10	2.145454	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	1	0	1	12	12	1.072727	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	1	0	1	13	13	1.072727	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	1	0	1	16	16	1.072727	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	1	0	1	18	18	2.145454	0	0	0.5
	0	0.5	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	1	0	1	19	19	1.072727	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	1	0	1	21	21	2.218181	0	0	0
	0	0.333333333		0	0.333333333		0	0.333333333		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2001	1	3	1	0	1	22	22	3.218181	0	0	0
	0	0.666666667		0	0.333333333		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	3	1	0	1	25	25	2.145454	0	0	0
	0	0.5	0	0	0	0.5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	2	0	1	1	1	8.799997	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.818181818		0.181818182		0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	3	2	0	1	2	2	7.799997	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.636363636		0.363636364		0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	3	2	0	1	3	3	5.436362	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.5	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	2	0	1	4	4	3.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.25	0.75	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	2	0	1	5	5	2.363635	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.8	0.2	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	2	0	1	6	6	7.654543	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.666666667		0.333333333		0	0	0	0	0	0
	0	0	0	0	0						
2001	1	3	2	0	1	7	7	7.509089	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.285714286		0.285714286		0.428571429		0	0	0	0	0
	0	0	0	0	0	0					
2001	1	3	2	0	1	8	8	3.363635	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0.6	0.4	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	2	0	1	9	9	5.363635	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.2	0.8	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	2	0	1	10	10	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	2	0	1	11	11	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.5	0	0.5	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	2	0	1	12	12	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	2	0	1	13	13	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	2	0	1	14	14	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0								
2001	1	3	2	0	1	15	15	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0								
2001	1	3	2	0	1	16	16	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0								
2001	1	3	2	0	1	18	18	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0								
2001	1	3	2	0	1	19	19	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.5	0.5	0	0	0	0	0	0	0
	0	0	0								
2001	1	3	2	0	1	20	20	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0								
2001	1	3	2	0	1	21	21	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0								
2001	1	3	2	0	1	38	38	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1								
2004	1	3	1	0	1	1	1	11.945451		0.923076923	
	0.076923077		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	3	1	0	1	2	2	12.381813		0.421052632	
	0.578947368		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	3	1	0	1	3	3	9.654543	0.222222222		
	0.777777778		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	3	1	0	1	4	4	8.654543	0.222222222		
	0.777777778		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					

2004	1	3	1	0	1	5	5	2.145454	0.5	0.5	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	6	6	1.072727	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	7	7	2.145454	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	8	8	3.218181	0	0.333333333	
	0.666666667		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	3	1	0	1	9	9	2.145454	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	10	10	6.509089	0	0.571428571	
	0.285714286		0	0	0.142857143		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	3	1	0	1	11	11	4.363635	0	0.2	0.8
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	12	12	4.5772715		0	
	0.222222222		0.777777778		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2004	1	3	1	0	1	13	13	10.945451		0	0
	0.615384615		0.153846154		0.076923077		0	0.076923077		0	0
	0	0.076923077		0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0		
2004	1	3	1	0	1	14	14	9.945451	0	0	
	0.692307692		0.307692308		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	3	1	0	1	15	15	14.527267		0	
	0.047619048		0.380952381		0.380952381		0.095238095		0.047619048		0
	0	0.047619048		0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
2004	1	3	1	0	1	16	16	7.72727	0	0.1	0.4
	0.2	0.3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	17	17	7.509089	0	0	
	0.142857143		0.571428571		0.285714286		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2004	1	3	1	0	1	18	18	6.436362	0	0	
	0.166666667		0.666666667		0.166666667		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2004	1	3	1	0	1	19	19	4.290908	0	0	0
	0.5	0.25	0.25	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	20	20	12.018178		0	0
	0.071428571		0.5	0.142857143		0.214285714		0	0.071428571		0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			
2004	1	3	1	0	1	21	21	4.290908	0	0	0
	0	0.5	0.5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	22	22	4.290908	0	0	0
	0	0.25	0.5	0	0.25	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	23	23	6.509089	0	0	0
	0.142857143		0.714285714		0.142857143		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	3	1	0	1	24	24	4.290908	0	0	0
	0.25	0.25	0.25	0.25	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	25	25	6.581816	0	0	0
	0	0.5	0.25	0.125	0.125	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	26	26	3.218181	0	0	0
	0	0	0.333333333		0.666666667		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	3	1	0	1	27	27	2.145454	0	0	0
	0	0	0.5	0	0	0.5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	28	28	1.072727	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	29	29	1.072727	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	30	30	2.145454	0	0	0
	0	0	0.5	0	0	0	0.5	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	31	31	2.145454	0	0	0
	0	0	0	0.5	0	0.5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	32	32	3.218181	0	0	
	0.333333333		0	0	0	0	0.333333333		0.333333333		0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2004	1	3	1	0	1	33	33	1.072727	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	35	35	2.145454	0	0	0
	0	0	0.5	0	0	0	0.5	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	37	37	1.072727	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	1	0	1	38	38	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	2	0	1	1	1	8.72727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.4	0.1	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	2	0	1	2	2	16.381813		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.421052632		0.578947368		0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	3	2	0	1	3	3	9.799997	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.454545455		0.545454545		0	0	0	0	0	0	0
	0	0	0	0	0						

2004	1	3	2	0	1	4	4	6.436362	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.166666667		0.833333333		0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	3	2	0	1	5	5	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.5	0.5	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	2	0	1	7	7	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	2	0	1	8	8	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.666666667		0.333333333		0	0	0	0	0	0
	0	0	0	0	0						
2004	1	3	2	0	1	10	10	5.363635	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.2	0.8	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	2	0	1	12	12	10.0136335		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.80952381		0.19047619		0	0	0	0
	0	0	0	0	0	0					
2004	1	3	2	0	1	13	13	8.72727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.1	0.2	0.5	0.1	0	0	0	0.1	0	0
	0	0	0								
2004	1	3	2	0	1	14	14	6.436362	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.666666667		0.166666667		0.166666667		0	0	0
	0	0	0	0	0	0					
2004	1	3	2	0	1	15	15	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	2	0	1	16	16	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.5	0.5	0	0	0	0	0	0
	0	0	0								
2004	1	3	2	0	1	17	17	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	2	0	1	18	18	4.363635	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.4	0.2	0	0.2	0	0	0.2	0
	0	0	0								
2004	1	3	2	0	1	19	19	4.436362	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.166666667		0.166666667		0.5	0.166666667		0	0
	0	0	0	0	0	0					
2004	1	3	2	0	1	20	20	4.363635	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.4	0.2	0.2	0	0	0	0
	0	0.2	0								
2004	1	3	2	0	1	21	21	4.436362	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.333333333		0.5	0	0.166666667		0	0
	0	0	0	0	0						
2004	1	3	2	0	1	22	22	2.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.333333333		0	0.333333333		0.333333333		0	0
	0	0	0	0	0	0					
2004	1	3	2	0	1	23	23	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	3	2	0	1	24	24	4.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0.25	0.25	0	0	0	0	0	0.25
	0.25	0	0								
2004	1	3	2	0	1	25	25	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0								
2004	1	3	2	0	1	26	26	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0								

#NWFSC 309 lines

2003	1	4	1	0	1	1	1	5.436362	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	4	1	0	1	2	2	5.509089	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	4	1	0	1	3	3	5.363635	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	4	1	0	1	4	4	6.581816	0.506499674		
	0.493500326		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2003	1	4	1	0	1	5	5	6.436362	0.745690638		
	0.254309362		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2003	1	4	1	0	1	6	6	2.145454	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	4	1	0	1	7	7	6.436362	0.304296724		
	0.695703276		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2003	1	4	1	0	1	8	8	3.218181	0	0.656568006	
	0.343431994		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	4	1	0	1	9	9	9.654543	0	0.906638112	
	0.093361888		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	4	1	0	1	10	10	11.872724		0.089977368	
	0.847991432		0.062031199		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2003	1	4	1	0	1	11	11	11.1590875		0.130353656	
	0.705602612		0.164043732		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2003	1	4	1	0	1	12	12	8.581816	0	0.631090855	
	0.177482257		0.191426887		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2003	1	4	1	0	1	13	13	7.581816	0	0.703664192	
	0.296335808		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	4	1	0	1	14	14	7.8681795		0	
	0.423413122		0.45281788		0.123768999		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			

2003	1	4	1	0	1	15	15	10.72727	0	0	
	0.791737459		0.208262541		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2003	1	4	1	0	1	16	16	19.381813		0	0
	0.934651647		0.065348353		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2003	1	4	1	0	1	17	17	16.236359		0	0
	0.556186453		0.443813547		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2003	1	4	1	0	1	18	18	14.090905		0	
	0.069119944		0.643227041		0.287653015		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			
2003	1	4	1	0	1	19	19	9.654543	0	0	
	0.487065685		0.366350155		0.14658416		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2003	1	4	1	0	1	20	20	6.509089	0	0	
	0.409440874		0.510622711		0.079936416		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2003	1	4	1	0	1	21	21	6.436362	0	0	
	0.17536941		0.661024175		0.163606414		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2003	1	4	1	0	1	22	22	6.509089	0	0	
	0.293721004		0.465227872		0.135984263		0	0	0	0	
	0.105066861		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0		
2003	1	4	1	0	1	23	23	4.290908	0	0	0
	0.281075715		0	0.566210179		0	0	0.152714106		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2003	1	4	1	0	1	24	24	2.145454	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	4	1	0	1	25	25	4.290908	0	0	0
	0.102968758		0	0.897031242		0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	4	1	0	1	26	26	3.363635	0	0	0
	0.176044825		0.176044825		0.235932762		0.411977587		0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2003	1	4	1	0	1	27	27	4.290908	0	0	0
	0	0.229870691		0.386405472		0.383723837		0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2003	1	4	1	0	1	28	28	2.145454	0	0	0
	0	0	0	0.864990304		0.135009696		0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	4	1	0	1	29	29	4.290908	0	0	0
	0	0	0.180572035		0.393399113		0.13751327		0.288515581		0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2003	1	4	1	0	1	30	30	2.145454	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	4	1	0	1	32	32	1.072727	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	4	1	0	1	36	36	1.072727	0	0	0
	0	0	0	0	0	0	0	1	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	4	2	0	1	1	1	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	4	2	0	1	2	2	7.581816	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	4	2	0	1	3	3	5.436362	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	4	2	0	1	4	4	7.581816	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.865281821		0.134718179		0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	4	2	0	1	5	5	5.363635	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	4	2	0	1	6	6	5.363635	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.594668781		0.405331219		0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	4	2	0	1	7	7	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	4	2	0	1	8	8	4.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.158651212		0.841348788		0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	4	2	0	1	9	9	5.363635	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.142651406		0.857348594		0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	4	2	0	1	10	10	8.581816	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
2003	1	4	2	0	1	11	11	7.7954525		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.702027889		0.117583457		0.180388654		0	0	0
	0	0	0	0	0	0	0				
2003	1	4	2	0	1	12	12	7.654543	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.651411527		0.24216404		0	0	0.106424432		0	0
	0	0	0	0	0	0					
2003	1	4	2	0	1	13	13	5.363635	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.274348422		0.725651578		0	0	0	0	0
	0	0	0	0	0						
2003	1	4	2	0	1	14	14	11.1590875		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.20654027		0.539690531		0.253769199		0	0	0
	0	0	0	0	0	0	0				
2003	1	4	2	0	1	15	15	7.581816	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.594153346		0.405846654		0	0	0	0	0
	0	0	0	0	0						
2003	1	4	2	0	1	16	16	8.654543	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.797253452		0.061185308		0	0.14156124		0	0
	0	0	0	0	0	0					
2003	1	4	2	0	1	17	17	7.509089	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.389250205		0.610749795		0	0	0	0	0
	0	0	0	0	0						

2003	1	4	2	0	1	18	18	6.436362	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.502422123		0.293371806		0.20420607		0	0	0
	0	0	0	0	0	0					
2003	1	4	2	0	1	19	19	2.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.507132103		0.492867897		0	0	0	0	0
	0	0	0	0	0						
2003	1	4	2	0	1	20	20	1.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
2003	1	4	2	0	1	22	22	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.414381493		0	0	0	0.585618507		0	0
	0	0	0	0	0						
2003	1	4	2	0	1	23	23	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0								
2003	1	4	2	0	1	26	26	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
2004	1	4	1	0	1	1	1	9.0863605		0.93940443	
	0.06059557		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	4	1	0	1	2	2	16.309086		0.575092407	
	0.424907593		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	4	1	0	1	3	3	20.527267		0.528276205	
	0.471723795		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	4	1	0	1	4	4	12.018178		0.382577482	
	0.617422518		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	4	1	0	1	5	5	14.309086		0.508528791	
	0.460490222		0.030980987		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2004	1	4	1	0	1	6	6	4.290908	0.160636589		
	0.839363411		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	4	1	0	1	7	7	4.290908	0.257304455		
	0.469843993		0.272851552		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2004	1	4	1	0	1	8	8	4.290908	0	0.590852157	
	0.409147843		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	4	1	0	1	9	9	6.436362	0	0.634430348	
	0.365569652		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	4	1	0	1	10	10	3.218181	0	0.258129176	
	0.741870824		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	4	1	0	1	11	11	4.290908	0	0.873698013	
	0.126301987		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	4	1	0	1	12	12	4.290908	0	0.357108008	
	0.399391306		0.243500685		0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	4	1	0	1	13	13	9.72727	0	0.590901707	
	0.086830976	0.322267317	0	0	0	0	0	0	0		
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	4	1	0	1	14	14	6.436362	0	0	
	0.844626241	0.155373759	0	0	0	0	0	0	0		
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	4	1	0	1	15	15	12.090905	0	0	
	0.684234657	0.236611988	0.057677145	0.021476209	0	0	0				
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			
2004	1	4	1	0	1	16	16	19.381813	0	0	
	0.499866749	0.332401303	0.167731948	0	0	0	0	0			
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2004	1	4	1	0	1	17	17	14.018178	0	0	
	0.572622346	0.190880813	0.177256645	0	0.029602746	0	0				
	0.02963745	0	0	0	0	0	0	0	0	0	
	0	0	0	0	0	0	0	0	0		
2004	1	4	1	0	1	18	18	11.799997	0	0	
	0	0.540932754	0.324397305	0.134669941	0	0	0	0			
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2004	1	4	1	0	1	19	19	12.945451	0	0	
	0	0.100292914	0.740598532	0.123327216	0.035781338	0	0				
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			
2004	1	4	1	0	1	20	20	11.018178	0		
	0.060345915	0	0.65178746	0.164515615	0.063005095	0.060345915					
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	
2004	1	4	1	0	1	21	21	8.72727	0	0	0
	0.039157744	0.167722251	0.456269997	0.336850008	0	0	0				
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2004	1	4	1	0	1	22	22	4.363635	0	0	0
	0	0.080852017	0.809586252	0	0	0.109561732	0	0			
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2004	1	4	1	0	1	23	23	1.072727	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	4	1	0	1	24	24	5.363635	0	0	0
	0	0.682587698	0.095145854	0.142917794	0	0	0.079348653				
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2004	1	4	1	0	1	25	25	2.145454	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	4	1	0	1	26	26	3.218181	0	0	0
	0.12622959	0	0.87377041	0	0	0	0	0	0		
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	4	1	0	1	27	27	4.290908	0	0	0
	0	0	0.219193953	0	0.283495628	0.258199774	0.239110645				
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2004	1	4	2	0	1	1	1	6.7227255	0	0	
	0	0	0	0	0	0	0	0	0	0	0
	0	0.607311882	0.392688118	0	0	0	0	0	0		
	0	0	0	0	0	0					
2004	1	4	2	0	1	2	2	13.945451	0	0	
	0	0	0	0	0	0	0	0	0	0	0
	0	0.520112678	0.479887322	0	0	0	0	0	0		
	0	0	0	0	0	0					

2004	1	4	2	0	1	3	3	9.72727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.83340628		0.16659372		0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	4	2	0	1	4	4	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	4	2	0	1	5	5	8.654543	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.361517439		0.638482561		0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	4	2	0	1	6	6	4.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	4	2	0	1	8	8	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	4	2	0	1	9	9	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
2004	1	4	2	0	1	10	10	5.509089	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.085931695		0.544362383		0.369705922		0	0	0	0
	0	0	0	0	0	0					
2004	1	4	2	0	1	11	11	6.509089	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.64229028		0.35770972		0	0	0	0	0
	0	0	0	0	0						
2004	1	4	2	0	1	12	12	8.72727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.750452582		0.20394348		0.045603937		0	0	0
	0	0	0	0	0	0					
2004	1	4	2	0	1	13	13	16.236359		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.270077915		0.607090586		0.122831499		0	0
	0	0	0	0	0	0	0				
2004	1	4	2	0	1	14	14	9.654543	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.037280463		0.483786538		0.379303237		0.099629762		0
	0	0	0	0	0	0	0				
2004	1	4	2	0	1	15	15	16.527267		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.00887167		0.53472858		0.17236563		0.168438917		
	0.115595204		0	0	0	0	0	0	0	0	
2004	1	4	2	0	1	16	16	9.799997	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.043953561		0.259015797		0.567517233		0.129513409		0
	0	0	0	0	0	0	0				
2004	1	4	2	0	1	17	17	11.799997		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.022107371		0.19803354		0.047610719		0.684949556	
	0	0.047298814		0	0	0	0	0	0		
2004	1	4	2	0	1	18	18	4.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.061489427		0	0.111216971		0.827293602		0	0
	0	0	0	0	0	0					
2004	1	4	2	0	1	19	19	4.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.12334209		0.302668674		0.573989236		0	0
	0	0	0	0	0	0					
2004	1	4	2	0	1	20	20	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.283490095		0.716509905		0	0	0	0
	0	0	0	0	0						
2004	1	4	2	0	1	21	21	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	1	0	0	0	0	0	0
	0	0	0								
2004	1	4	2	0	1	22	22	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0.5	0	0.5	0	0	0
	0	0	0								
2004	1	4	2	0	1	23	23	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0.503479627		0.496520373		0	0
	0	0	0	0	0						
2004	1	4	2	0	1	26	26	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0								
2004	1	4	2	0	1	31	31	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0								
2005	1	4	1	0	1	1	1	1.072727	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	4	1	0	1	2	2	3.218181	0.287141693		
	0.712858307		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2005	1	4	1	0	1	3	3	5.436362	0.402738298		
	0.597261702		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2005	1	4	1	0	1	4	4	7.581816	0.269579664		
	0.616431301		0.113989035		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2005	1	4	1	0	1	5	5	5.7954525		0.267211075	
	0.626069373		0.106719552		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2005	1	4	1	0	1	6	6	7.581816	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	4	1	0	1	7	7	6.436362	0	0.572828378	
	0.312794296		0.114377326		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2005	1	4	1	0	1	8	8	3.218181	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	4	1	0	1	9	9	6.436362	0	0.307572523	
	0.692427477		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	4	1	0	1	10	10	9.654543	0.067768578		
	0.277953651		0.654277771		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2005	1	4	1	0	1	11	11	8.581816	0	0.685542829	
	0.314457171		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	4	1	0	1	12	12	6.509089	0	0.196535348	
	0.44102813		0.362436522		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2005	1	4	1	0	1	13	13	4.290908	0	0	
	0.74428596		0.25571404		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					

2005	1	4	1	0	1	14	14	10.72727	0	0	
	0.293687777		0.591447956		0.114864267		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2005	1	4	1	0	1	15	15	8.581816	0	0	
	0.621570958		0.378429042		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2005	1	4	1	0	1	16	16	7.509089	0	0	
	0.284388547		0.575304531		0.140306921		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2005	1	4	1	0	1	17	17	9.72727	0	0.06788456	
	0.233192925		0.434259726		0.26466279		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2005	1	4	1	0	1	18	18	10.945451		0	0
	0.166238884		0.659189565		0.116228341		0.05834321		0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			
2005	1	4	1	0	1	19	19	11.018178		0	0
	0.053335569		0.63425327		0.312411161		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2005	1	4	1	0	1	20	20	20.599994		0	0
	0	0.554076633		0.103700836		0.342222531		0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2005	1	4	1	0	1	21	21	15.163632		0	0
	0	0.184320064		0.750428863		0.065251073		0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2005	1	4	1	0	1	22	22	10.872724		0	0
	0	0.146114861		0.768253841		0.085631297		0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2005	1	4	1	0	1	23	23	4.363635	0	0	0
	0	0.884508878		0.115491122		0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	4	1	0	1	24	24	12.945451		0	0
	0	0.276760463		0.677188563		0.029927166		0.016123808		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			
2005	1	4	1	0	1	25	25	9.72727	0	0	0
	0.015086032		0.479928593		0.504985375		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2005	1	4	1	0	1	26	26	7.509089	0	0	0
	0	0.072648017		0.791633797		0.135718187		0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2005	1	4	1	0	1	27	27	2.145454	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	4	1	0	1	28	28	3.218181	0	0	0
	0	0.091894512		0.908105488		0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	4	1	0	1	29	29	1.072727	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	4	1	0	1	30	30	2.145454	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	4	1	0	1	31	31	2.145454	0	0	0
	0	0	1	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	4	1	0	1	32	32	1.072727	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	4	2	0	1	1	1	4.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.263223341		0.736776659		0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	4	2	0	1	2	2	6.581816	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.270953198		0.729046802		0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	4	2	0	1	3	3	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	4	2	0	1	4	4	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	4	2	0	1	5	5	7.7954525		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.445541076		0.554458924		0	0	0	0	0	0
	0	0	0	0	0	0					
2005	1	4	2	0	1	6	6	5.363635	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.403472344		0.596527656		0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	4	2	0	1	7	7	7.509089	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.655399253		0.344600747		0	0	0	0	0	0
	0	0	0	0	0						
2005	1	4	2	0	1	8	8	4.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.25535335		0.275044492		0.469602159		0	0	0	0	0
	0	0	0	0	0	0					
2005	1	4	2	0	1	9	9	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	4	2	0	1	10	10	6.436362	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0.503787455		0.496212545		0	0	0	0	0	0
	0	0	0	0	0						
2005	1	4	2	0	1	11	11	3.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.167561408		0	0.832438592		0	0	0	0	0	0
	0	0	0	0	0						
2005	1	4	2	0	1	12	12	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.765623597		0.234376403		0	0	0	0	0
	0	0	0	0	0						
2005	1	4	2	0	1	13	13	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2005	1	4	2	0	1	14	14	6.509089	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.82326775		0.17673225		0	0	0	0	0
	0	0	0	0	0						
2005	1	4	2	0	1	15	15	17.163632		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.222489534		0.613149132		0.115461977		0.048899356	
	0	0	0	0	0	0	0	0			
2005	1	4	2	0	1	16	16	10.72727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.298137224		0.607546156		0	0.09431662		0	0
	0	0	0	0	0	0					

2005	1	4	2	0	1	17	17	16.45454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.122735505		0.737875186		0.102226583		0.037162726		0
	0	0	0	0	0	0	0				
2005	1	4	2	0	1	18	18	8.72727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.09979777		0.576337368		0.125091062		0.1987738		0
	0	0	0	0	0	0	0				
2005	1	4	2	0	1	19	19	11.945451		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.034046702		0.720657912		0.245295386		0	0
	0	0	0	0	0	0	0				
2005	1	4	2	0	1	20	20	6.509089	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.903358676		0.096641324		0	0	0
	0	0	0	0	0						
2005	1	4	2	0	1	21	21	7.654543	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.709542047		0.0438456		0.163837244		0.046041362	
	0	0.036733746		0	0	0	0	0			
2005	1	4	2	0	1	22	22	4.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.359422092		0.09953211		0.470662002		0.070383797	
	0	0	0	0	0	0	0				
2005	1	4	2	0	1	23	23	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0								
2005	1	4	2	0	1	24	24	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.393546039		0.606453961		0	0	0
	0	0	0	0	0						
2005	1	4	2	0	1	25	25	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0								
2005	1	4	2	0	1	26	26	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0								
2006	1	4	1	0	1	2	2	5.436362	0.851384091		
	0.148615909		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2006	1	4	1	0	1	3	3	2.290908	0.449793701		
	0.550206299		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2006	1	4	1	0	1	4	4	3.218181	0.417122162		
	0.582877838		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2006	1	4	1	0	1	5	5	1.072727	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	4	1	0	1	6	6	1.072727	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	4	1	0	1	9	9	3.218181	0	0.685512163	
	0.314487837		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	4	1	0	1	10	10	1.072727	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	4	1	0	1	11	11	3.218181	0	0.872654882	
	0.127345118		0	0	0	0	0	0	0	0	0

0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2006 1 4 1 0 1 12 12 4.290908 0 0.657749721
0.342250279 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2006 1 4 1 0 1 13 13 2.145454 0 0.612864526
0.387135474 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2006 1 4 1 0 1 14 14 4.363635 0 0
0.637739568 0.362260432 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0
2006 1 4 1 0 1 15 15 4.290908 0 0.179901067
0.458009447 0.362089486 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0
2006 1 4 1 0 1 16 16 4.363635 0 0
0.712763317 0.287236683 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0
2006 1 4 1 0 1 17 17 2.145454 0 0
0.266005384 0.733994616 0 0 0 0 0 0 0
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0 0 0 0 0 0
2006 1 4 1 0 1 18 18 5.363635 0 0
0.162133667 0.259327958 0.578538376 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
2006 1 4 1 0 1 19 19 7.581816 0 0
0.266490954 0.305508664 0.361256211 0.066744171 0 0 0
0 0 0 0 0 0 0 0 0 0 0
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2006 1 4 1 0 1 20 20 4.436362 0 0 0
0.830966618 0.169033382 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2006 1 4 1 0 1 21 21 8.799997 0 0
0.158749291 0.571900944 0.216295828 0.053053937 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2006 1 4 1 0 1 22 22 8.72727 0 0
0.558773589 0.244898032 0.083821244 0.112507135 0 0 0
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2006 1 4 1 0 1 23 23 9.799997 0 0 0
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2006 1 4 1 0 1 24 24 7.72727 0 0 0
0.467232897 0.372729664 0.070322411 0.089715028 0 0 0
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0 0 0 0 0 0 0
2006 1 4 1 0 1 25 25 7.509089 0 0 0
0 0.35902504 0.564851124 0.076123836 0 0 0 0
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0 0 0 0 0 0
2006 1 4 1 0 1 26 26 6.436362 0 0 0
0.666245779 0.13219451 0.094190461 0.10736925 0 0 0
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2006 1 4 1 0 1 27 27 5.581816 0 0 0
0.148273397 0.62765425 0.179345106 0.044727247 0 0 0
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2006 1 4 1 0 1 28 28 7.509089 0 0 0
0 0.304582119 0.256541042 0.287585576 0.151291263 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0

2006	1	4	1	0	1	29	29	5.363635	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2006	1	4	1	0	1	31	31	1.072727	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	4	1	0	1	32	32	3.218181	0	0	0
	0	0	0	0.529823005		0.164279981		0	0	0	
	0.305897013		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2006	1	4	1	0	1	33	33	1.072727	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	4	1	0	1	34	34	2.145454	0	0	0
	0	0	0.599231262		0	0.400768738		0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	4	1	0	1	36	36	1.072727	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	4	2	0	1	2	2	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	4	2	0	1	3	3	4.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.786246003		0.213753997		0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	4	2	0	1	4	4	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.470660283		0.529339717		0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	4	2	0	1	5	5	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	4	2	0	1	6	6	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	4	2	0	1	9	9	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	4	2	0	1	10	10	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	4	2	0	1	11	11	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	4	2	0	1	12	12	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	4	2	0	1	13	13	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2006	1	4	2	0	1	14	14	4.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.168836599		0.363047156		0.468116245		0	0	0
	0	0	0	0	0	0					
2006	1	4	2	0	1	15	15	5.436362	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0.356451525		0.420848295		0.22270018		0	0	0
	0	0	0	0	0	0					
2006	1	4	2	0	1	16	16	5.363635	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.530208928		0.356490103		0.11330097		0	0	0
	0	0	0	0	0	0					
2006	1	4	2	0	1	17	17	5.436362	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.036146206		0.907787707		0.056066087		0	0	0
	0	0	0	0	0	0					
2006	1	4	2	0	1	18	18	7.509089	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.684948736		0.176746503		0.138304761		0	0	0
	0	0	0	0	0	0					
2006	1	4	2	0	1	19	19	7.509089	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.778195523		0.221804477		0	0	0	0
	0	0	0	0	0						
2006	1	4	2	0	1	20	20	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.540019805		0.192198398		0.267781796		0	0
	0	0	0	0	0	0					
2006	1	4	2	0	1	21	21	4.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.837818697		0.162181303		0	0	0
	0	0	0	0	0						
2006	1	4	2	0	1	22	22	1.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.5	0	0.5	0	0	0	0	0	0
	0	0	0								
2006	1	4	2	0	1	23	23	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.139598258		0.860401742		0	0	0
	0	0	0	0	0						
2006	1	4	2	0	1	24	24	2.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.432157274		0.5	0.067842726		0	0
	0	0	0	0	0						
2006	1	4	2	0	1	25	25	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
2006	1	4	2	0	1	26	26	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0								
2007	1	4	1	0	1	1	1	1.145454	0.5	0.5	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	4	1	0	1	2	2	1.072727	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	4	1	0	1	3	3	2.145454	0.526624239		
	0.473375761		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2007	1	4	1	0	1	4	4	2.145454	0.429096143		
	0.570903857		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2007	1	4	1	0	1	5	5	2.145454	0.570903857		
	0.429096143		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2007	1	4	1	0	1	8	8	2.145454	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2007	1	4	1	0	1	9	9	3.290908	0	0.905479656	
	0.094520344		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	4	1	0	1	10	10	1.072727	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	4	1	0	1	11	11	1.072727	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	4	1	0	1	12	12	3.290908	0	0	
	0.792624099		0.207375901		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2007	1	4	1	0	1	13	13	5.436362	0	0	
	0.967374094		0.032625906		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2007	1	4	1	0	1	14	14	4.363635	0	0.209518017	
	0.61770184		0.172780143		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2007	1	4	1	0	1	15	15	8.654543	0	0.12303883	
	0.317813671		0.348856852		0.210290647		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2007	1	4	1	0	1	16	16	4.290908	0	0	
	0.061700757		0.12935864		0.808940603		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2007	1	4	1	0	1	17	17	2.145454	0	0	0
	0.5	0	0.5	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	4	1	0	1	18	18	6.436362	0	0	0
	0.952092695		0.047907305		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	4	1	0	1	19	19	4.363635	0	0	0
	0.364131117		0.635868883		0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	4	1	0	1	20	20	5.363635	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	4	1	0	1	21	21	3.218181	0	0	0
	0	0.937262529		0.062737471		0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	4	1	0	1	22	22	4.290908	0	0	0
	0.092244832		0.052764921		0.854990247		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2007	1	4	1	0	1	23	23	1.072727	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	4	1	0	1	24	24	8.72727	0	0	0
	0	0.070606608		0.170431247		0.065022989		0.646264646		0.04767451	
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0			
2007	1	4	1	0	1	25	25	4.290908	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	4	1	0	1	26	26	5.363635	0	0	0
	0	0	0.891504866		0	0.108495134		0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	4	1	0	1	27	27	3.218181	0	0	0
	0.38669343		0	0	0.257307741		0.355998829		0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2007	1	4	1	0	1	28	28	2.145454	0	0	0
	0	0.623616236		0	0.376383764		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	4	1	0	1	29	29	4.363635	0	0	0
	0	0.187930658		0.207549792		0.424571576		0.179947974		0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2007	1	4	1	0	1	30	30	2.145454	0	0	0
	0	0	0	0.05812682		0	0.94187318		0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	4	1	0	1	31	31	1.072727	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	4	1	0	1	32	32	1.145454	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	4	1	0	1	34	34	1.072727	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	4	2	0	1	1	1	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	4	2	0	1	2	2	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	4	2	0	1	3	3	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	4	2	0	1	10	10	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	4	2	0	1	11	11	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2007	1	4	2	0	1	12	12	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.661149094		0.338850906		0	0	0	0	0
	0	0	0	0	0						
2007	1	4	2	0	1	13	13	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
2007	1	4	2	0	1	14	14	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.48050754		0.51949246		0	0	0	0	0
	0	0	0	0	0						
2007	1	4	2	0	1	15	15	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.280545082		0.719454918		0	0	0	0	0
	0	0	0	0	0						
2007	1	4	2	0	1	16	16	5.436362	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.500619822		0.17082905		0.157722078		0.17082905	
	0	0	0	0	0	0	0				

2007	1	4	2	0	1	17	17	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0								
2007	1	4	2	0	1	18	18	4.290908	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.778296004		0.221703996		0	0	0
	0	0	0	0	0						
2007	1	4	2	0	1	19	19	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
2007	1	4	2	0	1	20	20	5.363635	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.060266667		0.149594667		0.790138667		0
	0	0	0	0	0	0					
2007	1	4	2	0	1	21	21	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.424439552		0	0.575560448		0	0
	0	0	0	0	0						
2007	1	4	2	0	1	22	22	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0								
2007	1	4	2	0	1	24	24	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.346823194		0	0.392018603		0.261158203	
	0	0	0	0	0	0					
2007	1	4	2	0	1	26	26	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								
2007	1	4	2	0	1	27	27	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0								
2008	1	4	1	0	1	1	1	5.509089	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	1	0	1	2	2	9.872724	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	1	0	1	3	3	3.218181	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	1	0	1	4	4	7.509089	0.78791378		
	0.21208622		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2008	1	4	1	0	1	5	5	1.072727	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	1	0	1	6	6	2.145454	0.417813085		
	0.582186915		0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2008	1	4	1	0	1	13	13	3.218181	0	0.405547245	
	0	0.594452755		0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	4	1	0	1	14	14	1.072727	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	1	0	1	16	16	1.072727	0	0	0
	1	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	1	0	1	17	17	1.072727	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	1	0	1	18	18	3.218181	0	0	
	0.20974612		0.511129828		0	0.279124052		0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2008	1	4	1	0	1	19	19	1.072727	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	1	0	1	20	20	1.072727	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	1	0	1	21	21	3.218181	0	0	0
	0	0.300184973		0.699815027		0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	4	1	0	1	22	22	3.218181	0	0	0
	0	0.681695707		0	0.318304293		0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	4	1	0	1	23	23	3.218181	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	1	0	1	24	24	6.436362	0	0	0
	0	0.454158058		0.17430699		0.371534952		0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2008	1	4	1	0	1	25	25	3.218181	0	0	0
	0	0.287522146		0	0.383826879		0.328650974		0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2008	1	4	1	0	1	26	26	5.363635	0	0	0
	0	0.350657661		0.313852352		0.335489987		0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2008	1	4	1	0	1	27	27	3.218181	0	0	0
	0	0	0.343271238		0.320113426		0.336615336		0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0					
2008	1	4	1	0	1	28	28	3.218181	0	0	0
	0	0	0.367474852		0	0.632525148		0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	4	1	0	1	30	30	5.436362	0	0	0
	0	0	0.293863854		0.385926883		0	0.142065113		0.178144149	
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0				
2008	1	4	1	0	1	31	31	1.072727	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	1	0	1	33	33	1.072727	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	1	0	1	36	36	1.072727	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	2	0	1	1	1	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								

2008	1	4	2	0	1	2	2	5.363635	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	2	0	1	3	3	7.509089	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	2	0	1	4	4	7.509089	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0.497168455	0.502831545	0	0	0	0	0	0	0		
	0	0	0	0	0						
2008	1	4	2	0	1	5	5	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	2	0	1	6	6	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	2	0	1	10	10	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	2	0	1	12	12	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	2	0	1	13	13	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	2	0	1	15	15	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0								
2008	1	4	2	0	1	16	16	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0								
2008	1	4	2	0	1	17	17	2.145454	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.571266745	0.428733255	0	0	0		
	0	0	0	0	0						
2008	1	4	2	0	1	20	20	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.375233001	0.624766999	0	0	0		
	0	0	0	0	0						
2008	1	4	2	0	1	21	21	3.218181	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.303707554	0.295218295	0.401074151	0			
	0	0	0	0	0	0					
2008	1	4	2	0	1	23	23	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0								
2008	1	4	2	0	1	24	24	1.072727	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0								

0 # Mean Size at Age Observations
0 # Total number of environmental variables
0 # Total number of environmental observations
0 # No Weight frequency data
0 # No tagging data
0 # No morph composition data

999 # End data file

Control File

```
# Lingcod control file South
# for SS v3.x
# July 2, 2009

# Morph setup
1       # Number of growth patterns
1       # N sub morphs within growth patterns

1 # Blocks
1  # blocks in each design

#1973  1982  1983 1992  1993 1997  1998 2002 2003 2008
1998  2008

# Mortality and growth specifications
0.5     # Fraction female at birth
1       # M setup: 0=single
Par,1=N_breakpoints,2=Lorenzen,3=agespecific;_4=agespec_withseasinterpolate
2       # Number of M breakpoints
11 13   # Ages at M breakpoints
1        # Growth model: 1=VB with L1 and L2, 2=VB with A0 and Linf, 3=Richards, 4=Read
vector of L@A
1       # Age for growth Lmin
20      # Age for growth Lmax or 999 = Linf
0.0     # SD constant added to LAA (0.1 mimics v1.xx for compatibility only)
0       # Variability about growth: 0=CV~f(LAA) [mimic v1.xx], 1=CV~f(A), 2=SD~f(LAA),
3=SD~f(A)
1       # Maturity option: 1=length logistic, 2=age logistic, 3=read age-maturity matrix
by growth_pattern
1       # First age allowed to mature
1        # fecundity option - ?
0        # hermaphro
1       # mg parm offset option:
#old key: 1=direct assignment, 2=each pat. x gender offset from pat. 1 gender 1,
3=offsets as SS2 V1.xx with M old and CV old offset from young values
#new key: 1=none, 2= M, G, CV_G as offset from female-GP1, 3=like SS2 V1.x)

1       # mg parm adjust method 1=do V1.23 approach, 2=use logistic transform between
bounds approach

# Maturity & Growth Parameters
# min   max   init     prior pr_type  sd      phase   env     UseDev  Minyr   Maxyr   DevSD
        use_bl bl_type
0.05    0.25    0.18    0.19    0       99      -3      0       0       0       0       0.5
        0       0       #M1_natM_young
0.05    0.25    0.18    0.19    0       99      -4      0       0       0       0       0.5
        0       0       #M1_natM_old
10      60      30      32.5    0       99      2       0       0       0       0       0.5
        0       0       #M1_Lmin
40      140     108     120     0       99      -2      0       0       0       0       0.5
        0       0       #M1_Lmax
0.01    0.5     0.1041  0.105   0       99      2       0       0       0       0       0.5
        0       0       #M1_VBK
0.01    0.5     0.0633  0.0633  0       99      1       0       0       0       0       0.5
        0       0       #M1_CV-young
0.01    0.5     0.085   0.07    0       0.8     3       0       0       0       0       0
        0       0       # CV old
0.15    0.40    0.32    0.32    0       99      -3      0       0       0       0       0.5
        0       0       #M2_natM_young
0.15    0.40    0.32    0.32    0       99      -4      0       0       0       0       0.5
        0       0       #M2_natM_old
10      60      30      32.5    0       99      3       0       0       0       0       0.5
        0       0       #M2_Lmin
40      140     81      90      0       99      -3      0       0       0       0       0.5
        0       0       #M2_Lmax
0.01    1       0.149   0.15    0       99      2       0       0       0       0       0.5
        0       0       #M2_VBK
```

```
0.01    0.5     0.05    0.05    0       99      1       0       0       0       0       0.5
        0       0       #M2_CV-young
0.01    0.5     0.085   0.07    0       0.8     3       0       0       0       0       0
        0       0       # Male cv old

# Add 2+2*gender lines to read the wt-Len and mat-Len parameters
# Female length-weight
#       LO      HI      INIT            PRIOR   PR_type SD      PHASE
        -3      3       0.00000176  0.00000176 0       99      -3      0       0       0
        0       0.5     0       0       #Female wt-len-1 a
        -3      5       3.39780    3.39780    0       99      -3      0       0       0
        0       0.5     0       0       #Female wt-len-2 b
# Female maturity
        -3      100     60.601  60      0       99      -3      0       0       0       0
        0.5     0       0       #Female mat-len-infl
        -5      5       -0.155  0.1     0       99      -3      0       0       0       0
        0.5     0       0       #Female mat-len-slope
# Female fecundity - Same as biomass if intercept = 1 and slope = 0
        -3      3       1.      1.      0       99      -3      0       0       0       0
        0.5     0       0       #Female eggs/gm intercept
        -3      3       0.      0.      0       99      -3      0       0       0       0
        0.5     0       0       #Female eggs/gm slope
# Male length-weight
        -3      3       0.000003953     0.000003953     0       99      -3      0       0
        0       0       0.5     0       0       #Male wt-len-1
        -5      5       3.2149          3.2149          0       99      -3      0       0
        0       0       0.5     0       0       #Male wt-len-2
# Distribute recruitment among growth pattern x area x season
0       999     1       1       0       0.8     -3      0       0       0       0       0.5
        0       0       # GP 1
0       999     1       1       0       0.8     -3      0       0       0       0       0.5
        0       0       # Area 1
0       999     1       1       0       0.8     -3      0       0       0       0       0.5
        0       0       # Season 1
# Cohort growth (K) deviation parameter
-1      1       1       1       0       99      -3      0       0       1980    1983    0.5
        0       0
# Seasonal effects on biology parameters (0=none)
 0 0 0 0 0 0 0 0 0 0
# Spawner-recruit parameters

1       # SR_fxn:  1=Beverton-Holt

#LO     HI      INIT    PRIOR   Pr_type SD      PHASE
1       100     8.22947 7.6187  0       99      3       #Ln(R0)
0.2     5       0.8     0.9     0       99      -4      #steepness
0       20      0.5     0.5     0       99      -3      #SD_recruitments
-5      5       0       0       0       99      -3      #Env_link
-5      5       0       0       0       99      -5      #_ln(init_eq_R_multiplier)
 0      2       0       1       0       50      -50             # Autocorrelation placeholder
(Future implementation)
0 # index of environmental variable to be used
0 # env target parameter: 1=rec devs, 2=R0, 3=steepness
1 # rec dev type: 0=none, 1=devvector (zero-sum), 2=simple deviations (no sum constraint)

# Recruitment residuals
1928    # Start year recruitment residuals
2007    # End year recruitment residuals
3       # Phase

1 # Read 11 advanced recruitment options: 0=no, 1=yes
0       # first year for early rec devs
-4      # phase for early rec devs
5       # Phase for forecast recruit deviations
1       # Lambda for forecast recr devs before endyr+1
1960    #_last_yr_nobias_adj_in_MPD
1974    # first year of full bias correction (linear ramp up from this year minus the
plus-age to this year)
2007    # last year for full bias correction in_MPD
2008    #_first_recent_yr_nobias_adj_in_MPD
1.0      # Max bias correction
```

```
0       # placeholder
-15     # Lower bound rec devs
15      # Upper bound rec devs
0        # read intitial values for rec devs

# Fishing mortality setup
0.1     # F ballpark for tuning early phases
1999    # F ballpark year
1       # F method:  1=Pope's; 2=Instan. F; 3=Hybrid (recommended)
0.9     # max F or harvest rate, depends on F_Method

#init_F_setupforeachfleet

#LO     HI      INIT    PRIOR   PR_type SD      PHASE
0       1       0.0039  0.09    0       99      1
0       1       0.0000  0.09    0       99      -1

# Catchability (Q) setup
# A=do power: 0=skip, survey is prop. to abundance, 1= add par for non-linearity
# B=env. link: 0=skip, 1= add par for env. effect on Q
# C=extra SD: 0=skip, 1= add par. for additive constant to input SE (in ln space)
# D=type: <0=mirror lower abs(#) fleet, 0=no par Q is median unbiased, 1=no par Q is mean
unbiased, 2=estimate par for ln(Q)
#          3=ln(Q) + set of devs about ln(Q) for all years. 4=ln(Q) + set of devs about Q
for indexyr-1
# E=Units: 0=numbers, 1=biomass
# F=err_type 0=lognormal, >0=T-dist. DF=input value
# A B C D E F
  0 0 0 0 1 0 #Com_1
  0 0 0 0 1 0 #Rec_2
  0 0 0 0 1 0 #Tri_3
  0 0 0 0 1 0 #NWFSC_4
  0 0 0 0 1 0 #Logbk_5
  0 0 0 0 0 0 #Dock

# Selectivity Specification
#Type   Retent  Moffset Special
#_SELEX_&_RETENTION_PARAMETERS

#Selex_type Do_retention(0/1) Do_male Mirrored_selex_number

#Length Selectivity
24      1       0       0       #Com_1
24      0       0       0       #Rec_2
24      0       0       0       #Tri_3
24      0       0       0       #NWFSC_4
5       0       0       1       #Logbk_5
5       0       0       2       #Dock
#_Age   selectivity

10      0       0       0       #Com_1
10      0       0       0       #Rec_2
10      0       0       0       #Tri_3
10      0       0       0       #NWFSC_4
10      0       0       0       #Logbk_5
10      0       0       0       #Dock
# Selectivity Parameter

#Low    High    Init    Prior   PrType  SD      Phase   env     usedev  minyr   maxyear sd
        block   blswitch # 1 means that parm' = baseparm + blockparm # 2 means that parm'
= blockparm
#Comm
35      100     45      75      0       50      2       0       0       0       0       0.5
        1       2       # Peak
-6      4       -5      0       0       50      -2      0       0       0       0       0.5
        0       0       # Top width
-1      9       4       4       0       50      3       0       0       0       0       0
        0       0       # Ascending width
-1      9       0       5.5     0       50      -3      0       0       0       0       0
        0       0       # Descending width
```

```
-5      9       -2      -2      0       50      2       0       0       0       0       0
        0       0       # inital value
-5      9       9       5       0       50      -3      0       0       0       0       0
        0       0       # Final

#retention
31      100     40      55      0       50      -2      0       0       0       0       0.5
        1       2       # Inflection
0.1     10      2       1       0       99      -2      0       0       0       0       0.5
        0       0       # Slope
0.001   1       1       1       0       99      -3      0       0       0       0       0.5
        1       2       # Asymptotic retention
0       0       0       0       0       99      -3      0       0       0       0       0.5
        0       0       # male arithmetic offset to inflection

#Recreational

35      100     50      75      0       50      2       0       0       0       0       0.5
        1       2       # Peak
-6      4       -5.9    0       0       50      -2      0       0       0       0       0
        0       0       # Top width ##bound
-1      9       4       4       0       50      3       0       0       0       0       0
        0       0       # Ascending width
-1      9       5       5.5     0       50      3       0       0       0       0       0
        0       0       # Descending width
-5      9       -4.9    -2      0       50      -2      0       0       0       0       0
        0       0       # inital value
-5      9       -4.9    5       0       50      3       0       0       0       0       0
        0       0       # Final
#Triennial
35      100     70      75      0       50      -2      0       0       0       0       0.5
        0       0       # Peak
-6      4       -0.55   0       0       50      -2      0       0       0       0       0
        0       0       # Top width
-1      9       5.34    4       0       50      -2      0       0       0       0       0
        0       0       # Ascending width
-1      9       5.2     5.5     0       50      -2      0       0       0       0       0
        0       0       # Descending width
-5      9       -1.14   -2      0       50      -2      0       0       0       0       0
        0       0       # inital value
-5      9       -4.9    5       0       50      -3      0       0       0       0       0
        0       0       # Final
#NWFSC
35      100     40      75      0       50      2       0       0       0       0       0.5
        0       0       # Peak
-6      4       0       0       0       50      2       0       0       0       0       0
        0       0       # Top width
-1      9       4       4       0       50      3       0       0       0       0       0
        0       0       # Ascending width
-1      9       -.99    5.5     0       50      3       0       0       0       0       0
        0       0       # Descending width ##bound
-5      9       -2      -2      0       50      2       0       0       0       0       0
        0       0       # inital value
-5      9       -4      5       0       50      -3      0       0       0       0       0
        0       0       # Final

#logbook mirror
-2      0       -1      0       0       50      -2      0       0       0       0       0
        0       0
-2      0       -1      0       0       50      -3      0       0       0       0       0
        0       0

#dockside mirror
-2      0       -1      0       0       50      -2      0       0       0       0       0
        0       0
-2      0       -1      0       0       50      -3      0       0       0       0       0
        0       0

1       # Selex block setup: 0=Read one line apply all, 1=read one line each parameter
# Lo    Hi      Init    Prior   P_type  SD      Phase
35      100     45      60      0       50      2
```

```
#-6     4       0       0       0       50      3
31      100     40      55      0       99      3
0.1     1       0.9     0.9     0       99      3
35      100     45      75      0       50      3

1 #_env/block/dev_adjust_method (1=standard; 2=logistic trans to keep in base parm
bounds)
0 # Tagging flag: 0=none,1=read parameters for tagging

### Likelihood related quantities ###
# variance/sample size adjustment by fleet
1 # Do variance adjustments
0 0 0 0 0 0  # const added to survey cv
0 0 0 0 0 0  # const added to discard sd
0 0 0 0 0 0   # const added to body weight sd
1 1 1 1 1 1   # mult scalar for length comps
.5 .5 1 1 1 1   # mult scalar for age comps
1 1 1 1 1 1 # mult scalar for length at age obs

30      # DF discard fraction data t-distribution
30      # DF mean body weight data t-distribution

1       # Max N lambda phases: read this N values for each item below
1       # SD offset (CPUE, discard, mean body weight, recruitment devs): 0=omit log(s)
term, 1=include

5 # N changes to default Lambdas = 1.0
# Component codes:
#  1=survey
#  2=discard
#  3=mean body weight
#  4=length frequency
#  5=age frequency
#  6=Weight frequency
#  7=size at age
#  8=catch
#  9=initial equilibrium catch
#  10=rec devs
#  11=parameter priors
#  12=parameter deviations
#  13=Crash penalty
#  14=Morph composition
#  15=Tag composition
#  16=Tag return
# Component fleet/survey  phase  value  wtfreq_method
5       1       1       0       1
5       2       1       0       1
5       3       1       0       1
5       4       1       0       1
5       5       1       0       1

0 # extra SD pointer

999 # end of control file
```

Agenda Item E.2.a
Attachment 9
September 2009

Lingcod

STAR Panel Report

July 27-30, 2009
Deca Hotel
Seattle, WA

Panel Reviewers
Dr. Vidar Wespestad, STAR Chair and SSC representative
Dr. J.J. Maguire, Center for Independent Experts
Dr. Stephen Smith, Center for Independent Experts
Dr. Jim Ianelli, National Marine Fisheries Service Alaska Fisheries Science Center

STAR Panel Advisors Present:
Ms. Joanna Grebel, California Department of Fish and Game, GMT Representative
Mr. Dan Platt, GAP Representative
Mr. John DeVore, PFMC Representative

STAT:

Dr. Owen Hamel, National Marine Fisheries Service Northwest Fisheries Science Center
Ms.Suresh Sethi, School of Aquatic and Fisheries Sciences, University of Washington
Mr. Thomas Wadsworth, Moss Landing Marine Laboratories, Moss Landing, California
Dr. Hamel was present and presented for the STAT

Overview

A draft assessment of lingcod (*Ophiodon elongatus*) off the west coast of the United States, from the U.S.-Mexico border to the U.S. Canadian border was reviewed by the STAR panel during July 27-31, 2009. The assessment was conducted as two separate assessments of (1) Lingcod off of Washington and Oregon (the North stock), and lingcod off of California (the South stock).
For each stock, two fisheries are modeled: the commercial fishery and the recreational fishery (four fisheries). Landings are included from 1928-2008, with equilibrium landings estimated for the commercial fisheries prior to 1928. Since the fishery off of California developed earlier, the equilibrium catches there are an order of magnitude higher.
The previous assessment was conducted in 2005 in SS2. The current assessment utilizes SS3, extends the catch series, commercial discard rates from 2002-2007; Triennial survey indices for the years 1980-2004; NWFSC survey indices for the years 2003-2008; commercial logbook CPUE indices for the years 1976-1997 (North) or 1978-1997 (South); PSMFC Dockside (recreational) boat survey index 1980-1989, 1993-1997 (South); Commercial length composition data for 1965-2008 (North) or 1978-2008 (South); Commercial discard length composition data for 2003-2007 (North) and 2004-2007 (South); Recreational length composition data for 1993-2008 (North) or 1987-2008 (South); Triennial length composition data for 1986-2004 (North) or 1989-2004 (South); NWFSC length composition data for 2003-2008.

Age data was available and used in sensitivities but not in the base models due to issues with outliers and possible aging bias. Removing the age data significantly changed the recruitment time series- scaling it down and redefining recruitment strength in the early 1970s. The effect on the south model was clearly less significant, which was expected given the lack of age data in the south.

The current assessment indicated that the stock has recovered when assessed from a coastwide perspective as well as when assessed separately as substocks off of Washington and Oregon, and off of California. Overfishing last occurred in 2003, although there was some dispute about the magnitude of recreational fishery catch off of California for that year. The Base Model results for the depletion ratio of the spawning biomass at the start of 2009 were 61.9% for the North, 73.7% for the South, and 67.0% coastwide.

The STAR panel concluded that the lingcod assessment constitutes the best available scientific information on the status of lingcod off the U.S. west coast and recommends that it be used for status determination and management in the Council process. The STAR panel thanks the STAT members for their thorough preparation and willingness to respond to panel requests.

Analyses requested by the STAR Panel

1. The original base case models started estimation of recruitment in 1970 but the residual pattern for the commercial length compositions from the Northern stock indicated that there were strong signals for one or more year-classes moving through the fishery between 1966 and 1971 that were not being fit well by the model (Figures 70 and 71). The panel asked for a sensitivity run with the estimation of recruitment starting in 1950 for the Northern stock. Relatively large numbers of fish were sampled from a few trips in

the mid-1960s and the panel recommended that input N be calculated as 3.5 times the number trips in this early period — half the average conversion used for the more recent years.

The new model set 1950 as the initial year for estimating recruitment in the northern model and resulted in a better fit to the length compositions in the 1960s and hence reduced the associated residuals as well as picking up the large recruitment in 1964 which had not been so for the original base case. Depletion was estimated to be 47% compared to 62.1% for the original base case. These results suggest that the final base case should start estimating recruitment at least as early as 1950.

2. The stock assessment includes catches from 1928 but with recruitment only being estimated from 1970 in the original base case, error estimates for recruitment in the early period were obtained directly from the stock/recruitment curve and underestimated the true uncertainty for recruitment and other associated parameters from this early period. The panel requested a sensitivity run with recruitment estimated starting in 1928 to evaluate the uncertainty associated with SB_zero.

   The standard deviation for SB_zero changed by 1.4 times for the northern model and by 3.28 times for the southern model. This difference seemed reasonable given that there was more data for the northern model and the standard deviations were considered realistic enough to have the new base case begin estimating recruitment starting in 1928.

3. Include estimates of uncertainty estimated in request 2 as well as for many of the other parameters presented in the sensitivity tables.

   The standard deviations for SB_zero and SB_2009 were included the new sensitivity runs requested but there was some question as to whether all of the uncertainty was actually captured. The STAR panel and STAT deferred on how to better capture all the uncertainty given the structure of the assessment.

4. Spawning output is expressed in terms of female spawning stock and ignores the importance of the nest-guarding by the males for successful reproduction. The panel requested that the annual trend in sex ratio by numbers for ages five-plus from 1928 to 2009 be investigated to determine if fishing may have resulted in significant changes in this ratio leading to changes in spawning success.

   The proportion of females in the catch varied between 70 and 80% in the northern with little evidence of trend while the proportion of females in the south has declined since 1980, dropping to 65 to 70% in the 1980s to mid-1990s and again in 2003 to 2005.

   in The higher proportion of males in the southern area is not really indicative of any trend; but the proportion of males in the catch during the period of nest guarding may factor into reproductive success and perhaps be used as an indicator and incorporated into evaluations of reproductive output.

5. Growth curves for both sexes in the northern area estimated a length of 20 cm at age 0 (Figure 48) which seemed too large given the data. In addition, it was not clear whether SS3 assumes that T_0 equals 0 when estimating k and L_infinity. The panel requested that the data and growth model fit presented in Figure 48 be verified.

   This analysis discovered that lengths-at-age in SS3 were actually beginning of year and not mid-year as previously assumed. Changes to bin size, etc., were tried but results were still not satisfactory. Given that the model actually uses beginning of year length-at-age, the associated dispersions for the lengths-at-age will need to be lined up properly. Other options for setting the length at age 0 will be explored for the final base case run.

6. There appears to be a large number of outliers in the length-at-age relationships for the commercial data in the northern area (Figs 7 to 10) that may be due to incorrect determination of gender for the sampled fish. The panel requested a model run with combined sex conditional length-at-age compositions to evaluate this possibility.

   Combined sex conditional length-at-age compositions did not appear to resolve the outlier issue and made little difference to the model fit or parameter estimates.

7. The STAT presented a sensitivity model with no age data and the panel requested that the recruitment estimates from this sensitivity run be compared with the base case recruitment estimates to provide insight into how the age data and outliers identified in request 6 maybe affecting the model.

   The age data results in lower recruitments since 2000 than estimated without ages for the northern model. In the south there was less of a consistent pattern for the recruitment series estimated with and without ages. These results suggested that the no age option should be retained as a sensitivity run for the final base case.

8. The Washington tagging data was not used in the current assessment having been criticized in the previous assessment. The panel requested that the trends from the tagging data be plotted against recruitment estimates from base case to evaluate if there could be any reason to use the index.

   There was insufficient time to address this request.

9. The 2003 NWFSC survey estimate of lingcod biomass was much higher than either the 2004 estimate from the same survey or the 2004 estimate from the triennial survey. The panel requested that the frequency distribution of catches per tow be tabulated for the NWFSC by year for North and South areas. In addition, the catches making up the 2003 estimate from the NWFSC survey should be investigated to determine if there are reasons why the estimate may not be reflecting actual abundance.

   Three large tows of lingcod accounted for 63.5% of the total lingcod catch in the 2003 NWFSC survey. The first of these tows there was adequately sampled while the second and third tows contained large catches of dogfish and were subsampled. The second tow had only two lingcod in the subsample (one male and one female) that were scaled up to represent the overall catch. All three tows had large lingcod in them. There is really very little that can be done to develop a defensible estimate of the numbers caught after the fact when something like this happens and onboard procedures need to be in place to specify an adequate sample in these kinds of circumstances.

10. A dome-shaped selectivity pattern was estimated for the triennial survey in the north while the selectivity pattern was asymptotic for the southern area. Given that there was less data to estimate the selectivity pattern in the south and no reason to believe that selectivity patterns should differ between the two areas, the panel requested a model run for the south using the dome-shaped selectivity for the triennial survey.

    Use of the dome-shaped selectivity for the triennial survey from the northern model in the southern model resulted in a slight increase in biomass over the base case but stock status did not change appreciably. The panel recommended using the dome-shaped selectivity in the final base case for the southern model.

11. A number of extra abundance indices (e.g., PISCO scuba index, CENCAL index) were presented by the STAT for the southern area and evaluated in terms of improvement in fit for the abundance indices used in the base case. The panel requested that the fits of the south model to the abundance indices both with and without the extra indices be presented to fully evaluate the usefulness of these extra indices.

    The plots of the fits of the model to the abundance indices were updated as requested and showed that the extra abundance indices contributed little to improving the fit of the model.

12. Sensitivity runs presented by the STAT showed that removing the triennial survey from the southern model resulted in little change to stock status while removing the commercial and recreational CPUE data resulted in a much lower depletion level. The latter time series were only used up to 1997 to account for management changes in the more recent years and is was difficult to understand the reasons for the sensitivity results. The panel requested plots of the biomass trends from the sensitivity run for the southern model with either CPUE or the triennial survey indices removed.

    The biomass trends for the no triennial survey case were virtually identical to those of the base case while removal of the CPUE data resulted in lower overall biomass, especially in the most recent years. The possibility that the trends in the CPUE data relative to those in triennial survey prior to 1998 may compensate in the model for decline in the triennial survey after 1998 was discussed but it was not clear what the mechanism behind this behavior was.

13. The STAT presented sensitivity runs for the north model removing either the NWFSC survey, the triennial survey or the commercial CPUE. For any one of these runs, stock status changed little from the base case. The panel requested a sensitivity run with all of

the abundance indices and associated composition data removed from the Northern model to understand the influence of these indices on the northern model.

The removal of all of the abundances from the model resulted in little change in stock status from the base case model, probably reflecting the poor fit to the abundance indices, especially in the most recent years. Current trends appear to be a consequence of the trends in the length compositions.

14. The panel requested that the monthly distribution of catches be tabulated for both areas starting in 1981 to see if there have been seasonal changes in the monthly distribution of catches that might explain patterns observed in the length-at-age data.

    Catches appear to have increased in the May to July and August to October periods relative to the rest of the year since around 1997/98. Further investigation into the possible impact of this trend could be deferred to be a research recommendation.

15. The panel requested some preliminary runs on two new base case candidates:

    a. Estimate recruits starting in 1928, estimate L_1 and L_2 to be within a range of ages where adequate amounts of data were observed (e.g., ages 2 and 20, respectively) and use the selectivity estimated for the triennial survey in the north for the southern model.
    b. As above but remove all ages (checking to see if L_1 is still estimable).

    Initial results suggested that the outliers in the length-at-age data were affecting the models and the decision was made to go ahead with removing the age data for the base case. The new base run was compared to lower and higher assumed natural mortality rates in the north and south (M = 0.16 – 0.22, 0.18 base females; 0.285 – 0.39, 0.32 base males) and lower and higher values of assumed steepness (h = 0.7 – 0.9, 0.8 base). There was surprisingly little contrast in the results across this range of uncertainty.

Base Model Specification

The Panel agreed with the stock structure splits for north and south management units. For each region there are two fishing fleets. In the north three indices are used and in the south, there are four abundance indices. The model ranged from 1928 through 2008. In both models there was a single block for commercial selectivity and retention changes, occurring in 1998 (to present) reflecting the increased regulation and areal limitations which have come into place over that period. That same block is used to model changes in recreational selectivity, reflecting changes in minimum size limits. In the North, male and female selectivities are estimated separately for the recreational fishery, whereas data to do so is lacking in the South.

The modeled ages extended from 0 to the accumulator at age 20. The modeled length bins range from 10 to 128 at 2 cm intervals while the data extend from 28 to 110 cm. Growth is partially estimated, with max size estimated in N but not in S. The value of “L1” (length at age 1) is to be estimated.

The age data were omitted from both models since these data showed a poor residual pattern that was apparently due to data outliers. Also, at early ages there appears to be mis-aging that was not captured appropriately. Results using the length frequency data alone significantly changed the recruitment time series- scaling it down and redefining recruitment strength in the early 1970s. The effect on the south model was clearly less significant, which was expected given the lack of age data in the south. The Panel and author agreed that the results were an improvement and resolved a number of fit issues and residual patterns. In particular, the poor residual pattern noted in Figure 71 of the draft assessment was resolved.

The estimates of triennial survey selectivity for the northern stock are to be used for the southern stock since the original selectivity estimates were unreasonable.
The underlying model is dis-aggregated by gender in order to capture the sex-specific differences in natural mortality (set to 0.18 yr-1 for females and 0.32 yr-1 for males). Data on gender-specific composition data were available. Recruitment is to be estimated from 1928 (to better capture historical uncertainty in stock size) and the steepness parameter is fixed at 0.8. Other details for the base model were agreed and are as specified in the document (i.e., Tables 13-15).

Technical merits of the assessment

This was a very thorough assessment that explored a number of sources of uncertainty. The STAR Panel agrees with the STAT view that there was inherent uncertainty that was not included in the model that may be important such as the degree of connection between the two lingcod stocks and also between the northern stock and the stock off British Columbia; the effect of the PDO, ENSO and other climatic variables on recruitment, growth and survival of lingcod.

The STAR Panel found that the STAT base model is the best available results given the uncertainties regarding surveys and age and growth data addressed above. The sensitivity results showed high uncertainty in age data. A base model was selected based on extensive model testing and an attempt was made to balance the sources of uncertainty. In addition, an attempt was made to make the North and South models as equivalent in as possible.
The Panel recommends that the next lingcod assessment be an update rather than a full assessment. Given the problems event in the age and growth data and problems in survey availability the STAR Panel does not recommend another full assessment until the data issues are addressed.

Explanation of areas of disagreement regarding STAR panel recommendations

A. Among STAR panel members (including concerns raised by the GAP and GMT representatives

There were no areas of disagreement among STAR panel members.

B. Between the STAR panel and the STAT

There were no areas of disagreement between the STAR panel and the STAT.

Unresolved problems and major sources of uncertainty

Management, data, or fishery issues raised by the GAP and the GMT representatives

There were discussions regarding near shore surveys and the potential need to look at existing area closures that may improve access to lingcod by near shore fisheries. The GMT will be examining these issues as part of their management review.

Prioritized recommendations for future research and data collection

1. Investigate the effect of the year when recruitment is estimated on the estimates of B0 and of current status, since this may have an effect the estimated level of depletion.

2. Investigation of the large survey estimate for lingcod in the 2003 NWFSC survey showed that catches from only three tows made up 63.5% of the total lingcod catch in the survey. The second and third large tows also had large catches of dogfish and the catches were subsampled for counts and detailed sampling. As a result only 2 lingcod were actually measured in the second largest tow (one male and one female) but these measurements were expanded to the whole catch. It is difficult and inappropriate to try to correct such estimates after the fact during the assessments. Instead onboard sampling procedures need to be developed to ensure that a proper and informative subsample of fish be measured during the survey.

3. The sensitivity run with no abundance indices produced a similar fit to the base case suggesting that there was little trend information in the abundance indices used in the base case. Can it be determined if the NWFSC survey is fishing in the right places for lingcod? Are there other survey techniques that can be used (e.g., longline, combined lingcod/sablefish pot survey, trap surveys)?

4. Investigate the suitability of using catches of lingcod in the IPHC survey as an alternate abundance index.

5. Re-examine the usefulness of the Washington tagging data for next assessment.

6. There was confusion over whether SS3 was using mid-year or beginning of year length at age resulting in larger than expected mean length at age for age 0 and 1. The method for setting the correct mean length at age for the younger ages needs to be clarified before the next assessment.

7. Further investigation of the age and length data needs to be done to understand if seasonal or area differences or some other causes are behind the outliers observed in the length-at-age data.

8. Look at environmental covariates for recruitment and time-varying growth and availability inshore.

9. The fact that lingcod males (and cabezon) are nest-guarders was ignored when determining reproductive output. A cursory look at the proportion of sex ratio in the catch did not appear to indicate any serious changes for either species in recent years. However, we do not know what kind of change in sex ratio would indicate a serious change in reproductive success. The impact of nest-guarding on reproductive output should be investigated.

Acknowledgements

The Panel thanks Dr. Jim Hastie and staff at the NWFSC for their exceptional support and provisioning during the STAR meeting.

Agenda Item E.2.a
Attachment 10
September 2009

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DRAFT

Status of Cabezon (*Scorpaenichthys marmoratus*) in California and Oregon Waters as Assessed in 2009

by

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26 August 2009

Table of Contents

Acronyms Used in the Document

ABC – Allowable Biological Catch
AIC – Akaike Information Criterion
BB – Beach/bank recreational mode
BCER – Big Creek Ecological Reserve
CalCOFI - California Cooperative Oceanic Fisheries Investigation
CALCOM - California Commercial Cooperative Groundfish Program
CAS – California sub-stock
CDFG – California Department of Fish and Game
CFIS – Commercial Fisheries Information System
CI – Confidence interval
CMASTR – Master Commercial Fisheries Database for CDFG
CPFV – Commercial Passenger Fishing Vessel
CPUE – Catch per unit of effort
CRFS – California Recreational Fisheries Survey
CV – Coefficient of variation
EEZ – Exclusive Economic Zone
ENSO – El Niño Southern Oscillation
FMP – Groundfish Fishery Management Plan
GLM – Generalized Linear Model
IRI – Index of Relative Importance
MM – Man-made recreational mode
MLMA – Marine Life Management Act
MLML- Moss Landing Marine Laboratories
MPA – Marine Protected Area
MPD – Maximum of the posterior density function
MRFSS - Marine Recreational Fisheries Statistics Survey
MSY – Maximum Sustainable Yield
mt – Metric tons
NCS – Northern California Sub-stock
NFMP – Nearshore Fishery Management Plan
NWFSC – Northwest Fisheries Science Center
ODFW – Oregon Department of Fish and Wildlife
OFL – Overfishing Limit
ORBS – Ocean Recreational Boat Survey
ORS – Oregon sub-stock
OY- Optimum Yield
PBR – Private Boat and Rental recreational mode
PFEL – Pacific Fisheries Environmental Laboratory
PFMC – Pacific Fishery Management Council
PISCO - Partnership for Interdisciplinary Studies of Coastal Oceans
PSMFC – Pacific States Marine Fisheries Commission
RCA – Rockfish Conservation Area
RecFIN – Recreational Fisheries Information Network
SCS – Southern California sub-stock
SLOSEA – San Luis Obispo Science and Ecosystem Alliance
SMURF - Standard Monitoring Units for the Recruitment of (temperate reef) Fishes
SoCAL – Southern California
SS – Stock Synthesis
STAR – Stock Assessment Review (panel)
STAT – Stock Assessment Team
SWFSC – Southwest Fishery Science Center
TOR – Terms of Reference
WCGOP – West Coast Groundfish Observer Program

Executive Summary

Stock

This is the third full assessment of the population status of cabezon (*Scorpaenichthys marmoratus* [Ayres]) off the west coast of the United States. The first assessment was for a state-wide California cabezon stock in the year 2003 (Cope *et al.* 2004). The second assessment (Cope and Punt 2006) considered two sub-stocks (the northern California sub-stock (NCS) and the southern California sub-stock (SCS)), demarcated at Point Conception, CA. The current assessment retains the two California sub-stocks, also evaluating the population as a coast-wide California stock (CAS), and extends the assessment to a third sub-stock for cabezon in the waters off of Oregon (ORS). Separation of these spatial sub-stocks is based on distinguishing localized population dynamics, preliminary population genetics results, and is supported by spatial differences in the fishery (the NCS has been the primary area from which removals have occurred), the ecology of nearshore groundfish species, and is consistent with current state management needs.

Catches

Cabezon removals were assigned to six fleets in California (two commercial and four recreational) and four fleets in Oregon (two commercial and two recreational) for each sub-stock because each of these fleets targets a different component of the population (Figures E-1–E-3; Table E-1). The California time series begins in 1916, with the onset of commercial landings, while Oregon begins in 1973, with the start of the recreational fishery. Historical recreational removals for California were based on the reconstruction used in Cope and Punt (2006), while the staff of the Oregon Department of Fish and Wildlife supplied the historical Oregon recreational time series. Historically, vessel-based recreational catch (PBR (private) and CPFV (charter)) has been the primary reported source of biomass removals of cabezon. Commercial catch has become a major source of removals in the last 15 years because of the developing live-fish fishery in both California and southern Oregon. The sensitivity of the assessment results to the magnitude of historical recreational catch is explored as part of the assessment. Commercial discard mortality, assumed negligible in the last assessment, is included in this assessment. Because cabezon are caught primarily in the nearshore fishery and are believed to not suffer from barotrauma, discard mortality is assumed to be low. The sensitivity of model outputs to assumptions of discard mortality is explored.

Catch histories used in the current assessment differ slightly from the former assessment (Figure E-4). Whereas the commercial removals are very similar, the recreational sector is different from 1980 onward. These years are mostly dependent on RecFIN data extractions, which showed both changes in mean weights and numbers of catch, resulting in minor but noticeable differences. The largest difference is found in 1980, where the RecFIN PBR value in southern California (SCS) was determined to be unreasonably high and set instead to the average of values for years 1981-1989.

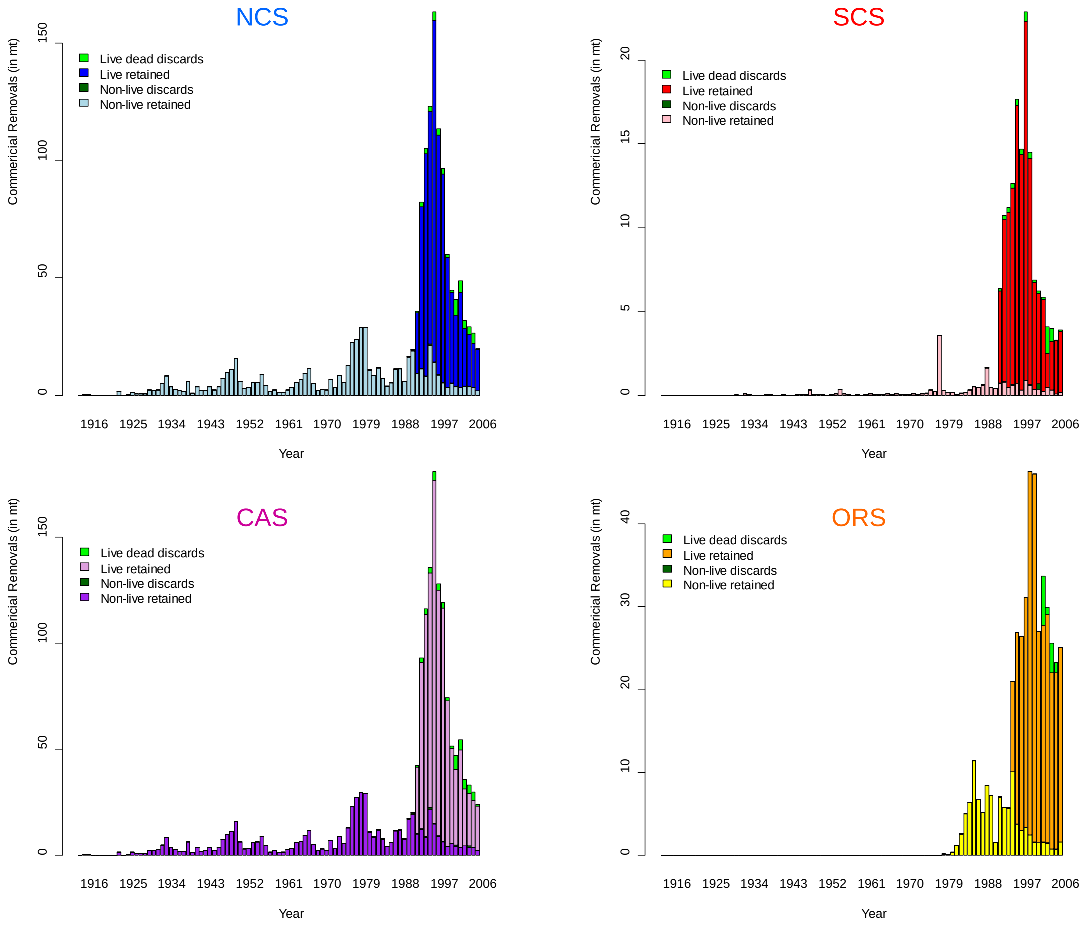

Figure E-1. Commercial fishery cabezon removals (in mt) by fleet and sub-stock.

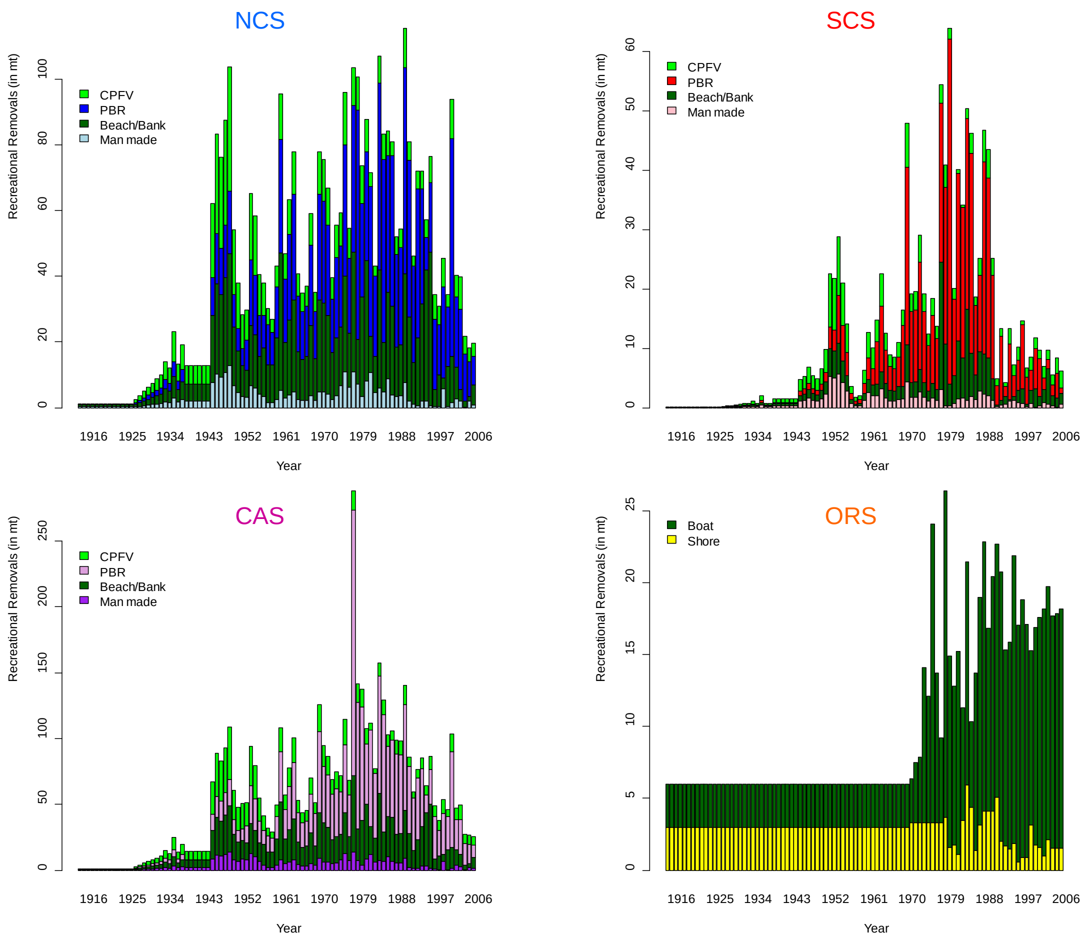

Figure E-2. Recreational fishery cabezon removals (in mt) by fleet and sub-stock.

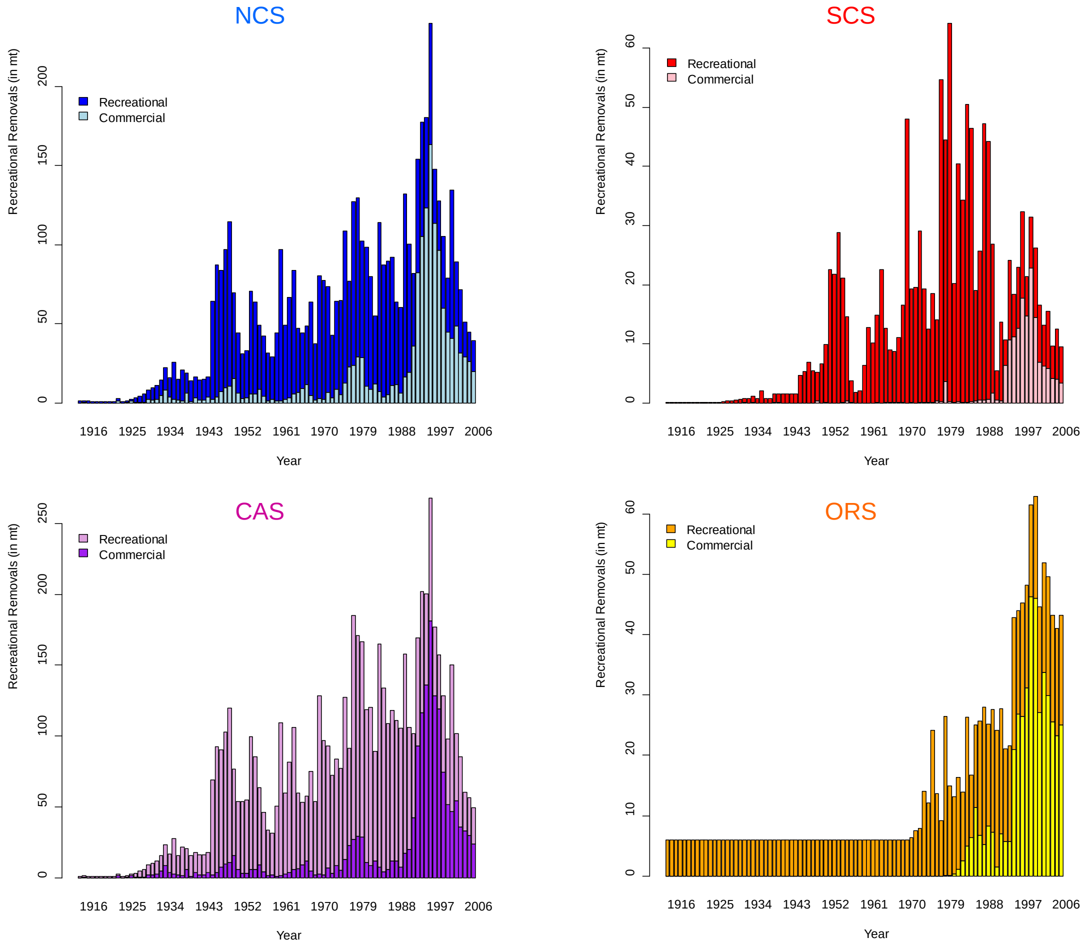

Figure E-3. Total removals of cabezon (in mt) by major fishery and sub-stock.

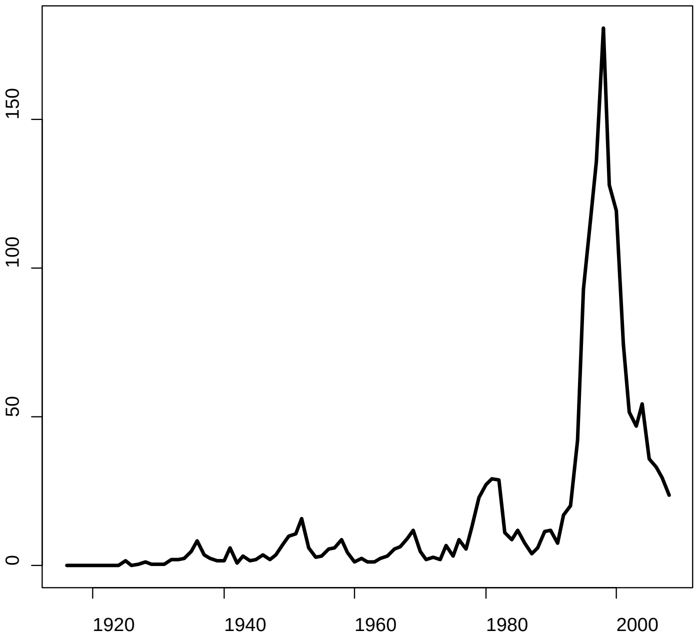

Figure E-4. Comparison between the 2009 and 2005 assessment inputs of total removals for the commercial (top panel) and recreational (bottom panel) fishery sectors.

Table E-1. Recent landings (mt) of cabezon by assessment sub-stock and fleet.

	NCS						SCS					
	Commercial		Recreational				Commercial		Recreational			
YEAR	Nonlive	Live	Man-Made	Shore	PBR	CPFV	Nonlive	Live	Man-Made	Shore	PBR	CPFV
1998	14.3	149.0	0.7	46.7	21.2	7.9	0.7	17.0	0.8	2.2	5.1	2.2
1999	8.8	104.7	0.5	5.2	21.3	7.4	0.3	14.4	0.8	2.5	10.8	0.6
2000	5.5	91.1	0.3	9.8	15.2	5.7	0.9	22.0	0.2	0.4	4.5	1.6
2001	3.3	56.7	5.9	3.1	27.8	8.7	0.6	13.9	0.7	2.3	3.3	2.2
2002	5.1	39.6	0.5	12.1	18.0	3.7	0.4	6.5	0.1	3.1	6.8	1.8
2003	3.9	36.8	1.5	14.1	66.2	12.1	0.7	5.5	0.3	1.6	6.4	1.3
2004	3.2	45.4	2.8	9.5	21.4	6.7	0.2	5.7	0.9	2.2	1.9	1.9
2005	3.8	27.8	2.0	3.5	24.5	9.9	0.4	3.6	0.5	6.0	1.6	1.5
2006	3.9	25.3	0.3	1.7	14.4	5.3	0.3	3.7	0.4	1.6	1.8	1.7
2007	3.4	23.0	1.9	1.5	10.7	4.2	0.1	3.2	0.0	1.6	4.2	2.6
2008	2.0	17.8	0.8	6.3	8.5	4.1	0.2	3.7	0.6	1.8	0.9	2.9

	CAS						ORS			
	Commercial		Recreational				Commercial		Recreational	
YEAR	Nonlive	Live	Man-Made	Shore	PBR	CPFV	Nonlive	Live	Shore	Boat
1998	15.0	166.0	1.5	48.8	26.3	10.1	3.7	23.2	0.6	16.5
1999	9.1	119.1	1.3	7.6	32.2	8.0	3.0	23.5	0.9	17.9
2000	6.4	113.0	0.5	10.2	19.7	7.2	3.4	27.8	0.9	16.2
2001	3.9	70.5	6.6	5.4	31.1	10.9	2.4	43.9	3.2	12.1
2002	5.4	46.1	0.6	15.2	24.8	5.5	1.5	44.5	1.8	15.1
2003	4.6	42.3	1.8	15.7	72.6	13.4	1.5	25.5	1.6	16.0
2004	3.4	51.1	3.6	11.8	23.3	8.6	1.5	32.2	1.0	17.2
2005	4.3	31.5	2.5	9.6	26.1	11.4	1.5	28.4	2.1	17.6
2006	4.2	28.9	0.7	3.3	16.2	7.0	0.8	24.9	1.6	16.1
2007	3.4	26.2	2.0	3.0	14.9	6.9	0.8	22.5	1.6	16.3
2008	2.2	21.6	1.4	8.1	9.4	6.9	1.6	23.5	1.6	16.6

Data and assessment

Each sub-stock assessment uses data on size (mean weight and length compositions) and indices of abundance to inform the population dynamics, as was the case in the 2005 assessment. Additionally, these assessments incorporate conditional age-at-length data for the first time to estimate growth parameters internal to the model (previous assessments used growth parameters derived from externally fitted growth curves). All sub-stock assessments use Stock Synthesis 3.03A as the modeling environment.

Several potential indices of abundance are formally considered for the California sub-stocks: 1) Fishery-dependent CPFV logbook CPUE, a CDFG hook-and-line survey, and PSMFC dockside and onboard surveys, 2) Fishery-independent adult surveys (TENERA and PISCO), and 3) recruitment surveys (CalCOFI, Southern California Edison Impingement, PISCO SMURFS, SLO SMURFS). There is also one index of abundance for the Oregon sub-stock based on the Ocean Recreational Boat Survey (ORBS) sampling program. Changes in bag and size limits in California also necessitated the separation of the CPFV data into two series: 1960-99 and 2000-08. This approach differs from the previous assessment, which used a continuous index from 1960-2004. Sensitivity of model output to this assumption is investigated.

Each index of abundance is developed by fitting generalized linear models (GLMs) to the proportion of non-zero records and the catch-rate given that the catch was non-zero, and taking the product of the resultant year effects. Only the CPFV logbook index is used in the base model for the California sub-stocks, because of its area-wide coverage. Small-scale resolution, large uncertainty, short time series, and potential bias in SCUBA surveys for cryptic species like cabezon, as well as the low occurrence of cabezon in sampling protocols ruled out including the other indices in the base case. The Oregon sub-stock base case included the ORBS survey.

Additional modifications were made to the specification of this year's assessment models, relative to the previous assessment. Changes in regulations necessitated the implementation of time blocks on the selectivities of the commercial live-fish fishery and boat-based recreational fleets for all sub-stocks. Additional variance was applied to the perceived variability of the candidate abundance indices in order to address the underestimation of variability in the delta GLM-based models. The models were also tuned to balance the input of recruitment variability ($_R$) and sample sizes of length and age compositions with model output estimates of these same values. This resulted in $_R$ values less than those used in the last assessment.

Stock biomass

Cabezon were lightly exploited until the 1940s in California, particularly in northern California. Catches began to increase in southern California in the 1960s. This increase in catch caused a relatively large decline in spawning biomass. In Oregon, the take of cabezon did not begin until the 1970s, which in turn has also caused a decline in spawning biomass (Figures E-5 and E-6). The estimated depletion levels for NCS and SCS are 45% (± 7%) and 60% (± 14%), respectively. Estimated depletion for the CAS and ORS sub-stocks are 34% (± 6%) and 52% (± 10%), respectively. Greatest uncertainty is found in the smaller SCS and ORS sub-stocks.

The model-derived initial and terminal female spawning biomass estimates corresponding to the above depletion measures are 1036 (± 60) and 469 (± 97) mt for the NCS, 262 (± 23) and 158 (± 48) mt for the SCS, 1207 (±61) and 410 (± 85) mt for the CAS and 409 (±57) and 214 (±69) for the ORS. Overall, spawning biomass has increased in California in recent years but not in Oregon. Recent trends in spawning biomass and depletion for each sub-stock can be seen in Tables E-2 and E-9.

Total unfished cabezon spawning output, as a sum of the two California sub-stocks, is estimated at 1298 mt compared to 1361 mt for the 2005 assessment. The CA state-wide estimates of spawning output are 1207 mt for the 2009 assessment and 1268 mt for the 2005 assessment (Table E-3). Current total cabezon spawning output, summed from the two sub-stock models is 627 mt, compared with 410 mt for the one stock state-wide model. Median depletion in the 2005 assessment versus the 2005 depletion estimate from the current assessment is more similar to the results obtained from summing the two sub-stock models than for the one stock state-wide model.

Though much of the declines in cabezon populations correspond to removals by the recreational fishery sectors, the added impact of the live-fish fishery is also witnessed in declines through the mid- to late-1990s in all sub-stocks.

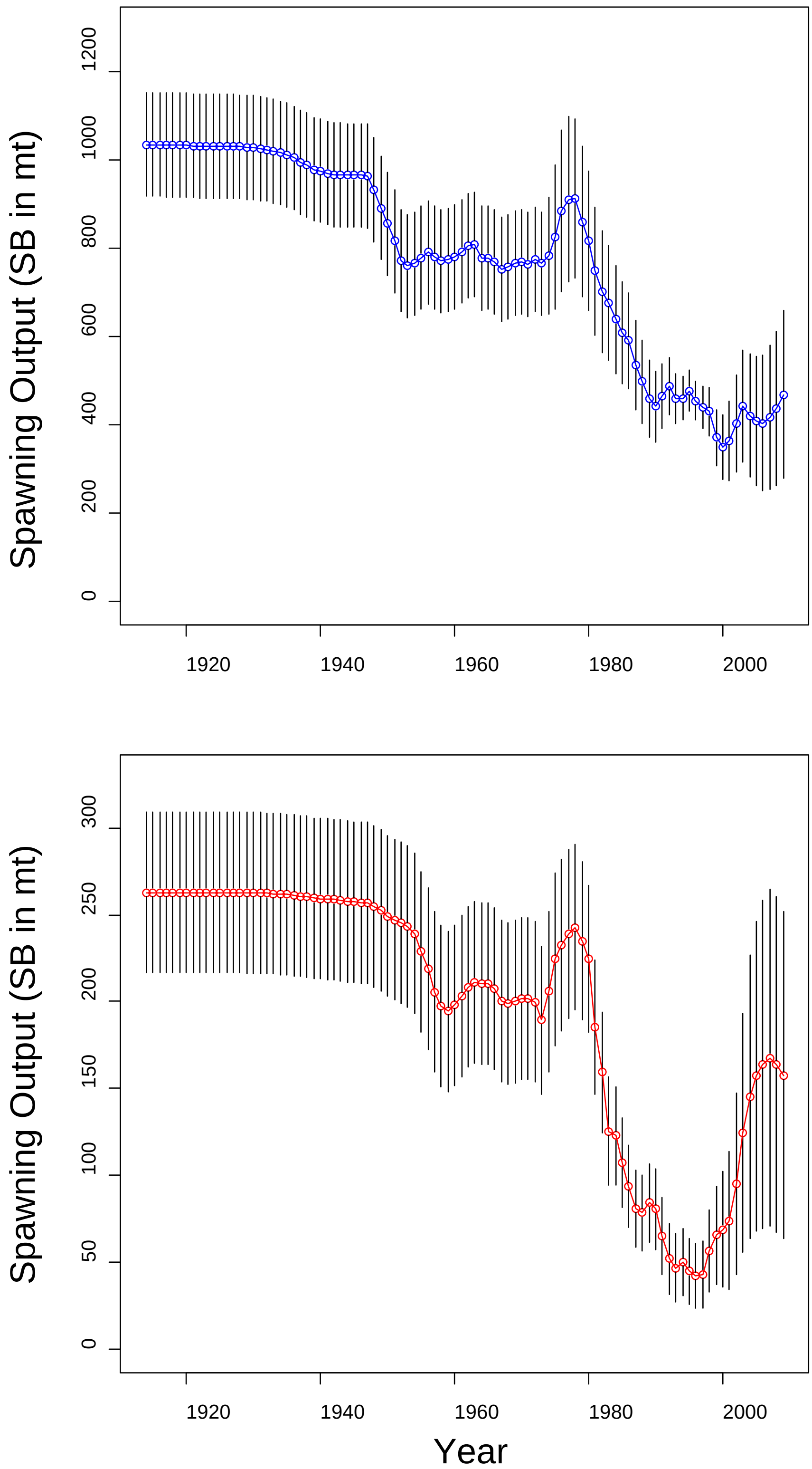

Figure E-5. Spawning output for the northern (NCS, top) and southern (SCS, bottom) California sub-stocks. Black bars indicate 2 standard deviations of uncertainty.

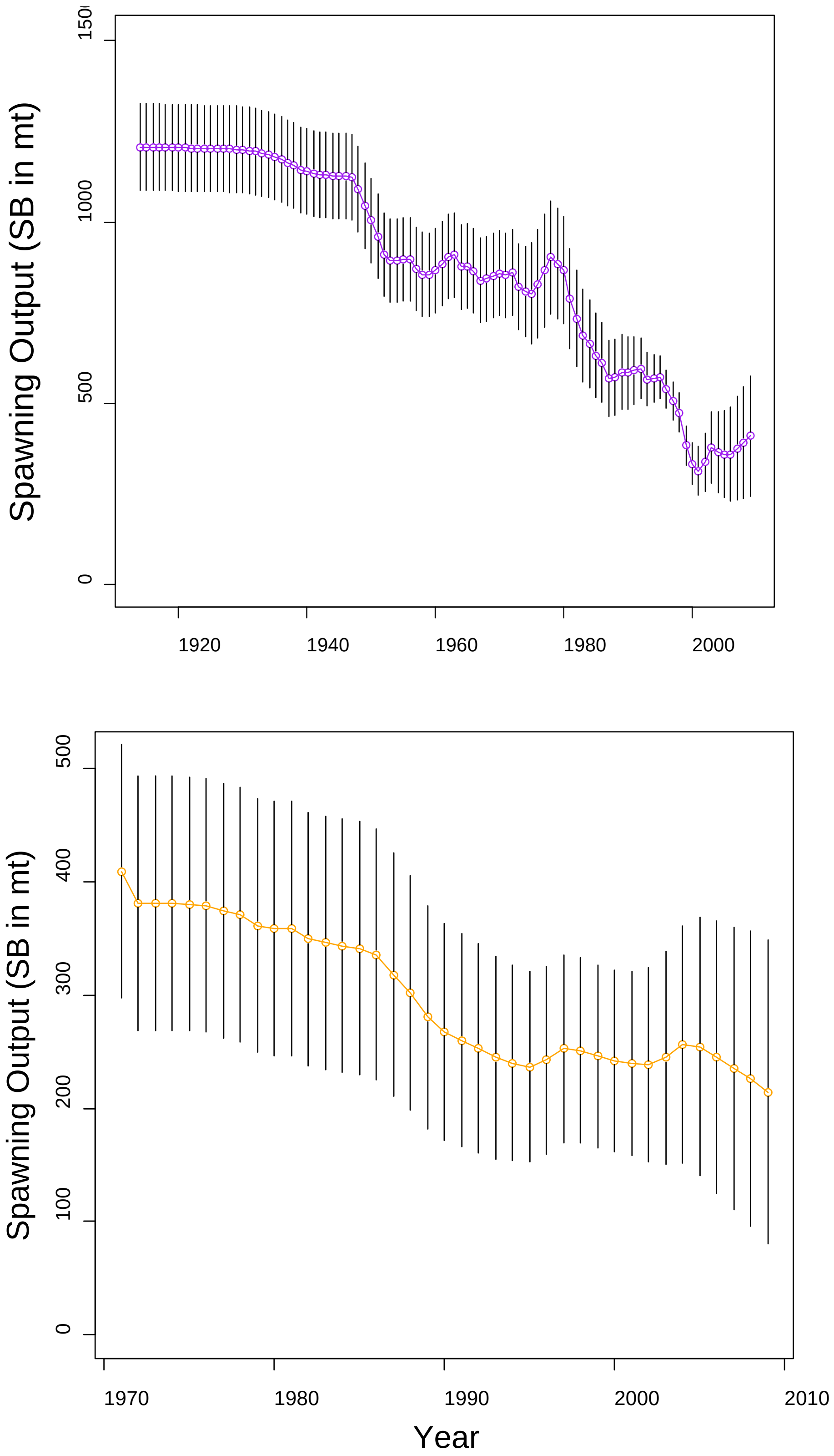

Figure E-6. Spawning output trajectories for the California (CAS, top) and Oregon (ORS, bottom) sub-stocks. Black bars indicate 2 standard deviations of uncertainty.

Table E-2. Recent trend in estimated cabezon female spawning biomass and relative depletion for each sub-stock.

NCS

Year	**Spawning output (mt)**	**~95% C.I.**	**Estimated depletion**	**~95% C.I.**
2000	351	278-425	33.9%	0.29-0.39
2001	364	275-453	35.1%	0.29-0.42
2002	405	295-515	39.0%	0.31-0.47
2003	443	315-571	42.7%	0.33-0.52
2004	421	282-561	40.7%	0.30-0.51
2005	410	263-556	39.5%	0.29-0.51
2006	404	250-558	39.0%	0.27-0.51
2007	417	253-582	40.3%	0.28-0.53
2008	438	262-614	42.2%	0.29-0.55
2009	469	279-659	45.2%	0.31-0.59

CAS

Year	**Spawning output (mt)**	**~95% C.I.**	**Estimated depletion**	**~95% C.I.**
2000	333	275-391	27.6%	0.24-0.32
2001	313	247-380	26.0%	0.21-0.31
2002	338	257-419	28.0%	0.22-0.33
2003	379	281-476	31.4%	0.25-0.38
2004	366	255-477	30.3%	0.23-0.38
2005	360	240-480	29.8%	0.22-0.38
2006	359	229-489	29.7%	0.21-0.39
2007	376	234-519	31.2%	0.21-0.41
2008	392	238-547	32.5%	0.22-0.43
2009	410	244-576	34.0%	0.23-0.45

SCS

Year	**Spawning output (mt)**	**~95% C.I.**	**Estimated depletion**	**~95% C.I.**
2000	69	36-102	26.3%	0.17-0.36
2001	74	34-114	28.2%	0.16-0.40
2002	95	43-147	36.2%	0.21-0.51
2003	124	56-193	47.4%	0.27-0.67
2004	145	64-227	55.2%	0.31-0.79
2005	157	68-246	59.8%	0.34-0.86
2006	164	70-258	62.4%	0.35-0.90
2007	168	71-265	63.8%	0.36-0.92
2008	164	68-260	62.4%	0.35-0.90
2009	158	64-252	60.0%	0.33-0.87

ORS

Year	**Spawning output (mt)**	**~95% C.I.**	**Estimated depletion**	**~95% C.I.**
2000	242	161-322	59.0%	0.52-0.66
2001	239	158-320	58.5%	0.51-0.65
2002	238	153-324	58.2%	0.51-0.66
2003	245	150-339	59.8%	0.51-0.69
2004	256	151-361	62.6%	0.52-0.73
2005	254	140-368	62.1%	0.49-0.75
2006	245	125-366	60.0%	0.45-0.75
2007	235	110-360	57.4%	0.41-0.74
2008	226	96-356	55.2%	0.37-0.73
2009	214	80-349	52.4%	0.33-0.72

Table E-3. Total cabezon spawning output and depletion rates in California.

	Total California Cabezon Spawning Biomass (mt)				
Model	SB_{1916}	SB_{2005}	SB_{2005}/SB_{1916}	SB_{2009}	SB_{2009}/SB_{1916}
2009 Assessment					
NCS+SCS	1298	567	44%	627	48%
CAS	1207	360	30%	410	34%
2005 Assessment					
NCS+SCS	1361	516	37.9%		
CAS	1268	634	50.0%		

Recruitment

A Beverton-Holt equation with lognormal process error is used to characterize the spawner-recruitment relationship of all cabezon sub-populations. The steepness parameter is also set to 0.7 for all base models. Recruitment residuals are estimated for 1970–2006 for all California sub-stocks and 1980-2006 for the Oregon sub-stock. These series were defined by identifying the informative portion of recruitment deviations through declining asymptotic variances when the full time series of recruitment deviations are estimated. The last 10 years of recruitments for each sub-stock are found in Tables E-4 and E-9.

There are several notable recruitment events in and among the California stocks after 1980, but only one (in 2005) after 2000 (Figures E-7 and E-8). Distinct recruitment patterns are seen in both California sub-stocks. For the state-wide California model, all recruitments since 2000 are below the expectation of deterministic recruitments, contributing to the overall decline in recent years. The fact that depletion in the state-wide model is estimated to be lower than that of either individual sub-stock demonstrates how overall recruitment patterns can be altered by combining data from areas with different patterns. Such an approach can diminish or embellish recruitment deviations and result in emergent population dynamics unrepresentative of the individual areas (Figure E-9). The addition of more age-composition data would help resolve more fully the estimates of recruitment patterns in California.

Oregon recruitment is less dynamic than in California, but shows a similar trend of one large recruitment in the late 1990s (1999) and only one notable recruitment above expectation in the most recent years (2004). The relative uncertainty around recruitments in Oregon is also lower than in the California sub-stocks.

Table E-4. Recent trend in estimated cabezon recruitment (in 1000s) for each sub-stock.

NCS			SCS		
Year	**Estimated recruitment**	**~95% C.I.**	**Year**	**Estimated recruitment**	**~95% C.I.**
2000	491	253-729	**2000**	87	0-190
2001	421	157-686	**2001**	128	0-281
2002	584	186-981	**2002**	227	0-458
2003	733	240-1226	**2003**	152	0-308
2004	552	130-974	**2004**	79	0-159
2005	886	219-1554	**2005**	92	1-182
2006	738	166-1310	**2006**	121	2-240
2007	750	593-906	**2007**	192	140-244
2008	764	606-923	**2008**	194	141-246
2009	776	3-1549	**2009**	192	0-460

CAS			ORS		
Year	**Estimated recruitment**	**~95% C.I.**	**Year**	**Estimated recruitment**	**~95% C.I.**
2000	467	241-694	**2000**	211	112-310
2001	341	132-550	**2001**	188	101-276
2002	543	187-899	**2002**	148	68-228
2003	732	277-1188	**2003**	131	56-207
2004	425	121-728	**2004**	187	73-301
2005	565	161-968	**2005**	137	31-242
2006	559	144-974	**2006**	88	8-169
2007	732	581-883	**2007**	141	0-284
2008	750	595-906	**2008**	180	117-242
2009	759	2-1516	**2009**	178	0-363

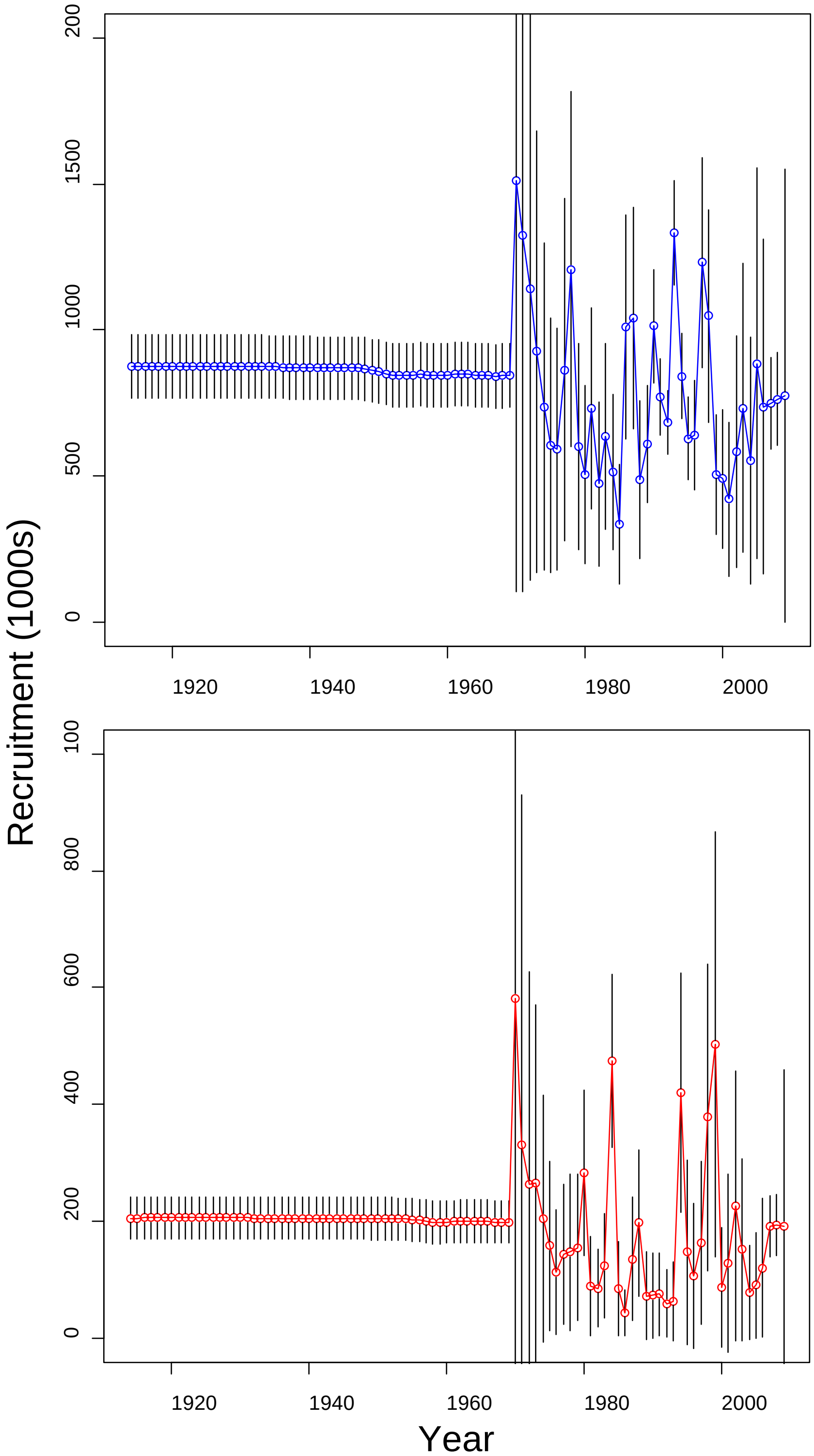

Figure E-7. Time-trajectories of recruitment (1000s) for the NCS and the SCS. Points are point estimates; vertical lines represent the approximate 95% confidence intervals.

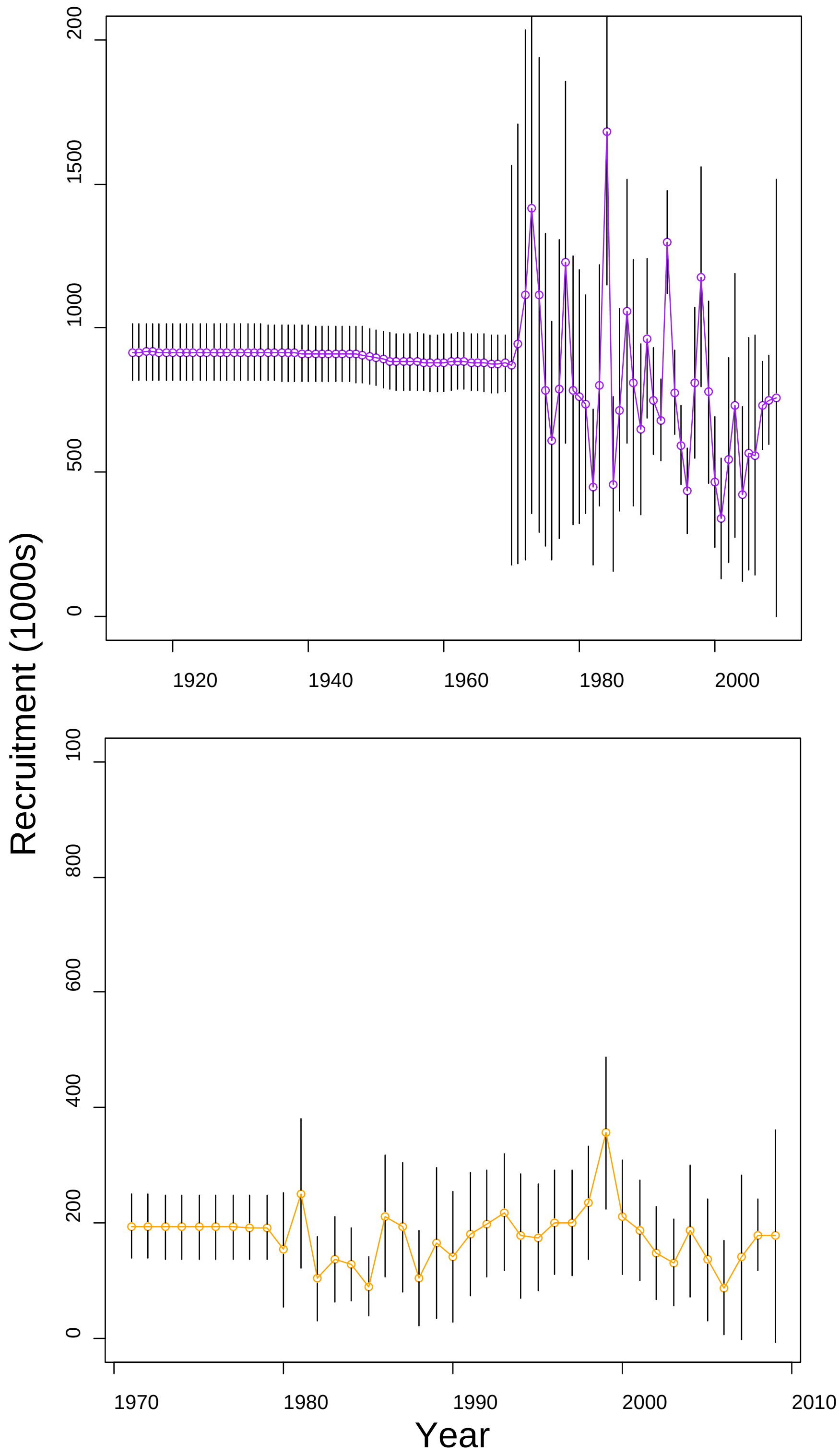

Figure E-8. Time-trajectories of recruitment (1000s) for the CAS and the ORS. Points are point estimates; vertical lines represent the approximate 95% confidence intervals.

Recruitment deviations

Year

Figure E-9. Recruitment deviations for each of the California sub-stocks.

Reference points

The unfished spawning outputs of the northern and southern California cabezon sub-stocks are estimated to be 1036 (NCS) and 262 (SCS) mt, respectively, with estimated 2009 spawning outputs of 469 (NCS) and 158 (SCS) mt (Figure E-5). The unfished spawning outputs for the state-wide California and Oregon stocks are estimated at 1207 (CAS) and 409 (ORS) mt, respectively, with estimated 2009 spawning outputs of 410 (CAS) and 214 (ORS) mt (Figure E-6). Total unfished cabezon spawning output, as a sum of the two California sub-stocks, is estimated at 1298 mt. This compares to 1361 in the 2005 assessment and 1207 for the 2009 one CA sub-stock. Current total cabezon spawning output for the summed CA sub-stock models is 627 mt, compared with 410 mt for the one-stock model. Median depletion in 2005 versus the 2005 depletion estimate from the current assessment is more similar to the summed results of the two sub-stock models than the one-stock model.

The target reference point for cabezon is 40% of the spawning biomass ($SB_{40\%}$), with a limit reference point of 25% ($SB_{25\%}$). Allowable Biological Catch is set using an

F_{MSY}-proxy harvest rate of $SPR_{45\%}$ ($F_{45\%}$), with Optimum Yields reduced from that level, according to the 40-10 harvest policy, when the spawning biomass falls below the target level. An alternative set of reference points comes from the Nearshore Fishery Management Plan (NFMP) of California that suggests a 60-10 rule with $SPR_{50\%}$ ($F_{50\%}$). Under these scenarios, the reference points only changed when based on the SPR proxy for MSY. Due to the large number of reference points and associated yields relating to the four base case models in this assessment, refer to Table E-10 for each of the sub-stock-specific quantities. Population and fishing rates relative to target levels are given in Figures E-10 and E-11.

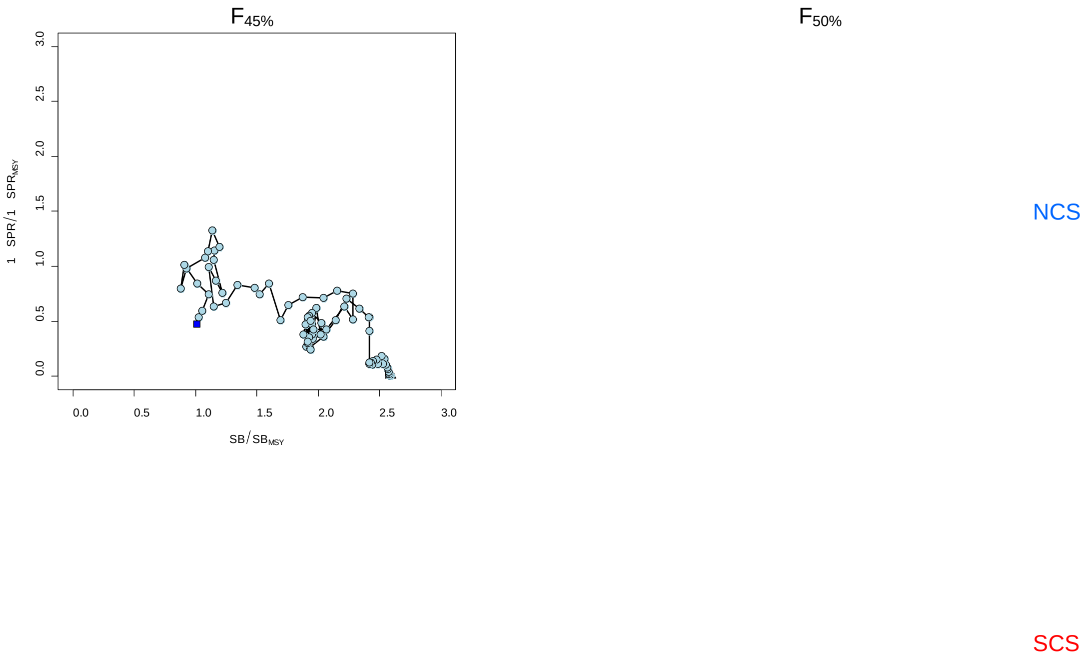

Figure E-10. Spawning biomass (x-axis) and exploitation rates (y-axis) relative to the target levels (at MSY) for each sub-stock (NCS top row; SCS bottom row) for each F_{MSY} proxy (columns). Solid triangles represent the start of the time period; solid squares represent the end of the time period.

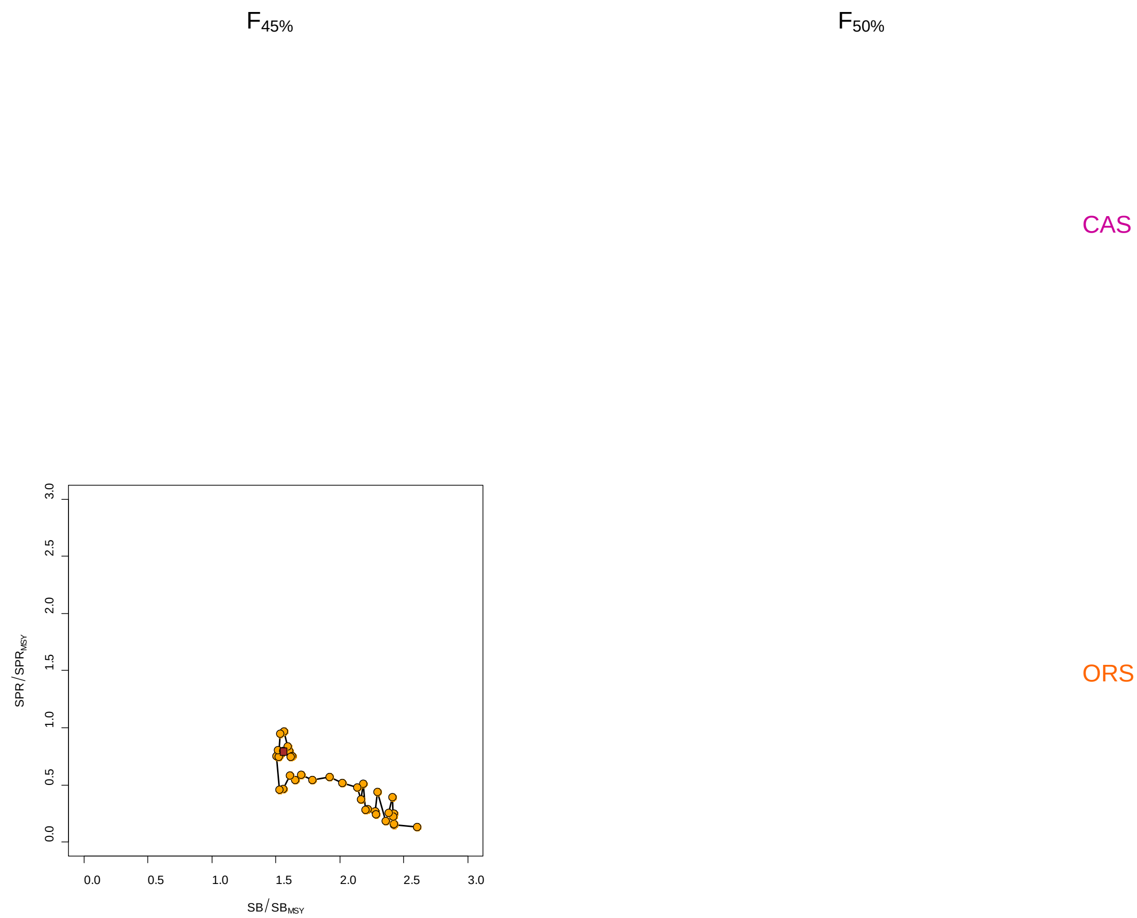

Figure E-11. Spawning biomass (x-axis) and exploitation rates (y-axis) relative to the target levels (at MSY) for each state sub-stock (CAS top row; ORS bottom row) for each F_{MSY} proxy (columns). Solid triangles represent the start of the time period; solid squares represent the end of the time period.

Exploitation status

The abundance of cabezon is estimated to have dropped below the $SB_{40\%}$ management target in 1998 (CAS), 1999 (NCS) and 1986 (SCS) in the California sub-stock base case models. Oregon has yet to fall below the target level. The state-wide California model approaches the overfished threshold ($SB_{25\%}$) in the year 2001 and the SCS falls below this threshold in the years 1991-1998 (Figure E-12). The current (2009) spawning output of the cabezon resource off California is estimated to be about 45% (NCS) and 60% (SCS) of the unfished level, both above the target level of 40% (Figure E-12). The state-wide California model is currently estimated at 34% of the unfished biomass, below the target but above the limit reference point. The Oregon base case estimate of depletion is at 52%, above the target level. The SCS model is the most dynamic, with large uncertainties in current biomass. While the uncertainty in the depletion level of the Oregon stock is generally low, uncertainty in the spawning biomass is high (Figure E-6).

Fishing mortality rates in excess of the current F-target for cabezon of $SPR_{45\%}$ are estimated to have begun in the 1980s in southern California and in the 1990s in northern California (Figure E-13), but have dropped in more recent years (Table E-5). Harvest rates for the Oregon stock have not exceeded this target level. In 2008, relative F (catch/biomass of age2+) is estimated at 0.04 (NCS), 0.03 (SCS), 0.06 (CAS) and 0.09 (ORS) for the sub-stocks.

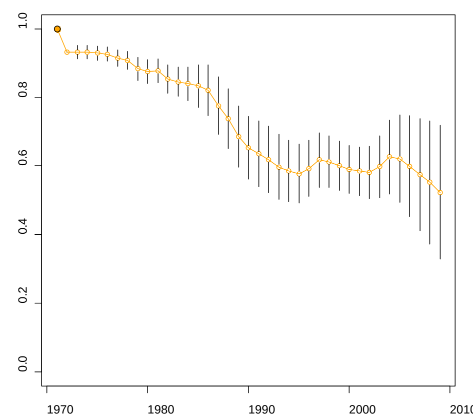

Figure E-12. Time trajectories of depletion and spawning output compared to the target and limit reference points for each cabezon sub-stock considered in this assessment.

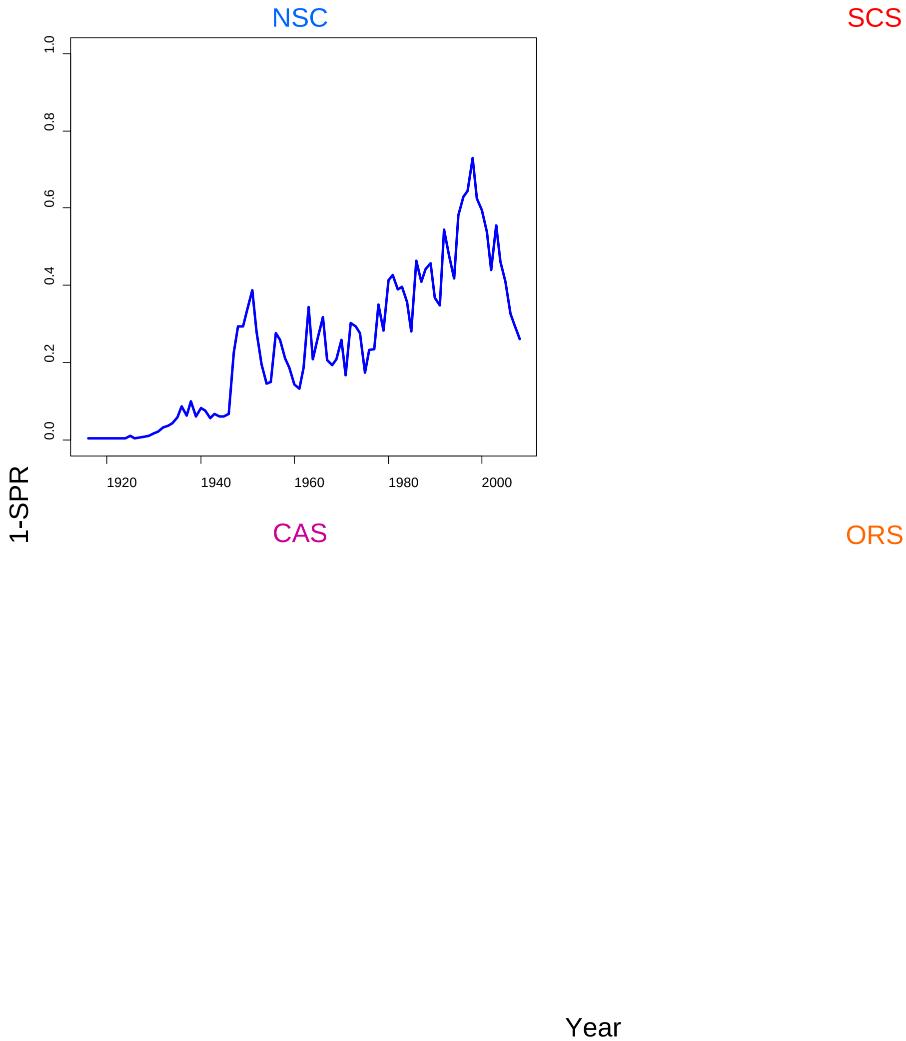

Figure E-13. Estimate of the spawning potential ratio (1-SPR) from each of the sub-stock base case models. Values above the red overfishing line indicate fishing above the MSY proxy harvest rate.

Table E-5. Recent trend in fishing rate as it relates to spawning potential ratio (1-SPR) and relative exploitation rate (catch/biomass of age-2+).

NCS

Year	Estimated 1-SPR (%)	~95% C.I.	Relative F
2000	0.59	0.53-0.65	0.13
2001	0.54	0.47-0.61	0.11
2002	0.44	0.37-0.51	0.08
2003	0.56	0.48-0.63	0.14
2004	0.46	0.37-0.55	0.10
2005	0.41	0.32-0.50	0.08
2006	0.33	0.24-0.41	0.06
2007	0.30	0.21-0.38	0.05
2008	0.26	0.18-0.34	0.04

SCS

Year	Estimated 1-SPR (%)	~95% C.I.	Relative F
2000	0.63	0.52-0.75	0.14
2001	0.53	0.39-0.67	0.08
2002	0.41	0.27-0.55	0.06
2003	0.33	0.20-0.45	0.05
2004	0.26	0.15-0.38	0.04
2005	0.27	0.15-0.39	0.04
2006	0.20	0.11-0.29	0.03
2007	0.23	0.13-0.34	0.04
2008	0.22	0.12-0.31	0.03

CAS

Year	Estimated 1-SPR (%)	~95% C.I.	Relative F
2000	0.67	0.63-0.72	0.18
2001	0.63	0.58-0.69	0.15
2002	0.55	0.48-0.62	0.11
2003	0.64	0.57-0.70	0.18
2004	0.55	0.46-0.63	0.13
2005	0.50	0.41-0.59	0.11
2006	0.41	0.32-0.50	0.08
2007	0.39	0.29-0.48	0.07
2008	0.35	0.25-0.44	0.06

ORS

Year	Estimated 1-SPR (%)	~95% C.I.	Relative F
2000	0.46	0.37-0.55	0.08
2001	0.53	0.43-0.63	0.10
2002	0.52	0.41-0.63	0.10
2003	0.41	0.30-0.52	0.07
2004	0.44	0.33-0.56	0.09
2005	0.44	0.31-0.56	0.09
2006	0.41	0.28-0.55	0.08
2007	0.41	0.27-0.55	0.08
2008	0.44	0.28-0.60	0.09

Management performance
Currently, cabezon has a 15 inch size limit in California for both the commercial and recreational fisheries. Since 2005, there has been a one fish bag limit for recreational anglers. Cabezon experienced emergency commercial closures for some portion of the year from 2001-2005 once the OY had been exceeded. Since then, cumulative trip limits have been reduced from 900 pounds to 200-300 pounds (inseason adjustment) so the commercial fishery could remain open year-round and not exceed the state-wide OY of 69 mt (Table E-6). Even though the 2005 assessment of cabezon was split into two sub-stocks, resulting in depletion levels of 40% (NCS) and 28% (SCS), the State of California continued to manage cabezon on a state-wide level.

Oregon established a 16 inch size limit for cabezon in 2004. Currently, there is a six fish bag limit for the “rockfish et al” complex combined that includes cabezon. From 2004-2008, inseason changes were made where cabezon were prohibited to be taken by boats during portions of the year. This is the first of assessment of cabezon in Oregon, so ABCs have not been previously set for cabezon to evaluate management performance.

Figures E-10 and E-11 indicate reference points based on the federal (the 40-10 control rule with a $F_{45\%}$ F_{MSY} proxy) and state (the 60-20 control rule with a $F_{50\%}$ F_{MSY} proxy) guidelines for each sub-stock. The SCS assessments demonstrates a sub-stock that was historically overfished and undergoing overfishing, based on the current harvest rate proxies. For the SCS, these thresholds were exceeded from the 1980s through the 1990s (Figure E-13). The NCS and CAS experienced potential overfishing during the late 1990s (attributable to the increase in live-fish landings), but never exceeded harvest to a level to be considered overfished (Figure E-13). The ORS base case infers that no level of overfishing has occurred, though exploitation rates have been at their highest historical levels in the most recent years (Figure E-13).

Table E-6. Recent trend in estimated total cabezon catch and commercial landings (mt) relative to management guidelines. [N/A because cabezon have been managed using state-wide OY (CAS) or first time assessment (ORS).] The NCS has recently landed around 80% of California's state-wide cabezon take, SCS around 20%.

NCS

Year	ABC (mtons)	OY (mtons)	Commercial Landings (mtons)	Total Removals (mtons)
1999	N/A	N/A	113.5	147.8
2000	N/A	N/A	96.5	127.5
2001	N/A	N/A	60.0	105.4
2002	N/A	N/A	44.7	79.1
2003	N/A	N/A	40.7	134.5
2004	N/A	N/A	48.7	89.0
2005	N/A	N/A	31.7	71.6
2006	N/A	N/A	29.2	50.9
2007	N/A	N/A	26.3	44.7
2008	N/A	N/A	19.8	39.5

SCS

Year	ABC (mtons)	OY (mtons)	Commercial Landings (mtons)	Total Removals (mtons)
1999	N/A	N/A	14.7	29.3
2000	N/A	N/A	22.9	29.5
2001	N/A	N/A	14.5	23.0
2002	N/A	N/A	6.9	18.6
2003	N/A	N/A	6.2	15.9
2004	N/A	N/A	5.9	12.8
2005	N/A	N/A	4.1	13.8
2006	N/A	N/A	4.0	9.5
2007	N/A	N/A	3.3	11.7
2008	N/A	N/A	3.9	10.1

CAS

Year	ABC (mtons)	OY * (mtons)	Commercial Landings (mtons)	Total Removals (mtons)
1999	N/A	N/A	128.2	177.2
2000	N/A	72	119.4	157.1
2001	N/A	72	74.5	128.5
2002	N/A	81	51.6	97.7
2003	N/A	88	46.9	150.4
2004	N/A	69	54.5	101.8
2005	103	69	35.8	85.4
2006	108	69	33.2	60.4
2007	94	69	29.7	56.4
2008	94	69	23.7	49.6

ORS

Year	ABC (mtons)	OY (mtons)	Commercial Landings (mtons)	Total Removals (mtons)
1999	N/A	N/A	26.5	45.3
2000	N/A	N/A	31.2	48.3
2001	N/A	N/A	46.3	61.6
2002	N/A	N/A	46.0	62.9
2003	N/A	N/A	27.0	44.6
2004	N/A	N/A	33.7	51.9
2005	N/A	N/A	29.9	49.6
2006	N/A	N/A	25.6	43.3
2007	N/A	N/A	23.2	41.1
2008	N/A	N/A	25.1	43.2

* State-wide OYs in California (CAS) prior to 2005 were put into place by the Fish and Game Commission.

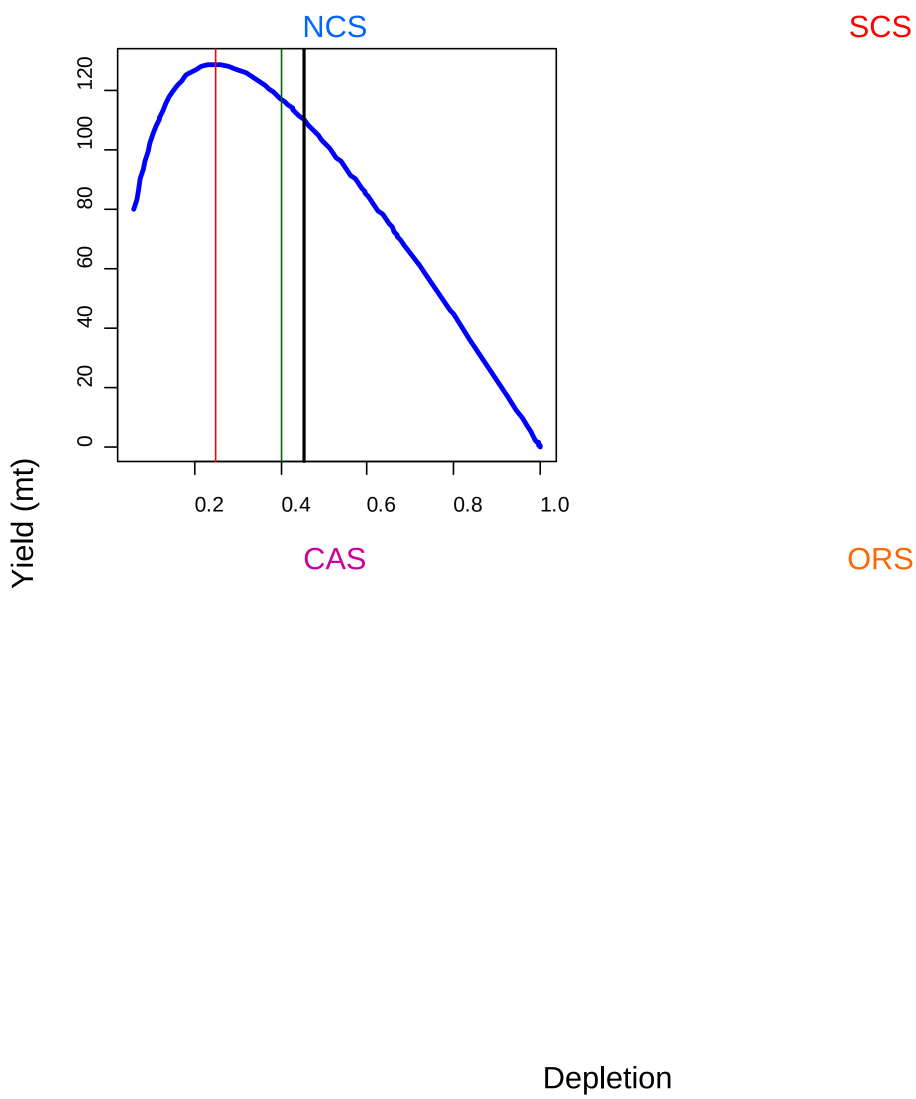

Figure E-14. Equilibrium yield curves for each sub-stock base case model. Reference points and current stock status are indicated by the vertical lines.

Regional Management

The results of these assessments provide the scientific basis for cabezon to be managed regionally using the California Department of Fish and Game northern/central and southern California management areas and/or across the entire states of California and Oregon. They also provide a basis by which state-wide management can still be informed by regional dynamics. Given important differences in population dynamics between the two California sub-stocks, summing the biomass across sub-stocks results in state-wide biomass estimates that incorporate regional differences in dynamics. This approach is not equivalent to the one stock state-wide model that ignores regional dynamics.

More work and sampling effort is needed to evaluate whether cabezon among these areas differ biologically (growth, maturity, etc.), but the results of this assessment indicate that the center of cabezon biomass resides within central/northern California. The possibility of additional cabezon sub-populations can not be ruled out. Regional management is an important consideration in relatively sedentary nearshore reef species such as cabezon and future assessments should continue to provide scientific analyses on increasingly finer spatial scales.

Unresolved problems and major uncertainties

Several sources of uncertainty were recognized and explored using sensitivity analyses. Results for all California sub-stock assessments are insensitive to the systematic inclusion or exclusion of each data source. In the previous assessment, the NCS was sensitive to the inclusion of the TENERA adult survey, causing the population to show a greater decline compared to the base case. Sensitivity to the TENERA adult survey is not a characteristic of the current assessment. The 2005 assessment of the SCS was highly sensitive to the inclusion of the 2000 man-made recreational fleet mean weight data. This behavior is also not seen in the current implementation of the assessment. The model was not sensitive the choice of breaking the CPFV time series into two series because of management changes affecting the interpretation of the continuous time series.

Other major uncertainties relate to the values assumed for natural mortality (*M*) for each sex, the assumption of male growth patterns, the choice of the stock-recruit relationship (Beverton-Holt vs. Ricker), and values assumed for recruitment compensation (steepness (*h*)). Most uncertainty was seen in the absolute biomass measures. Overall, all California models are less sensitive than in the previous assessments and population depletion in most sensitivity trials was either above or near the target depletion levels.

The Oregon model was robust to almost all data and parameter manipulation trials accept the removal of the ORBS survey. Removal of the only abundance index causes the population to drop sharply below the overfished level and absolute biomass to be much smaller than in the base case.

Forecasts

Twelve-year forward projections of yield are conducted for each sub-stock under two alternatives based on federal and state ABC control rule definitions (based on F_{MSY} proxies of $F_{45\%}$ and $F_{50\%}$, respectively) and federal and state OY threshold harvest control rules (40-10 or 60-20, respectively). The standard PFMC OY control rule for groundfish such as cabezon is based on $F_{45\%}$ with a 40-10 adjustment for stocks below the target level of 40% of the unfished reproductive output. The California Nearshore Fishery Management Plan proposes the use of a F_{MSY} proxy of $F_{50\%}$ and a 60-20 adjustment for stocks below 60% of the unfished reproductive output. The relative proportion of all fleets in future harvests is assumed to be the same as the last year (2008) in the model. Results of the projections are given in Table E-7. Overfishing limits (OFLs) are provided in this table because they will be used in the 2011-12 management cycle.

Table E-7. Projection of potential cabezon ABC, OY, spawning biomass and depletion for each substock base case models, based on the SPR=45% and 50% targets and appropriate control rule.

NCS	40:10 and $SPR_{45\%}$					60:20 and $SPR_{50\%}$				
Year	**ABC (mtons)**	**OY (mtons)**	**Age 2+ biomass (mtons)**	**Spawning biomass (mtons)**	**Depletion**	**ABC (mtons)**	**OY (mtons)**	**Age 2+ biomass (mtons)**	**Spawning biomass (mtons)**	**Depletion**
2009	137	137	1049	469	45.2%	114	95	1049	469	45.2%
2010	132	132	1023	447	43.2%	114	96	1057	472	45.5%
2011	128	128	1008	433	41.8%	115	97	1066	476	45.9%
2012	126	126	999	423	40.9%	116	99	1075	479	46.2%
2013	125	125	992	418	40.3%	117	100	1083	482	46.5%
2014	124	124	988	414	40.0%	118	101	1090	485	46.8%
2015	123	123	984	412	39.7%	119	102	1095	488	47.1%
2016	123	122	980	410	39.6%	119	103	1099	490	47.3%
2017	122	122	978	409	39.4%	120	104	1102	492	47.4%
2018	122	121	975	407	39.3%	120	104	1104	493	47.6%
2019	122	121	973	406	39.2%	120	105	1106	494	47.6%
2020	121	121	971	405	39.1%	120	105	1108	495	47.7%

SCS	40:10 and $SPR_{45\%}$					60:20 and $SPR_{50\%}$				
Year	**ABC (mtons)**	**OY (mtons)**	**Age 2+ biomass (mtons)**	**Spawning biomass (mtons)**	**Depletion**	**ABC (mtons)**	**OY (mtons)**	**Age 2+ biomass (mtons)**	**Spawning biomass (mtons)**	**Depletion**
2009	39	39	293	158	60.0%	33	33	293	158	60.0%
2010	34	34	273	134	51.1%	30	28	278	138	52.6%
2011	32	32	261	120	45.6%	28	25	272	127	48.5%
2012	30	30	255	112	42.7%	27	24	271	123	46.9%
2013	30	30	252	109	41.5%	27	23	272	123	46.6%
2014	29	29	250	107	40.9%	27	24	274	123	46.9%
2015	29	29	249	107	40.6%	28	24	276	124	47.2%
2016	29	29	248	106	40.3%	28	24	277	125	47.5%
2017	29	29	247	105	40.1%	28	24	278	125	47.7%
2018	29	29	245	105	39.9%	28	24	278	126	47.9%
2019	29	28	245	104	39.7%	28	24	279	126	47.9%
2020	28	28	244	104	39.5%	28	25	279	126	48.0%

Table E-7 (Continued).

CAS	40:10 and $SPR_{45\%}$					60:20 and $SPR_{50\%}$				
Year	ABC (mtons)	OY (mtons)	Age 2+ biomass (mtons)	Spawning biomass (mtons)	Depletion	ABC (mtons)	OY (mtons)	Age 2+ biomass (mtons)	Spawning biomass (mtons)	Depletion
2009	115	108	877	410	34.0%	95	59	877	410	34.0%
2010	112	103	884	395	32.7%	98	64	924	424	35.1%
2011	111	103	904	393	32.5%	102	70	972	443	36.7%
2012	113	106	929	401	33.2%	107	77	1017	465	38.5%
2013	116	110	952	413	34.2%	112	84	1056	487	40.3%
2014	120	114	973	425	35.2%	116	91	1090	506	41.9%
2015	122	118	989	434	36.0%	120	96	1117	522	43.2%
2016	124	120	1001	441	36.5%	122	101	1138	534	44.3%
2017	126	122	1011	447	37.0%	125	104	1156	544	45.1%
2018	127	124	1019	451	37.3%	126	107	1170	552	45.7%
2019	128	125	1026	454	37.6%	128	109	1180	557	46.2%
2020	129	126	1031	456	37.8%	129	110	1189	562	46.6%

ORS	40:10 and $SPR_{45\%}$					60:20 and $SPR_{50\%}$				
Year	ABC (mtons)	OY (mtons)	Age 2+ biomass (mtons)	Spawning biomass (mtons)	Depletion	ABC (mtons)	OY (mtons)	Age 2+ biomass (mtons)	Spawning biomass (mtons)	Depletion
2009	60	60	455	214	52.4%	51	47	455	214	52.4%
2010	53	53	425	189	46.3%	47	41	437	196	48.0%
2011	50	50	411	170	41.6%	45	37	433	184	44.9%
2012	48	48	406	161	39.4%	45	37	437	180	44.0%
2013	48	48	406	159	38.8%	46	38	444	182	44.5%
2014	49	48	407	159	38.9%	47	39	451	186	45.4%
2015	49	49	407	160	39.1%	47	40	457	189	46.2%
2016	49	49	407	160	39.1%	48	41	461	192	46.8%
2017	49	49	407	160	39.1%	48	42	464	193	47.2%
2018	49	49	407	160	39.1%	49	42	466	194	47.5%
2019	49	49	407	160	39.0%	49	42	467	195	47.7%
2020	49	49	406	159	39.0%	49	43	469	196	47.8%

Decision table

Decision table projections based on alternative states of nature (columns in the decision tables) for 3 of the 4 sub-stocks were explored to capture uncertainty in population conditions (Table E-8) and control rules (40-10,$F_{45\%}$ and 60-20,$F_{50\%}$). The STAR panel agreed with the STAT that state-wide management was most appropriately determined from the combined NCS and SCS models, not the CAS model. A decision table for the CAS is therefore not presented. For the NCS, SCS, and ORS sub-stocks, the low and high *M* scenarios refer to different assumptions about sex-specific natural mortality (the greatest source of uncertainty in all sub-stock models) and were retained from the last assessment. The low scenario assumes M = 0.2/yr and 0.25/yr for females and males respectively, while the high scenario assumes 0.3/yr and 0.35/yr respectively. Catch histories (rows in the decision tables) were based on three proposed catch scenarios: 1) catch series based on the specified control rule (either 40-10 or 60-20) derived from the low *M* state of nature (low *M* catch scenario); 2) catch series based on the specified control rule (either 40-10 or 60-20) derived from the base case *M* state of nature (base case *M* scenario); and 3) catch series based on the specified control rule (either 40-10 or 60-20) derived from the high *M* state of nature (high *M* catch scenario).

All sub-stocks demonstrated spawning output depletion below limit reference points when the low *M* scenario was subjected to the base case and high catch scenarios. This also occurred when the base case *M* scenario was subjected to the high catch scenario. All other scenarios demonstrated depletion near or above the target reference points at the end of each projection period. Relative to biomass and depletion estimates, the 60-20 rule was much more conservative than the 40-10 rule.

Table E-8. Decision analysis of spawning output depletion based on different states of nature (columns) under different catch histories (rows) and control rules for each cabezon sub-stock. For the 40-10 rule, 0.40 and 0.25 are the target and limit reference points, respectively. For the 60-20 rule, 0.60 and 0.30 are the target and limit reference points, respectively. At or above the target reference point is indicated by green; between the target and limit reference points is indicated by yellow; below the limit reference point is indicated by red.

NCS: 40-10, $F_{45\%}$

					State of Nature		
					Low *M*	Base Case *M*	High *M*
		Removals			(F= 0.2/M=0.25)	(F=0.25/M=0.3)	(F=0.3/M=0.35)
	Year	Comm.	Rec.	Total	p = 0.25	p = 0.5	p = 0.25
Low *M* catches	2009	41	41	82	0.34	0.45	0.53
	2010	43	42	84	0.35	0.46	0.54
	2011	44	43	86	0.36	0.47	0.55
	2012	45	44	88	0.36	0.48	0.56
	2013	45	44	89	0.37	0.49	0.58
	2014	46	45	91	0.37	0.49	0.59
	2015	46	45	92	0.37	0.50	0.60
	2016	47	46	92	0.38	0.50	0.61
	2017	47	46	93	0.38	0.51	0.62
	2018	47	46	94	0.38	0.51	0.62
	2019	47	47	94	0.38	0.52	0.63
	2020	48	47	95	0.38	0.52	0.63
Base case *M* catches	2009	69	68	137	0.34	0.45	0.53
	2010	67	64	132	0.32	0.43	0.51
	2011	66	62	128	0.30	0.42	0.50
	2012	65	61	126	0.29	0.41	0.50
	2013	65	60	125	0.28	0.40	0.50
	2014	64	59	124	0.27	0.40	0.51
	2015	64	59	123	0.26	0.40	0.51
	2016	64	59	122	0.26	0.40	0.52
	2017	64	58	122	0.25	0.39	0.52
	2018	63	58	121	0.24	0.39	0.53
	2019	63	58	121	0.24	0.39	0.53
	2020	63	58	121	0.23	0.39	0.53
High *M* catches	2009	107	105	212	0.34	0.45	0.53
	2010	99	93	191	0.28	0.39	0.47
	2011	94	85	179	0.24	0.35	0.44
	2012	92	81	173	0.20	0.32	0.42
	2013	91	79	170	0.18	0.30	0.41
	2014	90	78	169	0.16	0.29	0.41
	2015	90	78	168	0.13	0.27	0.41
	2016	89	77	166	0.11	0.26	0.40
	2017	89	77	165	0.09	0.25	0.40
	2018	88	76	164	0.07	0.23	0.40
	2019	87	75	162	0.05	0.22	0.39
	2020	87	75	162	0.04	0.21	0.39

Table E-8 (Continued).

NCS: 60-20, $F_{50\%}$

		Removals			State of Nature		
					Low *M* (F= 0.2/M=0.25)	Base Case *M* (F=0.25/M=0.3)	High *M* (F=0.3/M=0.35)
	Year	Comm.	Rec.	Total	p = 0.25	p = 0.5	p = 0.25
Low *M* catches	2009	23	22	45	0.34	0.45	0.53
	2010	27	27	53	0.37	0.48	0.56
	2011	30	30	60	0.39	0.51	0.59
	2012	33	33	65	0.41	0.53	0.61
	2013	34	35	69	0.42	0.54	0.62
	2014	36	36	72	0.43	0.55	0.64
	2015	37	38	75	0.44	0.56	0.65
	2016	38	39	77	0.45	0.57	0.66
	2017	39	40	78	0.45	0.58	0.67
	2018	39	40	80	0.46	0.58	0.68
	2019	40	41	81	0.46	0.59	0.68
	2020	40	42	82	0.47	0.59	0.69
Base case *M* catches	2009	48	47	95	0.34	0.45	0.53
	2010	49	47	96	0.34	0.46	0.54
	2011	50	48	97	0.35	0.46	0.54
	2012	50	48	99	0.34	0.46	0.55
	2013	51	49	100	0.34	0.47	0.56
	2014	52	50	101	0.34	0.47	0.57
	2015	52	50	102	0.34	0.47	0.57
	2016	53	51	103	0.34	0.47	0.58
	2017	53	51	104	0.34	0.47	0.59
	2018	53	51	104	0.34	0.48	0.59
	2019	53	51	105	0.34	0.48	0.60
	2020	54	51	105	0.33	0.48	0.60
High *M* catches	2009	83	81	165	0.34	0.45	0.53
	2010	76	72	148	0.31	0.42	0.50
	2011	73	68	141	0.28	0.40	0.48
	2012	72	66	138	0.26	0.38	0.48
	2013	73	66	139	0.25	0.37	0.48
	2014	73	66	140	0.24	0.36	0.48
	2015	74	67	140	0.22	0.36	0.48
	2016	74	67	141	0.21	0.35	0.48
	2017	74	67	141	0.20	0.34	0.48
	2018	74	67	141	0.18	0.34	0.48
	2019	74	67	141	0.17	0.33	0.48
	2020	74	67	141	0.15	0.32	0.48

Table E-8 (Continued).

SCS: 40-10, $F_{45\%}$

					State of Nature		
					Low *M* (F= 0.2/M=0.25)	Base Case *M* (F=0.25/M=0.3)	High *M* (F=0.3/M=0.35)
		Removals					
	Year	Comm.	Rec.	Total	p = 0.25	p = 0.5	p = 0.25
Low *M* catches	2009	7	11	18	0.33	0.60	0.90
	2010	6	11	17	0.31	0.56	0.82
	2011	6	11	16	0.30	0.54	0.78
	2012	6	11	17	0.31	0.54	0.76
	2013	6	11	17	0.32	0.54	0.75
	2014	7	12	18	0.33	0.55	0.75
	2015	7	12	19	0.34	0.56	0.74
	2016	7	12	20	0.35	0.56	0.74
	2017	7	13	20	0.35	0.57	0.74
	2018	8	13	21	0.36	0.57	0.73
	2019	8	13	21	0.36	0.57	0.73
	2020	8	13	21	0.37	0.57	0.73
Base case *M* catches	2009	15	24	39	0.33	0.60	0.90
	2010	12	22	34	0.27	0.51	0.78
	2011	11	20	32	0.22	0.46	0.70
	2012	11	19	30	0.20	0.43	0.66
	2013	11	19	30	0.19	0.41	0.64
	2014	11	19	29	0.18	0.41	0.63
	2015	11	18	29	0.18	0.41	0.62
	2016	11	18	29	0.17	0.40	0.61
	2017	11	18	29	0.16	0.40	0.61
	2018	10	18	29	0.15	0.40	0.61
	2019	10	18	28	0.15	0.40	0.60
	2020	10	18	28	0.14	0.39	0.60
High *M* catches	2009	28	47	75	0.33	0.60	0.90
	2010	22	39	62	0.19	0.43	0.70
	2011	19	34	53	0.10	0.32	0.58
	2012	17	32	49	0.06	0.26	0.52
	2013	16	30	46	0.04	0.23	0.48
	2014	16	29	44	0.02	0.21	0.46
	2015	16	28	43	0.01	0.20	0.45
	2016	15	27	42	0.00	0.18	0.43
	2017	15	27	42	0.00	0.16	0.43
	2018	15	26	41	0.00	0.14	0.42
	2019	15	26	41	0.00	0.13	0.41
	2020	15	26	40	0.46	0.11	0.41

Table E-8 (Continued).

SCS: 60-20, $F_{50\%}$

					State of Nature		
					Low *M*	Base Case *M*	High *M*
		Removals			(F= 0.2/M=0.25)	(F=0.25/M=0.3)	(F=0.3/M=0.35)
	Year	Comm.	Rec.	Total	p = 0.25	p = 0.5	p = 0.25
Low *M* catches	2009	4	6	10	0.33	0.60	0.90
	2010	3	6	10	0.33	0.58	0.84
	2011	4	6	10	0.34	0.57	0.81
	2012	4	7	11	0.35	0.58	0.80
	2013	4	8	12	0.37	0.60	0.79
	2014	5	9	14	0.39	0.61	0.79
	2015	5	9	15	0.40	0.62	0.79
	2016	6	10	16	0.42	0.63	0.79
	2017	6	11	17	0.43	0.64	0.79
	2018	6	11	17	0.44	0.64	0.79
	2019	7	11	18	0.45	0.64	0.78
	2020	7	12	18	0.45	0.64	0.78
Base case *M* catches	2009	12	20	33	0.33	0.60	0.90
	2010	10	18	28	0.28	0.53	0.79
	2011	9	16	25	0.25	0.48	0.73
	2012	8	15	24	0.24	0.47	0.70
	2013	8	15	23	0.24	0.47	0.68
	2014	9	15	24	0.24	0.47	0.68
	2015	9	15	24	0.25	0.47	0.67
	2016	9	15	24	0.25	0.48	0.67
	2017	9	15	24	0.25	0.48	0.67
	2018	9	15	24	0.25	0.48	0.67
	2019	9	15	24	0.25	0.48	0.66
	2020	9	16	25	0.25	0.48	0.66
High *M* catches	2009	24	39	63	0.33	0.60	0.90
	2010	19	34	53	0.21	0.46	0.73
	2011	17	30	47	0.14	0.36	0.62
	2012	15	27	42	0.10	0.31	0.56
	2013	14	25	39	0.08	0.29	0.53
	2014	13	24	38	0.06	0.28	0.52
	2015	13	23	37	0.04	0.27	0.51
	2016	13	23	36	0.02	0.26	0.50
	2017	13	23	36	0.01	0.25	0.50
	2018	13	22	35	0.00	0.24	0.49
	2019	13	22	35	0.00	0.23	0.49
	2020	13	22	35	0.00	0.23	0.49

Table E-8 (Continued).

ORS: 40-10, $F_{45\%}$

	Year	Removals Comm.	Removals Rec.	Removals Total	State of Nature: Low *M* (F= 0.2/M=0.25) p = 0.25	State of Nature: Base Case *M* (F=0.25/M=0.3) p = 0.5	State of Nature: High *M* (F=0.3/M=0.35) p = 0.25
Low *M* catches	2009	19	14	33	0.37	0.52	0.69
	2010	17	13	31	0.35	0.50	0.66
	2011	17	12	29	0.33	0.48	0.64
	2012	17	12	29	0.33	0.48	0.64
	2013	17	12	30	0.34	0.49	0.65
	2014	18	13	31	0.34	0.51	0.67
	2015	19	13	32	0.35	0.52	0.68
	2016	19	14	33	0.36	0.53	0.70
	2017	20	14	34	0.37	0.54	0.71
	2018	20	14	34	0.37	0.55	0.71
	2019	20	14	34	0.37	0.55	0.72
	2020	20	15	35	0.38	0.56	0.73
Base case *M* catches	2009	34	25	60	0.37	0.52	0.69
	2010	30	23	53	0.31	0.46	0.63
	2011	29	21	50	0.26	0.42	0.59
	2012	28	20	48	0.23	0.39	0.57
	2013	28	20	48	0.22	0.39	0.57
	2014	29	20	48	0.21	0.39	0.58
	2015	29	20	49	0.20	0.39	0.59
	2016	29	20	49	0.19	0.39	0.60
	2017	29	20	49	0.18	0.39	0.61
	2018	29	20	49	0.16	0.39	0.61
	2019	29	20	49	0.15	0.39	0.62
	2020	29	20	49	0.14	0.39	0.62
High *M* catches	2009	67	50	117	0.37	0.52	0.69
	2010	57	42	99	0.23	0.38	0.57
	2011	52	37	89	0.12	0.28	0.49
	2012	50	34	84	0.05	0.23	0.45
	2013	50	33	83	0.01	0.19	0.43
	2014	49	33	82	0.01	0.17	0.42
	2015	49	33	82	0.00	0.14	0.42
	2016	49	33	81	0.00	0.11	0.41
	2017	48	32	80	0.00	0.09	0.41
	2018	48	32	80	0.00	0.06	0.40
	2019	47	32	79	0.00	0.03	0.40
	2020	47	31	79	1.52	0.01	0.40

Table E-8 (Continued).

ORS: 60-20, $F_{50\%}$

		Removals			State of Nature		
					Low *M* (F= 0.2/M=0.25)	Base Case *M* (F=0.25/M=0.3)	High *M* (F=0.3/M=0.35)
	Year	Comm.	Rec.	Total	p = 0.25	p = 0.5	p = 0.25
Low *M* catches	2009	11	9	20	0.37	0.52	0.69
	2010	11	8	20	0.37	0.52	0.67
	2011	11	8	20	0.37	0.51	0.66
	2012	12	9	21	0.38	0.52	0.67
	2013	13	9	22	0.39	0.54	0.68
	2014	14	10	24	0.41	0.56	0.70
	2015	15	11	26	0.42	0.58	0.72
	2016	16	12	27	0.44	0.59	0.74
	2017	16	12	28	0.44	0.60	0.75
	2018	17	12	29	0.45	0.61	0.76
	2019	17	13	30	0.46	0.62	0.76
	2020	18	13	31	0.46	0.62	0.77
Base case *M* catches	2009	27	20	47	0.37	0.52	0.69
	2010	23	18	41	0.33	0.48	0.65
	2011	21	16	37	0.30	0.45	0.61
	2012	21	15	37	0.29	0.44	0.61
	2013	22	16	38	0.28	0.44	0.62
	2014	23	16	39	0.28	0.45	0.63
	2015	24	17	40	0.28	0.46	0.64
	2016	24	17	41	0.28	0.47	0.65
	2017	24	17	42	0.28	0.47	0.66
	2018	25	17	42	0.27	0.47	0.67
	2019	25	18	42	0.27	0.48	0.67
	2020	25	18	43	0.26	0.48	0.68
High *M* catches	2009	57	42	99	0.37	0.52	0.69
	2010	49	37	86	0.25	0.41	0.59
	2011	42	31	73	0.16	0.32	0.52
	2012	40	28	68	0.11	0.28	0.49
	2013	40	27	67	0.08	0.26	0.48
	2014	41	28	68	0.05	0.25	0.48
	2015	41	28	69	0.02	0.24	0.49
	2016	41	28	69	0.00	0.22	0.49
	2017	41	28	69	0.01	0.20	0.49
	2018	41	28	69	0.00	0.19	0.49
	2019	41	28	69	0.00	0.17	0.48
	2020	41	28	69	0.00	0.15	0.48

Table E-9. Summary of recent trends in estimated cabezon exploitation and stock levels from the base case models for each sub-stock. All values reported at the beginning of the year.

NCS

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Commercial landings (mt)	97	60	45	41	49	32	29	26	20	N/A
Total catch (mt)	128	105	79	135	89	72	51	45	39	N/A
ABC (mt)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OY	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1-SPR	0.59	0.54	0.44	0.56	0.46	0.41	0.33	0.30	0.26	0.55
Exploitation rate										
(catch/age 2+ biomass)	0.13	0.11	0.08	0.14	0.10	0.08	0.06	0.05	0.04	0.13
Age 2+ biomass (mt)	970	970	965	950	897	893	892	943	994	1,049
Spawning biomass (mt)	351	364	405	443	421	410	404	417	438	469
~95% Confidence interval	278-425	275-453	295-515	315-571	282-561	263-556	250-558	253-582	262-614	279-659
Range of states of nature										
Recruitment (1000s)	491	421	584	733	552	886	738	750	764	776
~95% Confidence interval	253-729	157-686	186-981	240-1226	130-974	219-1554	166-1310	593-906	606-923	3-1549
Range of states of nature										
Depletion	33.9%	35.1%	39.0%	42.7%	40.7%	39.5%	39.0%	40.3%	42.2%	45.2%
~95% Confidence interval	0.29-0.39	0.29-0.42	0.31-0.47	0.33-0.52	0.30-0.51	0.29-0.51	0.27-0.51	0.28-0.53	0.29-0.55	0.31-0.59
Range of states of nature										

SCS

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Commercial landings (mt)	15	23	14	7	6	6	4	4	3	N/A
Total catch (mt)	29	30	23	19	16	13	14	10	12	N/A
ABC (mt)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OY	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1-SPR	0.63	0.53	0.41	0.33	0.26	0.27	0.20	0.23	0.22	0.55
Exploitation rate										
(catch/age 2+ biomass)	0.14	0.08	0.06	0.05	0.04	0.04	0.03	0.04	0.03	0.13
Age 2+ biomass (mt)	216	282	297	307	325	331	319	306	293	293
Spawning biomass (mt)	69	74	95	124	145	157	164	168	164	158
~95% Confidence interval	36-102	34-114	43-147	56-193	64-227	68-246	70-258	71-265	68-260	64-252
Range of states of nature										
Recruitment (1000s)	87	128	227	152	79	92	121	192	194	192
~95% Confidence interval	0-190	0-281	0-458	0-308	0-159	1-182	2-240	140-244	141-246	0-460
Range of states of nature										
Depletion	26.3%	28.2%	36.2%	47.4%	55.2%	59.8%	62.4%	63.8%	62.4%	60.0%
~95% Confidence interval	0.17-0.36	0.16-0.40	0.21-0.51	0.27-0.67	0.31-0.79	0.34-0.86	0.35-0.90	0.36-0.92	0.35-0.90	0.33-0.87
Range of states of nature										

Table E-9 (Continued)

CAS

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Commercial landings (mt)	128	119	74	52	47	55	36	33	30	N/A
Total catch (mt)	177	157	128	98	150	102	85	60	56	N/A
ABC (mt)										
OY	72	72	81	88	54	69	69	69	69	
1-SPR	0.67	0.63	0.55	0.64	0.55	0.50	0.41	0.39	0.35	0.53
Exploitation rate										
(catch/age 2+ biomass)	0.18	0.15	0.11	0.18	0.13	0.11	0.08	0.07	0.06	0.12
Age 2+ biomass (mt)	855	865	861	845	796	804	793	811	831	877
Spawning biomass (mt)	333	313	338	379	366	360	359	376	392	410
~95% Confidence interval	275-391	247-380	257-419	281-476	255-477	240-480	229-489	234-519	238-547	244-576
Range of states of nature										
Recruitment (1000s)	467	341	543	732	425	565	559	732	750	759
~95% Confidence interval	241-694	132-550	187-899	277-1188	121-728	161-968	144-974	581-883	595-906	2-1516
Range of states of nature										
Depletion	27.6%	26.0%	28.0%	31.4%	30.3%	29.8%	29.7%	31.2%	32.5%	34.0%
~95% Confidence interval	0.24-0.32	0.21-0.31	0.22-0.33	0.25-0.38	0.23-0.38	0.22-0.38	0.21-0.39	0.21-0.41	0.22-0.43	0.23-0.45
Range of states of nature										

ORS

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Commercial landings (mt)	26	31	46	46	27	34	30	26	23	N/A
Total catch (mt)	45	48	62	63	45	52	50	43	41	N/A
ABC (mt)										
OY										
1-SPR	0.46	0.53	0.52	0.41	0.44	0.44	0.41	0.41	0.44	0.55
Exploitation rate										
(catch/age 2+ biomass)	0.08	0.10	0.10	0.07	0.09	0.09	0.08	0.08	0.09	0.13
Age 2+ biomass (mt)	562	599	602	593	584	557	538	516	483	455
Spawning biomass (mt)	242	239	238	245	256	254	245	235	226	214
~95% Confidence interval	161-322	158-320	153-324	150-339	151-361	140-368	125-366	110-360	96-356	80-349
Range of states of nature										
Recruitment (1000s)	211	188	148	131	187	137	88	141	180	178
~95% Confidence interval	112-310	101-276	68-228	56-207	73-301	31-242	8-169	0-284	117-242	0-363
Range of states of nature										
Depletion	59.0%	58.5%	58.2%	59.8%	62.6%	62.1%	60.0%	57.4%	55.2%	52.4%
~95% Confidence interval	0.52-0.66	0.51-0.65	0.51-0.66	0.51-0.69	0.52-0.73	0.49-0.75	0.45-0.75	0.41-0.74	0.37-0.73	0.33-0.72
Range of states of nature										

Table E-10. Summary of cabezon reference points from each sub-stock base case model. Values are based on 2008 fishery selectivity and allocation. $F_{45\%}$ with 40:10 and $F_{50\%}$ with 60:20 are provided. for each sub-stock.

	NCS				SCS			
	40:10 and $F_{45\%}$		60:20 and $F_{50\%}$		40:10 and $F_{45\%}$		60:20 and $F_{50\%}$	
Quantity	Estimate	~95% Confidence interval	Estimate	~95% Confidence interval	Estimate	~95% Confidence interval	Estimate	~95% Confidence interval
Unfished spawning stock biomass (SB_0, mt)	1042	981-1103	1042	981-1103	299	271-327	299	271-327
Unfished 2+ biomass (mt)	1846	1740-1952	1846	1740-1952	535	485-585	535	485-585
Unfished recruitment (R_0, thousands)	884	828-941	884	828-941	234	213-257	234	213-257
Reference points based on SB $_{40\%}$								
MSY Proxy Spawning Stock Biomass ($SB_{40\%}$)	417	393-441	417	393-441	120	108-131	120	108-131
SPR resulting in $SB_{40\%}$ ($SPR_{SB40\%}$)	46.4%		46.4%		46.4%		46.4%	
Exploitation rate resulting in $SB_{40\%}$	0.12	0.116-0.121	0.12	0.116-0.121	0.11	0.109-0.11	0.11	0.109-0.11
Yield with $SPR_{SB40\%}$ at $SB_{40\%}$ (mt)	118	110-125	118	110-125	31	28-34	31	28-34
Reference points based on SPR proxy for MSY								
Spawning Stock Biomass at SPR (SB_{SPR})(mt)	400	377-424	459	432-485	115	104-126	132	119-144
$SPR_{MSY\text{-}proxy}$	50.0%		50.0%		50.0%		50.0%	
Exploitation rate corresponding to SPR	0.12	0.12-0.13	0.11	0.1-0.11	0.11	0.11-0.12	0.10	0.097-0.099
Yield with $SPR_{MSY\text{-}proxy}$ at SB_{SPR} (mt)	120	112-128	112	105-120	31	29-34	30	27-32
Reference points based on estimated MSY values								
Spawning Stock Biomass at *MSY* (SB_{MSY}) (mt)	257	242-272	257	242-272	76	69-84	76	69-84
SPR_{MSY}	32.7%	0.326-0.329	32.7%	0.326-0.329	33.5%	0.33-0.34	33.5%	0.33-0.34
Exploitation Rate corresponding to SPR_{MSY}	0.18	0.18-0.19	0.18	0.18-0.19	0.16	0.16-0.17	0.16	0.16-0.17
MSY (mt)	130	121-138	130	121-138	34	31-37	34	31-37

	California				Oregon			
	40:10 and $F_{45\%}$		60:20 and $F_{50\%}$		40:10 and $F_{45\%}$		60:20 and $F_{50\%}$	
Quantity	Estimate	~95% Confidence interval	Estimate	~95% Confidence interval	Estimate	~95% Confidence interval	Estimate	~95% Confidence interval
Unfished spawning stock biomass (SB_0, mt)	1219	1163-1276	1219	1163-1276	409	352-466	409	352-466
Unfished 2+ biomass (mt)	2067	1977-2158	2067	1977-2158	803	689-917	803	689-917
Unfished recruitment (R_0, thousands)	936	890-982	936	890-982	195	167-223	195	167-223
Reference points based on SB $_{40\%}$								
MSY Proxy Spawning Stock Biomass ($SB_{40\%}$)	488	465-510	488	465-510	164	141-187	164	141-187
SPR resulting in $SB_{40\%}$ ($SPR_{SB40\%}$)	46.4%		46.4%		46.4%		46.4%	
Exploitation rate resulting in $SB_{40\%}$	0.12	0.117-0.122	0.12	0.117-0.122	0.12	0.114-0.117	0.12	0.114-0.117
Yield with $SPR_{SB40\%}$ at $SB_{40\%}$ (mt)	131	124-137	131	124-137	48	41-55	48	41-55
Reference points based on SPR proxy for MSY								
Spawning Stock Biomass at SPR (SB_{SPR})(mt)	468	446-490	537	512-561	157	135-179	180	155-205
$SPR_{MSY\text{-}proxy}$	50.0%		50.0%		50.0%		50.0%	
Exploitation rate corresponding to SPR	0.12	0.12-0.13	0.11	0.10-0.11	0.12	0.119-0.122	0.10	0.1-0.11
Yield with $SPR_{MSY\text{-}proxy}$ at SB_{SPR} (mt)	133	126-139	125	118-131	49	41-56	46	39-53
Reference points based on estimated MSY values								
Spawning Stock Biomass at *MSY* (SB_{MSY}) (mt)	305	291-319	305	291-319	109	94-124	109	94-124
SPR_{MSY}	33.0%	0.328-0.332	33.0%	0.328-0.332	34.5%	0.343-0.346	34.5%	0.343-0.346
Exploitation Rate corresponding to SPR_{MSY}	0.18	0.18-0.19	0.18	0.18-0.19	0.16	0.162-0.167	0.16	0.162-0.167
MSY (mt)	143	136-150	143	136-150	51	44-59	51	44-59

Research Recommendations

1. Improve estimates of natural mortality: All sub-stocks show significant sensitivity to natural mortality, a parameter not estimated in the model and assumed known. Estimates of natural mortality may be derived from tag-recapture studies or the comparison of length compositions inside and outside marine protected areas. There are two studies currently attempting to gather this information for future use in stock assessments. One is being conducted in the northern Channel Islands (J. Wilson, UCSB, pers. comm.) and the other is being conducted in the Morro Bay area (R. Nakamura and D. Wendt, CalPOLY, pers. comm.). These studies, and other like them, need to be encouraged.

2. Age and growth determination: The large discrepancy in estimated male growth parameters between Oregon and California deserve further attention to confirm this relationship. Further attention to ageing cabezon in California is needed to increase our spatial understanding of cabezon growth along the coast. Age samples from each fishery would also help to define growth and selectivity, while informing recruitment patterns and helping decrease the uncertainty in the scale (absolute abundance) of each sub-stock.

3. Fishery-independent surveys: Continued support and development of current fishery-independent nearshore surveys (like those initiated in Morro Bay and Monterey) is needed to extend the time series and increase spatial coverage. Both are required to increase the power of such indices in statistical catch-at-age models.

4. Defining the stock structure of cabezon: Current work on cabezon stock structure needs continued attention to better understand the connectivity between cabezon subpopulations. This would help focus or inform future sampling design to provide data for assessment purposes.

5. Alternative assessment procedures: The need for greater spatial resolution in the management of nearshore fisheries also increases the amount of data required to perform traditional stock assessments. Alternative assessment procedures that are less data-hungry, but still provide relevant management outputs should be encouraged. This assessment provides examples of some approaches as applied to cabezon. Such side-by-side comparisons of simplified assessment approaches to the statistical catch-at-age model outputs are useful in understanding the relationship of alternative to traditional assessment methods in hopes of developing the best available scientific advice for management under data-limited situations.

6. Re-defining “spawning biomass”: The nest-guarding behavior of cabezon males gives added reproductive importance to their abundance, relative to most other groundfish species. A metric other than female spawning biomass may be needed to incorporate the status of the male portion of the population into reference points. Further investigation is needed to identify appropriate ways in which the role of males in reproductive success can be incorporated into metrics for evaluating population status.

7. Changes in batch fecundity with age: Batch fecundity in cabezon is recognized, but it is not understood how and if batch fecundity changes with age. Understanding

whether the number of batches increases with age will help specify the fecundity relationship in the assessment model.

8. The effects of climate on cabezon population dynamics: The recruitment patterns of the California sub-stocks suggest a possible link between environmental forcing and population dynamics. Specifically, strong ENSOs conditions (especially in southern California) may be a pre-cursor to significant recruitment events. This link should be explored further to help increase the understanding of spatially-explicit recruitment responses and inform future recruitment events.

Purpose

This is the third assessment of the population status of cabezon (*Scorpaenichthys marmoratus* [Ayres]) off the California coast and the first to include Oregon waters (Figure 1). Available data sources remain insufficient to form the basis for a reliable assessment of cabezon in Washington. The current assessment is intended to provide information that will be of use by managers at both the state and federal levels. This document follows, to the extent possible given the available information, the Terms of Reference (TOR) for stock assessments established by the PFMC Scientific and Statistical Committee.

Three objectives are addressed in this document. First, the life history of cabezon is described and all the available data sources that were considered for use in the assessment models are explained. Second, the document describes the results of modeling cabezon populations at different spatial scales while attempting to incorporate and represent the uncertainty contained in both the model and its derived outputs. Including spatially-structure sub-stocks addresses the biological reality that cabezon populations are not continuously connect along the long California coastline. Outlining specific points wherein the model is both uncertain and sensitive should identify areas of future research needed to improve our understanding of cabezon population dynamics. Thirdly, although this model uses the traditional west coast approach of incorporating likelihood theory into statistical catch at age models (specifically, Stock Synthesis (Methot 2009), we also explore some alternative assessment methods useful for either rapidly assessing many species or assessing species with limited traditional stock assessment data.

This assessment is notable from many other west coast groundfish species because there is no fishery-independent index of abundance that covers the range of the assessed stocks. It consequently relies on indices of abundance based on recreational CPUE and spatially-restricted fishery-independent data, and information about larval and recruit abundance. Although no state- or federally-funded biomass indices are currently available for this species and private entities (e.g. SLOSEA in the Morro Bay area) are still developing an adequate time series of abundance, these alternative data sources can, in the meantime, inform estimation of the parameters of a population dynamics model. Much uncertainty remains in regard to the assumption that changes in recreational CPUE are linearly proportional to changes in population size. There is also no information on the age-structure of catches to inform selectivity, just aged samples for the purpose of estimating growth parameters. Therefore, although the model is age-structured, it is fit to mean weights and length-composition data by converting the model-predicted catch age-compositions to catch size-compositions using growth curves and weight-length relationships.

Introduction

The cabezon (*Scorpaenichthys marmoratus*) is the largest member (up to 99 cm) of the family Cottidae (commonly referred to as sculpins) found in the waters along the Northeast Pacific. Cabezon are desired by both commercial and recreational fishers because of their great size, physical attractiveness, and tasty flesh. Knowledge of cabezon life history has improved, but remains sparse relative too many other groundfishes. Current understanding is based on information collected from a limited extent of the ecological distribution and over limited time periods. The population status of cabezon in California waters was last assessed in 2005, and the spawning output was estimated to be near 40% of the unfished spawning output for the northern California sub-stock and near 28% for the southern California sub-stock, but there was considerable uncertainty, especially for the southern California sub-stock (Cope and Punt 2006). Cabezon are currently managed as part of a nearshore complex of fishes that include several species of rockfishes and greenlings.

This is the third quantitative assessment of the population status of cabezon. Spatial differences in biomass trends were included by recognizing two putative populations ("sub-stocks") of cabezon in California, demarcated at Point Conception, CA and one sub-stock in Oregon (Figure 1). Available data from coastal Washington waters remain insufficient to form the basis for a reliable stock assessment.

Stock Structure

The need for increased spatial resolution in the assessment of cabezon was recognized during the STAR panel review of the first cabezon assessment (STAR Panel 2004). This need was addressed in the second assessment by distinguishing two stocks in California waters, to the north and south of Point Conception (Figure 1): the northern (NCS) and southern (SCS) California sub-stocks. This designation was based on distinct fishing histories, the distribution of fishing effort, patchy and discrete habitat, and perceived low dispersal and movement of cabezon in all life stages. Specifically, the live-fish fishery for cabezon is active primarily north of Point Conception while, historically, the recreational take of cabezon has been greatest in central California, with the removals off southern Californian being fairly low. Cabezon are a cooler-water species, and are more abundant in the central and northern Californian nearshore areas. Additionally, cabezon and their habitat are often spatially discrete, increasing susceptibility to serial depletion (Oresanz *et al.* 1998, Perry *et al.* 1999)—the systematic depletion of small populations in discrete areas. Recognizing and avoiding serial depletion underscores the need to examine population trends at decreasing spatial scales. The extent to which assessments can be conducted at small spatial scales is, however, often limited by data availability, resources needed to develop and review additional assessments, and management's capacity for implementing finer-scale regulations and enforcement. It nevertheless is important to balance these trade offs to provide the most informed assessment for resource management (Cope 2008).

Two lines of evidence support maintaining at least two cabezon sub-stocks for assessment purposes in California and one sub-stock in Oregon. Villablanca and Nakamura (2008), investigating both mitochondria DNA and microsatellite genetic markers, distinguished 6 cabezon subpopulations in California (3 north and 3 south of Point Conception; Figure 2). They also found differences between these populations and those sampled in Oregon.

Additional insight into cabezon population structure in California comes from investigating spatial population dynamics. We applied the two-step clustering method of Cope and Punt (2009) to CPUE data from the Commercial Passenger Fishing Vessel fishery (see *CPFV CPUE indices* in the 'Indices of Abundance' section for data details) to detect areas with similar population dynamics. Twenty-one fishing locations along the California coast (Figure 3) were considered in the analysis. Only locations (18 of the 21) with common years were included in the analysis, so there is a trade-off between the numbers of years and locations used in the analysis (Figure 4A). Four different location/year combinations were considered (Figure 4B) to look for consistent location groupings. The average coefficient of variation (CV) of each location varied among locations and data sets (Figure 5). Large CVs (>1) can obscure the results of the cluster analysis and need to be interpreted with this in mind.

The cluster analysis supports the minimum designation of sub-stocks at Point Conception when all data sets and caveats are considered (Figure 6). This designation is consistent with the California Department of Fish and Game's central and northern management areas (Figure 1). Further investigation separating the NCS and SCS data sets and re-clustering each sub-stock data set separately indicates an additional subpopulation designation north and south of Monterey. Southern California locations did not demonstrate strong differentiation among locations. Though this additional structure in California is consistent with the genetic data, data and management limitations advise maintaining just two sub-stocks of cabezon in California at this time.

In addition to consider the cabezon resource as multiple sub-stocks in California, this assessment also explores the implications of assessing the entire cabezon resource off California (CAS) as a single homogeneous resource to compare some of the impacts of allowing for spatial resolution. In all scenarios, Oregon (ORS) remains separate from the California sub-stock(s). There was no available evidence of stock structure in Oregon waters, so all populations in Oregon are treated as one stock.

Life History

Distribution

Cabezon is distributed along the entire west coast of the continental United States. It ranges from central Baja California north to Sitka, Alaska (Quast 1968; Miller and Lea 1972; Love *et al*. 2005). Cabezon are primarily a nearshore species found intertidally, among jetty rocks, and in and around kelp forests and rocky reefs out to depths of greater than 110 m (Miller and Lea 1972; Love *et al*. 2005). The majority of the commercial and recreational catch is taken inside of 15–20fm (and approximately 99% within 30fm; Feder *et al.* 1974) and along the central California coast up through Oregon, with the Morro Bay area in California supporting a major cabezon fishery. The nearshore distribution of this species makes it accessible to a greater portion of coastal populations and users marine resources. This proximity to land also makes cabezon habitat susceptible to terrestrial land use outfalls.

Species Associations

Cabezon is a member of a nearshore assemblage of fishes that includes several *Sebastes* species (*e.g. S. atrovirens, S. auriculatus, S. carnarus, S. caurinus, S. chrysomelas, S. dallii, S. maliger, S. melanops, S. mystinus, S. nebulosus, S. rastrelliger, S. serranoides*, and *S. serriceps*), kelp (*Hexagrammos decagrammus*) and rock greenling (*H. lagocephlaus*), monkeyface prickleback (*Cebidichthys violaceus*), California scorpionfish (*Scorpaena guttata*), and California sheephead (*Semicossyphus pulcher*). These 19 fishes are included in California's Nearshore Fishery Management Plan (CDFG 2002), an FMP required by mandate of the 1999 Marine Life Management Act. Cabezon is also included in the Oregon interim nearshore fishery management plan (ODFW 2002). Though often considered data poor relative to many other assessed groundfishes, decades of recreational removals and the increase of the live-fish fishery has increased management attention on nearshore fishes and facilitated the allocation of state and federal resources to perform stock assessments for nearshore fishes. Presently, cabezon, California sheephead (Alonzo *et al*. 2004), black rockfish (Sampson 2008, Wallace *et al*. 2008), blue rockfish (Key *et al*. 2008), gopher rockfish (Key *et al.* 2006), kelp greenling (Cope and MacCall 2006), and California scorpionfish (Maunder 2006) have been assessed.

Spawning and Early Life History

Cabezon are known to spawn in recesses of natural and manmade objects, and males demonstrate nest-guarding behavior (Garrison and Miller 1982). Spawning is protracted, and there appears to be a seasonal progression of spawning that begins off California in winter and proceeds northward to Washington by spring. Spawning off California peaks in January and February (O'Connell 1953) while spawning in Puget Sound (Washington State) occurs for up to 10 months (November-August), peaking in March–April (Lauth 1987). Laid eggs are sticky and adhere to the surface where deposited. After hatching, the young of the year spend 3–4 months as pelagic larvae and juveniles. Settlement takes place after the young fish have attained 3–5 cm in length (O'Connell; 1953; Lauth 1987). It is apparent that females lay multiple batches in different nests (often of different colors), but whether these eggs are temporally distinct enough to qualify for separate spawning events is not understood (O'Connell 1953; Lauth 1987).

The number of eggs spawned appears to increase with fish size (weight or length) (O'Connell 1953; Lauth 1988). However, the actual relationship between age / size and number of eggs spawned is uncertain because of the possibility of multiple spawnings per year. For the purposes of this assessment, reproductive output is defined to be proportional to the product of maturity-at-age and body weight at the start of the year. Unless number of batches changes by age (of which we have no information or way of parameterizing the effects), this assumption seems robust.

Maturity ogives (Table 1; Figure 7) for all California sub-stocks were estimated using the California Department of Fish and Game (CDFG) visual inspection codes and the data used by Grebel (2003). Females with gonads that had early-yolk-stage eggs were assumed to be mature, although it is possible that some of these fish were maturing, but not yet mature. This will lead to a more optimistic interpretation of the rate at which cabezon mature (younger and at smaller size).

Oregon maturity curves (Table 1; Figure 7) were estimated using samples obtained from the ports of Newport, Depoe Bay, and Port Orford. Methods and details of the data collection and maturity determination are found in Hannah *et al.* 2009.

Age and Size relationships

Cabezon are among the largest of the cottids, attaining a length of nearly 1m and a weight in excess of 11 kg (Feder *et al.* 1974). Female cabezon are larger than males of the same age. O'Connell (1953) provided the first estimates of cabezon age and growth using whole otoliths from specimens from central and southern California. Lauth (1987) provided another estimate of cabezon growth from the Puget Sound (WA) using several ageing structures (whole otoliths, sectioned fin rays). Most recently, Grebel (2003) conducted a large study (almost 700 individuals collected over 6 years) on age and growth of cabezon from California using several age structures (sectioned otoliths, pectoral fin rays, dorsal fin rays, dorsal spines, and vertebrae). Her results using a thin-section of the saggital otolith form the basis for estimating growth for California cabezon in this assessment. Ages from Grebel (2003) were all standardized to a 1 January birthdate to avoid bias caused by rapid growth during the first years of life. Lastly, Oregon Department of Fish and Wildlife (J. Thompson, pers. comm.) provided age-at-length measurements from 2005-08 to provide data for the only estimates of cabezon growth in Oregon (Figure 8).

Growth curves based on the von Bertalanffy growth function incorporating multiple age reads via the random effects model developed by Cope and Punt (2007) were fit to the resulting age-length data for each state (Table 1; Figure 8). Incorporation of multiple age reads in the growth curve fitting better incorporates uncertainty in the age-length relationship via ageing error, which can be substantial. Individuals of both sexes obtained greater lengths at lower growth rates in Oregon (Figures 8 & 9).

Partial "validation" of growth curves is possible by comparing tag-recapture data from fish of known length and age. Tagging data from California (courtesy of J. Grebel) compare reasonably well with the externally fit growth curves (Figure 10). Because Grebel (2003) found no biologically significant differences between the age-at-length relationships among regions (northern, central, and southern) in California, her sex-specific results are used for both sub-stocks in this assessment. The growth curves obtained by Grebel (2003) differed statistically from that of O'Connell's (1953), who had much larger individuals in his samples. Whether these differences in estimated age-length relationships derive from an ageing disparity between whole (used by O'Connell) and sectioned (used by Grebel) otoliths, or they represent real differences caused by changes in the population structure (possibly due to fishing and/or the environment) is purely speculative at present. We consider model sensitivity to alternative growth assumptions by including a trial model run using the O'Connell estimates of growth (see *Sensitivity analysis* section).

Growth curves for Oregon age and growth data, for areas north and south of Cape Blanco (Figure 1), were also fit to investigate spatial trends in growth (Figure 11). No significant growth trends were apparent, so only one growth morph is considered for Oregon.

Weight-length relationships for cabezon are provided in O'Connell (1953; central California), Lauth (1987; Puget Sound, WA), and Lea *et al.* (1999; central California) for both sexes combined. Lea *et al*. (1999) also provide relationships for females and males separately, in central California only. Raw length-weight data used in Grebel (2003) provide sub-stock- and sex-specific length-weight information with larger sample sizes than the earlier studies, and these data are used for the present assessment (length in cm and weight in kg; Table 1). Sampling effort covered the years 1993–2002 for the NCS and 2002 for the SCS. Lacking data specific to Oregon, the California data were also used to define the weight-length relationship in Oregon waters.

Natural Mortality (*M*)
Little is known about the natural mortality rate of cabezon, so empirical methods using life history traits (growth rate (k), age-at-maturity (a_M), maximum age ( )) were used to estimate natural mortality for each sub-stock. Four general methods for estimating M (O. Hamel, NWFSC, pers. comm., which combines Hoenig 1983 and Pauly 1980; Chen and Watanabe 1989; Jensen 1996) were applied to data for each sex, and the results averaged to obtain sex-specific natural mortality rates (Table 2). The means of these approaches imply natural mortality rates of approximately 0.25/yr for females and 0.3/yr for males, but these methods may produce highly uncertain values of M (Pascual and Iribarne 1993). Therefore, sensitivity of the assessment model to the assumed values of M is explored and summarized.

Fisheries History

Historically, the recreational sector has been the main source of cabezon removals. Cabezon have been a very minor component of the catch in commercial fisheries for more than a century (Jordan and Everman 1898). The earliest modern commercial fishery information (O'Connell 1953) indicates that a small amount of cabezon was being sold in fish markets in the San Francisco area by the 1930s with incidental take recorded back to 1916. However, it was not until the 1990s that a truly directed commercial fishery for cabezon was established in the waters of California and Oregon.

The most significant change in the fishery for cabezon has been the development of the live-fish/premium commercial fishery that, in addition to cabezon, targets several other nearshore fishes (CDFG 2002). This fishery started in southern California in the late 1980s and spread northward during the late 1990s to Oregon (Starr *et al.* 2002). Fishermen routinely obtain much higher prices for fish brought back to markets alive. Cabezon are not subject to barotrauma because they lack a swim bladder and are usually found in shallow nearshore waters accessible to many fishers. These traits make cabezon an ideal target for both the live-fish and recreational fisheries. Gears that take cabezon include hook and line and pot/trap type gears, as they are successful at bringing up fish with relatively little damage. Cabezon continues to be an important component of the live-fish fishery, even with increased restrictions on the live-fish catch, especially as the allowable catches of other marketable groundfish species have been reduced.

Fisheries Management
The Pacific Fishery Management Council (PFMC) and NOAA Fisheries have management responsibility for the groundfish species included in the Groundfish

Fishery Management Plan (FMP) out to the boundary of the 200-mile Exclusive Economic Zone (EEZ). Many nearshore species, such as cabezon, that fall primarily within the 3-mile limit of states' waters are also included in state-specific Nearshore Fishery Management Plans (NFMP). NFMPs are currently being developed and implemented in California and Oregon in response to the increased commercial take of the live-fish fishery (CDFG 2002).

No management regulations existed for cabezon in California before 1982 when a size limit (12-inches) was set for recreationally and commercially caught cabezon (see Appendix A for a complete list of California regulations). This limit was raised to 14-inches in 1999 for the commercial fishery, and extended to include recreationally retained fish in 2000. It was increased further to 15-inches in 2001 for both the commercial and recreational fisheries. Recreational bag limits have been 10fish/day in California since 2002, however changed from 10 to 3 in different areas of the coast in 2004 and 2005, with one inseason change. In 2005, the bag limit was changed to 1 and is still today. Cabezon are currently included in the California recreational regulatory complex Rockfish, Cabezon, and Greenlings (the RCG complex) and subject to seasonal closures for recreational fishers.

Historically, commercial landings of cabezon were monitored as part of a mixed group called "Other Fish". This group of species includes sharks, skates, rays, grenadiers and other groundfish. This group has been defined historically as groundfish species that do not have directed or economically important fisheries. The coastwise ABC for this entire group of species was 14,700mt during 1999–2002 (5,200mt for the Eureka, Monterey and Conception INPFC areas and 9,500mt for the Columbia and Vancouver INPFC areas). In California, the cabezon fishery is currently independently monitored and regulated by analyzing two-month cumulative trip limits within the Cabezon, Greenlings and California sheephead (CGS) complex. From 2001-2005 there were emergency closures for cabezon, but more recently, the fishery has been open all year, with cumulative trip limits reduced from 900 pounds down to 200 or 300 pounds (see Appendix A).

In Oregon, some general regulations since 1983 pertaining to hook and line gears are as follows: 1) it is unlawful to use more than one rod or one line when angling for any fish in the nearshore environment and 2) no more than three hooks may be used while angling for species other than Pacific halibut (*Hippoglossus stenolepis*). Furthermore, there are three areas that are closed to the take of marine fish in certain times of the year, including Whale Cove habitat refuge (May 1-Aug. 31), Pyramid Rock (May 1-Aug. 31) and Three Arch Rocks (May 1- Sept. 15). Specific to cabezon, Oregon imposed a 15 inch size limit in 2003, which was increased to a 16 inch size limit in 2004 and is still today. Initially, bag limits for cabezon began in 1978 with a 15 fish limit for the rockfish, cabezon and greenling complex. Currently, Oregon has a 6 fish per day bag limit for the "rockfish et al" complex combined. In the years 2004-2008, inseason changes were made where cabezon were prohibited to be taken by boats. Regulations affecting cabezon in the waters off Oregon can be seen in Appendix B.

Assessment Data Sources

Data for species managed by NOAA Fisheries and the Pacific Fishery Management Council are collected by both federal (and/or quasi-federal) and state agencies. This can complicate analysis because several agencies may collect the same types of data. Where this occurs, the analyses below are based on those data that are most likely to be informative regarding changes in population size.

Removals

Whenever possible, removals are characterized as landed catch plus fish released and presumed dead. Historical catches (prior to 1980) are reconstructed from historical documents, and reported and inferred relationships among fishing sectors. Different estimation procedures are used for California and Oregon.

Recreational Fishing History in California

Recreational fishing in California became popular in the late 1890s, but was limited to mostly big game fishes (tuna, marlin, and swordfish) and wealthy participants (Holder 1914). Recreational fishing opportunities in California for most people were quite limited before 1920. Private boat access to nearshore fishes increased after 1920 (Croaker 1939), but it was not until Commercial Passenger Fishing Vessels (CPFVs) began operating in earnest off southern California in 1928 that the general public gained extensive access to many nearshore fishes (Scofield 1928; Young 1969). Both barges – large, flat, open-spaced ships – and more traditional CPFV boats comprised the fleet. There were 15 barges and 20–30 boats off southern California in 1928 (Scofield 1928). The period 1929–39 saw a rapid increase in the popularity of CPFVs (Croaker 1939), which also spread northward to central and northern California. By 1932, sportfishing in Monterey was very popular, with cabezon a major target species (Classic 1932). Pier and shore fishing modes also provided major recreational fishing outlets during this time of increased CPFV activity (Scofield 1928; Croaker 1938; Baxter & Young 1953; Young 1969). In all modes, most fishing occurred during the summer and autumn months, with some fishing extending into spring (Fry 1932; Baxter & Young 1953). CPFV captains have been required to submit logbooks detailing catches since 1936 (Croaker 1939; Baxter & Young 1953; Young 1969), although compliance rates were and are not 100%. In 1937, the sportfishing catch exceeded the commercial catch for many species (Conner 1937).

The popularity of CPFV fishing continued to increase until the war years of 1942–46 when CPFV activity was considerably reduced (Calhoun 1950). The CPFV fleet underwent a period of rapid re-establishment, reinvention, and growth after 1946 (Young 1969). Fleets, boat size, and passenger interest all increased throughout California. This expansion continued into the 1970s with the fleet peaking in 1973 (Baxter & Young 1953; Young 1969; Hill & Schneider 1999). A concomitant increase in private boat, shorefishing, and pier/jetty modes also occurred during this time, particularly in central California (especially in Monterey and Morro Bay), where cabezon are well represented, during the 1950s (Baxter & Young 1953).

Reconstructing Recreational Removals

This assessment uses the same methods as the 2005 assessment (Cope and Punt 2006) for reconstructing catch history back to 1916 for both cabezon sub-stocks. The catches for the state-wide California stock (CAS) is the sum of the NCS and SCS catches. The initial year was selected because of the availability of commercial catches back to 1916 (see *Reconstructing Commercial Removals* below). There was very little recreational catch, if any, before 1916 so the fishing mortalities before 1916 are set to zero when conducting the assessment.

Four recreational fishing modes are distinguished in California: 1) Man-made (piers/jetties), 2) beach/bank, 3) Private Boat and Rental (PBR), and 4) CPFV. These modes were distinguished for analysis and modeling purposes because of differences in selectivities and the length-frequency of the catch: the man-made and beach/bank modes generally catch smaller individuals than the PBR and CPFV modes. Most cabezon are taken from jetties in the man-made mode (Pinkas *et al.* 1967).

Information on the activities of recreational fishermen has been collected by both state (California Recreational Fisheries Survey (CRFS); CDFG) and federal (Marine Recreational Fisheries Statistic Survey (MRFSS); PSMFC) programs. From 1980-2003 (excluding the years 1990–92), the MRFSS program (available via the RecFIN database: **http://www.recfin.org/**) provides effort information from a random-digit dialing protocol and catch/trip information from intercept interviews. These data can be used to calculate total catches by mode. In 2004, the CDFG, in cooperation with the Pacific States Marine Fisheries Commission (PSMFC), started the California Recreational Fisheries Survey (CRFS) program to replace the MRFSS sampling program in California for all modes. This program aims to increase sampling effort for better catch and effort estimation, to increase spatial resolution of catches, and to identify targeted species. Before the CRFS was implemented, CDFG only collected logbook catches from the CPFV fishery. Very few estimates of the removals by the man-made, beach/bank, and PBR modes are available for the years before 1980. The CPFV fleet therefore provides the longest time-series of measured catches (1936-present) and is used to reconstruct the removals by the other three modes for the years prior to 1980.

Total recreational removals for each cabezon sub-stock for each recreational mode were reconstructed in three steps: 1) the historical CPFV removals (in numbers) were reconstructed, 2) the CPFV removals were used to estimate the removals (in numbers) by the other three modes, and 3) the average weights per mode were used to estimate total removals in kg., which were then converted to metric tons (mt).

<u>1. Historical CPFV removals</u>
The historical CPFV catch (1916–2008) was reconstructed as follows:

> **Years 2004-2008**: CRFS, extracted from RecFIN 13 March, 2009.
> **Years 1957–78; 1980–2008**: Hill and Schneider (1999) performed a data recovery exercise to extract catch, effort, block (CDFG designated 10 x 10 nautical mile statistical areas), and month information from the California CPFV logbooks. This information provides area-specific catches (in numbers) for each cabezon sub-stock for 1957–2008, excluding 1979 (the data for this year are lost). This data set was obtained March 2009.
> **Year 1979:** Oliphant *et al.* (1990) report the total catch of cabezon by the CPFV fleet for 1979. This total is allocated to sub-stock using the geometric mean of the ratio $Catch_{NCS}$:$Catch_{SCS}$ for 1976–78 and 1980–82.
> **Years 1936–40; 1947–56**: Hill and Schneider (1999) provide CPFV catches for the SCS only. The total California CPFV catches for these years are found

in Best (1963). The difference between total California catches and the catches from the SCS give the catches from the NCS.

Years 1941–46: O'Connell (1953) provides the catch by the CPFV fleet in 1946 for each sub-stock. No data are available for 1941–45; the catches during these years have been assumed equal to that for 1946.

Years 1928(SCS)/1929(NCS)–1935: No data on catches are available for these years. Scofield (1928) identified the major start of the CPFV fleet in southern California to be 1928, which then moved into central and northern California in 1929 (Young 1969). These start years reflect the beginning of the CPFV time-series for the SCS and NCS, respectively. A linear increase in catch from the start year through 1935 is assumed because the CPFV fleet is known to have increased rapidly during these years (Fry 1932; Young 1969),

Years 1916–27(SCS)/–1928(NCS): The catches by the CPFV fleet were assumed to be zero for these years.

Heimann & Carlisle (1970) reported that cabezon are rarely discarded in the CPFV fishery because of their large size and trophy status. Furthermore, discarded cabezon have a higher probability of survival because they are not affected by barotrauma. Even though a size limit has been imposed in recent years (see Appendix A), the analyses of this document assume that there is no discard mortality by the recreational sector.

It was recognized early in the CPFV reporting process (Croaker 1938; Baxter & Young 1953) that logbook records may be inaccurate for two main reasons: 1) mis-reporting of catches (either over- or under-reporting; Karpov *et al.* 1995), and 2) less than 100% reporting compliance rates (Hill & Barnes 1998). Baxter & Young (1953) investigated these inaccuracies in CPFV catch and concluded that cabezon catch rates reported by the CPFV fleet are accurate and reliable. Reported CPFV removals are therefore not adjusted for mis-reporting. Since 1936, compliance rates have always been less than 100% though, and necessitate the adjustment of raw CPFV removals. Compliance rates (as reported from several sources) are provided in Table 3 and were assumed to be the same for the NCS and the SCS fleets. The reported compliance rates were then used to interpolate compliance rates for the years for which rates were not available, and CPFV removals in numbers were expanded to correct for lack of reporting compliance. There are no compliance rates for the period 1962–1980. Values used for these years were semi-arbitrarily set to account for the expanding fleet during the 1960s and 1970s.

The assumption of compliance rates being the same in the north and south may not be valid; however, we have no data to make this adjustment. During the 1940s-60s, there was full time staff at the CDFG in southern California devoted to working on CPFV logbook compliance, and it is believed that these efforts increased compliance rates in this region during this time period (S. Crooke, CDFG, pers. comm.).

<u>2. Estimating removals for the man-made, beach/bank, and PBR modes via CPFV ratios</u>

Removals (in numbers) for the other three recreational modes (man-made, beach/bank, and PBR) were determined in two ways: 1) based on surveys of the modes, and 2) based on an estimate of the ratio of the catch by the mode to the catch by the CPFV mode multiplied by the catch by the CPFV mode. Surveys are available for only a small numbers of years:

a) The RecFIN database contains estimates of removals for the years 1980–89 and 1993–2008. This data was extracted 13 March, 2009.
b) Miller & Gotshall (1965) provide estimates of NCS removals for the period 1957–61.

The ratios of the CPFV catches to the catches by the other modes from RecFIN were used to estimate removals when data were missing for the years 1980–2008 (Tables 4 & 5). The work of Miller & Gotshall (1965) and Pinkas *et al.* (1968) provide ratios for the years of their study (Tables 4 & 5). These ratios were used to make inferences about the ratios for the years for which no data are available. The PBR fishery was assumed to start in the same year as the CPFV fishery. The man-made and beach/bank modes began before the CPFV fishery, so the estimated catch in these modes for the years before the CPFV fishery began were projected back to 1916.

<u>3. Calculating removals in kg</u>

The average annual weight of the removals (in kg) for each mode are given in Tables 4 and 5 for the NCS and SCS respectively, with shaded values indicating mean weights that were reported. The true reported weights (not converted from lengths) for 1980–2008 were downloaded from RecFIN. The reported weights for the NCS for the years before 1980 are: 1) 1947–51: Baxter & Young (1953) and 2) 1957–61: Miller and Gotshall (1965), while the reported values for the SCS for 1964–66 were taken from Pinkas *et al.* (1968). The weights for all remaining years are assumed values, based on these sources, averaged RecFIN weights, or a mid-point of the two (Tables 4 & 5). The weights for the PBR mode for the years prior to 1980 are set to those for the CPFV mode because these fisheries catch similar sized fish. The removals in the NCS by mode are heavier on average than those in the SCS. Removals (in kg) were calculated by multiplying numbers by average weights then converted to metric tons before being included in the assessment model. The total removals (in mt) of the recreational sector by mode are shown in Figure 12.

Removals are considered known without error in the assessment, so Cope and Punt (2006) provided two sensitivity tests to examine the implications of uncertainty in the pre-1980 catch reconstruction time period. Also, the original recreational removal in the SCS for 1980 (185 mt) was identified as extraordinarily high. This high value is attributed primarily to the catch by the PBR mode (157 mt). Further investigation revealed that RecFIN waves (*i.e.* bi-monthly totals) 1, 2, 3, and 5 had notably higher removals in 1980 than during 1981–89, but that average wave weights were not markedly different among years (Figure 13). Comparing the relative RecFIN removals of other species in the 1980s also shows that the year 1980 comprises an unusually high proportion of the total removals for the decade (Figure 14). This systematic result across species can be explained either by a massive, but correctly estimated, increase in recreational take from the PBR recreational mode in 1980 south of Point Conception or an overexpansion of catch estimates. Anecdotal evidence suggests that effort during 1980, the first of the MRFSS program, was likely misapplied. The STAR panel agreed with the STAT team that the 1980 value was too high, so the value for the PBR was taken to be the average of the RecFIN removals for that mode from 1981-1989. This value corresponded very closely to the value in

1981. This adjusted 1980 value is included in Figure 12. Sensitivity to using the RecFIN extracted 1980 SCS PBR recreational removal is explored.

Reconstructing Recreational Removals in Oregon

The Oregon recreational fishery was broken into shore-based (man-made and beach/bank) and boat-based (PBR and CPFVs) modes for the purposes of this assessment. Figure 12 illustrates the total recreational removals (in mt). The shore-based catches were downloaded from RecFIN for 1980-2008. The average value of 1989 and 1993 was used for 1990-1992 (MRFSS sampling hiatus). The 1980 value was used back to 1973, the starting year for the Oregon catch history series. The boat-based catch estimates were provided by ODFW. Estimates of the numbers of cabezon harvested for the years 1973-1992 were obtained from various data sources. The following outline explains the historical catch estimation procedure for cabezon landed by boat-based recreational anglers fishing in open ocean areas for differing time periods.

> **Years 1973-77**: Estimated numbers of landed miscellaneous fish (category including cabezon) were obtained from handwritten summaries, provided by Don Bodenmiller. They then applied the average of annual proportion cabezon in miscellaneous category from 1979-1983 (5 yr. average) from ODFW historical species catch estimate database (Table 6).
>
> **Year 1978**: Estimated numbers of miscellaneous fish were obtained from printouts of estimates in ODFW storage loft. The same proportion cabezon as above was applied (Table 6).
>
> **Years 1979-89**: Estimated number of cabezon landed were obtained from ODFW historical species catch estimate database. Expansion factors were applied to adjust for each port that was not sampled during sampling time frame based on geographic distribution of catch from the closest time period where that port was sampled. Additional expansion factors were applied for the unsampled portion of year based on the temporal distribution of catch from the 1999-2000 year-round-sampling study. The start and stop dates of sampling at each port was subjectively analyzed to approximate start and stop dates of coast-wide sampling for each year (Table 7).
>
> **Years 1990-92**: Annual estimates of number of cabezon landed were obtained from historical reconstruction of annual catches completed by D. Bodenmiller, L. Zumbrunnen and E. Schindler (ODFW) in 2001. This reconstruction also provided the basis for Oregon RecFIN estimates from 1993-2000 (Table 7).
>
> **1993-2008**: Estimates of landed cabezon (in mt) were provided from the Oregon Recreational Boat Survey (ORBS) program

The estimation of average weight for conversion of numbers to metric tons in Oregon is as follows. There were no data on size from 1973-79, so the average of the 1980-82 average weights (obtained from RecFIN) were used, which is not the same as simply averaging weights of all sampled fish. Year specific average weights (also obtained from RecFIN) were used from 1980-89. No data on size is available from RecFIN for 1990-92, so an average weight was interpolated from the 1989 point estimate to 1993 point estimate.

Commercial Catches

Several sources of California commercial landings are available to reconstruct commercial cabezon landings by sub-stock back to 1916 (the first year of required reporting in the commercial fishery):

> **Years 1931–2008**: The CALCOM database provides annual landings (in pounds) by gear. Methodology can be seen in Ralston *et al* (in review). Data was extracted on 9 June, 2009. Additional allocation of landings to the live-fish fishery was available using the price per pound filed in the CFIS-CMASTR database. This analysis was provided by Bob Leos (CDFG).
>
> **Years 1930**: The Pacific Fisheries Environmental Laboratory (PFEL) live access server (http://las.pfeg.noaa.gov:8080/las_fish1/servlets/dataset) provide electronic summaries of CDFG fish ticket receipts originally reported in the Fish Bulletin series (available electronically at: http://ceo.ucsd.edu/fishbull/).
>
> **Years 1916–29:** The publication *California Fish and Game* (vols 1–16) are the original source of landing reports before the Fish Bulletin series and are used for this time period. During 1916–29, cabezon was included in the category "sculpin" which included California scorpionfish. Given the limited northern range of the scorpionfish (Love *et al*. 1987), 100% of the "sculpin" catch from Monterey north was assumed to be cabezon. Fish Bulletins 74 (CDFG 1949) and 149 (Heimann and Carlisle 1970) provide summarized commercial cabezon landings for 1916–47 and 1916–69, respectively, and were used to cross-compare cabezon catches from the *California Fish and Game* volumes. Both sources provided the same estimates of total cabezon landings.
>
> **Years 1916–30 adjusted**: Due to the spatial resolution of landings during this time period, an adjustment was made. Landings for the port complex "Santa Barbara" (including Morro Bay of the NCS and Santa Barbara of the SCS) were allocated to the appropriate sub-stock using the geometric mean of the ratio of the Morro Bay to Santa Barbara landings for the years 1978–82 from CALCOM.

Commercial landings are reported in pounds and were converted to metric tons for this assessment. Two fleets are modeled within the assessment: 1) vessels landing dead fish (non-live fishery), and 2) vessels landing live fish (live-fish fishery). Cabezon are caught commercially using a variety of gears-types, but have been taken almost exclusively by hook-and-line and pots since the 1990s. All catches are assumed to be taken using a single gear-type for the purposes of this assessment

California landings of cabezon were low until the early- to mid-1990s when the live-fish/premium finfish fishery began targeting cabezon. Commercial cabezon landings reached a peak of over 150mt in 1998 and averaged more than 80mt since the mid-1990s, most of which came from the NCS. Figure 15 shows the commercial landings by the two fleets.

There have also been spatial and temporal patterns in cabezon commercial landings. Historically, much of the landings were reported in the late winter/early spring months, but much of the catch has been taken in the summer and fall months since the start of the live-fish fishery. All catch is assumed to be taken in the middle of the year for the purposes of the assessment.

Oregon commercial landings estimates were taken directly from PacFIN (23 June, 2009). Similar to California, the live-fish fishery began in the late 1990s with a peak of around 45 mt in 2001-2002 (Figure 15).

Commercial Discards in California and Oregon
Commercial discard mortality estimates are provided by the West Coast Groundfish Observer Program (WCGOP; E. Heery, pers. comm.) and rates of mortality for discarded cabezon are assumed to be 100% for all trawl-related gear and 7% for the live-fish fishery (Figures 16 & 17). Cabezon are not as susceptible to discard mortality as many other fish because they live in shallow habitat, do not have swim bladders, and do not appreciably suffer from barotrauma. Recent information (beginning in 2003) regarding discards in the nearshore live-fish fishery were provided by the WCGOP. Prior to this, the harmonic mean discard ratio was applied back to 1983 in California. Estimated commercial landings and discards for each sub-stock are given in Table 8. Sensitivities to model assumption of discard rates are also considered in the tests of sensitivity.

Total Removals
Figure 18 illustrates the historical pattern of total cabezon removals in California and Oregon. Due to updates and changes in some data sources since the last assessment, a comparison of the two assessments historical catch reconstruction is made (Figure 19). Where the commercial fishery estimates did not change, differences can be seen in the recreational fishery since the 1980s, mainly due to changes in the mean weights used to calculate removals (described below).

Size Compositions
Cabezon otoliths and other ageing structures have not been collected routinely during port sampling. Therefore, the only information on the biological structure of the catch is from length and weight measurements. Sex is not recorded when sampling for length or weight, so all of the catch length-compositions considered in this assessment are sex-aggregated. Catch length-compositions were developed for each sub-stock, fishery sector, and fleet (Table 9; Figures 20-27).

The catch length compositions for each state and year for the recreational fisheries were obtained from RecFIN (extracted on 16 March, 2009). RecFIN expands the sampled length proportions by port, fishing fleet (mode), and wave (bi-monthly period) to estimate the proportions-at-length for the entire year. In the 2005 assessment, not all lengths retrieved from RecFIN were used because they were not true lengths, they were either converted from weights or another measurement of length (i.e. RecFIN converts total lengths (TL) into fork lengths (FL) for user downloads). For this reason, we used the sample lengths (in TL) where no conversions from weight were made. This increased samples substantially, especially in the 1980s. Comparison between the sampled and expanded length compositions showed no significant differences; using the sample data increased the number of measured fish that were otherwise disregarded due to sample strata.

Additional sources of length composition from two northern California CPFV studies were evaluated for use in this assessment. The first was a CDFG CPFV onboard observer program from 1987-98 that monitored catch north of Point Conception. The second was a more recent study in the Morro Bay area (CalPOLY) from 2003-08.

Even though samples for cabezon were low in these studies, the composition data were still used to help support more recent evaluation of the CPFV fishery. In the past, the CPFV fishery has not been sampled as much as the other recreational fishing modes; however, the CRFS program has made efforts to increase this effort since 2004.

Regarding SCS, information from two CDFG CPFV studies in southern California was also included in that model, representing the time periods from 1975-78 and 1986-89. Lastly, information from the Groundfish Disaster Relief Program in southern California from 2002-05 was used. Fish from this study were caught by hook and line on chartered CPFVs. Table 10 includes sample sizes for all length compositions used in each sub-stock assessment.

Mean weights from RecFIN were extracted for all recreational modes of fishing. In a similar situation, many weights were converted from lengths so we used the actual sampled weights to determine mean weights (Table 11). Using the sample weights also provided a source to calculate a coefficient of variation so as to fit the mean weight data in the assessment model using a likelihood function.

The commercial length-compositions for California were extracted on 29 March, 2009 from the CALCOM database. Commercial length samples are expanded using the standard routine at the port-gear-month level and then aggregated for the state. Oregon length compositions came from PacFIN biological database (extracted by J. Wallace, NOAA/NWFSC on 3 June, 2009).. The ORS is the only assessment containing sex-specific length compositions. No body weights are available for any of the commercial fleet.

Other sources of size-composition data and tagging information were considered for this assessment, representing different areas within California. Because of the sparse representation of cabezon in the data, the investigators of the projects were unsure if the data would be useful at this time, but were excited about the potential uses of this information in the future. Most of these studies were designed to evaluate the impacts of Marine Protected Areas (MPAs). The following sources should be considered in future assessments:

- San Luis Obispo Science and Ecosystem Alliance (SLOSEA) in Morro Bay, 2004-08 (R. Nakamura, CalPOLY pers. comm.)
- California Collaborative Fisheries Research Program (CCFRP) in central California, 2007-08 (R. Starr, CA Sea Grant, pers. comm.)
- CDFG tagging project in Carmel Bay (2008; D. Haas, CDFG, pers. comm.)
- Northern Channel Islands tagging project (2008; J. Wilson, UCSB, pers. comm.)

In the 2005 assessment, the following sources of length-composition and mean weight data were investigated for the SCS but cabezon did not occur in any of these databases frequently enough to provide additional information for the assessment of the SCS and were not used.

- CDFG southern California commercial fishery sampling program (1993–2001)
- Los Angeles County Sanitation Department trawl survey (1972–present)

City of Los Angeles Sanitation Department trawl and rig surveys (1987–present)
Orange County Sanitation Department trawl survey (1970–present)
San Diego County Sanitation Department trawl survey (1991–present)
Southern California Coastal Water Research Program (1994,1998)

Indices of Abundance

There is no standardized survey designed to provide biomass indices for cabezon along the U.S. west coast. All surveys presently used to provide biomass indices for groundfish populations are conducted at depths that are largely outside the depth preference of cabezon. Cabezon are caught so infrequently in the standardized trawl surveys that those data sources are not considered further in this assessment. A nearshore trap survey, designed to monitor cabezon abundance in the Morro Bay area (D. Wendt, CalPOLY, pers. comm.), is still in its infancy, though it may prove to be valuable for future cabezon assessments (and possibly those for other nearshore fishes). In lieu of an index designed specifically for cabezon abundance estimation, this assessment considers a wide variety of potential abundance indices. These include fishery dependent recreational data, adult SCUBA surveys, and egg/larval/juvenile surveys.

Potential indices of abundance are developed for each sub-stock by fitting generalized linear models (GLMs) to the proportion of zero and non-zero records, and then to the non-zero catch rates (or whatever quantity was being measured, such as number of larvae impinged). This approach is known as the "delta method" and is described in detail elsewhere (Lo *et al.* 1992; Vignaux 1994; Maunder & Punt 2004). The product of the year effects from each GLM (which can conveniently be based on different error structures) yields the index of abundance. Table 12 lists the data sources considered in this assessment for each sub-stock, the years for which data are available, the number of data points, the number of non-zero records for each data source, and the percentage of the data points for which the catch rate is non-zero.

The proportion of non-zero records was modeled as a binomial random variable; both gamma and lognormal error structures were explored for the positive records. Only main-factor models were considered and, initially, no interaction terms were explored, though year-area interactions, if present, can seriously compromise the development of abundance indices (Maunder & Punt 2004). A variety of alternative fixed-effects models were explored, and the final fixed-effects model for each choice of error model was selected using AIC (Burnham & Anderson 1998). Table 13 lists the fixed-effects models considered and the associated AIC values, and Tables 14-16 list the index values for each data source. The results of the analyses for the CPFV indices of all California sub-stocks and the Oregon ORBS survey index are illustrated by plots of the results of the gamma and lognormal models along with non-GLM derived indices produced using the geometric mean of positive catch rates (Figure 28). The CVs in Tables 14-16 were calculated by bootstrapping or jackknifing the best fitting model. Given inadequacies in spatial or sampling coverage, all resultant CVs should be viewed as under-estimates of the true variation of the index about the trend in the population. Additional variance (equivalent to 3 times the average yearly CV of the time series) was added to each index in order to more adequately capture the inherent uncertainty of each index (Tables 14-16; Figure 29). Sensitivity of derived model outputs to assuming the original CVs was also considered.

California: CPFV CPUE indices

The CPFV logbooks contain information on effort from 1947 for the southern California fleet and from 1957 for the central/northern California fleet (Hill & Schneider 1999). Effort was recorded as angler days prior to 1959 and as angler hours from 1962. Effort was recorded in angler hours and angler days in 1960 and 1961. Young (1969) estimated a conversion factor to relate the two measures of effort and estimated angler hours for 1947–59, the assumption being made that conditions in the CPFV fleet did not change over this period. Unfortunately, this was one of the most dynamic periods during the history of the CPFV fleet (Young 1969; see also *Recreational Fishing History in California*), so this assumption may not be valid. The previous assessment (Cope and Punt 2006) showed little sensitivity to the starting year of the index, so we consider the CPFV index beginning in 1960 to consistently use angler hour as the measure of effort. Changes in recreational regulations (size limitd, Figure 30; bag limits, Figure 31) were recognized as sufficient to divide the CPFV into two time periods: 1) 1960-99 and 2) 2000-08, based on RecFIN length composition data and bag limit analysis. Further scrutiny of changing size and bag limits rendered the 2000-08 time series for the NCS inadequate to consider in a base case. Sensitivities to including this time series and using the full time series (1960-2008) were investigated.

Factors considered in the CPFV GLM were year, month, and location. Instead of using CDFG blocks to define location, blocks were collapsed into groups based on major fishing ports or areas. The final fixed-effects model chosen for each sub-stock included all factors (Table 13). Both lognormal and gamma error structures were considered, but the lognormal model was ultimately selected for each base case. Dick (2004) also found the lognormal error model appropriate for California CPFV indices. Sensitivity to the choice of error model when standardizing the catch and effort data was not explored because the lognormal and gamma indices were similar in trends (Figure 28). Diagnostic plots for the base case CPFV indices are provided in Figures 32-34.

The STAR panel emphasized the difference in index trends between the geometric average and the delta-GLM derived index values for the NCS. Such a difference underscores a significant effect of the included factors (year, month, or location) on the resultant index (Figure 35). Investigation of interaction terms revealed significant interactions between location and year (specifically, the Santa Cruz location) and month and year (mostly for years in the 1960s and 1970s that were ultimately not fit well in the base model). The year-location interaction is not inconsistent with the emerging stock structure seen in the index clustering and genetic investigations (Figures 2 and 6). Given data constraints to only two areas in California, the index data was not broken up any further. The STAR panel recognized the need for future research to better reconcile these spatial interactions, but agreed the current formulation of the NCS is the most appropriate.

Further description of the spatial nature of catch rates along the California coast was explored using the percent index of relative importance (%IRI; Pinkas *et al*. 1971; Cortes 1999). Defined using numbers of cabezon, weight of cabezon catch, and frequency of cabezon occurrence, the %IRI was used to summarize the contribution of each fishing location (Figure 36) to the CPFV fishery through time. For the NCS, Princeton/Halfmoon Bay and Morro Bay comprised a large percentage of the IRI in the early years, but more northerly ports have since increased in contribution (Figure 36). In the south, most of the IRI is contributed by the northern-most locations through the whole time period (Figure 36), though it is clear cabezon are most encountered in the central and northern CPFV fisheries.

In the future, evaluating the CDFG logbook database in CFIS (1980-present) and compared to the historical database is recommended. Using the data in this format allows for better spatial resolution and the opportunity to subset the data into nearshore targeted trips, though at the expense of a shorter time series. If comparisons between the two data sets show little difference, the historical database should be retained for further considerations.

An index from the central California CPFV onboard observer program (1987–98), operated by CDFG, was also considered during the first cabezon assessment. The CPFV logbook and CPFV observer series exhibit similar trends (Cope *et al*. 2004). The index developed from the observer data was not used in this assessment because the information is not independent from the information contained in the CPFV logbooks and the indices based on the logbook data represent the longer time series.

ORBS Survey

The Ocean Recreational Boat Survey began development in 1979 to sample the catch and effort of ocean-going anglers off the Oregon coast. The most reliable data for development of an abundance index for cabezon is taken strictly from bottom-fishing trips. The most reliable time series runs from 2001-08 and was not affected by recreational regulations (T. Buell, ODFW, pers. comm.), so the full index is retained (Figure 39). Diagnostic plots for this index are found in Figure 37. This is the only survey available for the Oregon sub-stock.

Adult SCUBA Surveys

Two fishery-independent SCUBA surveys were investigated for potential use (Table 12) in the California sub-stocks. The first is a nearshore benthic survey of adult fishes, conducted from 1977–2008 by TENERA Environmental (an environmental consulting firm in San Luis Obispo, CA) at one site just south of Point Buchon (Figure 1), and this is only relevant to the NCS. Transects were 50m in length in depths from 3–10 m along high to moderate relief rocky reefs and kelp forests. Abundance indices were developed using the factors year and month (Table 13). The second is the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) adult survey (1999-2008), particularly for the Monterey region. Since 2007, they have extended their survey area monitoring inside and outside MPAs in central and southern California.

These two indices were not included in any of the California base case models for two reasons: 1) SCUBA surveys may not provide reliable abundance indices for cryptic species such as cabezon; and 2) the spatial coverage of these surveys, which is limited, is such that abundance indices based on them may not be representative of state-wide trends (Cope and Punt 2006). Despite not including either of these adult surveys in the base case, sensitivity of the results of the assessment to their inclusion is examined.

CDFG hook-and-line, PSMFC dockside, and PSMFC onboard surveys
Three additional surveys applicable to the NCS were provided by Tom Wadsworth (MLML, pers.comm) for the STAR panel. Details of the data available and development of each survey into an index can be found in Wadsworth (2009). The CDFG hook-and-line survey runs from years 1979-82 and 1995-98 and cover represent the Big Creek Ecological Reserve (BCER) only. The PSMFC dockside runs from years 1981-89 and 1993-07 and covers the whole NCS. The PSMFC observer time series is 1999-07 and represents the whole NCS. These data series were not retained in the final base model because they had little influence on the results (see Sensitivity section for results).

Recruitment surveys
CalCOFI
The Southwest Fisheries Science Center (SWFSC) has conducted larval tows off California since 1950. Tows are generally made at stations from the Mexican border to roughly 36°N, so these data relate primarily to southern California. Surface (manta) tows made south of 31°N during June-September and west of 122°W are also excluded from the analyses due to few positive tows. Additionally, data for the years 1977, 1979, 1982 and 1983 are excluded because of changes in survey methodology. The factors considered in the analyses were: day and night (day: between 6AM and 6PM), latitude (north and south of 34°N), longitude (east and west of 121°W), and month. Since surface tows are the focus of consideration and have low numbers of positive tows (Table 12), this data source is not considered further in this assessment.

Power-plant Impingement
An index of recruitment was created using impingement data obtained from the Edison power plants in California (Table 12). These data (catch in numbers per standardized flow volume) come from only the extreme southern California Bight (33-34°N) and are consequently reflecting only the SCS. The factors considered when developing this index were: station (some stations had multiple intake areas), and season (Dec-Feb, Mar-May, Jun-Aug, and Sept-Nov). This index is considered to pertain to recruitment rather than to reproductive output because the lengths of the fish impinged were primarily those of fish aged 0 and 1 years.

SMURFS
PISCO and CalPOLY (San Luis Obispo) have both collected recruitment information on nearshore fishes in California. The description of these standard monitoring units for the recruitment of temperate reef fishes (SMURFS) and the methodology can be found in Ammann (2004). This method may be a good index for some nearshore fish, however there was not much information available for cabezon (Table 12).

All indices considered either in the base case or in sensitivities are shown in Figures 38 and 39. Tables 14-16 provide all values and CVs of these indices.

Indices not considered
RecFIN

The catch and effort data for the man-made, beach/bank and PBR modes contain few records with cabezon. As was the case in the former (2005) assessment, an abundance index based on RecFIN was not considered further in this assessment. A portion of this data is included in the PSMFC dockside survey provided by T. Wadsworth (MLML, pers. comm.).

Monterey Adult Survey
The survey is a visual count of adult fish among nearshore rocky reefs in the Monterey area during 1993–98. As the former assessment found no influence of this index on assessment results, its limited representation of the assessment area, and lack of additional years, this survey was not considered in any model trials.

Additional dive surveys are being conducted in the waters off California, who seek volunteers to help with their surveys. Where these surveys are not particularly good indicators of abundance for cryptic species such as cabezon, they could be evaluated for other nearshore species. We are listing some of these programs here so divers are aware of these volunteer opportunities in the future.

> Reef Check California aims to build a network of informed and involved citizens who support the sustainable use and conservation of our nearshore marine resources. (http://www.reefcheck.org/)
>
> Channel Islands Kelp Forest Monitoring Program through National Parks Service began in 1982. (http://www.nps.gov/chis/)
>
> Reef Environmental Education Foundation (REEF) began in 1990. (http://www.reef.org/)

Ichthyoplankton Indices
Cabezon larvae are initially neustonic and available (and readily identifiable) to planktonic sampling gears. The SWFSC has conducted ichthyoplankton surveys off the west coast and developed databases with information on the abundance of cabezon larvae. Generally the size of fish collected during these studies is <15mm (pre-settlement) and therefore not thought to correlate well with recruitment to age-1. However, the abundance of this size group may relate (in a linearly proportional way) to the amount of reproductive output the year before the year of sampling. The possibility of developing an index using the Santa Cruz mid-water juvenile rockfish survey was investigated. However, cabezon are only a very small component of the catch in this survey (S. Ralston, SWFSC, pers. comm.) so no attempt was made to develop an index of pre-settlement of cabezon using these data.

Southern California Sanitation Districts Fish Surveys
The sanitation districts of Los Angeles, Orange, and San Diego Counties and the City of Los Angeles conduct fish surveys every year to monitor the effects of sewage outfall on nearshore communities. This data sources provided insufficient information to develop indices of abundance for cabezon.

Data Input Files
The SS3 input files for each sub-stock are provided in Appendices C-1 (NCS) and D-1 (SCS), E-1 (CAS) and F-1 (ORS).

Assessment

Assessment Model
This is the third assessment of the cabezon resource off the California coast. It differs in several key ways from the past assessment (Cope and Punt 2006). This assessment uses the newest version of stock synthesis (SS 3.03A; Methot 2009), a flexible length- and age-based population dynamics modeling environment. Previous work (not shown here) replicated the old assessment derived outputs in this new version of SS to make certain new model outputs were not sensitive to the use of the new SS version.

This assessment includes several differences in the data and thier treatment compared to the former assessment. Catch histories, mostly in the recreational fishery, differed due to changes in the weight and numbers of fish reported in each fishery mode (Figure 19). The treatment of discards also differed between the previous and current assessments. While discards were not considered in the last assessment (partially due to the lack of commercial information on discards and to the basic biology and fishery behavior causing low impact on cabezon when discarded), the new assessment was able to use multiple years of data from the WCGOP. The 2005 assessment did not use any RecFIN lengths prior to 1993 because the lengths were derived from weights. This assessment has recovered the measured lengths of those samples and now includes the full time series of RecFIN length compositions for all modes in each of the sub-stocks. Finally, age-at-length data were treated conditionally so as to allow the estimation of growth parameters internal to the model rather than being externally fit as before.

On a technical note, all tuning was based on average effective sample sizes by fleet rather than tuning each year of each fleet. Finally, the addition of an Oregon sub-stock is new to this assessment.

The population dynamics model
The base case assessment for each sub-stock is based on the following assumptions:

1. There are two fishery sectors (commercial and recreational). The commercial sector consists of two fleets and the recreational sector consists of four fleets.
   - Fleet 1: Commercial non-live-fish fishery
   - Fleet 2: Commercial live-fish fishery
   - Fleet 3: Recreational mode: Man-made (MM)
   - Fleet 4: Recreational mode: Beach/bank (BB)
   - Fleet 5: Recreational mode: Private boat and rentals (PBR)
   - Fleet 6: Recreational mode: Commercial Passenger Fishing Vessel (CPFV).

Fleet distinctions imply different length-specific selectivity patterns. The Oregon sub-stock did not have enough data or data resolution for all four recreational fleets, so fleets 3 and 4 were combined into a ‘shore’ mode and fleets 5 and 6 were combined into ‘boat’ mode.

2. Selectivity is assumed to be dome-shaped for the commercial live-fish fishery and the man-made and beach/bank fleets in the recreational fishery because each of these fleets tends not to land the larger sized fishes. Selectivity is assumed to be asymptotic for the remaining fleets (all fleets, though, use selectivity option 24 to allow for sensitivity testing of estimating a dome-shaped selectivity curve). Changes in management regulations have affected selectivities in each sub-stock, so time blocks were used to allow estimation of

separate selectivities per block (Tables 17 & 18). For the CAS and NCS, additional selectivity curves were estimated for blocks based on changes in size limits (1999-08) in the commercial live-fish fishery and size and bag limits (2000-04; 2005-08) for the PBR and CPFV recreational modes. In the SCS, blocked selectivities also correspond to the commercial live-fish fishery (1999-08) and the PBR and CPFV recreational modes (2000-08). Blocking in the Oregon sub-stock model differed, with two blocks in the commercial fishery due to size limit changes (2000-03; 2004-08) and one block for the recreational boat fishery (2003-08). All yearly selectivities within a block are assumed to be constant over time. The sensitivity of the results of the assessment to alternative specifications related to selectivity and time-blocking is examined in the tests of sensitivity. The selectivity patterns for the non-live commercial fleet in the assessment of the SCS are set to those for the non-live commercial fleet in the NCS owing to a lack of size composition data for the commercial fleets in the SCS.

3. There is one fishing season each year and the removals are taken instantaneously in the middle of the year after half of the natural mortality.
4. The estimates of removals-in-mass are known with negligible error.
5. Recruitment is related to reproductive output by means of a Beverton-Holt stock-recruitment relationship with log-normally distributed process error.
6. Length-at-age is normally distributed about its expected value.
7. There is no connection between any of the sub-stocks of cabezon, either through recruitment or migration. This assumption as it pertains to the NCS and SCS is explored through sensitivities.

Parameter estimation

The population dynamics model includes many parameters. The values for some of these parameters are based on auxiliary information, while others are estimated by fitting the model to the data (Tables 17 & 18). The base-case value for steepness (*h*) is assumed to be 0.7, based on a recommendation from the past assessment review (Cope and Punt 2006). The implications of this choice of steepness are evaluated using a likelihood profile. Recruitment variation, $_{R}$, is initially set equal to 1.0, then tuned to match the residual mean square error of recruitment deviations derived from the fitted model. The base-case values for the instantaneous rate of natural mortality are set to $0.25yr^{-1}$ for females and $0.3yr^{-1}$ for males (Table 2). Given the considerable uncertainty associated with the (assumed) base-case values for *M*, sensitivity tests examine the consequences of changing this parameter value for each sex.

For the purposes of this stock assessment, data were prepared as conditional ages by length bin so as to internally estimate the growth parameters and perpetuate uncertainty in those estimates through the model fitting process. This is an improvement upon the former assessment that used the externally fit growth parameters and assumption of CVs about length at age. Growth parameter values estimated external to the assessment model are compared with those derived from estimation within the assessment to diagnose whether the realization of growth differs in each approach (Figure 74).

No attempt is made to estimate recruitment deviations for the first year of the assessment period (1916), nor those for some of the subsequent years, because the data are completely uninformative regarding the values for some of the early (and most recent) recruitment deviations. Observing the behavior of the asymptotic standard error estimates of recruitment deviations can help to inform the choice of the first year for which recruitment deviations are estimated. The base-case models for each sub-stock were run estimating recruitment deviations for all years to determine the first year for which recruitment deviations could be estimated with reasonable precision (Figure 40). A decrease in these standard deviations may indicate when estimation of recruitment deviations should begin because the data provide some information about the recruitment deviations. For all California sub-stocks models, 1970 was chosen as the first year for which a recruitment deviation is estimated. For the Oregon sub-stock, 1980 was determined the best year to begin estimating recruitments. The final year of the estimated recruitment time series is set to 2006 for all sub-stocks to account for the lack of informative data for estimating recruitments in the final years of the model. Additionally, it is recommended that the bias correction carry through the most informative period of the recruitment time series. This period where recruitments are bias-corrected for lognormal error was defined as 1980-2004 for all sub-stocks. The sensitivity of each sub-stock assessment to the choice of years for estimating recruitment deviations is considered in tests of sensitivity.

Selectivity as a function of length was estimated for all fleets for which mean weight or length-composition data were available. Dome-shaped selectivity was modeled using a six parameter double normal curve for the commercial live-fish and recreational man-made and beach/bank fleets. All parameters were estimated except for selectivity at the first size bin (<6 cm), which was assumed to be near 0 (Tables 17 & 18). Length selectivities for the non-live commercial and recreational PBR and CPFV fleets were also described using the six parameter double normal function, with three of the parameters (the width of the descending limb, selectivity at the first size bin (<6 cm), and selectivity of the final length bin (>92 cm)) set to mimic logistic selectivity. There are no length-frequency data for the non-live commercial fleet or the first selectivity block of the live-fish fishery for the SCS, so the selectivity patterns for these fleet mirrors the estimate for the NCS. The selectivity pattern for the CPFV abundance index mirrors that of its corresponding CPFV fleet. Likewise, the ORBS survey mirrors the boat mode selectivity in the Oregon sub-stock. All recruitment surveys were set to estimate age 0 recruitment (selectivity option 33 in SS v. 3.03A).

Likelihood components

The following six components comprised the objective function that was minimized to estimate the free parameters of the model:

1. Abundance Index (assumed log-normally distributed).
2. Mean Weight (assumed normally distributed).
3. Length Composition (assumed multinomially distributed).
4. Conditional age at length (assumed multinomially distributed).
5. Recruitment Deviations.
6. Parameter Priors (penalties on deviations from the prior distribution; generally very small for these model parameterizations).

Coefficients of variation (CV) about the abundance indices derived from bootstrapping or jackknifing techniques may greatly underestimate the true uncertainty regarding the relationship between these indices and biomass. Additional variance (equivalent to 3 times the average yearly CV of the time series) was added to each index in order to more adequately capture the inherent uncertainty (Tables 14-16). The sensitivity of the results to setting the CVs to the values obtained from the bootstrap procedure (Tables 14-16) is explored in the tests of sensitivity.

The mean weight data (Table 11) were assumed to be normally distributed with CVs based on the raw data when these data were included in the objective function. The CVs for the estimates of mean weight for the CPFV fleet for 1947–51 for the NCS and CAS were set to 0.5 (larger than observed for RecFIN) to avoid over-weighting these early data.

The catch length-composition data were pooled into 44 length-classes (up to 92 cm), each of width 2cm, except the first, which includes 0–5.9cm. Although the length compositions can be based on hundreds or thousands of measurements, fits to length-frequency data usually exhibit substantial overdispersion relative to a multinomial distribution where the sample sizes are set to the number of animals measured. Therefore, for the purposes of the present analyses, the sample sizes are compared to the "effective" number of animals measured each year using the approach developed by McAllister and Ianelli (1997). Sample sizes are then iteratively changed by adjusting yearly sample sizes so that the mean inputted sample sizes by fleet approach the model-derived mean effective sample sizes by fleet. Such an approach is termed 'tuning'. Model sensitivity to using the originally assumed sample sizes (a 'non-tuned' model) was explored in the tests of sensitivity.

Recruitment deviation and parameter priors were calculated assuming lognormal and normal error structures, respectively. The variances for all of the estimated parameters were set very high to minimize the influence of the prior on the results.

Parameter (Control) Input Files
The SS3 files for the assessments of each sub-stock are provided in Appendices C-2 (NCS) and D-2 (SCS), E-2 (CAS) and F-2 (ORS).

Model diagnostics (base models)
Abundance surveys
Figures 41 and 42 show the fits to the base-case indices of abundance for all sub-stock models. As seen in the previous assessments, the California models tracks the changes in the CPFV indices qualitatively, but there are considerable differences between the model-estimates and the data for some years. These differences are, for the most part, consistent with the very wide confidence intervals assumed for the data. The fit of the CPFV index for the SCS (Figure 41) is particularly poor in the mid 1980s to the early 1990s, but fit the most recent years well. The former assessment had trouble fitting the most recent years. Blocking the time series for this assessment seems to have improved the fit. The NCS (Figure 41) and CAS (Figure 42) models not surprisingly fit similarly to their respective time series. The Oregon sub-stock model has trouble fitting the earliest and lowest index value, but does track the rest of the index values. Weaker fits to the index data in each of the sub-stocks is generally attributable to the fact that the age, length and weight data drive population dynamics rather than the abundance index information.

Mean weights

Figures 43-46 show the fits to the mean weight data for all sub-stocks. The confidence intervals for the mean weights are wide (as expected given the CVs in Table 11), which implies that the model is not constrained to a substantial extent by these data. Model fits to the data are generally good and do not indicate any notable divergence of these data from the conclusions of the overall maximum of the posterior density (MPD). Improved fits to the mean weight are seen in the current stock assessment versus the previous assessment, indicating more coherence of data sources. The past SCS assessment showed major sensitivity to the mean weight for the man-made fleet (fleet 3) in 2000, a sensitivity not seen in the current assessment (see trial when mean weights are removed, Table 21B and the trial when the low value in 2000 is removed, Table 23). This low mean weight is still visible in the data and is interpreted as a recruitment event, though it does not well fit (Figure 44). Despite the lack of fit to the 2000 data point, the population still demonstrates the large recruitment, indicating information in other data sources (e.g. later year mean weights and length compositions) contribute independent information supporting the 1999 recruitment event.

Length composition data
The base-case fits and diagnostics to the length-composition data for each sub-stock are given in Figures 47-52 (NSC), 53-57 (SCS), 58-63 (CAS), and 64-69 (ORS). When interpreting these figures, it should be noted that the observed and model-predicted lengths are “plussed” at low and high sizes. This has little impact on the results at high size, but can give a misleading impression at low size (e.g. the fit to the data for 1999 and 2000 for the non-live-fish fleets in the NCS and CAS base case models (Figures 47 and 58)).

Overall, fits to the length compositions for all sub-stocks across all fleets was good. The strongest fits in the NCS (Figures 47-52) were found in the live-fish fishery and PBR mode samples (Figures 48 and 51). No severe misfits, residual patterns, or unbalanced inputs were detected in any of the fleets for any of the sub-stocks. Low sample sizes in the commercial live-fish fleet and shore-based modes (MM, BB) of the SCS (Figures 53-55) rendered them the weakest contributor to the length composition likelihood for that sub-stock. Fits were best in the PBR recreational mode (Figure 56). The CAS was similarly driven by live-fish fishery (Figure 59) and PBR (Figure 62) compositions and samples, the beach/bank mode contributed earlier in the time series (Figure 61). Similar to the California sub-stocks, the Oregon sub-stock gained much of its length composition information from the live-fish commercial (Figure 66) and boat-based recreational fishing modes (Figure 69).

Conditional age-at-length data
Fits to the conditional age-at-length data are provided for each sub-stock in Figures 70-73. These fits to ages conditioned on length produced estimates of growth similar to those derived by externally fitting the same age and length data with ageing error (Figure 74; Cope and Punt 2007).

Results

Base case results: NCS
Figure 75 shows the MPD estimates of the time-trajectories of spawning output (in absolute terms) and recruitment, along with their asymptotic 95% confidence intervals. There is considerable inter-annual variation in recruitment. The time series

of spawning biomass and recruitment are found in Table 19. The estimates of recruitment are most precise before 1980 because no recruitment deviations are estimated for these years and the estimates of recruitment consequently reflect expectations based on the stock-recruitment relationship (Figure 75, bottom panel). In contrast, the estimates of reproductive output are most precise during the late 1980s and early 1990s (Figure 75, top panel). The NCS is estimated to have been at 45% of its virgin level (1036 mt) at the start of 2009 (469 mt; Figure 76). These current estimates are generally consistent with probable scales of biomass and trajectories found in the 2005 assessment (Figure 77). A large bump in the biomass is seen in the late 1970s due to a major recruitment event in the early 1970s. Sensitivity to the start of the recruitment time series is investigated to observe whether the derived outputs are sensitive to this recruitment event. Other major recruitment events are seen in the 1990s. Figure 78 shows the estimated spawner-recruit relationship along with the asymptotic standard deviations of estimated recruitments demonstrating when the data begin to inform estimated recruitments (seen as a drop in the asymptotic standard deviation below the specified recruitment variation) Appendix G lists the MPD estimates of the numbers-at-age matrix for each sex (also plotted in Figure 79).

Figure 80 shows the length-specific selectivity ogives for each fleet. The live-fish fishery (fleet 2) is greatly dome-shaped with respect to length in the most recent (1999-2008) selectivity block. Selectivity for the beach bank fleet (fleet 4) also declines with size. The selectivity ogives suggest that immature fish are not completely excluded from the current and historical catch, especially in the man-made and beach/bank recreational modes.

Harvest rates for each fleet are given in Figure 81. The onset of the live-fish fishery in the late 1990s shows a dramatic peak in harvest rate by this fleet. Only the PBR recreational fishery fleets show harvest rates of the same magnitude. Harvest rates since the 1980s for the PBR recreational modes represent a major source of cabezon removals from the NCS. The combination of the expanding live-fish fishery and high recreational removals caused harvest to exceed the MSY-proxy harvest rate currently calculated for this sub-stock in the late 1990s (Figure 82).

Despite the fact that catches in the late 1990s exceeded the currently estimated MSY-proxy harvest rate, the NCS depletion level has since increased from the precautionary zone to a level above the target spawing biomass (Figures 76 & 83).

Base case results: SCS

Figure 84 shows the MPD estimates of the time-trajectories of spawning output (in absolute terms) and recruitment, along with their asymptotic standard errors. The historical values of spawning biomass and recruitment can be seen in Table 19. The time-trajectory of reproductive output drops dramatically after 1980, stays low until the early 2000s, and then increases substantially. The increase in reproductive output occurs because of the 1999 year-class, the largest in the time-series. Additional large recruitments were seen in 1984 and 1994. All three of these large recruitments followed on the heels of notable El Niño Southern Oscillation events (ENSOs) of 1982/1983, 1991/1992, and 1997/1998. This correlation with environmental conditions along with smaller relative biomass compared to conspecifics of the NCS may indicate that the SCS is a more dynamic subpopulation. This is also consistent with the higher recruitment variation ($_R$) estimated for the SCS (0.7) versus all other cabezon sub-stocks (0.5). Major recruitment events for the SCS are also consistently lagged 1 year compared to the NCS. The SCS reproductive output is estimated very precisely during the 1990s and is estimated, with much greater uncertainty, to have been at 60% of its virgin level (263 mt) at the start of 2009 (158 mt) (Figure 85). Though the relative and absolute level of the population trajectory is similar to the last assessment (Figure 77). Despite the increase in biomass scale, the biomass of cabezon off southern California remains much smaller than that off central / northern California. Figure 86 shows the estimated spawner-recruit relationship, along with the asymptotic standard error estimates around each estimated recruitment. The model is moderately informed regarding recruitments. Appendix H and Figure 87 give the MPD estimates of the numbers-at-age matrix.

Figure 88 shows the length-specific selectivity ogives for each fleet. The selectivity patterns for the non-live-fish fishery are inestimable because of the lack of length compositions and are therefore assumed equal to the selectivity for the non-live-fish fleet in the NCS. The live-fish fishery shows a very strong dome-shaped pattern that changes as size-limits affected fishery retention. The selectivity patterns for the man-made and beach/bank fleets decline more rapidly with length for the SCS than is the case for the NCS. These selectivity patterns suggest that immature fish are not completely excluded from the current and historical catch, especially in the man-made recreational fishery.

Harvest rates for each fleet are given in Figure 89. There are two significant periods of removals: 1) the 1980s when harvest rates increased dramatically because of the increase in recreational fishing, particularly by the PBR (fleet 5) recreational mode; and 2) the late 1990s when the live-fish fishery (fleet 2) took large catches. The first of these periods of harvest, along with the lack of strong recruitment events, led to the large reduction in reproductive output during the early 1980s (Figure 84). Through much of the 1980s and up until recently, catch of the SCS exceeded the currently estimated MSY-proxy harvest rate for that sub-stock (Figure 82). Large reductions in removals coupled with a major recruitment in the late 1990s has allowed the moderately growing cabezon to increase from 25% of the unfished level in 1999 to more than 60% since 2007 (Figures 83 and 85).

Base case results: CAS

Figure 90 shows MPD estimates of the time-trajectories of spawning output (in absolute terms) and recruitment, along with their asymptotic standard errors for the state-wide (i.e. treated as a single homogenous population) California assessment of cabezon. The historical values of spawning biomass and recruitment can be seen in Table 19. The time-trajectory of spawning output for the combined assessment is qualitatively most similar to that for the NCS, although, as expected, biomass levels are higher. In this base case, all data for each fleet is combined so as to create the same six fleets combining the data from the SCS and NCS. Despite both of the area-specific sub-stocks being above the target reference points, the depletion of the combined model is 34%, below the 40% target (410 mt compared to an unfished spawning biomass of 1,207 mt; Figure 91). The terminal year estimate of biomass is also smaller than the NCS estimate. Figure 92 shows the estimated spawner-recruit relationship along with the asymptotic standard errors estimates around each estimated recruitment. The model is well informed regarding recruitments. Appendix I and Figure 93 give the MPD estimates of the numbers-at-age matrix.

Comparison of the current state-wide base case to alternative ways of estimating state-wide California estimates of cabezon spawning output and recruitment are provided in Table 20 and Figure 94. The summation of the SCS and NCS leads to the highest spawning output and retains consistency with the stock status estimated for each individual-area assessment. It is also most consistent with state-wide results from the 2005 assessment that used different fleet designations to distinguish spatial-explicit fisheries (Table 20; Figure 77). Thus one can alternatively specify the current state-wide model using area-specific fleets (1 for each fleet in each area = 12 total fleets), as was done for the state-wide assessment in 2005. Such an approach gives you a depletion value (35%) closer to the state-wide model without spatial fleet designations and still less than either of the area-specific assessments. These seemingly incongruent results (deriving a state-wide depletion value less than either of the sub-stock models) can be attributed to combining divergent area-specific population dynamics to explain one synthetic overall pattern. This is seen most clearly when comparing recruitment deviations (Figure 95). The NCS and SCS have distinctive recruitment patterns. These area-specific patterns get obscured when the data have to explain just one best-fit recruitment pattern, causing much weaker recruitment in the last 10 years and thus, in this particular case, reducing the ability for the population to compensate for the combined removals. Allowing selectivities to vary by area (via area-specific fleet specification) does little to reduce this effect (Figure 95).

A final consideration to a state-wide model specification was the two-area (north and south) model with connected recruitment via a constant recruitment distribution ratio (Figure 94). This allowed for the two sub-stocks to be modeled with connectivity in the early life stage (as opposed to the base case assumption of no connectivity), with total recruitment being redistributed via an estimated recruitment ratio. Such an approach results in the largest combine biomass and least depleted state-wide stock (Table 23C). This formulation is based on the assumption of a well-estimated constant recruitment distribution, which is unlikely given the varying dynamics in each sub-stock.

Figure 96 shows the length-specific selectivity ogives for each fleet in the state-wide base case. The state-wide selectivities are heavily influenced by the NCS data and appropriately reflect this relationship.

Harvest rates for each fleet modeled in the CAS are given in Figure 97. Similar to the NSC and SCS, the 1980s and early 2000s PBR removals and the late 1990s commercial live-fish fishery removals are the major periods of harvest. These relatively large removals are reflected in exploitation rates at or surpassing currently estimated MSY-proxy harvest rates for much of that period (Figure 82). Large reductions in removals coupled have occurred in recent years, but without the kind of major recruitment event observed in the sub-area models, depletion has not rebounded to exceed the target level (Figures 83 and 91).

Base case results: ORS

Figure 98 shows MPD estimates of the time-trajectories of spawning output (in absolute terms) and recruitment, along with the asymptotic standard errors for the Oregon sub-stock. The historical values of spawning biomass and recruitment can be seen in Table 19. There is much uncertainty about the absolute scale of the population, though less uncertainty about the recruitment. Uncertainty in the spawning output under initial conditions is similar to that of the terminal year spawning output. The depletion of the ORS is 52% (214 mt compared to an unfished spawning biomass of 409 mt; Figure 99). Given the high uncertainty in both the initial and terminal conditions, certainty in the depletion is unsurprisingly higher, with only a small portion of the 95% distribution around mean depletion below the target reference point. In general, the scale of biomass off Oregon is greater than the SCS, but lower than the NCS. Figure 100 shows the estimated spawner-recruit relationship along with the asymptotic standard error estimates around each estimated recruitment. The model is generally well informed regarding recruitments. Appendix J and Figure 101 give the MPD estimates of the numbers-at-age matrix.

Figure 102 shows the length-specific selectivity ogives for each fleet in the ORS base case. Distinct dome-shaped selectivities are found in the live-fish fishery, with changes in the shape due to size regulations. The affects of size regulations on the recreational boat-based modes is less apparent.

Harvest rates for each fleet modeled in the ORS are given in Figure 103. Removal levels are much below those seen in any of the California sub-stocks, with the live fish fishery (fleet 2) being the highest. Only under the highest removals from the live-fish fishery did the population approach the MSY-proxy harvest rate (Figure 82). The base case MPD for the ORS suggests the current stock status is well above the target reference points (Figures 83 and 99).

Sensitivity analyses

Sensitivity tests were conducted to evaluate how derived model outputs may change due to our uncertainty in the data sources or model specification. The first set of sensitivities considered the affect of removing data sources on the derived outputs of initial spawning output (SB_0), terminal year spawning output (SB_{2009}), depletion and MSY. The results of these sensitivity analyses are provided in Table 21.

The NCS (Table 21A) was most sensitive to the removal of the CPFV abundance index (Trial 11), which dropped the depletion estimate below the target level, but still well above the overfished limit. The model was also sensitive to the removal of all length composition data (Trial 19), a result seen with all sub-stocks, but that is as expected when the primary information informing selectivity and recruitment deviations are the length compositions. Both spawning output measures were the most and similarly sensitive, whereas depletion and MSY (which ranged between 125 mt and 140 mt for most trials) were the most robust.

The SCS (Table 21B) demonstrated low sensitivity to all practical trials (removing all the lengths (Trial 14) is not considered a practical trial as it removes the primary information to estimate selectivity, but included for completeness), none of which dropped the stock status below the target level. Removal of the abundance indices (Trial 7) resulted in a less depleted stock, opposite the affect found in the NCS. MSY was again very robust, ranging between 25 mt and 35 mt.

The CAS (Table 21C) was similarly insensitive to most data trials, again showing the most sensitivity to removal of the CPFV abundance index (Trial 10). All practical trials were above the limit reference point with several raising the stock status above the target reference point. These trials included using one continuous CPFV time series, removing the live-fish length compositions, removing the beach/bank length compositions, and removing the conditional age-at-length data. These results did not mimic the results in the NCS, thus showing emergent behavior in the state-wide approach. MSY generally ranged from 140 mt to 155 mt.

The ORS (Table 21D), though generally robust to removing data, was highly sensitive to the removal of the ORBS survey (Trial1). Removing this piece of information caused the population to drop below the limit reference point. MSY was the relatively least certain amongst all sub-stocks, generally ranging from 30 mt to 50 mt.

Natural mortality (*M*) and steepness (*h*) were unknown and treated as fixed parameters in each of the sub-stock assessments. To investigate the sensitivity of model derived outputs to the values assumed for these parameters and whether the current data are informative to the value of these parameters, likelihood profiles of *M* and *h* were conducted for each sub-stock.

Steepness estimates proved uninformative in each of the sub-stocks (Figure 104) as it tended to either approach the upper (in the SCS and ORS) or lower (in the NCS and CAS) bound. The biggest change in behavior in each case occurred when steepness was above or below 0.4. Current spawning output is more sensitive than initial spawning output in all California sub-stocks, causing both depletion and MSY (which is expected) to approach zero as steepness approaches the minimum (Figures 105 & 106). The overfished state is reached in the NCS and SCS if steepness is less than 0.4. In the CAS base case, the overfished state is reached with steepness less than 0.5. The ORS was less sensitive to the assumption of steepness with the current spawning output being the least sensitive derived output. In no trial did the base case ORS fall below the overfished threshold.

The models also lacked information as to the value of *M*, though very different behaviors are obtained among the sub-stocks (Table 22; Figure 107). Information contained in the sub-stock data sets were most consistent with different levels of natural mortality across areas. The NCS and CAS tended to find better fits at the lower bounds of M, especially for females, whereas the ORS tended to fit better at the higher bounds (Figure 107). All sub-stocks dropped below the overfished level at the lowest values of M. Generally, values less than 0.2 led to overfished status. The values of M explored gave widely varying values for all derived outputs for the SCS and ORS. The NCS and CAS, while showing relatively more stability, still demonstrated disperate derived outputs depending on natural mortality. As was the case in the previous assessment, natural mortality is the most sensitive assumption in all models.

Additional sensitivities were run using a variety of model specifications to better understand the behavior of each assessment model to changes in key assumptions. Such sensitivities included alternative treatments of variance in abundance indices, retrospective analyses of the marginal contribution of data from recent yeears, and assumptions regarding catch histories, the time series of recruitment deviations and spawner-recruit relationships, selectivity specifications, and age and growth. The latter assumed either no ageing error or that male growth in California is more like that of Oregon males (Figure 9) or past estimates in California (O'Connell 1953).

Results to these sensitivities are found in Table 23. Assuming a Ricker spawner-recruit relationship caused a major decline in all California sub-stocks, though no evidence exists to support this relationship. Estimating natural mortality also caused major declines in the NCS and CAS. The SCS showed particular sensitivity to the assumption of the male growth parameters, where slower growing males with larger terminal size led to greatly depressed stock status. Oregon showed little sensitivity to any of the trials. These trials emphasize the importance of gaining further understanding of the growth and mortality rates for all sub-stocks.

Retrospective patterns, identified through the progressive removal of data back to a certain year, give further insight into the replicability of the current spawning output trajectories and estimated stock status (Table 23 and Figure 108). The California sub-stocks show consistent patterns and scales of spawning output for most retrospective analyses. The greatest difference is produced when 10 years of data are removed. This is expected given most of the conditional ages used to estimate growth and the length samples from the live-fish fishery to estimate selectivity are removed. The ORS shows much more unstable behavior, demonstrating again how the depletion status is robust to model specification, but the uncertainty about scale is very large. Removing 10 years of data essentially takes most of the data out of the assessment, thus causing an unrealistic decline in the population.

Projection and decision analysis

Twelve-year forward yield projections are conducted for each sub-stock under two alternative ABC control rules (based on F_{MSY} proxies of $F_{45\%}$ and $F_{50\%}$) and two OY threshold control rules (40-10 or 60-20). The standard PFMC OY control rule for groundfish such as cabezon is based on $F_{45\%}$ with a 40-10 adjustment for stocks below the target level of 40% of the unfished reproductive output. The California NFMP proposes the use of a F_{MSY} proxy of $F_{50\%}$ and a 60-20 adjustment for stocks below 60% of the unfished reproductive output. The relative proportion of the six fleets in future harvests is assumed to be the same as the last year (2008) in the model.

The results in Table 24 suggest that sub-stocks (NCS, SCS, and ORS) above the target reference level of $SB_{40\%}$ would see a reduction in population size converging on the target reference point near the end of the projection period under the 40-10 control rule. The CAS would increase toward the target reference point during the same period. The extent of this increase is greatest for the most conservative OY control rule ($F_{50\%}$ with a 60-20 adjustment) and least for the less conservative control rule ($F_{45\%}$ with a 40-10 adjustment). Most increases under the 60-20 rule increased populations near the 50% virgin biomass level.

Decision table projections based on alternative states of nature (columns in the decision tables) for 3 of the 4 sub-stocks were explored to capture uncertainty in population conditions (Table 25) and control rules (40-10,$F_{45\%}$ and 60-20,$F_{50\%}$). The STAR panel agreed with the STAT that state-wide management was most appropriately determined from the combined NCS and SCS models, not the CAS model. A decision table for the CAS is therefore not presented. For the NCS, SCS, and ORS sub-stocks, the low and high M scenarios refer to different assumptions about sex-specific natural mortality (the greatest source of uncertainty in all sub-stock models) and were retained from the last assessment. The low scenario assumes M = 0.2/yr and 0.25/yr for females and males respectively, while the high scenario assumes 0.3/yr and 0.35/yr for females and males respectively. Catch histories (rows in the decision tables) were based on three proposed catch scenarios: 1) catch series based on the specified control rule (either 40-10 or 60-20) derived from the low *M* state of nature (low *M* catch scenario); 2) catch series based on the specified control rule (either 40-10 or 60-20) derived from the base case *M* state of nature (base case *M* scenario); and 3) catch series based on the specified control rule (either 40-10 or 60-20) derived from the high *M* state of nature (high *M* catch scenario).

All sub-stocks demonstrated spawning output depletion below limit reference points when the low *M* scenario was subjected to the base case and high catch scenarios. This also occurred when the base case *M* scenario was subjected to the high catch scenario. All other scenarios demonstrated depletion near or above the target reference points at the end of each projection period. Relative to biomass and depletion estimates, the 60-20 rule was much more conservative than the 40-10 rule.

Alternative Assessment Approaches

Given the large number of species needing stock assessments and the lack of resources (e.g. data, time, etc.), simplified metrics or rapid assessment approaches that relate to stock status are needed. Here we report on three approaches that use minimal data and simplifying assumptions and compare their outputs (as applicable) to those of the current assessment.

Productivity-Susceptibility Analysis

Measuring the vulnerability of a stock (defined as the combination of stock productivity and susceptibility to fishing) relates directly to the goals of the US National Standard 1 guideline to maintain optimal yield without overfishing. Specifically, vulnerability determination may help determine whether a species is “in the fishery”, identify species complexes for management, and create additional buffers for management consideration.

Productivity-Susceptibility Analysis was recently presented by Patrick *et al.* (*in press*) as a formal means by which to define vulnerability. It defines the two axis of vulnerability (x-axis = productivity and y-axis = susceptibility) based on multiple attributes describing the life histories and functional relationship to fishing practices, respectively (see Patrick *et al.* for details). The attributes scores are then combined to give an overall productivity and susceptibility score. Vulnerability is then defined as the Euclidean distance of the coordinate productivity and susceptibility scores. Composite scores of 1 indicate the lowest productivity or lowest susceptibility, whereas scores of 3 indicate the highest of each. Vulnerability scores, therefore, are lowest at 0 and highest at 2.83.

Cabezon scores (1 score provided for the whole species) are as follows: productivity = 1.9; susceptibility = 2.1; vulnerability = 1.42. These scores indicates cabezon are both moderately productive and susceptible, thus have moderate vulnerability. Comparing this score to other groundfish species, cabezon are relatively less vulnerable and score near other species that are either near or above target biomass levels (Figure 109; Field *et al. in press*). These results are not inconsistent with the results of this stock assessment for any of the sub-stocks.

Length-based reference points
Froese (2004) suggested a way to assess potential fishery impacts on population dynamics by measuring three simple metrics (generically referred to as P_x) from catch length compositions: 1) proportion of mature individuals (P_{mat}), 2) proportion of fish at the size which the highest yield from a cohort occurs (P_{opt}), and 3) proportion of large, mature individuals (P_{mega}). Cope and Punt (*in press*) extended this analysis by adding a fourth metric (P_{obj}; the sum of all Froese (2004) metrics) that identifies the general selectivity pattern of the fishery and thus allows the resultant P_x measures to be related to biomass without knowledge of historical conditions. The analysis also presented general guidelines for interpreting stock status from P_x values.

The approach of Cope and Punt (*in press*) was applied to each of the sub-stocks by considering the combined length compositions of all fisheries (Figures 110 & 111). For each sub-stock, the P_x measure relatable to the spawning biomass proxies of $SB_{40\%}$ and $SB_{25\%}$ are provided along with the relationship of depletion with P_{obj}. In the current presentation, the use of P_{mat} to inform stock status is consistent with the current assessment results from the SCS (Figure 110) and ORS (Figure 111). This approach is more precautionary than the stock assessment results in the NCS (Figure 110) and CAS (Figure 111), indicating below target biomass levels when the stock assessment indicates biomass levels above the target. Three of the four sub-stocks (all but the SCS) also indicate relationships between P_{obj} and biomass opposite to expectations (right columns in Figures 110 & 111). These discrepancies may be due to improper weighting of the length composition data (weighted only by sample, not by relative catch, in these examples) and need to be explored further. Overall, the terminal year values of P_{mat} are consistent with the stock status presented in each sub-stock assessment.

Preliminary work has shown that using P_{obj} as a predictor of biomass may be used as an effective control rule. Further exploration (via simulation testing) and application are needed to establish the broad applicability of this approach. Given the diversity in selectivity, fishery types, and spatial scales, cabezon seems a good candidate to explore further.

Depletion-corrected average catch
The depletion-corrected average catch (MacCall 2009) was also considered, but is not reported because the correction factors become very small when natural mortality is above 0.2. The DCAC approach thus produces essentially the same estimate of ‘pretty good yield’ of cabezon as taking the average catch of the total removal history for each sub-stock. These averages are 58 mt (NCS), 14 mt (SCS), and 29 mt (ORS) and are about half that derived from the base cases (129 mt for the NCS, 30 mt for the SCS, and 51 mt for the ORS).

Response To Past Research Recommendations

<u>1. Accurate accounting of removals, especially from the recreational and live-fish fisheries:</u> The commercial live-fish fishery and recreational modes (especially the shore-based (man-made, beach/bank) and private boat modes) remain challenges to record accurate removals. Since 2003 the West Coast Observer Program has provided at-sea observations in the live-fish fishery. Programs such as these should grow and

the challenge of obtaining accurate removals of recreationally taken fish should contain to receive attention.

2. A fishery-independent survey of cabezon population abundance: Since the 2005 assessment, cooperative fisheries investigations have started along the California coast and hold promise to provide fishery-independent surveys to nearshore fishes, as well as improving our understanding of critical biological parameters such as natural mortality. The small-scale (relative to the stock assessed areas) coverage of these surveys remains a challenge. Maintenance and expansion of such surveys will increase the usefulness of these data sources in future assessments.

3. A study of the stock structure of cabezon: This assessment provided further research in the stock structure of cabezon (Cope and Punt 2009; Villablanca and Nakamura 2008). Genetic investigations are ongoing for cabezon. With the addition of Oregon, further understanding of cabezon populations at small and large scales is encouraged.

4. Age validation/ age determination: Catch age-composition that represent fishery data remain unavailable to the assessments and no new ages were available for California outside the Grebel (2003) study. Recent age sample were available in Oregon, but only useful for age and growth estimation, not informative to selectivity or recruitment. The Oregon samples did provide ageing comparisons within lab, but given the large discrepancy in growth between male cabezon in California and Oregon, ongoing comparisons among readers would be useful. As suggested in the previous assessment, information on the age-structure of the catches for each fishery sector would substantially improve some aspects of the assessment.

5. A better understanding of the relationship between CPUE and population size: No new information was provided on the relationship between fishery-dependent CPUE indices and biomass. The results of the assessments in California were relatively insensitive to the inclusion of such abundance indices, but the Oregon assessment was highly sensitive, underscoring the need for increased understanding of the relationship of such CPUE-based abundance indices to biomass.

6. Alternative assessment procedures: Alternative assessment methods were presented in this assessment to demonstrate how such methods can be compared to traditional assessment approaches and the potential they may have in informing of stock status and/or future catch recommendations. Such methods may have great utility when attempting to rapidly assess many species of varying data and resource availability. This assessment does not address the issue of alternative metrics such as a spawning biomass measure that includes to nest-guarding males. Alternative model specifications could also address this issue, but were not explored here. This subject is still very relevant to interpreting derived assessment outputs and appropriate proxies for stock status.

7. Effect of climate on cabezon: No new studies were done relating cabezon abundance to climate, though the results of these assessments (especially in the SCS) indicate there may be very strong relationship of recruitment to climate.

8. Sex-specific data: The correlation of color to sex in cabezon (O'Connell 1953; Lauth 1987; Grebel 2003) remains uncertain, but the collection of sex-specific information remains important to enhance future assessments. No additional sex information was provided in the Caliornia sub-stocks for this assessment.

Research Recommendations

1. Improve estimates of natural mortality: All sub-stocks show significant sensitivity to natural mortality, a parameter not estimated in the model and assumed known. Estimates of natural mortality may be derived from tag-recapture studies or the comparison of length compositions inside and outside marine protected areas. There are two studies currently attempting to gather this information for future use in stock assessments. One is representing the northern Channel Islands (J. Wilson, UCSB, pers. comm.) and the other is representing the Morro Bay area (R. Nakamura and D. Wendt, CalPOLY, pers. comm.). These studies, and other like them, need to be encouraged.

2. Age and growth determination: The large discrepancy in estimated male growth parameters between Oregon and California deserve further attention to confirm this relationship. Further attention to ageing cabezon in California is needed to increase our spatial understanding of cabezon growth along the coast. Age samples from each fishery would also help to define growth and selectivity, while informing recruitment patterns and helping decrease the uncertainty in the scale (absolute abundance) of each sub-stock.

3. Fishery-independent surveys: Continued support and development of current fishery-independent nearshore surveys (like those initiated in Morro Bay and Monterey) is needed to extend the time series and increase spatial coverage. Both are required to increase the power of such indices in statistical catch-at-age models.

4. Defining the stock structure of cabezon: Current work on cabezon stock structure needs continued attention to better understand the connectivity between cabezon subpopulations. This would help focus or inform future sampling design to provide data for assessment purposes.

5. Alternative assessment procedures: The need for greater spatial resolution in the management of nearshore fisheries also increases the amount of data required to perform traditional stock assessments. Alternative assessment procedures that are less data-hungry, but still provide relevant management outputs should be encouraged. This assessment provides examples of some approaches as applied to cabezon. Such side-by-side comparisons of simplified assessment approaches to the statistical catch-at-age model outputs are useful in understanding the relationship of alternative to traditional assessment methods in hopes of developing the best available scientific advice for management under data-limited situations.

6. Re-defining "spawning biomass": The nest-guarding behavior of cabezon males gives added reproductive importance to their abundance, relative to most other groundfish species. A metric other than female spawning biomass may be needed to incorporate the status of the male portion of the population into reference points.

Further investigation is needed to identify appropriate ways in which the role of males in reproductive success can be incorporated into metrics for evaluating population status.

7. Changes in batch fecundity with age: Batch fecundity in cabezon is recognized, but it is not understood how and if batch fecundity changes with age. Understanding whether the number of batches increases with age will help specify the fecundity relationship in the assessment model.

8. The effects of climate on cabezon population dynamics: The recruitment patterns of the California sub-stocks suggest a possible link between environmental forcing and population dynamics. Specifically, strong ENSOs conditions (especially in southern California) may be a pre-cursor to significant recruitment events. This link should be explored further to help increase the understanding of spatially-explicit recruitment responses and inform future recruitment events.

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TABLES

Table 1. Biological parameters for cabezon considered for the 2009 assessment.

A. Age and growth (VBGF) parameters. Length in cm.

	L_∞	k	t_0
Oregon			
Female	68.83	0.2	-2.26
Male	59.05	0.25	-1.26
California			
Female	58.97	0.21	-1.28
Male	41.5	0.5	-0.75

B. Age and length maturity function parameters

	a	b
Oregon		
age (years)	-1.28	3.86
length (cm)	-0.37	43.67
California		
age (years)	-1.58	4.10
length (cm)	-0.74	34.60

C. Weight (kg)-length (cm) relationship

	a	b	R^2	N
California/Oregon				
Female	0.00000918	3.188	0.99	377
Male	0.00001163	3.118	0.96	234
NCS				
Female	0.00000920	3.187	0.99	322
Male	0.00001163	3.118	0.96	227
SCS				
Female	0.00001236	3.113	0.95	55
Male	0.00001989	2.997	0.91	7

Table 2A. Natural mortality calculations used to obtain estimates of natural mortality (*M*) for female cabezon.

		Estiamte of natural mortality (*M*)					
		Oregon		California: NCA		California: SCS	
Method	Approach	Input values	Estimated M	Input values	Estimated M	Input values	Estimated M
Hamel (pers. comm)	Hoenig (1983) * Pauly (1980)	= 25 k =0.2 max weight = 14kg water temp = 13°C	-0.23	= 20 k =0.21 max weight = 14kg water temp = 13°C	-0.25	= 20 k =0.21 max weight = 14kg water temp = 18°C	-0.26
Chen and Watanabe (1989)	$M(t) \quad \frac{k}{1 \quad e^{k(t \quad t_0)}}, \quad t \quad t_M$ $\frac{k}{a_0 \quad a_1(t \quad t_M) \quad a_2(t \quad t_M)^2}, \quad t \quad t_M$ *where* $a_0 \quad 1 \quad e^{k(t_M \quad t_0)}$ $a_1 \quad ke^{k(t_M \quad t_0)}$ $a_2 \quad 0.5k^2e^{k(t_M \quad t_0)}$ $t_M \quad \frac{1}{k}\ln(1 \quad e^{kt_0})$		-0.23	k =0.21 t_0 = -1.28	-0.25	k =0.21 t_0 = -1.28	-0.25
Jensen (1996)	$M = 1.65/a_M$	a_M = 7	-0.24	a_M = 7	-0.24	a_M = 7	-0.24
Jensen (1996)	$M = 1.5k$ *or1.6k*	k = 0.2	-0.31	k = 0.2	-0.33	k = 0.2	-0.33
		Average *M* estimate	-0.25 -0.23		-0.27 -0.25		-0.27 -0.25

Table 2B. Natural mortality calculations used to obtain estimates of natural mortality (*M*) for male cabezon.

		Estiamte of natural mortality (*M*)					
		Oregon		California: NCA		California: SCS	
Method	Approach	Input values	Estimated M	Input values	Estimated M	Input values	Estimated M
Hamel (pers. comm)	Hoenig (1983) * Pauly (1980)	= 25 *k* =0.2 max weight = 14kg water temp = 13°C	-0.25	= 20 *k* =0.5 max weight = 14kg water temp = 13°C	-0.33	= 20 *k* =0.5 max weight = 14kg water temp = 18°C	-0.37
Chen and Watanabe (1989)	$M(t) \quad \frac{k}{1 \quad e^{k(t \quad t_0)}}, \quad t \quad t_M$ $\frac{k}{a_0 \quad a_1(t \quad t_M) \quad a_2(t \quad t_M)^2}, \quad t \quad t_M$ *where* $a_0 \quad 1 \quad e^{k(t_M \quad t_0)}$ $a_1 \quad ke^{k(t_M \quad t_0)}$ $a_2 \quad 0.5k^2e^{k(t_M \quad t_0)}$ $t_M \quad \frac{1}{k}\ln(1 \quad e^{kt_0})$		-0.30	*k* =0.5 t_0 = -0.75	NA	*k* =0.5 t_0 = -0.75	NA
Jensen (1996)	$M = 1.65/a_M$	a_M = 6	-0.28	a_M = 6	-0.28	a_M = 6	-0.28
Jensen (1996)	*M* = 1.5*k or1.6k*	*k* = 0.25	-0.39	*k* = 0.45	-0.78	*k* = 0.45	-0.78
		Average *M* estimate	-0.30 -0.27		-0.46 -0.31		-0.47 -0.32

Table 3. Reported and assumed CPFV compliance rates, and raw and subsequently expanded CPFV removals for each California cabezon sub-stock, 1916-1961. Reported rates for 1987–98 are for the NCS and are applied to the SCS.

		Catch (in numbers)				
		Northern California substock		Southern California substock		
Year	Compliance rates	Raw CPFV	expanded CPFV	Raw CPFV	Expanded CPFV	
1916		0	0	0	0	
1917		0	0	0	0	
1918		0	0	0	0	
1919		0	0	0	0	
1920		0	0	0	0	
1921		0	0	0	0	
1922		0	0	0	0	
1923		0	0	0	0	
1924		0	0	0	0	
1925		0	0	0	0	no expansion made (few CPFVs)
1926		0	0	0	0	
1927		0	0	0	0	
1928	1.00	0	0	39	39	
1929	1.00	432	432	78	78	
1930	1.00	647	647	117	117	
1931	1.00	862	862	157	157	
1932	1.00	1076	1076	196	196	
1933	1.00	1291	1291	235	235	
1934	1.00	1506	1506	274	274	
1935	1.00	1721	1721	314	314	
1936	0.80	1934	2418	353	441	
1937	0.90	1880	2089	263	292	Croaker 1938
1938	0.95	3794	3994	784	825	
1939	0.90	2045	2272	278	309	
1940	0.90	2986	3318	262	291	
1941	0.90	2272	2524	552	613	
1942	0.90	2272	2524	552	613	War years assumed to equal 1946 values
1943	0.90	2272	2524	552	613	(taken from O'Connell 1953)
1944	0.90	2272	2524	552	613	
1945	0.90	2272	2524	552	613	
1946	0.90	2272	2524	552	613	
1947	0.83	8304	10017	1563	1885	
1948	0.93	12531	13416	1982	2122	
1949	0.93	11406	12278	2567	2763	Baxter & Young 1953
1950	0.98	13749	14102	2099	2153	
1951	0.96	16053	16704	1899	1976	
1952	0.95	8272	8707	2526	2659	
1953	0.95	5821	6127	3756	3954	
1954	0.95	4333	4561	8584	9036	
1955	0.95	3851	4054	8277	8713	Assumed values from Miller and Gotshal
1956	0.95	8434	8878	9388	9882	(1965)
1957	0.95	7544	7941	6859	7220	
1958	0.95	5197	5471	4625	4868	
1959	0.95	4136	4354	1184	1246	
1960	0.95	1939	2041	567	597	Miller & Gotshall (1965)
1961	0.95	1900	2000	671	706	

Table 3 (Continued). Reported and assumed CPFV compliance rates, and raw and subsequently expanded CPFV removals for each California cabezon sub-stock, 1962-2008. Reported rates for 1987–98 are for the NCS and are applied to the SCS.

		Catch (in numbers)				
		Northern California substock		Southern California substock		
Year	Compliance rates	Raw CPFV	expanded CPFV	Raw CPFV	Expanded CPFV	
1962	0.85	2663	3133	1845	2171	
1963	0.85	5888	6927	3713	4368	
1964	0.85	3315	3900	2954	3475	
1965	0.85	4458	5245	3062	3602	
1966	0.85	5500	6471	4681	5507	
1967	0.85	2871	3378	2422	2849	
1968	0.85	2470	2906	1725	2029	
1969	0.85	2612	3073	1648	1939	
1970	0.80	3930	4913	1978	2473	
1971	0.80	2337	2921	2046	2558	Assumed values discounted for increasing in CPFV fleet through 60s & 70s
1972	0.80	5170	6463	5967	7459	
1973	0.80	5012	6265	2389	2986	
1974	0.80	4432	5540	2435	3044	
1975	0.80	2637	3296	3617	4521	
1976	0.80	3923	4904	2396	2995	
1977	0.80	3977	4971	1549	1936	
1978	0.80	6445	8056	2286	2858	
1979	0.80	2751	3439	2017	2521	
1980	0.65	4132	6357	1986	3055	
1981	0.65	3533	5435	2255	3469	
1982	0.65	3670	5646	1476	2271	
1983	0.65	2360	3631	1367	2103	Karpov *et al.* 1995
1984	0.65	1322	2034	415	638	
1985	0.65	1165	1792	578	889	
1986	0.65	2546	3917	1813	2789	
1987	0.71	2676	3763	1960	2756	
1988	0.76	3124	4105	2241	2945	
1989	0.80	3020	3775	3184	3980	
1990	0.91	2382	2627	4310	4754	
1991	0.63	1731	2743	2795	4430	
1992	0.62	3600	5815	1587	2564	D. Wilson-Vandenberg (CDF&G; pers. comm.)
1993	0.68	1851	2732	955	1410	
1994	0.62	1241	2001	644	1038	
1995	0.56	1103	1987	1017	1832	
1996	0.54	1679	3126	2099	3908	
1997	0.65	1732	2654	1679	2573	
1998	0.48	1845	3848	834	1739	
1999	0.65	2271	3494	774	1191	
2000	0.65	1735	2669	1652	2542	
2001	0.65	4685	7208	1313	2020	
2002	0.65	1180	1815	821	1263	Average from 1980-1998 values
2003	0.65	3295	5069	434	668	
2004	0.65	1964	3022	608	935	
2005	0.65	2423	3728	686	1055	
2006	0.65	1339	2060	725	1115	
2007	0.65	1196	1840	708	1089	
2008	0.65	1137	1749	836	1286	

Table 4. Numbers removed, average weights, removals in weight, CPFV ratios, and expanded removals (numbers) by year for each mode in the recreational fleet for the NCS, 1916-1961. Shaded values indicate reported values; non-shaded are assumed.

	CPFV			Man-Made				Shore-based				PBR			
Year	Removals (#s)	Avg. Wt (kg)	Removals (kg)	CPFV ratio	#s Expanded	Avg. Wt (kg)	Removals (kg)	CPFV ratio	#s Expanded	Avg. Wt (kg)	Removals (kg)	CPFV ratio	#s Expanded	Avg. Wt (kg)	Removals (kg)
1916	0		0		485	0.68	330		1728	0.41	707		0		0
1917	0		0		485	0.68	330		1728	0.41	707		0		0
1918	0		0		485	0.68	330		1728	0.41	707		0		0
1919	0		0		485	0.68	330		1728	0.41	707		0		0
1920	0		0		485	0.68	330		1728	0.41	707		0		0
1921	0		0		485	0.68	330		1728	0.41	707		0		0
1922	0		0		485	0.68	330		1728	0.41	707		0		0
1923	0		0		485	0.68	330		1728	0.41	707		0		0
1924	0		0		485	0.68	330		1728	0.41	707		0		0
1925	0		0		485	0.68	330		1728	0.41	707		0		0
1926	0		0		485	0.68	330		1728	0.41	707		0		0
1927	0		0		485	0.68	330		1728	0.41	707		0		0
1928	0		0		485	0.68	330		1728	0.41	707		0		0
1929	432	2.27	980	1.12	485	0.68	330	4.00	1728	0.41	707	0.50	216	2.27	490
1930	647	2.27	1467	1.12	727	0.68	494	4.00	2588	0.41	1059	0.50	324	2.27	734
1931	862	2.27	1955	1.12	968	0.68	658	4.00	3448	0.41	1411	0.50	431	2.27	977
1932	1076	2.27	2440	1.12	1208	0.68	822	4.00	4304	0.41	1761	0.50	538	2.27	1220
1933	1291	2.27	2928	1.12	1450	0.68	986	4.00	5164	0.41	2113	0.50	646	2.27	1464
1934	1506	2.27	3416	1.12	1691	0.68	1150	4.00	6024	0.41	2465	0.50	753	2.27	1708
1935	1721	2.27	3903	1.12	1933	0.68	1314	4.00	6884	0.41	2817	0.50	861	2.27	1952
1936	2418	2.27	5484	1.12	2715	0.68	1847	4.00	9672	0.41	3958	0.50	1209	2.27	2742
1937	2089	2.27	4738	1.12	2346	0.68	1595	4.00	8356	0.41	3420	0.50	1045	2.27	2369
1938	3994	2.27	9058	1.12	4485	0.68	3050	4.00	15976	0.41	6538	0.50	1997	2.27	4529
1939	2272	2.27	5153	1.12	2551	0.68	1735	4.00	9088	0.41	3719	0.50	1136	2.27	2576
1940	3318	2.27	7525	1.12	3726	0.68	2534	4.00	13272	0.41	5432	0.50	1659	2.27	3763
1941	2524	2.27	5724	1.12	2834	0.68	1927	5.00	12620	0.41	5165	0.00	0	2.27	0
1942	2524	2.27	5724	1.12	2834	0.68	1927	5.00	12620	0.41	5165	0.00	0	2.27	0
1943	2524	2.27	5724	1.12	2834	0.68	1927	5.00	12620	0.41	5165	0.00	0	2.27	0
1944	2524	2.27	5724	1.12	2834	0.68	1927	5.00	12620	0.41	5165	0.00	0	2.27	0
1945	2524	2.27	5724	1.12	2834	0.68	1927	5.00	12620	0.41	5165	0.00	0	2.27	0
1946	2524	2.27	5724	1.12	2834	0.68	1927	5.00	12620	0.41	5165	0.00	0	2.27	0
1947	10017	2.27	22718	1.12	11249	0.68	7649	5.00	50084	0.41	20498	0.50	5008	2.27	11359
1948	13416	2.27	30428	1.12	15067	0.68	10245	5.00	67082	0.41	27455	0.50	6708	2.27	15214
1949	12278	2.27	27845	1.12	13788	0.68	9376	5.00	61389	0.41	25124	0.50	6139	2.27	13923
1950	14102	2.27	31982	1.12	15836	0.68	10769	5.00	70508	0.41	28857	0.50	7051	2.27	15991
1951	16704	2.27	37885	1.12	18759	0.68	12756	5.00	83522	0.41	34183	0.50	8352	2.27	18943
1952	8707	2.27	19747	1.12	9778	0.68	6649	5.00	43535	0.41	17818	0.50	4354	2.27	9874
1953	6127	2.27	13896	1.12	6881	0.68	4679	5.00	30635	0.41	12538	0.50	3064	2.27	6948
1954	4561	2.27	10344	1.12	5122	0.68	3483	5.00	22805	0.41	9333	0.50	2281	2.27	5172
1955	4054	2.27	9194	1.12	4553	0.68	3096	5.00	20270	0.41	8296	1.00	4054	2.27	9194
1956	8878	2.27	20135	1.12	9970	0.68	6780	5.00	44390	0.41	18167	1.00	8878	2.27	20135
1957	7941	2.27	18010	1.12	8918	0.68	6064	5.00	39705	0.41	16250	1.00	7941	2.27	18010
1958	5471	2.27	12408	1.12	6144	0.68	4178	5.13	28051	0.41	11480	1.00	5471	2.27	12408
1959	4354	2.27	9875	1.12	4890	0.68	3325	8.40	36574	0.41	14968	1.00	4354	2.27	9875
1960	2041	2.42	4929	1.12	2292	0.68	1559	13.74	28051	0.41	11480	2.48	5066	2.42	12235
1961	2000	2.00	4000	1.12	2246	0.68	1527	8.40	28051	0.41	11480	2.48	4964	2.00	9928

Table 4 (Continued). Numbers removed, average weights, removals in weight, CPFV ratios, and expanded removals (numbers) by year for each mode in the recreational fleet for the NCS, 1962-2008. Shaded values indicate reported values; non-shaded are assumed.

	CPFV			Man-Made				Shore-based				PBR			
Year	Removals (#s)	Avg. Wt (kg)	Removals (kg)	CPFV ratio	#s Expanded	Avg. Wt (kg)	Removals (kg)	CPFV ratio	#s Expanded	Avg. Wt (kg)	Removals (kg)	CPFV ratio	#s Expanded	Avg. Wt (kg)	Removals (kg)
1962	3133	2.00	6266	1.12	3518	0.68	2393	8.40	26317	0.72	18948	2.48	7776	2.00	15553
1963	6927	2.00	13854	1.12	7779	0.68	5290	8.40	58187	0.72	41894	2.48	17194	2.00	34387
1964	3900	2.00	7800	1.12	4380	0.68	2978	6.00	23400	0.72	16848	2.48	9680	2.00	19361
1965	5245	2.00	10490	1.12	5890	0.68	4005	6.00	31470	0.72	22658	2.48	13019	2.00	26037
1966	6471	2.00	12942	1.12	7267	0.68	4942	6.00	38826	0.72	27955	2.48	16062	2.00	32124
1967	3378	2.00	6756	1.12	3794	0.68	2580	6.00	20268	0.72	14593	2.48	8385	2.00	16769
1968	2906	2.00	5812	1.12	3263	0.68	2219	6.00	17436	0.72	12554	2.48	7213	2.00	14426
1969	3073	2.00	6146	1.12	3451	0.68	2347	6.00	18438	0.72	13275	2.48	7628	2.00	15255
1970	4913	2.00	9826	1.12	5517	0.68	3752	6.00	29478	0.72	21224	2.48	12195	2.00	24389
1971	2921	2.00	5842	1.12	3280	0.68	2231	6.00	17526	0.72	12619	2.48	7250	2.00	14501
1972	6463	2.00	12926	1.12	7258	0.68	4935	6.00	38778	0.72	27920	2.48	16042	2.00	32084
1973	6265	2.00	12530	1.12	7036	0.68	4784	6.00	37590	0.72	27065	2.48	15550	2.00	31101
1974	5540	2.00	11080	1.12	6221	0.68	4231	6.00	33240	0.72	23933	2.48	13751	2.00	27502
1975	3296	2.00	6592	1.12	3701	0.68	2517	6.00	19776	0.72	14239	2.48	8181	2.00	16362
1976	4904	2.00	9808	1.12	5507	0.68	3745	5.00	24520	0.72	17654	2.48	12172	2.00	24345
1977	4971	2.00	9942	2.00	9942	0.68	6761	5.00	24855	0.72	17896	2.48	12339	2.00	24677
1978	8056	2.00	16112	2.00	16112	0.68	10956	5.00	40280	0.72	29002	2.48	19996	2.00	39992
1979	3439	2.00	6878	2.00	6878	0.68	4677	5.00	17195	0.72	12380	2.48	8536	2.00	17072
1980	6357	1.81	11522	2.07	13157	0.83	9349	4.97	31598	1.16	34458	4.04	25695	1.74	34458
1981	5435	1.85	10055	1.91	10365	0.71	7519	3.11	16893	0.80	12970	5.45	29635	2.35	12970
1982	5646	2.06	11616	0.83	4710	0.73	3167	4.88	27576	1.10	30039	2.89	16309	1.74	30039
1983	3631	2.70	9804	2.96	10762	0.75	8314	10.36	37627	0.98	36160	5.03	18254	1.81	36160
1984	2034	2.06	4185	4.71	9582	1.12	12692	5.24	10655	1.02	11610	14.62	29747	1.53	11610
1985	1792	1.70	3046	4.72	8466	0.56	4342	8.63	15465	0.71	10195	7.85	14066	1.73	10195
1986	3917	2.05	8022	1.69	6608	0.91	5983	5.02	19682	1.04	20447	9.72	38089	1.49	56884
1987	3763	2.06	7742	1.69	6349	0.78	4920	5.02	18908	0.67	12639	9.79	36834	1.51	55696
1988	4105	1.85	7594	1.69	6926	1.27	8778	5.02	20627	0.74	15264	6.39	26251	1.58	41489
1989	3775	1.13	4247	1.69	6369	0.63	3981	5.02	18968	0.98	18522	8.36	31567	1.45	45824
1990	2627	2.06	5405	1.69	4432	0.84	3709	5.02	13200	1.04	13757	6.20	16281	1.97	32023
1991	2743	2.06	5644	1.69	4628	0.84	3872	5.02	13783	1.04	14365	6.20	17000	1.97	33437
1992	5815	2.06	11964	1.69	9811	0.84	8209	5.02	29219	1.04	30452	6.20	36039	1.97	70884
1993	2732	2.06	5621	1.35	3685	0.55	1941	8.89	24290	1.06	26469	12.83	35061	1.36	26469
1994	2001	1.53	3067	0.64	1284	0.94	942	6.32	12648	1.00	13569	10.58	21164	1.38	13569
1995	1987	2.79	5549	1.31	2541	0.29	573	9.99	19345	1.06	20109	15.28	29591	1.53	20109
1996	3126	1.77	5535	1.21	3606	0.54	1879	10.28	30639	0.97	29744	7.96	23730	1.47	29744
1997	2654	2.06	5460	1.06	2777	0.74	1854	13.23	34765	1.15	40373	3.58	9399	1.05	40373
1998	3848	2.06	7917	0.25	961	0.69	557	10.64	40841	1.14	43044	3.54	13577	1.56	43044
1999	3494	2.11	7372	0.58	2035	0.23	439	1.71	5975	0.86	4456	4.25	14867	1.44	4456
2000	2669	2.12	5654	0.23	593	0.54	317	3.90	10272	0.95	9608	3.49	9180	1.66	9608
2001	7208	1.21	8691	0.73	5274	1.11	3674	0.45	3246	0.96	3901	2.11	15186	1.83	3901
2002	1815	2.06	3734	0.75	1351	0.35	943	5.48	9923	1.22	13256	4.95	8956	2.01	13256
2003	5069	2.38	12056	0.27	1349	1.11	1491	1.75	8712	1.62	11280	7.17	35607	1.86	11280
2004	3022	2.23	6724	0.49	1479	1.06	1569	1.57	4756	2.04	9708	2.37	7154	2.31	16522
2005	3728	2.66	9921	0.45	1665	1.20	2003	0.62	2316	1.56	3622	1.93	7202	2.36	16985
2006	2060	2.59	5330	0.11	220	0.66	144	0.25	523	1.89	987	1.67	3448	2.12	7313
2007	1840	2.29	4220	0.32	590	1.66	982	0.29	534	1.40	747	3.34	6136	2.24	13729
2008	1749	2.33	4077	0.34	593	0.62	370	1.17	2054	1.37	2822	4.69	8203	2.10	17214

Table 5. Numbers removed, averaged weights, removals in weight, CPFV ratios, and expanded removals (numbers) by year for each mode in the recreational fleet for the SCS 1916-1961. Shaded values indicate reported values; non-shaded are assumed.

	CPFV			Man-Made				Shore-based				PBR			
Year	Removals (#s)	Avg. Wt (kg)	Removals (kg)	CPFV ratio	#s Expanded	Avg. Wt (kg)	Removals (kg)	CPFV ratio	#s Expanded	Avg. Wt (kg)	Removals (kg)	CPFV ratio	#s Expanded	Avg. Wt (kg)	Removals (kg)
1916	0		0	1.16	45	0.50	23	0.61	24	0.85	20	0.00	0		0
1917	0		0	1.16	45	0.50	23	0.61	24	0.85	20	0.00	0		0
1918	0		0	1.16	45	0.50	23	0.61	24	0.85	20	0.00	0		0
1919	0		0	1.16	45	0.50	23	0.61	24	0.85	20	0.00	0		0
1920	0		0	1.16	45	0.50	23	0.61	24	0.85	20	0.00	0		0
1921	0		0	1.16	45	0.50	23	0.61	24	0.85	20	0.00	0		0
1922	0		0	1.16	45	0.50	23	0.61	24	0.85	20	0.00	0		0
1923	0		0	1.16	45	0.50	23	0.61	24	0.85	20	0.00	0		0
1924	0		0	1.16	45	0.50	23	0.61	24	0.85	20	0.00	0		0
1925	0		0	1.16	45	0.50	23	0.61	24	0.85	20	0.00	0		0
1926	0		0	1.16	45	0.50	23	0.61	24	0.85	20	0.00	0		0
1927	0		0	1.16	45	0.50	23	0.61	24	0.85	20	0.00	0		0
1928	39	1.00	39	1.16	45	0.50	23	0.61	24	0.85	20	0.40	16	1.00	16
1929	78	1.00	78	1.16	91	0.50	45	0.61	48	0.85	41	0.40	31	1.00	31
1930	117	1.00	117	1.16	136	0.50	68	0.61	72	0.85	61	0.40	47	1.00	47
1931	157	1.00	157	1.16	182	0.50	91	0.61	96	0.85	82	0.40	63	1.00	63
1932	196	1.00	196	1.16	228	0.50	114	0.61	120	0.85	102	0.40	78	1.00	78
1933	235	1.00	235	1.16	273	0.50	136	0.61	144	0.85	122	0.40	94	1.00	94
1934	274	1.00	274	1.16	318	0.50	159	0.61	168	0.85	143	0.40	110	1.00	110
1935	314	1.00	314	1.16	364	0.50	182	0.61	192	0.85	163	0.40	126	1.00	126
1936	441	1.00	441	1.16	512	0.50	256	0.61	270	0.85	229	0.40	176	1.00	176
1937	292	1.00	292	1.16	339	0.50	169	0.61	179	0.85	152	0.40	117	1.00	117
1938	825	1.00	825	1.16	958	0.50	479	0.61	505	0.85	429	0.40	330	1.00	330
1939	309	1.00	309	1.16	359	0.50	179	0.61	189	0.85	161	0.40	124	1.00	124
1940	291	1.00	291	1.16	338	0.50	169	0.61	178	0.85	151	0.40	116	1.00	116
1941	613	1.00	613	1.16	712	0.50	356	0.61	375	0.85	319	0.40	245	1.00	245
1942	613	1.00	613	1.16	712	0.50	356	0.61	375	0.85	319	0.40	245	1.00	245
1943	613	1.00	613	1.16	712	0.50	356	0.61	375	0.85	319	0.40	245	1.00	245
1944	613	1.00	613	1.16	712	0.50	356	0.61	375	0.85	319	0.40	245	1.00	245
1945	613	1.00	613	1.16	712	0.50	356	0.61	375	0.85	319	0.40	245	1.00	245
1946	613	1.00	613	1.16	712	0.50	356	0.61	375	0.85	319	0.40	245	1.00	245
1947	1885	1.00	1885	1.16	2188	0.50	1094	0.61	1154	0.85	981	0.40	754	1.00	754
1948	2122	1.00	2122	1.16	2463	0.50	1232	0.61	1299	0.85	1104	0.40	849	1.00	849
1949	2763	1.00	2763	1.16	3207	0.50	1604	0.61	1691	0.85	1437	0.40	1105	1.00	1105
1950	2153	1.00	2153	1.16	2499	0.50	1249	0.61	1317	0.85	1120	0.40	861	1.00	861
1951	1976	1.00	1976	1.16	2294	0.50	1147	0.61	1209	0.85	1028	0.40	790	1.00	790
1952	2659	1.00	2659	1.16	3086	0.50	1543	0.61	1627	0.85	1383	0.40	1064	1.00	1064
1953	3954	1.00	3954	1.16	4589	0.50	2295	0.61	2420	0.85	2057	0.40	1582	1.00	1582
1954	9036	1.00	9036	1.16	10488	0.50	5244	0.61	5529	0.85	4700	0.40	3614	1.00	3614
1955	8713	1.00	8713	1.16	10113	0.50	5057	0.61	5332	0.85	4532	0.40	3485	1.00	3485
1956	9882	1.00	9882	1.16	11470	0.50	5735	0.61	6047	0.85	5140	0.81	8051	1.00	8051
1957	7220	1.00	7220	1.16	8380	0.50	4190	0.61	4418	0.85	3755	0.81	5882	1.00	5882
1958	4868	1.00	4868	1.16	5650	0.50	2825	0.61	2979	0.85	2532	0.81	3966	1.00	3966
1959	1246	1.00	1246	1.16	1446	0.50	723	0.61	762	0.85	648	0.81	1015	1.00	1015
1960	597	1.00	597	1.16	693	0.50	346	0.61	365	0.85	311	0.81	486	1.00	486
1961	706	1.00	706	1.16	819	0.50	410	0.61	432	0.85	367	0.81	575	1.00	575

Table 5 (Continued). Numbers removed, average weights, removals in weight, CPFV ratios, and expanded removals (numbers) by year for each mode in the recreational fleet for the SCS 1962-2008. Shaded values indicate reported values; non-shaded are assumed. Gray cell indicates the modified 1980 PBR value (average of 1981-89).

	CPFV			Man-Made				Beach/Bank				PBR			
Year	Removals (#s)	Avg. Wt (kg)	Removals (kg)	CPFV ratio	#s Expanded	Avg. Wt (kg)	Removals (kg)	CPFV ratio	#s Expanded	Avg. Wt (kg)	Removals (kg)	CPFV ratio	#s Expanded	Avg. Wt (kg)	Removals (kg)
1962	2171	1.00	2171	1.16	2520	0.50	1260	0.61	1328	0.85	1129	0.81	1769	1.00	1769
1963	4368	1.00	4368	1.16	5070	0.50	2535	0.61	2673	0.85	2272	0.81	3559	1.00	3559
1964	3475	1.00	3475	1.16	4033	0.50	2017	0.61	2126	0.85	1807	0.81	2831	1.00	2831
1965	3602	1.00	3602	1.16	4181	0.50	2090	0.61	2204	0.85	1874	2.00	7204	1.00	7204
1966	5507	1.00	5507	1.16	6392	0.50	3196	0.61	3370	0.85	2864	2.00	11014	1.00	11014
1967	2849	1.00	2849	1.16	3307	0.50	1653	1.00	2849	0.85	2422	2.00	5698	1.00	5698
1968	2029	1.00	2029	1.16	2355	0.50	1178	1.00	2029	0.85	1725	2.00	4058	1.00	4058
1969	1939	1.00	1939	1.16	2251	0.50	1125	1.00	1939	0.85	1648	2.00	3878	1.00	3878
1970	2473	1.00	2473	1.16	2870	0.50	1435	1.00	2473	0.85	2102	2.00	4946	1.00	4946
1971	2558	1.00	2558	1.16	2969	0.50	1485	1.00	2558	0.85	2174	4.00	10232	1.00	10232
1972	7459	1.00	7459	1.16	8658	0.50	4329	1.00	7459	0.85	6340	4.00	29836	1.00	29836
1973	2986	1.00	2986	1.16	3466	0.50	1733	1.00	2986	0.85	2538	4.00	11944	1.00	11944
1974	3044	1.00	3044	1.16	3533	0.50	1767	1.00	3044	0.85	2587	4.00	12176	1.00	12176
1975	4521	1.00	4521	1.16	5248	0.50	2624	1.00	4521	0.85	3843	4.00	18084	1.00	18084
1976	2995	1.00	2995	1.16	3476	0.50	1738	1.00	2995	0.85	2546	4.00	11980	1.00	11980
1977	1936	1.00	1936	1.16	2247	0.50	1124	1.00	1936	0.85	1646	4.00	7744	1.00	7744
1978	2858	1.00	2858	1.16	3317	0.50	1659	1.00	2858	0.85	2429	4.00	11432	1.00	11432
1979	2521	1.00	2521	1.16	2926	0.50	1463	1.00	2521	0.85	2143	4.00	10084	1.00	10084
1980	3055	1.03	3131	2.07	6326	0.48	3036	5.76	17609	1.22	21466	6.24	19074	1.41	26821
1981	3469	1.09	3766	0.21	744	0.40	298	3.75	13023	0.80	10418	5.58	19359	1.36	26382
1982	2271	0.78	1766	0.35	790	0.48	375	1.93	4376	0.83	3626	22.64	51406	1.13	58146
1983	2103	0.82	1716	0.65	1373	0.58	801	2.92	6141	0.76	4650	7.24	15220	0.85	12901
1984	638	1.10	702	5.31	3389	0.43	1468	16.84	10746	0.91	9806	40.28	25698	1.10	28220
1985	889	0.55	489	6.34	5634	0.30	1690	9.25	8219	0.82	6740	23.03	20469	1.24	25290
1986	2789	0.59	1637	0.80	2231	0.59	1313	1.57	4379	0.93	4088	13.04	36371	0.88	32152
1987	2756	1.24	3422	0.80	2205	0.84	1852	1.57	4327	1.13	4883	10.63	29305	1.15	33615
1988	2945	0.50	1473	0.80	2356	0.59	1386	1.57	4624	1.20	5548	5.03	14799	0.79	11734
1989	3980	0.71	2819	0.80	3184	0.89	2839	1.57	6249	1.49	9328	2.75	10960	1.18	12950
1990	4754	1.10	5244	0.80	3803	0.59	2237	1.57	7464	0.91	6782	6.50	30901	1.05	32460
1991	4430	1.10	4887	0.80	3544	0.59	2085	1.57	6955	0.91	6320	6.50	28795	1.05	30248
1992	2564	1.10	2828	0.80	2051	0.59	1207	1.57	4025	0.91	3658	6.50	16666	1.05	17507
1993	1410	0.85	1199	0.19	262	0.59	154	0.24	343	0.98	335	4.34	6120	0.53	3256
1994	1038	1.23	1279	0.80	830	0.59	488	0.81	843	0.91	766	9.07	9414	1.14	10769
1995	1832	0.38	687	0.53	975	0.59	574	1.49	2734	0.49	1329	1.58	2903	0.59	1713
1996	3908	0.68	2638	0.64	2496	0.44	1106	0.13	512	0.58	299	2.52	9850	0.97	9540
1997	2573	0.68	1741	0.80	2058	0.59	1211	0.67	1721	0.37	628	1.15	2972	1.21	3596
1998	1739	1.28	2232	0.80	1391	0.59	818	1.22	2130	0.99	2114	3.65	6355	0.78	4963
1999	1191	0.49	580	2.13	2538	0.31	784	2.82	3357	0.73	2459	9.38	11166	0.97	10843
2000	2542	0.62	1576	0.97	2478	0.07	166	0.23	579	0.71	412	1.77	4512	1.00	4529
2001	2020	1.10	2228	0.59	1200	0.59	706	1.19	2409	0.96	2319	2.82	5687	0.58	3323
2002	1263	1.39	1757	0.18	230	0.59	135	1.72	2171	1.44	3127	6.20	7830	0.87	6789
2003	668	2.00	1337	0.88	585	0.59	344	2.64	1766	0.91	1605	9.28	6201	1.03	6385
2004	935	2.03	1895	0.64	600	1.00	600	2.14	2001	0.91	1819	1.22	1137	1.36	1548
2005	1055	1.42	1494	0.63	661	0.80	529	6.62	6980	0.83	5811	1.13	1195	1.28	1533
2006	1115	1.52	1696	1.47	1637	0.78	1280	6.62	7377	0.91	6704	4.13	4600	1.25	5757
2007	1089	2.42	2631	0.19	204	0.58	118	6.62	7205	0.91	6548	7.26	7909	1.35	10653
2008	1286	2.22	2850	1.81	2325	1.03	2403	6.62	8509	0.91	7732	1.99	2554	1.30	3322

Table 6. Expansion factors, proportion cabezon, and average weight used to estimate metric tons of cabezon landed by ocean boats in Oregon (ORS), 1973-78.

Year	Statewide sampling period	Estimated Misc. landings during sampled period	Expansion factor for unsampled ports during sampled period	Expansion factor for unsampled time period	Estimated annual Misc. landings	% cabezon (1979-1983 average)	Estimated annual cabezon landings	Average weight	Est mt cabezon
1973	Jun 15 - Sep 15	2727	0.96	0.59	4815	0.28	1348	2.31	3.1
1974	Jun 15 - Sep 15	3651	0.96	0.59	6446	0.28	1805	2.31	4.2
1975	Jun 15 - Sep 15	4031	0.96	0.59	7117	0.28	1993	2.31	4.6
1976	Jun 15 - Sep 15	8672	0.88	0.59	16703	0.28	4677	2.31	10.8
1977	Jun 15 - Sep 15	7300	0.91	0.59	13597	0.28	3807	2.31	8.8
1978	Jun 15 - Sep 15	18206	0.96	0.59	32143	0.28	9000	2.31	20.8

Table 7. Expansion factors and average weights used to estimate metric tons of cabezon landed by ocean boats in Oregon (ORS), 1979-92.
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Year	Statewide sampling starts	Statewide sampling ends	Estimated # of cabezon within sampled period	Proportion of coverage during sampling period	Proportion of annual landings in sampled period	Expanded annual estimate	Average weight**	Estimated MT landed by ocean boats
1979	mid-May	mid-Sept	3033	0.91	0.73	4522	2.31	10.4
1980	mid-May	mid-Sept	1898	0.91	0.73	2830	2.07	5.9
1981	mid-May	mid-Sept	5578	0.96	0.73	7903	2.87	22.7
1982	1-Jun	Labor Day	4140	0.96	0.65	6649	2	13.3
1983	mid-June	mid-Sept	4399	0.96	0.59	7793	1.42	11
1984	mid-June	Labor Day	4099	0.96	0.56	7650	1.85	14.1
1985	1-Jul	Labor Day	2163	0.96	0.47	4830	1.62	7.8
1986	mid-May	Labor Day	4505	0.96	0.7	6659	2.33	15.5
1987	early-June	mid-Sept	1750	0.96	0.68	2684	2.18	5.9
1988	1-May	mid-Sept	5535	0.96	0.79	7286	1.69	12.3
1989	1-May	mid-Sept	6742	0.93	0.79	9171	1.73	15.8
1990*	1-May	mid-Sept				9674	1.94	18.7
1991*	mid-May	Labor Day				5938	2.14	12.7
1992*	1-May	mid-Sept				6958	2.35	16.3

*Expansion to annual landings in numbers of fish completed in 2001 ODFW historical catch reconstruction
**RecFIN estimated average weight of examined catch (A) for Ocean Boats,1979 is 1980-1982 average, 1990-1992 interpolated

Table 8. Commercial landings, discards, and recreational catch (mt) of cabezon for the NCS from 1916-59.

	NSC							
	Commercial				Recreational			
Year	Nonlive	(discards)	Live	(discards)	Man-Made	Shore	PBR	CPFV
1916	0.03	0.00	0.00	0.00	0.33	0.71	0.00	0.00
1917	0.15	0.00	0.00	0.00	0.33	0.71	0.00	0.00
1918	0.08	0.00	0.00	0.00	0.33	0.71	0.00	0.00
1919	0.00	0.00	0.00	0.00	0.33	0.71	0.00	0.00
1920	0.00	0.00	0.00	0.00	0.33	0.71	0.00	0.00
1921	0.00	0.00	0.00	0.00	0.33	0.71	0.00	0.00
1922	0.00	0.00	0.00	0.00	0.33	0.71	0.00	0.00
1923	0.00	0.00	0.00	0.00	0.33	0.71	0.00	0.00
1924	0.00	0.00	0.00	0.00	0.33	0.71	0.00	0.00
1925	1.52	0.00	0.00	0.00	0.33	0.71	0.00	0.00
1926	0.00	0.00	0.00	0.00	0.33	0.71	0.00	0.00
1927	0.34	0.00	0.00	0.00	0.33	0.71	0.00	0.00
1928	1.19	0.00	0.00	0.00	0.33	0.71	0.00	0.00
1929	0.54	0.00	0.00	0.00	0.33	0.71	0.49	0.98
1930	0.47	0.00	0.00	0.00	0.49	1.06	0.73	1.47
1931	0.51	0.00	0.00	0.00	0.66	1.41	0.98	1.96
1932	2.12	0.00	0.00	0.00	0.82	1.76	1.22	2.44
1933	1.90	0.00	0.00	0.00	0.99	2.11	1.46	2.93
1934	2.37	0.00	0.00	0.00	1.15	2.47	1.71	3.42
1935	4.71	0.00	0.00	0.00	1.31	2.82	1.95	3.90
1936	8.33	0.00	0.00	0.00	1.85	3.96	2.74	5.48
1937	3.71	0.00	0.00	0.00	1.60	3.42	2.37	4.74
1938	2.46	0.00	0.00	0.00	3.05	6.54	4.53	9.06
1939	1.82	0.00	0.00	0.00	1.74	3.72	2.58	5.15
1940	1.51	0.00	0.00	0.00	2.53	5.43	3.76	7.53
1941	6.02	0.00	0.00	0.00	1.93	5.17	0.00	5.72
1942	1.04	0.00	0.00	0.00	1.93	5.17	0.00	5.72
1943	3.41	0.00	0.00	0.00	1.93	5.17	0.00	5.72
1944	1.75	0.00	0.00	0.00	1.93	5.17	0.00	5.72
1945	1.95	0.00	0.00	0.00	1.93	5.17	0.00	5.72
1946	3.54	0.00	0.00	0.00	1.93	5.17	0.00	5.72
1947	2.05	0.00	0.00	0.00	7.65	20.50	11.36	22.72
1948	3.71	0.00	0.00	0.00	10.25	27.46	15.22	30.43
1949	7.27	0.00	0.00	0.00	9.38	25.13	13.92	27.85
1950	9.54	0.00	0.00	0.00	10.77	28.86	15.99	31.98
1951	10.80	0.00	0.00	0.00	12.76	34.18	18.94	37.89
1952	15.60	0.00	0.00	0.00	6.65	17.82	9.87	19.75
1953	6.02	0.00	0.00	0.00	4.68	12.54	6.95	13.90
1954	2.82	0.00	0.00	0.00	3.48	9.33	5.17	10.34
1955	3.14	0.00	0.00	0.00	3.10	8.30	9.19	9.19
1956	5.57	0.00	0.00	0.00	6.78	18.17	20.14	20.14
1957	5.63	0.00	0.00	0.00	6.06	16.25	18.01	18.01
1958	8.79	0.00	0.00	0.00	4.18	11.48	12.41	12.41
1959	4.30	0.00	0.00	0.00	3.33	14.97	9.88	9.88

Table 8 (Continued). Commercial landings, discards, and recreational catch (mt) of cabezon for the NCS from 1960-2008.

	NSC							
	Commercial				Recreational			
Year	Nonlive	(discards)	Live	(discards)	Man-Made	Shore	PBR	CPFV
1960	1.39	0.00	0.00	0.00	1.56	11.48	12.24	4.93
1961	2.24	0.00	0.00	0.00	1.53	11.48	9.93	4.00
1962	1.12	0.00	0.00	0.00	2.39	18.95	15.55	6.27
1963	1.27	0.00	0.00	0.00	5.29	41.89	34.39	13.85
1964	2.33	0.00	0.00	0.00	2.98	16.85	19.36	7.80
1965	3.36	0.00	0.00	0.00	4.01	22.66	26.04	10.49
1966	5.66	0.00	0.00	0.00	4.94	27.96	32.12	12.94
1967	6.44	0.00	0.00	0.00	2.58	14.59	16.77	6.76
1968	9.06	0.00	0.00	0.00	2.22	12.55	14.43	5.81
1969	11.68	0.00	0.00	0.00	2.35	13.28	15.26	6.15
1970	4.76	0.00	0.00	0.00	3.75	21.22	24.39	9.83
1971	2.03	0.00	0.00	0.00	2.23	12.62	14.50	5.84
1972	2.62	0.00	0.00	0.00	4.94	27.92	32.08	12.93
1973	2.05	0.00	0.00	0.00	4.78	27.07	31.10	12.53
1974	6.69	0.00	0.00	0.00	4.23	23.93	27.50	11.08
1975	3.30	0.00	0.00	0.00	2.52	14.24	16.36	6.59
1976	8.60	0.00	0.00	0.00	3.75	17.65	24.35	9.81
1977	5.40	0.00	0.00	0.00	6.76	17.90	24.68	9.94
1978	12.57	0.00	0.00	0.00	10.96	29.00	39.99	16.11
1979	22.61	0.00	0.00	0.00	6.22	16.47	22.71	9.15
1980	23.66	0.00	0.00	0.00	10.87	36.54	44.59	11.52
1981	28.95	0.00	0.00	0.00	7.20	13.58	69.75	10.05
1982	28.79	0.00	0.00	0.00	3.45	30.33	28.34	11.62
1983	10.52	0.00	0.00	0.00	8.03	36.73	33.06	9.80
1984	8.42	0.00	0.00	0.00	10.77	10.88	45.59	4.18
1985	11.66	0.00	0.00	0.00	4.72	10.98	24.33	3.05
1986	7.18	0.00	0.00	0.00	5.98	36.00	56.88	8.02
1987	3.72	0.00	0.00	0.00	4.92	14.95	55.70	7.74
1988	5.29	0.00	0.00	0.00	8.78	26.42	41.49	7.59
1989	10.89	0.00	0.00	0.00	3.98	26.94	45.82	4.25
1990	11.17	0.00	0.00	0.00	3.50	14.94	28.31	5.40
1991	5.79	0.00	0.00	0.00	3.66	15.60	29.56	5.64
1992	16.21	0.00	0.00	0.00	7.74	33.05	62.63	11.96
1993	17.05	0.47	0.39	0.01	2.03	25.64	47.63	5.62
1994	4.70	0.23	26.73	0.65	1.20	12.59	29.26	3.07
1995	5.54	0.28	71.94	1.72	0.74	20.46	45.33	5.55
1996	4.32	0.20	96.03	2.37	1.96	29.64	34.96	5.53
1997	6.10	0.53	101.75	2.48	2.04	39.87	9.89	5.46
1998	6.61	0.35	145.25	3.63	0.66	46.66	21.23	7.92
1999	4.94	0.21	105.46	2.55	0.47	5.16	21.34	7.37
2000	3.08	0.13	90.76	2.22	0.32	9.80	15.22	5.65
2001	1.39	0.08	56.84	1.38	5.86	3.12	27.79	8.69
2002	1.62	0.04	41.98	0.97	0.47	12.12	18.03	3.73
2003	1.85	0.21	32.07	6.49	1.49	14.11	66.20	12.06
2004	1.18	0.00	42.61	4.79	2.75	9.54	21.37	6.72
2005	0.84	0.03	27.61	3.11	1.95	3.53	24.54	9.92
2006	0.70	0.55	24.37	3.51	0.25	1.74	14.38	5.33
2007	0.85	0.00	21.37	4.06	1.94	1.49	10.67	4.22
2008	0.48	0.05	18.82	0.43	0.77	6.27	8.51	4.08

Table 8 (Continued). Commercial landings, discards, and recreational catch (mt) of cabezon for the SCS from 1916-59.

	SCS							
	Commercial				Recreational			
Year	Nonlive	(discards)	Live	(discards)	Man-Made	Shore	PBR	CPFV
1916	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00
1917	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00
1918	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00
1919	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00
1920	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00
1921	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00
1922	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00
1923	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00
1924	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00
1925	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00
1926	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00
1927	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00
1928	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.04
1929	0.00	0.00	0.00	0.00	0.05	0.04	0.03	0.08
1930	0.00	0.00	0.00	0.00	0.07	0.06	0.05	0.12
1931	0.00	0.00	0.00	0.00	0.09	0.08	0.06	0.16
1932	0.00	0.00	0.00	0.00	0.11	0.10	0.08	0.20
1933	0.03	0.00	0.00	0.00	0.14	0.12	0.09	0.24
1934	0.00	0.00	0.00	0.00	0.16	0.14	0.11	0.27
1935	0.07	0.00	0.00	0.00	0.18	0.16	0.13	0.31
1936	0.01	0.00	0.00	0.00	0.26	0.23	0.18	0.44
1937	0.00	0.00	0.00	0.00	0.17	0.15	0.12	0.29
1938	0.00	0.00	0.00	0.00	0.48	0.43	0.33	0.83
1939	0.00	0.00	0.00	0.00	0.18	0.16	0.12	0.31
1940	0.03	0.00	0.00	0.00	0.17	0.15	0.12	0.29
1941	0.04	0.00	0.00	0.00	0.36	0.32	0.25	0.61
1942	0.00	0.00	0.00	0.00	0.36	0.32	0.25	0.61
1943	0.00	0.00	0.00	0.00	0.36	0.32	0.25	0.61
1944	0.02	0.00	0.00	0.00	0.36	0.32	0.25	0.61
1945	0.00	0.00	0.00	0.00	0.36	0.32	0.25	0.61
1946	0.00	0.00	0.00	0.00	0.36	0.32	0.25	0.61
1947	0.01	0.00	0.00	0.00	1.09	0.98	0.75	1.89
1948	0.01	0.00	0.00	0.00	1.23	1.10	0.85	2.12
1949	0.01	0.00	0.00	0.00	1.60	1.44	1.11	2.76
1950	0.29	0.00	0.00	0.00	1.25	1.12	0.86	2.15
1951	0.02	0.00	0.00	0.00	1.15	1.03	0.79	1.98
1952	0.05	0.00	0.00	0.00	1.54	1.38	1.06	2.66
1953	0.02	0.00	0.00	0.00	2.30	2.06	1.58	3.95
1954	0.00	0.00	0.00	0.00	5.24	4.70	3.61	9.04
1955	0.01	0.00	0.00	0.00	5.06	4.53	3.49	8.71
1956	0.06	0.00	0.00	0.00	5.74	5.14	8.05	9.88
1957	0.36	0.00	0.00	0.00	4.19	3.76	5.88	7.22
1958	0.07	0.00	0.00	0.00	2.83	2.53	3.97	4.87
1959	0.01	0.00	0.00	0.00	0.72	0.65	1.02	1.25

Table 8 (Continued). Commercial landings, discards, and recreational catch (mt) of cabezon for the SCS from 1960-2008.

	SCS							
	Commercial				Recreational			
Year	Nonlive	(discards)	Live	(discards)	Man-Made	Shore	PBR	CPFV
1960	0.00	0.00	0.00	0.00	0.35	0.31	0.49	0.60
1961	0.01	0.00	0.00	0.00	0.41	0.37	0.58	0.71
1962	0.00	0.00	0.00	0.00	1.26	1.13	1.77	2.17
1963	0.01	0.00	0.00	0.00	2.54	2.27	3.56	4.37
1964	0.07	0.00	0.00	0.00	2.02	1.81	2.83	3.48
1965	0.02	0.00	0.00	0.00	2.09	1.87	7.20	3.60
1966	0.05	0.00	0.00	0.00	3.20	2.86	11.01	5.51
1967	0.04	0.00	0.00	0.00	1.65	2.42	5.70	2.85
1968	0.06	0.00	0.00	0.00	1.18	1.73	4.06	2.03
1969	0.04	0.00	0.00	0.00	1.13	1.65	3.88	1.94
1970	0.09	0.00	0.00	0.00	1.44	2.10	4.95	2.47
1971	0.02	0.00	0.00	0.00	1.49	2.17	10.23	2.56
1972	0.04	0.00	0.00	0.00	4.33	6.34	29.84	7.46
1973	0.02	0.00	0.00	0.00	1.73	2.54	11.94	2.99
1974	0.07	0.00	0.00	0.00	1.77	2.59	12.18	3.04
1975	0.03	0.00	0.00	0.00	2.62	3.84	18.08	4.52
1976	0.09	0.00	0.00	0.00	1.74	2.55	11.98	3.00
1977	0.11	0.00	0.00	0.00	1.12	1.65	7.74	1.94
1978	0.32	0.00	0.00	0.00	1.66	2.43	11.43	2.86
1979	0.21	0.00	0.00	0.00	1.24	1.82	8.55	2.14
1980	3.57	0.00	0.00	0.00	3.04	21.47	26.82	3.13
1981	0.26	0.00	0.00	0.00	0.30	10.42	26.38	3.77
1982	0.15	0.00	0.00	0.00	0.38	3.63	58.15	1.77
1983	0.19	0.00	0.00	0.00	0.80	4.65	12.90	1.72
1984	0.05	0.00	0.00	0.00	1.47	9.81	28.22	0.70
1985	0.12	0.00	0.00	0.00	1.69	6.74	25.29	0.49
1986	0.19	0.00	0.00	0.00	1.31	15.32	32.15	1.64
1987	0.29	0.00	0.00	0.00	1.85	7.38	33.62	3.42
1988	0.49	0.00	0.00	0.00	1.39	4.16	11.73	1.47
1989	0.46	0.00	0.00	0.00	2.84	6.56	12.95	2.82
1990	0.61	0.00	0.00	0.00	2.24	6.78	32.46	5.24
1991	1.60	0.00	0.00	0.00	2.08	6.32	30.25	4.89
1992	0.46	0.00	0.00	0.00	1.21	3.66	17.51	2.83
1993	0.39	0.01	0.00	0.00	0.15	0.33	3.26	1.20
1994	0.70	0.02	5.48	0.14	0.49	0.77	10.77	1.28
1995	0.74	0.02	9.68	0.24	0.57	1.32	1.71	0.69
1996	0.45	0.01	10.43	0.26	1.09	0.29	9.38	2.64
1997	0.61	0.02	11.68	0.29	1.21	0.63	3.60	1.74
1998	0.67	0.02	16.58	0.41	0.83	2.15	5.05	2.23
1999	0.32	0.01	13.89	0.35	0.78	2.45	10.82	0.58
2000	0.85	0.02	21.39	0.54	0.17	0.41	4.52	1.58
2001	0.60	0.02	13.49	0.34	0.70	2.30	3.30	2.23
2002	0.36	0.00	6.35	0.16	0.13	3.11	6.76	1.76
2003	0.36	0.32	5.40	0.14	0.34	1.61	6.39	1.34
2004	0.21	0.00	5.50	0.14	0.87	2.24	1.94	1.89
2005	0.44	0.01	2.05	1.58	0.55	6.04	1.59	1.49
2006	0.31	0.00	2.89	0.79	0.40	1.59	1.81	1.70
2007	0.07	0.00	3.14	0.08	0.05	1.55	4.21	2.63
2008	0.05	0.00	3.65	0.09	0.64	1.83	0.89	2.85

Table 8 (Continued). Commercial landings, discards, and recreational catch (mt) of cabezon for the CAS from 1916-59.

	CAS							
	Commercial				Recreational			
Year	Nonlive	(discards)	Live	(discards)	Man-Made	Shore	PBR	CPFV
1916	0.03	0.00	0.00	0.00	0.35	0.73	0.00	0.00
1917	0.15	0.00	0.00	0.00	0.35	0.73	0.00	0.00
1918	0.08	0.00	0.00	0.00	0.35	0.73	0.00	0.00
1919	0.00	0.00	0.00	0.00	0.35	0.73	0.00	0.00
1920	0.00	0.00	0.00	0.00	0.35	0.73	0.00	0.00
1921	0.00	0.00	0.00	0.00	0.35	0.73	0.00	0.00
1922	0.00	0.00	0.00	0.00	0.35	0.73	0.00	0.00
1923	0.00	0.00	0.00	0.00	0.35	0.73	0.00	0.00
1924	0.00	0.00	0.00	0.00	0.35	0.73	0.00	0.00
1925	1.52	0.00	0.00	0.00	0.35	0.73	0.00	0.00
1926	0.00	0.00	0.00	0.00	0.35	0.73	0.00	0.00
1927	0.34	0.00	0.00	0.00	0.35	0.73	0.00	0.00
1928	1.19	0.00	0.00	0.00	0.35	0.73	0.02	0.04
1929	0.54	0.00	0.00	0.00	0.38	0.75	0.52	1.06
1930	0.47	0.00	0.00	0.00	0.56	1.12	0.78	1.58
1931	0.51	0.00	0.00	0.00	0.75	1.49	1.04	2.11
1932	2.12	0.00	0.00	0.00	0.94	1.86	1.30	2.64
1933	1.93	0.00	0.00	0.00	1.12	2.24	1.56	3.16
1934	2.37	0.00	0.00	0.00	1.31	2.61	1.82	3.69
1935	4.78	0.00	0.00	0.00	1.50	2.98	2.08	4.22
1936	8.34	0.00	0.00	0.00	2.10	4.19	2.92	5.93
1937	3.71	0.00	0.00	0.00	1.76	3.57	2.49	5.03
1938	2.46	0.00	0.00	0.00	3.53	6.97	4.86	9.88
1939	1.82	0.00	0.00	0.00	1.91	3.88	2.70	5.46
1940	1.54	0.00	0.00	0.00	2.70	5.58	3.88	7.82
1941	6.05	0.00	0.00	0.00	2.28	5.48	0.25	6.34
1942	1.04	0.00	0.00	0.00	2.28	5.48	0.25	6.34
1943	3.41	0.00	0.00	0.00	2.28	5.48	0.25	6.34
1944	1.77	0.00	0.00	0.00	2.28	5.48	0.25	6.34
1945	1.95	0.00	0.00	0.00	2.28	5.48	0.25	6.34
1946	3.54	0.00	0.00	0.00	2.28	5.48	0.25	6.34
1947	2.05	0.00	0.00	0.00	8.74	21.48	12.11	24.60
1948	3.72	0.00	0.00	0.00	11.48	28.56	16.06	32.55
1949	7.28	0.00	0.00	0.00	10.98	26.56	15.03	30.61
1950	9.83	0.00	0.00	0.00	12.02	29.98	16.85	34.14
1951	10.82	0.00	0.00	0.00	13.90	35.21	19.73	39.86
1952	15.65	0.00	0.00	0.00	8.19	19.20	10.94	22.41
1953	6.04	0.00	0.00	0.00	6.97	14.60	8.53	17.85
1954	2.82	0.00	0.00	0.00	8.73	14.03	8.79	19.38
1955	3.15	0.00	0.00	0.00	8.15	12.83	12.68	17.91
1956	5.62	0.00	0.00	0.00	12.52	23.31	28.19	30.02
1957	5.99	0.00	0.00	0.00	10.25	20.01	23.89	25.23
1958	8.85	0.00	0.00	0.00	7.00	14.01	16.37	17.28
1959	4.30	0.00	0.00	0.00	4.05	15.62	10.89	11.12

Table 8 (Continued). Commercial landings, discards, and recreational catch (mt) of cabezon for the CAS from 1960-2008.

	CAS							
	Commercial				Recreational			
Year	Nonlive	(discards)	Live	(discards)	Man-Made	Shore	PBR	CPFV
1960	1.39	0.00	0.00	0.00	1.91	11.79	12.72	5.53
1961	2.25	0.00	0.00	0.00	1.94	11.85	10.50	4.71
1962	1.12	0.00	0.00	0.00	3.65	20.08	17.32	8.44
1963	1.28	0.00	0.00	0.00	7.83	44.17	37.95	18.22
1964	2.40	0.00	0.00	0.00	5.00	18.66	22.19	11.28
1965	3.37	0.00	0.00	0.00	6.10	24.53	33.24	14.09
1966	5.72	0.00	0.00	0.00	8.14	30.82	43.14	18.45
1967	6.48	0.00	0.00	0.00	4.23	17.02	22.47	9.61
1968	9.12	0.00	0.00	0.00	3.40	14.28	18.48	7.84
1969	11.72	0.00	0.00	0.00	3.47	14.92	19.13	8.09
1970	4.85	0.00	0.00	0.00	5.19	23.33	29.34	12.30
1971	2.05	0.00	0.00	0.00	3.72	14.79	24.73	8.40
1972	2.66	0.00	0.00	0.00	9.26	34.26	61.92	20.39
1973	2.07	0.00	0.00	0.00	6.52	29.60	43.05	15.52
1974	6.76	0.00	0.00	0.00	6.00	26.52	39.68	14.12
1975	3.33	0.00	0.00	0.00	5.14	18.08	34.45	11.11
1976	8.69	0.00	0.00	0.00	5.48	20.20	36.33	12.80
1977	5.51	0.00	0.00	0.00	7.89	19.54	32.42	11.88
1978	12.89	0.00	0.00	0.00	12.62	31.43	51.42	18.97
1979	22.83	0.00	0.00	0.00	7.46	18.28	31.26	11.29
1980	27.23	0.00	0.00	0.00	13.90	58.01	71.41	14.65
1981	29.21	0.00	0.00	0.00	7.50	24.00	96.13	13.82
1982	28.94	0.00	0.00	0.00	3.82	33.96	86.49	13.38
1983	10.70	0.00	0.00	0.00	8.83	41.38	45.96	11.52
1984	8.47	0.00	0.00	0.00	12.24	20.69	73.81	4.89
1985	11.77	0.00	0.00	0.00	6.41	17.72	49.62	3.54
1986	7.36	0.00	0.00	0.00	7.30	51.31	89.04	9.66
1987	4.01	0.00	0.00	0.00	6.77	22.33	89.31	11.16
1988	5.78	0.00	0.00	0.00	10.16	30.58	53.22	9.07
1989	11.35	0.00	0.00	0.00	6.82	33.50	58.77	7.07
1990	11.78	0.00	0.00	0.00	5.74	21.72	60.77	10.65
1991	7.39	0.00	0.00	0.00	5.74	21.92	59.81	10.53
1992	16.67	0.00	0.00	0.00	8.95	36.71	80.14	14.79
1993	17.44	0.48	0.39	0.01	2.19	25.98	50.88	6.82
1994	5.40	0.24	32.21	0.78	1.69	13.36	40.02	4.35
1995	6.28	0.30	81.62	1.96	1.31	21.78	47.03	6.24
1996	4.77	0.21	106.46	2.63	3.04	29.94	44.33	8.17
1997	6.71	0.54	113.43	2.77	3.26	40.50	13.49	7.20
1998	7.28	0.37	161.83	4.05	1.49	48.81	26.28	10.15
1999	5.26	0.22	119.35	2.90	1.26	7.62	32.16	7.95
2000	3.93	0.15	112.15	2.76	0.49	10.21	19.75	7.23
2001	1.99	0.10	70.33	1.72	6.56	5.42	31.10	10.92
2002	1.98	0.04	48.33	1.13	0.61	15.23	24.79	5.49
2003	2.21	0.53	37.47	6.63	1.84	15.72	72.59	13.39
2004	1.39	0.00	48.11	4.93	3.62	11.77	23.31	8.62
2005	1.28	0.03	29.66	4.70	2.50	9.57	26.13	11.41
2006	1.01	0.55	27.26	4.30	0.66	3.33	16.20	7.03
2007	0.92	0.01	24.51	4.14	1.99	3.04	14.88	6.85
2008	0.53	0.05	22.47	0.53	1.41	8.11	9.40	6.93

Table 8 (Continued). Commercial landings, discards, and recreational catch (mt) of cabezon for the CAS from 1973-2008.

	Oregon					
	Commercial				Recreational	
Year	Nonlive	(discards)	Live	(discards)	Shored-based	Boat-based
1973	0.00	0.00	0.00	0.00	3.29	3.10
1974	0.00	0.00	0.00	0.00	3.29	4.20
1975	0.00	0.00	0.00	0.00	3.29	4.60
1976	0.00	0.00	0.00	0.00	3.29	10.80
1977	0.00	0.00	0.00	0.00	3.29	8.80
1978	0.00	0.00	0.00	0.00	3.29	20.80
1979	0.00	0.00	0.00	0.00	3.29	10.40
1980	0.00	0.00	0.00	0.00	3.29	5.90
1981	0.08	0.00	0.06	0.00	3.66	22.70
1982	0.03	0.00	0.03	0.00	1.57	13.30
1983	0.28	0.00	0.04	0.00	1.78	11.00
1984	1.09	0.00	0.05	0.00	1.12	14.10
1985	2.54	0.00	0.03	0.00	3.47	7.80
1986	4.92	0.00	0.05	0.00	5.91	15.50
1987	6.37	0.00	0.00	0.00	4.41	5.90
1988	11.33	0.00	0.00	0.00	1.39	12.30
1989	6.70	0.00	0.00	0.00	3.17	15.80
1990	5.16	0.00	0.00	0.00	4.11	18.70
1991	8.32	0.00	0.00	0.00	4.11	12.70
1992	7.23	0.00	0.00	0.00	4.11	16.30
1993	1.43	0.00	0.03	0.00	5.05	17.60
1994	6.99	0.00	0.04	0.00	2.03	18.70
1995	5.72	0.00	0.03	0.00	1.71	13.60
1996	5.65	0.00	0.06	0.00	1.48	14.40
1997	10.08	0.00	10.87	0.00	1.85	20.00
1998	3.70	0.00	23.19	0.00	0.56	16.50
1999	3.00	0.00	23.46	0.00	0.90	17.90
2000	3.39	0.00	27.80	0.00	0.87	16.20
2001	2.38	0.00	43.94	0.00	3.17	12.10
2002	1.51	0.03	44.50	0.00	1.77	15.10
2003	1.44	0.04	25.55	0.00	1.59	16.00
2004	1.51	0.03	26.21	5.96	0.98	17.20
2005	1.39	0.12	27.58	0.83	2.11	17.60
2006	0.75	0.00	21.29	3.58	1.56	16.10
2007	0.65	0.10	21.22	1.26	1.56	16.30
2008	1.56	0.00	23.50	0.00	1.56	16.60

Table 9. Catch length-compositions by sub-stock, fishery sector, and fleet. N = original length-composition sample sizes, either trips (recreational) or clusters (commercial). [A-NCS, B-SCS, C-CAS, D-ORS]

NCS			Length bin																																	
Sector	Year	N	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72+
Commercial																																					
Non-live	1995	71	0	0	0	0	0	0	0	0	0	0	255	211	378	410	330	438	294	301	165	505	64	41	109	73	35	2	22	3	0	0	3	0	0	0
	1996	231	0	0	0	0	0	0	0	2	2	28	86	243	509	597	506	442	309	204	170	150	156	134	77	50	32	21	19	0	2	0	0	0	0	0
	1997	102	0	0	0	0	0	0	0	0	0	4	23	85	450	706	594	706	527	490	608	150	359	182	184	103	89	147	141	141	0	77	0	0	0	0
	1998	26	0	0	0	0	0	0	0	0	0	0	28	28	257	406	753	601	548	875	214	66	100	182	0	26	0	0	0	0	0	0	0	0	0	0
	1999	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	134	542	456	412	414	230	75	0	80	0	55	0	0	0	0	0	0	0	0	0
	2000	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	338	518	253	253	308	196	237	55	140	140	0	55	0	0	0	70	0	0	0
Live	1997	16	0	0	0	0	0	0	0	0	0	0	0	0	0	96	1440	1632	2496	1632	2112	864	960	576	576	288	192	96	192	0	96	0	0	0	0	0
	1998	111	0	0	0	0	0	0	0	0	0	0	476	2443	7430	10842	20456	23249	18562	12723	11932	4637	3847	2460	1442	666	954	815	312	133	0	0	0	0	0	0
	1999	174	0	0	0	0	0	0	0	0	0	48	0	65	26	281	2590	16100	15080	10976	8326	5929	3277	2809	1864	1327	1173	458	535	207	68	6	0	0	0	0
	2000	323	0	0	0	0	0	0	0	0	0	0	16	42	87	128	5872	13902	12400	10458	6570	5997	4051	2499	1541	1602	648	363	255	114	121	21	0	0	0	0
	2001	156	0	0	0	0	0	0	0	0	0	0	0	0	0	12	878	3910	9455	8455	6143	4749	2930	1664	845	833	285	246	160	48	0	12	0	0	0	0
	2002	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1934	4961	3071	2582	2326	2533	1369	1406	1075	580	451	360	202	0	64	0	0	0	0
	2003	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	408	662	234	152	226	10	614	610	1830	0	610	610	0	0	0	0	0	0
	2004	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	192	1375	2183	916	208	101	6	274	245	306	378	123	70	115	0	0	0	0	0
	2005	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59	1472	885	1003	678	479	0	114	331	138	114	67	0	0	0	0	0	0	0
	2006	31	0	0	0	0	0	0	0	0	0	0	0	64	215	64	128	386	2401	2380	1236	1605	1279	606	388	572	194	486	325	0	0	0	0	32	0	0
	2007	50	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	97	663	756	393	239	285	130	120	173	108	210	101	67	45	0	31	10	0	0
	2008	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44	0	628	657	878	594	287	91	135	68	92	69	23	23	0	0	0	0	0	0
Recreational																																					
Man-Made	1980	33	0	0	0	0	0	1	1	3	2	4	8	4	3	3	4	1	2	1	2	1	1	1	1	1	0	1	1	0	0	0	0	0	0	1
	1981	27	0	0	0	0	0	0	0	2	0	3	9	4	8	4	4	2	1	1	0	2	1	2	0	0	0	0	0	1	0	0	0	0	0	0
	1982	20	0	0	0	0	0	2	1	1	0	1	0	4	2	3	1	1	2	1	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0
	1983	24	0	0	0	0	0	1	0	2	0	6	4	2	2	3	4	3	0	2	2	1	1	0	0	1	0	0	1	0	0	0	0	0	0	0
	1984	25	0	0	0	0	0	2	0	0	2	1	0	2	2	5	1	3	0	1	1	0	2	2	1	1	1	0	1	0	0	1	0	0	0	0
	1985	26	0	0	1	0	0	1	2	2	4	7	2	2	7	2	2	0	1	0	2	1	0	2	0	0	1	0	0	0	0	0	0	0	0	0
	1986	28	0	0	0	0	1	0	0	1	0	3	3	4	5	3	1	2	1	2	0	1	1	2	1	1	1	0	0	1	0	0	0	0	0	0
	1987	27	0	0	0	0	1	2	3	1	1	1	3	1	5	3	0	3	5	1	0	2	0	2	1	0	2	0	0	0	0	0	0	0	0	0
	1988	24	0	1	0	2	0	2	1	1	1	0	3	5	3	4	1	2	0	1	1	3	2	2	1	4	0	1	0	0	3	0	2	0	0	0
	1989	8	0	0	0	0	0	0	0	0	1	1	0	2	0	1	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	1993	20	0	0	0	1	0	2	0	5	2	2	4	2	2	4	0	2	1	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0
	1994	5	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	1996	13	0	0	1	1	1	1	0	2	0	1	1	0	2	2	1	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1997	4	0	0	0	0	0	0	0	2	0	1	1	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	1998	3	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1999	4	0	0	1	0	0	0	0	3	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2000	2	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2001	7	0	0	0	0	0	1	2	2	1	2	2	1	4	1	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2002	5	0	0	0	1	0	0	1	0	1	0	1	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	2003	4	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	2004	12	0	0	0	0	0	0	0	2	1	3	0	2	2	1	1	0	1	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
	2005	18	0	0	0	0	0	0	1	0	2	1	1	2	3	1	0	1	2	5	1	0	0	1	3	1	0	0	0	0	0	0	0	0	0	0
	2006	6	0	0	0	0	0	0	0	0	0	1	2	2	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	2007	11	0	0	0	0	0	0	1	1	1	1	2	0	1	0	0	0	0	0	0	1	2	0	0	0	0	0	1	0	0	0	0	0	0	0
	2008	16	0	0	0	0	0	0	0	1	1	2	3	3	3	1	0	0	1	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Table 9A (Continued). NCS

NCS			Length bin																																	
Sector	Year	N	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72+
Shore	1980	29	0	0	0	0	1	1	0	0	0	0	3	3	2	5	2	5	1	3	5	3	3	1	2	0	1	2	0	0	0	0	0	0	1	1
	1981	28	0	0	0	0	0	0	0	0	2	2	0	7	5	7	5	9	4	2	2	3	1	0	1	1	0	0	0	0	0	0	0	0	0	0
	1982	45	0	0	0	0	1	0	0	1	3	3	5	3	4	5	5	4	5	3	6	5	4	3	1	2	0	0	0	2	1	0	1	0	0	0
	1983	53	0	0	0	0	0	0	0	2	2	2	6	5	3	11	8	20	10	16	6	6	3	3	2	0	2	1	0	1	0	0	0	0	0	0
	1984	22	0	0	0	0	0	0	1	0	1	2	1	1	3	1	1	4	2	2	2	1	1	2	0	3	0	0	0	0	0	0	0	0	0	0
	1985	26	0	0	2	0	2	0	0	3	1	3	1	2	3	5	8	5	1	2	4	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0
	1986	30	0	0	0	0	0	0	0	0	3	2	3	0	5	8	4	5	3	7	6	7	2	2	1	0	0	3	0	0	0	0	0	0	0	0
	1987	17	0	0	1	1	1	0	2	2	1	0	1	0	1	2	1	4	3	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
	1988	5	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1989	8	0	0	0	0	0	2	0	5	1	0	0	0	0	2	0	0	0	1	1	1	0	0	0	1	1	0	1	1	0	0	0	0	0	0
	1993	40	0	0	0	0	1	0	1	0	2	0	2	1	2	8	9	10	6	9	3	4	2	2	1	0	1	2	0	1	0	0	0	0	0	0
	1994	15	0	0	0	0	0	1	1	0	0	1	0	1	1	1	2	6	1	0	3	1	0	2	1	0	1	1	0	0	0	0	0	0	0	0
	1996	36	0	0	0	0	0	0	0	0	0	1	1	3	6	5	15	10	9	6	4	3	2	0	2	1	0	0	0	0	0	0	0	0	0	0
	1997	26	0	0	0	0	0	0	0	0	2	1	1	2	2	7	6	7	9	7	6	5	2	2	1	1	1	0	0	0	0	0	0	0	0	0
	1998	29	0	0	0	0	0	0	0	0	0	1	1	0	5	4	8	8	11	6	9	5	1	0	3	3	0	0	0	0	0	0	0	0	0	0
	1999	19	0	0	0	0	0	0	0	0	0	2	0	3	6	10	5	4	3	4	1	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
	2000	13	0	0	0	0	0	0	1	0	0	0	1	2	0	1	6	1	2	3	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
	2001	8	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	2	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2002	9	0	0	0	0	0	0	0	1	0	1	0	0	0	1	2	0	3	3	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0
	2003	4	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	1	0	2	0	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0
	2004	13	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	3	4	1	2	2	0	2	4	0	1	0	0	0	0	0	0	0	0
	2005	10	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	2	2	2	0	2	0	0	1	0	1	0	0	0	0	0	0	0	0
	2006	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
	2007	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2008	8	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	2	1	2	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0
PBR	1980	46	0	0	0	0	0	0	0	0	0	0	1	4	0	2	2	3	4	3	7	12	6	6	6	1	3	2	5	2	2	1	1	0	0	0
	1981	27	0	0	0	0	0	1	0	0	0	0	0	1	2	0	1	3	5	3	3	2	4	4	6	6	3	2	3	2	2	0	1	1	0	2
	1982	26	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	3	4	5	3	5	2	0	1	3	3	2	0	0	0	0	0	0
	1983	29	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	4	4	3	2	6	1	3	1	6	4	2	2	3	0	1	0	0	0	0
	1984	43	0	0	0	0	0	0	0	0	1	0	0	0	1	1	2	12	11	8	6	4	7	11	5	5	6	2	3	0	1	0	0	0	0	0
	1985	26	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	1	7	1	6	4	4	2	3	2	4	2	1	0	0	0	0	0	0
	1986	51	0	0	0	0	0	0	0	0	0	0	0	0	1	4	7	7	5	6	10	6	4	5	7	4	4	1	2	1	1	0	0	0	0	0
	1987	37	0	0	0	0	0	0	0	0	1	0	0	0	1	0	3	4	5	8	4	8	8	2	2	3	3	2	2	1	0	1	0	0	0	0
	1988	25	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	4	3	7	5	4	2	5	1	2	3	2	0	0	0	1	1	0	0	0
	1989	29	0	0	0	1	0	0	0	0	0	0	1	3	3	3	3	4	4	6	5	7	3	4	2	4	1	5	1	0	1	1	1	0	0	0
	1993	85	0	0	0	0	0	0	0	2	0	1	3	0	2	7	12	10	27	23	23	8	3	6	6	8	2	3	0	0	1	0	0	0	0	0
	1994	40	0	0	0	0	0	0	0	0	0	0	2	1	0	3	5	10	7	8	5	4	6	0	0	2	1	3	2	2	0	0	0	0	0	0
	1996	56	0	0	0	0	0	0	0	0	1	2	0	1	7	9	9	4	14	8	12	8	8	6	5	6	4	2	2	0	2	0	1	0	0	0
	1997	16	0	0	0	0	0	0	0	0	0	0	1	2	0	3	4	0	4	2	3	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	1998	37	0	0	0	0	0	0	1	1	0	1	0	0	2	3	3	7	11	9	7	3	2	8	2	1	1	2	0	0	0	0	0	0	0	0
	1999	46	0	0	0	0	0	0	0	0	0	0	0	0	0	5	4	4	8	12	6	7	4	5	3	3	2	2	0	0	0	0	0	0	0	0
	2000	33	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	4	3	8	7	5	7	3	0	1	3	0	0	1	0	0	0	0	0
	2001	22	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4	0	4	3	3	5	10	2	7	3	1	0	1	0	0	0	0	0	0	0
	2002	16	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	3	4	3	6	3	2	1	3	0	1	0	1	1	1	0	1	0	0	0
	2003	62	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	2	9	9	8	14	12	13	8	7	6	1	2	0	1	0	0	0	0	0
	2004	237	1	0	0	0	0	0	0	0	0	0	0	0	1	3	5	7	23	48	46	55	60	63	54	31	28	25	12	9	1	2	2	2	1	2
	2005	439	0	0	0	0	0	0	0	0	0	0	1	1	3	7	2	16	34	53	85	91	99	102	106	90	61	41	32	19	11	4	7	1	0	2
	2006	412	0	0	0	0	0	0	1	0	0	0	1	0	2	4	10	13	36	64	69	72	72	71	62	67	49	51	26	8	8	2	2	1	0	1
	2007	303	0	0	0	0	0	1	0	0	0	0	0	2	2	2	7	19	25	50	47	47	59	67	48	50	34	27	18	11	8	2	3	2	0	1
	2008	256	0	0	0	0	1	0	0	0	0	0	0	1	2	5	4	19	38	47	52	63	59	48	40	28	36	14	12	8	7	4	2	1	0	2

Table 9A (Continued). NCS

NCS			Length bin																																	
Sector	Year	N	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72+
CPFV (Observer)	1987	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	2	3	2	5	3	3	2	2	5	0	1	0	0	0	0	0
	1988	21	0	0	0	0	0	0	0	0	0	0	1	2	2	0	1	3	4	6	6	8	16	4	5	10	2	2	4	0	1	2	1	0	0	0
	1989	21	0	0	0	0	0	0	0	0	0	0	0	1	1	2	3	8	2	8	8	3	8	7	8	4	4	4	1	1	0	1	0	0	0	0
	1990	6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3	1	1	1	1	1	0	0	1	0	1	0	0	0	0	0	0
	1991	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	2	1	2	1	0	1	1	3	1	0	0	0	0	0	0	0
	1992	16	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	6	1	5	4	2	2	2	2	0	1	0	0	1	0	0	0	0	0	0
	1993	12	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	2	4	6	3	3	1	3	2	2	0	1	0	0	0	0	0	0	0	0
	1994	16	0	0	0	0	0	0	0	0	0	0	0	0	2	0	6	7	2	4	5	4	4	1	0	2	2	0	0	1	0	1	0	0	0	0
	1995	18	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	6	3	7	3	6	1	2	3	0	1	0	1	0	0	0	0	0	0	0
	1996	31	0	0	0	0	0	0	0	0	1	0	0	1	6	14	10	11	13	10	8	7	7	7	6	3	0	1	0	1	1	0	0	0	0	0
	1997	30	0	0	0	0	0	0	0	0	0	1	0	0	0	1	5	16	6	9	6	1	9	1	0	2	0	1	0	1	0	0	0	0	0	0
	1998	23	0	0	0	0	0	0	0	0	0	0	1	0	1	1	3	7	6	8	2	5	4	2	1	0	0	0	0	0	0	0	0	0	0	0
CPFV (RecFIN)	1980	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	2	0	0	1	1	1	0	0	0	0	0	0	0	0
	1981	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0
	1982	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	1983	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	1	0	0	0
	1985	8	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	2	0	2	0	2	1	2	2	2	0	0	0	0	0	0	0	0
	1986	9	0	0	0	0	0	0	0	1	0	1	1	0	0	0	2	0	5	2	1	3	2	2	1	3	2	1	1	0	3	0	1	0	0	1
	1987	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1988	6	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	1	0	1	0	3	3	0	0	0	2	0	0	0	0	0	0	1
	1989	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1994	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	1	0	2	1	0	0	0	0	0	0	0	0	0	0
	1996	16	0	0	0	0	0	0	0	0	0	0	0	1	2	1	3	1	5	1	4	3	4	2	2	1	1	3	0	1	0	0	0	0	1	0
	1997	28	0	0	0	0	0	0	0	0	0	1	0	0	0	1	5	16	6	8	5	1	9	1	0	2	0	1	0	1	0	0	0	0	0	0
	1998	29	0	0	0	0	0	0	0	0	0	0	1	0	1	1	4	9	7	8	2	6	5	2	1	1	0	0	0	0	0	0	0	0	0	0
	1999	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	2	1	0	0	0	1	1	0	0	0	0	0	0
	2000	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	1	0	2	2	3	1	1	1	0	0	0	0	0	0	0	0
	2001	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	9	8	11	4	12	11	7	3	5	2	0	0	0	0	0	0	0	0
	2002	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	1	2	1	0	0	0	0	1	0	0	0	0	0	0	0
	2003	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	10	10	12	14	16	5	13	5	3	2	2	1	1	0	0	0	0	1
	2004	23	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	2	5	4	4	6	5	3	2	0	0	1	0	0	0	1	0	0	0
	2005	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4	6	9	6	7	11	5	1	3	3	0	1	3	0	0	0	0
	2006	34	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	5	7	7	8	9	6	6	4	0	3	1	0	0	0	0	0	0
	2007	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	6	3	7	3	9	7	4	7	5	3	3	0	1	0	0	0	0
	2008	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	7	9	6	3	5	3	7	2	0	1	2	1	0	0	0	0	1
CPFV (CalPOLY)	2003	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	1	2	0	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0
	2004	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	0	3	1	3	0	5	2	2	3	0	0	0	0	0	0	0	0	0
	2005	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	0	0	0	1	1	0	0	0	0	0
	2006	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	3	0	0	0	0	0	0	0	0
	2007	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	2008	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0

Table 9B (Continued). SCS

SCS			Length bin																															
Sector	Year	N	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68+
Commercial																																		
Live	2002	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	228	57	57	57	171	114	0	57	57	57	0	0	0	0	0	0
	2003	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	159	264	201	393	21	255	21	0	0	117	0	117	0	0	0	0
	2005	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	195	156	78	39	0	39	39	39	39	0	0	0	0	0	0	0
	2006	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	880	560	560	240	240	160	0	0	0	0	0	0	0	0	0	0
	2008	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66	302	144	82	250	376	710	388	0	16	0	0	0	0	0	0	0
Recreational																																		
Man-made	1980	7	0	0	0	0	0	0	1	1	1	0	0	0	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1981	2	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1982	4	0	0	0	0	0	0	0	0	0	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1983	5	0	0	0	0	0	0	1	0	0	0	2	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	1984	8	0	0	1	0	1	1	0	0	1	0	0	3	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1985	5	0	0	0	1	1	1	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1986	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1987	6	0	0	0	0	0	0	0	0	0	0	1	2	1	0	1	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0
	1988	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1989	8	0	1	0	0	0	2	0	0	1	0	0	1	1	2	1	1	1	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0
	1993	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1996	2	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1999	5	0	0	0	0	1	0	0	1	1	2	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2000	2	0	0	2	4	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2002	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2003	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2004	4	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	2005	7	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	2006	6	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2007	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2008	5	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Shore	1980	6	0	0	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	2	1	1	1	1	0	0	0	0	0	0	0	0	0
	1981	8	0	0	0	0	0	0	0	0	0	2	0	0	0	1	4	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
	1982	5	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	1983	7	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	2	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	1984	8	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	1985	10	0	0	0	0	0	0	0	0	0	0	1	4	1	2	1	3	3	2	2	0	0	0	0	0	1	0	0	0	0	0	0	0
	1986	12	0	0	0	0	0	0	1	0	0	1	1	1	3	1	4	3	2	1	0	2	0	1	0	0	0	0	0	0	0	0	1	0
	1987	5	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	1	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0
	1988	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	1989	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	2	1	5	1	0	0	1	0	0	0	0	0	0	1	0
	1993	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
	1996	2	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1997	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1998	5	0	0	0	0	0	0	0	0	0	0	1	2	1	3	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	1999	4	0	0	0	0	0	0	0	0	0	0	1	2	0	2	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2000	2	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2001	3	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2002	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	2003	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2004	4	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2005	2	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 9B (Continued). SCS

SCS			Length bin																															
Sector	Year	N	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68
PBR	1980	60	0	0	0	0	0	0	0	0	0	2	5	6	10	8	19	17	9	11	9	15	12	6	10	13	6	6	8	1	1	0	0	0
	1981	25	0	0	0	0	0	0	0	0	0	0	1	0	2	6	3	3	3	4	3	5	4	1	0	1	4	0	1	2	0	0	0	0
	1982	24	0	0	0	0	0	0	0	0	0	1	3	5	3	2	5	3	3	3	2	4	0	2	2	4	3	0	0	0	0	0	0	0
	1983	28	0	0	0	0	0	0	0	0	1	1	0	4	10	3	6	5	2	2	2	2	2	0	1	0	0	0	1	0	0	0	0	0
	1984	34	0	0	0	0	0	0	0	0	2	0	0	2	2	5	7	5	5	6	6	2	3	2	4	2	0	0	0	0	0	0	0	0
	1985	18	0	0	0	0	0	0	0	0	0	0	4	3	1	0	2	2	5	2	4	1	1	0	0	2	2	0	1	0	0	0	0	1
	1986	20	0	0	0	0	0	0	0	0	3	5	3	4	2	4	2	2	1	4	1	3	1	1	1	2	1	0	0	0	0	0	0	0
	1987	10	0	0	0	0	0	0	0	0	0	0	1	3	1	2	1	1	0	1	2	0	0	1	1	1	1	0	1	0	0	0	0	0
	1988	9	0	0	0	0	0	0	0	0	0	0	0	1	4	1	0	3	2	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0
	1989	14	0	0	0	0	0	0	0	0	1	0	3	0	2	1	1	3	3	1	0	3	2	2	1	2	1	1	0	0	0	0	0	0
	1993	10	0	0	0	0	0	0	0	0	1	0	2	1	4	4	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	1994	13	0	0	0	0	0	0	0	0	0	0	1	1	2	3	3	1	0	2	0	1	0	2	0	0	1	1	0	2	0	0	0	0
	1996	11	0	0	0	0	0	0	0	0	0	1	1	3	6	5	1	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	1997	9	0	0	0	0	0	0	0	0	0	0	0	0	1	4	1	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
	1998	10	0	0	0	0	0	0	0	0	0	0	2	1	0	6	6	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	1999	23	0	0	0	0	0	0	1	0	1	1	0	3	1	6	11	9	6	2	2	1	0	0	0	1	0	0	0	0	0	0	0	0
	2000	6	0	0	0	0	0	0	0	0	0	0	2	2	1	0	0	0	0	1	0	0	0	0	2	1	0	0	0	0	0	0	0	0
	2001	6	0	0	0	0	0	0	0	0	0	1	0	0	2	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2002	18	0	0	0	0	0	0	0	0	0	0	0	0	6	5	5	1	1	0	1	2	0	0	0	1	0	0	0	0	0	0	0	0
	2003	20	0	0	0	0	0	0	0	0	0	0	0	1	1	5	6	5	3	4	0	1	1	0	1	1	0	0	0	0	0	0	0	0
	2004	76	0	0	0	0	0	0	0	0	0	1	0	2	7	9	13	10	12	19	10	9	7	5	4	3	3	0	1	0	0	0	0	1
	2005	55	0	0	0	0	0	0	0	0	0	1	1	5	1	8	8	12	6	6	7	4	2	5	4	1	1	0	2	0	0	0	0	0
	2006	75	0	0	0	0	0	0	0	0	0	0	1	4	2	10	13	12	29	12	10	10	3	1	2	2	0	0	1	0	0	0	0	0
	2007	60	0	0	0	0	0	0	0	0	0	0	2	5	3	2	5	9	15	9	9	9	4	5	2	1	0	0	2	0	0	0	0	0
	2008	46	0	0	0	0	0	0	0	0	0	0	0	1	2	8	5	8	7	10	5	3	3	1	0	4	0	0	0	0	0	0	0	0
CPFV (Observer)	1975	32	0	0	0	0	0	0	1	0	1	2	7	6	11	13	7	10	3	6	4	2	2	2	0	1	0	0	1	0	0	0	0	0
	1976	63	0	0	0	1	0	0	0	1	1	5	6	11	18	9	6	8	5	8	3	4	2	2	4	0	1	1	0	0	0	0	0	0
	1977	44	0	0	0	0	1	0	0	0	0	5	9	10	11	5	7	7	4	3	4	1	3	3	0	1	1	0	0	0	1	0	0	0
	1978	51	0	0	0	1	0	0	2	1	0	5	5	7	12	8	11	8	5	9	8	3	3	4	0	4	4	0	1	0	0	0	0	0
	1986	60	0	0	0	0	0	0	1	1	6	15	13	16	14	4	3	3	3	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
	1987	64	0	0	0	0	0	0	0	0	2	1	13	12	25	13	12	9	10	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	1988	40	0	0	0	0	0	0	0	0	1	4	3	5	8	10	8	6	8	10	1	1	0	0	1	0	0	0	0	0	0	0	0	0
	1989	63	0	0	0	0	0	1	0	2	6	15	15	8	9	8	6	8	3	1	3	1	1	4	2	0	0	0	0	0	0	0	0	0
CPFV (tagging)	2002	4	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2003	50	0	0	0	0	0	0	0	0	2	1	6	2	5	9	10	23	21	25	14	15	4	6	4	3	0	1	1	0	0	0	0	0
	2004	20	0	0	0	0	0	0	1	0	0	0	2	2	1	3	5	2	7	7	4	6	8	4	6	5	3	1	1	0	0	0	0	0
	2005	31	0	0	0	0	0	0	0	0	0	0	1	7	9	4	6	6	3	3	2	4	7	2	0	0	0	0	0	0	0	0	0	0

Table 9B (Continued). SCS

SCS			Length bin																																
Sector	Year	N	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68+
CPFV (RecFIN)	1980	13	0	0	0	0	0	0	0	0	0	0	2	0	5	0	1	0	3	0	0	1	0	0	2	1	0	0	0	0	0	0	0	0
	1981	14	0	0	0	0	0	0	0	0	1	0	0	1	1	0	2	1	2	0	0	3	1	1	0	1	0	0	0	0	0	0	0	0
	1982	9	0	0	0	0	0	0	0	0	0	0	1	4	1	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	1983	19	0	0	0	0	0	0	0	0	1	1	1	0	2	5	4	0	3	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
	1984	8	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0
	1985	7	0	0	0	0	0	0	0	1	0	1	1	1	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1986	13	0	0	0	0	0	0	0	0	1	0	3	0	5	1	3	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1987	9	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	2	2	1	1	0	1	0	1	0	0	0	0	0	0	0
	1988	5	0	0	0	0	0	0	0	0	1	1	1	1	1	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1989	12	0	0	0	1	0	0	0	0	0	3	1	1	0	1	2	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
	1993	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	1994	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	1996	11	0	0	0	0	0	0	0	1	2	0	1	0	1	5	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	1997	4	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1998	8	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	0	2	0	0	1	0	0	1	0	0	0	0	0	0	0	0
	1999	5	0	0	0	0	0	0	0	0	0	0	2	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	2000	4	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2001	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2002	7	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	1	2	1	0	0	0	0	0	0	0	0	1	0	0	0	0
	2003	7	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0	0
	2004	14	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	1	1	3	1	2	1	3	0	2	1	0	0	0	0	0	0
	2005	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	0	1	0	1	0	0	0	0	0	0	0	0	0	0
	2006	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	1	3	1	0	2	0	0	1	1	0	0	0	0	0	0
	2007	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	3	4	0	3	2	2	0	0	1	2	0	1	0	0
	2008	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	1	1	1	2	3	2	0	1	1	0	0	0	1	0	0

Table 9C (Continued). CAS

CAS			Length bin																																	
Sector	Year	N	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72+
Commercial																																				
Non-live	1995	71	0	0	0	0	0	0	0	0	0	0	255	211	378	410	330	438	294	301	165	505	64	41	109	73	35	2	22	3	0	0	3	0	0	0
	1996	231	0	0	0	0	0	0	0	2	2	28	86	243	509	597	506	442	309	204	170	150	156	134	77	50	32	21	19	0	2	0	0	0	0	0
	1997	102	0	0	0	0	0	0	0	0	0	4	23	85	450	706	594	706	527	490	608	150	359	182	184	103	89	147	141	141	0	77	0	0	0	0
	1998	26	0	0	0	0	0	0	0	0	0	0	28	28	257	406	753	601	548	875	214	66	100	182	0	26	0	0	0	0	0	0	0	0	0	0
	1999	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	134	542	456	412	414	230	75	0	80	0	55	0	0	0	0	0	0	0	0	0
	2000	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	338	518	253	253	308	196	237	55	140	140	0	55	0	0	0	70	0	0	0
Live	1997	16	0	0	0	0	0	0	0	0	0	0	0	0	0	96	1440	1632	2496	1632	2112	864	960	576	576	288	192	96	192	0	96	0	0	0	0	0
	1998	111	0	0	0	0	0	0	0	0	0	0	476	2443	7430	10842	20456	23249	18562	12723	11932	4637	3847	2460	1442	666	954	815	312	133	0	0	0	0	0	0
	1999	174	0	0	0	0	0	0	0	0	0	48	0	65	26	281	2590	16100	15080	10976	8326	5929	3277	2809	1864	1327	1173	458	535	207	68	6	0	0	0	0
	2000	323	0	0	0	0	0	0	0	0	0	0	16	42	87	128	5872	13902	12400	10458	6570	5997	4051	2499	1541	1602	648	363	255	114	121	21	0	0	0	0
	2001	156	0	0	0	0	0	0	0	0	0	0	0	0	0	12	878	3910	9455	8455	6143	4749	2930	1664	845	833	285	246	160	48	0	12	0	0	0	0
	2002	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1934	5189	3128	2639	2383	2704	1483	1406	1132	637	508	360	202	0	64	0	0	0	0
	2003	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	567	926	435	545	247	265	635	610	1830	117	610	727	0	0	0	0	0	0
	2004	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	192	1375	2183	916	208	101	6	274	245	306	378	123	70	115	0	0	0	0	0
	2005	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59	1667	1041	1081	717	479	39	153	370	177	114	67	0	0	0	0	0	0	0
	2006	34	0	0	0	0	0	0	0	0	0	0	0	64	215	64	128	466	3281	2940	1796	1845	1519	766	388	572	194	486	325	0	0	0	0	32	0	0
	2007	50	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	97	663	756	393	239	285	130	120	173	108	210	101	67	45	0	31	10	0	0
	2008	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44	66	930	801	960	844	663	801	523	68	108	69	23	23	0	0	0	0	0	0
Recreational																																				
Man-Made	1980	40	0	0	0	0	0	1	2	4	3	4	8	4	4	5	4	2	2	1	2	1	1	1	1	1	0	1	1	0	0	0	0	0	0	1
	1981	29	0	0	0	0	0	0	0	2	1	3	9	4	8	5	4	2	1	1	0	2	1	2	0	0	0	0	0	1	0	0	0	0	0	0
	1982	24	0	0	0	0	0	2	1	1	0	2	0	5	2	5	1	1	2	1	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0
	1983	29	0	0	0	0	0	1	1	2	0	6	6	3	2	3	4	3	1	2	3	1	1	0	0	1	0	0	1	0	0	0	0	0	0	0
	1984	33	0	0	1	0	1	3	0	0	3	1	0	5	3	6	1	4	0	1	1	0	2	2	1	1	1	0	1	0	0	1	0	0	0	0
	1985	31	0	0	1	1	1	2	2	2	4	8	4	2	7	2	2	0	1	0	2	1	0	2	0	0	1	0	0	0	0	0	0	0	0	0
	1986	29	0	0	0	0	1	0	0	1	0	3	4	4	5	3	1	2	1	2	0	1	1	2	1	1	1	0	0	1	0	0	0	0	0	0
	1987	33	0	0	0	0	1	2	3	1	1	1	4	3	6	3	1	4	6	2	0	3	0	3	1	0	2	0	0	0	0	0	0	0	0	0
	1988	25	0	1	0	2	0	2	1	1	1	0	3	5	3	5	1	2	0	1	1	3	2	2	1	4	0	1	0	0	3	0	2	0	0	0
	1989	16	0	1	0	0	0	2	0	0	2	1	0	3	1	3	1	2	1	2	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0
	1993	21	0	0	0	1	0	2	0	5	2	2	5	2	2	4	0	2	1	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0
	1994	5	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	1996	15	0	0	1	1	1	1	0	3	0	2	1	1	2	2	1	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1997	4	0	0	0	0	0	0	0	2	0	1	1	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	1998	3	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1999	9	0	0	1	0	1	0	0	4	2	2	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2000	4	0	0	2	4	3	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2001	7	0	0	0	0	0	1	2	2	1	2	2	1	4	1	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2002	6	0	0	0	1	0	0	1	0	1	0	1	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	2003	5	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	2004	16	0	0	0	0	0	1	0	2	1	3	0	3	2	1	2	0	1	0	1	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0
	2005	25	0	0	0	0	0	0	1	0	3	1	2	3	4	2	1	1	2	5	1	0	1	1	3	1	0	0	0	0	0	0	0	0	0	0
	2006	12	0	0	0	0	0	0	0	1	0	1	3	2	0	0	3	1	2	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	2007	13	0	0	0	0	0	0	1	1	1	1	2	0	1	2	0	0	0	0	0	1	2	0	0	0	0	0	1	0	0	0	0	0	0	0
	2008	21	0	0	0	0	0	0	0	1	1	2	3	3	5	2	0	0	2	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0

Table 9C (Continued). CAS

CAS			Length bin																																	
Sector	Year	N	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72+
Shore	1980	35	0	0	0	0	1	1	0	0	1	1	3	4	3	6	2	5	1	3	7	4	4	2	3	0	1	2	0	0	0	0	0	0	1	1
	1981	36	0	0	0	0	0	0	0	0	2	4	0	7	5	8	9	9	4	2	3	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0
	1982	50	0	0	0	0	1	0	0	1	3	3	5	3	6	6	7	5	5	3	6	5	4	3	2	2	0	0	0	2	1	0	1	0	0	0
	1983	60	0	0	0	0	0	0	1	2	2	2	7	5	3	11	9	22	10	16	7	7	3	3	2	0	2	1	0	1	0	0	0	0	0	0
	1984	30	0	0	0	0	0	0	1	0	1	2	1	1	3	2	4	5	3	2	4	1	1	2	0	3	0	0	0	0	0	0	0	0	0	0
	1985	36	0	0	2	0	2	0	0	3	1	3	2	6	4	7	9	8	4	4	6	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0
	1986	42	0	0	0	0	0	0	1	0	3	3	4	1	8	9	8	8	5	8	6	9	2	3	1	0	0	3	0	0	0	0	1	0	0	0
	1987	22	0	0	1	1	1	0	2	2	1	0	1	0	3	2	2	4	4	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	1988	7	0	0	0	0	0	0	1	0	0	0	0	1	0	1	1	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	1989	11	0	0	0	0	0	2	0	5	1	0	0	1	0	2	1	0	1	3	2	6	1	0	0	2	1	0	1	1	0	0	1	0	0	0
	1993	42	0	0	0	0	1	0	1	0	2	0	2	1	3	8	9	10	6	9	4	4	2	3	1	0	1	2	0	1	0	0	0	0	0	0
	1994	15	0	0	0	0	0	1	1	0	0	1	0	1	1	1	2	6	1	0	3	1	0	2	1	0	1	1	0	0	0	0	0	0	0	0
	1996	38	0	0	0	0	0	0	0	0	0	1	1	4	7	5	16	10	9	6	4	3	2	0	2	1	0	0	0	0	0	0	0	0	0	0
	1997	27	0	0	0	0	0	0	0	0	2	1	3	2	2	7	6	7	9	7	6	5	2	2	1	1	1	0	0	0	0	0	0	0	0	0
	1998	34	0	0	0	0	0	0	0	0	0	1	2	2	6	7	9	8	11	6	11	5	1	0	3	3	0	0	0	0	0	0	0	0	0	0
	1999	23	0	0	0	0	0	0	0	0	0	2	1	5	6	12	5	6	3	5	1	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
	2000	15	0	0	0	0	0	0	1	0	1	0	2	2	0	1	6	2	2	4	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
	2001	11	0	0	0	0	0	0	0	0	0	2	0	1	1	1	0	3	1	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2002	11	0	0	0	0	0	0	0	1	0	1	0	0	0	1	3	0	4	3	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	2003	6	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	1	0	2	0	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0
	2004	17	0	0	0	0	0	0	0	0	0	0	1	0	2	1	3	0	3	4	1	2	2	0	2	4	0	1	0	0	0	0	0	0	0	0
	2005	12	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	2	3	3	2	0	2	0	0	1	0	1	0	0	0	0	0	0	0	0
	2006	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
	2007	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2008	8	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	2	1	2	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0
PBR	1980	106	0	0	0	0	0	0	0	0	0	2	6	10	10	10	21	20	13	14	16	27	18	12	16	14	9	8	13	3	3	1	1	0	0	0
	1981	52	0	0	0	0	0	1	0	0	0	0	1	1	4	6	4	6	8	7	6	7	8	5	6	7	7	2	4	4	2	0	1	1	0	2
	1982	50	0	0	0	0	0	0	0	0	0	1	3	5	3	4	7	4	4	6	6	9	3	7	4	4	4	3	3	2	0	0	0	0	0	0
	1983	57	0	0	0	0	0	0	0	0	1	2	0	4	11	4	7	9	6	5	4	8	3	3	2	6	4	2	3	3	0	1	0	0	0	0
	1984	77	0	0	0	0	0	0	0	0	3	0	0	2	3	6	9	17	16	14	12	6	10	13	9	7	6	2	3	0	1	0	0	0	0	0
	1985	44	0	0	0	0	0	0	0	0	0	1	4	3	1	0	2	4	6	9	5	7	5	4	2	5	4	4	3	1	0	0	0	0	1	0
	1986	71	0	0	0	0	0	0	0	0	3	5	3	4	3	8	9	9	6	10	11	9	5	6	8	6	5	1	2	1	1	0	0	0	0	0
	1987	47	0	0	0	0	0	0	0	0	1	0	1	3	2	2	4	5	5	9	6	8	8	3	3	4	4	2	3	1	0	1	0	0	0	0
	1988	34	0	0	0	0	0	0	0	0	1	0	0	1	4	1	0	7	5	8	5	6	2	5	1	2	3	2	0	0	0	1	1	0	0	0
	1989	43	0	0	0	1	0	0	0	0	1	0	4	3	5	4	4	7	7	7	5	10	5	6	3	6	2	6	1	0	1	1	1	0	0	0
	1993	95	0	0	0	0	0	0	0	2	1	1	5	1	6	11	13	11	27	23	24	8	3	6	6	8	2	3	0	0	1	0	0	0	0	0
	1994	53	0	0	0	0	0	0	0	0	0	0	3	2	2	6	8	11	7	10	5	5	6	2	0	2	2	4	2	4	0	0	0	0	0	0
	1996	67	0	0	0	0	0	0	0	0	1	3	1	4	13	14	10	4	17	8	12	8	8	6	5	6	4	2	2	0	3	0	1	0	0	0
	1997	25	0	0	0	0	0	0	0	0	0	0	1	2	1	7	5	1	4	2	3	1	3	0	0	1	0	0	0	0	0	0	0	0	0	0
	1998	47	0	0	0	0	0	0	1	1	0	1	2	1	2	9	9	10	11	11	9	3	2	8	2	1	1	2	0	0	0	0	0	0	0	0
	1999	69	0	0	0	0	0	0	1	0	1	1	0	3	1	11	15	13	14	14	8	8	4	5	3	4	2	2	0	0	0	0	0	0	0	0
	2000	39	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	2	4	4	8	7	5	7	5	1	1	3	0	0	1	0	0	0	0	0
	2001	28	0	0	0	0	0	0	0	0	0	1	1	0	2	1	6	1	4	3	3	5	10	2	7	3	1	0	1	0	0	0	0	0	0	0
	2002	34	0	0	0	0	0	0	0	0	0	0	0	0	7	5	6	4	5	3	7	5	2	1	3	1	1	0	1	1	1	0	1	0	0	0
	2003	82	1	0	0	1	0	0	0	0	0	0	0	1	1	5	8	7	12	13	8	15	13	13	9	8	6	1	2	0	1	0	0	0	0	0
	2004	313	1	0	0	0	0	0	0	0	0	1	0	2	8	12	18	17	35	67	56	64	67	68	58	34	31	25	13	9	1	2	2	3	1	2
	2005	494	0	0	0	0	0	0	0	0	0	1	2	6	4	15	10	28	40	59	92	95	101	107	110	91	62	41	34	19	11	4	7	1	0	2
	2006	487	0	0	0	0	0	0	1	0	0	0	2	4	4	14	23	25	65	76	79	82	75	72	64	69	49	51	27	8	8	2	2	1	0	1
	2007	363	0	0	0	0	0	1	0	0	0	0	2	7	5	4	12	28	40	59	56	56	63	72	50	51	34	27	20	11	8	2	3	2	0	1
	2008	302	0	0	0	0	1	0	0	0	0	0	0	2	4	13	9	27	45	57	57	66	62	49	40	32	36	14	12	8	7	4	2	1	0	3

Table 9C (Continued). CAS

CAS			Length bin																															
Sector	Year	N	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68
CPFV (Observer)	1975	32	0	0	0	0	0	0	1	0	1	2	7	6	11	13	7	10	3	6	4	2	2	2	0	1	0	0	1	0	0	0	0	0
	1976	63	0	0	0	1	0	0	0	1	1	5	6	11	18	9	6	8	5	8	3	4	2	2	4	0	1	1	0	0	0	0	0	0
	1977	44	0	0	0	0	1	0	0	0	0	5	9	10	11	5	7	7	4	3	4	1	3	3	0	1	1	0	0	0	1	0	0	0
	1978	51	0	0	0	1	0	0	2	1	0	5	5	7	12	8	11	8	5	9	8	3	3	4	0	4	4	0	1	0	0	0	0	0
	1986	60	0	0	0	0	0	0	1	1	6	15	13	16	14	4	3	3	3	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
	1987	64	0	0	0	0	0	0	0	0	2	1	13	12	25	13	12	9	10	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	1988	40	0	0	0	0	0	0	0	0	1	4	3	5	8	10	8	6	8	10	1	1	0	0	1	0	0	0	0	0	0	0	0	0
	1989	63	0	0	0	0	0	1	0	2	6	15	15	8	9	8	6	8	3	1	3	1	1	4	2	0	0	0	0	0	0	0	0	0
CPFV (Observer)	1987	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	2	3	2	5	3	3	2	2	5	0	1	0	0	0
	1988	21	0	0	0	0	0	0	0	0	0	0	1	2	2	0	1	3	4	6	6	8	16	4	5	10	2	2	4	0	1	2	1	0
	1989	21	0	0	0	0	0	0	0	0	0	0	0	1	1	2	3	8	2	8	8	3	8	7	8	4	4	4	1	1	0	1	0	0
	1990	6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3	1	1	1	1	1	0	0	1	0	1	0	0	0	0
	1991	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	2	1	2	1	0	1	1	3	1	0	0	0	0	0
	1992	16	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	6	1	5	4	2	2	2	2	0	1	0	0	1	0	0	0	0
	1993	12	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	2	4	6	3	3	1	3	2	2	0	1	0	0	0	0	0	0
	1994	16	0	0	0	0	0	0	0	0	0	0	0	0	2	0	6	7	2	4	5	4	4	1	0	2	2	0	0	1	0	1	0	0
	1995	18	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	6	3	7	3	6	1	2	3	0	1	0	1	0	0	0	0	0
	1996	31	0	0	0	0	0	0	0	0	1	0	0	1	6	14	10	11	13	10	8	7	7	7	6	3	0	1	0	1	1	0	0	0
	1997	30	0	0	0	0	0	0	0	0	0	1	0	0	0	1	5	16	6	9	6	1	9	1	0	2	0	1	0	1	0	0	0	0
	1998	23	0	0	0	0	0	0	0	0	0	0	1	0	1	1	3	7	6	8	2	5	4	2	1	0	0	0	0	0	0	0	0	0
CPFV (CalPOLY)	2003	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	1	2	0	1	2	1	1	0	0	0	0	0	0	0	0	0
	2004	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	0	3	1	3	0	5	2	2	3	0	0	0	0	0	0	0
	2005	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	0	0	0	1	1	0	0	0
	2006	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	3	0	0	0	0	0	0
	2007	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	1	1	1	1	0	0	0	0	0	0	0	0
	2008	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	2	0	0	0	1	0	0	0	0
CPFV (tagging)	2002	4	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2003	50	0	0	0	0	0	0	0	0	2	1	6	2	5	9	10	23	21	25	14	15	4	6	4	3	0	1	1	0	0	0	0	0
	2004	20	0	0	0	0	0	0	1	0	0	0	2	2	1	3	5	2	7	7	4	6	8	4	6	5	3	1	1	0	0	0	0	0
	2005	31	0	0	0	0	0	0	0	0	0	0	1	7	9	4	6	6	3	3	2	4	7	2	0	0	0	0	0	0	0	0	0	0

Table 9C (Continued). CAS

CAS			Length bin																															
Sector	Year	N	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68
CPFV (RecFIN)	1980	18	0	0	0	0	0	0	0	0	0	0	2	0	5	0	1	0	3	1	2	1	2	0	2	2	1	1	0	0	0	0	0	0
	1981	16	0	0	0	0	0	0	0	0	1	0	0	1	1	0	2	1	2	0	1	4	1	1	0	2	1	0	0	0	0	0	0	0
	1982	10	0	0	0	0	0	0	0	0	0	0	1	4	1	1	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0
	1983	22	0	0	0	0	0	0	0	0	1	1	1	0	2	5	4	0	3	0	0	1	1	1	0	0	0	1	0	1	0	0	1	0
	1984	8	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0
	1985	15	0	0	0	0	0	0	0	1	0	1	2	1	0	0	3	1	1	3	0	2	0	2	1	2	2	2	0	0	0	0	0	0
	1986	22	0	0	0	0	0	0	0	1	1	1	4	0	5	1	5	2	5	3	1	3	2	2	1	3	2	1	1	0	3	0	1	0
	1987	10	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	2	2	2	1	0	1	0	1	0	0	0	0	0	0	0
	1988	11	0	0	0	0	0	0	1	0	1	1	1	1	2	1	2	0	0	2	0	1	0	3	3	0	0	0	2	0	0	0	0	0
	1989	14	0	0	0	1	0	0	0	0	0	3	1	1	0	2	2	1	1	0	3	1	0	0	1	0	0	0	0	0	0	0	0	0
	1993	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	1994	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	2	0	0	1	0	3	1	0	0	0	0	0	0	0	0
	1996	27	0	0	0	0	0	0	0	1	2	0	1	1	3	6	4	2	5	1	4	3	4	3	2	1	1	3	0	1	0	0	0	0
	1997	32	0	0	0	0	0	0	0	0	0	1	0	1	2	2	5	16	6	8	5	1	9	1	0	2	0	1	0	1	0	0	0	0
	1998	37	0	0	0	0	0	0	0	0	0	0	1	0	1	3	5	11	7	10	2	6	6	2	1	2	0	0	0	0	0	0	0	0
	1999	14	0	0	0	0	0	0	0	0	0	0	2	0	1	0	1	0	0	1	1	0	3	2	1	0	0	0	1	1	0	0	0	0
	2000	15	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	1	3	1	0	2	2	3	1	1	1	0	0	0	0	0	0
	2001	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	9	8	11	4	12	11	7	3	5	2	0	0	0	0	0	0
	2002	12	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	1	6	3	1	2	1	0	0	0	0	1	1	0	0	0	0
	2003	41	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	2	10	11	12	14	17	6	13	5	3	3	2	1	1	0	0	0
	2004	37	0	0	0	0	0	0	0	0	0	0	1	1	0	2	3	1	3	6	7	5	8	6	6	2	2	1	1	0	0	0	1	0
	2005	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	7	6	10	6	8	11	5	1	3	3	0	1	3	0	0
	2006	49	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	9	6	10	8	8	11	6	6	5	1	3	1	0	0	0	0
	2007	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	8	6	11	3	12	9	6	7	5	4	5	0	2	0	0
	2008	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8	8	10	7	5	8	5	7	3	1	1	2	1	1	0	0

Table 9D (Continued). ORS

OREGON Sector	Year	N	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66
Commercial																																	
Non-live																																	
Females	2001	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	413	0	0	140	25	0	0	0	0	0
	2003	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	11	4	0	0	0	0	17	0	0	0	3
	2005	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Males	2001	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	400	671	0	0	0	0	0	0	0	0	0
	2003	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	0	54	86	0	0	0	0	22	0	0	0	0	0	0
	2007	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
	2008	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0
Unsexed	2000	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	117	31	0	164	3	87	0	0	14	0	0	0	0	0	0	0
	2001	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	101	0	0	0	0	0	0	40	0	0	0	0	0	0	0
	2002	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	16	11	0	0	0	0	0	0	0
	2003	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	399	176	149	271	61	225	141	0	5	0	0	5	23	0
	2004	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	184	0	0	0	0	3	0	0	0	0	14	0
	2005	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	7	0	0	0	0	0	0	0	0
	2006	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39	46	26	43	77	56	15	42	11	15	0	0	0	0	0
	2008	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
Live																																	
Females	1999	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	67	55	77	60	32	0	0	0	0	0	0	0
	2000	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	362	206	307	263	110	119	185	104	259	192	76	48	69	29	32	47
	2001	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	68	62	105	0	0	0	51	51	0	0	0	0	0	0	0	0	0
	2002	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	182	0	361	0	190	83	37	45	0	84	6	0	0	4	0	0
	2008	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	23	21	0	0	0
Males	1999	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	284	206	0	99	42	36	65	52	7	0	0	14	0	0	0
	2000	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1081	850	368	547	527	670	319	555	333	552	64	152	34	0	20	32
	2001	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	75	0	0	0	0	0	0	0	0	0	0	0	0	0
	2002	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	620	811	513	196	148	140	96	0	63	0	0	0	0	0	0	0
	2008	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	72	63	0	0	0	0	0	0	0	0	23
Unsexed	1998	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	506	1394	329	498	700	1048	151	291	166	163	0	61	0	0
	1999	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	94	77	37	62	56	0	23	0	0	0	0	0
	2000	75	0	0	0	0	0	0	0	0	0	0	0	0	0	192	1337	4462	4181	5534	7773	6290	5183	4614	2000	2018	1706	627	365	359	227	206	36
	2001	129	0	0	0	0	0	0	0	0	0	0	0	0	0	201	3460	11115	9058	13514	10543	11516	10382	7338	7737	6340	6824	4410	3323	1649	1780	461	425
	2002	164	0	0	0	0	0	0	0	0	0	0	0	0	45	75	640	16057	16778	18841	13315	9726	5949	5002	4824	2145	2152	1144	948	448	385	96	47
	2003	105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	92	0	917	7581	9380	9367	5463	3867	3334	1811	1178	832	774	338	314	101	54
	2004	142	0	0	0	0	0	0	0	0	0	0	0	0	0	98	327	68	1745	7490	6624	5519	4789	4237	2927	2286	2267	1533	1356	908	537	354	105
	2005	87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	77	178	8243	8254	6986	3796	2887	2295	1827	1046	992	640	426	346	204	137
	2006	128	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66	731	3121	2472	2707	2079	2224	2703	2637	2356	2211	1129	1015	738	381	166
	2007	127	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86	70	1315	3547	5577	3350	5404	4294	5166	6011	3670	5568	3649	3214	1881	1012	902
	2008	91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	84	1389	1811	2176	1992	1832	1234	802	967	1148	701	417	394	211	224

Columns 6–66 are length bins.

Table 9D (Continued). ORS

OREGON			Length bin																																
Sector	Year	N	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68
Recreational																																			
Shore	1980	44	1	0	0	0	1	2	0	1	3	2	8	7	7	3	8	7	4	1	1	1	3	1	2	0	0	2	0	0	1	0	0	0
	1981	28	0	0	0	0	0	0	1	2	0	2	4	0	6	5	9	4	0	1	1	2	0	0	1	0	1	0	0	0	0	0	0	0
	1982	27	0	0	0	0	0	1	0	3	2	2	4	4	6	4	4	2	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0
	1983	23	0	0	0	0	0	0	0	1	0	2	1	4	4	6	3	2	1	1	3	0	1	0	1	1	0	0	0	0	0	0	0	0
	1984	18	0	0	0	0	1	2	0	2	1	0	1	2	1	2	1	2	1	4	1	0	1	0	1	0	0	0	0	0	0	0	0	0
	1985	48	0	0	0	0	2	1	5	5	6	1	2	1	3	6	6	3	5	4	0	2	3	3	1	1	0	0	0	0	0	0	0	0
	1986	55	0	0	0	0	0	0	0	3	5	3	5	4	5	4	6	4	6	9	1	6	2	1	0	0	1	1	0	0	0	0	0	0
	1987	28	0	0	0	0	0	0	2	7	3	3	2	6	3	3	3	1	3	2	2	0	0	1	0	0	0	0	0	0	1	0	0	0
	1988	21	0	0	0	0	0	0	1	3	2	4	2	2	4	4	4	2	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	1989	16	0	0	0	0	0	1	0	0	0	1	2	1	7	4	0	0	0	0	2	0	0	1	0	1	1	0	0	0	0	0	0	0
	1993	42	0	0	0	0	0	2	2	3	4	3	6	3	5	9	9	6	2	1	0	1	1	3	1	0	1	0	0	0	0	1	0	0
	1994	49	0	0	0	1	0	1	5	1	2	5	8	3	1	10	8	1	1	0	2	1	1	0	1	0	0	0	0	0	0	0	0	0
	1996	23	0	0	0	0	0	0	0	1	2	1	0	0	4	3	4	1	3	4	1	3	0	0	0	0	0	0	0	0	0	0	0	0
	1997	30	0	0	0	0	0	0	1	2	3	3	2	4	4	8	3	2	0	1	2	0	0	1	0	0	0	0	0	0	0	0	0	0
	1998	6	0	0	0	0	0	0	0	0	1	2	1	1	2	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1999	8	0	0	0	0	0	0	1	0	0	0	1	0	1	1	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2000	13	0	0	0	0	0	0	0	0	0	1	2	2	4	0	2	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2001	9	0	0	1	0	0	0	0	0	1	0	1	2	1	2	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
	2002	15	0	0	0	0	0	0	1	0	1	0	0	2	2	1	4	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	2003	7	0	0	0	0	0	0	0	0	0	0	1	0	2	1	0	1	2	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0
	2004	12	0	0	0	0	0	0	1	0	0	0	1	2	1	2	1	2	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0
	2005	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	1	1	0	1	0	1	0	1	1	0	0	0	0	0	0
Boat	1980	24	0	0	0	0	0	0	0	0	0	0	0	2	0	1	1	0	1	0	2	1	1	2	2	1	3	3	5	1	0	0	0	1
	1981	24	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	1	0	0	0	4	4	4	2	2	1	5	4	0	2	2	1	0
	1982	36	0	0	0	0	0	1	0	0	1	0	0	0	0	1	1	1	1	4	7	10	1	3	4	5	2	4	2	3	0	2	1	0
	1983	19	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	2	1	3	2	0	3	6	1	1	0	3	1	0	0	1	0
	1984	35	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	1	0	8	5	5	7	8	5	3	6	2	2	4	1	1	0	0
	1985	48	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	2	5	8	3	9	5	5	10	8	8	9	5	6	1	0	1	0
	1986	35	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	1	5	1	2	0	4	8	13	10	9	6	2	3	1	1	0	0
	1987	47	0	0	0	0	0	0	0	0	3	1	0	0	2	1	0	3	4	2	7	6	10	6	18	14	6	9	6	3	3	2	0	1
	1988	91	0	0	0	0	0	0	0	0	0	2	3	3	2	3	4	5	6	7	8	9	19	14	10	13	11	19	4	5	3	0	2	1
	1989	36	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	2	10	3	4	10	9	4	7	5	9	1	0	3	1	0	1
	1993	69	0	0	0	0	0	0	0	1	0	0	0	0	0	1	2	3	5	7	6	15	11	5	13	3	8	6	4	3	2	0	2	1
	1994	85	0	0	0	0	0	0	0	0	0	1	0	0	1	2	6	3	1	2	7	6	12	7	6	11	8	3	4	3	1	1	0	0
	1996	47	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	3	7	5	2	8	7	5	3	7	2	7	1	1	2	1	2	0
	1997	79	0	0	0	0	0	0	0	0	0	0	0	0	1	2	8	9	4	10	13	5	14	20	17	15	14	7	3	2	0	4	0	0
	1998	115	0	0	0	0	0	0	0	0	0	0	0	1	0	3	12	5	13	11	16	21	23	14	15	21	14	10	5	4	1	1	2	0
	1999	122	0	0	0	0	0	0	0	0	0	0	0	0	2	2	8	6	5	13	17	11	17	27	18	16	13	6	5	7	9	3	1	1
	2000	79	0	0	0	0	0	0	0	0	0	0	0	0	2	4	5	7	6	8	12	12	12	11	12	18	17	5	4	3	3	0	2	0
	2001	61	0	0	0	0	0	0	0	0	0	0	1	0	4	2	3	9	7	8	13	10	8	8	5	5	7	3	3	1	4	0	0	0
	2002	73	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	8	11	13	11	10	14	19	10	7	10	7	9	3	0	1	0	1
	2003	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	1	2	1	0	4	1	1	0	0	0	0	0	0
	2004	481	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	39	69	106	95	128	125	118	111	76	58	34	17	15	11	3
	2005	696	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	6	28	57	87	137	141	211	223	172	132	98	46	55	28	19	11
	2006	779	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	4	40	58	125	132	152	175	215	189	166	116	72	57	32	22	13
	2007	534	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	37	82	88	116	116	143	150	140	116	89	94	56	34	20	16
	2008	711	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4	19	96	127	165	187	202	186	210	186	145	116	88	55	34	32	14

Table 10. Sample sizes and number of fish measured for all sub-stocks and fisheries. N is the number of trips (recreational modes) or clusters (commercial fisheries) and FISH is the number of fish actually measured. *Indicates expanded compositions. Recreational compositions came from RecFIN if not indicated otherwise.

A) NCS

Commercial

Non-live			
Year	N	FISH	FISH*
1995	71	186	3,639
1996	231	1,667	3,739
1997	102	745	5,766
1998	26	86	4,084
1999	8	31	2,398
2000	8	44	2,563

Live			
	N	FISH	FISH*
1997	16	138	13,248
1998	111	1,222	123,379
1999	174	1,417	71,145
2000	323	2,444	66,687
2001	156	1,062	40,625
2002	33	228	22,914
2003	9	55	5,966
2004	36	228	6,492
2005	28	112	5,340
2006	31	176	12,361
2007	50	275	3,434
2008	29	135	3,589

Recreational

	Man-Made		Shore		PBR		CPFV	
Year	N	FISH	N	FISH	N	FISH	N	FISH
1980	33	47	29	45	46	73	5	8
1981	27	44	28	51	27	57	2	4
1982	20	22	45	67	26	37	1	1
1983	24	35	53	109	29	46	3	4
1984	25	29	22	28	43	86		
1985	26	39	26	45	26	40	8	16
1986	28	34	30	61	51	75	9	33
1987	27	37	17	22	37	58	1	1
1988	24	46	5	5	25	41	6	14
1989	8	8	8	17	29	63	2	4
1993	20	30	40	67	85	147		
1994	5	6	15	24	40	61	3	8
1996	13	17	36	68	56	111	16	36
1997	4	7	26	62	16	22	28	57
1998	3	5	29	65	37	64	29	48
1999	4	6	19	41	46	65	9	9
2000	2	2	13	19	33	47	11	16
2001	7	20	8	9	22	44	24	74
2002	5	7	9	17	16	32	5	11
2003	4	4	4	11	62	96	34	97
2004	12	16	13	22	237	481	23	37
2005	18	25	10	14	439	868	37	62
2006	6	8	4	6	412	692	34	60
2007	11	11	4	4	303	532	40	61
2008	16	18	8	11	256	493	38	50

	CPFV (CDFG)	
Year	N	FISH
1987	4	32
1988	21	80
1989	21	74
1990	6	11
1991	13	18
1992	16	30
1993	12	32
1994	16	41
1995	18	37
1996	31	107
1997	30	59
1998	23	41

	CPFV (CalPOLY)	
	N	FISH
2003	11	13
2004	18	24
2005	5	7
2006	3	5
2007	3	7
2008	3	6

B) SCS

Commercial

Live		
Year	N	FISH*
2002	4	855
2003	2	1548
2005	1	624
2006	3	2720
2008	9	2334

Recreational

	Man-Made			Shore		PBR		CPFV	
Year	N	FISH		N	FISH	N	FISH	N	FISH
1980	7	7	#	6	11	60	174	13	15
1981	2	2	#	8	9	25	43	14	14
1982	4	4	#	5	7	24	45	9	9
1983	5	6	#	7	7	28	42	19	19
1984	8	10	#	8	8	34	53	8	8
1985	5	6	#	10	20	18	31	7	8
1986	1	1	#	12	22	20	40	13	16
1987	6	10	#	5	7	10	17	9	12
1988	1	1	#	2	2	9	14	5	8
1989	8	14	#	3	14	14	27	12	13
1993	1	1	#	2	3	10	15	2	2
1994			#			13	20	5	5
1996	2	3	#	2	3	11	21	11	13
1997			#	1	2	9	9	4	4
1998			#	5	10	10	22	8	9
1999	5	8	#	4	8	23	45	5	5
2000	2	10	#	2	4	6	9	4	4
2001			#	3	5	6	7	1	1
2002	1	1	#	2	3	18	22	7	8
2003	1	1	#	2	2	20	29	7	7
2004	4	4	#	4	4	76	116	14	19
2005	7	7	#	2	5	55	74	8	8
2006	6	7				75	112	15	16
2007	2	2				60	82	19	22
2008	5	5				46	57	17	19

	CPFV (CDFG)	
Year	N	FISH
1975	32	79
1976	63	96
1977	44	76
1978	51	101
1986	60	82
1987	64	101
1988	40	66
1989	63	93

	CPFV (GDRP)	
	N	FISH
2002	4	4
2003	50	152
2004	20	68
2005	31	54

Table 10 (Continued). Sample sizes and number of fish measured for all sub-stocks and fisheries. N is the number of trips (recreational) or clusters (commercial) and FISH is the number of fish actually measured. *Indicates expanded compositions. Recreational compositions came from RecFIN if not indicated otherwise.

C) CAS

Commercial

Non-live

Year	N	FISH	FISH*
1995	71	186	3,639
1996	231	1,667	3,739
1997	102	745	5,766
1998	26	86	4,084
1999	8	31	2,398
2000	8	44	2,563

Live

Year	N	FISH	FISH*
1997	16	138	13,248
1998	111	1,222	123,379
1999	174	1,417	71,145
2000	323	2,444	66,687
2001	156	1,062	40,625
2002	37	289	23,769
2003	11	83	7,514
2004	36	228	6,492
2005	29	128	5,964
2006	34	210	15,081
2007	50	275	3,434
2008	38	244	5,923

Recreational

	Man-Made		Shore		PBR		CPFV	
Year	N	FISH	N	FISH	N	FISH	N	FISH
1980	40	54	35	56	106	247	18	23
1981	29	46	36	60	52	100	16	18
1982	24	26	50	74	50	82	10	10
1983	29	41	60	116	57	88	22	23
1984	33	39	30	36	77	139	8	8
1985	31	45	36	65	44	71	15	24
1986	29	35	42	83	71	115	22	49
1987	33	47	22	29	47	75	10	13
1988	25	47	7	7	34	55	11	22
1989	16	22	11	31	43	90	14	17
1993	21	31	42	70	95	162	2	2
1994	5	6	15	24	53	81	8	13
1996	15	20	38	71	67	132	27	49
1997	4	7	27	64	25	31	32	61
1998	3	5	34	75	47	86	37	57
1999	9	14	23	49	69	110	14	14
2000	4	12	15	23	39	56	15	20
2001	7	20	11	14	28	51	25	75
2002	6	8	11	20	34	54	12	19
2003	5	5	6	13	82	125	41	104
2004	16	20	17	26	313	597	37	56
2005	25	32	12	19	494	942	45	70
2006	12	15	4	6	487	804	49	76
2007	13	13	4	4	363	614	59	84
2008	21	23	8	11	302	551	55	69

CPFV (CDFG)

Year	N	FISH
1975	32	79
1976	63	96
1977	44	76
1978	51	101
1986	60	82
1987	64	101
1988	40	66
1989	63	93
1987	4	32
1988	21	80
1989	21	74
1990	6	11
1991	13	18
1992	16	30
1993	12	32
1994	16	41
1995	18	37
1996	31	107
1997	30	59
1998	23	41

CPFV (CalPOLY)

Year	N	FISH
2003	11	13
2004	18	24
2005	5	7
2006	3	5
2007	3	7
2008	3	6

CPFV (GDRP)

Year	N	FISH
2002	4	4
2003	50	152
2004	20	68
2005	31	54

Table 10 (Continued). Sample sizes and number of fish measured for all sub-stocks and fisheries. N is the number of trips (recreational) or clusters (commercial) and FISH is the number of fish actually measured. *Indicates expanded compositions. Recreational compositions came from RecFIN if not indicated otherwise.

D) ORS

Commercial

	Non-live		
	Year	N	FISH*
Females	**2001**	2	578
	2003	3	61
	2005	1	3
Males	**2001**	1	1071
	2003	1	231
	2007	1	3
	2008	2	8
Unsexed	**2000**	4	416
	2001	1	141
	2002	2	43
	2003	5	1455
	2004	4	208
	2005	1	15
	2006	8	370
	2008	1	4
	Live		
	Year	N	FISH*
Females	**1999**	4	325
	2000	26	2444
	2001	3	337
	2002	6	992
	2008	1	92
Males	**1999**	5	805
	2000	32	6119
	2001	2	75
	2002	7	2587
	2008	3	158
Unsexed	**1998**	5	5382
	1999	1	349
	2000	75	47126
	2001	129	110873
	2002	164	98678
	2003	105	45427
	2004	142	43182
	2005	87	38421
	2006	128	26929
	2007	127	55154
	2008	91	15554

Recreational

	Shore		Boat	
Year	N	FISH	N	FISH
1980	44	66	24	29
1981	28	39	24	36
1982	27	36	36	55
1983	23	31	19	28
1984	18	23	35	63
1985	48	60	48	88
1986	55	66	35	70
1987	28	42	47	107
1988	21	31	91	155
1989	16	21	36	74
1993	42	63	69	106
1994	49	52	85	85
1996	23	27	47	65
1997	30	36	79	150
1998	6	9	115	192
1999	8	9	122	188
2000	13	14	79	143
2001	9	12	61	101
2002	15	16	73	137
2003	7	9	10	15
2004	12	13	481	1010
2005	4	9	696	1461
2006			779	1580
2007			534	1308
2008			711	1877

Table 11. Annual mean body weights of cabezon by fleet in NCS and SCS.

NCS								SCS							
Fleet	Year	Mean weight (kg)	CV	Fleet	Year	Mean weight (kg)	CV	Fleet	Year	Mean weight (kg)	CV	Fleet	Year	Mean weight (kg)	CV
Man made	1980	0.83	1.45	PBR	1980	1.74	0.50	Man made	1980	0.48	0.56	PBR	1980	1.41	0.55
	1981	0.71	0.80		1981	2.35	0.96		1981	0.40	0.71		1981	1.36	0.57
	1982	0.73	0.83		1982	1.74	0.45		1982	0.48	0.32		1982	1.13	0.63
	1983	0.75	0.81		1983	1.81	0.49		1983	0.58	0.72		1983	0.85	0.60
	1984	1.12	0.85		1984	1.53	0.44		1984	0.43	0.61		1984	1.10	0.48
	1985	0.56	0.98		1985	1.73	0.43		1987	0.84	0.60		1985	1.24	0.82
	1986	0.91	0.83		1986	1.49	0.48		1989	0.89	0.92		1986	0.88	0.73
	1987	0.78	0.83		1987	1.51	0.49		1996	0.44	0.32		1987	1.15	0.71
	1988	1.27	0.91		1988	1.58	0.52		1999	0.31	0.60		1988	0.79	0.41
	1989	0.63	0.71		1989	1.45	0.60		2000	0.07	1.45		1989	1.18	0.61
	1993	0.55	0.98		1993	1.36	0.52		2004	1.00	0.85		1993	0.53	0.39
	1994	0.94	0.67		1994	1.38	0.65		2005	0.80	0.96		1994	1.14	0.52
	1995	0.29	0.41		1995	1.53	0.68		2006	0.78	0.51		1995	0.59	0.43
	1996	0.54	0.72		1996	1.47	0.60		2007	0.58	0.18		1996	0.97	1.03
	1997	0.74	0.89		1997	1.05	0.44		2008	1.03	0.90		1997	1.21	0.70
	1998	0.69	0.62		1998	1.56	0.50	Shore	1980	1.22	0.59		1998	0.78	0.39
	1999	0.23	1.20		1999	1.44	0.40		1981	0.80	0.56		1999	0.97	0.66
	2000	0.54	0.10		2000	1.66	0.33		1982	0.83	0.59		2000	1.00	1.00
	2001	1.11	0.57		2001	1.83	0.34		1983	0.76	0.61		2001	0.58	0.32
	2002	0.35	0.71		2002	2.01	0.59		1984	0.91	0.25		2002	0.87	0.64
	2003	1.11	0.90		2003	1.86	0.39		1985	0.82	0.56		2003	1.03	0.49
	2004	1.06	0.98		2004	2.31	0.49		1986	0.93	0.88		2004	1.36	0.84
	2005	1.20	0.72		2005	2.36	0.42		1987	1.13	0.61		2005	1.28	0.70
	2006	0.66	0.74		2006	2.12	0.44		1988	1.20	0.59		2006	1.25	0.55
	2007	1.66	0.99		2007	2.24	0.42		1989	1.49	0.61		2007	1.35	0.59
	2008	0.62	0.95		2008	2.10	0.48		1993	0.98	0.62		2008	1.30	0.56
Shore	1958	0.41	0.20	CPFV	1947	2.27	0.50		1995	0.49	0.68	CPFV	1980	1.03	0.65
	1960	0.41	0.20		1948	2.27	0.50		1996	0.58	0.22		1981	1.09	0.54
	1961	0.41	0.20		1949	2.27	0.50		1997	0.37	0.06		1982	0.78	0.92
	1980	1.16	0.84		1950	2.27	0.50		1998	0.99	0.44		1983	0.82	0.73
	1981	0.80	0.52		1951	2.27	0.50		1999	0.73	0.50		1984	1.10	0.52
	1982	1.10	0.77		1960	2.42	0.50		2000	0.71	0.73		1985	0.55	0.55
	1983	0.98	0.55		1980	1.81	0.35		2001	0.96	0.39		1986	0.59	0.38
	1984	1.02	0.64		1981	1.85	0.33		2002	1.44	0.75		1987	1.24	0.47
	1985	0.71	0.63		1983	2.70	0.50		2005	0.83	0.49		1988	0.50	0.62
	1986	1.04	0.57		1985	1.70	0.45						1989	0.71	0.73
	1987	0.67	0.77		1986	2.05	0.93						1993	0.85	0.90
	1988	0.74	0.74		1988	1.85	0.69						1994	1.23	0.49
	1989	0.98	1.11		1989	1.13	0.32						1995	0.38	0.28
	1993	1.06	0.68		1994	1.53	0.42						1996	0.68	0.55
	1994	1.00	0.78		1995	2.79	0.27						1997	0.68	0.41
	1995	1.06	0.69		1996	1.77	0.72						1998	1.28	0.59
	1996	0.97	0.47		1999	2.11	0.10						1999	0.49	0.51
	1997	1.15	0.50		2000	2.12	0.47						2000	0.62	0.28
	1998	1.14	0.44		2001	1.21	0.32						2002	1.39	0.97
	1999	0.86	0.47		2003	2.38	0.54						2003	2.00	0.75
	2000	0.95	0.68		2004	2.23	0.20						2004	2.03	0.52
	2001	0.96	0.48		2005	2.66	0.30						2005	1.42	0.27
	2002	1.22	0.58		2006	2.59	0.45						2006	1.52	0.50
	2003	1.62	0.49		2007	2.29	0.38						2007	2.42	0.52
	2004	2.04	0.40		2008	2.33	0.44						2008	2.22	0.52
	2005	1.56	0.62												
	2006	1.89	0.63												
	2007	1.40	0.21												
	2008	1.37	0.25												

Table 11 (Continued). Annual mean body weights of cabezon by fleet in CAS and ORS.

California								Oregon			
Fleet	Year	Mean weight (kg)	CV	Fleet	Year	Mean weight (kg)	CV	Fleet	Year	Mean weight (kg)	CV
Man made	1980	0.77	1.44	PBR	1980	1.50	0.54	SHORE	1980	0.81	0.97
	1981	0.69	0.81		1981	1.93	0.95		1981	0.71	0.75
	1982	0.69	0.82		1982	1.40	0.57		1982	0.51	0.73
	1983	0.72	0.81		1983	1.35	0.65		1983	0.75	0.67
	1984	0.96	0.92		1984	1.37	0.48		1984	0.70	0.75
	1985	0.54	0.98		1985	1.51	0.59		1985	0.73	0.79
	1986	0.89	0.84		1986	1.28	0.58		1986	0.83	0.68
	1987	0.79	0.78		1987	1.43	0.54		1987	0.55	1.19
	1988	1.25	0.92		1988	1.38	0.58		1988	0.48	0.67
	1989	0.79	0.88		1989	1.37	0.61		1989	0.78	0.89
	1993	0.54	0.99		1993	1.30	0.55		1993	0.73	1.05
	1994	0.94	0.67		1994	1.35	0.64		1994	0.54	0.69
	1995	0.29	0.41		1995	1.47	0.71		1995	0.64	0.59
	1996	0.52	0.68		1996	1.40	0.65		1996	0.79	0.52
	1997	0.74	0.89		1997	1.09	0.52		1997	0.58	0.68
	1998	0.69	0.62		1998	1.35	0.57		1998	0.54	0.65
	1999	0.29	0.70		1999	1.27	0.50		1999	0.64	0.44
	2000	0.15	1.40		2000	1.52	0.46		2000	0.53	0.44
	2001	1.11	0.57		2001	1.64	0.45		2001	0.75	0.82
	2002	0.35	0.71		2002	1.48	0.74		2002	0.70	0.37
	2003	1.04	0.69		2003	1.62	0.48		2003	1.30	0.81
	2004	1.05	0.92		2004	2.17	0.54		2004	0.80	0.65
	2005	1.12	0.76		2005	2.27	0.45		2005	1.73	0.51
	2006	0.72	0.59		2006	1.94	0.49	BOAT	1980	2.83	0.60
	2007	1.42	1.06		2007	2.11	0.46		1981	2.45	0.50
	2008	0.70	0.93		2008	2.01	0.51		1982	2.31	0.65
Shore	1980	1.17	0.78	CPFV	1980	1.29	0.58		1983	2.01	0.58
	1981	0.80	0.52		1981	1.26	0.53		1984	1.86	0.45
	1982	1.07	0.77		1982	1.04	1.03		1985	2.02	0.43
	1983	0.96	0.55		1983	1.14	0.90		1986	2.14	0.37
	1984	1.00	0.58		1984	1.10	0.52		1987	2.03	0.46
	1985	0.75	0.60		1985	1.32	0.64		1988	1.95	0.53
	1986	1.01	0.65		1986	1.57	1.08		1989	1.95	0.45
	1987	0.79	0.74		1987	1.26	0.45		1993	2.55	0.60
	1988	0.87	0.66		1988	1.36	0.90		1994	2.32	0.53
	1989	1.21	0.85		1989	0.81	0.62		1995	2.16	0.49
	1993	1.05	0.68		1993	0.85	0.90		1996	2.13	0.51
	1994	1.00	0.78		1994	1.42	0.44		1997	2.28	0.54
	1995	0.99	0.73		1995	2.31	0.52		1998	2.12	0.49
	1996	0.95	0.47		1996	1.53	0.80		1999	2.31	0.48
	1997	1.12	0.52		1997	0.68	0.41		2000	2.12	0.48
	1998	1.12	0.44		1998	1.25	0.57		2001	1.96	0.57
	1999	0.84	0.47		1999	1.30	0.70		2002	2.21	0.49
	2000	0.91	0.69		2000	1.52	0.71		2003	1.83	0.37
	2001	0.96	0.44		2001	1.14	0.35		2004	2.58	0.38
	2002	1.24	0.58		2002	1.39	0.97		2005	2.79	0.37
	2003	1.51	0.52		2003	2.32	0.56		2006	2.77	0.37
	2004	1.95	0.45		2004	2.10	0.41		2007	2.80	0.40
	2005	1.36	0.67		2005	2.28	0.40		2008	2.56	0.42
	2006	1.89	0.63		2006	1.75	0.54				
	2007	1.40	0.21		2007	2.36	0.46				
	2008	1.37	0.25		2008	2.29	0.46				

Table 12. Summary statistics for the data sources that were considered as the basis for abundance indices. Gray bars indicate data sources not included in the base case models.

Area	Data Source	Years	# Observations	# Positives	% Positive
ORS	ORBS	2001-2008	1529	1306	85.42%
CAS	CPFV Logbook CPUE	1960-2008	34570	12826	37.10%
	PISCO Adult survey	1999-2008	7305	383	5.24%
NCS	CPFV Logbook CPUE	1960-2008	20016	7359	36.77%
	TENERA Adult Survey	1977-2008	112	106	94.64%
	PISCO Adult survey	1999-2008	5779	367	6.35%
	PISCO SMURFS	1999-2008	4283	628	14.66%
	SLO SMURFS	2006-2008	294	76	25.85%
SCS	CPFV Logbook CPUE	1960-2008	14549	5462	37.54%
	PISCO Adult survey	1999-2008	1526	16	1.05%
	CalCOFI manta tow	1978,1980,1981, 1984-2008	8757	668	7.63%
	SoCal Edison Impingement	1972-2008	6967	1011	14.51%

Table 13. Model selection using AIC values for the different models considered when developing potential indices of abundance for each cabezon sub-stock.

NSC			
	Binomial	Lognormal	Gamma
Model	AIC	AIC	AIC
NCS CPFV			
Yr	21097	-41134	-39331
Yr+Loc	20305	-42193	-40530
Yr+Mo	20844	-41305	-39724
Yr+Mo+Loc	*19962*	*-42419*	-40883
TENERA			
Yr	74	55	46
Year + Mo	*84*	40	*38*
SMURFS			
Yr	329	229	241
Yr+Mo	240	227	235
Yr+St	306	223	230
Yr+SM	331	233	246
Yr+Kp	330	230	240
Yr+Mo+St	216	217	224
Yr+Mo+SM	238	230	240
Yr+Mo+Kp	235	228	235
Yr+St+SM	307	228	236
Yr+St+Kp	307	225	232
Yr+SM+Kp	332	234	245
Yr+Mo+St+SM	212	221	229
Yr+Mo+St+Kp	*212*	*219*	225
Yr+Mo+SM+Kp	232	232	239
Yr+St+SM+Kp	308	230	238
YR+Mo+St+SM+Kp	207	223	231
PISCO ADULTS			
Yr	*2728*	*-126*	-43
Yr+St	2604	-67	-17
Yr+Rs	2727	-125	-41
Yr+St+Rs	2603	-65	NA
PISCO SMURFS			
Yr	3250	-552	-447
Yr+Mo	3060	-556	-463
Yr+St	3248	-558	-456
Yr+Lv	3250	-549	-449
Yr+Mo+St	*3048*	*-562*	-472
Yr+Mo+Lv	3061	-555	-468
Yr+St+Lv	3247	-555	-457
Yr+Mo+St+Lv	3048	-561	-475

SCS			
	Binomial	Lognormal	Gamma
Model	AIC	AIC	AIC
SCS CPFV			
Yr	15416	-39359	-37549
Yr+Loc	14961	-40205	-38643
Yr+Mo	14864	-39509	-37847
Yr+Mo+Loc	*14355*	*-40395*	-38954
CalCOFI			
Yr	4593	-2130	# -1782
Yr+Mo	4098	-2148	-1840
Yr+St	3848	-2110	-1900
Yr+D/N	4399	-2151	-1820
Yr+Mo+St	3324	-2126	-1942
Yr+Mo+D/N	3897	-2175	-1885
Yr+St+D/N	3652	-2140	-1949
Yr+Mo+St+D/N	*3112*	-2162	*-1994*
SoCAL Edison Impingement			
Yr	5353	-10135	-9984
Yr+Mo	5348	-10142	-10002
Yr+Su	4098	-10143	-9984
Yr+Mo+Su	*4087*	*-10152*	-10002
PISCO ADULTS			
Yr	*164*	*2*	4
Yr+St	78	8	9
Yr+Rs	156	4	6

CAS			
	Binomial	Lognormal	Gamma
Model	AIC	AIC	AIC
CA CPFV			
Yr	36770	-79689	NA
Yr+Loc	35534	-81948	NA
Yr+Mo	36084	-79944	NA
Yr+Mo+Loc	*34655*	*-82309*	NA
PISCO ADULTS			
Yr	*2987*	*-136*	NA
Yr+St	2731	-68	NA
Yr+Rs	2987	-134	NA
Yr+St+Rs	2730	-66	NA

ORS			
	Binomial	Lognormal	Gamma
Model	AIC	AIC	AIC
ORBS			
Yr	1269	-3062	-2819
Yr+Mo	1228	-3060	-2852
Yr+Pt	905	-3451	-3424
Yr+Mo+Pt	*763*	-3487	*-3546*

Factor names

Kp: Kelp coverage	SM: SMURF
Lv: Level	St: Station
Loc: Location	Su: Survey
Mo: Month	Yr: Year
Pt: Port	
Rs: Reserve site	

Table 14. Fishery-dependent abundance indices considered in the 2009 cabezon stock assessment for the NCS. The CVs are derived from a bootstrap procedure. The +CV column refers to the inflated CVs used in the model fit.

	Fishery Dependent																	
	Northern California CPFV									CDFG hook-&-line			PSMFC dockside			PSMFC observer		
Year	Index	CV	+CV	Index	CV	+CV	Index	CV	+CV	Index	CV	+CV	Index	CV	+CV	Index	CV	+CV
1960	0.011	0.13	0.41				0.011	0.14	0.43									
1961	0.010	0.13	0.41				0.010	0.13	0.42									
1962	0.012	0.15	0.43				0.012	0.16	0.45									
1963	0.019	0.15	0.42				0.019	0.15	0.44									
1964	0.019	0.14	0.42				0.020	0.14	0.44									
1965	0.023	0.13	0.40				0.023	0.12	0.42									
1966	0.023	0.14	0.41				0.023	0.13	0.42									
1967	0.013	0.13	0.41				0.014	0.13	0.42									
1968	0.008	0.14	0.42				0.008	0.14	0.43									
1969	0.007	0.15	0.43				0.007	0.16	0.45									
1970	0.011	0.14	0.41				0.011	0.13	0.43									
1971	0.008	0.14	0.42				0.008	0.13	0.42									
1972	0.015	0.11	0.39				0.015	0.11	0.40									
1973	0.013	0.11	0.39				0.013	0.11	0.40									
1974	0.012	0.11	0.39				0.012	0.11	0.40									
1975	0.007	0.11	0.39				0.007	0.11	0.40									
1976	0.009	0.12	0.40				0.009	0.11	0.41									
1977	0.008	0.14	0.41				0.009	0.13	0.43									
1978	0.016	0.12	0.39				0.016	0.11	0.40	0.32	0.89	0.89						
1979										1.17	0.03	0.03						
1980	0.012	0.12	0.40				0.012	0.12	0.41	0.37	0.58	0.58	0.0048	0.22	0.22			
1981	0.007	0.14	0.41				0.007	0.13	0.42	0.09	0.68	0.68	0.0046	0.29	0.29			
1982	0.006	0.14	0.42				0.006	0.14	0.43				0.0044	0.60	0.60			
1983	0.006	0.14	0.42				0.006	0.14	0.43				0.0024	0.25	0.25			
1984	0.003	0.15	0.43				0.003	0.14	0.44				0.0020	0.23	0.23			
1985	0.002	0.17	0.45				0.002	0.16	0.46				0.0014	0.31	0.31			
1986	0.004	0.20	0.47				0.004	0.19	0.48				0.0026	0.26	0.26			
1987	0.007	0.15	0.43				0.007	0.14	0.43				0.0031	0.24	0.24			
1988	0.008	0.14	0.42				0.008	0.14	0.43				0.0022	0.27	0.27			
1989	0.007	0.16	0.44				0.007	0.15	0.44				0.0032	0.31	0.31			
1990	0.005	0.12	0.40				0.005	0.12	0.41									
1991	0.004	0.16	0.44				0.004	0.14	0.44									
1992	0.006	0.15	0.42				0.006	0.14	0.43									
1993	0.004	0.15	0.43				0.004	0.15	0.44				0.0035	0.19	0.19			
1994	0.002	0.19	0.47				0.002	0.19	0.49				0.0032	0.20	0.20			
1995	0.002	0.18	0.46				0.002	0.17	0.47	0.02	0.58	0.58	0.0055	0.20	0.20			
1996	0.004	0.16	0.44				0.004	0.16	0.45	0.24	0.56	0.56	0.0043	0.16	0.16			
1997	0.005	0.14	0.42				0.004	0.14	0.43	0.04	0.77	0.77	0.0043	0.20	0.20			
1998	0.004	0.15	0.43				0.004	0.15	0.45	0.04	0.65	0.65	0.0038	0.18	0.18			
1999	0.005	0.16	0.44				0.005	0.14	0.44				0.0018	0.18	0.18	0.0019	0.76	0.76
2000				0.002	0.19	0.56	0.003	0.17	0.46				0.0029	0.21	0.21	0.0067	0.61	0.61
2001				0.004	0.18	0.55	0.007	0.16	0.46				0.0085	0.17	0.17	0.0348	0.47	0.47
2002				0.002	0.24	0.61	0.003	0.21	0.51				0.0016	0.24	0.24	0.0299	0.51	0.51
2003				0.007	0.15	0.52	0.012	0.13	0.42				0.0051	0.16	0.16	0.0217	0.49	0.49
2004				0.006	0.16	0.53	0.009	0.13	0.43				0.0033	0.17	0.17	0.0089	0.52	0.52
2005				0.006	0.17	0.54	0.010	0.13	0.42				0.0046	0.14	0.14	0.0124	0.47	0.47
2006				0.003	0.18	0.55	0.005	0.14	0.44				0.0028	0.15	0.15	0.0152	0.48	0.48
2007				0.003	0.19	0.56	0.006	0.15	0.45				0.0025	0.16	0.16	0.0129	0.43	0.43
2008				0.004	0.18	0.55	0.007	0.14	0.44									

Table 14 (Continued). Fishery-independent abundance indices considered in the 2009 cabezon stock assessment for the NCS. The CVs are derived from a bootstrap procedure. The +CV column refers to the inflated CVs used in the model fit.

	Fishery Independent											
	TENERA_adult			PISCO_adult			PISCO_smurf			SLO_smurf		
Year	Index	CV	+CV	Index	CV	+CV	Index	CV	+CV	Index	CV	+CV
1960												
1961												
1962												
1963												
1964												
1965												
1966												
1967												
1968												
1969												
1970												
1971												
1972												
1973												
1974												
1975												
1976												
1977	0.63	0.31	1.06									
1978	0.93	0.66	1.41									
1979	0.89	0.18	0.93									
1980	0.78	0.44	1.19									
1981	0.54	0.53	1.28									
1982	0.78	0.54	1.29									
1983	0.52	0.56	1.30									
1984	0.25	0.79	1.54									
1985	0.53	0.49	1.24									
1986	1.61	0.52	1.27									
1987	0.79	0.69	1.44									
1988	0.98	0.40	1.15									
1989	0.91	0.36	1.11									
1990	0.85	0.39	1.14									
1991	1.11	0.27	1.01									
1992	0.67	0.43	1.18									
1993	0.36	1.04	1.78									
1994	0.30	0.18	0.93									
1995	0.38	0.53	1.28									
1996	0.33	1.02	1.77									
1997	0.54	0.38	1.13									
1998												
1999	0.00	1.83	2.58	0.09	0.26	0.60	0.02	0.34	0.81			
2000	0.26	0.33	1.07	0.07	0.29	0.63	0.03	0.20	0.67			
2001	0.27	0.44	1.19	0.10	0.25	0.59	0.17	0.22	0.69			
2002	0.23	0.22	0.97	0.06	0.22	0.56	0.03	0.21	0.68			
2003	0.34	0.25	1.00	0.11	0.11	0.45	0.06	0.23	0.70			
2004	0.50	0.29	1.04	0.06	0.17	0.52	0.02	0.23	0.70			
2005	0.32	0.18	0.92	0.06	0.18	0.52	0.01	0.30	0.76			
2006	0.49	0.35	1.10	0.05	0.17	0.52	0.02	0.23	0.70	0.28	0.44	1.24
2007	0.17	0.45	1.19	0.06	0.13	0.47	0.02	0.24	0.71	0.28	0.51	1.30
2008	0.35	0.24	0.98	0.06	0.12	0.46	0.02	0.25	0.72	1.18	0.30	1.09

Table 15. Fishery-dependent and -independent abundance indices considered in the 2009 cabezon stock assessment for the SCS. The CVs are derived from a bootstrap procedure. The +CV column refers to the inflated CVs used in the model fit.

	Fishery Dependent									Fishery Independent								
	Southern California CPFV									CalCOFI			Impingement			PISCO_adult		
Year	Index	CV	+CV	Index	CV	+CV	Index	CV	+CV	Index	CV	+CV	Index	CV	+CV	Index	CV	+CV
1960	0.000	0.28	0.56				0.000	0.28	0.57									
1961	0.001	0.22	0.50				0.001	0.22	0.51									
1962	0.003	0.16	0.44				0.003	0.16	0.46									
1963	0.005	0.16	0.44				0.006	0.17	0.46									
1964	0.005	0.15	0.44				0.005	0.14	0.43									
1965	0.003	0.14	0.42				0.004	0.13	0.42									
1966	0.005	0.13	0.41				0.006	0.13	0.43									
1967	0.003	0.12	0.40				0.003	0.12	0.41									
1968	0.002	0.14	0.42				0.002	0.13	0.43									
1969	0.002	0.15	0.43				0.002	0.15	0.44									
1970	0.002	0.13	0.41				0.002	0.13	0.42									
1971	0.002	0.14	0.42				0.003	0.15	0.44									
1972	0.005	0.13	0.41				0.006	0.14	0.43				0.001	0.34	0.89			
1973	0.003	0.14	0.42				0.003	0.13	0.43				0.002	0.28	0.83			
1974	0.003	0.14	0.42				0.004	0.14	0.43				0.001	0.21	0.76			
1975	0.004	0.13	0.41				0.005	0.12	0.41				0.002	0.13	0.68			
1976	0.002	0.12	0.40				0.003	0.12	0.42				0.002	0.13	0.68			
1977	0.002	0.13	0.41				0.002	0.13	0.42				0.001	0.23	0.78			
1978	0.002	0.13	0.41				0.002	0.13	0.42	0.016	0.72	1.73	0.001	0.19	0.74			
1979													0.000	0.22	0.77			
1980	0.002	0.12	0.41				0.002	0.12	0.41	0.004	1.53	2.54	0.001	0.17	0.72			
1981	0.002	0.12	0.40				0.002	0.12	0.41	0.002	0.35	1.37	0.001	0.22	0.78			
1982	0.001	0.13	0.41				0.001	0.14	0.43				0.001	0.27	0.83			
1983	0.001	0.16	0.44				0.001	0.15	0.45	0.001	0.86	1.88	0.000	0.25	0.80			
1984	0.000	0.19	0.47				0.000	0.19	0.48	0.002	0.39	1.40	0.001	0.23	0.78			
1985	0.001	0.16	0.44				0.001	0.17	0.46	0.004	0.43	1.44	0.001	0.20	0.75			
1986	0.002	0.15	0.43				0.003	0.15	0.44	0.002	0.45	1.47	0.000	0.21	0.76			
1987	0.004	0.12	0.40				0.004	0.11	0.40	0.001	0.61	1.63	0.001	0.20	0.76			
1988	0.003	0.13	0.41				0.004	0.13	0.42	0.002	0.55	1.57	0.000	0.39	0.94			
1989	0.004	0.12	0.40				0.005	0.11	0.41	0.005	0.47	1.49	0.001	0.26	0.82			
1990	0.005	0.11	0.39				0.006	0.11	0.40	0.001	0.60	1.62	0.000	0.28	0.83			
1991	0.003	0.12	0.40				0.004	0.11	0.41	0.002	0.60	1.61	0.000	0.24	0.79			
1992	0.002	0.12	0.40				0.002	0.11	0.40	0.001	0.79	1.81	0.000	0.23	0.78			
1993	0.001	0.14	0.42				0.001	0.15	0.44	0.000	0.51	1.53	0.000	0.36	0.91			
1994	0.001	0.22	0.50				0.001	0.22	0.51	0.000	0.87	1.88	0.000	0.35	0.90			
1995	0.001	0.15	0.44				0.001	0.16	0.45	0.003	0.52	1.54	0.000	0.48	1.03			
1996	0.002	0.12	0.40				0.002	0.11	0.40	0.003	0.45	1.47	0.000	0.48	1.03			
1997	0.002	0.10	0.38				0.002	0.11	0.40	0.002	0.41	1.42	0.000	0.34	0.89			
1998	0.001	0.17	0.45				0.001	0.16	0.46	0.000	0.51	1.52	0.000	0.42	0.97			
1999	0.001	0.20	0.48				0.001	0.20	0.49	0.003	0.41	1.43	0.001	0.20	0.75			
2000				0.001	0.18	0.61	0.001	0.18	0.47	0.002	0.53	1.55	0.000	0.39	0.94	0.04	0.71	1.99
2001				0.001	0.20	0.63	0.001	0.15	0.44	0.001	0.49	1.50	0.000	0.57	1.13			
2002				0.000	0.24	0.68	0.001	0.23	0.52	0.004	0.40	1.42	0.001	0.40	0.95			
2003				0.001	0.27	0.71	0.001	0.23	0.53	0.007	0.46	1.48	0.001	0.49	1.04	0.02	0.71	1.99
2004				0.001	0.23	0.66	0.001	0.19	0.49	0.003	0.53	1.54	0.000	0.63	1.18	0.03	0.57	1.86
2005				0.000	0.23	0.66	0.000	0.23	0.53	0.002	0.40	1.41	0.000	0.66	1.21	0.01	0.71	1.99
2006				0.001	0.20	0.63	0.001	0.17	0.46	0.006	0.36	1.38	0.000	0.78	1.33	0.02	0.52	1.80
2007				0.001	0.21	0.65	0.001	0.19	0.48	0.002	0.46	1.48	0.000	0.60	1.15			
2008				0.001	0.21	0.64	0.001	0.19	0.48	0.005	0.59	1.61	0.001	0.51	1.06	0.01	0.71	1.99

Table 16. Fishery-dependent and -independent abundance indices considered in the 2009 cabezon stock assessment for the state-wide California and Oregon sub-stocks. The CVs are derived from a bootstrap procedure. The +CV column refers to the inflated CVs used in the model fit.

	Fishery Dependent									Fishery Independent			OREGON		
	California CPFV									PISCO_adult			ORBS		
Year	Index	CV	+CV	Index	CV	+CV	Index	CV	+CV	Index	CV	+CV	Index	CV	+CV
1960	0.004	0.13	0.33				0.004	0.13	0.33						
1961	0.004	0.12	0.32				0.004	0.11	0.31						
1962	0.006	0.12	0.32				0.006	0.11	0.31						
1963	0.010	0.11	0.31				0.010	0.11	0.31						
1964	0.010	0.11	0.31				0.010	0.09	0.30						
1965	0.010	0.10	0.30				0.010	0.09	0.30						
1966	0.011	0.09	0.29				0.012	0.09	0.29						
1967	0.006	0.09	0.29				0.007	0.09	0.29						
1968	0.004	0.10	0.30				0.004	0.09	0.29						
1969	0.004	0.12	0.32				0.004	0.11	0.31						
1970	0.005	0.10	0.30				0.005	0.09	0.29						
1971	0.004	0.10	0.30				0.005	0.10	0.30						
1972	0.009	0.09	0.29				0.009	0.09	0.29						
1973	0.006	0.09	0.29				0.006	0.08	0.28						
1974	0.006	0.09	0.29				0.006	0.09	0.29						
1975	0.005	0.09	0.29				0.005	0.09	0.29						
1976	0.005	0.09	0.29				0.005	0.08	0.28						
1977	0.004	0.09	0.29				0.004	0.09	0.29						
1978	0.007	0.09	0.29				0.007	0.09	0.29						
1979															
1980	0.005	0.09	0.29				0.005	0.09	0.29						
1981	0.004	0.09	0.29				0.004	0.10	0.30						
1982	0.003	0.10	0.30				0.003	0.10	0.30						
1983	0.003	0.11	0.31				0.003	0.10	0.30						
1984	0.001	0.12	0.32				0.001	0.11	0.32						
1985	0.001	0.12	0.32				0.001	0.12	0.32						
1986	0.003	0.12	0.32				0.003	0.12	0.32						
1987	0.005	0.09	0.29				0.005	0.09	0.29						
1988	0.005	0.09	0.29				0.005	0.09	0.29						
1989	0.005	0.10	0.30				0.005	0.08	0.29						
1990	0.005	0.08	0.28				0.005	0.09	0.29						
1991	0.004	0.09	0.29				0.004	0.09	0.29						
1992	0.003	0.09	0.29				0.003	0.09	0.29						
1993	0.002	0.11	0.31				0.002	0.11	0.31						
1994	0.001	0.14	0.34				0.001	0.15	0.35						
1995	0.001	0.11	0.31				0.001	0.11	0.31						
1996	0.003	0.09	0.29				0.003	0.09	0.29						
1997	0.003	0.09	0.29				0.003	0.08	0.28						
1998	0.002	0.11	0.31				0.002	0.10	0.30						
1999	0.002	0.13	0.33				0.002	0.12	0.32	0.07	0.26	0.51			
2000				0.001	0.13	0.40	0.002	0.12	0.32	0.06	0.26	0.52			
2001				0.002	0.14	0.41	0.003	0.12	0.32	0.08	0.25	0.51	0.08	0.20	0.40
2002				0.001	0.18	0.46	0.001	0.16	0.36	0.04	0.22	0.47	0.13	0.14	0.34
2003				0.002	0.12	0.40	0.004	0.12	0.32	0.10	0.11	0.36	0.13	0.12	0.32
2004				0.002	0.13	0.40	0.003	0.11	0.31	0.05	0.17	0.42	0.17	0.13	0.33
2005				0.002	0.13	0.40	0.003	0.12	0.32	0.04	0.18	0.43	0.17	0.09	0.29
2006				0.002	0.13	0.41	0.002	0.11	0.31	0.05	0.17	0.42	0.13	0.10	0.30
2007				0.002	0.14	0.41	0.002	0.11	0.31	0.05	0.13	0.38	0.16	0.12	0.32
2008				0.002	0.14	0.41	0.002	0.12	0.32	0.05	0.12	0.37	0.16	0.10	0.30

Table 17. Input variables and parameters of the population dynamics model for NCS and SCS. The base-case values are given for those parameters that are pre-specified. An X indicates the parameter is estimated. Prior distributions for the parameters are listed in the SS3 control files (Appendices C-2 and D-2).

	NCS				SCS			
			Blocking				Blocking	
Parameter	Pre-specified in Base Case	Estimated in Base Case	1999-2008	2000-2008*	Pre-specified in Base Case	Estimated in Base Case	1999-2008	2000-2008
Age at minimum length (L_{min})	0				0			
Age at maximum length (L_{max})	L_{inf}				L_{inf}			
Natural Mortality (*M*)	0.25(F)/0.3(M)				0.25(F)/0.3(M)			
Minimum Length (L_{min})		X			12.42(F)/11.67(M)			
Maximum Length (L_{max})		X			64(F)/43.5(M)			
Growth rate (k)		X			0.13(F)/0.23(M)			
Length at age 0 CV		X			0.16(F)/0.33(M)			
Length at age L_{inf} CV		X			0.12(F)/0.06(M)			
lnR_O		X				X		
steepness (*h*)	0.7				0.7			
$_R$	0.5				0.7			
Recruitment (years)		(1970-2006)				(1970-2006)		
Selectivities								
Commercial non-live								
parameter 1		X			40.1			
parameter 2		X			-0.94			
parameter 3		X			4.1			
parameter 4	4				4			
parameter 5	-10				-10			
parameter 6	10				10			
Commericial live								
parameter 1		X	X		38.3		38	
parameter 2		X	X		-0.57		-0.3	
parameter 3		X	X		3.37		2.3	
parameter 4		X	X		-2		3	
parameter 5	-5				-5		5	
parameter 6		X	X		6.24		-3.5	
Recreational Man-made								
parameter 1		X				X		
parameter 2		X				X		
parameter 3		X				X		
parameter 4		X				X		
parameter 5	-10				-10			
parameter 6		X				X		
Recreational Shore								
parameter 1		X				X		
parameter 2		X				X		
parameter 3		X				X		
parameter 4		X				X		
parameter 5	-10				-10			
parameter 6		X				X		
Recreational PBR								
parameter 1		X		X		X		X
parameter 2		X		X		X		X
parameter 3		X		X		X		X
parameter 4	4				4			
parameter 5	-10				-10			
parameter 6	10				10			
Recreational CPFV								
parameter 1		X		X		X		X
parameter 2		X		X		X		X
parameter 3		X		X		X		X
parameter 4	4				4			
parameter 5	-10				-10			
parameter 6	10				10			
CPFV survey	mirrors Recreational CPFV				mirrors Recreational CPFV			

* Indicates there are two block patterns within the blocked years

Table 18. Input variables and parameters of the population dynamics model for the state-wide CAS and ORS sub-stocks. The base-case values are given for those parameters that are pre-specified. An X indicates the parameter is estimated. Prior distributions for the parameters are listed in the SS3 control files (Appendices E-2 and F-2).

	CAS				ORS			
			Blocking				Blocking	
Parameter	Pre-specified in Base Case	Estimated in Base Case	1999-2008	2000-2008*	Pre-specified in Base Case	Estimated in Base Case	2000-2008*	2003-2008
Age at minimum length (L_{min})	0				0			
Age at maximum length (L_{max})	L_{inf}				L_{inf}			
Natural Mortality (*M*)	0.25(F)/0.3(M)				0.25(F)/0.3(M)			
Minimum Length (L_{min})		X				X		
Maximum Length (L_{max})		X				X		
Growth rate (k)		X				X		
Length at age 0 CV		X				X		
Length at age 17 CV		X				X		
lnR_O		X				X		
steepness (*h*)	0.7				0.7			
$_R$	0.5				0.5			
Recruitment (years)		(1970-2006)				(1980-2006)		
Selectivities								
Commercial non-live								
parameter 1		X				X		
parameter 2		X				X		
parameter 3		X				X		
parameter 4	4				4			
parameter 5	-10				-10			
parameter 6	10				10			
Commericial live								
parameter 1		X	X			X	X	
parameter 2		X	X			X	X	
parameter 3		X	X			X	X	
parameter 4		X	X			X	X	
parameter 5	-5				-5			
parameter 6		X	X			X	X	
Recreational Man-made					Man-Made and Shore			
parameter 1		X			make up the "SHORE" fleet			
parameter 2		X						
parameter 3		X			see below			
parameter 4		X						
parameter 5	-10							
parameter 6		X						
Recreational Shore								
parameter 1		X				X		
parameter 2		X				X		
parameter 3		X				X		
parameter 4		X				X		
parameter 5	-10				-10			
parameter 6		X				X		
Recreational PBR					PBR and CPFV			
parameter 1		X		X	make up the "BOAT" fleet			
parameter 2		X		X				
parameter 3		X		X				
parameter 4	4				see below			
parameter 5	-10							
parameter 6	10							
Recreational CPFV					Includes PBR & CPFV			
parameter 1		X		X		X		X
parameter 2		X		X		X		X
parameter 3		X		X		X		X
parameter 4	4				4			
parameter 5	-10				-10			
parameter 6	10				10			
CPFV survey	mirrors Recreational CPFV				mirrors Recreational CPFV			

* Indicates there are two block patterns within the blocked years

Table 19. Time series of spawning output (SB in mt) and recruitment (Rec in 1000s) for the NCS and SCS in years 1916-1959. Standard deviations (based on asymptotic estimation) of each yearly measure is given in the 'sd' column.

	NCS				SCS			
Year	SB	sd	Rec	sd	SB	sd	Rec	sd
Virgin	1036	60	876	55	263	24	206	19
1916	1036	60	876	55	263	24	206	19
1917	1036	60	876	55	263	24	206	19
1918	1035	60	876	55	263	24	206	19
1919	1035	60	876	55	263	24	206	19
1920	1034	60	876	55	263	24	206	19
1921	1034	60	876	55	263	24	206	19
1922	1033	60	876	55	263	24	206	19
1923	1033	60	876	55	263	24	206	19
1924	1033	60	876	55	263	24	206	19
1925	1033	60	876	55	263	24	206	19
1926	1031	60	876	55	263	24	206	19
1927	1031	60	876	55	263	24	206	19
1928	1031	60	876	55	263	24	206	19
1929	1030	60	875	55	263	24	206	19
1930	1029	60	875	55	263	24	206	19
1931	1027	60	875	55	262	24	206	19
1932	1025	60	875	55	262	24	206	19
1933	1021	60	875	55	262	24	206	19
1934	1017	60	874	55	262	24	206	19
1935	1012	60	874	55	261	24	206	19
1936	1006	60	873	55	261	24	206	19
1937	996	60	872	55	261	24	206	19
1938	990	60	872	55	260	24	206	19
1939	980	60	871	55	259	24	206	19
1940	977	60	870	55	259	24	206	19
1941	972	60	870	55	259	24	206	19
1942	968	60	869	55	259	24	206	19
1943	968	60	869	55	258	24	206	19
1944	967	60	869	55	258	24	206	19
1945	966	60	869	55	257	24	206	19
1946	966	60	869	55	257	24	206	19
1947	965	60	869	55	257	24	206	19
1948	934	60	866	55	255	24	205	19
1949	892	60	861	55	252	24	205	19
1950	856	60	857	55	249	24	205	19
1951	817	60	852	55	247	24	205	19
1952	772	59	845	55	245	24	205	19
1953	760	59	843	55	243	24	204	19
1954	766	59	844	55	239	24	204	19
1955	780	60	846	55	229	24	203	19
1956	792	60	848	55	219	24	202	19
1957	780	60	846	55	206	24	200	19
1958	773	60	845	55	198	24	199	19
1959	775	60	846	55	194	24	199	19

Table 19 (Continued). Time series of spawning output (SB in mt) and recruitment (Rec in 1000s) for the CAS in years 1916-1959. Standard deviations (based on asymptotic estimation) of each yearly measure is given in the 'sd' column.

	CAS			
Year	SB	sd	Rec	sd
Virgin	1207	61	917	50
1916	1207	61	917	50
1917	1207	61	917	50
1918	1206	61	917	50
1919	1205	61	917	50
1920	1205	61	917	50
1921	1204	61	917	50
1922	1204	61	917	50
1923	1204	61	917	50
1924	1203	61	917	50
1925	1203	61	917	50
1926	1202	61	916	50
1927	1202	61	916	50
1928	1202	61	916	50
1929	1201	61	916	50
1930	1199	61	916	50
1931	1197	61	916	50
1932	1195	61	916	50
1933	1190	61	916	50
1934	1186	61	915	50
1935	1181	61	915	50
1936	1174	60	914	50
1937	1162	60	913	50
1938	1156	60	913	50
1939	1144	60	912	50
1940	1141	60	911	50
1941	1135	60	911	50
1942	1130	60	910	50
1943	1129	60	910	50
1944	1127	60	910	50
1945	1127	60	910	50
1946	1126	60	910	50
1947	1124	60	910	50
1948	1091	60	907	50
1949	1045	60	902	50
1950	1004	59	898	50
1951	960	59	892	50
1952	911	59	886	50
1953	894	59	884	50
1954	894	59	884	50
1955	896	59	884	50
1956	897	59	884	50
1957	871	59	881	50
1958	856	59	878	50
1959	855	59	878	50

Table 19 (Continued). Time series of spawning output (SB in mt) and recruitment (Rec in 1000s) for the NCS and SCS in years 1960-2008. Standard deviations (based on asymptotic estimation) of each yearly measure is given in the 'sd' column.

	NCS				SCS			
Year	SB	sd	Rec	sd	SB	sd	Rec	sd
Virgin	1036	60	876	55	263	24	206	19
1960	782	60	847	55	198	24	199	19
1961	794	60	848	55	203	24	200	19
1962	807	60	850	55	209	24	201	19
1963	809	60	850	55	211	24	201	19
1964	779	60	846	56	210	24	201	19
1965	780	60	846	56	210	24	201	19
1966	771	60	845	56	207	24	200	19
1967	753	60	842	56	200	24	199	19
1968	759	60	843	56	199	24	199	19
1969	767	60	844	56	200	24	199	19
1970	771	60	1511	718	202	24	582	338
1971	765	60	1325	623	202	24	332	305
1972	776	60	1140	509	200	23	263	185
1973	766	60	927	385	189	22	265	156
1974	784	68	737	285	206	24	206	108
1975	827	84	608	222	224	25	158	74
1976	885	93	592	210	233	25	113	54
1977	912	95	864	298	239	25	144	61
1978	913	92	1208	310	243	24	148	68
1979	862	87	602	180	235	23	155	64
1980	817	80	505	155	225	22	283	72
1981	749	75	732	175	186	20	90	44
1982	703	70	474	143	159	18	86	34
1983	677	67	636	161	125	16	124	46
1984	640	63	516	135	123	14	475	76
1985	610	59	336	104	107	13	85	41
1986	592	55	1012	195	94	12	44	20
1987	536	51	1041	193	81	11	136	54
1988	499	48	487	137	78	11	198	64
1989	460	45	612	102	84	12	73	39
1990	442	41	1014	98	81	12	73	37
1991	466	37	772	67	65	11	76	36
1992	488	33	684	55	52	10	60	30
1993	460	28	1333	92	47	10	63	35
1994	461	25	842	74	50	10	420	104
1995	478	23	629	72	45	10	147	80
1996	456	23	639	95	42	10	107	63
1997	441	24	1231	183	43	10	164	71
1998	431	28	1048	185	57	12	378	134
1999	372	32	507	105	66	14	503	186
2000	351	37	491	121	69	17	87	53
2001	364	46	421	135	74	20	128	78
2002	405	56	584	203	95	26	227	118
2003	443	65	733	252	124	35	152	80
2004	421	71	552	215	145	42	79	41
2005	410	75	886	341	157	46	92	46
2006	404	79	738	292	164	48	121	61
2007	417	84	750	80	168	49	192	26
2008	438	90	764	81	164	49	194	27
2009	469	97	776	394	158	48	192	137

Table 19 (Continued). Time series of spawning output (SB in mt) and recruitment (Rec in 1000s) for the CAS and ORS in years 1960-2008. Standard deviations (based on asymptotic estimation) of each yearly measure is given in the 'sd' column.

	CAS				ORS			
Year	SB	sd	Rec	sd	SB	sd	Rec	sd
Virgin	1207	61	917	50	409	57	195	28
1960	867	59	880	50				
1961	885	59	883	50				
1962	904	59	885	50				
1963	909	60	886	50				
1964	877	59	881	50				
1965	878	59	882	50				
1966	865	59	880	50				
1967	839	59	876	50				
1968	843	59	876	50				
1969	852	60	878	50				
1970	859	60	871	352				
1971	853	60	944	389				
1972	861	60	1115	468				
1973	822	60	1417	541	381	57	193	28
1974	807	64	1117	420	381	57	193	28
1975	803	71	786	277	380	57	193	28
1976	829	77	609	211	379	57	193	28
1977	866	79	789	264	374	57	193	28
1978	903	80	1227	320	371	57	193	28
1979	886	78	783	238	361	57	192	28
1980	867	75	761	224	358	57	154	50
1981	789	71	736	193	359	57	251	66
1982	734	68	449	138	349	57	104	37
1983	686	65	801	213	346	57	137	38
1984	665	62	1679	269	344	57	129	32
1985	633	59	460	154	341	57	90	26
1986	613	56	716	179	336	56	212	54
1987	568	54	1059	234	318	55	193	57
1988	573	53	811	217	302	53	104	42
1989	586	53	649	151	280	50	165	66
1990	585	51	964	141	267	49	142	58
1991	590	48	749	94	260	48	181	54
1992	596	43	681	73	253	47	199	47
1993	566	38	1297	92	245	46	219	52
1994	569	33	777	75	240	44	178	55
1995	572	29	594	71	237	43	176	47
1996	540	27	437	76	243	42	202	46
1997	508	27	812	133	253	42	200	47
1998	475	27	1177	194	251	42	236	50
1999	384	28	779	161	246	41	356	67
2000	333	30	467	116	242	41	211	50
2001	313	34	341	107	239	41	188	44
2002	338	41	543	182	238	44	148	41
2003	379	50	732	232	245	48	131	38
2004	366	57	425	155	256	54	187	58
2005	360	61	565	206	254	58	137	54
2006	359	66	559	212	245	61	88	41
2007	376	73	732	77	235	64	141	73
2008	392	79	750	79	226	66	180	32
2009	410	85	759	386	214	69	178	94

Table 20. Total cabezon spawning output and depletion rates in differing California models, compared to the 2005 assessment.

	Total California Cabezon Spawning Biomass (mt)				
Model	SB_{1916}	SB_{2005}	SB_{2005}/SB_{1916}	SB_{2009}	SB_{2005}/SB_{1916}
2009 Assessment					
NCS+SCS	1298	567	44%	627	48%
CAS	1207	360	30%	410	34%
2005 Assessment					
NCS+SCS	1361	516	37.9%		
CAS	1268	634	50.0%		

Table 21. Values for the likelihood components and summary statistics related to current status of cabezon sub-stocks for sensitivity tests by changing the data sources included in each assessment. Gray boxes indicate data source is ignored. Green indicates stock status above the target reference point ($SB_{2009/1916} \geq SB_{40\%}$). Yellow indicates stock status in the precautionary zone ($SB_{25\%} < SB_{2009/1916} < SB_{40\%}$). Red indicates stock status below the limit reference point (($SB_{2009/1916} \leq SB_{25\%}$).

A) NCS (Trials 1-11)

	Trial											
Likelihood Components	Base Case	1	2	3	4	5	6	7	8	9	10	11
Abundance Index												
CPFV (1960-1999)	26	26		26	27	26	26	26	25	26	26	
CPFV (2000-2008)		3										
CPFV (1960-2008)			29									
TENERA adult survey				2							3	
PISCO adult survey					1						1	
PISCO SMURFs						2					2	
SLO SMURFS							0				0	
CDFG hook and line								1			1	
PSMFC dockside									7		7	
PSMFC onboard										8	8	
Mean Body Weight	21	21	20	21	21	21	21	21	21	21	21	22
Length Comps.	1246	1232	1234	1233	1232	1234	1232	1233	1233	1232	1232	1230
Commerical (non-live)	40	27	28	27	27	27	27	27	27	27	27	27
Commerical (live)	95	96	94	95	95	95	95	95	94	95	94	94
Rec: Man-made	233	230	233	232	233	233	230	233	234	233	234	231
Rec: Beach/bank	262	264	262	263	262	263	264	263	262	263	261	262
Rec: PBR	277	277	277	277	276	277	277	276	276	276	277	277
Rec: CPFV	339	339	340	339	339	339	339	339	340	339	340	340
Conditional age at length	2095	2096	2099	2096	2097	2096	2096	2096	2097	2097	2098	2095
Recruitment penalty	8	9	10	9	9	8	9	9	9	9	9	11
Parameter priors	23	21	24	22	22	22	21	22	23	23	22	23
TOTAL LIKELIHOOD	3420	3408	3416	3410	3409	3409	3406	3408	3414	3415	3429	3380
1916 reproductive output	1036 (60)	1043 (60)	1102 (67)	1028 (58)	1020 (58)	1038 (60)	1028 (60)	1036 (60)	1041 (60)	1035 (60)	1020 (55)	952
2009 reproductive output	469 (97)	489 (97)	648 (112)	454 (90)	443 (90)	488 (99)	465 (96)	473 (97)	506 (95)	475 (96)	469 (83)	337
%Depletion	45% (7%)	47% (7%)	59% (7%)	44% (7%)	43% (7%)	47% (7%)	45% (7%)	46% (7%)	49% (7%)	46% (7%)	46% (6%)	35% (7%)
MSY	129 (8)	130 (8)	139 (9)	128 (8)	127 (8)	129 (8)	129 (8)	129 (8)	130 (8)	129 (8)	127 (7)	103 (7)

Table 21 (Continued).

B) NCS (Trials 12-21)

Likelihood Components	Trial										
	Base Case	12	13	14	15	16	17	18	19	20	21
Abundance Index											
CPFV (1960-1999)	26	26	26	26	24	25	28	25	21	16	25
CPFV (2000-2008)											
CPFV (1960-2008)											
TENERA adult survey											
PISCO adult survey											
PISCO SMURFs											
SLO SMURFS											
CDFG hook and line											
PSMFC dockside											
PSMFC onboard											
Mean Body Weight	21		21	23	20	22	19	20	25	26	23
Length Comps.	1246	1233	1203	1140	999	967	955	895		1110	1205
Commerical (non-live)	40	27		27	27	28	25	27		26	24
Commerical (live)	95	96	94		98	100	97	95		76	80
Rec: Man-made	233	232	232	231		230	225	236		208	222
Rec: Beach/bank	262	264	263	268	259		261	259		235	271
Rec: PBR	277	276	275	276	271	274		279		251	274
Rec: CPFV	339	338	339	338	343	335	346			315	334
Conditional age at length	2095	2095	2098	2081	2087	2095	2081	2092	2033		
Recruitment penalty	8	9	9	8	8	10	7	8	8	14	13
Parameter priors	23	22	22	20	25	19	18	23	10	1	0
TOTAL LIKELIHOOD	3420	3386	3379	3299	3164	3138	3109	3063	2098	1166	1266
1916 reproductive output	1036 (60)	1043 (61)	1043 (62)	1043 (64)	959 (53)	1126 (71)	1097 (72)	979 (57)	925 (111)	257 (30)	1197 (103)
2009 reproductive output	469 (97)	646 (98)	501 (101)	465 (107)	450 (95)	605 (128)	475 (104)	422 (88)	48 (31)	162 (67)	735 (167)
%Depletion	45% (7%)	44% (7%)	48% (7%)	45% (8%)	47% (8%)	54% (9%)	43% (7%)	43% (7%)	5% (3%)	63% (10%)	61% (9%)
MSY	129 (8)	129 (8)	132 (8)	129 (9)	122 (7)	144 (10)	123 (9)	124 (8)	82 (4)	118 (7)	119 (10)

Table 21 (Continued).

B) SCS (Trials 1-7)

Likelihood Components	Base Case	1	2	3	4	5	6	7
	Trial							
Abundance Index								
CPFV (1960-1999)	44	44		45	44	44	45	
CPFV (2000-2008)	2			2	1	2	2	
CPFV (1960-2008)			48					
CalCOFI manta tows				28			26	
SoCal Edison Impingement					18		16	
PISCO adult survey						0	0	
Mean Body Weight	66	66	66	66	67	64	68	58
Length Comps.	807	806	805	816	811	778	819	808
Commerical (live)	38	38	37	39	40	38	40	38
Rec: Man-made	120	120	119	120	120	120	121	119
Rec: Beach/bank	152	152	152	150	152	124	150	150
Rec: PBR	200	200	199	202	201	200	203	199
Rec: CPFV	297	297	297	304	299	296	305	302
Conditional age at length	40	40	41	43	39	40	43	41
Recruitment penalty	15	15	16	12	13	15	11	17
Parameter priors	0	0	0	0	0	0	0	0
TOTAL LIKELIHOOD	974	972	976	1013	995	944	1031	924
1916 reproductive output	262 (23)	266 (24)	271 (22)	277 (19)	246 (17)	261 (24)	265 (16)	292 (30)
2009 reproductive output	158 (48)	165 (49)	178 (44)	162 (38)	107 (28)	156 (48)	130 (28)	213 (71)
%Depletion	60% (14%)	62% (14%)	66% (12%)	59% (11%)	44% (9%)	60% (14%)	49% (8%)	73% (18%)
MSY	30 (3)	30 (3)	30 (3)	32 (2)	28 (2)	29 (3)	27 (2)	29 (3)

Table 21 (Continued).

B) SCS (Trials 8-15)

Likelihood Components	Trial							
	Base Case	8	9	10	11	12	13	14	15
Abundance Index									
CPFV (1960-1999)	44	36	44	43	38	42	49	26	45
CPFV (2000-2008)	2	2	2	1	2	2	1	1	1
CPFV (1960-2008)									
CalCOFI manta tows									
SoCal Edison Impingement									
PISCO adult survey									
Mean Body Weight	66		65	63	40	61	56	28	66
Length Comps.	807	798	771	687	650	607	499		802
Commerical (live)	38	37		38	39	40	37		35
Rec: Man-made	120	118	120		121	121	120		119
Rec: Beach/bank	152	149	152	153		152	147		151
Rec: PBR	200	201	202	201	201		196		197
Rec: CPFV	297	293	296	295	290	294			299
Conditional age at length	40	44	37	40	38	37	44	32	
Recruitment penalty	15	13	15	15	15	15	12	10	15
Parameter priors	0	0	0	0	0	0	0	0	0
TOTAL LIKELIHOOD	974	892	934	849	783	764	661	98	929
1916 reproductive output	262 (23)	300 (37)	247 (21)	256 (23)	260 (22)	241 (19)	300 (34)	248 (22)	285 (30)
2009 reproductive output	158 (48)	203 (67)	122 (40)	138 (43)	138 (45)	99 (33)	184 (64)	37 (19)	202 (59)
%Depletion	60% (14%)	68% (15%)	49% (13%)	54% (13%)	53% (14%)	41% (11%)	61% (15%)	15% (7%)	71% (15%)
MSY	30 (3)	35 (4)	28 (2)	28 (2)	25 (2)	27 (2)	33 (4)	23 (2)	32 (3)

Table 21 (Continued).

C) CAS (Trials 1-10)

Likelihood Components	Trial: Base Case	1	2	3	4	5	6	7	8	9	10
Abundance Index											
CPFV (1960-1999)	50	49		50	50	50	50	48	50	50	
CPFV (2000-2008)		2								3	
CPFV (1960-2008)			56							140	
TENERA adult survey				2						2	
PISCO adult survey					1					2	
PISCO SMURFs						7				8	
SLO SMURFS							0			0	
CalCOFI								15		15	
SoCal Edison Impingement									33	33	
Mean Body Weight	18	18	17	18	18	18	18	18	19	19	18
Length Comps.	1449	1450	1458	1449	1448	1450	1449	1451	1452	1456	1440
Commerical (non-live)	44	44	45	44	43	44	44	44	43	44	43
Commerical (live)	83	83	81	83	83	83	83	84	85	85	82
Rec: Man-made	248	248	249	248	248	248	248	248	243	247	246
Rec: Beach/bank	291	291	290	291	291	291	291	292	298	296	288
Rec: PBR	289	290	288	289	289	291	289	289	291	292	290
Rec: CPFV	494	495	505	494	493	493	494	495	492	493	491
Conditional age at length	863	862	869	863	864	863	863	864	861	863	865
Recruitment penalty	8	8	9	8	8	8	8	7	7	6	12
Parameter priors	10	10	9	10	9	10	10	9	8	9	10
TOTAL LIKELIHOOD	2397	2400	2417	2399	2398	2405	2397	2412	2431	2462	2345
1916 reproductive output	1207 (61)	1219 (61)	1179 (73)	1205 (60)	1194 (59)	1212 (61)	1206 (61)	1245 (61)	1218 (58)	1241 (55)	1128 (62)
2009 reproductive output	410 (85)	434 (84)	501 (110)	406 (81)	387 (79)	424 (88)	409 (85)	458 (87)	392 (72)	413 (69)	291 (73)
%Depletion	34% (6%)	36% (6%)	43% (7%)	34% (6%)	32% (5%)	35% (6%)	34% (6%)	37% (6%)	32% (5%)	33% (5%)	26% (6%)
MSY	141 (8)	143 (8)	148 (9)	141 (8)	140 (8)	142 (8)	141 (8)	146 (8)	146 (8)	147 (7)	110 (7)

Table 21 (Continued).

C) CAS (Trials 1-10)

Likelihood Components	Trial									
	Base Case	11	12	13	14	15	16	17	18	19
Abundance Index										
CPFV (1960-1999)	50	50	50	48	48	47	49	47	29	43
CPFV (2000-2008)										
CPFV (1960-2008)										
TENERA adult survey										
PISCO adult survey										
PISCO SMURFs										
SLO SMURFS										
CalCOFI										
SoCal Edison Impingement										
Mean Body Weight	18		18	20	16	19	18	17	16	19
Length Comps.	1449	1449	1403	1360	1198	1152	1149	940		1401
Commerical (non-live)	44	43		42	44	44	43	46		40
Commerical (live)	83	84	82		87	89	87	80		75
Rec: Man-made	248	248	247	245		243	242	244		249
Rec: Beach/bank	291	292	291	298	292		292	289		270
Rec: PBR	289	289	288	295	286	289		282		270
Rec: CPFV	494	493	496	481	489	488	485			498
Conditional age at length	863	863	864	853	850	858	854	868	824	
Recruitment penalty	8	8	7	8	8	8	9	6	7	14
Parameter priors	10	9	9	10	14	6	5	10	3	1
TOTAL LIKELIHOOD	2397	2379	2351	2298	2134	2090	2084	1887	878	1477
1916 reproductive output	1207 (61)	1209 (61)	1223 (63)	1327 (71)	1113 (59)	1263 (68)	1268 (76)	1277 (77)	1203 (168)	1366 (71)
2009 reproductive output	410 (85)	390 (83)	429 (87)	533 (123)	350 (76)	500 (103)	437 (93)	524 (126)	92 (78)	589 (145)
%Depletion	34% (6%)	32% (6%)	35% (6%)	40% (8%)	32% (6%)	40% (6%)	35% (6%)	41% (8%)	8% (6%)	43% (9%)
MSY	141 (8)	141 (8)	143 (8)	157 (12)	134 (7)	152 (9)	135 (8)	153 (11)	107 (7)	115 (6)

Table 21 (Continued).

D) ORS

Likelihood Components	Base Case	Trial 1	2	3	4	5	6	7	8	9
Abundance Index										
ORBS (2001-2008)	10		10	10	11	9	2	No convergence	6	7
Mean Body Weight	5	5		5	6	5	3		4	5
Length Comps.	623	619	625	534	475	419	423		577	623
Commerical (non-live)	88	88	88		89	88	88		88	88
Commerical (live)	140	143	141	140		131	144		135	141
Rec: Shore	192	190	192	191	190		190		169	194
Rec: Boat	204	197	204	202	197	200			186	201
Conditional age at length	262	259	261	261	259	261	255			260
Recruitment penalty	6	10	6	6	4	5	7		10	7
Parameter priors	8	7	8	8	8	2	1		1	10
TOTAL LIKELIHOOD	914	900	909	825	763	701	692		599	912
Virgin reproductive output	409 (57)	281 (32)	406 (55)	401 (53)	366 (44)	463 (80)	567 (186)		267 (76)	351 (43)
2009 reproductive output	214 (69)	57 (31)	212 (67)	206 (64)	194 (53)	281 (99)	377 (210)		190 (87)	140 (49)
%Depletion	52% (10%)	20% (9%)	53% (10%)	51% (10%)	53% (9%)	61% (11%)	66% (16%)		71% (15%)	40% (10%)
MSY	51 (8)	30 (40)	43 (6)	43 (6)	44 (5)	50 (9)	56 (18)		51 (13)	37 (5)

Table 22. Sensitivity results to assumptions of sex-specific natural mortality (*M*) for each cabezon sub-stock. Green indicates stock status above the target reference point ($SB_{2009/1916} \geq SB_{40\%}$). Yellow indicates stock status in the precautionary zone ($SB_{25\%} < SB_{2009/1916} < SB_{40\%}$). Red indicates stock status below the limit reference point (($SB_{2009/1916} \leq SB_{25\%}$).

	Natural mortality ( )		Derived Outputs				
Substock	Female	Male	SB_0	SB_{2009}	Depletion	MSY	NegLogLike
NCS	0.15	0.15	1117 (47)	228 (55)	20% (5%)	87 (4)	3383
NCS	0.15	0.2	1257 (51)	272 (64)	22% (2%)	87 (4)	3378
NCS	0.2	0.2	992 (48)	358 (73)	36% (6%)	102 (5)	3385
NCS	0.2	0.25	1100 (52)	385 (80)	35% (6%)	104 (5)	3387
NCS	0.25	0.25	920 (53)	426 (87)	46% (7%)	128 (8)	3406
NCS	0.25	0.3	1036 (60)	469 (97)	45% (7%)	129 (8)	3420
NCS	0.3	0.3	958 (77)	523 (115)	55% (8%)	172 (15)	3427
NCS	0.3	0.35	927 (105)	723 (170)	78% (11%)	239 (28)	3418
NCS	0.35	0.35	1058 (109)	787 (175)	74% (10%)	238 (26)	3414
SCS	0.15	0.15	295 (15)	45 (15)	15% (5%)	20 (1)	1001
SCS	0.15	0.2	334 (17)	43 (15)	13% (4%)	20 (1)	988
SCS	0.2	0.2	259 (17)	98 (29)	38% (10%)	24 (2)	984
SCS	0.2	0.25	287 (19)	96 (30)	33% (9%)	24 (2)	973
SCS	0.25	0.25	241 (23)	158 (47)	65% (14%)	30 (3)	985
SCS	0.25	0.3	262 (23)	158 (48)	60% (14%)	30 (3)	974
SCS	0.3	0.3	275 (46)	264 (87)	96% (18%)	44 (7)	989
SCS	0.3	0.35	282 (42)	252 (83)	90% (18%)	41 (6)	978
SCS	0.35	0.35	554 (281)	673 (413)	121% (19%)	112 (56)	992
CAS	0.15	0.15	1300 (56)	165 (89)	11% (3%)	104 (4)	2391
CAS	0.15	0.2	1494 (63)	189 (56)	13% (3%)	105 (4)	2390
CAS	0.2	0.2	1144 (53)	269 (64)	24% (3%)	121 (6)	2385
CAS	0.2	0.25	1300 (58)	303 (69)	23% (5%)	119 (6)	2388
CAS	0.25	0.25	1081 (57)	406 (87)	38% (7%)	147 (9)	2392
CAS	0.25	0.3	1207 (61)	410 (85)	34% (6%)	141 (8)	2397
CAS	0.3	0.3	1063 (66)	443 (92)	42% (7%)	173 (12)	2412
CAS	0.3	0.35	1129 (64)	509 (99)	45% (7%)	166 (10)	2385
CAS	0.35	0.35	1169 (109)	586 (133)	50% (8%)	239 (24)	2433
OR	0.15	0.15	299 (18)	65 (16)	22% (5%)	25 (1)	965
OR	0.15	0.2	375 (24)	99 (26)	26% (6%)	26 (2)	953
OR	0.2	0.2	301 (23)	98 (26)	33% (7%)	30 (2)	932
OR	0.2	0.25	373 (32)	129 (38)	37% (8%)	32 (3)	928
OR	0.25	0.25	326 (38)	154 (46)	47% (9%)	40 (5)	914
OR	0.25	0.3	409 (57)	214 (69)	52% (10%)	51 (8)	914
OR	0.3	0.3	423 (95)	278 (110)	66% (12%)	62 (14)	907
OR	0.3	0.35	535 (140)	371 (161)	69% (13%)	69 (18)	912
OR	0.35	0.35	1027 (845)	895 (883)	87% (15%)	180 (148)	906

Table 23. Results of sensitivity trials to model specification for each cabezon sub-stock. Green indicates stock status above the target reference point ($SB_{2009/1916} \geq SB_{40\%}$). Yellow indicates stock status in the precautionary zone ($SB_{25\%} < SB_{2009/1916} < SB_{40\%}$). Red indicates stock status below the limit reference point (($SB_{2009/1916} \leq SB_{25\%}$).

A) NCS

Trial	SB_{1916}	SB_{2009}	Depletion	MSY	Likelihood
Base Case	1036 (60)	469 (97)	45% (7%)	129 (8)	3420
Untuned	1043 (63)	474 (99)	46% (7%)	129 (9)	3073
Original Index CVs	1262 (69)	1014 (154)	80% (9%)	157 (10)	3567
Retrospecitive analysis					
no 2008	1029 (57)	461 (93)	45% (7%)	127 (8)	3337
no 2007-2008	1014 (54)	432 (89)	43% (7%)	124 (7)	3284
no 2006-2008	1052 (55)	496 (94)	47% (7%)	128 (7)	3234
no 2005-2008	1046 (52)	560 (103)	54% (8%)	125 (44)	3169
no 2004-2008	992 (45)	379 (78)	38% (7%)	119 (48)	3100
no 1999-2008	808 (57)	258 (90)	32% (10%)	97 (33)	1529
Catch history					
Halved	518 (30)	235 (49)	45% (7%)	64 (4)	3421
Double	2073 (121)	937 (194)	45% (7%)	258 (16)	3421
Discard mortality					
none	1026 (60)	470 (96)	46% (7%)	128 (8)	3421
total	1041 (61)	464 (98)	45% (7%)	130 (8)	3408
No blocking of selectivities	987 (65)	582 (105)	59% (7%)	126 (9)	3574
Recruitment deviations					
start:1960	1051 (62)	380 (86)	36% (7%)	132 (9)	3415
start:1980	1051 (53)	517 (80)	49% (6%)	130 (7)	3426
No rec. devs. Estimated	964 (26)	449 (20)	47% (18%)	101 (2)	3529
Selectivity					
dome-shaped: PBR (5) & CPFV (6)	1277 (98)	598 (133)	47% (8%)	130 (10)	3404
logistic: MM (3) & BB (4)	1072 (65)	455 (100)	43% (7%)	131 (9)	3478
Ricker S/R	1305 (76)	205 (61)	16% (4%)	67 (4)	3407
$CV_{old\ males} = 0.1$	1418 (188)	488 (199)	34% (10%)	145 (23)	1141
O'Connell VBGF parameters	842 (29)	109 (46)	13% (5%)	87 (3)	1421
$Male_{CA}$ VBGF = $Male_{OR}$	Unconverged model				
No ageing error	1051 (63)	505 (101)	48% (7%)	120 (8)	3370
Estimate *M*	1194 (74)	360 (82)	30% (6%)	85 (5)	3405
Remove pre-1990 RecFIN lengths	1031 (66)	514 (108)	50% (8%)	133 (9)	2943

B) SCS

Trial	SB_{1916}	SB_{2009}	Depletion	MSY	Likelihood
Base Case	262 (23)	158 (48)	60% (14%)	30 (3)	974
Untuned	271 (29)	124 (50)	46% (15%)	30 (3)	702
Original Index CVs	246 (18)	141 (33)	57% (10%)	28 (2)	1204
Retrospecitive analysis					
no 2008	252 (23)	126 (42)	50% (13%)	29 (3)	930
no 2007-2008	267 (24)	154 (48)	58% (14%)	30 (3)	901
no 2006-2008	265 (24)	152 (46)	57% (13%)	30 (3)	863
no 2005-2008	260 (22)	157 (44)	61% (13%)	29 (2)	822
no 2004-2008	252 (21)	133 (42)	52% (13%)	29 (2)	787
no 1999-2008	262 (25)	168 (49)	64% (14%)	30 (4)	611
Catch history					
Halved	131 (12)	79 (24)	60% (14%)	15 (1)	974
Double	525 (46)	311 (94)	59% (14%)	59 (5)	974
Discard mortality					
none	263 (24)	160 (48)	61% (14%)	30 (3)	974
total	264 (24)	157 (48)	59% (14%)	30 (3)	974
No blocking of selectivities	299 (34)	250 (66)	84% (14%)	32 (4)	1030
Original 1980 RecFIN PBR estimate	309 (32)	213 (68)	69% (16%)	35 (4)	979
Recruitment deviations					
start:1960	261 (24)	145 (47)	56% (14%)	29 (3)	974
start:1980	249 (13)	139 (30)	56% (10%)	28 (1)	986
No rec. devs. Estimated	226 (5)	90 (10)	40% (4%)	23 (0)	1049
Selectivity					
dome-shaped: PBR (5) & CPFV (6)	285 (33)	199 (67)	70% (16%)	32 (4)	969
logistic: MM (3) & BB (4)	283 (29)	195 (60)	69% (15%)	31 (3)	984
Ricker S/R	333 (28)	55 (28)	17% (8%)	16 (1)	981
$CV_{old\ males} = 0.1$	321 (35)	115 (43)	36% (11%)	31 (3)	990
O'Connell VBGF parameters*	Unconverged model				
$Male_{CA}$ VBGF = $Male_{OR}$	131 (8)	30 (9)	23% (7%)	22 (1)	1004
No ageing error	264 (23)	155 (47)	59% (13%)	26 (2)	973
Estimate *M*	310 (24)	123 (46)	40% (14%)	24 (2)	963
Remove pre-1990 RecFIN lengths	219 (17)	106 (31)	48% (12%)	23 (2)	600
Man-made 2000 mean weight increased	260 (23)	146 (45)	56% (13%)	29 (3)	969

Table 23 (continued). Results of sensitivity trials to model specification for each cabezon sub-stock. Green indicates stock status above the target reference point ($SB_{2009/1916} \geq SB_{40\%}$). Yellow indicates stock status in the precautionary zone ($SB_{25\%} < SB_{2009/1916} < SB_{40\%}$). Red indicates stock status below the limit reference point (($SB_{2009/1916} \leq SB_{25\%}$).

C) CAS

Trial	SB_{1916}	SB_{2009}	Depletion	MSY	Likelihood
Base Case	1207 (61)	410 (85)	34% (6%)	141 (8)	2397
Untuned	1350 (83)	235 (68)	17% (4%)	162 (11)	2264
Original Index CVs	1548 (67)	1079 (155)	70% (8%)	187 (10)	2686
1 Area, Multiple Fleets	1178 (40)	408 (43)	35% (3%)	106 (4)	3459
2 Area, Multiple Fleets, est. rec. ratio	1750 (152)	1176 (226)	67% (8%)	283 (18)	3050
Retrospecitive analysis					
no 2008	1198 (55)	377 (76)	32% (5%)	138 (7)	2333
no 2007-2008	1202 (53)	370 (74)	31% (5%)	138 (36)	2278
no 2006-2008	1230 (55)	416 (75)	34% (5%)	141 (7)	2221
no 2005-2008	1250 (58)	439 (91)	35% (6%)	146 (74)	2145
no 2004-2008	1179 (45)	287 (62)	24% (5%)	134 (57)	2059
no 1999-2008	1355 (216)	610 (268)	45% (13%	177 (97)	1260
Catch history					
Halved	604 (30)	205 (42)	34% (6%)	70 (4)	2397
Double	2415 (121)	820 (170)	34% (6%)	282 (16)	2397
Discard mortality					
none	1199 (60)	415 (85)	35% (6%)	140 (8)	2396
total	1221 (62)	411 (88)	34% (6%)	143 (8)	2399
No blocking of selectivities	1023 (55)	433 (73)	42% (5%)	123 (7)	2570
Original 1980 RecFIN PBR estimate	1227 (62)	416 (86)	34% (6%)	144 (8)	2396
Recruitment deviations					
start:1960	1196 (66)	327 (77)	27% (6%)	142 (9)	2389
start:1980	1245 (55)	483 (77)	39% (5%)	145 (7)	2401
No rec. devs. Estimated	1285 (33)	592 (36)	46% (2%)	121 (3)	2477
Selectivity					
dome-shaped: PBR (5) & CPFV (6)	1516 (109)	554 (123)	37% (6%)	141 (9)	2365
logistic: MM (3) & BB (4)	1245 (61)	417 (88)	34% (6%)	141 (8)	2411
Ricker S/R	1517 (76)	114 (42)	8% (3%)	75 (4)	2375
$CV_{old\ males} = 0.1$	1234 (62)	404 (85)	33% (6%)	119 (6)	2408
O'Connell VBGF parameters	969 (37)	80 (23)	8% (2%)	98 (4)	1695
$Male_{CA}$ VBGF = $Male_{OR}$	1145 (216)	648 (207)	57% (9%)	233 (39)	3157
No ageing error	1226 (63)	436 (87)	36% (6%)	126 (7)	2377
Estimate *M*	1455 (100)	289 (75)	20% (5%)	97 (5)	2386

D) ORS

Trial	SB_{1916}	SB_{2009}	Depletion	MSY	Likelihood
Base Case	409 (57)	214 (69)	52% (10%)	51 (8)	914
Untuned	304 (51)	194 (60)	49% (10%)	42 (6)	862
Original Index CVs	463 (66)	309 (81)	67% (9%)	59 (9)	950
Retrospecitive analysis					
no 2008	571 (187)	406 (217)	71% (15%)	65	787
no 2007-2008	367 (65)	193 (71)	57% (13%)	47 (9)	670
no 2006-2008	512 (369)	414 (418)	81% (24%)	92 (69)	537
no 2005-2008	225 (61)	110 (67)	49% (19%)	42 (10)	448
no 2004-2008	228 (56)	100 (90)	44% (4%)	38 (11)	409
no 1999-2008	189 (26)	2 (11)	1% (6%)	24 (3)	249
Discard mortality					
none	400 (55)	208 (66)	52% (10%)	43 (6)	914
total	477 (70)	250 (83)	52% (10%)	51 (8)	915
No blocking of selectivities	316 (41)	166 (53)	53% (10%)	34 (5)	1053
RecFin mt removal estimates used	418 (59)	220 (72)	53% (10%)	44 (6)	915
Recruitment deviations					
start:1990	353 (38)	149 (41)	42% (8%)	38 (4)	925
No rec. devs. Estimated	497 (56)	312 (58)	63% (5%)	58 (7)	967
Selectivity					
dome-shaped: Boat mode	483 (107)	295 (125)	59% (13%)	49 (11)	908
Ricker S/R	411 (58)	217 (70)	53% (10%)	44 (7)	915
No ageing error	410 (60)	219 (72)	53% (10%)	45 (7)	910

Table 24. Projection of potential cabezon ABC, OY, spawning biomass and depletion for each substock base case models, based on the SPR=45% and 50% targets and appropriate control rule.

NCS	40:10 and $SPR_{45\%}$					60:20 and $SPR_{50\%}$				
Year	**ABC (mtons)**	**OY (mtons)**	**Age 2+ biomass (mtons)**	**Spawning biomass (mtons)**	**Depletion**	**ABC (mtons)**	**OY (mtons)**	**Age 2+ biomass (mtons)**	**Spawning biomass (mtons)**	**Depletion**
2009	137	137	1049	469	45.2%	114	95	1049	469	45.2%
2010	132	132	1023	447	43.2%	114	96	1057	472	45.5%
2011	128	128	1008	433	41.8%	115	97	1066	476	45.9%
2012	126	126	999	423	40.9%	116	99	1075	479	46.2%
2013	125	125	992	418	40.3%	117	100	1083	482	46.5%
2014	124	124	988	414	40.0%	118	101	1090	485	46.8%
2015	123	123	984	412	39.7%	119	102	1095	488	47.1%
2016	123	122	980	410	39.6%	119	103	1099	490	47.3%
2017	122	122	978	409	39.4%	120	104	1102	492	47.4%
2018	122	121	975	407	39.3%	120	104	1104	493	47.6%
2019	122	121	973	406	39.2%	120	105	1106	494	47.6%
2020	121	121	971	405	39.1%	120	105	1108	495	47.7%

SCS	40:10 and $SPR_{45\%}$					60:20 and $SPR_{50\%}$				
Year	**ABC (mtons)**	**OY (mtons)**	**Age 2+ biomass (mtons)**	**Spawning biomass (mtons)**	**Depletion**	**ABC (mtons)**	**OY (mtons)**	**Age 2+ biomass (mtons)**	**Spawning biomass (mtons)**	**Depletion**
2009	39	39	293	158	60.0%	33	33	293	158	60.0%
2010	34	34	273	134	51.1%	30	28	278	138	52.6%
2011	32	32	261	120	45.6%	28	25	272	127	48.5%
2012	30	30	255	112	42.7%	27	24	271	123	46.9%
2013	30	30	252	109	41.5%	27	23	272	123	46.6%
2014	29	29	250	107	40.9%	27	24	274	123	46.9%
2015	29	29	249	107	40.6%	28	24	276	124	47.2%
2016	29	29	248	106	40.3%	28	24	277	125	47.5%
2017	29	29	247	105	40.1%	28	24	278	125	47.7%
2018	29	29	245	105	39.9%	28	24	278	126	47.9%
2019	29	28	245	104	39.7%	28	24	279	126	47.9%
2020	28	28	244	104	39.5%	28	25	279	126	48.0%

Table 24 (Continued).

CAS	40:10 and $SPR_{45\%}$					60:20 and $SPR_{50\%}$				
Year	**ABC (mtons)**	**OY (mtons)**	**Age 2+ biomass (mtons)**	**Spawning biomass (mtons)**	**Depletion**	**ABC (mtons)**	**OY (mtons)**	**Age 2+ biomass (mtons)**	**Spawning biomass (mtons)**	**Depletion**
2009	115	108	877	410	34.0%	95	59	877	410	34.0%
2010	112	103	884	395	32.7%	98	64	924	424	35.1%
2011	111	103	904	393	32.5%	102	70	972	443	36.7%
2012	113	106	929	401	33.2%	107	77	1017	465	38.5%
2013	116	110	952	413	34.2%	112	84	1056	487	40.3%
2014	120	114	973	425	35.2%	116	91	1090	506	41.9%
2015	122	118	989	434	36.0%	120	96	1117	522	43.2%
2016	124	120	1001	441	36.5%	122	101	1138	534	44.3%
2017	126	122	1011	447	37.0%	125	104	1156	544	45.1%
2018	127	124	1019	451	37.3%	126	107	1170	552	45.7%
2019	128	125	1026	454	37.6%	128	109	1180	557	46.2%
2020	129	126	1031	456	37.8%	129	110	1189	562	46.6%

ORS	40:10 and $SPR_{45\%}$					60:20 and $SPR_{50\%}$				
Year	**ABC (mtons)**	**OY (mtons)**	**Age 2+ biomass (mtons)**	**Spawning biomass (mtons)**	**Depletion**	**ABC (mtons)**	**OY (mtons)**	**Age 2+ biomass (mtons)**	**Spawning biomass (mtons)**	**Depletion**
2009	60	60	455	214	52.4%	51	47	455	214	52.4%
2010	53	53	425	189	46.3%	47	41	437	196	48.0%
2011	50	50	411	170	41.6%	45	37	433	184	44.9%
2012	48	48	406	161	39.4%	45	37	437	180	44.0%
2013	48	48	406	159	38.8%	46	38	444	182	44.5%
2014	49	48	407	159	38.9%	47	39	451	186	45.4%
2015	49	49	407	160	39.1%	47	40	457	189	46.2%
2016	49	49	407	160	39.1%	48	41	461	192	46.8%
2017	49	49	407	160	39.1%	48	42	464	193	47.2%
2018	49	49	407	160	39.1%	49	42	466	194	47.5%
2019	49	49	407	160	39.0%	49	42	467	195	47.7%
2020	49	49	406	159	39.0%	49	43	469	196	47.8%

Table 25. Decision analysis of spawning output depletion based on different states of nature (columns) under different catch histories (rows) and control rules for each cabezon sub-stock. For the 40-10 rule ($F_{45\%}$), 0.40 and 0.25 are the target and limit reference points, respectively. For the 60-20 rule ($F_{50\%}$), 0.60 and 0.30 are the target and limit reference points, respectively. At or above the target reference point is indicated by green; between the target and limit reference points is indicated by yellow; below the limit reference point is indicated by red.

NCS: 40-10, $F_{45\%}$

		Removals			State of Nature		
					Low *M* (F= 0.2/M=0.25)	Base Case *M* (F=0.25/M=0.3)	High *M* (F=0.3/M=0.35)
	Year	Comm.	Rec.	Total	p = 0.25	p = 0.5	p = 0.25
Low *M* catches	2009	41	41	82	0.34	0.45	0.53
	2010	43	42	84	0.35	0.46	0.54
	2011	44	43	86	0.36	0.47	0.55
	2012	45	44	88	0.36	0.48	0.56
	2013	45	44	89	0.37	0.49	0.58
	2014	46	45	91	0.37	0.49	0.59
	2015	46	45	92	0.37	0.50	0.60
	2016	47	46	92	0.38	0.50	0.61
	2017	47	46	93	0.38	0.51	0.62
	2018	47	46	94	0.38	0.51	0.62
	2019	47	47	94	0.38	0.52	0.63
	2020	48	47	95	0.38	0.52	0.63
Base case *M* catches	2009	69	68	137	0.34	0.45	0.53
	2010	67	64	132	0.32	0.43	0.51
	2011	66	62	128	0.30	0.42	0.50
	2012	65	61	126	0.29	0.41	0.50
	2013	65	60	125	0.28	0.40	0.50
	2014	64	59	124	0.27	0.40	0.51
	2015	64	59	123	0.26	0.40	0.51
	2016	64	59	122	0.26	0.40	0.52
	2017	64	58	122	0.25	0.39	0.52
	2018	63	58	121	0.24	0.39	0.53
	2019	63	58	121	0.24	0.39	0.53
	2020	63	58	121	0.23	0.39	0.53
High *M* catches	2009	107	105	212	0.34	0.45	0.53
	2010	99	93	191	0.28	0.39	0.47
	2011	94	85	179	0.24	0.35	0.44
	2012	92	81	173	0.20	0.32	0.42
	2013	91	79	170	0.18	0.30	0.41
	2014	90	78	169	0.16	0.29	0.41
	2015	90	78	168	0.13	0.27	0.41
	2016	89	77	166	0.11	0.26	0.40
	2017	89	77	165	0.09	0.25	0.40
	2018	88	76	164	0.07	0.23	0.40
	2019	87	75	162	0.05	0.22	0.39
	2020	87	75	162	0.04	0.21	0.39

Table 25 (Continued).

NCS: 60-20, $F_{50\%}$

		Removals			State of Nature		
					Low *M* (F= 0.2/M=0.25)	Base Case *M* (F=0.25/M=0.3)	High *M* (F=0.3/M=0.35)
	Year	Comm.	Rec.	Total	p = 0.25	p = 0.5	p = 0.25
Low *M* catches	2009	23	22	45	0.34	0.45	0.53
	2010	27	27	53	0.37	0.48	0.56
	2011	30	30	60	0.39	0.51	0.59
	2012	33	33	65	0.41	0.53	0.61
	2013	34	35	69	0.42	0.54	0.62
	2014	36	36	72	0.43	0.55	0.64
	2015	37	38	75	0.44	0.56	0.65
	2016	38	39	77	0.45	0.57	0.66
	2017	39	40	78	0.45	0.58	0.67
	2018	39	40	80	0.46	0.58	0.68
	2019	40	41	81	0.46	0.59	0.68
	2020	40	42	82	0.47	0.59	0.69
Base case *M* catches	2009	48	47	95	0.34	0.45	0.53
	2010	49	47	96	0.34	0.46	0.54
	2011	50	48	97	0.35	0.46	0.54
	2012	50	48	99	0.34	0.46	0.55
	2013	51	49	100	0.34	0.47	0.56
	2014	52	50	101	0.34	0.47	0.57
	2015	52	50	102	0.34	0.47	0.57
	2016	53	51	103	0.34	0.47	0.58
	2017	53	51	104	0.34	0.47	0.59
	2018	53	51	104	0.34	0.48	0.59
	2019	53	51	105	0.34	0.48	0.60
	2020	54	51	105	0.33	0.48	0.60
High *M* catches	2009	83	81	165	0.34	0.45	0.53
	2010	76	72	148	0.31	0.42	0.50
	2011	73	68	141	0.28	0.40	0.48
	2012	72	66	138	0.26	0.38	0.48
	2013	73	66	139	0.25	0.37	0.48
	2014	73	66	140	0.24	0.36	0.48
	2015	74	67	140	0.22	0.36	0.48
	2016	74	67	141	0.21	0.35	0.48
	2017	74	67	141	0.20	0.34	0.48
	2018	74	67	141	0.18	0.34	0.48
	2019	74	67	141	0.17	0.33	0.48
	2020	74	67	141	0.15	0.32	0.48

Table 25 (Continued).

SCS: 40-10, $F_{45\%}$

	Year	Removals: Comm.	Removals: Rec.	Removals: Total	State of Nature: Low *M* (F= 0.2/M=0.25) p = 0.25	State of Nature: Base Case *M* (F=0.25/M=0.3) p = 0.5	State of Nature: High *M* (F=0.3/M=0.35) p = 0.25
Low *M* catches	2009	7	11	18	0.33	0.60	0.90
	2010	6	11	17	0.31	0.56	0.82
	2011	6	11	16	0.30	0.54	0.78
	2012	6	11	17	0.31	0.54	0.76
	2013	6	11	17	0.32	0.54	0.75
	2014	7	12	18	0.33	0.55	0.75
	2015	7	12	19	0.34	0.56	0.74
	2016	7	12	20	0.35	0.56	0.74
	2017	7	13	20	0.35	0.57	0.74
	2018	8	13	21	0.36	0.57	0.73
	2019	8	13	21	0.36	0.57	0.73
	2020	8	13	21	0.37	0.57	0.73
Base case *M* catches	2009	15	24	39	0.33	0.60	0.90
	2010	12	22	34	0.27	0.51	0.78
	2011	11	20	32	0.22	0.46	0.70
	2012	11	19	30	0.20	0.43	0.66
	2013	11	19	30	0.19	0.41	0.64
	2014	11	19	29	0.18	0.41	0.63
	2015	11	18	29	0.18	0.41	0.62
	2016	11	18	29	0.17	0.40	0.61
	2017	11	18	29	0.16	0.40	0.61
	2018	10	18	29	0.15	0.40	0.61
	2019	10	18	28	0.15	0.40	0.60
	2020	10	18	28	0.14	0.39	0.60
High *M* catches	2009	28	47	75	0.33	0.60	0.90
	2010	22	39	62	0.19	0.43	0.70
	2011	19	34	53	0.10	0.32	0.58
	2012	17	32	49	0.06	0.26	0.52
	2013	16	30	46	0.04	0.23	0.48
	2014	16	29	44	0.02	0.21	0.46
	2015	16	28	43	0.01	0.20	0.45
	2016	15	27	42	0.00	0.18	0.43
	2017	15	27	42	0.00	0.16	0.43
	2018	15	26	41	0.00	0.14	0.42
	2019	15	26	41	0.00	0.13	0.41
	2020	15	26	40	0.46	0.11	0.41

Table 25 (Continued).

SCS: 60-20, $F_{50\%}$

	Year	Removals Comm.	Removals Rec.	Removals Total	State of Nature: Low *M* (F= 0.2/M=0.25) p = 0.25	State of Nature: Base Case *M* (F=0.25/M=0.3) p = 0.5	State of Nature: High *M* (F=0.3/M=0.35) p = 0.25
Low *M* catches	2009	4	6	10	0.33	0.60	0.90
	2010	3	6	10	0.33	0.58	0.84
	2011	4	6	10	0.34	0.57	0.81
	2012	4	7	11	0.35	0.58	0.80
	2013	4	8	12	0.37	0.60	0.79
	2014	5	9	14	0.39	0.61	0.79
	2015	5	9	15	0.40	0.62	0.79
	2016	6	10	16	0.42	0.63	0.79
	2017	6	11	17	0.43	0.64	0.79
	2018	6	11	17	0.44	0.64	0.79
	2019	7	11	18	0.45	0.64	0.78
	2020	7	12	18	0.45	0.64	0.78
Base case *M* catches	2009	12	20	33	0.33	0.60	0.90
	2010	10	18	28	0.28	0.53	0.79
	2011	9	16	25	0.25	0.48	0.73
	2012	8	15	24	0.24	0.47	0.70
	2013	8	15	23	0.24	0.47	0.68
	2014	9	15	24	0.24	0.47	0.68
	2015	9	15	24	0.25	0.47	0.67
	2016	9	15	24	0.25	0.48	0.67
	2017	9	15	24	0.25	0.48	0.67
	2018	9	15	24	0.25	0.48	0.67
	2019	9	15	24	0.25	0.48	0.66
	2020	9	16	25	0.25	0.48	0.66
High *M* catches	2009	24	39	63	0.33	0.60	0.90
	2010	19	34	53	0.21	0.46	0.73
	2011	17	30	47	0.14	0.36	0.62
	2012	15	27	42	0.10	0.31	0.56
	2013	14	25	39	0.08	0.29	0.53
	2014	13	24	38	0.06	0.28	0.52
	2015	13	23	37	0.04	0.27	0.51
	2016	13	23	36	0.02	0.26	0.50
	2017	13	23	36	0.01	0.25	0.50
	2018	13	22	35	0.00	0.24	0.49
	2019	13	22	35	0.00	0.23	0.49
	2020	13	22	35	0.00	0.23	0.49

Table 25 (Continued).

ORS: 40-10, $F_{45\%}$

	Year	Removals Comm.	Rec.	Total	State of Nature: Low *M* (F= 0.2/M=0.25) p = 0.25	Base Case *M* (F=0.25/M=0.3) p = 0.5	High *M* (F=0.3/M=0.35) p = 0.25
Low *M* catches	2009	19	14	33	0.37	0.52	0.69
	2010	17	13	31	0.35	0.50	0.66
	2011	17	12	29	0.33	0.48	0.64
	2012	17	12	29	0.33	0.48	0.64
	2013	17	12	30	0.34	0.49	0.65
	2014	18	13	31	0.34	0.51	0.67
	2015	19	13	32	0.35	0.52	0.68
	2016	19	14	33	0.36	0.53	0.70
	2017	20	14	34	0.37	0.54	0.71
	2018	20	14	34	0.37	0.55	0.71
	2019	20	14	34	0.37	0.55	0.72
	2020	20	15	35	0.38	0.56	0.73
Base case *M* catches	2009	34	25	60	0.37	0.52	0.69
	2010	30	23	53	0.31	0.46	0.63
	2011	29	21	50	0.26	0.42	0.59
	2012	28	20	48	0.23	0.39	0.57
	2013	28	20	48	0.22	0.39	0.57
	2014	29	20	48	0.21	0.39	0.58
	2015	29	20	49	0.20	0.39	0.59
	2016	29	20	49	0.19	0.39	0.60
	2017	29	20	49	0.18	0.39	0.61
	2018	29	20	49	0.16	0.39	0.61
	2019	29	20	49	0.15	0.39	0.62
	2020	29	20	49	0.14	0.39	0.62
High *M* catches	2009	67	50	117	0.37	0.52	0.69
	2010	57	42	99	0.23	0.38	0.57
	2011	52	37	89	0.12	0.28	0.49
	2012	50	34	84	0.05	0.23	0.45
	2013	50	33	83	0.01	0.19	0.43
	2014	49	33	82	0.01	0.17	0.42
	2015	49	33	82	0.00	0.14	0.42
	2016	49	33	81	0.00	0.11	0.41
	2017	48	32	80	0.00	0.09	0.41
	2018	48	32	80	0.00	0.06	0.40
	2019	47	32	79	0.00	0.03	0.40
	2020	47	31	79	1.52	0.01	0.40

Table 25 (Continued).

ORS: 60-20, $F_{50\%}$

		Removals			State of Nature		
					Low *M* (F= 0.2/M=0.25)	Base Case *M* (F=0.25/M=0.3)	High *M* (F=0.3/M=0.35)
	Year	Comm.	Rec.	Total	p = 0.25	p = 0.5	p = 0.25
Low *M* catches	2009	11	9	20	0.37	0.52	0.69
	2010	11	8	20	0.37	0.52	0.67
	2011	11	8	20	0.37	0.51	0.66
	2012	12	9	21	0.38	0.52	0.67
	2013	13	9	22	0.39	0.54	0.68
	2014	14	10	24	0.41	0.56	0.70
	2015	15	11	26	0.42	0.58	0.72
	2016	16	12	27	0.44	0.59	0.74
	2017	16	12	28	0.44	0.60	0.75
	2018	17	12	29	0.45	0.61	0.76
	2019	17	13	30	0.46	0.62	0.76
	2020	18	13	31	0.46	0.62	0.77
Base case *M* catches	2009	27	20	47	0.37	0.52	0.69
	2010	23	18	41	0.33	0.48	0.65
	2011	21	16	37	0.30	0.45	0.61
	2012	21	15	37	0.29	0.44	0.61
	2013	22	16	38	0.28	0.44	0.62
	2014	23	16	39	0.28	0.45	0.63
	2015	24	17	40	0.28	0.46	0.64
	2016	24	17	41	0.28	0.47	0.65
	2017	24	17	42	0.28	0.47	0.66
	2018	25	17	42	0.27	0.47	0.67
	2019	25	18	42	0.27	0.48	0.67
	2020	25	18	43	0.26	0.48	0.68
High *M* catches	2009	57	42	99	0.37	0.52	0.69
	2010	49	37	86	0.25	0.41	0.59
	2011	42	31	73	0.16	0.32	0.52
	2012	40	28	68	0.11	0.28	0.49
	2013	40	27	67	0.08	0.26	0.48
	2014	41	28	68	0.05	0.25	0.48
	2015	41	28	69	0.02	0.24	0.49
	2016	41	28	69	0.00	0.22	0.49
	2017	41	28	69	0.01	0.20	0.49
	2018	41	28	69	0.00	0.19	0.49
	2019	41	28	69	0.00	0.17	0.48
	2020	41	28	69	0.00	0.15	0.48

FIGURES

Figure 1. Map of the cabezon sub-stock assessment areas (represented by solid lines at Pt. Conception and the California/Oregon border). Two important headlands are distinguished by broken lines. The North/South management area is shown with the broken dotted line and is also the border between the California Department of Fish and Game's Northern and Central California Marine Management regions. Point Conception divides the Central and Southern Marine Management regions. The 70m isobath indicates nearshore waters. Map courtesy of Marlene Bellman (PSMFC/NOAA Fisheries).

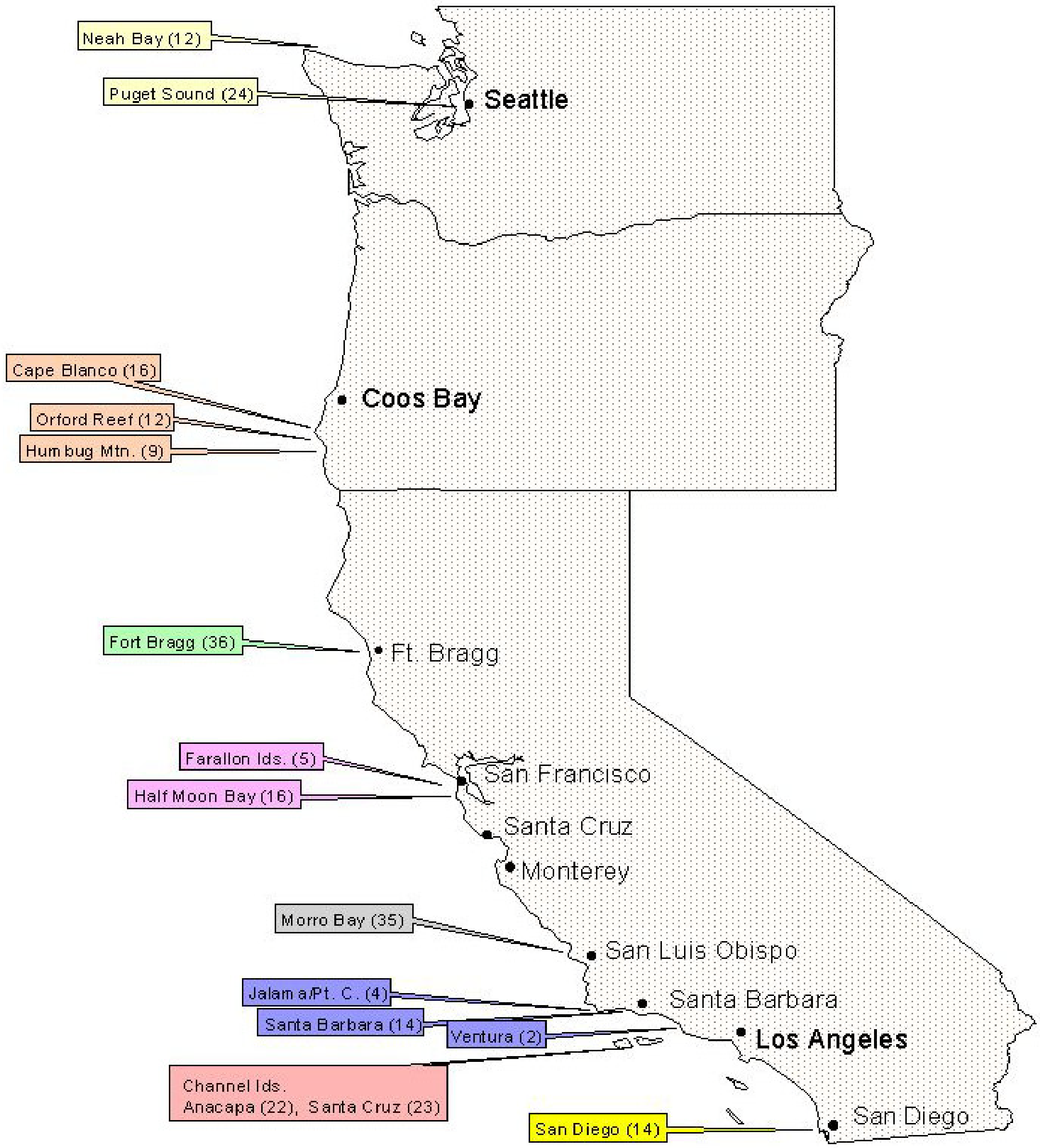

Figure 2. Map of distinct (distinguished by colored) cabezon subpopulations based on mtDNA markers (sample sizes in parentheses) from the work of Villablanca and Nakamura (2008). Map courtesy of F. Villablanca.

Figure 3. Map of California waters including the 18 fishing locations used in the cluster analysis of cabezon population dynamics based on CPFV CPUE. Map courtesy of Marlene Bellman (PSMFC/NOAA Fisheries).

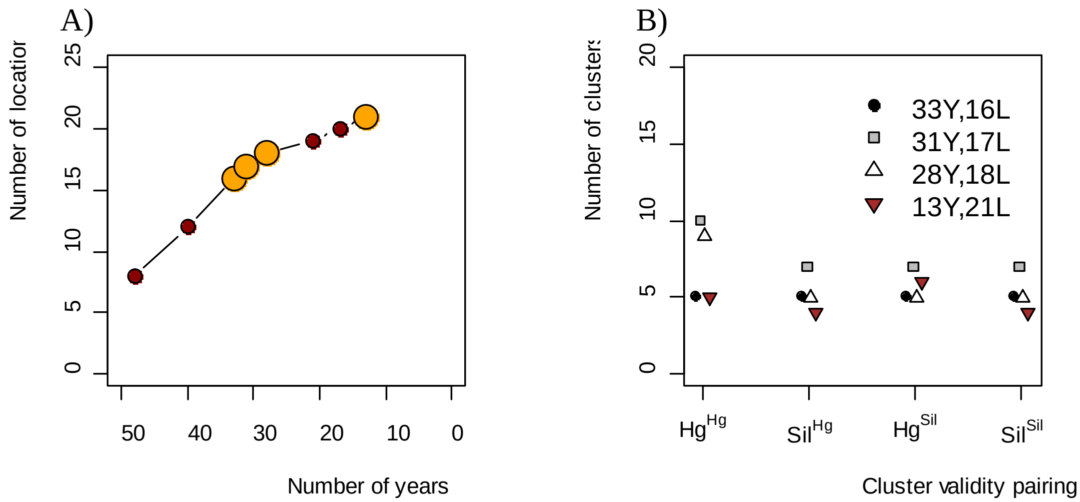

Figure 4. Determination of the CPFV data series used in the spatial clustering analyses of cabezon sub-stocks in California. A) Trade-off between number of years and number of landing locations in the California CPFV CPUE time series. Large circles indicate year/location pairing used in spatial cluster analysis. B) Number of spatial clusters based on cluster validity diagnostic pairings (see Cope and Punt i*n press* for details). Y = Years; L = Location; Hg = Hubert ; Sil= Silouette.

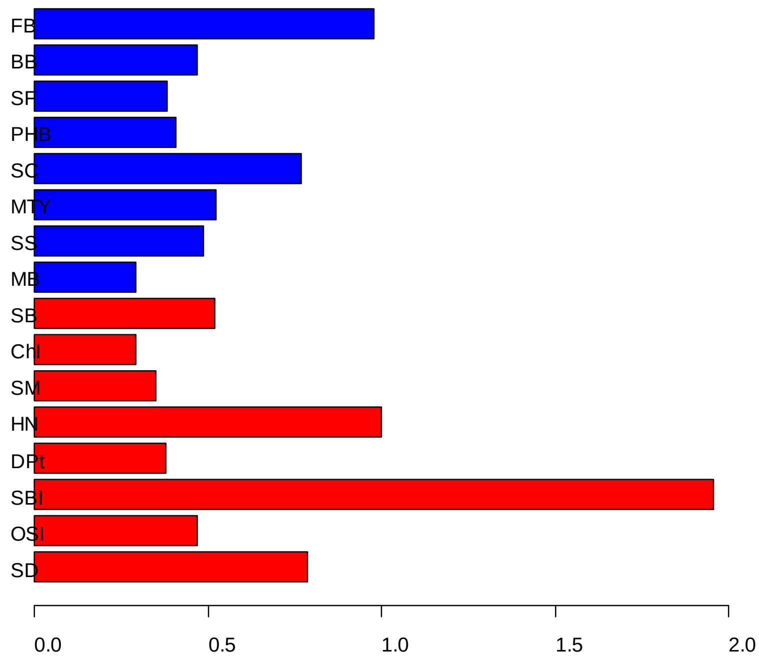

Figure 5. The coefficient of variation (CV) for each fishing location used in the spatial clustering analysis for the two extreme data series based on numbers of years and locations. Blue bars indicate the areas designated as the northern California sub-stock (NCS) while red bars indicate the southern California sub-stock (SCS).

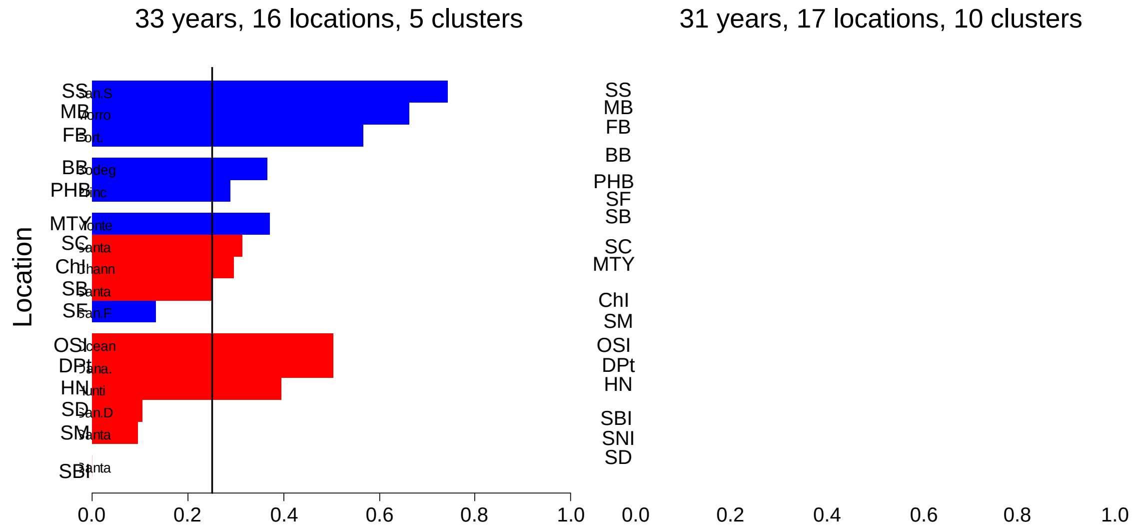

Figure 6. Resultant silhouette plots for the cluster analyses of cabezon fishing locations in California. Number of years, locations and cluster are noted above each plot. Blue bars indicate the areas designated as the northern California sub-stock (NCS) while red bars indicate the southern California sub-stock (SCS).

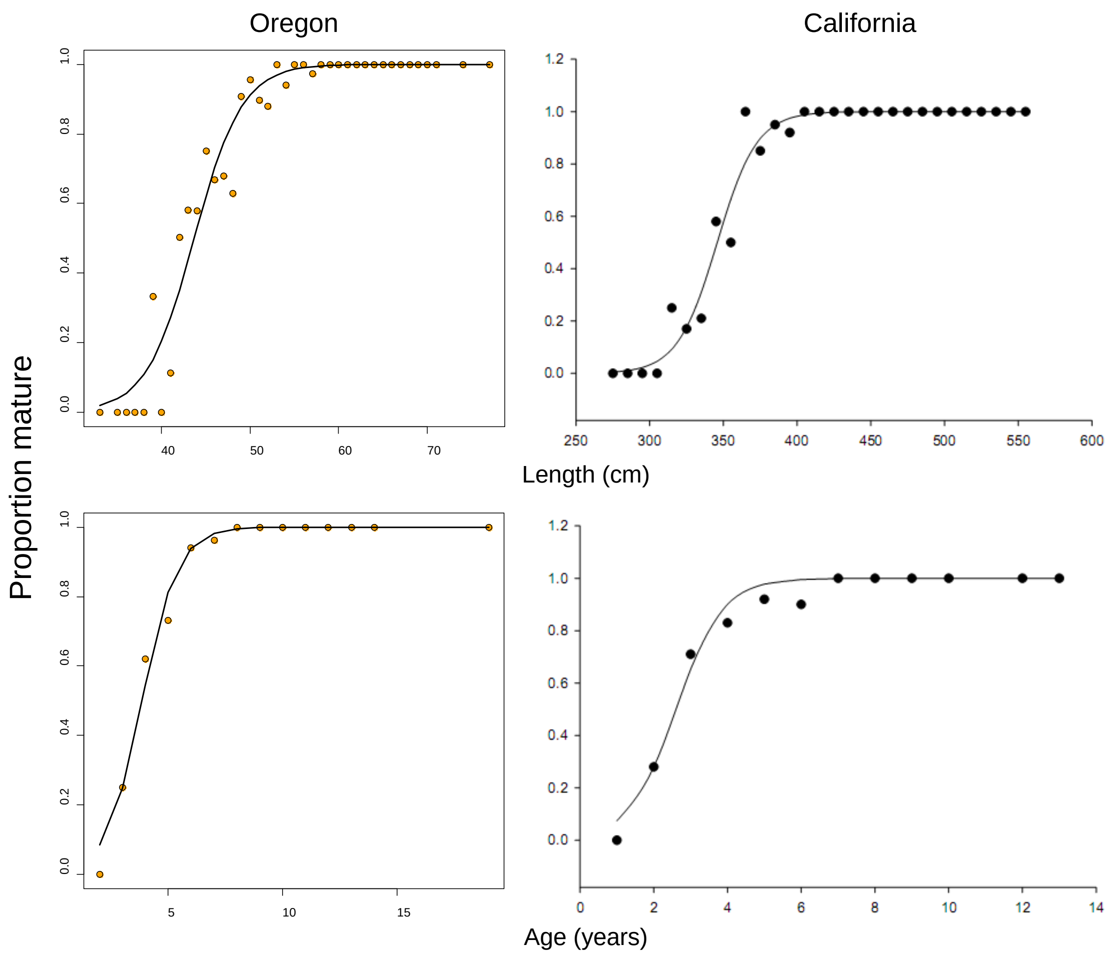

Figure 7. Length (top rows) and age (bottom rows) at maturity curves for Oregon (left panels) and California (right panels).

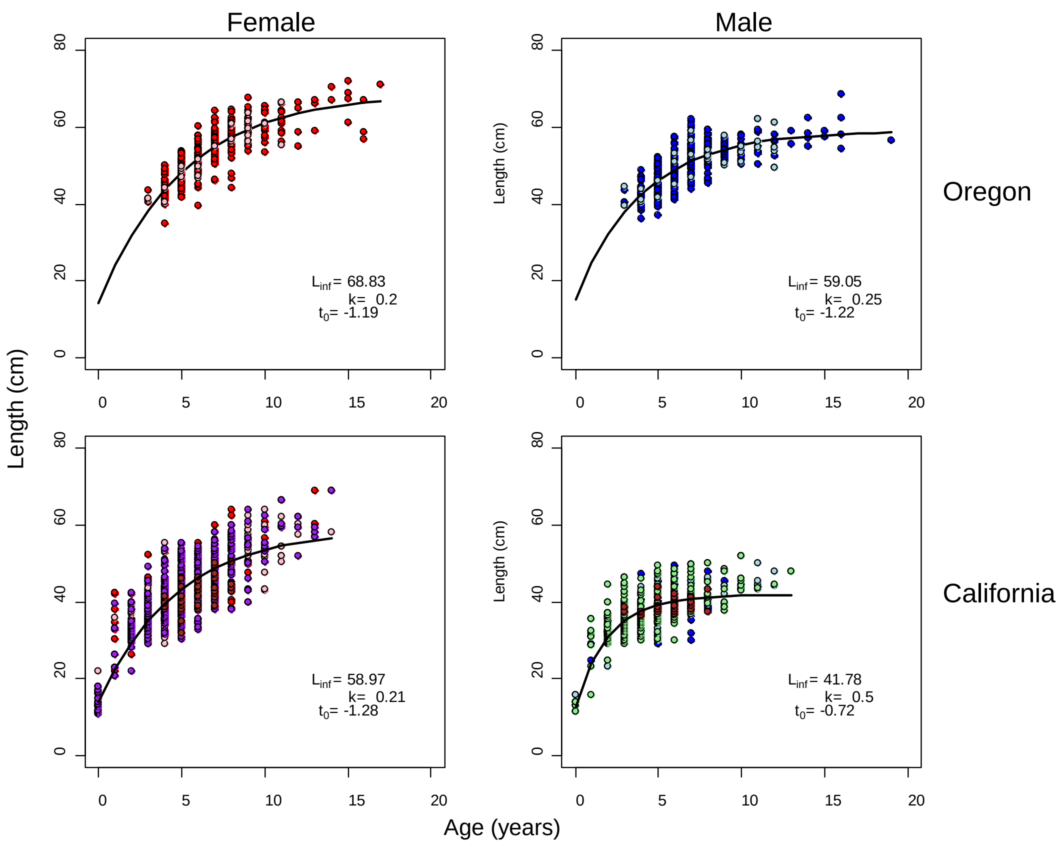

Figure 8. Age and growth fits and parameter estimates for the von Bertalanffy growth function incorporating multiple age reads (differing colored circles) for each sex (columns) and state (rows).

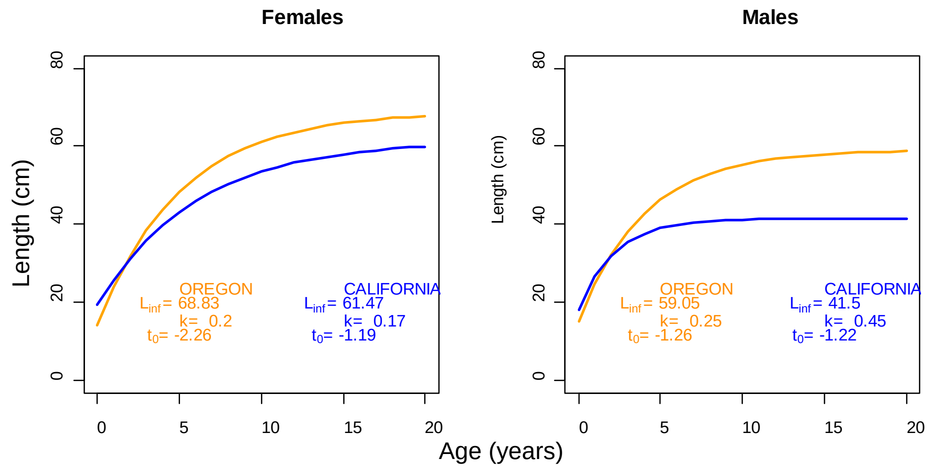

Figure 9. Comparison of estimated age at length of each sex by state. Growth fits in these comparisons are based on fits to the von Bertalanffy growth curve using primary age reads and does not incorporate the ageing error into estimation of the growth curve.

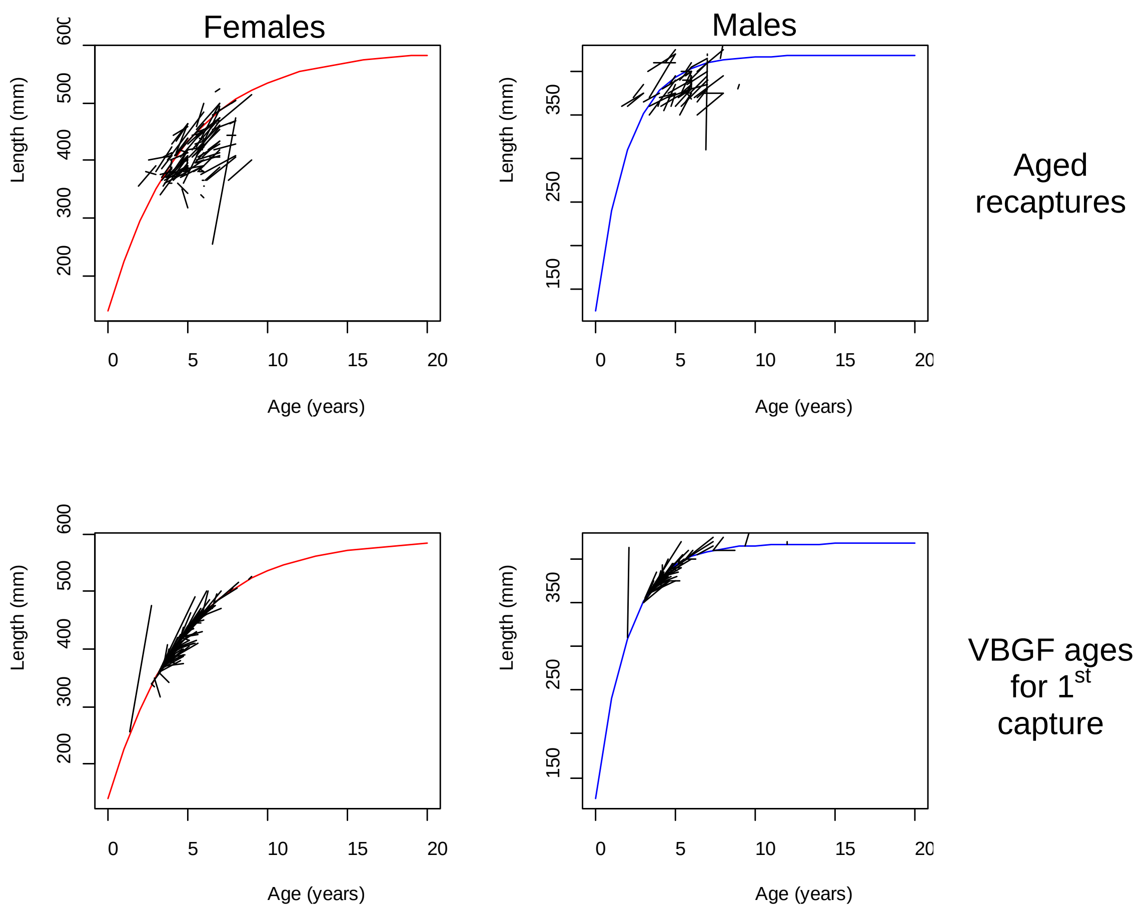

Figure 10. Stick plots of tagging data (black lines) compared to sex-specific (columns) growth curves in California. The tagging were compared to the growth curve in two ways: 1) The capture data was back-calculated from the age recapture (top row); 2) The capture age was estimated from the von Bertalanffy growth function (VBGF) and the recapture age was calculated by adding days at large to the capture age (bottom row).

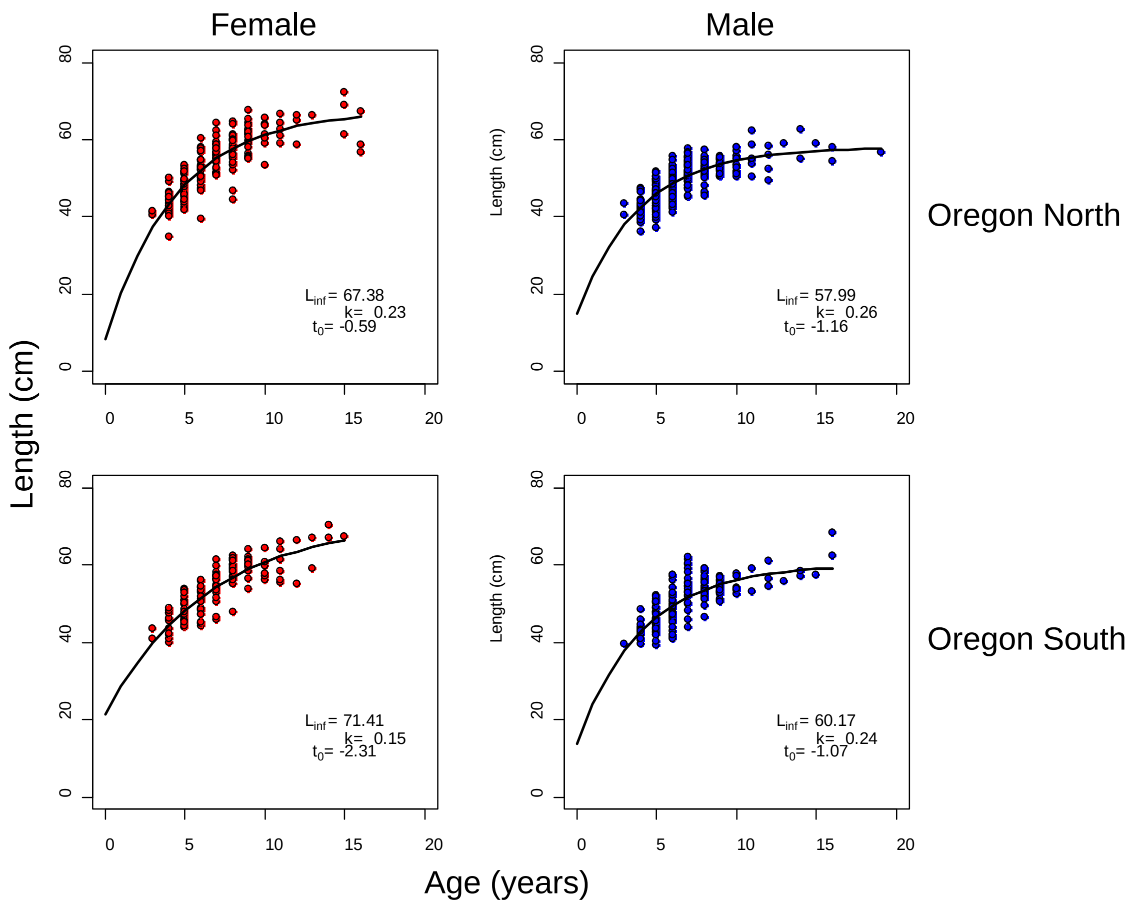

Figure 11. Plots and fits to the von Bertalanffy growth function of Oregon data above (North) and below (South) Cape Blanco.

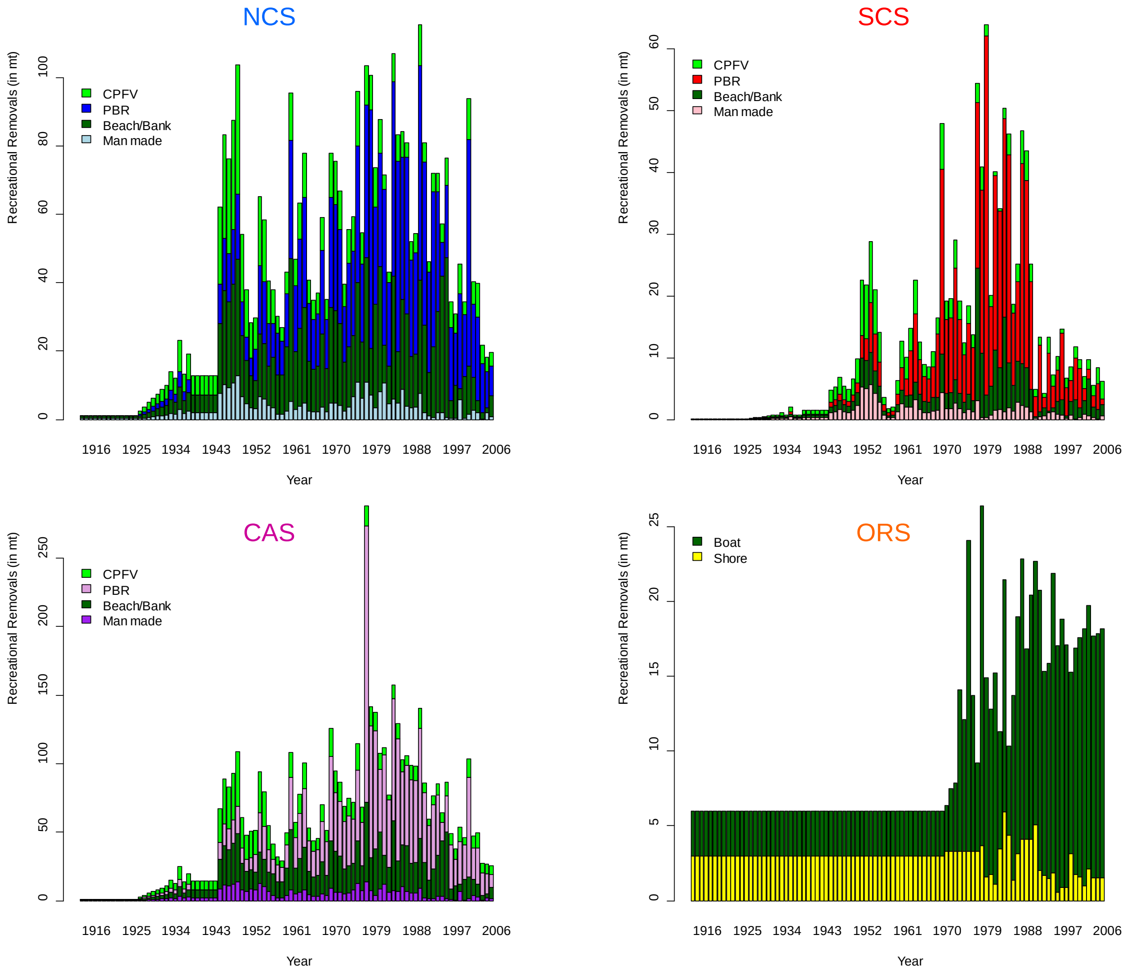

Figure 12. Recreational fishery cabezon removals (in mt) by fleet and sub-stock.

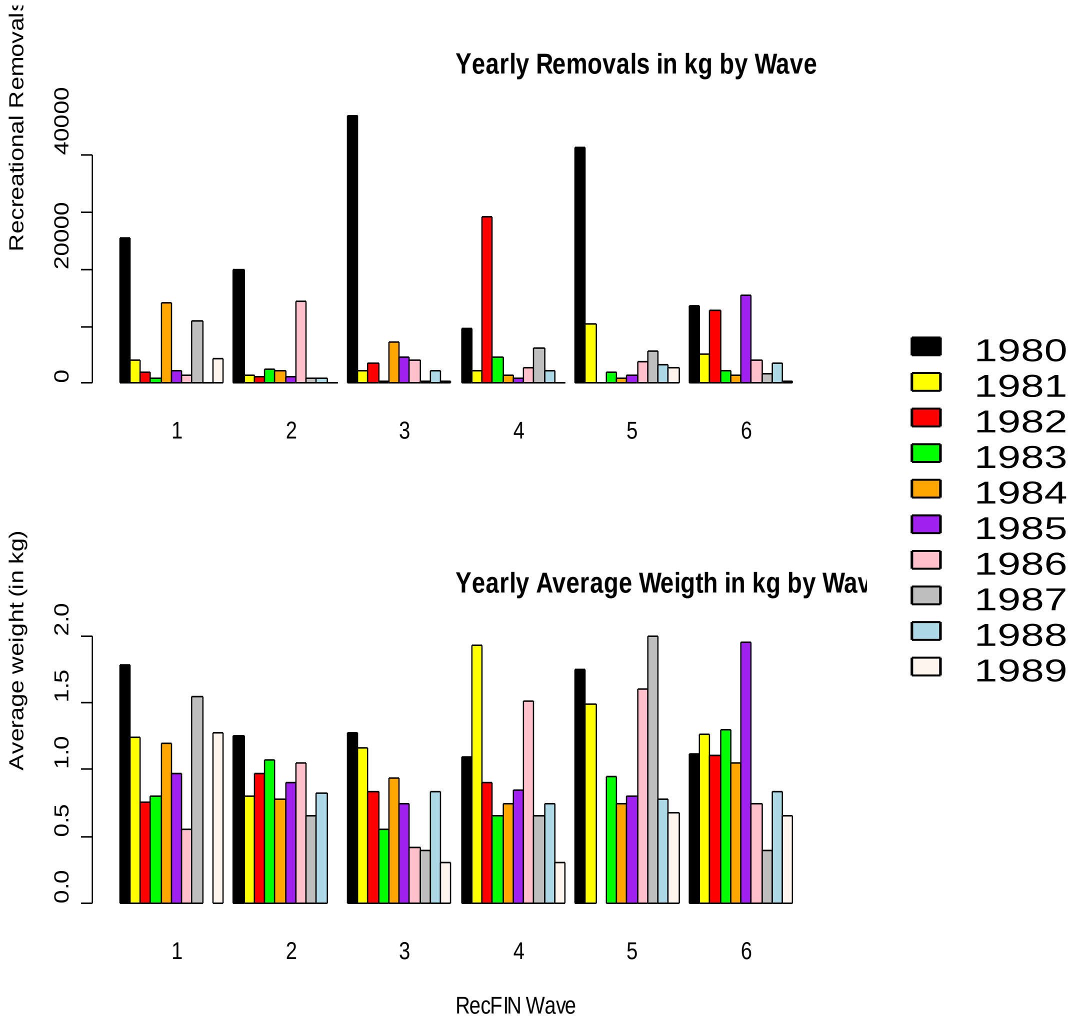

Figure 13. Yearly removals (top panel) and average weight (bottom panel) of cabezon by two-month sampling 'wave' taken in the PBR recreational mode for the SCS in years 1980-1989.

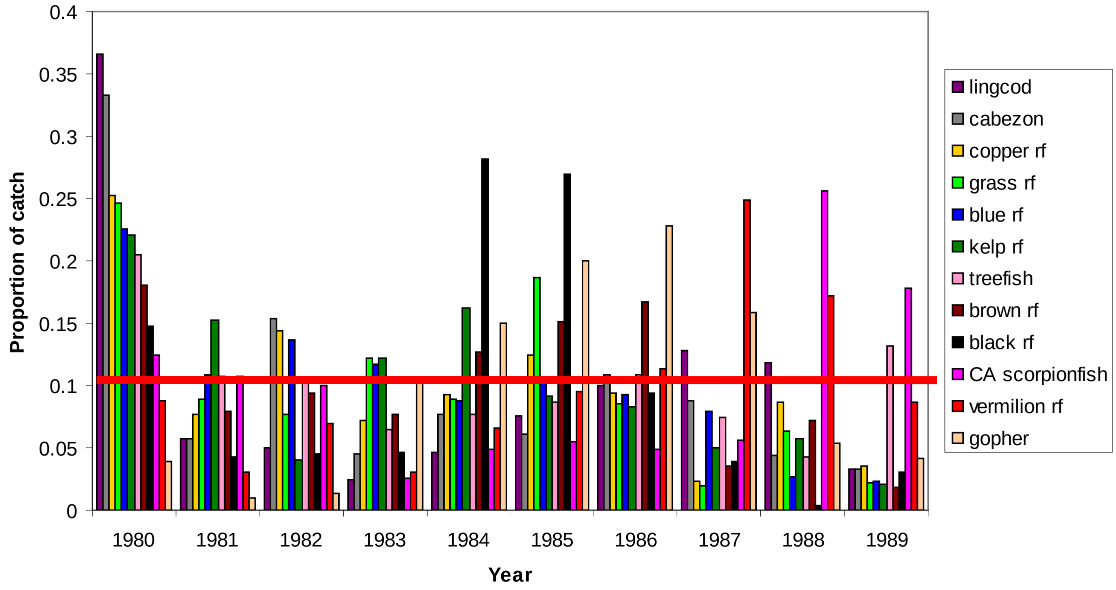

Figure 14. Proportion of yearly catch for several nearshore species associated with cabezon (gray bars) for years 1980-1989. Proportions are species-specific and defined as the proportion of the yearly species catch to the total species catch from 1980-1989. The red horizontal line is the expected value if all years were equivalent in proportionality.

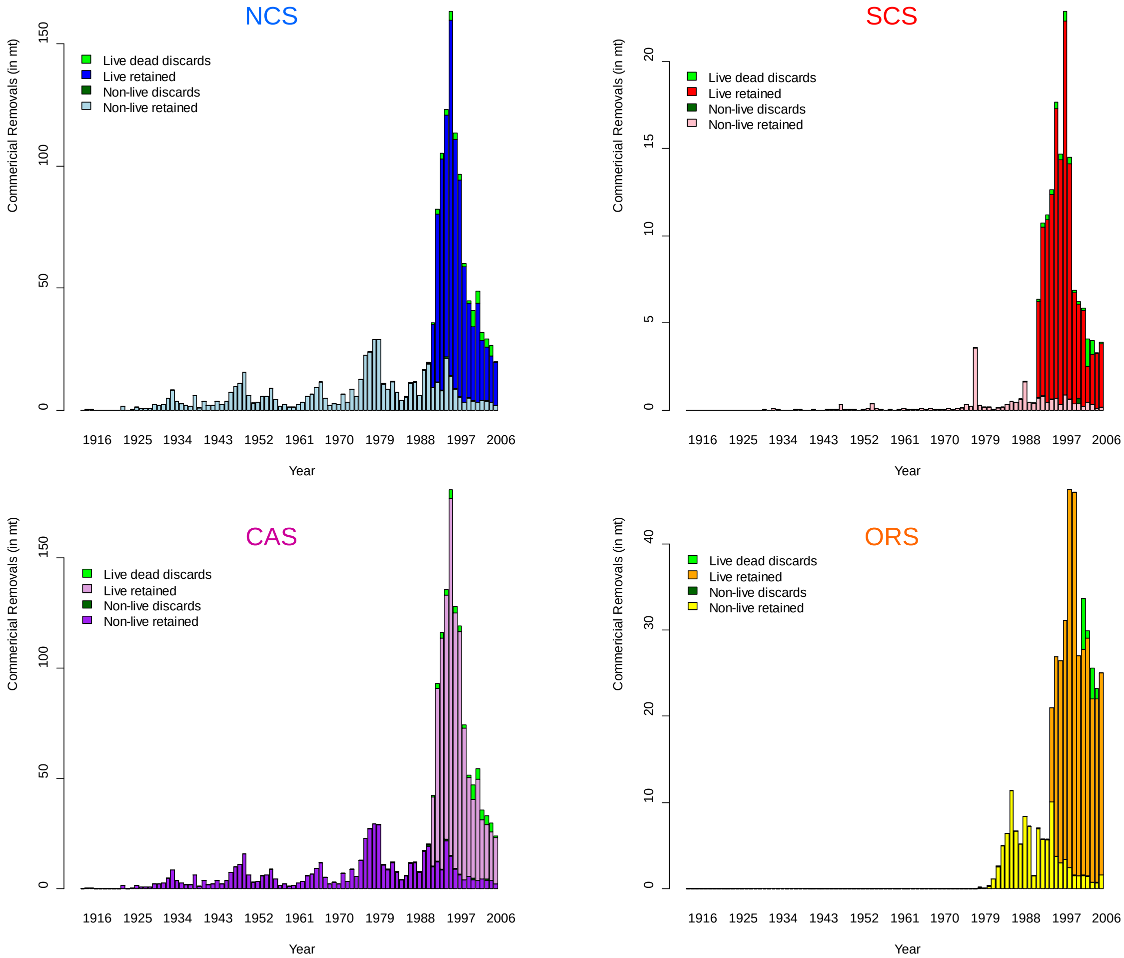

Figure 15. Commercial fishery cabezon removals (in mt) by fleet and sub-stock.

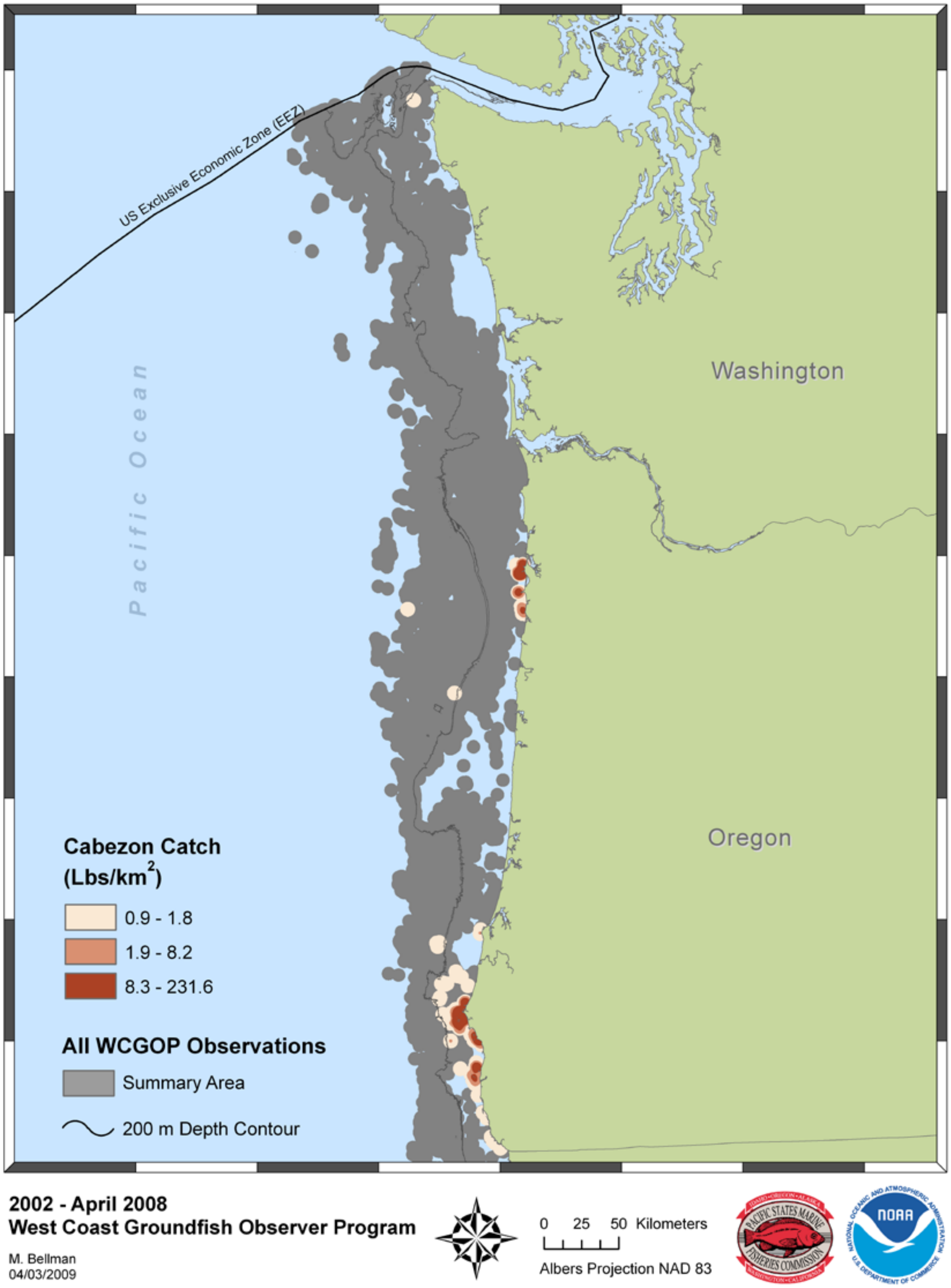

Figure 16. Spatial distribution of cabezon catch (lbs/km^2) observed by the West Coast Groundfish Observer Program from 2002 – April 2008 and the summary area of all observed fishing events off of Washington and Oregon. Map courtesy of M. Bellman.

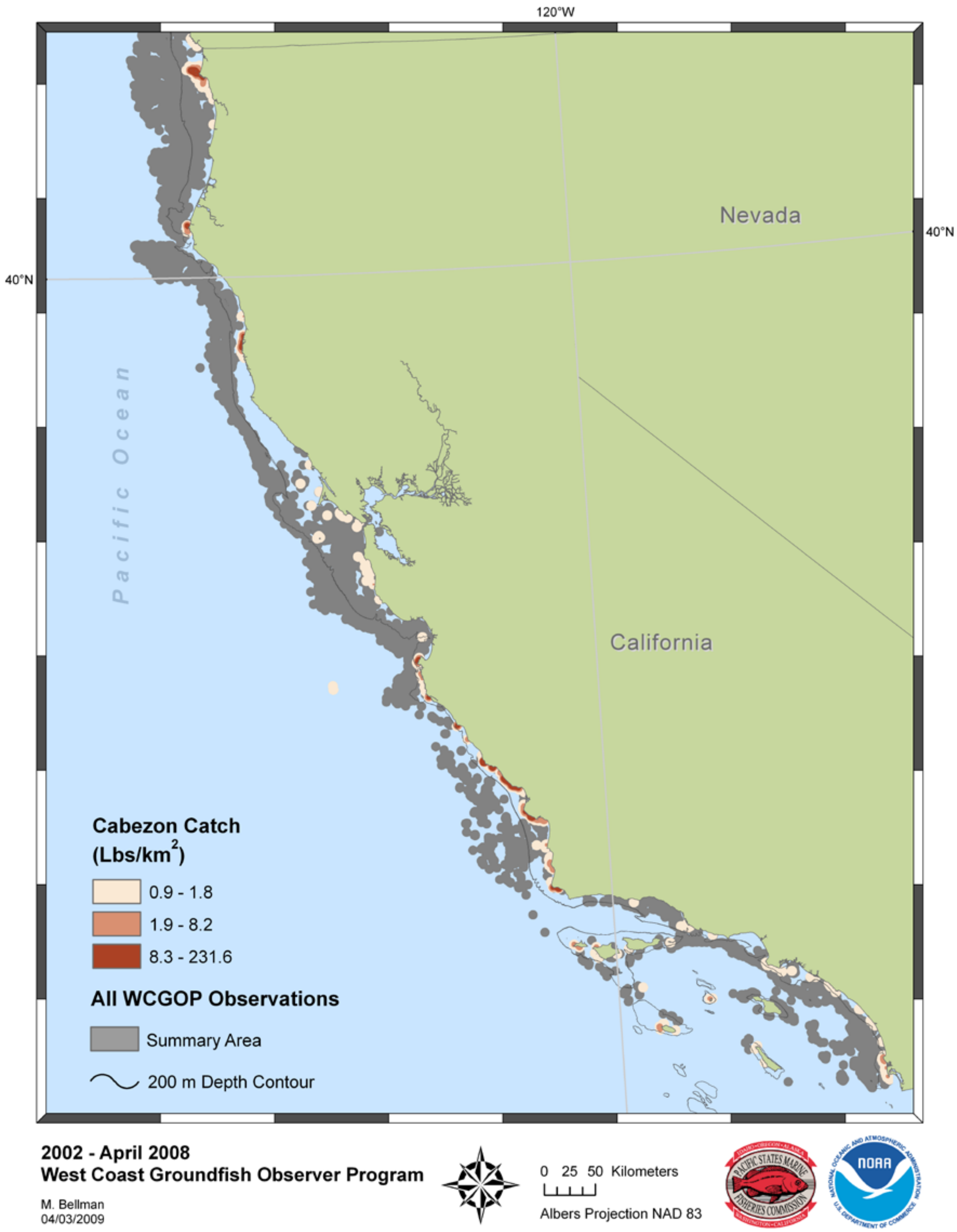

Figure 17. Spatial distribution of cabezon catch (lbs/km^2) observed by the West Coast Groundfish Observer Program from 2002 – April 2008 and the summary area of all observed fishing events off of California. Map courtesy of M. Bellman.

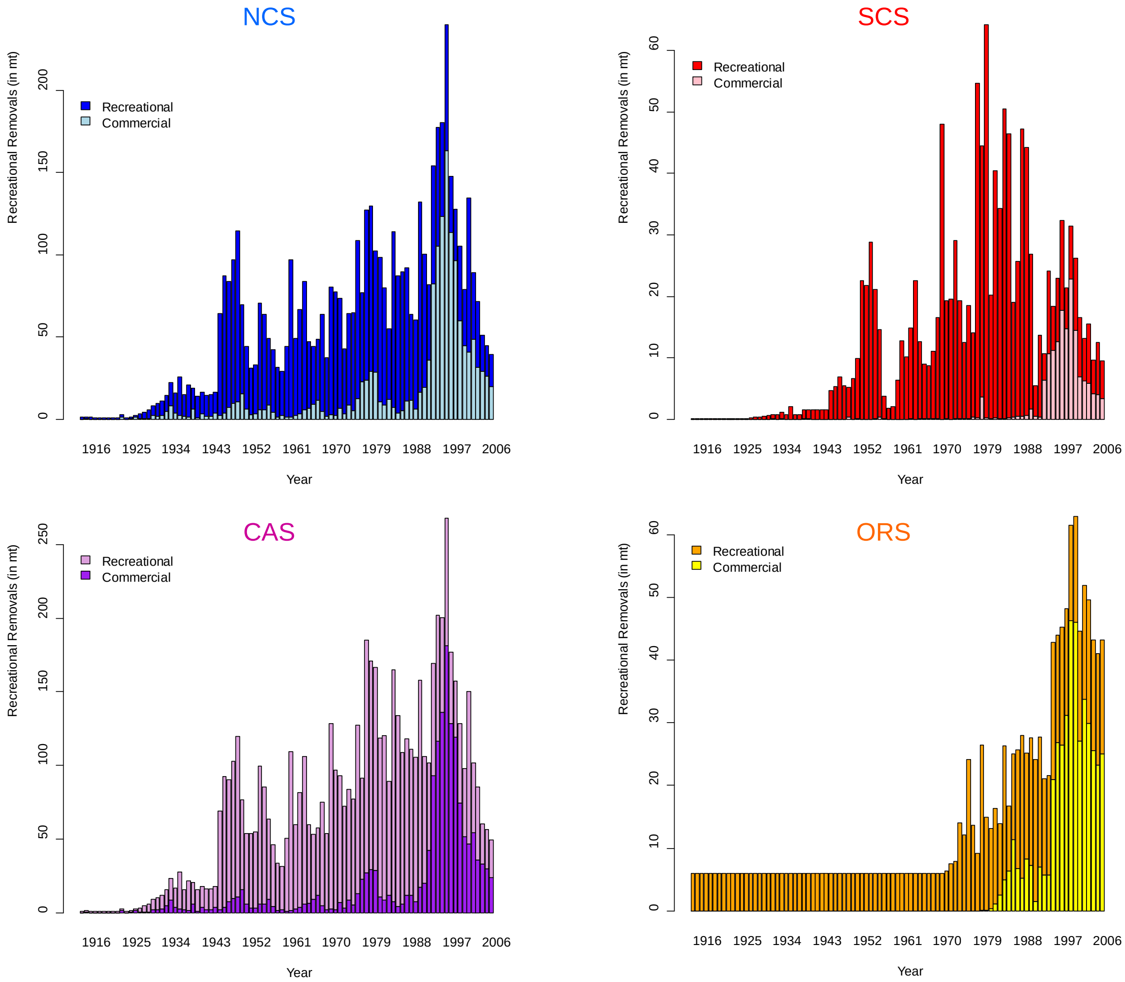

Figure 18. Total removals of cabezon (in mt) by major fishery and sub-stock.

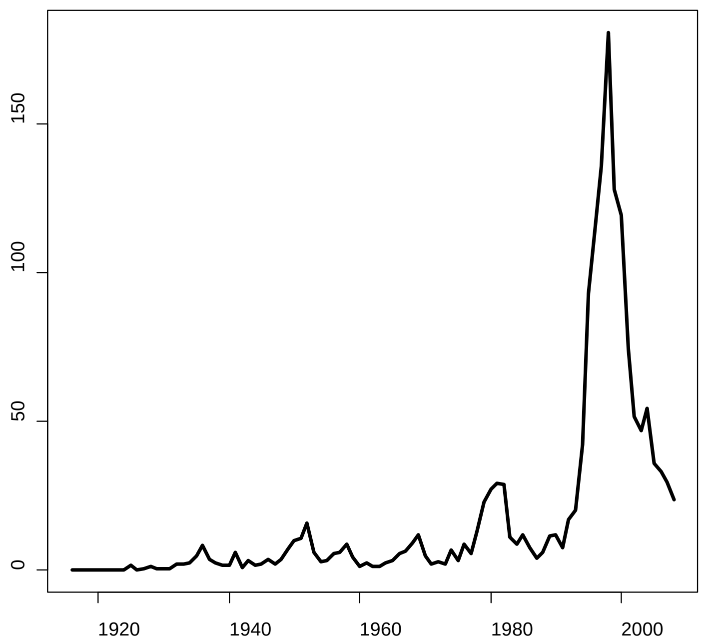

Figure 19. Comparison of total fishery removals between the 2009 and 2005 assessments for the commercial (top panel) and recreational (bottom panel) fishery sectors.

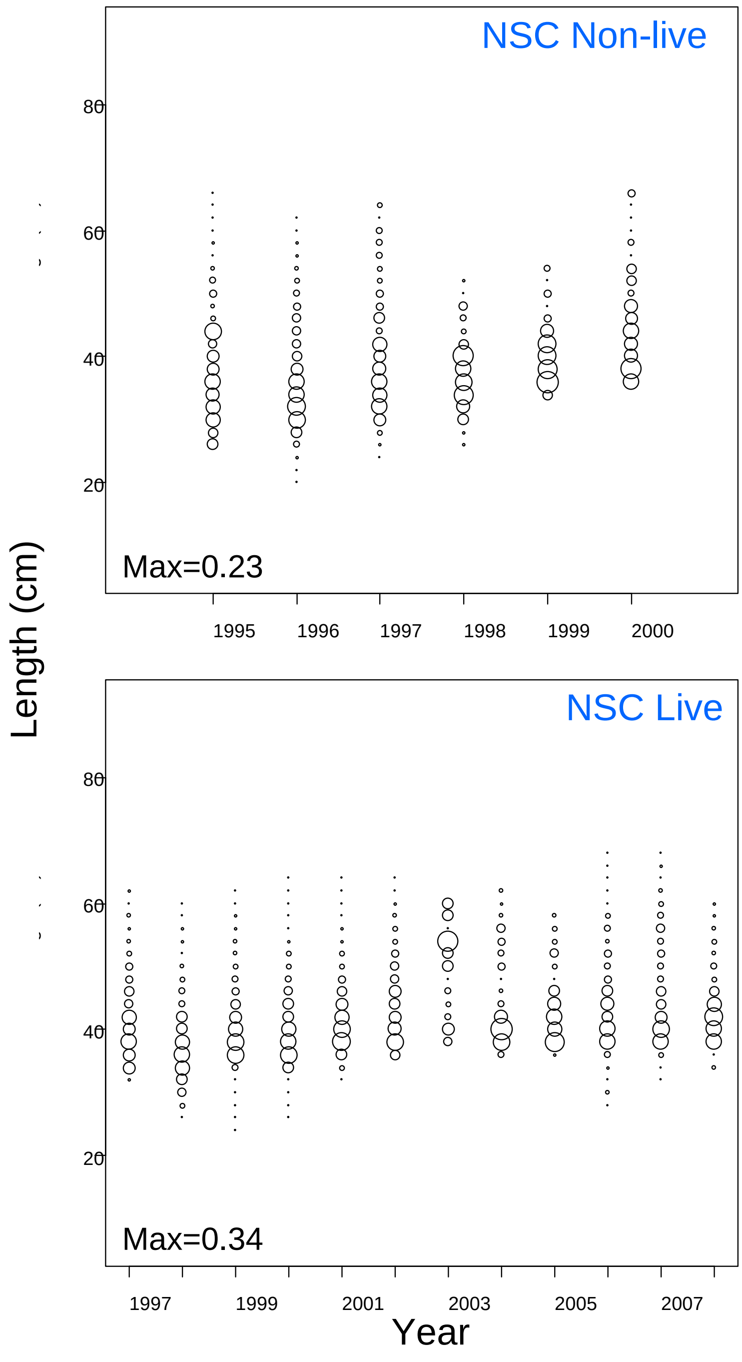

Figure 20. Length composition bubble plots for the NCS commercial fisheries. Values in the lower left of each panel refer to the proportion size of the biggest bubble.

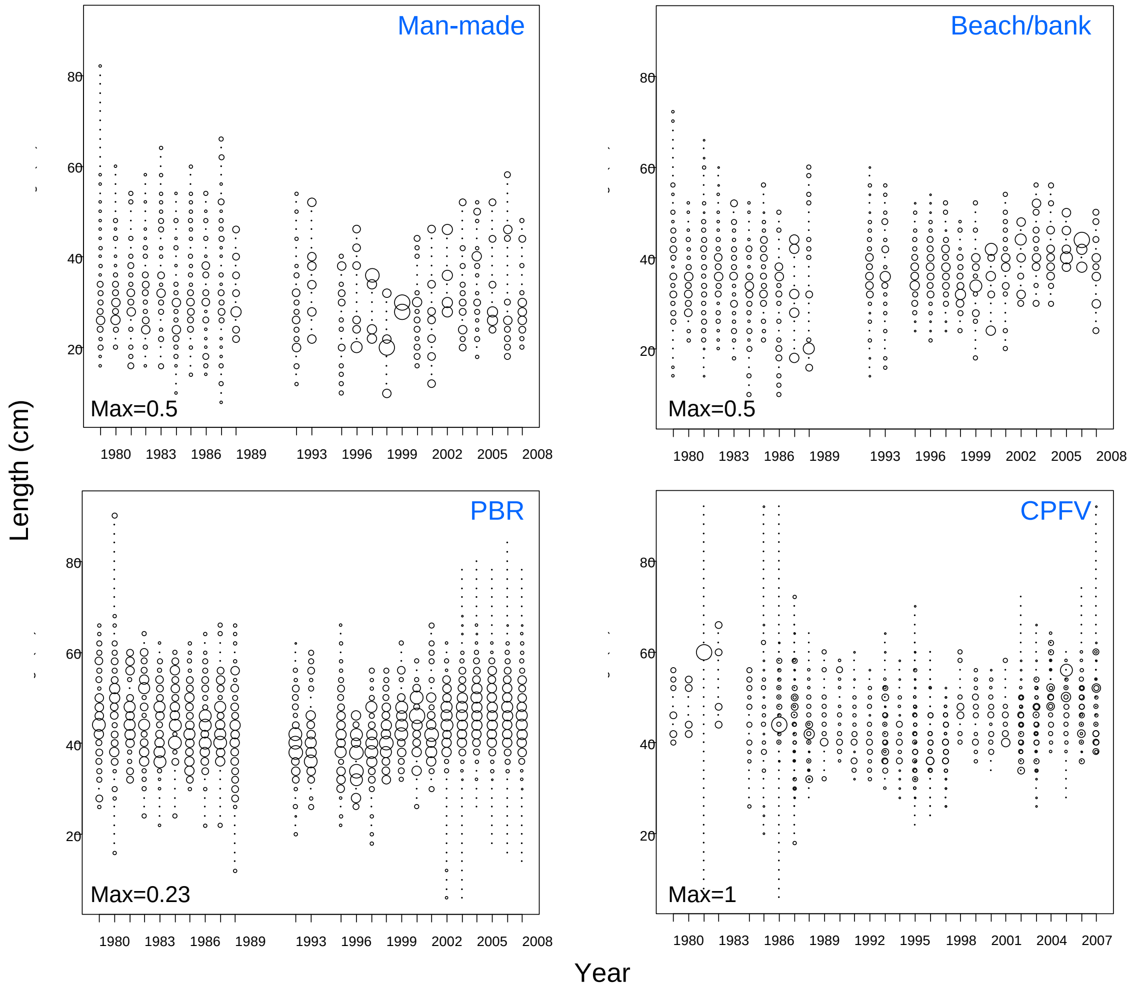

Figure 21. Length composition bubble plots for the NCS recreational fishery modes. Values in the lower left of each panel refer to the proportion size of the biggest bubble.

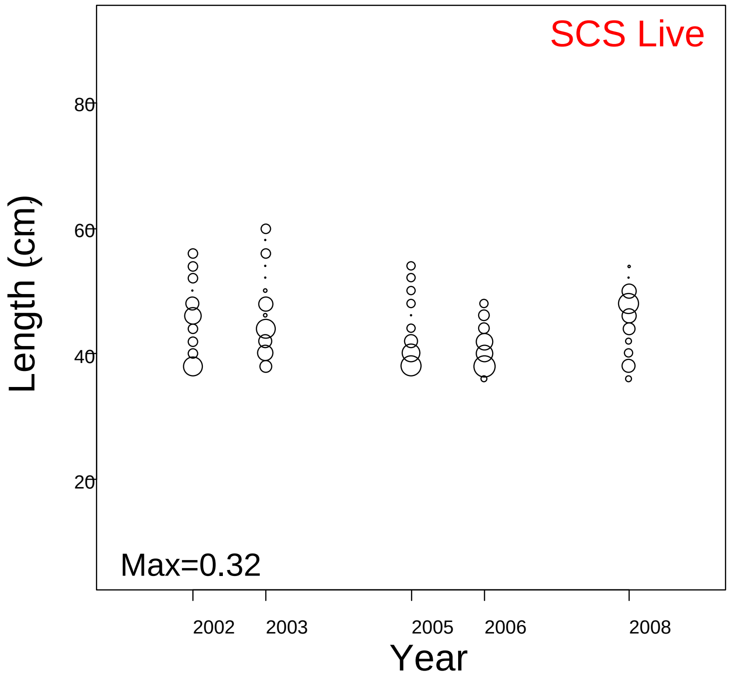

Figure 22. Length composition bubble plots for the SCS live-fish commercial fishery. Values in the lower left of each panel refer to the proportion size of the biggest bubble.

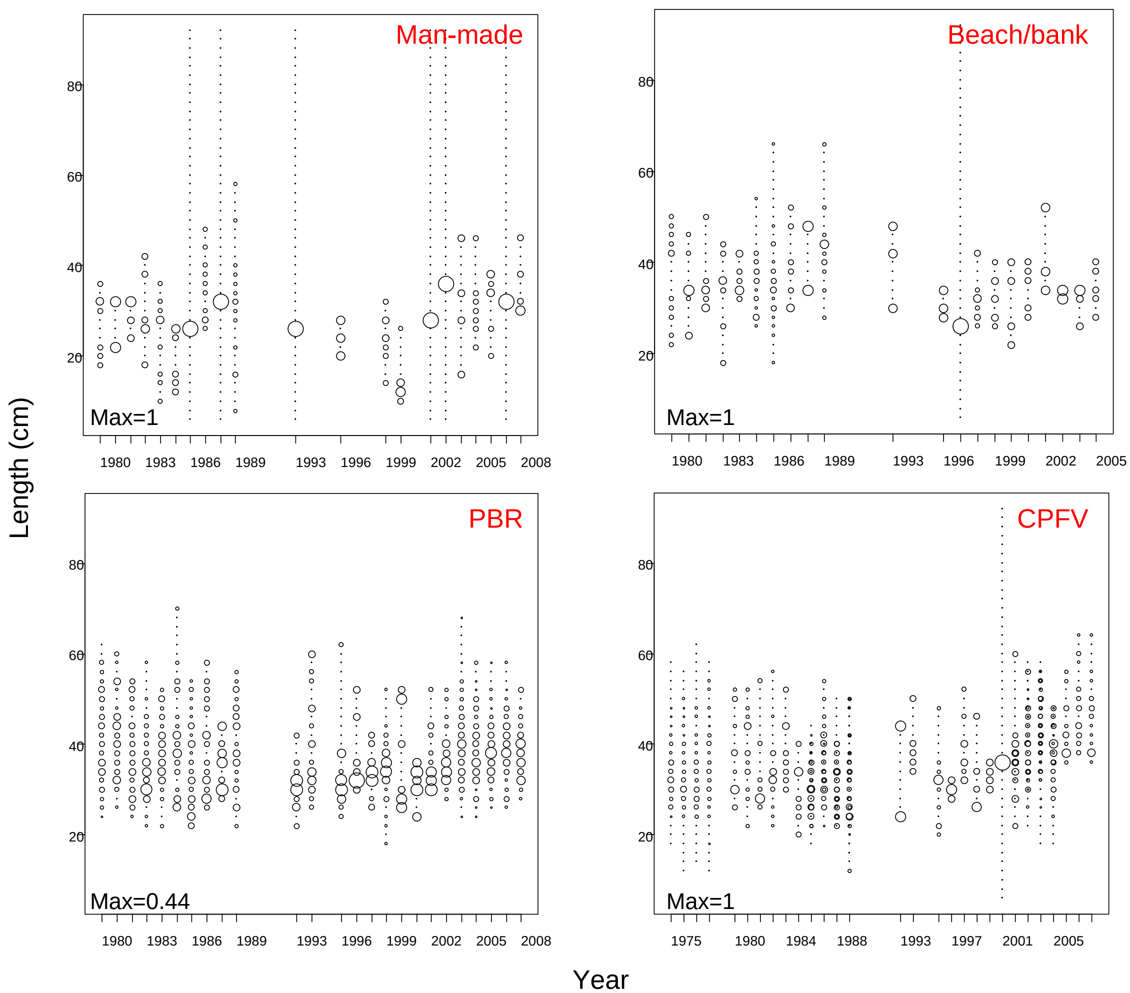

Figure 23. Length composition bubble plots for the SCS recreational fishery modes. Values in the lower left of each panel refer to the proportion size of the biggest bubble.

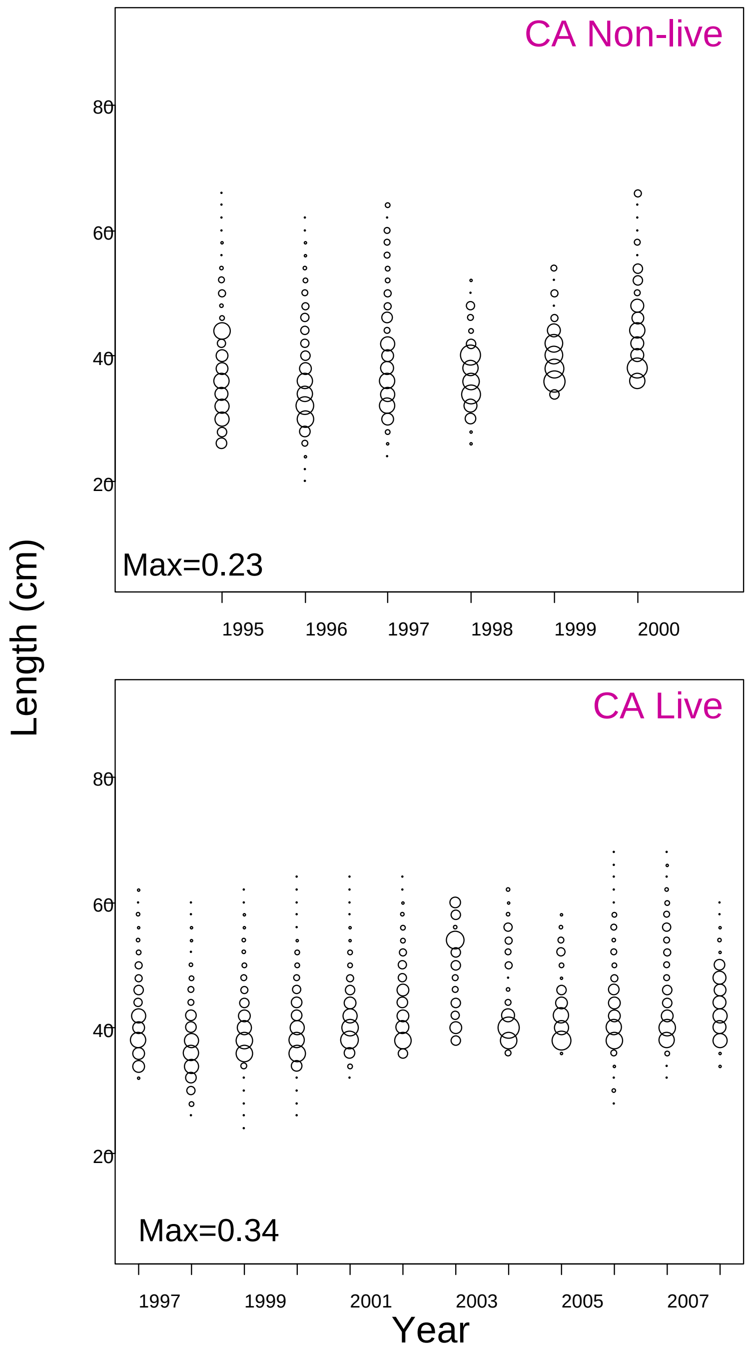

Figure 24. Length composition bubble plots for the CAS commercial fisheries. Values in the lower left of each panel refer to the proportion size of the biggest bubble.

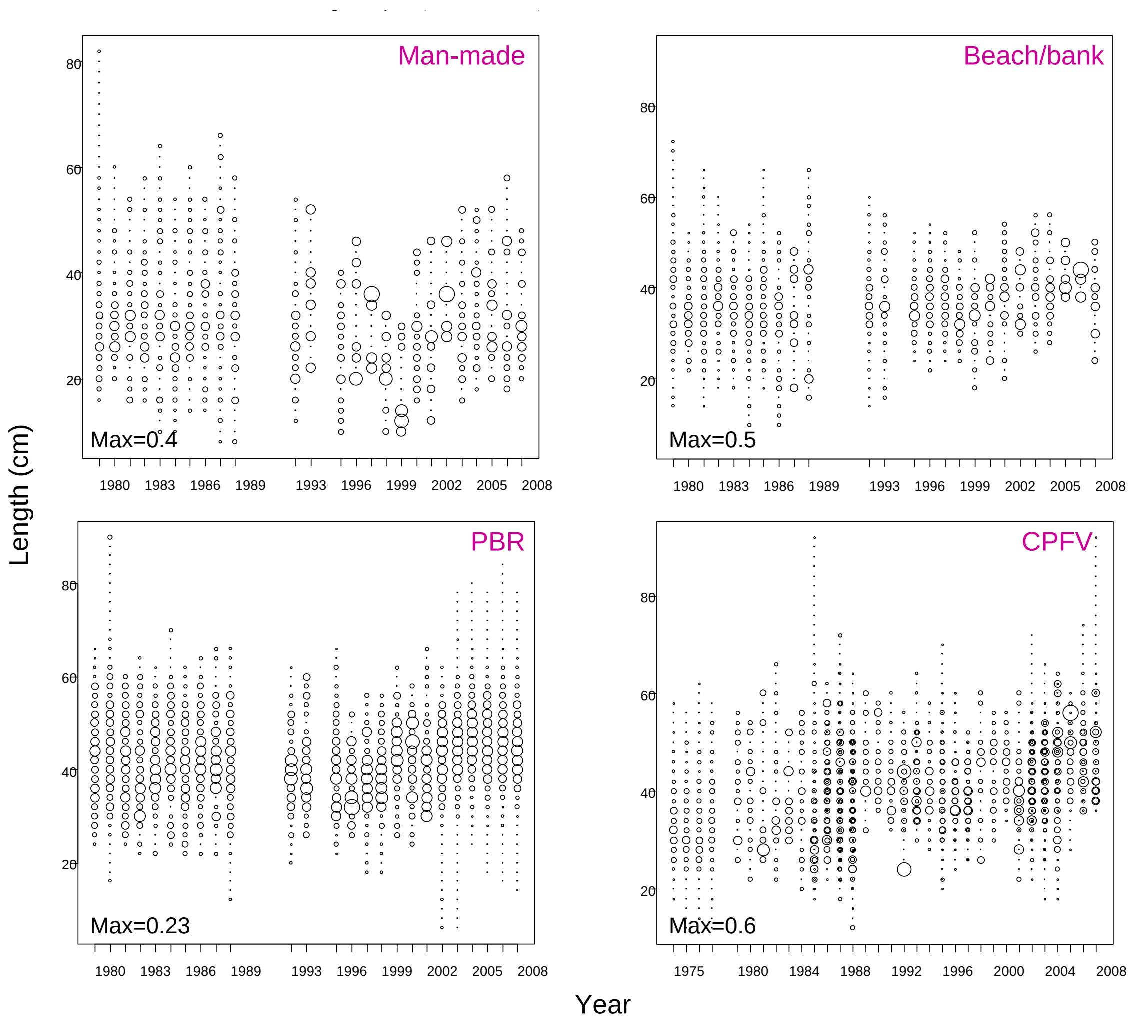

Figure 25. Length composition bubble plots for the CAS recreational fishery modes. Values in the lower left of each panel refer to the proportion size of the biggest bubble.

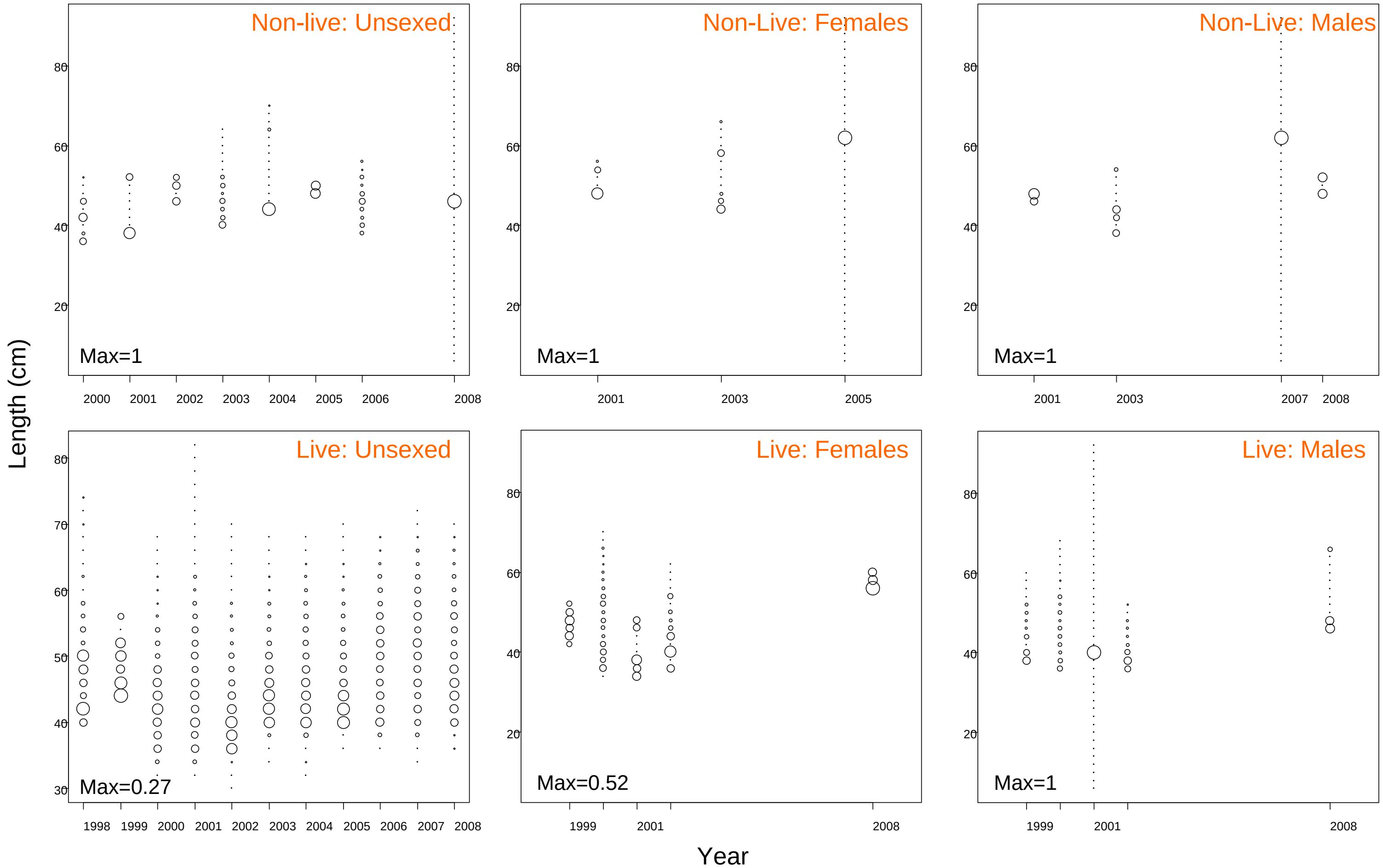

Figure 26. Length composition bubble plots for the ORS commercial fisheries. Values in the lower left of each panel refer to the proportion size of the biggest bubble.

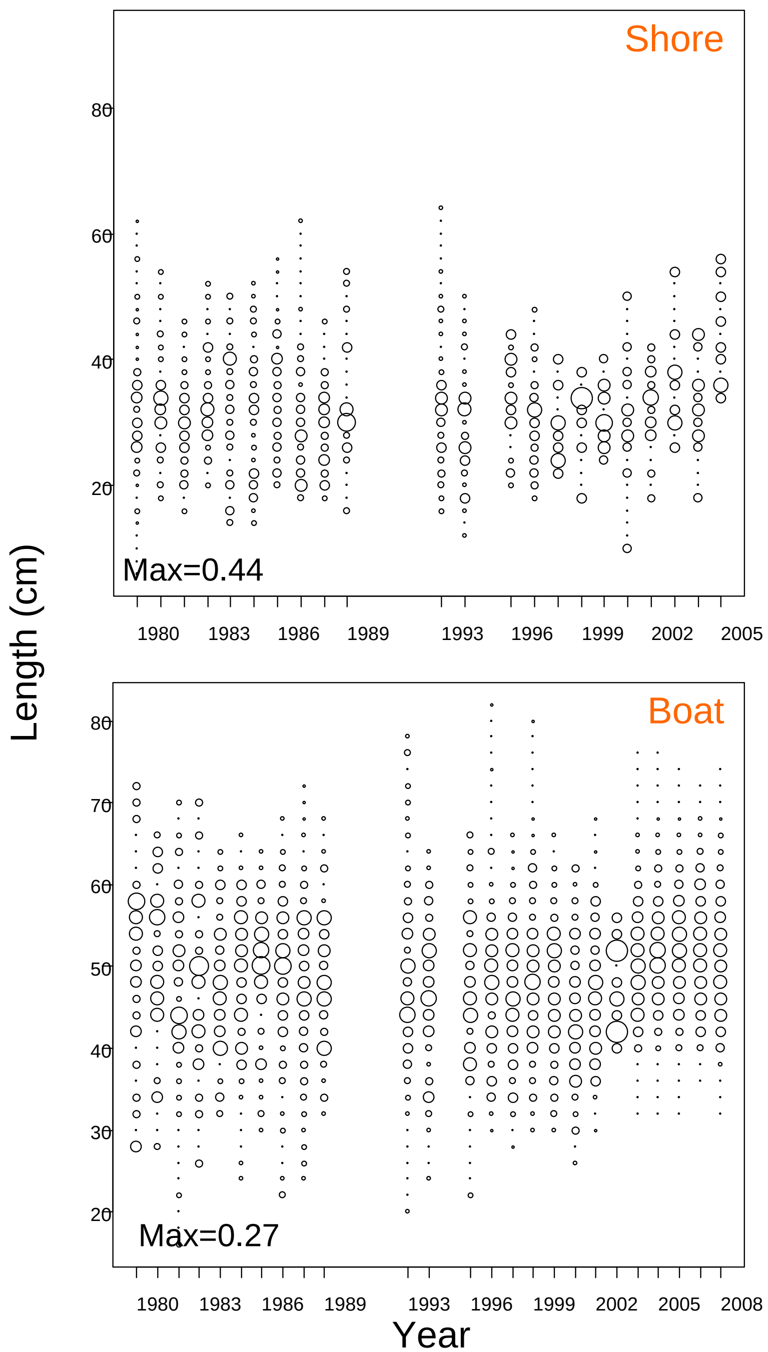

Figure 27. Length composition bubble plots for the ORS recreational fishery modes. Values in the lower left of each panel refer to the proportion size of the biggest bubble.

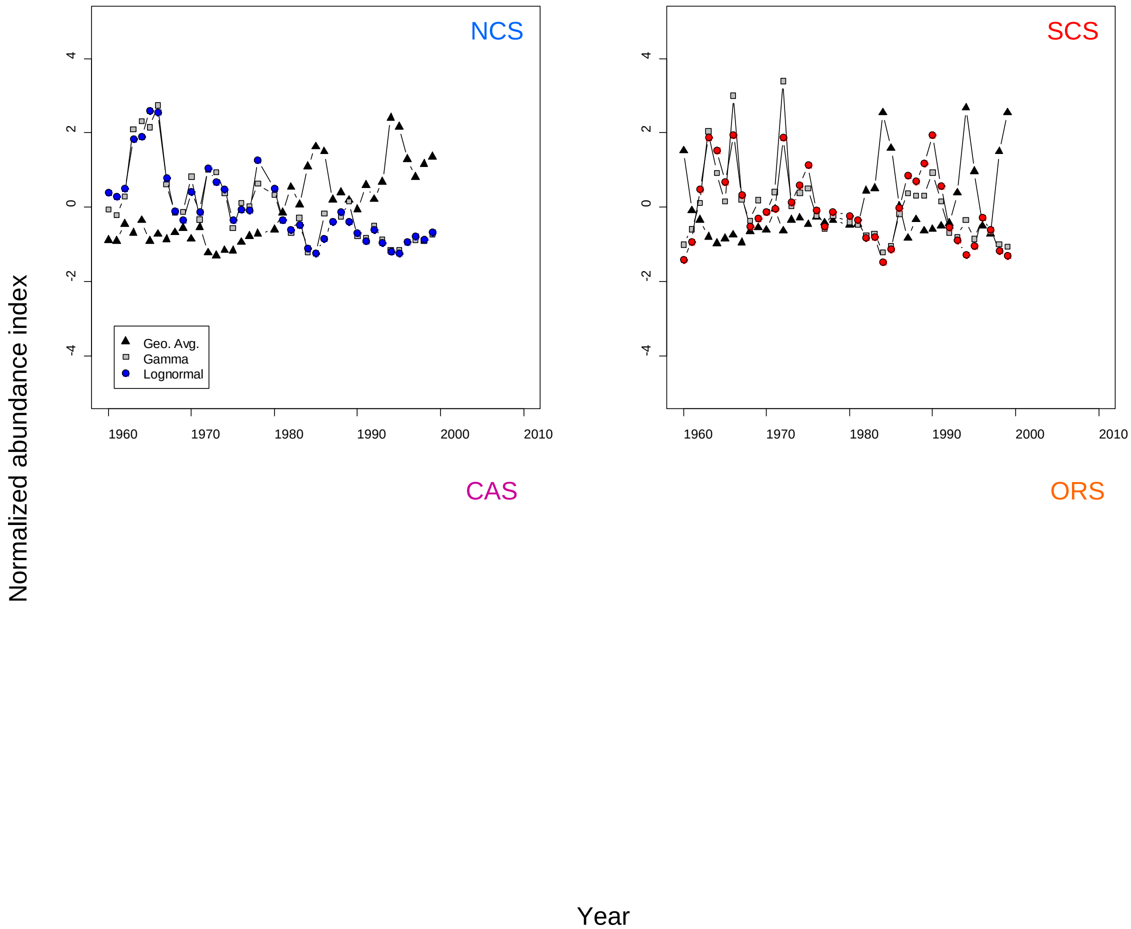

Figure 28. Geometric mean and delta GLM-based CPUE abundance indices for each sub-stock. Plotted values are the normalized (Z-score) index values. Vertical broken line shows the break in time series for the SCS CPFV indices.

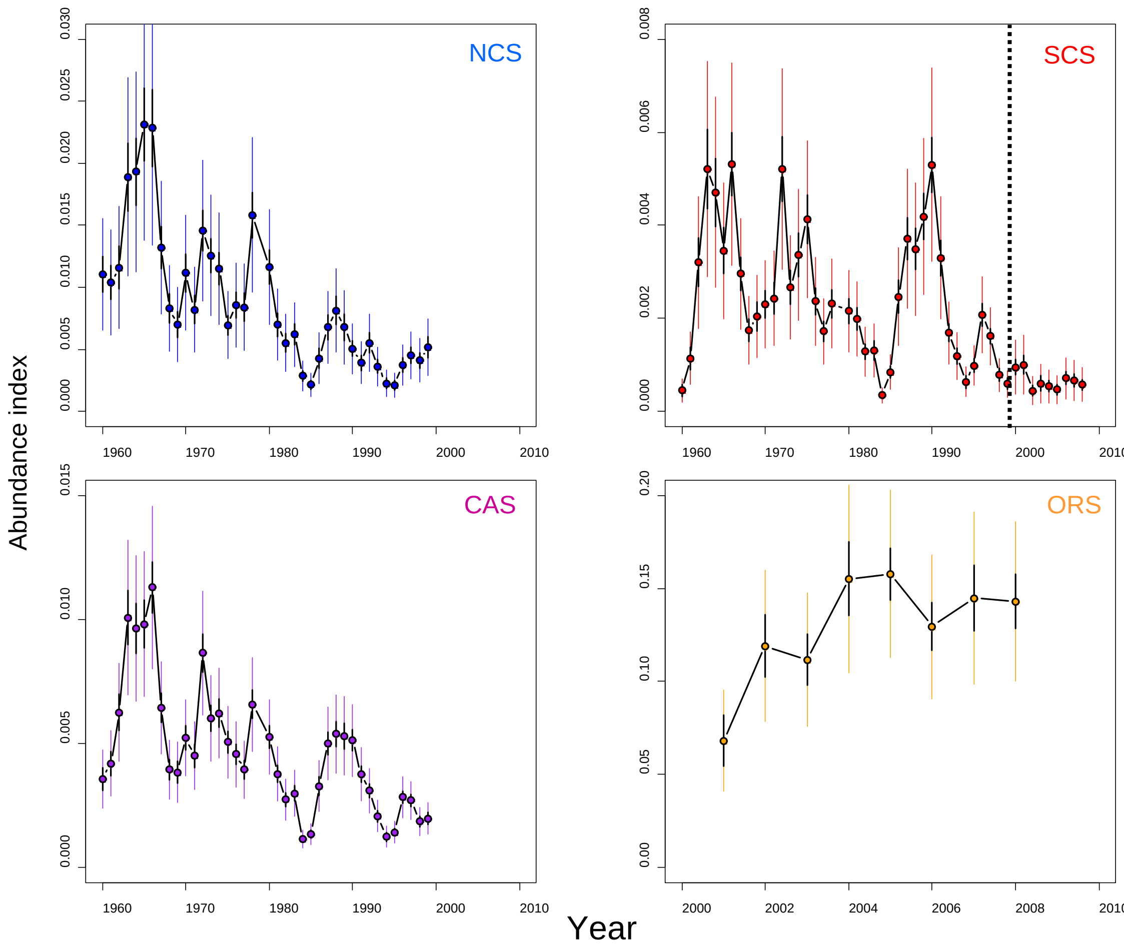

Figure 29. Time series of abundance series for the California CPFV indices and ORBS survey with 95% confidence intervals. Black line confidence intervals are based on the original estimates of CVs from the delta-GLM models; colored lines are based on the inflated CVs. Vertical broken line in the SCS panel distinguishes the two CPFV time series.

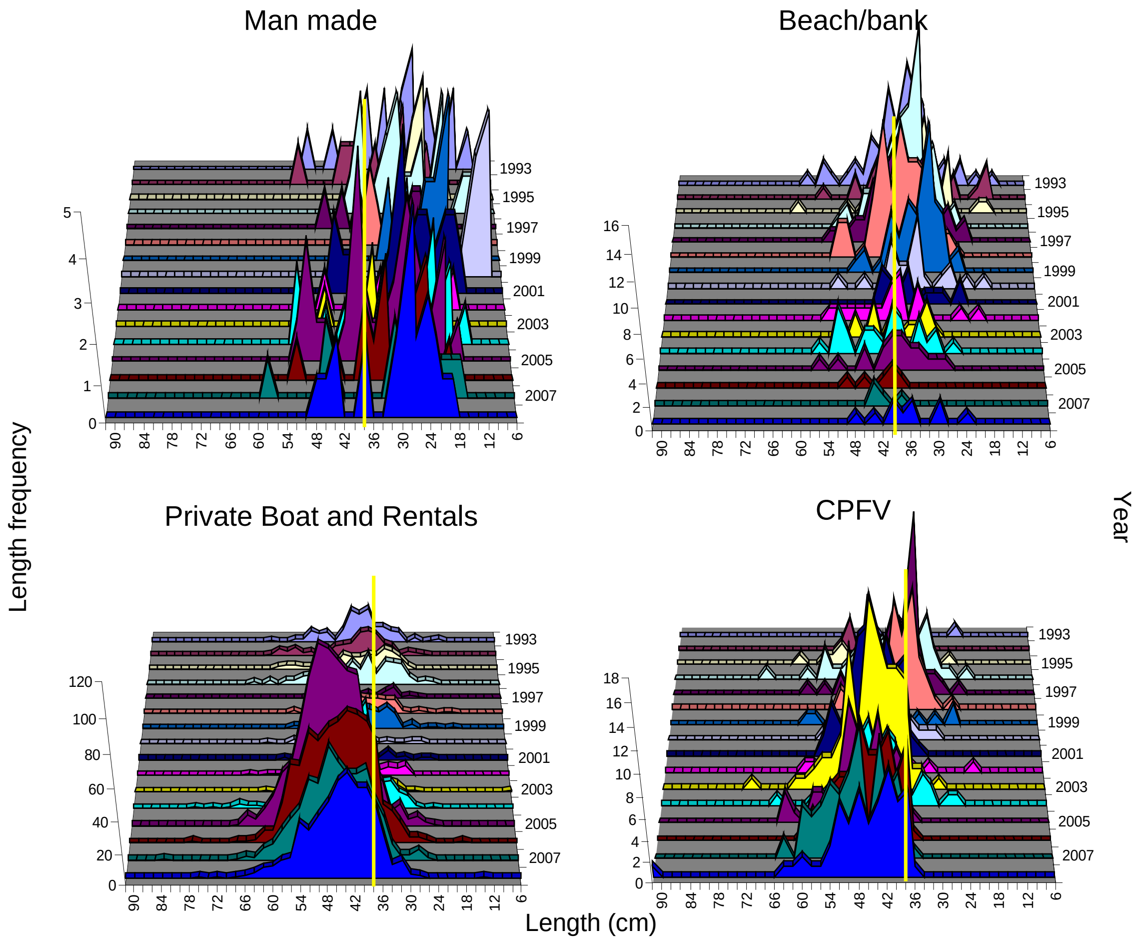

Figure 30. Length compositions for the four recreational modes in California. Yellow vertical line indicates the size limit (38 inches) implemented in 2000.

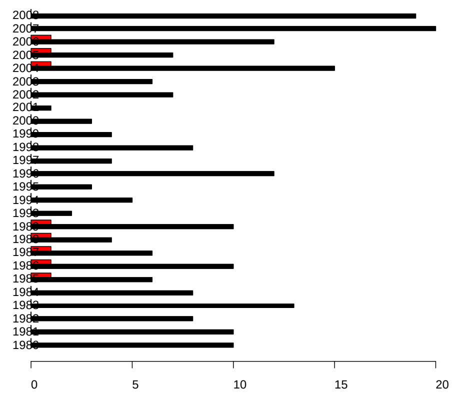

Figure 31. Frequency of cabezon in bags for the NCS and SCS sub-stocks from the PBR and CPFV recreational fishing modes. Horizontal blue and red lines indicate the transition to bag limits of 1.

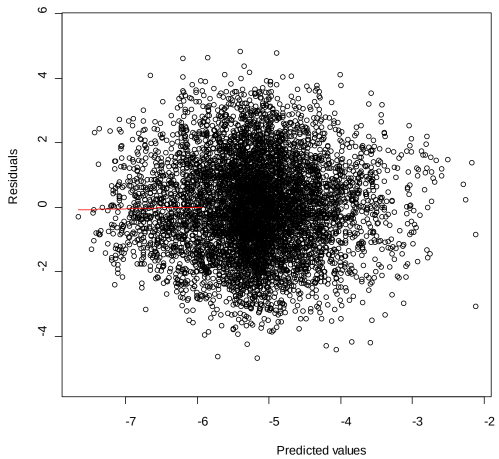

Figure 32. Diagnostic plots of the GLM-fit to the positive records for the CAS CPFV index.

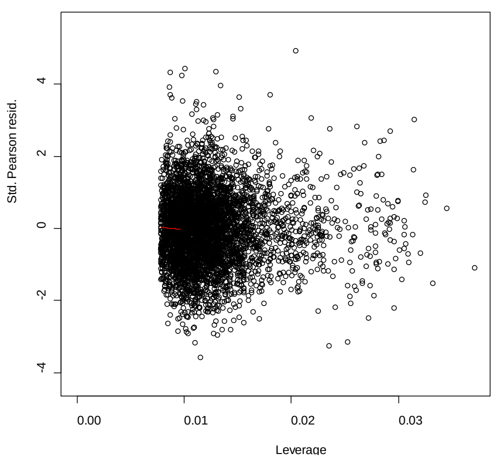

Figure 33. Diagnostic plots of the GLM-fit to the positive records for the NCS CPFV index.

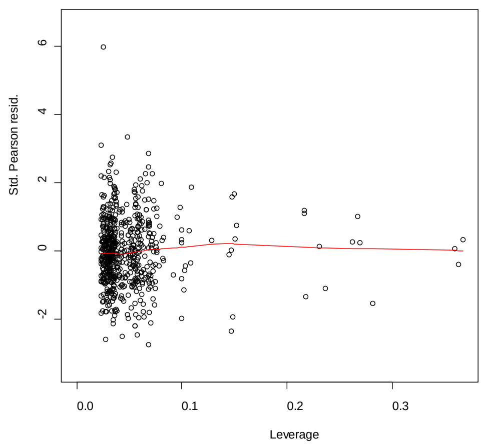

Figure 34. Diagnostic plots of the GLM-fit to the positive records for the SCS CPFV index (1960-2008).

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Figure 35. Relationship between the natural log (ln) of catch versus year (top left panel), month (top right panel), and location (lower left panel) for the NCS CPFV index. The location of Santa Cruz (Sn.C) demonstrated significant location-year interactions.

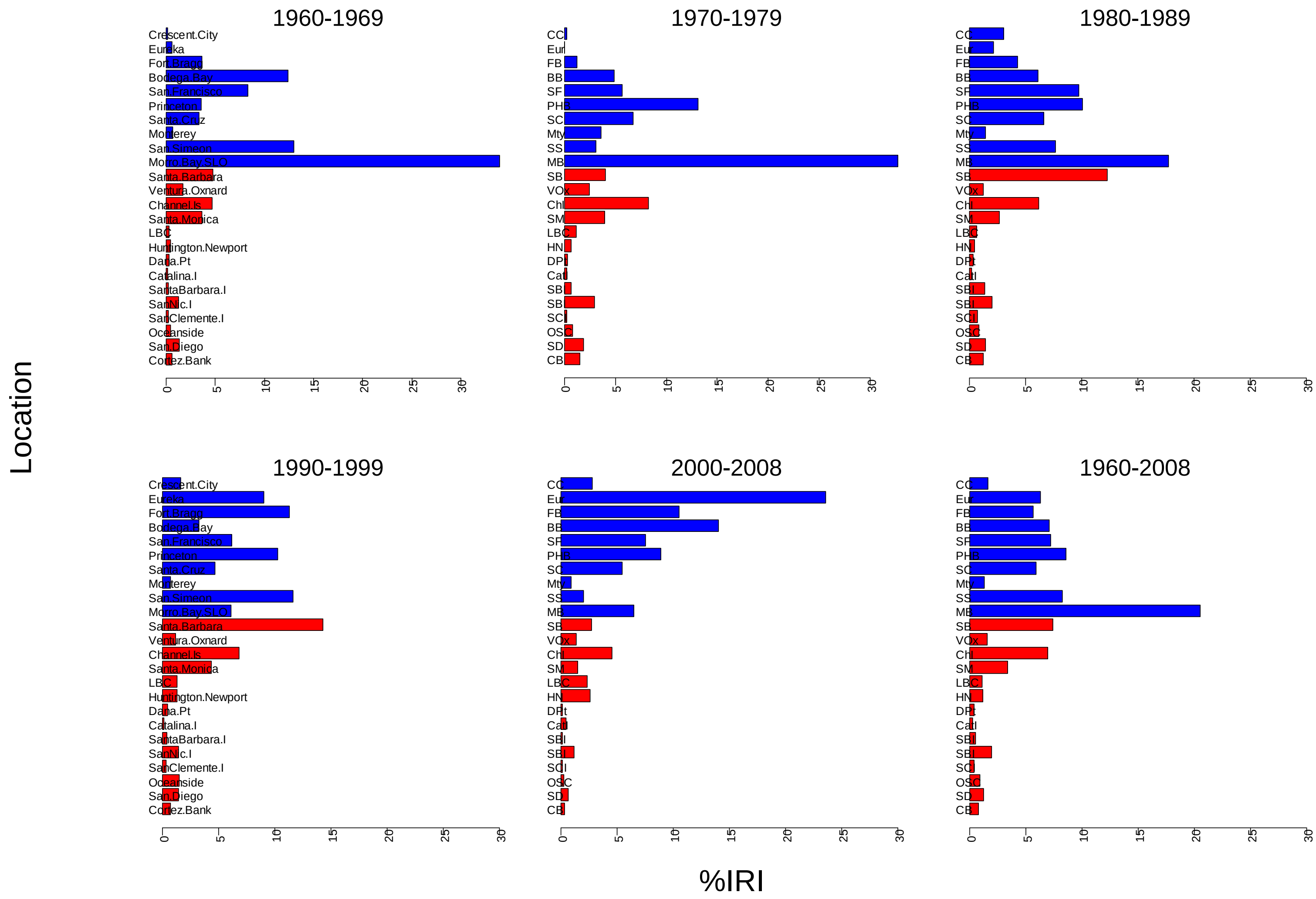


Figure 36. Percent Index of Relative Importance (%IRI) of cabezon catch in the CPFV fishery by fishing location through time.

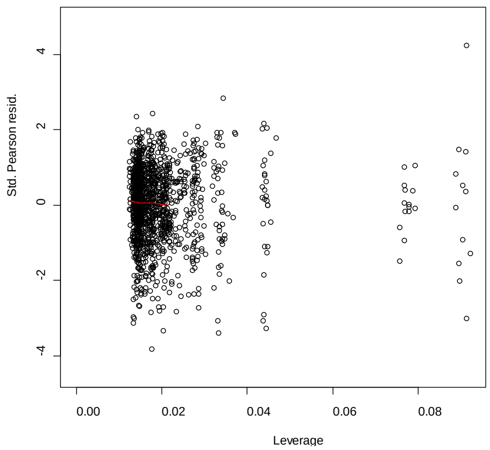


Figure 37. Diagnostic plots of the GLM-fit to the positive records for the ORS ORBS index.

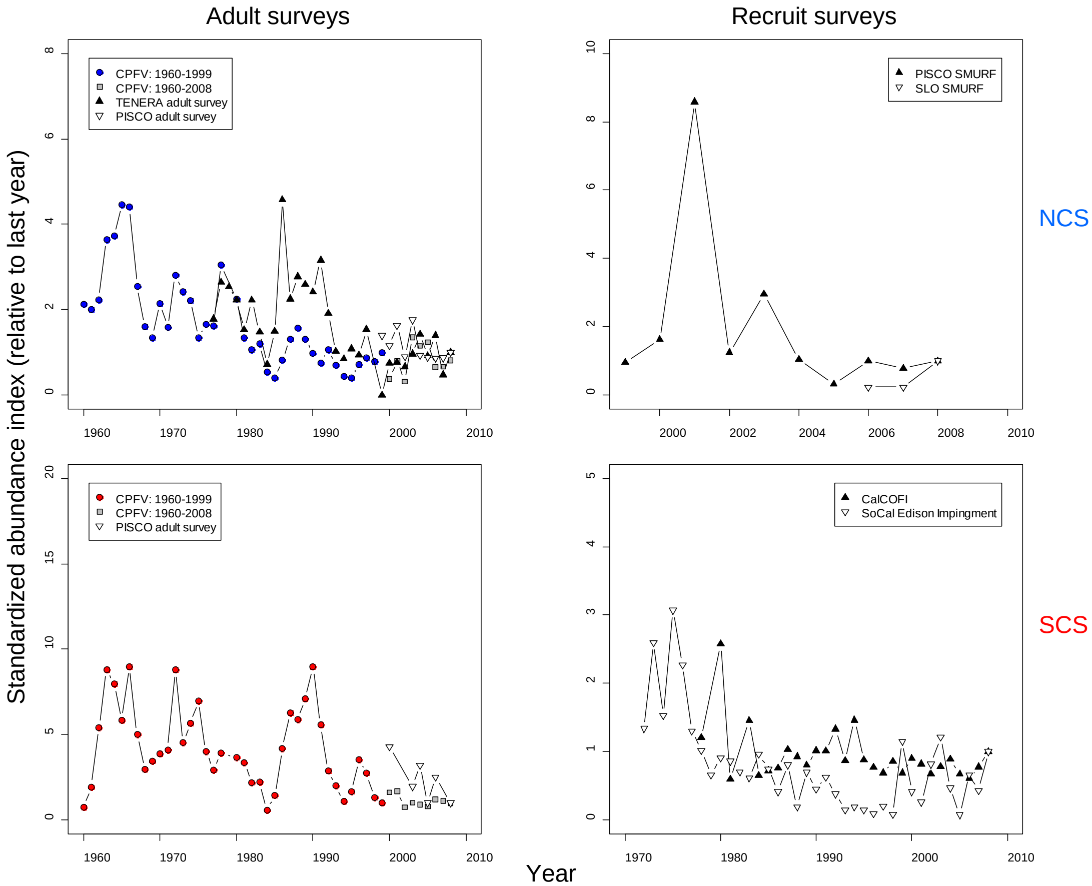


Figure 38. Indices of abundance (mean values) considered in either base case or sensitivity models for the NCS and SCS.

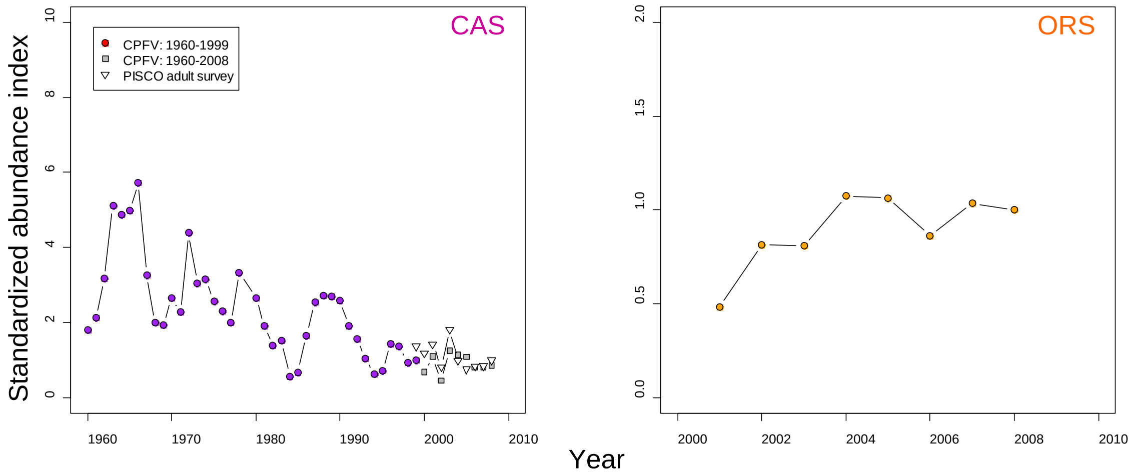


Figure 39. Indices of abundance (mean values) considered in either base case or sensitivity models for the CAS and ORS.

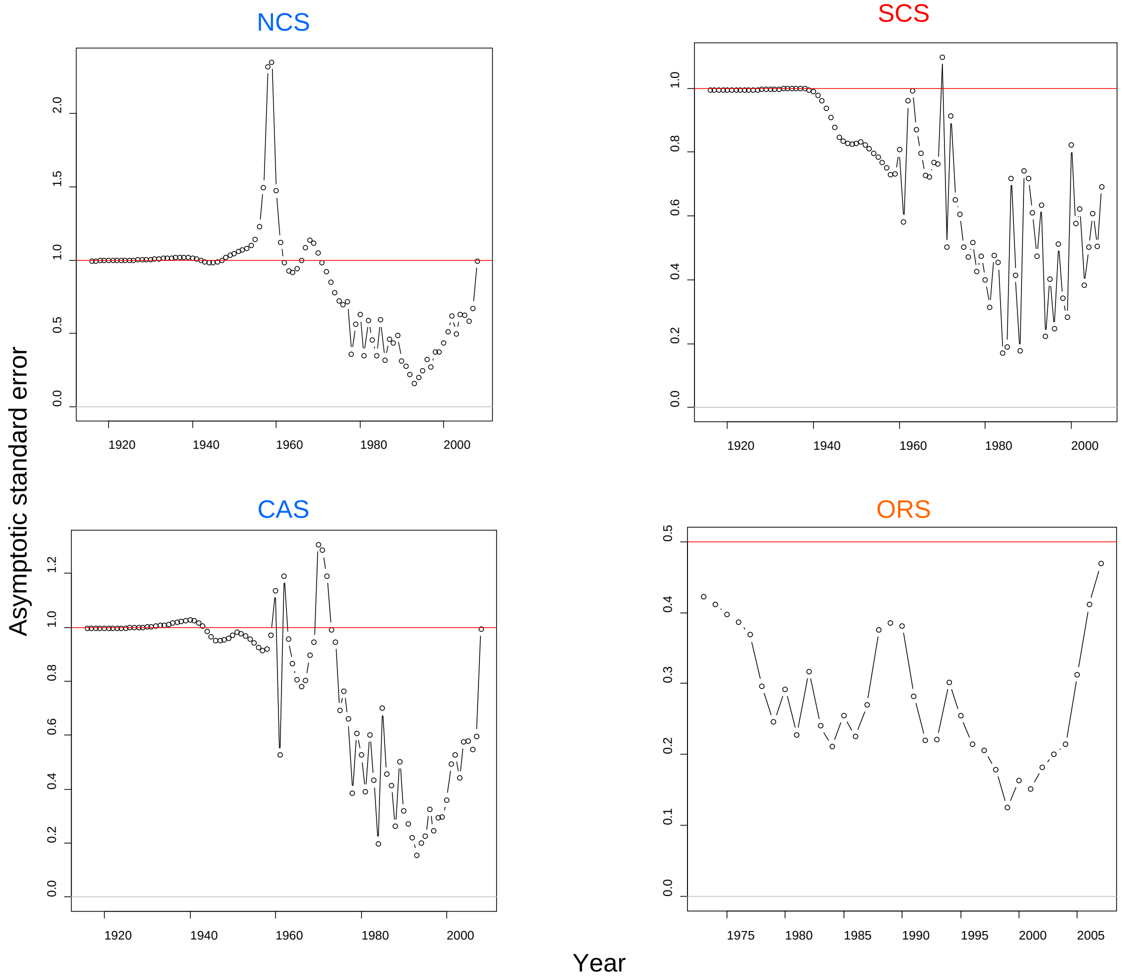


Figure 40. Asymptotic standard error of recruitment deviations when recruitment is estimated for the full time series in each sub-stock base case.

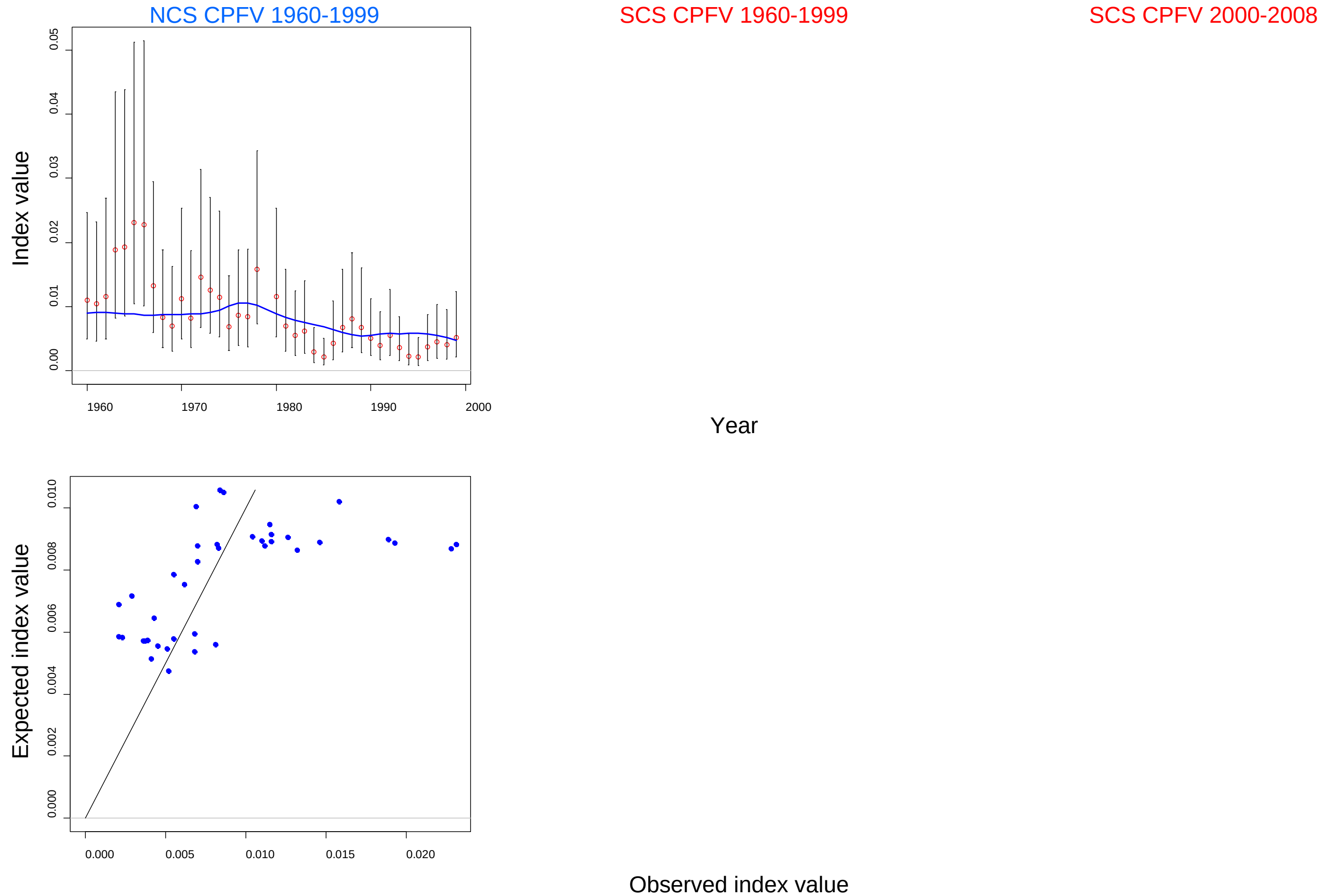


Figure 41. Fits to the CPFV relative abundance time series (top panels) and the 1:1 points to observed and expected index values (bottom panels) used in the NCS and SCS base cases.

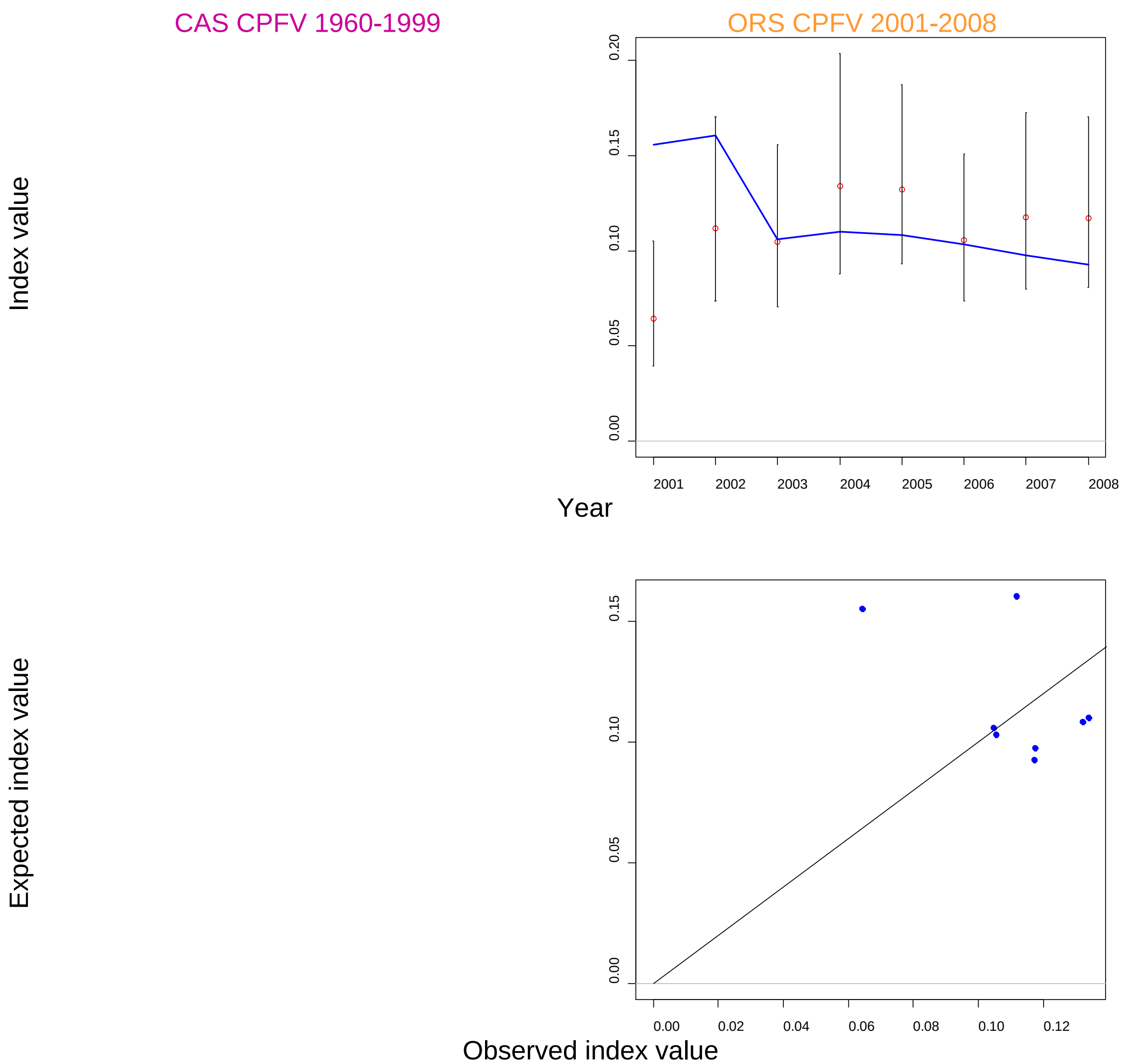


Figure 42. Fits to the CPFV relative abundance time series (top panels) and the 1:1 points to observed and expected index values (bottom panels) used in the CAS and ORS base cases.

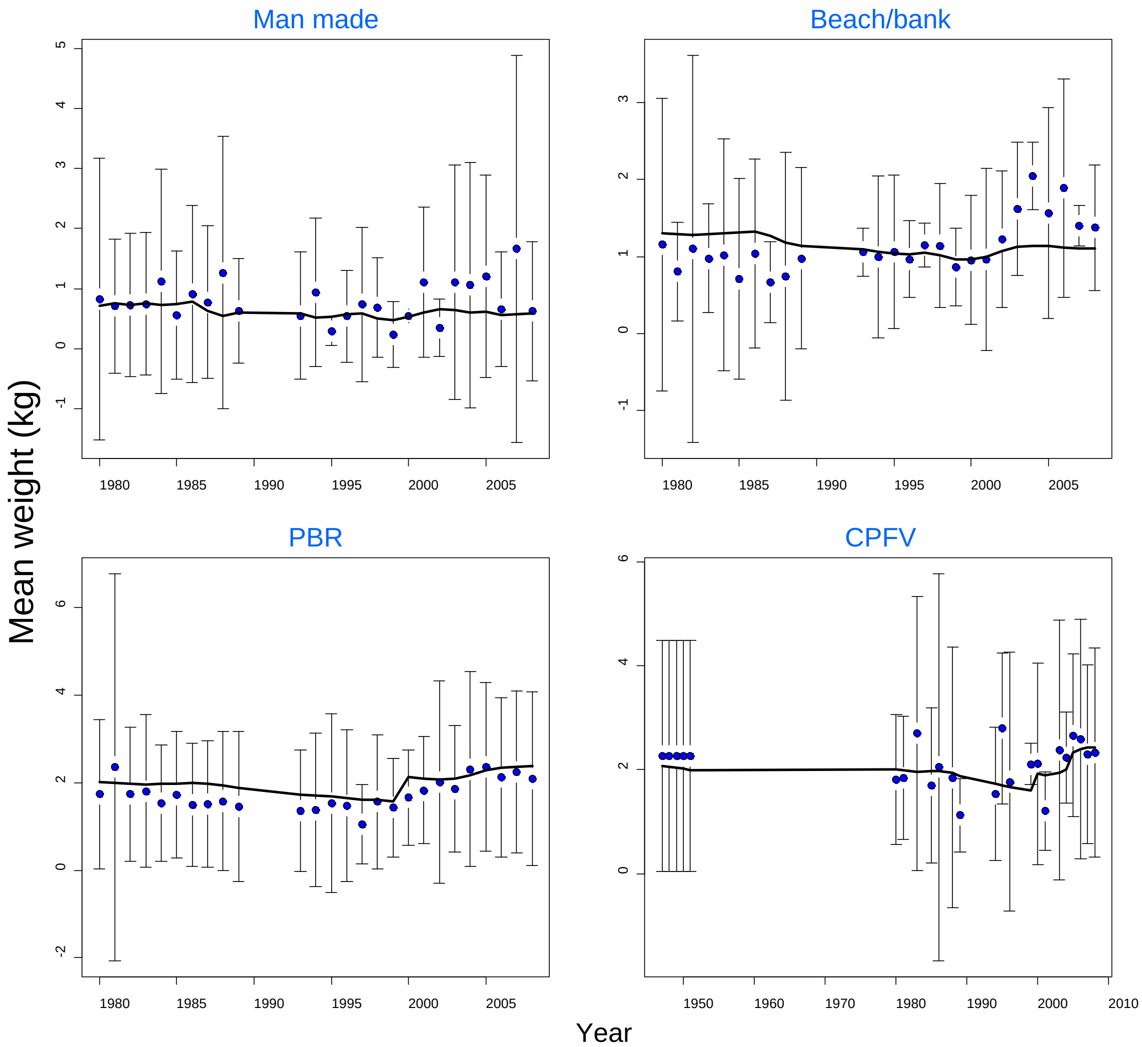


Figure 43. Plots to the observed (solid dots with 95% confidence intervals) and model-predicted (solid black lines) mean weights for each recreational fleet of the NCS.

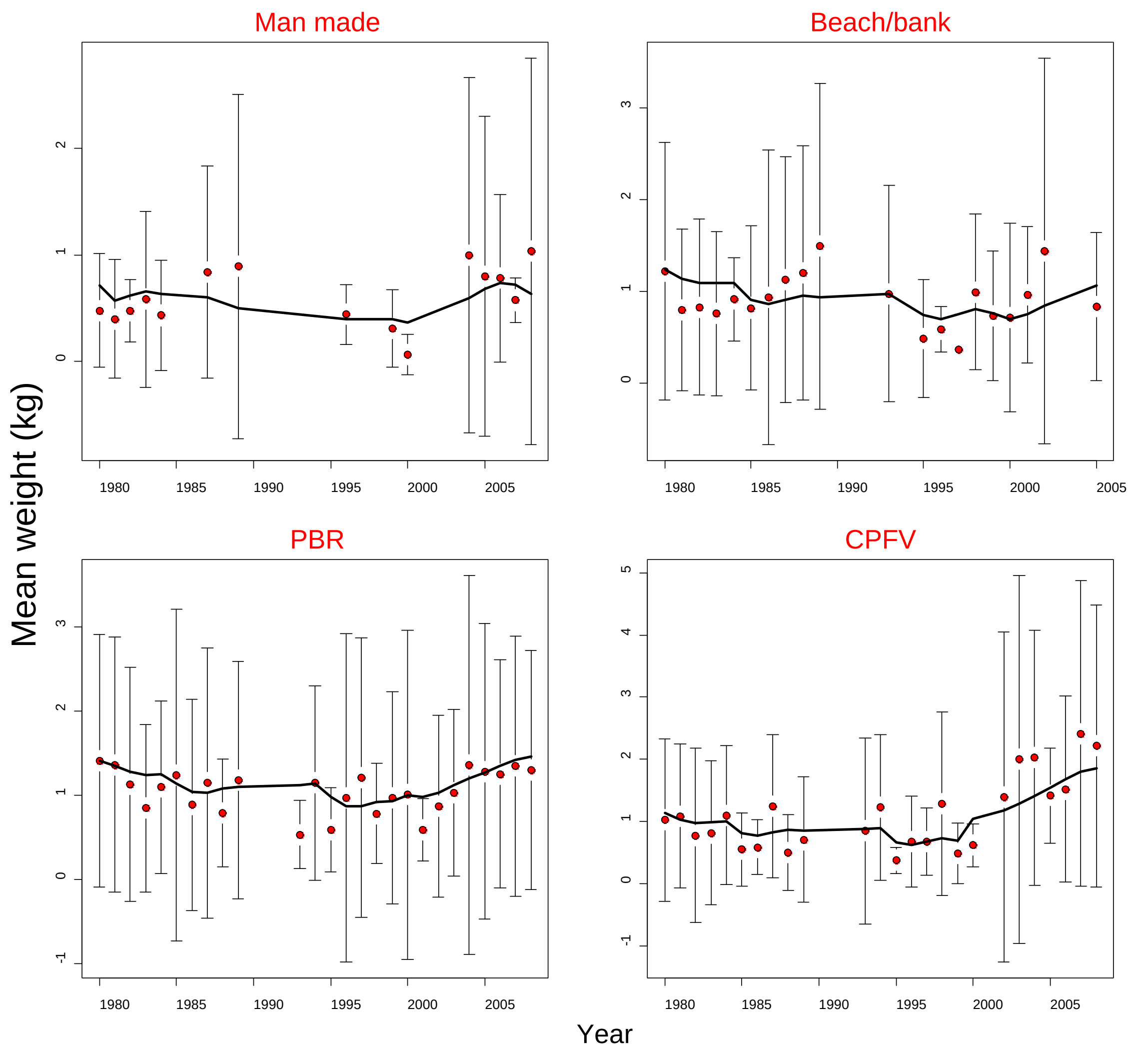


Figure 44. Plots to the observed (solid dots with 95% confidence intervals) and model-predicted (solid black lines) mean weights for each recreational fleet of the SCS.

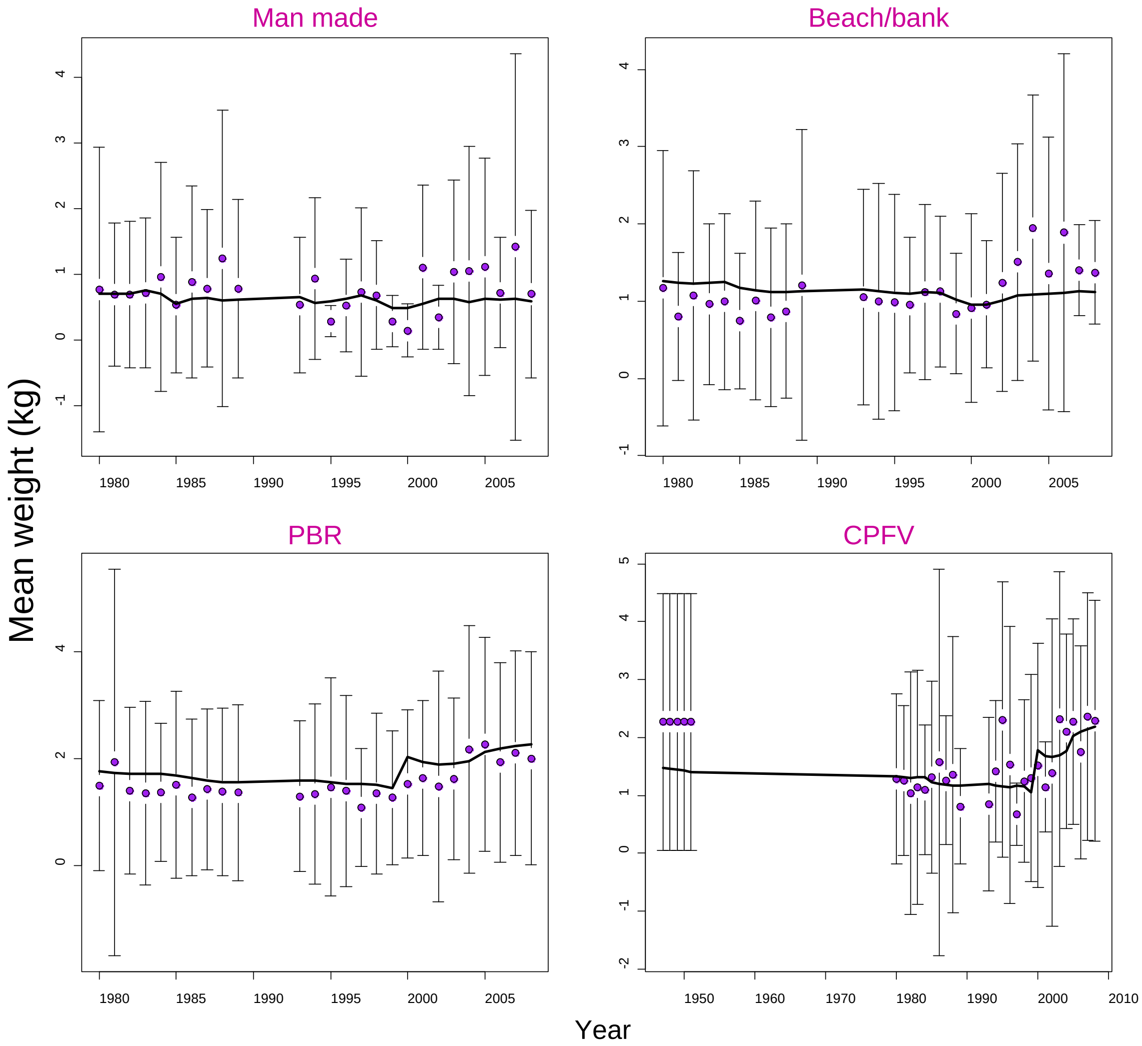


Figure 45. Plots to the observed (solid dots with 95% confidence intervals) and model-predicted (solid black lines) mean weights for each recreational fleet of the CAS.

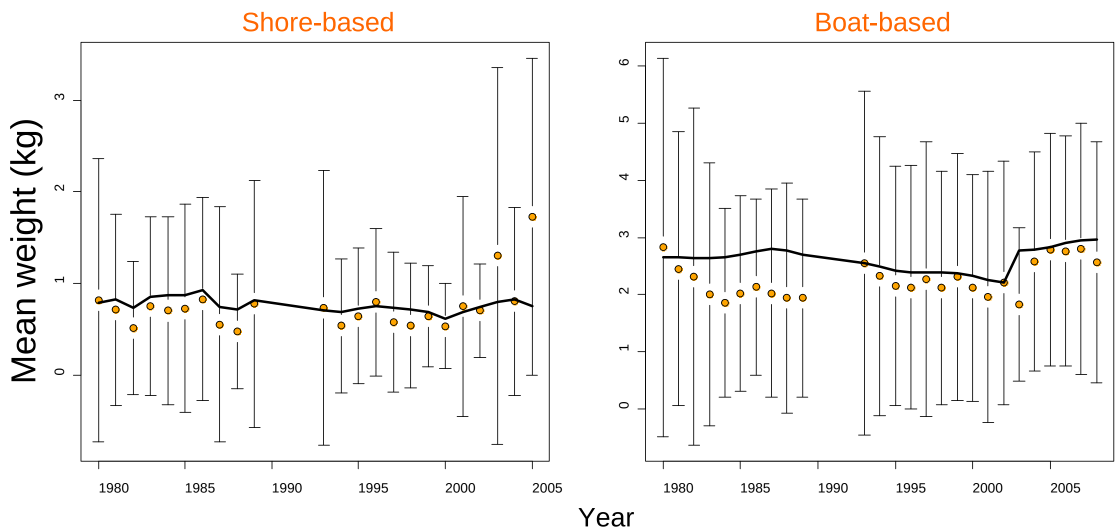


Figure 46. Plots to the observed (solid dots with 95% confidence intervals) and model-predicted (solid black lines) mean weights for each recreational fleet of the ORS.

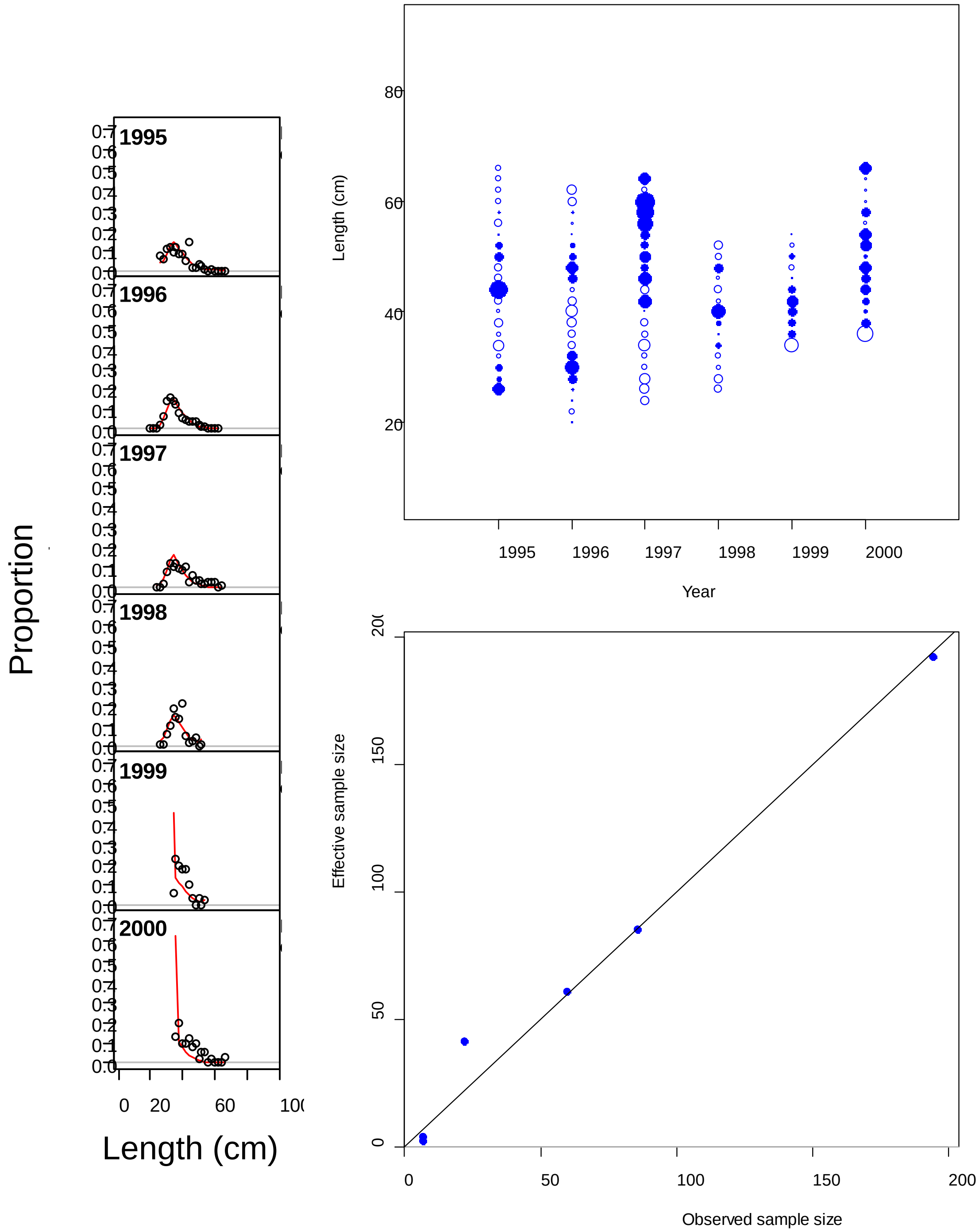


Figure 47. Fits to the Non-live (fleet 1) commercial fishery length compositions for the NCS. Left panel: Observed (circles) and model-predicted fits (red line) to length composition by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

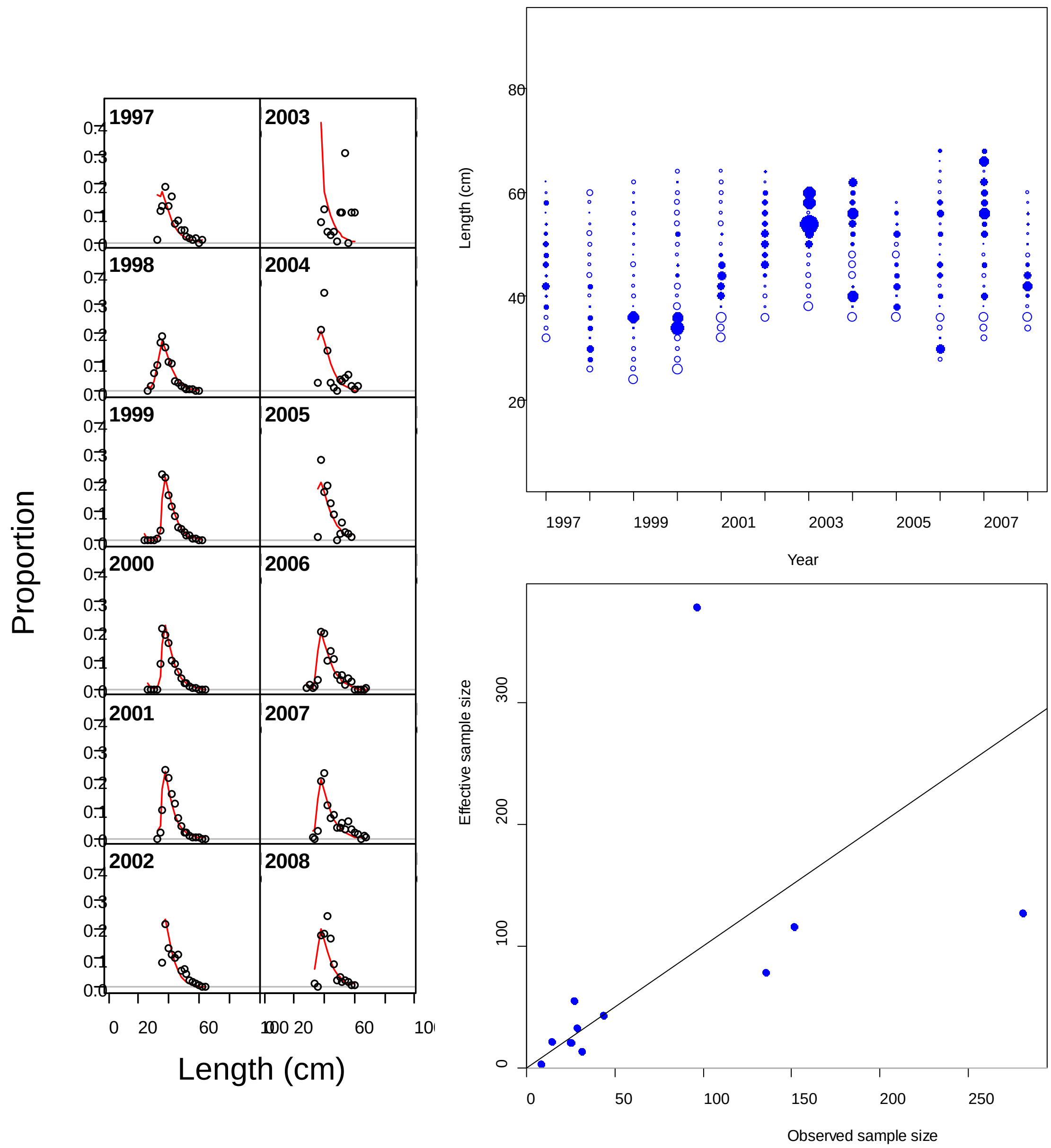


Figure 48. Fits to the live-fish (fleet 2) commercial fishery length compositions for the NCS. Left panel: Observed (circles) and model-predicted fits (red line) to length composition by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

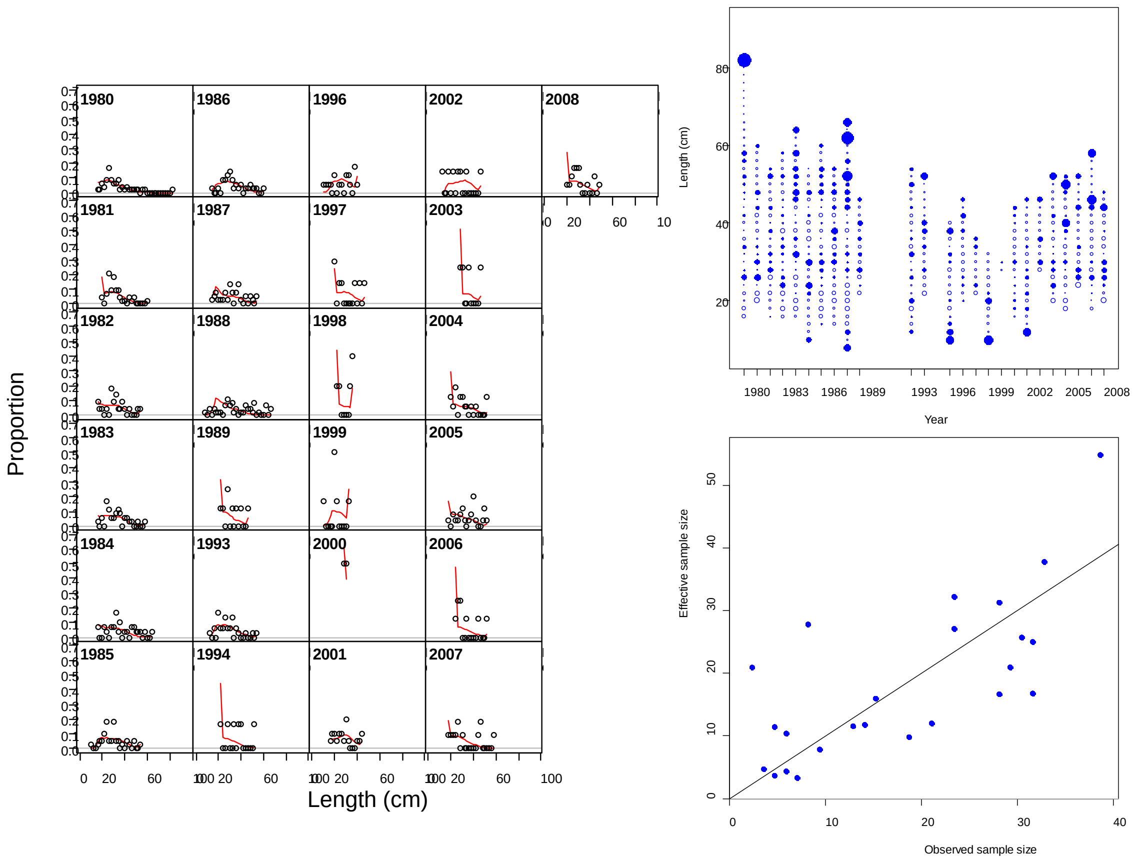


Figure 49. Fits to the man-made (fleet 3) recreational mode length compositions for the NCS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

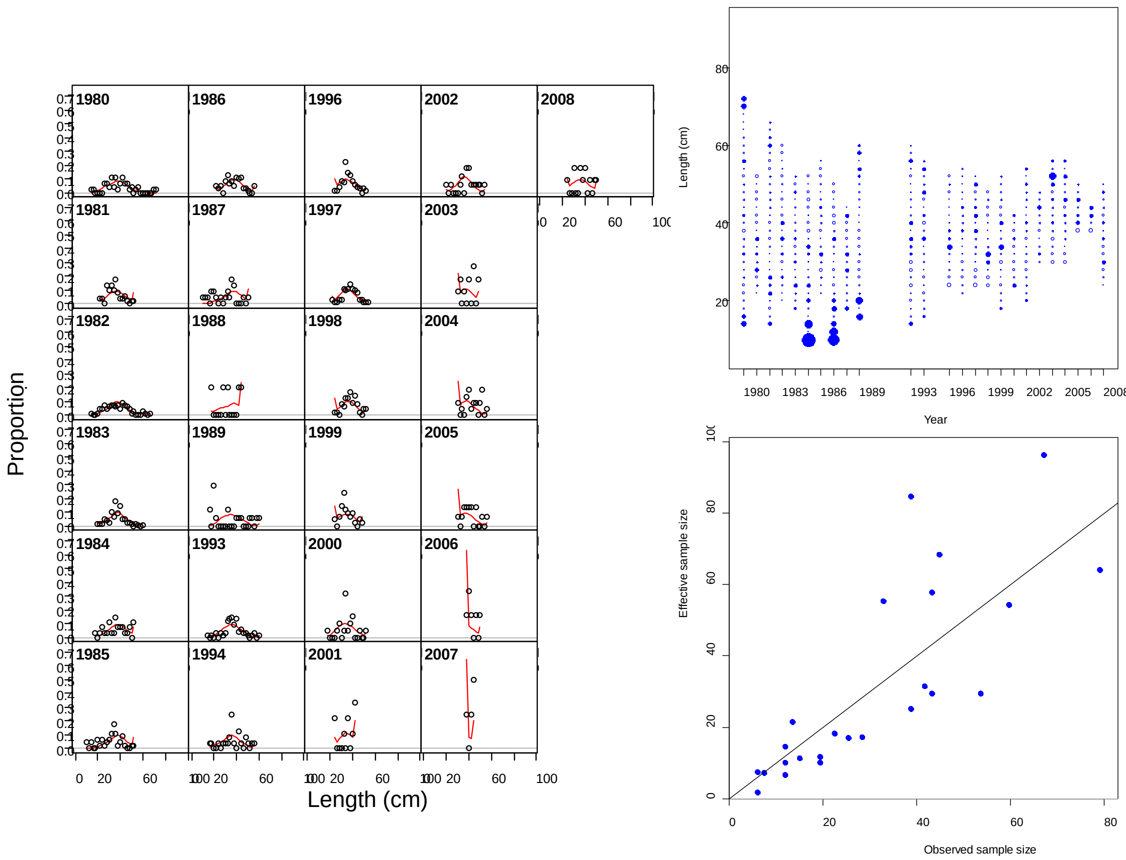


Figure 50. Fits to the beach/bank (fleet 4) recreational mode length compositions for the NCS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

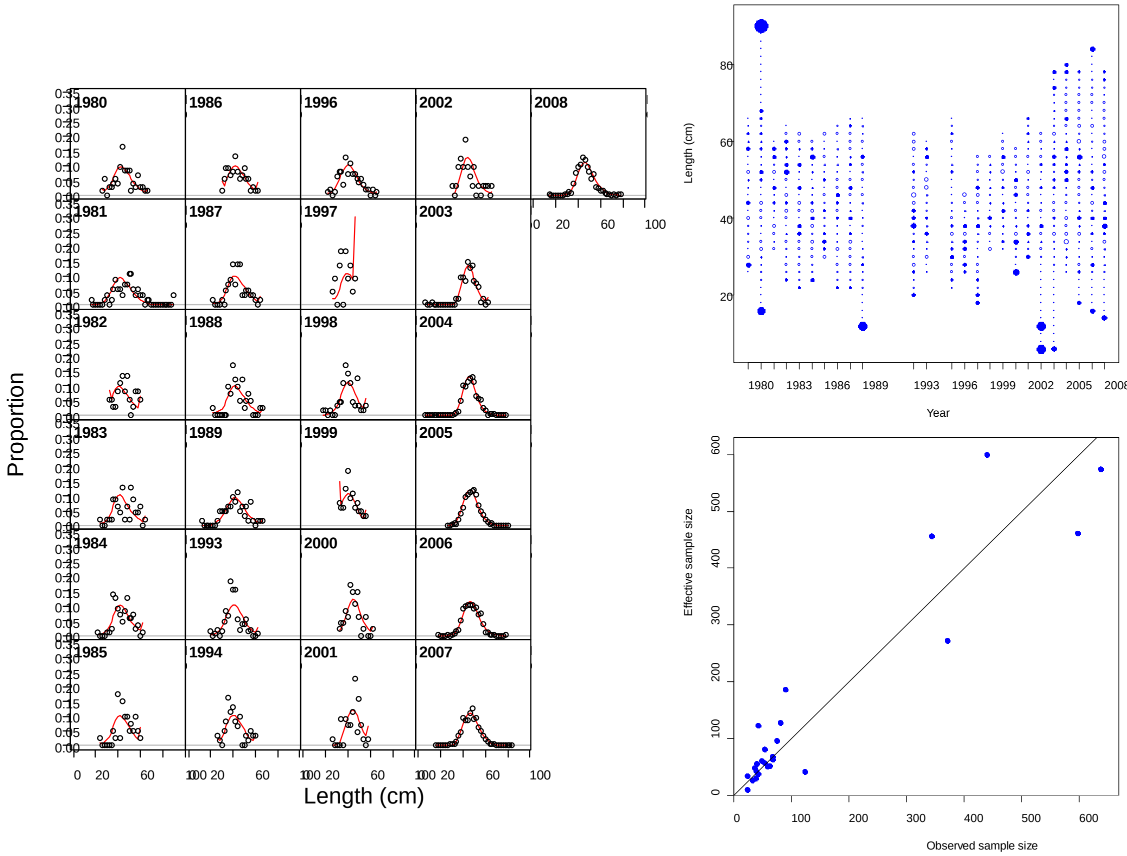


Figure 51. Fits to the PBR (fleet 5) recreational mode length compositions for the NCS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

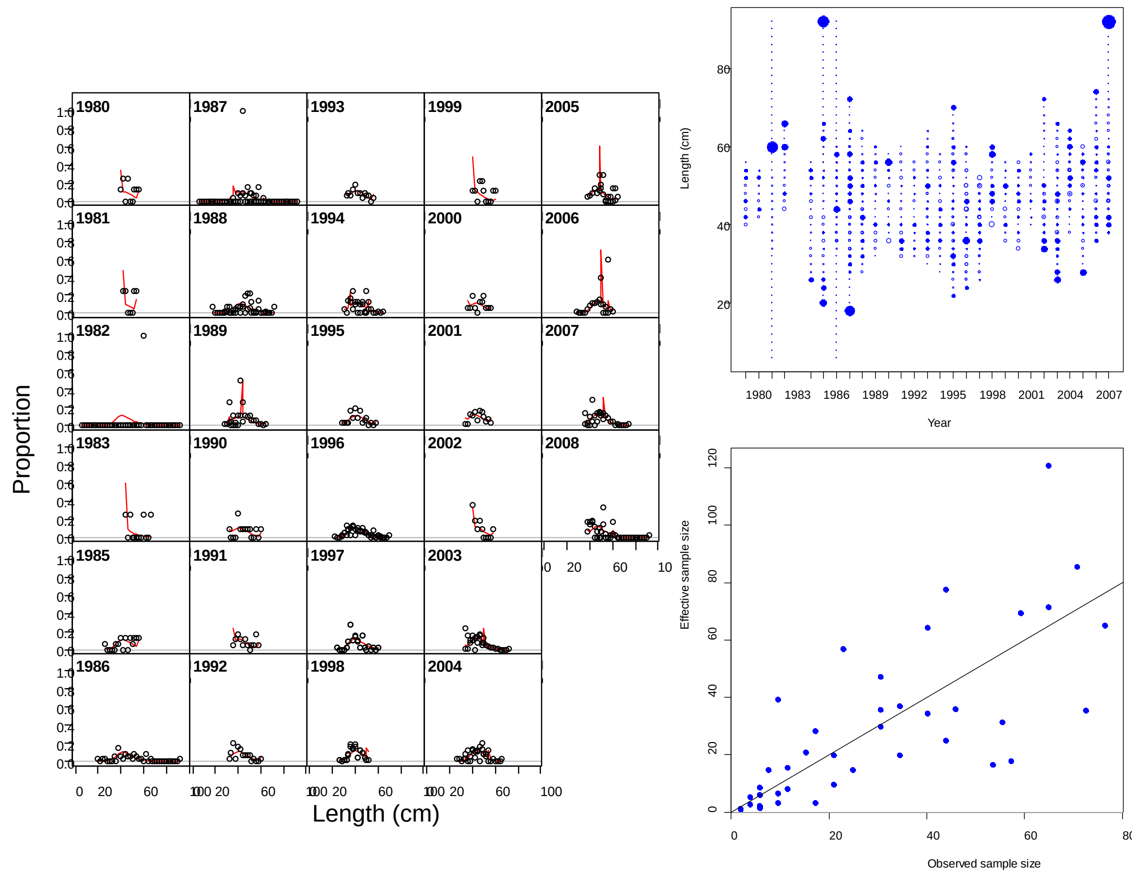


Figure 52. Fits to the CPFV (fleet 6) recreational mode length compositions for the NCS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

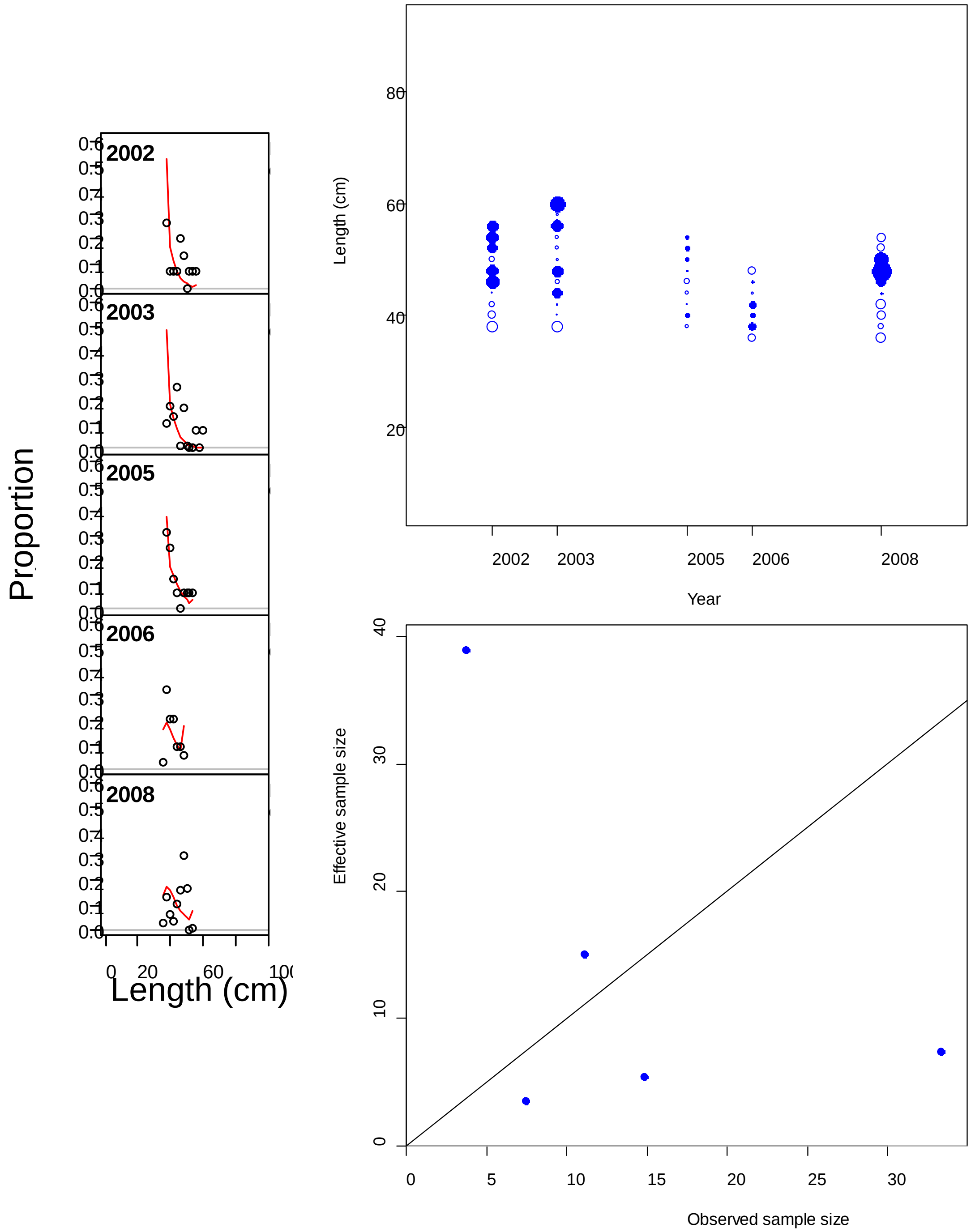


Figure 53. Fits to the live-fish (fleet 2) commercial fishery length compositions for the SCS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

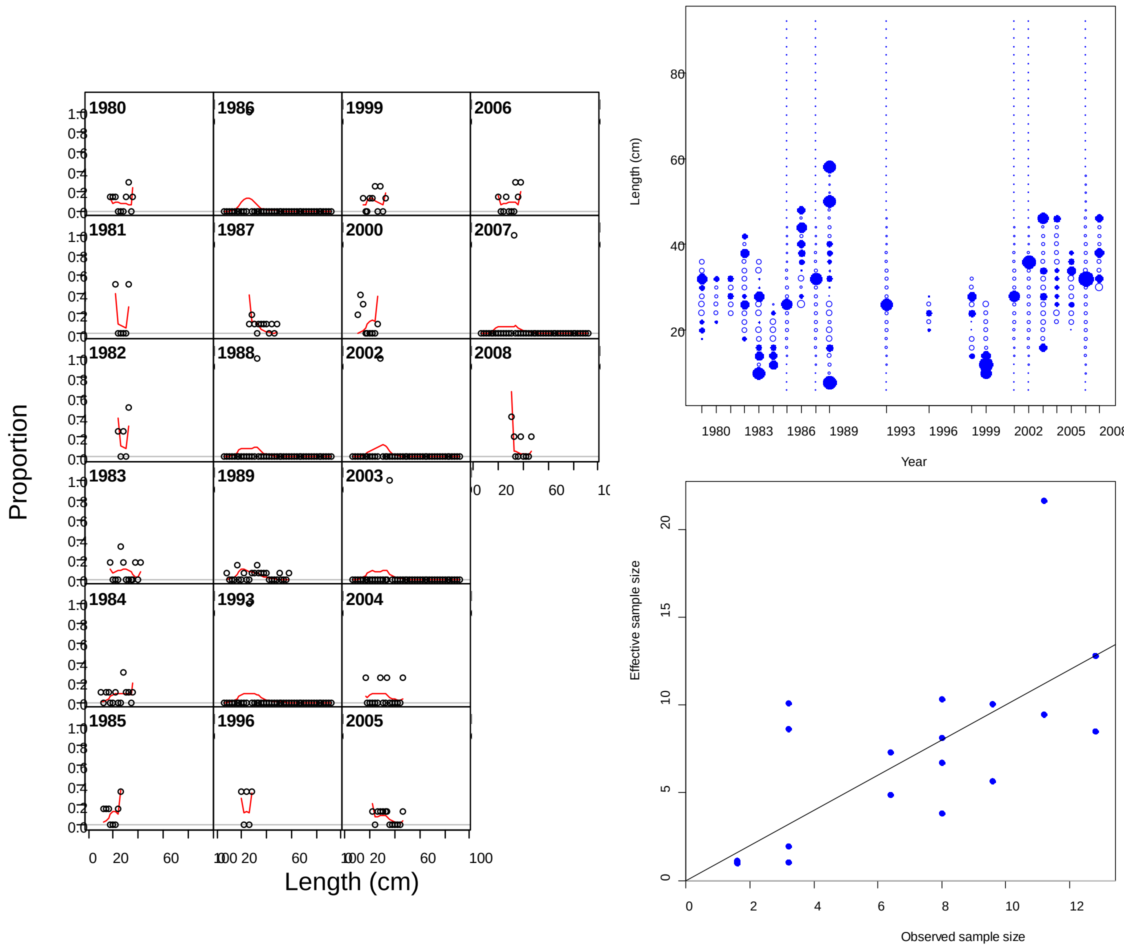


Figure 54. Fits to the man-made (fleet 3) recreational fishery length compositions for the SCS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

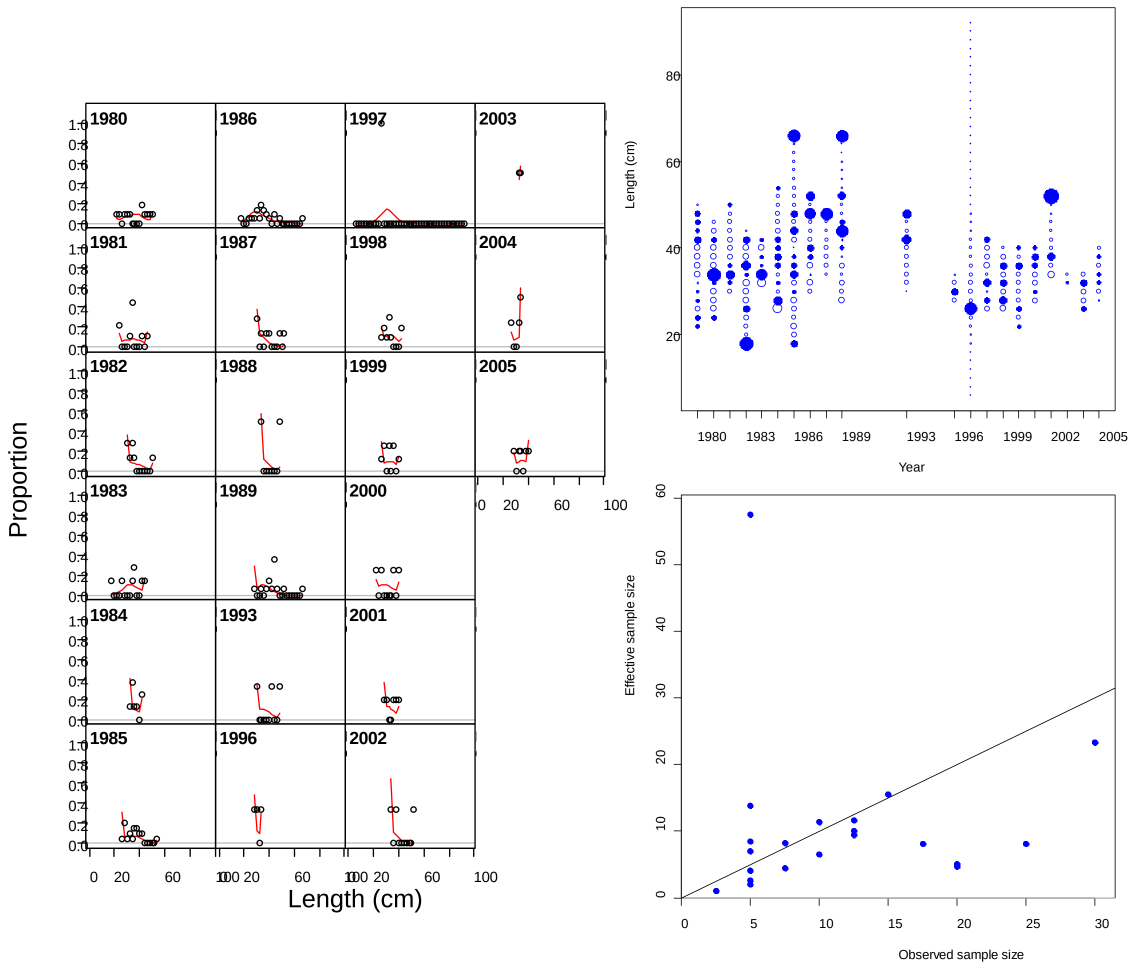


Figure 55. Fits to the beach/bank (fleet 4) recreational fishery length compositions for the SCS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

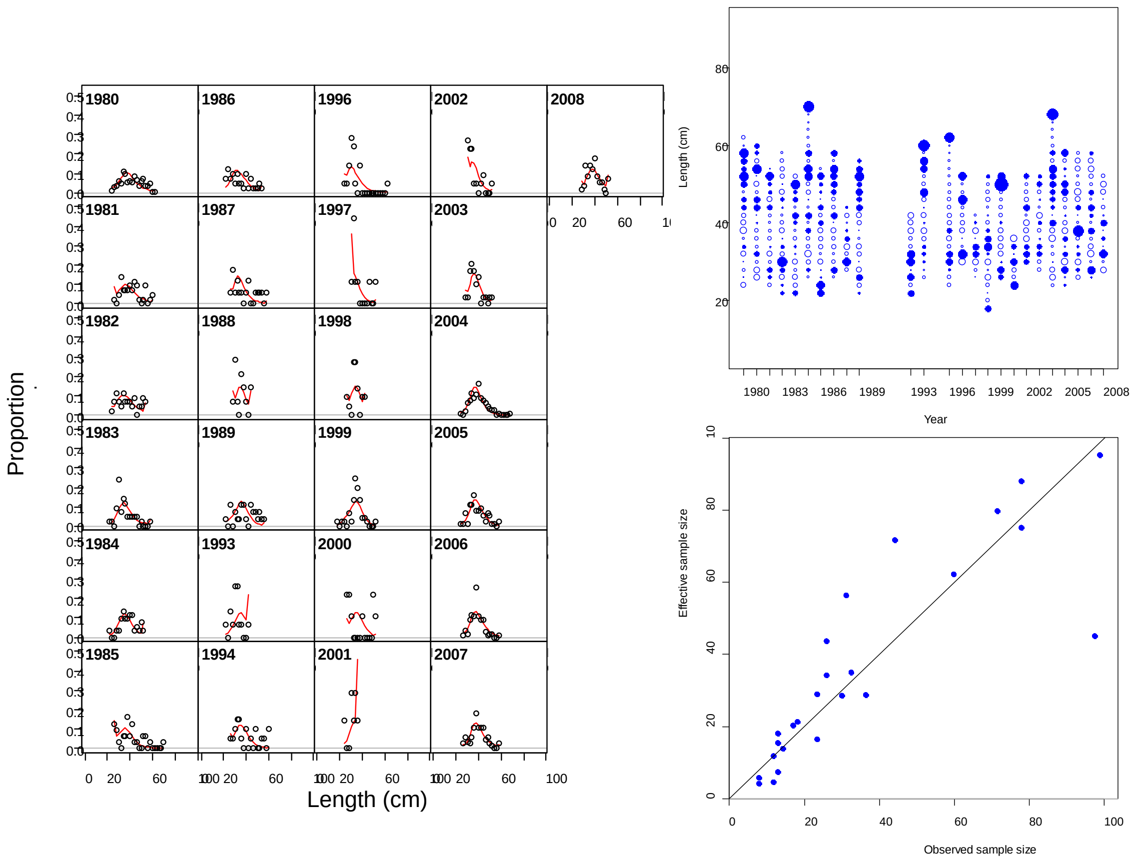


Figure 56. Fits to the PBR (fleet 5) recreational fishery length compositions for the SCS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

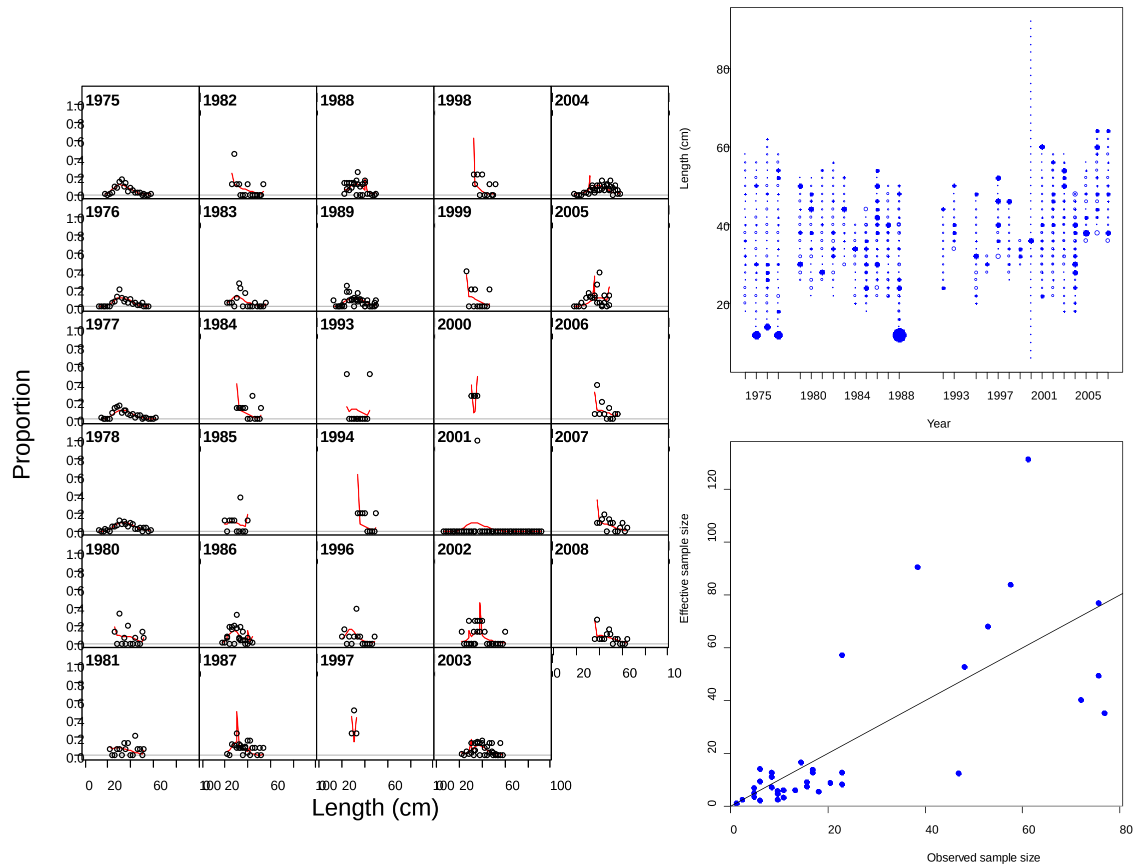


Figure 57. Fits to the CPFV (fleet 6) recreational fishery length compositions for the SCS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

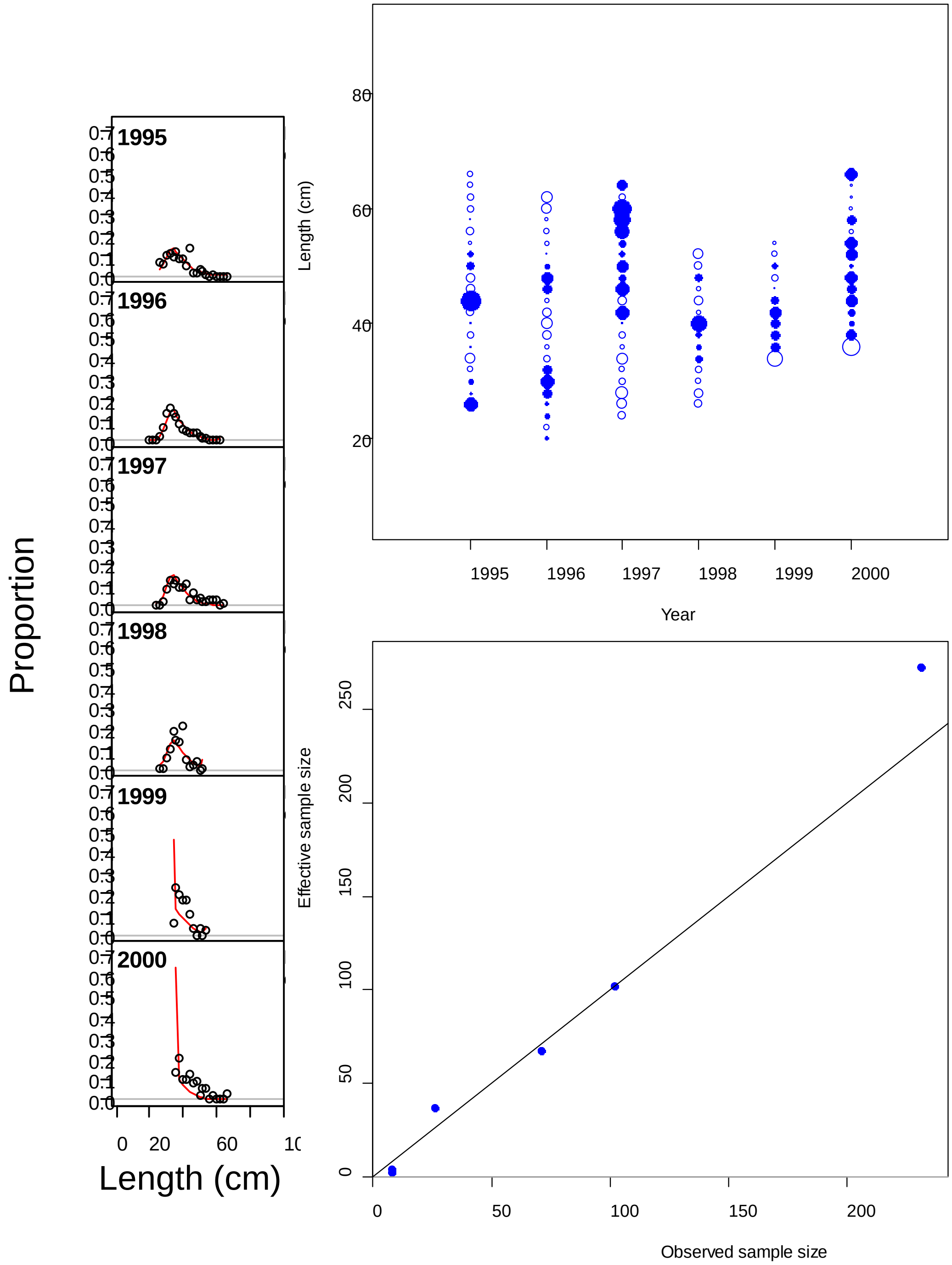


Figure 58. Fits to the non-live (fleet 1) commercial fishery length compositions for the CAS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

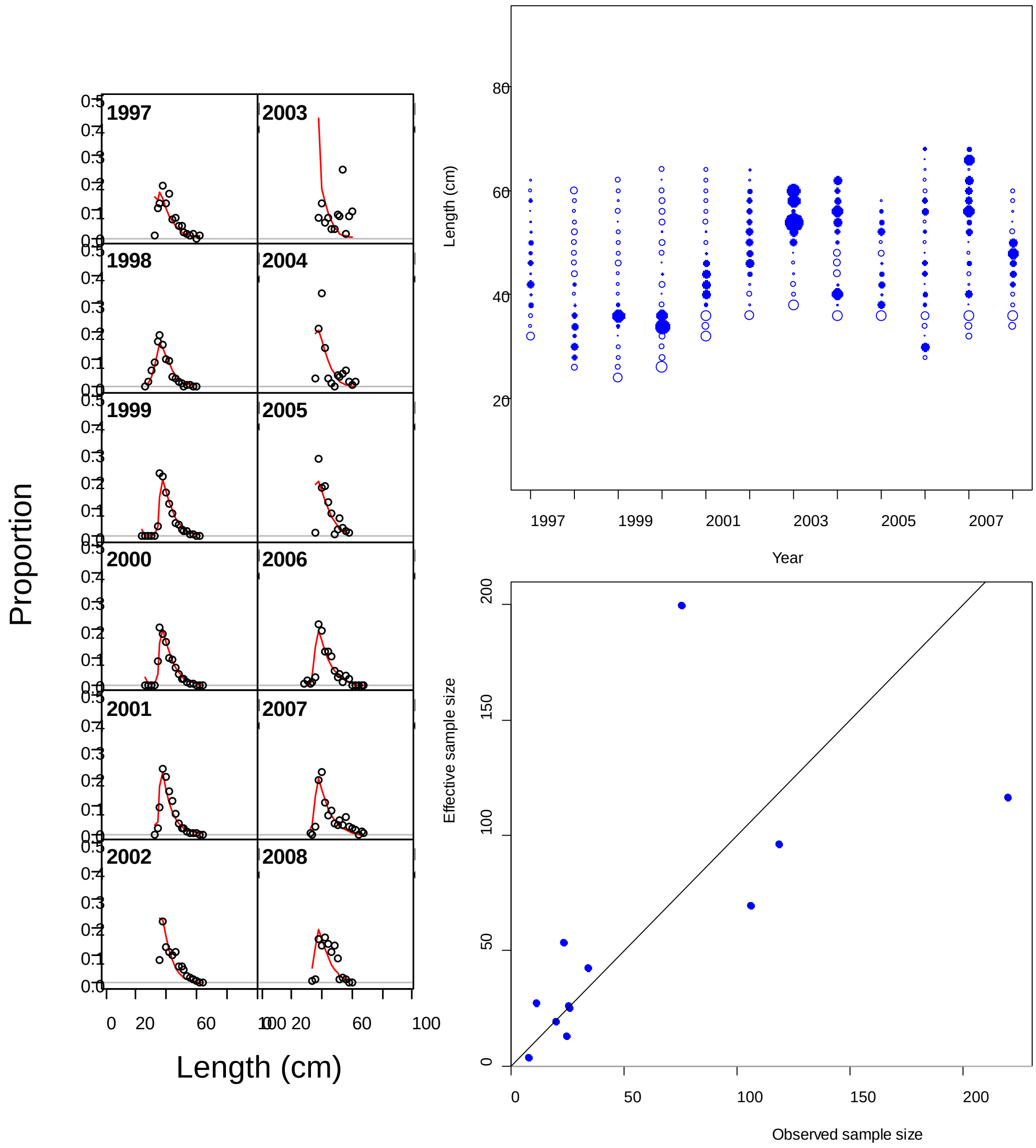


Figure 59. Fits to the live-fish (fleet 2) commercial fishery length compositions for the CAS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

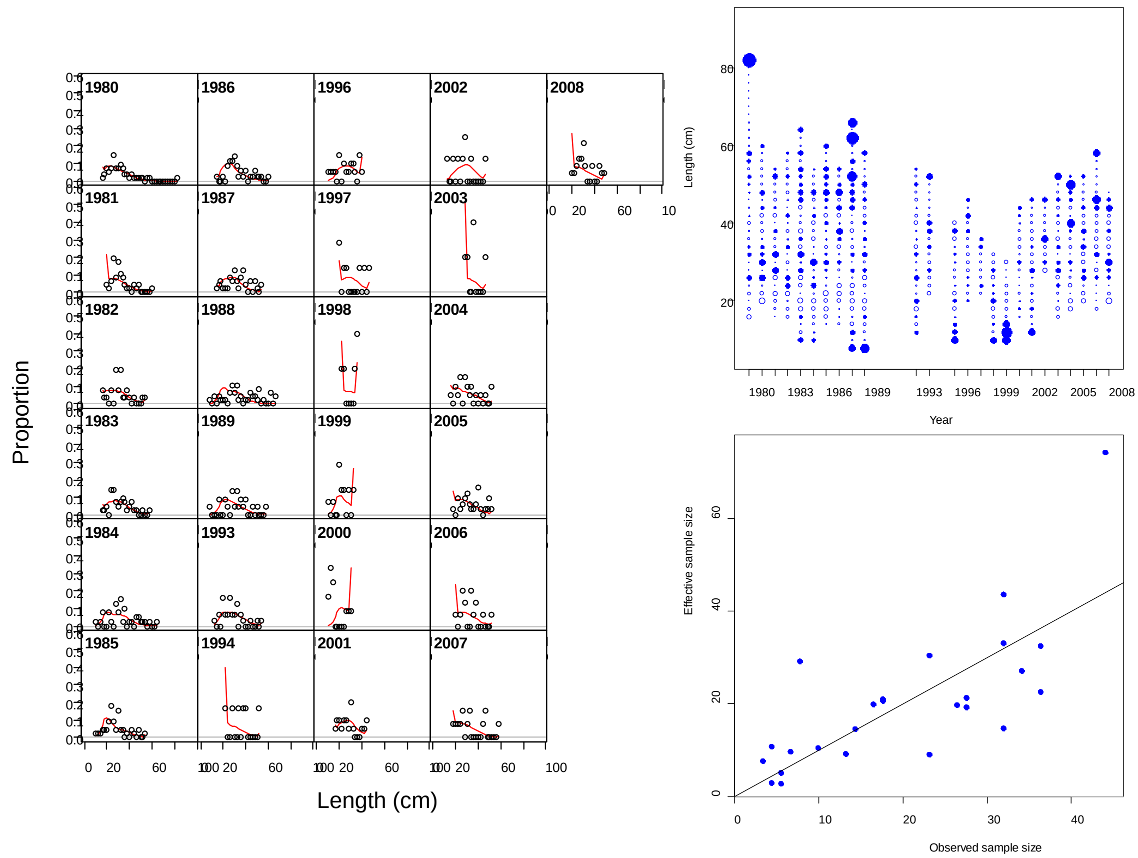


Figure 60. Fits to the man-made (fleet 3) recreational mode length compositions for the CAS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

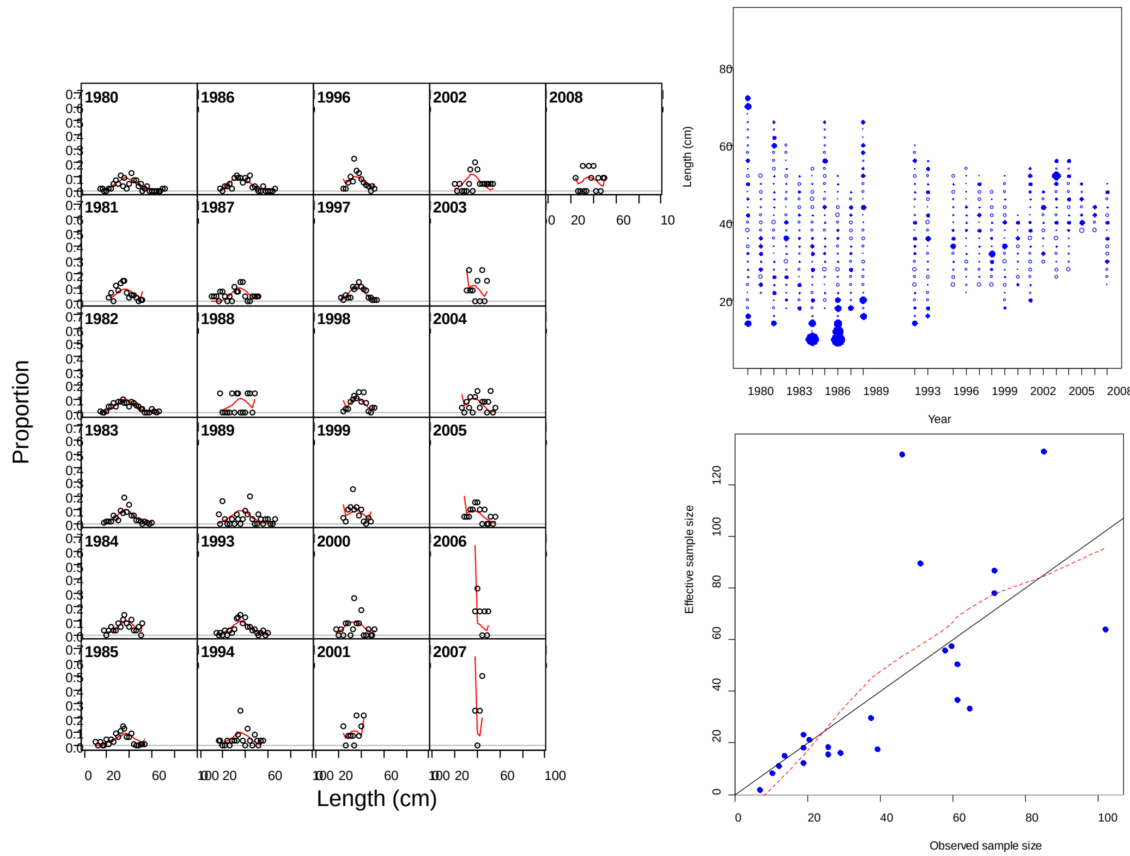


Figure 61. Fits to the beach/bank (fleet 4) recreational mode length compositions for the CAS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

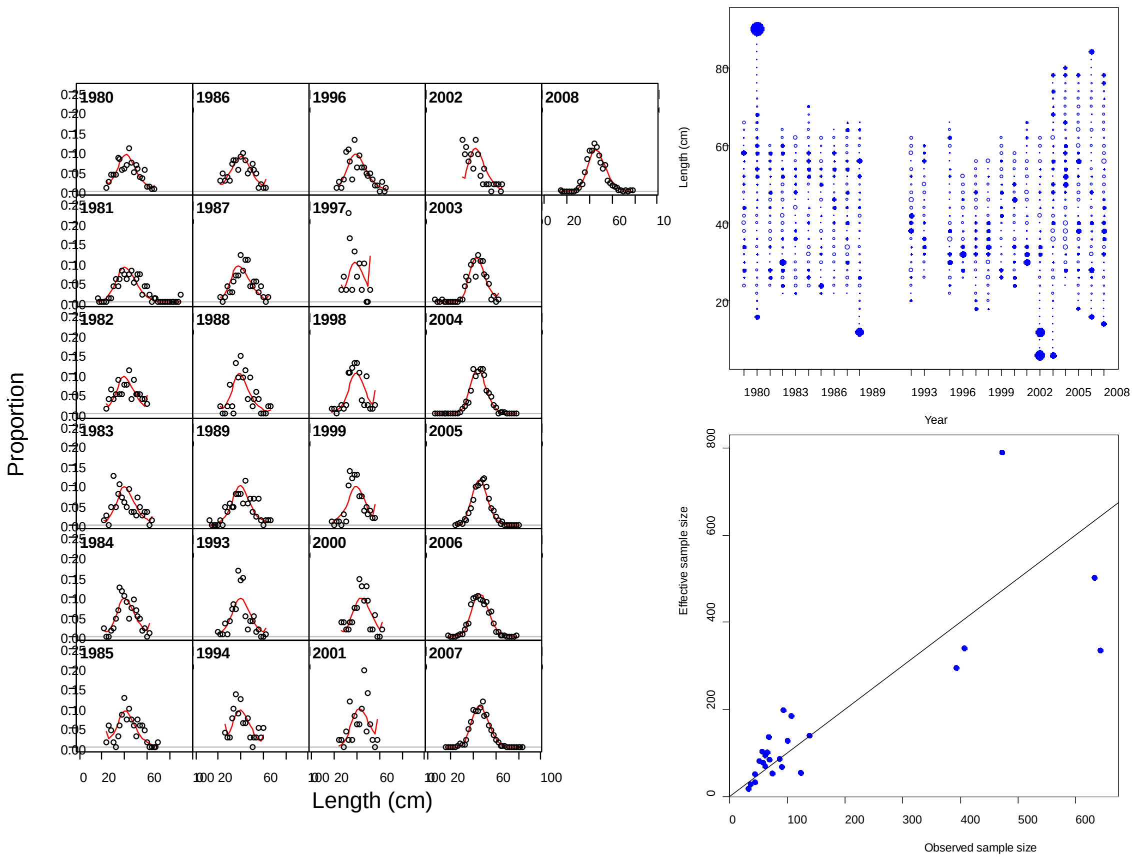


Figure 62. Fits to the PBR (fleet 5) recreational mode length compositions for the CAS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

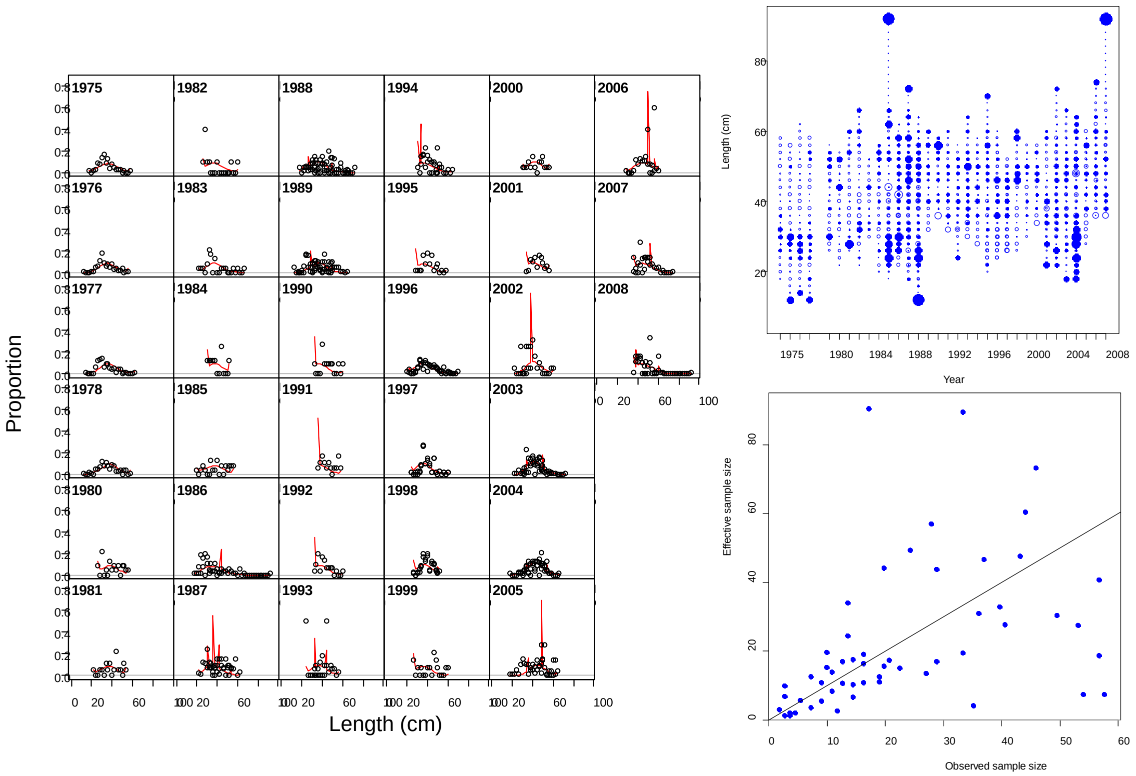


Figure 63. Fits to the CPFV (fleet 6) recreational mode length compositions for the CAS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

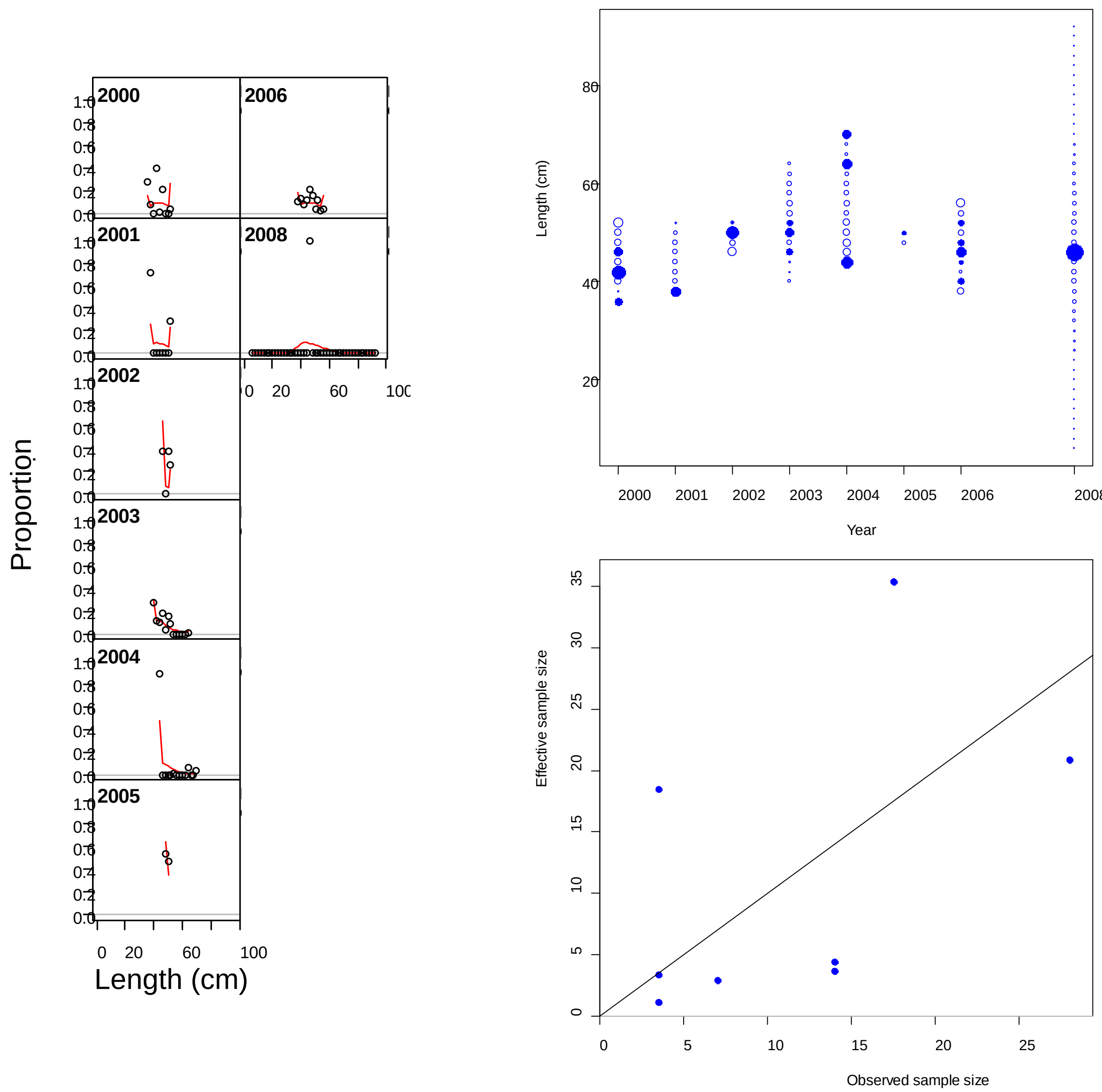


Figure 64. Fits to the unsexed non-live (fleet 1) commercial fishery length compositions for the ORS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

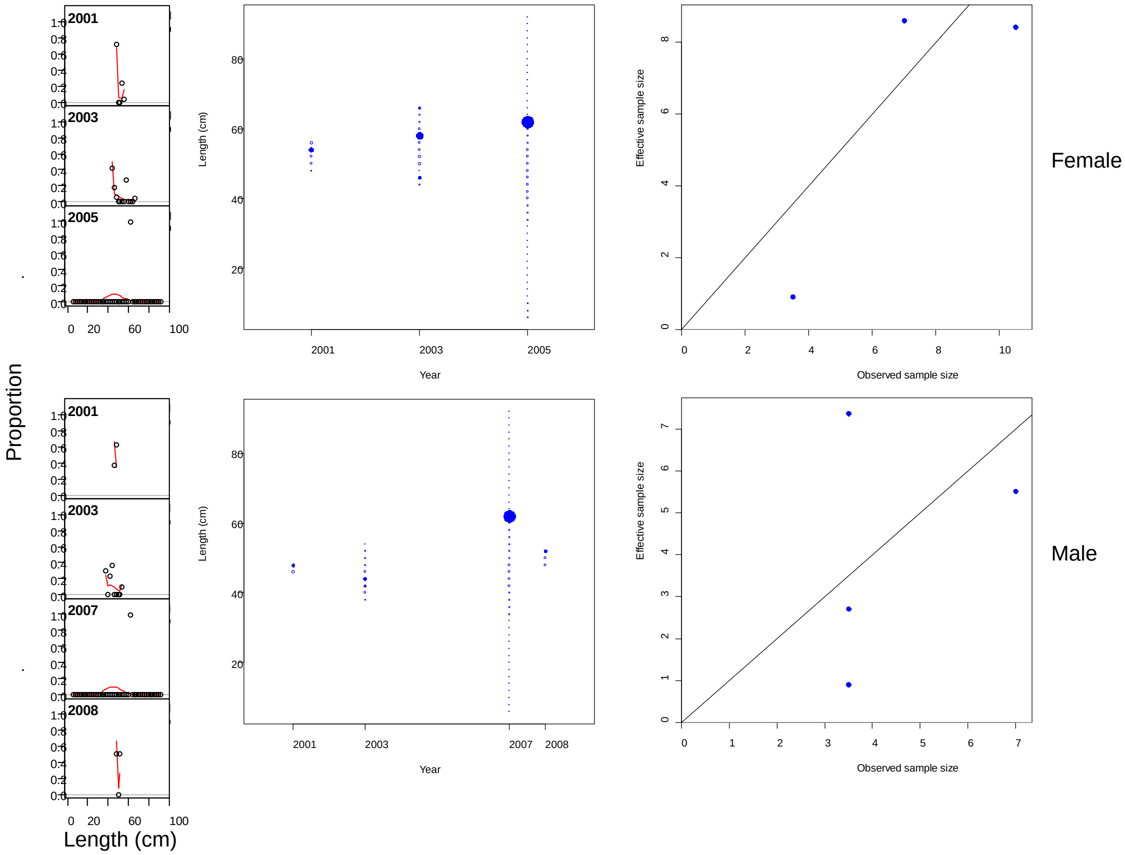


Figure 65. Fits to the sex-specific non-live (fleet 1) commercial fishery length compositions for the ORS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

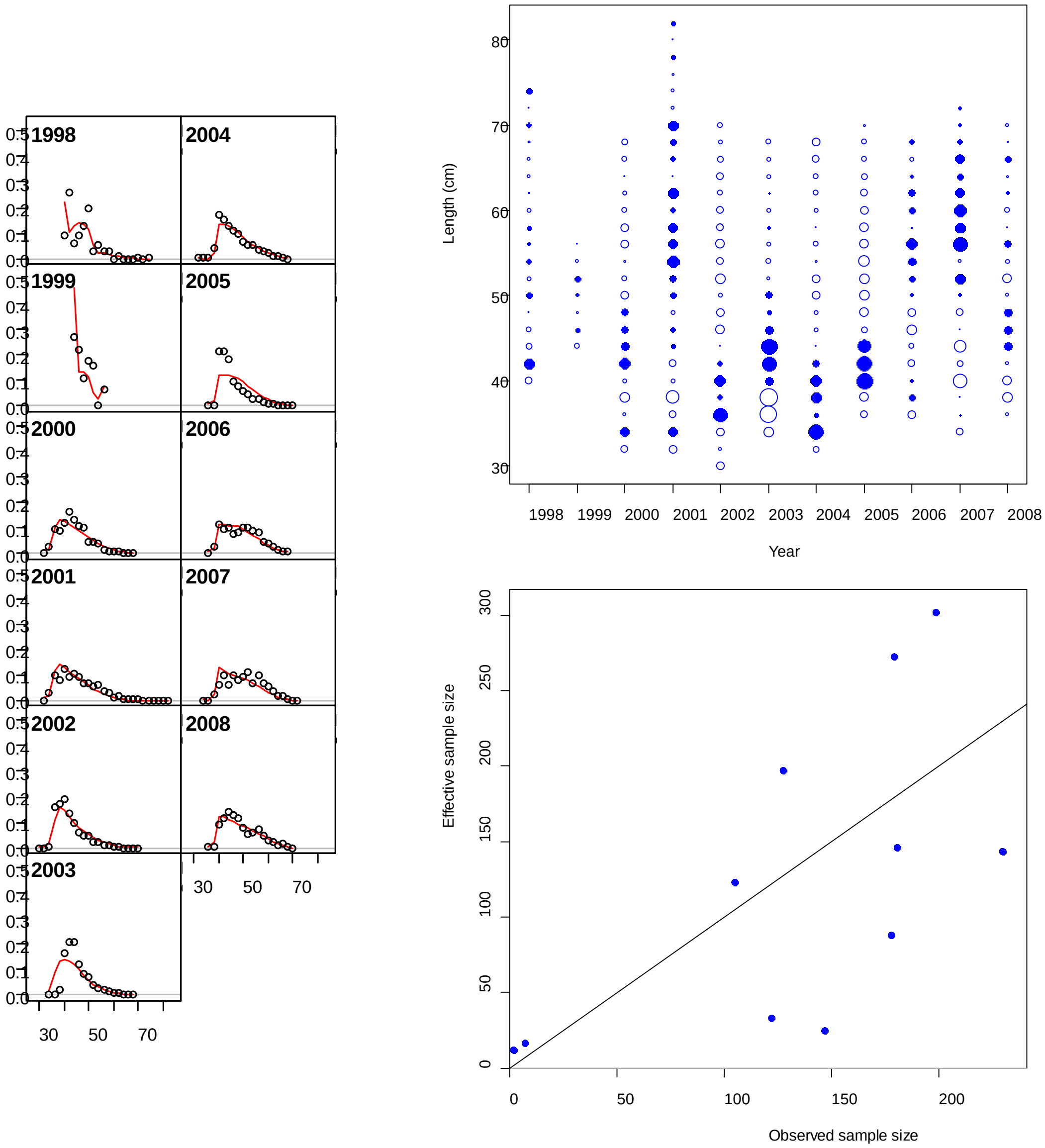


Figure 66. Fits to the unsexed live-fish (fleet 2) commercial fishery length compositions for the ORS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

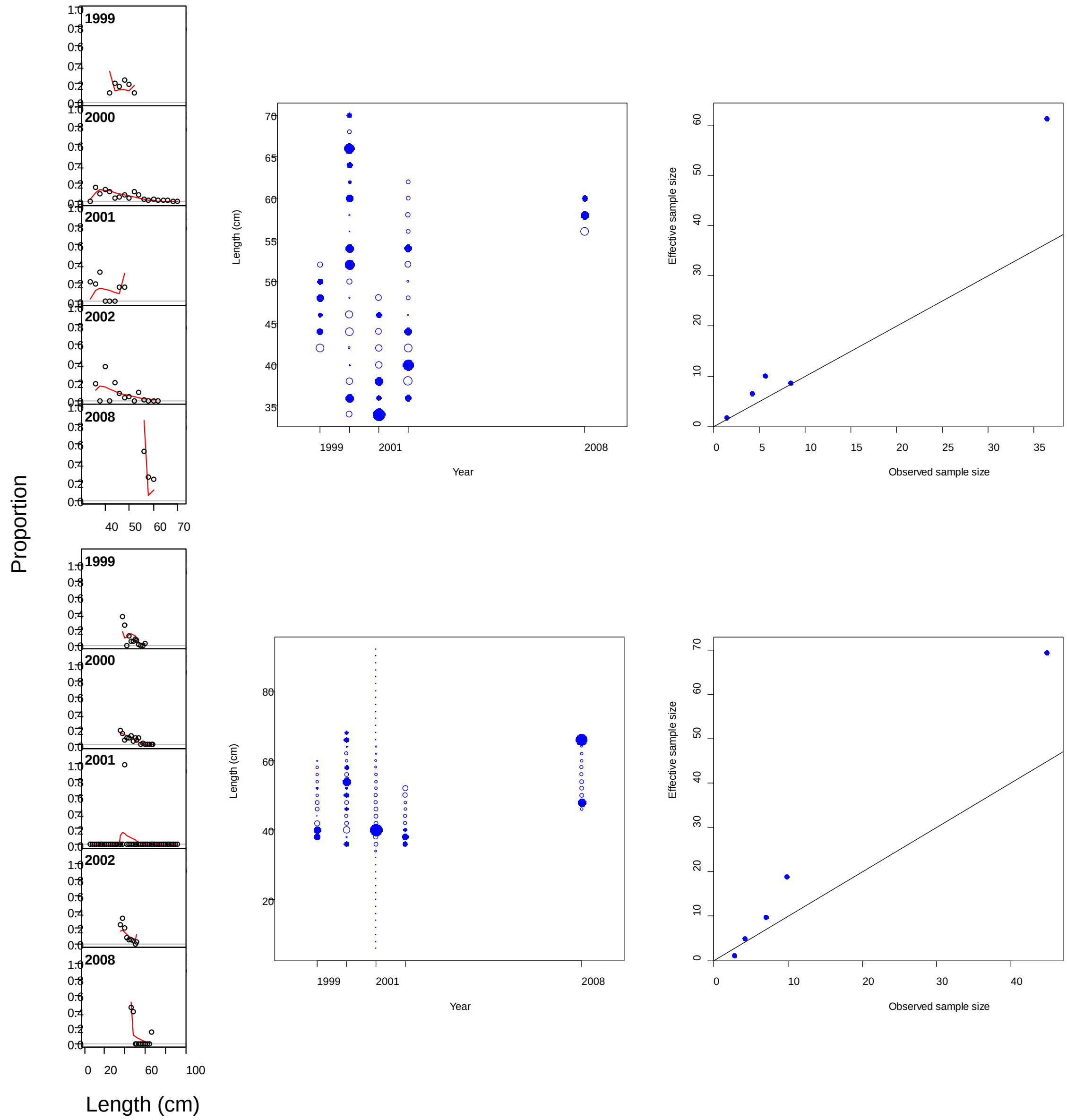


Figure 67. Fits to the sex-specific live-fish (fleet 2) commercial fishery length compositions for the ORS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

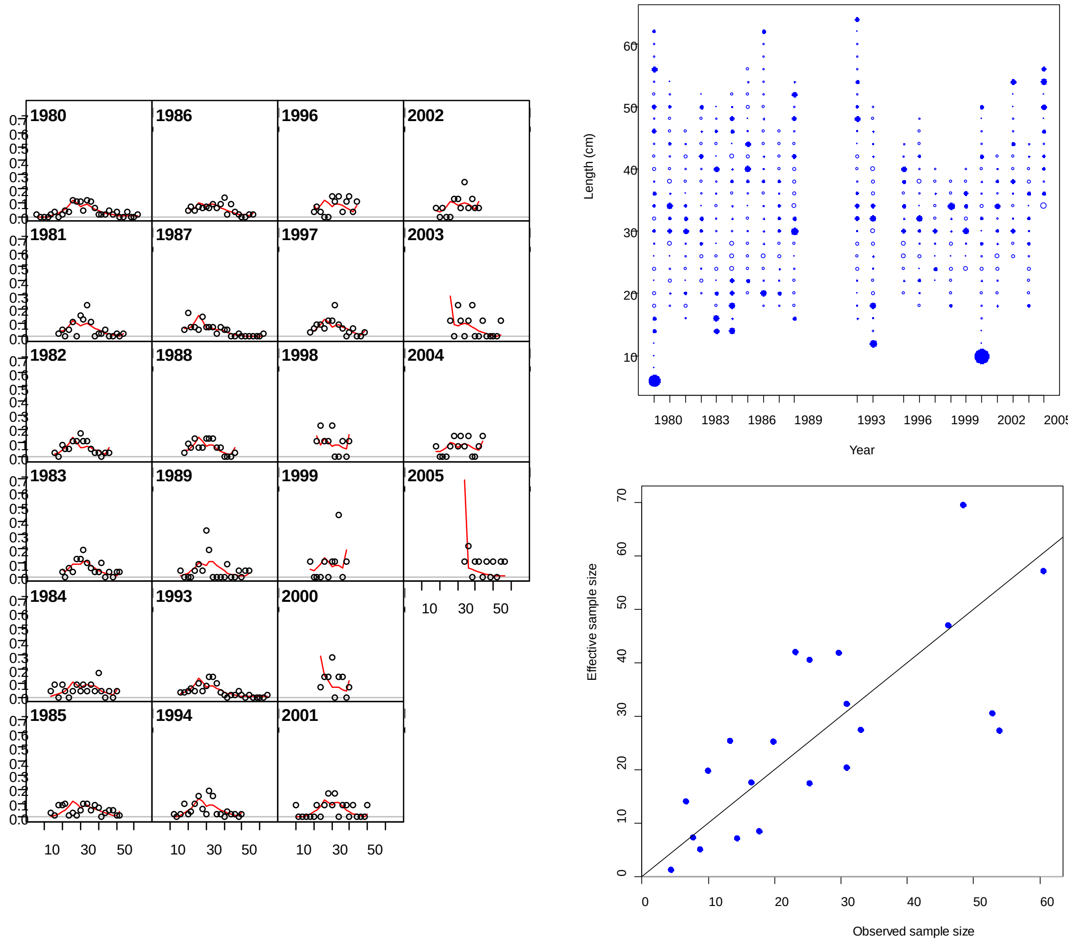


Figure 68. Fits to the shore-based (fleet 3) recreational mode length compositions for the ORS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

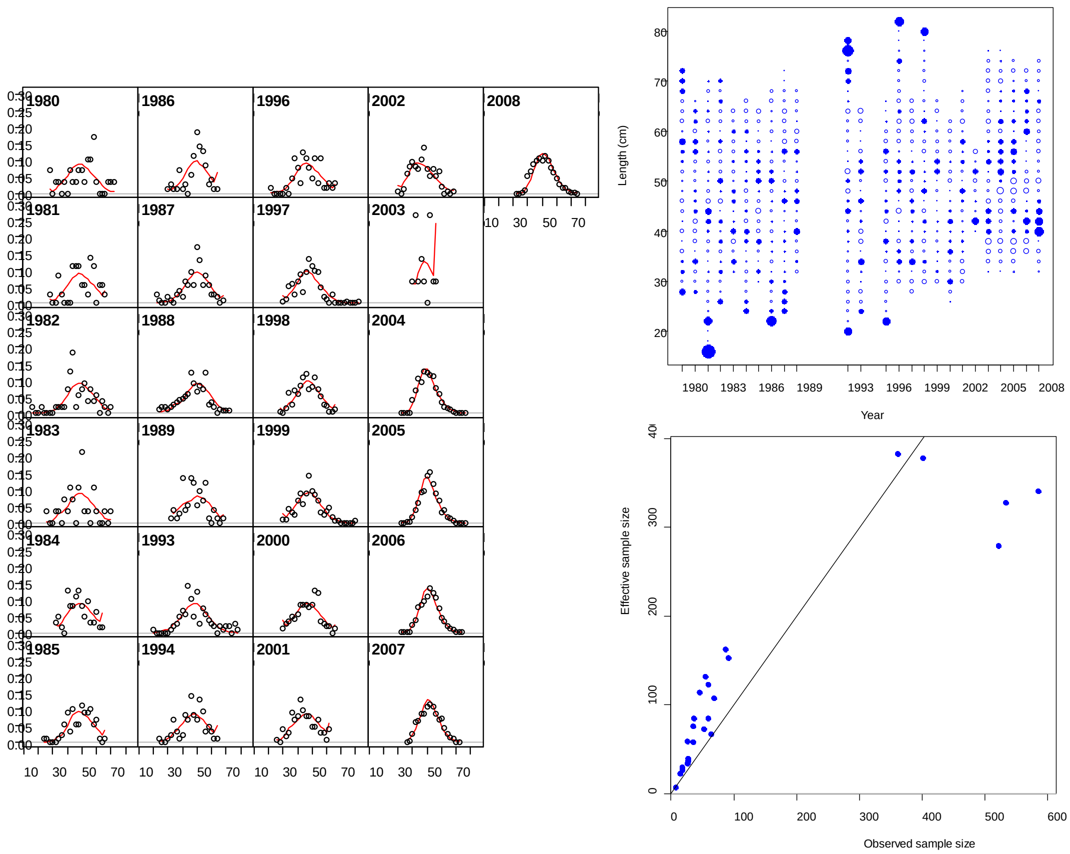


Figure 69. Fits to the boat-based (fleet 4) recreational mode length compositions for the ORS. Left panel: Observed (circles) and model-predicted fits (red line) to length compositions by year; top right panel: Pearson residuals to length composition fits; bottom right panel: comparison of inputted (observed) sample sizes vs. model-derived effective sample sizes for each year. Black solid line is the 1:1 line; red broken line is lowess fit.

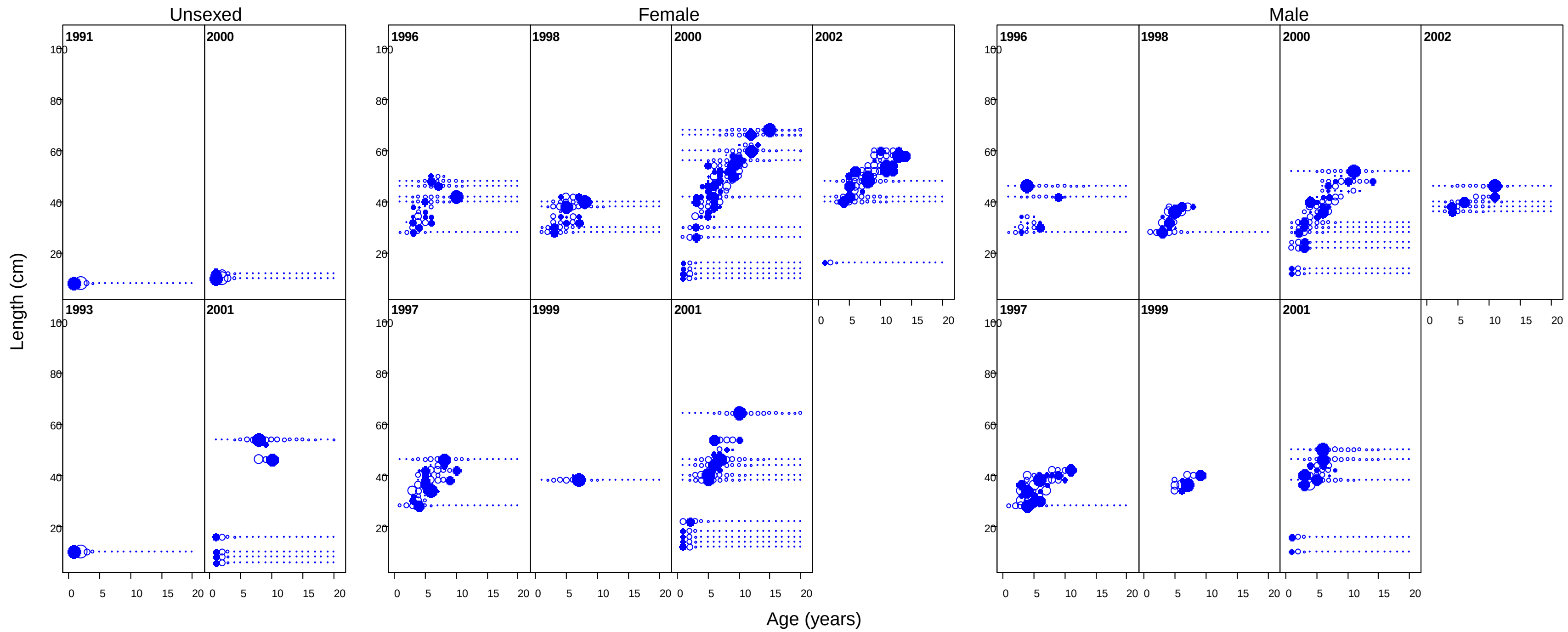


Figure 70. Pearson residual from fits to the unsexed and sexed conditional age at length data for the NCS.

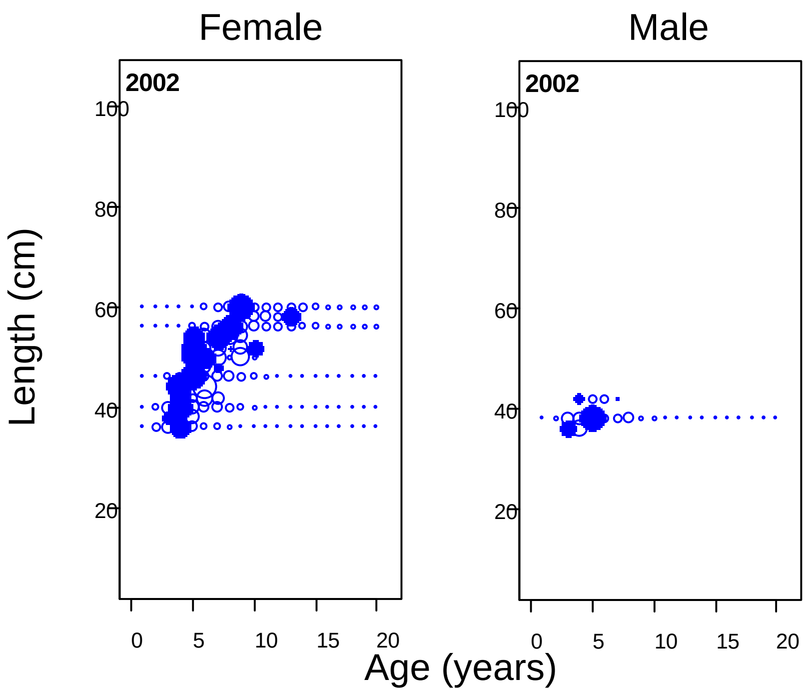


Figure 71. Pearson residual from fits to the sex-specific conditional age at length data for the SCS.

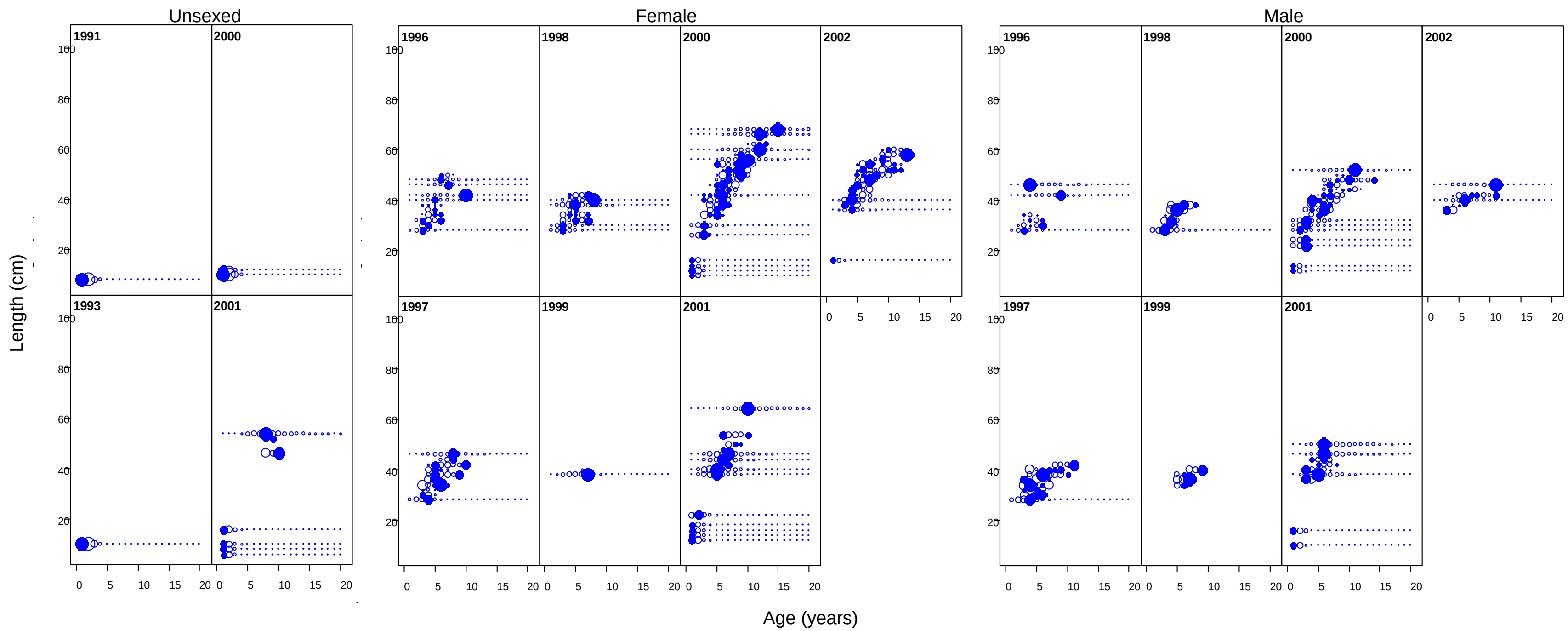


Figure 72. Pearson residual from fits to the unsexed and sexed conditional age at length data for the CAS.

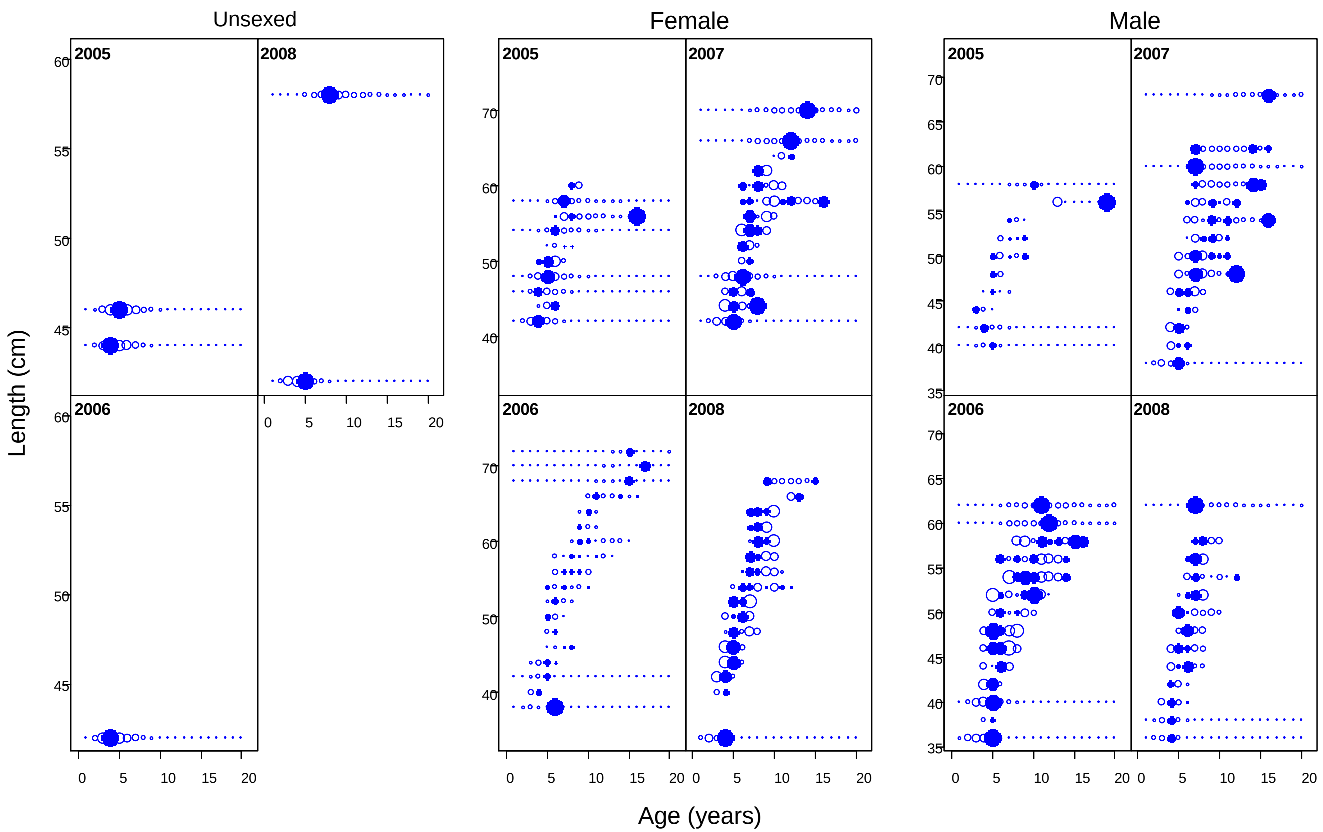


Figure 73. Pearson residual from fits to the unsexed and sexed conditional age at length data for the ORS.

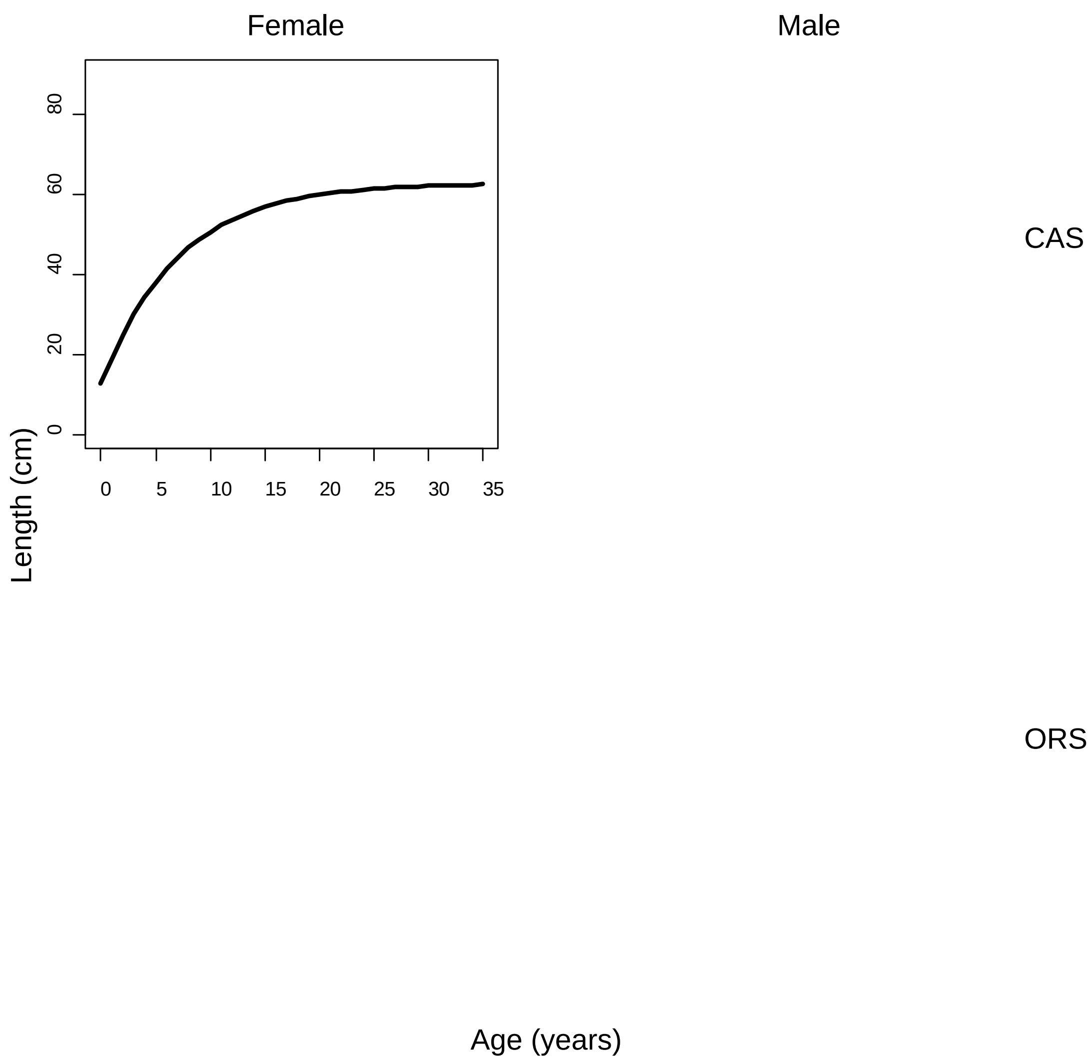


Figure 74. Comparison of growth curves from the assessment model estimates (black line) to externally fit growth curves (broken colored lines) for each sex (columns) and state sub-stock (rows).

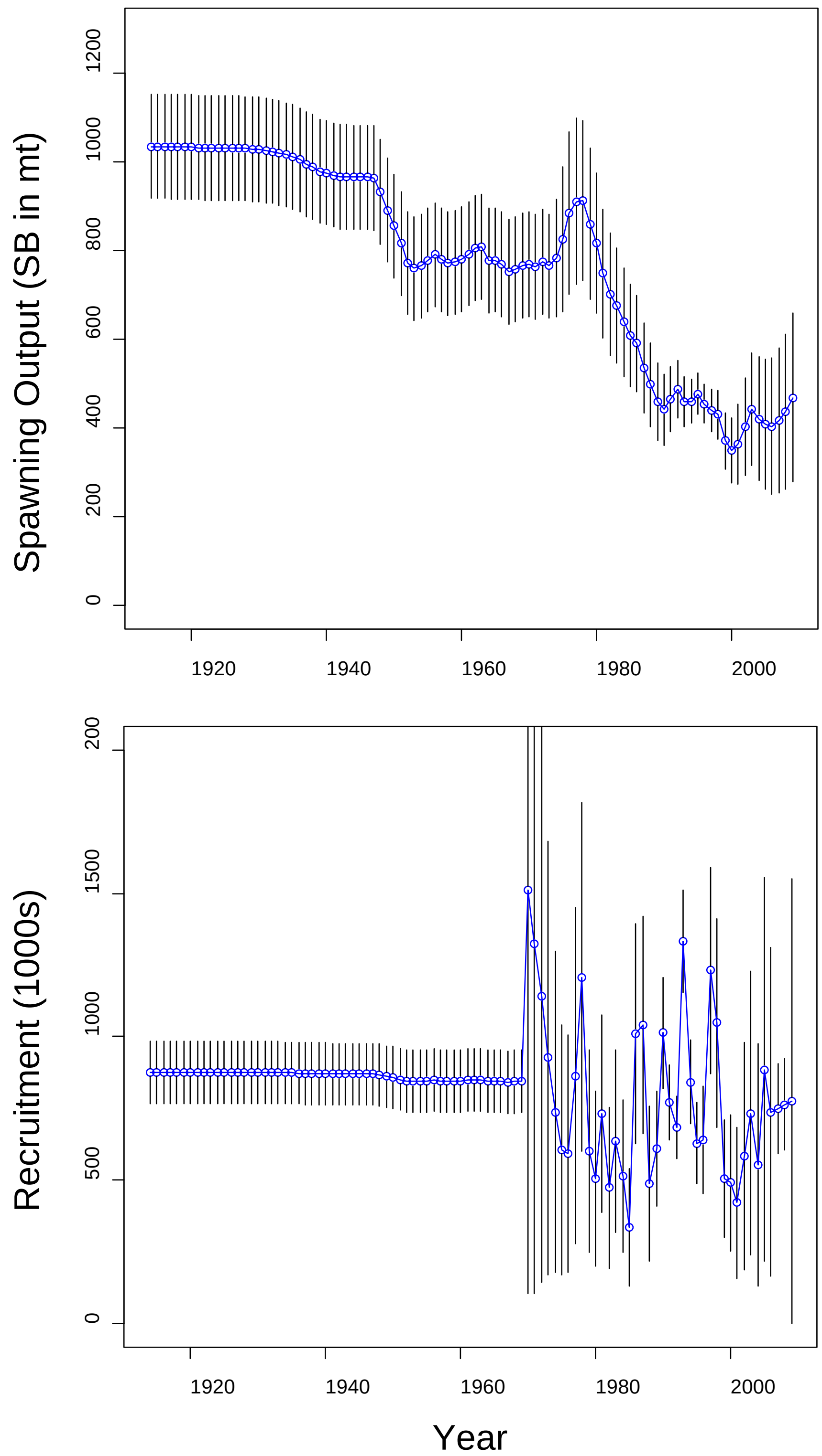


Figure 75. MPD time trajectories for spawning output (top panel) and recruitment trajectories (bottom panel) for the NCS. Vertical black lines are the asymptotic 95% confidence intervals.

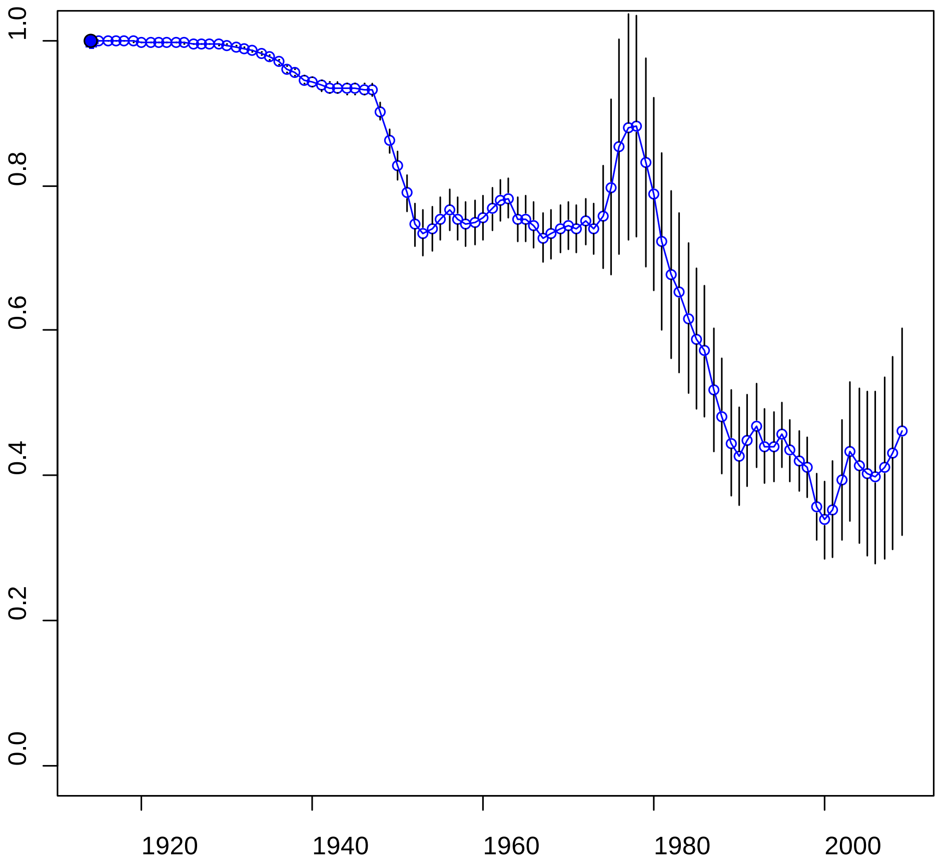


Figure 76. Time trajectories of depletion and spawning output compared to the target ($SB_{40\%}$) and limit reference ($SB_{25\%}$) points for the cabezon NCS.

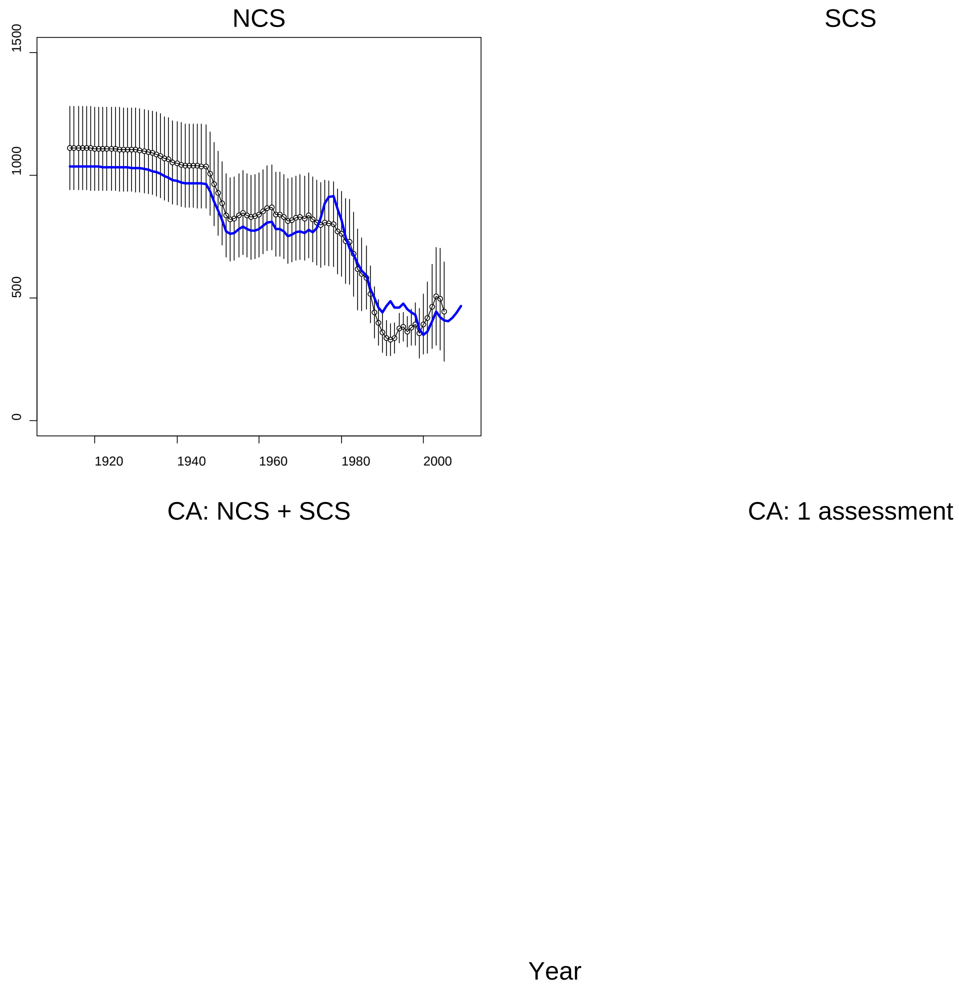
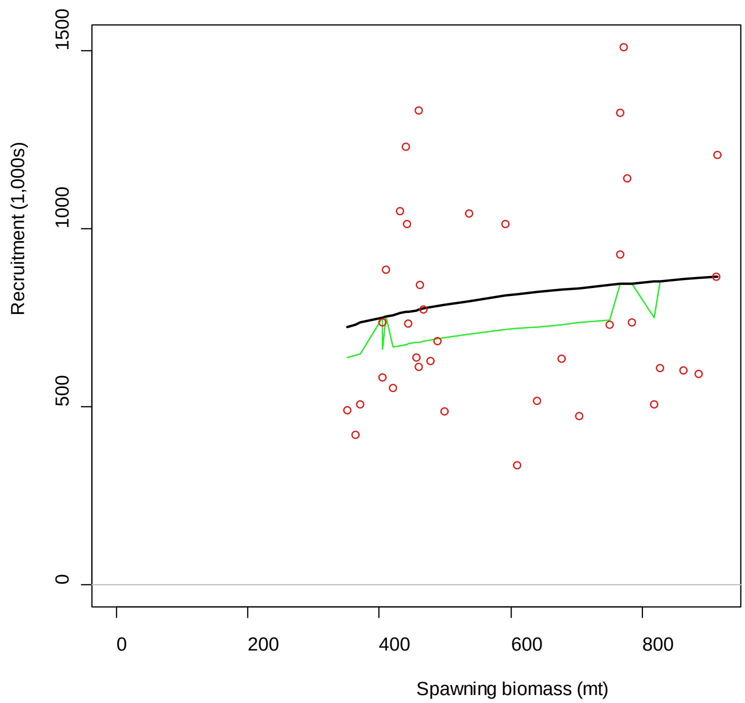


Figure 77. Time trajectories of spawning biomass of the 2005 assessment (black lines) compared to the current 2009 assessment (colored lines) for each sub-stock. Vertical lines are the 95% confidence intervals for the 2005 assessment.



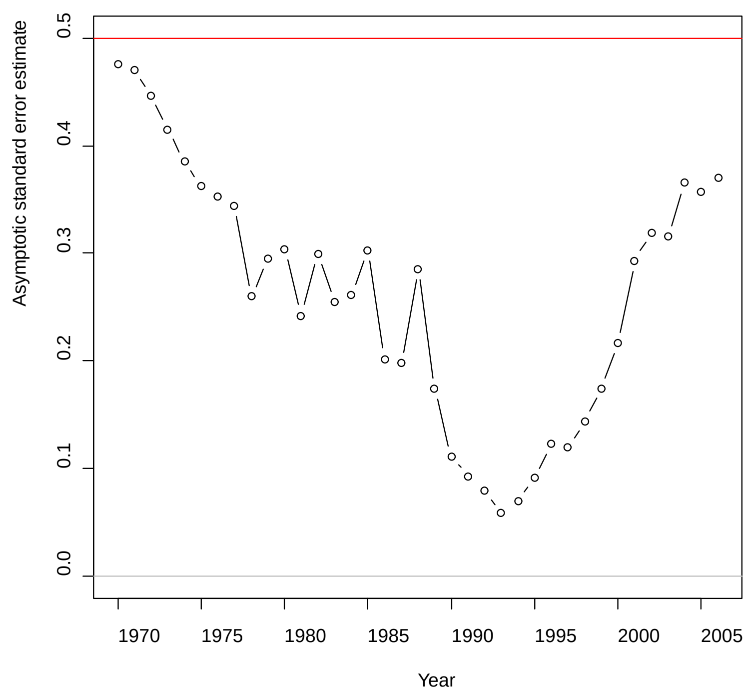


Figure 78. Spawner-recruit relationship (top panel) and the asymptotic standard deviations (bottom panel) for the NCS recruitment time series. Black line in top panel is the expected mean recruits; green line in same panel is the bias-adjusted expected recruits.

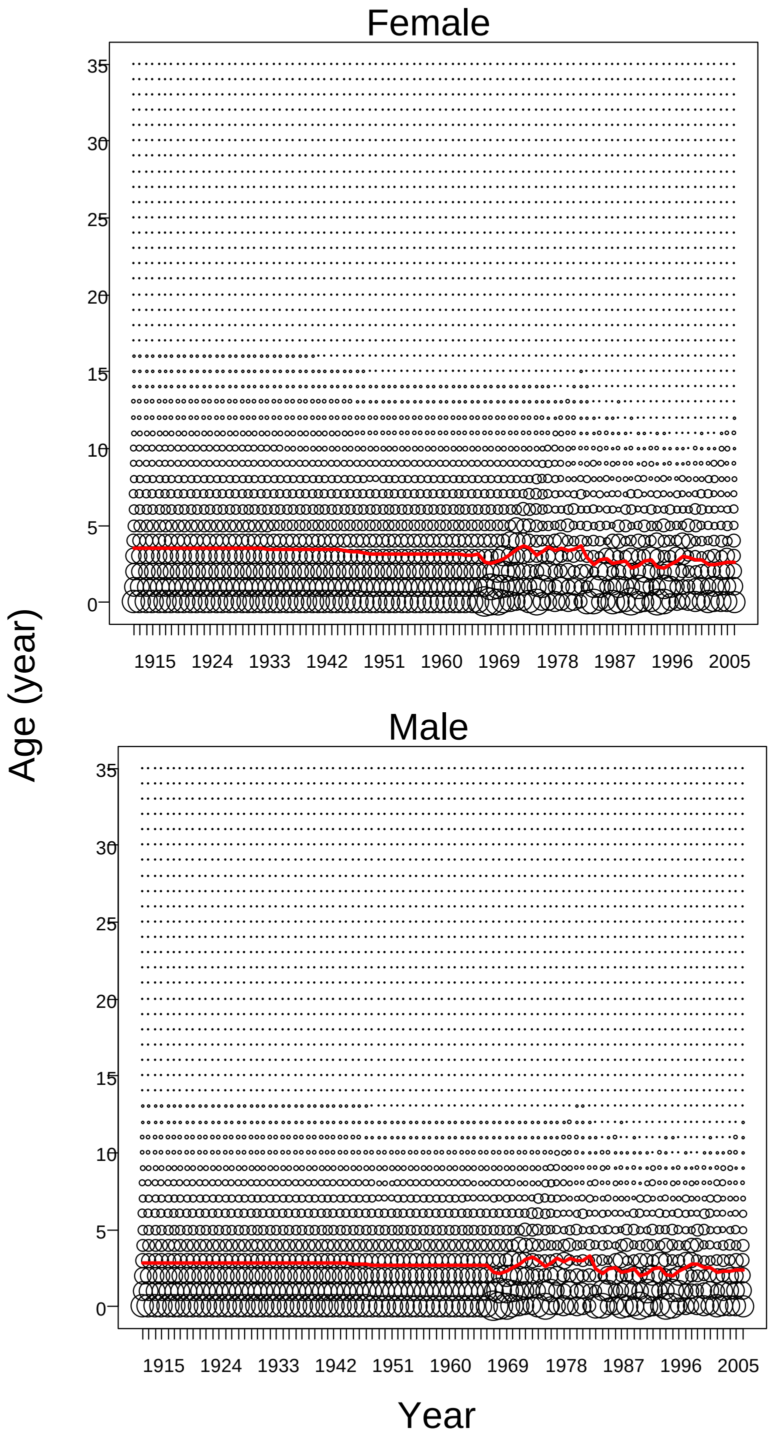


Figure 79. Numbers at age for females (top panel) and males (bottom panel) in the NCS. Red line shows the mean age by year.

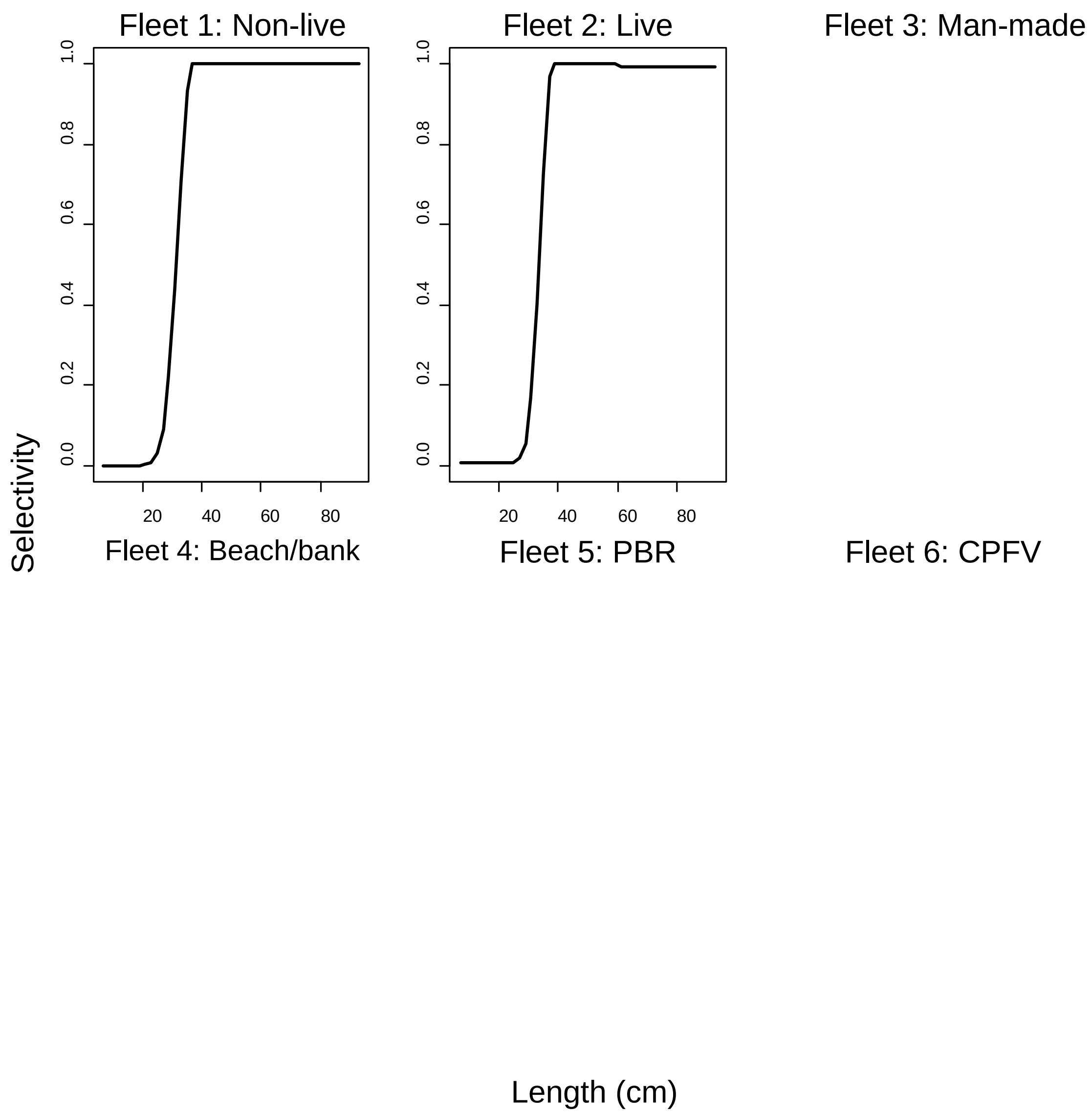


Figure 80. Selectivity at length for female and male cabezon by fishery fleet for the NCS. Black solid lines start selectivity in year 1916; blue broken lines start selectivity in year 1999 (fleet 2) and year 2000 (fleets 5 and 6); red dotted lines start selectivity in 2005.

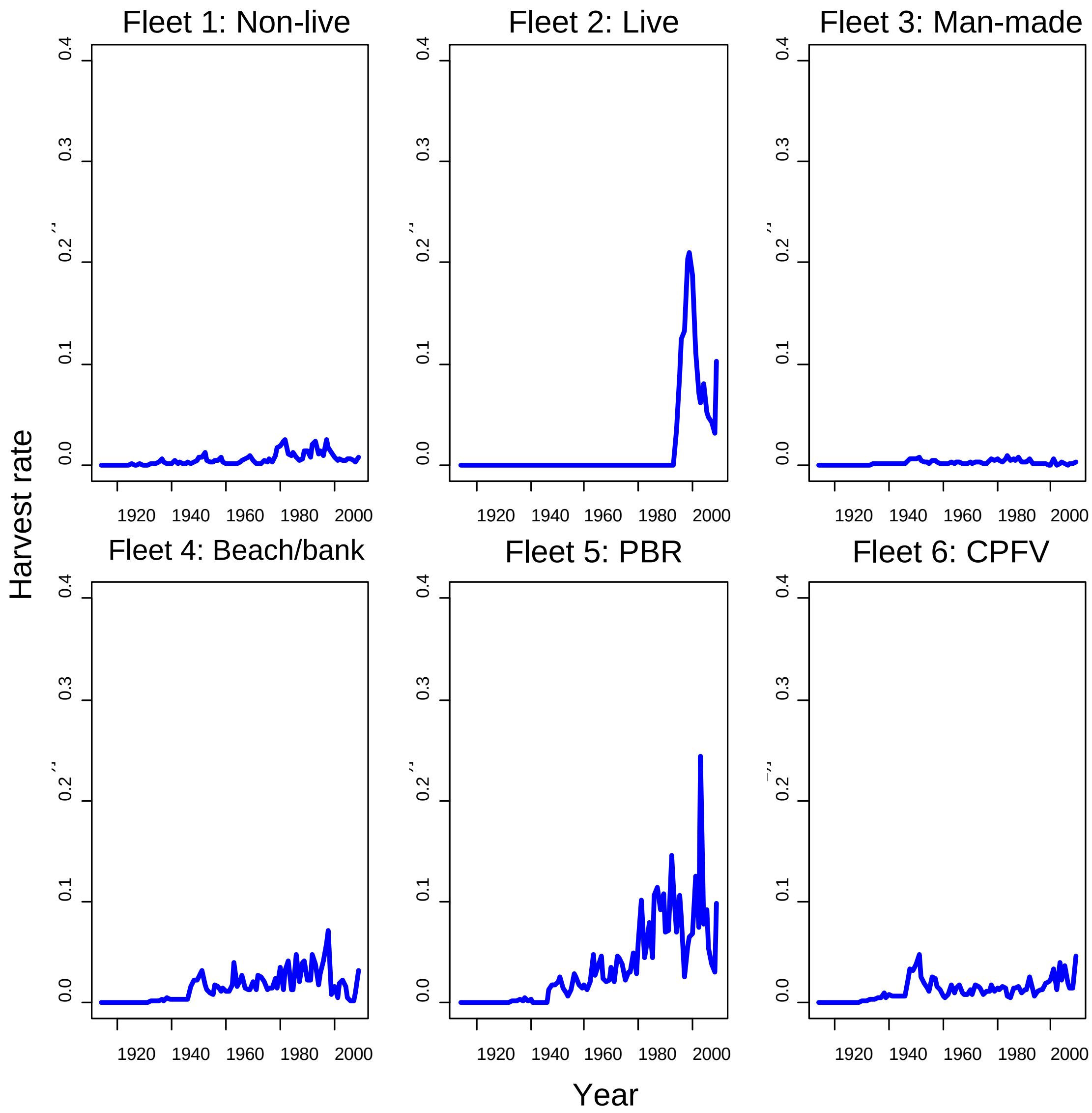


Figure 81. Time series of harvest rates by fishery fleet for the NCS.

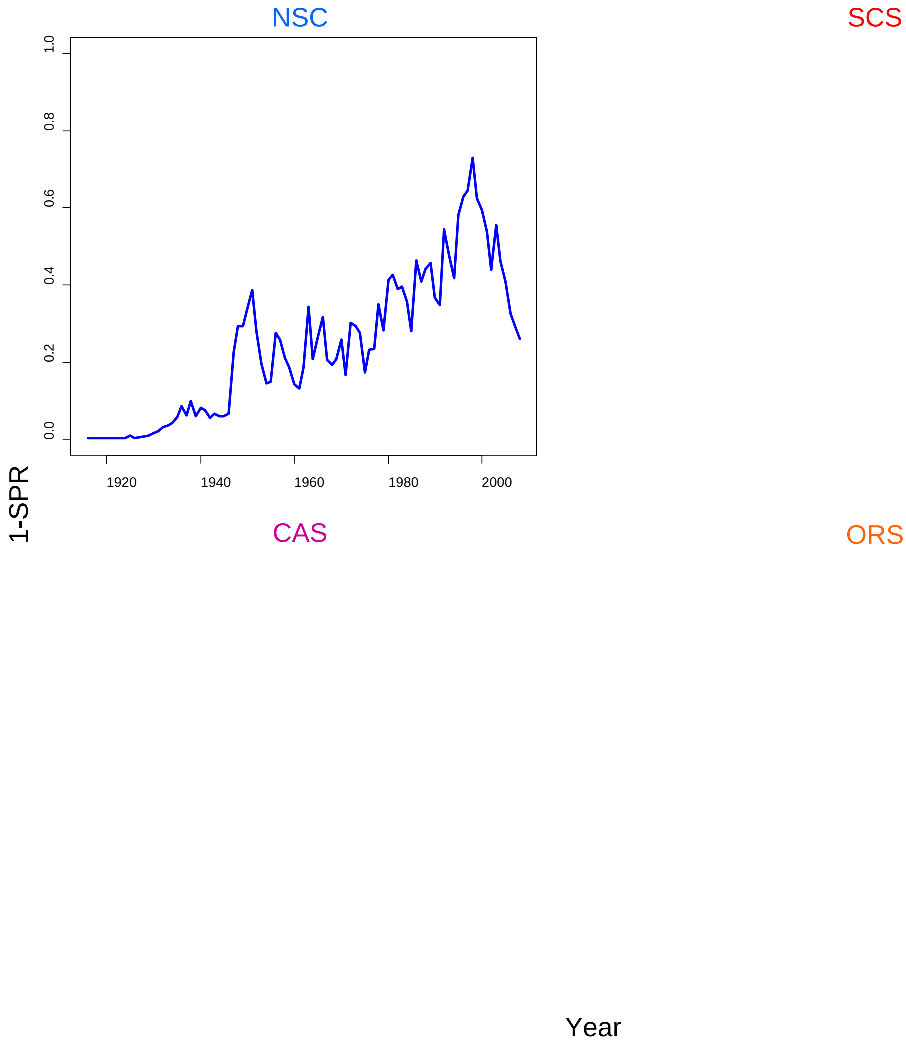


Figure 82. Estimate of the spawning potential ratio (1-SPR) from each of the sub-stock base case models. Values above the red overfishing line indicate fishing above the MSY proxy harvest rate.

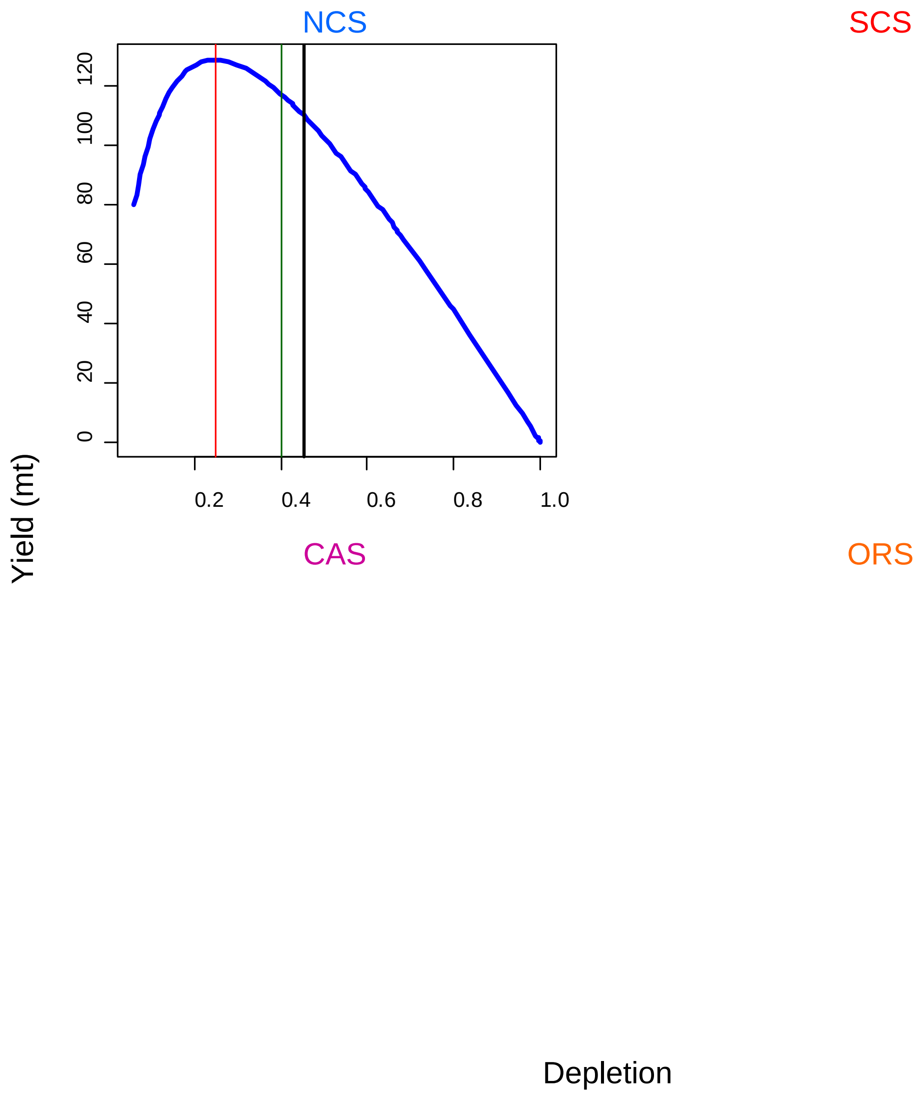


Figure 83. Equilibrium yield curves for each sub-stock base case model. Reference points and current stock status are indicated by the vertical lines.

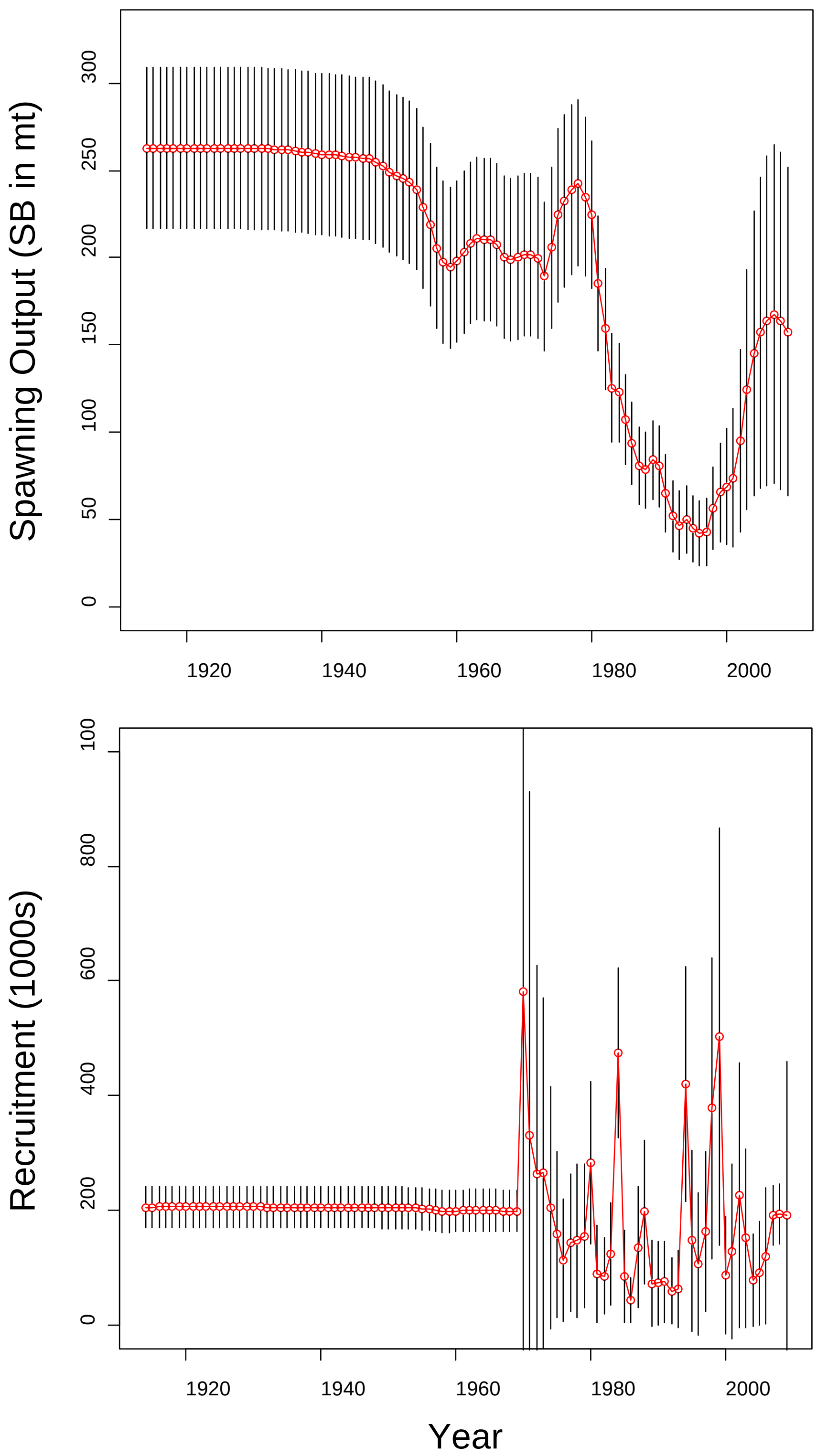


Figure 84. MPD time trajectories for spawning output (top panel) and recruitment trajectories (bottom panel) for the SCS. Vertical black lines are the asymptotic 95% confidence intervals.

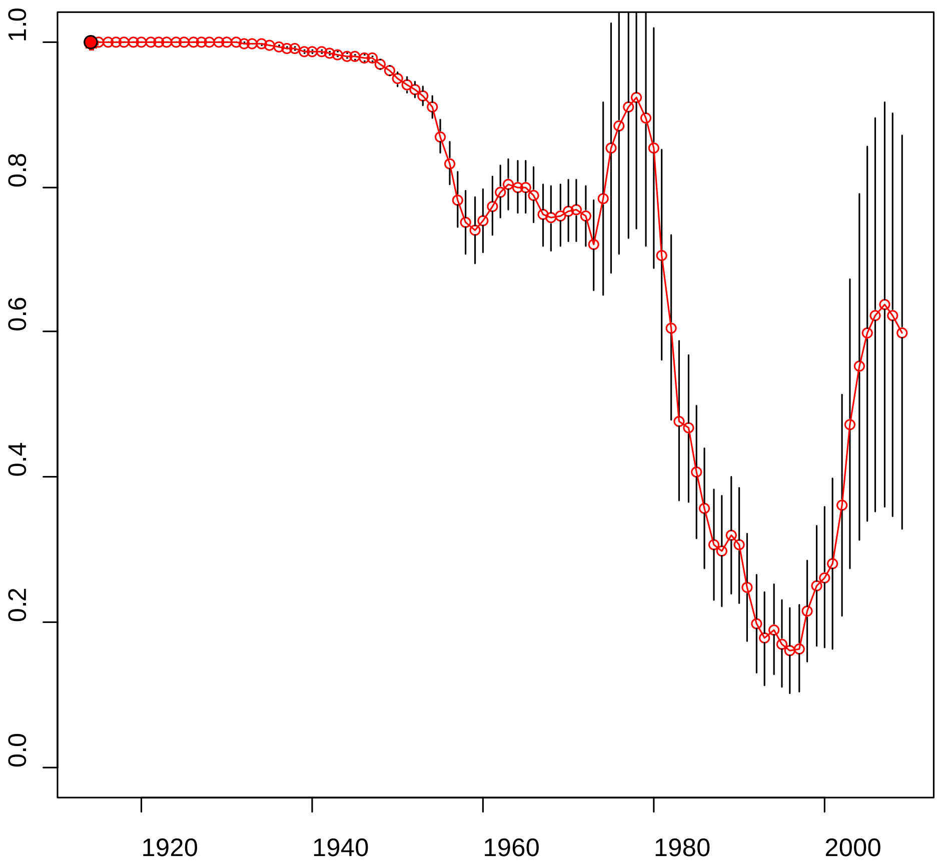


Figure 85. Time trajectories of depletion and spawning output compared to the target ($SB_{40\%}$) and limit reference ($SB_{25\%}$) points for the cabezon SCS.

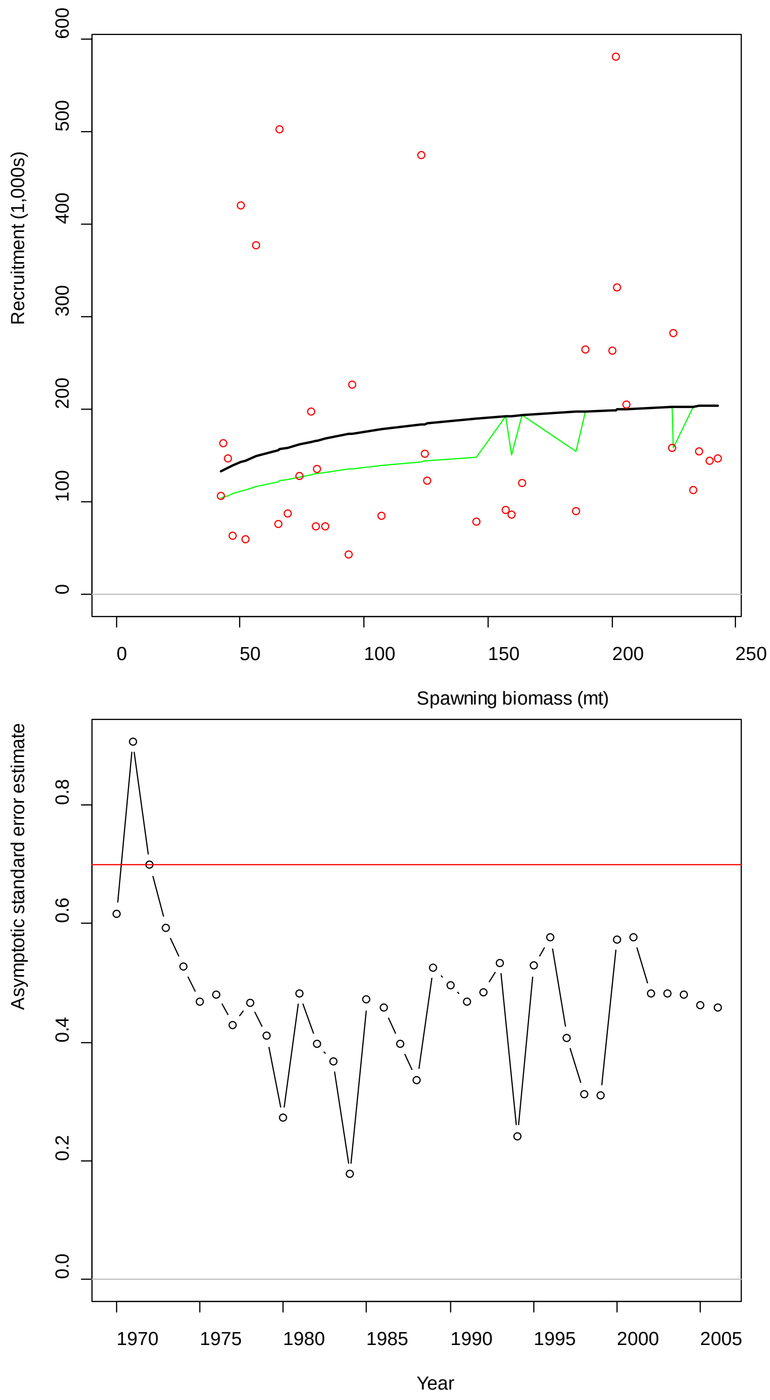


Figure 86. Spawner-recruit relationship (top panel) and the asymptotic standard deviations (bottom panel) for the SCS recruitment time series. Black line in top panel is the expected mean recruits; green line in same panel is the bias-adjusted expected recruits.

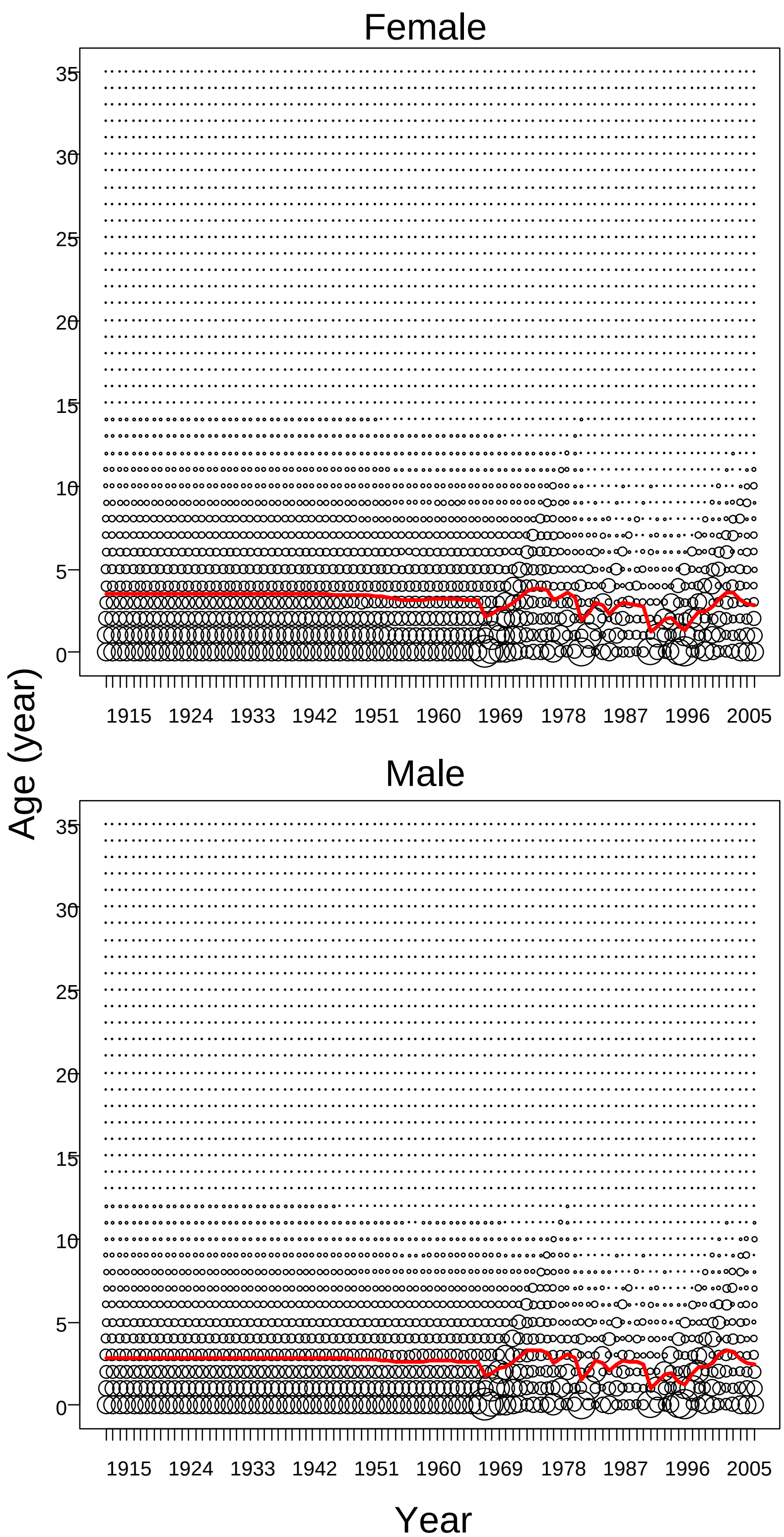


Figure 87. Numbers at age for females (top panel) and males (bottom panel) in the SCS. Red line shows the mean age by year.

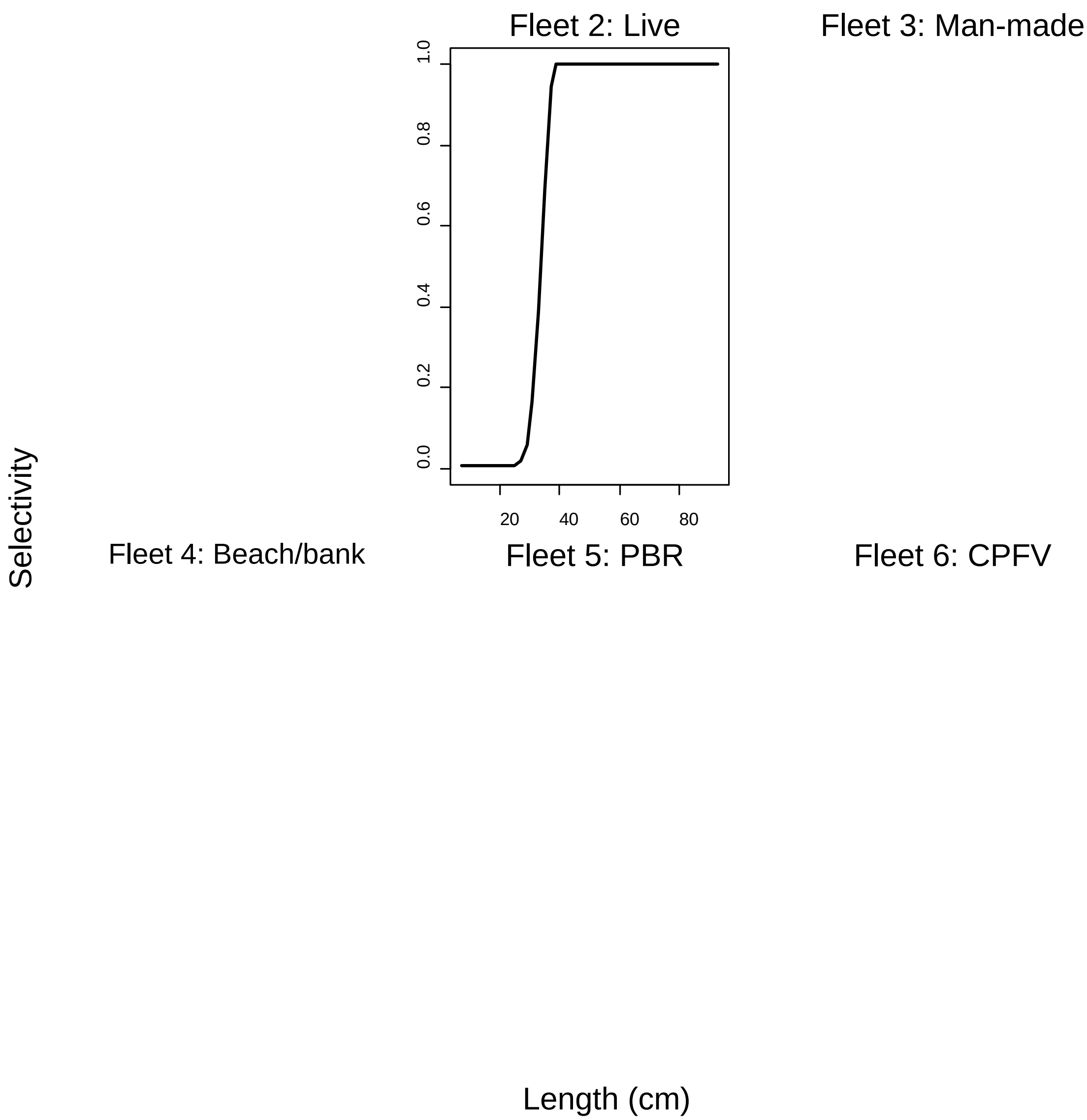


Figure 88. Selectivity at length for female and male cabezon by fishery fleet for the SCS. Black solid lines start selectivity in year 1916; blue broken lines start selectivity in year 1999 (fleet 2) and year 2000 (fleets 5 and 6). There is no length information for the non-live fishery in SCS (not included here).

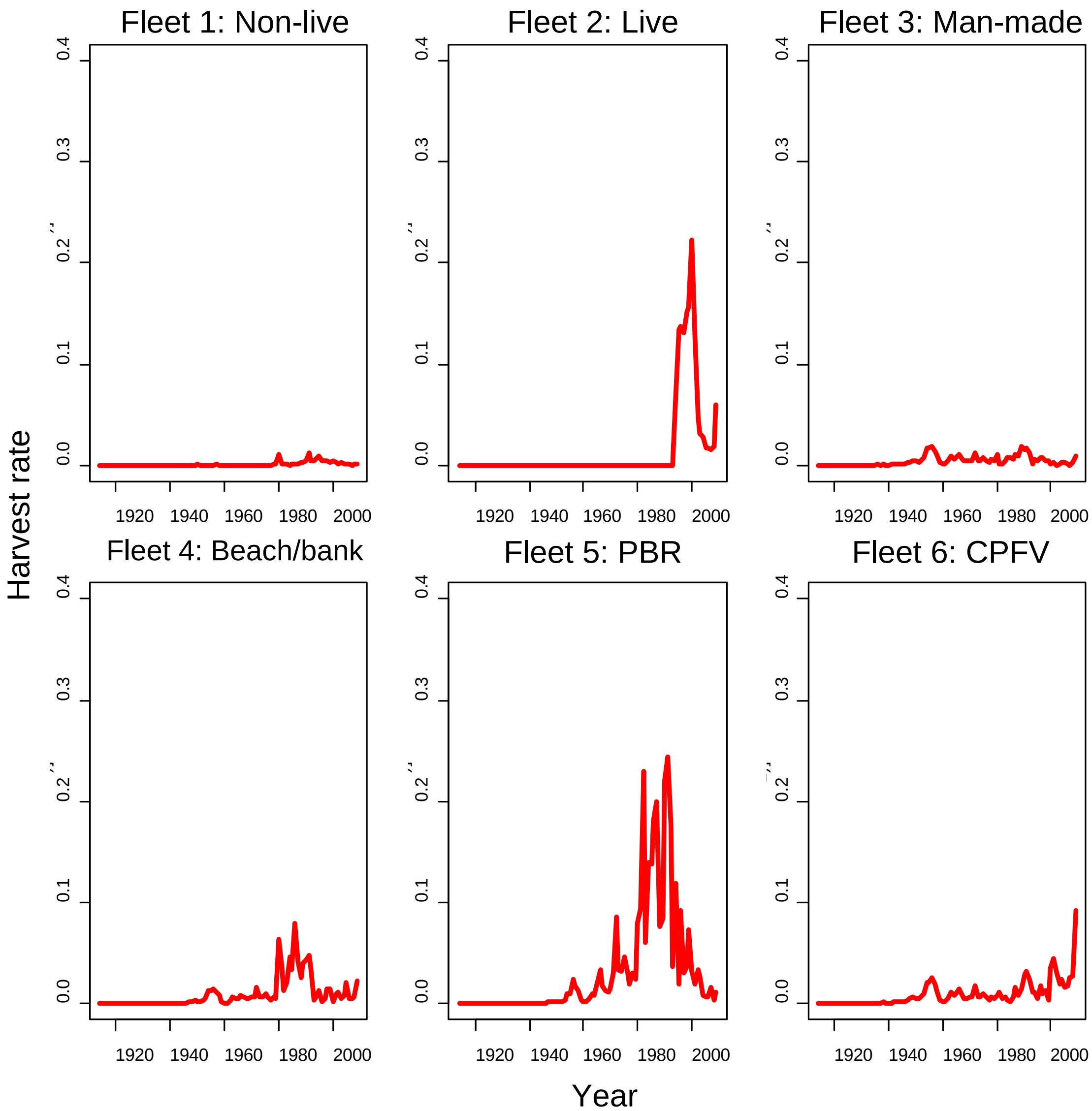


Figure 89. Time series of harvest rates by fishery fleet for the SCS.

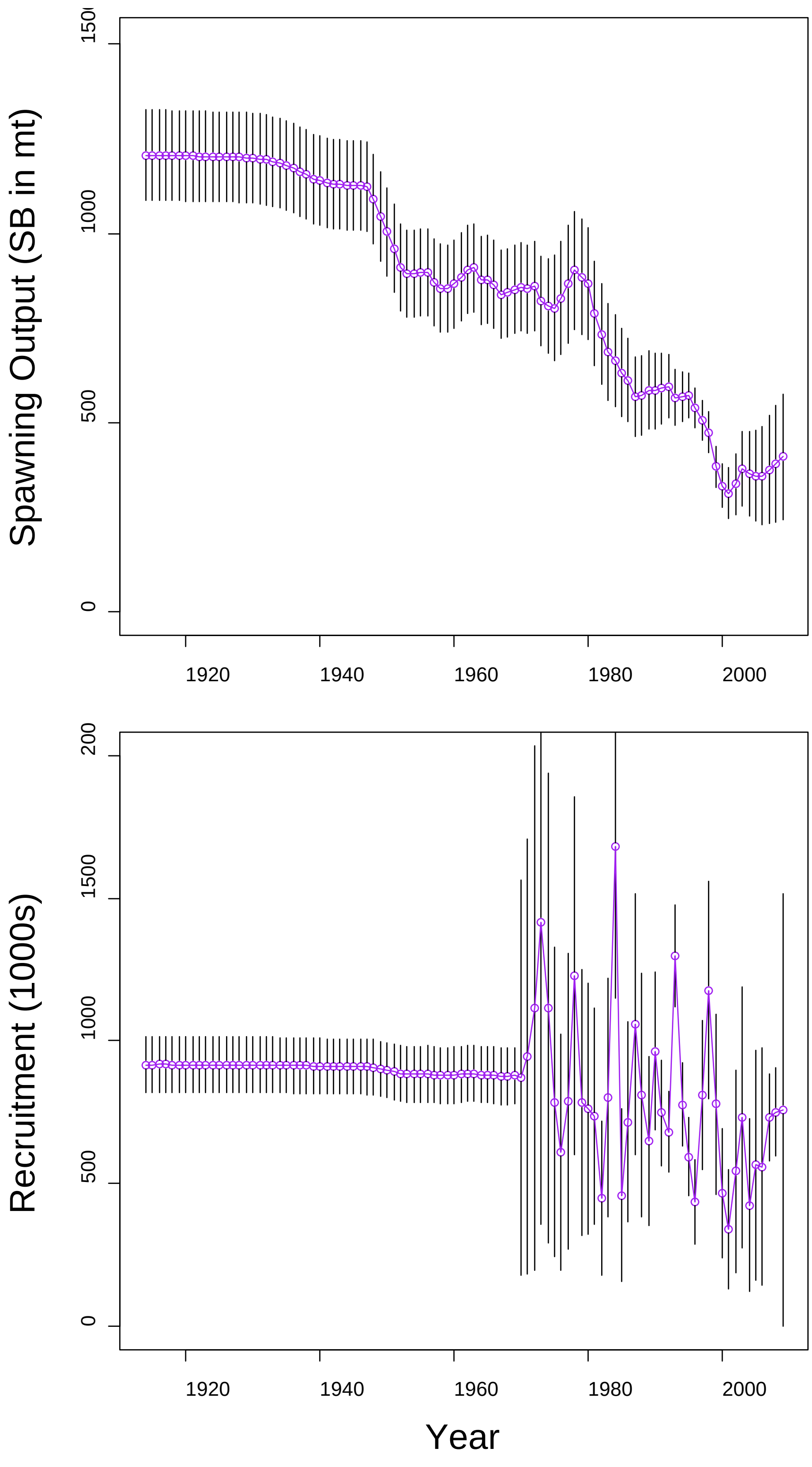


Figure 90. MPD time trajectories for spawning output (top panel) and recruitment trajectories (bottom panel) for the CAS. Vertical black lines are the asymptotic 95% confidence intervals.

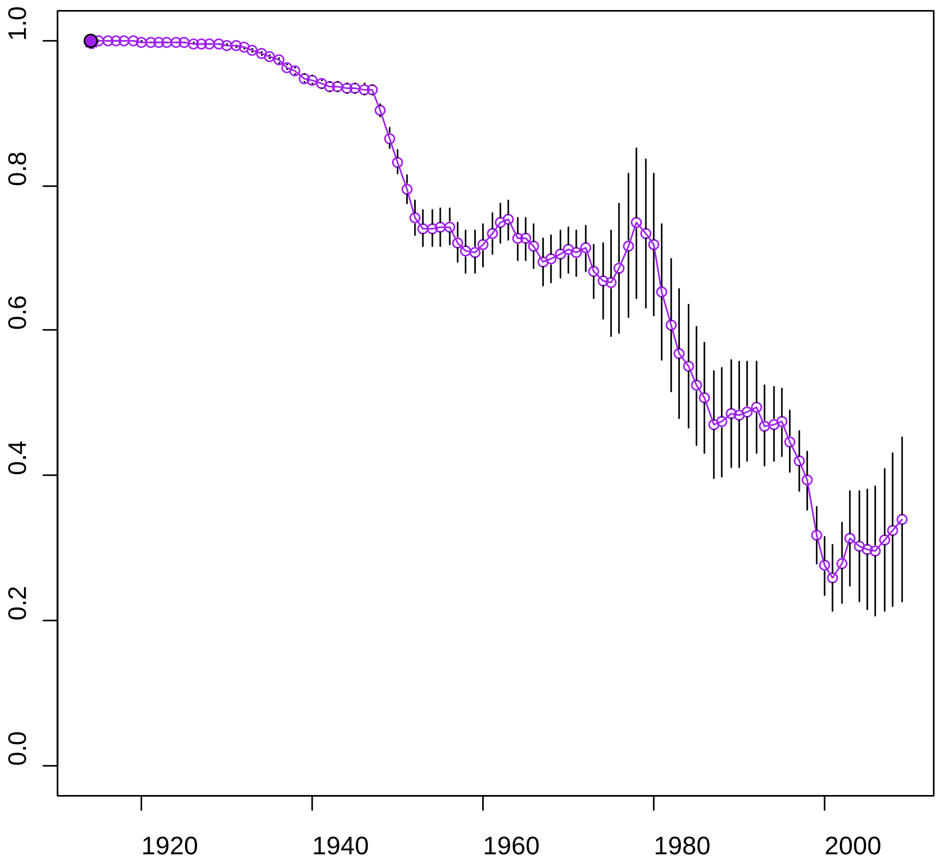


Figure 91. Time trajectories of depletion and spawning output compared to the target ($SB_{40\%}$) and limit reference ($SB_{25\%}$) points for the cabezon CAS.

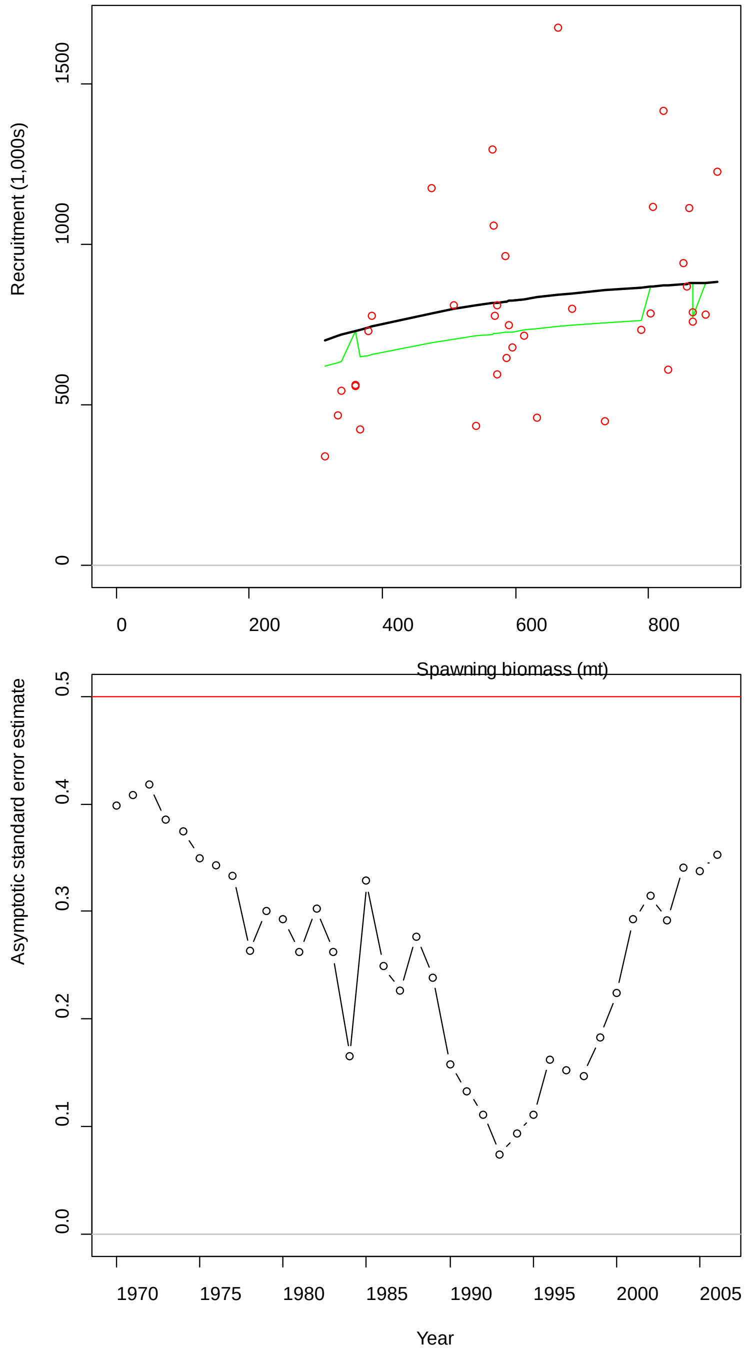


Figure 92. Spawner-recruit relationship (top panel) and the asymptotic standard deviations (bottom panel) for the CAS recruitment time series. Black line in top panel is the expected mean recruits; green line in same panel is the bias-adjusted expected recruits.

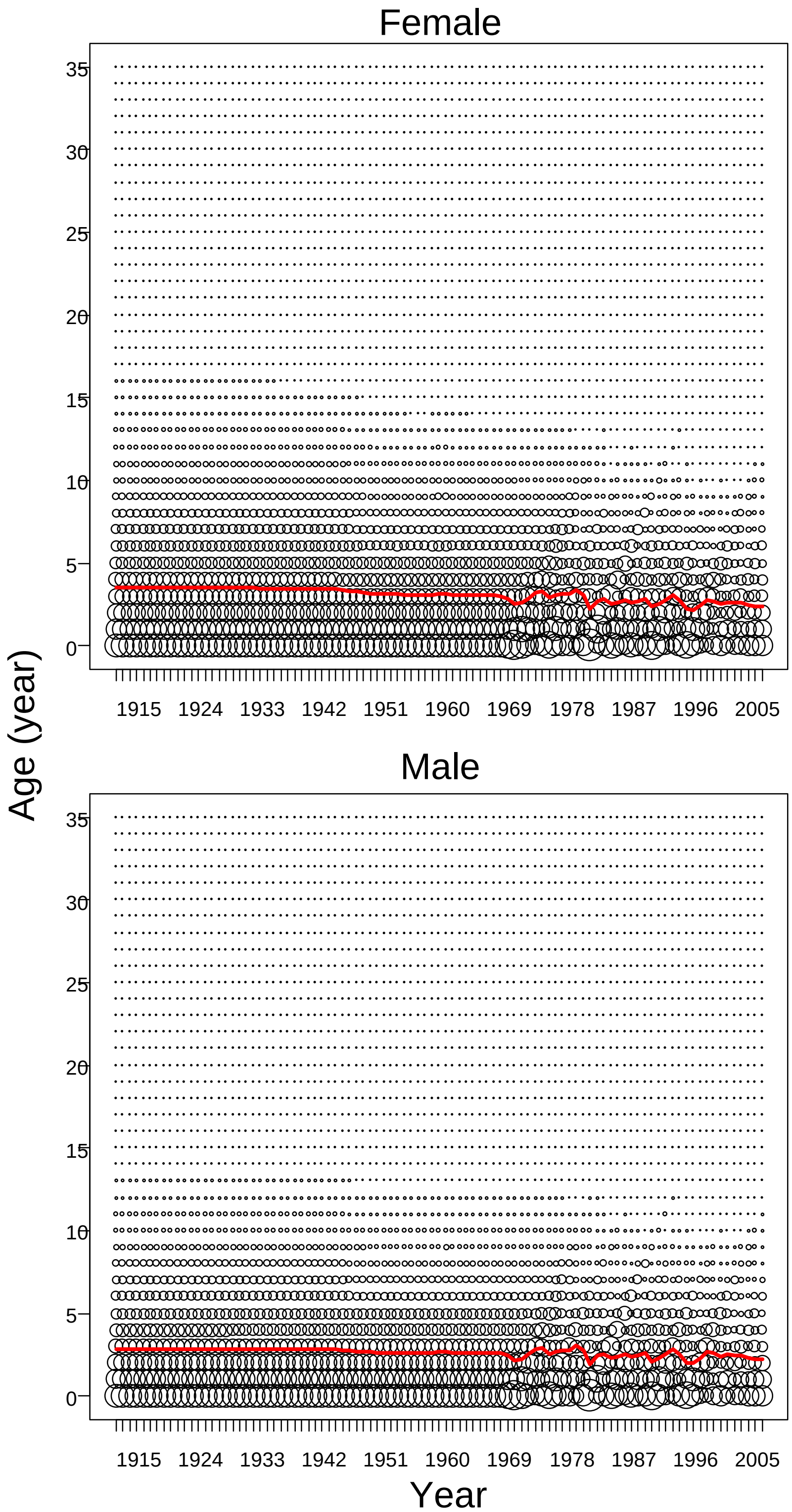


Figure 93. Numbers at age for females (top panel) and males (bottom panel) in the CAS. Red line shows the mean age by year.

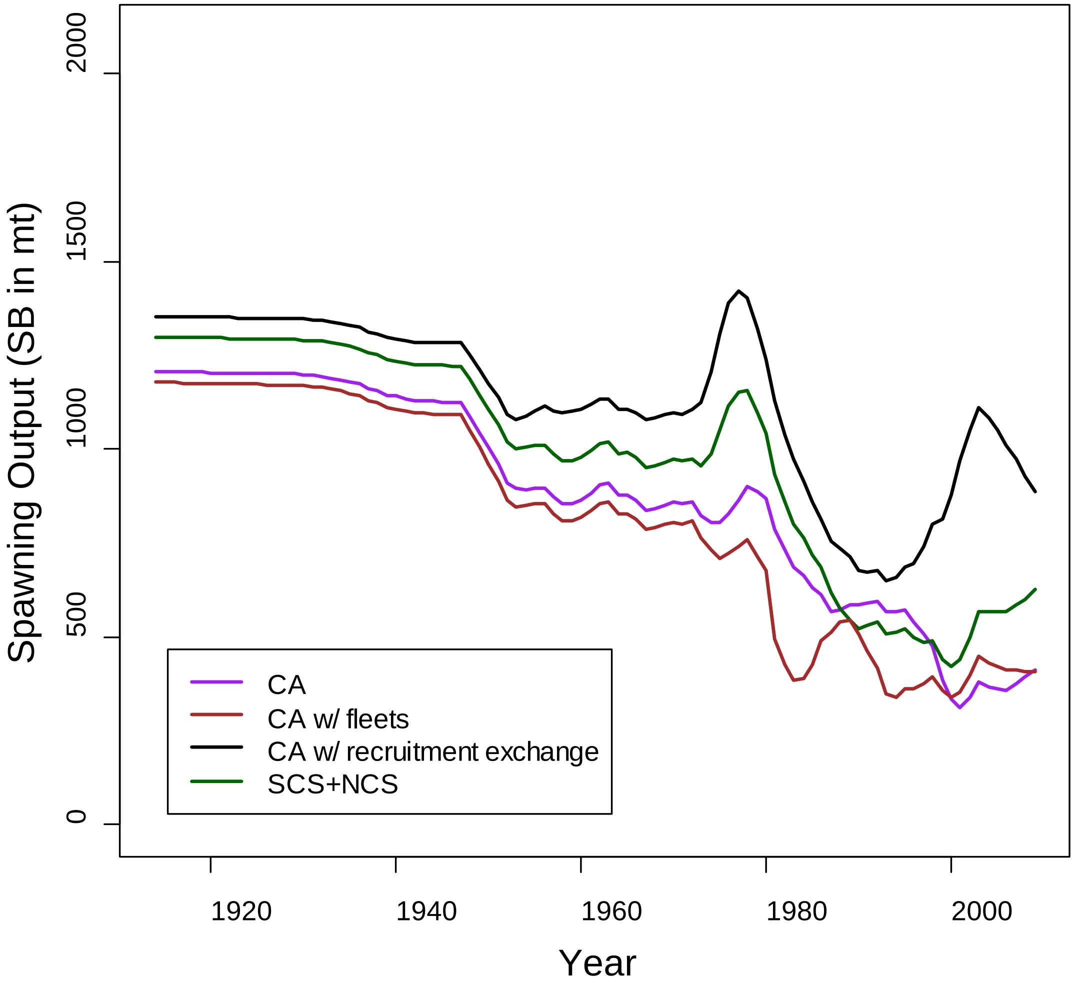


Figure 94. Comparison of spawning output trajectories for four realizations of a state-wide California cabezon sub-stock assessment.

Figure 95. Comparison of recruitment deviations between the NCS and SCS base cases (top left panel), all California sub-stock base cases (top right panel), and CAS and CAS ('+fleets') specified with separate NCS and SCS fleets.

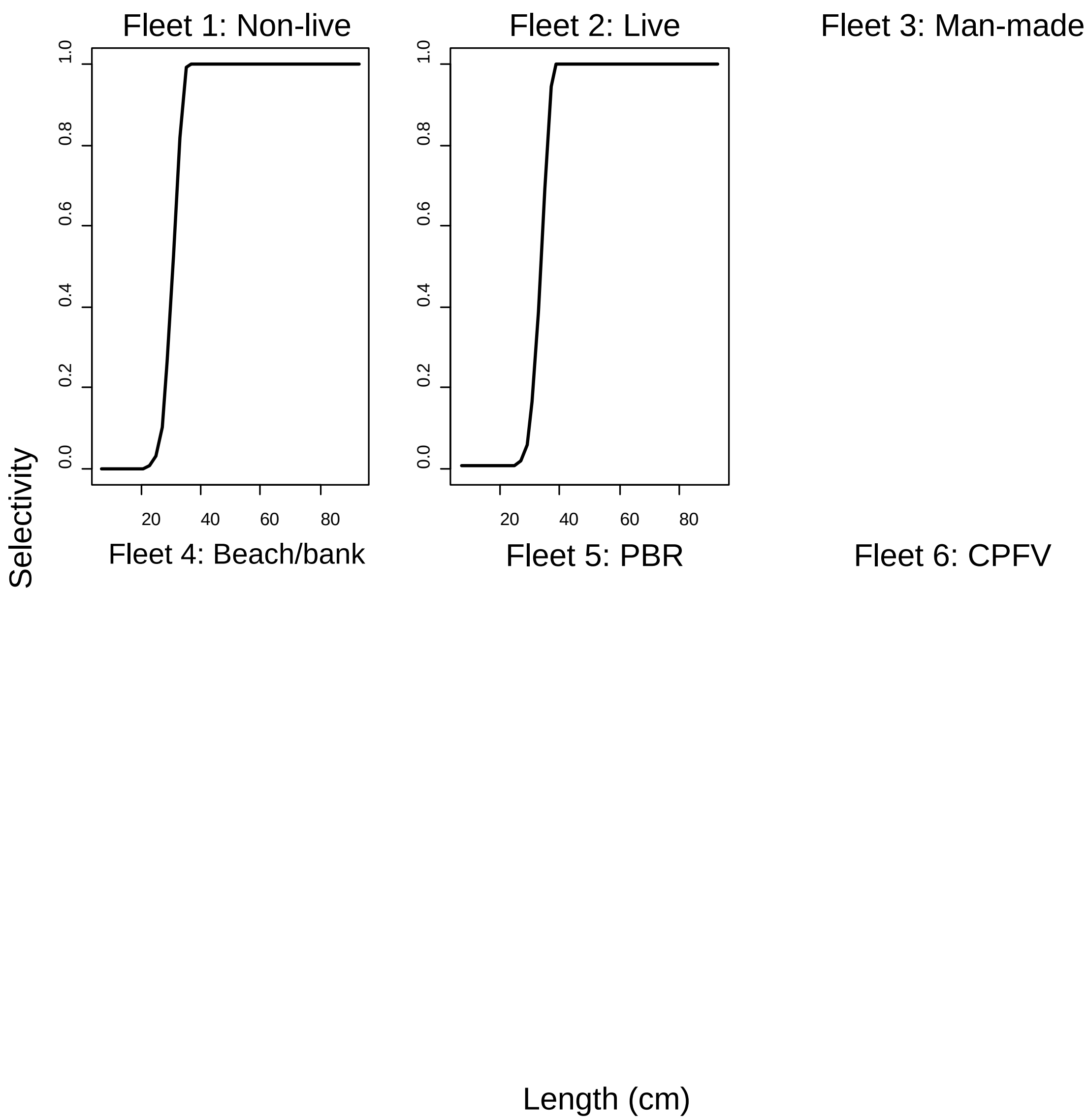


Figure 96. Selectivity at length for female and male cabezon by fishery fleet for the CAS. Black solid lines start selectivity in year 1916; blue broken lines start selectivity in year 1999 (fleet 2) and year 2000 (fleets 5 and 6); red dotted lines start selectivity in 2005.

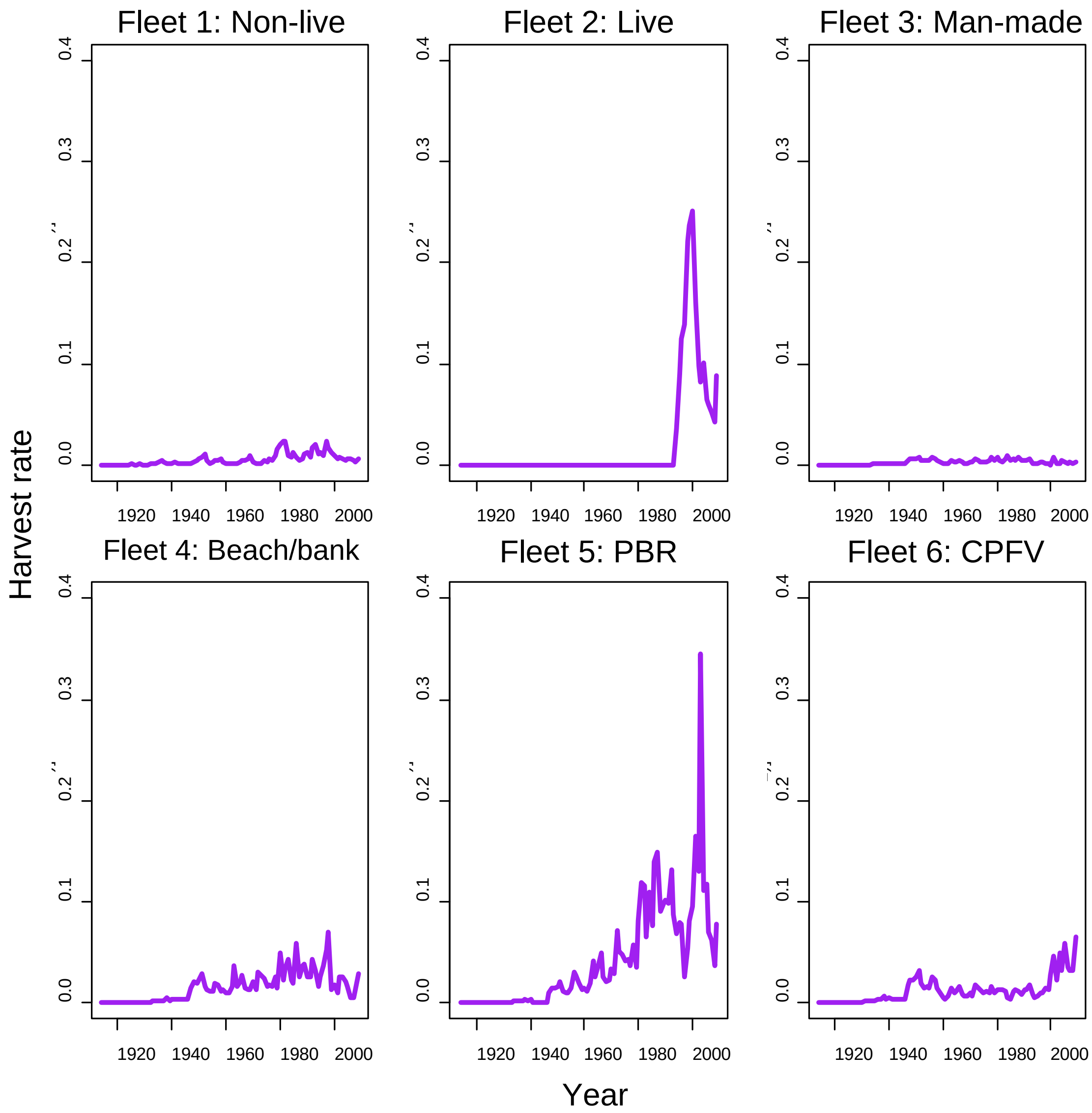


Figure 97. Time series of harvest rates by fishery fleet for the CAS.

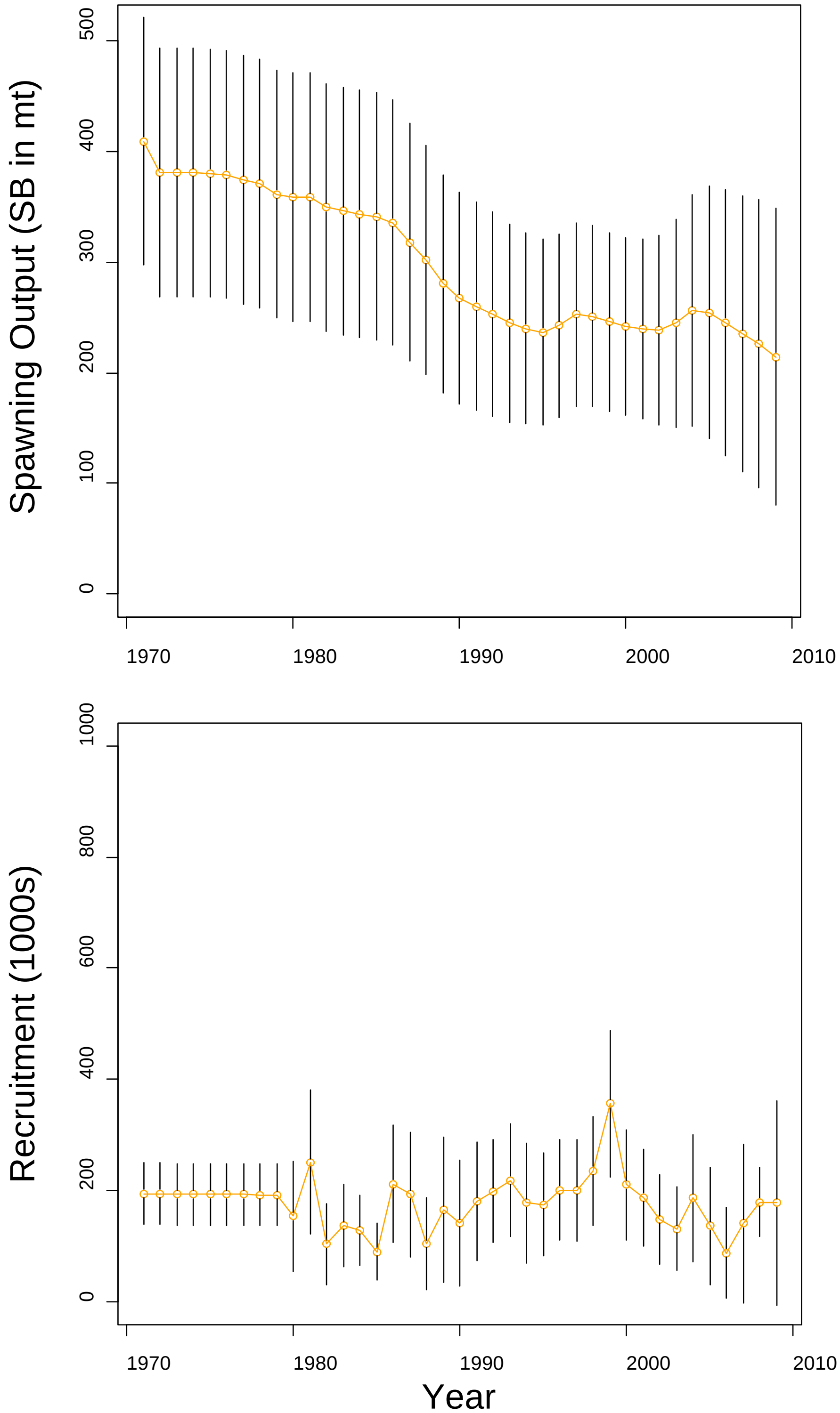


Figure 98. MPD time trajectories for spawning output (top panel) and recruitment trajectories (bottom panel) for the ORS. Vertical black lines are the asymptotic 95% confidence intervals.

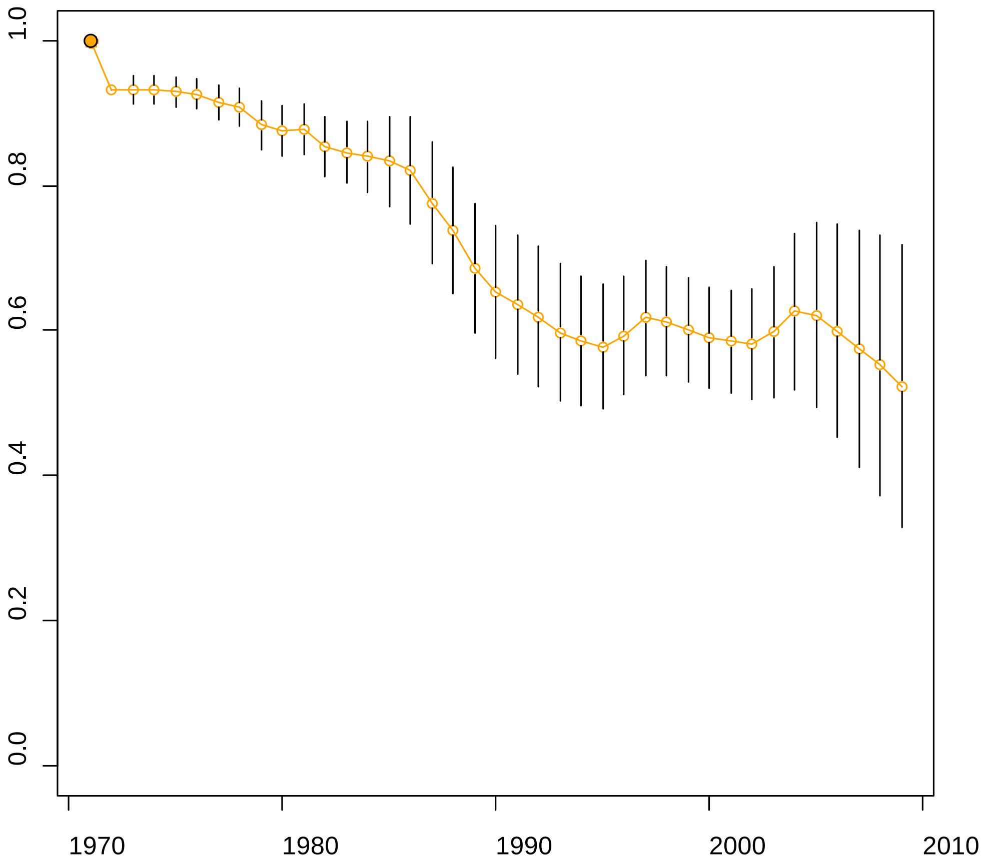
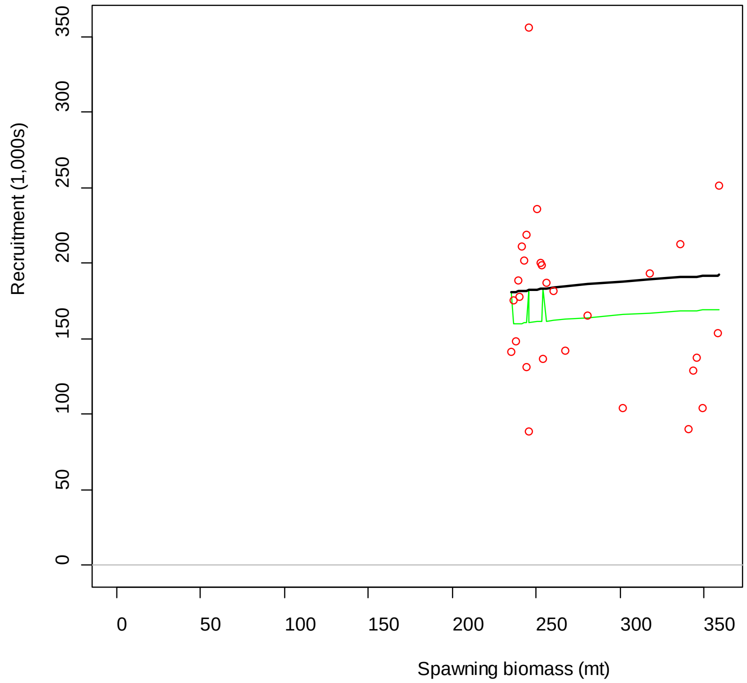


Figure 99. Time trajectories of depletion and spawning output compared to the target ($SB_{40\%}$) and limit reference ($SB_{25\%}$) points for the cabezon ORS.



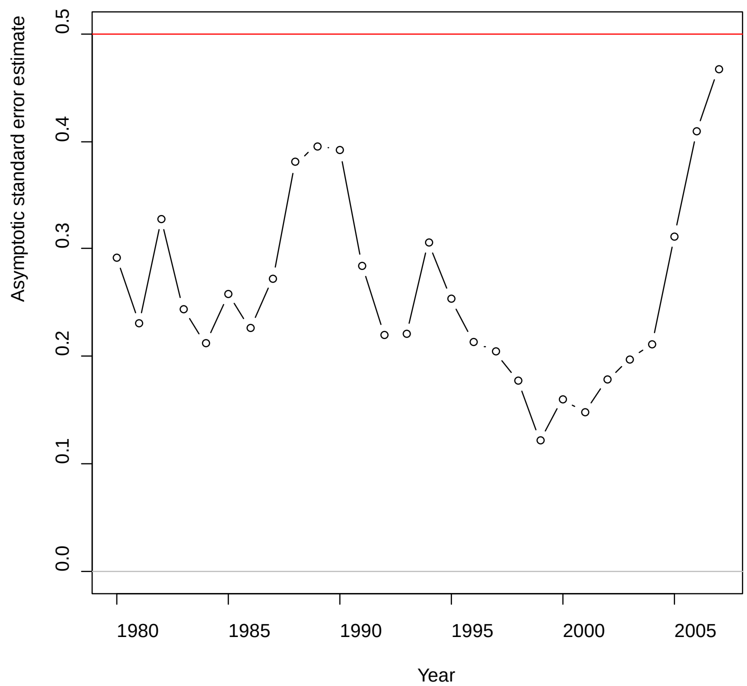


Figure 100. Spawner-recruit relationship (top panel) and the asymptotic standard deviations (bottom panel) for the ORS recruitment time series. Black line in top panel is the expected mean recruits; green line in same panel is the bias-adjusted expected recruits.

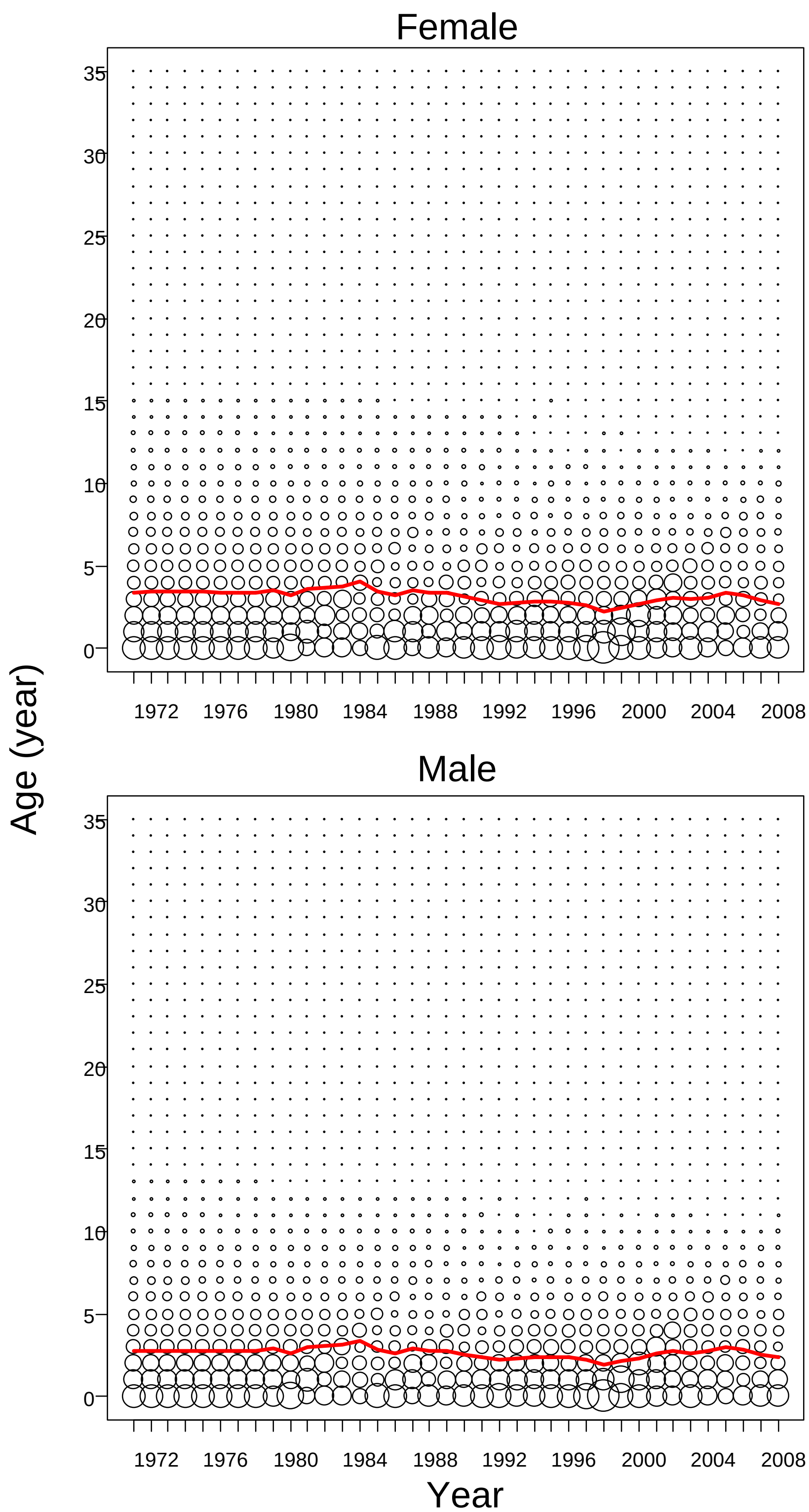


Figure 101. Numbers at age for females (top panel) and males (bottom panel) in the ORS. Red line shows the mean age by year.

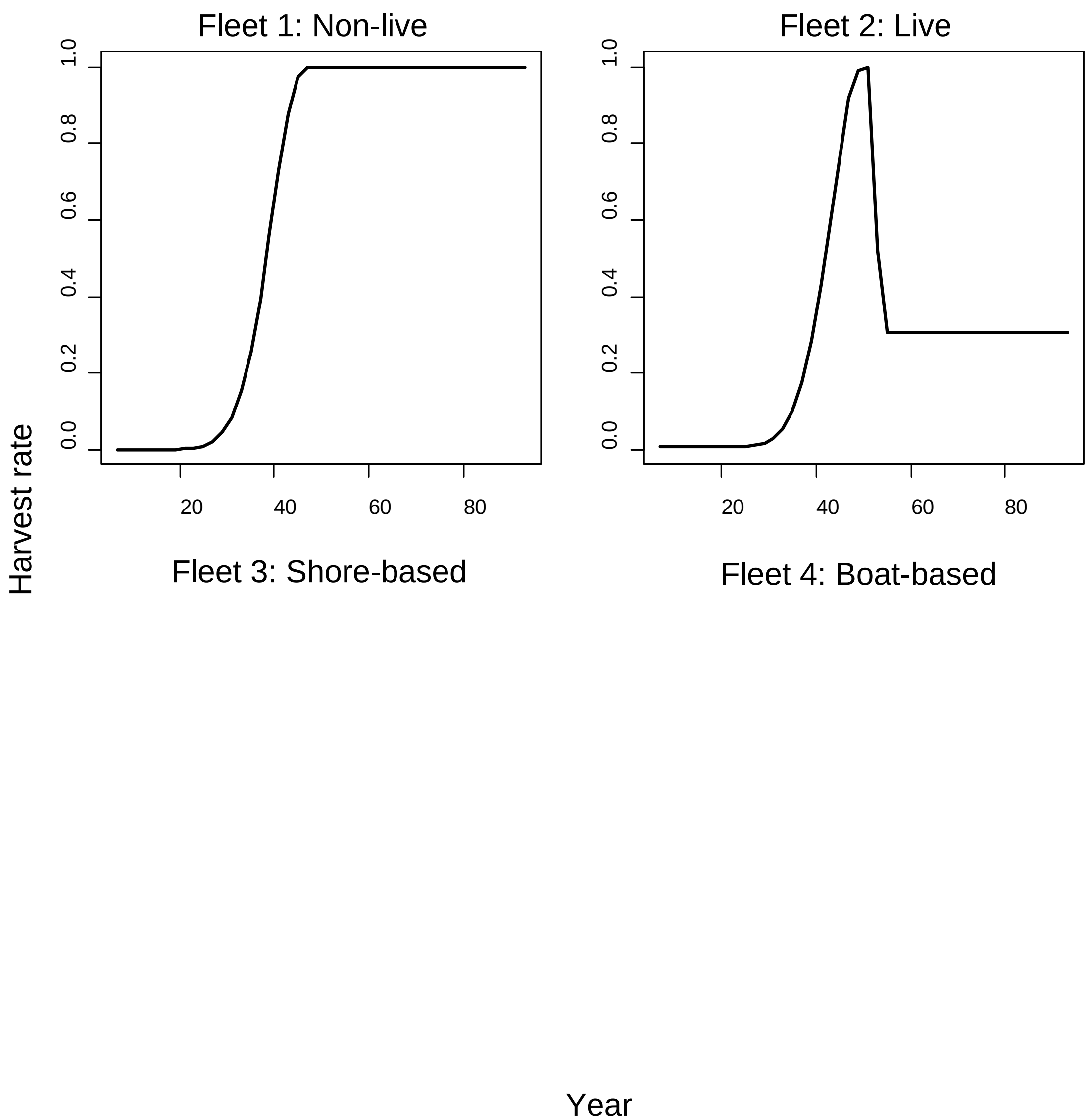


Figure 102. Selectivity at length for female and male cabezon by fishery fleet for the ORS. Black solid lines start selectivity in year 1916; blue broken lines start selectivity in year 2000 (fleet 2) and year 2003 (fleet 4); red dotted lines start selectivity in 2004.

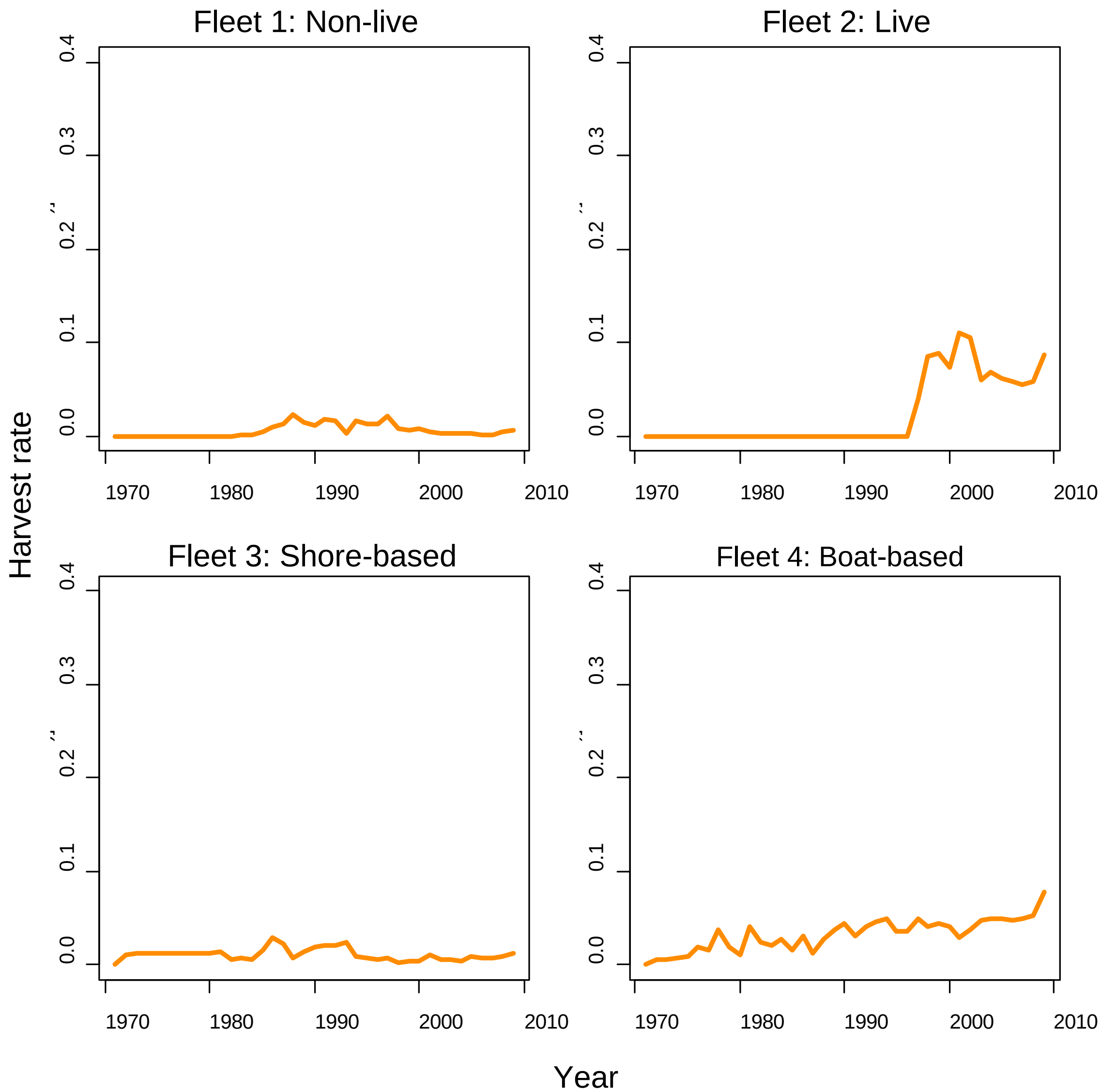


Figure 103. Time series of harvest rates by fishery fleet for the ORS.

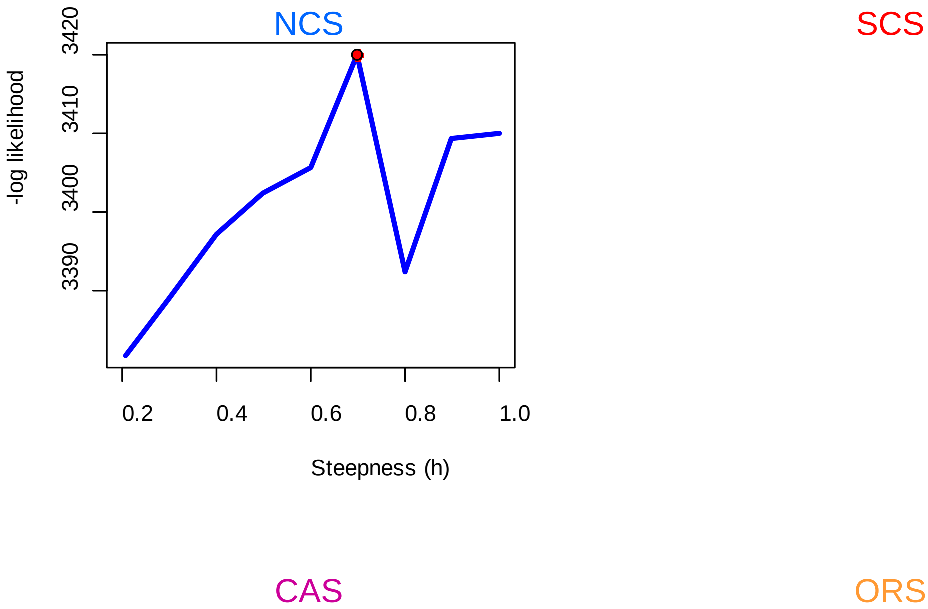


Figure 104. Recruitment compensation (steepness) likelihood profiles for each sub-stock. Red point show the assumed base case values. Broken black line indicates the likelihood value of significant difference.

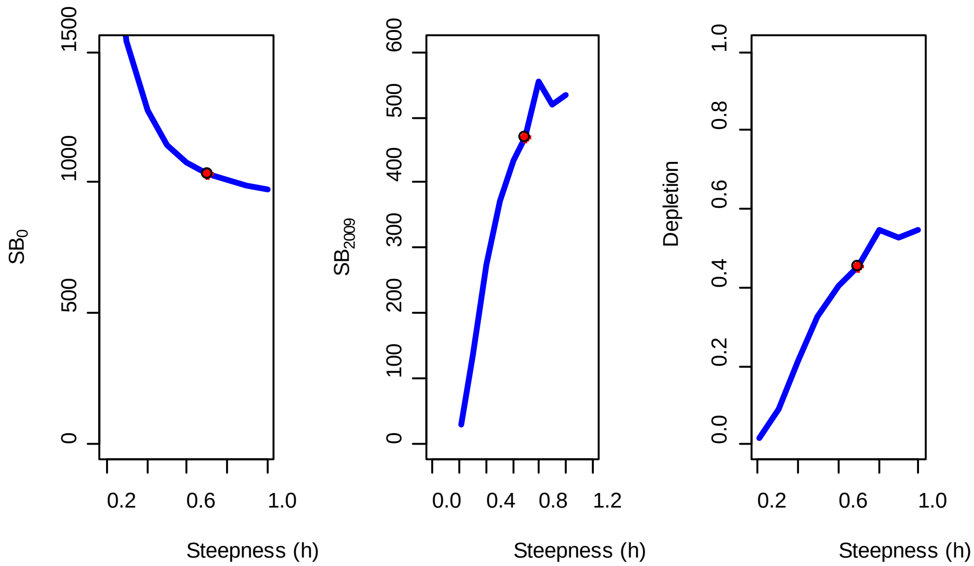


Figure 105. Values of initial spawning output (SB_0; left panels), current spawning output (SB_{2009}; middle left panels), depletion (middle right panels), and MSY (right panels) for the NCS (upper panels) and SCS (lower panels).

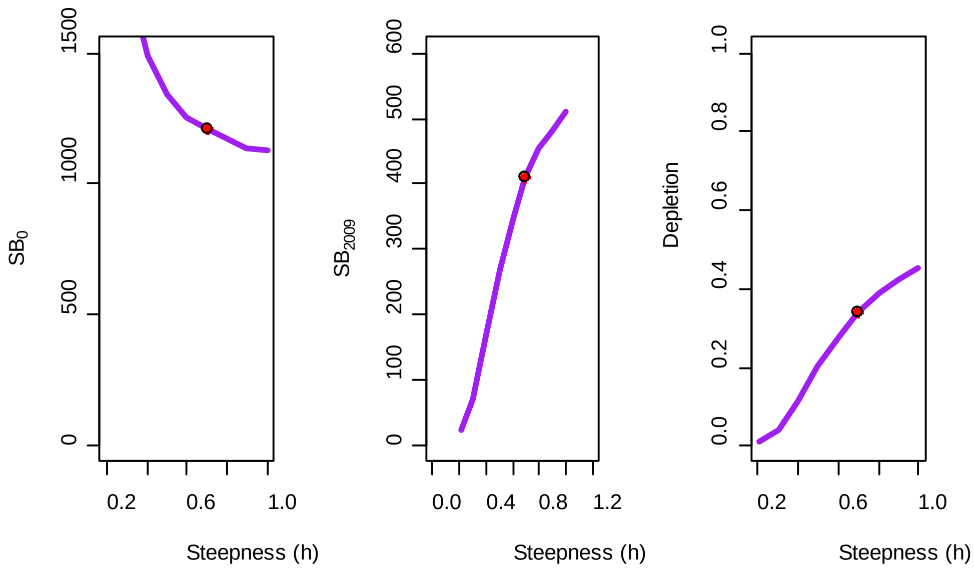


Figure 106. Values of initial spawning output (SB_0; left panels), current spawning output (SB_{2009}; middle left panels), depletion (middle right panels), and MSY (right panels) for the CAS (upper panels) and ORS (lower panels).

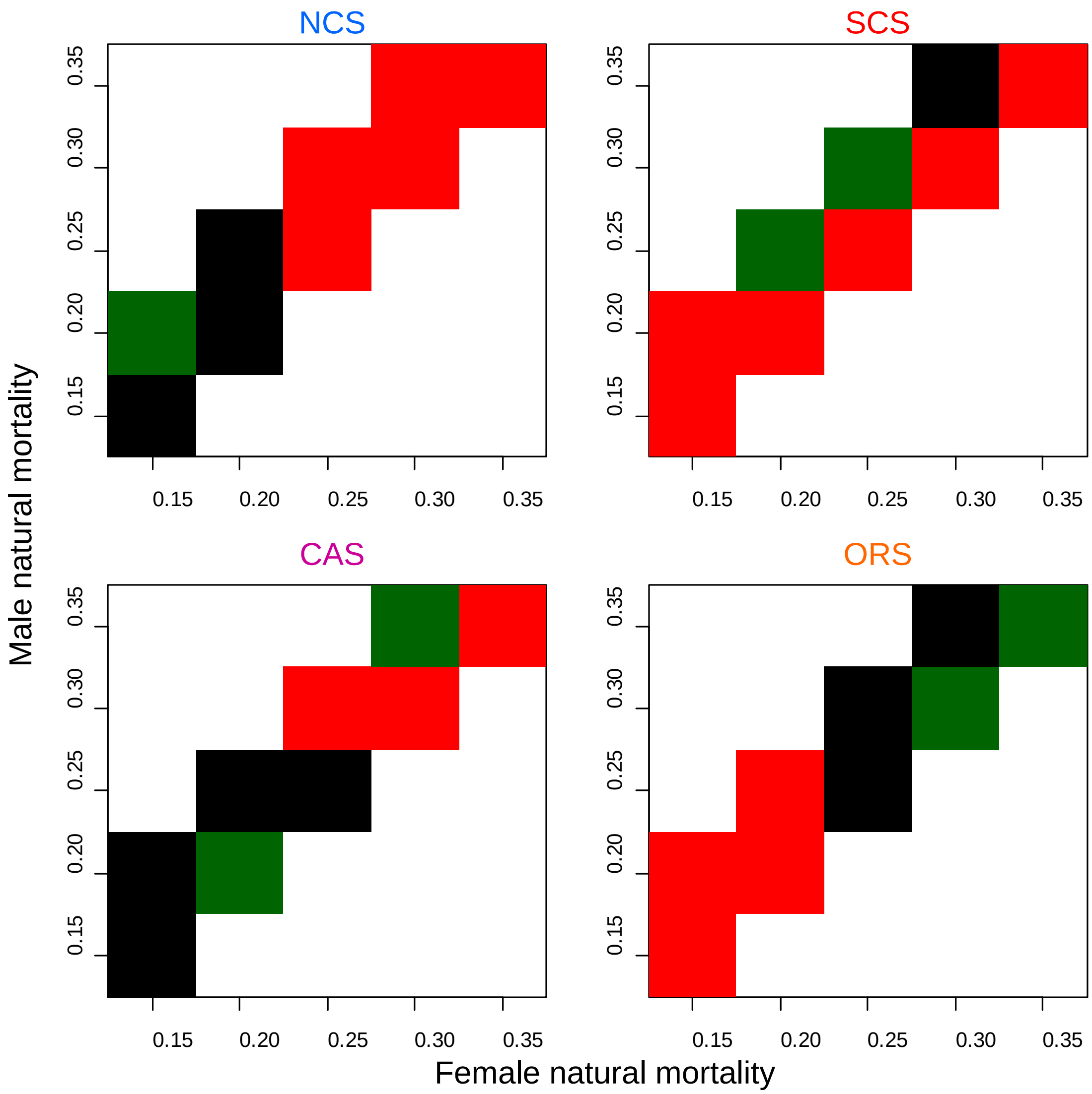


Figure 107. Likelihood profile for sex-specific natural mortality. Green values are within 1.92 likelihood units from the minimum. Black values are 1.92 to 10 likelihood units from the minimum. Red values are >10 likelihood units from the minimum.

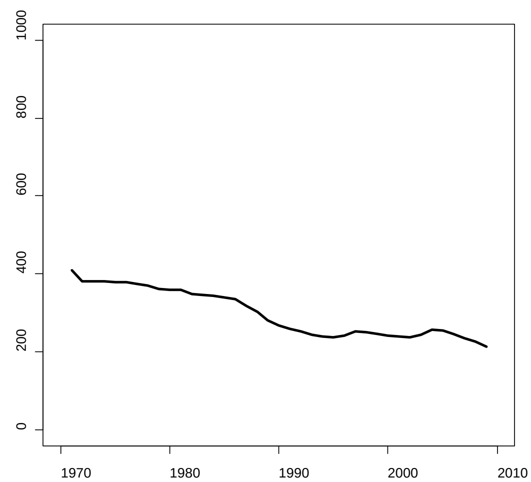


Figure 108. Spawning output trajectories estimated by the base case and retrospective analysis trials for each cabezon sub-stock.

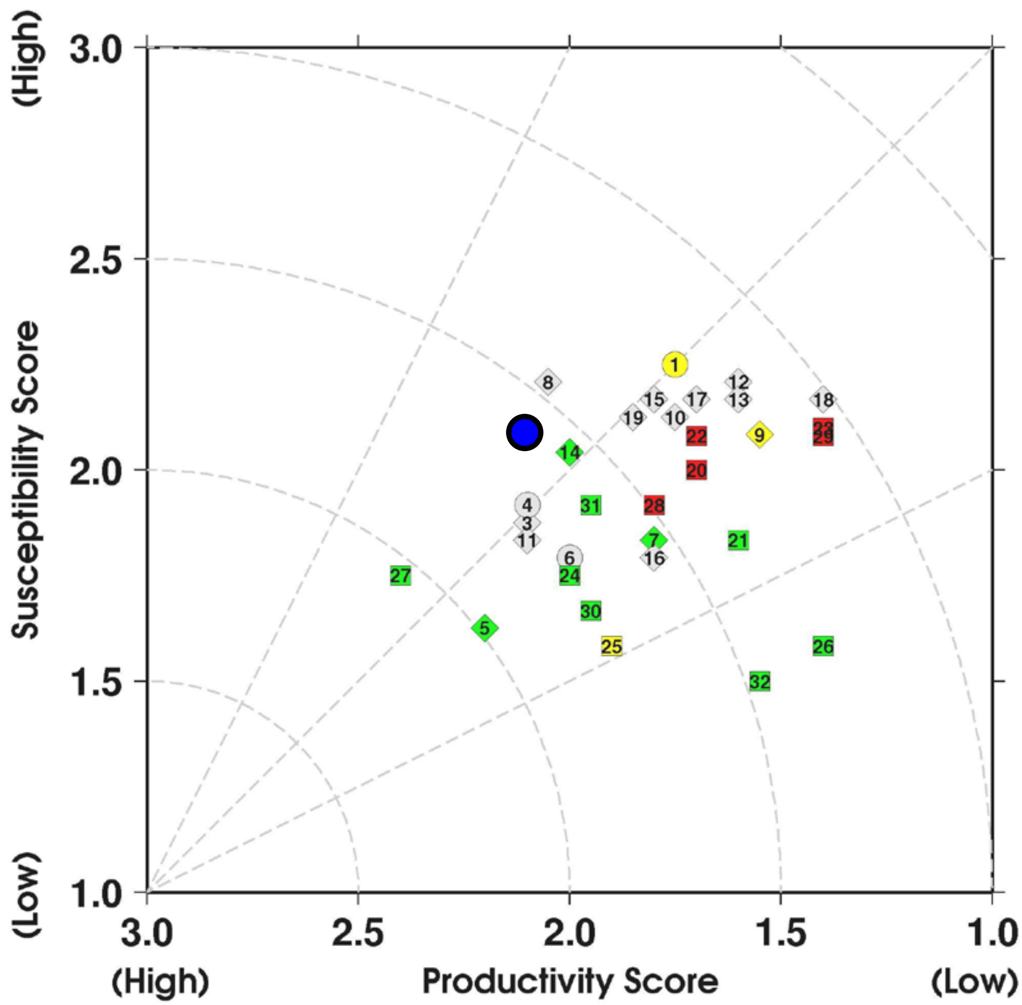


Figure 109. Productivity and susceptibility scores for cabezon (large blue point) compared with 31 other groundfish species. Grey points indicate species without assessment; red points indicate rebuilding stocks; yellow points indicate stocks that are in the precautionary zone ($0.25SSB_0 < \text{SSB} < 0.4SSB_0$); green points indicate assessed stocks above the target reference point. Figure provided by Field et al. (2009).

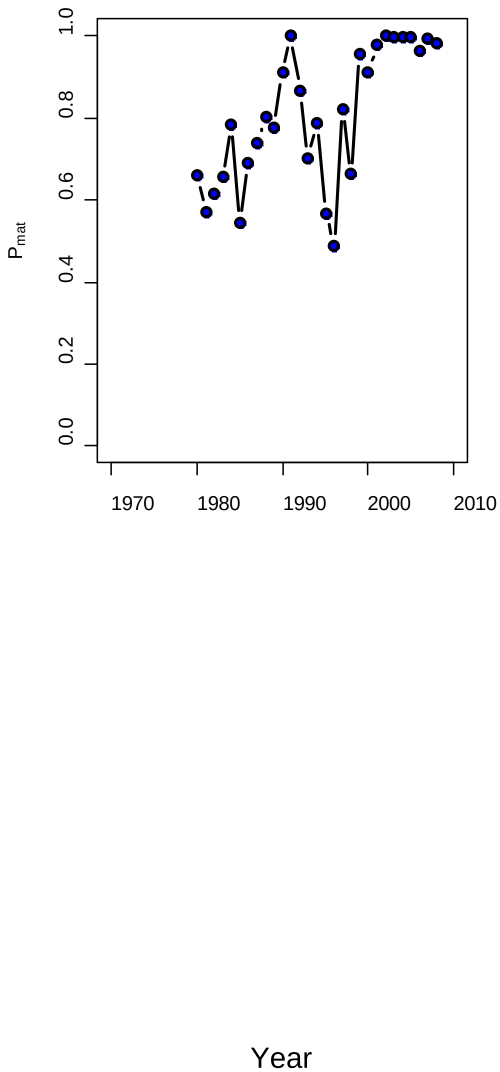


Figure 110. Relationship between P_x values and stock status for the NCS (top row) and SCS (bottom row). Left columns: Proportion of catch mature (P_{mat}) through time. Green broken line is the $SB_{40\%}$ proxy based on P_{mat}; red solid line is the $SB_{25\%}$ proxy based on P_{mat}. Shaded areas indicate years wherein the biomass falls below $SB_{40\%}$according to the sub-stock assessment. Left column: P_{obj} as it relates to depletion rate. Green line is the linear relationship. Blue lines are the linear relationship for different selectivity periods in the fishery.

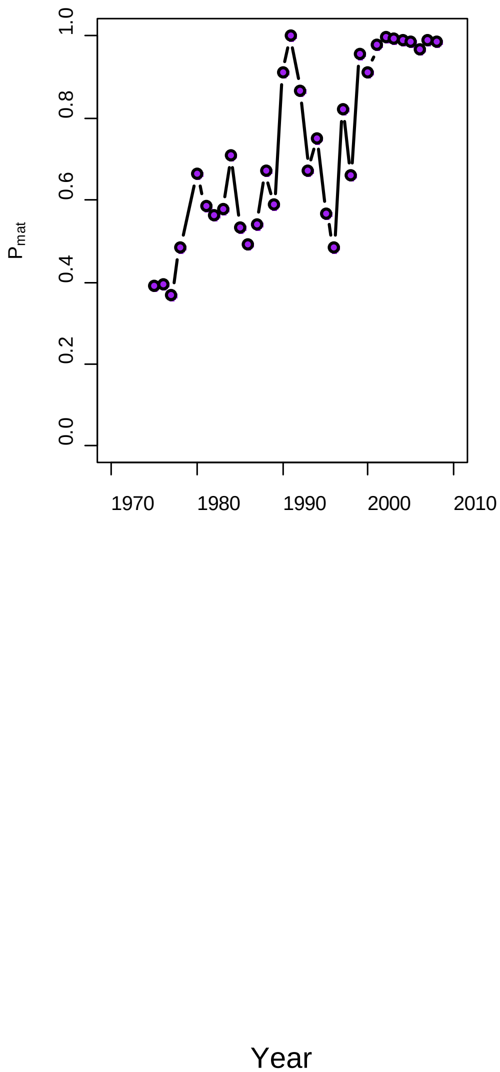


Figure 111. Relationship between P_x values and stock status for the CAS (top row) and ORS (bottom row). Left columns: Proportion of catch mature (P_{mat}) through time. Green broken line is the $SB_{40\%}$ proxy based on P_{mat}; red solid line is the $SB_{25\%}$ proxy based on P_{mat}. Shaded areas indicate years wherein the biomass falls below $SB_{40\%}$according to the sub-stock assessment. Left column: P_{obj} as it relates to depletion rate. Green line is the linear relationship.

Appendix A. Summary of California Management Measures Affecting Cabezon.

Year	Description	Effective Date
1982	Recreational & commercial size limit 12" (30.5 cm), TL	1/1/1982
Pre-1996	Recreational Regulations Recreational fillet length size limit of 12" (30.5 cm)	3/1/1996?
1999	Nearshore Fisheries Management Act gives Fish and Game Commission (FGC) additional authority to regulate fisheries (FG Code §8585.5)	1/1/1999
1999	After January 1, 1999 FGC may adopt regulations to regulate nearshore fish stock and fisheries (FG Code §8587.2)	1/1/1999
1999	Trawl caught dead nearshore (including cabezon) are exempt from size limits (FG Code §8588 (a))	1/1/1999
1999	Commercial size limit 14" (35.6 cm), TL (trawl caught dead nearshore fishes exempt)	1/1/1999
2000	Recreational size limit 14" (35.6 cm), TL	1/1/2000
2000	Recreational Regulations Shall not be filleted on a boat	3/1/2000
Pre-2003	Recreational Bag Limit of 10 fish w/in 20 fish aggregate	3/1/1984
1999	Nearshore fish stock defined with a nearshore fishery permit requirement to take cabezon	4/1/1999
2000	FGC fixes cabezon OY at 67,132 pounds (37.6%) recreational; 111,596 pounds (62.4%) commercial; Total = 178,728 pounds	10/2000
2001	Establishes a December 31, 1999 control date to qualify for the Restricted Access program (CCR Title 14 §150 (d))	10/13/2000
2000	FGC changes cabezon OY at 63,608 pounds (40.3%) recreational; 94,398 pounds (59.7%) commercial; Total = 158,006 pounds	12/2000
2001	Prohibit take from Thursday to Sunday, inclusive (except north of 40°10' – near Cape Mendocino)	01/2001
2001	Recreational Regulations Central and Southern Management Areas; Recreational Fishery open year round; no depth restrictions, except no take in Cowcod Closure area in southern management area in waters 20 fm or greater.	1/1/2001
2001	Size limit increased to 15" (38.1 cm), TL (recreational and commercial)	3/1/2001
2001	FGC fixes cabezon OY at 63,608 pounds recreational; 94,398 pounds commercial; Total OY = 158,006 pounds in emergency regulations	9/1/2001
2001	FGC enacts emergency action to close commercial fishery for the remainder of the calendar year	9/24/2001
2001	Limitation on the number of hooks (150) used to take nearshore stocks and the number of hooks per line (15)	3/5/2001

2001	Defines nearshore fish stocks (including cabezon), nearshore fisheries, nearshore waters, and shallow nearshore rockfish (CCR Title 14 §1.90 (a)(b))	3/5/2001
2001	Prohibits the take of cabezon in the northern rockfish and lingcod management area during March and April or in the southern rockfish and lingcod management area in January and February (CCR Title 14 §150.16 (a)	3/5/2001
2001	Commercial seasonal closures for cabezon shall apply that are consistent with federal seasonal closures for minor nearshore rockfishes, as noticed in the Federal Register by the National Marine Fisheries Service or defined in Title 50, Code of Federal Regulations (CFR), Parts 600 and 600, for ocean waters south of 40°10' (CCR Title 14 §150.06 (c)	3/5/2001
2002	Finfish traps required to have rigid 5” rings in entrance	1/8/2002
2002	FGC fixes cabezon OY at 84,330 pounds (47.2%) recreational; 94,398 (52.8%) pounds commercial; Total OY = 178,728 pounds reaffirming emergency action	2/4/2002
2002	FGC enacts emergency action to close commercial fishery for the remainder of the calendar year	7/01/2002
2002	Recreational Regulations Recreational Area Mgmt areas changed	1/10/2002
2002	Recreational Regulations Emergency Sportfishing Closure for cabezon in waters deeper than 20 fm for all boat-based anglers south of 40º10' N lat.	7/29/2002
2003	FGC fixes cabezon OY at 84,330 pounds (47.2%) recreational; 94,398 (52.8%) pounds commercial; Total OY = 178,728 pounds	1/1/2003
2003	Recreational Regulations Recreational rockfish, cabezon, and greenling (RCG) complex; 10 fish bag-limit regulation established in the Central and Southern Management Areas	1/1/2003
2003	Recreational Regulations Northern Management Area (CA/OR border to 40º10' N lat.): recreational bag limit remains at 10 fish (outside the rockfish bag limit); Open year round; No depth Restriction North-Central, South-Central and Southern Management Areas (40º10' N lat. to US/Mexico border): recreational bag limit 3 fish with in the RCG bag limit; Open July-Dec; 20 fm or less	1/3/2003
2003	Cumulative trip limits set for two-month periods, includes a two month closure from March to April.	
2003	FGC regulatory changes enacted as follows: Seasons: Jan-Feb – open Mar-Apr – closed May-Dec – open (or until the TAC allocation has been reached) Cumulative trip limits per nearshore permittee for January and February set at 200 pounds	1/1/2003

2003	Participants must have a valid 2003-2004 nearshore fishery permit for one regional management area (CCR Title 14 § 52.04)	2/8/2003
2003	CCR Title 14 §150 (c) defines nearshore fishes (including cabezon) used for landings qualifications and their respective market category codes	3/10/2003
2003	Commercial RCAs 42 N lat. to 40 10’ N lat. – closed 27 fm to 100 fm South of 40 10 N lat. January – June – closed 20 fm to 150 fm July-August – closed 20 fm to 150 fm, except between a line drawn due south from Point Fermin and a line drawn due west from Newport South Jerry, vessels fishing with hook and line and/or trap(or pot) gear may operate from shore to a boundary line approximating 50 fm September to December – 20 fm to 150 fm	5/7/2003
2003	Participants must have a valid 2003-2004 nearshore fishery permit for one management region.	4/1/2003
2003	FGC enacts emergency action to close commercial fishery for the remainder of the calendar year	7/10/2003
2003	Recreational Regulations Emergency sportfishing closure for cabezon statewide for all boat-based angers	12/8/2003
2003	Changes to Commercial RCAs 40 10’ N lat to 34 27’ N lat – closed 20 fm to 150 fm south of 34 27’ N lat July-August – closed 20 fm to 150 fm (special open area in Pt. Fermin/Newport South Jetty area) September to December – closed 30 fm to 150 fm	9/5/2003
2003	Weekday commercial closures repealed	12/3/2003
2003	Changes to Commercial RCAs South of 42 N lat.– November to December – closed shoreline to 150 fm	11/26/2003
2003	Additional cabezon cumulative trip limit regulations affecting the commercial take are defined. Cumulative two-month trip limits for the entire year are listed (CCR Title 14 § 150.16 (e)(6)(A))	12/7/2003
2004	FGC fixes cabezon OY at 118,300 pounds (61%) recreational; 75,600 pounds (39%) commercial; Total OY = 193,300 pounds	12/3/2003
2004	Seasonal closure periods in alignment with federal nearshore rockfish (north and south of 40 10’ N lat) (repealed and new subsection)	1/15/2004
2004	Recreational Regulations Northern Management Area (CA/OR border to 40º10' N lat.): recreational bag limit remains at 10 fish (outside the rockfish bag limit); Open year round; No depth Restriction	1/1/2004

	Central Management Area (40º10' N lat. to Point Conception): recreational bag limit 3 fish within the RCG bag limit; Open Jan-Feb (30 fm or less), May-Aug (20 fm or less), and Sep-Dec (30 fm or less) Southern Management Area (Point Conception to US/Mexico border): recreational bag limit 3 fish within the RCG bag limit; Open Mar-Dec; 60 fm or less	
2004	Recreational Regulations Northern Management Area (CA/OR border to 40º10' N lat.): recreational bag limit 3 fish within the RCG bag limit; Open Jun-Dec; 30 fm or less North-Central Management Area (40º10' N lat. to Point Lopez): recreational bag limit 3 fish within the RCG bag limit; Open Aug-Oct; 30 fm or less South-Central Management Area (40º10' N lat. to Point Lopez): recreational bag limit 3 fish within the RCG bag limit; Open Jun (30 fm or less), Aug (30 fm or less), Sep-Dec (20 fm or less) Southern Management Area (Point Conception to US/Mexico border): recreational bag limit 3 fish within the RCG bag limit; Open Jun-Aug (60 fm or less), Sep-Oct (30 fm or less), Nov-Dec (60 fm or less)	6/4/2004
2004	Commercial Regulations 42 N lat. to 40 10’ N lat - closed 30 fm to 100 fm 40 10’ N lat to 34 27’ N lat. January to April – closed 30 fm to 150 fm May to August – closed 20 fm to 150 fm September to December – closed 30 fm to 150 fm South of 34 27’ N lat. – closed 60 fm to 150 fm	1/8/2004
2004	FGC enacts emergency action to close commercial fishery for the remainder of the calendar year	9/4/2004
2005	FGC fixes cabezon OY at 92,800 pounds (61%) recreational; 59,300 pounds (39%) commercial; Total OY = 152,100 pounds	1/1/2005
2005	Commercial Regulations 42 N lat. to 40 10’ N lat - closed 30 fm to 100 fm 40 10’ N lat to 34 27’ N lat. January to April – closed 30 fm to 150 fm May to August – closed 20 fm to 150 fm September to December – closed 30 fm to 150 fm South of 34 27’ N lat. – closed 60 fm to 150 fm	1/1/2005
2005	Recreational Regulations 42 N lat to 40 10’ N lat - Open Jul1–Oct 31 40 fm restriction, 3 cabezon sub bag limit 40 10’ N lat. to 37 11’ N lat. - Open Jul 1–Nov 30 20 fm restriction, 3 cabezon sub bag limit 37 11’ N lat. to 36 N lat. - Open Jul 1–Nov 30	1/1/2005

	20 fm restriction, 3 cabezon sub bag limit 36 N lat. to 34 27’ N lat. - Open May 1–Sep 30 between 20-40 fm, 3 cabezon sub bag limit South of 34 27’ N lat. - Open Mar 1–Jun 30 between 30-60 fm; Jul 1-Sep 30, 40 fm restriction, 3 cabezon sub bag limit	
2005	Revised cumulative two month commercial trip limits established January – February – 300 lb/ 2 months March – April – closed May – June – 250 lb/2 months July – August – 150 lb/2 months September - October – 900 lb/2 months November - December – 100 lb/2 months	3/31/2005
2005	Recreational Regulations Recreational sub bag limit reduced from 3 fish to one fish	4/1/2005
2005	Recreational Regulations 42 N lat to 40 10’ N lat – extend season to May through Dec, 30 fm depth restriction 40 10 N lat. to 36 N lat. – extend season to July through Dec 36 N lat. to 34 27’ N lat – liberalize the RCA to 40 fm (instead of only open between 20 and 40) South of 34 27’ N lat. – extend season from March through December depth restrictions: March – status quo – open 30-60 fm April – August – 60 fm restriction Sept – Oct – 30 fm restriction Nov-Dec – 60 fm restriction	5/1/2005
2005	FGC enacts emergency action to close commercial fishery for the remainder of the calendar year	10/01/2005
2005	Recreational Regulations Emergency sportfishing closure – the Northern and North-Central Management Area closed Oct-Dec for all anglers	10/18/2005
2006	FGC fixes cabezon OY at 92,800 pounds (61%) recreational; 59,300 pounds (39%) commercial; Total OY = 152,100 pounds	1/1/2006
2006	Recreational Regulations 42 N lat to 40 10’ N lat - Open Jul 1–Oct 31 40 fm restriction, 1 cabezon sub bag limit 40 10’ N lat. to 37 11’ N lat. - Open Jul 1–Nov 30 20 fm restriction, 1 cabezon sub bag limit	1/1/2006

	37 11’ N lat. to 36 N lat. - Open Jul 1–Nov 30 20 fm restriction, 1 cabezon sub bag limit 36 N lat. to 34 27’ N lat. - Open May 1–Sep 30 between 20-40 fm, 1 cabezon sub bag limit South of 34 27’ N lat. - Open Mar 1–Jun 30 between 30-60 fm; Jul 1-Sep 30, 40 fm restriction, 1 cabezon sub bag limit	
2006	Commercial Sep-Oct cumulative trip limit reduced from 900 lb to 200 lb (inseason) to remain within TAC	9/1/2006
2007	FGC fixes cabezon OY at 92,800 pounds (61%) recreational; 59,300 pounds (39%) commercial; Total OY = 152,100 pounds	1/1/2007
2007	Commercial RCAs – 42 N lat. to 40 10’N lat. - closed 30 fm to 100 fm 40 10’N lat. to 34 27’ N lat – closed 30 fm to 150 fm South of 34 27’ N lat. - closed 60 fm to 150 fm	1/1/2007
2007	Recreational Regulations 42 N lat. to 40 -10’ N lat. – open May 1–Dec 31 30 fm restriction, 1 cabezon sub bag limit 40 10’ N lat. to 37 11’ N lat. – open Jun 1–Nov 30 30 fm restriction, 1 cabezon sub bag limit 37 11’ N lat. to 34 27’ N lat. – open May 1–Nov 30 40 fm restriction, 1 cabezon sub bag limit South of 34 27 N lat. – open Mar1–Dec 31 60 fm restriction, 1 cabezon sub bag limit	1/1/2007
2007	Commercial September-October cumulative trip limit reduced from 900 lb to 200 lb (inseason) to remain within TAC	9/1/2007
2007	Recreational Regulations Emergency sportfishing closure north of 37 11’ N lat (North and North-Central management Areas)	10/1/2007
2008	FGC fixes cabezon OY at 92,800 pounds (61%) recreational; 59,300 pounds (39%) commercial; Total OY = 152,100 pounds	1/1/2008
2008	Recreational Regulations Emergency sportfishing regulations – changed the maximum depth restriction north of 37 11’ N lat. to 20 fm (from 30 fm)	5/10/2008
2008	Commercial September-October cumulative trip limit reduced from 900 lb to 300 lb (inseason) to remain within TAC	9/1/2008
	Commercial RCA 42 N lat. to 40 10’ N lat – close 30 fm to 100fm	
2008	Recreational Regulations Emergency sportfishing closure north of Point Arena (38 57.5’ N lat.) and created a new management area (split the North-Central into two areas)	9/2/2008

2009	FGC fixes cabezon OY at 92,800 pounds (61%) recreational; 59,300 pounds (39%) commercial; Total OY = 152,100 pounds	3/1/2009
2009	Change to commercial RCA – 42 N lat. to 40 10' N lat. – close 20 fm -100 fm	3/1/2009
2009	Recreational Regulations 42 N lat. to 40 -10' N lat. – open May 15–Sep 15 20 fm restriction, 2 cabezon sub bag limit 40 10' N lat. to 38 57.5' N lat. – open May 15–Aug 15 20 fm restriction, 2 cabezon sub bag limit 38 57.5' N lat. to 37 11' N lat. – open Jun 13–Oct 31 30 fm restriction, 2 cabezon sub bag limit 37 11' N lat. to 34 27' N lat. – open May 1–Nov 15 40 fm restriction, 2 cabezon sub bag limit South of 34 27 N lat. – open Mar 1–Dec 31 60 fm restriction, 2 cabezon sub bag limit	3/1/2009
	Emergency closures enacted by the Fish and Game Commission for the commercial cabezon statewide fishery 2001 – closed from Sept. 21 to Dec. 31 2002 – closed from July 1 to Dec. 31 2003 – closed from July 10 to Dec. 31 2004 – closed from Sept. 4 to Dec. 31 2005 – closed from Oct. 1 to Dec. 31	

Appendix B. Summary of Oregon Management Measures Affecting Cabezon.

Year	Effective Jan. 1 (regulations set preseason)	Inseason Changes and Effective Dates
2008	Rockfish, cabezon (16" min.), greenling (10" min.): 6 Stonewall Bank YRCA: Closed for P. halibut and most marine species (open for salmon and offshore pelagic species). North of Humbug Mt.: Retention of any groundfish species other than sablefish is prohibited on all-depth P. halibut days when P. halibut is aboard vessel. North of Cape Falcon: Retention of any groundfish species other than sablefish and Pacific cod is prohibited on all-depth P. halibut days when P. halibut is aboard vessel.	7/7 Rockfish et al bag limit reduced from 6 to 5 and closed outside 20-fm line through Dec. 31; flatfish closed outside 40-fm line through Dec. 31 8/21 Cabezon prohib. for boats 9/7 Return to preseason regs., i.e., rockfish et al bag limit 6 and waters closed offshore of 40-fm line through Sept. 30
2007	Rockfish, cabezon (16" min.), greenling (10" min.): 6 Stonewall Bank YRCA: Closed for P. halibut and most marine species (open for salmon and offshore pelagic species). North of Humbug Mt.: Retention of any groundfish species other than sablefish is prohibited on all-depth P. halibut days when P. halibut is aboard vessel. North of Cape Falcon: Retention of any groundfish species other than sablefish and Pacific cod is prohibited on all-depth P. halibut days when P. halibut is aboard vessel.	8/11 Cabezon prohib. for boats
2006	Rockfish, cabezon (16" min.), greenling (10" min.), flounder, sole and other marine species not listed: 6 North of Humbug Mt.: Retention of any groundfish species other than sablefish is prohibited on all-depth P. halibut days when P. halibut is aboard vessel. North of Cape Falcon: Retention of any groundfish species other than sablefish and Pacific cod is prohibited on all-depth P. halibut days when P. halibut is aboard vessel.	9/23 Cabezon prohib. for boats

Year	Effective Jan. 1 (regulations set preseason)	Inseason Changes and Effective Dates
2005	Rockfish, cabezon (16" min.), greenling (10" min.), flounder, sole and other marine species not listed: 8 North of Humbug Mt.: Retention of any groundfish species other than sablefish is prohibited on all-depth P. halibut days when P. halibut is aboard vessel.	7/16 Rockfish *et al* bag limit reduced to 5 8/11 Cabezon prohib. for boats 10/18 P. halibut and groundfish closed <40 fm for boats
2004	Rockfish, cabezon (16" min.), greenling (10" min.): 10 40-fm curve: Seaward closed June 1-Sept. 30.	8/18 Cabezon prohib.
2003	Rockfish, cabezon (15" min.), greenling, flounder, sole and other marine species not listed: 10	11/21 ocean closed to GF outside 27-fm line
2002 through 2000	Rockfish: 10 Other fish: 25	
1999 through 1994	Rockfish: 15 Other fish: 25	
1993 through 1978	Rockfish, cabezon and greenling: 15 Other fish: 25	Effective 4/1/1978
1977	Other fish: 25, no more than 5 lingcod and 2 halibut	
1976	Other fish: 25, no more than 5 lingcod and 2 halibut	No bag limits prior 1976

Appendix C-1. Data file for NCS.

NCS cabezon data file 2009, SS v3.03a, May 2009
1916 #_styr
2008 #_endyr
1 #N_seasons_per_year
12 #vector_with_N_months_in_each_season
1 #spawning_season_-_spawning_will_occur_at_beginning_of_this_season
7 #N_fishing_fleets
7 #N_surveys_data_type_numbers_below_must_be_sequential_with_the_N_fisheries4
1 #Number of areas

fleet1%fleet2%fleet3%fleet4%fleet5%fleet6%fleet7%survey1%survey2%survey3%survey4%survey5%survey6%survey7
0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 #_surveytiming_in_season
1 1 1 1 1 1 1 1 1 1 1 1 1 1 #_area_assignments_for_each_fishery_and_survey
1 1 1 1 1 1 1 # Units for catch by fishing fleet: 1=Biomass(mt),2=Numbers(1000s)
0.01 0.01 0.01 0.01 0.01 0.01 0.01 # SE of log(catch) by fleet for equilibrium and continuous options

2 #number_of_genders(1 2)
35 #accumulator_age _model_always_starts_with_age_0

#Catch (mt)

#Fleet1	Fleet2	Fleet3	Fleet4	Fleet5	Fleet6 Fleet7				
#CommNL		CommL	MM	Shore	PBR	CPFV	age-samplsYear		Season
0	0	0	0	0	0	0	#initial_equilibrium		

93 # Number of lines catch data - FINAL CATCHES w/discards

0.03	0.00	0.33	0.71	0.00	0.00	0	1916	1
0.15	0.00	0.33	0.71	0.00	0.00	0	1917	1
0.08	0.00	0.33	0.71	0.00	0.00	0	1918	1
0.00	0.00	0.33	0.71	0.00	0.00	0	1919	1
0.00	0.00	0.33	0.71	0.00	0.00	0	1920	1
0.00	0.00	0.33	0.71	0.00	0.00	0	1921	1
0.00	0.00	0.33	0.71	0.00	0.00	0	1922	1
0.00	0.00	0.33	0.71	0.00	0.00	0	1923	1
0.00	0.00	0.33	0.71	0.00	0.00	0	1924	1
1.52	0.00	0.33	0.71	0.00	0.00	0	1925	1
0.00	0.00	0.33	0.71	0.00	0.00	0	1926	1
0.34	0.00	0.33	0.71	0.00	0.00	0	1927	1
1.19	0.00	0.33	0.71	0.00	0.00	0	1928	1
0.54	0.00	0.33	0.71	0.49	0.98	0	1929	1
0.47	0.00	0.49	1.06	0.73	1.47	0	1930	1
0.51	0.00	0.66	1.41	0.98	1.96	0	1931	1
2.12	0.00	0.82	1.76	1.22	2.44	0	1932	1
1.90	0.00	0.99	2.11	1.46	2.93	0	1933	1
2.37	0.00	1.15	2.47	1.71	3.42	0	1934	1
4.71	0.00	1.31	2.82	1.95	3.90	0	1935	1
8.33	0.00	1.85	3.96	2.74	5.48	0	1936	1
3.71	0.00	1.60	3.42	2.37	4.74	0	1937	1
2.46	0.00	3.05	6.54	4.53	9.06	0	1938	1
1.82	0.00	1.74	3.72	2.58	5.15	0	1939	1
1.51	0.00	2.53	5.43	3.76	7.53	0	1940	1
6.02	0.00	1.93	5.17	0.00	5.72	0	1941	1
1.04	0.00	1.93	5.17	0.00	5.72	0	1942	1
3.41	0.00	1.93	5.17	0.00	5.72	0	1943	1
1.75	0.00	1.93	5.17	0.00	5.72	0	1944	1
1.95	0.00	1.93	5.17	0.00	5.72	0	1945	1
3.54	0.00	1.93	5.17	0.00	5.72	0	1946	1
2.05	0.00	7.65	20.50	11.36	22.72	0	1947	1
3.71	0.00	10.25	27.46	15.22	30.43	0	1948	1
7.27	0.00	9.38	25.13	13.92	27.85	0	1949	1
9.54	0.00	10.77	28.86	15.99	31.98	0	1950	1
10.80	0.00	12.76	34.18	18.94	37.89	0	1951	1
15.60	0.00	6.65	17.82	9.87	19.75	0	1952	1
6.02	0.00	4.68	12.54	6.95	13.90	0	1953	1
2.82	0.00	3.48	9.33	5.17	10.34	0	1954	1
3.14	0.00	3.10	8.30	9.19	9.19	0	1955	1
5.57	0.00	6.78	18.17	20.14	20.14	0	1956	1
5.63	0.00	6.06	16.25	18.01	18.01	0	1957	1
8.79	0.00	4.18	11.48	12.41	12.41	0	1958	1

4.30	0.00	3.33	14.97	9.88	9.88	0	1959	1
1.39	0.00	1.56	11.48	12.24	4.93	0	1960	1
2.24	0.00	1.53	11.48	9.93	4.00	0	1961	1
1.12	0.00	2.39	18.95	15.55	6.27	0	1962	1
1.27	0.00	5.29	41.89	34.39	13.85	0	1963	1
2.33	0.00	2.98	16.85	19.36	7.80	0	1964	1
3.36	0.00	4.01	22.66	26.04	10.49	0	1965	1
5.66	0.00	4.94	27.96	32.12	12.94	0	1966	1
6.44	0.00	2.58	14.59	16.77	6.76	0	1967	1
9.06	0.00	2.22	12.55	14.43	5.81	0	1968	1
11.68	0.00	2.35	13.28	15.26	6.15	0	1969	1
4.76	0.00	3.75	21.22	24.39	9.83	0	1970	1
2.03	0.00	2.23	12.62	14.50	5.84	0	1971	1
2.62	0.00	4.94	27.92	32.08	12.93	0	1972	1
2.05	0.00	4.78	27.07	31.10	12.53	0	1973	1
6.69	0.00	4.23	23.93	27.50	11.08	0	1974	1
3.30	0.00	2.52	14.24	16.36	6.59	0	1975	1
8.60	0.00	3.75	17.65	24.35	9.81	0	1976	1
5.40	0.00	6.76	17.90	24.68	9.94	0	1977	1
12.57	0.00	10.96	29.00	39.99	16.11	0	1978	1
22.61	0.00	6.22	16.47	22.71	9.15	0	1979	1
23.66	0.00	10.87	36.54	44.59	11.52	0	1980	1
28.95	0.00	7.20	13.58	69.75	10.05	0	1981	1
28.79	0.00	3.45	30.33	28.34	11.62	0	1982	1
10.78	0.00	8.03	36.73	33.06	9.80	0	1983	1
8.63	0.00	10.77	10.88	45.59	4.18	0	1984	1
11.95	0.00	4.72	10.98	24.33	3.05	0	1985	1
7.36	0.00	5.98	36.00	56.88	8.02	0	1986	1
3.82	0.00	4.92	14.95	55.70	7.74	0	1987	1
5.42	0.00	8.78	26.42	41.49	7.59	0	1988	1
11.16	0.00	3.98	26.94	45.82	4.25	0	1989	1
11.45	0.00	3.50	14.94	28.31	5.40	0	1990	1
5.94	0.00	3.66	15.60	29.56	5.64	0	1991	1
16.62	0.00	7.74	33.05	62.63	11.96	0	1992	1
19.19	0.40	2.03	25.64	47.63	5.62	0	1993	1
9.33	26.52	1.20	12.59	29.26	3.07	0	1994	1
11.60	70.60	0.74	20.46	45.33	5.55	0	1995	1
8.10	97.07	1.96	29.64	34.96	5.53	0	1996	1
21.70	101.64	2.04	39.87	9.89	5.46	0	1997	1
14.34	148.99	0.66	46.66	21.23	7.92	0	1998	1
8.77	104.71	0.47	5.16	21.34	7.37	0	1999	1
5.48	91.06	0.32	9.80	15.22	5.65	0	2000	1
3.29	56.69	5.86	3.12	27.79	8.69	0	2001	1
5.08	39.62	0.47	12.12	18.03	3.73	0	2002	1
3.88	36.80	1.49	14.11	66.20	12.06	0	2003	1
3.21	45.44	2.75	9.54	21.37	6.72	0	2004	1
3.83	27.83	1.95	3.53	24.54	9.92	0	2005	1
3.92	25.25	0.25	1.74	14.38	5.33	0	2006	1
3.36	22.98	1.94	1.49	10.67	4.22	0	2007	1
2.03	17.81	0.77	6.27	8.51	4.08	0	2008	1

#Abundance_Indices -CPFV logbook for northern California- excluded 2000 on due to regs
150   #_N_observations

#Year	Season	Type	Value	CV		
1960	1	8	0.011	0.1314	#CPFV	1960-1999
1961	1	8	0.0104	0.1295		
1962	1	8	0.0116	0.1489		
1963	1	8	0.0189	0.145		
1964	1	8	0.0193	0.1391		
1965	1	8	0.0231	0.1264		
1966	1	8	0.0228	0.1357		
1967	1	8	0.0132	0.1293		
1968	1	8	0.0083	0.1385		
1969	1	8	0.007	0.152		
1970	1	8	0.0112	0.1368		
1971	1	8	0.0082	0.1412		
1972	1	8	0.0146	0.1104		
1973	1	8	0.0126	0.1096		
1974	1	8	0.0115	0.1133		
1975	1	8	0.0069	0.1113		

1976	1	8	0.0086	0.1204	
1977	1	8	0.0084	0.1359	
1978	1	8	0.0158	0.1156	
1980	1	8	0.0116	0.1198	
1981	1	8	0.007	0.1357	
1982	1	8	0.0055	0.1374	
1983	1	8	0.0062	0.1383	
1984	1	8	0.0029	0.1493	
1985	1	8	0.0021	0.1685	
1986	1	8	0.0043	0.1965	
1987	1	8	0.0068	0.15	
1988	1	8	0.0081	0.1375	
1989	1	8	0.0068	0.1589	
1990	1	8	0.0051	0.1221	
1991	1	8	0.0039	0.1579	
1992	1	8	0.0055	0.1452	
1993	1	8	0.0036	0.1514	
1994	1	8	0.0023	0.1877	
1995	1	8	0.0021	0.1782	
1996	1	8	0.0037	0.161	
1997	1	8	0.0045	0.1423	
1998	1	8	0.0041	0.1497	
1999	1	8	0.0052	0.1606	
2000	1	9	0.001973241	0.1905504	#CPFV 2000-2008
2001	1	9	0.00419535	0.1804157	
2002	1	9	0.001621111	0.2366469	
2003	1	9	0.007002323	0.1478856	
2004	1	9	0.005998673	0.1550706	
2005	1	9	0.006397351	0.1678667	
2006	1	9	0.00338893	0.1805034	
2007	1	9	0.003429973	0.1940449	
2008	1	9	0.004212459	0.181244	
1960	1	10	0.011189686	0.1403355	#CPFV 1960-2008
1961	1	10	0.010454995	0.1287348	
1962	1	10	0.011803248	0.1573131	
1963	1	10	0.018824835	0.1473084	
1964	1	10	0.01954609	0.1436568	
1965	1	10	0.023159354	0.1232461	
1966	1	10	0.023269051	0.1289916	
1967	1	10	0.013506577	0.1255457	
1968	1	10	0.008479818	0.1362345	
1969	1	10	0.007234217	0.1589584	
1970	1	10	0.011299674	0.1328118	
1971	1	10	0.008333628	0.1283073	
1972	1	10	0.014670537	0.1058603	
1973	1	10	0.012657511	0.1089924	
1974	1	10	0.011692142	0.1058872	
1975	1	10	0.007025193	0.1062976	
1976	1	10	0.008695207	0.1138991	
1977	1	10	0.008576544	0.1340326	
1978	1	10	0.01610517	0.1095806	
1980	1	10	0.011939013	0.1206656	
1981	1	10	0.007125414	0.1318622	
1982	1	10	0.005638644	0.1389786	
1983	1	10	0.006232833	0.1411077	
1984	1	10	0.002871991	0.1435943	
1985	1	10	0.00213849	0.1631991	
1986	1	10	0.004334673	0.1906836	
1987	1	10	0.006791934	0.1382016	
1988	1	10	0.008114207	0.1351386	
1989	1	10	0.006791293	0.1469791	
1990	1	10	0.005022444	0.1199596	
1991	1	10	0.00394981	0.1423868	
1992	1	10	0.005579659	0.1413498	
1993	1	10	0.003614237	0.1467767	
1994	1	10	0.002305334	0.1949135	
1995	1	10	0.00210529	0.1741876	
1996	1	10	0.003781507	0.1580962	
1997	1	10	0.00449938	0.1419203	
1998	1	10	0.004014023	0.1521422	

1999	1	10	0.005113424		0.1441433	
2000	1	10	0.003388209		0.1651355	
2001	1	10	0.00682279		0.1645581	
2002	1	10	0.002677995		0.21337	
2003	1	10	0.011514264		0.1280046	
2004	1	10	0.009188242		0.1323926	
2005	1	10	0.009875835		0.1309226	
2006	1	10	0.005257004		0.1443985	
2007	1	10	0.005668318		0.1535073	
2008	1	10	0.006790803		0.1421037	
1977	1	11	0.6282	0.3117		#TENERA adult
1978	1	11	0.9299	0.6584		
1979	1	11	0.8947	0.1842		
1980	1	11	0.7827	0.4417		
1981	1	11	0.5391	0.5321		
1982	1	11	0.7835	0.5442		
1983	1	11	0.5204	0.5568		
1984	1	11	0.252	0.7899		
1985	1	11	0.5272	0.4939		
1986	1	11	1.6052	0.5201		
1987	1	11	0.7935	0.6916		
1988	1	11	0.9752	0.4046		
1989	1	11	0.9113	0.3631		
1990	1	11	0.8514	0.3892		
1991	1	11	1.1086	0.2669		
1992	1	11	0.6737	0.4345		
1993	1	11	0.36	1.0358		
1994	1	11	0.3001	0.183		
1995	1	11	0.3806	0.5293		
1996	1	11	0.3287	1.0193		
1997	1	11	0.5408	0.3845		
1999	1	11	0	1.8341		
2000	1	11	0.2644	0.3253		
2001	1	11	0.2667	0.44		
2002	1	11	0.2339	0.2249		
2003	1	11	0.3397	0.2538		
2004	1	11	0.5032	0.2911		
2005	1	11	0.324	0.1774		
2006	1	11	0.4918	0.3489		
2007	1	11	0.1668	0.447		
2008	1	11	0.3515	0.2369		
1999	1	12	0.0880	0.256873	#PISCO Adults	
2000	1	12	0.0731	0.2851443		
2001	1	12	0.1029	0.2512754		
2002	1	12	0.0569	0.2174249		
2003	1	12	0.1112	0.1100548		
2004	1	12	0.0591	0.1746166		
2005	1	12	0.0553	0.1824315		
2006	1	12	0.0547	0.1735423		
2007	1	12	0.0550	0.1277854		
2008	1	12	0.0631	0.1163246		
1999	1	13	0.088	0.2569		#PISCO
2000	1	13	0.0731	0.2851		
2001	1	13	0.1029	0.2513		
2002	1	13	0.0568	0.2174		
2003	1	13	0.1112	0.1101		
2004	1	13	0.0591	0.1746		
2005	1	13	0.0553	0.1824		
2006	1	13	0.0547	0.1735		
2007	1	13	0.055	0.1278		
2008	1	13	0.0631	0.1163		
2006	1	14	0.2755	0.4435		#SLO
2007	1	14	0.2769	0.5095		
2008	1	14	1.1772	0.2981		

#_Discard_Biomass
1 #_(1=biomass _2=fraction)
0 #_N_observations

#_Mean_BodyWt
102

# Year	Seas	Type	Partition	Value	CV
1980	1	3	2	0.826	1.447
1981	1	3	2	0.707	0.802
1982	1	3	2	0.732	0.833
1983	1	3	2	0.746	0.815
1984	1	3	2	1.124	0.846
1985	1	3	2	0.558	0.975
1986	1	3	2	0.905	0.830
1987	1	3	2	0.775	0.834
1988	1	3	2	1.267	0.914
1989	1	3	2	0.625	0.709
1993	1	3	2	0.551	0.978
1994	1	3	2	0.936	0.672
1995	1	3	2	0.290	0.415
1996	1	3	2	0.542	0.722
1997	1	3	2	0.736	0.890
1998	1	3	2	0.686	0.618
1999	1	3	2	0.233	1.199
2000	1	3	2	0.540	0.105
2001	1	3	2	1.111	0.573
2002	1	3	2	0.348	0.706
2003	1	3	2	1.105	0.902
2004	1	3	2	1.061	0.981
2005	1	3	2	1.203	0.717
2006	1	3	2	0.657	0.741
2007	1	3	2	1.663	0.990
2008	1	3	2	0.624	0.948
1980	1	4	2	1.156	0.839
1981	1	4	2	0.804	0.522
1982	1	4	2	1.100	0.772
1983	1	4	2	0.976	0.548
1984	1	4	2	1.021	0.637
1985	1	4	2	0.710	0.628
1986	1	4	2	1.039	0.568
1987	1	4	2	0.668	0.769
1988	1	4	2	0.740	0.738
1989	1	4	2	0.976	1.112
1993	1	4	2	1.056	0.683
1994	1	4	2	0.996	0.782
1995	1	4	2	1.057	0.691
1996	1	4	2	0.967	0.466
1997	1	4	2	1.147	0.498
1998	1	4	2	1.143	0.441
1999	1	4	2	0.864	0.469
2000	1	4	2	0.954	0.681
2001	1	4	2	0.960	0.477
2002	1	4	2	1.221	0.584
2003	1	4	2	1.620	0.487
2004	1	4	2	2.041	0.400
2005	1	4	2	1.564	0.623
2006	1	4	2	1.888	0.627
2007	1	4	2	1.400	0.214
2008	1	4	2	1.374	0.249
1980	1	5	2	1.736	0.503
1981	1	5	2	2.353	0.960
1982	1	5	2	1.738	0.448
1983	1	5	2	1.811	0.491
1984	1	5	2	1.533	0.445
1985	1	5	2	1.730	0.426
1986	1	5	2	1.493	0.479
1987	1	5	2	1.512	0.489
1988	1	5	2	1.580	0.515
1989	1	5	2	1.452	0.604
1993	1	5	2	1.358	0.522
1994	1	5	2	1.380	0.649
1995	1	5	2	1.532	0.682
1996	1	5	2	1.473	0.599
1997	1	5	2	1.052	0.439

1998	1	5	2	1.564	0.500
1999	1	5	2	1.435	0.401
2000	1	5	2	1.658	0.335
2001	1	5	2	1.830	0.343
2002	1	5	2	2.013	0.588
2003	1	5	2	1.859	0.395
2004	1	5	2	2.310	0.492
2005	1	5	2	2.359	0.416
2006	1	5	2	2.121	0.438
2007	1	5	2	2.237	0.422
2008	1	5	2	2.098	0.483
1947	1	6	2	2.268	0.500
1948	1	6	2	2.268	0.500
1949	1	6	2	2.268	0.500
1950	1	6	2	2.268	0.500
1951	1	6	2	2.268	0.500
1980	1	6	2	1.813	0.353
1981	1	6	2	1.850	0.326
1983	1	6	2	2.700	0.498
1985	1	6	2	1.700	0.446
1986	1	6	2	2.048	0.928
1988	1	6	2	1.850	0.691
1989	1	6	2	1.125	0.319
1994	1	6	2	1.533	0.425
1995	1	6	2	2.793	0.266
1996	1	6	2	1.771	0.719
1999	1	6	2	2.110	0.095
2000	1	6	2	2.118	0.467
2001	1	6	2	1.206	0.320
2003	1	6	2	2.378	0.536
2004	1	6	2	2.225	0.201
2005	1	6	2	2.661	0.300
2006	1	6	2	2.588	0.453
2007	1	6	2	2.293	0.383
2008	1	6	2	2.331	0.439

Population size structure
1 # Length bin method: 1=Use data bins
Lower edge of bins

#6	8	10	12	14	16	18	20	22	24	26	28
	30	32	34	36	38	40	42	44	46	48	50
	52	54	56	58	60	62	64	66	68	70	72
	74	76	78	80	82	84	86	88	90	92	

0.0001 # Minimum proportion for compressing tails of observed compositional data
0.0001 # Constant added to expected frequencies
0 # Combine males and females at and below this bin number
44 #_N_length_bins
#_lower_edge_of_length_bins

6	8	10	12	14	16	18	20	22	24	26	28
	30	32	34	36	38	40	42	44	46	48	50
	52	54	56	58	60	62	64	66	68	70	72
	74	76	78	80	82	84	86	88	90	92	
134	#N_observations	(counts	-	samples	are	trips)					
#Year	Seas	Fleet	sexes	Mkt	Nsamp	begin	data:	females	then	males	

#Fleet 1 Not live fish fishery

1995	1	1	0	0	71	0	0	0	0	0	0
	0	0	0	0	255	211	378	410	330	438	294
	301	165	505	64	41	109	73	35	2	22	3
	0	0	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1996	1	1	0	0	231	0	0	0	0	0	0
	0	2	2	28	86	243	509	597	506	442	309
	204	170	150	156	134	77	50	32	21	19	0
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1997	1	1	0	0	102	0	0	0	0	0	0
	0	0	0	4	23	85	450	706	594	706	527
	490	608	150	359	182	184	103	89	147	141	141
	0	77	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	1	0	0	26	0	0	0	0	0	0
	0	0	0	0	28	28	257	406	753	601	548
	875	214	66	100	182	0	26	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1999	1	1	0	0	8	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	134	542	456
	412	414	230	75	0	80	0	55	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2000	1	1	0	0	8	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	338	518
	253	253	308	196	237	55	140	140	0	55	0
	0	0	70	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

#Fleet 2 Live fish fishery

1997	1	2	0	0	16	0	0	0	0	0	0
	0	0	0	0	0	0	0	96	1440	1632	2496
	1632	2112	864	960	576	576	288	192	96	192	0
	96	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	2	0	0	111	0	0	0	0	0	0
	0	0	0	0	476	2443	7430	10842	20456	23249	18562
	12723	11932	4637	3847	2460	1442	666	954	815	312	133
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1999	1	2	0	0	174	0	0	0	0	0	0
	0	0	0	48	0	65	26	281	2590	16100	15080
	10976	8326	5929	3277	2809	1864	1327	1173	458	535	207
	68	6	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2000	1	2	0	0	323	0	0	0	0	0	0
	0	0	0	0	16	42	87	128	5872	13902	12400
	10458	6570	5997	4051	2499	1541	1602	648	363	255	114

	121	21	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	2	0	0	156	0	0	0	0	0	0
	0	0	0	0	0	0	0	12	878	3910	9455
	8455	6143	4749	2930	1664	845	833	285	246	160	48
	0	12	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	2	0	0	33	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1934	4961
	3071	2582	2326	2533	1369	1406	1075	580	451	360	202
	0	64	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	2	0	0	9	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	408
	662	234	152	226	10	614	610	1830	0	610	610
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	2	0	0	36	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	192	1375
	2183	916	208	101	6	274	245	306	378	123	70
	115	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	2	0	0	28	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	59	1472
	885	1003	678	479	0	114	331	138	114	67	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	2	0	0	31	0	0	0	0	0	0
	0	0	0	0	0	64	215	64	128	386	2401
	2380	1236	1605	1279	606	388	572	194	486	325	0
	0	0	0	32	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	2	0	0	50	0	0	0	0	0	0
	0	0	0	0	0	0	0	6	0	97	663
	756	393	239	285	130	120	173	108	210	101	67
	45	0	31	10	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

2008	1	2	0	0	29	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	44	0	628
	657	878	594	287	91	135	68	92	69	23	23
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

#Fleet 3 Manmade mode

1980	1	3	0	0	33	0	0	0	0	0	1
	1	3	2	4	8	4	3	3	4	1	2
	1	2	1	1	1	1	1	0	1	1	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1981	1	3	0	0	27	0	0	0	0	0	0
	0	2	0	3	9	4	8	4	4	2	1
	1	0	2	1	2	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1982	1	3	0	0	20	0	0	0	0	0	2
	1	1	0	1	0	4	2	3	1	1	2
	1	0	1	0	0	0	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1983	1	3	0	0	24	0	0	0	0	0	1
	0	2	0	6	4	2	2	3	4	3	0
	2	2	1	1	0	0	1	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1984	1	3	0	0	25	0	0	0	0	0	2
	0	0	2	1	0	2	2	5	1	3	0
	1	1	0	2	2	1	1	1	0	1	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1985	1	3	0	0	26	0	0	1	0	0	1
	2	2	4	7	2	2	7	2	2	0	1
	0	2	1	0	2	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1986	1	3	0	0	28	0	0	0	0	1	0
	0	1	0	3	3	4	5	3	1	2	1
	2	0	1	1	2	1	1	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1987	1	3	0	0	27	0	0	0	0	1	2
	3	1	1	1	3	1	5	3	0	3	5
	1	0	2	0	2	1	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1988	1	3	0	0	24	0	1	0	2	0	2
	1	1	1	0	3	5	3	4	1	2	0
	1	1	3	2	2	1	4	0	1	0	0
	3	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1989	1	3	0	0	8	0	0	0	0	0	0
	0	0	1	1	0	2	0	1	0	1	0
	1	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1993	1	3	0	0	20	0	0	0	1	0	2
	0	5	2	2	4	2	2	4	0	2	1
	0	0	1	0	0	1	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1994	1	3	0	0	5	0	0	0	0	0	0
	0	0	1	0	0	1	0	0	1	0	1
	1	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1996	1	3	0	0	13	0	0	1	1	1	1
	0	2	0	1	1	0	2	2	1	0	3
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1997	1	3	0	0	4	0	0	0	0	0	0
	0	2	0	1	1	0	0	0	0	0	1
	0	1	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	3	0	0	3	0	0	0	0	0	0
	0	0	1	1	0	0	0	0	1	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1999	1	3	0	0	4	0	0	1	0	0	0
	0	3	1	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2000	1	3	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	3	0	0	7	0	0	0	0	0	1
	2	2	1	2	2	1	4	1	0	0	0
	1	1	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	3	0	0	5	0	0	0	1	0	0
	1	0	1	0	1	1	0	0	1	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	3	0	0	4	0	0	0	0	0	0
	0	0	0	0	0	1	1	0	0	1	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	3	0	0	12	0	0	0	0	0	0
	0	2	1	3	0	2	2	1	1	0	1
	0	1	0	0	0	0	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	3	0	0	18	0	0	0	0	0	0
	1	0	2	1	1	2	3	1	0	1	2
	5	1	0	0	1	3	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	3	0	0	6	0	0	0	0	0	0
	0	0	0	1	2	2	0	0	1	0	0

	0	0	1	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	3	0	0	11	0	0	0	0	0	0
	1	1	1	1	2	0	1	0	0	0	0
	0	0	1	2	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	3	0	0	16	0	0	0	0	0	0
	0	1	1	2	3	3	3	1	0	0	1
	0	0	2	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
#Fleet 4 Beach/bank mode											
1980	1	4	0	0	29	0	0	0	0	1	1
	0	0	0	0	3	3	2	5	2	5	1
	3	5	3	3	1	2	0	1	2	0	0
	0	0	0	0	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1981	1	4	0	0	28	0	0	0	0	0	0
	0	0	2	2	0	7	5	7	5	9	4
	2	2	3	1	0	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1982	1	4	0	0	45	0	0	0	0	1	0
	0	1	3	3	5	3	4	5	5	4	5
	3	6	5	4	3	1	2	0	0	0	2
	1	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1983	1	4	0	0	53	0	0	0	0	0	0
	0	2	2	2	6	5	3	11	8	20	10
	16	6	6	3	3	2	0	2	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1984	1	4	0	0	22	0	0	0	0	0	0
	1	0	1	2	1	1	3	1	1	4	2
	2	2	1	1	2	0	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1985	1	4	0	0	26	0	0	2	0	2	0
	0	3	1	3	1	2	3	5	8	5	1
	2	4	1	0	0	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1986	1	4	0	0	30	0	0	0	0	0	0
	0	0	3	2	3	0	5	8	4	5	3
	7	6	7	2	2	1	0	0	3	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1987	1	4	0	0	17	0	0	1	1	1	0
	2	2	1	0	1	0	1	2	1	4	3
	0	0	0	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1988	1	4	0	0	5	0	0	0	0	0	0
	1	0	0	0	0	1	0	1	0	0	0
	0	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1989	1	4	0	0	8	0	0	0	0	0	2
	0	5	1	0	0	0	0	2	0	0	0
	1	1	1	0	0	0	1	1	0	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1993	1	4	0	0	40	0	0	0	0	1	0
	1	0	2	0	2	1	2	8	9	10	6
	9	3	4	2	2	1	0	1	2	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1994	1	4	0	0	15	0	0	0	0	0	1
	1	0	0	1	0	1	1	1	2	6	1
	0	3	1	0	2	1	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1996	1	4	0	0	36	0	0	0	0	0	0
	0	0	0	1	1	3	6	5	15	10	9
	6	4	3	2	0	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1997	1	4	0	0	26	0	0	0	0	0	0
	0	0	2	1	1	2	2	7	6	7	9
	7	6	5	2	2	1	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	4	0	0	29	0	0	0	0	0	0
	0	0	0	1	1	0	5	4	8	8	11
	6	9	5	1	0	3	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1999	1	4	0	0	19	0	0	0	0	0	0
	0	0	0	2	0	3	6	10	5	4	3
	4	1	0	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2000	1	4	0	0	13	0	0	0	0	0	0
	1	0	0	0	1	2	0	1	6	1	2
	3	0	0	1	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	4	0	0	8	0	0	0	0	0	0
	0	0	0	2	0	0	0	1	0	2	0
	1	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	4	0	0	9	0	0	0	0	0	0
	0	1	0	1	0	0	0	1	2	0	3
	3	1	1	1	1	1	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	4	0	0	4	0	0	0	0	0	0
	0	0	0	0	0	0	1	2	0	1	0
	2	0	3	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	4	0	0	13	0	0	0	0	0	0
	0	0	0	0	0	0	2	0	1	0	3
	4	1	2	2	0	2	4	0	1	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	4	0	0	10	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	1	2	2
	2	2	0	2	0	0	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	4	0	0	4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	2	1	0	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	4	0	0	4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	1	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	4	0	0	8	0	0	0	0	0	0
	0	0	0	1	0	0	2	0	0	2	1
	2	0	1	0	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
#Fleet 5 PBR											
1980	1	5	0	0	46	0	0	0	0	0	0
	0	0	0	0	1	4	0	2	2	3	4
	3	7	12	6	6	6	1	3	2	5	2
	2	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1981	1	5	0	0	27	0	0	0	0	0	1
	0	0	0	0	0	1	2	0	1	3	5
	3	3	2	4	4	6	6	3	2	3	2
	2	0	1	1	0	0	0	0	0	0	0
	0	0	0	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1982	1	5	0	0	26	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	2	1	1
	3	4	5	3	5	2	0	1	3	3	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

1983	1	5	0	0	29	0	0	0	0	0	0
	0	0	0	1	0	0	1	1	1	4	4
	3	2	6	1	3	1	6	4	2	2	3
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1984	1	5	0	0	43	0	0	0	0	0	0
	0	0	1	0	0	0	1	1	2	12	11
	8	6	4	7	11	5	5	6	2	3	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1985	1	5	0	0	26	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	2	1
	7	1	6	4	4	2	3	2	4	2	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1986	1	5	0	0	51	0	0	0	0	0	0
	0	0	0	0	0	0	1	4	7	7	5
	6	10	6	4	5	7	4	4	1	2	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1987	1	5	0	0	37	0	0	0	0	0	0
	0	0	1	0	0	0	1	0	3	4	5
	8	4	8	8	2	2	3	3	2	2	1
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1988	1	5	0	0	25	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	4	3
	7	5	4	2	5	1	2	3	2	0	0
	0	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1989	1	5	0	0	29	0	0	0	1	0	0
	0	0	0	0	1	3	3	3	3	4	4
	6	5	7	3	4	2	4	1	5	1	0
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	0	0	0	0	0						
1993	1	5	0	0	85	0	0	0	0	0	0
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1994	1	5	0	0	40	0	0	0	0	0	0
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1996	1	5	0	0	56	0	0	0	0	0	0
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1997	1	5	0	0	16	0	0	0	0	0	0
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	2	3	1	2	0	0	0	0	0	0	0
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1998	1	5	0	0	37	0	0	0	0	0	0
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1999	1	5	0	0	46	0	0	0	0	0	0
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	0	0	0	0	0						
2000	1	5	0	0	33	0	0	0	0	0	0
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	3	8	7	5	7	3	0	1	3	0	0
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	0	0	0	0	0						
2001	1	5	0	0	22	0	0	0	0	0	0
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	3	3	5	10	2	7	3	1	0	1	0
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	0	0	0	0	0						
2002	1	5	0	0	16	0	0	0	0	0	0
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	3	6	3	2	1	3	0	1	0	1	1
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	5	0	0	62	1	0	0	1	0	0
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	9	8	14	12	13	8	7	6	1	2	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	5	0	0	237	1	0	0	0	0	0
	0	0	0	0	0	0	1	3	5	7	23
	48	46	55	60	63	54	31	28	25	12	9
	1	2	2	2	1	0	1	0	1	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	5	0	0	439	0	0	0	0	0	0
	0	0	0	0	1	1	3	7	2	16	34
	53	85	91	99	102	106	90	61	41	32	19
	11	4	7	1	0	0	0	0	1	1	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	5	0	0	412	0	0	0	0	0	0
	1	0	0	0	1	0	2	4	10	13	36
	64	69	72	72	71	62	67	49	51	26	8
	8	2	2	1	0	0	0	0	1	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	5	0	0	303	0	0	0	0	0	1
	0	0	0	0	0	2	2	2	7	19	25
	50	47	47	59	67	48	50	34	27	18	11
	8	2	3	2	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	5	0	0	256	0	0	0	0	1	0
	0	0	0	0	0	1	2	5	4	19	38
	47	52	63	59	48	40	28	36	14	12	8
	7	4	2	1	0	1	0	1	1	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
#Fleet 6 CPFV											
1980	1	6	0	0	5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	2	0	2	0	0	1	1	1	0	0
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	0	0	0	0	0						
1981	1	6	0	0	2	0	0	0	0	0	0
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	0	0	0	0	0						
1982	1	6	0	0	1	0	0	0	0	0	0
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	0	0	0	0	0						
1983	1	6	0	0	3	0	0	0	0	0	0
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	0	0	0	0	0						
1985	1	6	0	0	8	0	0	0	0	0	0
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	0	0	0	0	0						
1986	1	6	0	0	9	0	0	0	0	0	0
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	2	1	3	2	2	1	3	2	1	1	0
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	0	0	0	0	0						
1987	1	6	0	0	1	0	0	0	0	0	0
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	0	0	0	0	0						
1988	1	6	0	0	6	0	0	0	0	0	0
	1	0	0	0	0	0	1	1	0	0	0
	1	0	1	0	3	3	0	0	0	2	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1989	1	6	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	2	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

1994	1	6	0	0	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	2
	1	0	0	1	0	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1996	1	6	0	0	16	0	0	0	0	0	0
	0	0	0	0	0	1	2	1	3	1	5
	1	4	3	4	2	2	1	1	3	0	1
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	0	0	0	0	0						
1997	1	6	0	0	28	0	0	0	0	0	0
	0	0	0	1	0	0	0	1	5	16	6
	8	5	1	9	1	0	2	0	1	0	1
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	0	0	0	0	0						
1998	1	6	0	0	29	0	0	0	0	0	0
	0	0	0	0	1	0	1	1	4	9	7
	8	2	6	5	2	1	1	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1999	1	6	0	0	9	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	1	0	2	2	1	0	0	0	1	1
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2000	1	6	0	0	11	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	1
	3	1	0	2	2	3	1	1	1	0	0
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	0	0	0	0	0						
2001	1	6	0	0	24	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	1	9
	8	11	4	12	11	7	3	5	2	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	6	0	0	5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	4	2	1	2	1	0	0	0	0	1	0
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	0	0	0	0	0						
2003	1	6	0	0	34	0	0	0	0	0	0
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	10	12	14	16	5	13	5	3	2	2	1
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	6	0	0	23	0	0	0	0	0	0
	0	0	0	0	1	1	0	1	1	0	2
	5	4	4	6	5	3	2	0	0	1	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	6	0	0	37	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	3
	4	6	9	6	7	11	5	1	3	3	0
	1	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	6	0	0	34	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	3
	5	7	7	8	9	6	6	4	0	3	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	6	0	0	40	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	2
	6	3	7	3	9	7	4	7	5	3	3
	0	1	0	0	0	0	1	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	6	0	0	38	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	3
	7	9	6	3	5	3	7	2	0	1	2
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1987	1	6	0	0	4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	3	2	3	2	5	3	3	2	2	5	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1988	1	6	0	0	21	0	0	0	0	0	0
	0	0	0	0	1	2	2	0	1	3	4
	6	6	8	16	4	5	10	2	2	4	0
	1	2	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1989	1	6	0	0	21	0	0	0	0	0	0
	0	0	0	0	0	1	1	2	3	8	2
	8	8	3	8	7	8	4	4	4	1	1
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1990	1	6	0	0	6	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	3	1	1	1	1	1	0	0	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1991	1	6	0	0	13	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	2
	3	2	1	2	1	0	1	1	3	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1992	1	6	0	0	16	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	3	6	1
	5	4	2	2	2	2	0	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1993	1	6	0	0	12	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	3	2	4
	6	3	3	1	3	2	2	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1994	1	6	0	0	16	0	0	0	0	0	0
	0	0	0	0	0	0	2	0	6	7	2
	4	5	4	4	1	0	2	2	0	0	1
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1995	1	6	0	0	18	0	0	0	0	0	0
	0	0	0	0	0	1	1	1	1	6	3
	7	3	6	1	2	3	0	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1996	1	6	0	0	31	0	0	0	0	0	0
	0	0	1	0	0	1	6	14	10	11	13
	10	8	7	7	7	6	3	0	1	0	1

	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1997	1	6	0	0	30	0	0	0	0	0	0
	0	0	0	1	0	0	0	1	5	16	6
	9	6	1	9	1	0	2	0	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	6	0	0	23	0	0	0	0	0	0
	0	0	0	0	1	0	1	1	3	7	6
	8	2	5	4	2	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	6	0	0	11	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	3	2	1
	2	0	1	2	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	6	0	0	18	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	3	0
	3	1	3	0	5	2	2	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	6	0	0	5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	1	2	0	0	0	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	6	0	0	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	0	0	3	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	6	0	0	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	2	0	1	1	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

2008	1	6	0	0	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	1	1	0	0	0	0	2	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
20	#_N_age_bins										
1	2	3	4	5	6	7	8	9	10	11	12
	13	14	15	16	17	18	19	20			
2	#_N_ageerror_definitions										
#Female											
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1									
0.479363	0.479363	0.547477	0.604513	0.652275	0.69227	0.725762	0.753807	0.777291	0.796957	0.813425	0.827214
	0.838762	0.848431	0.856529	0.863309	0.868987	0.873741	0.877723	0.881057	0.883849	0.886186	0.888144
	0.889783	0.891156	0.892306	0.893268	0.894074	0.894749	0.895314	0.895788	0.896184	0.896516	0.896794
	0.897027	0.897221									
#Male											
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1									
0.571868	0.571868	0.297421	0.206562	0.161637	0.135119	0.117833	0.105851	0.0972099	0.0908204	0.0860316	0.0824308
	0.0797446	0.0777855	0.0764214	0.0755572	0.0751234	0.0750688	0.0753554	0.0759549	0.0768471	0.0780175	0.0794561
	0.0811573	0.0831183	0.0853394	0.0878231	0.0905741	0.0935993	0.0969071	0.100508	0.104414	0.108639	0.113197
	0.118107	0.123388									
147	#_N_Agecomp_obs										
2	#_Lbin_method:		1=poplenbins		2=datalenbins		3=lengths				
0	#_combine	males	into	females	at	or	below	this	bin	number	
#Conditional_Age-at_Length			1	2	3	4	5	6	7	8	9
	10	11	12	13	14	15	16	17	18	19	20
	1	2	3	4	5	6	7	8	9	10	11
	12	13	14	15	16	17	18	19	20		
#Joanna's data											
#Yr	Seas	Flt/Survey	Gender	Part	Ageerr	Lbin_lo	Lbin_hi	Nsamp	1	2	3
	4	5	6	7	8	9	10	11	12	13	14
	15	16	17	18	19	20	1	2	3	4	5
	6	7	8	9	10	11	12	13	14	15	16
	17	18	19	20							
#Females											
1996	1	7	1	0	1	12	12	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	13	13	5	0	0	2
	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	14	14	8	0	1	5
	0	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	15	15	7	0	0	3
	0	2	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	16	16	3	0	0	0
	1	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

1996	1	7	1	0	1	17	17	4	0	0	1
	1	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	18	18	1	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	19	19	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	21	21	1	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	22	22	1	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	23	23	2	0	0	0
	0	0	1	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	12	12	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	13	13	7	0	0	5
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	14	14	4	0	0	2
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	15	15	12	0	0	1
	3	3	4	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	16	16	6	0	0	0
	2	3	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	17	17	7	0	0	0
	3	3	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	18	18	5	0	0	0
	1	2	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	19	19	4	0	0	0
	1	2	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

1997	1	7	1	0	1	20	20	2	0	0	0
	0	0	1	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	21	21	1	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	1	0	1	12	12	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	1	0	1	13	13	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	1	0	1	14	14	5	0	0	1
	1	2	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	1	0	1	15	15	7	0	0	1
	3	2	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	1	0	1	16	16	5	0	0	0
	2	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	1	0	1	17	17	4	0	0	0
	0	4	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	1	0	1	18	18	1	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	1	0	1	19	19	3	0	0	0
	1	0	0	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1999	1	7	1	0	1	17	17	1	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1999	1	7	1	0	1	18	18	4	0	0	0
	0	0	3	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	3	3	2	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	4	4	5	5	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

2000	1	7	1	0	1	5	5	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	6	6	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	11	11	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	13	13	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	15	15	6	0	0	1
	2	2	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	16	16	5	0	0	0
	2	2	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	17	17	8	0	0	0
	2	1	3	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	18	18	11	0	0	2
	1	2	4	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	19	19	11	0	0	1
	2	3	2	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	20	20	7	0	0	0
	0	3	1	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	21	21	11	0	0	0
	1	3	5	1	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	22	22	7	0	0	0
	0	1	1	3	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	23	23	9	0	0	0
	0	1	0	3	1	3	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	24	24	11	0	0	0
	0	0	3	4	3	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

2000	1	7	1	0	1	25	25	8	0	0	0
	0	1	0	1	1	4	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	26	26	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	27	27	3	0	0	0
	0	0	0	0	1	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	29	29	2	0	0	0
	0	0	0	0	0	0	1	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	31	31	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	32	32	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	4	4	3	3	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	5	5	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	6	6	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	7	7	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	9	9	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	17	17	1	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	18	18	2	0	0	0
	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

2001	1	7	1	0	1	19	19	2	0	0	0
	0	0	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	20	20	1	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	21	21	2	0	0	0
	0	0	0	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	22	22	2	0	0	0
	0	0	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	23	23	3	0	0	0
	0	0	0	1	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	25	25	2	0	0	0
	0	0	1	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	30	30	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	6	6	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	18	18	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	19	19	1	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	20	20	2	0	0	0
	0	1	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	21	21	3	0	0	0
	0	2	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	22	22	1	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	23	23	4	0	0	0
	0	1	0	0	2	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

2002	1	7	1	0	1	24	24	4	0	0	0
	0	0	2	0	0	0	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	25	25	3	0	0	0
	0	0	0	0	1	0	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	26	26	3	0	0	0
	0	0	0	0	0	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	27	27	3	0	0	0
	0	0	0	0	0	1	0	0	0	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	28	28	3	0	0	0
	0	0	0	0	0	1	1	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	19	19	1	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
#Males											
1996	1	7	2	0	2	12	12	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	2	0	2	13	13	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	1	1	0
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	2	0	2	14	14	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	1	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	2	0	2	15	15	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	2	0	2	19	19	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	2	0	2	21	21	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	2	0	2	12	12	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	2	0	2	13	13	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	1	1

	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	2	0	2	14	14	18	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	7	6	3
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	2	0	2	15	15	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	9	2
	2	1	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	2	0	2	16	16	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	2	0
	1	2	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	2	0	2	17	17	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	1
	3	0	0	0	1	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	2	0	2	18	18	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	1
	1	2	1	3	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	2	0	2	19	19	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	1	0	0	0	0	0
	0	0	0	0							
1998	1	7	2	0	2	12	12	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	2	0	2	13	13	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	3	2	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	2	0	2	14	14	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	3	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	2	0	2	15	15	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	1	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	2	0	2	16	16	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	5
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	2	0	2	17	17	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	2
	2	0	2	0	0	0	0	0	0	0	0
	0	0	0	0							
1999	1	7	2	0	2	15	15	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1999	1	7	2	0	2	16	16	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1

	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1999	1	7	2	0	2	17	17	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1999	1	7	2	0	2	18	18	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	1	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	4	4	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	5	5	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	9	9	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	10	10	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	12	12	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	13	13	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	14	14	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	15	15	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	16	16	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	2	1
	4	1	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	17	17	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	1
	4	6	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	18	18	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	5	2
	1	1	1	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	19	19	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	1

	2	3	0	1	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	20	20	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	3	3	1	1	1	0	1	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	21	21	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	2	1	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	22	22	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	1	1	0	2	0	0	0	1	0	0
	0	0	0	0							
2000	1	7	2	0	2	23	23	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	24	24	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0							
2001	1	7	2	0	2	3	3	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	2	0	2	6	6	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	2	0	2	16	16	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	2	0	2	17	17	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	2	0	2	18	18	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	2	0	2	19	19	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	2	0	2	20	20	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	1	2	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	2	0	2	21	21	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	2	0	2	23	23	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	2	0	2	16	16	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	2	0	2	17	17	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	2	0	2	18	18	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	2	0	2	19	19	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	1	0	0	0	0	0
	0	0	0	0							
2002	1	7	2	0	2	21	21	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0							
#Unsexed											
1991	1	7	0	0	1	2	2	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1993	1	7	0	0	1	3	3	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	0	0	1	3	3	5	5	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	0	0	1	4	4	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	0	0	1	1	1	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	0	0	1	2	2	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	0	0	1	3	3	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	0	0	1	6	6	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	0	0	1	21	21	2	0	0	0
	0	0	0	0	1	0	1	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	0	0	1	24	24	2	0	0	0
	0	0	0	0	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	0	0	1	25	25	1	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

0	#_N_MeanSize-at-Age_obs							
#Yr	Seas	Flt	Svy	Gender	Part	Ageerr	Ignore	datavector(female-male)
#	samplesize(female-male)							
0	#_N_environ_variables							
0	#_N_environ_obs							
0	#	N	sizefreq	methods	to	read		
#Sizefreq	N	bins	per	method				
#Sizetfreq	units(bio	num)	per	method				
#Sizefreq	scale(kg	lbs	cm	inches)	per	method		
#Sizefreq	mincomp	per	method					
#Sizefreq	N	obs	per	method				
#_Sizefreq	bins							
#_Year	season	Fleet	Partition	Gender	SampleSize		<data>	
0	#	no	tag	data				
0	#	no	morphcomp		data			

999
ENDDATA

Appendix C-2. Control file for NCS.

```
# NCS cabezon control file, SS v3.03a, May 2009
# Morph setup
1               # Number of growth patterns
1               # N sub morphs within growth patterns
2               #_Nblock_Patterns
1 2             #_Blocks_per_pattern
1999 2008                 #Accounts for change in commerical regs (size limits)
2000 2004 2005 2008    #Accounts for change in recreational regs (size & bag limits)

# Mortality and growth specifications
0.5             # Fraction female at birth
0               # M setup: 0=single Par,1=N_breakpoints,2=Lorenzen,3=agespecific;_4=agespec_withseasinterpolate
#2              # Number of M breakpoints
#0 0            # Ages at M breakpoints
1               # Growth model: 1=VB with L1 and L2, 2=VB with A0 and Linf, 3=Richards, 4=Read vector of L@A
0               # Age for growth Lmin
999             # Age for growth Lmax or 999 = Linf
0               # SD constant added to LAA (0.1 mimics SS2 v1.x for compatibility only)
0               # Variability about growth: 0=CV~f(LAA) [mimic v1.xx], 1=CV~f(A), 2=SD~f(LAA), 3=SD~f(A)
1               # Maturity option: 1=length logistic, 2=age logistic, 3=read age-maturity matrix by growth_pattern
1               # First age allowed to mature
1   #_fecundity option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b
0   #_hermaphroditism option:  0=none; 1=age-specific fxn
1   #_parameter_offset_approach (1=none, 2= M, G, CV_G as offset from female-GP1, 3=like SS2 V1.x)
1   #_env/block/dev_adjust_method (1=standard; 2=with logistic trans to keep within base parm bounds)

#_LO    HI      INIT            PRIOR    PR_type SD          PHASE env-var use_dev dev_minyr dev_maxyr
dev_stddev Block Block_Fxn
0.02    0.5     0.25    0.25    0       0.08    -4      0       0       0       0       0.5
0       0       #       NatM_p_2_Fem_GP:1 old
1       40      13.97   14      0       1       3       0       0       0       0       0.5
0       0       #       L_at_Amin_Fem_GP_1
20      90      59.0    58      0       100     2       0       0       0       0       0.5
0       0       #       L_at_Amax_Fem_GP_1
0.05    0.3     0.17    0.185   0       0.8     3       0       0       0       0       0.5
0       0       #       VonBert_K_Fem_GP_1
0.01    0.5     0.14    0.139   0       0.8     3       0       0       0       0       0.5
0       0       #       CV_young_Fem_GP_1
0.01    0.5     0.1     0.1     0       0.8     3       0       0       0       0       0.5
0       0       #       CV_old_Fem_GP_1

0.02    0.5     0.3     0.3     0       0.08    -4      0       0       0       0       0.5
0       0       #       NatM_p_1_Mal_GP:1 old
1       40      12.57   13  0   1       3       0       0       0       0       0.5     0
0       #       L_at_Amin_Mal_GP_1
20      90      41.8    41.8  0 100     2       0       0       0       0       0.5     0
0       #       L_at_Amax_Mal_GP_1
0.05    0.6     0.45    0.45    0       0.8     3       0       0       0       0       0.5
0       0       #       VonBert_K_Mal_GP_1
0.01    0.5     0.17    0.17    0       0.8     3       0       0       0       0       0.5
0       0       #       CV_young_Mal_GP_1
0.01    0.5     0.14    0.1     0       0.8     3       0       0       0       0       0.5
0       0       #       CV_old_Mal_GP_1

# Add 2+2*gender lines to read the wt-Len and mat-Len parameters
-3      3       0.000009204     0.000009204     0       0.8     -3      0       0       0
        0       0.5     0       0       #Female wt-len-1
-3      4       3.187   3.187  0        3       -3      0       0       0       0       0.5
        0       0       #Female wt-len-2
-3      40      34.6    35   0          10      -3      0       0       0       0       0.5
        0       0       #Female mat-len-1
-3      3       -0.7    -0.7   0        0.8     -3      0       0       0       0       0.5
        0       0       #Female mat-len-2
-3      3       1       1    0          0.8     -3      0       0       0       0       0.5
        0       0       #Female eggs/gm intercept
-3      3       0       0    0          0.8     -3      0       0       0       0       0.5
        0       0       #Female eggs/gm slope
```

```
-3	3	0.00001163	0.00001163	0	0.8	-3	0	0	0	0
	0.5	0	0	#Male wt-len-1
-3	4	3.118	3.190852	0	3	-3	0	0	0	0
	0.5	0	0	#Male wt-len-2

-4 4 0 0 -1 99 -3 0 0 0 0 0.5 0 0 #_recrdistribution_by_growth_pattern
-4 4 0 0 -1 99 -3 0 0 0 0 0.5 0 0 #_recrdistribution_by_area 1
-4 4 0 0 -1 99 -3 0 0 0 0 0.5 0 0 #_recrdistribution_by_season 1
 0 2 1 1 -1 99 -3 0 0 0 0 0.5 0 0 #_cohort_growth_deviation
# Seasonal effects on biology parameters (0=none)
 0 0 0 0 0 0 0 0 0 0

#_Spawner-Recruitment
3 #_SR_function
#_LO   HI    INIT PRIOR PR_type SD PHASE
  3    30    6.6    12  -1    10    2   # SR_R0
0.2     1    0.7  0.71   0   0.8   -3  # SR_steep
  0     1    0.5   1.1   0     1   -1    # SR_sigmaR
  0     5     0     0   0      1   -3    # SR_envlink
  0     5     0     0   0      1   -3    # SR_R1_offset
  0     2     0    1    0     50  -50   # Autocorrelation placeholder (Future implementation)
0 #_SR_env_link
0 #_SR_env_target_1=devs;_2=R0;_3=steepness
1 # do_recr_dev:  0=none; 1=devvector; 2=simple deviations
# Recruitment residuals
1970	# Start year recruitment residuals
2006	# End year recruitment residuals
1	# Phase
1	# Read 13 advanced recruitment options: 0=no, 1=yes
0	# first year for early rec devs
-4	# phase for early rec devs
5	# Phase for forecast recruit deviations
100	# Lambda for forecast recr devs before endyr+1
1979	#_last_yr_nobias_adj_in_MPD
1980	# first year of full bias correction (linear ramp up from this year minus the plus-age to this year)
2004	# last year for full bias correction in_MPD
2005	#_first_recent_yr_nobias_adj_in_MPD
1	#_max_bias_adj_in_MPD (1.0 to mimic pre-2009 models)
0	#_placeholder
-15	# Lower bound rec devs
15	# Upper bound rec devs
0	# read intitial values for rec devs

# Fishing mortality setup
0.1	# F ballpark for tuning early phases
2008	# F ballpark year
1	# F method:  1=Pope's; 2=Instan. F; 3=Hybrid (recommended)
0.9	# max F or harvest rate, depends on F_Method
#init_F_setup,	for	each	fleet
#LO	HI	INIT	PRIOR	P_TYPE SD	PHASE
 0	1	0	0.0001	0	99	-1   #1  InitF_FISHERY1_Comm_Non-Live
 0	1	0	0.0001	0	99	-1   #2  InitF_FISHERY2_Comm_Live
 0	1	0	0.0001	0	99	-1   #3  InitF_FISHERY3_Rec_MM
 0	1	0	0.0001	0	99	-1   #4  InitF_FISHERY4_Rec_BB
 0	1	0	0.0001	0	99	-1   #5  InitF_FISHERY5_Rec_PBR
 0	1	0	0.0001	0	99	-1   #6  InitF_FISHERY6_Rec_CPFV
 0	1	0	0.0001	0	99	-1   #7  InitF_FISHERY7_Ghost
#_Q_setup
#_add_parm_row_for_each_positive_entry_below(row_then_column)
# A=do power, B=env-var, C=extra SD, D=devtype(<0=mirror, 0/1=none, 2=cons, 3=rand, 4=randwalk); E=0=num/1=bio,
F=err_type
# A B C D E F
 0	0	0	0	1	0	#1  InitF_FISHERY1_Comm_Non-Live
 0	0	0	0	1	0	#2  InitF_FISHERY2_Comm_Live
 0	0	0	0	1	0	#3  InitF_FISHERY3_Rec_MM
 0	0	0	0	1	0	#4  InitF_FISHERY4_Rec_BB
 0	0	0	0	1	0	#5  InitF_FISHERY5_Rec_PBR
 0	0	0	0	1	0	#6  InitF_FISHERY6_Rec_CPFV
 0	0	0	0	1	0	#7  InitF_FISHERY7_Ghost
 0	0	0	0	0	0	#8  InitF_SURVEY1_CPFV 1960-1999
```

```
 0 0 0 0 0 0 #9  InitF_SURVEY2_CPFV 2000-2008
 0 0 0 0 0 0 #10 InitF_SURVEY3_CPFV 1960-2008
 0 0 0 0 0 0 #11 InitF_SURVEY4_TENERA_adult
 0 0 0 0 0 0 #12 InitF_SURVEY5_PISCO_adult
 0 0 0 0 0 0 #13 InitF_SURVEY6_PISCO_MONTEREY_SMURFs
 0 0 0 0 0 0 #14 InitF_SURVEY7_SLO_SMURFs

#_size_selex_types
#_Pattern Discard Male Special
 24 0 0 0 #1  Comm_Non-Live
 24 0 0 0 #2  Comm_Live
 24 0 0 0 #3  Rec_MM
 24 0 0 0 #4  Rec_BB
 24 0 0 0 #5  Rec_PBR
 24 0 0 0 #6  Rec_CPFV
 0 0 0 0  #7  CA_age_samples
 5 0 0 6  #8  CPFV 1960-1999
 5 0 0 6  #9  CPFV 2000-2008
 5 0 0 6  #10 CPFV 1960-2008
 30 0 0 0 #11 TENERA adult
 30 0 0 0 #12 PISCO Adults
 33 0 0 0 #13 PISCO SMURFS (Monterey)
 33 0 0 0 #14 SMURFS (SLO)

#_age_selex_types
#_Pattern Discard Male Special
 10 0 0 0 #1  Comm_Non-Live
 10 0 0 0 #2  Comm_Live
 10 0 0 0 #3  Rec_MM
 10 0 0 0 #4  Rec_BB
 10 0 0 0 #5  Rec_PBR
 10 0 0 0 #6  Rec_CPFV
 10 0 0 0 #7  CA_age_samples
 10 0 0 0 #8  CPFV_CPUE
 10 0 0 0 #9  CPFV 2000-2008
 10 0 0 0 #10 CPFV 1960-2008
 10 0 0 0 #11 TENERA adult
 10 0 0 0 #12 PISCO Adults
 10 0 0 0 #13 PISCO SMURFS (Monterey)
 10 0 0 0 #14 SMURFS (SLO)

#_LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr
dev_stddev Block Block_Fxn
#FLEET 1 NOT THE LIVE FISH FISHERY
 10 91 31 31 1 0.05 2 0 0 0 0 0.5
 0 0 # PEAK
 -5.0 3.0 -2.8 -2.8 1 0.05 3 0 0 0 0 0.5
 0 0 # TOP:_width of plateau
 -4.0 12.0 4.1 4.1 1 0.05 3 0 0 0 0 0.5 0
0 # Asc_width
 -10 6.0 4 -1.0 1 0.05 -3 0 0 0 0 0.5
 0 0 # Desc_width
-15.0 15.0 -10 -5.0 1 0.05 -2 0 0 0 0 0.5
 0 0 # INIT:_selectivity_at_fist_bin
 -5.0 15.0 10 -0.3 1 0.05 -2 0 0 0 0 0.5
 0 0 # FINAL:_selectivity_at_last_bin

#FLEET 2 LIVE FISH FISHERY
 10 91 38.2 38.2 1 0.05 2 0 0 0 0 0.5 1 2 #
PEAK
 -5.0 3.0 -0.3 -0.3 1 0.05 3 0 0 0 0 0.5
 1 2 # TOP:_width of plateau
 -4.0 12.0 2.3 2.3 1 0.05 3 0 0 0 0 0.5 1
2 # Asc_width
 -10 6.0 3 3.0 1 0.05 3 0 0 0 0 0.5 1
2 # Desc_width
-15.0 5.0 -5 -5.0 1 0.05 -2 0 0 0 0 0.5
 0 0 # INIT:_selectivity_at_fist_bin
 -5.0 15.0 -3.5 -3.5 1 0.05 2 0 0 0 0 0.5
 1 2 # FINAL:_selectivity_at_last_bin
```

```
#FLEET 3 Man Made
  10      91     10.8    10.8    1       0.05    2       0       0       0       0       0.5
          0      0  # PEAK
 -5.0     3.0    -0.5    -0.5    1       0.05    3       0       0       0       0       0.5
          0      0  # TOP:_width of plateau
 -4.0     12.0   -0.6    -0.6    1       0.05    3       0       0       0       0       0.5
          0      0  # Asc_width
  -10     6.0    -2      -2.0    1       0.05    3       0       0       0       0       0.5
          0      0  # Desc_width
-15.0     15.0   -10     -5.0    1       0.05    -2      0       0       0       0       0.5
          0      0  # INIT:_selectivity_at_fist_bin
 -5.0     15.0   -0.5    -0.5    1       0.05    2       0       0       0       0       0.5
          0      0  # FINAL:_selectivity_at_last_bin

#FLEET 4 Beach Bank
  10      91     33.7    33.7    1       0.05    2       0       0       0       0       0.5
          0      0  # PEAK
 -5.0     3.0    -2.8    -2.8    1       0.05    3       0       0       0       0       0.5
          0      0  # TOP:_width of plateau
 -4.0     12.0   4.1     4.1   1   0.05   3       0       0       0       0       0.5     0
0  # Asc_width
  -10     6.0    -1      -1.0    1       0.05    3       0       0       0       0       0.5
          0      0  # Desc_width
-15.0     15.0   -10     -5.0    1       0.05    -2      0       0       0       0       0.5
          0      0  # INIT:_selectivity_at_fist_bin
 -5.0     15.0   -0.3    -0.3    1       0.05    2       0       0       0       0       0.5
          0      0  # FINAL:_selectivity_at_last_bin

#FLEET 5 PBR
  10      91     45      45      1       0.05    2       0       0       0       0       0.5
          2      2  # PEAK
 -5.0     3.0    -2.8    -2.8    1       0.05    3       0       0       0       0       0.5
          2      2  # TOP:_width of plateau
 -4.0     12.0   4.1     4.1   1   0.05   3       0       0       0       0       0.5     2
2  # Asc_width
  -10     6.0    4       -1.0    1       0.05    -3      0       0       0       0       0.5
          0      0  # Desc_width
-15.0     15.0   -10     -5.0    1       0.05    -2      0       0       0       0       0.5
          0      0  # INIT:_selectivity_at_fist_bin
 -5.0     15.0   10      -0.3    1       0.05    -2      0       0       0       0       0.5
          0      0  # FINAL:_selectivity_at_last_bin

#FLEET 6 CPFV
  10      91     45      45      1       0.05    2       0       0       0       0       0.5
          2      2  # PEAK
 -5.0     3.0    -2.8    -2.8    1       0.05    3       0       0       0       0       0.5
          2      2  # TOP:_width of plateau
 -4.0     12.0   4.1     4.1   1   0.05   3       0       0       0       0       0.5     2
2  # Asc_width
  -10     6.0    4       -1.0    1       0.05    -3      0       0       0       0       0.5
          0      0  # Desc_width
-15.0     15.0   -10     -5.0    1       0.05    -2      0       0       0       0       0.5
          0      0  # INIT:_selectivity_at_fist_bin
 -5.0     15.0   10      -0.3    1       0.05    -2      0       0       0       0       0.5
          0      0  # FINAL:_selectivity_at_last_bin

#FLEET 7 CA_age_samples

#Survey 1: CPFV CPUE 1960-1999
  1   44   1      1       0       10   -3   0       0       0       0       0.5     0       0
           #min Len bin - fixed
  1       100    44      50      0       10   -4   0       0       0       0       0.5     0
0          #max Len bin fixed

#Survey 2: CPFV CPUE 2000-2008
  1       44     1       1       0       10      -3      0       0       0       0       0.5
          0      0       #min Len bin - fixed
  1       100    44      50      0       10      -4      0       0       0       0       0.5
          0      0       #max Len bin fixed
```

```
#Survey 3: CPFV CPUE 1960-2008
   1        44      1       1       0       10      -3      0       0       0       0       0.5
            0       0       #min Len bin - fixed
   1        100     44      50      0       10      -4      0       0       0       0       0.5
            0       0       #max Len bin fixed

#Survey 4: TENERA adult
#Survey 5: PISCO adult
#Survey 6: PISCO SMURFS
#Survey 7: SMURFS (SLO)

1           #_Custom_block_setup SELECTIVITY BLOCK: 1999-2008
#FLEET 1 NOT THE LIVE FISH FISHERY
#   10      91      31      31      1       0.05    2       # PEAK
# -5.0      3.0     -2.8    -2.8    1       0.05    3       # TOP:_width of plateau
# -4.0      12.0    4.1     4.1  1  0.05    3       # Asc_width
#  -10      6.0     4       -1.0    1       0.05    -3      # Desc_width
# -5.0      15.0    10      -0.3    1       0.05    -2      # FINAL:_selectivity_at_last_bin
#FLEET 2 LIVE FISH FISHERY
   10   91  38.2    38.2  1   0.05  3       # PEAK
  -5.0      3.0     -0.3    -0.3    1       0.05    4       # TOP:_width of plateau
  -4.0      12.0    2.3     2.3  1  0.05    4       # Asc_width
   -10      6.0     3       3.0  1  0.05    4       # Desc_width
  -5.0      15.0    -3.5    -3.5    1       0.05    3       # FINAL:_selectivity_at_last_bin
#FLEET 5 PBR
   10       91      45      45      1       0.05    3       # PEAK
   10       91      45      45      1       0.05    3       # PEAK
  -5.0      3.0     -2.8    -2.8    1       0.05    4       # TOP:_width of plateau
  -5.0      3.0     -2.8    -2.8    1       0.05    4       # TOP:_width of plateau
  -4.0      12.0    4.1     4.1  1  0.05    4       # Asc_width
  -4.0      12.0    4.1     4.1  1  0.05    4       # Asc_width
#  -10      6.0     4       -1.0    1       0.05    -3      # Desc_width
# -5.0      15.0    10      -0.3    1       0.05    -2      # FINAL:_selectivity_at_last_bin
#FLEET 6 CPFV
   10       91      45      45      1       0.05    3       # PEAK
   10       91      45      45      1       0.05    3       # PEAK
  -5.0      3.0     -2.8    -2.8    1       0.05    4       # TOP:_width of plateau
  -5.0      3.0     -2.8    -2.8    1       0.05    4       # TOP:_width of plateau
  -4.0      12.0    4.1     4.1  1  0.05    4       # Asc_width
  -4.0      12.0    4.1     4.1  1  0.05    4       # Asc_width
#  -10      6.0     4       -1.0    1       0.05    -3      # Desc_width
# -5.0      15.0    10      -0.3    1       0.05    -2      # FINAL:_selectivity_at_last_bin
2           #separt_adj_method

# Tag loss and Tag reporting parameters go next
0  # TG_custom:  0=no read; 1=read if tags exist
#_Cond -6 6 1 1 2 0.01 -4 0 0 0 0 0 0 0  #_placeholder if no parameters
### Likelihood related quantities ###
1           # Do variance adjustments
#1  Comm: Non-live Fishery
#2  Comm: Live Fishery
#3  Rec: Man-made
#4  Rec: Beach/bank
#5  Rec: PBR
#6  Rec: CPFV
#7  CA age samples
#8  CPFV CPUE survey 1960-1999
#9  CPFV CPUE survey 2000-2008
#10 CPFV CPUE survey 1960-2008
#11 TENERA adult survey
#12 PISCO adult survey
#13 PISCO SMURFS
#14 SLO SMURFS
#           1       2       3       4       5       6       7       8       9       10      11
            12      13      14
            0       0       0       0       0       0       0       0.28    0.37    0.29    0.75
            0.34    0.47    0.79    #_add_to_survey_CV
            0       0       0       0       0       0       0       0       0       0       0
            0       0       0       #_add_to_discard_stddev
```

```
0	0	0	0	0	0	0	0	0	0	0
0	0	0	#_add_to_bodywt_CV
0.84	0.87	1.17	1.49	1.45	1.91	1	1	1	1	1
1	1	1	#_mult_by_lencomp_N
1	1	1	1	1	1	10.5	1	1	1	1
1	1	1	#_mult_by_agecomp_N
1	1	1	1	1	1	1	1	1	1	1
1	1	1	#_mult_by_size-at-age_N

30	#  DF For discard T-distribution
30	#  DF For meanbodywt T-distribution
1	#_maxlambdaphase
0	#_sd_offset
6	# N changes to default Lambdas = 1.0
######################################
#Example of changes to default lambda
#3 # number of changes to make to default Lambdas (default value is 1.0)
# Like_comp codes:  1=surv; 2=disc; 3=mnwt; 4=length; 5=age; 6=SizeFreq; 7=sizeage; 8=catch;
# 9=init_equ_catch; 10=recrdev; 11=parm_prior; 12=parm_dev; 13=CrashPen; 14=Morphcomp; 15=Tag-comp; 16=Tag-negbin
#like_comp fleet/survey  phase  value  sizefreq_method
# 1  8 1 0 1 #_CPUE/survey:_1 CPFV Logbook 1960-1999
 1  9 1 0 1 #_CPUE/survey:_2 CPFV Logbook 2000-2008
 1 10 1 0 1 #_CPUE/survey:_3 CPFV Logbook 1960-2008
 1 11 1 0 1 #_CPUE/survey:_4 TENREA Adult
 1 12 1 0 1 #_CPUE/survey:_5 PISCO Adult
 1 13 1 0 1 #_CPUE/survey:_6 PISCO SMURF
 1 14 1 0 1 #_CPUE/survey:_7 SLO SMURF
#  4 1 1 0 1 #_lencomp:_FLEET 1
#  4 2 1 0 1 #_lencomp:_FLEET 2
#  4 3 1 0 1 #_lencomp:_FLEET 3
#  4 4 1 0 1 #_lencomp:_FLEET 4
#  4 5 1 0 1 #_lencomp:_FLEET 5
#  4 6 1 0 1 #_lencomp:_FLEET 6
#  5 7 1 0 1 #_Cond_age:_Females, Males, & Unsexed
#  1 1 1 0 1 #_init_equ_catch
#  1 1 1 0 1 #_recruitments
#  1 1 1 0 1 #_parameter-priors
#  1 1 1 0 1 #_parameter-dev-vectors
#  1 1 1 0 1 #_crashPenLambda
######################################

0 # (0/1) read specs for more stddev reporting
# 1 1 -1 5 1 5 # selex type, len/age, year, N selex bins, Growth pattern, N growth ages
# 3 9 15 21 27 # vector with selex std bin picks (-1 in first bin to self-generate)
# 1 2 14 26 40 # vector with growth std bin picks (-1 in first bin to self-generate)

999 # end of control file
```

Appendix D-1. Data file for SCS.

SCS cabezon data file 2009, SS v3.03a, May 2009
1916 #_styr
2008 #_endyr
1 #N_seasons_per_year
12 #vector_with_N_months_in_each_season
1 #spawning_season_-_spawning_will_occur_at_beginning_of_this_season
7 #N_fishing_fleets
6 #N_surveys_data_type_numbers_below_must_be_sequential_with_the_N_fisheries4
1 #Number of areas

fleet1%fleet2%fleet3%fleet4%fleet5%fleet6%fleet7%survey1%survey2%survey3%survey4%survey5%survey6
0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 #_surveytiming_in_season
1 1 1 1 1 1 1 1 1 1 1 1 1 #_area_assignments_for_each_fishery_and_survey
1 1 1 1 1 1 1 # Units for catch by fishing fleet: 1=Biomass(mt),2=Numbers(1000s)
0.01 0.01 0.01 0.01 0.01 0.01 0.01 # SE of log(catch) by fleet for equilibrium and continuous options

2 #number_of_genders(1 / 2)
35 #accumulator_age;_model_always_starts_with_age_0

#Catch	(mt)								
#Fleet1	Fleet2	Fleet3	Fleet4	Fleet5	Fleet6 Fleet7				
#CommNL		CommL	MM	Shore	PBR	CPFV	age-samplsYear		Season
0	0	0	0	0	0	0	#initial_equilibrium		
93 # Number of lines catch data			- FINAL CATCHES w/discards						
0.00	0.00	0.02	0.02	0.00	0.00	0	1916	1	
0.00	0.00	0.02	0.02	0.00	0.00	0	1917	1	
0.00	0.00	0.02	0.02	0.00	0.00	0	1918	1	
0.00	0.00	0.02	0.02	0.00	0.00	0	1919	1	
0.00	0.00	0.02	0.02	0.00	0.00	0	1920	1	
0.00	0.00	0.02	0.02	0.00	0.00	0	1921	1	
0.00	0.00	0.02	0.02	0.00	0.00	0	1922	1	
0.00	0.00	0.02	0.02	0.00	0.00	0	1923	1	
0.00	0.00	0.02	0.02	0.00	0.00	0	1924	1	
0.00	0.00	0.02	0.02	0.00	0.00	0	1925	1	
0.00	0.00	0.02	0.02	0.00	0.00	0	1926	1	
0.00	0.00	0.02	0.02	0.00	0.00	0	1927	1	
0.00	0.00	0.02	0.02	0.02	0.04	0	1928	1	
0.00	0.00	0.05	0.04	0.03	0.08	0	1929	1	
0.00	0.00	0.07	0.06	0.05	0.12	0	1930	1	
0.00	0.00	0.09	0.08	0.06	0.16	0	1931	1	
0.00	0.00	0.11	0.10	0.08	0.20	0	1932	1	
0.03	0.00	0.14	0.12	0.09	0.24	0	1933	1	
0.00	0.00	0.16	0.14	0.11	0.27	0	1934	1	
0.07	0.00	0.18	0.16	0.13	0.31	0	1935	1	
0.01	0.00	0.26	0.23	0.18	0.44	0	1936	1	
0.00	0.00	0.17	0.15	0.12	0.29	0	1937	1	
0.00	0.00	0.48	0.43	0.33	0.83	0	1938	1	
0.00	0.00	0.18	0.16	0.12	0.31	0	1939	1	
0.03	0.00	0.17	0.15	0.12	0.29	0	1940	1	
0.04	0.00	0.36	0.32	0.25	0.61	0	1941	1	
0.00	0.00	0.36	0.32	0.25	0.61	0	1942	1	
0.00	0.00	0.36	0.32	0.25	0.61	0	1943	1	
0.02	0.00	0.36	0.32	0.25	0.61	0	1944	1	
0.00	0.00	0.36	0.32	0.25	0.61	0	1945	1	
0.00	0.00	0.36	0.32	0.25	0.61	0	1946	1	
0.01	0.00	1.09	0.98	0.75	1.89	0	1947	1	
0.01	0.00	1.23	1.10	0.85	2.12	0	1948	1	
0.01	0.00	1.60	1.44	1.11	2.76	0	1949	1	
0.29	0.00	1.25	1.12	0.86	2.15	0	1950	1	
0.02	0.00	1.15	1.03	0.79	1.98	0	1951	1	
0.05	0.00	1.54	1.38	1.06	2.66	0	1952	1	
0.02	0.00	2.30	2.06	1.58	3.95	0	1953	1	
0.00	0.00	5.24	4.70	3.61	9.04	0	1954	1	
0.01	0.00	5.06	4.53	3.49	8.71	0	1955	1	
0.06	0.00	5.74	5.14	8.05	9.88	0	1956	1	

0.36	0.00	4.19	3.76	5.88	7.22	0	1957	1
0.07	0.00	2.83	2.53	3.97	4.87	0	1958	1
0.01	0.00	0.72	0.65	1.02	1.25	0	1959	1
0.00	0.00	0.35	0.31	0.49	0.60	0	1960	1
0.01	0.00	0.41	0.37	0.58	0.71	0	1961	1
0.00	0.00	1.26	1.13	1.77	2.17	0	1962	1
0.01	0.00	2.54	2.27	3.56	4.37	0	1963	1
0.07	0.00	2.02	1.81	2.83	3.48	0	1964	1
0.02	0.00	2.09	1.87	7.20	3.60	0	1965	1
0.05	0.00	3.20	2.86	11.01	5.51	0	1966	1
0.04	0.00	1.65	2.42	5.70	2.85	0	1967	1
0.06	0.00	1.18	1.73	4.06	2.03	0	1968	1
0.04	0.00	1.13	1.65	3.88	1.94	0	1969	1
0.09	0.00	1.44	2.10	4.95	2.47	0	1970	1
0.02	0.00	1.49	2.17	10.23	2.56	0	1971	1
0.04	0.00	4.33	6.34	29.84	7.46	0	1972	1
0.02	0.00	1.73	2.54	11.94	2.99	0	1973	1
0.07	0.00	1.77	2.59	12.18	3.04	0	1974	1
0.03	0.00	2.62	3.84	18.08	4.52	0	1975	1
0.09	0.00	1.74	2.55	11.98	3.00	0	1976	1
0.11	0.00	1.12	1.65	7.74	1.94	0	1977	1
0.32	0.00	1.66	2.43	11.43	2.86	0	1978	1
0.21	0.00	1.24	1.82	8.55	2.14	0	1979	1
3.57	0.00	3.04	21.47	26.82	3.13	0	1980	1
0.26	0.00	0.30	10.42	26.38	3.77	0	1981	1
0.15	0.00	0.38	3.63	58.15	1.77	0	1982	1
0.19	0.00	0.80	4.65	12.90	1.72	0	1983	1
0.05	0.00	1.47	9.81	28.22	0.70	0	1984	1
0.12	0.00	1.69	6.74	25.29	0.49	0	1985	1
0.19	0.00	1.31	15.32	32.15	1.64	0	1986	1
0.30	0.00	1.85	7.38	33.62	3.42	0	1987	1
0.51	0.00	1.39	4.16	11.73	1.47	0	1988	1
0.47	0.00	2.84	6.56	12.95	2.82	0	1989	1
0.62	0.00	2.24	6.78	32.46	5.24	0	1990	1
1.64	0.00	2.08	6.32	30.25	4.89	0	1991	1
0.47	0.00	1.21	3.66	17.51	2.83	0	1992	1
0.40	0.00	0.15	0.33	3.26	1.20	0	1993	1
0.72	5.62	0.49	0.77	10.77	1.28	0	1994	1
0.81	9.90	0.57	1.32	1.71	0.69	0	1995	1
0.47	10.73	1.09	0.29	9.38	2.64	0	1996	1
0.63	12.01	1.21	0.63	3.60	1.74	0	1997	1
0.68	16.98	0.83	2.15	5.05	2.23	0	1998	1
0.33	14.36	0.78	2.45	10.82	0.58	0	1999	1
0.87	21.98	0.17	0.41	4.52	1.58	0	2000	1
0.62	13.85	0.70	2.30	3.30	2.23	0	2001	1
0.36	6.52	0.13	3.11	6.76	1.76	0	2002	1
0.68	5.54	0.34	1.61	6.39	1.34	0	2003	1
0.20	5.65	0.87	2.24	1.94	1.89	0	2004	1
0.44	3.63	0.55	6.04	1.59	1.49	0	2005	1
0.31	3.69	0.40	1.59	1.81	1.70	0	2006	1
0.07	3.23	0.05	1.55	4.21	2.63	0	2007	1
0.15	3.74	0.64	1.83	0.89	2.85	0	2008	1

#Abundance_Indices
168 #_N_observations

#Year	Season	Type	Value	CV	
1960	1	8	0.000452314	0.2832594	#CPFV 1960-1999
1961	1	8	0.001137818	0.2153741	
1962	1	8	0.003200635	0.1623748	
1963	1	8	0.005207429	0.163968	
1964	1	8	0.004708524	0.1546894	
1965	1	8	0.003454028	0.1426449	
1966	1	8	0.005310159	0.1289376	
1967	1	8	0.00295466	0.1215879	
1968	1	8	0.001747249	0.1365701	
1969	1	8	0.002038152	0.1537628	
1970	1	8	0.002294708	0.1297591	
1971	1	8	0.002429784	0.1374047	
1972	1	8	0.005203361	0.1342096	
1973	1	8	0.002669626	0.1350328	

1974	1	8	0.003356827	0.1397297	
1975	1	8	0.004128903	0.1279682	
1976	1	8	0.002363132	0.1212524	
1977	1	8	0.001723166	0.1280545	
1978	1	8	0.002312066	0.1336883	
1980	1	8	0.002157117	0.1248343	
1981	1	8	0.001987522	0.1234024	
1982	1	8	0.001285069	0.1320386	
1983	1	8	0.001306797	0.1565492	
1984	1	8	0.000343328	0.1914159	
1985	1	8	0.000844097	0.1586893	
1986	1	8	0.00246611	0.1466684	
1987	1	8	0.003709234	0.1214355	
1988	1	8	0.003489054	0.1275649	
1989	1	8	0.004188435	0.1196436	
1990	1	8	0.005298528	0.1116753	
1991	1	8	0.003296344	0.117396	
1992	1	8	0.001690471	0.1164691	
1993	1	8	0.001184995	0.1423761	
1994	1	8	0.000635505	0.2208527	
1995	1	8	0.000984728	0.1545501	
1996	1	8	0.002077128	0.1150459	
1997	1	8	0.00161451	0.103947	
1998	1	8	0.000783863	0.1728826	
1999	1	8	0.000591253	0.2027761	
2000	1	9	0.000949932	0.1781485	#CPFV 2000-2008
2001	1	9	0.00099995	0.2002925	
2002	1	9	0.000446063	0.2449126	
2003	1	9	0.000597964	0.2731998	
2004	1	9	0.000535188	0.2288712	
2005	1	9	0.000466744	0.2308095	
2006	1	9	0.000712774	0.1960171	
2007	1	9	0.000663963	0.2141304	
2008	1	9	0.000571155	0.207621	
1960	1	10	0.000470536	0.277252	#CPFV 1960-2008
1961	1	10	0.001208953	0.2224335	
1962	1	10	0.003406825	0.163965	
1963	1	10	0.005626631	0.1707729	
1964	1	10	0.005176841	0.1398065	
1965	1	10	0.003776024	0.1292879	
1966	1	10	0.005858958	0.1337603	
1967	1	10	0.003268861	0.1164255	
1968	1	10	0.001897916	0.1339299	
1969	1	10	0.002176078	0.1519568	
1970	1	10	0.002477159	0.1324957	
1971	1	10	0.00258813	0.1522869	
1972	1	10	0.005728542	0.1350124	
1973	1	10	0.002896862	0.1349098	
1974	1	10	0.003643093	0.1368207	
1975	1	10	0.004523044	0.1225044	
1976	1	10	0.002518716	0.1248367	
1977	1	10	0.001844795	0.1276191	
1978	1	10	0.002478905	0.129705	
1980	1	10	0.002318204	0.1223473	
1981	1	10	0.002127032	0.1154456	
1982	1	10	0.001353648	0.1356315	
1983	1	10	0.001378662	0.1547292	
1984	1	10	0.000351147	0.1907344	
1985	1	10	0.000876894	0.165969	
1986	1	10	0.002607573	0.152497	
1987	1	10	0.004085936	0.1076187	
1988	1	10	0.003796372	0.125861	
1989	1	10	0.004584953	0.1132214	
1990	1	10	0.005826888	0.1108954	
1991	1	10	0.003588858	0.1128685	
1992	1	10	0.001826133	0.1123283	
1993	1	10	0.001248646	0.1493557	
1994	1	10	0.000663145	0.2172859	
1995	1	10	0.001036	0.1611227	
1996	1	10	0.002284409	0.1087476	

1997	1	10	0.001771288	0.1120026	
1998	1	10	0.000833307	0.1645284	
1999	1	10	0.000623416	0.2002253	
2000	1	10	0.000949932	0.1781485	
2001	1	10	0.001075176	0.1454224	
2002	1	10	0.000525332	0.2320693	
2003	1	10	0.000642323	0.2340119	
2004	1	10	0.000582414	0.1937882	
2005	1	10	0.000467995	0.2330727	
2006	1	10	0.000760891	0.165078	
2007	1	10	0.000727296	0.1900022	
2008	1	10	0.000616015	0.1868014	
1978	1	11	0.016469	0.716219	#CalCOFI:manta
1980	1	11	0.003682	1.525368	
1981	1	11	0.001965	0.353765	
1983	1	11	0.000745	0.862236	
1984	1	11	0.001515	0.385216	
1985	1	11	0.004325	0.427435	
1986	1	11	0.001908	0.449719	
1987	1	11	0.001061	0.611327	
1988	1	11	0.002251	0.550732	
1989	1	11	0.004629	0.474342	
1990	1	11	0.000755	0.600677	
1991	1	11	0.002051	0.597394	
1992	1	11	0.000855	0.788863	
1993	1	11	0.000471	0.513378	
1994	1	11	0.000133	0.866171	
1995	1	11	0.002915	0.522748	
1996	1	11	0.002699	0.454805	
1997	1	11	0.002193	0.408187	
1998	1	11	0.000189	0.50679	
1999	1	11	0.002981	0.40929	
2000	1	11	0.002236	0.532012	
2001	1	11	0.001094	0.486084	
2002	1	11	0.003644	0.400154	
2003	1	11	0.007146	0.461904	
2004	1	11	0.002537	0.527275	
2005	1	11	0.001678	0.397993	
2006	1	11	0.006018	0.362456	
2007	1	11	0.001973	0.45983	
2008	1	11	0.004615	0.592653	
1972	1	12	9.91E-04	0.3375879	#Edison Impingement
1973	1	12	1.92E-03	0.278647	
1974	1	12	1.13E-03	0.2066957	
1975	1	12	2.27E-03	0.1251556	
1976	1	12	1.68E-03	0.1312414	
1977	1	12	9.64E-04	0.2322483	
1978	1	12	7.53E-04	0.1857204	
1979	1	12	4.89E-04	0.2186301	
1980	1	12	6.75E-04	0.1667745	
1981	1	12	6.36E-04	0.2232059	
1982	1	12	5.22E-04	0.273381	
1983	1	12	4.54E-04	0.2476573	
1984	1	12	7.14E-04	0.2283976	
1985	1	12	5.54E-04	0.1997272	
1986	1	12	3.08E-04	0.2069409	
1987	1	12	5.98E-04	0.2040686	
1988	1	12	1.44E-04	0.3873733	
1989	1	12	5.16E-04	0.2642365	
1990	1	12	3.37E-04	0.2750285	
1991	1	12	4.64E-04	0.2425585	
1992	1	12	2.82E-04	0.2307056	
1993	1	12	1.10E-04	0.3610428	
1994	1	12	1.43E-04	0.3517632	
1995	1	12	1.10E-04	0.4753732	
1996	1	12	6.73E-05	0.4754682	
1997	1	12	1.52E-04	0.3397869	
1998	1	12	6.24E-05	0.4211199	
1999	1	12	8.50E-04	0.1974443	
2000	1	12	3.07E-04	0.3912762	

2001	1	12	1.95E-04	0.5737525	
2002	1	12	6.06E-04	0.4017963	
2003	1	12	8.96E-04	0.4861232	
2004	1	12	3.48E-04	0.6324122	
2005	1	12	5.65E-05	0.6582139	
2006	1	12	4.90E-04	0.782376	
2007	1	12	3.19E-04	0.5970551	
2008	1	12	7.40E-04	0.5104997	
2000	1	13	0.035797214	0.7051926	#PISCO Adults Survey
2003	1	13	0.016455171	0.7052816	
2004	1	13	0.02684791	0.5719691	
2005	1	13	0.008466561	0.7052987	
2006	1	13	0.020918165	0.519804	
2008	1	13	0.008362464	0.7052989	

#_Discard_Biomass
1 #_(1=biomass;_2=fraction)
0 #_N_observations

#_Mean_BodyWt
86

# Year	Seas	Type	Partition	Value	CV
1980	1	3	2	0.48	0.562
1981	1	3	2	0.4	0.707
1982	1	3	2	0.475	0.316
1983	1	3	2	0.583	0.723
1984	1	3	2	0.433	0.611
1987	1	3	2	0.84	0.602
1989	1	3	2	0.892	0.922
1996	1	3	2	0.443	0.322
1999	1	3	2	0.309	0.596
2000	1	3	2	0.067	1.447
2004	1	3	2	1	0.849
2005	1	3	2	0.8	0.955
2006	1	3	2	0.781	0.514
2007	1	3	2	0.575	0.184
2008	1	3	2	1.033	0.895
1980	1	4	2	1.219	0.589
1981	1	4	2	0.8	0.563
1982	1	4	2	0.829	0.59
1983	1	4	2	0.757	0.605
1984	1	4	2	0.913	0.252
1985	1	4	2	0.82	0.558
1986	1	4	2	0.934	0.878
1987	1	4	2	1.129	0.607
1988	1	4	2	1.2	0.589
1989	1	4	2	1.493	0.607
1993	1	4	2	0.975	0.616
1995	1	4	2	0.486	0.678
1996	1	4	2	0.583	0.216
1997	1	4	2	0.365	0.058
1998	1	4	2	0.993	0.435
1999	1	4	2	0.733	0.495
2000	1	4	2	0.713	0.734
2001	1	4	2	0.963	0.393
2002	1	4	2	1.44	0.746
2005	1	4	2	0.833	0.493
1980	1	5	2	1.406	0.545
1981	1	5	2	1.363	0.567
1982	1	5	2	1.131	0.628
1983	1	5	2	0.848	0.599
1984	1	5	2	1.098	0.477
1985	1	5	2	1.235	0.815
1986	1	5	2	0.884	0.727
1987	1	5	2	1.147	0.714
1988	1	5	2	0.793	0.412
1989	1	5	2	1.181	0.61
1993	1	5	2	0.532	0.387
1994	1	5	2	1.144	0.516
1995	1	5	2	0.59	0.434

1996	1	5	2	0.969	1.029
1997	1	5	2	1.21	0.701
1998	1	5	2	0.781	0.39
1999	1	5	2	0.971	0.663
2000	1	5	2	1.004	0.995
2001	1	5	2	0.584	0.323
2002	1	5	2	0.867	0.636
2003	1	5	2	1.03	0.49
2004	1	5	2	1.362	0.844
2005	1	5	2	1.282	0.699
2006	1	5	2	1.252	0.553
2007	1	5	2	1.347	0.586
2008	1	5	2	1.301	0.557
1980	1	6	2	1.025	0.65
1981	1	6	2	1.086	0.543
1982	1	6	2	0.778	0.922
1983	1	6	2	0.816	0.725
1984	1	6	2	1.1	0.519
1985	1	6	2	0.55	0.55
1986	1	6	2	0.587	0.381
1987	1	6	2	1.242	0.474
1988	1	6	2	0.5	0.623
1989	1	6	2	0.708	0.729
1993	1	6	2	0.85	0.898
1994	1	6	2	1.232	0.485
1995	1	6	2	0.375	0.283
1996	1	6	2	0.675	0.552
1997	1	6	2	0.677	0.406
1998	1	6	2	1.284	0.588
1999	1	6	2	0.487	0.505
2000	1	6	2	0.62	0.283
2002	1	6	2	1.391	0.973
2003	1	6	2	2.002	0.754
2004	1	6	2	2.026	0.516
2005	1	6	2	1.416	0.274
2006	1	6	2	1.521	0.502
2007	1	6	2	2.416	0.519
2008	1	6	2	2.216	0.523

Population size structure
1 # Length bin method: 1=Use data bins
Lower edge of bins

#6	8	10	12	14	16	18	20	22	24	26	28
	30	32	34	36	38	40	42	44	46	48	50
	52	54	56	58	60	62	64	66	68	70	72
	74	76	78	80	82	84	86	88	90	92	

0.0001 # Minimum proportion for compressing tails of observed compositional data
0.0001 # Constant added to expected frequencies
0 # Combine males and females at and below this bin number
44 #_N_length_bins
#_lower_edge_of_length_bins

6	8	10	12	14	16	18	20	22	24	26	28
	30	32	34	36	38	40	42	44	46	48	50
	52	54	56	58	60	62	64	66	68	70	72
	74	76	78	80	82	84	86	88	90	92	

109 #N_observations

#Year	Seas	Fleet	sexes	Mkt	Nsamp	begin	data:	females	then	males	
#Fleet 2 Live fish fishery											
2002	1	2	0	0	4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	228
	57	57	57	171	114	0	57	57	57	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	2	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	159
	264	201	393	21	255	21	0	0	117	0	117

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	2	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	195
	156	78	39	0	39	39	39	39	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	2	0	0	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	80	880
	560	560	240	240	160	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	2	0	0	9	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	66	302
	144	82	250	376	710	388	0	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

#Fleet 3 Manmade mode

1980	1	3	0	0	7	0	0	0	0	0	0
	1	1	1	0	0	0	1	2	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1981	1	3	0	0	2	0	0	0	0	0	0
	0	0	1	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1982	1	3	0	0	4	0	0	0	0	0	0
	0	0	0	1	0	1	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1983	1	3	0	0	5	0	0	0	0	0	0
	1	0	0	0	2	1	0	0	0	0	1
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

1984	1	3	0	0	8	0	0	1	0	1	1
	0	0	1	0	0	3	1	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1985	1	3	0	0	5	0	0	0	1	1	1
	0	0	0	1	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1986	1	3	0	0	1	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1987	1	3	0	0	6	0	0	0	0	0	0
	0	0	0	0	1	2	1	0	1	1	1
	1	0	1	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1988	1	3	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1989	1	3	0	0	8	0	1	0	0	0	2
	0	0	1	0	0	1	1	2	1	1	1
	1	0	0	0	0	1	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1993	1	3	0	0	1	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1996	1	3	0	0	2	0	0	0	0	0	0
	0	1	0	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1999	1	3	0	0	5	0	0	0	0	1	0
	0	1	1	2	0	2	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2000	1	3	0	0	2	0	0	2	4	3	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	3	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	3	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	3	0	0	4	0	0	0	0	0	1
	0	0	0	0	0	1	0	0	1	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	3	0	0	7	0	0	0	0	0	0
	0	0	1	0	1	1	1	1	1	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	3	0	0	6	0	0	0	0	0	0
	0	1	0	0	1	0	0	0	2	1	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	3	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	3	0	0	5	0	0	0	0	0	0
	0	0	0	0	0	0	2	1	0	0	1
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
#Fleet 4 Beach/bank mode											
1980	1	4	0	0	6	0	0	0	0	0	0
	0	0	1	1	0	1	1	1	0	0	0
	0	2	1	1	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1981	1	4	0	0	8	0	0	0	0	0	0
	0	0	0	2	0	0	0	1	4	0	0
	0	1	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1982	1	4	0	0	5	0	0	0	0	0	0
	0	0	0	0	0	0	2	1	2	1	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1983	1	4	0	0	7	0	0	0	0	0	0
	1	0	0	0	1	0	0	0	1	2	0
	0	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1984	1	4	0	0	8	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	3	1	1
	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1985	1	4	0	0	10	0	0	0	0	0	0
	0	0	0	0	1	4	1	2	1	3	3
	2	2	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1986	1	4	0	0	12	0	0	0	0	0	0
	1	0	0	1	1	1	3	1	4	3	2

	1	0	2	0	1	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1987	1	4	0	0	5	0	0	0	0	0	0
	0	0	0	0	0	0	2	0	1	0	1
	1	0	0	0	1	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1988	1	4	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1989	1	4	0	0	3	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	1	0	1
	2	1	5	1	0	0	1	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1993	1	4	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	1	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1996	1	4	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	1	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1997	1	4	0	0	1	0	0	0	0	0	0
	0	0	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	4	0	0	5	0	0	0	0	0	0
	0	0	0	0	1	2	1	3	1	0	0
	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

1999	1	4	0	0	4	0	0	0	0	0	0
	0	0	0	0	1	2	0	2	0	2	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2000	1	4	0	0	2	0	0	0	0	0	0
	0	0	1	0	1	0	0	0	0	1	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	4	0	0	3	0	0	0	0	0	0
	0	0	0	0	0	1	1	0	0	1	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	4	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	1
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	4	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	4	0	0	4	0	0	0	0	0	0
	0	0	0	0	1	0	0	1	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	4	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	1	0	1	1	0	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
#Fleet 5 PBR											
1980	1	5	0	0	60	0	0	0	0	0	0
	0	0	0	2	5	6	10	8	19	17	9
	11	9	15	12	6	10	13	6	6	8	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1981	1	5	0	0	25	0	0	0	0	0	0
	0	0	0	0	1	0	2	6	3	3	3
	4	3	5	4	1	0	1	4	0	1	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1982	1	5	0	0	24	0	0	0	0	0	0
	0	0	0	1	3	5	3	2	5	3	3
	3	2	4	0	2	2	4	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1983	1	5	0	0	28	0	0	0	0	0	0
	0	0	1	1	0	4	10	3	6	5	2
	2	2	2	2	0	1	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1984	1	5	0	0	34	0	0	0	0	0	0
	0	0	2	0	0	2	2	5	7	5	5
	6	6	2	3	2	4	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1985	1	5	0	0	18	0	0	0	0	0	0
	0	0	0	0	4	3	1	0	2	2	5
	2	4	1	1	0	0	2	2	0	1	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1986	1	5	0	0	20	0	0	0	0	0	0
	0	0	3	5	3	4	2	4	2	2	1
	4	1	3	1	1	1	2	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1987	1	5	0	0	10	0	0	0	0	0	0
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1988	1	5	0	0	9	0	0	0	0	0	0
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1989	1	5	0	0	14	0	0	0	0	0	0
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	0	0	0	0	0						
1993	1	5	0	0	10	0	0	0	0	0	0
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1994	1	5	0	0	13	0	0	0	0	0	0
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1996	1	5	0	0	11	0	0	0	0	0	0
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1997	1	5	0	0	9	0	0	0	0	0	0
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	0	0	0	0	0						
1998	1	5	0	0	10	0	0	0	0	0	0
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1999	1	5	0	0	23	0	0	0	0	0	0
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	0	0	0	0	0						
2000	1	5	0	0	6	0	0	0	0	0	0
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	0	0	0	0	0						
2001	1	5	0	0	6	0	0	0	0	0	0
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2002	1	5	0	0	18	0	0	0	0	0	0
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	0	0	0	0	0						
2003	1	5	0	0	20	0	0	0	0	0	0
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2004	1	5	0	0	76	0	0	0	0	0	0
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	19	10	9	7	5	4	3	3	0	1	0
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2005	1	5	0	0	55	0	0	0	0	0	0
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	6	7	4	2	5	4	1	1	0	2	0
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2006	1	5	0	0	75	0	0	0	0	0	0
	0	0	0	0	1	4	2	10	13	12	29
	12	10	10	3	1	2	2	0	0	1	0
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	0	0	0	0	0						
2007	1	5	0	0	60	0	0	0	0	0	0
	0	0	0	0	2	5	3	2	5	9	15
	9	9	9	4	5	2	1	0	0	2	0
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2008	1	5	0	0	46	0	0	0	0	0	0
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	0	0	0	0	0						
#Fleet 6 CPFV											
1975	1	6	0	0	32	0	0	0	0	0	0
	1	0	1	2	7	6	11	13	7	10	3
	6	4	2	2	2	0	1	0	0	1	0
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	0	0	0	0	0						
1976	1	6	0	0	63	0	0	0	1	0	0
	0	1	1	5	6	11	18	9	6	8	5
	8	3	4	2	2	4	0	1	1	0	0
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1977	1	6	0	0	44	0	0	0	0	1	0
	0	0	0	5	9	10	11	5	7	7	4
	3	4	1	3	3	0	1	1	0	0	0
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	0	0	0	0	0						
1978	1	6	0	0	51	0	0	0	1	0	0
	2	1	0	5	5	7	12	8	11	8	5
	9	8	3	3	4	0	4	4	0	1	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1986	1	6	0	0	60	0	0	0	0	0	0
	1	1	6	15	13	16	14	4	3	3	3
	0	2	1	0	0	0	0	0	0	0	0
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	0	0	0	0	0						
1987	1	6	0	0	64	0	0	0	0	0	0
	0	0	2	1	13	12	25	13	12	9	10
	3	1	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0						
1988	1	6	0	0	40	0	0	0	0	0	0
	0	0	1	4	3	5	8	10	8	6	8
	10	1	1	0	0	1	0	0	0	0	0
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	0	0	0	0	0						
1989	1	6	0	0	63	0	0	0	0	0	1
	0	2	6	15	15	8	9	8	6	8	3
	1	3	1	1	4	2	0	0	0	0	0
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	0	0	0	0	0						
1980	1	6	0	0	13	0	0	0	0	0	0
	0	0	0	0	2	0	5	0	1	0	3
	0	0	1	0	0	2	1	0	0	0	0
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	0	0	0	0	0						
1981	1	6	0	0	14	0	0	0	0	0	0
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	0	0	0	0	0						
1982	1	6	0	0	9	0	0	0	0	0	0
	0	0	0	0	1	4	1	1	0	0	0
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1983	1	6	0	0	19	0	0	0	0	0	0
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	0	0	0	0	0						
1984	1	6	0	0	8	0	0	0	0	0	0
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	0	0	0	0	0						
1985	1	6	0	0	7	0	0	0	0	0	0
	0	1	0	1	1	1	0	0	3	0	0
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	0	0	0	0	0						
1986	1	6	0	0	13	0	0	0	0	0	0
	0	0	1	0	3	0	5	1	3	2	0
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	0	0	0	0	0						
1987	1	6	0	0	9	0	0	0	0	0	0
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	0	0	0	0	0						
1988	1	6	0	0	5	0	0	0	0	0	0
	0	0	1	1	1	1	1	0	2	0	0
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1989	1	6	0	0	12	0	0	0	1	0	0
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	0	0	0	0	0						
1993	1	6	0	0	2	0	0	0	0	0	0
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	0	0	0	0	0						
1994	1	6	0	0	5	0	0	0	0	0	0
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	0	0	0	0	0						
1996	1	6	0	0	11	0	0	0	0	0	0
	0	1	2	0	1	0	1	5	1	1	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1997	1	6	0	0	4	0	0	0	0	0	0
	0	0	0	0	0	1	2	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	6	0	0	8	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	1	2	0

	2	0	0	1	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1999	1	6	0	0	5	0	0	0	0	0	0
	0	0	0	0	2	0	1	0	1	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2000	1	6	0	0	4	0	0	0	0	0	0
	0	0	0	0	0	0	1	1	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	6	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	6	0	0	7	0	0	0	0	0	0
	0	0	1	0	0	0	0	1	0	1	1
	2	1	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	6	0	0	7	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	1	1	0
	1	0	0	1	1	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	6	0	0	14	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	2	1	1
	1	3	1	2	1	3	0	2	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	6	0	0	8	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	2
	3	0	1	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

2006	1	6	0	0	15	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	6
	1	3	1	0	2	0	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	6	0	0	19	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	2
	2	3	4	0	3	2	2	0	0	1	2
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	6	0	0	17	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	5
	1	1	1	2	3	2	0	1	1	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	6	0	0	4	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	1	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	6	0	0	48	0	0	0	0	0	0
	0	0	2	1	6	2	5	9	10	23	21
	25	14	15	4	6	4	3	0	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	6	0	0	19	0	0	0	0	0	0
	1	0	0	0	2	2	1	3	5	2	7
	7	4	6	8	4	6	5	3	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	6	0	0	39	0	0	0	0	0	0
	1	1	1	4	1	8	12	9	8	8	4
	4	2	4	7	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
20	#_N_age_bins										
1	2	3	4	5	6	7	8	9	10	11	12
	13	14	15	16	17	18	19	20			
2	#_N_ageerror_definitions										

#Female											
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1									
0.479363	0.479363	0.547477	0.604513	0.652275	0.69227	0.725762	0.753807	0.777291	0.796957	0.813425	0.827214
	0.838762	0.848431	0.856529	0.863309	0.868987	0.873741	0.877723	0.881057	0.883849	0.886186	0.888144
	0.889783	0.891156	0.892306	0.893268	0.894074	0.894749	0.895314	0.895788	0.896184	0.896516	0.896794
	0.897027	0.897221									
#Male											
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1									
0.571868	0.571868	0.297421	0.206562	0.161637	0.135119	0.117833	0.105851	0.0972099	0.0908204	0.0860316	0.0824308
	0.0797446	0.0777855	0.0764214	0.0755572	0.0751234	0.0750688	0.0753554	0.0759549	0.0768471	0.0780175	0.0794561
	0.0811573	0.0831183	0.0853394	0.0878231	0.0905741	0.0935993	0.0969071	0.100508	0.104414	0.108639	0.113197
	0.118107	0.123388									
16	#_N_Agecomp_obs										
2	#_Lbin_method:		1=poplenbins		2=datalenbins		3=lengths				
0	#_combine	males	into	females	at	or	below	this	bin	number	
#Conditional_Age-at_Length			1	2	3	4	5	6	7	8	9
	10	11	12	13	14	15	16	17	18	19	20
	1	2	3	4	5	6	7	8	9	10	11
	12	13	14	15	16	17	18	19	20		
#Joanna's data											
#Yr	Seas	Flt	Survey	Gender	Part	Ageerr	Lbin_lo	Lbin_hi	1	2	3
	4	5	6	7	8	9	10	11	12	13	14
	15	16	17	18	19	20	1	2	3	4	5
	6	7	8	9	10	11	12	13	14	15	16
	17	18	19	20							
#Females											
2002	1	7	1	0	1	16	16	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	17	17	8	0	0	3
	3	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	18	18	2	0	0	0
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	19	19	6	0	0	0
	4	1	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	20	20	6	0	0	0
	4	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	21	21	1	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	22	22	4	0	0	0
	0	1	0	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	23	23	11	0	0	0
	0	3	3	1	3	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	24	24	3	0	0	0
	0	1	0	0	1	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	25	25	8	0	0	0
	0	1	0	4	1	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	26	26	2	0	0	0
	0	0	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	27	27	2	0	0	0
	0	0	0	0	0	1	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	28	28	1	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
#Males											
2002	1	7	2	0	2	16	16	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	2	0	2	17	17	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	2	0	2	19	19	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0							

0 # N_size-at-age_observations;_values_on_row1;_N_on_row2
0 # Total number of environmental variables
0 # Total number of environmental observations
0 # No Weight frequency data; N sizefreq methods to read
0 # No tagging data
0 # No morph composition data

999
ENDDATA

Appendix D-2. Control file for SCS.

```
# cabezon control file, SS v3.03a, May 2009
# updated 30 July 09
# Selectivity values for the Commercial fisheries set to the coastwide CA model

# Morph setup
1        # Number of growth patterns
1        # N sub morphs within growth patterns
2            #_Nblock_Patterns
1 1          #_Blocks_per_pattern
1999  2008    #Accounts for change in commerical regs (size limits)
2000  2008    #Accounts for change in recreational regs (size & bag limits)

# Mortality and growth specifications
0.5      # Fraction female at birth
0        # M setup: 0=single Par,1=N_breakpoints,2=Lorenzen,3=agespecific;_4=agespec_withseasinterpolate
#2       # Number of M breakpoints
#0 0     # Ages at M breakpoints
1        # Growth model: 1=VB with L1 and L2, 2=VB with A0 and Linf, 3=Richards, 4=Read vector of L@A
0        # Age for growth Lmin
999      # Age for growth Lmax or 999 = Linf
0        # SD constant added to LAA (0.1 mimics SS2 v1.x for compatibility only)
0        # Variability about growth: 0=CV~f(LAA) [mimic v1.xx], 1=CV~f(A), 2=SD~f(LAA), 3=SD~f(A)
1        # Maturity option: 1=length logistic, 2=age logistic, 3=read age-maturity matrix by growth_pattern
1        # First age allowed to mature
1 #_fecundity option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b
0 #_hermaphroditism option:  0=none; 1=age-specific fxn
1 #_parameter_offset_approach (1=none, 2= M, G, CV_G as offset from female-GP1, 3=like SS2 V1.x)
1 #_env/block/dev_adjust_method (1=standard; 2=with logistic trans to keep within base parm bounds)

#_LO    HI    INIT         PRIOR    PR_type SD       PHASE env-var use_dev dev_minyr dev_maxyr
dev_stddev Block Block_Fxn
#0.02   0.5   0.25    0.25    0     1      -3     0     0     0     0     0.5
0       0     #       NatM_p_1_Fem_GP:1 young
0.02    0.5   0.25    0.25    0     1      -4     0     0     0     0     0.5
0       0     #       NatM_p_2_Fem_GP:1 old
1       40    12.42  12.5     0     1      -3     0     0     0     0     0.5
0       0     #       L_at_Amin_Fem_GP_1
20      90    64.0    63.9    0     16     -2     0     0     0     0     0.5
0       0     #       L_at_Amax_Fem_GP_1
0.05    0.3   0.126   0.13    0     0.02   -3     0     0     0     0     0.5
0       0     #       VonBert_K_Fem_GP_1
0.01    0.5   0.158   0.16    0     0.8    -3     0     0     0     0     0.5
0       0     #       CV_young_Fem_GP_1
0.01    0.5   0.117  0.117  0    0.8     -3     0     0     0     0     0.5     0
0       #     CV_old_Fem_GP_1

#0.02   0.5   0.3     0.3     0     1      -3     0     0     0     0     0.5
0       0     #       NatM_p_1_Mal_GP:1 young
0.02    0.5   0.3     0.3     0     1      -4     0     0     0     0     0.5
0       0     #       NatM_p_1_Mal_GP:1 old
1       40    11.67   11.7  0     1      -3     0     0     0     0     0.5     0
0       #     L_at_Amin_Mal_GP_1
20      90    43.5    43.4  0    6       -2     0     0     0     0     0.5     0
0       #     L_at_Amax_Mal_GP_1
0.05    0.6   0.228   0.23    0     0.04   -3     0     0     0     0     0.5
0       0     #       VonBert_K_Mal_GP_1
0.01    0.5   0.33    0.33    0     0.8    -3     0     0     0     0     0.5
0       0     #       CV_young_Mal_GP_1
0.01    0.5   0.06    0.06    0     0.8    -3     0     0     0     0     0.5
0       0     #       CV_old_Mal_GP_1

# Add 2+2*gender lines to read the wt-Len and mat-Len parameters
-3      3     0.00001236      0.00001236      0     0.8    -3     0     0     0
        0     0.5     0       0       #Female wt-len-1
```

```
-3      4       3.113   3.113  0        3       -3      0       0       0       0       0.5
        0       0       #Female wt-len-2
-3      40      34.6    35     0        30      -3      0       0       0       0       0.5
        0       0       #Female mat-len-1
-3      3       -0.7    -0.7   0        0.8     -3      0       0       0       0       0.5
        0       0       #Female mat-len-2
-3      3       1       1      0        0.8     -3      0       0       0       0       0.5
        0       0       #Female eggs/gm intercept
-3      3       0       0      0        0.8     -3      0       0       0       0       0.5
        0       0       #Female eggs/gm slope
-3      3       0.00001989  0.00001989  0       0.8     -3      0       0       0       0
        0.5     0       0       #Male wt-len-1
-3      4       2.997   2.997  0        3       -3      0       0       0       0       0.5
        0       0       #Male wt-len-2

-4 4 0 0 -1 99 -3 0 0 0 0 0.5 0 0 #_recrdistribution_by_growth_pattern
-4 4 0 0 -1 99 -3 0 0 0 0 0.5 0 0 #_recrdistribution_by_area 1
-4 4 0 0 -1 99 -3 0 0 0 0 0.5 0 0 #_recrdistribution_by_season 1
 0 2 1 1 -1 99 -3 0 0 0 0 0.5 0 0 #_cohort_growth_deviation
# Seasonal effects on biology parameters (0=none)
 0 0 0 0 0 0 0 0 0 0

#_Spawner-Recruitment
3 #_SR_function
#_LO   HI    INIT PRIOR PR_type SD PHASE
  3   30   5.5   12  -1    10    2  # SR_R0
0.2    1   0.7  0.71   0   0.8  -3  # SR_steep
  0    1   0.7   1.1   0    1   -1  # SR_sigmaR
  0    5    0     0   0    1   -3  # SR_envlink
  0    5    0     0   0    1   -3  # SR_R1_offset
  0         2     0    1            0    50  -50  # Autocorrelation placeholder (Future implementation)
0 #_SR_env_link
0 #_SR_env_target_1=devs;_2=R0;_3=steepness
1 #do_recr_dev:  0=none; 1=devvector; 2=simple deviations
# Recruitment residuals
1970      # Start year recruitment residuals
2006      # End year recruitment residuals
1         # Phase
1         # Read 13 advanced recruitment options: 0=no, 1=yes
0         # first year for early rec devs
-4        # phase for early rec devs
5         # Phase for forecast recruit deviations
100       # Lambda for forecast recr devs before endyr+1
1979      #_last_yr_nobias_adj_in_MPD
1980      # first year of full bias correction (linear ramp up from this year minus the plus-age to this year)
2004      # last year for full bias correction in_MPD
2005      #_first_recent_yr_nobias_adj_in_MPD
1         #_max_bias_adj_in_MPD (1.0 to mimic pre-2009 models)
0         #_placeholder
-15       # Lower bound rec devs
15        # Upper bound rec devs
0         # read intitial values for rec devs

# Fishing mortality setup
0.1       # F ballpark for tuning early phases
2008      # F ballpark year
1         # F method:  1=Pope's; 2=Instan. F; 3=Hybrid (recommended)
0.9       # max F or harvest rate, depends on F_Method
#init_F_setup,     for      each     fleet
#LO       HI       INIT     PRIOR    P_TYPE SD        PHASE
 0        1        0        0.0001   0       99       -1  #1  InitF_FISHERY1_Comm_Non-Live
 0        1        0        0.0001   0       99       -1  #2  InitF_FISHERY2_Comm_Live
 0        1        0        0.0001   0       99       -1  #3  InitF_FISHERY3_Rec_MM
 0        1        0        0.0001   0       99       -1  #4  InitF_FISHERY4_Rec_BB
 0        1        0        0.0001   0       99       -1  #5  InitF_FISHERY5_Rec_PBR
 0        1        0        0.0001   0       99       -1  #6  InitF_FISHERY6_Rec_CPFV
 0        1        0        0.0001   0       99       -1  #7  InitF_FISHERY7_Ghost

#_Q_setup
#_add_parm_row_for_each_positive_entry_below(row_then_column)
```

```
# A=do power, B=env-var, C=extra SD, D=devtype(<0=mirror, 0/1=none, 2=cons, 3=rand, 4=randwalk); E=0=num/1=bio,
F=err_type
# A B C D E F
 0     0     0     0     1     0 #1  InitF_FISHERY1_Comm_Non-Live
 0     0     0     0     1     0 #2  InitF_FISHERY2_Comm_Live
 0     0     0     0     1     0 #3  InitF_FISHERY3_Rec_MM
 0     0     0     0     1     0 #4  InitF_FISHERY4_Rec_BB
 0     0     0     0     1     0 #5  InitF_FISHERY5_Rec_PBR
 0     0     0     0     1     0 #6  InitF_FISHERY6_Rec_CPFV
 0     0     0     0     1     0 #7  InitF_FISHERY7_Ghost
 0     0     0     0     0     0 #8  InitF_SURVEY1_CPFV 1960-1999
 0     0     0     0     0     0 #9  InitF_SURVEY2_CPFV 2000-2008
 0     0     0     0     0     0 #10 InitF_SURVEY3_CPFV 1960-2008
 0     0     0     0     0     0 #11 InitF_SURVEY4_CalCOFI manta tows
 0     0     0     0     0     0 #12 InitF_SURVEY5_Edison Impingement
 0     0     0     0     0     0 #13 InitF_SURVEY6_PISCO_adult

#_size_selex_types
#_Pattern Discard Male Special
 24 0 0 0 # 1  Comm_Non-Live
 24 0 0 0 # 2 Comm_Live
 24 0 0 0 # 3 Rec_MM
 24 0 0 0 # 4 Rec_BB
 24 0 0 0 # 5  Rec_PBR
 24 0 0 0 # 6  Rec_CPFV
 0 0 0 0  # 7  CA_age_samples
 5 0 0 6  # 8  CPFV 1960-1999
 5 0 0 6  # 9  CPFV 2000-2008
 5 0 0 6  #10 CPFV 1960-2008
 33 0 0 0 #11 CalCOFI
 33 0 0 0 #12 Edison impingement
 30 0 0 0 #13 PISCO Adults

#_age_selex_types
#_Pattern Discard Male Special
 10 0 0 0 #1  Comm_Non-Live
 10 0 0 0 #2  Comm_Live
 10 0 0 0 #3  Rec_MM
 10 0 0 0 #4  Rec_BB
 10 0 0 0 #5  Rec_PBR
 10 0 0 0 #6  Rec_CPFV
 10 0 0 0 #7  CA_age_samples
 10 0 0 0 #8  CPFV_CPUE
 10 0 0 0 #9  CPFV 2000-2008
 10 0 0 0 #10 CPFV 1960-2008
 10 0 0 0 #11 CalCOFI
 10 0 0 0 #12 Edison Impingement
 10 0 0 0 #13 PISCO Adults

#_LO        HI     INIT          PRIOR    PR_type  SD PHASE env-var use_dev dev_minyr dev_maxyr
dev_stddev Block Block_Fxn
#FLEET 1 NOT THE LIVE FISH FISHERY
  10        91      35.543   35       1       0.05     -2      0      0      0      0      0.5
         0        0  # PEAK
 -5.0       3.0     -0.978  -0.99     1       0.05     -3      0      0      0      0      0.5
         0        0  # TOP:_width of plateau
 -4.0      12.0      3.467      3.4   1     0.05     -3      0      0      0      0      0.5     0
         0  # Asc_width
  -10       6.0      4         -1.0     1       0.05     -3      0      0      0      0      0.5
         0        0  # Desc_width
-15.0      15.0      -10       -5.0     1       0.05     -2      0      0      0      0      0.5
         0        0  # INIT:_selectivity_at_fist_bin
 -5.0      15.0      10        -0.3     1       0.05     -2      0      0      0      0      0.5
         0        0  # FINAL:_selectivity_at_last_bin
#FLEET 2 LIVE FISH FISHERY
  10    91   38.282     38   1     0.05   -2     0      0      0      0      0.5     1      2  # PEAK
 -5.0       3.0     -0.572     -0.3     1       0.05     -3      0      0      0      0      0.5
         1        2  # TOP:_width of plateau
 -4.0      12.0      3.367      2.3   1     0.05     -3      0      0      0      0      0.5     1
         2  # Asc_width
```

```
-10 6.0 -1.997 3.0 1 0.05 -3 0 0 0 0 0.5 1
2 # Desc_width
-15.0 5.0 -5 -5.0 1 0.05 -2 0 0 0 0 0.5
0 0 # INIT:_selectivity_at_fist_bin
-5.0 15.0 6.243 -3.5 1 0.05 -2 0 0 0 0 0.5
1 2 # FINAL:_selectivity_at_last_bin
#FLEET 3 Man Made
10 91 10.8 10.8 1 0.05 2 0 0 0 0 0.5
0 0 # PEAK
-5.0 3.0 -0.5 -0.5 1 0.05 3 0 0 0 0 0.5
0 0 # TOP:_width of plateau
-4.0 12.0 -0.6 -0.6 1 0.05 3 0 0 0 0 0.5
0 0 # Asc_width
-10 6.0 -2 -2.0 1 0.05 3 0 0 0 0 0.5
0 0 # Desc_width
-15.0 15.0 -10 -5.0 1 0.05 -2 0 0 0 0 0.5
0 0 # INIT:_selectivity_at_fist_bin
-5.0 15.0 -0.5 -0.5 1 0.05 2 0 0 0 0 0.5
0 0 # FINAL:_selectivity_at_last_bin
#FLEET 4 Shore
10 91 33.7 33.7 1 0.05 2 0 0 0 0 0.5
0 0 # PEAK
-5.0 3.0 -2.8 -2.8 1 0.05 3 0 0 0 0 0.5 0
0 # TOP:_width of plateau
-4.0 12.0 4.1 4.1 1 0.05 3 0 0 0 0 0.5 0
0 # Asc_width
-10 6.0 -1 -1.0 1 0.05 3 0 0 0 0 0.5
0 0 # Desc_width
-15.0 15.0 -10 -5.0 1 0.05 -2 0 0 0 0 0.5
0 0 # INIT:_selectivity_at_fist_bin
-5.0 15.0 -0.3 -0.3 1 0.05 2 0 0 0 0 0.5
0 0 # FINAL:_selectivity_at_last_bin
#FLEET 5 PBR
10 91 45 45 1 0.05 2 0 0 0 0 0.5
2 2 # PEAK
-5.0 3.0 -2.8 -2.8 1 0.05 3 0 0 0 0 0.5
2 2 # TOP:_width of plateau
-4.0 12.0 4.1 4.1 1 0.05 3 0 0 0 0 0.5 2
2 # Asc_width
-10 6.0 4 -1.0 1 0.05 -3 0 0 0 0 0.5
0 0 # Desc_width
-15.0 15.0 -10 -5.0 1 0.05 -2 0 0 0 0 0.5
0 0 # INIT:_selectivity_at_fist_bin
-5.0 15.0 10 -0.3 1 0.05 -2 0 0 0 0 0.5
0 0 # FINAL:_selectivity_at_last_bin
#FLEET 6 CPFV
10 91 45 45 1 0.05 2 0 0 0 0 0.5
2 2 # PEAK
-5.0 3.0 -2.8 -2.8 1 0.05 3 0 0 0 0 0.5
2 2 # TOP:_width of plateau
-4.0 12.0 4.1 4.1 1 0.05 3 0 0 0 0 0.5 2
2 # Asc_width
-10 6.0 4 -1.0 1 0.05 -3 0 0 0 0 0.5
0 0 # Desc_width
-15.0 15.0 -10 -5.0 1 0.05 -2 0 0 0 0 0.5
0 0 # INIT:_selectivity_at_fist_bin
-5.0 15.0 10 -0.3 1 0.05 -2 0 0 0 0 0.5
0 0 # FINAL:_selectivity_at_last_bin
#FLEET 7 CA_age_samples

#Survey 1: CPFV CPUE 1960-1999
1 44 1 1 0 10 -3 0 0 0 0 0.5 0 0
#min Len bin - fixed
1 100 44 50 0 10 -4 0 0 0 0 0.5 0
0 #max Len bin fixed

#Survey 2: CPFV CPUE 2000-2008
1 44 1 1 0 10 -3 0 0 0 0 0.5
0 0 #min Len bin - fixed
```

```
  1      100     44     50     0     10     -4     0     0     0     0     0.5
         0       0      #max Len bin fixed

#Survey 3: CPFV CPUE 1960-2008
  1      44      1      1      0     10     -3     0     0     0     0     0.5
         0       0      #min Len bin - fixed
  1      100     44     50     0     10     -4     0     0     0     0     0.5
         0       0      #max Len bin fixed

#Survey 4: CalCOFI
#Survey 5: Edison Impingement
#Survey 6: PISCO adult

1   #_Custom_block_setup SELECTIVITY BLOCK: 1999-2008
#FLEET 2 LIVE FISH FISHERY
  10      91     39.0307      38     1     0.05    -3   # PEAK
 -5.0     3.0    -0.601767    -0.3   1     0.05    -4   # TOP:_width of plateau
 -4.0     12.0   2.02299      2.3    1     0.05    -4   # Asc_width
  -10     6.0    2.56787      3.0    1     0.05    -4   # Desc_width
 -5.0     15.0   -0.816397    -3.5   1     0.05    -3   # FINAL:_selectivity_at_last_bin
#FLEET 5 PBR
  10      91     45     45     1     0.05    3     # PEAK
 -5.0     3.0    -2.8   -2.8   1     0.05    4     # TOP:_width of plateau
 -4.0     12.0   4.1    4.1    1     0.05    4     # Asc_width
#  -10    6.0    4      -1.0   1     0.05    -3    # Desc_width
# -5.0    15.0   10     -0.3   1     0.05    -2    # FINAL:_selectivity_at_last_bin
#FLEET 6 CPFV
  10      91     45     45     1     0.05    2     # PEAK
 -5.0     3.0    -2.8   -2.8   1     0.05    3     # TOP:_width of plateau
 -4.0     12.0   4.1    4.1    1     0.05    3     # Asc_width
#  -10    6.0    4      -1.0   1     0.05    -3    # Desc_width
# -5.0    15.0   10     -0.3   1     0.05    -2    # FINAL:_selectivity_at_last_bin

2    #separt_adj_method

# Tag loss and Tag reporting parameters go next
0  # TG_custom:  0=no read; 1=read if tags exist
#_Cond -6 6 1 1 2 0.01 -4 0 0 0 0 0 0 0  #_placeholder if no parameters

### Likelihood related quantities ###
1 # Do variance adjustments
#1  Comm: Non-live Fishery
#2  Comm: Live Fishery
#3  Rec: Man-made
#4  Rec: Beach/bank
#5  Rec: PBR
#6  Rec: CPFV
#7  CA age samples
#8  CPFV CPUE survey 1960-1999
#9  CPFV CPUE survey 2000-2008
#10 CPFV CPUE survey 1960-2008
#11 CalCOFI
#12 Edison Impingement
#13 PISCO adult survey
#       1       2       3       4       5       6       7       8       9       10      11
        12      13
#       0       0       0       0       0       0       0       0       0       0       0
        0       0       #_add_to_survey_CV
        0       0       0       0       0       0       0       0.28    0.43    0.29    0.1
        0.55    1.3     #_add_to_survey_CV
        0       0       0       0       0       0       0       0       0       0       0
        0       0       #_add_to_discard_stddev
        0       0       0       0       0       0       0       0       0       0       0
        0       0       #_add_to_bodywt_CV
#       1       1       1       1       1       1       1       1       1       1       1
        1       1       #_mult_by_lencomp_N
        1       3.7     1.6     2.5     1.3     1.2     1       1       1       1       1
        1       1       #_mult_by_lencomp_N
        1       1       1       1       1       1       1.3     1       1       1       1
        1       1       #_mult_by_agecomp_N
```

1 1 1 1 1 1 1 1 1 1 1
1 1 #_mult_by_size-at-age_N

30 # DF For discard T-distribution
30 # DF For meanbodywt T-distribution
1 #_maxlambdaphase
0 #_sd_offset
4 # N changes to default Lambdas = 1.0

```
#####################################
#Example of changes to default lambda
#3 # number of changes to make to default Lambdas (default value is 1.0)
# Like_comp codes:  1=surv; 2=disc; 3=mnwt; 4=length; 5=age; 6=SizeFreq; 7=sizeage; 8=catch;
# 9=init_equ_catch; 10=recrdev; 11=parm_prior; 12=parm_dev; 13=CrashPen; 14=Morphcomp; 15=Tag-comp; 16=Tag-negbin
#like_comp fleet/survey  phase  value  sizefreq_method
#  1 8 1 0 1 #_CPUE/survey:_1 CPFV Logbook 1960-1999
#  1 9 1 0 1 #_CPUE/survey:_2 CPFV Logbook 2000-2008
 1 10 1 0 1 #_CPUE/survey:_3 CPFV Logbook 1960-2008
 1 11 1 0 1 #_CPUE/survey:_4 CalCOFI
 1 12 1 0 1 #_CPUE/survey:_5 Edison Impingement
 1 13 1 0 1 #_CPUE/survey:_6 PISCO Adult
#  4 1 1 0 1 #_lencomp:_FLEET 1
#  4 2 1 0 1 #_lencomp:_FLEET 2
#  4 3 1 0 1 #_lencomp:_FLEET 3
#  4 4 1 0 1 #_lencomp:_FLEET 4
#  4 5 1 0 1 #_lencomp:_FLEET 5
#  4 6 1 0 1 #_lencomp:_FLEET 6
#  5 7 1 0 1 #_Cond_age:_Females, Males, & Unsexed
#  1 1 1 0 1 #_init_equ_catch
#  1 1 1 0 1 #_recruitments
#  1 1 1 0 1 #_parameter-priors
#  1 1 1 0 1 #_parameter-dev-vectors
#  1 1 1 0 1 #_crashPenLambda
#####################################

0 # (0/1) read specs for more stddev reporting
# 1 1 -1 5 1 5 # selex type, len/age, year, N selex bins, Growth pattern, N growth ages
# 3 9 15 21 27 # vector with selex std bin picks (-1 in first bin to self-generate)
# 1 2 14 26 40 # vector with growth std bin picks (-1 in first bin to self-generate)

999 # end of control file
```

Appendix E-1. Data file for CAS.

```
# CAS cabezon data file 2009, SS v3.03a, May 2009
1916 #_styr
2008 #_endyr
1	#N_seasons_per_year
12	#vector_with_N_months_in_each_season
1	#spawning_season_-_spawning_will_occur_at_beginning_of_this_season
7	#N_fishing_fleets
9	#N_surveys;_data_type_numbers_below_must_be_sequential_with_the_N_fisheries
1	#Number of areas

fleet1%fleet2%fleet3%fleet4%fleet5%fleet6%fleet7%survey1%survey2%survey3%survey4%survey5%survey6%survey7%survey8%
survey9
0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	#_surveytiming_in_season
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	#_area_assignments_for_each_fishery_and_survey
1 1 1 1 1 1 1	# Units for catch by fishing fleet: 1=Biomass(mt),2=Numbers(1000s)
0.01 0.01 0.01 0.01 0.01 0.01 0.01  # SE of log(catch) by fleet for equilibrium and continuous options

2	#number_of_genders(1 / 2)
35	#accumulator_age;_model_always_starts_with_age_0

#Catch	(mt)
#Fleet1	Fleet2	Fleet3	Fleet4	Fleet5	Fleet6 Fleet7
#CommNL		CommL	MM	Shore	PBR	CPFV	age_samples	Year	Season
0	0	0	0	0	0	0	#initial_equilibrium
93 # Number of lines catch data - FINAL CATCHES w/discards
```

0.03	0.00	0.35	0.73	0.00	0.00	0	1916	1
0.15	0.00	0.35	0.73	0.00	0.00	0	1917	1
0.08	0.00	0.35	0.73	0.00	0.00	0	1918	1
0.00	0.00	0.35	0.73	0.00	0.00	0	1919	1
0.00	0.00	0.35	0.73	0.00	0.00	0	1920	1
0.00	0.00	0.35	0.73	0.00	0.00	0	1921	1
0.00	0.00	0.35	0.73	0.00	0.00	0	1922	1
0.00	0.00	0.35	0.73	0.00	0.00	0	1923	1
0.00	0.00	0.35	0.73	0.00	0.00	0	1924	1
1.52	0.00	0.35	0.73	0.00	0.00	0	1925	1
0.00	0.00	0.35	0.73	0.00	0.00	0	1926	1
0.34	0.00	0.35	0.73	0.00	0.00	0	1927	1
1.19	0.00	0.35	0.73	0.02	0.04	0	1928	1
0.54	0.00	0.38	0.75	0.52	1.06	0	1929	1
0.47	0.00	0.56	1.12	0.78	1.58	0	1930	1
0.51	0.00	0.75	1.49	1.04	2.11	0	1931	1
2.12	0.00	0.94	1.86	1.30	2.64	0	1932	1
1.93	0.00	1.12	2.24	1.56	3.16	0	1933	1
2.37	0.00	1.31	2.61	1.82	3.69	0	1934	1
4.78	0.00	1.50	2.98	2.08	4.22	0	1935	1
8.34	0.00	2.10	4.19	2.92	5.93	0	1936	1
3.71	0.00	1.76	3.57	2.49	5.03	0	1937	1
2.46	0.00	3.53	6.97	4.86	9.88	0	1938	1
1.82	0.00	1.91	3.88	2.70	5.46	0	1939	1
1.54	0.00	2.70	5.58	3.88	7.82	0	1940	1
6.05	0.00	2.28	5.48	0.25	6.34	0	1941	1
1.04	0.00	2.28	5.48	0.25	6.34	0	1942	1
3.41	0.00	2.28	5.48	0.25	6.34	0	1943	1
1.77	0.00	2.28	5.48	0.25	6.34	0	1944	1
1.95	0.00	2.28	5.48	0.25	6.34	0	1945	1
3.54	0.00	2.28	5.48	0.25	6.34	0	1946	1
2.05	0.00	8.74	21.48	12.11	24.60	0	1947	1
3.72	0.00	11.48	28.56	16.06	32.55	0	1948	1
7.28	0.00	10.98	26.56	15.03	30.61	0	1949	1
9.83	0.00	12.02	29.98	16.85	34.14	0	1950	1
10.82	0.00	13.90	35.21	19.73	39.86	0	1951	1
15.65	0.00	8.19	19.20	10.94	22.41	0	1952	1
6.04	0.00	6.97	14.60	8.53	17.85	0	1953	1
2.82	0.00	8.73	14.03	8.79	19.38	0	1954	1
3.15	0.00	8.15	12.83	12.68	17.91	0	1955	1
5.62	0.00	12.52	23.31	28.19	30.02	0	1956	1
5.99	0.00	10.25	20.01	23.89	25.23	0	1957	1

8.85	0.00	7.00	14.01	16.37	17.28	0	1958	1
4.30	0.00	4.05	15.62	10.89	11.12	0	1959	1
1.39	0.00	1.91	11.79	12.72	5.53	0	1960	1
2.25	0.00	1.94	11.85	10.50	4.71	0	1961	1
1.12	0.00	3.65	20.08	17.32	8.44	0	1962	1
1.28	0.00	7.83	44.17	37.95	18.22	0	1963	1
2.40	0.00	5.00	18.66	22.19	11.28	0	1964	1
3.37	0.00	6.10	24.53	33.24	14.09	0	1965	1
5.72	0.00	8.14	30.82	43.14	18.45	0	1966	1
6.48	0.00	4.23	17.02	22.47	9.61	0	1967	1
9.12	0.00	3.40	14.28	18.48	7.84	0	1968	1
11.72	0.00	3.47	14.92	19.13	8.09	0	1969	1
4.85	0.00	5.19	23.33	29.34	12.30	0	1970	1
2.05	0.00	3.72	14.79	24.73	8.40	0	1971	1
2.66	0.00	9.26	34.26	61.92	20.39	0	1972	1
2.07	0.00	6.52	29.60	43.05	15.52	0	1973	1
6.76	0.00	6.00	26.52	39.68	14.12	0	1974	1
3.33	0.00	5.14	18.08	34.45	11.11	0	1975	1
8.69	0.00	5.48	20.20	36.33	12.80	0	1976	1
5.51	0.00	7.89	19.54	32.42	11.88	0	1977	1
12.89	0.00	12.62	31.43	51.42	18.97	0	1978	1
22.83	0.00	7.46	18.28	31.26	11.29	0	1979	1
27.23	0.00	13.90	58.01	71.41	14.65	0	1980	1
29.21	0.00	7.50	24.00	96.13	13.82	0	1981	1
28.94	0.00	3.82	33.96	86.49	13.38	0	1982	1
10.97	0.00	8.83	41.38	45.96	11.52	0	1983	1
8.68	0.00	12.24	20.69	73.81	4.89	0	1984	1
12.07	0.00	6.41	17.72	49.62	3.54	0	1985	1
7.55	0.00	7.30	51.31	89.04	9.66	0	1986	1
4.11	0.00	6.77	22.33	89.31	11.16	0	1987	1
5.93	0.00	10.16	30.58	53.22	9.07	0	1988	1
11.63	0.00	6.82	33.50	58.77	7.07	0	1989	1
12.07	0.00	5.74	21.72	60.77	10.65	0	1990	1
7.57	0.00	5.74	21.92	59.81	10.53	0	1991	1
17.09	0.00	8.95	36.71	80.14	14.79	0	1992	1
19.59	0.40	2.19	25.98	50.88	6.82	0	1993	1
10.04	32.14	1.69	13.36	40.02	4.35	0	1994	1
12.41	80.50	1.31	21.78	47.03	6.24	0	1995	1
8.56	107.80	3.04	29.94	44.33	8.17	0	1996	1
22.32	113.65	3.26	40.50	13.49	7.20	0	1997	1
15.02	165.98	1.49	48.81	26.28	10.15	0	1998	1
9.10	119.07	1.26	7.62	32.16	7.95	0	1999	1
6.35	113.03	0.49	10.21	19.75	7.23	0	2000	1
3.91	70.54	6.56	5.42	31.10	10.92	0	2001	1
5.44	46.14	0.61	15.23	24.79	5.49	0	2002	1
4.55	42.34	1.84	15.72	72.59	13.39	0	2003	1
3.41	51.09	3.62	11.77	23.31	8.62	0	2004	1
4.28	31.47	2.50	9.57	26.13	11.41	0	2005	1
4.24	28.94	0.66	3.33	16.20	7.03	0	2006	1
3.44	26.21	1.99	3.04	14.88	6.85	0	2007	1
2.19	21.55	1.41	8.11	9.40	6.93	0	2008	1

#Abundance_Indices
216 #_N_observations

#Year	Season	Type	Value	CV	
1960	1	8	0.003569573	0.1264597	#CPFV 1960-1999
1961	1	8	0.004188287	0.11550688	
1962	1	8	0.006246827	0.11716954	
1963	1	8	0.010074766	0.10957163	
1964	1	8	0.009629989	0.10614817	
1965	1	8	0.009805879	0.09790296	
1966	1	8	0.011286564	0.09044949	
1967	1	8	0.00644204	0.0896925	
1968	1	8	0.003947586	0.10387586	
1969	1	8	0.003838455	0.11684276	
1970	1	8	0.005224122	0.09562956	
1971	1	8	0.004496888	0.10465009	
1972	1	8	0.008650627	0.08861907	
1973	1	8	0.00601308	0.08884906	
1974	1	8	0.006211383	0.09231888	

1975	1	8	0.005058109	0.08820247	
1976	1	8	0.004568031	0.09062617	
1977	1	8	0.003940812	0.09395383	
1978	1	8	0.00656997	0.08647531	
1980	1	8	0.005250099	0.08683573	
1981	1	8	0.003767996	0.08944441	
1982	1	8	0.002732926	0.10409536	
1983	1	8	0.002990655	0.10712495	
1984	1	8	0.001142674	0.11529581	
1985	1	8	0.001346136	0.11562747	
1986	1	8	0.003282127	0.11705519	
1987	1	8	0.005006518	0.09172441	
1988	1	8	0.005382393	0.09315619	
1989	1	8	0.005303112	0.09976812	
1990	1	8	0.005128299	0.08385973	
1991	1	8	0.003764223	0.0887545	
1992	1	8	0.003091355	0.0898675	
1993	1	8	0.0020728	0.10790711	
1994	1	8	0.001233568	0.14491168	
1995	1	8	0.001421875	0.11158891	
1996	1	8	0.002831094	0.08992817	
1997	1	8	0.002703445	0.08719669	
1998	1	8	0.001853618	0.10983901	
1999	1	8	0.001970287	0.12568128	
2000	1	9	0.00135106	0.1314358	#CPFV 2000-2008
2001	1	9	0.002170723	0.1356551	
2002	1	9	0.000900426	0.1818937	
2003	1	9	0.002465609	0.1238841	
2004	1	9	0.002262145	0.1307548	
2005	1	9	0.002156659	0.1291184	
2006	1	9	0.001596934	0.1322206	
2007	1	9	0.00160575	0.1400739	
2008	1	9	0.001703499	0.1388095	
1960	1	10	0.003603473	0.12529667	#CPFV 1960-2008
1961	1	10	0.00422777	0.11340875	
1962	1	10	0.006342528	0.1128821	
1963	1	10	0.010160662	0.10873295	
1964	1	10	0.009884469	0.09495078	
1965	1	10	0.010039024	0.09397481	
1966	1	10	0.011782677	0.09180671	
1967	1	10	0.006726405	0.08505302	
1968	1	10	0.004090315	0.09266688	
1969	1	10	0.003963075	0.10857903	
1970	1	10	0.005402911	0.09194584	
1971	1	10	0.004605732	0.10029151	
1972	1	10	0.008963003	0.08726804	
1973	1	10	0.006188497	0.08181022	
1974	1	10	0.006404248	0.08721701	
1975	1	10	0.005225801	0.08884661	
1976	1	10	0.00467619	0.08276395	
1977	1	10	0.004064863	0.09296821	
1978	1	10	0.006758306	0.08645533	
1980	1	10	0.005425769	0.08625227	
1981	1	10	0.003866641	0.09578397	
1982	1	10	0.00278264	0.09791423	
1983	1	10	0.003021278	0.10255609	
1984	1	10	0.001134578	0.1136517	
1985	1	10	0.0013361	0.11820532	
1986	1	10	0.003317589	0.11604652	
1987	1	10	0.005121936	0.09287003	
1988	1	10	0.005473009	0.09321711	
1989	1	10	0.005376785	0.08362734	
1990	1	10	0.005171739	0.08607796	
1991	1	10	0.003827265	0.09261628	
1992	1	10	0.00315013	0.09085644	
1993	1	10	0.002074089	0.10840646	
1994	1	10	0.001238437	0.1477387	
1995	1	10	0.001434396	0.11303097	
1996	1	10	0.002936946	0.09233882	
1997	1	10	0.002756911	0.08213361	

1998	1	10	0.001856165		0.10009348	
1999	1	10	0.001956529		0.12013276	
2000	1	10	0.001805899		0.12296804	
2001	1	10	0.002824685		0.11623809	
2002	1	10	0.001249648		0.15946963	
2003	1	10	0.003801144		0.11878178	
2004	1	10	0.003101041		0.11312068	
2005	1	10	0.002980493		0.1173888	
2006	1	10	0.002150293		0.11092879	
2007	1	10	0.002202424		0.11301302	
2008	1	10	0.002243224		0.11618095	
1977	1	11	0.6282	0.3117		#TENERA adult
1978	1	11	0.9299	0.6584		
1979	1	11	0.8947	0.1842		
1980	1	11	0.7827	0.4417		
1981	1	11	0.5391	0.5321		
1982	1	11	0.7835	0.5442		
1983	1	11	0.5204	0.5568		
1984	1	11	0.252	0.7899		
1985	1	11	0.5272	0.4939		
1986	1	11	1.6052	0.5201		
1987	1	11	0.7935	0.6916		
1988	1	11	0.9752	0.4046		
1989	1	11	0.9113	0.3631		
1990	1	11	0.8514	0.3892		
1991	1	11	1.1086	0.2669		
1992	1	11	0.6737	0.4345		
1993	1	11	0.36	1.0358		
1994	1	11	0.3001	0.183		
1995	1	11	0.3806	0.5293		
1996	1	11	0.3287	1.0193		
1997	1	11	0.5408	0.3845		
1999	1	11	0	1.8341		
2000	1	11	0.2644	0.3253		
2001	1	11	0.2667	0.44		
2002	1	11	0.2339	0.2249		
2003	1	11	0.3397	0.2538		
2004	1	11	0.5032	0.2911		
2005	1	11	0.324	0.1774		
2006	1	11	0.4918	0.3489		
2007	1	11	0.1668	0.447		
2008	1	11	0.3515	0.2369		
1999	1	12	0.0739	0.2585712		#PISCO adults
2000	1	12	0.0640	0.2642103		
2001	1	12	0.0772	0.2531238		
2002	1	12	0.0441	0.2185799		
2003	1	12	0.0979	0.1092816		
2004	1	12	0.0537	0.1671391		
2005	1	12	0.0409	0.177508		
2006	1	12	0.0453	0.1653677		
2007	1	12	0.0459	0.1272527		
2008	1	12	0.0539	0.1151816		
1999	1	13	0.0193	0.3426557		#PISCO SMURFS
2000	1	13	0.0331	0.201354		
2001	1	13	0.1739	0.2195138		
2002	1	13	0.0253	0.2085032		
2003	1	13	0.0599	0.2264606		
2004	1	13	0.0210	0.2269958		
2005	1	13	0.0066	0.296077		
2006	1	13	0.0202	0.2296618		
2007	1	13	0.0159	0.2409526		
2008	1	13	0.0203	0.2531415		
2006	1	14	0.2755	0.4435		#SLO SMURFS
2007	1	14	0.2769	0.5095		
2008	1	14	1.1772	0.2981		
1978	1	15	0.016469	0.716219		#CalCOFI: manta tows
1980	1	15	0.003682	1.525368		
1981	1	15	0.001965	0.353765		
1983	1	15	0.000745	0.862236		
1984	1	15	0.001515	0.385216		

1985	1	15	0.004325	0.427435	
1986	1	15	0.001908	0.449719	
1987	1	15	0.001061	0.611327	
1988	1	15	0.002251	0.550732	
1989	1	15	0.004629	0.474342	
1990	1	15	0.000755	0.600677	
1991	1	15	0.002051	0.597394	
1992	1	15	0.000855	0.788863	
1993	1	15	0.000471	0.513378	
1994	1	15	0.000133	0.866171	
1995	1	15	0.002915	0.522748	
1996	1	15	0.002699	0.454805	
1997	1	15	0.002193	0.408187	
1998	1	15	0.000189	0.50679	
1999	1	15	0.002981	0.40929	
2000	1	15	0.002236	0.532012	
2001	1	15	0.001094	0.486084	
2002	1	15	0.003644	0.400154	
2003	1	15	0.007146	0.461904	
2004	1	15	0.002537	0.527275	
2005	1	15	0.001678	0.397993	
2006	1	15	0.006018	0.362456	
2007	1	15	0.001973	0.45983	
2008	1	15	0.004615	0.592653	
1972	1	16	9.91E-04	0.3375879	#Edison Impingement
1973	1	16	1.92E-03	0.278647	
1974	1	16	1.13E-03	0.2066957	
1975	1	16	2.27E-03	0.1251556	
1976	1	16	1.68E-03	0.1312414	
1977	1	16	9.64E-04	0.2322483	
1978	1	16	7.53E-04	0.1857204	
1979	1	16	4.89E-04	0.2186301	
1980	1	16	6.75E-04	0.1667745	
1981	1	16	6.36E-04	0.2232059	
1982	1	16	5.22E-04	0.273381	
1983	1	16	4.54E-04	0.2476573	
1984	1	16	7.14E-04	0.2283976	
1985	1	16	5.54E-04	0.1997272	
1986	1	16	3.08E-04	0.2069409	
1987	1	16	5.98E-04	0.2040686	
1988	1	16	1.44E-04	0.3873733	
1989	1	16	5.16E-04	0.2642365	
1990	1	16	3.37E-04	0.2750285	
1991	1	16	4.64E-04	0.2425585	
1992	1	16	2.82E-04	0.2307056	
1993	1	16	1.10E-04	0.3610428	
1994	1	16	1.43E-04	0.3517632	
1995	1	16	1.10E-04	0.4753732	
1996	1	16	6.73E-05	0.4754682	
1997	1	16	1.52E-04	0.3397869	
1998	1	16	6.24E-05	0.4211199	
1999	1	16	8.50E-04	0.1974443	
2000	1	16	3.07E-04	0.3912762	
2001	1	16	1.95E-04	0.5737525	
2002	1	16	6.06E-04	0.4017963	
2003	1	16	8.96E-04	0.4861232	
2004	1	16	3.48E-04	0.6324122	
2005	1	16	5.65E-05	0.6582139	
2006	1	16	4.90E-04	0.782376	
2007	1	16	3.19E-04	0.5970551	
2008	1	16	7.40E-04	0.5104997	

#_Discard_Biomass
1 #_(1=biomass;_2=fraction)
0 #_N_observations

#_Mean_BodyWt
109

#Year	Seas	Type	Mkt	Value	CV
1980	1	3	2	0.772	1.436

1981	1	3	2	0.693	0.806
1982	1	3	2	0.692	0.822
1983	1	3	2	0.722	0.807
1984	1	3	2	0.961	0.925
1985	1	3	2	0.539	0.979
1986	1	3	2	0.890	0.838
1987	1	3	2	0.789	0.778
1988	1	3	2	1.250	0.921
1989	1	3	2	0.785	0.884
1993	1	3	2	0.535	0.986
1994	1	3	2	0.936	0.672
1995	1	3	2	0.290	0.415
1996	1	3	2	0.525	0.684
1997	1	3	2	0.736	0.890
1998	1	3	2	0.686	0.618
1999	1	3	2	0.288	0.699
2000	1	3	2	0.146	1.403
2001	1	3	2	1.111	0.573
2002	1	3	2	0.348	0.706
2003	1	3	2	1.040	0.686
2004	1	3	2	1.050	0.923
2005	1	3	2	1.116	0.757
2006	1	3	2	0.724	0.592
2007	1	3	2	1.421	1.059
2008	1	3	2	0.701	0.927
1980	1	4	2	1.172	0.775
1981	1	4	2	0.803	0.524
1982	1	4	2	1.074	0.766
1983	1	4	2	0.963	0.552
1984	1	4	2	0.997	0.584
1985	1	4	2	0.746	0.601
1986	1	4	2	1.011	0.648
1987	1	4	2	0.792	0.743
1988	1	4	2	0.871	0.662
1989	1	4	2	1.210	0.848
1993	1	4	2	1.053	0.678
1994	1	4	2	0.996	0.782
1995	1	4	2	0.986	0.726
1996	1	4	2	0.951	0.472
1997	1	4	2	1.120	0.516
1998	1	4	2	1.125	0.441
1999	1	4	2	0.841	0.473
2000	1	4	2	0.908	0.686
2001	1	4	2	0.961	0.436
2002	1	4	2	1.244	0.580
2003	1	4	2	1.507	0.517
2004	1	4	2	1.948	0.452
2005	1	4	2	1.355	0.665
2006	1	4	2	1.888	0.627
2007	1	4	2	1.400	0.214
2008	1	4	2	1.374	0.249
1980	1	5	2	1.499	0.540
1981	1	5	2	1.932	0.955
1982	1	5	2	1.405	0.567
1983	1	5	2	1.351	0.647
1984	1	5	2	1.367	0.482
1985	1	5	2	1.514	0.590
1986	1	5	2	1.281	0.584
1987	1	5	2	1.429	0.537
1988	1	5	2	1.380	0.578
1989	1	5	2	1.370	0.612
1993	1	5	2	1.296	0.554
1994	1	5	2	1.346	0.639
1995	1	5	2	1.471	0.706
1996	1	5	2	1.400	0.652
1997	1	5	2	1.090	0.518
1998	1	5	2	1.349	0.569
1999	1	5	2	1.272	0.500
2000	1	5	2	1.524	0.463
2001	1	5	2	1.636	0.451

2002	1	5	2	1.480	0.742
2003	1	5	2	1.622	0.476
2004	1	5	2	2.175	0.544
2005	1	5	2	2.273	0.448
2006	1	5	2	1.938	0.491
2007	1	5	2	2.108	0.462
2008	1	5	2	2.005	0.507
1947	1	6	2	2.268	0.500
1948	1	6	2	2.268	0.500
1949	1	6	2	2.268	0.500
1950	1	6	2	2.268	0.500
1951	1	6	2	2.268	0.500
1980	1	6	2	1.288	0.580
1981	1	6	2	1.256	0.526
1982	1	6	2	1.040	1.029
1983	1	6	2	1.143	0.903
1984	1	6	2	1.100	0.519
1985	1	6	2	1.317	0.640
1986	1	6	2	1.571	1.085
1987	1	6	2	1.262	0.450
1988	1	6	2	1.359	0.897
1989	1	6	2	0.813	0.623
1993	1	6	2	0.850	0.898
1994	1	6	2	1.417	0.440
1995	1	6	2	2.309	0.525
1996	1	6	2	1.527	0.800
1997	1	6	2	0.677	0.406
1998	1	6	2	1.246	0.575
1999	1	6	2	1.298	0.702
2000	1	6	2	1.519	0.707
2001	1	6	2	1.144	0.348
2002	1	6	2	1.391	0.973
2003	1	6	2	2.316	0.560
2004	1	6	2	2.103	0.408
2005	1	6	2	2.278	0.397
2006	1	6	2	1.745	0.538
2007	1	6	2	2.362	0.461
2008	1	6	2	2.289	0.464

Population size structure
1 # Length bin method: 1=Use data bins
Lower edge of bins

#6	8	10	12	14	16	18	20	22	24	26	28
	30	32	34	36	38	40	42	44	46	48	50
	52	54	56	58	60	62	64	66	68	70	72
	74	76	78	80	82	84	86	88	90	92	

0.0001 # Minimum proportion for compressing tails of observed compositional data
0.0001 # Constant added to expected frequencies
0 # Combine males and females at and below this bin number
44 #_N_length_bins
#_lower_edge_of_length_bins

6	8	10	12	14	16	18	20	22	24	26	28
	30	32	34	36	38	40	42	44	46	48	50
	52	54	56	58	60	62	64	66	68	70	72
	74	76	78	80	82	84	86	88	90	92	

148 #N_observations - do we need to put a cap on some of these sample sizes per Method recommendation - 300?

#Year	Seas	Fleet	sexes	Mkt	Nsamp	begin	data:	females	then	males	
#Fleet 1 Not live fish fishery											
1995	1	1	0	0	71	0	0	0	0	0	0
	0	0	0	0	255	211	378	410	330	438	294
	301	165	505	64	41	109	73	35	2	22	3
	0	0	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1996	1	1	0	0	231	0	0	0	0	0	0
	0	2	2	28	86	243	509	597	506	442	309
	204	170	150	156	134	77	50	32	21	19	0

	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1997	1	1	0	0	102	0	0	0	0	0	0
	0	0	0	4	23	85	450	706	594	706	527
	490	608	150	359	182	184	103	89	147	141	141
	0	77	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	1	0	0	26	0	0	0	0	0	0
	0	0	0	0	28	28	257	406	753	601	548
	875	214	66	100	182	0	26	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1999	1	1	0	0	8	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	134	542	456
	412	414	230	75	0	80	0	55	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2000	1	1	0	0	8	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	338	518
	253	253	308	196	237	55	140	140	0	55	0
	0	0	70	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

#Fleet 2 Live fish fishery

1997	1	2	0	0	16	0	0	0	0	0	0
	0	0	0	0	0	0	0	96	1440	1632	2496
	1632	2112	864	960	576	576	288	192	96	192	0
	96	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	2	0	0	111	0	0	0	0	0	0
	0	0	0	0	476	2443	7430	10842	20456	23249	18562
	12723	11932	4637	3847	2460	1442	666	954	815	312	133
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1999	1	2	0	0	174	0	0	0	0	0	0
	0	0	0	48	0	65	26	281	2590	16100	15080
	10976	8326	5929	3277	2809	1864	1327	1173	458	535	207
	68	6	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

2000	1	2	0	0	323	0	0	0	0	0	0
	0	0	0	0	16	42	87	128	5872	13902	12400
	10458	6570	5997	4051	2499	1541	1602	648	363	255	114
	121	21	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	2	0	0	156	0	0	0	0	0	0
	0	0	0	0	0	0	0	12	878	3910	9455
	8455	6143	4749	2930	1664	845	833	285	246	160	48
	0	12	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	2	0	0	37	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1934	5189
	3128	2639	2383	2704	1483	1406	1132	637	508	360	202
	0	64	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	2	0	0	11	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	567
	926	435	545	247	265	635	610	1830	117	610	727
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	2	0	0	36	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	192	1375
	2183	916	208	101	6	274	245	306	378	123	70
	115	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	2	0	0	29	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	59	1667
	1041	1081	717	479	39	153	370	177	114	67	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	2	0	0	34	0	0	0	0	0	0
	0	0	0	0	0	64	215	64	128	466	3281
	2940	1796	1845	1519	766	388	572	194	486	325	0
	0	0	0	32	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	2	0	0	50	0	0	0	0	0	0
	0	0	0	0	0	0	0	6	0	97	663
	756	393	239	285	130	120	173	108	210	101	67
	45	0	31	10	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	2	0	0	38	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	44	66	930
	801	960	844	663	801	523	68	108	69	23	23
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
#Fleet 3 Manmade mode											
1980	1	3	0	0	40	0	0	0	0	0	1
	2	4	3	4	8	4	4	5	4	2	2
	1	2	1	1	1	1	1	0	1	1	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1981	1	3	0	0	29	0	0	0	0	0	0
	0	2	1	3	9	4	8	5	4	2	1
	1	0	2	1	2	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1982	1	3	0	0	24	0	0	0	0	0	2
	1	1	0	2	0	5	2	5	1	1	2
	1	0	1	0	0	0	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1983	1	3	0	0	29	0	0	0	0	0	1
	1	2	0	6	6	3	2	3	4	3	1
	2	3	1	1	0	0	1	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1984	1	3	0	0	33	0	0	1	0	1	3
	0	0	3	1	0	5	3	6	1	4	0
	1	1	0	2	2	1	1	1	0	1	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1985	1	3	0	0	31	0	0	1	1	1	2
	2	2	4	8	4	2	7	2	2	0	1
	0	2	1	0	2	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1986	1	3	0	0	29	0	0	0	0	1	0
	0	1	0	3	4	4	5	3	1	2	1
	2	0	1	1	2	1	1	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1987	1	3	0	0	33	0	0	0	0	1	2
	3	1	1	1	4	3	6	3	1	4	6
	2	0	3	0	3	1	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1988	1	3	0	0	25	0	1	0	2	0	2
	1	1	1	0	3	5	3	5	1	2	0
	1	1	3	2	2	1	4	0	1	0	0
	3	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1989	1	3	0	0	16	0	1	0	0	0	2
	0	0	2	1	0	3	1	3	1	2	1
	2	0	0	1	0	1	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1993	1	3	0	0	21	0	0	0	1	0	2
	0	5	2	2	5	2	2	4	0	2	1
	0	0	1	0	0	1	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1994	1	3	0	0	5	0	0	0	0	0	0
	0	0	1	0	0	1	0	0	1	0	1
	1	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1996	1	3	0	0	15	0	0	1	1	1	1
	0	3	0	2	1	1	2	2	1	0	3
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1997	1	3	0	0	4	0	0	0	0	0	0
	0	2	0	1	1	0	0	0	0	0	1
	0	1	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	3	0	0	3	0	0	0	0	0	0
	0	0	1	1	0	0	0	0	1	2	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1999	1	3	0	0	9	0	0	1	0	1	0
	0	4	2	2	0	2	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2000	1	3	0	0	4	0	0	2	4	3	0
	0	0	0	0	1	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	3	0	0	7	0	0	0	0	0	1
	2	2	1	2	2	1	4	1	0	0	0
	1	1	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	3	0	0	6	0	0	0	1	0	0
	1	0	1	0	1	2	0	0	1	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	3	0	0	5	0	0	0	0	0	0
	0	0	0	0	0	1	1	0	0	2	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	3	0	0	16	0	0	0	0	0	1
	0	2	1	3	0	3	2	1	2	0	1
	0	1	0	1	0	0	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	3	0	0	25	0	0	0	0	0	0
	1	0	3	1	2	3	4	2	1	1	2
	5	1	0	1	1	3	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

2006	1	3	0	0	12	0	0	0	0	0	0
	0	1	0	1	3	2	0	0	3	1	2
	0	0	1	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	3	0	0	13	0	0	0	0	0	0
	1	1	1	1	2	0	1	2	0	0	0
	0	0	1	2	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	3	0	0	21	0	0	0	0	0	0
	0	1	1	2	3	3	5	2	0	0	2
	0	0	2	1	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
#Fleet 4 Beach/bank mode											
1980	1	4	0	0	35	0	0	0	0	1	1
	0	0	1	1	3	4	3	6	2	5	1
	3	7	4	4	2	3	0	1	2	0	0
	0	0	0	0	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1981	1	4	0	0	36	0	0	0	0	0	0
	0	0	2	4	0	7	5	8	9	9	4
	2	3	3	2	0	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1982	1	4	0	0	50	0	0	0	0	1	0
	0	1	3	3	5	3	6	6	7	5	5
	3	6	5	4	3	2	2	0	0	0	2
	1	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1983	1	4	0	0	60	0	0	0	0	0	0
	1	2	2	2	7	5	3	11	9	22	10
	16	7	7	3	3	2	0	2	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1984	1	4	0	0	30	0	0	0	0	0	0
	1	0	1	2	1	1	3	2	4	5	3
	2	4	1	1	2	0	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1985	1	4	0	0	36	0	0	2	0	2	0
	0	3	1	3	2	6	4	7	9	8	4
	4	6	1	0	0	1	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1986	1	4	0	0	42	0	0	0	0	0	0
	1	0	3	3	4	1	8	9	8	8	5
	8	6	9	2	3	1	0	0	3	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1987	1	4	0	0	22	0	0	1	1	1	0
	2	2	1	0	1	0	3	2	2	4	4
	1	0	0	1	1	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1988	1	4	0	0	7	0	0	0	0	0	0
	1	0	0	0	0	1	0	1	1	0	0
	0	1	1	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1989	1	4	0	0	11	0	0	0	0	0	2
	0	5	1	0	0	1	0	2	1	0	1
	3	2	6	1	0	0	2	1	0	1	1
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1993	1	4	0	0	42	0	0	0	0	1	0
	1	0	2	0	2	1	3	8	9	10	6
	9	4	4	2	3	1	0	1	2	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1994	1	4	0	0	15	0	0	0	0	0	1
	1	0	0	1	0	1	1	1	2	6	1
	0	3	1	0	2	1	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1996	1	4	0	0	38	0	0	0	0	0	0
	0	0	0	1	1	4	7	5	16	10	9
	6	4	3	2	0	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1997	1	4	0	0	27	0	0	0	0	0	0
	0	0	2	1	3	2	2	7	6	7	9
	7	6	5	2	2	1	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	4	0	0	34	0	0	0	0	0	0
	0	0	0	1	2	2	6	7	9	8	11
	6	11	5	1	0	3	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1999	1	4	0	0	23	0	0	0	0	0	0
	0	0	0	2	1	5	6	12	5	6	3
	5	1	0	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2000	1	4	0	0	15	0	0	0	0	0	0
	1	0	1	0	2	2	0	1	6	2	2
	4	0	0	1	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	4	0	0	11	0	0	0	0	0	0
	0	0	0	2	0	1	1	1	0	3	1
	2	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	4	0	0	11	0	0	0	0	0	0
	0	1	0	1	0	0	0	1	3	0	4
	3	1	1	1	1	1	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	4	0	0	6	0	0	0	0	0	0
	0	0	0	0	0	0	1	3	1	1	0
	2	0	3	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	4	0	0	17	0	0	0	0	0	0
	0	0	0	0	1	0	2	1	3	0	3

	4	1	2	2	0	2	4	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	4	0	0	12	0	0	0	0	0	0
	0	0	0	0	0	1	1	1	2	2	3
	3	2	0	2	0	0	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	4	0	0	4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	2	1	0	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	4	0	0	4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	1	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	4	0	0	8	0	0	0	0	0	0
	0	0	0	1	0	0	2	0	0	2	1
	2	0	1	0	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
#Fleet 5 PBR											
1980	1	5	0	0	106	0	0	0	0	0	0
	0	0	0	2	6	10	10	10	21	20	13
	14	16	27	18	12	16	14	9	8	13	3
	3	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1981	1	5	0	0	52	0	0	0	0	0	1
	0	0	0	0	1	1	4	6	4	6	8
	7	6	7	8	5	6	7	7	2	4	4
	2	0	1	1	0	0	0	0	0	0	0
	0	0	0	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1982	1	5	0	0	50	0	0	0	0	0	0
	0	0	0	1	3	5	3	4	7	4	4
	6	6	9	3	7	4	4	4	3	3	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1983	1	5	0	0	57	0	0	0	0	0	0
	0	0	1	2	0	4	11	4	7	9	6
	5	4	8	3	3	2	6	4	2	3	3
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1984	1	5	0	0	77	0	0	0	0	0	0
	0	0	3	0	0	2	3	6	9	17	16
	14	12	6	10	13	9	7	6	2	3	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1985	1	5	0	0	44	0	0	0	0	0	0
	0	0	0	1	4	3	1	0	2	4	6
	9	5	7	5	4	2	5	4	4	3	1
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1986	1	5	0	0	71	0	0	0	0	0	0
	0	0	3	5	3	4	3	8	9	9	6
	10	11	9	5	6	8	6	5	1	2	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1987	1	5	0	0	47	0	0	0	0	0	0
	0	0	1	0	1	3	2	2	4	5	5
	9	6	8	8	3	3	4	4	2	3	1
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1988	1	5	0	0	34	0	0	0	0	0	0
	0	0	1	0	0	1	4	1	0	7	5
	8	5	6	2	5	1	2	3	2	0	0
	0	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1989	1	5	0	0	43	0	0	0	1	0	0
	0	0	1	0	4	3	5	4	4	7	7
	7	5	10	5	6	3	6	2	6	1	0
	1	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1993	1	5	0	0	95	0	0	0	0	0	0
	0	2	1	1	5	1	6	11	13	11	27
	23	24	8	3	6	6	8	2	3	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1994	1	5	0	0	53	0	0	0	0	0	0
	0	0	0	0	3	2	2	6	8	11	7
	10	5	5	6	2	0	2	2	4	2	4
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1996	1	5	0	0	67	0	0	0	0	0	0
	0	0	1	3	1	4	13	14	10	4	17
	8	12	8	8	6	5	6	4	2	2	0
	3	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1997	1	5	0	0	25	0	0	0	0	0	0
	0	0	0	0	1	2	1	7	5	1	4
	2	3	1	3	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	5	0	0	47	0	0	0	0	0	0
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	11	9	3	2	8	2	1	1	2	0	0
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1999	1	5	0	0	69	0	0	0	0	0	0
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	14	8	8	4	5	3	4	2	2	0	0
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	0	0	0	0	0						
2000	1	5	0	0	39	0	0	0	0	0	0
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	4	8	7	5	7	5	1	1	3	0	0
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	0	0	0	0	0						
2001	1	5	0	0	28	0	0	0	0	0	0
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	0	0	0	0	0						
2002	1	5	0	0	34	0	0	0	0	0	0
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	0	0	0	0	0						
2003	1	5	0	0	82	1	0	0	1	0	0
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2004	1	5	0	0	313	1	0	0	0	0	0
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	67	56	64	67	68	58	34	31	25	13	9
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	5	0	0	494	0	0	0	0	0	0
	0	0	0	1	2	6	4	15	10	28	40
	59	92	95	101	107	110	91	62	41	34	19
	11	4	7	1	0	0	0	0	1	1	0
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	0	0	0	0	0						
2006	1	5	0	0	487	0	0	0	0	0	0
	1	0	0	0	2	4	4	14	23	25	65
	76	79	82	75	72	64	69	49	51	27	8
	8	2	2	1	0	0	0	0	1	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	5	0	0	363	0	0	0	0	0	1
	0	0	0	0	2	7	5	4	12	28	40
	59	56	56	63	72	50	51	34	27	20	11
	8	2	3	2	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	5	0	0	302	0	0	0	0	1	0
	0	0	0	0	0	2	4	13	9	27	45
	57	57	66	62	49	40	32	36	14	12	8
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
#Fleet 6 CPFV											
1975	1	6	0	0	32	0	0	0	0	0	0
	1	0	1	2	7	6	11	13	7	10	3
	6	4	2	2	2	0	1	0	0	1	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

1976	1	6	0	0	63	0	0	0	1	0	0
	0	1	1	5	6	11	18	9	6	8	5
	8	3	4	2	2	4	0	1	1	0	0
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	0	0	0	0	0						
1977	1	6	0	0	44	0	0	0	0	1	0
	0	0	0	5	9	10	11	5	7	7	4
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	0	0	0	0	0						
1978	1	6	0	0	51	0	0	0	1	0	0
	2	1	0	5	5	7	12	8	11	8	5
	9	8	3	3	4	0	4	4	0	1	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1986	1	6	0	0	60	0	0	0	0	0	0
	1	1	6	15	13	16	14	4	3	3	3
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	0	0	0	0	0						
1987	1	6	0	0	64	0	0	0	0	0	0
	0	0	2	1	13	12	25	13	12	9	10
	3	1	0	0	0	0	0	0	0	0	0
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1988	1	6	0	0	40	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1989	1	6	0	0	63	0	0	0	0	0	1
	0	2	6	15	15	8	9	8	6	8	3
	1	3	1	1	4	2	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0						
1980	1	6	0	0	18	0	0	0	0	0	0
	0	0	0	0	2	0	5	0	1	0	3
	1	2	1	2	0	2	2	1	1	0	0
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1981	1	6	0	0	16	0	0	0	0	0	0
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	0	1	4	1	1	0	2	1	0	0	0
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	0	0	0	0	0						
1982	1	6	0	0	10	0	0	0	0	0	0
	0	0	0	0	1	4	1	1	0	0	0
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1983	1	6	0	0	22	0	0	0	0	0	0
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1984	1	6	0	0	8	0	0	0	0	0	0
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	0	0	0	0	0						
1985	1	6	0	0	15	0	0	0	0	0	0
	0	1	0	1	2	1	0	0	3	1	1
	3	0	2	0	2	1	2	2	2	0	0
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	0	0	0	0	0						
1986	1	6	0	0	22	0	0	0	0	0	0
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	3	1	3	2	2	1	3	2	1	1	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1987	1	6	0	0	10	0	0	0	0	0	0
	0	0	0	0	0	0	1	1	1	0	1
	2	2	2	1	0	1	0	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1988	1	6	0	0	11	0	0	0	0	0	0
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	0	0	0	0	0						
1989	1	6	0	0	14	0	0	0	1	0	0
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	0	0	0	0	0						
1993	1	6	0	0	2	0	0	0	0	0	0
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	0	0	1	0	0	0	0	0	0	0	0
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	0	0	0	0	0						
1994	1	6	0	0	8	0	0	0	0	0	0
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	0	0	0	0	0						
1996	1	6	0	0	27	0	0	0	0	0	0
	0	1	2	0	1	1	3	6	4	2	5
	1	4	3	4	3	2	1	1	3	0	1
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1997	1	6	0	0	32	0	0	0	0	0	0
	0	0	0	1	0	1	2	2	5	16	6
	8	5	1	9	1	0	2	0	1	0	1
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	6	0	0	37	0	0	0	0	0	0
	0	0	0	0	1	0	1	3	5	11	7
	10	2	6	6	2	1	2	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1999	1	6	0	0	14	0	0	0	0	0	0
	0	0	0	0	2	0	1	0	1	0	0
	1	1	0	3	2	1	0	0	0	1	1
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	0	0	0	0	0						
2000	1	6	0	0	15	0	0	0	0	0	0
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2001	1	6	0	0	25	0	0	0	0	0	0
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	8	11	4	12	11	7	3	5	2	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	6	0	0	12	0	0	0	0	0	0
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	0	0	0	0	0						
2003	1	6	0	0	41	0	0	0	0	0	0
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	11	12	14	17	6	13	5	3	3	2	1
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	0	0	0	0	0						
2004	1	6	0	0	37	0	0	0	0	0	0
	0	0	0	0	1	1	0	2	3	1	3
	6	7	5	8	6	6	2	2	1	1	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	6	0	0	45	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	5
	7	6	10	6	8	11	5	1	3	3	0
	1	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	6	0	0	49	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	1	9
	6	10	8	8	11	6	6	5	1	3	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	6	0	0	59	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	4
	8	6	11	3	12	9	6	7	5	4	5
	0	2	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

2008	1	6	0	0	55	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	8
	8	10	7	5	8	5	7	3	1	1	2
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	6	0	0	4	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	1	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	6	0	0	48	0	0	0	0	0	0
	0	0	2	1	6	2	5	9	10	23	21
	25	14	15	4	6	4	3	0	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	6	0	0	19	0	0	0	0	0	0
	1	0	0	0	2	2	1	3	5	2	7
	7	4	6	8	4	6	5	3	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	6	0	0	39	0	0	0	0	0	0
	1	1	1	4	1	8	12	9	8	8	4
	4	2	4	7	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1987	1	6	0	0	4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	3	2	3	2	5	3	3	2	2	5	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1988	1	6	0	0	21	0	0	0	0	0	0
	0	0	0	0	1	2	2	0	1	3	4
	6	6	8	16	4	5	10	2	2	4	0
	1	2	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1989	1	6	0	0	21	0	0	0	0	0	0
	0	0	0	0	0	1	1	2	3	8	2
	8	8	3	8	7	8	4	4	4	1	1
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1990	1	6	0	0	6	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	3	1	1	1	1	1	0	0	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1991	1	6	0	0	13	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	2
	3	2	1	2	1	0	1	1	3	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1992	1	6	0	0	16	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	3	6	1
	5	4	2	2	2	2	0	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1993	1	6	0	0	12	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	3	2	4
	6	3	3	1	3	2	2	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1994	1	6	0	0	16	0	0	0	0	0	0
	0	0	0	0	0	0	2	0	6	7	2
	4	5	4	4	1	0	2	2	0	0	1
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1995	1	6	0	0	18	0	0	0	0	0	0
	0	0	0	0	0	1	1	1	1	6	3
	7	3	6	1	2	3	0	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1996	1	6	0	0	31	0	0	0	0	0	0
	0	0	1	0	0	1	6	14	10	11	13
	10	8	7	7	7	6	3	0	1	0	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1997	1	6	0	0	30	0	0	0	0	0	0
	0	0	0	1	0	0	0	1	5	16	6
	9	6	1	9	1	0	2	0	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	6	0	0	23	0	0	0	0	0	0
	0	0	0	0	1	0	1	1	3	7	6
	8	2	5	4	2	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	6	0	0	11	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	3	2	1
	2	0	1	2	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	6	0	0	18	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	3	0
	3	1	3	0	5	2	2	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	6	0	0	5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	1	2	0	0	0	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	6	0	0	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	0	0	3	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	6	0	0	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	2	0	1	1	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	6	0	0	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	1	1	0	0	0	0	2	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

20	#_N_age_bins										
1	2	3	4	5	6	7	8	9	10	11	12
	13	14	15	16	17	18	19	20			
2	#_N_ageerror_definitions										
#Female											
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1									
0.479363	0.479363	0.547477	0.604513	0.652275	0.69227	0.725762	0.753807	0.777291	0.796957	0.813425	0.827214
	0.838762	0.848431	0.856529	0.863309	0.868987	0.873741	0.877723	0.881057	0.883849	0.886186	0.888144
	0.889783	0.891156	0.892306	0.893268	0.894074	0.894749	0.895314	0.895788	0.896184	0.896516	0.896794
	0.897027	0.897221									
#Male											
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1									
0.571868	0.571868	0.297421	0.206562	0.161637	0.135119	0.117833	0.105851	0.0972099	0.0908204	0.0860316	0.0824308
	0.0797446	0.0777855	0.0764214	0.0755572	0.0751234	0.0750688	0.0753554	0.0759549	0.0768471	0.0780175	0.0794561
	0.0811573	0.0831183	0.0853394	0.0878231	0.0905741	0.0935993	0.0969071	0.100508	0.104414	0.108639	0.113197
	0.118107	0.123388									
149	#_N_Agecomp_obs										
2	#_Lbin_method:		1=poplenbins		2=datalenbins		3=lengths				
0	#_combine	males	into	females	at	or	below	this	bin	number	
#Conditional_Age-at_Length			1	2	3	4	5	6	7	8	9
	10	11	12	13	14	15	16	17	18	19	20
	1	2	3	4	5	6	7	8	9	10	11
	12	13	14	15	16	17	18	19	20		
#Joanna's data											
#Yr	Seas	Flt/Survey	Gender	Part	Ageerr	Lbin_lo	Lbin_hi	Nsamp	1	2	3
	4	5	6	7	8	9	10	11	12	13	14
	15	16	17	18	19	20	1	2	3	4	5
	6	7	8	9	10	11	12	13	14	15	16
	17	18	19	20							
#Females											
1996	1	7	1	0	1	12	12	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	13	13	5	0	0	2
	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	14	14	8	0	1	5
	0	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	15	15	7	0	0	3
	0	2	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	16	16	3	0	0	0
	1	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	17	17	4	0	0	1
	1	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	18	18	1	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	19	19	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	21	21	1	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	22	22	1	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	1	0	1	23	23	2	0	0	0
	0	0	1	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	12	12	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	13	13	7	0	0	5
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	14	14	4	0	0	2
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	15	15	12	0	0	1
	3	3	4	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	16	16	6	0	0	0
	2	3	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	17	17	7	0	0	0
	3	3	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	18	18	5	0	0	0
	1	2	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	19	19	4	0	0	0
	1	2	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	20	20	2	0	0	0
	0	0	1	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	1	0	1	21	21	1	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

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	0	0	0	0							
1998	1	7	1	0	1	12	12	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	1	0	1	13	13	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	1	0	1	14	14	5	0	0	1
	1	2	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	1	0	1	15	15	7	0	0	1
	3	2	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	1	0	1	16	16	5	0	0	0
	2	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	1	0	1	17	17	4	0	0	0
	0	4	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	1	0	1	18	18	1	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	1	0	1	19	19	3	0	0	0
	1	0	0	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1999	1	7	1	0	1	17	17	1	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1999	1	7	1	0	1	18	18	4	0	0	0
	0	0	3	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	3	3	2	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	4	4	5	5	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	5	5	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	6	6	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	11	11	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	13	13	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	15	15	6	0	0	1
	2	2	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	16	16	5	0	0	0
	2	2	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	17	17	8	0	0	0
	2	1	3	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	18	18	11	0	0	2
	1	2	4	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	19	19	11	0	0	1
	2	3	2	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	20	20	7	0	0	0
	0	3	1	2	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	21	21	11	0	0	0
	1	3	5	1	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	22	22	7	0	0	0
	0	1	1	3	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	23	23	9	0	0	0
	0	1	0	3	1	3	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	24	24	11	0	0	0
	0	0	3	4	3	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	25	25	8	0	0	0
	0	1	0	1	1	4	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	26	26	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	27	27	3	0	0	0
	0	0	0	0	1	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	29	29	2	0	0	0
	0	0	0	0	0	0	1	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	31	31	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	32	32	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	4	4	3	3	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	5	5	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	6	6	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	7	7	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	9	9	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	17	17	1	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	18	18	2	0	0	0
	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	19	19	2	0	0	0
	0	0	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	20	20	1	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	21	21	2	0	0	0
	0	0	0	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	22	22	2	0	0	0
	0	0	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	23	23	3	0	0	0
	0	0	0	1	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	25	25	2	0	0	0
	0	0	1	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	1	0	1	30	30	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	6	6	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	16	16	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	17	17	8	0	0	3
	3	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	18	18	3	0	0	0
	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	19	19	7	0	0	0
	4	2	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	20	20	8	0	0	0
	4	2	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	21	21	4	0	0	0
	0	3	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	22	22	5	0	0	0
	0	1	0	3	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	23	23	15	0	0	0
	0	4	3	1	5	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	24	24	7	0	0	0
	0	1	2	0	1	0	1	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	25	25	11	0	0	0
	0	1	0	4	2	2	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	26	26	5	0	0	0
	0	0	0	0	2	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	27	27	5	0	0	0
	0	0	0	0	0	2	0	0	0	2	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	1	0	1	28	28	4	0	0	0
	0	0	0	0	0	2	1	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	1	0	1	19	19	1	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
#Males											
1996	1	7	2	0	2	12	12	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	2	0	2	13	13	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	1	1	0
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	2	0	2	14	14	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	1	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	2	0	2	15	15	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	2	0	2	19	19	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	7	2	0	2	21	21	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	2	0	2	12	12	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	2	0	2	13	13	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	1	1	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	2	0	2	14	14	18	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	7	6	3
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	2	0	2	15	15	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	9	2
	2	1	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	2	0	2	16	16	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	2	0
	1	2	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	2	0	2	17	17	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	1
	3	0	0	0	1	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	2	0	2	18	18	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	1
	1	2	1	3	0	0	0	0	0	0	0
	0	0	0	0							
1997	1	7	2	0	2	19	19	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	1	0	0	0	0	0
	0	0	0	0							
1998	1	7	2	0	2	12	12	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	2	0	2	13	13	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	3	2	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	2	0	2	14	14	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	3	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	2	0	2	15	15	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	1	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	2	0	2	16	16	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	5
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	7	2	0	2	17	17	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	2
	2	0	2	0	0	0	0	0	0	0	0
	0	0	0	0							
1999	1	7	2	0	2	15	15	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1999	1	7	2	0	2	16	16	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	1
	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1999	1	7	2	0	2	17	17	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1999	1	7	2	0	2	18	18	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	1	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	4	4	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	5	5	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	9	9	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	10	10	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	12	12	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	13	13	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	14	14	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	15	15	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	16	16	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	2	1
	4	1	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	17	17	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	1
	4	6	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	18	18	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	5	2
	1	1	1	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	19	19	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	1	1
	2	3	0	1	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	20	20	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	3	3	1	1	1	0	1	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	21	21	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	2	1	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	22	22	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	1	1	0	2	0	0	0	1	0	0
	0	0	0	0							
2000	1	7	2	0	2	23	23	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	2	0	2	24	24	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0							
2001	1	7	2	0	2	3	3	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	2	0	2	6	6	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	2	0	2	16	16	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	2	0	2	17	17	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	2	0	2	18	18	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	2	0	2	19	19	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	2	0	2	20	20	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	1	2	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	2	0	2	21	21	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	2	0	2	23	23	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	2	0	2	16	16	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	2	0	2	17	17	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	2	0	2	18	18	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	7	2	0	2	19	19	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	1	1	0	0	1	0	0	0	0	0
	0	0	0	0							
2002	1	7	2	0	2	21	21	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0							
#Unsexed											
1991	1	7	0	0	1	2	2	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1993	1	7	0	0	1	3	3	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	0	0	1	3	3	5	5	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2000	1	7	0	0	1	4	4	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	0	0	1	1	1	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	0	0	1	2	2	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	0	0	1	3	3	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	0	0	1	6	6	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

2001	1	7	0	0	1	21	21	2	0	0	0
	0	0	0	0	1	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	0	0	1	24	24	2	0	0	0
	0	0	0	0	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	7	0	0	1	25	25	1	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

0 #_N_MeanSize-at-Age_obs
#Yr Seas Flt Svy Gender Part Ageerr Ignore datavector(female-male)
samplesize(female-male)
0 #_N_environ_variables
0 #_N_environ_obs
0 # N sizefreq methods to read
#Sizefreq N bins per method
#Sizetfreq units(bio num) per method
#Sizefreq scale(kg lbs cm inches) per method
#Sizefreq mincomp per method
#Sizefreq N obs per method
#_Sizefreq bins
#_Year season Fleet Partition Gender SampleSize <data>
0 # no tag data
0 # no morphcomp data

999

ENDDATA

Appendix E-2. Control file for CAS.

```
# CAS cabezon control file, SS v3.03a, May 2009
# Morph setup
1            # Number of growth patterns
1            # N sub morphs within growth patterns
2            #_Nblock_Patterns
1 2                      # Blocks_per_pattern
1999 2008                # Accounts for change in commerical regs (size limits)
2000 2004 2005 2008    # Accounts for change in recreational regs (size & bag limits)

# Mortality and growth specifications
0.5          # Fraction female at birth
0            # M setup: 0=single Par,1=N_breakpoints,2=Lorenzen,3=agespecific;_4=agespec_withseasinterpolate
#2           # Number of M breakpoints
#0 0         # Ages at M breakpoints
1            # Growth model: 1=VB with L1 and L2, 2=VB with A0 and Linf, 3=Richards, 4=Read vector of L@A
0            # Age for growth Lmin
999          # Age for growth Lmax or 999 = Linf
0            # SD constant added to LAA (0.1 mimics SS2 v1.x for compatibility only)
0            # Variability about growth: 0=CV~f(LAA) [mimic v1.xx], 1=CV~f(A), 2=SD~f(LAA), 3=SD~f(A)
1            # Maturity option: 1=length logistic, 2=age logistic, 3=read age-maturity matrix by growth_pattern
1            # First age allowed to mature
1   #_fecundity option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b
0   #_hermaphroditism option:  0=none; 1=age-specific fxn
1   #_parameter_offset_approach (1=none, 2= M, G, CV_G as offset from female-GP1, 3=like SS2 V1.x)
1   #_env/block/dev_adjust_method (1=standard; 2=with logistic trans to keep within base parm bounds)

#_LO     HI      INIT          PRIOR     PR_type SD       PHASE env-var use_dev dev_minyr dev_maxyr
dev_stddev Block Block_Fxn
0.02     0.5     0.25    0.25    0       0.08    -4      0       0       0       0       0.5
0        0       #       NatM_p_2_Fem_GP:1 old
1        40      13.97   14      0       1       3       0       0       0       0       0.5
0        0       #       L_at_Amin_Fem_GP_1
20       90      59.0    58      0       100   2   0     0       0       0       0.5     0
0        #       L_at_Amax_Fem_GP_1
0.05     0.3     0.17    0.185   0       0.8     3       0       0       0       0       0.5
0        0       #       VonBert_K_Fem_GP_1
0.01     0.5     0.14    0.139   0       0.8     3       0       0       0       0       0.5
0        0       #       CV_young_Fem_GP_1
0.01     0.5     0.1   0.1       0       0.8     3       0       0       0       0       0.5
0        0       #       CV_old_Fem_GP_1

0.02     0.5     0.3     0.3     0       0.08    -4      0       0       0       0       0.5
0        0       #       NatM_p_1_Mal_GP:1 old
1        40      12.57   13  0       1       3       0       0       0       0.5     0
0        #       L_at_Amin_Mal_GP_1
20       90      41.8    41.8  0   100   2   0       0       0       0       0.5     0       0
         #       L_at_Amax_Mal_GP_1
0.05     0.6     0.45    0.45    0       0.8     3       0       0       0       0       0.5
0        0       #       VonBert_K_Mal_GP_1
0.01     0.5     0.17    0.17    0       0.8     3       0       0       0       0       0.5
0        0       #       CV_young_Mal_GP_1
0.01     0.5     0.14    0.1     0       0.8     3       0       0       0       0       0.5
0        0       #       CV_old_Mal_GP_1

# Add 2+2*gender lines to read the wt-Len and mat-Len parameters
-3       3       0.000009184   0.000009184     0       0.8     -3      0       0       0       0
         0.5     0       0       #Female wt-len-1
-3       4       3.188     3.188  0       3       -3      0       0       0       0       0.5
         0       0       #Female wt-len-2
-3       40      34.6          35    0       10      -3      0       0       0       0       0.5
         0       0       #Female mat-len-1
-3       3       -0.7      -0.7  0       0.8     -3      0       0       0       0       0.5
         0       0       #Female mat-len-2
-3       3       1         1     0       0.8     -3      0       0       0       0       0.5
         0       0       #Female eggs/gm intercept
-3       3       0         0     0       0.8     -3      0       0       0       0       0.5
         0       0       #Female eggs/gm slope
```

```
-3      3       0.00001163  0.00001163   0     0.8    -3    0    0    0    0
        0.5     0     0     #Male wt-len-1
-3      4       3.118   3.190852   0     3    -3    0    0    0    0
        0.5     0     0     #Male wt-len-2

-4 4 0 0 -1 99 -3 0 0 0 0 0.5 0 0 #_recrdistribution_by_growth_pattern
-4 4 0 0 -1 99 -3 0 0 0 0 0.5 0 0 #_recrdistribution_by_area 1
-4 4 0 0 -1 99 -3 0 0 0 0 0.5 0 0 #_recrdistribution_by_season 1
 0 2 1 1 -1 99 -3 0 0 0 0 0.5 0 0 #_cohort_growth_deviation
# Seasonal effects on biology parameters (0=none)
 0 0 0 0 0 0 0 0 0 0

#_Spawner-Recruitment
3 #_SR_function
#_LO   HI    INIT PRIOR PR_type SD PHASE
  3   30    10   12  -1    10   2  # SR_R0
0.2    1    0.7  0.71   0   0.8   -3  # SR_steep
  0    1   0.5    1   0     1   -1     # SR_sigmaR
  0    5     0    0   0     1   -3     # SR_envlink
  0    5     0    0   0     1   -3     # SR_R1_offset
  0    2     0    1   0    50  -50    # Autocorrelation placeholder (Future implementation)
0 #_SR_env_link
0 #_SR_env_target_1=devs;_2=R0;_3=steepness
1 #do_recr_dev:  0=none; 1=devvector; 2=simple deviations
# Recruitment residuals
1970        # Start year recruitment residuals
2006        # End year recruitment residuals
1           # Phase
1          # Read 13 advanced recruitment options: 0=no, 1=yes
0           # first year for early rec devs
-4          # phase for early rec devs
5           # Phase for forecast recruit deviations
100         # Lambda for forecast recr devs before endyr+1
1979        #_last_yr_nobias_adj_in_MPD
1980        # first year of full bias correction (linear ramp up from this year minus the plus-age to this year)
2004        # last year for full bias correction in_MPD
2005        #_first_recent_yr_nobias_adj_in_MPD
1           #_max_bias_adj_in_MPD (1.0 to mimic pre-2009 models)
0           #_placeholder
-15         # Lower bound rec devs
15          # Upper bound rec devs
0          # read intitial values for rec devs

# Fishing mortality setup
0.1         # F ballpark for tuning early phases
2008        # F ballpark year
1           # F method:  1=Pope's; 2=Instan. F; 3=Hybrid (recommended)
0.9         # max F or harvest rate, depends on F_Method
#init_F_setup,     for      each     fleet
#LO      HI      INIT     PRIOR    P_TYPE SD        PHASE
 0        1        0      0.0001     0       99      -1  #1  InitF_FISHERY1_Comm_Non-Live
 0        1        0      0.0001     0       99      -1  #2  InitF_FISHERY2_Comm_Live
 0        1        0      0.0001     0       99      -1  #3  InitF_FISHERY3_Rec_MM
 0        1        0      0.0001     0       99      -1  #4  InitF_FISHERY4_Rec_BB
 0        1        0      0.0001     0       99      -1  #5  InitF_FISHERY5_Rec_PBR
 0        1        0      0.0001     0       99      -1  #6  InitF_FISHERY6_Rec_CPFV
 0        1        0      0.0001     0       99      -1  #7  InitF_FISHERY7_Ghost

#_Q_setup
#_add_parm_row_for_each_positive_entry_below(row_then_column)
# A=do power, B=env-var, C=extra SD, D=devtype(<0=mirror, 0/1=none, 2=cons, 3=rand, 4=randwalk); E=0=num/1=bio,
F=err_type
# A B C D E F
 0 0 0    0       1       0 #1  InitF_FISHERY1_Comm_Non-Live
 0        0       0       0       1       0       #2  InitF_FISHERY2_Comm_Live
 0        0       0       0       1       0       #3  InitF_FISHERY3_Rec_MM
 0        0       0       0       1       0       #4  InitF_FISHERY4_Rec_BB
 0        0       0       0       1       0       #5  InitF_FISHERY5_Rec_PBR
 0        0       0       0       1       0       #6  InitF_FISHERY6_Rec_CPFV
 0        0       0       0       1       0       #7  InitF_FISHERY7_Ghost
```

0 0 0 0 0 0 #8 InitF_SURVEY1_CPFV 1960-1999
0 0 0 0 0 0 #9 InitF_SURVEY2_CPFV 2000-2008
0 0 0 0 0 0 #10 InitF_SURVEY3_CPFV 1960-2008
0 0 0 0 0 0 #11 InitF_SURVEY4_TENERA_adult
0 0 0 0 0 0 #12 InitF_SURVEY5_PISCO_adult
0 0 0 0 0 0 #13 InitF_SURVEY6_PISCO_MONTEREY_SMURFs
0 0 0 0 0 0 #14 InitF_SURVEY7_SLO_SMURFs
0 0 0 0 0 0 #15 InitF_SURVEY8_CalCOFI
0 0 0 0 0 0 #16 InitF_SURVEY9_Edison_Impingement

#_size_selex_types
#_Pattern Discard Male Special
24 0 0 0 #1 Comm_Non-Live
24 0 0 0 #2 Comm_Live
24 0 0 0 #3 Rec_MM
24 0 0 0 #4 Rec_BB
24 0 0 0 #5 Rec_PBR
24 0 0 0 #6 Rec_CPFV
0 0 0 0 #7 CA_age_samples
5 0 0 6 #8 CPFV 1960-1999
5 0 0 6 #9 CPFV 2000-2008
5 0 0 6 #10 CPFV 1960-2008
30 0 0 0 #11 TENERA adult
30 0 0 0 #12 PISCO Adults
33 0 0 0 #13 PISCO SMURFS (Monterey)
33 0 0 0 #14 SMURFS (SLO)
33 0 0 0 #15 CalCOFI
33 0 0 0 #16 Edison impingement

#_age_selex_types
#_Pattern Discard Male Special
10 0 0 0 #1 Comm_Non-Live
10 0 0 0 #2 Comm_Live
10 0 0 0 #3 Rec_MM
10 0 0 0 #4 Rec_BB
10 0 0 0 #5 Rec_PBR
10 0 0 0 #6 Rec_CPFV
10 0 0 0 #7 CA_age_samples
10 0 0 0 #8 CPFV_CPUE
10 0 0 0 #9 CPFV 2000-2008
10 0 0 0 #10 CPFV 1960-2008
10 0 0 0 #11 TENERA adult
10 0 0 0 #12 PISCO Adults
10 0 0 0 #13 PISCO SMURFS (Monterey)
10 0 0 0 #14 SMURFS (SLO)
10 0 0 0 #15 CalCOFI
10 0 0 0 #16 Edison Impingement

#_LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr
dev_stddev Block Block_Fxn
#FLEET 1 NOT THE LIVE FISH FISHERY
10 91 31 31 1 0.05 2 0 0 0 0 0.5
0 0 # PEAK
-5.0 3.0 -2.8 -2.8 1 0.05 3 0 0 0 0 0.5
0 0 # TOP:_width of plateau
-4.0 12.0 4.1 4.1 1 0.05 3 0 0 0 0 0.5 0
0 # Asc_width
-10 6.0 4 -1.0 1 0.05 -3 0 0 0 0 0.5
0 0 # Desc_width
-15.0 15.0 -10 -5.0 1 0.05 -2 0 0 0 0 0.5
0 0 # INIT:_selectivity_at_fist_bin
-5.0 15.0 10 -0.3 1 0.05 -2 0 0 0 0 0.5
0 0 # FINAL:_selectivity_at_last_bin
#FLEET 2 LIVE FISH FISHERY
10 91 38.2 38.2 1 0.05 2 0 0 0 0 0.5 1 2 # PEAK
-5.0 3.0 -0.3 -0.3 1 0.05 3 0 0 0 0 0.5
1 2 # TOP:_width of plateau
-4.0 12.0 2.3 2.3 1 0.05 3 0 0 0 0 0.5 1
2 # Asc_width

```
 -10    6.0    3    3.0  1    0.05    3    0    0    0    0    0.5    1
2  # Desc_width
-15.0    5.0    -5    -5.0    1    0.05    -2    0    0    0    0    0.5
    0    0  # INIT:_selectivity_at_fist_bin
 -5.0    15.0    -3.5    -3.5    1    0.05    2    0    0    0    0    0.5
    1    2  # FINAL:_selectivity_at_last_bin
#FLEET 3 Man Made
  10    91    10.8    10.8    1    0.05    2    0    0    0    0    0.5
    0    0  # PEAK
 -5.0    3.0    -0.5    -0.5    1    0.05    3    0    0    0    0    0.5
    0    0  # TOP:_width of plateau
 -4.0    12.0    -0.6    -0.6    1    0.05    3    0    0    0    0    0.5
    0    0  # Asc_width
 -10    6.0    -2    -2.0    1    0.05    3    0    0    0    0    0.5
    0    0  # Desc_width
-15.0    15.0    -10    -5.0    1    0.05    -2    0    0    0    0    0.5
    0    0  # INIT:_selectivity_at_fist_bin
 -5.0    15.0    -0.5    -0.5    1    0.05    2    0    0    0    0    0.5
    0    0  # FINAL:_selectivity_at_last_bin
#FLEET 4 Shore
  10    91    33.7    33.7    1    0.05    2    0    0    0    0    0.5
    0    0  # PEAK
 -5.0    3.0    -2.8    -2.8    1    0.05    3    0    0    0    0    0.5
    0    0  # TOP:_width of plateau
 -4.0    12.0    4.1    4.1  1    0.05    3    0    0    0    0    0.5    0
0  # Asc_width
 -10    6.0    -1    -1.0    1    0.05    3    0    0    0    0    0.5
    0    0  # Desc_width
-15.0    15.0    -10    -5.0    1    0.05    -2    0    0    0    0    0.5
    0    0  # INIT:_selectivity_at_fist_bin
 -5.0    15.0    -0.3    -0.3    1    0.05    2    0    0    0    0    0.5
    0    0  # FINAL:_selectivity_at_last_bin
#FLEET 5 PBR
  10    91    45    45    1    0.05    2    0    0    0    0    0.5
    2    2  # PEAK
 -5.0    3.0    -2.8    -2.8    1    0.05    3    0    0    0    0    0.5
    2    2  # TOP:_width of plateau
 -4.0    12.0    4.1    4.1  1    0.05    3    0    0    0    0    0.5    2
2  # Asc_width
 -10    6.0    4    -1.0    1    0.05    -3    0    0    0    0    0.5
    0    0  # Desc_width
-15.0    15.0    -10    -5.0    1    0.05    -2    0    0    0    0    0.5
    0    0  # INIT:_selectivity_at_fist_bin
 -5.0    15.0    10    -0.3    1    0.05    -2    0    0    0    0    0.5
    0    0  # FINAL:_selectivity_at_last_bin
#FLEET 6 CPFV
  10    91    45    45    1    0.05    2    0    0    0    0    0.5
    2    2  # PEAK
 -5.0    3.0    -2.8    -2.8    1    0.05    3    0    0    0    0    0.5
    2    2  # TOP:_width of plateau
 -4.0    12.0    4.1    4.1  1    0.05    3    0    0    0    0    0.5    2
2  # Asc_width
 -10    6.0    4    -1.0    1    0.05    -3    0    0    0    0    0.5
    0    0  # Desc_width
-15.0    15.0    -10    -5.0    1    0.05    -2    0    0    0    0    0.5
    0    0  # INIT:_selectivity_at_fist_bin
 -5.0    15.0    10    -0.3    1    0.05    -2    0    0    0    0    0.5
    0    0  # FINAL:_selectivity_at_last_bin
#FLEET 7 CA_age_samples

#Survey 1: CPFV CPUE 1960-1999
  1   44   1    1    0    10   -3   0    0    0    0    0.5    0    0
    #min Len bin - fixed
  1    100    44    50    0    10   -4   0    0    0    0    0.5    0
0    #max Len bin fixed
#Survey 2: CPFV CPUE 2000-2008
  1    44    1    1    0    10    -3    0    0    0    0    0.5
    0    0    #min Len bin - fixed
  1    100    44    50    0    10    -4    0    0    0    0    0.5
    0    0    #max Len bin fixed
```

```
#Survey 3: CPFV CPUE 1960-2008
   1      44     1      1      0      10     -3     0      0      0      0      0.5
          0      0      #min Len bin - fixed
   1      100    44     50     0      10     -4     0      0      0      0      0.5
          0      0      #max Len bin fixed
#Survey 4: TENERA adult
#Survey 5: PISCO adult
#Survey 6: PISCO SMURFS
#Survey 7: SMURFS (SLO)
#Survey 8: CalCOFI
#Survey 9: Edison Impingement

1         #_Custom_block_setup SELECTIVITY BLOCK: 1999-2008
#FLEET 1 NOT THE LIVE FISH FISHERY
#   10     91     31     31     1     0.05    2      # PEAK
# -5.0     3.0    -2.8   -2.8   1     0.05    3      # TOP:_width of plateau
# -4.0     12.0   4.1    4.1    1     0.05    3      # Asc_width
#  -10     6.0    4      -1.0   1     0.05    -3     # Desc_width
# -5.0     15.0   10     -0.3   1     0.05    -2     # FINAL:_selectivity_at_last_bin
#FLEET 2 LIVE FISH FISHERY
  10    91   38.2   38.2   1    0.05    3   # PEAK
 -5.0      3.0    -0.3   -0.3   1     0.05    4      # TOP:_width of plateau
 -4.0      12.0   2.3    2.3    1     0.05    4      # Asc_width
  -10      6.0    3      3.0    1     0.05    4      # Desc_width
 -5.0      15.0   -3.5   -3.5   1     0.05    3      # FINAL:_selectivity_at_last_bin
#FLEET 5 PBR
  10       91     45     45     1     0.05    3      # PEAK
  10       91     45     45     1     0.05    3      # PEAK
 -5.0      3.0    -2.8   -2.8   1     0.05    4      # TOP:_width of plateau
 -5.0      3.0    -2.8   -2.8   1     0.05    4      # TOP:_width of plateau
 -4.0      12.0   4.1    4.1    1     0.05    4      # Asc_width
 -4.0      12.0   4.1    4.1    1     0.05    4      # Asc_width
#  -10     6.0    4      -1.0   1     0.05    -3     # Desc_width
# -5.0     15.0   10     -0.3   1     0.05    -2     # FINAL:_selectivity_at_last_bin
#FLEET 6 CPFV
  10       91     45     45     1     0.05    3      # PEAK
  10       91     45     45     1     0.05    3      # PEAK
 -5.0      3.0    -2.8   -2.8   1     0.05    4      # TOP:_width of plateau
 -5.0      3.0    -2.8   -2.8   1     0.05    4      # TOP:_width of plateau
 -4.0      12.0   4.1    4.1    1     0.05    4      # Asc_width
 -4.0      12.0   4.1    4.1    1     0.05    4      # Asc_width
#  -10     6.0    4      -1.0   1     0.05    -3     # Desc_width
# -5.0     15.0   10     -0.3   1     0.05    -2     # FINAL:_selectivity_at_last_bin

2         #separt_adj_method

# Tag loss and Tag reporting parameters go next
0  # TG_custom:  0=no read; 1=read if tags exist
#_Cond -6 6 1 1 2 0.01 -4 0 0 0 0 0 0 0  #_placeholder if no parameters
### Likelihood related quantities ###
1         # Do variance adjustments
#1  Comm: Non-live Fishery
#2  Comm: Live Fishery
#3  Rec: Man-made
#4  Rec: Beach/bank
#5  Rec: PBR
#6  Rec: CPFV
#7  CA age samples
#8  CPFV CPUE survey 1960-1999
#9  CPFV CPUE survey 2000-2008
#10 CPFV CPUE survey 1960-2008
#11 TENERA adult survey
#12 PISCO adult survey
#13 PISCO SMURFS
#14 SLO SMURFS
#15 CalCOFI
#16 Edison Impingement
#         1      2      3      4      5      6      7      8      9      10     11
          12     13     14   15 16
```

```
#     0     0     0     0     0     0     0     0     0     0     0
      0     0     0           #_add_to_survey_CV
      0     0     0     0     0     0     0     0.20 0.27   0.20 0.75   0.34 0.47   0.79 0.51
0.28  #_add_to_survey_CV
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0 0   #_add_to_discard_stddev
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0 0   #_add_to_bodywt_CV
#     1     1     1     1     1     1     1     1     1     1     1
      1     1     1     1 1   #_mult_by_lencomp_N
      1     0.68  1.1   1.7   1.3   0.9   1     1     1     1     1
      1     1     1     1 1   #_mult_by_lencomp_N
      1     1     1     1     1     1     4     1     1     1     1
      1     1     1     1 1   #_mult_by_agecomp_N
      1     1     1     1     1     1     1     1     1     1     1
      1     1     1     1 1   #_mult_by_size-at-age_N

30    #  DF For discard T-distribution
30    #  DF For meanbodywt T-distribution
1     #_maxlambdaphase
0     #_sd_offset
8     # N changes to default Lambdas = 1.0

######################################
#Example of changes to default lambda
#3 # number of changes to make to default Lambdas (default value is 1.0)
# Like_comp codes:  1=surv; 2=disc; 3=mnwt; 4=length; 5=age; 6=SizeFreq; 7=sizeage; 8=catch;
# 9=init_equ_catch; 10=recrdev; 11=parm_prior; 12=parm_dev; 13=CrashPen; 14=Morphcomp; 15=Tag-comp; 16=Tag-negbin
#like_comp fleet/survey  phase  value  sizefreq_method
#  1  8 1 0 1 #_CPUE/survey:_1 CPFV Logbook 1960-1999
  1  9 1 0 1 #_CPUE/survey:_2 CPFV Logbook 2000-2008
  1 10 1 0 1 #_CPUE/survey:_3 CPFV Logbook 1960-2008
  1 11 1 0 1 #_CPUE/survey:_4 TENREA Adult
  1 12 1 0 1 #_CPUE/survey:_5 PISCO Adult
  1 13 1 0 1 #_CPUE/survey:_6 PISCO SMURF
  1 14 1 0 1 #_CPUE/survey:_7 SLO SMURF
  1 15 1 0 1 #_CPUE/survey:_8 CalCOFI
  1 16 1 0 1 #_CPUE/survey:_9 Edison Impingement
#  4 1 1 0 1 #_lencomp:_FLEET 1
#  4 2 1 0 1 #_lencomp:_FLEET 2
#  4 3 1 0 1 #_lencomp:_FLEET 3
#  4 4 1 0 1 #_lencomp:_FLEET 4
#  4 5 1 0 1 #_lencomp:_FLEET 5
#  4 6 1 0 1 #_lencomp:_FLEET 6
#  5 7 1 0 1 #_Cond_age:_Females, Males, & Unsexed
#  1 1 1 0 1 #_init_equ_catch
#  1 1 1 0 1 #_recruitments
#  1 1 1 0 1 #_parameter-priors
#  1 1 1 0 1 #_parameter-dev-vectors
#  1 1 1 0 1 #_crashPenLambda
######################################

0 # (0/1) read specs for more stddev reporting
# 1 1 -1 5 1 5 # selex type, len/age, year, N selex bins, Growth pattern, N growth ages
# 3 9 15 21 27 # vector with selex std bin picks (-1 in first bin to self-generate)
# 1 2 14 26 40 # vector with growth std bin picks (-1 in first bin to self-generate)

999 # end of control file
```

Appendix F-1. Data file for ORS.

```
# Oregon Cabezon 2009, SS v3.03a, May 2009
1973 #_styr
2008 #_endyr
1	#N_seasons_per_year
12	#vector_with_N_months_in_each_season
1	#spawning_season_-_spawning_will_occur_at_beginning_of_this_season
5	#N_fishing_fleets
1	#N_surveys;_data_type_numbers_below_must_be_sequential_with_the_N_fisheries
1	# Number of areas
fleet1%fleet2%fleet3%fleet4%fleet5%survey1
0.5 0.5	0.5 0.5	0.5 0.5	#_surveytiming_in_season
1 1 1 1 1 1 #_area_assignments_for_each_fishery_and_survey
1 1 1 1 1   # Units for catch by fishing fleet: 1=Biomass(mt),2=Numbers(1000s)
0.01 0.01 0.01 0.01 0.01	# SE of log(catch) by fleet for equilibrium and continuous options

2	#number_of_genders(1 / 2)
35	#accumulator_age;_model_always_starts_with_age_0

### Catch section ###
# Initial equilibrium catch (landings + discard) by fishing fleet
# comm nonlive - comm live - shore-based (man-made, beach/bank) - boat-based(PBR,CPFV)-ghost Josie
0 0	3	3 0	#	initial_equilibrium
36 # Number of lines catch data - FINAL CATCHES w/discards
0.00	0.00	3.29	3.10	0.00	1973	1
0.00	0.00	3.29	4.20	0.00	1974	1
0.00	0.00	3.29	4.60	0.00	1975	1
0.00	0.00	3.29	10.80	0.00	1976	1
0.00	0.00	3.29	8.80	0.00	1977	1
0.00	0.00	3.29	20.80	0.00	1978	1
0.00	0.00	3.29	10.40	0.00	1979	1
0.00	0.00	3.29	5.90	0.00	1980	1
0.08	0.06	3.66	22.70	0.00	1981	1
0.03	0.03	1.57	13.30	0.00	1982	1
0.28	0.04	1.78	11.00	0.00	1983	1
1.09	0.05	1.12	14.10	0.00	1984	1
2.54	0.03	3.47	7.80	0.00	1985	1
4.92	0.05	5.91	15.50	0.00	1986	1
6.37	0.00	4.41	5.90	0.00	1987	1
11.33	0.00	1.39	12.30	0.00	1988	1
6.70	0.00	3.17	15.80	0.00	1989	1
5.16	0.00	4.11	18.70	0.00	1990	1
8.32	0.00	4.11	12.70	0.00	1991	1
7.23	0.00	4.11	16.30	0.00	1992	1
1.43	0.03	5.05	17.60	0.00	1993	1
6.99	0.04	2.03	18.70	0.00	1994	1
5.72	0.03	1.71	13.60	0.00	1995	1
5.65	0.06	1.48	14.40	0.00	1996	1
10.08	10.87	1.85	20.00	0.00	1997	1
3.70	23.19	0.56	16.50	0.00	1998	1
3.00	23.46	0.90	17.90	0.00	1999	1
3.39	27.80	0.87	16.20	0.00	2000	1
2.38	43.94	3.17	12.10	0.00	2001	1
1.54	44.50	1.77	15.10	0.00	2002	1
1.49	25.55	1.59	16.00	0.00	2003	1
1.54	32.17	0.98	17.20	0.00	2004	1
1.51	28.41	2.11	17.60	0.00	2005	1
0.75	24.87	1.56	16.10	0.00	2006	1
0.76	22.48	1.56	16.30	0.00	2007	1
1.56	23.50	1.56	16.60	0.00	2008	1

#Abundance_Indices
8
#_N_observations
#Year	Season	Type	Value	CV
2001	1	6	0.0643624 0.14954056
2002	1	6	0.1118209 0.11422067
2003	1	6	0.104658	0.10200015
```

2004	1	6	0.1338716	0.11435232
2005	1	6	0.1321419	0.07760565
2006	1	6	0.1055009	0.08183698
2007	1	6	0.1175127	0.09619694
2008	1	6	0.1172195	0.09070033

#_Discard_Biomass
1 #_(1=biomass;_2=fraction)
0 #_N_observations
#Year Season Type Value CV

#_Mean_BodyWt
2009 from sample data to calc CV - at least 2 fish
49

#Year	Seas	Type	Part	Mean Wt	CV
1980	1	3	2	0.814285714	0.970463018
1981	1	3	2	0.71025641	0.752533617
1982	1	3	2	0.508333333	0.730598086
1983	1	3	2	0.748387097	0.666204197
1984	1	3	2	0.7	0.747289474
1985	1	3	2	0.727272727	0.794497861
1986	1	3	2	0.828181818	0.682160738
1987	1	3	2	0.55	1.191415914
1988	1	3	2	0.476666667	0.671788184
1989	1	3	2	0.775	0.888923879
1993	1	3	2	0.72952381	1.048709233
1994	1	3	2	0.535	0.694708094
1995	1	3	2	0.641428571	0.588770803
1996	1	3	2	0.794230769	0.51677122
1997	1	3	2	0.577878788	0.675419209
1998	1	3	2	0.535555556	0.647841302
1999	1	3	2	0.637777778	0.440197226
2000	1	3	2	0.533076923	0.443416053
2001	1	3	2	0.748333333	0.817815652
2002	1	3	2	0.701333333	0.372787567
2003	1	3	2	1.298571429	0.808659434
2004	1	3	2	0.803076923	0.652704746
2005	1	3	2	1.726666667	0.512147281
1980	1	4	2	2.825925926	0.598248467
1981	1	4	2	2.452941176	0.498613661
1982	1	4	2	2.313461538	0.649932671
1983	1	4	2	2.010714286	0.582563165
1984	1	4	2	1.863492063	0.451892613
1985	1	4	2	2.017045455	0.432939218
1986	1	4	2	2.136428571	0.368500822
1987	1	4	2	2.027102804	0.458061681
1988	1	4	2	1.947096774	0.527351162
1989	1	4	2	1.947297297	0.45395525
1993	1	4	2	2.554174757	0.600461742
1994	1	4	2	2.324607843	0.534473908
1995	1	4	2	2.159622642	0.494231194
1996	1	4	2	2.130454545	0.511176505
1997	1	4	2	2.277575758	0.537967412
1998	1	4	2	2.120108696	0.490665528
1999	1	4	2	2.311046512	0.475578793
2000	1	4	2	2.118968254	0.476218242
2001	1	4	2	1.961354167	0.570703128
2002	1	4	2	2.207352941	0.492217198
2003	1	4	2	1.831666667	0.373385062
2004	1	4	2	2.58370664	0.377365756
2005	1	4	2	2.786372348	0.371878338
2006	1	4	2	2.765892405	0.37197854
2007	1	4	2	2.797415902	0.400341519
2008	1	4	2	2.563985083	0.418941384

Population size structure
1 # Length bin method: 1=Use data bins
 # 2=generate from min/max/width read below
 # 3=Read count and vector below
#44 # Count of population bins

# Lower edge of bins											
#6	8	10	12	14	16	18	20	22	24	26	28
	30	32	34	36	38	40	42	44	46	48	50
	52	54	56	58	60	62	64	66	68	70	72
	74	76	78	80	82	84	86	88	90	92	
0.0001	# Minimum proportion for compressing tails of observed compositional data										
0.0001	# Constant added to expected frequencies										
0	# Combine males and females at and below this bin number										
44	#_N_length_bins										
#_lower_edge_of_length_bins											
6	8	10	12	14	16	18	20	22	24	26	28
	30	32	34	36	38	40	42	44	46	48	50
	52	54	56	58	60	62	64	66	68	70	72
	74	76	78	80	82	84	86	88	90	92	
83	#N_observations		(counts	-	samples	are	trips)				
#Year	Seas	Fleet	sexes	Partition	Nsamp	6	8	10	12	14	16
	18	20	22	24	26	28	30	32	34	36	38
	40	42	44	46	48	50	52	54	56	58	60
	62	64	66	68	70	72	74	76	78	80	82
	84	86	88	90	92	6	8	10	12	14	16
	18	20	22	24	26	28	30	32	34	36	38
	40	42	44	46	48	50	52	54	56	58	60
	62	64	66	68	70	72	74	76	78	80	82
	84	86	88	90	92						
#Not-live											
2001	1	1	1	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	413	0	0	140	25	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	1	1	0	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	26	11	4	0	0	0	0	17	0
	0	0	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	1	1	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	1	2	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	400	671	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	1	2	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	69
	0	54	86	0	0	0	0	22	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

2007	1	1	2	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	1	2	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	4	0	4	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2000	1	1	0	0	4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	117	31
	0	164	3	87	0	0	14	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	1	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	101
	0	0	0	0	0	0	40	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	1	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	16	0	16	11	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	1	0	0	5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	399	176	149	271	61	225	141	0	5	0	0
	5	23	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	1	0	0	4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	184	0	0	0	0	3	0	0	0
	0	14	0	0	7	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	1	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	8	7	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	1	0	0	8	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	39
	46	26	43	77	56	15	42	11	15	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	1	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	4	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
#Live											
1999	1	2	1	0	4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	34	67	55	77	60	32	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2000	1	2	1	0	26	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	21	362	206
	307	263	110	119	185	104	259	192	76	48	69
	29	32	47	0	15	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	2	1	0	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	68	62	105
	0	0	0	51	51	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	2	1	0	6	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	182	0
	361	0	190	83	37	45	0	84	6	0	0
	4	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	2	1	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	48	23	21
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1999	1	2	2	0	5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	284
	206	0	99	42	36	65	52	7	0	0	14
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2000	1	2	2	0	32	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1081	850
	368	547	527	670	319	555	333	552	64	152	34
	0	20	32	15	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	2	2	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	75	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	2	2	0	7	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	620	811
	513	196	148	140	96	0	63	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	2	2	0	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	72	63	0	0	0	0	0	0
	0	0	23	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	2	0	0	5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	506	1394	329	498	700	1048	151	291	166	163	0
	61	0	0	0	39	0	36	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1999	1	2	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	94	77	37	62	56	0	23	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2000	1	2	0	0	75	0	0	0	0	0	0
	0	0	0	0	0	0	0	192	1337	4462	4181
	5534	7773	6290	5183	4614	2000	2018	1706	627	365	359
	227	206	36	16	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	2	0	0	129	0	0	0	0	0	0
	0	0	0	0	0	0	0	201	3460	11115	9058

	13514	10543	11516	10382	7338	7737	6340	6824	4410	3323	1649
	1780	461	425	327	403	0	0	0	36	0	31
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	2	0	0	164	0	0	0	0	0	0
	0	0	0	0	0	0	45	75	640	16057	16778
	18841	13315	9726	5949	5002	4824	2145	2152	1144	948	448
	385	96	47	42	19	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	2	0	0	105	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	92	0	917
	7581	9380	9367	5463	3867	3334	1811	1178	832	774	338
	314	101	54	24	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	2	0	0	142	0	0	0	0	0	0
	0	0	0	0	0	0	0	98	327	68	1745
	7490	6624	5519	4789	4237	2927	2286	2267	1533	1356	908
	537	354	105	12	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	2	0	0	87	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	77	178
	8243	8254	6986	3796	2887	2295	1827	1046	992	640	426
	346	204	137	69	18	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	2	0	0	128	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	66	731
	3121	2472	2707	2079	2224	2703	2637	2356	2211	1129	1015
	738	381	166	193	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	2	0	0	127	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	86	70	1315
	3547	5577	3350	5404	4294	5166	6011	3670	5568	3649	3214
	1881	1012	902	360	37	41	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	2	0	0	91	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	90	84
	1389	1811	2176	1992	1832	1234	802	967	1148	701	417
	394	211	224	76	6	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

#Shore	modes										
1980	1	3	0	0	44	1	0	0	0	1	2
	0	1	3	2	8	7	7	3	8	7	4
	1	1	1	3	1	2	0	0	2	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1981	1	3	0	0	28	0	0	0	0	0	0
	1	2	0	2	4	0	6	5	9	4	0
	1	1	2	0	0	1	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1982	1	3	0	0	27	0	0	0	0	0	1
	0	3	2	2	4	4	6	4	4	2	1
	1	0	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1983	1	3	0	0	23	0	0	0	0	0	0
	0	1	0	2	1	4	4	6	3	2	1
	1	3	0	1	0	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1984	1	3	0	0	18	0	0	0	0	1	2
	0	2	1	0	1	2	1	2	1	2	1
	4	1	0	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1985	1	3	0	0	48	0	0	0	0	2	1
	5	5	6	1	2	1	3	6	6	3	5
	4	0	2	3	3	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1986	1	3	0	0	55	0	0	0	0	0	0
	0	3	5	3	5	4	5	4	6	4	6
	9	1	6	2	1	0	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1987	1	3	0	0	28	0	0	0	0	0	0
	2	7	3	3	2	6	3	3	3	1	3
	2	2	0	0	1	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1988	1	3	0	0	21	0	0	0	0	0	0
	1	3	2	4	2	2	4	4	4	2	2
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1989	1	3	0	0	16	0	0	0	0	0	1
	0	0	0	1	2	1	7	4	0	0	0
	0	2	0	0	1	0	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1993	1	3	0	0	42	0	0	0	0	0	2
	2	3	4	3	6	3	5	9	9	6	2
	1	0	1	1	3	1	0	1	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1994	1	3	0	0	49	0	0	0	1	0	1
	5	1	2	5	8	3	1	10	8	1	1
	0	2	1	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1996	1	3	0	0	23	0	0	0	0	0	0
	0	1	2	1	0	0	4	3	4	1	3
	4	1	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1997	1	3	0	0	30	0	0	0	0	0	0
	1	2	3	3	2	4	4	8	3	2	0
	1	2	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	3	0	0	6	0	0	0	0	0	0
	0	0	1	2	1	1	2	0	0	1	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1999	1	3	0	0	8	0	0	0	0	0	0
	1	0	0	0	1	0	1	1	4	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2000	1	3	0	0	13	0	0	0	0	0	0
	0	0	0	1	2	2	4	0	2	2	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	3	0	0	9	0	0	1	0	0	0
	0	0	1	0	1	2	1	2	0	1	1
	0	1	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	3	0	0	15	0	0	0	0	0	0
	1	0	1	0	0	2	2	1	4	1	2
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	3	0	0	7	0	0	0	0	0	0
	0	0	0	0	1	0	2	1	0	1	2
	0	0	1	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	3	0	0	12	0	0	0	0	0	0
	1	0	0	0	1	2	1	2	1	2	0
	0	1	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	3	0	0	4	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	2	0
	1	1	0	1	0	1	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
#Boat	modes										
1980	1	4	0	0	24	0	0	0	0	0	0
	0	0	0	0	0	2	0	1	1	0	1
	0	2	1	1	2	2	1	3	3	5	1
	0	0	0	1	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						

1981	1	4	0	0	24	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	3	1	0
	0	0	4	4	4	2	2	1	5	4	0
	2	2	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1982	1	4	0	0	36	0	0	0	0	0	1
	0	0	1	0	0	0	0	1	1	1	1
	4	7	10	1	3	4	5	2	4	2	3
	0	2	1	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1983	1	4	0	0	19	0	0	0	0	0	0
	0	0	0	0	1	0	0	1	1	0	2
	1	3	2	0	3	6	1	1	0	3	1
	0	0	1	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1984	1	4	0	0	35	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	3	1	0
	8	5	5	7	8	5	3	6	2	2	4
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1985	1	4	0	0	48	0	0	0	0	0	0
	0	0	0	1	1	0	0	0	1	2	5
	8	3	9	5	5	10	8	8	9	5	6
	1	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1986	1	4	0	0	35	0	0	0	0	0	0
	0	0	0	0	0	0	1	2	1	1	5
	1	2	0	4	8	13	10	9	6	2	3
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1987	1	4	0	0	47	0	0	0	0	0	0
	0	0	3	1	0	0	2	1	0	3	4
	2	7	6	10	6	18	14	6	9	6	3
	3	2	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1988	1	4	0	0	91	0	0	0	0	0	0
	0	0	0	2	3	3	2	3	4	5	6
	7	8	9	19	14	10	13	11	19	4	5
	3	0	2	1	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1989	1	4	0	0	36	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	3	1	2
	10	3	4	10	9	4	7	5	9	1	0
	3	1	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1993	1	4	0	0	69	0	0	0	0	0	0
	0	1	0	0	0	0	0	1	2	3	5
	7	6	15	11	5	13	3	8	6	4	3
	2	0	2	1	2	2	0	3	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1994	1	4	0	0	85	0	0	0	0	0	0
	0	0	0	1	0	0	1	2	6	3	1
	2	7	6	12	7	6	11	8	3	4	3
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1996	1	4	0	0	47	0	0	0	0	0	0
	0	0	1	0	0	0	0	1	0	3	7
	5	2	8	7	5	3	7	2	7	1	1
	2	1	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1997	1	4	0	0	79	0	0	0	0	0	0
	0	0	0	0	0	0	1	2	8	9	4
	10	13	5	14	20	17	15	14	7	3	2
	0	4	0	0	0	0	1	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1998	1	4	0	0	115	0	0	0	0	0	0
	0	0	0	0	0	1	0	3	12	5	13
	11	16	21	23	14	15	21	14	10	5	4
	1	1	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
1999	1	4	0	0	122	0	0	0	0	0	0
	0	0	0	0	0	0	2	2	8	6	5
	13	17	11	17	27	18	16	13	6	5	7
	9	3	1	1	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2000	1	4	0	0	79	0	0	0	0	0	0
	0	0	0	0	0	0	2	4	5	7	6
	8	12	12	12	11	12	18	17	5	4	3
	3	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2001	1	4	0	0	61	0	0	0	0	0	0
	0	0	0	0	1	0	4	2	3	9	7
	8	13	10	8	8	5	5	7	3	3	1
	4	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2002	1	4	0	0	73	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	2	8	11
	13	11	10	14	19	10	7	10	7	9	3
	0	1	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2003	1	4	0	0	10	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	4	1	2	1	0	4	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2004	1	4	0	0	481	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	2
	39	69	106	95	128	125	118	111	76	58	34
	17	15	11	3	1	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2005	1	4	0	0	696	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	1	3	6
	28	57	87	137	141	211	223	172	132	98	46
	55	28	19	11	1	1	2	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2006	1	4	0	0	779	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	1	1	4
	40	58	125	132	152	175	215	189	166	116	72
	57	32	22	13	5	1	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2007	1	4	0	0	534	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	5
	37	82	88	116	116	143	150	140	116	89	94
	56	34	20	16	4	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
2008	1	4	0	0	711	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	1	4	19
	96	127	165	187	202	186	210	186	145	116	88

	55	34	32	14	6	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0						
20	#_N_age_bins										
1	2	3	4	5	6	7	8	9	10	11	12
	13	14	15	16	17	18	19	20			
1	#_N_ageerror_definitions										
#Female											
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	-1	-1									
0.457687	0.457687	0.46745	0.478098	0.48971	0.502373	0.516184	0.531244	0.547669	0.565581	0.585115	0.606417
	0.629649	0.654984	0.682614	0.712746	0.745606	0.781441	0.820522	0.863142	0.909621	0.960309	1.01559
	1.07587	1.14161	1.21331	1.2915	1.37676	1.46975	1.57116	1.68175	1.80236	1.93389	2.07733
	2.23376	2.40435									
114	#_N_Agecomp_obs										
2	#_Lbin_method:		1=poplenbins		2=datalenbins		3=lengths				
0	#_combine	males	into	females	at	or	below	this	bin	number	
#Conditional_Age-at_Length			1	2	3	4	5	6	7	8	9
	10	11	12	13	14	15	16	17	18	19	20
	1	2	3	4	5	6	7	8	9	10	11
	12	13	14	15	16	17	18	19	20		
#Recreational (ORBS) data Josie ages											
#Females											
#Year	Seas	Flt/Svy	Gender	Part	Ageerr	Lbin_lo	Lbin_hi	Nsamp	1	2	3
	4	5	6	7	8	9	10	11	12	13	14
	15	16	17	18	19	20	1	2	3	4	5
	6	7	8	9	10	11	12	13	14	15	16
	17	18	19	20							
2005	1	5	1	0	1	19	19	3	0	0	0
	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	5	1	0	1	20	20	2	0	0	0
	1	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	5	1	0	1	21	21	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	5	1	0	1	22	22	3	0	0	0
	0	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	5	1	0	1	23	23	5	0	0	0
	1	3	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	5	1	0	1	24	24	4	0	0	0
	0	1	1	1	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	5	1	0	1	25	25	1	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

2005	1	5	1	0	1	26	26	3	0	0	0
	0	0	1	0	1	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	5	1	0	1	27	27	1	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	5	1	0	1	28	28	3	0	0	0
	0	0	0	0	2	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	1	0	1	17	17	1	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	1	0	1	18	18	4	0	0	1
	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	1	0	1	19	19	1	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	1	0	1	20	20	9	0	0	1
	1	5	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	1	0	1	21	21	9	0	0	0
	0	6	1	1	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	1	0	1	22	22	6	0	0	0
	0	2	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	1	0	1	23	23	6	0	0	0
	0	4	0	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	1	0	1	24	24	7	0	0	0
	0	1	4	1	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	1	0	1	25	25	9	0	0	0
	0	2	1	4	1	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	1	0	1	26	26	18	0	0	0
	0	0	2	7	5	3	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	1	0	1	27	27	13	0	0	0
	0	0	1	3	4	2	1	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

2006	1	5	1	0	1	28	28	15	0	0	0
	0	0	0	0	6	4	3	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	1	0	1	29	29	4	0	0	0
	0	0	0	0	0	3	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	1	0	1	30	30	7	0	0	0
	0	0	0	0	0	2	2	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	1	0	1	31	31	5	0	0	0
	0	0	0	0	0	0	1	2	0	0	1
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	1	0	1	32	32	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	1	0	1	33	33	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	1	0	1	34	34	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	1	0	1	19	19	1	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	1	0	1	20	20	4	0	0	0
	1	2	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	1	0	1	21	21	4	0	0	0
	1	2	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	1	0	1	22	22	2	0	0	0
	0	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	1	0	1	23	23	4	0	0	0
	0	0	2	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	1	0	1	24	24	4	0	0	0
	0	0	3	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	1	0	1	25	25	9	0	0	0
	0	0	1	4	3	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

2007	1	5	1	0	1	26	26	9	0	0	0
	0	0	0	6	2	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	1	0	1	27	27	12	0	0	0
	0	0	2	3	3	1	0	1	1	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	1	0	1	28	28	7	0	0	0
	0	0	1	1	3	1	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	1	0	1	29	29	3	0	0	0
	0	0	0	0	2	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	1	0	1	30	30	2	0	0	0
	0	0	0	0	0	0	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	1	0	1	31	31	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	1	0	1	33	33	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	1	0	1	15	15	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	1	0	1	18	18	4	0	0	2
	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	1	0	1	19	19	10	0	0	1
	9	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	1	0	1	20	20	8	0	0	0
	3	7	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	1	0	1	21	21	13	0	0	0
	3	11	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	1	0	1	22	22	15	0	0	0
	5	9	3	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	1	0	1	23	23	10	0	0	0
	1	4	7	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

2008	1	5	1	0	1	24	24	10	0	0	0
	0	6	5	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	1	0	1	25	25	18	0	0	0
	0	2	6	6	2	3	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	1	0	1	26	26	8	0	0	0
	0	0	2	4	3	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	1	0	1	27	27	7	0	0	0
	0	0	0	4	2	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	1	0	1	28	28	11	0	0	0
	0	0	0	2	5	4	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	1	0	1	29	29	5	0	0	0
	0	0	0	1	2	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	1	0	1	30	30	6	0	0	0
	0	0	0	1	2	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	1	0	1	31	31	2	0	0	0
	0	0	0	0	0	0	0	0	1	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	1	0	1	32	32	2	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
#Males											
2005	1	5	2	0	1	18	18	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	5	2	0	1	19	19	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	5	2	0	1	20	20	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	5	2	0	1	21	21	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	3
	2	1	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	5	2	0	1	22	22	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	4

	4	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	5	2	0	1	23	23	7	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	3
	0	2	0	2	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	5	2	0	1	24	24	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	2	1	2	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	5	2	0	1	25	25	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	0	1	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	5	2	0	1	26	26	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	1	0							
2005	1	5	2	0	1	27	27	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	2	0	1	16	16	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	2	0	1	17	17	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	2	0	1	18	18	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	2	0	1	19	19	12	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	3	6
	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	2	0	1	20	20	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	3
	4	1	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	2	0	1	21	21	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	7
	7	0	1	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	2	0	1	22	22	25	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	10
	9	4	1	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	2	0	1	23	23	28	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	4
	9	8	5	1	1	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	2	0	1	24	24	42	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1

	9	11	8	6	6	0	1	0	0	0	0
	0	0	0	0							
2006	1	5	2	0	1	25	25	28	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	8	8	7	4	0	0	0	1	0	0
	0	0	0	0							
2006	1	5	2	0	1	26	26	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	3	3	4	2	3	0	0	0	1	0	0
	0	0	0	0							
2006	1	5	2	0	1	27	27	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	0	1	2	1	1	0	1	1
	0	0	0	0							
2006	1	5	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0							
2006	1	5	2	0	1	29	29	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0							
2007	1	5	2	0	1	17	17	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	2	0	1	18	18	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	2	0	1	19	19	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	6
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	2	0	1	20	20	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	6
	3	1	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	2	0	1	21	21	12	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	5
	5	0	1	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	2	0	1	22	22	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	2
	3	8	0	0	0	0	1	0	0	0	0
	0	0	0	0							
2007	1	5	2	0	1	23	23	19	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	3	9	1	3	1	1	0	0	0	0	0
	0	0	0	0							
2007	1	5	2	0	1	24	24	12	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	3	1	4	3	0	1	0	0	0	0	0
	0	0	0	0							
2007	1	5	2	0	1	25	25	16	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	1	2	4	5	1	2	0	0	0	0	1
	0	0	0	0							
2007	1	5	2	0	1	26	26	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	1	3	1	0	2	0	0	0	0
	0	0	0	0							
2007	1	5	2	0	1	27	27	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	1	1	0
	0	0	0	0							
2007	1	5	2	0	1	28	28	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	5	2	0	1	29	29	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	1	0	1
	0	0	0	0							
2007	1	5	2	0	1	32	32	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0							
2008	1	5	2	0	1	16	16	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	2	0	1	17	17	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	2	0	1	18	18	11	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	9	2
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	2	0	1	19	19	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	11	2
	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	2	0	1	20	20	25	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	6	9
	10	2	1	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	2	0	1	21	21	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	7
	6	1	1	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	2	0	1	22	22	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	2
	7	1	1	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	2	0	1	23	23	14	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	9
	4	2	2	1	1	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	2	0	1	24	24	26	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	2

	6	11	10	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	2	0	1	25	25	13	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	6	3	4	1	1	2	0	0	0	0
	0	0	0	0							
2008	1	5	2	0	1	26	26	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	4	4	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	2	0	1	27	27	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	3	0	1	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	2	0	1	29	29	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0							
#Unidentified											
2005	1	5	0	0	1	20	20	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	5	0	0	1	21	21	1	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	0	0	1	19	19	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	0	0	1	19	19	1	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	0	0	1	27	27	1	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

0	#_N_MeanSize-at-Age_obs							
#Yr	Seas	Flt	Svy	Gender	Part	Ageerr	Ignore	datavector(female-male)
#	samplesize(female-male)							
0	#_N_environ_variables							
0	#_N_environ_obs							
0	#	N	sizefreq	methods	to	read		
#Sizefreq	N	bins	per	method				
#Sizetfreq	units(bio	num)	per	method				
#Sizefreq	scale(kg	lbs	cm	inches)	per	method		
#Sizefreq	mincomp	per	method					
#Sizefreq	N	obs	per	method				
#_Sizefreq	bins							
#_Year	season	Fleet	Partition	Gender	SampleSize		<data>	
0	#	no	tag	data				
0	#	no	morphcomp		data			

999

ENDDATA

Appendix F-2. Control file for ORS.

```
# OREGON cabezon control file                for SS v3.03a-May09

# Morph setup
1       # Number of growth patterns
1       # N sub morphs within growth patterns

2 #_Nblock_Patterns
2 1     #_Blocks_per_pattern
2000 2003 2004    2008   #Accounts for change in size limits (commercial)
2003    2008      #Accounts for change in size limits (recreational)

# Mortality and growth specifications
0.5     # Fraction female at birth
0       # M setup: 0=single Par,1=N_breakpoints,2=Lorenzen,3=agespecific;_4=agespec_withseasinterpolate
#2      # Number of M breakpoints
#0 0    # Ages at M breakpoints
1       # Growth model: 1=VB with L1 and L2, 2=VB with A0 and Linf, 3=Richards, 4=Read vector of L@A
0        # Age for growth Lmin
999     # Age for growth Lmax or 999 = Linf
0        # SD constant added to LAA (0.1 mimics SS2 v1.x for compatibility only)
0       # Variability about growth: 0=CV~f(LAA) [mimic v1.xx], 1=CV~f(A), 2=SD~f(LAA), 3=SD~f(A)
1        # Maturity option: 1=length logistic, 2=age logistic, 3=read age-maturity matrix by growth_pattern
1        # First age allowed to mature
1   #_fecundity option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b
0   #_hermaphroditism option:  0=none; 1=age-specific fxn
1   #_parameter_offset_approach (1=none, 2= M, G, CV_G as offset from female-GP1, 3=like SS2 V1.x)
1   #_env/block/dev_adjust_method (1=standard; 2=with logistic trans to keep within base parm bounds)

#_LO    HI     INIT          PRIOR    PR_type SD        PHASE env-var use_dev dev_minyr dev_maxyr
dev_stddev Block Block_Fxn
0.02    0.5     0.25    0.25    0       0.08    -4      0       0       0       0       0.5
0       0       #       NatM_p_2_Fem_GP:1 old
1        40     13.97   14      0       1        3      0       0       0       0       0.5
0       0       #       L_at_Amin_Fem_GP_1
20       90     59.0     58     0       100     2       0       0       0       0       0.5
0       0       #       L_at_Amax_Fem_GP_1
0.05    0.3     0.17    0.185   0       0.8     3       0       0       0       0       0.5
0       0       #       VonBert_K_Fem_GP_1
0.01    0.5     0.14    0.139   0       0.8     3       0       0       0       0       0.5
0       0       #       CV_young_Fem_GP_1
0.01    0.5      0.1   0.1      0       0.8     3       0      0        0       0       0.5
0       0       #       CV_old_Fem_GP_1

0.02    0.5      0.3     0.3    0       0.08    -4      0       0       0       0       0.5
0       0       #       NatM_p_1_Mal_GP:1 old
1        40     12.57   13  0       1       3       0       0       0       0       0.5     0
0       #       L_at_Amin_Mal_GP_1
20       90     41.8    41.8    0       100     2       0       0       0       0       0.5
0       0       #       L_at_Amax_Mal_GP_1
0.05    0.6     0.45    0.45    0       0.8     3       0       0      0        0       0.5
0       0       #       VonBert_K_Mal_GP_1
0.01    0.5     0.17    0.17    0       0.8     3       0       0       0       0       0.5
0       0       #       CV_young_Mal_GP_1
0.01    0.5     0.14    0.1     0       0.8     3       0       0       0       0       0.5
0       0       #       CV_old_Mal_GP_1

# Add 2+2*gender lines to read the wt-Len and mat-Len parameters
-3      3       0.000009184     0.000009184     0       0.8     -3      0       0       0
        0       0.5     0       0       #Female wt-len-1
-3      4       3.188   3.188 0 3       -3      0       0       0       0       0.5
        0       0       #Female wt-len-2
-3 50   43.7    43.7  0     10      -3      0       0       0       0       0.5     0
        0       #Female mat-len-1
-3      3       -0.37   -0.37  0        0.8     -3      0       0       0       0       0.5
        0       0       #Female mat-len-2
```

```
-3	3	1	1	0	0.8	-3	0	0	0	0	0.5
	0	0	#Female eggs/gm intercept
-3	3	0	0	0	0.8	-3	0	0	0	0	0.5
	0	0	#Female eggs/gm slope
-3	3	0.00001163	0.00001163	0	0.8	-3	0	0	0	0
	0.5	0	0	#Male wt-len-1
-3	4	3.118	3.118	0	3	-3	0	0	0	0	0.5
	0	0	#Male wt-len-2

-4 4 0 0 -1 99 -3 0 0 0 0 0.5 0 0 #_recrdistribution_by_growth_pattern
-4 4 0 0 -1 99 -3 0 0 0 0 0.5 0 0 #_recrdistribution_by_area 1
-4 4 0 0 -1 99 -3 0 0 0 0 0.5 0 0 #_recrdistribution_by_season 1
 0 2 1 1 -1 99 -3 0 0 0 0 0.5 0 0 #_cohort_growth_deviation
# Seasonal effects on biology parameters (0=none)
 0 0 0 0 0 0 0 0 0 0

#_Spawner-Recruitment
3 #_SR_function
#_LO   HI    INIT PRIOR PR_type SD PHASE
  3    30    6.6    12  -1    10    2  # SR_R0
0.2     1    0.701  0.71   0   0.8   -3  # SR_steep
  0     1      0.5   1.1   0     1   -1  # SR_sigmaR
  0     5      0     0   0     1   -3  # SR_envlink
  0     5      0     0   0     1   -3  # SR_R1_offset
  0        2     0       1        0         50  -50  # Autocorrelation placeholder (Future implementation)
0 #_SR_env_link
0 #_SR_env_target_1=devs;_2=R0;_3=steepness
1 #do_recr_dev:  0=none; 1=devvector; 2=simple deviations

# Recruitment residuals
1980	# Start year recruitment residuals
2007	# End year recruitment residuals
1	# Phase

1 # Read 13 advanced recruitment options: 0=no, 1=yes
0	# first year for early rec devs
-4	# phase for early rec devs
5	# Phase for forecast recruit deviations
100	# Lambda for forecast recr devs before endyr+1
1979	#_last_yr_nobias_adj_in_MPD
1980	# first year of full bias correction (linear ramp up from this year minus the plus-age to this year)
2004	# last year for full bias correction in_MPD
2005	#_first_recent_yr_nobias_adj_in_MPD
 1 #_max_bias_adj_in_MPD (1.0 to mimic pre-2009 models)
 0 #_placeholder
-15	# Lower bound rec devs
15	# Upper bound rec devs
0 # read intitial values for rec devs

# Fishing mortality setup
0.1	# F ballpark for tuning early phases
2003	# F ballpark year
1	# F method:  1=Pope's; 2=Instan. F; 3=Hybrid (recommended)
0.9	# max F or harvest rate, depends on F_Method

#init_F_setup,	for	each	fleet
#LO	HI	INIT	PRIOR	PRIOR TYPE	SD	PHASE
0	1	0.0	0.0001	0	99	-1
0	1	0.0	0.0001	0	99	-1
0	1	0.0001	0.0001	0	99	1
0	1	0.0001	0.0001	0	99	1
0	1	0.0	0.0001	0	99	-1

#_Qsetup
#_add_parm_row_for_each_positive_entry_below(Loop rows within columns Then columns
#1 Do-power(0/1)
#2 env-Var
#3 extra SD
#4 devtype(<0=mirror, 0/1=none, 2=cons, 3=rand, 4=randwalk)
#5 Num/Bio(0/1)
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#6 err_type(0=lognormal, >0=Student's T)

#_Q_setup
#_add_parm_row_for_each_positive_entry_below(row_then_column)
# A=do power, B=env-var, C=extra SD, D=devtype(<0=mirror, 0/1=none, 2=cons, 3=rand, 4=randwalk); E=0=num/1=bio,
F=err_type
# A B C D E F
 0 0 0   0   1   0 #1  InitF_FISHERY1_Comm_Non-Live
 0   0   0   0   1   0   #2  InitF_FISHERY2_Comm_Live
 0   0   0   0   1   0   #4  InitF_FISHERY3_Rec_Shore
 0   0   0   0   1   0   #6  InitF_FISHERY4_Rec_Boat
 0   0   0   0   1   0   #6  InitF_FISHERY5_OR_age_samples
 0   0   0   0   0   0 #8  InitF_SURVEY1_ORBS

#_size_selex_types
#_Pattern Discard Male Special
 24 0 0 0 #1  Comm_Non-Live
 24 0 0 0 #2  Comm_Live
 24 0 0 0 #3  Rec_Shore
 24 0 0 0 #4  Rec_PBR
 0 0 0 0 #5  OR_age_samples
 5 0 0 4 #8  ORBS

#_age_selex_types
#_Pattern Discard Male Special
 10 0 0 0 #1  Comm_Non-Live
 10 0 0 0 #2  Comm_Live
 10 0 0 0 #3  Rec_Shore
 10 0 0 0 #4  Rec_Boat
 10 0 0 0 #5  OR_age_samples
 10 0 0 0 #6  ORBS

#_LO   HI   INIT   PRIOR   PR_type  SD PHASE env-var use_dev dev_minyr dev_maxyr
dev_stddev Block Block_Fxn
#FLEET 1 NOT THE LIVE FISH FISHERY
  10   91   31   31   1   0.05   2   0   0   0   0   0.5
   0   0  # PEAK
 -5.0   3.0   -2.8   -2.8   1   0.05   3   0   0   0   0   0.5
   0   0  # TOP:_width of plateau
 -4.0   12.0   4.1   4.1   1   0.05   3   0   0   0   0   0.5   0
0  # Asc_width
  -10   6.0   4   -1.0   1   0.05   -3   0   0   0   0   0.5
   0   0  # Desc_width
-15.0   15.0   -10   -5.0   1   0.05   -2   0   0   0   0   0.5
   0   0  # INIT:_selectivity_at_fist_bin
 -5.0   15.0   10   -0.3   1   0.05   -2   0   0   0   0   0.5
   0   0  # FINAL:_selectivity_at_last_bin

#FLEET 2 LIVE FISH FISHERY
  10   91   38.2   38.2   1   0.05   2   0   0  0  0  0.5  1  2  # PEAK
 -5.0   3.0   -0.3   -0.3   1   0.05   3   0  0   0   0   0.5  1  2  #
TOP:_width of plateau
 -4.0   12.0   2.3   2.3   1   0.05   3  0  0   0   0  0.5  1   2  # Asc_width
  -10   6.0   3   3.0   1   0.05   3   0   0   0   0   0.5  1   2  #
Desc_width
-15.0   5.0   -5   -5.0   1   0.05   -2  0   0   0   0   0.5   0
0  # INIT:_selectivity_at_fist_bin
 -5.0   15.0   -3.5   -3.5   1   0.05   2  0   0   0   0   0.5   1
2  # FINAL:_selectivity_at_last_bin

#FLEET 3 Shore
  10   91   33.7   33.7   1   0.05   2   0   0   0   0   0.5
   0   0  # PEAK
 -5.0   3.0   -2.8   -2.8   1   0.05   3   0   0   0   0   0.5  0
0  # TOP:_width of plateau
 -4.0   12.0   4.1   4.1   1   0.05   3   0   0   0   0   0.5   0
0  # Asc_width
  -10   6.0   -1   -1.0   1   0.05   3   0   0   0   0   0.5
   0   0  # Desc_width
```

```
-15.0    15.0    -10     -5.0    1    0.05    -2    0    0    0    0    0.5
         0       0  # INIT:_selectivity_at_fist_bin
 -5.0    15.0    -0.3    -0.3    1    0.05     2    0    0    0    0    0.5
         0       0  # FINAL:_selectivity_at_last_bin

#FLEET 4 Boat
  10     91      45      45      1    0.05     2    0    0    0    0    0.5
         2       2  # PEAK
 -5.0    3.0     -2.8    -2.8    1    0.05     3    0    0    0    0    0.5
         2       2  # TOP:_width of plateau
 -4.0    12.0    4.1     4.1   1    0.05    3    0    0    0    0    0.5    2
2  # Asc_width
 -10     6.0     4       -1.0    1    0.05    -3    0    0    0    0    0.5
         0       0  # Desc_width
-15.0    15.0    -10     -5.0    1    0.05    -2    0    0    0    0    0.5
         0       0  # INIT:_selectivity_at_fist_bin
 -5.0    15.0    10      -0.3    1    0.05    -2    0    0    0    0    0.5
         0       0  # FINAL:_selectivity_at_last_bin

#FLEET 7 CA_age_samples

#Survey 1: CPFV CPUE 1960-1999
   1   44   1    1    0    10   -3   0    0    0    0    0.5    0    0
         #min Len bin - fixed
   1     100   44    50    0    10   -4   0    0    0    0    0.5    0
0        #max Len bin fixed

1        #_Custom_block_setup SELECTIVITY BLOCK: 1999-2008
#FLEET 2 LIVE FISH FISHERY
  10   91   38.2   38.2   1   0.05   3   # PEAK
  10   91   38.2   38.2   1   0.05   3   # PEAK
 -5.0    3.0     -0.3    -0.3    1    0.05    4    # TOP:_width of plateau
 -5.0    3.0     -0.3    -0.3    1    0.05    4    # TOP:_width of plateau
 -4.0    12.0    2.3     2.3   1    0.05    4  # Asc_width
 -4.0    12.0    2.3     2.3   1    0.05    4  # Asc_width
 -10     6.0     3       3.0   1    0.05    4    # Desc_width
 -10     6.0     3       3.0   1    0.05    4    # Desc_width
 -5.0    15.0    -3.5    -3.5    1    0.05    3  # FINAL:_selectivity_at_last_bin
 -5.0    15.0    -3.5    -3.5    1    0.05    3  # FINAL:_selectivity_at_last_bin
#FLEET 4 Boat
  10     91      45      45      1    0.05    3    # PEAK
 -5.0    3.0     -2.8    -2.8    1    0.05    4    # TOP:_width of plateau
 -4.0    12.0    4.1     4.1   1    0.05    4    # Asc_width

2        #separt_adj_method
# Tag loss and Tag reporting parameters go next
0  # TG_custom:  0=no read; 1=read if tags exist
#_Cond -6 6 1 1 2 0.01 -4 0 0 0 0 0 0 0  #_placeholder if no parameters

### Likelihood related quantities ###
1        # Do variance adjustments
#1  Comm: Non-live Fishery
#2  Comm: Live Fishery
#3  Rec: Shore
#4  Rec: Boat
#5  CA age samples
#6  ORBS survey
#        1      2      3             4             5            6
# 0      0      0      0      0      0      #_add_to_survey_CV (no additions)
  0      0      0      0      0      0.1    #_add_to_survey_CV
  0      0      0      0      0      0      #_add_to_discard_stddev
  0      0      0      0      0      0      #_add_to_bodywt_CV
#  1     1      1      1      1      1   #_mult_by_lencomp_N
  3.5    1.4    1.1    0.75   1.4    1   #_mult_by_lencomp_N
  1      1      1      1      1      1      #_mult_by_agecomp_N
  1      1      1      1      1      1      #_mult_by_size-at-age_N

30  #  DF For discard T-distribution
30  #  DF For meanbodywt T-distribution
1        #_maxlambdaphase
```

```
0               #_sd_offset
0               # N changes to default Lambdas = 1.0
######################################
#Example of changes to default lambda
#3 # number of changes to make to default Lambdas (default value is 1.0)
# Like_comp codes:  1=surv; 2=disc; 3=mnwt; 4=length; 5=age; 6=SizeFreq; 7=sizeage; 8=catch;
# 9=init_equ_catch; 10=recrdev; 11=parm_prior; 12=parm_dev; 13=CrashPen; 14=Morphcomp; 15=Tag-comp; 16=Tag-negbin
#like_comp fleet/survey  phase  value  sizefreq_method
#  1 8 1 0 1 #_CPUE/survey:_1 ORBS
#  4 1 1 0 1 #_lencomp:_FLEET 1
#  4 2 1 0 1 #_lencomp:_FLEET 2
#  4 3 1 0 1 #_lencomp:_FLEET 3
#  4 4 1 0 1 #_lencomp:_FLEET 4
#  5 7 1 0 1 #_Cond_age:_Females, Males, & Unsexed
#  1 1 1 0 1 #_init_equ_catch
#  1 1 1 0 1 #_recruitments
#  1 1 1 0 1 #_parameter-priors
#  1 1 1 0 1 #_parameter-dev-vectors
#  1 1 1 0 1 #_crashPenLambda
######################################

0 # (0/1) read specs for more stddev reporting
# 1 1 -1 5 1 5 # selex type, len/age, year, N selex bins, Growth pattern, N growth ages
# 3 9 15 21 27 # vector with selex std bin picks (-1 in first bin to self-generate)
# 1 2 14 26 40 # vector with growth std bin picks (-1 in first bin to self-generate)

999 # end of control file
```

Appendix G. Numbers at age for A) females and B) males for the NCS sub-stock. Decadal numbers are given up to 1980.

A) NCS Females

	Age class																									
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+
1914	438	341	266	207	161	125	98	76	59	46	36	28	22	17	13	10	8	6	5	4	3	2	2	1	1	4
1920	438	341	266	207	161	125	98	76	59	46	36	28	22	17	13	10	8	6	5	4	3	2	2	1	1	4
1930	438	341	265	207	161	125	97	76	59	46	36	28	22	17	13	10	8	6	5	4	3	2	2	1	1	4
1940	435	339	264	205	160	124	96	74	57	44	34	26	20	16	12	9	7	6	4	3	3	2	2	1	1	3
1950	428	335	261	202	155	118	89	67	51	38	29	22	17	13	10	8	6	5	3	3	2	2	1	1	1	3
1960	423	329	256	198	153	117	88	66	50	37	28	21	15	11	8	6	4	3	2	2	1	1	1	1	0	1
1970	755	329	255	198	153	117	88	67	50	37	27	20	14	11	8	6	4	3	2	2	1	1	1	1	0	1
1980	253	234	365	201	105	82	75	70	64	55	46	19	14	10	7	5	4	3	2	2	1	1	1	0	0	1
1981	366	197	181	280	152	78	60	54	49	45	38	32	13	9	7	5	4	3	2	1	1	1	1	0	0	1
1982	237	285	152	140	213	113	57	42	37	34	31	26	21	9	6	5	3	2	2	1	1	1	1	0	0	1
1983	318	185	221	117	106	158	83	41	30	26	24	21	18	15	6	4	3	2	2	1	1	1	0	0	0	1
1984	258	248	143	170	89	79	116	59	29	21	18	17	15	12	10	4	3	2	2	1	1	1	0	0	0	1
1985	168	201	191	110	129	67	58	84	43	21	15	13	12	10	9	7	3	2	2	1	1	1	0	0	0	1
1986	506	131	156	148	84	98	50	43	62	31	15	11	9	9	8	6	5	2	2	1	1	1	0	0	0	1
1987	521	394	101	120	112	62	71	35	30	42	21	10	7	6	6	5	4	3	1	1	1	1	0	0	0	1
1988	244	406	305	78	91	84	46	51	25	21	29	14	7	5	4	4	3	3	2	1	1	0	0	0	0	1
1989	306	190	313	234	59	68	61	32	35	17	14	20	10	5	3	3	2	2	2	2	1	0	0	0	0	0
1990	507	238	147	240	177	44	49	43	22	24	11	9	13	6	3	2	2	2	1	1	1	0	0	0	0	0
1991	386	395	185	113	183	133	32	35	31	16	17	8	7	9	4	2	1	1	1	1	1	1	0	0	0	0
1992	342	300	306	143	87	138	99	23	25	22	11	12	6	5	6	3	1	1	1	1	1	1	0	0	0	0
1993	667	266	232	234	107	63	97	67	15	16	14	7	7	3	3	4	2	1	1	1	0	0	0	0	0	0
1994	421	519	207	179	177	79	45	67	45	10	11	9	5	5	2	2	3	1	1	0	0	0	0	0	0	0
1995	314	328	403	160	136	131	57	32	47	31	7	7	6	3	3	2	1	2	1	0	0	0	0	0	0	0
1996	320	245	255	311	119	96	89	37	20	29	19	4	5	4	2	2	1	1	1	0	0	0	0	0	0	0
1997	615	249	190	196	230	83	63	56	23	12	18	11	3	3	2	1	1	1	0	1	0	0	0	0	0	0
1998	524	479	193	145	143	157	53	39	34	14	7	10	7	2	2	1	1	1	0	0	0	0	0	0	0	0
1999	254	408	371	147	104	93	93	30	21	18	7	4	5	3	1	1	1	0	0	0	0	0	0	0	0	0
2000	245	197	317	287	112	74	61	57	18	12	10	4	2	3	2	0	0	0	0	0	0	0	0	0	0	0
2001	211	191	153	246	220	81	50	39	35	11	7	6	2	1	2	1	0	0	0	0	0	0	0	0	0	0
2002	292	164	148	119	188	162	57	33	25	22	6	4	4	1	1	1	1	0	0	0	0	0	0	0	0	0
2003	366	227	128	115	91	141	117	40	23	17	15	4	3	2	1	0	1	0	0	0	0	0	0	0	0	0
2004	276	285	176	99	88	68	99	78	25	14	10	8	2	2	1	0	0	0	0	0	0	0	0	0	0	0
2005	443	215	221	137	76	66	49	69	53	17	9	6	5	2	1	1	0	0	0	0	0	0	0	0	0	0
2006	369	345	167	172	105	57	48	35	48	36	11	6	4	4	1	1	1	0	0	0	0	0	0	0	0	0
2007	375	287	269	130	133	80	43	35	25	34	26	8	4	3	2	1	0	0	0	0	0	0	0	0	0	0
2008	382	292	223	209	100	101	60	32	26	18	25	18	6	3	2	2	1	0	0	0	0	0	0	0	0	0
2009	388	298	227	173	161	77	76	45	23	19	13	18	13	4	2	2	1	0	0	0	0	0	0	0	0	0

B) NCS Males

Year	Age class																								
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+
1914	438	324	240	178	132	98	72	54	40	29	22	16	12	9	7	5	4	3	2	1	1	1	1	0	0	1
1920	438	324	240	178	132	98	72	54	40	29	22	16	12	9	7	5	4	3	2	1	1	1	1	0	0	1
1930	438	324	240	178	132	98	72	53	40	29	22	16	12	9	7	5	4	3	2	1	1	1	1	0	0	1
1940	435	322	239	177	131	96	71	52	38	28	21	15	11	8	6	5	3	2	2	1	1	1	1	0	0	1
1950	428	319	236	173	126	92	67	49	35	26	19	14	10	7	5	4	3	2	2	1	1	1	0	0	0	0
1960	423	313	231	170	125	91	66	48	34	25	18	13	9	6	5	3	2	2	1	1	1	0	0	0	0	0
1970	755	313	231	170	125	91	66	48	34	24	17	12	9	6	5	3	2	2	1	1	1	0	0	0	0	0
1980	253	223	330	172	86	64	56	51	45	37	30	12	9	6	4	3	2	2	1	1	1	0	0	0	0	0
1981	366	187	164	240	124	61	45	39	35	31	25	21	8	6	4	3	2	1	1	1	1	0	0	0	0	0
1982	237	271	138	120	173	88	43	31	27	24	21	17	14	5	4	3	2	1	1	1	0	0	0	0	0	0
1983	318	176	200	101	86	124	62	30	22	19	16	14	12	9	4	3	2	1	1	1	0	0	0	0	0	0
1984	258	236	129	145	73	62	87	44	21	15	13	11	10	8	6	3	2	1	1	1	0	0	0	0	0	0
1985	168	191	173	94	105	52	44	62	31	15	10	9	8	7	6	4	2	1	1	1	0	0	0	0	0	0
1986	506	124	141	127	69	76	38	31	44	22	10	7	6	6	5	4	3	1	1	1	0	0	0	0	0	0
1987	521	375	91	102	91	49	53	26	22	30	15	7	5	4	4	3	3	2	1	1	0	0	0	0	0	0
1988	244	386	276	67	74	65	35	38	18	15	21	10	5	3	3	2	2	2	1	1	0	0	0	0	0	0
1989	306	181	282	201	48	53	46	24	26	12	10	14	7	3	2	2	2	1	1	1	0	0	0	0	0	0
1990	507	227	133	206	144	34	37	32	16	18	8	7	9	5	2	2	1	1	1	1	1	0	0	0	0	0
1991	386	375	167	97	149	104	24	26	22	11	12	6	5	6	3	1	1	1	1	1	1	0	0	0	0	0
1992	342	286	277	122	71	108	74	17	18	16	8	8	4	3	4	2	1	1	1	1	0	0	0	0	0	0
1993	667	253	209	200	87	49	74	50	11	12	10	5	5	3	2	3	1	1	0	0	0	0	0	0	0	0
1994	421	494	187	153	144	62	34	51	34	8	8	7	3	4	2	1	2	1	0	0	0	0	0	0	0	0
1995	314	312	365	137	110	103	43	24	35	23	5	5	5	2	2	1	1	1	1	0	0	0	0	0	0	0
1996	320	233	230	266	97	76	68	28	15	22	14	3	3	3	1	1	1	1	1	0	0	0	0	0	0	0
1997	615	237	171	167	186	66	49	43	17	9	13	9	2	2	2	1	1	0	0	0	0	0	0	0	0	0
1998	524	456	174	124	116	124	42	31	26	10	5	8	5	1	1	1	0	0	0	0	0	0	0	0	0	0
1999	254	388	335	125	84	74	75	24	17	14	5	3	4	3	1	1	0	0	0	0	0	0	0	0	0	0
2000	245	188	287	246	90	58	49	48	15	10	8	3	2	2	1	0	0	0	0	0	0	0	0	0	0	0
2001	211	182	139	211	178	63	40	32	30	9	6	5	2	1	1	1	0	0	0	0	0	0	0	0	0	0
2002	292	156	134	102	153	127	44	27	21	20	6	4	3	1	1	1	1	0	0	0	0	0	0	0	0	0
2003	366	216	115	98	74	110	90	30	18	15	13	4	3	2	1	0	1	0	0	0	0	0	0	0	0	0
2004	276	271	160	85	72	53	77	61	20	12	9	9	3	2	1	0	0	0	0	0	0	0	0	0	0	0
2005	443	204	200	117	62	51	37	53	42	14	8	6	6	2	1	1	0	0	0	0	0	0	0	0	0	0
2006	369	328	151	148	86	45	37	26	37	29	9	6	4	4	1	1	1	0	0	0	0	0	0	0	0	0
2007	375	273	243	112	108	63	32	26	19	26	20	7	4	3	3	1	1	0	0	0	0	0	0	0	0	0
2008	382	278	202	179	82	79	45	23	19	13	18	14	5	3	2	2	1	0	0	0	0	0	0	0	0	0
2009	388	283	205	149	132	60	57	33	17	13	9	13	10	3	2	1	1	0	0	0	0	0	0	0	0	0

Appendix H. Numbers at age for A) females and B) males for the SCS sub-stock. Decadal numbers are given up to 1980.

A) SCS Females

Year	Age class																									
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+
1914	103	80	62	49	38	30	23	18	14	11	8	7	5	4	3	2	2	1	1	1	1	1	0	0	0	1
1920	103	80	62	49	38	30	23	18	14	11	8	7	5	4	3	2	2	1	1	1	1	1	0	0	0	1
1930	103	80	62	49	38	29	23	18	14	11	8	7	5	4	3	2	2	1	1	1	1	1	0	0	0	1
1940	103	80	62	48	38	29	23	18	14	11	8	6	5	4	3	2	2	1	1	1	1	1	0	0	0	1
1950	102	80	62	48	37	28	22	17	13	10	8	6	5	4	3	2	2	1	1	1	1	1	0	0	0	1
1960	100	77	60	46	35	26	19	14	10	8	6	5	4	3	2	2	1	1	1	1	0	0	0	0	0	1
1970	291	78	60	46	35	27	20	15	11	8	6	5	4	3	2	2	1	1	1	0	0	0	0	0	0	0
1980	142	60	44	33	20	21	20	19	14	13	17	4	3	2	2	1	1	1	1	0	0	0	0	0	0	0
1981	45	110	46	32	23	13	14	13	13	9	8	11	3	2	1	1	1	1	0	0	0	0	0	0	0	0
1982	43	35	84	34	23	16	9	9	9	8	6	6	7	2	1	1	1	1	0	0	0	0	0	0	0	0
1983	62	34	27	61	23	15	10	5	5	5	5	4	3	4	1	1	1	0	0	0	0	0	0	0	0	0
1984	237	48	26	20	45	17	10	7	4	4	4	3	3	2	3	1	1	0	0	0	0	0	0	0	0	0
1985	43	185	37	19	14	30	11	7	4	2	2	2	2	2	1	2	0	0	0	0	0	0	0	0	0	0
1986	22	33	141	27	13	9	19	7	4	3	2	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0
1987	68	17	25	100	18	8	5	11	4	2	2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
1988	99	53	13	18	66	11	5	3	7	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
1989	37	77	40	10	13	46	8	3	2	4	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	37	29	58	29	7	9	31	5	2	1	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	38	29	21	40	19	4	5	17	3	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	30	30	21	15	25	11	2	3	9	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	32	23	22	15	10	16	6	1	2	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	210	25	18	17	11	7	11	5	1	1	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	74	164	19	13	12	7	5	7	3	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	53	57	126	14	10	8	5	3	5	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	82	41	44	93	10	6	5	3	2	3	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
1998	189	64	32	33	67	7	4	3	2	1	2	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
1999	251	147	49	24	23	44	4	3	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	44	196	113	37	17	16	28	3	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	64	34	152	87	27	12	10	17	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	113	50	26	117	65	20	8	7	11	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	76	88	39	20	88	48	14	6	5	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	39	59	69	30	15	66	35	10	4	3	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	46	31	46	53	23	12	49	26	8	3	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	61	36	24	35	40	17	9	37	19	6	2	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	96	47	28	18	27	31	13	7	27	15	4	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0
2008	97	75	37	21	14	21	23	10	5	20	11	3	1	1	2	0	0	0	0	0	0	0	0	0	0	0
2009	96	75	58	28	16	11	16	17	7	4	15	8	2	1	1	1	0	0	0	0	0	0	0	0	0	0

B) SCS Males

Year	Age class																									
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+
1914	103	76	57	42	31	23	17	13	9	7	5	4	3	2	2	1	1	1	0	0	0	0	0	0	0	0
1920	103	76	57	42	31	23	17	13	9	7	5	4	3	2	2	1	1	1	0	0	0	0	0	0	0	0
1930	103	76	57	42	31	23	17	13	9	7	5	4	3	2	2	1	1	1	0	0	0	0	0	0	0	0
1940	103	76	56	42	31	23	17	12	9	7	5	4	3	2	2	1	1	1	0	0	0	0	0	0	0	0
1950	102	76	56	41	30	22	16	12	9	7	5	4	3	2	1	1	1	1	0	0	0	0	0	0	0	0
1960	100	74	54	40	29	20	14	10	7	5	4	3	2	1	1	1	1	0	0	0	0	0	0	0	0	0
1970	291	74	54	40	29	21	15	11	8	5	4	3	2	2	1	1	1	0	0	0	0	0	0	0	0	0
1980	142	58	40	29	16	16	15	14	10	8	10	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0
1981	45	105	41	28	19	11	10	10	9	6	5	6	2	1	1	1	0	0	0	0	0	0	0	0	0	0
1982	43	33	76	29	19	13	7	7	6	6	4	3	4	1	1	0	0	0	0	0	0	0	0	0	0	0
1983	62	32	24	53	19	12	8	4	4	3	3	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0
1984	237	46	23	17	37	13	8	5	3	3	2	2	1	1	2	0	0	0	0	0	0	0	0	0	0	0
1985	43	176	33	16	12	24	8	5	3	2	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
1986	22	32	127	23	11	8	15	5	3	2	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0
1987	68	16	22	86	15	7	4	9	3	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	99	50	11	15	55	9	4	3	5	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	37	73	36	8	11	38	6	3	2	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	37	27	52	25	6	7	24	4	2	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	38	27	19	35	16	3	4	13	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	30	28	19	13	21	9	2	2	7	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	32	22	20	13	8	13	5	1	1	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	210	24	16	14	9	6	9	4	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	74	156	17	11	10	6	4	6	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	53	55	114	12	8	7	4	2	4	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	82	39	39	80	8	5	4	2	1	2	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
1998	189	61	29	28	55	5	3	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	251	140	44	20	19	36	3	2	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	44	186	102	32	14	13	23	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	64	32	137	74	23	10	9	15	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	113	47	24	100	53	16	7	6	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	76	84	35	17	72	38	11	5	4	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	39	56	62	26	13	52	27	8	3	3	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	46	29	41	45	19	9	37	19	6	2	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	61	34	21	30	33	14	7	27	14	4	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	96	45	25	16	22	24	10	5	19	10	3	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0
2008	97	71	33	18	12	16	17	7	3	14	7	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
2009	96	72	52	24	13	8	12	13	5	2	10	5	1	1	0	1	0	0	0	0	0	0	0	0	0	0

Appendix I. Numbers at age for A) females and B) males for the CAS sub-stock. Decadal numbers are given up to 1980.

A) CAS Females

	Age class																									
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+
1914	458	357	278	217	169	131	102	80	62	48	38	29	23	18	14	11	8	7	5	4	3	2	2	1	1	4
1920	458	357	278	216	169	131	102	80	62	48	38	29	23	18	14	11	8	7	5	4	3	2	2	1	1	4
1930	458	357	278	216	168	131	102	79	62	48	37	29	23	18	14	11	8	6	5	4	3	2	2	1	1	4
1940	456	355	276	215	167	129	100	77	59	46	35	27	21	16	13	10	8	6	5	4	3	2	2	1	1	4
1950	449	351	272	210	160	121	92	69	53	40	31	24	18	14	11	8	6	5	4	3	2	2	1	1	1	3
1960	440	342	265	205	157	119	89	66	49	36	27	20	15	11	8	6	4	3	2	2	1	1	1	1	0	2
1970	436	342	265	204	157	119	89	67	49	36	26	19	14	11	8	6	4	3	2	2	1	1	1	0	0	1
1980	381	305	370	182	106	103	108	101	58	36	24	17	12	9	6	5	3	2	2	1	1	1	1	0	0	1
1981	368	296	234	280	135	76	72	74	68	39	24	16	11	8	6	4	3	2	2	1	1	1	0	0	0	1
1982	224	287	229	179	209	97	54	50	50	45	26	15	10	7	5	4	3	2	1	1	1	1	0	0	0	1
1983	400	175	222	175	133	151	68	37	33	33	30	17	10	7	5	3	2	2	1	1	1	0	0	0	0	1
1984	839	312	135	169	131	97	108	48	26	23	23	20	11	7	4	3	2	2	1	1	1	0	0	0	0	0
1985	230	654	240	103	127	96	70	76	33	18	16	15	14	8	5	3	2	2	1	1	1	0	0	0	0	0
1986	358	179	505	184	78	94	70	50	54	23	12	11	11	9	5	3	2	1	1	1	1	0	0	0	0	0
1987	529	279	138	383	136	55	65	47	33	35	15	8	7	7	6	3	2	1	1	1	0	0	0	0	0	0
1988	406	412	215	105	287	99	39	44	31	22	23	10	5	4	4	4	2	1	1	1	0	0	0	0	0	0
1989	324	316	317	164	79	210	71	27	31	22	15	15	6	3	3	3	3	1	1	1	0	0	0	0	0	0
1990	482	253	244	242	123	57	149	49	19	21	14	10	10	4	2	2	2	2	1	1	0	0	0	0	0	0
1991	374	375	195	186	182	90	41	105	34	13	14	10	7	7	3	1	1	1	1	1	0	0	0	0	0	0
1992	340	291	290	149	140	134	65	29	73	23	9	10	7	4	5	2	1	1	1	1	0	0	0	0	0	0
1993	648	265	224	220	110	100	92	43	19	47	15	6	6	4	3	3	1	1	1	1	0	0	0	0	0	0
1994	388	505	205	172	165	81	72	65	30	13	32	10	4	4	3	2	2	1	0	0	0	0	0	0	0	0
1995	297	303	392	158	129	121	58	50	45	21	9	22	7	3	3	2	1	1	1	0	0	0	0	0	0	0
1996	218	231	234	300	116	91	81	38	32	29	13	6	14	4	2	2	1	1	1	0	0	0	0	0	0	0
1997	406	170	179	178	217	79	59	51	23	19	17	8	3	8	2	1	1	1	0	0	0	0	0	0	0	0
1998	589	316	131	136	128	146	50	36	31	14	11	10	5	2	5	1	1	1	0	0	0	0	0	0	0	0
1999	389	458	244	99	94	80	83	27	19	16	7	6	5	2	1	2	1	0	0	0	0	0	0	0	0	0
2000	234	303	355	187	73	64	49	48	15	10	8	4	3	3	1	1	1	0	0	0	0	0	0	0	0	0
2001	170	182	235	274	139	50	40	29	26	8	5	4	2	2	1	1	0	1	0	0	0	0	0	0	0	0
2002	272	133	141	181	205	98	33	25	17	15	4	3	2	1	1	1	0	0	0	0	0	0	0	0	0	0
2003	366	211	103	108	137	149	68	22	16	10	9	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0
2004	212	285	164	79	82	98	99	42	13	9	5	4	1	1	1	0	0	0	0	0	0	0	0	0	0	0
2005	282	165	221	126	60	59	68	66	27	8	5	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0
2006	280	220	128	170	96	44	42	46	44	18	5	3	2	2	0	0	0	0	0	0	0	0	0	0	0	0
2007	366	218	171	99	131	72	32	30	32	30	12	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0
2008	375	285	169	132	76	98	53	23	21	23	21	8	2	1	1	1	0	0	0	0	0	0	0	0	0	0
2009	380	292	221	131	102	58	73	38	17	15	16	15	6	2	1	1	1	0	0	0	0	0	0	0	0	0

B) CAS Males

Year	Age class																								
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+
1914	458	340	252	186	138	102	76	56	42	31	23	17	13	9	7	5	4	3	2	2	1	1	1	0	0	1
1920	458	340	252	186	138	102	76	56	42	31	23	17	12	9	7	5	4	3	2	2	1	1	1	0	0	1
1930	458	339	251	186	138	102	76	56	41	31	23	17	12	9	7	5	4	3	2	2	1	1	1	0	0	1
1940	456	338	250	185	136	100	74	54	40	29	22	16	12	9	6	5	3	3	2	1	1	1	1	0	0	1
1950	449	334	246	180	131	95	69	50	36	27	19	14	10	8	6	4	3	2	2	1	1	1	0	0	0	1
1960	440	325	240	176	129	93	67	48	34	24	17	12	9	6	4	3	2	2	1	1	1	0	0	0	0	0
1970	436	325	239	176	129	93	67	48	34	24	17	12	9	6	4	3	2	2	1	1	1	0	0	0	0	0
1980	381	290	334	156	87	81	82	74	41	24	16	11	8	5	4	3	2	1	1	1	0	0	0	0	0	0
1981	368	282	211	240	110	61	55	55	49	27	16	10	7	5	4	3	2	1	1	1	0	0	0	0	0	0
1982	224	273	207	153	171	77	42	38	37	33	18	11	7	5	3	2	2	1	1	1	0	0	0	0	0	0
1983	400	166	200	150	109	120	53	28	25	25	22	12	7	4	3	2	1	1	1	1	0	0	0	0	0	0
1984	839	297	121	145	107	77	83	37	19	17	17	15	8	5	3	2	1	1	1	0	0	0	0	0	0	0
1985	230	622	217	88	104	76	54	58	25	13	12	11	10	5	3	2	1	1	1	0	0	0	0	0	0	0
1986	358	170	457	158	63	74	53	38	40	17	9	8	8	7	4	2	1	1	1	0	0	0	0	0	0	0
1987	529	265	124	329	112	44	50	36	25	26	11	6	5	5	4	2	1	1	1	0	0	0	0	0	0	0
1988	406	392	194	90	235	78	30	34	24	17	17	7	4	3	3	3	1	1	1	0	0	0	0	0	0	0
1989	324	300	286	140	64	166	55	21	24	16	11	12	5	3	2	2	2	1	1	0	0	0	0	0	0	0
1990	482	240	220	207	100	45	115	38	14	16	11	7	8	3	2	1	1	1	1	0	0	0	0	0	0	0
1991	374	357	176	160	149	71	32	79	26	10	11	7	5	5	2	1	1	1	1	0	0	0	0	0	0	0
1992	340	277	262	128	115	106	50	22	55	18	7	7	5	3	3	1	1	1	1	1	0	0	0	0	0	0
1993	648	252	202	188	90	79	72	33	14	36	11	4	5	3	2	2	1	0	0	0	0	0	0	0	0	0
1994	388	480	185	147	135	64	55	49	23	10	24	8	3	3	2	1	1	1	0	0	0	0	0	0	0	0
1995	297	288	354	135	106	96	45	38	34	15	7	16	5	2	2	1	1	1	0	0	0	0	0	0	0	0
1996	218	220	212	256	96	73	64	29	25	21	10	4	10	3	1	1	1	1	1	0	0	0	0	0	0	0
1997	406	162	161	152	179	64	47	40	18	15	13	6	2	6	2	1	1	0	0	0	0	0	0	0	0	0
1998	589	301	118	115	105	118	41	29	24	11	9	7	3	1	3	1	0	0	0	0	0	0	0	0	0	0
1999	389	436	219	84	78	66	70	23	16	13	6	4	4	2	1	2	1	0	0	0	0	0	0	0	0	0
2000	234	288	321	159	59	53	43	44	14	9	7	3	2	2	1	0	1	0	0	0	0	0	0	0	0	0
2001	170	173	213	234	114	41	35	27	26	8	5	4	2	1	1	0	0	0	0	0	0	0	0	0	0	0
2002	272	126	127	155	168	79	27	23	17	16	5	3	2	1	1	1	0	0	0	0	0	0	0	0	0	0
2003	366	201	93	93	112	119	55	19	15	11	10	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0
2004	212	271	148	68	67	79	81	36	12	9	7	6	2	1	1	0	0	0	0	0	0	0	0	0	0	0
2005	282	157	200	108	49	47	54	55	24	8	6	4	4	1	1	1	0	0	0	0	0	0	0	0	0	0
2006	280	209	116	146	79	35	33	38	38	16	5	4	3	3	1	0	0	0	0	0	0	0	0	0	0	0
2007	366	207	155	85	107	57	25	24	26	26	11	4	3	2	2	1	0	0	0	0	0	0	0	0	0	0
2008	375	271	153	114	62	78	41	18	17	18	18	8	2	2	1	1	0	0	0	0	0	0	0	0	0	0
2009	380	278	200	113	83	45	56	29	13	12	13	12	5	2	1	1	1	0	0	0	0	0	0	0	0	0

Appendix J. Numbers at age for A) females and B) males for the ORS sub-stock. All years are provided.
A) ORS Females

	Age class																									
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+
1971	97	76	59	46	36	28	22	17	13	10	8	6	5	4	3	2	2	1	1	1	1	1	0	0	0	1
1972	97	76	58	45	35	27	21	16	12	10	7	6	4	3	3	2	2	1	1	1	1	0	0	0	0	1
1973	97	76	58	45	35	27	21	16	12	10	7	6	4	3	3	2	2	1	1	1	1	0	0	0	0	1
1974	97	75	58	45	35	27	21	16	12	10	7	6	4	3	3	2	2	1	1	1	1	0	0	0	0	1
1975	97	75	58	45	35	27	21	16	12	10	7	6	4	3	3	2	2	1	1	1	1	0	0	0	0	1
1976	97	75	58	45	35	27	21	16	12	10	7	6	4	3	3	2	2	1	1	1	1	0	0	0	0	1
1977	97	75	58	44	34	26	20	16	12	9	7	6	4	3	3	2	2	1	1	1	1	0	0	0	0	1
1978	96	75	58	44	34	26	20	16	12	9	7	6	4	3	3	2	2	1	1	1	1	0	0	0	0	1
1979	96	75	58	44	34	26	20	15	12	9	7	5	4	3	3	2	1	1	1	1	1	0	0	0	0	1
1980	77	75	58	44	34	26	20	15	12	9	7	5	4	3	2	2	1	1	1	1	1	0	0	0	0	1
1981	126	60	58	44	34	26	20	15	12	9	7	5	4	3	2	2	1	1	1	1	1	0	0	0	0	1
1982	52	98	46	44	34	26	20	15	11	9	7	5	4	3	2	2	1	1	1	1	1	0	0	0	0	1
1983	69	41	76	35	34	26	20	15	11	9	7	5	4	3	2	2	1	1	1	1	0	0	0	0	0	1
1984	65	53	31	58	27	26	20	15	11	9	7	5	4	3	2	2	1	1	1	1	0	0	0	0	0	1
1985	45	50	41	24	45	21	20	15	11	9	7	5	4	3	2	2	1	1	1	1	0	0	0	0	0	1
1986	106	35	39	32	18	34	16	15	11	9	7	5	4	3	2	2	1	1	1	1	0	0	0	0	0	1
1987	97	83	27	29	24	14	25	12	11	8	6	5	4	3	2	2	1	1	1	1	0	0	0	0	0	1
1988	52	75	63	20	22	18	10	19	9	8	6	5	4	3	2	2	1	1	1	1	0	0	0	0	0	1
1989	83	41	58	48	15	16	13	8	14	7	6	5	4	3	2	2	1	1	1	1	0	0	0	0	0	1
1990	71	64	31	44	36	11	12	10	6	11	5	5	3	3	2	2	1	1	1	1	0	0	0	0	0	0
1991	91	55	49	24	33	27	8	9	7	4	8	4	3	3	2	1	1	1	1	1	0	0	0	0	0	0
1992	99	71	42	37	18	25	20	6	7	5	3	6	3	2	2	1	1	1	1	0	0	0	0	0	0	0
1993	110	77	54	32	28	13	18	15	5	5	4	2	4	2	2	1	1	1	1	0	0	0	0	0	0	0
1994	89	85	59	41	24	21	10	13	11	3	4	3	2	3	1	1	1	1	1	0	0	0	0	0	0	0
1995	88	69	66	45	31	18	15	7	10	8	2	3	2	1	2	1	1	1	1	0	0	0	0	0	0	0
1996	101	68	54	50	34	23	13	11	5	7	6	2	2	2	1	2	1	1	1	0	0	0	0	0	0	0
1997	100	78	53	41	38	26	17	10	8	4	5	4	1	1	1	1	1	1	1	0	0	0	0	0	0	0
1998	118	78	61	40	30	27	18	12	7	6	3	4	3	1	1	1	0	1	0	0	0	0	0	0	0	0
1999	178	92	60	46	30	21	19	13	8	5	4	2	3	2	1	1	1	0	1	0	0	0	0	0	0	0
2000	105	139	71	46	34	21	15	13	9	6	3	3	1	2	2	0	1	0	0	0	0	0	0	0	0	0
2001	94	82	108	54	33	24	14	10	9	6	4	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0
2002	74	73	63	81	37	22	16	10	7	6	4	3	2	2	1	1	1	0	0	0	0	0	0	0	0	0
2003	66	58	57	48	56	25	15	11	7	5	4	3	2	1	1	1	1	1	0	0	0	0	0	0	0	0
2004	93	51	45	43	35	40	18	11	8	5	3	3	2	1	1	1	0	1	0	0	0	0	0	0	0	0
2005	68	73	40	35	32	25	28	12	7	5	3	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0
2006	44	53	56	31	26	23	17	19	9	5	4	2	2	2	1	1	0	0	0	0	0	0	0	0	0	0
2007	71	34	41	43	23	19	16	12	14	6	4	3	2	1	1	1	1	0	0	0	0	0	0	0	0	0
2008	90	55	27	32	32	16	13	11	9	9	4	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0
2009	89	70	42	20	24	23	12	9	8	6	7	3	2	1	1	1	1	0	0	0	0	0	0	0	0	0

B) ORS Males

	Age class																									
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+
1971	97	72	53	40	29	22	16	12	9	7	5	4	3	2	1	1	1	1	0	0	0	0	0	0	0	0
1972	97	72	53	39	28	21	15	11	8	6	4	3	2	2	1	1	1	1	0	0	0	0	0	0	0	0
1973	97	72	53	39	28	21	15	11	8	6	4	3	2	2	1	1	1	1	0	0	0	0	0	0	0	0
1974	97	72	53	39	28	21	15	11	8	6	4	3	2	2	1	1	1	1	0	0	0	0	0	0	0	0
1975	97	72	52	39	28	21	15	11	8	6	4	3	2	2	1	1	1	1	0	0	0	0	0	0	0	0
1976	97	72	52	38	28	21	15	11	8	6	4	3	2	2	1	1	1	1	0	0	0	0	0	0	0	0
1977	97	72	52	38	28	21	15	11	8	6	4	3	2	2	1	1	1	1	0	0	0	0	0	0	0	0
1978	96	71	52	38	28	20	15	11	8	6	4	3	2	2	1	1	1	1	0	0	0	0	0	0	0	0
1979	96	71	52	38	28	20	15	11	8	6	4	3	2	2	1	1	1	0	0	0	0	0	0	0	0	0
1980	77	71	52	38	28	20	15	11	8	6	4	3	2	2	1	1	1	0	0	0	0	0	0	0	0	0
1981	126	57	52	38	28	20	15	11	8	6	4	3	2	2	1	1	1	0	0	0	0	0	0	0	0	0
1982	52	93	42	38	28	20	15	11	8	6	4	3	2	2	1	1	1	0	0	0	0	0	0	0	0	0
1983	69	39	68	31	28	20	15	11	8	6	4	3	2	2	1	1	1	0	0	0	0	0	0	0	0	0
1984	65	51	28	50	22	20	15	11	8	6	4	3	2	2	1	1	1	0	0	0	0	0	0	0	0	0
1985	45	48	37	21	37	16	15	11	8	6	4	3	2	2	1	1	1	0	0	0	0	0	0	0	0	0
1986	106	33	35	27	15	27	12	11	8	6	4	3	2	2	1	1	1	0	0	0	0	0	0	0	0	0
1987	97	79	24	25	20	11	19	8	8	5	4	3	2	1	1	1	1	0	0	0	0	0	0	0	0	0
1988	52	72	57	17	18	14	8	14	6	5	4	3	2	1	1	1	1	0	0	0	0	0	0	0	0	0
1989	83	39	53	42	13	13	10	6	10	4	4	3	2	1	1	1	1	0	0	0	0	0	0	0	0	0
1990	71	61	28	38	30	9	9	7	4	7	3	3	2	1	1	1	1	0	0	0	0	0	0	0	0	0
1991	91	53	44	20	28	22	6	6	5	3	5	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0
1992	99	67	38	32	15	20	15	5	5	3	2	3	1	1	1	1	0	0	0	0	0	0	0	0	0	0
1993	110	74	49	28	23	10	14	11	3	3	2	1	2	1	1	1	0	0	0	0	0	0	0	0	0	0
1994	89	81	53	35	20	16	7	10	8	2	2	2	1	2	1	1	0	0	0	0	0	0	0	0	0	0
1995	88	66	60	39	25	14	12	5	7	5	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
1996	101	65	48	44	28	18	10	8	4	5	4	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0
1997	100	75	48	36	32	20	13	7	6	3	3	3	1	1	1	0	1	0	0	0	0	0	0	0	0	0
1998	118	74	55	35	26	22	14	9	5	4	2	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0
1999	178	88	55	40	25	18	15	9	6	3	3	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0
2000	105	132	65	40	29	18	12	10	6	4	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
2001	94	78	97	47	29	20	12	8	7	4	3	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
2002	74	70	57	71	33	19	13	8	5	4	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0
2003	66	55	51	42	50	22	12	8	5	3	3	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
2004	93	49	40	38	30	35	15	8	6	3	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0
2005	68	69	36	30	27	21	24	10	5	4	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
2006	44	51	51	26	22	19	15	16	7	4	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
2007	71	33	37	37	19	15	13	10	11	4	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
2008	90	52	24	27	27	14	11	9	7	7	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0
2009	89	66	38	18	20	19	9	7	6	4	5	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0

CABEZON

STAR Panel Report

July 27-30, 2009

Deca Hotel
Seattle, WA

Panel Reviewers
Dr. Vidar Wespestad, STAR Chair and SSC representative
Dr. J.J. Maguire, Center for Independent Experts
Dr. Stephen Smith, Center for Independent Experts
Dr. Jim Ianelli, National Marine Fisheries Service Alaska Fisheries Science Center

STAR Panel Advisors Present:
Ms. Joanna Grebel, California Department of Fish and Game, GMT Representative
Mr. Dan Platt, GAP Representative
Mr. John DeVore, PFMC Representative

STAT Team:
Dr. Jason Cope, National Marine Fisheries Service Northwest Fisheries Science Center
Ms. Meisha Key, California Department of Fish and Game

Overview

The Star Panel met at the Hotel Deca in Seattle, WA to review the third full assessment of the population status of cabezon (*Scorpaenichthys marmoratus* [Ayres]) off the west coast of the United States. The first assessment was for a state-wide California cabezon stock in the year 2003, the second assessment in 2005, considered two sub-stocks (the northern California sub-stock (NCS) and the southern California sub-stock (SCS)), demarcated at Point Conception, CA.

The current draft assessment retains the two California sub-stocks, also evaluating the population as a State-wide California stock (CAS), and extends the assessment to a third sub-stock for cabezon in the waters off of Oregon (ORS). Separation of these spatial sub-stocks is based on distinguishing localized population dynamics, preliminary population genetics results, and is supported by spatial differences in the fishery (the NCS has been the primary area from which removals have occurred), the ecology of nearshore groundfish species, and is consistent with current state management needs.

The last full assessment of cabezon was done in 2006. Major changes made in this assessment, compared with the previous assessment include:

The assessment used the Stock Synthesis platform (version 3.03a) and incorporated a variety of data sources. Similar to the 2005 assessment each sub-stock assessment uses data on size (mean weight and length compositions) and indices of abundance. Primary catch data are from recreational databases and from commercial hook and line and trap fisheries in California. The low occurrence of cabezon in standard trawl surveys precludes their use.

Additional modifications made to the specification of this year's assessment models, relative to the previous assessment included:

- Implementation of time blocks on the selectivities of the commercial live-fish fishery and boat-based recreational fleets for all sub-stocks to account for regulatory changes.
- Additional variance was applied to the estimated variability of the candidate abundance indices in order to address the underestimation of variability in the delta GLM-based models.
- The models were tuned to balance the input of recruitment variability ($Sigma_R$) and sample sizes of length and age compositions with model output estimates of these same values. This resulted in $Sigma_R$ values less than those used in the last assessment.

- Incorporation of conditional age-at-length data for the first time to estimate growth parameters internal to the model (previous assessments used growth parameters derived from externally fitted growth curves).

Several potential indices of abundance were included for the California sub-stocks and one for the Oregon fishery:

- Fishery-dependent CPFV Logbook CPUE, a CDFG hook-and-line survey, and PSMFC dockside and onboard surveys,
- Fishery-independent adult surveys (TENERA and PISCO), and
- Recruitment surveys (CalCOFI, Southern California Edison Impingement, PISCO SMURFS, SLO SMURFS).
- Oregon Ocean Recreational Boat Survey (ORBS) sampling program.

Changes in bag and size limits in California also necessitated the separation of the CPFV data into two series: 1) 1960-1999 and 2000-2008. This approach differs from the previous assessment, which used a continuous index from 1960-2004.

The STAR panel concluded that the Cabezon assessment constitutes the best available scientific information on the status of Cabezon off the U.S. west coast and recommends that it be used for status determination and management in the Council process. The STAR panel thanks the STAT team members for their excellent preparation, presentation, and willingness to respond to panel requests.

Analyses requested by the STAR Panel

1. Clarify if larvae and juveniles are pelagic and for how long? This is related to stock structure and recruitment, whether spawners contribute locally or globally. This could also be a research recommendation for the next assessment.

   Rationale: The assessment assumes that there is little mixing at all life stages. Yet, after hatching the young of the year spend 3–4 months as pelagic larvae and juveniles which leaves considerable margin for mixing depending on where and when hatching occurs.

   Response: O'Connell 1953 states that "In all probability, the young carried offshore perish, unable to attain the bottom at the proper time. Assuming this to be true, extensive coastwise mixing would not occur." The chair consulted with Steve Ralston (NMFS/SWFSC) who considers that there is limited knowledge on cabezon larvae and juveniles and that there is no basis for O'Connell's probability statement. Further investigation of the abundance and distribution of cabezon larvae and juveniles in existing databases appears warranted for the next assessment.

2. Provide a model run using the pier catches as a recruit index for OR to compare with the ORBS index currently used in the assessment.

   Rationale: The catches of cabezon in the man-made fishery on piers and jetties are mostly of small cabezon and could possibly provide an early index of year class size.

   Response: The STAT was unable to complete this request because the data were not in an appropriate format and there appears to be several missing fields in the database. There were also questions on the appropriateness of estimated effort measures obtained from the RecFIN database. The next assessment should continue to explore additional indices of stock sizes for OR and CA as they become available.

3. Normalise, rather than standardize to a common year, the trends on Fig. 26 for a better comparison.

   Rationale: Figure 26 shows the geometric mean and delta GLM-based CPUE abundance indices for each sub-stock each on different scales which complicates their interpretation.

   Response: An updated graph was prepared with each series on similar scale. The trends for SCS, CAS and ORS showed greater consistency, but NCS still showed different trends.

4. Figure 26 in the draft assessment shows a big difference between the trends of the various treatment for NCS CPFV (table 13 of the draft assessment), in particular the geometric average. The Geometric average does not include any effect. Investigate what factor(s) accounts for the difference in trends.

   Rationale: Standardized catch per unit of effort is expected to be different than unstandardized CPUE, but the differences in trend in fig. 26 are more than normally expected and warrant further investigation.

   Response: The STAT found that location 6 had different CPUEs than the other locations and that December and January consistently had higher CPUEs than the other months. The standardization has no interactions term. The STAR Panel provided a general recommendation to address this issue in this and other assessments.

5. Provide a plot of the proportion of zeros for the NCS CPFV vs time.

Rationale: This was a further attempt at explaining the differences between the geometric mean average and the GLIM estimates in figure 26.

Response: The proportion of zeros seems to be increasing, particularly in the NCS where the problem is seen. The geometric mean does not include zeros, while the GLM does, so this may explain the differences.

6. Fit the growth model externally without t_0 to the data in fig. 8 assuming a zero intercept. Compare the fits and trends from this analysis to the case where growth was estimated in the model with t_0 estimated.

   Rationale: The von Bertalanffy growth equation was fitted in the model and resulted in relatively large negative t_0 estimates. The panel wanted to see how the L_{inf} and k parameters would change if a zero intercept was assumed.

   Response: Assuming a zero intercept made a relatively large difference in estimates of L_{inf} and K, but there is no basis to choose which one is better. For assessment purposes, the growth parameters were fit internal to the population model and resultant growth curves fit closely curves generated by the external fits when estimating t_0 (see Figure 74 of assessment document for the comparisons). The panel recommended that younger cabezon be aged to better inform the growth curves. The model estimate of spawning biomass is sensitive to estimates of k.

7. Provide a run with using the original CVs estimated for the NCS and the SCS CPFV 1960-1999. Show the fit to the NCS and the SCS CPFV 1960-1999 with the original CVs to see if fits better (figure 38).

   Rationale: The CVs derived when calculating surveys and CPUE indices are believed to underestimate the uncertainty in the indices. The draft assessment multiplied those CVs by 3 to better reflect the perceive uncertainty.

   Response: For NCS, using the original CVs did improve the fit noticeably, but it did not for SCS. Fitting the indices with the original CVs increased the absolute biomass outputs and resulted in higher depletion ratios (SB_{2009}/SB_{1916}) in the NCS, CAS and ORS. There was little change to either biomass or the depletion value in the SCS.

8. Label points as years in fig. 38 on the plots of expected vs. observed for NCS CPFV 1960 - 1999.

   Rationale: Figure 38 shows considerable lack of fit to the index and the panel wanted to evaluate if there was a temporal component to the lack of fit.

   Response: The largest outliers were at the beginning of the time series when there was little change in the expected values but relatively large changes in the observed values. There was no a priori reason to exclude those early years from the model. For more recent years there appears to be a better agreement between observed and expected values.

9. Verify that the confidence intervals on fig. 40 to 43 were correctly calculated. In the unlikely event that they were not, provide a run of the base case with the appropriate confidence intervals.

   Rationale: The panel found that the confidence intervals on those figures looked larger than expected.

   Response: The STAT confirmed that the confidence intervals were correctly calculated and that they were large.

10. Figure 105 (of the STAR assessment draft) showing the results of the retrospective analysis shows very different absolute stock size estimates for ORS depending on the number of years that are used in the assessment. Provide the confidence bounds of the retrospective analysis (base, -1 year and -5 years) to see if they overlap for OR.

    Rationale: Differences in absolute estimate of stock size of the magnitude showed in Fig. 105 for ORS are cause for concern. They imply very uncertain assessments.

    Response: The confidence intervals do overlap, confirming that the assessment is uncertain. The retrospective run with 5 years removed from the assessment shows a non-zero probability that the stock would go extinct. If asymmetric CI were calculated this problem would be eliminated.

11. Provide a table of the number of California commercial nearshore licenses for 2003 to 2008.

    Rationale: The panel wanted to have a better understanding of the potential changes in fishing effort.

    Response: In California the number of licenses decreased from 219 in 2003 to 171 in 2009.

12. Investigate why the plateau for fleet 4 ((beach/bank) in the California models) looks the same for all areas. This may be important for projection forward and for allocation calculations.

    Rationale: The panel wanted to be reassured that the selectivities were correctly estimated.

    Response: The STAT found that the model was not moving much from the starting value. The STAT used different starting values and parameter estimates but these modifications did not appreciably change the results from those obtained from the base model.

13. Provide a run where the selectivity for fleet 2 (live-fish fishery) for SCS comes from the coast wide estimates for the two periods.

    Rationale: Fleet 2 in SCS (figure 85) showed a highly peaked selectivity pattern that is unlikely to happen. The CAS selectivity (figure 93) shows a wider plateau and is more likely to have a biological basis.

    Response: The State wide (CAS) selectivity was used in the SCS base case and showed very similar results. The panel recommended using this State wide selectivity curve in the SCS base case.

14. On bubble plots for length compositions, remove years with only one sample (not necessarily for this meeting, but for final document).

    Rationale: Including those years with only one sample complicates the interpretation of the bubble plots.

Response: This was done in the final assessment.

15. Investigate interactions with years in the CPUE standardization for NCS CPFV (table 13 and figure 26 of the draft assessment).

Rationale: This was a continuation of the discussion covered in requests 3, 4 and 5 above. The panel has provided a general recommendation to address the issue of CPUE standardization for this and other assessments.

Response: The STAT team responded with runs examining alternative fits,

16. Multiply the geometric mean on slide 5 of the STAR request 1 for the NCS by 1 minus the proportion zero and plot against the GLIM.

Rationale: The panel wanted to see if the increasing proportion of zeros in the NCS CPUE caused the difference between the GLIM and the geometric mean time series.

Response: A continuation of request 15 that examined the effect of different treatments of zeros in the NCS CPUE (see request 19 and response for final resolution of issue)

17. For the base case, plot the gender ratio over time for ages 3+ in numbers from year 0.

Rationale: The panel wanted to see if there had been changes in gender ratio over time.

Response: The STAT plotted the gender ratio over time for the ORS, NCS and SCS. In all cases, the proportion of females was slightly higher than that for males, but there were no noticeable trends.

18. Provide a graph of main results with more informative confidence intervals.

Rationale: Sensitivity analysis focuses primarily on point estimates (the maximum posterity density) yet in some cases the results of the sensitivity runs relative to the base model should show the change (if any) of uncertainty for key parameters of interest (e.g., current stock size). For this reason, CVs or some other easy way to judge estimates of model uncertainty should be displayed.

Response: For the base case and each realization of the sensitivity trials, standard deviations were added to all tables reporting derived outputs (initial and terminal spawning output, depletion, and MSY) to provide a measure of the uncertainty around each point estimate. The STAT also presented to the STAR panel a figure comparing the CVs of the NCS base case versus the trial using the original (non-inflated) CPFV CPUE CVs. Much larger uncertainties were observed with the inflated CVs, except in most recent years (where it would count the most). The CPUE series stops in 1999, so it was not surprising that uncertainty increases afterwards. There was a strange period with stable CVs in the 1950s for base case which may have been due to the large catches in the late 1940s.

19. Plot the mean CPUE as shown in slide 22 of the STAR over the GLM values and the model results (expected and observed from base case over the slide 22 ln (cpue)).

    Rationale: This relates to requests 3 to 5 and 15 above to understand the differing trends between the GLM estimates and geometric mean estimates of CPUE.

    Response: The graphs provided by the STAT confirmed that the standardization was probably done correctly and that it was the geometric mean that was confusing the issue, having been calculated as the mean of the logs of the positive values and then exponentiated.

Description of base case model and alternative models to bracket uncertainty

The Panel agrees that the sub-stock configuration using Oregon (ORS), northern California (NCS), and southern California (SCS) model configuration is the most appropriate.

The NCS and SCS models include six fleets (two commercial and four recreational) and the ORS model includes four fleets (2 commercial and 2 recreational). The NCS and OCS (California) time series began in 1916, with the onset of commercial landings, while Oregon began in 1973. For the SCS, there were issues with the 1980 estimate of catch being nearly 4 times higher than 1979 and 1981. Because this estimate was derived from a new program, the Panel and authors agreed that a base model that uses the mean value for 1979 and 1981 for the 1980 estimate was preferred.

The base model includes the fishery-dependent CPFV Logbook CPUE (modeled through a GLM) for the California sub-stocks; the Oregon sub-stock model includes the Ocean Recreational Boat Survey (ORBS, 2001-2008). Note that changes in bag and size limits in California split the CPFV data into two series: 1) 1960-1999 and 2000-2008. The base model included the extra variance term added to the abundance indices (as specified in the document). Include available data on size (mean weight and length compositions) for each sub-stock assessment.

The underlying model is dis-aggregated by gender in order to capture the sex-specific differences in natural mortality (set to 0.25 yr^{-1} for females and 0.3 yr^{-1} for males). Data on gender-specific composition data were unavailable. The steepness parameter is also set to 0.7 for all base models. Recruitment residuals are estimated for 1970–2006 for all California sub-stocks and 1980-2006 for the Oregon sub-stock. The panel accepted the "tuned" recruitment variability (σ_R) and sample sizes of length and age compositions. Other details for the base model were agreed and are as specified in the document (i.e., Tables 17 and 18).

Technical merits of the assessment

This was a very thorough assessment, the team did a very complete analysis of all available fishery independent data and carried out many sensitivity runs to evaluate alternative model assumptions. The STAT team assembled all available data relating to both fishery and fishery independent time series data. The outstanding problem was that the traditional groundfish surveys provide very little information on cabezon trends since most of the biomass is concentrated in near-shore waters.

The STAT team proposed alternative assessment and management of nearshore fisheries to compensate for the lack of data required to perform traditional stock assessments. Alternative assessment procedures that require less data, but still provide relevant management outputs should be encouraged. This assessment provided examples of some approaches as applied to cabezon. Such side-by-side comparisons of simplified assessment approaches to the statistical catch-at-age model outputs are useful in understanding the relationship of alternative to traditional assessment methods in hopes of developing the best available scientific advice for management under data-limited situations.

The STAR panel encouraged the STAT team to explore less data intensive assessment methods and also to continue to improve spatial analysis to better define stock structure and distribution and geostatistical harvest control rules.

The STAR panel finds the assessment to be the best that can be produced with available data. The Panel recommends that future assessments be limited to updates until such time as the recommended research is accomplished, or new assessment methodology established. The STAR Panel doesn't recommend a new full assessment until there are improvements in the understanding of stock structure, mortality and growth parameters.

Explanation of areas of disagreement regarding STAR panel recommendations

A. Among STAR panel members (including concerns raised by the GAP and GMT representatives

There were no areas of disagreement among STAR panel members.

B. Between the STAR panel and the STAT team

There were no areas of disagreement between the STAR panel and the STAT team.

Unresolved problems and major sources of uncertainty

Stock structure is a major uncertainty that is being addressed with genetic studies and localized sampling. There is a need to increase sampling in near-shore waters so as to be able to determine the degree of stock separation. An absence of reliable fishery independent estimators complicates the assessment and makes it difficult to determine the absolute abundance of sub-stocks. The model results are sensitive to natural mortality estimates and there are considerable differences between males and females.

Management, data, or fishery issues raised by the GAP and the GMT representatives

GMT and GAP representatives commented that surveys in near shore areas are critical to better estimate abundance, and encourages the development of additional local monitoring surveys. There was discussion of working with commercial fishermen to develop potential cooperative indexing surveys to monitor population change.

Prioritized recommendations for future research and data collection

1. M seems high for both genders for a species of that size, shape and life habits. The current high estimates could be due to higher values at some ages or length. Tag – recapture studies currently being conducted are expected to be useful in that respect and should be used to estimate M. Information would be expected for the assessment cycle after the next.

2. Further tagging studies should be conducted to estimate growth, natural mortality, migration and to investigate stock structure, including for a larger portion of the distribution range.

3. Confirm/re-estimate the landings in 1980 in the RecFIN PBR which should include correcting the RecFIN database to avoid using unrealistic landings for that year in future assessments. Including the catch reconstruction from 1980 onwards, similar to what was done for lingcod.

4. Explore the shorter yet more detailed logbook data (digitized by license number) for CA from 1980 onwards (CPFV).

5. B_{MSY} is very close to the limit reference point. This suggests that further general investigation of target and limit reference point is warranted. Reference points need to be re-evaluated.

6. Develop at least one reliable fishery independent survey possibly using longline or trap (no rockfish bycatch) survey. This could be a combined cabezon and lingcod pot survey designed to adequately cover the inshore distribution area and the closed areas.

7. Continue to develop alternative management procedures that do not require traditional stock assessment.

8. Look at environmental covariates for recruitment and time-varying growth and availability inshore.

9. Investigate the implications of the male guarding behaviour (re-defining spawning output).

10. Investigate non-lethal methods to determine gender and collecting sex-specific data.

11. Investigate further the abundance and distribution of cabezon larvae and juveniles in existing databases to better understand stock structure and linkages.

12. Investigate the usefulness of catches of cabezon in the man-made fishery on piers and jetties as an index of recruitment.

Acknowledgements

The Panel thanks Dr. Jim Hastie and staff at the NWFSC for their exceptional support and provisioning during the STAR meeting.

Status of the U.S. yelloweye rockfish resource in 2009

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26 August, 2009

Table of Contents

Executive Summary

Stock

This assessment reports the status of the yelloweye rockfish (*Sebastes ruberrimus*) resource off the coast of the United States from southern California to the U.S.-Canadian border using data through 2008. The resource is modeled as a single stock, but with three explicit spatial areas: Washington, Oregon and California. Each area is modeled simultaneously with its own unique catch history and fishing fleets (recreational and commercial) but the dynamics follow the current understanding of yelloweye stock structure: large stocks linked via a common stock-recruit relationship with negligible adult movement among areas.

Catches

Yelloweye rockfish catches were estimated from a variety of sources, but are very uncertain due to the relatively small contribution of yelloweye to rockfish market categories and the relatively large scale of recreational removals. Catches include estimates of discarding after 2001 when management restrictions resulted in nearly all yelloweye caught by recreational and commercial fishermen being discarded at sea. Recent catches were based on current total mortality estimates (2002-2007) and the GMT scorecard (2008). Estimated catches increased gradually throughout the first half of the 20th century, with the exception of a brief period of higher removals around World War II. Catches peaked in 1982 at 421 mt, with removals in excess of 200 mt estimated for all years between 1977 and 1997. Uncertainty in catches is treated explicitly throughout this analysis.

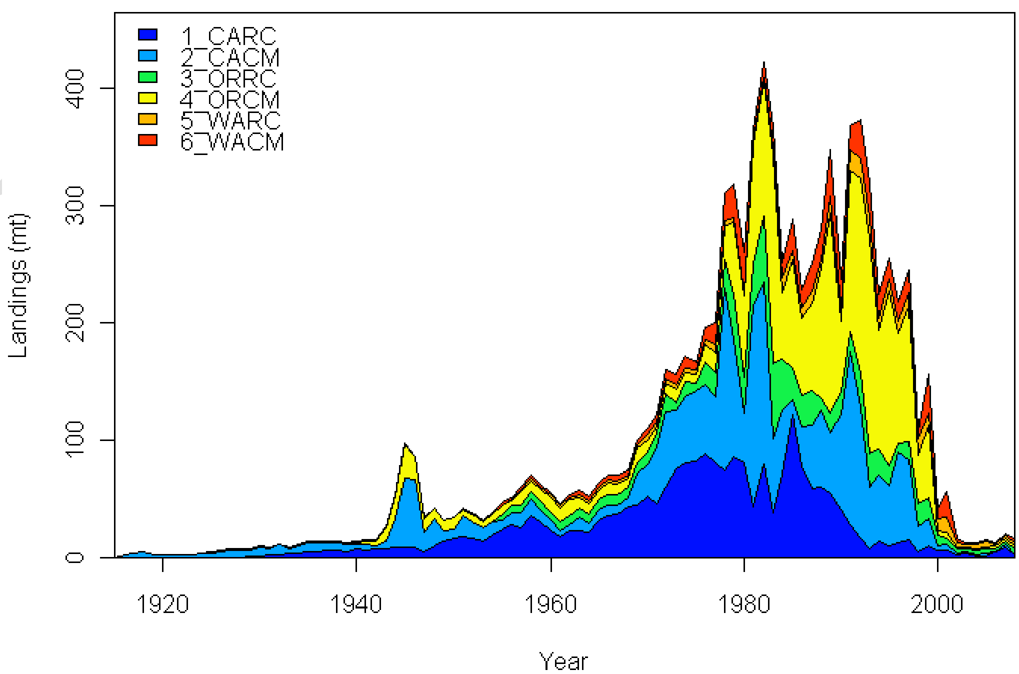

Figure a. Yelloweye rockfish estimated catch history, 1916-2008. Fleet names indicated by state (WA, OR or CA) and sector (recreational = RC, commercial = CM).

Table a. Recent yelloweye rockfish catches (mt) by fleet.

Year	California Recreational	California Commercial[1]	Oregon Recreational	Oregon Commercial[1]	Washington Recreational	Washington Commercial[1]
1999	9.4	23.5	18.1	61.3	10.6	32.9
2000	5.7	4.0	9.5	3.6	10.1	7.9
2001	6.4	4.3	4.8	6.2	12.5	21.8
2002	2.5	1.1	3.1	1.9	3.7	3.5
2003	3.7	0.7	3.0	1.0	2.6	1.3
2004	0.6	1.3	3.7	1.5	3.7	1.5
2005	0.9	1.9	4.3	1.4	5.2	1.4
2006	4.1	0.8	2.9	1.9	1.7	1.0
2007	8.0	2.9	3.1	2.0	2.5	1.1
2008	2.1	0.4	4.1	2.5	2.8	4.7

[1]Includes research catches.

Data and Assessment

This stock assessment used the newest version of Stock Synthesis available (3.03b, released 28 May 2009). The model data sources include catch, length- and age-frequency data from six state-specific recreational and commercial fishing fleets. Biological data is derived from both port and on-board observer sampling programs. Yelloweye catch in the IPHC long-line survey for Pacific halibut is also included via an index of relative abundance for Washington and for Oregon as well as length- and age-frequency data. Oregon recreational charter observer data from discarded yelloweye was used to construct a recent index of relative abundance (2004-2008) and length-frequency observations. The National Marine Fisheries Service (NMFS) Northwest Fisheries Science Center (NWFSC) trawl survey relative biomass indices and information from biological sampling, as well as the triennial trawl survey are included.

Externally estimated model parameters, including those defining weight-length, maturity, and fecundity relationships, are revised from values used in previous assessments. The assessment explicitly accounts for the small degree of dimorphic growth as well as markedly different exploitation histories among geographic areas (Washington, Oregon and California). Due to sparse and poorly informative age- and length-frequency data, recruitment is modeled as a deterministic process. Key parameters including natural mortality, stock-recruitment steepness and all growth parameters are estimated.

Although the base case assessment model captures some uncertainty via asymptotic intervals, uncertainty from two sources is reported through alternate states of nature bracketing the base case results and included explicitly in the decision table. The magnitude of the estimated catch time-series was found to have a large influence on the perception of current stock size and the estimate of steepness of the stock-recruit relationship was closely linked to the projected recovery rates. Alternate values of each were selected to bracket the best estimates with marginal probabilities one-half as likely. For historical catch these values, 75% and 150% of the estimated catch series prior to 2000, were subjective, but reflect both the lack of a comprehensive catch reconstruction in Washington and the change in likelihood of the fit to data sources over a reasonable range of catch levels. For steepness the 12.5th and 87.5th percentiles were calculated from the likelihood profile as a proxy for the probability distribution about this point estimate. The most optimistic and pessimistic of the nine combinations from these two axes (weighted 6.25% each relative to 25% for the best estimate on each dimension) are reported in this document and all combinations used to provide a more realistic degree of uncertainty for future projections, decision tables and rebuilding analyses.

Table b. Relative probabilities for combinations of the two alternate states of nature. Cells in bold denote those reported throughout this document.

		Historical catch		
		Low	Best estimate	High
Steepness	Low	**6.25%**	12.5%	6.25%
	Estimated value	12.5%	**<u>Base case</u>: 25%**	12.5%
	High	6.25%	12.5%	**6.25%**

Stock biomass

A fecundity relationship is used for yelloweye specifying that spawning output per unit weight increases with fish weight; therefore all reference to spawning output is in terms of eggs produced, instead of spawning biomass. Yelloweye rockfish are estimated to have been lightly exploited until the mid-1970's, when catches increased and a rapid decline in biomass and spawning output began. The relative spawning output reached a minimum of 15.8% of unexploited levels (slightly above the estimate of 12.1% from the 2007 assessment) in 2000. Yelloweye rockfish spawning output is estimated to have been gradually increasing since that time in response to large reductions in harvest. Although the relative trend in spawning output is quite robust to uncertainty in the estimated removals, the spawning output trajectory on an absolute scale is very sensitive. The estimated relative depletion level in 2007 is 19.2% (slightly above the estimate of 16.4% from the 2007 assessment) and 20.3% in 2009 (states of nature: 17.3-23.5%), corresponding to 201.5 million eggs. The range over states of nature reflects the very large uncertainty in the absolute scale of the estimated time-series for spawning output: 128.3-353.0 million eggs. The aggregate spawning output estimates mask the spatial heterogeneity included via the area-specific dynamics: relative spawning output has differed markedly among the three states, with California having the largest spawning output at unexploited equilibrium, followed by Oregon and then Washington. Currently, Oregon is estimated to have the largest spawning output, followed by California, then Washington. Relative depletion also varies dramatically by state, with California estimated to be at 16.4% of unexploited conditions, Oregon, 22.5%, and Washington, 27.3%.

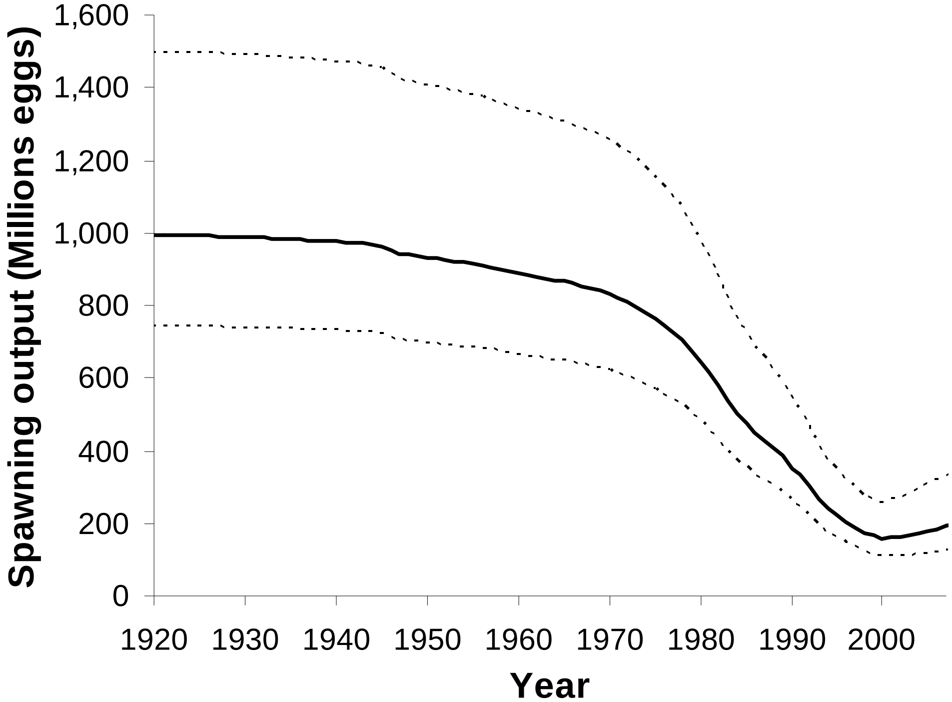

Figure b. Estimated spawning output time-series (1916-2009) for the base case model (solid line) with alternate states of nature (dashed lines).

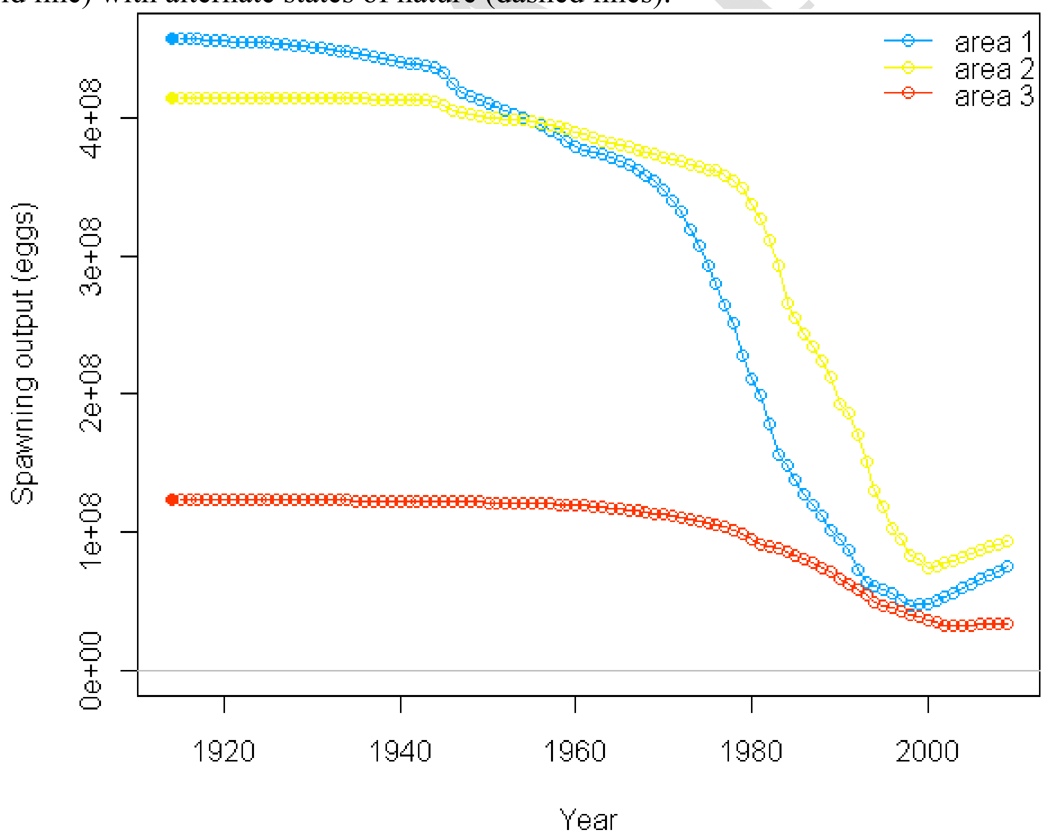

Figure c. Estimated spawning output time-series (1916-2009) by state for the base case model. Area 1, upper line (early years) = California; Area 2, middle line (early years) = Oregon; and Area 3, lower line (early years) = Washington.

Table c. Recent trend in estimated yelloweye rockfish spawning output, recruitment and relative depletion level.

Year	Spawning output (millions eggs)	Range of states of nature	Estimated recruitment (1000s)	Range of states of nature	Estimated depletion	Range of states of nature
2000	157.4	108.8-257.1	79.4	47.1-151.9	15.8%	14.6-17.2%
2001	160.3	109.2-265.1	80.5	47.2-154.9	16.1%	14.7-17.7%
2002	161.6	107.9-271.8	81.0	46.8-157.4	16.3%	14.5-18.1%
2003	167.3	110.9-283.1	83.2	47.9-161.5	16.8%	14.9-18.9%
2004	173.4	114.3-295.0	85.5	49.1-165.7	17.4%	15.4-19.7%
2005	179.5	117.6-307.0	87.7	50.3-169.8	18.1%	15.8-20.5%
2006	185.3	120.5-318.7	89.8	51.4-173.7	18.6%	16.2-21.3%
2007	191.3	123.7-330.7	92.0	52.5-177.6	19.2%	16.6-22.1%
2008	196.4	126.0-341.9	93.8	53.4-181.1	19.8%	16.9-22.8%
2009	201.5	128.3-353.0	95.5	54.2-184.5	20.3%	17.3-23.5%

Recruitment

Because year-class strength is modeled as a deterministic process in this assessment, the decline in estimated recruitment tracks closely that of the spawning output. The decline is especially pronounced given the low (and likely imprecise) estimate for steepness of the stock-recruit relationship in the base case model (0.417), and alternate models (0.344, 0.508). However, the considerable uncertainty in absolute recruitment levels is illustrated by the broad range over the states of nature.

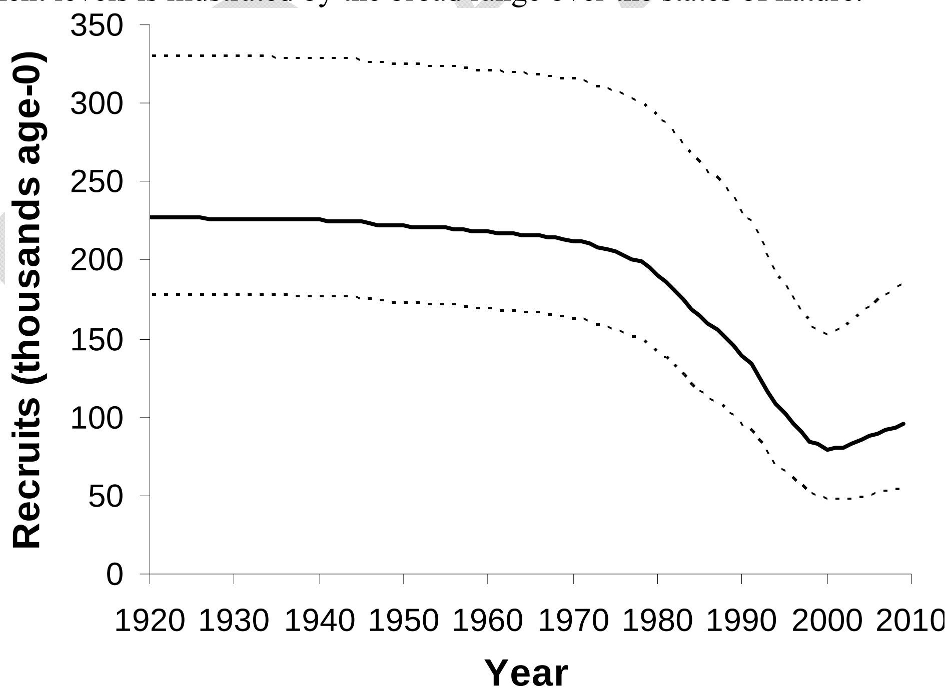

Figure d. Time series of estimated yelloweye rockfish recruitments for the base case model (solid line) and alternate states of nature (dashed lines).

Reference points

Unfished spawning output was estimated to be 994 million eggs. The target stock size ($SB_{40\%}$) is therefore 398 million eggs and the overfished threshold ($SB_{25\%}$) is 249 million eggs. Maximum sustained yield (MSY), conditioned on current fishery selectivity and allocations, was estimated in the assessment model to occur at a spawning stock biomass of 388 million eggs and produce an MSY catch of 56.4 mt (slightly above the estimate from the 2007 assessment of 43.7 mt). However, the yield at MSY is extremely sensitive to the states of nature resulting in a wide range for this value from 31.5 to 107.9 mt. Maximum sustainable yield is estimated to be achieved at an SPR of 60.4% (range of states of nature: 51.2-69.7%). This is nearly identical to the yield, 56.1 mt, generated by the SPR (61.0%) that stabilizes the stock at the $SB_{40\%}$ target. The fishing mortality target/overfishing level (SPR = 50.0%) results in a smaller equilibrium yield of 48.9 mt at a spawning output of 230 million eggs (23.1% of the unfished level).

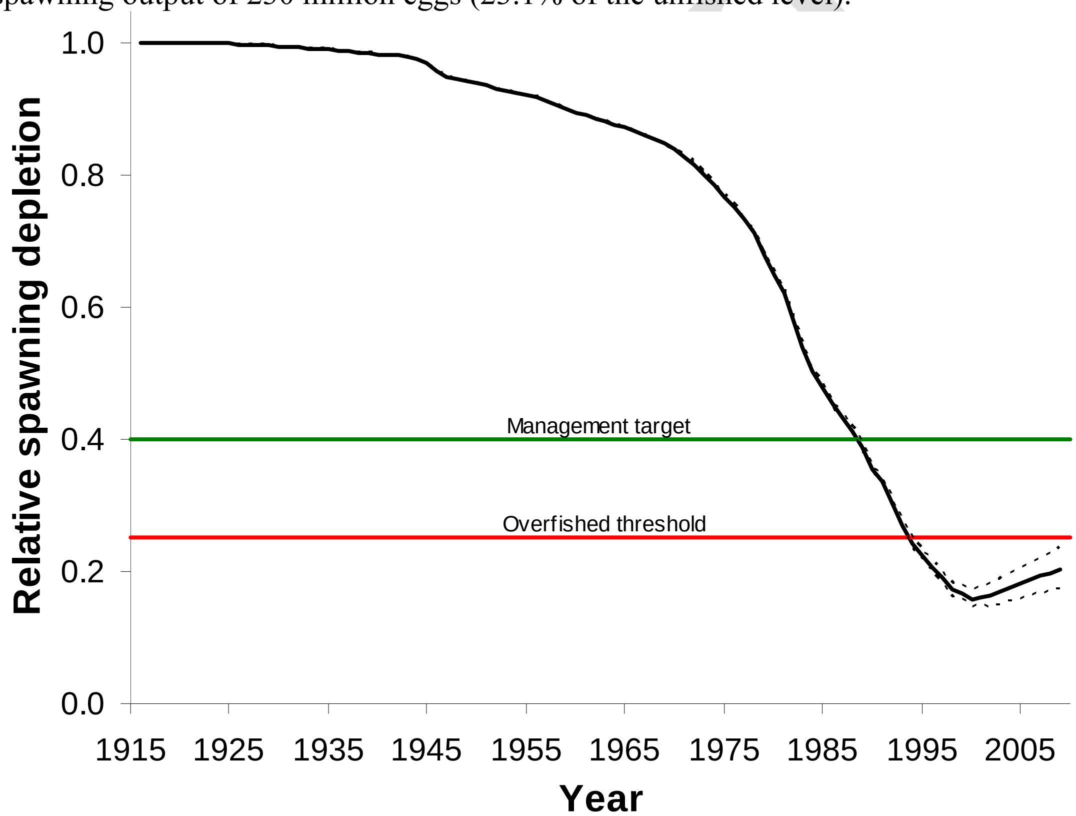

Figure e. Time series of relative spawning depletion as estimated in the base case model (solid line) and alternate states of nature (dashed lines).

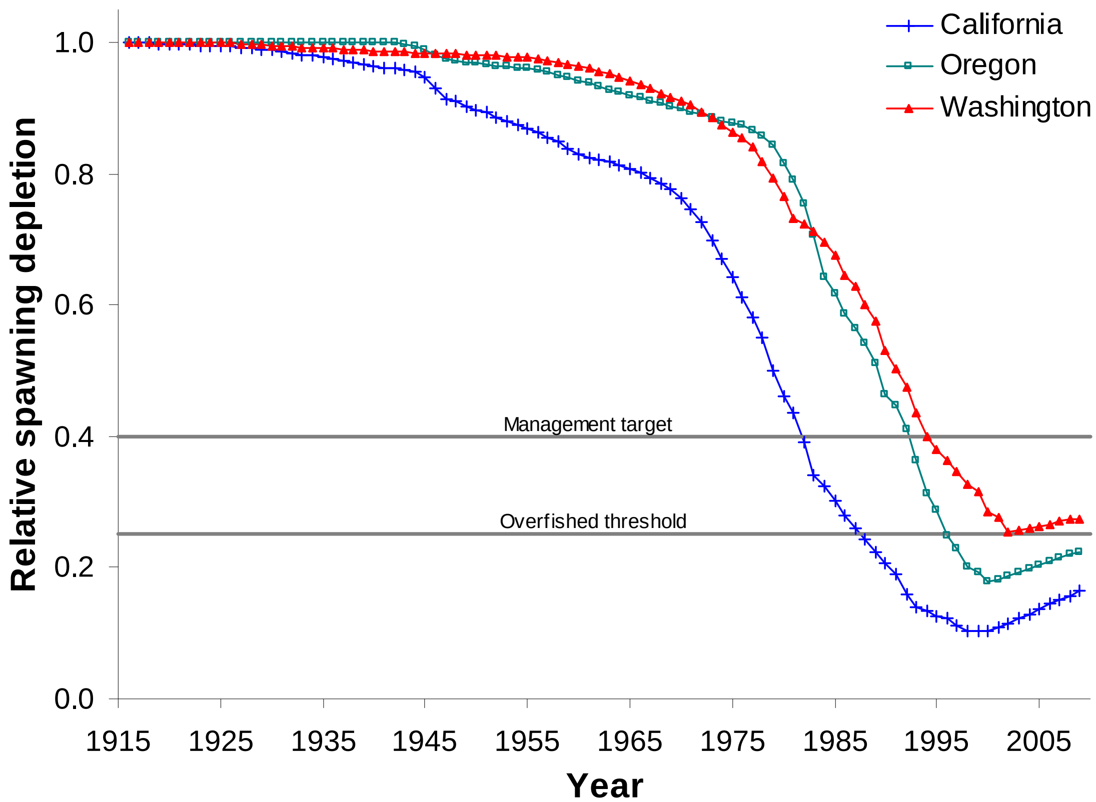

Figure f. Time series of relative spawning depletion by state for the base case model.

Exploitation status

The coast-wide abundance of yelloweye rockfish was estimated to have dropped below the $SB_{40\%}$ management target in 1989 and the overfished threshold in 1994. In hindsight, the spawning output passed through the target and threshold levels with annual catch averaging almost five times the current estimate of the *MSY*. The coast-wide stock remains below the overfished threshold, although the spawning output is estimated to have been increasing since 2000 in response to reductions in harvest. The degree of increase is largely insensitive to the magnitude of historical catch and only moderately sensitive to the value for steepness, but the absolute scale of the population reflects alternate removal series very closely. Fishing mortality rates are estimated to have been in excess of the current *F*-target for rockfish of $SPR_{50\%}$ from 1976 through 1999. Recent management actions have curtailed the rate such that recent SPR values are in excess of 60% over the last eight years. Relative exploitation rates (catch/biomass of age-8 and older fish) are estimated to have been at or less than 1% after 2001. The alternate states of nature result in estimated exploitation rates ranging from less than 1.6% to less than 0.6%.

Table d. Recent trend in spawning potential ratio (SPR) and relative exploitation rate (catch/biomass of age-8 and older fish).

Year	Estimated SPR (%)	Range of states of nature	Relative exploitation rate	Range of states of nature
1999	17.3%	15.9-19.0%	8.9%	8.2-9.6%
2000	53.0%	42.3-65.8%	2.4%	1.5-3.6%
2001	53.0%	42.4-65.3%	3.3%	2.0-4.9%
2002	76.6%	68.6-84.5%	0.9%	0.5-1.4%
2003	78.8%	70.8-86.4%	0.7%	0.4-1.1%
2004	82.0%	75.2-88.4%	0.7%	0.4-1.0%
2005	79.2%	71.5-86.5%	0.8%	0.5-1.2%
2006	79.6%	71.3-87.2%	0.6%	0.4-1.0%
2007	70.6%	60.4-80.9%	1.0%	0.6-1.6%
2008	79.3%	71.4-86.7%	0.8%	0.5-1.3%

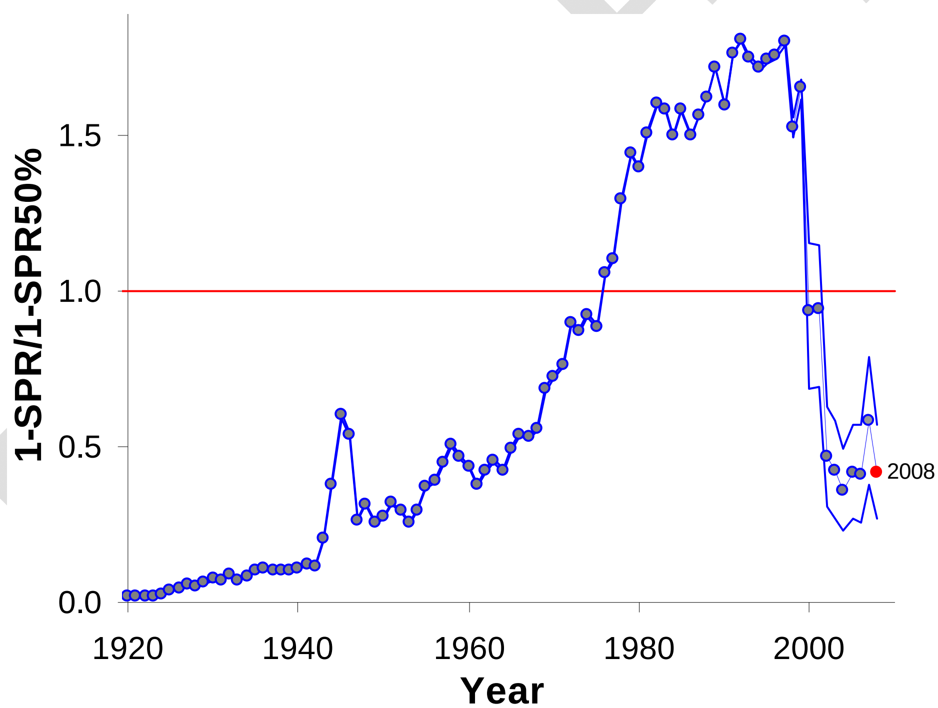

Figure g. Time series of relative spawning potential ratio (1-SPR/1-$SPR_{Target=0.5}$) for the base case model (round points) and alternate states of nature (light lines). Values of relative SPR above 1.0 reflect harvests in excess of the current overfishing proxy.

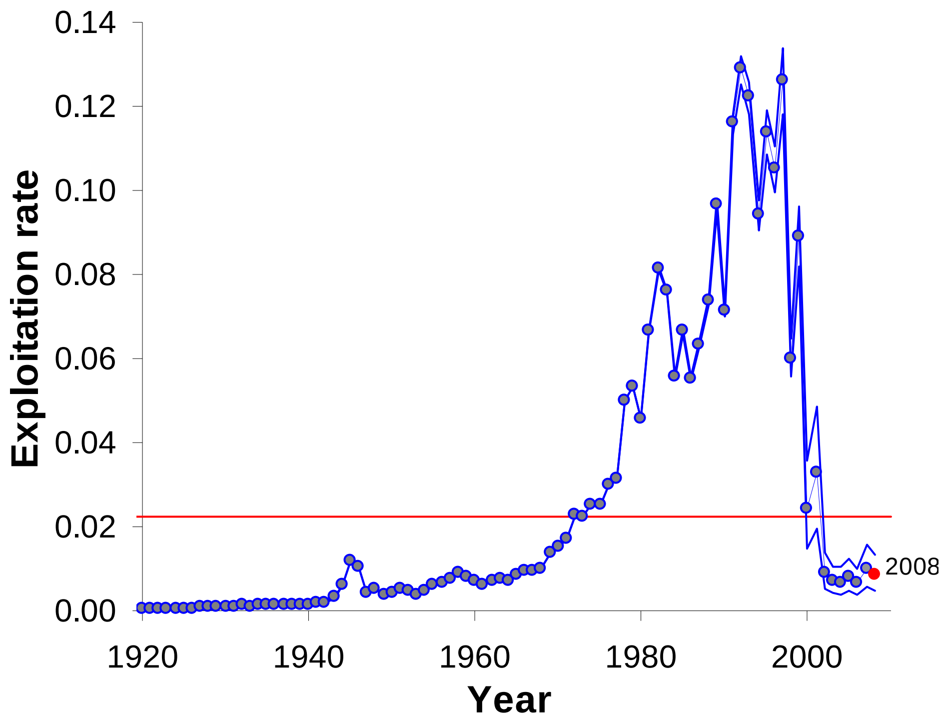

Figure h. Time series of estimated exploitation rate (catch/age 8 and older biomass) for the base case model (circles) and alternate states of nature (light lines). Horizontal line indicates the overfishing limit/target ($F_{50\%}$) from the base case.

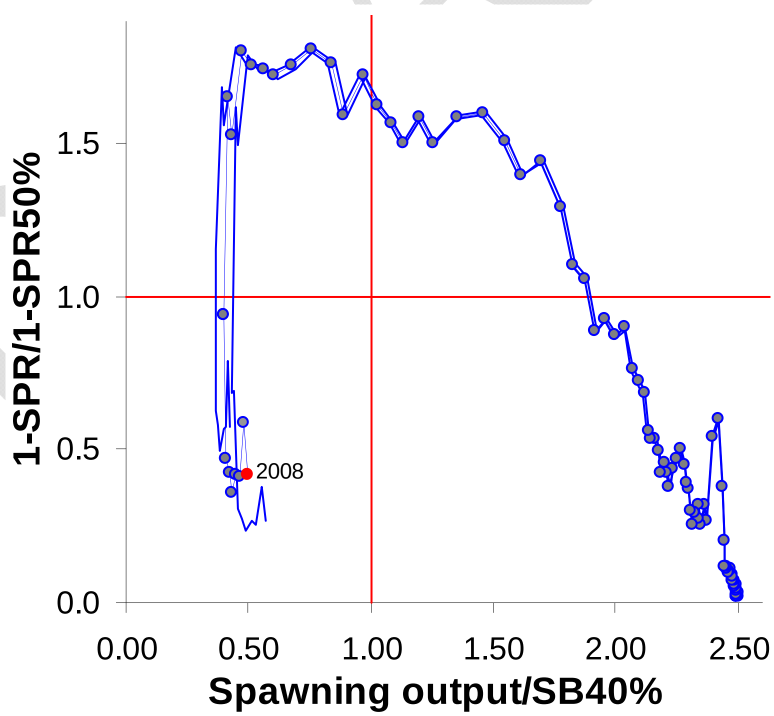

Figure i. Estimated relative spawning potential ratio relative to the proxy target/limit of 50% vs. estimated spawning output relative to the proxy 40% level from the base case model. Higher spawning output occurs on the right side of the x-axis, higher exploitation rates occur on the upper side of the y-axis.

Management performance

Before 2000, yelloweye rockfish were managed as part of the *Sebastes* Complex, which included all *Sebastes* species without individual assessments, ABCs and OYs. In 2000, the *Sebastes* Complex was divided into three depth-based groups (north and south of 40° 10’ N. latitude), and yelloweye rockfish were managed as part of the minor shelf rockfish group until 2002. Since then, there has been species-specific management, and total catch has been below both the ABC and OY for yelloweye each year. These catch levels represent a 95% reduction from average catches observed in the 1980s and 1990s. Managers have constrained catches by eliminating all retention of yelloweye rockfish in both commercial and recreational fisheries, instituting broad spatial closures (some specifically for moving fixed-gear fleets away from known areas of yelloweye abundance), and creating new gear restrictions intended to reduce trawling in rocky shelf habitats and the coincident catch of rockfish in shelf flatfish trawls. Since 2002, the total 6-year catch (88.5 mt) has been only 63% of the sum of the OYs for 2002-2008 and only 29% of the sum of the ABCs for that period. The total 2008 catch (16.7 mt) is estimated to be just 4% of the peak annual catch that occurred in the early 1980s.

Table e. Recent trend in yelloweye rockfish catch (mt) relative to management guidelines.

Year	ABC (mt)	OY (mt)	Commercial Catch (mt)[1]	Recreational Catch (mt)	Total Catch (mt)
1999	39[2]	NA	117.8	38.1	155.8
2000	39[2]	NA	15.5	25.3	40.9
2001	29[3]	NA	32.5	23.7	56.1
2002	27[3]	13.5[3]	6.4	9.3	15.8
2003	52	22	3.2	9.4	12.4
2004	53	22	4.4	8.0	12.3
2005	54	26	5.3	10.4	15.1
2006	55	27	3.8	8.7	12.4
2007	47	23	7.9	13.6	19.6
2008	47	20	7.8	9.0	16.7

[1]Includes research catches.
[2]Includes the Columbia and Vancouver INPFC areas only.
[3]Includes the Columbia, Vancouver and Eureka INPFC areas only.

Unresolved problems and major uncertainties

Data for yelloweye rockfish are sparse and relatively uninformative, especially regarding current trend. Historical catches are very uncertain, as yelloweye comprise a small percentage of overall rockfish removals and actual species-composition samples are infrequently available for historical analyses. Further, the relative contribution of recreational removals was very large, and there is low certainty in the estimates of the exact magnitude of these removals. The management related quantities were found to be very sensitive to alternate catch time-series and this is presented as one of the primary axes of uncertainty.

The choice to model the yelloweye rockfish stock with explicit areas in the assessment model is based on the sedentary life-history of adult yelloweye, and the markedly different population trends as well as historical and current exploitation rates among the three states. The data do not clearly inform this choice, but it does have substantial ramifications for future projections and management decisions and should be considered a major uncertainty in the assessment.

Parameters that generally contribute significant uncertainty to stock assessments, including those defining steepness, natural mortality and growth are estimated, but may be poorly determined due to the short time-series of data, which are primarily available after the biggest period of removals from the stock. Steepness of the stock-recruitment relationship especially is often poorly estimated from a time series like that of yelloweye (a 'one-way trip'), but its value is very important in determining projected rebuilding. For this reason alternate values (from the likelihood profile) are included as a second axis of uncertainty in this assessment.

Process error in recruitment is not explicitly accounted for in this assessment. This choice is driven by several factors: the lack of substantial reduction in the estimates of uncertainty in recruitment deviations (when estimated) relative to the level of recruitment variability (σ_r), the need to integrate over long time-series of poorly informed recruitment deviations rather than use the maximum likelihood point-estimate in order to achieve unbiased estimates, the computation time required to minimize and integrate a much larger dimensioned model, and the fact that, even when accounted for, recruitment variability did not represent the dominant axis of uncertainty with regard to current management quantities. Previous assessments have struggled with the lack of signal in recruitment deviations; the 2006 and 2007 models estimated deviations over only a short period of the time series (1968-1992). Further research is needed to ensure unbiased estimation is achieved when integrating or estimating large numbers of poorly informed recruitment deviations in stock assessment models.

Currently available fishery-independent indices of abundance are imprecise and not highly informative. It is unclear whether increased rates of recovery (or lack thereof) will be detectable without more precise survey methods applied over broad portions of the coast. Fishery data are also unlikely to produce conclusive information about the stock for the foreseeable future, due to lack of retention and active avoidance of yelloweye among all fleets. For these reasons, it is unlikely that the major uncertainties in this assessment will soon be resolved.

Forecasts

The forecast reported here will be replaced by the rebuilding analysis to be completed in September-October 2009 following SSC review of the stock assessment. In the interim, the total catch in 2009 and 2010 is set equal to the OY (17 mt). The target exploitation rate for 2011 and beyond is based upon an SPR of 71.9%, which approximates the harvest level in the current (2007) rebuilding strategy (the 71.9% SPR rate represents the target after the 'ramp-down' portion of the strategy is completed in 2010). Uncertainty in the rebuilding forecast will be included via integrating over all combinations of the alternate states of nature for catch history and steepness.

Current medium-term forecasts predict increases in coast-wide abundance under the SPR=71.9% rebuilding strategy, however these increases are largely driven by the California and Oregon portions of the stock. In fact, the Washington portion is projected to remain at current levels under recent allocation of catch; however, this result is likely to be sensitive to future revision of the estimated Washington historical catch series. Catch allocation used for the forecast reflects the average distribution of *F*s in 2005-2007 among fleets (recreational, commercial) in: Washington (0.013, 0.005), Oregon (0.004, 0.002) and California (0.006, 0.003). The estimated OY values for 2011 and 2012 are larger (20.9, 21.2) than those predicted from the 2007 rebuilding analysis (13.9, 14.2). The following table shows the projection of expected yelloweye rockfish catch, spawning output (by area) and depletion. It may be desirable to evaluate specific alternative allocation scenarios, if relative removals based on future management actions will be substantially different than recent values by state.

Table f. Projection of potential yelloweye rockfish ABC, OY, spawning output and depletion for the base case model based on the SPR = 71.9% fishing mortality target used for the last rebuilding plan (OY) and $F_{50\%}$ overfishing limit/target (ABC). Assuming the OY of 17 mt is achieved exactly in 2009 and 2010. Catch allocation used for the forecast reflects the average distribution of *F*s in 2005-2007 among fleets (recreational, commercial) in: Washington (0.013, 0.005), Oregon (0.004, 0.002) and California (0.006, 0.003).

					Spawning output (million eggs)			
Year	ABC[1] (mt)	OY[1] (mt)	Coast-wide Age 8+ biomass (mt)	Coast-wide Depletion	Coast-wide	California	Oregon	Washington
2009	*31*	*17*	2,008	20.3%	202	75	93	34
2010	*32*	*17*	2,039	20.8%	206	78	95	34
2011	49.3	20.9	2,068	21.2%	211	80	97	34
2012	49.9	21.2	2,093	21.6%	215	82	98	34
2013	50.5	21.4	2,118	22.0%	219	85	100	34
2014	51.1	21.7	2,141	22.4%	222	87	101	34
2015	51.6	21.9	2,165	22.7%	226	89	103	34
2016	52.1	22.1	2,187	23.0%	229	91	104	34
2017	52.6	22.3	2,210	23.3%	232	93	105	34
2018	53.0	22.5	2,232	23.6%	235	94	107	34
2019	53.5	22.7	2,255	23.9%	237	96	108	34
2020	53.9	22.9	2,277	24.1%	240	98	109	34

[1]ABC/OY values for 2009 and 2010 have already been adopted, and are not based on the results of this assessment.

Decision table

Because yelloweye rockfish are currently managed under a rebuilding plan, this decision table is only intended to better evaluate the management implications of the considerable uncertainty in the base case assessment model. Various alternate management actions, including a range of SPR rates and fixed OYs, will be compared in the rebuilding analysis. Landings in 2009-2010 are 17 mt for all cases. Catch allocation used for the forecast reflects the average distribution of *F*s in 2005-2007 among fleets (recreational, commercial) in: Washington (0.013, 0.005), Oregon (0.004, 0.002) and California (0.006, 0.003).

Table g. Decision table of 12-year projections for alternate states of nature (columns) and management options (rows) beginning in 2011. Relative probabilities are based on the joint distribution of alternate historical catch levels and steepness values.

			State of nature					
			75% of catch < 2000 and steepness = 0.344		Base case 100% of catch < 2000 and steepness = 0.417		150% of catch < 2000 and steepness = 0.508	
Relative probability			0.0625		0.25		0.0625	
Management decision	Year	Catch (mt)	Depletion	Spawning output (millions eggs)	Depletion	Spawning output (millions eggs)	Depletion	Spawning output (millions eggs)
Rebuilding SPR 71.9% catches from low alternative	2011	13.2	17.8%	132	21.2%	211	25.0%	375
	2012	13.4	18.1%	134	21.7%	216	25.7%	385
	2013	13.5	18.3%	136	22.2%	220	26.4%	396
	2014	13.6	18.6%	138	22.6%	225	27.1%	406
	2015	13.7	18.8%	140	23.0%	229	27.8%	416
	2016	13.7	19.0%	141	23.4%	233	28.4%	426
	2017	13.8	19.2%	142	23.8%	237	29.1%	436
	2018	13.9	19.3%	144	24.2%	241	29.7%	445
	2019	13.9	19.5%	145	24.6%	245	30.3%	455
	2020	14.0	19.6%	146	25.0%	248	31.0%	464
Rebuilding SPR 71.9% catches from base case	2011	20.9	17.8%	132	21.2%	211	25.0%	375
	2012	21.2	18.0%	134	21.6%	215	25.7%	385
	2013	21.4	18.1%	135	22.0%	219	26.3%	394
	2014	21.7	18.2%	136	22.4%	222	26.9%	404
	2015	21.9	18.3%	136	22.7%	226	27.5%	413
	2016	22.1	18.4%	137	23.0%	229	28.1%	422
	2017	22.3	18.5%	137	23.3%	232	28.7%	430
	2018	22.5	18.5%	137	23.6%	235	29.3%	439
	2019	22.7	18.5%	138	23.9%	237	29.9%	448
	2020	22.9	18.5%	138	24.1%	240	30.4%	456
Rebuilding SPR 71.9% catches from high alternative	2011	37.0	17.8%	132	21.2%	211	25.0%	375
	2012	37.6	17.7%	132	21.5%	213	25.5%	383
	2013	38.2	17.6%	131	21.7%	215	26.1%	391
	2014	38.7	17.5%	130	21.8%	217	26.6%	398
	2015	39.3	17.4%	129	22.0%	219	27.1%	406
	2016	39.8	17.2%	128	22.1%	220	27.5%	413
	2017	40.3	17.0%	126	22.2%	221	28.0%	419
	2018	40.8	16.7%	124	22.3%	222	28.4%	426
	2019	41.2	16.5%	123	22.4%	222	28.9%	433
	2020	41.7	16.2%	121	22.4%	223	29.3%	439

Research and data needs

The available data for yelloweye rockfish are very sparse and generally weakly informative about current status. The following research topics could improve the ability of this assessment to reliably model the yelloweye rockfish population dynamics in the future and provide better monitoring of progress toward rebuilding:

1. Develop and implement a comprehensive visual survey.
2. Do a scientific review of current efforts to develop and improve stock size indices for yelloweye based on IPHC (including additional stations) and make recommendations on the best approaches to develop such indices.
3. Explore a recalculation of GLMM estimates in the IPHC survey that explores station effects which allows inclusion of stations that differ over time.
4. Continue to refine historical catch estimates using ex-vessel prices, etc., particularly in WA.
5. Investigate the development of a WA recreational yelloweye CPUE based on the recreational halibut fishery. Consider a full time series and one ending in 2002, since the yelloweye RCA in waters off northern WA was implemented in 2003.
6. Encourage the collection of samples to refine the estimate biological parameters, particularly maturity and fecundity.
7. Continue to evaluate the spatial aspects of the assessments, including growth, the number and placement of boundaries between areas, as well as the northern boundary with Canada.
8. More work is needed to better understand the performance of maximum likelihood and Bayesian estimators of stock size and trends when large numbers of poorly informed recruitment deviations are estimated. Although it is logically appealing to include such uncertainty, even when little coherent data informing cohort strengths is available, technical and computational issues need to be solved before this approach can be implemented in a case like yelloweye rockfish.
9. Investigate alternative ways of re-weighting. This issue is relevant for all west coast stock assessments.
10. Investigate how best to account for the variability in dates in trawl surveys through a meta-analysis. This issue is relevant for all west coast stock assessments.
11. Continue to refine coast-wide historical catch estimates. This issue is relevant for all west coast stock assessments.
12. Access and processing of recreational data (catch and biological sampling) currently entails differing locations and formats for data from each of the three states and RecFIN. A single database that holds all raw recreational data in a consistent format would reduce assessment time spent on processing these data and potential introduction of errors or alternate interpretations due to processing.
13. The IPHC data organization should be revisited. Currently biological samples cannot be linked to the station from which they were collected. Age data for 2003-2005 is disconnected from length and sex information and other unknown issues may persist in these data. A thorough evaluation of what data are reliable and a final determination of what information is lost, or can potentially be recovered, is needed.

Rebuilding projections

The rebuilding projections will be presented in a separate document after the assessment has been reviewed by the SSC in September 2009.

Table h. Summary of recent trends in estimated yelloweye rockfish exploitation and stock levels from the base case model; all values reported at the beginning of the year.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Commercial catch (mt)[1]	15.5	32.5	6.4	3.2	4.4	5.3	3.8	7.9	7.8	NA
Total catch (mt)	40.9	56.1	15.8	12.4	12.3	15.1	12.4	19.6	16.7	NA
ABC (mt)	392[2]	293[3]	273[3]	52	53	54	55	47	47	31[4]
OY	NA	NA	13.53[3]	22	22	26	27	23	20	17[4]
SPR	53.0%	53.0%	76.6%	78.8%	82.0%	79.2%	79.6%	70.6%	79.3%	NA
Exploitation rate (catch/age 8+ biomass)	2.4%	3.3%	0.9%	0.7%	0.7%	0.8%	0.6%	1.0%	0.8%	NA
Age 8+ biomass (mt)	1,674	1,704	1,717	1,767	1,817	1,864	1,904	1,945	1,976	2,008
Spawning output (millions eggs)	157.4	160.3	161.6	167.3	173.4	179.5	185.3	191.3	196.4	201.5
(Range of states of nature)	108.8-257.1	109.2-265.1	107.9-271.8	110.9-283.1	114.3-295.0	117.6-307.0	120.5-318.7	123.7-330.7	126.0-341.9	128.3-353.0
Recruitment (1000s)	79.4	80.5	81	83.2	85.5	87.7	89.8	92	93.8	95.5
(Range of states of nature)	47.1-151.9	47.2-154.9	46.8-157.4	47.9-161.5	49.1-165.7	50.3-169.8	51.4-173.7	52.5-177.6	53.4-181.1	54.2-184.5
Depletion	15.8%	16.1%	16.3%	16.8%	17.4%	18.1%	18.6%	19.2%	19.8%	20.3%
(Range of states of nature)	14.6-17.2%	14.7-17.7%	14.5-18.1%	14.9-18.9%	15.4-19.7%	15.8-20.5%	16.2-21.3%	16.6-22.1%	16.9-22.8%	17.3-23.5%

[1] Includes research catches.
[2] Includes the Columbia and Vancouver INPFC areas only.
[3] Includes the Columbia, Vancouver and Eureka INPFC areas only.
[4] ABC/OY values for 2009 and 2010 have already been adopted, and are not based on the results of this assessment.

Table i. Summary of yelloweye rockfish reference points from the base case model.

Quantity	Estimate	Range of states of nature
Unfished spawning output (SB_0, millions eggs)	994	743-1,499
Unfished 8+ biomass (mt)	8,492	6,399-12,718
Unfished recruitment (R_0, thousands)	227	178-330
Reference points based on $SB_{40\%}$		
MSY Proxy Spawning output ($SB_{40\%}$, millions eggs)	392	297-600
Relative spawning depletion at $SB_{40\%}$	40.0%	NA
SPR resulting in $SB_{40\%}$ ($SPR_{SB40\%}$)	61.0%	54.6-68.6%
Exploitation rate resulting in $SB_{40\%}$	1.5%	1.2-1.9%
Yield with $SPR_{SB40\%}$ at $SB_{40\%}$ (mt)	56	31-107
Reference points based on SPR proxy for MSY		
Spawning output at $SPR_{MSY\text{-}proxy}$ (SB_{SPR}, millions eggs)	230	33-509
Relative spawning depletion at SB_{SPR}	23.1%	4.4-34.0%
$SPR_{MSY\text{-}proxy}$	50.0%	NA
Exploitation rate corresponding to SPR	2.2%	2.2-2.3%
Yield with $SPR_{MSY\text{-}proxy}$ at SB_{SPR} (mt)	49	7-108
Reference points based on estimated MSY values		
Spawning output at *MSY* (SB_{MSY}, millions eggs)	388	314-533
Relative spawning depletion at SB_{MSY}	39.1%	35.6-42.2%
SPR_{MSY}	60.4%	51.2-69.7%
Exploitation Rate corresponding to SPR_{MSY}	1.6%	1.1-2.1%
MSY (mt)	56	32-108

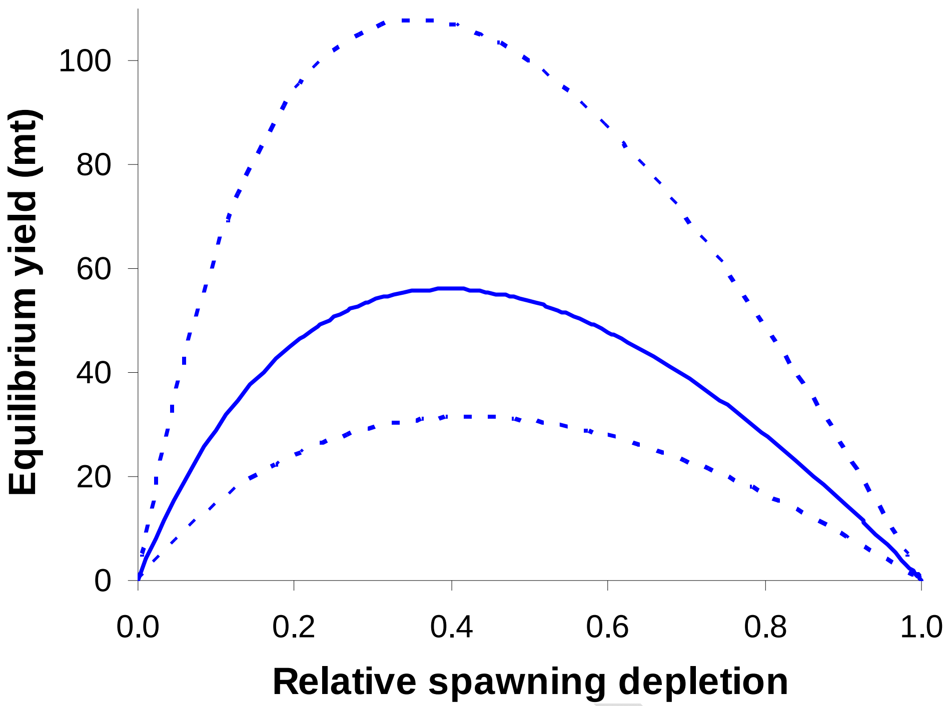

Figure j. Equilibrium yield curve for the base case model (solid line) and alternate states of nature (dashed lines), reflecting the higher and lower values for historical catch prior to 2000 and for steepness.

1. Introduction

1.1 Distribution and Stock Structure

Yelloweye rockfish (*Sebastes ruberrimus*) are distributed in the northeastern Pacific Ocean from the western Gulf of Alaska to northern Baja California (Hart 1973, Eschmeyer and Herald 1983, Love et al. 2002). The species is most abundant from southeast Alaska to central California (Love et al. 2002), with adults found along the continental shelf generally shallower than 400 m. Although smaller yelloweye tend to occur in shallower water, they do not show as pronounced an ontogenetic shift as do many eastern pacific rockfish species. Yelloweye are strongly associated with rocky bottom types, especially areas of high-relief such as caves and large boulders (Love et al. 2002). Mainly solitary, it is widely believed that yelloweye are very sedentary after settlement, with adults moving only short distances during their entire lifetime.

There is relatively little direct information regarding the stock structure of yelloweye rockfish off the U.S. and Canadian coasts. The pelagic larval phase exhibited by all rockfish promotes some mixing of reproductive output, dependent on ocean currents, the duration of the pelagic phase and the timing of annual spawning in relation to annually variable spring transition and upwelling events. However, the sedentary nature of yelloweye rockfish makes adult movement among major rocky habitat areas unlikely. An unpublished genetics study (Yamanaka et al. 2001) of yelloweye rockfish collected from northern Vancouver, B.C. and SE Alaskan waters found little variability among samples and suggested a panmictic stock in the study area. Preliminary results from an analysis of yelloweye collected off Oregon, Washington, Vancouver Island B.C., and the Strait of Georgia B.C. (Lynne Yamanaka, DFO, personal communication, cited in Wallace et al. 2006) suggest that there may be genetic separation between the Strait of Georgia (inside Vancouver Island) and the outer coast (Yamanaka et al. 2006). The yelloweye population residing in the waters of Puget Sound is also thought to be isolated from coastal waters. This Puget Sound stock was proposed for listing under the Endangered Species Act (Federal Register Vol. 73, No. 52, Monday, March 17, 2008, p. 14195-14200) with the result that the stock was considered distinct and proposed to have threatened status (Federal Register / Vol. 74, No. 77, Thursday, April 23, 2009, p. 18516-18542).

An unpublished study of otolith isotope levels (Gao et al. Draft Manuscript) examined ratios of C^{13}/C^{12} and O^{18}/O^{16} in 200 yelloweye rockfish otoliths from the Washington and Oregon coasts. The centroids from these otoliths showed no consistent differences, and suggest there might be a single spawning stock for this portion of the yelloweye rockfish population. Isotopic differences between otolith nuclei and the fifth annual zones may reflect changes in diet from age-1 to age-5. The fifth annual otolith zones differed between Washington and Oregon samples suggesting that the diet compositions of the two areas are slightly different, an unlikely result if appreciable numbers of age 5+ fish were moving between areas

This assessment attempts to mimic the general perception of stock structure for yelloweye rockfish: large stocks linked via a common (but annually variable) stock-recruit relationship with negligible adult movement among areas.

1.2 Life History and Ecosystem Interactions

Yelloweye rockfish spawn in late winter through the summer and possibly into the fall in SE Alaska (Love et al. 2002). Little is known about the pelagic juvenile phase, but recruiting juveniles settle in both shallow and deeper depths, often observed in the same areas as adults. These young juveniles are very conspicuous, and easy to identify, due to having markedly different coloration than adults.

Adult yelloweye rockfish are large-bodied, reaching lengths up to 91 cm (Eschmeyer and Herald 1983, Love et al. 2002). They are long-lived (the oldest observed age is 147 years, from Washington in 2005), late-maturing and slow growing. These life-history characteristics would suggest that yelloweye are relatively unproductive and very sensitive to exploitation. This is compounded by their status as an aggressive top-predator on rocky reefs, making hook-and-line gear highly effective, even gear designed for much larger species such as halibut and lingcod. Adult yelloweye are piscivorous predators eating most small pelagic and groundfish species as available.

The cohabitation of adult and juvenile yelloweye likely results in some cannibalism, and large changes in predator biomass (such as the rebuilding of lingcod, *Ophiodon elongatus,* in recent years) could have a strong feedback to juvenile survival and therefore stock productivity. Many rockfishes have shown decadal changes in productivity linked to ocean conditions, and it would not be surprising if yelloweye exhibited similar trends, although this is uncertain. There is evidence that changes in otolith ring width (and likely growth) is correlated with some of the leading environmental indicators of ocean conditions along the west coast (Black et al. 2008). It is very uncertain how future climate change may potentially influence west coast yelloweye growth, productivity or distribution.

1.3 Historical and Current Fishery

Yelloweye rockfish have historically been a prized catch for both commercial and recreational fleets. They have generally yielded a higher price than other rockfish and have therefore largely been retained when encountered, except in recent years when all retention has been prohibited. Throughout the exploitation history, yelloweye were targeted primarily with line-gear due to their affinity for rocky, and largely untrawlable, habitat.

Rockfish catches are recorded back to the beginning of the 20th century, primarily in California, but appreciable quantities were not landed until an early peak around World War II (Ralston et al. Draft Tech. Memo.). A small fraction of these catches have been yelloweye rockfish, gradually increasing in total removals until around 1970 and then increasing very rapidly as fishing technology, markets and total effort increased (Table 1, Figure 1). The late 1970s to the late 1990s saw the highest yelloweye catches of the time-series. After 2002, when yelloweye were declared overfished, total catches have been maintained at much lower levels. Yelloweye are currently caught only incidentally in commercial hook-and-line and sport fisheries targeting other species that are found in association with yelloweye. The recent fishery encounters a very patchy yelloweye rockfish distribution, and extensive effort is made to avoid all but a small amount of bycatch (Figure 2, Figure 3).

1.4 Management History and Performance

Modern rockfish management began in 1983 when the Pacific Fishery Management Council (PFMC) first imposed trip limits on landings of *Sebastes* species. Yelloweye were managed as part of the *Sebastes* complex until 2000, when the Council moved to species-specific management for overfished species of concern and a few others and minor rockfish groupings: nearshore, shelf or slope for the remaining species. Yelloweye rockfish were managed as part of the minor shelf rockfish group until 2002. In November 2001, the Council adopted a total catch optimum yield (OY) of 13.5 metric tons (mt) for yelloweye for all 2002 commercial, recreational, and tribal fisheries combined for Northern California (Eureka INPFC area), Oregon, and Washington. This was an interim level that allowed for fisheries to take place and potentially catch yelloweye along with other fish, but did not allow prosecution of fisheries that directly targeted yelloweye. Based on the 2002 assessment results (Methot et al. 2002), the Council adopted an OY of 22 mt for 2003. Since 2002, total catch has been below both the annual ABCs and OYs, which were based on rebuilding analyses showing very long time-periods required for stock recovery to target levels (Table 2). These catch levels represent a 95% reduction from average catches observed in the 1980s and 1990s. Managers have constrained catches by eliminating all retention of yelloweye rockfish in recreational fisheries, reducing commercial retention of yelloweye rockfish in the trawl fishery (to 200-300 lb per bimonthly period), instituting broad spatial closures, some specifically intended to move fixed-gear fleets away from known areas of yelloweye abundance, and creating new gear restrictions that have reduced trawling in rocky shelf habitats and the coincident catch of rockfish in shelf flatfish trawls. Since 2002, the total 6-year catch (88.5 mt) has been only 63% of the sum of the OYs for 2002-2008 and only 29% of the sum of the ABCs for that period. The total 2008 catch (16.7 mt) is estimated to be just 4% of the peak annual catch that occurred in the early 1980s.

1.5 Fisheries in Canada and Alaska

Yelloweye are caught by commercial line fisheries and recreational fleets in both British Columbia and Southeast Alaska. Current stock estimates and catches are much larger than those recently observed off the coasts of Washington, Oregon and California. In SE Alaska, total catches were 250 mt in 2007 and 261 mt in 2008 (Brylinsky et al. 2007). The overfishing level in SE Alaska has been 650 and 611 mt over the same period, more than twice the average estimated catches observed from the U.S. west coast over the period 1975-1999. Canadian yelloweye management also adopted conservation measures in 2002, reducing limits and closing 20% of the coastal waters to fishing. Prior to this time, peak catches had reached just over 1,000 mt in the early 1990s (Yamanaka et al. 2006). From 2002 to 2004, catches from Canadian outside waters have averaged 248 mt, but have trended downward from 313 to 200 mt. A large portion of this total (58%) comes from the halibut longline fishery.

2. Assessment

The following sources of data were used in building this assessment:

1) Fishery independent data: including relative abundance indices, length and age data from the International Pacific Halibut Commission's (IPHC) longline survey 1999-2008, and the NWFSC and Triennial bottom trawl surveys 2003-2008 (NWFSC survey) and 1980-2004 (Triennial survey).

2) Estimates of fecundity, maturity, length-weight relationships and ageing error from various sources.

3) Informative priors on natural mortality and stock recruit steepness derived from other fish and yelloweye stocks.

4) Commercial (targeted and bycatch) and recreational catch estimates from 1916-2008.

5) Commercial and recreational fishery biological data (age and length) from 1968-2008.

6) Fishery dependent catch-per-unit-effort series from recreational and charter observer programs from all three states.

Data availability by source and year is presented in Table 3. A description of each of the specific data sources is presented below.

2.1 Fishery Independent Data

2.1.1 International Pacific Halibut Commission Survey

The International Pacific Halibut Commission (IPHC) has conducted an annual longline survey for Pacific halibut off the coast of Oregon and Washington (IPHC area "2C") since 1997 (no surveys were performed in 1998 or 2000). Beginning in 1999, this has been a fixed station design, with roughly 1,800 hooks deployed at 84 locations each year (Figure 4); station locations differed in 1997 and are therefore not comparable with subsequent surveys. Rockfish bycatch, mainly yelloweye, has been recorded during this survey, although values for 1999 and 2001 are estimates based on subsampling the first 20 hooks of each 100-hook skate. The gear used to conduct this survey, while designed to efficiently sample Pacific halibut, is similar to that used in some targeted line fisheries for yelloweye and should be capable of sampling at least the adult population. Some variability in exact sampling location is practically unavoidable, and leeway is given in the IPHC methods to center the set on the target coordinates but to allow wind and currents to dictate the actual direction in which the gear is deployed. This can result in different habitats accessed at each fixed location among years.

Yelloweye catch has historically occurred at very few of the 84 stations in the design (Table 4). There are 27 stations in Washington waters, but yelloweye have been captured at only 10 of these, and 90% of the 341 yelloweye captured were encountered at just three stations. Further, 98% of the catch is accounted for by seven of the stations, with the most productive yelloweye stations occurring primarily in extreme northern Washington. There are 57 stations in Oregon, of which 12 have produced 1,338 yelloweye from 1999 to 2008. Of the twelve stations with yelloweye catches, five have produced 92% of the total catch and seven have accounted for 98%.

The IPHC longline survey catch data were standardized using a Generalized Linear Model (GLM) with binomial error structure. The choice of catch-per-hook, vs. catch per station was dictated by variability in the number of hooks deployed each year. The binomial error structure was logical, given the binary nature of capturing a yelloweye rockfish on each longline hook or not. The only two independent variables available to predict catch by the 495,600 hooks deployed were year (nine years) and station (84 fixed stations across both states). Treating station as a factor in the model was too computationally intensive to run, so only year was retained in the final analysis. Three models were run; two separate models for Oregon and Washington, as well as one with data from all stations fished for comparison of the method with previous analyses. The variability around the yearly index values was found using a Monte Carlo Markov Chain (MCMC) approach. Specifically, the function 'MCMClogit' that is part of the R package MCMCpack (Pemstein *et al*., 2007) was used. This approach dictated that the 'logit' link be used for the GLM model, because this is the only appropriate link available in MCMCpack (the MCMCprobit in MCMCpack is for ordinal data and is not suitable here). The final standardized index was the median of the posterior density for the back-transformed yearly effects (plus the grand mean). The annual estimates of the standard deviation of the logged MCMC values were used as the starting variance estimates for Stock Synthesis to correspond to the assumption of lognormal error.

The indices for both Oregon and Washington are highly variable and show conflicting if very little overall trend (Figure 5). This is to be expected given the small sample sizes, yet this survey may be the best index of relative abundance available for yelloweye rockfish, sampling the adult population in habitats where it is most abundant. The new method employed for this assessment was tested against the raw average catch per station (states combined) calculated for the 2007 assessment and the differences in point estimates were negligible (Figure 6), indicating that any change in information contribution of this series to the assessment model from 2007 to 2009 is primarily due to the choice to separate the series by state.

The fixed 84 IPHC station locations were supplemented in 2006, 2007 and 2008 by additional stations at the request of the states of Washington and Oregon. The addition of 'extra' stations in each state has followed divergent protocols, with Washington selecting new stations near existing stations that have captured yelloweye, and Oregon instituting a random station allocation to individual reefs based on habitat maps. Since this survey is analyzed as a relative index of abundance, there is no way to analyze these extra stations as part of the existing data set. Each of these data collection efforts could produce an improved time-series in the future, but are too short at present to be used as indices of relative abundance. Further, the divergent sampling designs will preclude analysis of pooled data for both states.

Biological samples were collected from yelloweye during the course of the IPHC survey. Length and sex information was recorded at sea, and age structures were retained for later ageing by Washington Department of Fish and Wildlife (WDFW) staff. Biological samples were augmented with the yelloweye captured at extra locations fished during 2006 to 2008 in Washington and in 2008 in Oregon. Both length and age data are available for IPHC survey yelloweye catches; however, station information for the biological samples has been lost (WDFW, personal communication, 2009). Further, due to a lab mishap, the age data for 2003-2005 cannot be connected with the rest of the biological sampling, and so must be treated as marginal age distributions with the sexes combined.

Thirty-seven length bins from 16 to 88 cm were used to summarize the length frequency of the IPHC survey catches in each year for Oregon and Washington, the first bin including all observations less than 16 cm and the last bin including all fish larger than 88 cm. This choice reflects the need to span the size range observed across all sources of data as well as retain as much information as possible about the growth trajectories (vs. aggregating to wider bins, such as 4 cm). Sampling for length and age was nearly complete for all yelloweye encountered, yet the sample sizes are still relatively small (Table 5), with a minimum of 17 and a maximum of 268 lengths recorded in each state annually, across all years. Broadly, the length frequency distributions for the IPHC survey from 1999-2008 in Washington show few fish smaller than 40 cm captured (Figure 7, Figure 8, Figure 9, Figure 10), consistent with the use of large hooks intended for halibut, the target species. Yelloweye captured in Oregon are slightly smaller, with a greater proportion of both sexes below 50 cm. Over this size range, it would be surprising if evidence of even the strongest cohorts was still visible, and none is in either state.

Age-frequency data from the recent (2006-2008) IPHC survey was compiled as conditional age-at-length distributions by state, sex and year. Individual length- and age-observations can be thought of as entries in an age-length key (matrix), with age across the columns and length down the rows. The approach consists of tabulating the sums within rows as the standard length-frequency distribution and, instead of also tabulating the sums to the age margin, the distribution of ages in each row of the age-length key is treated as a separate observation, conditioned on the row (length) from which it came. This approach has several benefits for analysis above and beyond the standard use of marginal age compositions. First, age structures are generally collected as a subset (or the same set) of the fish that have been measured. If the ages are to be used to create an external age-length key to transform the lengths to ages, then the uncertainty due to sampling and missing data in the key are not included in the resulting age-compositions used in the stock assessment. If the marginal age compositions are used with the length compositions in the assessment, the information content on sex-ratio and year class strength can be present twice in the likelihood, as the same fish are contributing to likelihood components that are assumed to be independent. Using conditional age-distributions for each length bin allows only the additional (and orthogonal) information provided by the limited age data (relative to the often far more numerous length observations) to be captured, without creating a 'double-counting' of the data in the total likelihood. The second major benefit to using conditional age-composition observations is that in addition to being able to estimate the basic growth parameters ($L_{age\text{-}1}$, $L_{age\text{-}70}$, K) inside the assessment model, the distribution of lengths at a given age, usually governed by two parameters -- the CV of length at some young age and the CV at a much older age -- are also able to be estimated. This information could only be derived from marginal age-composition observations where very strong and well-separated cohorts existed that were quite accurately aged and measured; rare conditions at best. By fully estimating the growth specifications within the stock assessment model, this major source of uncertainty is included in the assessment results, and bias due to size-based selectivity is avoided. Therefore, to retain objective weighting of the length and age data, and to fully include the uncertainty in growth parameters (and avoid potential bias due to external estimation where size-based selectivity is operating) conditional age at-length compositions were developed for the recent IPHC survey age data, and all other age-frequency series.

Age distributions included 64 bins from age 2 to age 65, with the last bin including all fish of greater age. The choice of these bins reflects the lack of any source for fish younger than age 2, and the need to reduce the computational time by limiting the total number of age bins for each entry. Most data series in the assessment model included very few fish greater than 65 years old; however they were most common in the IPHC survey. Nearly all fish sampled for length were also aged (Table 5). To aid in inspecting the full conditional age-at-length distributions, they are displayed graphically for each data set in this assessment via the entire matrix of age distribution-at-length, as well as summarized to marginal age-frequency distributions. It is often useful for data and model fit evaluation to compute these marginal age-compositions, and include them in the assessment model (with the likelihood contribution turned off, so they do not affect model fit in any way) for comparison of the 'implied' fit to the margin of the age-length key. The marginal age compositions allow for easier visual tracking of strong cohorts (although this information is still imparted to the model using conditional age-at-length observations, it is harder to visualize) and offer a view of the data more familiar for those accustomed to diagnosing model fit based on marginal age-composition data. This approach is used here.

The IPHC age data from 2006-2008 show many fish older than 65 years in both states, with somewhat more older and larger fish present in Washington than in Oregon (Figure 11, Figure 12, Figure 13). A similar pattern can be observed in the sex- and length-aggregated IPHC data available for the earlier period 2003-2005 (Figure 14, Figure 15). In aggregate, these age data appear relatively sparse, provide only a short time-series, show no coherent cohort structure and are unlikely to provide much more than estimates of the growth parameters and the diffuse information that there are more old fish remaining in Washington than in Oregon.

2.1.2 Triennial Bottom Trawl Survey

The longest time-series of fishery-independent data available for yelloweye rockfish is the triennial shelf trawl survey conducted by NMFS starting in 1977 (Dark and Wilkins 1994). The sampling methods used in the survey over the 21-year period are most recently described in Weinberg et al. (2002); the basic design was a series of equally spaced transects from which searches for tows in a specific depth range were initiated. In general, all of the surveys were conducted from mid-summer through early fall: the survey in 1977 was conducted from early July through late September; the surveys from 1980 through 1989 ran from mid-July to late September; the survey in 1992 spanned from mid-July through early October; the survey in 1995 was conducted from early June to late August; the 1998 survey ran from early June through early August; and the surveys in 2001 and 2004 were conducted in May-July (Figure 16). The abrupt shift in survey timing in 1995 led the 2007 canary rockfish (*Sebastes pinniger*) stock assessment to allow for a possibility that this change influenced catchability, and two separate catchability parameters were estimated for the two eras (Stewart 2007).

The initial year of the survey in 1977 was based on a sampling design that spanned depths from 50 to 260 fm (91 to 475 m), and did not come as far inshore (30 fm) as the subsequent surveys conducted on a triennial basis from 1980 to 2001. Because of the large number of 'water hauls' eliminated in 1977, especially in the US Vancouver INPFC area, and because the sampling depths were not the same as the other years, the 1977 survey year was not used in this assessment. A full description of the water haul issue can be found in Zimmerman et al. (2001).

The bottom trawl survey provides very sparse information on the spatial distribution of yelloweye rockfish, but identifies known areas of abundance off the northern Washington and central Oregon coasts corresponding to major rocky banks (Figure 17, Figure 18). Raw catch rates show a decline from 1980 to 1995, and then an increase in subsequent years, but are highly variable (Figure 19). There are no clear patterns in the catch rate by depth (Figure 20). The proportion of triennial tows that captured yelloweye rockfish shows an increasing trend over the entire early time-series, then an abrupt shift in 1995, coinciding with the shift to earlier sampling (Figure 21).

Triennial survey catch rates were standardized using the zero-inflated Generalized Linear Mixed Model (GLMM) based on the method described by Helser et al. (2004, 2007). The zero-inflated, or delta- approach explicitly models the proportion of positive observations via a binomial GLM (or GLMM) separately from the positive catch rates (e.g., Stefansson 1996). GLMMs were used because sampling vessels could be modeled as a random effect by assuming that vessels were chosen randomly each year from a larger distribution of vessels. Binomial GLMMs were used to predict the proportion of tows containing yelloweye rockfish in each year and gamma GLMMs with a log link were used to predict the catch-rates in each survey year for tows that included yelloweye. The product of the predicted values of the binomial and gamma GLMMs were back-transformed to calculate predicted density of yelloweye rockfish. This density was expanded to an area containing the range of depths within which positive tows were observed, and MCMC was used to estimate the variance about the estimated annual survey catch.

This method requires that all strata (year, area or depth-zone) contain enough positive catch observations to estimate the parameters of the Gamma GLMM. Preliminary exploration revealed that there were too few triennial tows to build a model for either the California or Oregon areas, or to separate the depth range into more than one stratum. Therefore a model was constructed for Washington waters only (46°N to 49°N, not including tows conducted north of the EEZ). The proportion of positive tows in Washington showed a similar pattern to those across the entire coast, with a distinct shift in 1995 (Figure 22). Positive tows ranged from three to 21 among survey years and number of fish from 13 to 114 making this survey index highly uncertain and subject to stochastic sampling variability (Table 6).

The GLMM fit the aggregate proportion positive observations very well (Figure 23). Evaluation of the deviance residuals (using a Gamma distribution with a log-link and ignoring the random effects) also reveals a reasonable fit to the sparse positive catches. The mean of the distribution of the estimated random effects is zero; hence the use of component deviances that ignore the random effects should produce plots that show the distribution of the residuals for each fitted value, but with somewhat more random variation than would be present if accounting for the random effects. However, the omission of random effects from the calculation of deviance components should not result in erroneous bias in the diagnostic figures. The deviance components should (and largely do) follow a gamma distribution with residuals concentrated about a small mean and a few observations with large residuals forming the long tail of the gamma distribution (Figure 24).

The estimated triennial survey time-series for Washington waters shows a relatively flat trend over both the early and later years of the survey, with the lowest values observed around 1995 (Figure 25).

Triennial survey length-frequency distributions are based on subsampling of survey-caught yelloweye rockfish from 1986 to 2004; biological samples of yelloweye were not collected in 1980 or 1983 (Table 7). These distributions are very noisy, and show no obvious trends in mean size or evidence of cohorts (Figure 26, Figure 27). Notably, nearly the entire size range of yelloweye observed from all sources is seen in the triennial data, fish occur across the 18 to 72 cm size categories. There were no age-structures collected for yelloweye during the triennial survey.

2.1.3 NWFSC Bottom Trawl Survey

The NWFSC shelf and slope trawl survey time series available for the depths in which yelloweye rockfish are found extends from 2003 to 2008. The survey identifies the same areas of increased abundance in northern Washington, the Heceta Bank area of Oregon and near Cape Mendocino in California (Figure 28, Figure 29). Positive catch rates show little trend over years or depth for all hauls conducted (Figure 30, Figure 31). The proportion of positive tows also does not show any clear trend over the relatively short time-span of the survey (Figure 32).

A GLMM-based approach identical to that used for the triennial survey was applied to the NWFSC data. Preliminary evaluation revealed that there were insufficient tows to populate models for either Washington or California waters. Even within Oregon, the NWFSC survey encounters yelloweye infrequently, in less than 10 tows for any year of the time series and has never observed more than 100 fish in a single year (although one of the tows conducted in 2003 captured 80 fish; Table 6). The proportion of non-zero tows in Oregon waters did not show a clear trend over time (Figure 33).

As for the triennial survey, the GLMM fit the aggregate proportion positive observations very well (Figure 34). The deviance residuals did not show a clear pattern against the linear-predictor (Figure 35; note again that random vessel effects are not included in this calculation). The biomass index shows a relatively flat trend over the period 2003-2008 with a very large value for 2003, a function of the single very large catch in that year (Figure 36).

The length-frequency distributions for the NWFSC survey from 2003-2008 were constructed using the same size bins as other data sources. These observations are based on very few fish, between 11 and 35 per year (Table 7). Most notably, the NWFSC length-frequency data show a very truncated size range; almost no fish larger than 58 cm were observed in any year of the survey (Figure 37, Figure 38). Fish less than 20 centimeters are rare, perhaps slightly more so than in the triennial survey. As is the case for the yelloweye length- and age-compositions from other fishery independent sources, neither clear trends, nor visible signs of cohorts appear in the biological data. Age structures were collected for nearly all yelloweye encountered by the NWFSC survey, but have not yet been read and are therefore unavailable for this assessment.

2.1.4 Visual Surveys

Yelloweye are a conspicuous member of the *Sebastes* genus, relatively easily identified during underwater visual surveys conducted by scuba-divers, manned or unmanned underwater vehicles. Density estimates for yelloweye rockfish have provided the basis for recent summaries of yelloweye rockfish population trends and abundance in both southeast Alaska and British Columbia waters (Yamanaka et al. 2006, Brylinsky et al. 2007, Brylinsky et al. 2008). An extensive effort was made specifically for this assessment to summarize existing density estimates from published and unpublished visual studies (W. Wakefield and J. Clemens, NWFSC, personal communication). These estimates, although not strictly comparable among all studies (in many cases the survey locations were non-random, or even selected based on predicted abundance of yelloweye and other species of interest), generally show lower but variable yelloweye density off the U.S. west coast compared to British Columbia or southeast Alaska (Table 8). Clear trends over time are not evident, but the observation that at least some locations in California may harbor relatively high densities suggests it is not outside the core range of the species.

2.1.5 Other Fishery Independent Data

A small number of yelloweye are encountered in the NWFSC's cooperative fishery independent hook-and-line survey targeting rockfish in the Southern California Bight (a total of five yelloweye, 2004-2008). These fish were included in the estimation of the weight-length relationship (see below), but no index can be developed from that survey. The authors are unaware of other small-scale projects that could currently provide data for this assessment, although some undoubtedly exist.

2.1.6 Research Removals

Research catches have historically been only a tiny fraction of the total removals from the yelloweye rockfish population. However, as total mortality has been substantially reduced in recent years, the relative contribution of research removals to the total has increased. This was particularly true in 2007, when research catches totaled 1.8 mt, or 9% of the total estimated removals from the stock. Research catches are included in estimates of total commercial catch, ensuring that all known sources of current mortality are accounted for in recent years.

2.2 Biological Data

A number of biological parameters were estimated outside the assessment model. These values are treated as fixed and therefore uncertainty reported for the stock assessment results does not include any uncertainty associated with these quantities. Input values for such parameters are provided in Table 9, and the methods are described below.

2.2.1 Weight-Length Relationship

The weight-length relationship used for this assessment is based on data from 2,012 fish sampled in California, Oregon and Washington between 1978 and 2008. Male and female curves were fit separately using a normal error assumption for the log-linear relationship $W = aL^b$. Parameter estimates derived from this analysis (Table 9) are consistent with other published studies and indicate that female yelloweye are slightly heavier for their length than males at sizes around and above that of maturity (Figure 39).

2.2.2 Maturity Schedule

The maturity-at-length relationship used in this assessment is based on a recent analysis conducted by researchers at ODFW (Hannah and Blume Draft Manuscript). They found that using histological methods produced a slightly lower size at 50% maturity than was previously estimated by visual inspection (Table 9). Their results indicate that 50% of female yelloweye are mature at a size of 38.8 cm; the logistic slope of -0.437 results in near complete maturity by 50 cm (Figure 39). These estimates are based on yelloweye from Oregon, and since no other maturity data are currently available, are used as the basis for the relationship for this stock assessment.

2.2.3 Fecundity

The disproportionate contribution of large female rockfish to reproductive output has been the topic of much research in recent years (e.g., Sogard et al. 2008). Increases in fecundity per unit female body weight have been identified and used in stock assessments for several rockfish species on the west coast. A recent analysis of fecundity data for 40 *Sebastes* species used a Bayesian hierarchical analysis to estimate fecundity per gram as a linear function of weight (Dick 2009). Yelloweye were found to have a relatively moderate increase in weight-specific fecundity with weight, with a posterior median intercept parameter of 137.9 eggs per gram and a slope of 0.0365. These values were quite uncertain, with the ~95% credibility interval ranging from -318.1 to 626.3 for the intercept and -0.0777 to 0.1418 for the slope. The relationship was converted to eggs per kg body weight for Stock Synthesis (Table 9, Figure 40) and results in predicted spawning output increasing slightly faster than the W-L relationship after maturity (Figure 39). Although uncertain, this analysis provides the best available estimates of fecundity for yelloweye rockfish and is used for this assessment.

2.2.4 Natural Mortality

The oldest observed yelloweye is a male, aged 147 years, captured in the Washington trawl fleet in 2005. Although this observation is subject to ageing imprecision, it, along with the large fraction of yelloweye aged 65+ in the IPHC surveys (Figure 11, Figure 12, Figure 13, Figure 14, Figure 15) indicate very low rates of natural mortality.

There are several sources of prior information for natural mortality for fish species and for yelloweye specifically. Two priors were developed based on a hybrid method including both Hoenig's (1983) method using maximum observed age, and Pauly's (1980) meta-analysis of natural mortality for a wide range of fish species. The method calculates prediction intervals based on the two methods, with the only required input information being the maximum observed age (O. Hamel, NWFSC, personal communication). Results for this analysis were relatively insensitive to the choice of maximum age: $\ln(M) = -2.953$, SD = 0.417 for a maximum age of 118 (the value assumed in previous assessments), and $\ln(M) = -3.05$, SD = 0.418 for a maximum age of 147 (Figure 41). Both values of maximum age generated priors with appreciable density over the entire plausible range from 0.02-0.10.

A second yelloweye-specific prior was constructed from age-distribution data collected at the Bowie seamount and at other locations in B.C., Canada. The Bowie seamount was thought to have been only very lightly exploited at the time these samples were collected and therefore the estimate of total mortality (Z) should be very close to that of natural mortality only (M) subject to the unknown effects of fluctuation in year-class strengths and sampling selectivity. The mean value for females based on Ricker's catch curve method was 0.0431 (Yamanaka et al. 2000) and it is this value that was used as the basis for fixing natural mortality (at 0.0431) in the 2007 assessment. Male yelloweye rockfish across five locations in B.C. showed a consistently higher estimate of Z (for the Bowie seamount, as well as other exploited locations) with offsets to female Z ranging from 0.04 to 0.12. To create a sex-specific prior for natural mortality, these offsets were bootstrapped and applied to a distribution for females with an arbitrary SD of 0.03 about the point estimate. The arbitrary SD was selected as the tightest value that still encompassed the range predicted from the Hoenig/Ricker prior developed above (i.e., it should be no more restrictive than that distribution). The prior was constructed for values for *M*, instead of ln(*M*), because this was the only form for the prior currently available in Stock Synthesis. The sex-specific priors derived from this method (Figure 41) were used for the pre-STAR base case model, however discussion during the review led to the mutual conclusion that Bowie Seamount data were not representative of the U.S. stock, largely due to the lack of evidence for highly divergent gender-specific mortality in the age-composition data. As a result, the prior derived from the Hoenig/Pauly method was approximated via a normal distribution (a log-normal prior was not available as an option in Stock Synthesis) and used for both males and females in the base case (Figure 42).

2.2.5 Ageing Bias and Imprecision

Observed yelloweye ages are derived from visually counting the rings on otoliths after they have been ‘broken-and-burned’. Because they are long-lived, these counts can be large, and the repeatability of individual age estimates is imperfect, especially for older fish. Treatment of ageing imprecision was a topic of specific concern in the 2006 assessment (see section on STAR panel recommendations below). Although not directly applicable for this assessment, an existing study using bomb-radiocarbon methods (Kerr et al. 2004) supports the premise that rings are formed annually on yelloweye otoliths and that enumeration of these rings is imprecise, but not likely to be systematically biased.

What is known about ageing imprecision for the U.S. west coast yelloweye stock is based on comparison of 556 otoliths read independently by two Washington Department of Fish and Wildlife (WDFW) age-readers (Figure 43). Individual reads ranged from 5 years to 123 years with most of the data consisting of reads between 15 and 60 years. Visual inspection reveals a wider degree of difference with increasing age, and generally precise double reads relative to other rockfish species on the U.S. west coast. For the 2009 assessment, these double reads were analyzed with software provided by A.E. Punt (University of Washington, personal communication), which is commonly used to estimate ageing imprecision and bias for west coast rockfish assessments (Punt et al. 2008). Briefly, the software estimates the underlying age distribution of a sample from up to three double- or cross-reads for each age structure, and can do this for multiple samples simultaneously. The most important assumption of the estimation technique is that at least one ageing method must be unbiased, so it is therefore not an age-validation. Functional forms can be explored for each method for both the bias (none, linear, type II) and the imprecision (constant or linear increase in CV, or type II increase in CV with age). Because the technique requires that the underlying age structure of each sample be estimated, a reasonably large quantity of data spread over the entire range of ages present in the sample is needed.

A step-wise procedure comparing the AIC values for ageing imprecision models fit to the double-read data was employed in order to select the most parsimonious functional form for the relationship. Because we have no external age-validation for comparison, ages are assumed to be unbiased. Estimates of the standard deviation of observed age at true age were very robust to choices of ‘minus’ and ‘plus’ groups (for accumulating the tails of the distribution) and a type II functional form improved the fit substantially (delta AIC > 20 units) over a simple linear relationship. The estimated relationship shows a non-linear increase in absolute imprecision with age, from a SD = 1.2 years at true age 10, to SD = 6.2

years at true age 100 (Figure 44), confirming the conclusions from purely visual inspection of raw double reads. This relationship was used in the base case model.

2.3 Fishery Dependent Data

2.3.1 Historical Commercial Catches

The historical commercial catch reconstruction used for this assessment represents an amalgamation of newly available data (unused in previous assessments), updates to 'standard' sources of information (PacFIN, CalCOM, and state databases), and portions of the reconstruction created for the 2006 (or possibly earlier) assessment retained as the best estimate where no additional improvements could be made. The results of this effort, by modeled fishing fleet, are provided in Table 1 and Figure 1. The sources and methods used for this reconstruction are summarized by state below.

For the state of California, commercial landings for the period 1916-1968 relied on estimates from the recent reconstruction efforts by SWFSC and California DFG scientists (Ralston et al. Draft Tech. Memo.). This effort utilized newly available spatial information regarding aggregate rockfish landings back to 1916 as well as intermittent species composition estimates by market category (and period over which that category was used) to apportion the aggregate catches to species, fishing gears and ports. This method is probably quite reliable for the most common species, but is likely much less accurate for species infrequently contributing to the total or making up a very small percentage. This reconstruction added substantial yelloweye catches to the early time period, especially around World War II. From 1969 to 2008, CalCOM (documentation: 2004) estimates of yelloweye catch were used. These estimates were updated in June, 2009 to reflect the changes made during that month. Changes in this database among recent assessments illustrate how sensitive the annual totals for individual species are to application of sparse species-composition sampling of time-varying market categories. A summary of the CalCOM catch estimation concluded that prior to 1992 "many of the landing estimates are not based on actual sampling, which could explain why they are highly erratic" (Pearson et al. 2008); they concluded those earlier landings were unreliable, but later years (from 1992 through 1996) were generally reliable.

In Oregon, there was no comprehensive historical reconstruction that could be used directly for this assessment, although data-entry and analysis efforts are underway. Instead, recently available (since the 2006 assessment) species composition estimates from the 1970s were used to estimate the fraction of aggregate rockfish catches that were likely yelloweye rockfish over the period 1916-1977. Alternate stratifications produced differing results, so simple summation over observed trips was used to derive an estimate of 0.0037%. This estimate reflects the rockfish fishery prior to the development of the mid-water (primarily widow rockfish) fishery in the late 1970s. Previously, in the 2006 and earlier assessments, estimates for this period were assumed to be 1% of aggregate rockfish catches and to have declined linearly before 1969. This fraction was applied to catch estimates from a variety of sources used in other reconstructions (Cleaver 1951, Fish and Wildlife Service, 1950-1955, 1957-1964, Anonymous 1957, Oregon Fish Commission, 1965-1967, and the Pacific Marine Fisheries Commission report 1977). The net result was a modest decrease, relative to the 2006 assessment, in the later portion of this period and an increase over 1925-1955, and 1916-1925, when flat estimates of 2 and 0 mt had been used. For the period 1978-1983 the values from the 2006 assessment were used. Beginning in

1984, best estimates of summary catch from the PacFIN system were extracted and values had changed only slightly from the estimates used in the 2007 update.

For the state of Washington there was also no comprehensive historical reconstruction that could be used directly for this assessment, although efforts are underway there, too. Due to difficulties in apportioning U.S., Canadian and Puget Sound catches, as well as a lack of new species composition estimates (although some hard-copy records exist that could be key-punched and used as a basis for future assessments), no effort was made to reanalyze the series created for the 2006 assessment by WDFW scientists (Wallace et al. 2006). Historical catch estimates from the 2006 assessment consisted of a linear ramp from 1 mt in 1955 to 4 mt in 1975. Catch estimates for the period 1976 to 1982 were referenced from Tagart and Kimura (1982). For 1983-1998 estimates from PacFIN supplemented with apportioned values from the state database for the line-fishery were retained. For the period since 1999, PacFIN summary catch estimates were extracted in late May, 2009.

The net result of the historical catch reconstruction in this yelloweye assessment was only a very small increase in total cumulative removals relative to the 2007 updated assessment, primarily occurring between 1940 and 1955 in California and Oregon (Figure 1,

Figure 45, Table 1). In aggregate, the estimated removals from commercial sources are based on sparse sampling of shifting market categories for a rare contributor to the total. Species compositions have been shared across years, areas and sectors, even in the recent (PacFIN) period since 1981. The degree of uncertainty in commercial catch should be an integral part of the conclusions drawn from this assessment.

2.3.2 Historical Recreational Catches

Estimates of recreational catch must be far more uncertain than those from commercial sources, due to a much less rigorous sampling program until very recently. For many west coast rockfish species, uncertainty in the recreational removals is relatively less important due to the small magnitude of these removals relative to commercial fisheries; however this is not the case for yelloweye rockfish. Yelloweye have been, until as recently at 2002, one of the most sought-after groundfish species captured by recreational fishermen. Release mortality for yelloweye is generally assumed to be very high, although sample sizes for existing studies are extremely small (e.g., 2 fish in Hannah and Matteson 2007). Recreational catch estimates from sources that can account for discarded fish have included all discard estimates for yelloweye as dead catch (e.g., “A+B1” estimates from RecFIN). For this yelloweye assessment some sources have been added or updated to reflect the current best estimates where new information has become available, and some of the values estimated for the 2006 assessment have been retained for lack of a better estimate. Sources and methods for each state are outlined below.

For the state of California, the historical recreational catch reconstruction provided by the SWFSC (Ralston et al. Draft Tech. Memo.) replaced the estimates included in the 2005 and 2007 assessments. This constituted a large increase in the total recreational removals over the period 1929-1980, and an extension of the estimates from 1955 (in the 2007 assessment) to 1929 (Table 1). Recreational catches were assumed to be negligible prior to 1929. Updated RecFIN estimates were extracted for the period 1981-2003 and converted to biomass via observed or extrapolated mean weights. An error was corrected in the recreational catch estimates prior to the STAR panel leading to a small change from the draft document provided for review. No attempt was made as part of this assessment to correct for the large numbers of recently discovered recreationally caught rockfish that have remained unapportioned to the species level in the state of California estimates. This should be revisited as part of the next assessment if species composition estimates become available.

A well-documented reconstruction was provided by the state of Oregon (T. Buell, ODFW, personal communication) for the period 1973-2002. Prior to 1973, recreational catch estimates were extrapolated for the 2006 assessment and those values were retained. The ODFW reconstruction apportioned the small number of unidentified recreationally caught rockfish to species, based on the ratio of species in the retained catch. This method makes several assumptions regarding angler behavior when interviewed, but no alternative approaches have been developed.

For the state of Washington, no revisions have been made to the estimates reported in the 2006 and 2007 assessments, as there have been no revisions to the sources upon which they were originally based (F. Wallace, WDFW, personal communication).

Some revisions were made to the California historical recreational catch reconstruction (1929-1980) after the data had been finalized for this assessment. These changes were small, but should be incorporated into future assessments.

The estimated removals from recreational sources are based on sparse sampling (or phone surveys) of only a very small fraction of anglers, trips and even ports where yelloweye have been caught. The degree of uncertainty in the recreational catch, perhaps even more so than the commercial catch, needs to be an integral part of the conclusions drawn from this assessment.

2.3.3 Foreign Catches

Foreign catches are included in the catch estimates for commercial fleets by state (Table 1), but are insignificant for yelloweye, totaling less than five mt in the peak year (1970) in Oregon.

2.3.4 Recent Removals (2002+)

Catches explicitly include discards beginning in 2002 when management restrictions have resulted in nearly all yelloweye caught by recreational and commercial fishermen being discarded at sea. Recent catches were based on current total mortality estimates (2002-2007) produced by the West Coast Groundfish Observer Program (WCGOP) and the GMT scorecard (2008). Although these sources are relatively comprehensive in covering all sources of mortality, incidental removals occurring in non-groundfish sectors, such as the fixed-gear halibut fishery are not routinely observed, nor included in these estimates.

In aggregate, all sources of removals have been below both the ABC and OY each year. These catch levels represent a 95% reduction from average catches observed in the 1980s and 1990s. Managers have constrained catches by eliminating all retention of yelloweye rockfish in both commercial and recreational fisheries, instituting broad spatial closures, some specifically for moving fixed-gear fleets away from known areas of yelloweye abundance, and new gear restrictions intended to reduce trawling in rocky shelf habitats and the coincident catch of rockfish in shelf flatfish trawls. Since 2002, the total 6-year catch (96 mt) has been only 63% of the sum of the OYs for 2002-2008 and only 29%

of the sum of the ABCs for that period. The total 2008 catch (16.7 mt) is just 4% of the peak annual catch that occurred in the early 1980s.

2.3.5 Fishery Catch-Per-Unit-Effort

There are four indices of recreational fishery catch per unit effort that were developed for previous assessments and are included again in this assessment. Methods used to calculate these time-series are described in the 2006 document. A number of concerns have been raised about these indices during the course of previous assessments, including changes in fishing behavior, target species, the types of trips included, and changes in management, as well as uncertainty in the underlying catch and effort estimates themselves. Upon further investigation of several of these indices, it was concluded that the issues could not be resolved with further analysis, or application of new methods for fitting the raw data, but that the actual data needed to confirm or reject such concerns was missing. For this reason, rather than provide many alternative formulations of the indices themselves, two steps were taken to reduce the potential for these factors to confound the current assessment: 1) years in which regulations had changed dramatically (bag limits, or limitation of co-occurring species) were removed, and 2) the relationship between observed indices and population abundance was allowed to be non-linear via the addition of a second catchability parameter for each index (Methot 2009). The individual indices are described below by state.

The California recreational CPUE series begins in 1980 and ends in 1999 with a gap between 1986 and 1993. The 2007 assessment included values for 2000 and 2001, but these years experienced large reductions in bag-limits and are therefore excluded in this assessment. This series is much higher, on average, in the 1980s than in the 1990s (Figure 46). Also in California, a recreational charter boat index was available for the years 1988 to 1998. This index shows little trend from 1988 to 1991 and then a consistent decline to the end of the series (Figure 47).

The Oregon recreational CPUE series is unchanged from the 2007 assessment. This series begins in 1979 and ends in 1999 with gaps in 1985 and 1997. There is an apparent upward trend from 1979 to 1983 and then a variable but generally declining trend until 1996, with 1998 and 1999 slightly higher than preceding years (Figure 48).

The Washington recreational CPUE series begins in 1990 and extends through 1999. The years 2000 and 2001 are again removed due to changes in bag limits (2001 was added in the 2006 assessment, but was not included in the original 2005 analysis). This series is uncertain and shows little coherent trend (Figure 49).

A new fishery dependent CPUE series was developed for this assessment based on the recreational charter observing program in Oregon. This program sends samplers on charter sport fishing trips where they record the catch rates and size distributions of yelloweye rockfish for as many anglers as they are capable of monitoring. Although this program has been in place since 2001, current non-retention regulations have been in place for yelloweye since 2004 making that the logical start year for a new time-series. Although a large number of drifts (a single-pass over rockfish habitat made by the charter vessel) have been observed in each year, the total number of yelloweye encountered has ranged from only 5 to 52 (Table 10).

A relative index of abundance from these data was fit using the statistical approach that was applied to the IPHC survey (described above). Binary data of whether a yelloweye rockfish was captured on each hook of each drift was analyzed with a binomial GLM. Auxiliary variables considered included: port (with sparse observations included in an aggregate port category), day of the calendar year, and depth at which fishing was conducted. In the final model, year and port group were used as factors with a fourth degree polynomial of depth and a second degree polynomial of the number of days into the calendar year (Figure 50). The final model's fourth degree polynomial of depth was identified via a preliminary fit using a GAM, and improved the model fit by 41.8 AIC units over fitting depth as a categorical variable. Fitting depth with a fourth degree polynomial was around 5 AIC units better than a third degree polynomial, and 10 and 59 units better than second degree and first degree (straight line) polynomials, respectively. The second degree day-of-year polynomial was one AIC unit better than a straight line fit and 0.7 AIC units better than a third degree polynomial. After using MCMClogit, the final back-transformed index was produced via MCMC with covariates standardized to median values of depth = 15 fathoms and the day-of-year = 191 days. This index shows a relatively uncertain increase in abundance from 2004-2008 (Figure 51).

2.3.6 Fishery Biological Data

Length-frequency distributions were developed for each fleet (recreational or commercial) for which observations were available. The same bin structure (2 cm) was used as for fishery independent observations. Due to the sparse sampling (mainly opportunistic, since yelloweye have been landed in very small proportions of mixed species market categories or recreational bag limits) length frequencies are raw, calculated as the count of fish among size bins. This has been the case in previous assessments, and preliminary investigation of alternate weighting procedures revealed little sensitivity to this choice. Sampling statistics (number of samples and number of individual fish) for each fleet and year (Table 11, Table 12) clearly show the different sampling targets employed over different time periods and between state agencies.

The California recreational fishery has yielded a small but relatively consistent number of samples since the early 1990s. Only measured lengths, not length converted from other measurements, are included in the length-frequency observations (this excludes many observations from the earlier years in California). The recreational charter boat sampling program produced over 1,800 lengths during the period 1987-1998. The Oregon has collected much of the length data (both sexed and unsexed) from the recreational fisheries, while Washington provides few samples beginning only in the late 1990s. California provides the majority of the commercial lengths from 1978 to 2007, with sampling in Oregon and Washington beginning only in the early 1990s.

Because most of the length data from California was not sex-specific, sexes-combined observations were summarized for recreational (Figure 52), charter (maintained separately in order to assess potential differences in selectivity; Figure 53) and commercial (Figure 54) fisheries. Although somewhat noisy, the recreational size-distributions contain fish from 16 to 68 cm during the 1990s and after. There are neither clear cohorts, nor obvious trends in average size. The charter vessel size-distributions show a similar range of size and perhaps a weak indication of a cohort moving through during the late 1980s and another in the mid 1990s. The commercial data, starting in 1978 do show a decreasing trend in size through the mid-1990s, after which they are relatively consistent with the recreational observations. As is expected, the commercial fishery observed fewer small (< ~26 cm) yelloweye than the recreational fishery.

Much of the length data from the Oregon recreational fishery was not sex-specific, and was therefore compiled as sexes-combined (Figure 55). Yelloweye from 20 to 82 cm are present in the data, and there is a slightly higher incidence of very large fish (> 66 cm) in the 1980s. The average size of yelloweye observed in the 1990s and thereafter was somewhat smaller, although a clear trend upward in average size is observed in this period. This trend may be due to changes in the population, particularly an above average 1983 year class, however comparison with yelloweye growth curves indicates that the increase is slightly more rapid than predicted via individual growth. It may represent faster growth rates, other factors, such as shifts in the fraction of private vs. charter boats and in target species (and therefore fishing areas and methods) that could be responsible for the trend, or a combination of both; the cause is unknown. Sex-specific observations from the Oregon recreational fishery show essentially the same range and lack of trend seen in the sexes-combined data for the earlier years (Figure 56). Beginning in 2004, length data from the Oregon recreational fishery have been collected by observers riding on charter boats from the major ports. Because these fish cannot be retained, they are measured quickly and released; fish are not routinely sexed. These data show a wide range in the size of yelloweye captured, with fish from 20 to 74 cm (Figure 57). The Oregon commercial fishery length data show fewer small yelloweye (< 30 cm) than observed in the recreational fishery, but generally the same size range (Figure 58). A noisy but slightly increasing trend in size may be present beginning around 2000.

From the Washington recreational fishery there are far fewer small yelloweye (< ~36 cm) than in California or Oregon fisheries (Figure 59). Among sexes-combined observations from the Washington commercial fishery, there are also few small yelloweye, and with perhaps a slight increasing trend in size appearing in the late 1990s (Figure 60). Recent samples from the Washington commercial fishery show no clear trends, but as many large yelloweye as seen in other sectors (Figure 61).

As for fishery independent data, fishery ages, recreational or commercial where available, are compiled as conditional age-at-length observations by two cm size bin. There are very few yelloweye ages available from the recreational fisheries (Table 13). All three states have collected a few ages, but there have been only a total of 83 samples collected from all recreational sources available for this assessment. Commercial age data are not much more numerous than those from recreational sources. Sparse sampling was conducted in the 1980s in California (resulting in only 52 useful ages), and only slightly better samples sizes have been collected in Oregon and Washington beginning in 2001 (Table 14). Age data from California was received late in the process, and although included not all lengths from the age samples were included in length frequency distributions. For the purposes of examination, the age data have been summed across length and plotted as marginal age compositions by fleet. Particularly sparse fleet-specific data (e.g., California recreational ages) have been omitted from plotting.

The Oregon recreational fishery captured yelloweye across a wide range of ages, including many fish of age 65 or greater in the 1980s (Figure 62). There seem to be slightly more females older than age 20, but there are no clear cohorts visible in the data. The Washington recreational fishery has also captured fish to age 65+, but the data is relatively sparse and presents no meaningful patterns (Figure 63). The California commercial fishery observed very few yelloweye older than age 30, despite the preponderance of the samples being collected in the 1980s (Figure 64). The Oregon commercial fishery age data is also very sparse, but does not contain many fish older than age 30 (Figure 65). The Washington commercial fishery ages clearly show many more old yelloweye than in Oregon or California, with many older than age 65 despite the samples primarily occurring after 2000 (Figure 66).

Some revisions were made to the Oregon recreational biological samples (additional ages now available) were made after the data for this assessment had been finalized. These should be included in the next assessment.

2.4 History of Modeling Approaches

2.4.1 Previous Assessments

Yelloweye stock abundance and trend were first analyzed as part of the "remaining rockfish" assessment completed in 1996 (Rogers et al. 1996). This assessment included a number of rockfish species managed as the "Sebastes complex". The estimated yelloweye rockfish Allowable Biological Catch (ABC) was 39 mt (included as a contribution to the 'other rockfish' ABC) for the Northern area (Columbia and Vancouver) based on biomass estimates from the triennial trawl survey and assumptions about natural mortality (*M*) and catchability (*Q*). No separate yelloweye ABC was estimated for the Southern area (Monterey and Conception), where yelloweye rockfish were also included in the ABC for the "other rockfish" assemblage.

The first yelloweye-specific stock assessment used the length-based version of Stock Synthesis (Methot 1989, 2000) to model the northern California and Oregon regions with separate models (Wallace 2001). Growth was estimated externally to the model. Recreational CPUE as well as recreational and commercial size-composition data were included in the model. The modeled time period extended from 1970 through 2000 and year-specific recruitments were estimated without constraint by a stock-recruit curve. The assessment examined both increasing natural mortality with age and dome-shaped selectivity with size as alternative factors to improve the fit to the data. Alternative model configurations found that increasing natural mortality with age provided a somewhat better fit to the data, but there were no age data included in the 2001 model.

The length-based version of Stock Synthesis was also employed in the 2002 stock assessment (Methot et al. 2002). There were a number of important differences in model configuration from Wallace (2001) that include: 1) inclusion of Washington catch, CPUE, size and age data, 2) inclusion of age-composition data from all three states, as available, and an update of size-composition data, 3) inclusion of mean length-at-age data from each data source, to aid in the simultaneous estimation of growth parameters and size selectivity, 4) allowing all fishery sectors to have dome-shaped selectivity 5) including a recruitment constraint to the stock-recruit relationship and estimating the curvature (steepness), 6) starting in 1955 rather than 1970, to better allow for potential long-term patterns in recruitment, and 7) use of a constant (and fixed) natural mortality rate of 0.045. The assessment explored area-specific model results including data from only subsets of the coast, and compared these results to a baseline coast-wide model. They concluded that the estimated differences between the areas (states) were neither sufficiently different nor sufficiently precisely estimated to recommend that management be based on area-specific population models. They suggested that area-specific modeling should remain in consideration as new data become available.

The 2005 assessment was a simple update of the 2002 model that included a revised catch time series and additional age- and length-composition information. The assessment used the newly revised version (1.19) of the Stock Synthesis modeling framework (Methot 2005, 2006).

In 2006, a full assessment for yelloweye rockfish was performed (Wallace et al. 2006). That assessment updated the 2005 analysis to the newest version (1.21) of Stock Synthesis available (Methot 2006). The 2006 yelloweye stock assessment included many model specifications carried over from the previous assessments. Separate area-specific models were again evaluated for Washington, Oregon and California, as well as a single coast-wide model assuming instantaneous mixing between areas. The area-specific models included only data from each area, except that the Oregon and Washington models both contained all IPHC length information. Results were presented for each of the area-specific models as well as the coast-wide model and also the aggregate of the area-specific models.

The 2007 assessment was an update, requiring no major changes to the basic model framework, approach and major structural assumptions. Several minor errors in data processing were corrected and the natural mortality rate borrowed from Canadian sources was corrected from the value used in 2006 (0.036) to the value reported by Yamanaka (2000) of 0.0431. The update also moved the assessment forward to the newest version of Stock Synthesis available at the time (Version 2.00c, March 2007).

In aggregate these assessments have largely drawn the same conclusions regarding population abundance and recent trends: that the yelloweye resource was heavily and unsustainably exploited from the early 1970s to around the year 2000 (Figure 67). There is clearly much retrospective uncertainty regarding the absolute scale of the yelloweye population, and there has also been a pattern of each subsequent assessment being slightly more pessimistic than those before since 2002. All of these assessments have estimated that the stock is relatively unproductive and will therefore require many years of low exploitation rates to rebuild to target levels and will never again produce catches as large as peak historical values.

2.4.2 Pre-Assessment Workshop, GAP and GMT Input

There were no 'pre-assessment' workshops held for the 2009 stock assessment and review cycle. However, the authors attempted to respond to all questions and concerns posed by interested parties via e-mail and phone conversations. GAP and GMT members were contacted early in the process and provided valuable background on the discussions regarding previous yelloweye assessments as well as industry points of contact. Discussion with commercial, charter and recreational fishermen were helpful in better understanding the current relationships among the fisheries, management and data collection programs. This has been a valuable part of the assessment process in recent years and should be continued in the future.

2.4.3 Response to STAR Panel Recommendations in 2006

The STAR panel report from the 2006 review (the 2007 assessment was an update, and did not go through the STAR process) identified a number of recommendations for future assessments. Although all these recommendations could not be addressed for 2009, progress on each is summarized below:

1) In the current assessment model, catches are assumed known without error. Because yelloweye rockfish are relatively rare in the fisheries, catches are estimated with considerable error. Ignoring this source of uncertainty will lead to an overestimation of model precision. Future assessments should allow catch to have some error to better propagate this key uncertainty to model estimates. SS2 should be modified to allow error in the catch data. This should not be difficult to code, although it may cause some problems with convergence that may require attention. Allowing for some autocorrelation in F might improve the estimation.

Preliminary investigation into the direct integration of uncertainty in catches via estimated parameters for annual *F*s indicated that it would not be feasible to integrate over the very broad distribution of possible catches in this manner. The method would probably be much more appropriate for assessments where only some portions of the catch has very great uncertainty associated with points estimates, however for yelloweye the entire time-series for all sectors is very uncertain. The choice of representing catch uncertainty via alternate states of nature represents an imperfect solution, but does attempt to provide those evaluating the results of this assessment with insight into the sensitivity of the model scale to historical catches.

2) Formal estimates of uncertainty in catch should be produced by modeling the species composition sampling process. This will require an extended analytical effort, but it should be doable. The analysis may lead to using model-based estimates for missing cells, rather than substitution, which may change the best estimates of catch somewhat. Estimates of uncertainties in the total unclassified rockfish landings and in the species fraction estimates in the earlier years may still have to be assumed.

This topic was not addressed specifically, but it should be noted that model-based catch estimators are an available tool for ongoing state-specific catch reconstructions. It is likely that all three states will have some level of comprehensive catch reconstruction completed for the 2011 assessment cycle; however, the authors are unaware of further exploration of model-based methods for these reconstructions.

3) Obtain data from Canada for a truly stockwide model.

This topic has been raised with Canadian scientists and may be more realistically possible after current (2009, L. Yamanaka, personal communication) assessment efforts for coastal waters of B.C. are completed.

4) Continue efforts on the fishery independent survey programs. The most promising should be expanded stockwide.

Although a number of projects are being evaluated in 'pilot' studies (e.g., open-ended trawls with cameras, AUV surveys, and others) it is likely to be several years (at a minimum) before any of these can produce results that might be directly useful as data in a stock assessment framework.

5) Consider an assessment model incorporating several rockfish species simultaneously.

The use of the meta-analysis for stock-recruit steepness is a step in this direction, but a formal process for developing (and reviewing) multiple-species assessments needs to be created before this will be a realistic option for stock assessment authors. The approach may be best tested in a 'research-mode' analysis before being applied to a 'production' assessment.

6) The panel recommends that aging error be explored again in future assessments. The panel was not completely comfortable with decreasing aging error as age increased as is currently in the base model. The panel discussed that it seemed counterintuitive that fish would become easier to age as they became older, and evidence for this pattern was sparse. However, removing the trend in aging error (to either a constant SD or CV) had small effects on model estimates.

This topic has been resolved using current double-read data and analysis software (see section 2.2.5 above).

7) Data are sparse in the most recent years of the model since the fisheries have been closed. Because of this, there is considerable uncertainty about current age and size structure of the population as well as uncertainty because most of the CPUE time series end in 2001. This uncertainty will become worse for future assessments if no new data streams are added. The best types of data to add would be surveys that estimate absolute abundance such as the submersible survey conducted in 2001. This survey would need to be expanded to include Oregon and California waters. Another option would be to continue and expand the IPHC survey.

As soon as actual data are produced by alternate survey methods it should be incorporated into the yelloweye stock assessment. It may be of little value to perform frequent full stock assessments if no new sources of (higher) quality data become available.

2.5 Model Description

2.5.1 Link from the 2007 to the 2009 Assessment Models

The results of this assessment (see below) provide a very close match to those from previous analyses, despite many changes in data, structural assumptions and modeling approaches. The 2007 depletion estimate is only slightly higher (14.5% in the 2007 assessment version vs. 19.2% in this assessment) despite all the changes made. The change from Stock Synthesis version 2.00c to version 3.0 was, in this author's experience, the easiest upgrade in recent assessment cycles; full back-compatibility of Stock Synthesis version 3 has made this possible when the model was configured in the same manner despite many new features.

Fully described below, a number of key parameters and modeling choices have been changed for this assessment. The most important of these are the use of fixed values in the 2007 assessment for natural mortality (0.043) and stock-recruitment steepness (0.45). Fecundity was previously assumed to be proportional to spawning biomass and recruitment deviations were estimated for the period 1968-1992. Further, there was no tuning of input sample sizes and variance estimates in the 2007 assessment.

2.5.2 Summary of Fleets

Fishery removals were divided among six fleets: 1) California recreational, 2) California commercial, 3) Oregon recreational, 4) Oregon commercial, 5) Washington recreational, and 6) Washington commercial. The California CPFV index of relative abundance and the length frequency distributions from this source are assigned the selectivity from the California recreational fishery. The Oregon charter observer index is treated separately (selectivity estimated independently) from the Oregon recreational fleet. The IPHC data is modeled by state, with each survey utilizing separate selectivity and catchability parameters. There were only sufficient data for a Washington triennial survey index and an Oregon NWFSC survey index, so each had its own fleet. The data available for each fleet are described in Table 3. The choice to structure fleets based on geographic areas allows direct comparison of the dynamics with and without explicit areas in the stock assessment model.

2.5.3 Modeling Software

This assessment used the Stock Synthesis modeling framework written by Dr. Richard Methot at the NWFSC. The most recent version (3.03b) was used, since it included many improvements in the output statistics for producing assessment results and several corrections to older versions used during the 2007 and earlier assessments.

2.5.4 Priors

Uniform (and intended to be noninformative) priors were applied to all estimated parameters in the base case model with only three exceptions where additional information was available (natural mortality, described in section 2.2.4, and steepness, described below). Parameter bounds were selected to be sufficiently wide to avoid truncating the searching procedure during maximum likelihood estimation. A list of all parameter bounds and priors are provided in this document (Table 15).

In addition to the priors for natural mortality, an informative prior for stock-recruitment steepness (h) is used for the base case model. The use of a prior on stock-recruitment steepness based on meta-analysis of rockfish (original basis: Dorn 2002) has become standard practice for U.S. west coast stock assessments. This prior has been updated to reflect current understanding in each of the 2007 and 2009 assessment cycles (M. Dorn, AFSC, personal communication). For 2009, this prior is relatively uninformative (less than two units of negative log-likelihood over most of the acceptable range for h, 0.2-1.0), but favors values approaching 1.0 (Figure 68). Sensitivity for the base case model to the use of these priors is reported below.

2.5.5 Sample Weighting

The approach to sample weighting used here attempts to achieve consistency between the degree of uncertainty in each data set and the model's ability to fit those data. Variances and sample sizes were first derived from the raw data sources. Variances and sample sizes were then iteratively re-weighted to ensure consistency between the input sample sizes (or standard errors) and the effective sample sizes (and root-mean-squared-errors) based on model fit. This approach attempts to reduce the potential for particular data sources to have a disproportionate effect of total model fit, while creating estimates of uncertainty that are commensurate with the uncertainty inherent in the input data. Iterative re-weighting was applied to the length data, starting from a compromise between the number of fish and the number of samples (a linear function of the number of samples and number of fish, not exceeding 44 fish per sample), and then multiplying the year-specific input sample sizes by a single constant for each data set that made the mean input sample size for compositional data roughly equal to the mean effective sample size based on model fit. The same method was applied to conditional age-at-length data, except that input sample sizes for age distributions, based on the number of fish observed in each sex-length bin combination were not further increased. These input samples sizes can be thought of as a maximum, where each fish is an independent sample from the true multinomial and therefore should not be increased. Similarly, variance estimates for index data were not reduced, even where the model was able to fit the data appreciably better than expected, because these estimates can be considered minimum estimates from the external analyses used to create them. These choices reflect the post-hoc nature of model tuning and the potential for increasing weight on those data sources that are consistent with model predictions, thereby reducing the perceived uncertainty in model results.

Table 16 shows the results of this re-weighting for compositional data in the base case model. The length data from a few fleets were up-weighted to reflect better than expected fit, except for the fleets where initial sample sizes reflected the number of fish, these were all down-weighted by a factor of 0.62-0.73. Age data fit better than expected (and so no tuning was applied), with the exception of the IPHC data which were down-weighted by a factor of 0.74 (Oregon) or 0.90 (Washington). An additional variance component was added to all of the fishery independent indices of abundance as part of the iterative reweighting process (Table 17). These values ranged from 0.36 to 0.54. Fishery dependent indices received an additional variance component of 0.0 to 0.16.

2.5.6 General Model Specifications

Stock synthesis has a broad suite of structural options available for each application. There are no true 'default' settings for most of these options; each application must be customized to best represent the life-history, dynamics, data-complexity and estimation approach (Bayesian or maximum likelihood) most appropriate.

This assessment is structured to be sex-specific, including separate growth curves for males and females, and therefore tracking the spawning output of only females for use in calculating management quantities. Growth parameters describing the von Bertalanffy growth equation, as well as the spread of lengths for a given age, were estimated for each sex, except that the length at age one year was forced to be identical for males and females. The parameterization used by Stock Synthesis allows the user to specify the age for the two growth parameters (rather than the length at age zero and the implied length at infinite age). Ages one and 70 were selected to be close to the range of observed data. Based on preliminary analyses, this choice had little effect on estimated growth curves. A list of the growth parameters, bounds and priors is given in Table 15. Natural mortality was freely estimated for each sex, based on the *a priori* evidence that it might differ for males and females.

For the internal population dynamics, ages 0-100 are individually tracked, with the accumulator age of 100 determining when the 'plus-group' calculations are applied. This is a relatively large age, and substantially increased the memory and computational requirements of the model, but was necessary to ensure that little growth would be predicted to occur (but not be modeled) at and beyond this age, since the model does not allow growth to continue in the plus-group.

Three explicit areas are included in the base case model, representing the three states: California, Oregon and Washington. Although these are political rather than strictly biological boundaries, the yelloweye population appears to be fragmented enough, and adult movement is likely small enough, that the exact placement of these lines is of little importance. What is known to be important (and related to states rather than biology) is the vastly different exploitation history among the three areas from the historical period to the current fishery. Growth is assumed to be identical among the three areas, largely due to the sparseness of the data. Recruitment dynamics are governed by a global stock-recruit function (using spawning output based on the fecundity relationship, rather than strictly spawning biomass as is common among assessments). This relationship is parameterized to include two estimated quantities: the log of unexploited equilibrium recruitment (R_0) and steepness (h). Recruitment is partitioned via estimation of one additional parameter for each area after the first, which are then renormalized to allocate the total recruits among the areas. The base case does not allow for process error in the stock recruitment relationships (either over time or areas) although this was investigated extensively during preliminary model building and via sensitivity analyses.

No seasons are used to structure removals or biological predictions, so data collection is assumed to be relatively continuous throughout the year. Fishery removals occur instantaneously at the mid-point of each year and recruitment on the 1st of January. Since the time-series is started in 1916, the stock is assumed to be in equilibrium at the beginning of the modeled period. The sex-ratio at birth is fixed at 1:1, although sex-specific natural mortality, size-based selectivity, and dimorphic growth can result in significant departure from equality due to differential mortality over age and sex.

2.5.7 Estimated and Fixed parameters

A full list of all estimated parameters and values of key parameters that are fixed is provided in Table 15.

A two-parameter logistic function was used to represent the selectivity for all fishing fleets and for the IPHC survey. Departure from simple logistic shapes via the use of double-normal selectivity was added for the two trawl surveys in the base case model. For all indices of abundance, catchability parameters were solved for analytically, except for the triennial survey, where allowing for a change (unrestricted) in catchability for the time-series including and after 1995 required the direct estimation of catchability for each period. For the historical fishery dependent time series, where the basic assumptions of CPUE analysis were likely violated, there were four additional parameters estimated to allow for a non-linear relationship between the index and modeled population abundance.

In total, there were nine estimated growth and mortality parameters, four parameters governing the stock recruitment relationship, six catchability related parameters (and seven analytic solutions which could have been treated as estimated parameters), and 23 parameters describing selectivity curves.

2.6 Model Selection and Evaluation

2.6.1 Key Assumptions and Structural Choices

All structural choices for stock assessment models are likely to be important under some circumstances. In this assessment these choices are generally made to 1) be as objective as possible, and 2) follow generally accepted methods of approaching similar models and data. The relative effect on assessment results of each of these choices is often unknown; however extensive effort was made to evaluate these choices during model building and the most important of these are presented through sensitivity analysis.

The use of a static (but sex-specific) value for natural mortality over time is also a very important assumption. In reality, natural mortality is likely to vary over time (and possibly space) and may be non-stationary where predation or environmental factors have directional instead of random patterns during the modeled period. However this degree of complexity is clearly beyond the information content of the available data. Growth is also assumed to be time- and space-invariant. This is a common assumption that has very important implications for estimation of selectivity and management quantities.

The three most important sources of uncertainty in this assessment are: the catch history, non-estimation of process-error in recruitment dynamics, both over space and time, and the choice to divide the assessment into explicit spatial areas.

Although the base case assessment model captures some uncertainty via asymptotic intervals, uncertainty from two sources is reported through alternate states of nature bracketing the base case results and included explicitly in the decision table. The magnitude of the estimated catch time-series was found to have a large influence on the perception of current stock size and the estimate of steepness of the stock-recruit relationship was closely linked to the projected recovery rates. Alternate values of each were selected to bracket the best estimates with marginal probabilities one-half as likely. For historical catch, these values, 75% and 150% of the estimated catch series prior to 2000, were subjective, but reflect the lack of a comprehensive catch reconstruction in Washington and the change in likelihood of the fit to data sources over a reasonable range of catch levels. For steepness the 12.5^{th} and 87.5^{th} percentiles were calculated from the likelihood profile as a proxy for the probability distribution about this point estimate. The most optimistic and pessimistic of the nine combinations from these two axes (weighted 6.25% each relative to 25% for the best estimate on each dimension) are reported in this document and all combinations used to provide a more realistic degree of uncertainty for future projections, decision tables and rebuilding analyses.

2.6.2 Alternate Models Explored

Hundreds of alternate assessment model formulations were evaluated prior to selecting the base case model. Because not all alternate formulations can be reported here, those that had the largest effects on parameter estimates or management quantities or are obviously of interest are retained and presented as sensitivity analyses (see below).

Prior to settling on the base case model, an extensive evaluation of dome-shaped vs. asymptotic selectivity curves for commercial, recreational and survey fleets was performed. Models very similar to the base case were fit while allowing each fleet to have dome-shaped selectivity. With only one exception, the NWFSC survey, all fleets produced asymptotic curves, requiring the application of informative priors on the descending limbs or fixed parameter values to ensure all parameters remained contributors to the objective function (i.e., when the final selectivity is estimated to be close to 1.0, then the descending width parameter is irrelevant to model fit and if not somehow informed can cause estimation instability). This exercise was repeated across fleets to determine whether additional flexibility was needed beyond a single parameter describing the ascending limb of the selectivity curve. This was found to be the case for the triennial survey, so an additional parameter was estimated, although little change was observed in model results.

This exercise was repeated as part of the STAR panel review, focusing on the IPHC selectivity for Oregon which was found to fit slightly better with dome-shaped selectivity. Although no change was made to the base case, the topic is addressed via sensitivity analyses below.

2.6.3 Convergence Status

To test for convergence prior to the STAR review, 100 trials were performed using a 'jitter' value (Methot 2009) of 0.1 for the base case model. This perturbs the initial values used for minimization with the intention of causing the search to traverse a broader region of the likelihood surface. Ninety-seven of these trials returned to exactly the same objective function value as in the base case, inverting the Hessian and producing small gradients. The remaining three got close to that minimum but failed to completely converge. Due to the high success rate, the exercise was repeated with a 'jitter' of 0.2. Of the second set of 100 trials, 69 returned to the base case minimum and 31 failed to converge. The spread of this search appears to indicate that the jitter was sufficient to search a large portion of the likelihood surface, and that the pre-STAR base case was not stuck in a local minimum. Results of runs that appeared to converge all showed identical levels of ending depletion and spawning biomass.

The exercise was repeated with the base case model after the STAR panel. A jitter value of 0.3 was applied for 100 trials, resulting in 43 models returning to the global minimum, and 57 failing to converge. This exercise appeared to traverse a wider region of the likelihood surface than earlier runs, but still did not discover any new minima. These tests cannot prove convergence of the model, but did not provide any evidence to the contrary. Robust behavior of this model over alternate phasing and initial values further indicated that there was little chance the results reported here are not the global maximum likelihood estimates.

2.7 Response to SSC Recommendations

If the SSC determines that additional analysis beyond completion of a rebuilding plan for the updated 2009 assessment is warranted, this work will be completed subsequent to the September 2009 review.

2.8 Base Case Model Results

The biological (growth and mortality) parameters estimated from the base case and alternate models appear to be quite reasonable (Table 18) and commensurate with inspection of the raw data. These parameters are relatively precisely estimated, both in terms of the asymptotic standard error estimates (Table 19) as well as the alternate states of nature (Table 18). Female and male yelloweye rockfish showed similar growth trajectories, beginning to diverge a approximately age 10; with males growing to a maximum size (66.4

cm) that was about 2.4 cm larger than females (Figure 70). Males are estimated to have a slightly wider spread of lengths at a given age, becoming more pronounced with age. The result that males are estimated to have a slightly larger size at the oldest ages (Figure 70) is somewhat unexpected for a *Sebastes* species. However, Canadian analyses (Yamanaka et al. 2006) also show males reaching a slightly larger (by 2 cm) maximum size, although those fish were slightly larger at 66 and 68 cm for females and males respectively.

The estimated natural mortality for males and females were nearly identical, with females slightly higher than males for both of the alternate states of nature. The estimated female value for the base case, 0.047, is slightly higher than that used in the 2007 assessment, but is still quite consistent with the very protracted age-structure observed in the population.

Estimated selectivity curves for the fishing fleets showed the expected pattern that the recreational sectors in all three states access somewhat smaller yelloweye than the commercial fisheries (Figure 71, Figure 72, Figure 73). This pattern was most pronounced in Oregon, and, also as expected, the recent charter fishing selectivity is shifted further toward smaller fish. Addition of the charter vessel length data did not appreciably change the estimate for the California recreational selectivity pattern and so the selectivity for the two series was not separated. Estimated selectivity curves for the IPHC surveys in both Oregon and Washington appear to access the largest yelloweye available, with Washington especially shifted slightly more than 10 cm larger than Oregon (Figure 74). The NWFSC trawl survey selected far more small yelloweye than did the triennial survey (Figure 75). That the estimated triennial survey selectivity was shifted toward the largest fish but also selecting some very small fish is likely an artifact of the very noisy compositional data. However, the pattern in selectivity makes direct interpretation of base case estimates for survey catchability (1980-1992: 1.43, and 1995-2004: 0.76) difficult, since very little of the population biomass occurs in the fully selected size range (> 85 cm). Forcing the triennial selectivity to conform to a more 'standard' parametric form had little effect on model results, but did degrade the fit to the survey data slightly. Similarly, catchability for the NWFSC survey was estimated to be 0.46 in the base case, however, with the highly dome-shaped selectivity, this does not imply that 46% of the biomass is actually observed.

The base case model predicted a relatively flat trend through both the Washington (Figure 76) and Oregon (Figure 77) IPHC survey indices. The poor residual pattern for the Oregon index (5 positive residuals followed by 4 negative residuals) seems unlikely to occur by chance, however, it also seems unlikely, given the life-history characteristics of yelloweye rockfish that any model could predict the negative offset seen between the 2004 and 2005 survey estimates. Although more investigation could be made, it would seem that there is likely still some unaccounted for process error in the survey methods.

The base case model was able to fit the NWFSC (Figure 78) and triennial (Figure 79) trawl survey indices as well as expected given the small number of positive hauls on which they are based, and the relatively small contribution to the total likelihood value. The fit to these indices, and the contribution of all indices to the objective function was largely unchanged among the three states of nature (Table 20).

Fits to the fishery CPUE series were generally quite good, and estimated power coefficients ranger from positive (0.55, California charter) to mildly negative (-0.27, Washington recreational; Table 18) indicating that observed values were often non-linear in relation to population trends. The predicted California recreational index tracked well the decline in observations through the 1990s (Figure 80), and the California charter series captured the difference between the 1980s observations and the reduced values in the 1990's, but none of the increasing trend in the early portion of the series (Figure 81). For the Oregon recreational index, the model again tracked the decline over the 20 year index, but none of the interannual variability (Figure 82). The Oregon recreational observer index showed a small and very uncertain increasing trend that was not captured by the predicted values but is not at all inconsistent with the results (Figure 83). With relatively large variances on many of the observations, the Washington recreational index provided a flat trend, which was largely matched by the slightly declining predictions (Figure 84).

The base case model fit the length distributions from the IPHC surveys in Oregon (Figure 85, Figure 86) and Washington (Figure 87, Figure 88) reasonably well, although there is some indication of negative residuals for the largest sizes in both series (especially Oregon, see sensitivity analyses below), indicating the model was predicting a greater proportion of the largest fish than was observed. Input sample sizes were tuned down slightly (Table 16), but this was expected, since the initial values were in numbers of fish rather than a compromise between numbers of fish and numbers of samples (it was not clear how correlated observations from a single long-line set would be). Both the NWFSC and triennial survey length-compositions were fit slightly better than expected (Figure 89, Figure 90, Figure 91, Figure 92; and were therefore tuned up, still resulting in relatively small average input sample sizes of 22 and 19). There appeared to be no pattern in the residuals for either series.

The sexes-combined length frequencies for the California recreational fleet fit somewhat better than expected (Figure 93), with no obvious patterns in the residuals (Figure 94). The sexes-combined length-frequency data for the California charter fleet was also fit slightly better than expected (Figure 95), and although there are no clear patterns in the residuals, there may be some indication of an above average cohort in the mid-1980s and another in the mid-1970s (Figure 96). The same was true for the California commercial length frequencies (Figure 97), although there were several large residuals apparent in 2001 (Figure 98). The unsexed Oregon recreational length data were tuned down (by a factor of 0.55, Table 16), however the number of samples was not available for all years, so it was expected that the number of fish would overestimate the appropriate input sample size for these data. Fits showed little residual pattern in the 1980s, but a strong diagonal pattern through the 1990s (Figure 99, Figure 100). This residual pattern from 1993-2003 could be due to a strong cohort (or cohorts) in the mid-1980s, although growth would have to be slightly above predicted rates to achieve the observed increase in mean size of this mode during the 10 year span over which it is observed. It is possible that other factors are also influencing this pattern, such as a shift in the targeting of the recreational fleet; however time-varying selectivity was not included for this fishery in the base case model. Little pattern is observed in the fits (Figure 101) or residuals (Figure 102) to the sex-specific Oregon recreational data from the 1980s. There are also no clear trends in the fit to the Oregon recreational charter observer data from 2004 to 2008 (Figure 103, Figure 104). Unlike the recreational length data from Oregon, the commercial lengths show no clear patterns in the fit or residuals through the 1990s (Figure 105, Figure 106), and fit the data slightly better than expected. In Washington, the recreational length data are quite sparse, but the fit and residuals appear reasonable (Figure 107, Figure 108). The sexes-combined length data for the Washington commercial fleet fit the data quite poorly, although still slightly better than expected (Figure 109). It is not clear whether patterns in the residuals should be investigated, or are just a result of the sparseness of the data (Figure 110). Sex-specific length frequencies from the Washington commercial fleet were also noisy, but showed no obvious patterns in the fits or residuals (Figure 111, Figure 112).

Fits to the age-frequency data are reported via the fit to the margin and residual plot where only marginal age data were available (early IPHC data) or via the full matrix of Pearson residuals for the conditional age-at-length data where these data were used. The early IPHC ages (not linked to length or sex information and so treated as marginal age distributions) fit the data slightly worse than expected, but showed little pattern in the residuals (Figure 113, Figure 114). For the more recent (2006 to 2008) sex-specific age data, the model appeared to underestimate the number of old fish present in the data (Figure 115, Figure 116); the cause of this pattern is unknown, but could perhaps be due to a mild misspecification of the selectivity curve, the growth curve if it tends to differ in Oregon, or some unknown degree of ageing bias in the samples. A similar, but slightly less pronounced pattern is also observed in the Washington IPHC age data (Figure 117, Figure 118). The California recreational fishery age data were very sparse, and little pattern can be discerned from the residuals (Figure 119, Figure 120), which fit about as well as expected. Oregon recreational age data fit slightly better than expected and showed no signs that the growth curve or lack of modeled annual recruitment strengths was inconsistent with the observations (Figure 121). The Oregon commercial age data are too sparse to draw much insight from residual patterns (Figure 122). Washington recreational (Figure 123) and commercial (Figure 124) age data also showed good residual patterns for the few years in which there were enough data to see them.

The estimated stock-recruitment relationship for the base case and alternate states of nature were very consistent in the prediction of little surplus production (steepness values 0.344, 0.417, 0.508; Table 20). These model runs reveal an almost linear relationship between the magnitude of historical removals and the scale of the estimated population size (Table 20, Figure 125). It is very appealing to try to integrate over the process error in recruitment variability via a longer time-series of deviations and more flexibility in the allocation of these deviations among areas, but this exercise is reserved for sensitivity analysis (see below) for this assessment. Because no process error in recruitment is modeled and steepness is relatively low among the states of nature, the time-series' of total recruitment (Figure 126) and spawning output (Figure 127) track one another very tightly. Both show that the aggregate yelloweye population was rapidly reduced from near unexploited conditions to low levels from about 1970 to 2000 (Table 20, Table 21), and this result is quite conserved among the alternate states of nature (Table 20, Table 22, Table 23). The coast-wide trend masks quite different levels of reduction among the three areas in the assessment. California is estimated to have had a much larger population historically, which has been reduced to much lower relative levels than in Oregon or Washington (Figure 128). The Washington stock is estimated to have been the smallest throughout the historical period, but to have been reduced the least. The same patterns are apparent in the estimated time-series of spawning output by area (Figure 129). Although there are not estimated to be extremely divergent values of growth and natural mortality for males and females, there are consistent trends in the predicted sex ratios for each of the three states with males becoming less numerous relative to females as exploitation rates increased (Figure 130). The matrix of predicted numbers at age by sex and area is provided in Appendix A.

A fundamental question that must be posed in light of these differences among areas is: Is the predicted density in the three areas reasonable in light of existing visual observations (and perhaps the common perception that there are more yelloweye rockfish in Washington than anywhere else on the coast)? To make this comparison, an estimate of the magnitude of available habitat, by area, was developed based on the assumption that only the hardest rocky lithology present in existing habitat maps (over depths in which yelloweye have been observed) would support appreciable yelloweye abundance (C. Whitmire, NWFSC, personal communication). This exercise revealed that the largest absolute quantity of yelloweye habitat in 55 to 450 m depths occurs in Oregon, where it comprises 10.5% of the total habitat in these depths and is more than four times as large as the suitable area in Washington (Table 24). California south of Point Conception represents the next largest habitat (although likely supporting a lower biomass of yelloweye given that this is the southernmost portion of their range) with 15.1% of the total habitat estimated to be rocky enough for yelloweye utilization. California north of Point Conception includes less than a third of the total area to the south (the continental shelf is much narrower throughout much of central and northern California than elsewhere on the coast) but still 48% more area than in Washington waters. Since most of the yelloweye observed via visual studies are at least three years old (although some juveniles are seen), the predicted numbers of age-3+ yelloweye in each area were divided by the suitable habitat area to generate a 'back-of-the-envelope' density estimate, assuming uniform distribution within areas, and, for lack of direct information, that one-third of the California stock occurs south of Point Conception. This calculation reveals that observed density estimates in the last 30 years should be in the range of 1-10 yelloweye per hectare (Figure 131), declining from 1980 through 2000, and that Washington should have the highest observed current density. This analysis appears consistent with density estimates for available visual studies (Table 8), given the assumption that these studies tended to focus on the rockiest regions and therefore perhaps the best yelloweye habitats.

Yelloweye rockfish are estimated to have been lightly exploited until the mid-1970's, when catches increased and a rapid decline in biomass and spawning output began. The relative spawning output reached a minimum of 15.8% of unexploited levels (slightly above the estimate of 12.1% from the 2007 assessment) in 2000 (Figure 132). Yelloweye rockfish spawning output is estimated to have been gradually increasing since that time, in response to large reductions in harvest. Although the relative trend in spawning output is quite robust to the uncertainty in the estimated removals and steepness captured in the alternate states of nature (Figure 132), the absolute scale of the spawning output trajectory is very sensitive (Figure 127). The estimated relative depletion level in 2007 is 19.2% (slightly above the estimate of 16.4% from the 2007 assessment) and 20.3% in 2009 (states of nature: 17.3-23.5%), corresponding to 201.5 million eggs. The range over states of nature reflects the very large uncertainty in the scale of the estimated time-series: 128.3-353.0 million eggs. The aggregate spawning output estimates do not convey the spatial heterogeneity included via the area-specific dynamics: relative spawning output has differed markedly among the three states, with California having the largest spawning output at unexploited equilibrium, followed by Oregon and then Washington. Currently, Oregon is estimated to have the largest spawning output, followed by California, then Washington. Relative depletion also varies dramatically by state, with California estimated to be at 16.4% of unexploited conditions, Oregon, 22.5%, and Washington, 27.3% (Figure 133).

2.9 Uncertainty and Sensitivity Analysis

Although the base case assessment model captures some uncertainty via asymptotic intervals, uncertainty from two sources is reported through alternate states of nature bracketing the base case results and included explicitly in the decision table. The magnitude of the estimated catch time-series was found to have a large influence on the perception of current stock size and the estimate of steepness of the stock-recruit relationship was closely linked to the projected recovery rates. Alternate values of each were selected to bracket the best estimates with marginal probabilities one-half as likely. For historical catch, these values, 75% and 150% of the estimated catch series prior to 2000, were subjective, but reflect the lack of a comprehensive catch reconstruction in Washington and the change in likelihood of the fit to data sources over a reasonable range of catch levels (Figure 134). For steepness the 12.5th and 87.5th percentiles were calculated from the likelihood profile using the X^2 critical value of 1.127 as a proxy for the probability distribution about this point estimate. This resulted in alternate values for steepness of 0.344 and 0.508 about the maximum likelihood estimate. The most optimistic and pessimistic of the nine combinations from these two axes (weighted 6.25% each relative to 25% for the best estimate on each dimension) are reported in this document and all combinations used to provide a more realistic degree of uncertainty for future projections, decision tables and rebuilding analyses.

2.9.1 Sensitivity Analysis

The results reported in this section are by no means meant to be a comprehensive comparison of all possible aspects of model uncertainty, nor do they reflect even the full range of models considered in developing the base case. These results are intended to provide more information about relatively obvious questions for any stock assessment such as sensitivity to priors, key structural choices and potential conflict in signal among data sources. The order in which they are presented is not intended to reflect their importance; each run included here provided important information for developing or evaluating the base model and alternate states of nature.

A series of sensitivity analyses were requested during the STAR panel review and are described here in the order in which they were requested. The STAT made the *a priori* decision to truncate all recreational CPUE series in 1999 to avoid the use of points in 2000 and 2001 that were potentially contaminated by changes in aggregate bag limits for rockfish and avoidance of certain species such as canary rockfish. When the CPUE estimates for 2000-2001 (California and Washington) were included in the base case model there was little change in the results for key parameters and derived quantities (Table 25). It is clear that the indices of abundance contribute very little to the overall objective function for this assessment, and that they appear to favor somewhat more pessimistic results. In order to better evaluate this pattern, a sensitivity run was performed where the likelihood contributions for all of the indices were increased by a factor of 10. This had the largest effect on the estimate for steepness, reducing the value to 0.30, but the estimate of depletion changed only to 15.4% and unexploited spawning output remained almost unchanged. Based on discussions with scientists at all three states while reviewing data sources for this assessment, the STAT decided to allow for recreational CPUE indices to be linear or non-linear via estimating an additional catchability exponent parameter for each series. This decision was largely driven by the inability to address major concerns over the behavior of these series via the standardization models (the data to do so not being extant). To test the influence of this decision on model results as sensitivity run was conducted forcing all recreational series to be strictly proportional to population abundance. This had very little effect on model results (Table 25).

During the STAR panel, a request was made to revisit the estimation of dome-shaped selectivity for the IPHC survey in Oregon. This was due to a mild pattern of over-predicting the largest fish for this series. When a very flat-topped dome was permitted (wide bounds on the width of the peak) the very largest fish were not estimated to be fully selected (Figure 135), however the ascending limb was nearly identical to the base case. Inspection of other selectivity curves in Oregon revealed no ‘cascade’ of dome-shaped estimates due to observations of at least a few large fish in each. Parameter estimates and management quantities were largely unchanged (Table 25). Inspection of recent growth data revealed evidence for a small size difference between yelloweye of both sexes in Oregon and Washington (Oregon fish slightly smaller) that could be an alternate explanation to dome-shaped selectivity (Figure 136). It was decided that further exploration of area-specific life-history characteristics (growth, maturity, fecundity) should be addressed before moving to dome-shaped selectivity for the IPHC survey in Oregon but not Washington.

Prior to the STAR panel review a range of sensitivity analyses were performed to investigate several aspects of the assessment. Because there was relatively little change between the pre- and post-STAR base case models (revised California recreational catches, addition of length-frequency data from the Northern California charter fleet, a processing error corrected in the Oregon recreational observer length-frequency data, and revision of the prior on natural mortality) these preliminary sensitivity analyses are retained here. Although the final base case may be slightly more or less sensitive to these factors than the pre-STAR model, they are still informative about the assessment.

The use of alternate states of nature for the level of historical yelloweye catches reflects the high degree of uncertainty in these estimates from both commercial and recreational sources. As is the case with any catch reconstruction, the plausible ‘envelope’ for actual catches probably widens for estimates farther back in time. In the case of catches this seems to be most relevant with the upper estimate rather than the lower as the likelihood of appreciable unaccounted for discarding goes up in the early time-periods. For this reason a series of pre-STAR models with 50% or 200% of the best estimates for historical catch were run using a different year to define the end of the ‘historical’ period. These pre-STAR models indicated a similar degree of sensitivity to alternate catch series for the period before 1996 and 1976 (Table 26).

The second set of pre-STAR sensitivity analyses presented here were intended to evaluate whether there is appreciably conflicting information among various data types and sources. Although this can also be evaluated via the likelihood profiles (see below), the implications for management related quantities are not always obvious without direct comparison of these estimates. To compare the influence of the length and age data (over all sources in the model) the emphasis was sequentially reduced by 50% for each. Very little change was observed from the pre-STAR base case results (Table 27). Given the high probability that the observed fishery dependent CPUE indices for yelloweye rockfish have been influenced by many factors other than population abundance, a model was run omitting these time-series. The results indicated these data were not having an undue influence on quantities of interest or key parameters (Table 27). Similarly, it is quite possible that the fishery independent sources of data have fundamental (and unknown) errors in our interpretation relative to this assessment (trawl surveys may not be adequately reflecting the population dynamics due to sparse sampling or more fundamental process errors like the biomass in trawlable areas not being proportional to the total). To investigate the effects of these data two pre-STAR models were run: 1) omitting all fishery independent data (index and biological) and 2) omitting all fishery independent data and forcing the catchability relationship between fishery dependent indices and population abundance to be linear (removing the *Q* power coefficients). Only the latter produced appreciable change in key quantities, increasing estimated steepness to 0.369, and therefore MSY to 53 mt, from 42.7 in the base case model (Table 27).

The third set of pre-STAR sensitivity models was intended to evaluate the effects of informative priors on steepness and natural mortality as well as the use of point estimates for the fecundity relationship, since this relationship is quite uncertain. Neither the steepness prior, the natural mortality priors or the fecundity relationship had much effect on the model results (Table 28).

The fourth set of pre-STAR sensitivity analyses was intended to address perhaps the most important choices made in building this assessment: structural choices regarding the explicit use of areas, sex-specific growth and mortality and estimation of recruitment deviations over the full time-series. Removing the explicit areas in the model increased the estimated steepness to 0.42 resulting in a slightly higher estimated MSY and current depletion (19.3%; Table 29). Removing sex-specific growth and mortality parameters (and therefore mimicking a single-sex model as has been used in previous assessments) resulted in very little change to model results, either with or without explicit areas included in the model structure (Table 29). When a full time-series of recruitment deviations was estimated, the modeled estimate of absolute biomass (historical and current) as well as current depletion went down (to 12.0%) but the perceived productivity of the stock went up (steepness to 0.393 and MSY to 49.7). However, in attempting to determine how reliable this model would be as a base case, a number of exploratory analyses were performed. Particularly, if many poorly informed deviations in recruitment strength and area apportionment are estimated in a maximum likelihood context it is important for these deviations to be zero-centered (such that reference point estimates are consistent with the observed time-series) and that the data are sufficiently informative to support their estimation. Given the lack of clear cohorts it is unclear whether there is appreciable evidence for recruitment variability; a reduction in the objective function of ~135 units was achieved, but with an additional 295 parameters. Shorter series of deviations resulted in frequent pathological behavior of the first or terminal deviations over areas, years or both. Perhaps more concerning for maximum likelihood estimation, was the result that although there were appreciable deviations in estimated annual recruitment strengths, the asymptotic variance estimates of these deviations were only slightly reduced below the input value for recruitment variability (σ_r, 0.5 for this sensitivity, but showing a similar pattern over a wide range of input values; Figure 137). In light of this behavior, it would be appealing to integrate over the deviation parameters, rather than trusting the maximum likelihood-based point estimates. Several attempts at summarizing the posterior density of model parameters and derived quantities resulted in poor performance of the jump function (likely due to parameter correlations and ambiguously determined recruitments: large in one of several years, but not in all, causing bimodal posterior distributions). Further, several issues regarding the application of the bias correction to get from the mean to the median during integration were identified, but could not be resolved in time for this assessment. These issues did not appear to have any effect on the base case model, where preliminary MCMC chains revealed little difference with MLE parameter estimates or confidence intervals.

In aggregate, these sensitivity analyses supported the use of historical catch as a primary axis of uncertainty, but suggest (not surprisingly) that this assessment is sensitive to many choices that cannot be clearly informed by the available data.

2.9.2 Retrospective Analysis

A 5-year retrospective analysis was conducted by running the model using data only through 2003 ("retrospective in 2004"), 2004, 2005, 2006 and 2007 (Figure 138). Little retrospective pattern is apparent as the terminal year of data is removed from the model.

The second type of retrospective analysis addresses assessment error, or at least the historical context of the current result given previous analyses. This comparison is framed in terms of relative depletion due to the use of a fecundity relationship this assessment. Because of this, some of the retrospective uncertainty in absolute scale of the yelloweye population is less pronounced. Since 2002, a pattern had emerged in which each new assessment was slightly more pessimistic about current status than those conducted previously, however the current results suggest a slight increase in relative spawning output (Figure 139).

2.9.3 Likelihood Profiles

Likelihood profiles (fully revised after the STAR panel) were completed for three key model parameters: steepness of the stock-recruit relationship (h), unexploited equilibrium recruitment (R_0), and male natural mortality (M_{males}). Likelihood profiles are commonly used to elucidate conflicting information among various data sources, to determine how asymmetric the likelihood surfaces surrounding point estimates may be, and to provide an additional evaluation of how precisely parameters are being estimated.

Steepness appears to be largely informed by the length data (Figure 140), but all likelihood components show a similar signal favoring steepness values below ~0.5. Although male natural mortality is correlated with steepness, it does not span a particularly wide range and is most correlated over the lowest steepness values (Figure 141).

Equilibrium recruitment is informed primarily by the length- and age-composition data (Figure 142); however, given a change of less than one unit of negative log-likelihood for the index data across a wide range of values, there appears (not surprisingly) to be no information in any of the abundance indices for this parameter. The choice to profile over male natural mortality was made easy, due to the nearly perfect correlation between estimated female natural mortality and the value used for males in the likelihood profile (Figure 143). For this reason, the profile can essentially be thought of as a profile over either male or female natural mortality. As was the case with R_0, the length and age data dominate the profile, showing a strong degradation to values much below 0.04 or above 0.052 (Figure 144). Again, the index data were largely uninformative and even the informative prior for female natural mortality was not having a substantial effect on the range of plausible parameter values.

2.9.4 Parametric Bootstrap Using Stock Synthesis

There is a built-in option to create bootstrapped data-sets using Stock Synthesis. This feature performs a parametric bootstrap using the error assumptions and sample sizes from the input data to generate new observations about the fitted model expectations. It is therefore not strictly a variance estimation exercise, but an exploration of the question: If the assessment was true, and the same relative quantity and quality of data were available, how reliably could the parameters and derived quantities be re-estimated?

There was insufficient time to use this powerful diagnostic tool for this assessment, but it should be considered a standard method for full assessments where time permits its application. Its use is particularly important for cases where the asymptotic (or posterior) intervals about model estimates are used as the primary representation of uncertainty.

3. Rebuilding Parameters

Revised rebuilding projections will be presented in a separate document after the assessment has been reviewed in September 2009. Although the base case assessment model captures some uncertainty via asymptotic intervals, uncertainty from two sources is reported through alternate states of nature bracketing the base case results and will be included explicitly in the decision table (Table 30).

4. Reference Points

The spawning output of yelloweye rockfish was estimated to have dropped below the $SB_{40\%}$ management target in 1989 and the overfished threshold in 1994. In hindsight, the spawning output passed through the target and threshold levels with annual catch averaging almost five times the current estimate of the MSY. The coast-wide stock remains below the overfished threshold, although the spawning output is estimated to have been increasing since 2000 in response to reductions in harvest. The degree of increase is largely insensitive to the magnitude of historical catch and only moderately sensitive to the value for steepness, but the absolute scale of the population reflects alternate removal series very closely. Fishing mortality rates are estimated to have been in excess of the current F-target for rockfish of $SPR_{50\%}$ from 1976 through 1999 (Figure 145, Figure 146, Figure 147). Recent management actions have curtailed the rate such that recent SPR values are in excess of 60% over the last eight years (Figure 148). Relative exploitation rates (catch/biomass of age-8 and older fish) are estimated to have been at or less than 1% after 2001. The alternate states of nature result in estimated exploitation rates ranging from less than 1.6% to less than 0.6%.

Unfished spawning output was estimated to be 994 million eggs. The target stock size ($SB_{40\%}$) is therefore 398 million eggs and the overfished threshold ($SB_{25\%}$) is 249 million eggs. Maximum sustained yield (MSY), conditioned on current fishery selectivity and allocations, was estimated in the assessment model to occur at a spawning stock biomass of 388 million eggs and produce an MSY catch of 56.4 mt (slightly above the estimate from the 2007 assessment of 43.7 mt). However, the yield at MSY is extremely sensitive to states of nature resulting in a wide range for this value from 31.5 to 107.9 mt. Maximum sustainable yield is estimated to be achieved at an SPR of 60.4% (range of states of nature: 51.2-69.7%). This is nearly identical to the yield, 56.1 mt, generated by the SPR (61.0%) that stabilizes the stock at the $SB_{40\%}$ target. The fishing mortality target/overfishing level (SPR = 50.0%) results in a much smaller equilibrium yield of 48.9 mt at a spawning output of 230 million eggs (23.1% of the unfished level). In sum, although the estimated MSY spawning output is very close to the proxy level, the harvest rate needed to achieve equilibrium at 40% of the unfished level in substantially lower than the MSY-proxy rate.

5. Harvest Projections and Decision Tables

The forecast reported here will be replaced by the rebuilding analysis to be completed in September-October 2009 following SSC review of the stock assessment. In the interim, the total catch in 2009 and 2010 is set equal to the OY (17 mt). The target exploitation rate for 2011 and beyond is based upon an SPR of 71.9%, which approximates the harvest level in the current (2007) rebuilding strategy (the 71.9% SPR rate represents the target after the 'ramp-down' portion of the strategy is completed in 2010). Uncertainty in the rebuilding forecast will be included via integrating over all combinations of the alternate states of nature for catch history and steepness. Current medium-term forecasts predict increases in coast-wide abundance under the SPR=71.9% rebuilding strategy, however these increases are largely driven by the California and Oregon portions of the stock. In fact, the Washington portion is projected to remain at current levels under recent allocation of catch. Catch allocation used for the forecast reflects the average distribution of Fs in 2005-2007 among fleets (recreational, commercial) in: Washington (0.013, 0.005), Oregon (0.004, 0.002) and California (0.006, 0.003). The estimated OY values for 2011 and 2012 are larger (20.9, 21.2) than those predicted from the 2007 rebuilding analysis (13.9, 14.2).The projection of expected yelloweye rockfish catch, spawning output (by area) and depletion shows very slow recovery (Table 31). It may be desirable to evaluate specific allocation scenarios, if relative removals based on future management actions will be substantially different than recent values by state.

Because yelloweye rockfish are currently managed under a rebuilding plan, the decision table included here (Table 32) is only intended to better evaluate the management implications of the considerable uncertainty in the base case assessment model. Various alternate management actions including SPR rates and fixed OYs will be evaluated in the rebuilding analysis. Landings in 2009-2010 are 17 mt for all cases. Catch allocation used for the forecast reflects the same relative *F*s used in the forecasts.

6. Regional Management Considerations

The choice to model the yelloweye rockfish stock with explicit areas in the assessment model is based on the sedentary life-history of adult yelloweye, and the markedly different population trends as well as historical and current exploitation rates among the three states. Current population status differs by state, with both near term forecasts as well as longer term the rates of recovery under OY catches predicted to be quite different for each area. This information may be valuable for making management and allocation decisions; alternate future projections can easily be added to this assessment, as needed, to better describe the implications of these choices.

The use of area-specific vs. coast-wide assessment models and management tools should be considered a major source of uncertainty. Future efforts, including links to

Canadian waters and alternate approaches to meta-population dynamics could produce differing results.

7. Research Needs

The available data for yelloweye rockfish are very sparse and generally weakly informative about current status. The following research topics could improve the ability of this assessment to reliably model the yelloweye rockfish population dynamics in the future and provide better monitoring of progress toward rebuilding:

1. Develop and implement a comprehensive visual survey.
2. Do a scientific review of current efforts to develop and improve stock size indices for yelloweye based on IPHC (including additional stations) and make recommendations on the best approaches to develop such indices.
3. Explore a recalculation of GLMM estimates in the IPHC survey that explores station effects which allows inclusion of stations that differ over time.
4. Continue to refine historical catch estimates using ex-vessel prices, etc., particularly in WA.
5. Investigate the development of a WA recreational yelloweye CPUE based on the recreational halibut fishery. Consider a full time series and one ending in 2002, since the yelloweye RCA in waters off northern WA was implemented in 2003.
6. Encourage the collection of samples to refine the estimate biological parameters, particularly maturity and fecundity.
7. Continue to evaluate the spatial aspects of the assessments, including growth, the number and placement of boundaries between areas, as well as the northern boundary with Canada.
8. More work is needed to better understand the performance of maximum likelihood and Bayesian estimators of stock size and trends when large numbers of poorly informed recruitment deviations are estimated. Although it is logically appealing to include such uncertainty, even when little coherent data informing cohort strengths is available, technical and computational issues need to be solved before this approach can be implemented in a case like yelloweye rockfish.
9. Investigate alternative ways of re-weighting. This issue is relevant for all west coast stock assessments.
10. Investigate how best to account for the variability in dates in trawl surveys through a meta-analysis. This issue is relevant for all west coast stock assessments.
11. Continue to refine coast-wide historical catch estimates. This issue is relevant for all west coast stock assessments.
12. Access and processing of recreational data (catch and biological sampling) currently entails differing locations and formats for data from each of the three states and RecFIN. A single database that holds all raw recreational data in a consistent format would reduce assessment time spent on processing these data and potential introduction of errors or alternate interpretations due to processing.
13. The IPHC data organization should be revisited. Currently biological samples cannot be linked to the station from which they were collected. Age data for 2003-2005 is disconnected from length and sex information and other unknown issues may persist in

these data. A thorough evaluation of what data are reliable and a final determination of what information is lost, or can potentially be recovered, is needed.

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10. Tables

Table 1. Total catches (mt) of yelloweye rockfish by fleet used in the assessment model. Foreign and research catches are included in commercial totals. See text for description of sources.

Year	California Recreational	California Commercial	Oregon Recreational	Oregon Commercial	Washington Recreational	Washington Commercial
1916	0.00	2.20	0.00	0.00	0.00	0.00
1917	0.00	3.62	0.00	0.00	0.00	0.00
1918	0.00	4.25	0.00	0.00	0.00	0.00
1919	0.00	2.16	0.00	0.00	0.00	0.00
1920	0.00	2.38	0.00	0.00	0.00	0.00
1921	0.00	2.30	0.00	0.00	0.00	0.00
1922	0.00	2.06	0.00	0.00	0.00	0.00
1923	0.00	2.21	0.00	0.00	0.00	0.00
1924	0.00	2.82	0.00	0.00	0.00	0.00
1925	0.00	3.86	0.00	0.00	0.00	1.00
1926	0.00	4.87	0.00	0.00	0.00	1.00
1927	0.00	5.92	0.00	0.00	0.00	1.00
1928	0.00	5.52	0.00	0.12	0.00	1.00
1929	0.73	5.66	0.00	0.21	0.00	1.00
1930	1.18	6.76	0.00	0.20	0.00	1.00
1931	1.76	5.62	0.00	0.15	0.00	1.00
1932	2.35	8.13	0.00	0.06	0.00	1.00
1933	2.94	4.45	0.00	0.08	0.00	1.00
1934	3.53	5.78	0.00	0.09	0.00	1.00
1935	4.12	7.99	0.00	0.08	0.00	1.00
1936	4.70	8.08	0.00	0.20	0.00	1.00
1937	5.61	6.08	0.00	0.26	0.00	1.00
1938	5.50	6.36	0.00	0.23	0.00	1.00
1939	4.81	6.43	0.00	0.17	0.00	1.00
1940	6.85	4.57	0.00	1.04	0.00	1.00
1941	6.25	5.35	0.00	2.18	0.00	1.00
1942	6.78	3.37	0.00	3.18	0.00	1.00
1943	7.30	5.89	0.00	11.61	0.00	1.00
1944	7.83	24.88	0.00	19.06	0.00	1.00
1945	8.36	58.56	0.00	29.27	0.00	1.00
1946	8.88	57.74	0.00	18.22	0.00	1.00
1947	5.02	16.28	0.00	11.40	0.00	1.00
1948	10.12	23.30	0.00	7.81	0.00	1.00
1949	13.09	9.89	0.00	7.94	0.00	1.00
1950	15.95	8.03	0.00	9.60	0.00	1.00
1951	17.91	16.99	0.00	6.20	0.00	1.00
1952	15.95	14.15	0.00	6.34	0.00	1.00
1953	13.97	11.77	0.00	5.07	0.00	1.00
1954	18.74	11.78	0.00	6.38	0.00	1.00
1955	24.06	6.98	6.20	6.70	1.00	2.00
1956	27.15	10.40	6.50	4.12	1.00	2.00
1957	24.78	13.17	6.70	11.81	1.00	2.00
1958	35.91	13.41	7.00	9.08	2.00	2.00
1959	30.41	10.25	7.20	9.97	2.00	2.00
1960	22.05	8.88	7.50	12.64	2.00	2.00

Table 1. Continued. Total catches (mt) of yelloweye rockfish by fleet used in the assessment model.

Year	California Recreational	California Commercial	Oregon Recreational	Oregon Commercial	Washington Recreational	Washington Commercial
1961	17.68	5.25	7.70	11.52	2.00	2.00
1962	22.08	5.43	8.00	13.43	2.00	2.00
1963	23.10	10.86	8.20	8.65	3.00	4.00
1964	20.82	7.52	8.50	8.68	3.00	4.00
1965	31.51	9.38	8.70	7.33	3.00	4.00
1966	35.34	8.97	9.00	10.20	3.00	4.00
1967	36.60	7.85	9.20	8.74	3.00	4.00
1968	42.79	7.66	9.50	7.13	3.00	4.00
1969	44.97	25.70	9.70	12.18	3.00	4.00
1970	51.89	27.70	10.00	10.43	4.00	5.10
1971	46.17	46.50	13.10	4.64	4.00	6.41
1972	59.61	63.66	16.30	8.49	4.00	7.31
1973	75.02	49.51	7.40	10.58	4.00	9.21
1974	80.47	56.38	12.80	6.95	4.00	10.31
1975	81.34	60.24	6.20	7.92	4.00	7.10
1976	88.56	57.96	19.40	15.18	4.30	10.30
1977	79.78	57.45	19.90	16.24	8.80	17.88
1978	74.46	154.20	24.50	28.50	4.50	23.90
1979	85.49	99.33	38.80	62.20	3.50	28.50
1980	80.19	42.07	31.50	68.34	2.40	35.06
1981	43.58	169.44	36.00	102.20	3.40	9.70
1982	79.60	154.33	56.90	114.50	3.40	12.60
1983	38.36	62.69	63.80	177.41	6.70	16.99
1984	71.26	53.66	43.70	57.06	12.20	13.42
1985	121.87	12.22	26.80	91.88	8.80	26.41
1986	77.31	33.51	27.40	65.62	9.00	14.94
1987	57.83	54.31	29.80	73.72	10.50	25.09
1988	60.07	65.44	9.40	110.73	8.30	25.56
1989	54.44	51.25	16.90	170.21	14.60	39.50
1990	40.06	81.32	18.70	61.12	9.90	26.27
1991	27.38	147.30	17.20	137.74	18.00	20.36
1992	16.41	111.10	29.40	165.88	16.20	33.85
1993	7.13	52.92	27.73	183.18	18.00	29.76
1994	13.78	56.02	21.57	102.19	10.30	19.58
1995	10.08	51.40	16.81	148.34	9.90	18.07
1996	12.74	76.54	8.17	92.52	10.80	16.89
1997	14.58	68.68	15.38	115.42	11.40	18.68
1998	4.84	21.89	18.78	41.47	14.40	5.57
1999	9.40	23.49	18.05	61.35	10.60	32.92
2000	5.71	4.02	9.52	3.64	10.10	7.86
2001	6.37	4.35	4.83	6.23	12.50	21.84
2002	2.49	1.07	3.14	1.90	3.70	3.48
2003	3.74	0.71	3.02	1.02	2.60	1.30
2004	0.60	1.34	3.69	1.50	3.70	1.50
2005	0.90	1.86	4.30	1.45	5.20	1.36

Table 1. Continued. Total catches (mt) of yelloweye rockfish by fleet used in the assessment model.

Year	California Recreational	California Commercial	Oregon Recreational	Oregon Commercial	Washington Recreational	Washington Commercial
2006	4.10	0.83	2.85	1.88	1.70	1.01
2007	8.00	2.92	3.14	1.95	2.49	1.14
2008	2.10	0.43	4.10	2.49	2.80	4.74

Table 2. Recent trend in yelloweye rockfish catch (mt) relative to management guidelines.

Year	ABC (mt)	OY (mt)	Commercial Catch (mt)[1]	Recreational Catch (mt)	Total Catch (mt)
1999	39[2]	NA	117.8	38.1	155.8
2000	39[2]	NA	15.5	25.3	40.9
2001	29[3]	NA	32.5	23.7	56.1
2002	27[3]	13.5[3]	6.4	9.3	15.8
2003	52	22	3.2	9.4	12.4
2004	53	22	4.4	8.0	12.3
2005	54	26	5.3	10.4	15.1
2006	55	27	3.8	8.7	12.4
2007	47	23	7.9	13.6	19.6
2008	47	20	7.8	9.0	16.7

[1]Includes research, foreign and discarded catches after 2001.
[2]Includes the Columbia and Vancouver INPFC areas only.
[3]Includes the Columbia, Vancouver and Eureka INPFC areas only.

Table 3. Summary of data sources used in the yelloweye assessment in 2009.

	1916-24	1925-27	1928	1929-54	1955-65	1966-76	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Catches																																						
CA Recreational				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CA Commercial	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
OR Recreational					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
OR Commercial			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WA Recreational					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WA Commercial		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Foreign						X																																
Research							X			X			X			X			X			X			X			X			X		X	X	X	X	X	X
WCGOP discards																																X	X	X	X	X	X	X
Fishery Data																																						
CPUE																																						
CA Recreational										X	X	X	X	X	X	X							X	X	X	X	X	X	X									
CA Rec. Charter																		X	X	X	X	X	X	X	X	X	X	X										
OR Recreational									X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X	X									
WA Recreational																				X	X	X	X	X	X	X	X	X	X									
OR Rec. Charter																																		X	X	X	X	X
Age																																						
CA Recreational													X													X												
CA Commercial								X	X	X	X	X	X		X	X		X													X				X			
OR Recreational									X					X	X	X	X		X												X							
OR Commercial																															X	X	X	X	X	X	X	
WA Recreational																												X	X	X	X			X	X	X		X
WA Commercial																							X								X	X	X	X	X	X	X	X
Length																																						
CA Recreational																							X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CA Rec. Charter																	X	X	X	X	X	X	X	X	X	X	X	X										
CA Commercial								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
OR Recreational								X	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X					
OR Rec. Charter																																		X	X	X	X	X
OR Commercial																						X			X	X	X	X	X	X	X	X	X	X	X	X	X	X
WA Recreational																												X	X	X	X			X	X	X		X
WA Commercial										X														X		X	X	X	X	X	X	X	X	X	X	X	X	X

Table 3. Continued. Summary of data sources used in the yelloweye assessment in 2009.

	1916-24	1925-27	1928	1929-54	1955-65	1966-76	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Survey data																																						
Index																																						
IPHC (OR)																													X	X	X	X	X	X	X	X	X	X
IPHC (WA)																													X	X	X	X	X	X	X	X	X	X
Triennial (WA)										X			X			X			X			X			X			X			X			X				
NWFSC (OR)																																	X	X	X	X	X	X
Age																																						
IPHC (OR)																																	X	X	X	X	X	X
IPHC (WA)																																	X	X	X	X	X	X
Length																																						
IPHC (OR)																																	X	X	X	X	X	X
IPHC (WA)																																	X	X	X	X	X	X
Triennial (WA)										X			X			X			X			X			X			X			X			X				
NWFSC (OR)																																	X	X	X	X	X	X

Table 4. Sample information contributing to the index of abundance from the IPHC long-line survey.

Year	Oregon (57 stations) Positive stations	Oregon (57 stations) Number of fish	Washington (27 stations) Positive stations	Washington (27 stations) Number of fish
1999	6	325	2	11
2001	6	149	3	54
2002	7	125	2	16
2003	8	215	6	101
2004	7	151	6	19
2005	7	81	7	75
2006	5	68	5	22
2007	7	102	4	30
2008	9	122	6	13

Table 5. Number of fish contributing biological information caught in association with the IPHC long-line survey (Note that a few fish were ambiguously allocated to state in the available data).

	Lengths (sexed)		Ages (sexed > 2005)	
Year	Oregon	Washington	Oregon	Washington
1999	0	0	0	0
2001	0	0	0	0
2002	0	0	0	0
2003	217	99	215	99
2004	155	17	157	17
2005	68	72	62	72
2006	58	34	58	34
2007	103	268	101	268
2008	253	83	251	83

Table 6. Summary of sampling used in the calculation of yelloweye biomass indices for the shelf trawl surveys.

	Triennial (WA only)			NWFSC (OR only)		
Year	Number of tows	Positive tows	Number of fish	Number of tows	Positive tows	Number of fish
1980	101	3	16	NA	NA	NA
1983	176	13	13	NA	NA	NA
1986	263	21	114	NA	NA	NA
1989	113	14	66	NA	NA	NA
1992	107	7	90	NA	NA	NA
1995	83	3	38	NA	NA	NA
1998	87	7	11	NA	NA	NA
2001	87	8	26	NA	NA	NA
2003	NA	NA	NA	62	7	100
2004	75	5	23	83	5	11
2005	NA	NA	NA	118	6	13
2006	NA	NA	NA	123	8	35
2007	NA	NA	NA	118	5	14
2008	NA	NA	NA	105	8	14

Table 7. Summary of data used to produce NWFSC and Triennial trawl survey length-frequency data.

	Triennial (WA only)		NWFSC (OR only)	
Year	Number of Samples	Number of fish	Number of samples	Number of Fish
1980	0	0	NA	NA
1983	0	0	NA	NA
1986	13	51	NA	NA
1989	9	44	NA	NA
1992	4	7	NA	NA
1995	5	7	NA	NA
1998	10	19	NA	NA
2001	10	21	NA	NA
2003	NA	NA	7	24
2004	4	10	5	11
2005	NA	NA	6	12
2006	NA	NA	8	35
2007	NA	NA	5	14
2008	NA	NA	8	14

Table 8. Comparison of density estimates from U.S. and Canadian visual surveys.

Region	Year	Local area	Platform	Method	N fish obs.	Density (N/ha)	Reference
SE AK	1991	CSEO	Delta sub	Line transect	NA	20.3	(Brylinsky et al. 2007)
SE AK	1994	SSEO	Delta sub	Line transect	99	11.7	(Brylinsky et al. 2007)
SE AK	1994	NSEO	Delta sub	Line transect	39	8.4	(Brylinsky et al. 2007)
SE AK	1995	CSEO	Delta sub	Line transect	235	29.3	(Brylinsky et al. 2007)
SE AK	1997	CSEO	Delta sub	Line transect	166	25.3	(Brylinsky et al. 2007)
SE AK	1997	Fairweather	Delta sub	Line transect	256	41.8	(Brylinsky et al. 2007)
SE AK	1999	EYKT	Delta sub	Line transect	206	23.2	(Brylinsky et al. 2007)
SE AK	1999	SSEO	Delta sub	Line transect	288	18.8	(Brylinsky et al. 2007)
SE AK	2001	NSEO	Delta sub	Line transect	30	14.2	(Brylinsky et al. 2007)
SE AK	2003	EYKT	Delta sub	Line transect	323	35.6	(Brylinsky et al. 2007)
SE AK	2003	CSEO	Delta sub	Line transect	706	18.8	(Brylinsky et al. 2007)
SE AK	2005	SSEO	Delta sub	Line transect	283	22.0	(Brylinsky et al. 2007)
SE AK	2007	CSEO	Delta sub	Line transect	301	10.7	(Brylinsky et al. 2007)
BC	2000	Bowie Seamount	Delta sub	Strip transect	NA	154[1]	(Yamanaka Unpublished data)
BC	2000	Queen Charlotte Islands	Delta sub	Strip transect	NA	27[1]	(Yamanaka Unpublished data)
BC	2003	Strait of Georgia	Towed camera	Strip transect	NA	3.4[2]	(Martin and Yamanaka 2004)
BC	2003	Strait of Georgia	Aquarius sub	Line transect	NA	5.6[3]	(Yamanaka Unpublished data)

[1] 3rd quartile of distance from center line used as width.
[2] Hardpan substrate only.
[3] Bedrock substrate only.

Table 8. Continued. Comparison of density estimates from U.S. and Canadian visual surveys.

Region	Year	Local area	Platform	Method	N fish obs.	Density (N/ha)	Reference
BC	2005	Strait of Georgia	Aquarius sub	Line transect	NA	79.8	(Yamanaka Unpublished data)
BC	2005	Queen Charlotte Islands	Aquarius sub	Line transect	NA	6.6	(Yamanaka Unpublished data)
WA	1998	Olympic Coast	Delta sub	Strip transect	36	8.7[4]	(Jagielo et al. 2003)
OR	1988	Heceta Bank	Delta sub	Strip transect	NA[5]	5.2	(Tissot et al. 2007)
OR	1989	Heceta Bank	Delta sub	Strip transect	NA[5]	5.8	(Tissot et al. 2007)
OR	1990	Heceta Bank	Delta sub	Strip transect	NA[5]	3.5	(Tissot et al. 2007)
OR	1990	Daisy Bank	Delta sub	Strip transect	11	11.6[6]	(Hixon et al. 1991, Hixon and Tissot 1992)
OR	1990	Coquille Bank (Bandon High Spot)	Delta sub	Strip transect	2	1.0[7]	(Hixon et al. 1991, Hixon and Tissot 1992)
OR	1991	Stonewall Bank	Delta sub	Strip transect	70	5.5[8]	(Hixon et al. 1991, Hixon and Tissot 1992)
OR	2002	Heceta Bank	Delta sub	Strip transect	48	4.5	(York 2005, Wakefield et al. Unpublished data.)
OR	2000	Heceta Bank	ROPOS ROV	Strip transect	66	9.0	(Wakefield et al. Unpublished data.)
OR	2001	Heceta Bank	ROPOS ROV	Strip transect	58	7.5	(Wakefield et al. Unpublished data.)
CA	1992-93	Soquel Canyon	Delta sub	Strip transect	104	30.8[9]	(Yoklavich et al. 2000)

[4]Direct counts from "untrawlable habitat".
[5]Total of 160 yelloweye RF observed across all three years.
[6]Surveyed 1.0 hours.
[7]Surveyed 2.0 hours.
[8]Surveyed 12.8 hours.
[9]Density estimate based on total number observed relative to total area surveyed.

Table 9. Summary of fixed biological parameters estimated externally and used as input for this stock assessment

Quantity	Value	Source
Female weight-length coefficient (*a*)	0.00000977	All available data pooled from fishery and survey sources.
Female weight-length exponent (*b*)	3.17	
Male weight-length coefficient (*a*)	0.0000170	
Male weight-length exponent (*b*)	3.03	
Female length at 50% maturity	38.78	Hannah and Bloom, 2009
Female maturity logistic slope	-0.437	
Fecundity eggs/kilogram intercept	137,900	Dick, 2009
Fecundity slope	36,500	

Table 10. Summary of sampling used to generate the Oregon charter observer CPUE index.

Year	Number of observed drifts	Number of observed angler-drifts	Number of yelloweye encountered
2004	905	6,538	22
2004	949	6,510	21
2005	1,100	7,163	5
2006	1,396	8,746	37
2007	1,349	7,813	52
2008	905	6,538	22

Table 11. Summary of sampling effort generating length-frequency distributions used in the assessment model for the recreational fleets.

	California		California Charter		Oregon		Oregon Observer		Washington	
Year	N trips	N fish	N trips	N fish	N trips	N fish	N trips	N fish	N hauls	N fish
1978	0	0	0	0	NA	120	0	0	0	0
1979	0	0	0	0	NA	107	0	0	0	0
1980	0	0	0	0	13	25	0	0	0	0
1981	0	0	0	0	8	13	0	0	0	0
1982	0	0	0	0	24	61	0	0	0	0
1983	0	0	0	0	8	17	0	0	0	0
1984	0	0	0	0	53	348	0	0	0	0
1985	0	0	0	0	31	222	0	0	0	0
1986	0	0	0	0	14	175	0	0	0	0
1987	0	0	16	23	22	165	0	0	0	0
1988	0	0	61	276	25	38	0	0	0	0
1989	0	0	84	279	36	112	0	0	0	0
1990	0	0	31	89	0	0	0	0	0	0
1991	0	0	37	112	0	0	0	0	0	0
1992	0	0	81	164	0	0	0	0	0	0
1993	5	33	77	203	88	163	0	0	0	0
1994	5	61	75	189	84	151	0	0	0	0
1995	9	47	72	152	50	110	0	0	0	0
1996	11	75	64	164	38	73	0	0	0	0
1997	3	9	68	144	51	99	0	0	0	0
1998	5	18	31	55	74	147	0	0	1	25
1999	8	88	0	0	109	246	0	0	4	95
2000	5	47	0	0	37	62	0	0	7	189
2001	5	15	0	0	204	368	0	0	10	101
2002	4	13	0	0	278	448	0	0	0	0
2003	4	15	0	0	306	490	2	2	0	0
2004	7	15	0	0	0	0	11	22	5	12
2005	10	57	0	0	0	0	12	26	2	4
2006	13	95	0	0	0	0	24	49	1	1
2007	11	57	0	0	0	0	23	56	0	0
2008	6	27	0	0	0	0	21	64	3	6

Table 12. Summary of sampling effort generating length-frequency distributions used in the assessment model for the commercial fleets.

	California		Oregon		Washington	
Year	N trips	N fish	N trips	N fish	N trips	N fish
1978	2	15	0	0	0	0
1979	15	60	0	0	0	0
1980	18	35	0	0	2	4
1981	17	62	0	0	0	0
1982	10	18	0	0	0	0
1983	20	43	0	0	0	0
1984	19	30	0	0	0	0
1985	20	27	0	0	0	0
1986	20	23	0	0	0	0
1987	18	26	0	0	0	0
1988	14	21	0	0	0	0
1989	20	51	0	0	0	0
1990	15	28	0	0	0	0
1991	27	224	0	0	0	0
1992	75	493	13	1	0	0
1993	97	710	0	0	2	20
1994	82	736	0	0	0	0
1995	37	378	73	5	0	0
1996	80	526	129	7	24	298
1997	53	290	232	7	21	142
1998	18	62	95	3	13	63
1999	58	508	166	11	8	45
2000	14	26	141	34	20	361
2001	26	146	219	46	31	583
2002	9	12	14	8	36	195
2003	3	4	30	2	24	59
2004	25	71	61	14	18	51
2005	12	54	39	22	16	23
2006	6	28	15	6	24	102
2007	20	79	5	3	6	29
2008	0	0	16	3	1	1

Table 13. Summary of sampling effort generating age-frequency distributions used in the assessment model for the recreational fleets.

	California		Oregon		Oregon Observer		Washington	
Year	N trips	N fish	N trips	N fish	N trips	N fish	N trips	N fish
1978	0	0	0	0	0	0	0	0
1979	0	0	1	17	0	0	0	0
1980	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0
1983	1	1	0	0	0	0	0	0
1984	0	0	10	88	0	0	0	0
1985	0	0	8	54	0	0	0	0
1986	0	0	12	68	0	0	0	0
1987	0	0	9	63	0	0	0	0
1988	0	0	0	0	0	0	0	0
1989	0	0	4	17	0	0	0	0
1990	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0
1996	1	1	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	1	25
1999	0	0	0	0	0	0	4	95
2000	0	0	0	0	0	0	7	189
2001	0	0	4	28	0	0	10	101
2002	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	5	10
2005	0	0	0	0	0	0	2	4
2006	0	0	0	0	0	0	1	1
2007	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	3	6

Table 14. Summary of sampling effort generating age-frequency distributions used in the assessment model for the commercial fleets.

	California		Oregon		Washington	
Year	N trips	N fish	N trips	N fish	N trips	N fish
1978	2	6	0	0	0	0
1979	5	10	0	0	0	0
1980	5	8	0	0	0	0
1981	2	7	0	0	0	0
1982	1	1	0	0	0	0
1983	1	1	0	0	0	0
1984	0	0	0	0	0	0
1985	4	10	0	0	0	0
1986	2	4	0	0	0	0
1987	0	0	0	0	0	0
1988	1	5	0	0	0	0
1989	0	0	0	0	0	0
1990	0	0	0	0	0	0
1991	0	0	0	0	0	0
1992	0	0	0	0	0	0
1993	0	0	0	0	2	19
1994	0	0	0	0	0	0
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	1	14	1	9	9	144
2002	0	0	3	4	12	104
2003	0	0	1	29	5	18
2004	0	0	7	16	13	41
2005	2	7	14	29	11	19
2006	0	0	11	12	24	96
2007	0	0	4	4	9	28
2008	0	0	0	0	1	1

Table 15. Description of model parameters in the base case assessment model.

Parameter	Number estimated	Bounds (low, high)	Prior (Mean, SD)
Natural mortality (*M*, female)	1	(0.01,0.15)	Normal (0.0517,0.0226)
Natural mortality (*M*, male)	1	(0.01,0.15)	Normal (0.0517,0.0226)
Stock and recruitment			
Ln(R_0)	1	(3,15)	Uniform
Ln(Mean recruitment offset Oregon, normalized)	1	(-5,5)	Uniform
Ln(Mean recruitment offset Washington, normalized)	1	(-5,5)	Uniform
Steepness (*h*)	1	(0.2,1.0)	Beta (0.73,0.189)
Catchability			
Surveys:			
Ln(*Q*) – IPHC Oregon	-		Analytic solution
Ln(*Q*) – IPHC Washington	-		Analytic solution
Ln(*Q*) – NWFSC survey (OR only)	-		Analytic solution
Ln(*Q*) – Triennial survey (1980-1992, WA only)	1	(-10,0)	Uniform
Ln(*Q*) – Triennial survey offset (1995-2004) to early	1	(-4,4)	Uniform
Fisheries:			
Ln(*Q*) – Fisheries	-		Analytic solution
Power coefficient for Ln(*Q*) relationship	4	(-6,6)	Uniform
Selectivity			
Fisheries (logistic):			
Length selectivity inflection	7	(10,70)	Uniform
95% width of selectivity logistic	7	(0.001,50)	Uniform
IPHC Surveys (logistic):			
Length selectivity inflection	2	(10,70)	Uniform
95% width of selectivity logistic	2	(0.001,50)	Uniform
Trawl Surveys (double-normal):			
Length at peak selectivity	1	(20,87)	Uniform
Width of top (as logistic)	-		Fixed at -4
Ascending width (as exp[width])	2	(0,8)	Uniform
Descending width (as exp[width])	1	(0,12)	Uniform
Initial selectivity (as logistic)	1	(-10,10)	
Final selectivity (as logistic)	-		Fixed at 10, or not used
Individual growth			
Females:			
Length at age 1	1	(10,35)	Uniform
Length at age 70	1	(40,120)	Uniform
von Bertalanffy *K*	1	(0.01,0.2)	Uniform
CV of length at age 1	1	(0.05,0.2)	Uniform
CV of length at age 70	1	(0.05,0.2)	Uniform
Males:			
Length at age 1 offset to females	-	NA	Fixed at 0.0
Length at age 70	1	(40,120)	Uniform
von Bertalanffy *K*	1	(0.01,0.2)	Uniform
CV of length at age 1	1	(0.05,0.2)	Uniform
CV of length at age 70	1	(0.05,0.2)	Uniform
Total: 44 estimated parameters			

Table 16. Input and effective sample sizes used for tuning the composition data in the base model.

Type of data	Fleet	Input adjustment	Average input after adjustment	Average effective N
Fishery independent:				
Length	IPHC (OR)	0.73[1]	103.9	104.5
	IPHC (WA)	0.62[1]	59.2	59.0
	Triennial (WA)	2.08	19.7	20.2
	NWFSC (OR)	2.79	21.8	23.4
Age	IPHC (OR)	0.74	8.4	8.4
	IPHC (WA)	0.90	7.5	7.6
Fishery dependent:				
Length	CA Recreational	3.24	41.3	43.5
	CA Rec. Charter	1.52	120.6	125.3
	CA Commercial	2.25	113.3	113.4
	OR Recreational	0.54[1]	72.5	73.0
	OR Rec. Charter	1.44	34.2	39.6
	OR Commercial	2.16	49.6	51.0
	WA Recreational	5.49	63.6	66.7
	WA Commercial	1.57	54.3	55.0
Age	CA Recreational	1	1.0	1.0
	CA Commercial	1	1.2	1.5
	OR Recreational	1	1.9	2.4
	OR Commercial	1	1.5	1.6
	WA Recreational	1	3.2	4.0
	WA Commercial	1	2.8	3.4

[1]Length data with initial input sample sizes (before tuning) based on number of fish instead of number of samples.

Table 17. Adjusted mean input standard errors and root-mean-squared error (RMSE) of fits to index data used to tune the base model. ~95% confidence interval intersection is reported as number of predictions inside the interval/number of data points.

Fleet	SD log(value) adjustment	Mean input SD log(value) after adjustment	RMSE	~95% CI intersection
Fishery independent:				
IPHC (OR)	+0.36	0.45	0.45	9/9
IPHC (WA)	+0.54	0.74	0.74	9/9
Triennial (WA)	+0.41	0.99	0.99	9/9
NWFSC (OR)	+0.42	1.00	1.00	5/6
Fishery dependent:				
CA Recreational	+0.16	0.53	0.53	14/14
CA Rec. Charter	+0.02	0.19	0.19	11/11
OR Recreational	+0.10	0.29	0.28	18/19
OR Rec. Charter	0.00	0.57	0.45	5/5
WA Recreational	0.00	0.92	0.42	10/10

Table 18. Estimated parameter values for the base case model and alternate states of nature.

Parameter	Low	Base case	High
Natural mortality (M, female)	0.048	0.047	0.046
Natural mortality (M, male)	0.048	0.047	0.046
Ln(R_0)	5.182	5.425	5.799
Ln(Mean recruitment offset Oregon, normalized)	-0.099	-0.099	-0.097
Ln(Mean recruitment offset Washington, normalized)	-1.283	-1.306	-1.324
Steepness (h; not estimated in the low or high cases)	0.344	0.417	0.508
CA Rec. power coefficient for Ln(Q) relationship	-0.051	0.056	0.179
CA Rec. Obs. power coefficient for Ln(Q) relationship	0.347	0.546	0.786
OR Rec. power coefficient for Ln(Q) relationship	-0.158	-0.078	0.015
WA Rec. power coefficient for Ln(Q) relationship	-0.316	-0.274	-0.224
Ln(Q) – Triennial survey (1980-1992, WA only)	0.621	0.355	-0.038
Ln(Q) – Triennial survey offset (1995-2004) to early	-0.590	-0.631	-0.676
CA Rec. length selectivity inflection	33.634	33.837	34.038
CA Comm. length selectivity inflection	36.040	36.149	36.248
OR Rec. length selectivity inflection	31.840	32.036	32.236
OR Rec. Obs. length selectivity inflection	22.372	22.727	23.061
OR Comm. length selectivity inflection	38.747	38.864	38.954
WA Rec. length selectivity inflection	42.110	42.643	43.083
WA Comm. length selectivity inflection	43.627	43.863	44.056
CA Rec. 95% width of selectivity logistic	13.846	13.697	13.531
CA Comm. 95% width of selectivity logistic	12.035	11.939	11.823
OR Rec. 95% width of selectivity logistic	7.988	8.021	8.038
OR Rec. Obs. 95% width of selectivity logistic	3.835	4.113	4.356
OR Comm. 95% width of selectivity logistic	12.355	12.189	11.972
WA Rec. 95% width of selectivity logistic	11.842	12.015	12.076
WA Comm. 95% width of selectivity logistic	10.511	10.466	10.392
OR IPHC length selectivity inflection	46.939	47.002	47.056
WA IPHC length selectivity inflection	57.807	57.989	58.117
OR IPHC 95% width of selectivity logistic	5.312	5.318	5.313
WA IPHC 95% width of selectivity logistic	9.831	9.829	9.818
NWFSC Length at peak selectivity	52.065	52.193	52.327
NWFSC ascending width (as exp[width])	6.432	6.346	6.265
Triennial ascending width (as exp[width])	6.655	6.670	6.686
NWFSC descending width (as exp[width])	3.202	3.169	3.132
Triennial initial selectivity (as logistic)	-2.957	-3.093	-3.234
Female length at age 1	18.524	18.393	18.227
Female length at age 70	62.418	62.380	62.346
Female von Bertalanffy K	0.049	0.049	0.049
Female CV of length at age 1	0.128	0.128	0.128
Female CV of length at age 70	0.071	0.071	0.072
Male length at age 70	64.783	64.738	64.701
Male von Bertalanffy K	0.048	0.048	0.049
Male CV of length at age 1	0.131	0.130	0.129
Male CV of length at age 70	0.061	0.061	0.061

Table 19. Yelloweye rockfish stock-recruitment, mortality and growth parameter estimates (or derived values) and standard errors from the base case model.

Parameter	Value	SD
R_0 – California (1000s Age-0)	104.3	NA
R_0 - Oregon (1000s Age-0)	94.5	NA
R_0 - Washington (1000s Age-0)	28.3	NA
Steepness (*h*)	0.417	0.054
Females:		
Natural mortality (*M*)	0.047	0.002
Length at age 1 (cm)	18.393	0.684
Length at age 70 (cm)	62.380	0.373
von Bertalanffy *K*	0.049	0.002
CV of length at age 1	0.128	0.012
CV of length at age 70	0.071	0.004
Males:		
Natural mortality (*M*)	0.047	0.001
Length at age 1 (cm)	Equal to female	NA
Length at age 70 (cm)	64.738	0.326
von Bertalanffy *K*	0.048	0.002
CV of length at age 1	0.130	0.011
CV of length at age 70	0.061	0.004

Table 20. Comparison of summary quantities among the base case and alternate states of nature.

Model	Low	Base case	High
Convergence			
Maximum gradient component	0.0000023	0.0000018	0.0000063
Negative log-likelihoods			
Total	6,105.1	6,102.5	6,100.4
Indices	-28.9	-28.3	-27.6
Length-frequency data	2,506.0	2,503.8	2,502.9
Age-frequency data	3,627.9	3,626.1	3,625.0
Priors	0.0	0.9	0.1
Select parameters			
Equilibrium recruitment (R_0, 1000s age-0)	178	227	330
Steepness (*h*)	0.344	0.417	0.508
Male *M*	0.048	0.047	0.046
Management quantities			
Equilibrium spawning output (SB_0, millions eggs)	743	994	1,499
2009 Spawning depletion	17.3%	20.3%	23.5%
2009 age-8+ biomass (mt)	1,267	2,008	3,477
2008 *SPR*	71.4%	79.3%	86.7%
MSY (mt)	31.5	56.1	107.9

Table 21. Time-series of population estimates from the base case model.

Year	Age-8+ biomass (mt)	Spawning output (millions eggs)	Spawning depletion	Age-0 recruits (1000s)	Total catch (mt)	SPR	Relative exploitation rate
1916	8,492	994	100.0%	227	2.2	99.1%	0.0%
1917	8,490	994	100.0%	227	3.6	98.5%	0.0%
1918	8,487	994	99.9%	227	4.3	98.3%	0.1%
1919	8,483	993	99.9%	227	2.2	99.1%	0.0%
1920	8,481	993	99.9%	227	2.4	99.0%	0.0%
1921	8,478	993	99.8%	227	2.3	99.0%	0.0%
1922	8,476	992	99.8%	227	2.1	99.1%	0.0%
1923	8,475	992	99.8%	227	2.2	99.1%	0.0%
1924	8,473	992	99.8%	227	2.8	98.8%	0.0%
1925	8,471	992	99.7%	227	4.9	98.0%	0.1%
1926	8,466	991	99.7%	227	5.9	97.6%	0.1%
1927	8,461	990	99.6%	227	6.9	97.2%	0.1%
1928	8,455	990	99.5%	227	6.6	97.3%	0.1%
1929	8,449	989	99.5%	227	7.6	96.9%	0.1%
1930	8,443	988	99.4%	227	9.1	96.3%	0.1%
1931	8,435	987	99.3%	226	8.5	96.5%	0.1%
1932	8,427	986	99.2%	226	11.5	95.4%	0.1%
1933	8,418	985	99.1%	226	8.5	96.5%	0.1%
1934	8,411	984	99.0%	226	10.4	95.8%	0.1%
1935	8,402	983	98.9%	226	13.2	94.7%	0.2%
1936	8,391	982	98.7%	226	14.0	94.4%	0.2%
1937	8,379	980	98.6%	226	13.0	94.8%	0.2%
1938	8,369	979	98.4%	226	13.1	94.7%	0.2%
1939	8,359	977	98.3%	226	12.4	95.0%	0.1%
1940	8,349	976	98.2%	226	13.5	94.5%	0.2%
1941	8,339	975	98.0%	225	14.8	94.0%	0.2%
1942	8,327	973	97.9%	225	14.3	94.1%	0.2%
1943	8,316	972	97.8%	225	25.8	89.9%	0.3%
1944	8,295	969	97.5%	225	52.8	81.1%	0.6%
1945	8,247	963	96.9%	225	97.2	70.0%	1.2%
1946	8,157	952	95.8%	224	85.8	73.0%	1.1%
1947	8,080	943	94.8%	223	33.7	86.7%	0.4%
1948	8,055	939	94.5%	222	42.2	84.1%	0.5%
1949	8,022	935	94.0%	222	31.9	87.2%	0.4%
1950	7,999	932	93.7%	222	34.6	86.2%	0.4%
1951	7,975	929	93.4%	222	42.1	84.1%	0.5%
1952	7,945	925	93.0%	221	37.4	85.4%	0.5%
1953	7,919	921	92.7%	221	31.8	87.2%	0.4%
1954	7,899	919	92.4%	221	37.9	85.1%	0.5%
1955	7,873	915	92.1%	220	46.9	81.5%	0.6%
1956	7,839	911	91.6%	220	51.2	80.3%	0.7%

Table 21. continued. Time-series of population estimates from the base case model.

Year	Age-8+ biomass (mt)	Spawning output (millions eggs)	Spawning depletion	Age-0 recruits (1000s)	Total catch (mt)	SPR	Relative exploitation rate
1957	7,802	906	91.1%	220	59.5	77.4%	0.8%
1958	7,757	901	90.6%	219	69.4	74.7%	0.9%
1959	7,703	894	89.9%	218	61.8	76.5%	0.8%
1960	7,657	888	89.3%	218	55.1	78.3%	0.7%
1961	7,619	883	88.8%	217	46.2	81.2%	0.6%
1962	7,590	880	88.5%	217	52.9	78.8%	0.7%
1963	7,555	875	88.0%	217	57.8	77.2%	0.8%
1964	7,516	870	87.5%	216	52.5	78.8%	0.7%
1965	7,483	866	87.1%	216	63.9	75.2%	0.9%
1966	7,440	860	86.5%	215	70.5	73.1%	0.9%
1967	7,391	854	85.9%	215	69.4	73.3%	0.9%
1968	7,343	848	85.3%	214	74.1	72.0%	1.0%
1969	7,292	842	84.6%	213	99.6	65.7%	1.4%
1970	7,217	832	83.7%	213	109.1	63.7%	1.5%
1971	7,134	822	82.7%	212	120.8	61.8%	1.7%
1972	7,040	810	81.5%	210	159.4	55.1%	2.3%
1973	6,911	795	79.9%	209	155.7	56.4%	2.3%
1974	6,787	779	78.4%	207	170.9	53.7%	2.5%
1975	6,650	762	76.7%	205	166.8	55.6%	2.5%
1976	6,520	746	75.0%	203	195.7	47.1%	3.0%
1977	6,363	727	73.1%	201	200.1	44.8%	3.1%
1978	6,205	707	71.1%	199	310.1	35.3%	5.0%
1979	5,942	675	67.9%	195	317.8	27.8%	5.3%
1980	5,675	643	64.6%	191	259.6	30.1%	4.6%
1981	5,469	617	62.0%	187	364.3	24.6%	6.7%
1982	5,165	580	58.3%	182	421.3	19.9%	8.2%
1983	4,809	537	54.0%	175	366.0	20.6%	7.6%
1984	4,512	499	50.2%	169	251.3	24.9%	5.6%
1985	4,330	477	47.9%	165	288.0	20.8%	6.7%
1986	4,117	450	45.3%	160	227.8	24.9%	5.5%
1987	3,964	431	43.3%	156	251.3	21.6%	6.3%
1988	3,790	409	41.1%	151	279.5	18.8%	7.4%
1989	3,591	385	38.7%	146	346.9	13.9%	9.7%
1990	3,328	353	35.5%	139	237.4	20.2%	7.1%
1991	3,172	334	33.6%	134	368.0	11.7%	11.6%
1992	2,891	301	30.3%	126	372.8	9.5%	12.9%
1993	2,606	268	26.9%	117	318.7	12.3%	12.2%
1994	2,374	240	24.1%	108	223.4	14.0%	9.4%
1995	2,236	223	22.5%	103	254.6	12.7%	11.4%
1996	2,069	203	20.5%	96	217.7	12.2%	10.5%
1997	1,937	188	18.9%	91	244.1	9.8%	12.6%

Table 21. continued. Time-series of population estimates from the base case model.

Year	Age-8+ biomass (mt)	Spawning output (millions eggs)	Spawning depletion	Age-0 recruits (1000s)	Total catch (mt)	SPR	Relative exploitation rate
1998	1,779	170	17.1%	84	107.0	23.6%	6.0%
1999	1,751	166	16.7%	83	155.8	17.3%	8.9%
2000	1,674	157	15.8%	79	40.9	53.0%	2.4%
2001	1,704	160	16.1%	80	56.1	53.0%	3.3%
2002	1,717	162	16.3%	81	15.8	76.6%	0.9%
2003	1,767	167	16.8%	83	12.4	78.8%	0.7%
2004	1,817	173	17.4%	85	12.3	82.0%	0.7%
2005	1,864	180	18.1%	88	15.1	79.2%	0.8%
2006	1,904	185	18.6%	90	12.4	79.6%	0.6%
2007	1,945	191	19.2%	92	19.6	70.6%	1.0%
2008	1,976	196	19.8%	94	16.7	79.3%	0.8%
2009	2,008	202	20.3%	96	NA	NA	NA

Table 22. Time-series of population estimates from the low state of nature.

Year	Age-8+ biomass (mt)	Spawning output (millions eggs)	Spawning depletion	Age-0 recruits (1000s)	Total catch (mt)	SPR	Relative exploitation rate
1916	6,399	743	100.0%	178	1.7	99.1%	0.0%
1917	6,398	743	100.0%	178	2.7	98.5%	0.0%
1918	6,395	743	99.9%	178	3.2	98.3%	0.0%
1919	6,392	742	99.9%	178	1.6	99.1%	0.0%
1920	6,391	742	99.9%	178	1.8	99.0%	0.0%
1921	6,389	742	99.8%	178	1.7	99.1%	0.0%
1922	6,388	742	99.8%	178	1.6	99.2%	0.0%
1923	6,386	742	99.8%	178	1.7	99.1%	0.0%
1924	6,385	742	99.8%	178	2.1	98.8%	0.0%
1925	6,383	741	99.7%	178	3.6	98.1%	0.1%
1926	6,380	741	99.7%	178	4.4	97.7%	0.1%
1927	6,376	740	99.6%	178	5.2	97.3%	0.1%
1928	6,371	740	99.5%	178	5.0	97.4%	0.1%
1929	6,367	739	99.5%	178	5.7	97.0%	0.1%
1930	6,362	739	99.4%	178	6.9	96.4%	0.1%
1931	6,356	738	99.3%	177	6.4	96.6%	0.1%
1932	6,351	737	99.2%	177	8.7	95.5%	0.1%
1933	6,343	736	99.1%	177	6.3	96.6%	0.1%
1934	6,338	736	99.0%	177	7.8	95.9%	0.1%
1935	6,332	735	98.9%	177	9.9	94.8%	0.2%
1936	6,323	734	98.7%	177	10.5	94.5%	0.2%
1937	6,315	733	98.6%	177	9.7	94.9%	0.2%
1938	6,307	732	98.4%	177	9.8	94.8%	0.2%
1939	6,299	731	98.3%	177	9.3	95.1%	0.1%
1940	6,292	730	98.2%	176	10.1	94.6%	0.2%
1941	6,284	729	98.0%	176	11.1	94.1%	0.2%
1942	6,275	728	97.9%	176	10.8	94.2%	0.2%
1943	6,267	727	97.8%	176	19.4	90.0%	0.3%
1944	6,250	725	97.5%	176	39.6	81.4%	0.6%
1945	6,215	720	96.9%	175	72.9	70.4%	1.2%
1946	6,147	712	95.8%	174	64.4	73.4%	1.0%
1947	6,089	705	94.8%	174	25.3	87.0%	0.4%
1948	6,070	702	94.5%	173	31.7	84.4%	0.5%
1949	6,045	699	94.1%	173	24.0	87.5%	0.4%
1950	6,028	697	93.8%	173	25.9	86.5%	0.4%
1951	6,010	694	93.4%	172	31.6	84.3%	0.5%
1952	5,986	691	93.0%	172	28.1	85.6%	0.5%
1953	5,967	689	92.7%	172	23.9	87.4%	0.4%
1954	5,952	687	92.4%	171	28.4	85.4%	0.5%
1955	5,932	684	92.1%	171	35.2	81.9%	0.6%
1956	5,906	681	91.6%	171	38.4	80.6%	0.6%

Table 22. continued. Time-series of population estimates from the low state of nature.

Year	Age-8+ biomass (mt)	Spawning output (millions eggs)	Spawning depletion	Age-0 recruits (1000s)	Total catch (mt)	SPR	Relative exploitation rate
1957	5,877	678	91.2%	170	44.6	77.8%	0.8%
1958	5,842	673	90.6%	170	52.1	75.1%	0.9%
1959	5,801	668	89.9%	169	46.4	76.8%	0.8%
1960	5,766	664	89.3%	168	41.3	78.6%	0.7%
1961	5,737	660	88.8%	168	34.6	81.5%	0.6%
1962	5,714	657	88.4%	168	39.7	79.1%	0.7%
1963	5,687	654	88.0%	167	43.4	77.6%	0.8%
1964	5,657	650	87.5%	167	39.4	79.1%	0.7%
1965	5,631	647	87.0%	166	48.0	75.6%	0.9%
1966	5,597	643	86.5%	166	52.9	73.5%	0.9%
1967	5,559	638	85.8%	165	52.1	73.7%	0.9%
1968	5,522	633	85.2%	164	55.6	72.4%	1.0%
1969	5,482	629	84.6%	164	74.7	66.1%	1.4%
1970	5,424	621	83.6%	163	81.8	64.1%	1.5%
1971	5,360	614	82.5%	162	90.6	62.2%	1.7%
1972	5,288	605	81.4%	161	119.6	55.5%	2.3%
1973	5,189	593	79.8%	159	116.8	56.7%	2.3%
1974	5,095	581	78.2%	157	128.2	54.1%	2.5%
1975	4,990	569	76.5%	155	125.1	56.0%	2.5%
1976	4,891	556	74.9%	153	146.8	47.5%	3.0%
1977	4,771	542	72.9%	151	150.0	45.1%	3.1%
1978	4,650	527	70.9%	149	232.6	35.7%	5.0%
1979	4,451	503	67.7%	145	238.4	28.2%	5.4%
1980	4,249	479	64.4%	141	194.7	30.5%	4.6%
1981	4,092	459	61.8%	137	273.3	24.9%	6.7%
1982	3,862	431	58.0%	132	316.0	20.2%	8.2%
1983	3,593	399	53.7%	126	274.5	20.9%	7.6%
1984	3,367	371	49.9%	120	188.5	25.1%	5.6%
1985	3,228	354	47.6%	117	216.0	21.0%	6.7%
1986	3,065	334	44.9%	112	170.8	25.1%	5.6%
1987	2,947	319	42.9%	109	188.4	21.7%	6.4%
1988	2,812	303	40.7%	105	209.6	19.0%	7.5%
1989	2,658	284	38.2%	101	260.2	13.9%	9.8%
1990	2,456	260	35.0%	94	178.0	20.2%	7.2%
1991	2,334	246	33.0%	91	276.0	11.7%	11.8%
1992	2,118	221	29.7%	84	279.6	9.4%	13.2%
1993	1,898	196	26.3%	76	239.0	12.0%	12.6%
1994	1,718	174	23.4%	70	167.6	13.6%	9.8%
1995	1,607	161	21.7%	65	191.0	12.3%	11.9%
1996	1,475	146	19.6%	60	163.2	11.7%	11.1%
1997	1,369	134	18.0%	56	183.1	9.3%	13.4%

Table 22. continued. Time-series of population estimates from the low state of nature.

Year	Age-8+ biomass (mt)	Spawning output (millions eggs)	Spawning depletion	Age-0 recruits (1000s)	Total catch (mt)	SPR	Relative exploitation rate
1998	1,243	120	16.1%	51	80.2	22.1%	6.5%
1999	1,213	116	15.6%	50	116.9	15.9%	9.6%
2000	1,147	109	14.6%	47	40.9	42.3%	3.6%
2001	1,152	109	14.7%	47	56.1	42.4%	4.9%
2002	1,139	108	14.5%	47	15.8	68.6%	1.4%
2003	1,164	111	14.9%	48	12.4	70.8%	1.1%
2004	1,189	114	15.4%	49	12.3	75.2%	1.0%
2005	1,212	118	15.8%	50	15.1	71.5%	1.2%
2006	1,229	121	16.2%	51	12.4	71.3%	1.0%
2007	1,247	124	16.6%	53	19.6	60.4%	1.6%
2008	1,256	126	16.9%	53	16.7	71.4%	1.3%
2009	1,267	128	17.3%	54	NA	NA	NA

Table 23. Time-series of population estimates from the high state of nature.

Year	Age-8+ biomass (mt)	Spawning output (millions eggs)	Spawning depletion	Age-0 recruits (1000s)	Total catch (mt)	SPR	Relative exploitation rate
1916	12,718	1,499	100.0%	330	3.3	99.1%	0.0%
1917	12,715	1,499	100.0%	330	5.4	98.5%	0.0%
1918	12,710	1,498	99.9%	330	6.4	98.2%	0.1%
1919	12,704	1,497	99.9%	330	3.2	99.1%	0.0%
1920	12,701	1,497	99.9%	330	3.6	99.0%	0.0%
1921	12,698	1,496	99.8%	330	3.5	99.0%	0.0%
1922	12,695	1,496	99.8%	330	3.1	99.1%	0.0%
1923	12,692	1,496	99.8%	330	3.3	99.1%	0.0%
1924	12,690	1,495	99.8%	330	4.2	98.8%	0.0%
1925	12,686	1,495	99.7%	330	7.3	98.0%	0.1%
1926	12,680	1,494	99.7%	330	8.8	97.6%	0.1%
1927	12,672	1,493	99.6%	329	10.4	97.2%	0.1%
1928	12,663	1,492	99.5%	329	10.0	97.3%	0.1%
1929	12,654	1,491	99.5%	329	11.4	96.9%	0.1%
1930	12,644	1,489	99.4%	329	13.7	96.3%	0.1%
1931	12,632	1,488	99.3%	329	12.8	96.5%	0.1%
1932	12,621	1,487	99.2%	329	17.3	95.3%	0.1%
1933	12,607	1,485	99.0%	329	12.7	96.5%	0.1%
1934	12,596	1,483	99.0%	329	15.6	95.7%	0.1%
1935	12,584	1,482	98.9%	329	19.8	94.7%	0.2%
1936	12,567	1,480	98.7%	329	21.0	94.3%	0.2%
1937	12,550	1,477	98.6%	329	19.4	94.7%	0.2%
1938	12,534	1,475	98.4%	329	19.7	94.6%	0.2%
1939	12,519	1,473	98.3%	328	18.6	94.9%	0.1%
1940	12,504	1,472	98.2%	328	20.2	94.4%	0.2%
1941	12,489	1,470	98.0%	328	22.2	93.9%	0.2%
1942	12,472	1,467	97.9%	328	21.5	94.0%	0.2%
1943	12,456	1,465	97.7%	328	38.7	89.7%	0.3%
1944	12,424	1,461	97.5%	328	79.2	80.8%	0.6%
1945	12,353	1,452	96.9%	327	145.8	69.7%	1.2%
1946	12,218	1,435	95.8%	326	128.8	72.7%	1.1%
1947	12,102	1,421	94.8%	325	50.6	86.6%	0.4%
1948	12,064	1,416	94.5%	325	63.4	84.0%	0.5%
1949	12,015	1,409	94.0%	325	47.9	87.1%	0.4%
1950	11,982	1,405	93.7%	325	51.9	86.1%	0.4%
1951	11,946	1,400	93.4%	324	63.2	83.9%	0.5%
1952	11,901	1,394	93.0%	324	56.2	85.2%	0.5%
1953	11,863	1,389	92.7%	324	47.7	87.1%	0.4%
1954	11,833	1,385	92.4%	323	56.8	84.9%	0.5%
1955	11,796	1,380	92.1%	323	70.4	81.3%	0.6%
1956	11,746	1,374	91.6%	323	76.8	80.1%	0.7%

Table 23. continued. Time-series of population estimates from the high state of nature.

Year	Age-8+ biomass (mt)	Spawning output (millions eggs)	Spawning depletion	Age-0 recruits (1000s)	Total catch (mt)	SPR	Relative exploitation rate
1957	11,691	1,366	91.2%	322	89.2	77.2%	0.8%
1958	11,624	1,358	90.6%	322	104.1	74.5%	0.9%
1959	11,545	1,348	89.9%	321	92.8	76.2%	0.8%
1960	11,478	1,339	89.3%	321	82.6	78.1%	0.7%
1961	11,422	1,332	88.9%	320	69.2	81.0%	0.6%
1962	11,380	1,326	88.5%	320	79.4	78.6%	0.7%
1963	11,330	1,320	88.0%	319	86.7	77.0%	0.8%
1964	11,273	1,312	87.5%	319	78.8	78.6%	0.7%
1965	11,226	1,306	87.1%	318	95.9	75.0%	0.9%
1966	11,163	1,298	86.6%	318	105.8	72.8%	0.9%
1967	11,091	1,289	86.0%	317	104.1	73.1%	0.9%
1968	11,022	1,280	85.4%	317	111.1	71.8%	1.0%
1969	10,948	1,270	84.7%	316	149.3	65.5%	1.4%
1970	10,838	1,256	83.8%	315	163.7	63.4%	1.5%
1971	10,716	1,241	82.8%	314	181.2	61.6%	1.7%
1972	10,579	1,224	81.7%	313	239.1	54.8%	2.3%
1973	10,387	1,200	80.1%	311	233.6	56.2%	2.2%
1974	10,205	1,177	78.5%	309	256.4	53.5%	2.5%
1975	10,003	1,152	76.9%	307	250.2	55.4%	2.5%
1976	9,810	1,128	75.3%	305	293.6	46.9%	3.0%
1977	9,578	1,099	73.3%	303	300.1	44.6%	3.1%
1978	9,344	1,070	71.4%	301	465.1	35.2%	5.0%
1979	8,953	1,022	68.2%	296	476.7	27.7%	5.3%
1980	8,557	973	64.9%	292	389.3	30.0%	4.5%
1981	8,251	935	62.3%	288	546.5	24.4%	6.6%
1982	7,799	879	58.6%	282	632.0	19.7%	8.1%
1983	7,270	814	54.3%	274	548.9	20.5%	7.6%
1984	6,829	759	50.6%	267	377.0	24.8%	5.5%
1985	6,562	725	48.3%	262	432.0	20.8%	6.6%
1986	6,247	685	45.7%	256	341.7	24.9%	5.5%
1987	6,024	656	43.8%	251	376.9	21.6%	6.3%
1988	5,770	624	41.6%	246	419.3	18.9%	7.3%
1989	5,480	588	39.2%	240	520.4	14.0%	9.5%
1990	5,095	540	36.0%	231	356.1	20.4%	7.0%
1991	4,871	513	34.2%	225	552.0	11.8%	11.3%
1992	4,461	464	31.0%	214	559.3	9.7%	12.5%
1993	4,046	415	27.7%	202	478.1	12.8%	11.8%
1994	3,710	374	24.9%	191	335.2	14.5%	9.0%
1995	3,517	350	23.3%	184	381.9	13.2%	10.9%
1996	3,281	321	21.4%	174	326.5	12.8%	10.0%
1997	3,099	299	20.0%	167	366.2	10.5%	11.8%

Table 23. continued. Time-series of population estimates from the high state of nature.

Year	Age-8+ biomass (mt)	Spawning output (millions eggs)	Spawning depletion	Age-0 recruits (1000s)	Total catch (mt)	SPR	Relative exploitation rate
1998	2,879	274	18.3%	158	160.4	25.3%	5.6%
1999	2,853	269	18.0%	156	233.7	19.0%	8.2%
2000	2,757	257	17.2%	152	40.9	65.8%	1.5%
2001	2,841	265	17.7%	155	56.1	65.3%	2.0%
2002	2,908	272	18.1%	157	15.8	84.5%	0.5%
2003	3,012	283	18.9%	162	12.4	86.4%	0.4%
2004	3,115	295	19.7%	166	12.3	88.4%	0.4%
2005	3,214	307	20.5%	170	15.1	86.5%	0.5%
2006	3,305	319	21.3%	174	12.4	87.2%	0.4%
2007	3,397	331	22.1%	178	19.6	80.9%	0.6%
2008	3,477	342	22.8%	181	16.7	86.7%	0.5%
2009	3,558	353	23.5%	184	NA	NA	NA

Table 24. Relative distribution of potential yelloweye habitat based on the hardest rocky lithology categories from current habitat maps (C. Whitmire, NWFSC, Personal Communication).

Region	Total area (ha)	Potential yelloweye habitat (ha)	Percent of region
California: South of Pt. Conception	1,239,388	187,602	15.1%
California: North of Pt. Conception	1,826,229	68,704	3.8%
Oregon	1,967,384	206,807	10.5%
Washington	957,596	46,434	4.8%

Table 25. Sensitivity analyses requested during the STAR panel review.

Model	Base case	Include 2000-2001 Rec. CPUE observations	Increase lambdas on indices by 10x	Force catchability for Rec. CPUE indices to be strictly linear	Allow Oregon IPHC survey selectivity to be dome-shaped
Convergence					
Maximum gradient component	0.0000018	0.0000393	0.0000034	0.0002225	0.0000080
Negative log-likelihoods					
Total	6,102.5	*6,101.3*	*5,842.0*	6,103.8	6,090.2
Indices	-28.3	*-29.6*	*-293.9*	-27.3	-28.3
Length-frequency data	2,503.8	2503.8	2,506.9	2,504.1	2,495.8
Age-frequency data	3,626.1	3626.2	3,627.3	3,625.9	3,621.9
Priors	0.9	0.9	1.7	1.0	0.9
Select parameters					
Equilibrium recruitment (R_0, 1000s age-0)	227	227	236	225	224
Steepness (*h*)	0.417	0.412	0.302	0.405	0.424
Male *M*	0.047	0.047	0.048	0.047	0.046
Management quantities					
Equilibrium spawning output (SB_0, millions eggs)	994	994	989	993	1,006
2009 Spawning depletion	20.3%	20.1%	15.4%	19.6%	20.9%
2009 age-8+ biomass (mt)	2,008	1,985	1,480	1,930	2,088
2008 *SPR*	79.3%	79.1%	74.5%	78.6%	79.7%
MSY (mt)	56.1	55.2	31.5	53.6	57.3

Table 26. Comparison among sensitivity analyses to catch history performed prior to the STAR panel review. Note that the base case model differs from that reported in this document.

Model	Pre-STAR base	200% of catch < 1976	50% of catch < 1976	200% of catch < 1996	50% of catch < 1996
Convergence					
Maximum gradient component	0.00000047	0.00003971	0.00000033	0.00000435	0.00000763
Negative log-likelihoods					
Total	5,903.3	5,941.8	5,892.0	5,883.8	5,947.0
Indices	-29.0	-12.3	-29.4	-28.8	-28.4
Length-frequency data	2,331.1	2,350.2	2,321.8	2,314.7	2,366.2
Age-frequency data	3,598.8	3,601.9	3,596.9	3,595.6	3,607.4
Priors	2.3	2.0	2.6	2.3	1.9
Select parameters					
Equilibrium recruitment (R_0, 1000s age-0)	239	238	234	414	162
Steepness (*h*)	0.342	0.437	0.299	0.361	0.392
Male *M*	0.047	0.042	0.049	0.044	0.051
Management quantities					
Equilibrium spawning output (SB_0, millions eggs)	1,050	1,281	942	2,028	582
2009 Spawning depletion	14.8%	13.8%	15.5%	14.8%	21.6%
2009 age-8+ biomass (mt)	1,527	1,764	1,422	2,908	1,284
2008 *SPR*	75.3%	71.8%	74.1%	85.0%	72.3%
MSY (mt)	42.7	68.6	30.0	85.8	33.3

Table 27. Comparison among sensitivity analyses to treatment of data performed prior to the STAR panel review. Note that the base case model differs from that reported in this document. Likelihoods in italics are not comparable across rows.

Model	Pre-STAR base	Reduce emphasis on length data by 50%	Reduce emphasis on age data by 50%	Remove all fishery CPUE data	Remove all fishery independent data	Remove all fishery independent data and *Q* power coefficients
Convergence						
Maximum gradient component	0.00000047	0.00001023	0.00000312	0.00009425	0.00007111	0.00032512
Negative log-likelihoods						
Total	5,903.3	*4,749.8*	*4,573.0*	*5,937.4*	*4,399.5*	*4,387.1*
Indices	-29.0	-29.1	-28.9	*5.3*	*-18.0*	*-30.6*
Length-frequency data	2,331.1	*1,201.3*	2,316.4	2,331.1	*1,971.7*	*1,972.0*
Age-frequency data	3,598.8	3,575.1	*2,283.1*	3,598.8	*2,443.7*	*2,443.9*
Priors	2.3	2.5	2.3	2.3	2.1	1.9
Select parameters						
Equilibrium recruitment (R_0, 1000s age-0)	239	242	246	239	279	279
Steepness (*h*)	0.342	0.325	0.34	0.353	0.342	0.369
Male *M*	0.047	0.047	0.048	0.047	0.056	0.056
Management quantities						
Equilibrium spawning output (SB_0, millions eggs)	1,050	1,043	1,044	1,051	1,096	1,097
2009 Spawning depletion	14.8%	15.0%	14.6%	15.4%	13.6%	15.1%
2009 age-8+ biomass (mt)	1,527	1,537	1,498	1,599	1,374	1,527
2008 *SPR*	75.3%	75.8%	75.0%	76.1%	75.4%	77.1%
MSY (mt)	42.7	39.6	42.5	45.5	46.3	53.0

Table 28. Comparison among sensitivity analyses to externally informed parameters performed prior to the STAR panel review. Note that the base case model differs from that reported in this document. Likelihoods in italics are not comparable across rows.

Model	Pre-STAR base	Remove steepness prior	Remove M priors	No fecundity relationship
Convergence				
Maximum gradient component	0.00000047	0.00000840	0.00000075	0.00000238
Negative log-likelihoods				
Total	5,903.3	*5,901.9*	*5,902.2*	5,902.9
Indices	-29.0	-29.1	-28.9	-28.9
Length-frequency data	2,331.1	2,331.1	2,331.1	2,331.0
Age-frequency data	3,598.8	3,598.8	3,598.8	3,598.7
Priors	2.3	*1.0*	*1.3*	2.2
Select parameters				
Equilibrium recruitment (R_0, 1000s age-0)	239	241	238	239
Steepness (*h*)	0.342	0.328	0.342	0.362
Male *M*	0.047	0.047	0.047	0.047
Management quantities				
Equilibrium spawning output (SB_0, millions eggs)	1,050	1,049	1,050	NA
2009 Spawning depletion	14.8%	14.3%	14.8%	13.0%
2009 age-8+ biomass (mt)	1,527	1,468	1,525	1,533
2008 *SPR*	75.3%	74.7%	75.3%	73.1%
MSY (mt)	42.7	39.7	42.9	43.8

Table 29. Comparison among sensitivity analyses to structural assumptions performed prior to the STAR panel review. Note that the base case model differs from that reported in this document. Likelihoods in italics are not comparable across rows.

Model	Pre-STAR base	No areas	No sex-specific growth or mortality (mimic single-sex model)	No areas or sex-specific growth or mortality	Estimate recruitment and area apportionment
Convergence					
Maximum gradient component	0.00000047	0.00006028	0.00000498	0.00001007	0.00668621
Negative log-likelihoods					
Total	5,903.3	5,899.4	*5,929.2*	*5,927.6*	*5,745.2*
Indices	-29.0	-29.6	-29.0	-29.6	-29.8
Length-frequency data	2,331.1	2,315.5	2,337.9	2,322.7	2,270.5
Age-frequency data	3,598.8	3,611.6	3,619.0	3,633.7	3,503.3
Priors	2.3	1.9	*1.3*	*0.9*	2.2
Select parameters					
Equilibrium recruitment (R_0, 1000s age-0)	239	251	235	248	196
Steepness (*h*)	0.342	0.42	0.346	0.424	0.393
Male *M*	0.047	0.047	0.047	0.047	0.042
Management quantities					
Equilibrium spawning output (SB_0, millions eggs)	1,050	1,060	1,161	1,158	1,076
2009 Spawning depletion	14.8%	19.3%	13.9%	18.4%	12.0%
2009 age-8+ biomass (mt)	1,527	2,066	1,486	2,031	1,239
2008 *SPR*	75.3%	74.9%	74.4%	74.0%	69.5%
MSY (mt)	42.7	64.9	42.7	64.4	49.7

Table 30. Relative probabilities for combinations of the two alternate states of nature to be used in the rebuilding analysis.

		Historical catch		
		Low	Best estimate	High
Steepness	Low	6.25%	12.5%	6.25%
	Estimated value	12.5%	25%	12.5%
	High	6.25%	12.5%	6.25%

Table 31. Projection of potential yelloweye rockfish ABC, OY, spawning output and depletion for the base case model based on the SPR = 71.9% fishing mortality target used for the last rebuilding plan (OY) and $F_{50\%}$ overfishing limit/target (ABC). Assuming the OY of 17 mt is achieved exactly in 2009 and 2010. Catch allocation used for the forecast reflects the average distribution of *F*s in 2005-2007 among fleets (recreational, commercial) in: Washington (0.013, 0.005), Oregon (0.004, 0.002) and California (0.006, 0.003).

Year	ABC[1] (mt)	OY[1] (mt)	Coast-wide Age 8+ biomass (mt)	Coast-wide Depletion	Spawning output (million eggs)			
					Coast-wide	California	Oregon	Washington
2009	*31*	*17*	2,008	20.3%	202	75	93	34
2010	*32*	*17*	2,039	20.8%	206	78	95	34
2011	49.3	20.9	2,068	21.2%	211	80	97	34
2012	49.9	21.2	2,093	21.6%	215	82	98	34
2013	50.5	21.4	2,118	22.0%	219	85	100	34
2014	51.1	21.7	2,141	22.4%	222	87	101	34
2015	51.6	21.9	2,165	22.7%	226	89	103	34
2016	52.1	22.1	2,187	23.0%	229	91	104	34
2017	52.6	22.3	2,210	23.3%	232	93	105	34
2018	53.0	22.5	2,232	23.6%	235	94	107	34
2019	53.5	22.7	2,255	23.9%	237	96	108	34
2020	53.9	22.9	2,277	24.1%	240	98	109	34

[1]ABC/OY values for 2009 and 2010 have already been adopted, and are not based on the results of this assessment.

Table 32. Decision table of 12-year projections for alternate states of nature (columns) and management options (rows) beginning in 2011. Relative probabilities are based on the joint distribution of alternate historical catch levels and steepness values.

			State of nature					
			75% of catch < 2000 and steepness = 0.344		Base case 100% of catch < 2000 and steepness = 0.417		150% of catch < 2000 and steepness = 0.508	
Relative probability			0.0625		0.25		0.0625	
Management decision	Year	Catch (mt)	Depletion	Spawning output (millions eggs)	Depletion	Spawning output (millions eggs)	Depletion	Spawning output (millions eggs)
Rebuilding SPR 71.9% catches from low alternative	2011	13.2	17.8%	132	21.2%	211	25.0%	375
	2012	13.4	18.1%	134	21.7%	216	25.7%	385
	2013	13.5	18.3%	136	22.2%	220	26.4%	396
	2014	13.6	18.6%	138	22.6%	225	27.1%	406
	2015	13.7	18.8%	140	23.0%	229	27.8%	416
	2016	13.7	19.0%	141	23.4%	233	28.4%	426
	2017	13.8	19.2%	142	23.8%	237	29.1%	436
	2018	13.9	19.3%	144	24.2%	241	29.7%	445
	2019	13.9	19.5%	145	24.6%	245	30.3%	455
	2020	14.0	19.6%	146	25.0%	248	31.0%	464
Rebuilding SPR 71.9% catches from base case	2011	20.9	17.8%	132	21.2%	211	25.0%	375
	2012	21.2	18.0%	134	21.6%	215	25.7%	385
	2013	21.4	18.1%	135	22.0%	219	26.3%	394
	2014	21.7	18.2%	136	22.4%	222	26.9%	404
	2015	21.9	18.3%	136	22.7%	226	27.5%	413
	2016	22.1	18.4%	137	23.0%	229	28.1%	422
	2017	22.3	18.5%	137	23.3%	232	28.7%	430
	2018	22.5	18.5%	137	23.6%	235	29.3%	439
	2019	22.7	18.5%	138	23.9%	237	29.9%	448
	2020	22.9	18.5%	138	24.1%	240	30.4%	456
Rebuilding SPR 71.9% catches from high alternative	2011	37.0	17.8%	132	21.2%	211	25.0%	375
	2012	37.6	17.7%	132	21.5%	213	25.5%	383
	2013	38.2	17.6%	131	21.7%	215	26.1%	391
	2014	38.7	17.5%	130	21.8%	217	26.6%	398
	2015	39.3	17.4%	129	22.0%	219	27.1%	406
	2016	39.8	17.2%	128	22.1%	220	27.5%	413
	2017	40.3	17.0%	126	22.2%	221	28.0%	419
	2018	40.8	16.7%	124	22.3%	222	28.4%	426
	2019	41.2	16.5%	123	22.4%	222	28.9%	433
	2020	41.7	16.2%	121	22.4%	223	29.3%	439

11. Figures

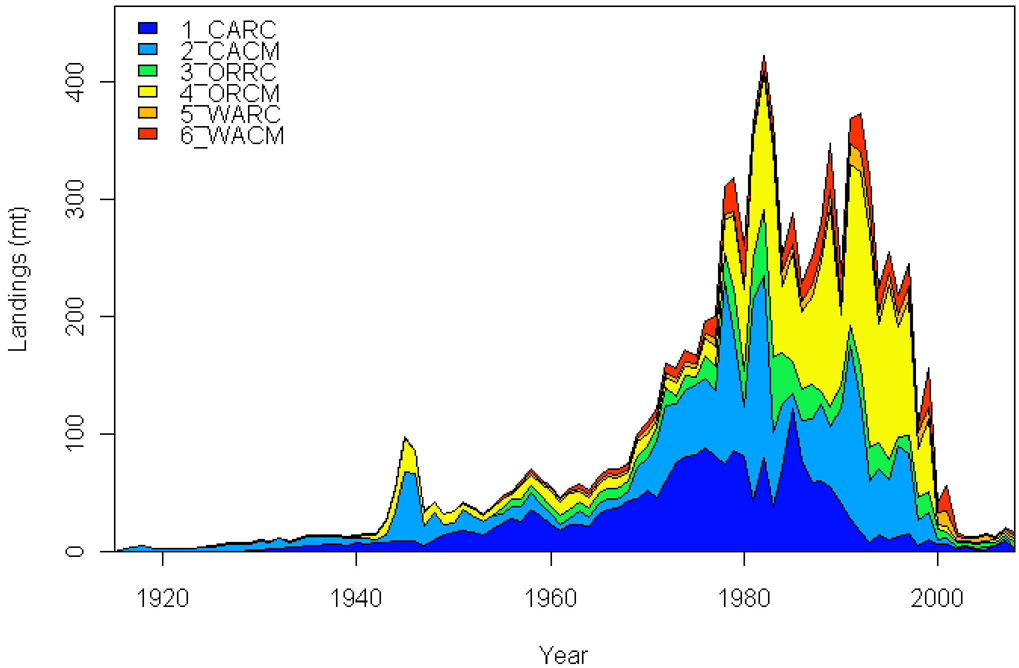

Figure 1. Yelloweye rockfish estimated catch history, 1916-2008. Fleet names indicated by state (WA, OR or CA) and sector (recreational = RC, commercial = CM).

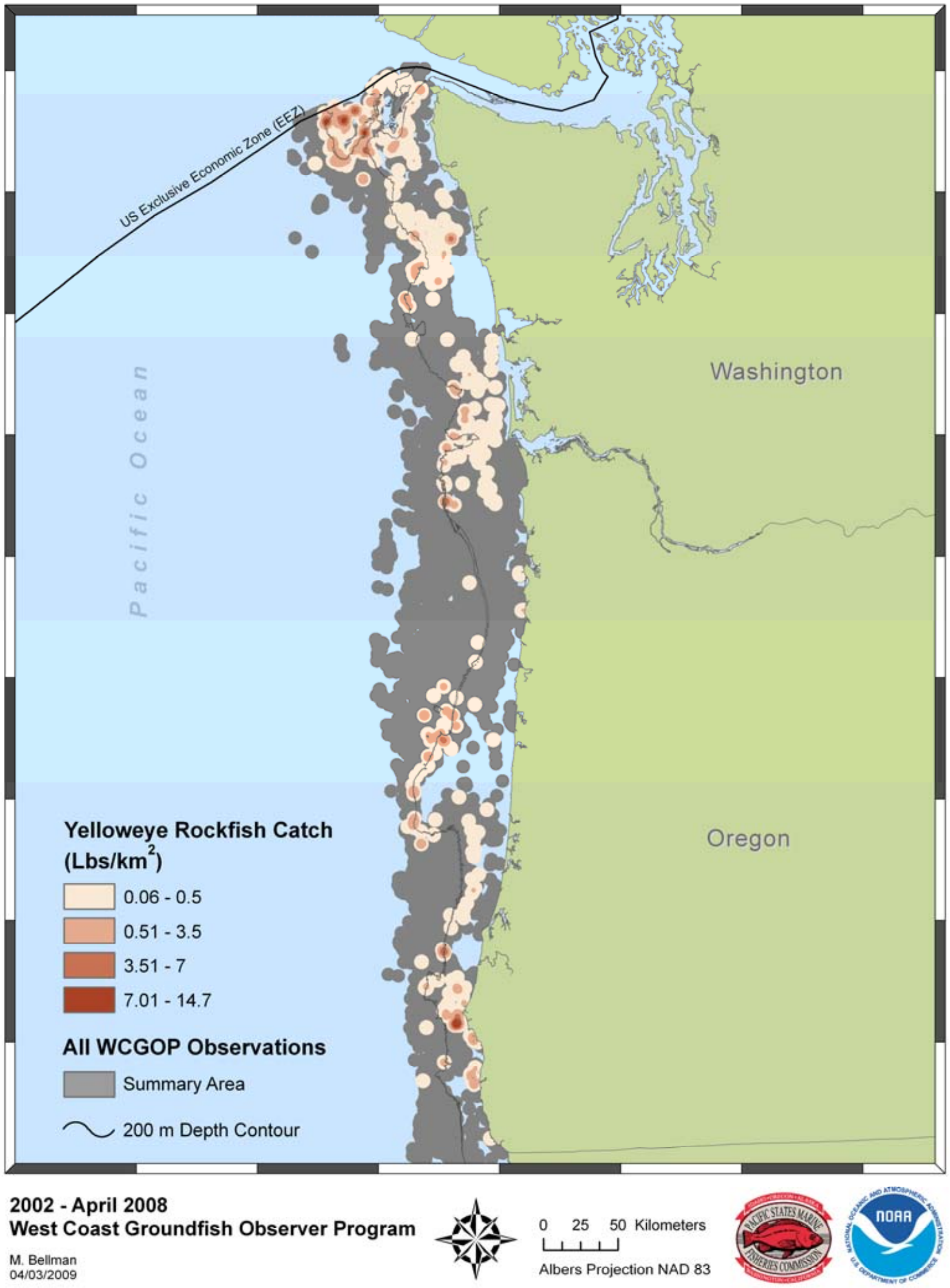

Figure 2. Spatial distribution of yelloweye rockfish catch (lbs/km^2) observed by the West Coast Groundfish Observer Program from 2002 – April 2008 in Oregon and Washington.

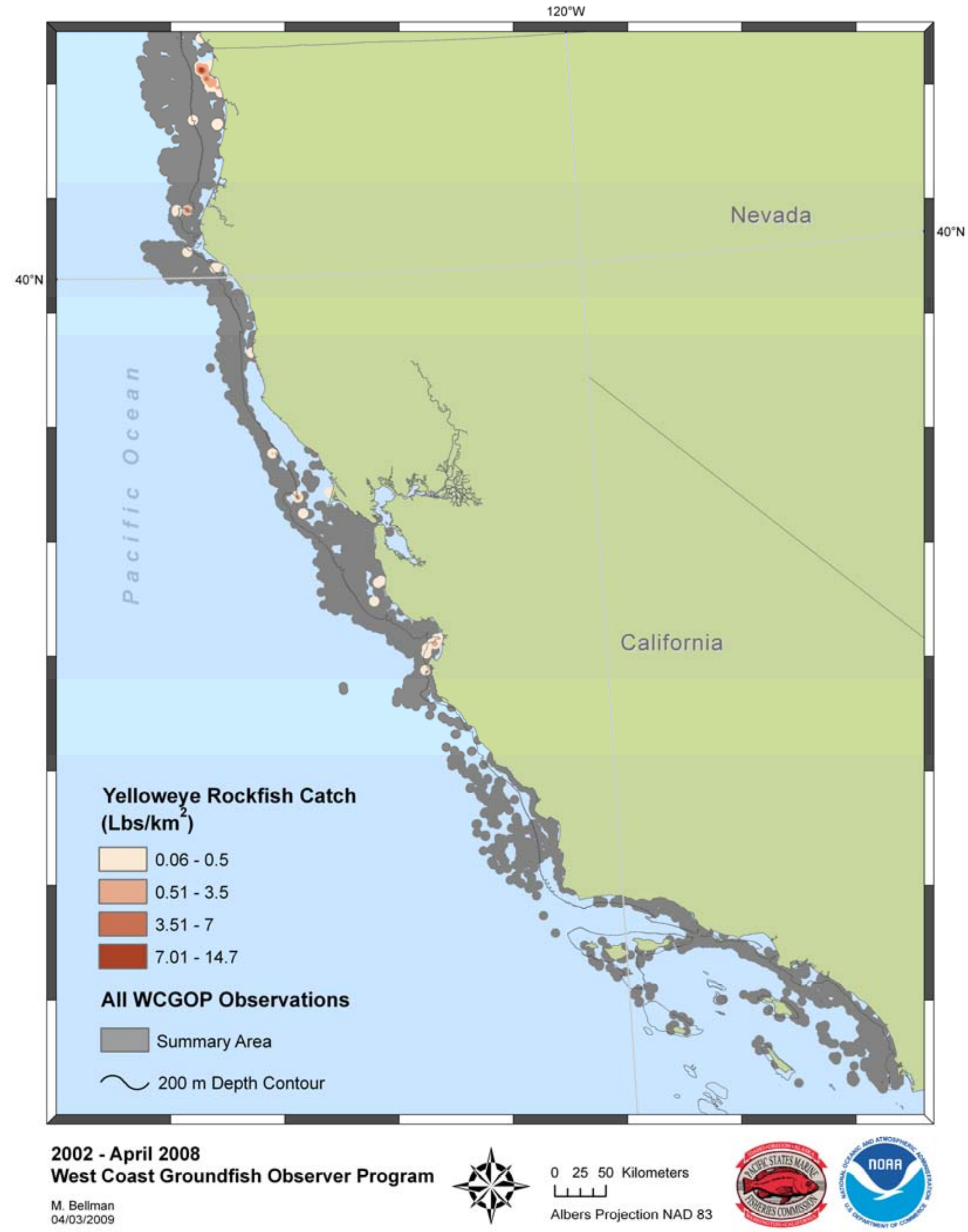

Figure 3. Spatial distribution of yelloweye rockfish catch (lbs/km^2) observed by the West Coast Groundfish Observer Program from 2002 – April 2008 in California.

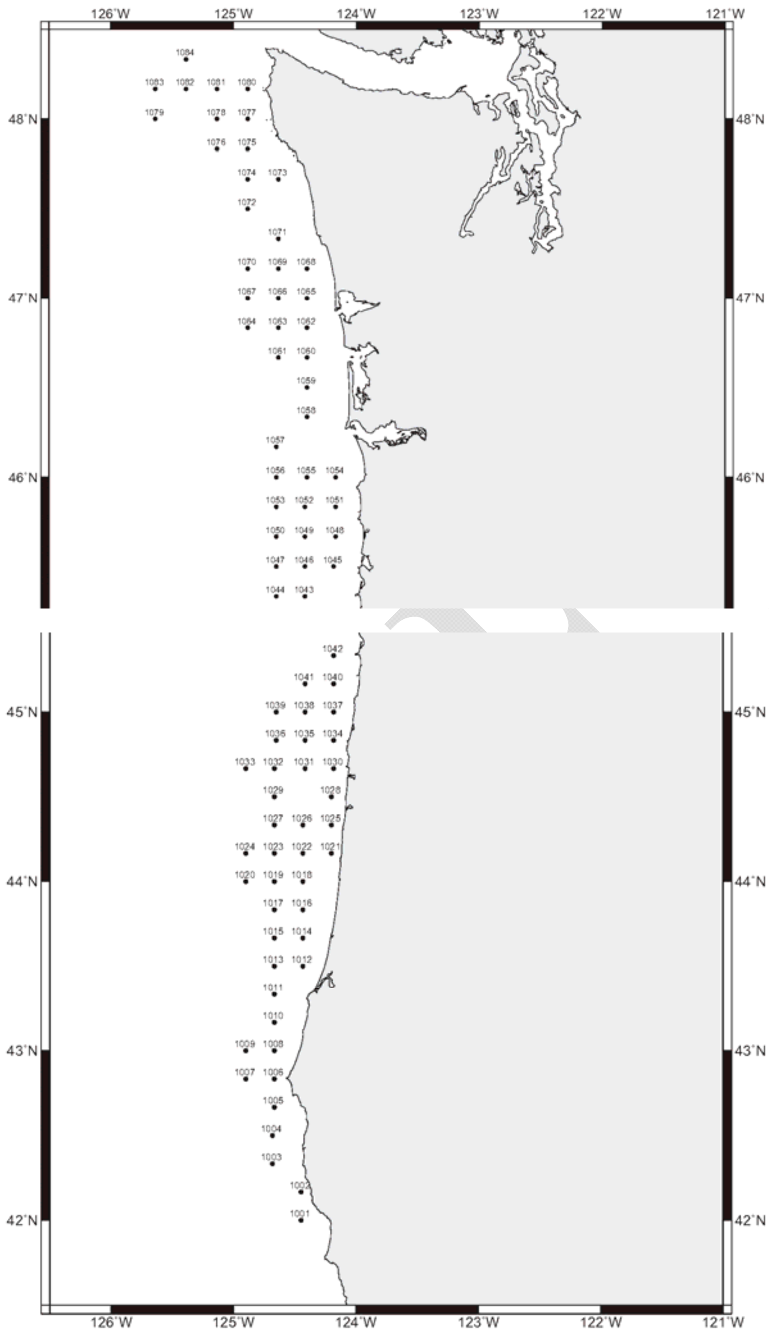

Figure 4. Stations fished by the IPHC long-line survey for Pacific halibut (From IPHC web-site: http://www.iphc.washington.edu/halcom/survey/ssadata/maps/ssa2amaps.pdf). Note that the two maps overlap slightly at the 1042-1044 station line.

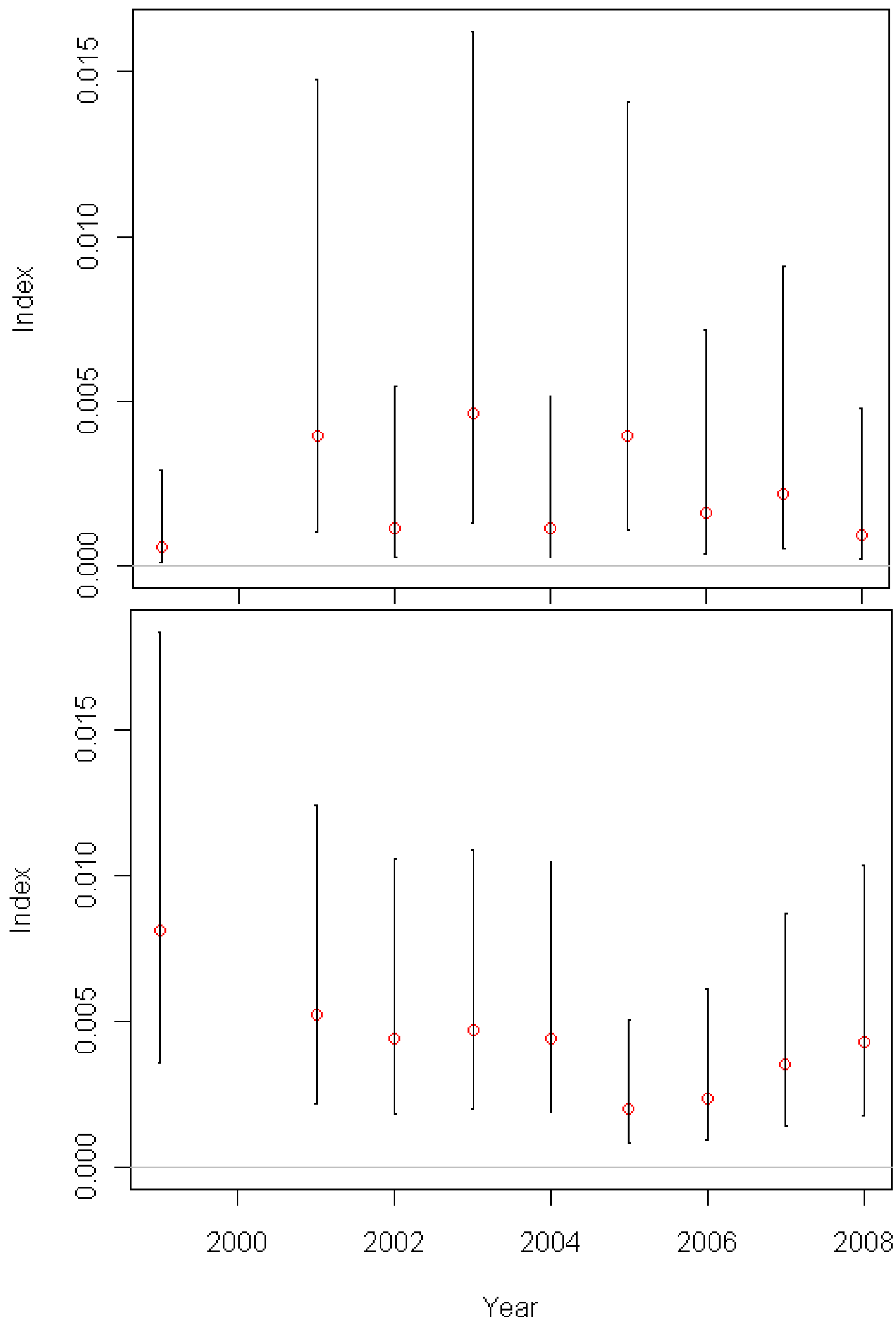

Figure 5. IPHC longline survey indices of relative abundance for Washington (upper panel) and Oregon (lower panel). Vertical lines indicate +/- 95% confidence intervals based on the assumption of lognormal error.

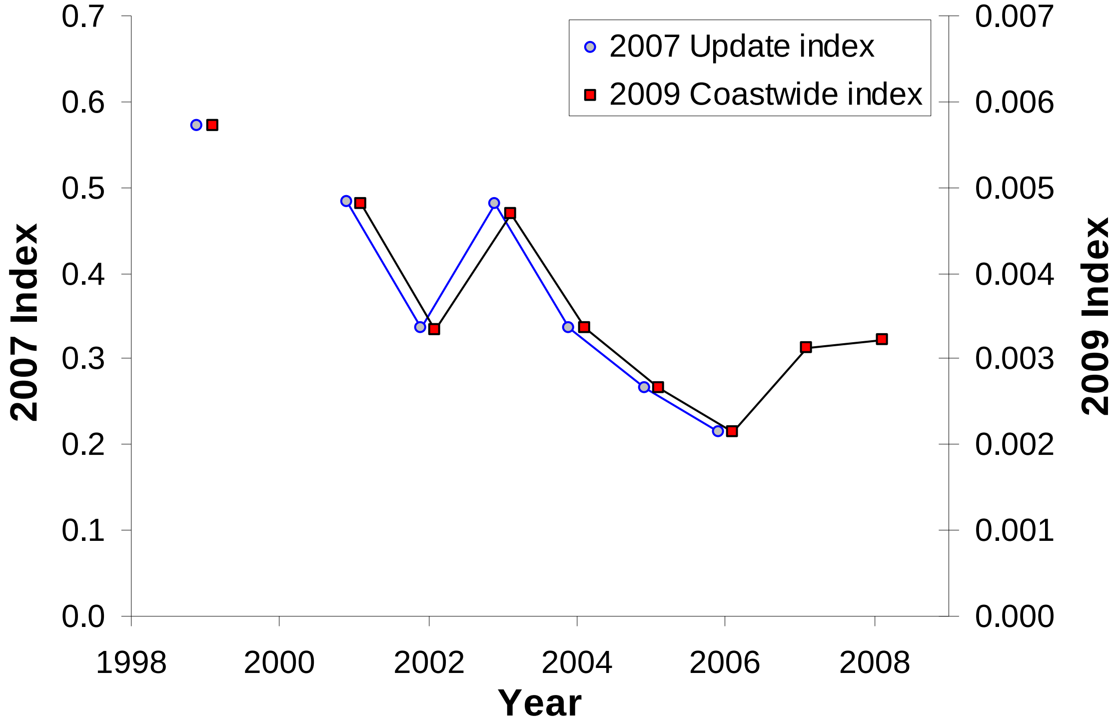

Figure 6. Comparison of a 2009 coast-wide index of abundance from the IPHC data with that calculated with the methods described in the 2007 assessment. Note that the years have been offset slightly to allow each point to be visible.

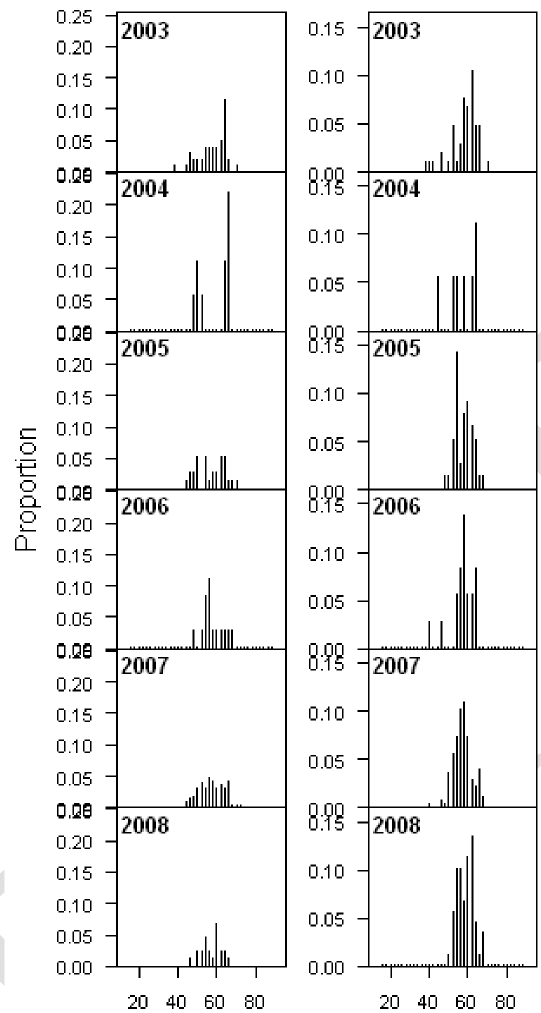

Figure 7. Length-frequency distributions for female (left panel) and male (right panel) yelloweye rockfish from the IPHC survey in Washington.

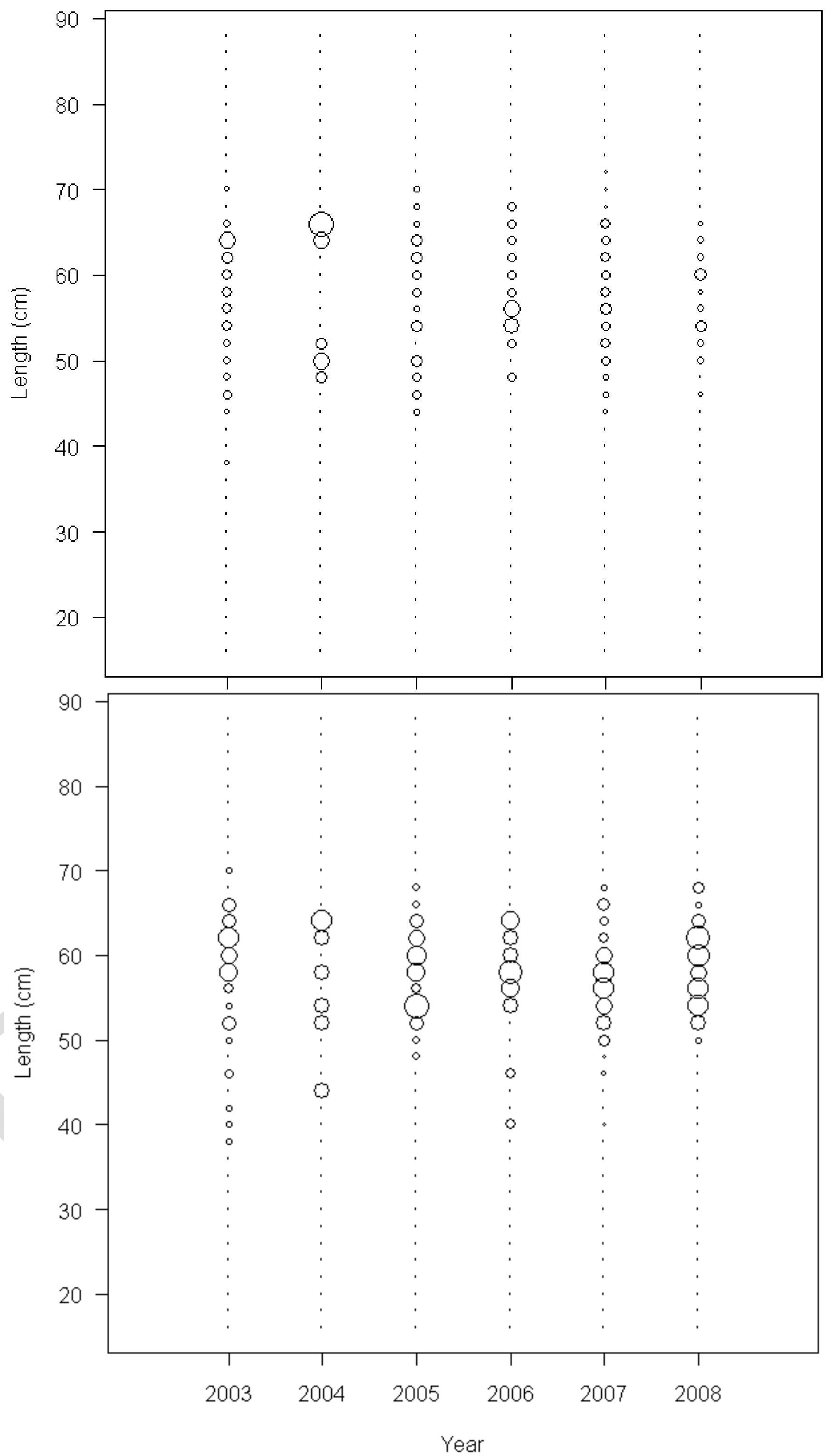

Figure 8. Length-frequency distributions for female (upper panel) and male (lower panel) yelloweye rockfish from the IPHC survey in Washington. Distributions sum to 1.0 in each year; the largest bubble sizes indicate proportions of 0.22 (females) and 0.14 (males).

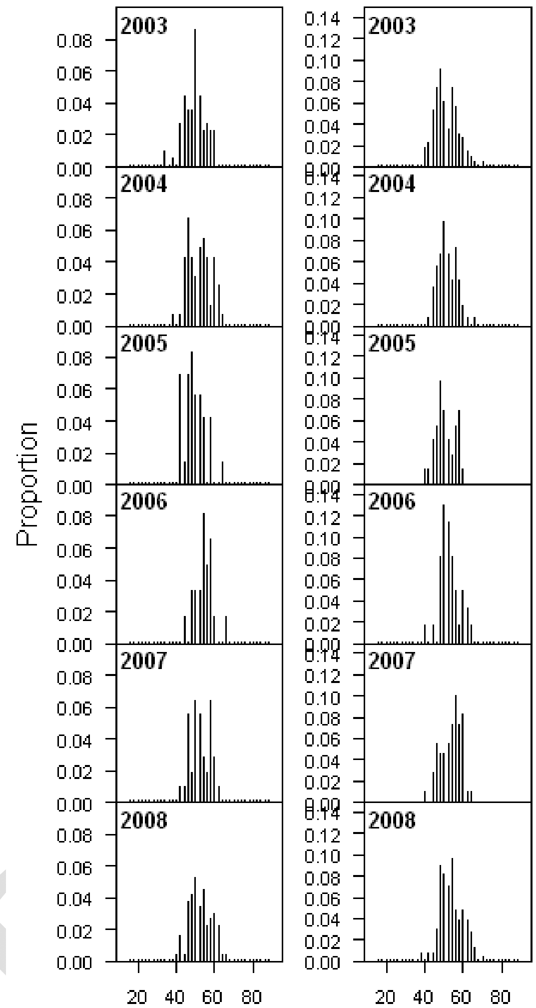

Figure 9. Length-frequency distributions for female (left panel) and male (right panel) yelloweye rockfish from the IPHC survey in Oregon.

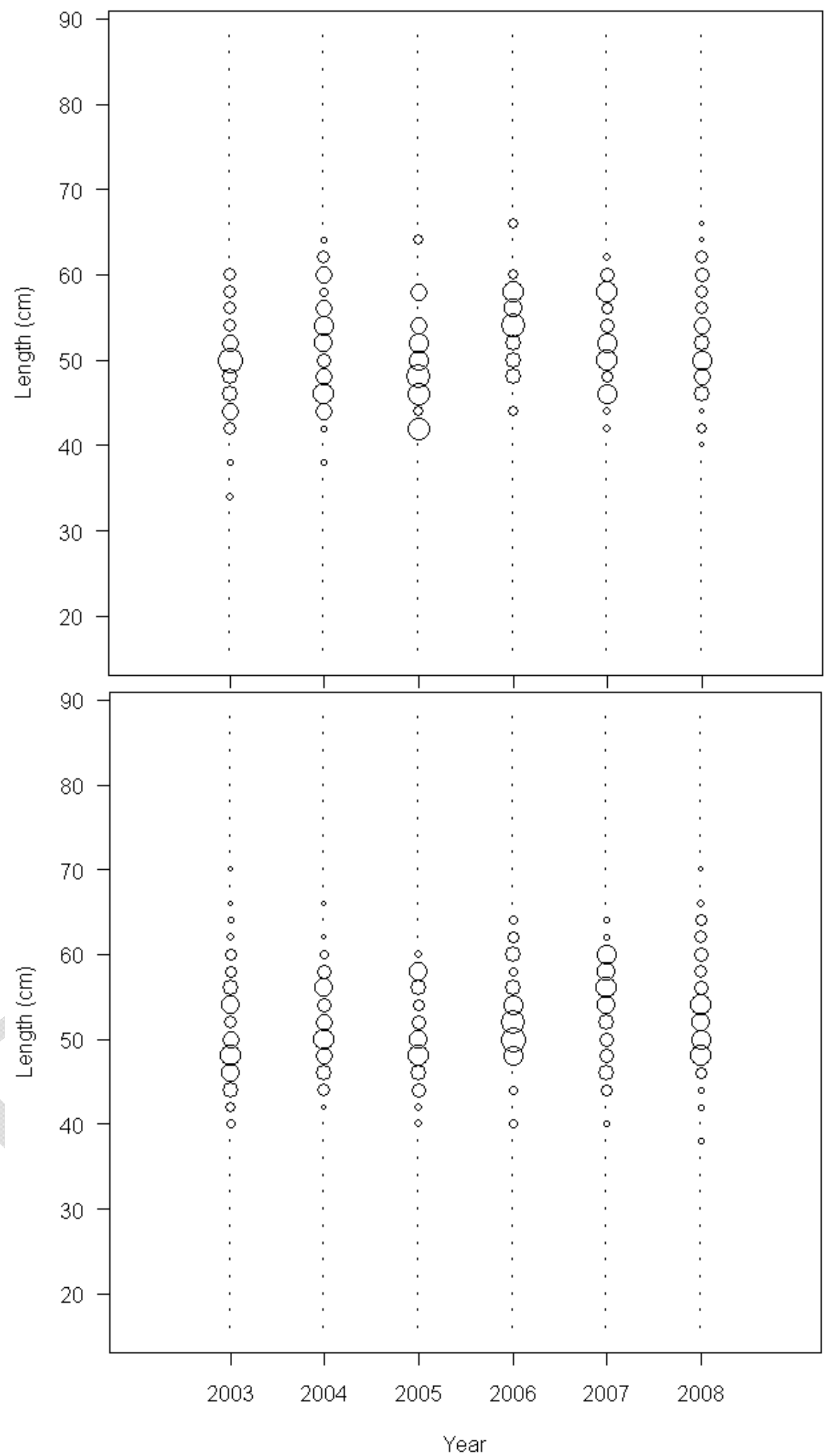

Figure 10. Length-frequency distributions for female (upper panel) and male (lower panel) yelloweye rockfish from the IPHC survey in Oregon. Distributions sum to 1.0 in each year; the largest bubble sizes indicate proportions of 0.09 (females) and 0.13 (males).

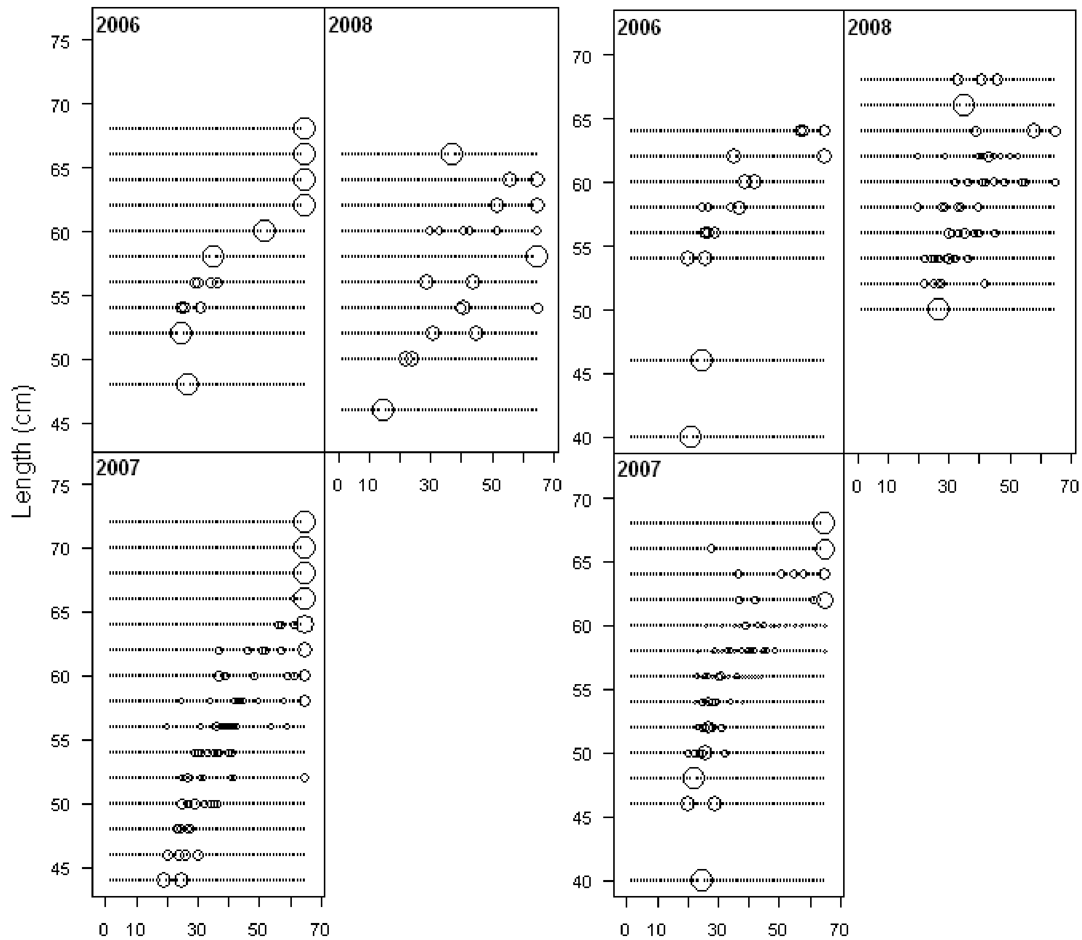

Figure 11. Conditional age-frequency distributions for female (left panels) and male (right panels) yelloweye rockfish from the recent IPHC surveys in Washington (2006-2008). Distributions sum to 1.0 in each age (row); the largest bubble sizes indicate proportions of 0.94 (one fish) for both females and males.

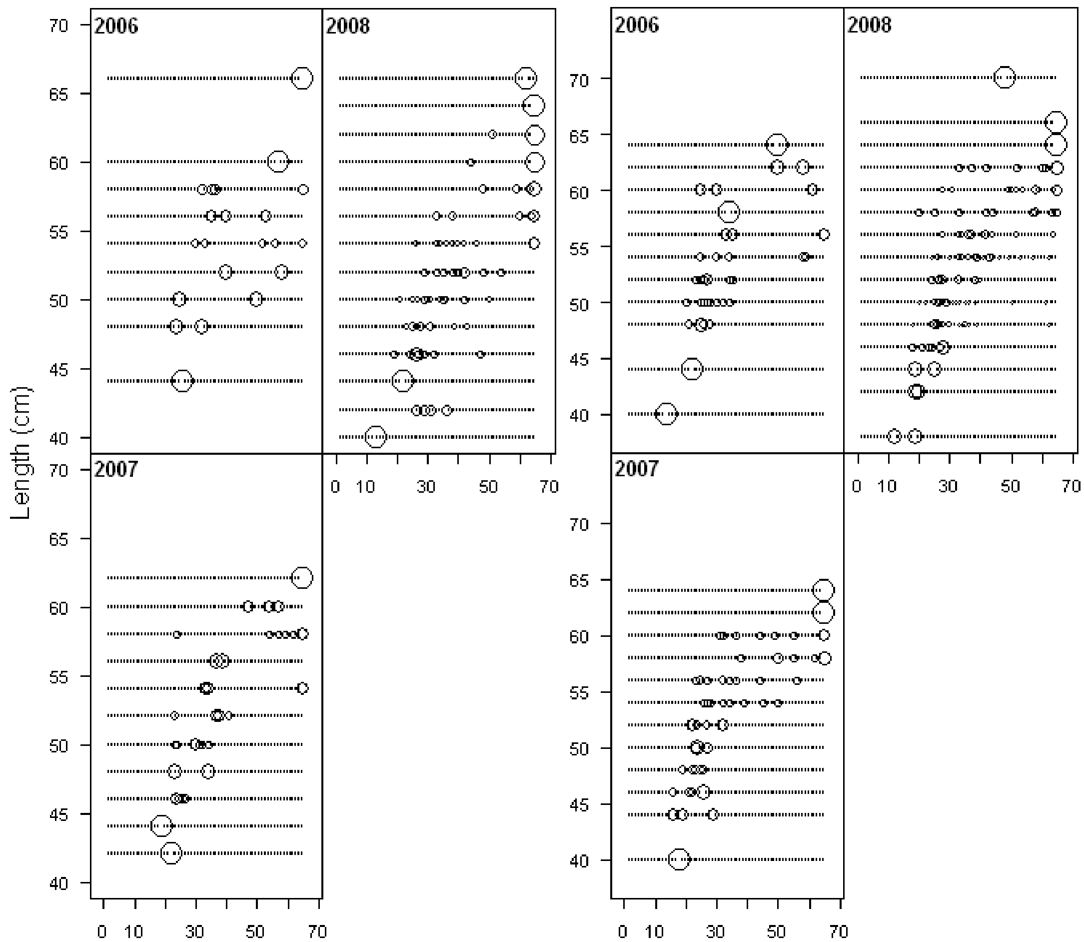

Figure 12. Conditional age-frequency distributions for female (left panels) and male (right panels) yelloweye rockfish from the recent IPHC surveys in Oregon (2006-2008). Distributions sum to 1.0 in each age (row); the largest bubble sizes indicate proportions of 0.94 (one fish) for both females and males.

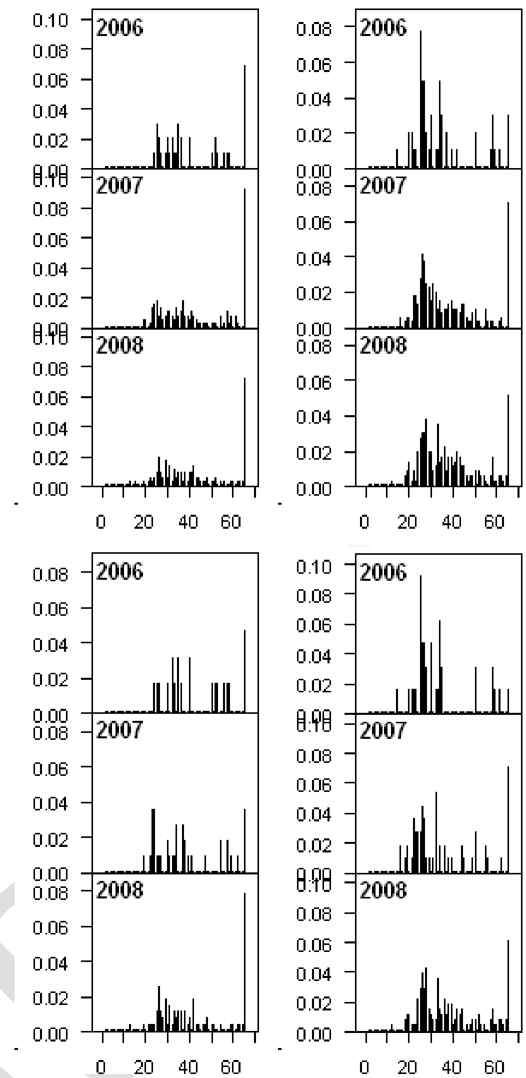

Figure 13. Marginal age-frequency distributions for female (left panels) and male (right panels) yelloweye rockfish from the recent IPHC surveys in Washington (upper panels) and Oregon (lower panels). These summaries are for inspection of the data only, they are not fit.

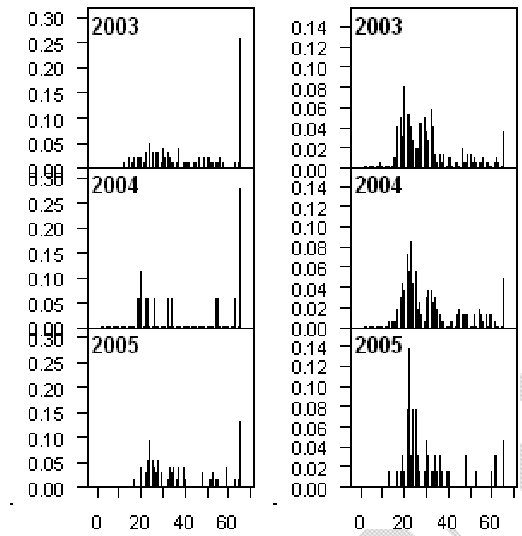

Figure 14. Marginal age-frequency distributions for Washington (left panels) and Oregon (right panels) yelloweye rockfish from the earlier IPHC surveys.

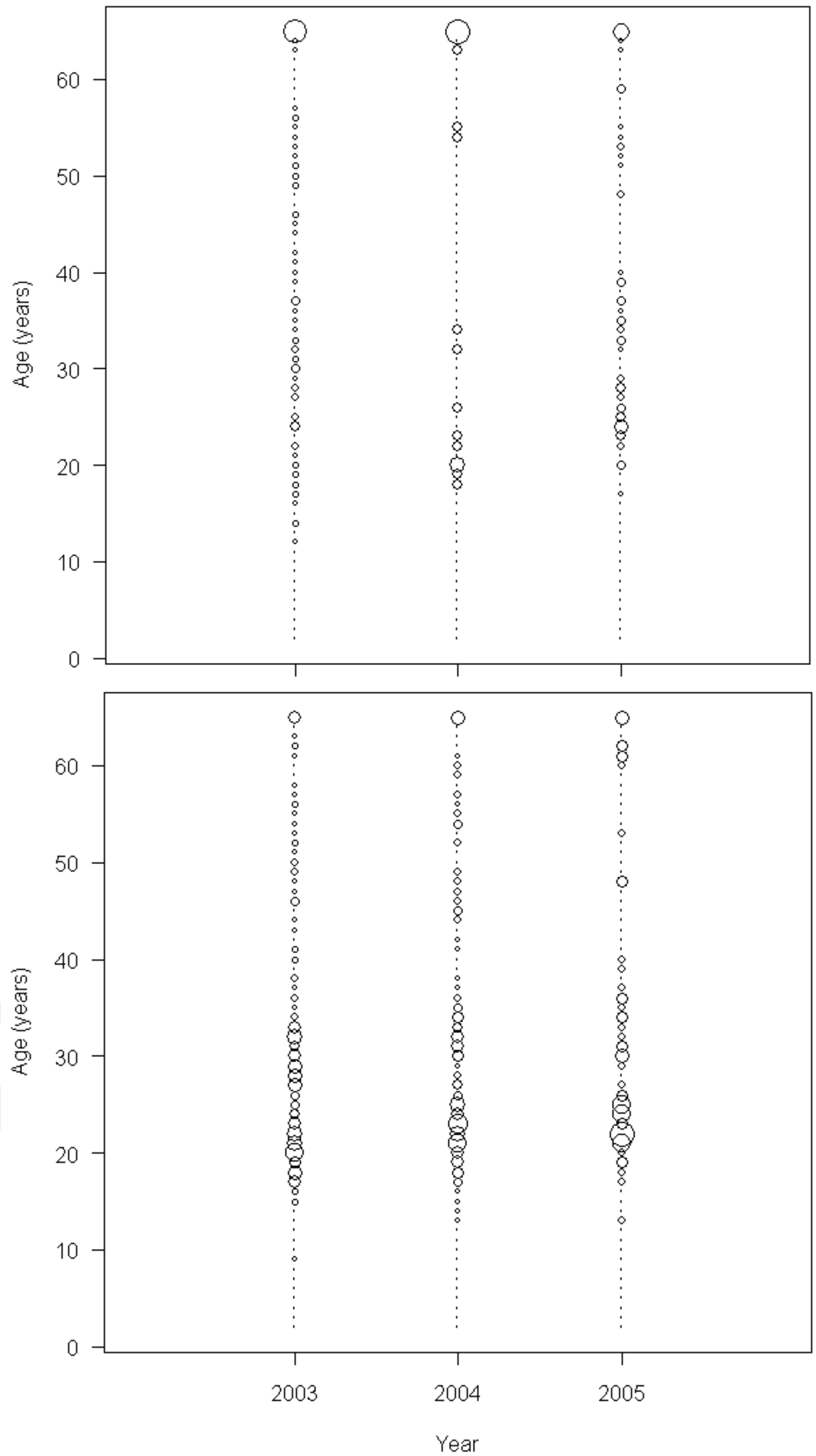

Figure 15. Marginal age-frequency distributions for Washington (upper panel) and Oregon (lower panel) yelloweye rockfish from the earlier IPHC surveys. Distributions sum to 1.0 in each year; the largest bubble sizes indicate proportions of 0.28 (Washington) and 0.14 (Oregon).

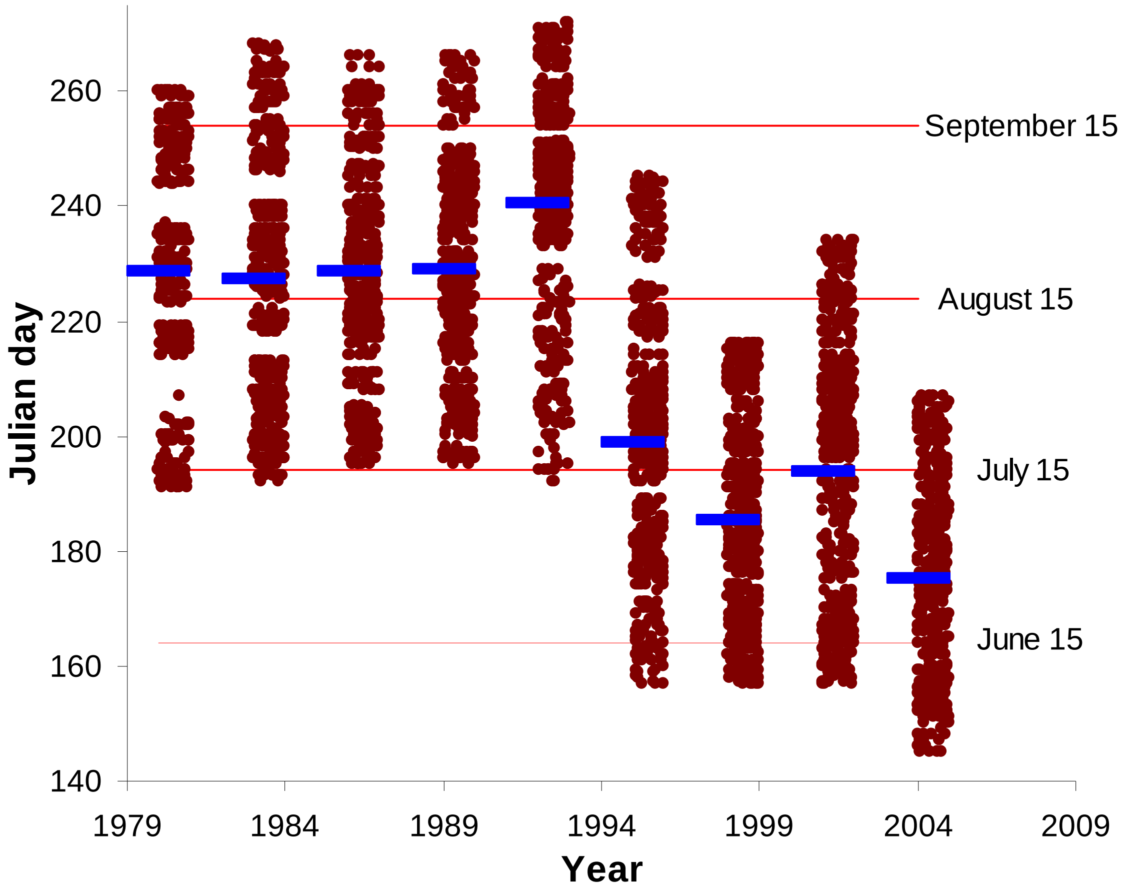

Figure 16. Distribution of dates of operation for the triennial survey (1980-2004). Solid bars show the mean date for each survey year, points represent individual hauls dates, but are jittered to allow better delineation of the distribution of individual points.

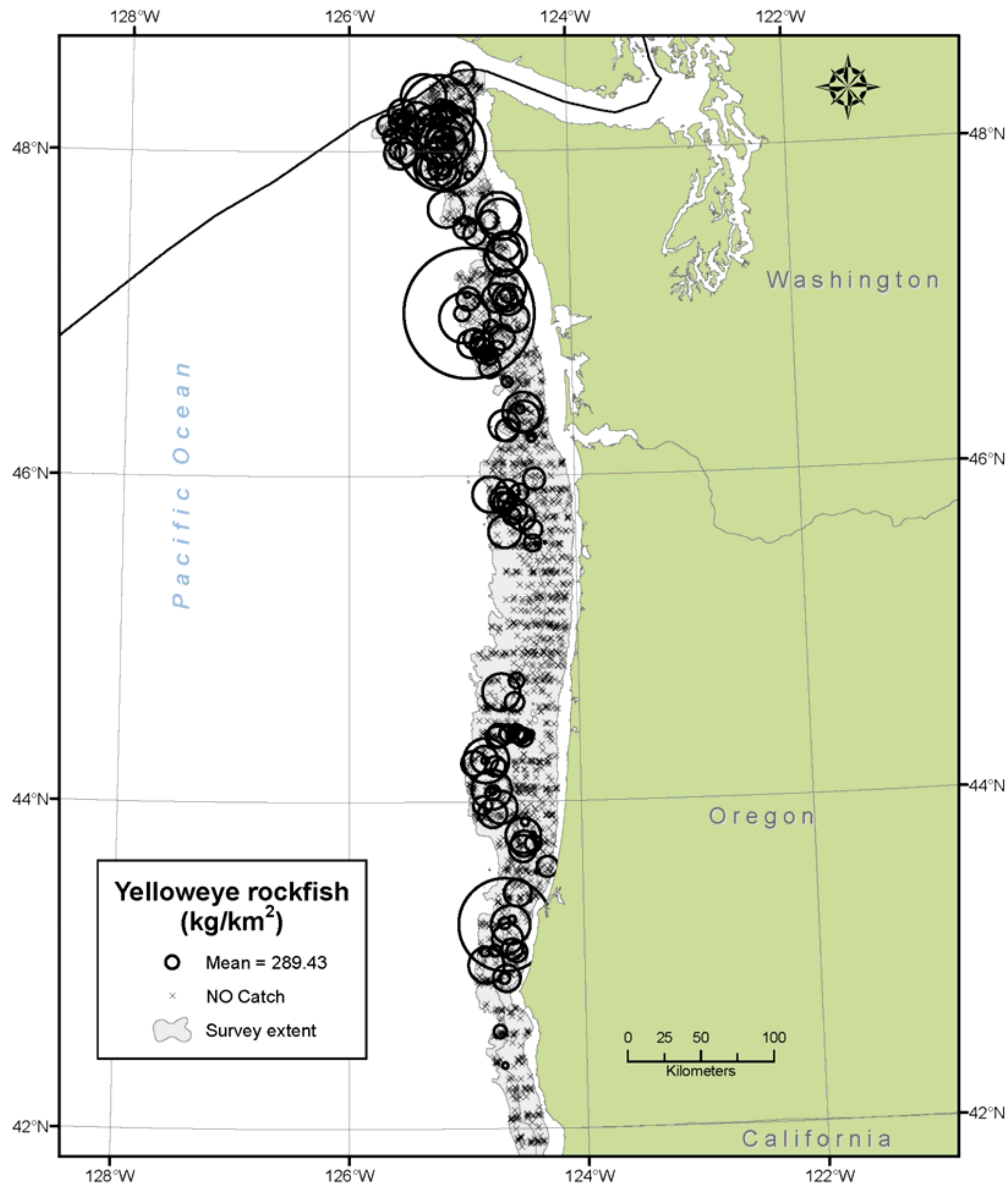

Figure 17. Distribution of yelloweye rockfish (*Sebastes ruberrimus*) catches for the Triennial trawl survey (1977-2004) in Washington and Oregon. Bubble area is proportional to CPUE (kg/km^2). Survey extent is 55-549 m (30-300 fm).

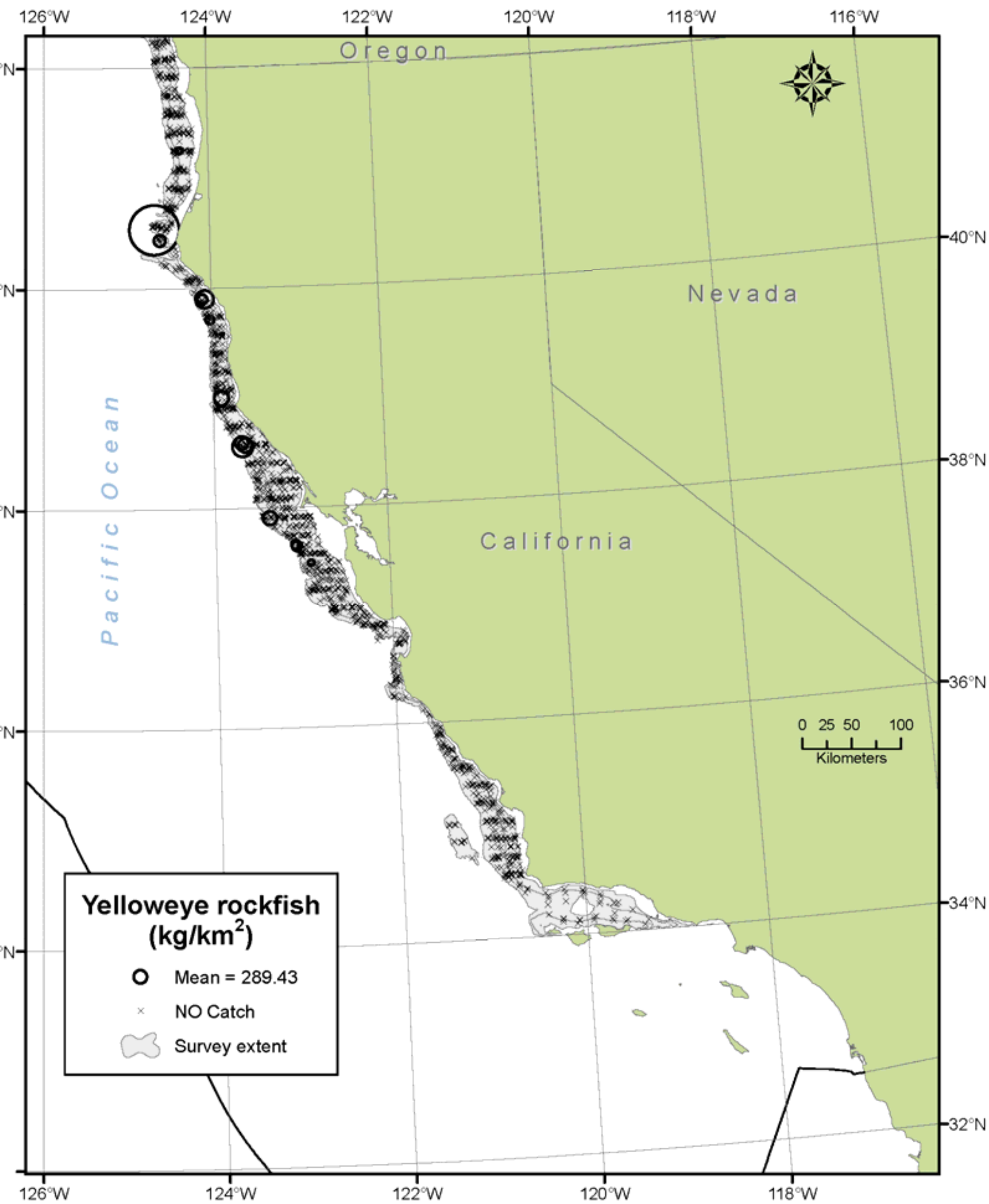

Figure 18. Distribution of yelloweye rockfish (*Sebastes ruberrimus*) catches for the Triennial trawl survey (1977-2004) in California. Bubble area is proportional to CPUE (kg/km^2). Survey extent is 55-549 m (30-300 fm).

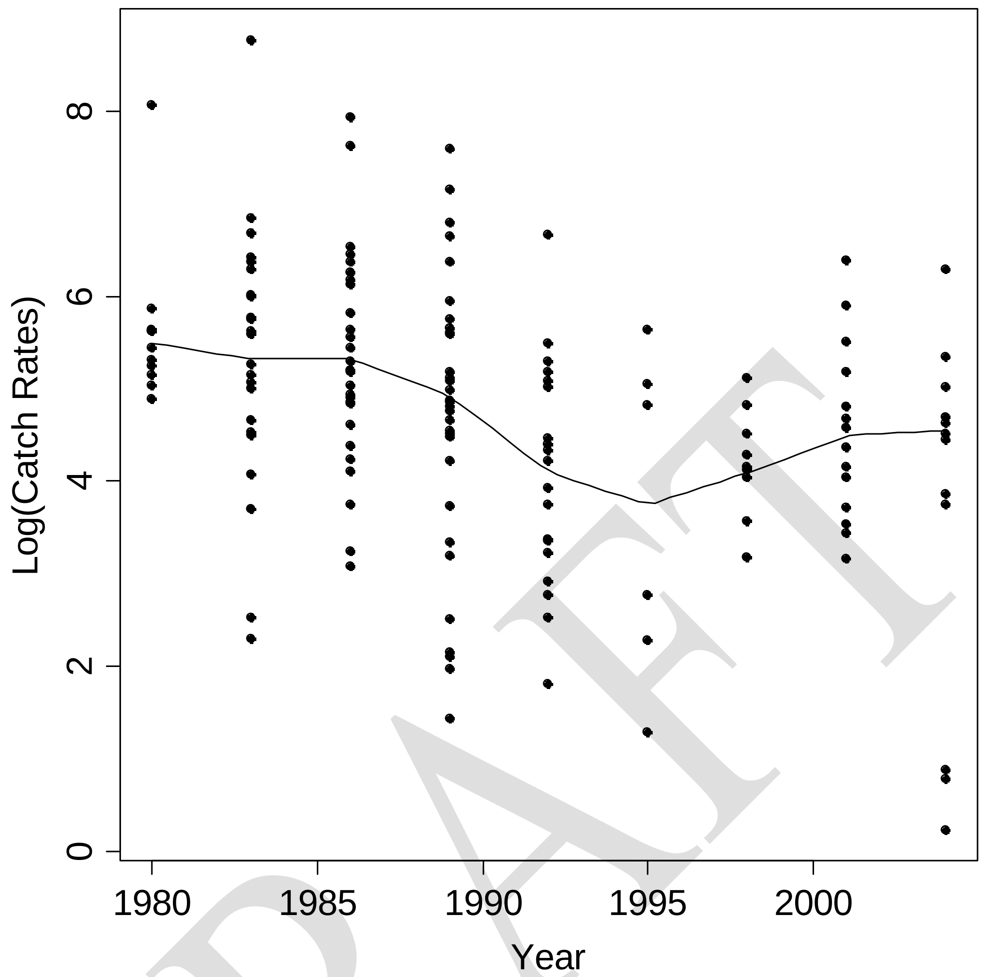

Figure 19. The log of the non-zero catch rates (in kg per km^2) by year for all positive hauls in the triennial survey, 1980-2004. The black line is a lowess smoother to aid evaluation only.

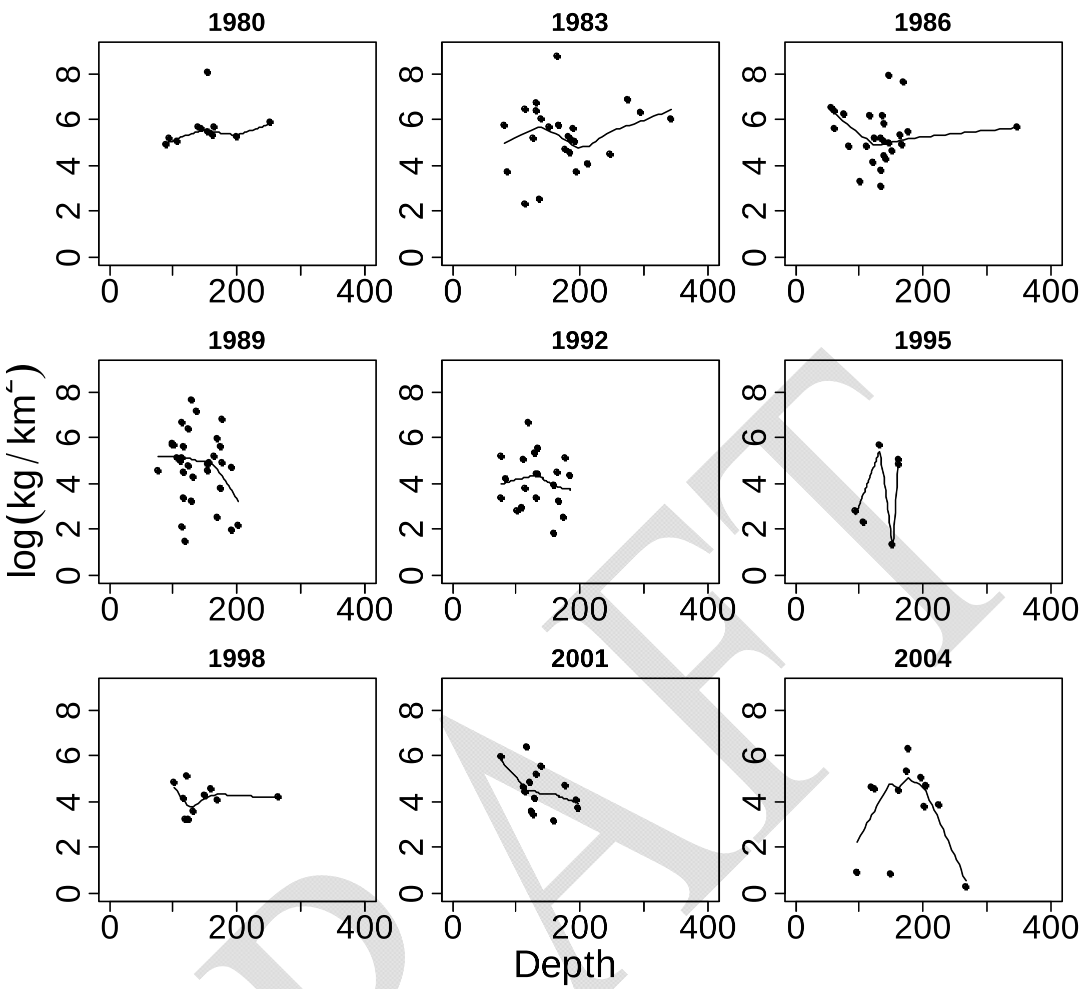

Figure 20. Non-zero catch rates, in log(kg/km^2), by depth and year for the triennial survey. The black line is a lowess smoother to aid evaluation only.

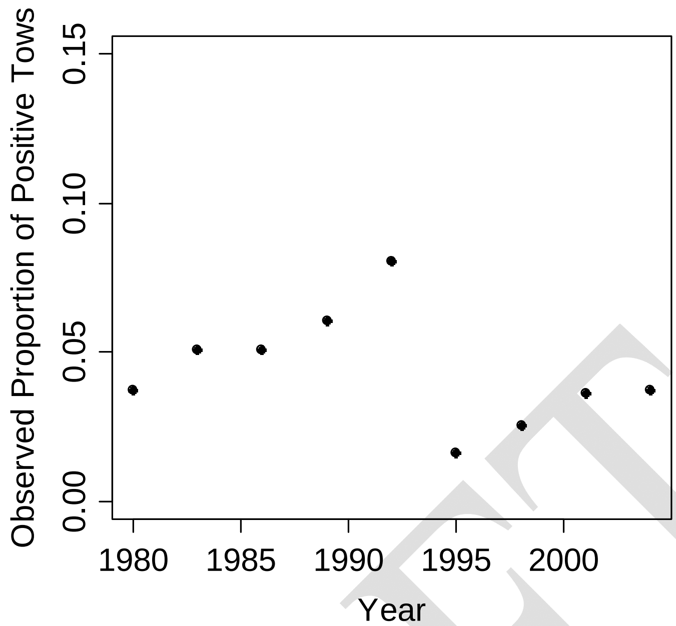

Figure 21. Observed proportion of non-zero tows by year in the triennial survey.

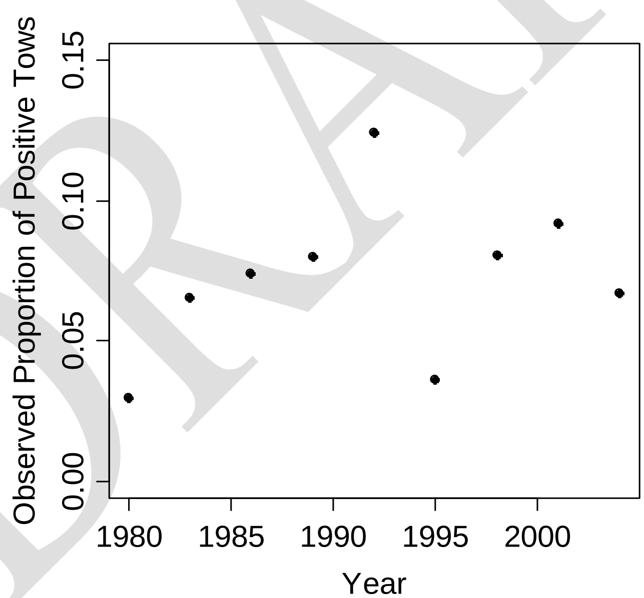

Figure 22. Observed proportion of non-zero tows by year in the triennial survey in Washington waters.

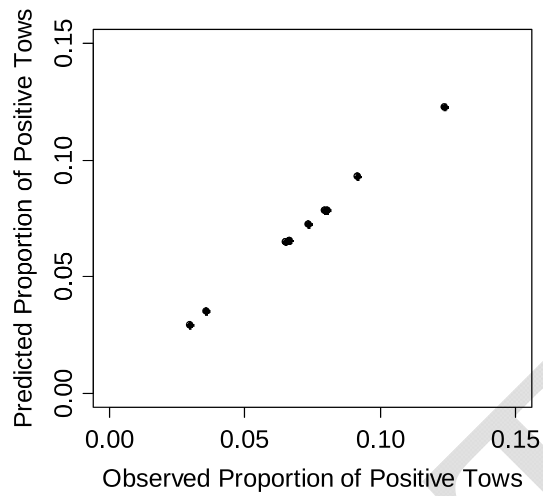

Figure 23. Observed vs. predicted proportion of positive tows for the triennial survey in Washington.

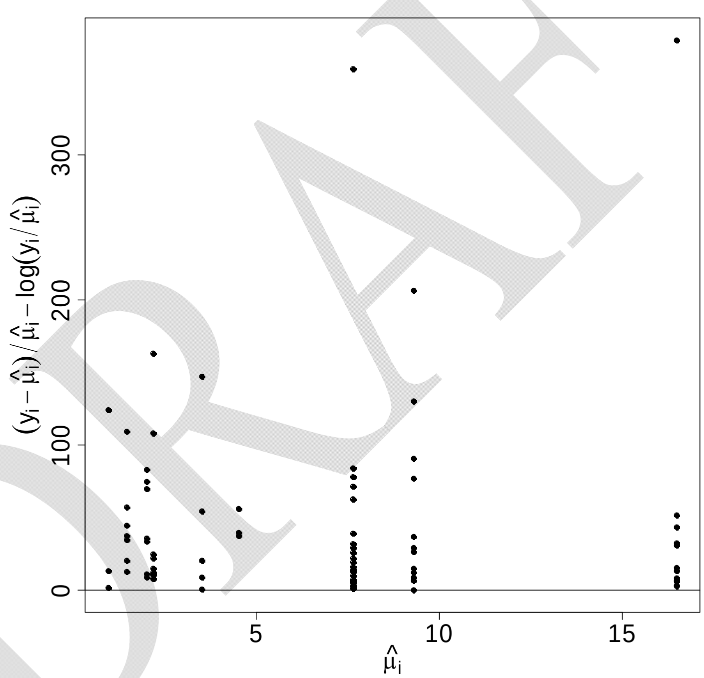

Figure 24. Deviance components (should be Gamma-distributed) vs. predicted values for all positive catch observations in the triennial GLMM for Washington. Note that variation from the random vessel-effects is not included.

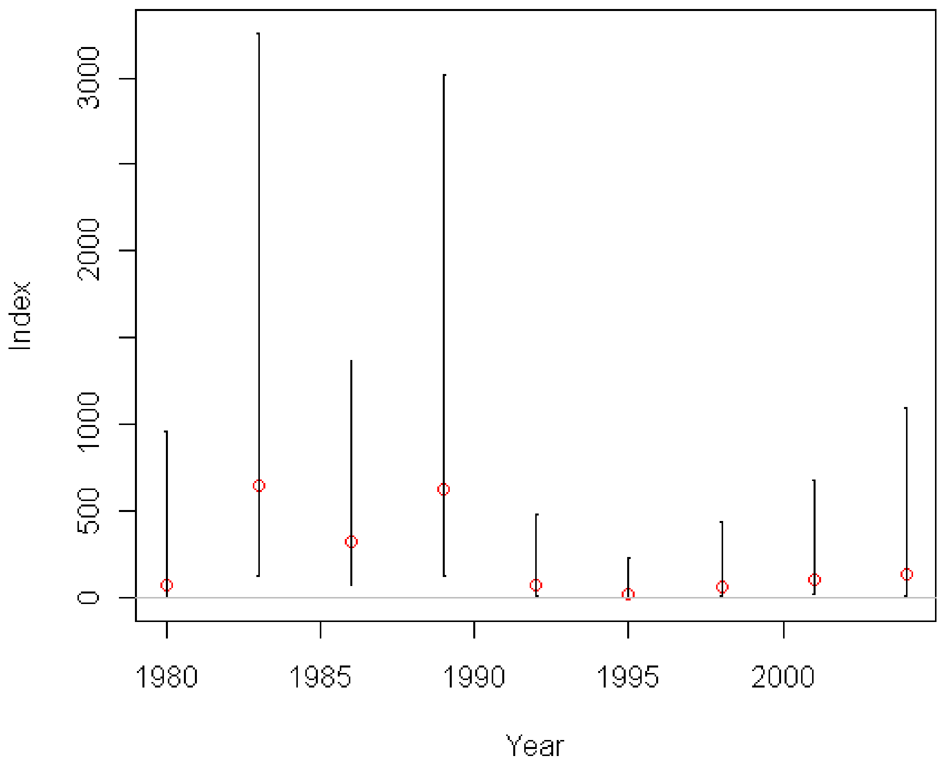

Figure 25. Index of relative abundance for the triennial survey in Washington.

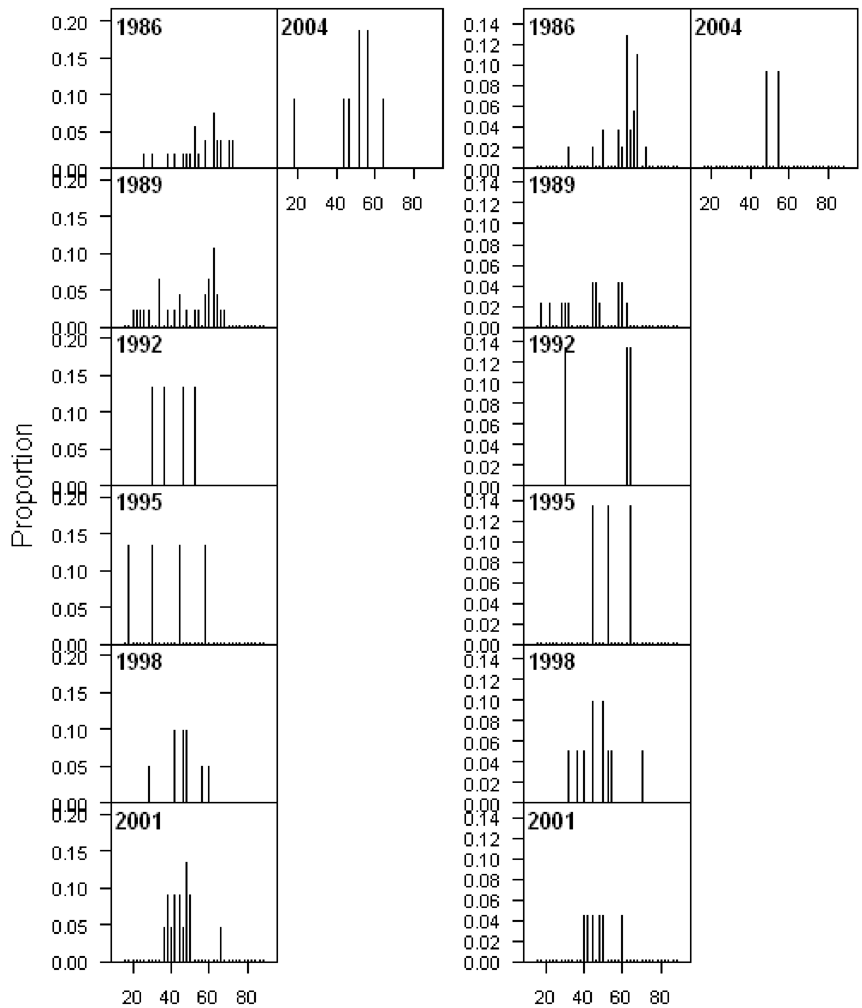

Figure 26. Length-frequency distributions for female (left panel) and male (right panel) yelloweye rockfish from the triennial bottom trawl survey in Washington. The x-axis represents the 2-cm size bin.

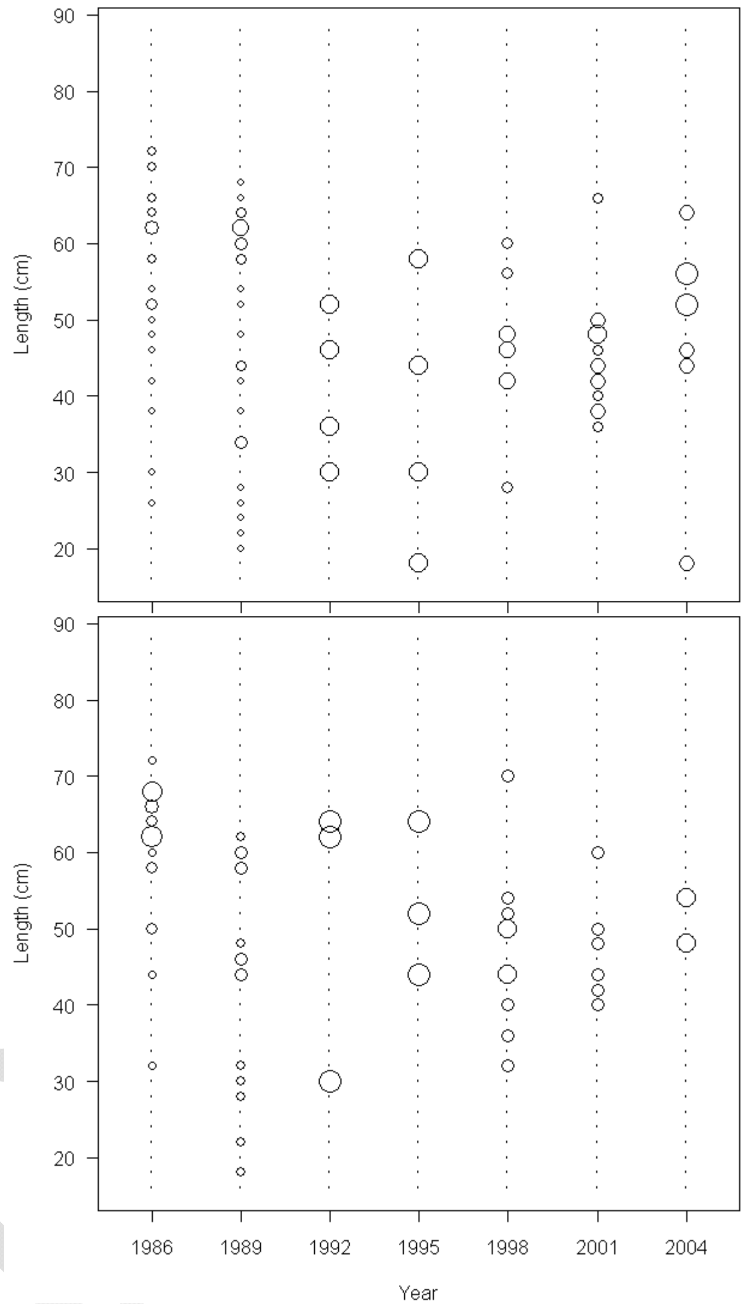

Figure 27. Length-frequency distributions for female (upper panel) and male (lower panel) yelloweye rockfish from the triennial bottom trawl survey in Washington. Distributions sum to 1.0 in each year; the largest bubble sizes indicate proportions of 0.19 (females) and 0.13 (males).

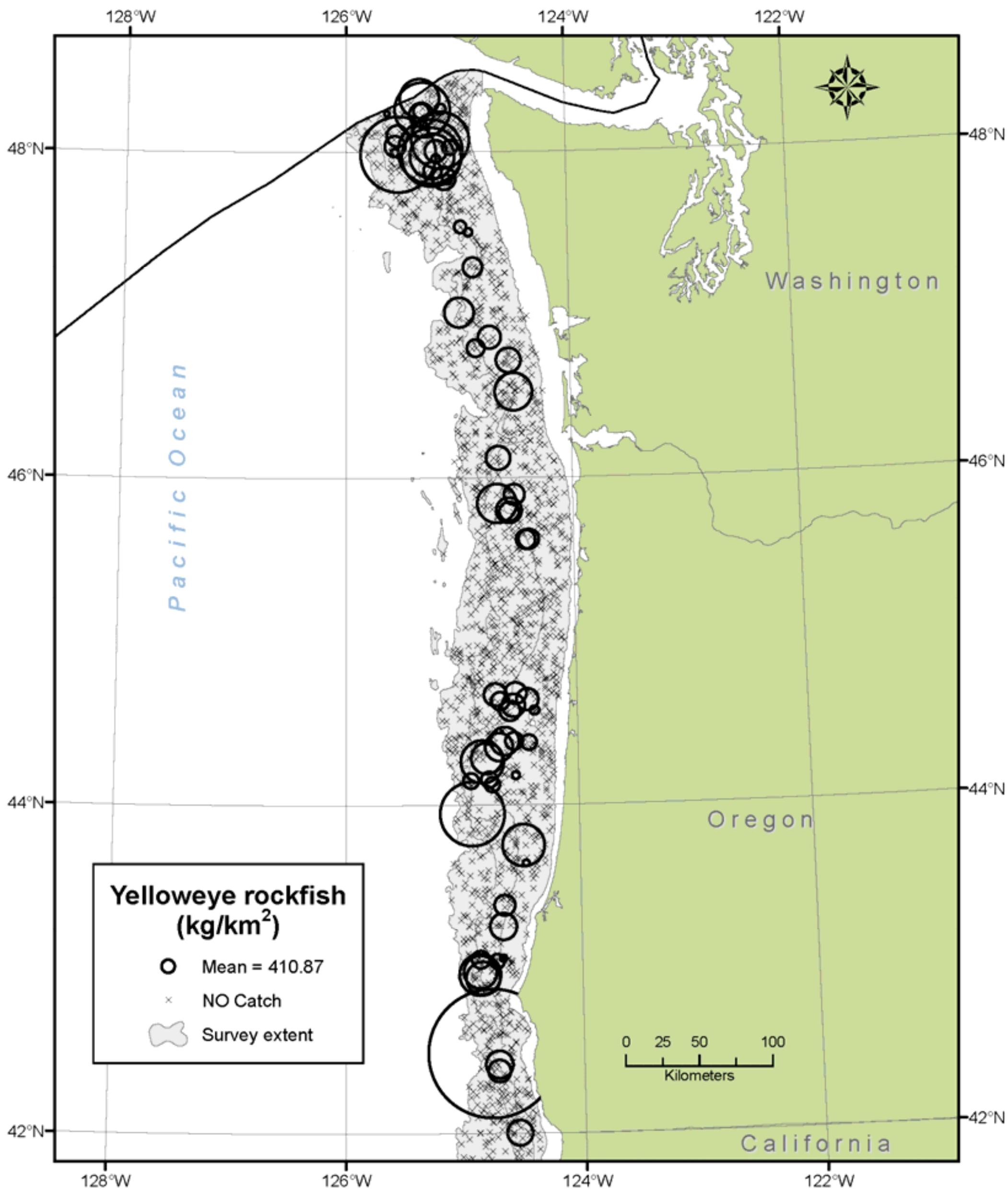

Figure 28. Distribution of yelloweye rockfish (*Sebastes ruberrimus*) catches for the NWFSC trawl survey (2003-2008) in Washington and Oregon. Bubble area is proportional to CPUE (kg/km^2). Survey extent is 55-1280 m (30-700 fm).

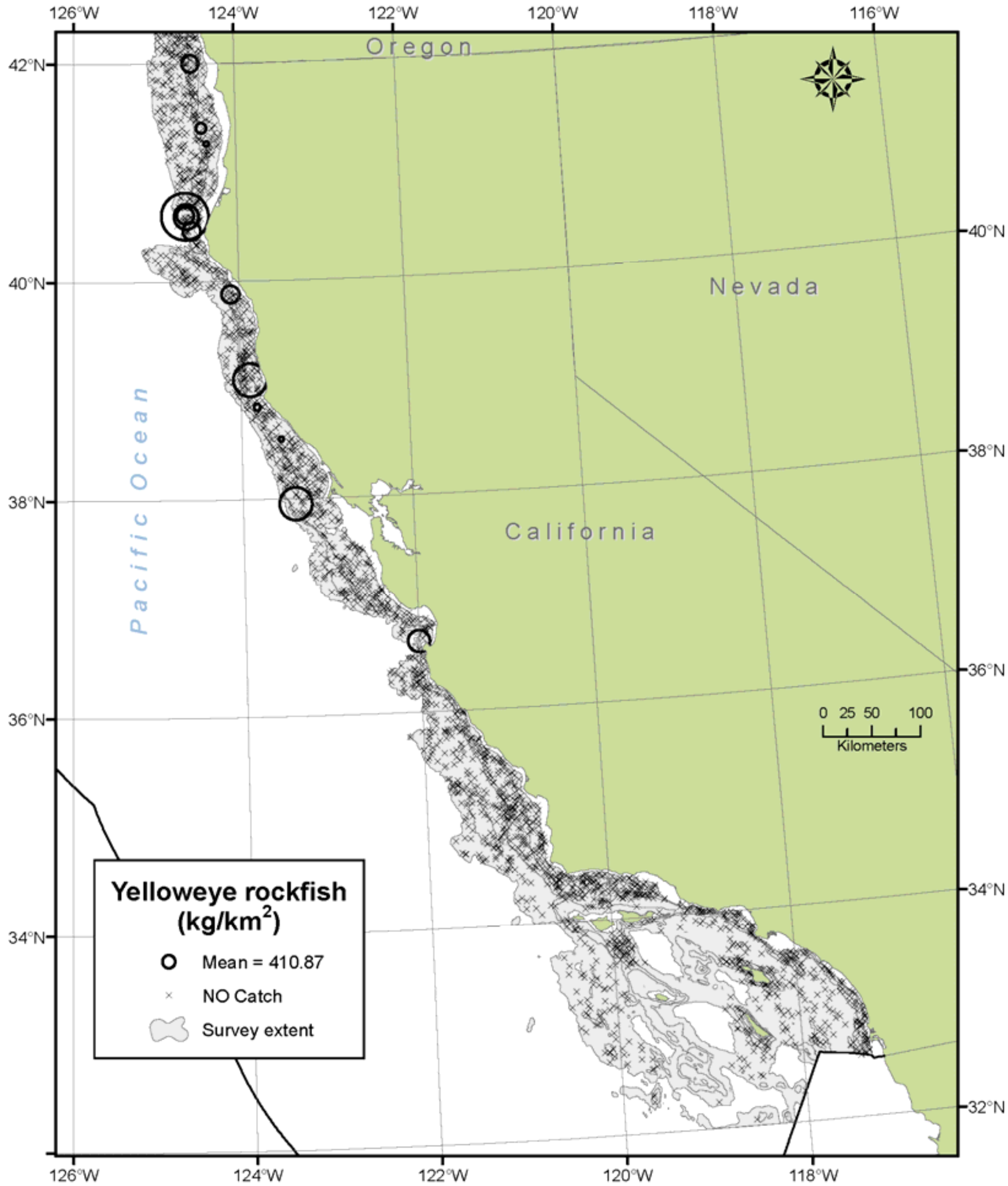

Figure 29. Distribution of yelloweye rockfish (*Sebastes ruberrimus*) catches for the NWFSC trawl survey (2003-2008) in California. Bubble area is proportional to CPUE (kg/km^2). Survey extent is 55-1280 m (30-700 fm).

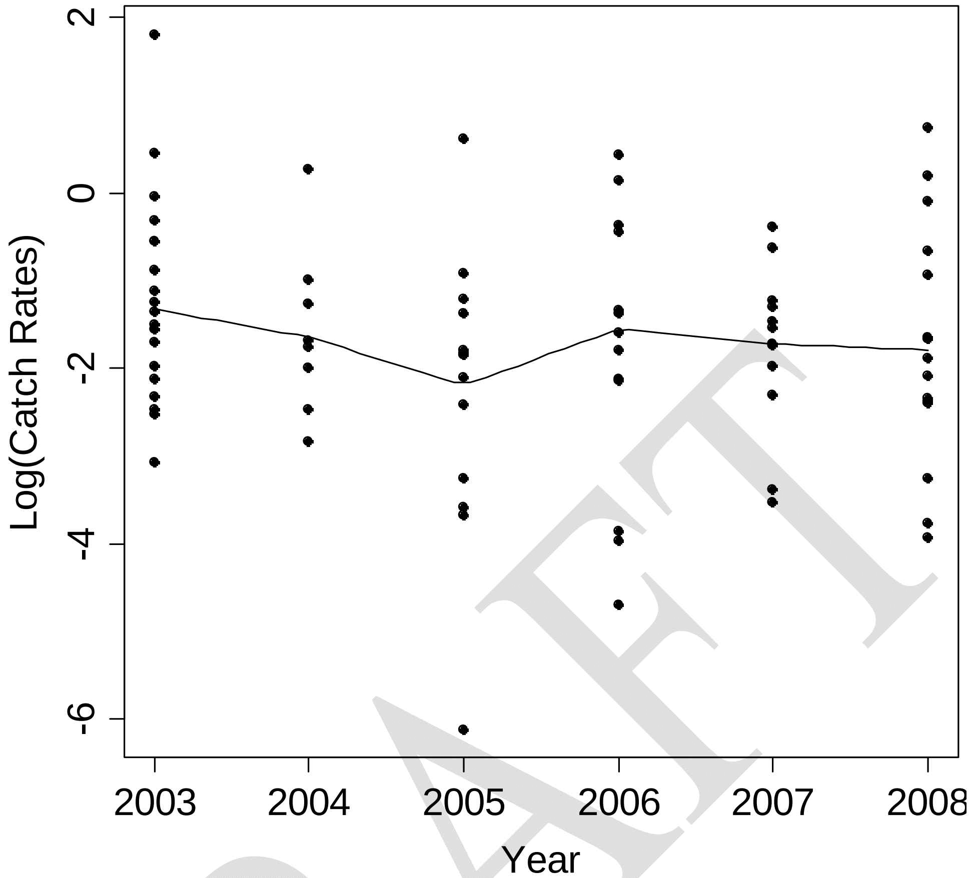

Figure 30. The log of the non-zero catch rates (in kg per km^2) by year for all positive hauls in the NWFSC survey 2003-2008. The black line is a lowess smoother to aid evaluation only.

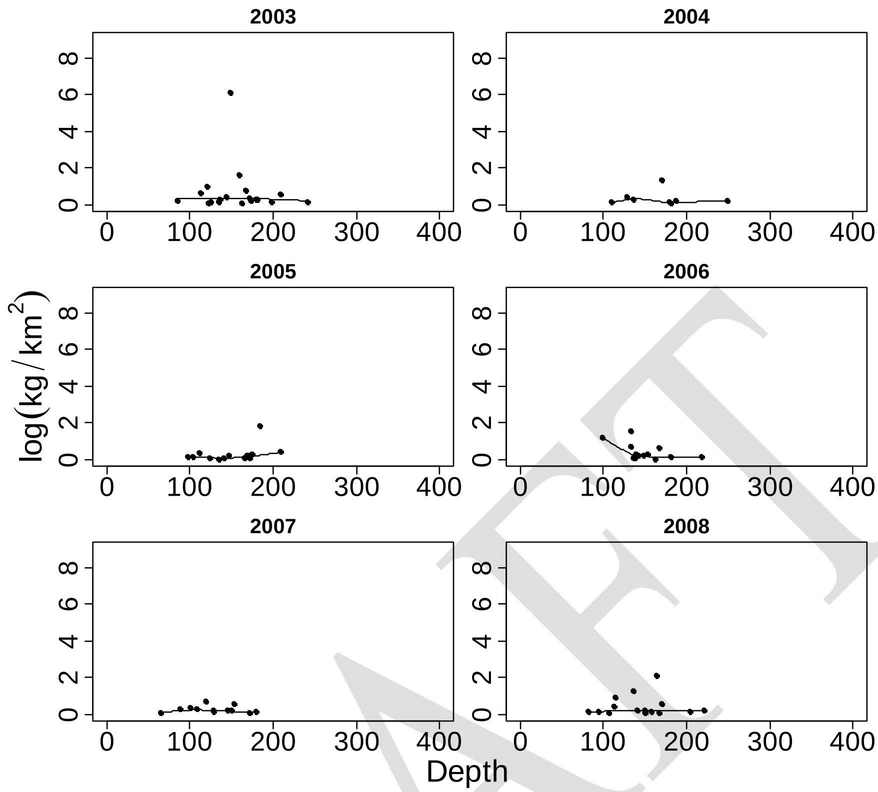

Figure 31. Coast-wide non-zero catch rates over depth for each year in log(kg/km^2); the black line is a lowess smoothing line (NWFSC survey).

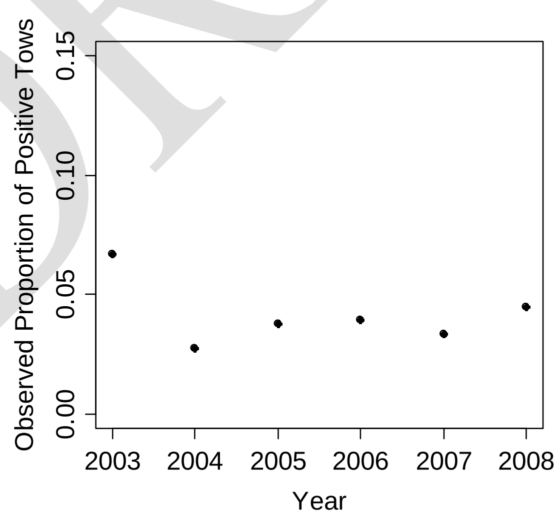

Figure 32. Observed proportion of non-zero tows by year in the NWFSC survey.

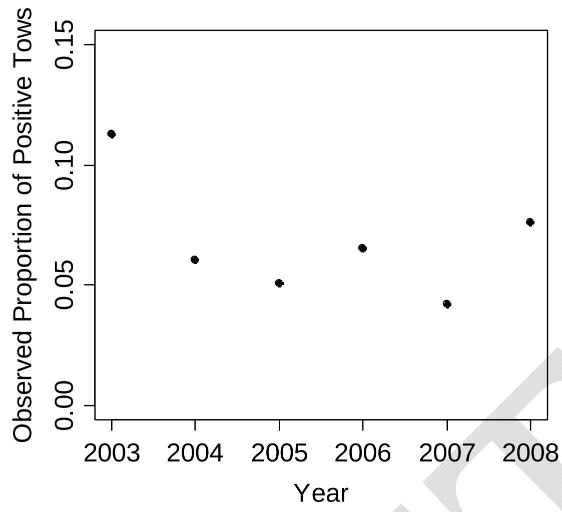

Figure 33. Proportion of non-zero tows in the NWFSC survey in Oregon.

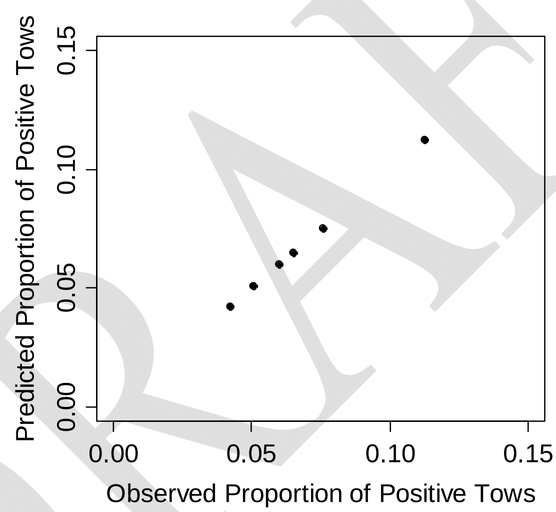

Figure 34. Observed vs. predicted proportion of positive tows for the NWFSC survey in Oregon.

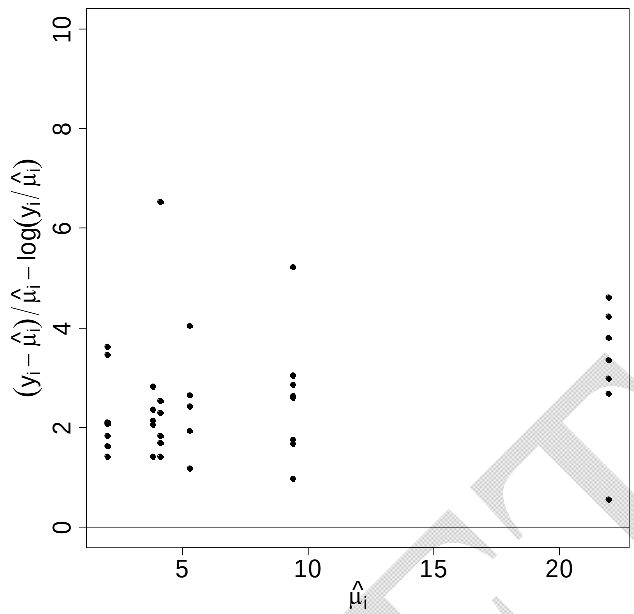

Figure 35. Deviance components (should be Gamma-distributed) vs. predicted values for all positive catch observations in the NWFSC GLMM for Oregon. Note that variation from the random vessel-effects is not included.

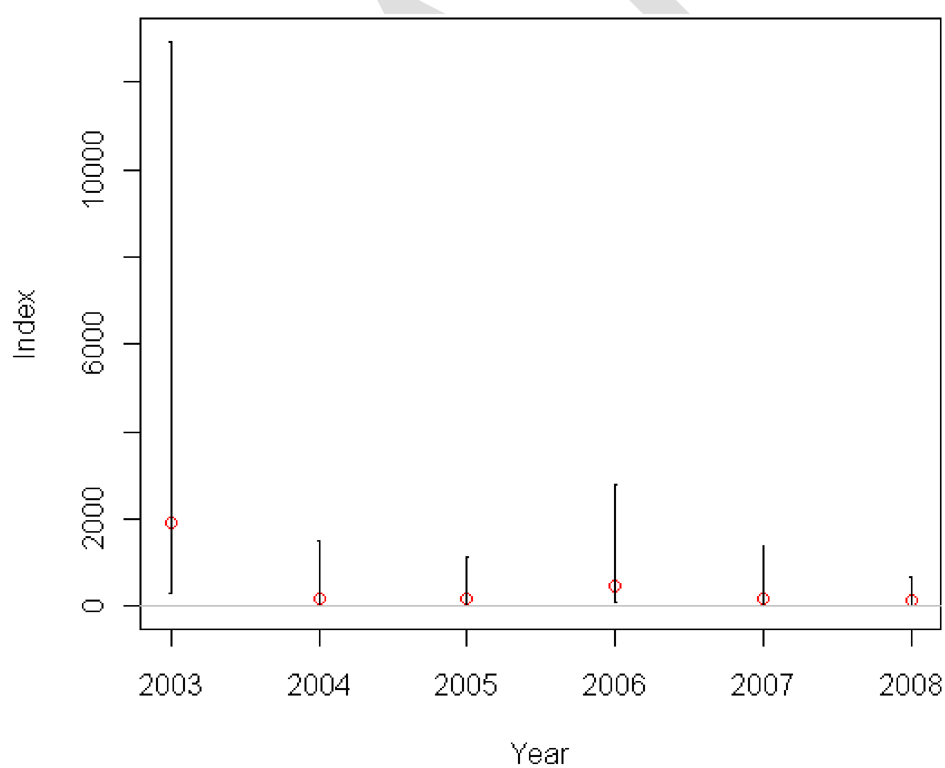

Figure 36. Index of relative abundance for the NWFSC survey in Oregon.

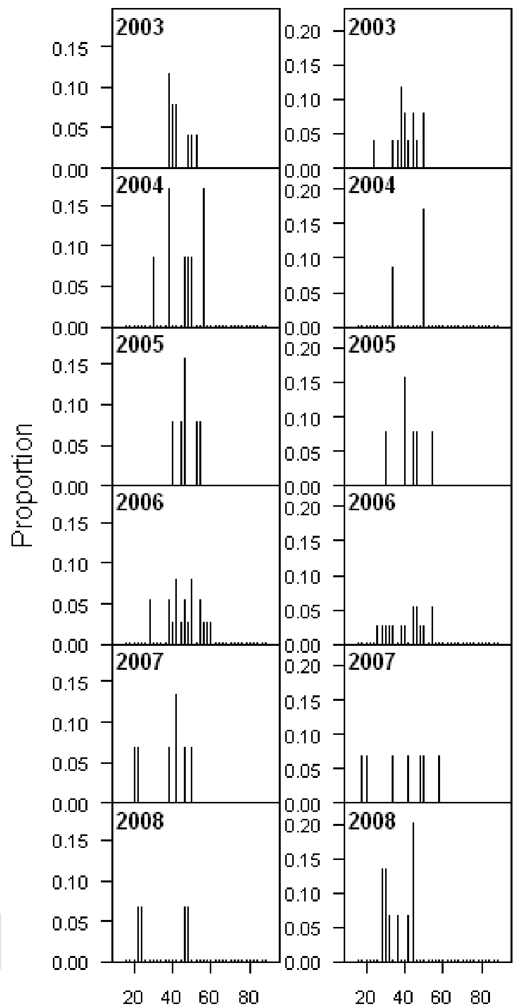

Figure 37. Length-frequency distributions for female (left panel) and male (right panel) yelloweye rockfish from the NWFSC bottom trawl survey in Oregon. The x-axis represents the 2-cm size bin.

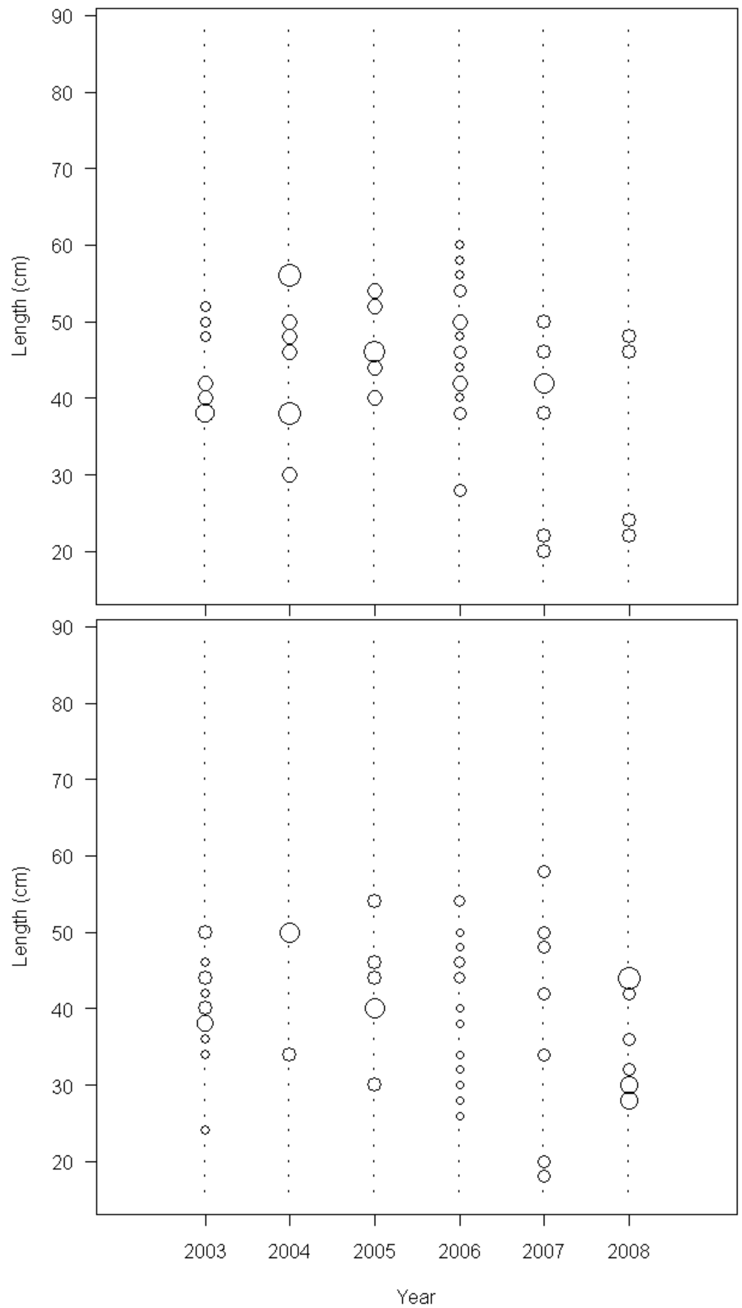

Figure 38. Length-frequency distributions for female (upper panel) and male (lower panel) yelloweye rockfish from the NWFSC bottom trawl survey in Washington. Distributions sum to 1.0 in each year; the largest bubble sizes indicate proportions of 0.17 (females) and 0.12 (males).

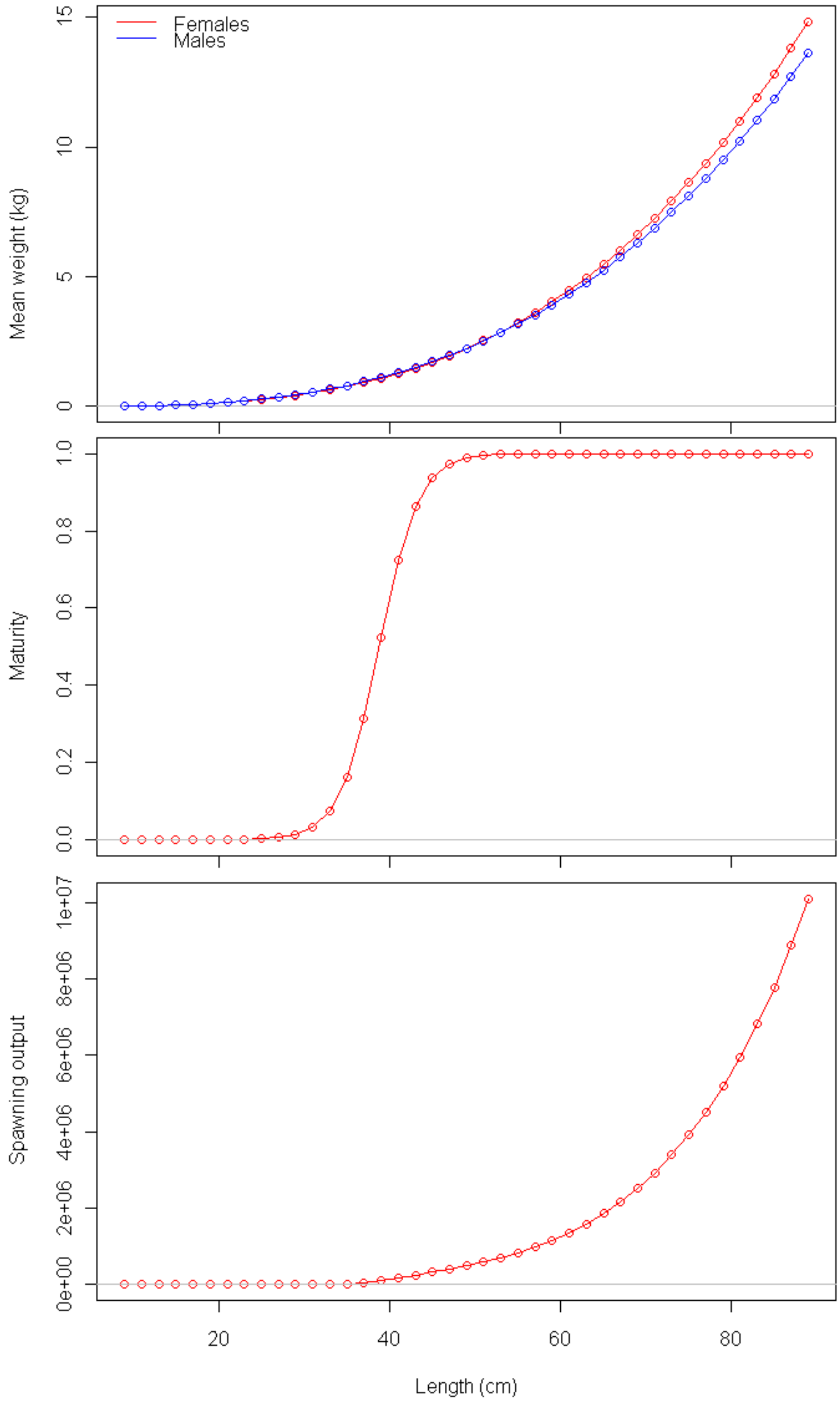

Figure 39. W-L relationship for male and female yelloweye (upper panel), female maturity curve (middle panel), and female spawning output at length (lower panel) illustrating the product of the female W-L, fecundity and maturity relationships.

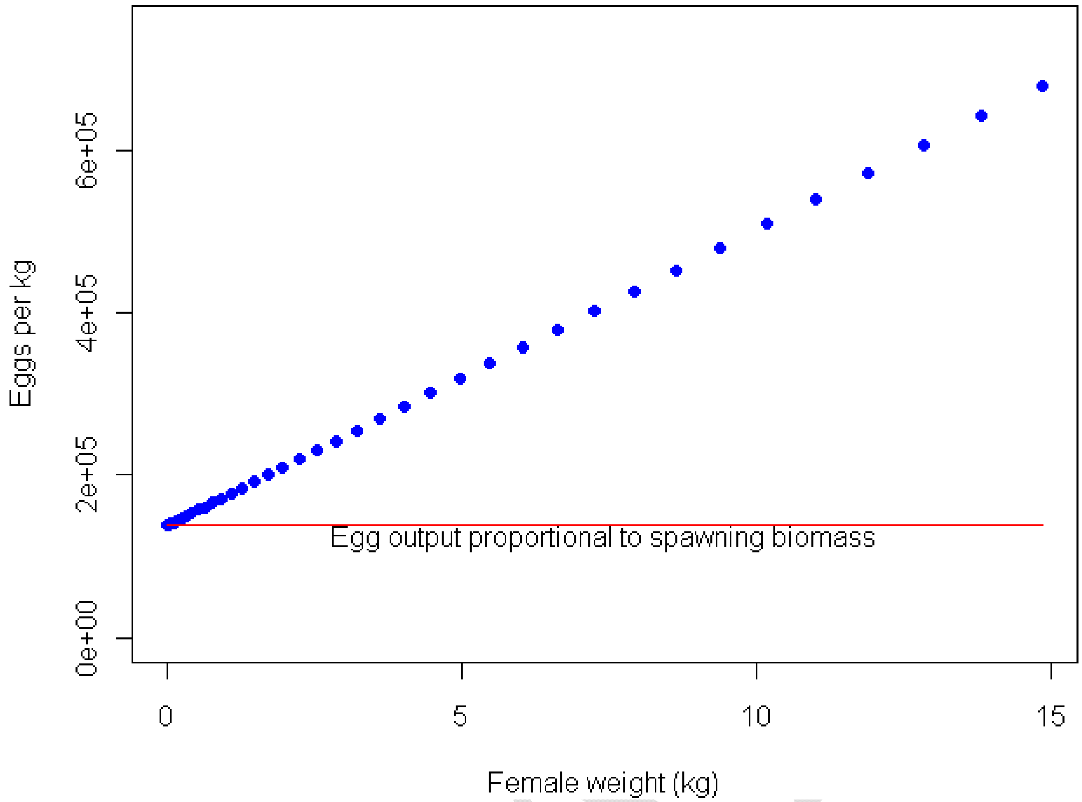

Figure 40. Female yelloweye fecundity relationship (Filled circles, From Dick, 2009). Horizontal line indicates no fecundity relationship (for comparison).

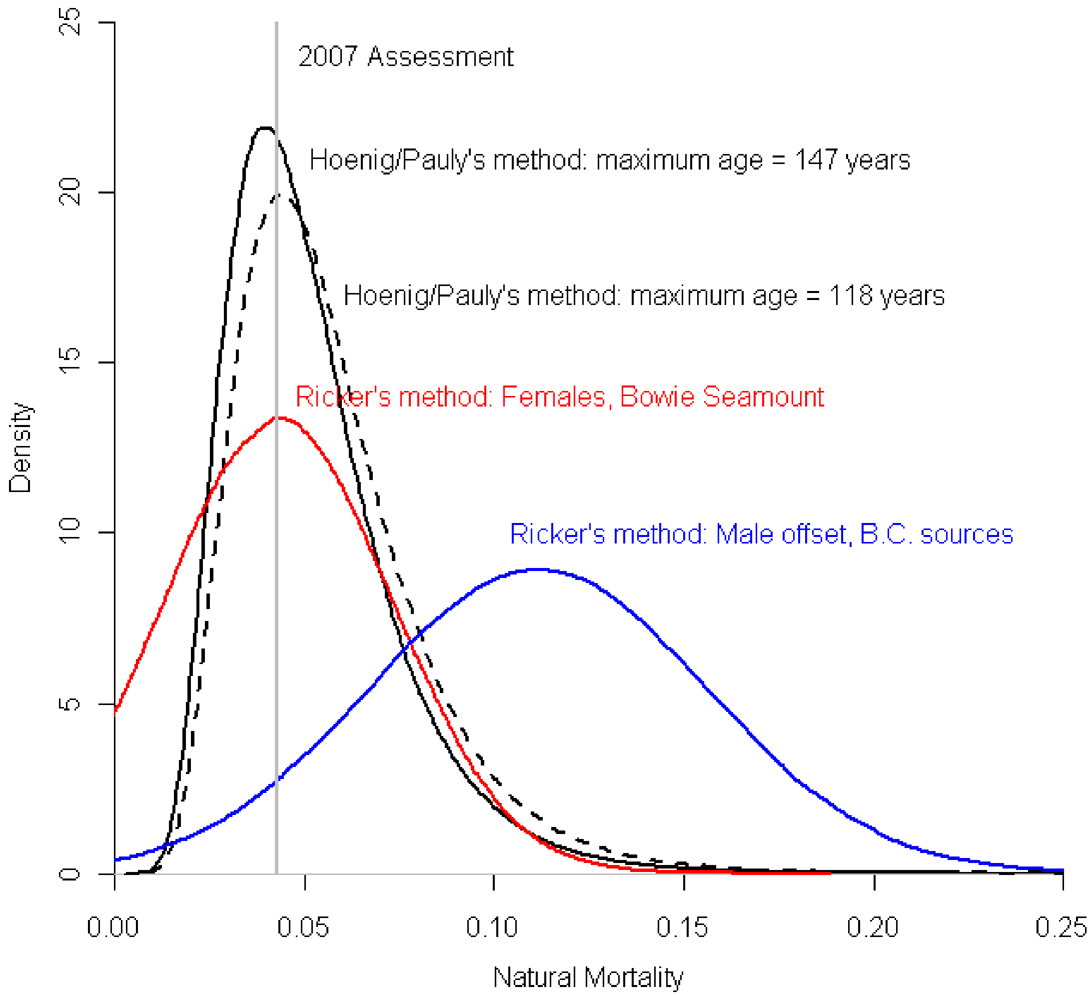

Figure 41. Priors for natural mortality from various sources.

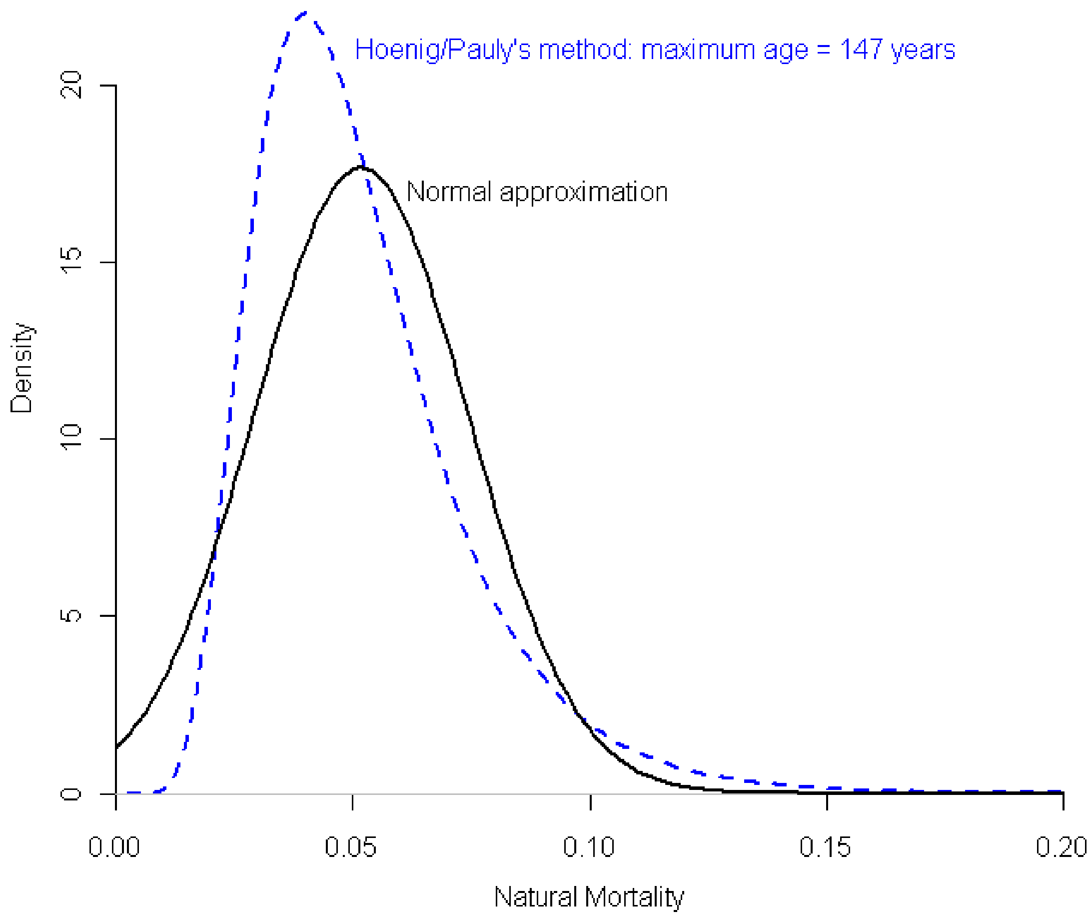

Figure 42. Prior for natural mortality (normal approximation) used in the base case model, with original log-normal distribution for comparison.

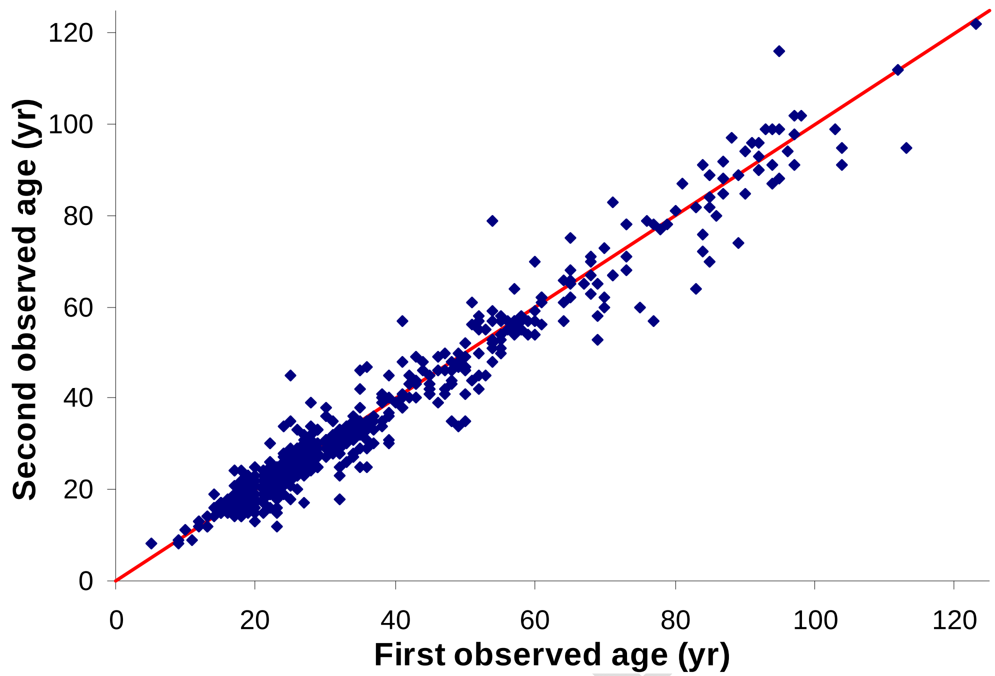

Figure 43. Comparison of first and second age reads (by WDFW age readers) for 556 yelloweye rockfish. Diagonal line indicates the 1:1 relationship.

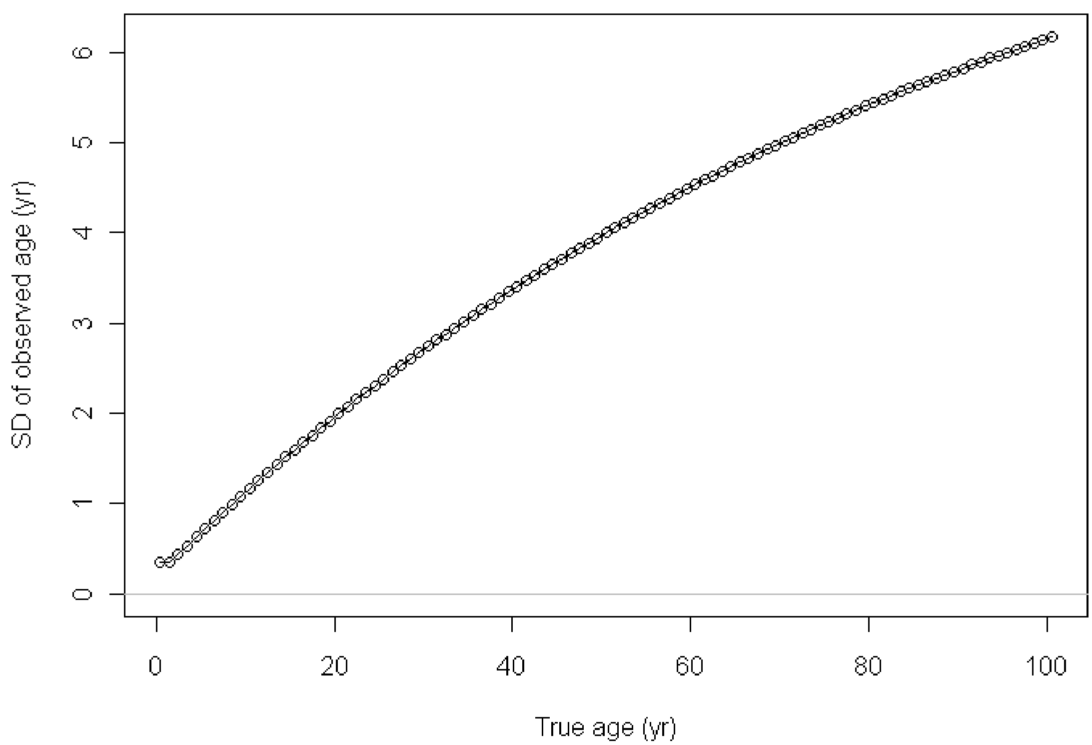

Figure 44. Externally estimated relationship between variability of observed age and true age in years.

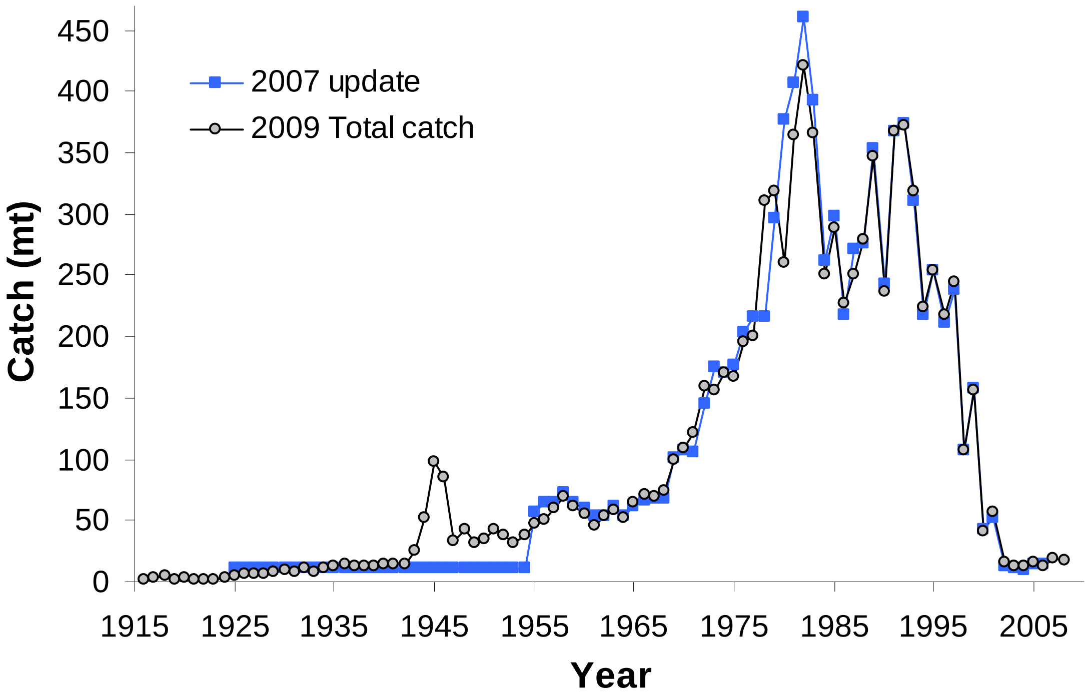

Figure 45. Comparison of the 2007 and recently revised yelloweye rockfish catch history, 1916-2008.

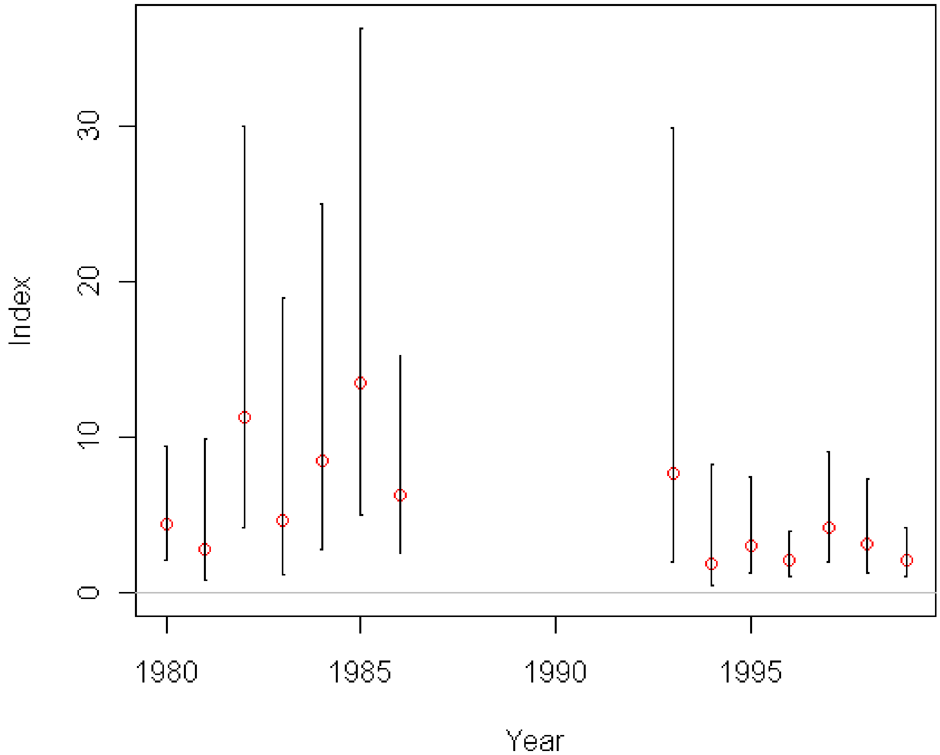

Figure 46. Index of relative abundance for the California recreational CPUE series.

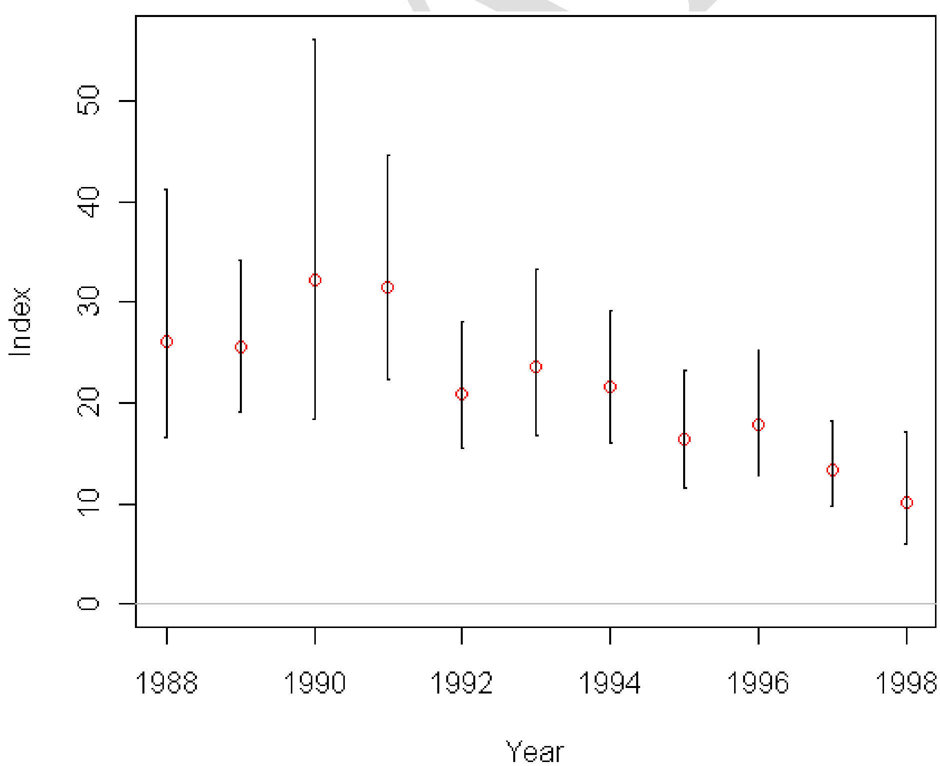

Figure 47. Index of relative abundance for the California recreational observer CPUE series.

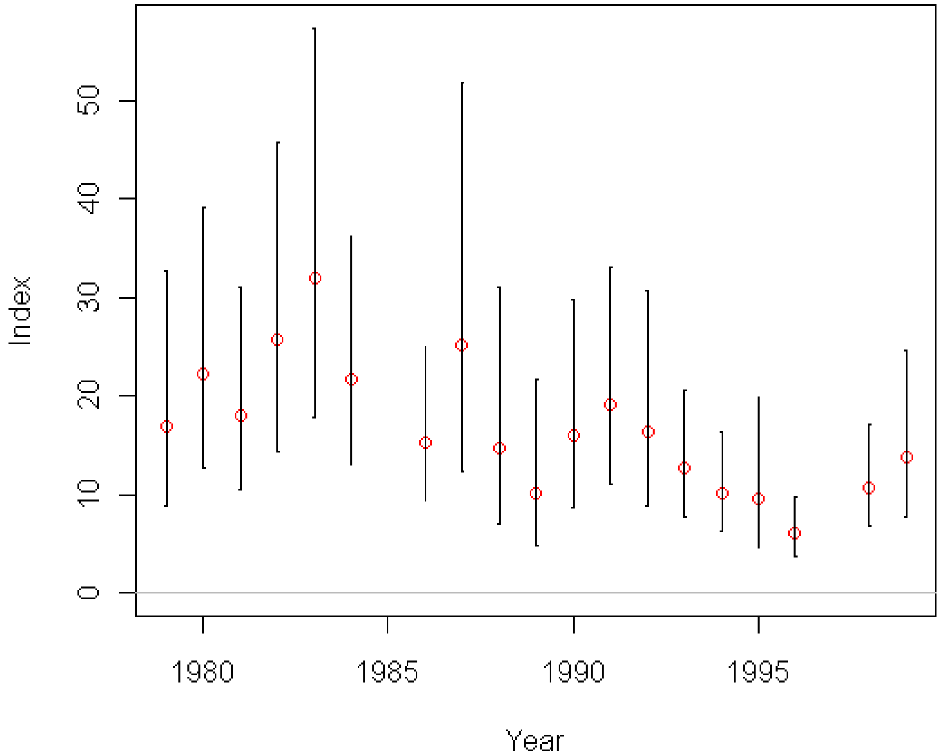

Figure 48. Index of relative abundance for the Oregon recreational CPUE series.

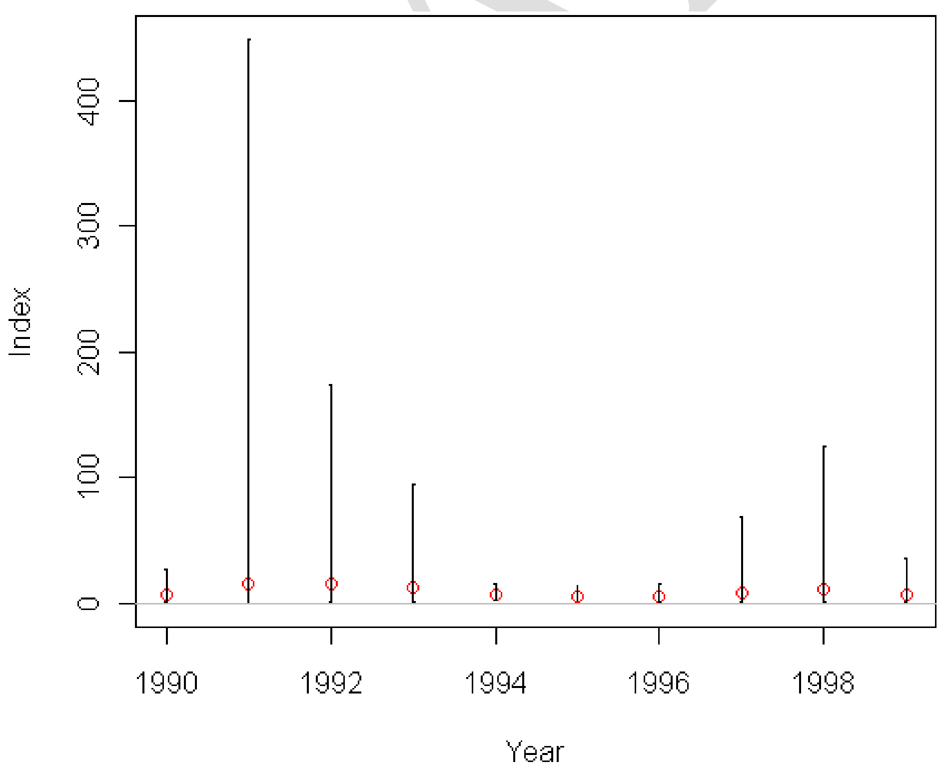

Figure 49.Index of relative abundance for the Washington recreational CPUE series.

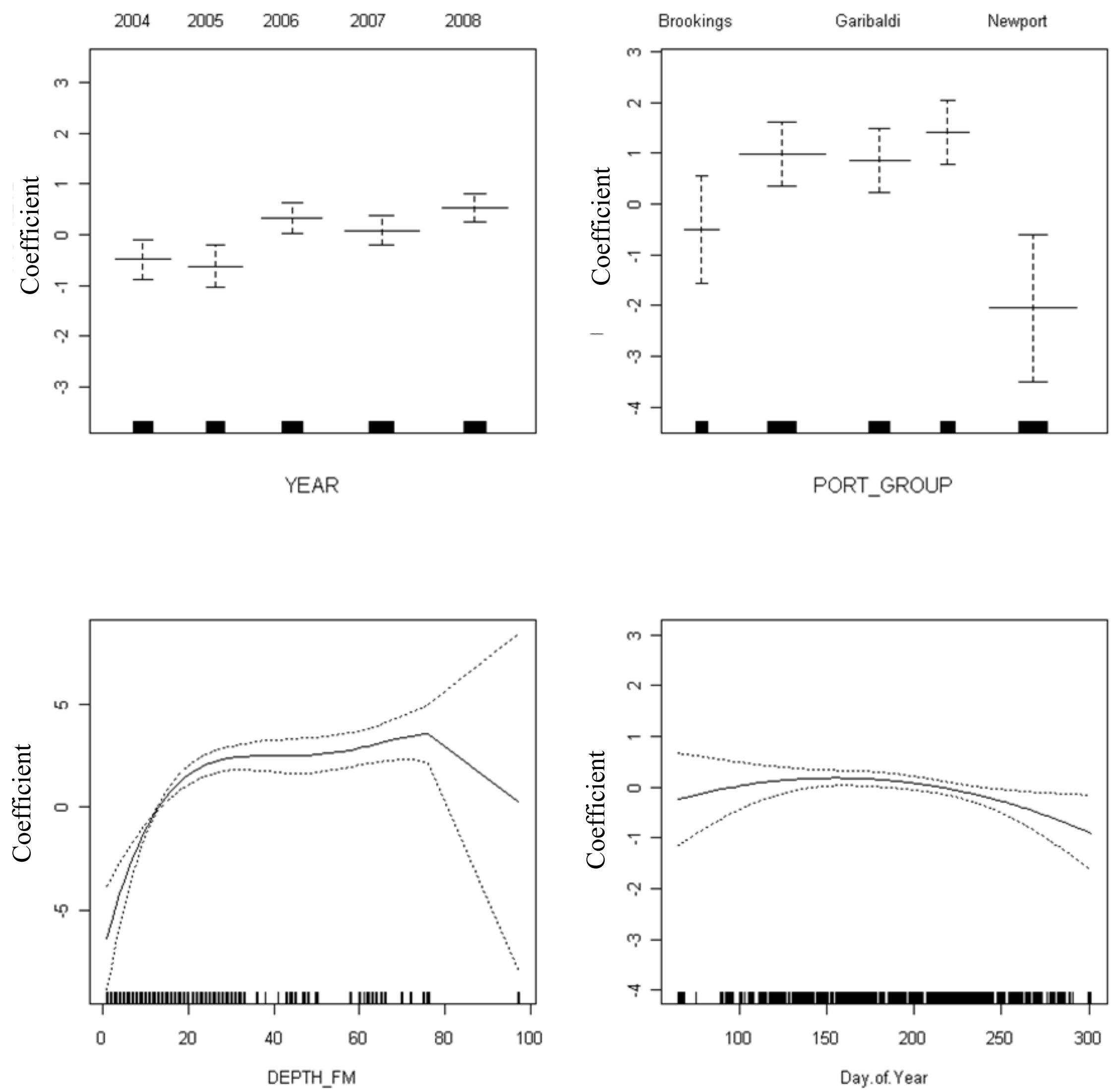

Figure 50.Estimated relationships of covariates included in the analysis of recreational charter observer CPUE data from Oregon. Error bars represent +/- 2 SEs about maximum likelihood estimates.

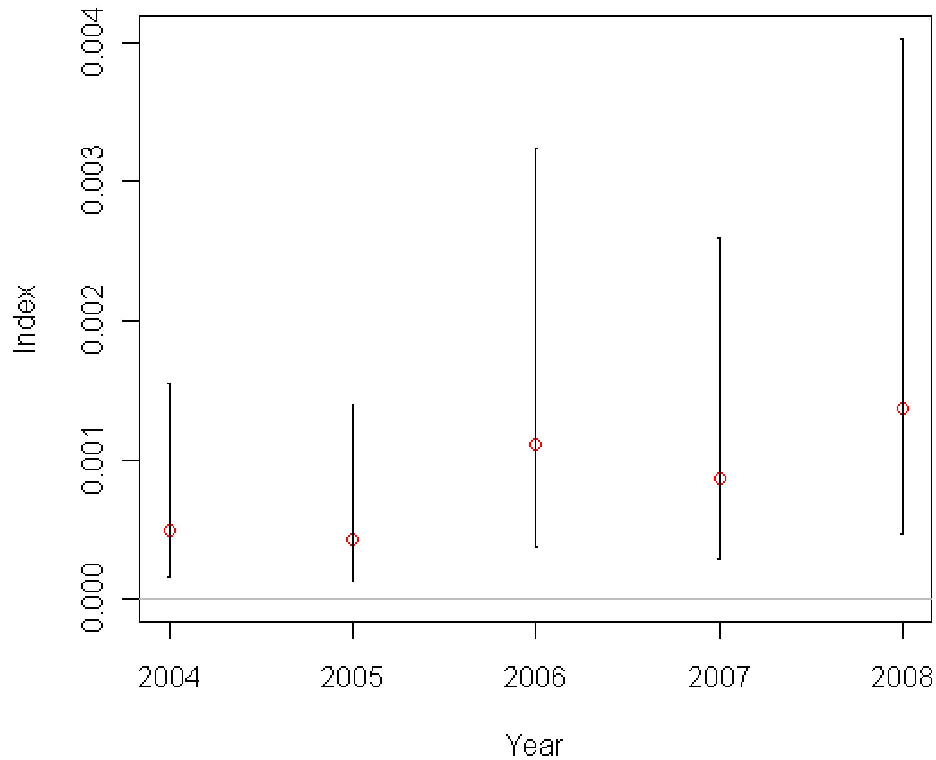

Figure 51. Index of relative abundance for the Oregon recreational observer CPUE series.

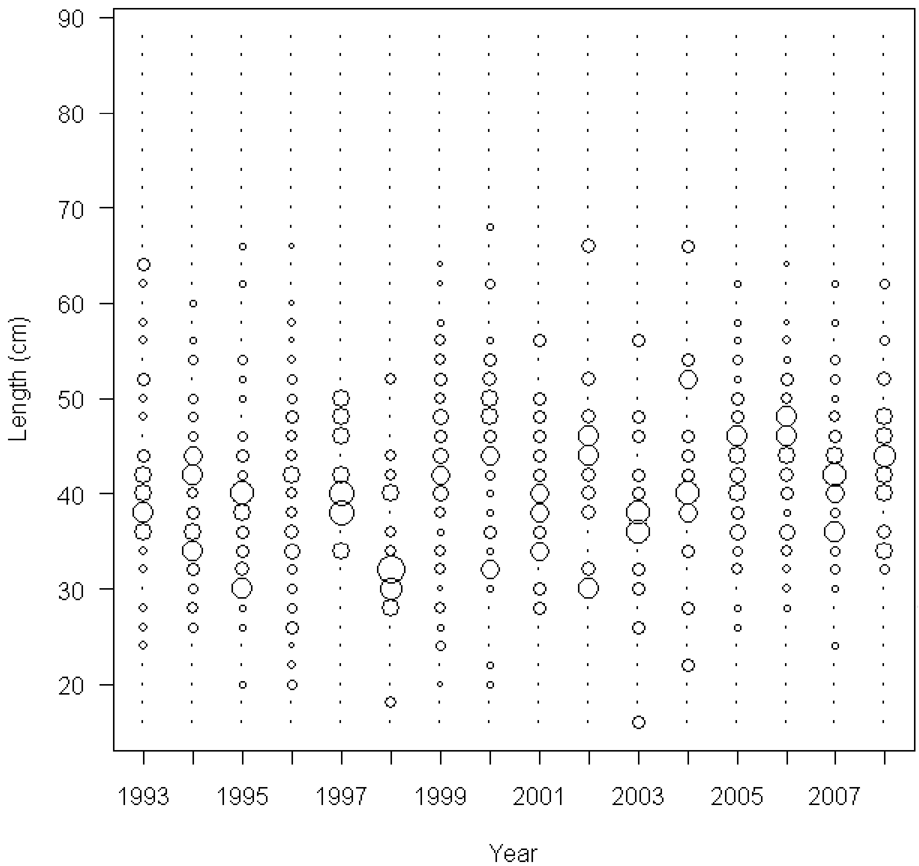

Figure 52. Length-frequency distributions for sexes-combined yelloweye rockfish from the California recreational fishery. Distributions sum to 1.0 in each year; the largest bubble sizes indicate a proportion of 0.27.

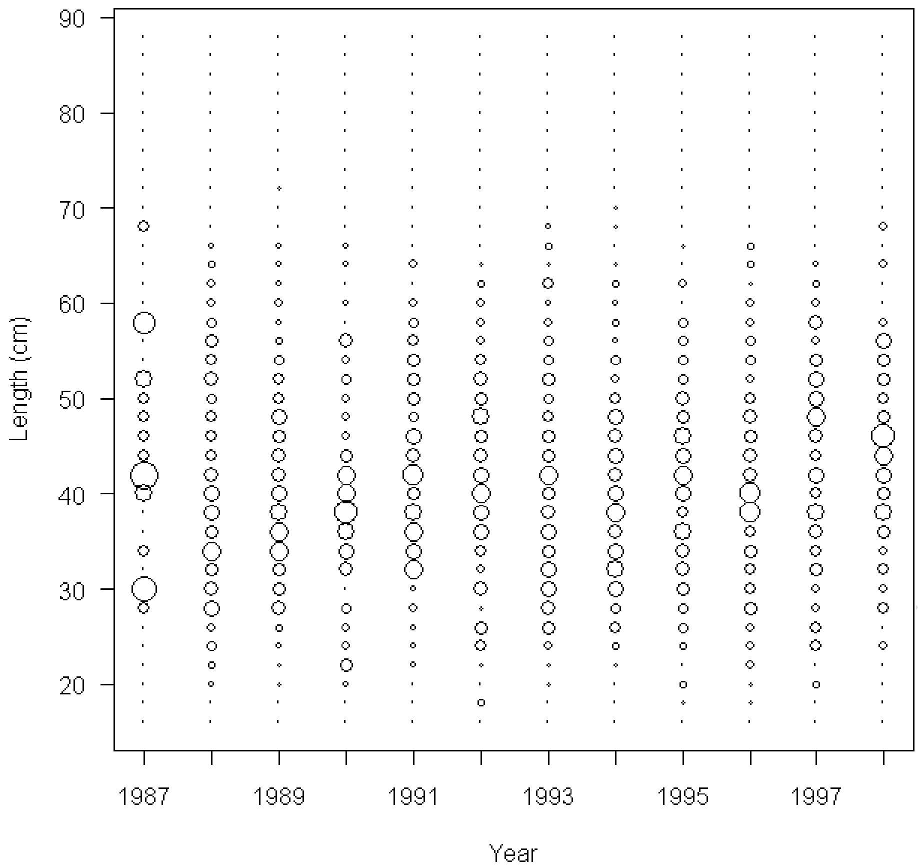

Figure 53. Length-frequency distributions for sexes-combined yelloweye rockfish from the California recreational charter fishery. Distributions sum to 1.0 in each year; the largest bubble sizes indicate a proportion of 0.21.

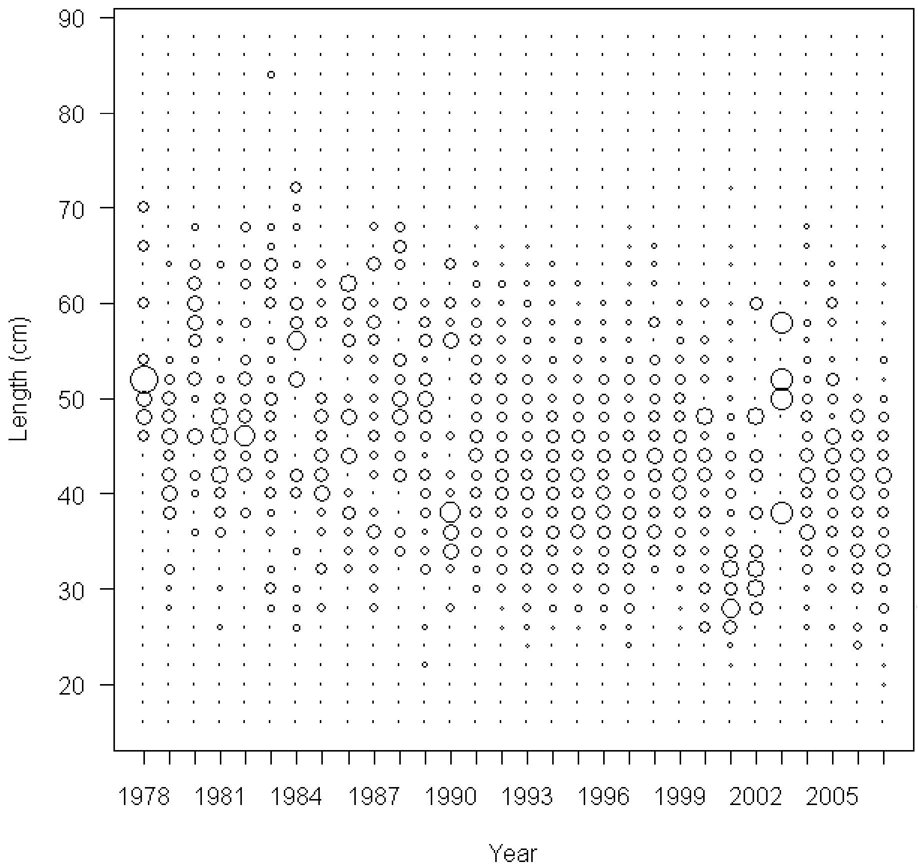

Figure 54. Length-frequency distributions for sexes-combined yelloweye rockfish from the California commercial fishery. Distributions sum to 1.0 in each year; the largest bubble sizes indicate a proportion of 0.39.

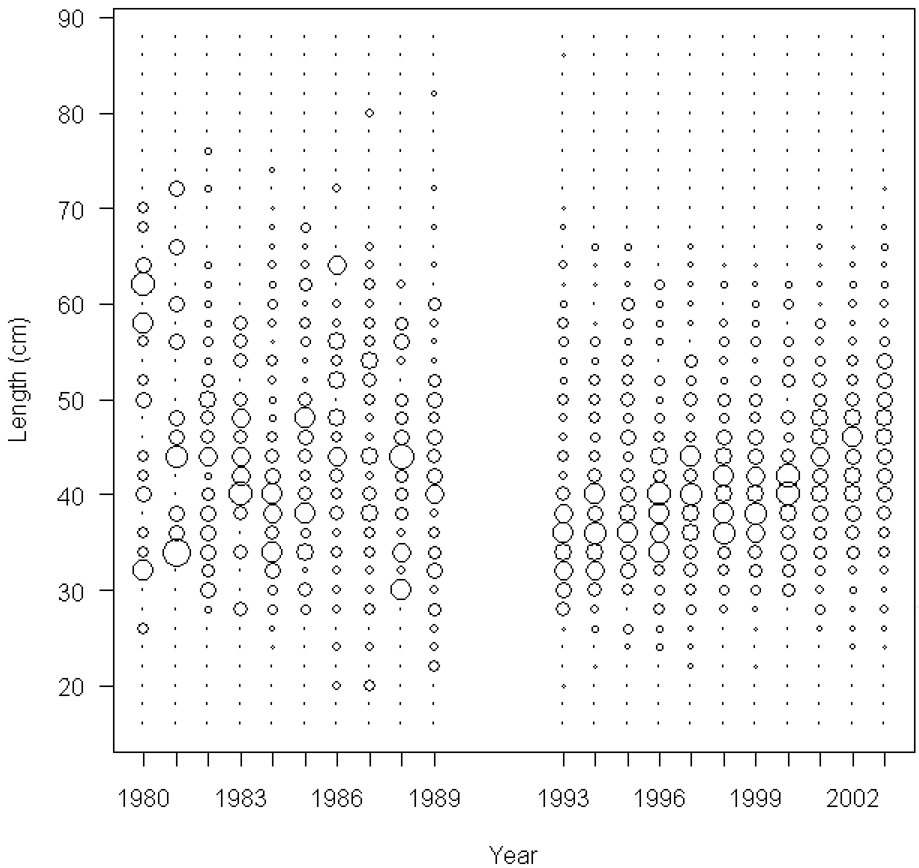

Figure 55.Length-frequency distributions for sexes-combined yelloweye rockfish from the Oregon recreational fishery. Distributions sum to 1.0 in each year; the largest bubble sizes indicate a proportion of 0.22.

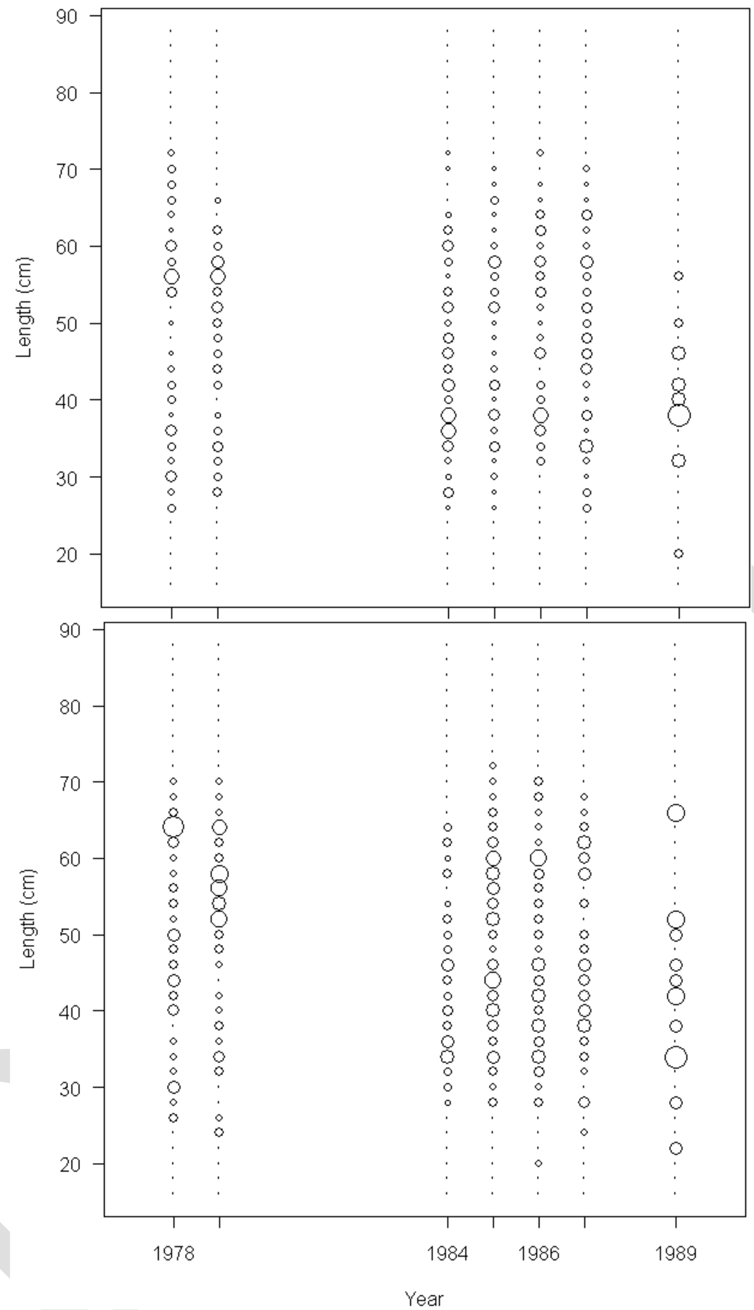

Figure 56. Length-frequency distributions for female (upper panel) and male (lower panel) yelloweye rockfish from the Oregon recreational fishery. Distributions sum to 1.0 in each year; the largest bubble sizes indicate proportions of 0.15 (females) and 0.09 (males).

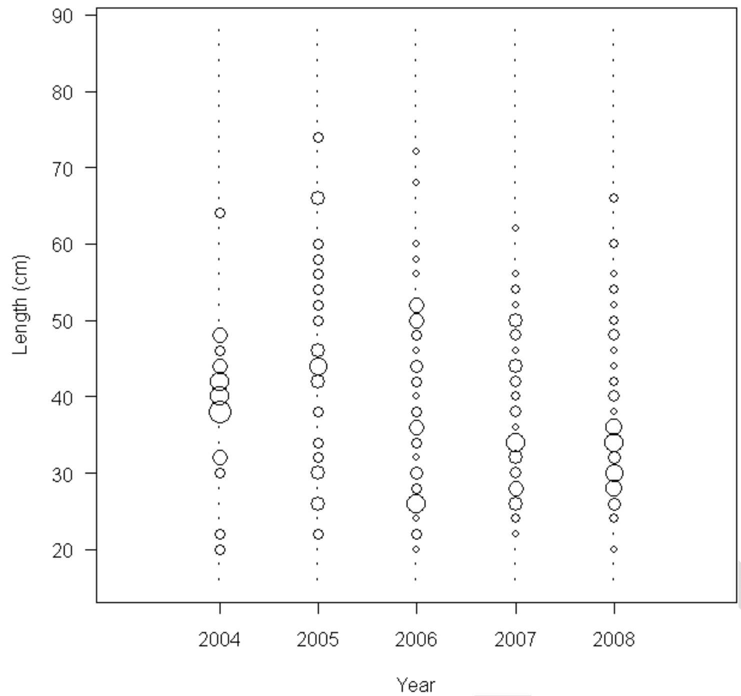

Figure 57. Length-frequency distributions for sexes-combined yelloweye rockfish from the Oregon recreational observer program. Distributions sum to 1.0 in each year; the largest bubble sizes indicate a proportion of 0.18.

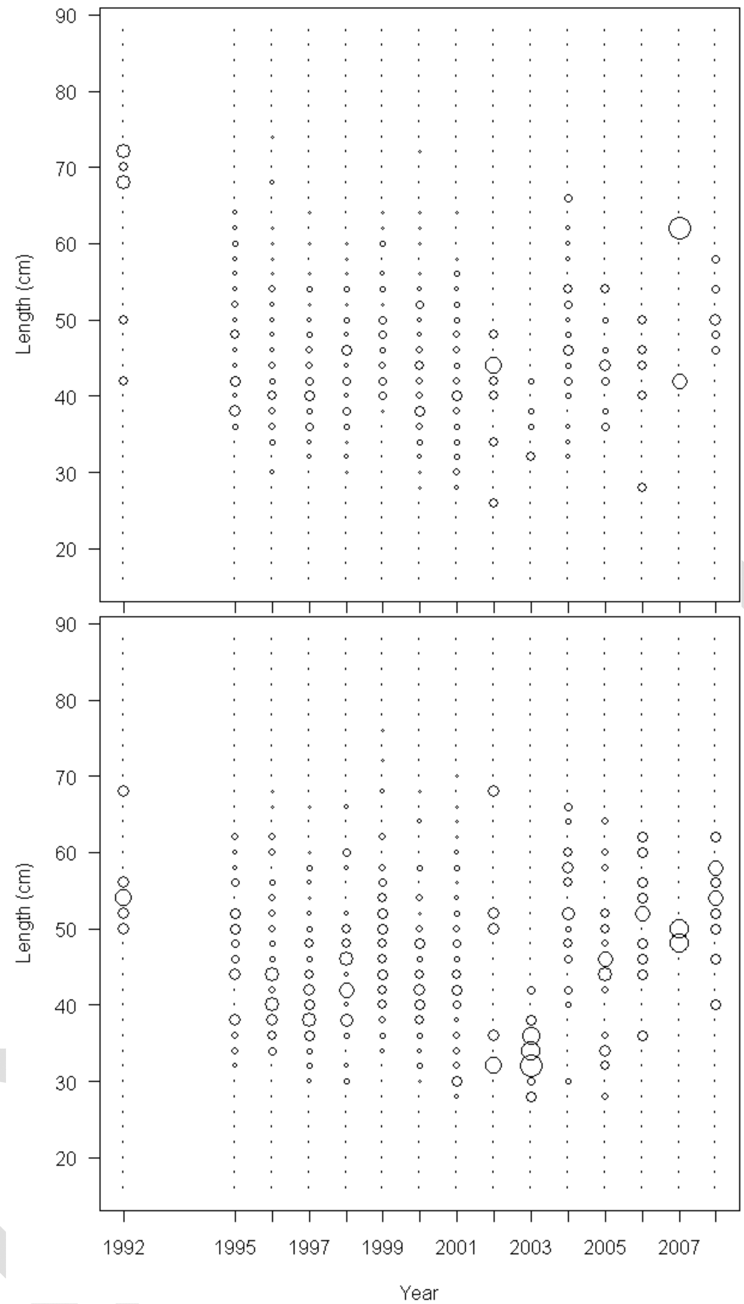

Figure 58. Length-frequency distributions for female (upper panel) and male (lower panel) yelloweye rockfish from the Oregon commercial fishery. Distributions sum to 1.0 in each year; the largest bubble sizes indicate proportions of 0.37 (females) and 0.25 (males).

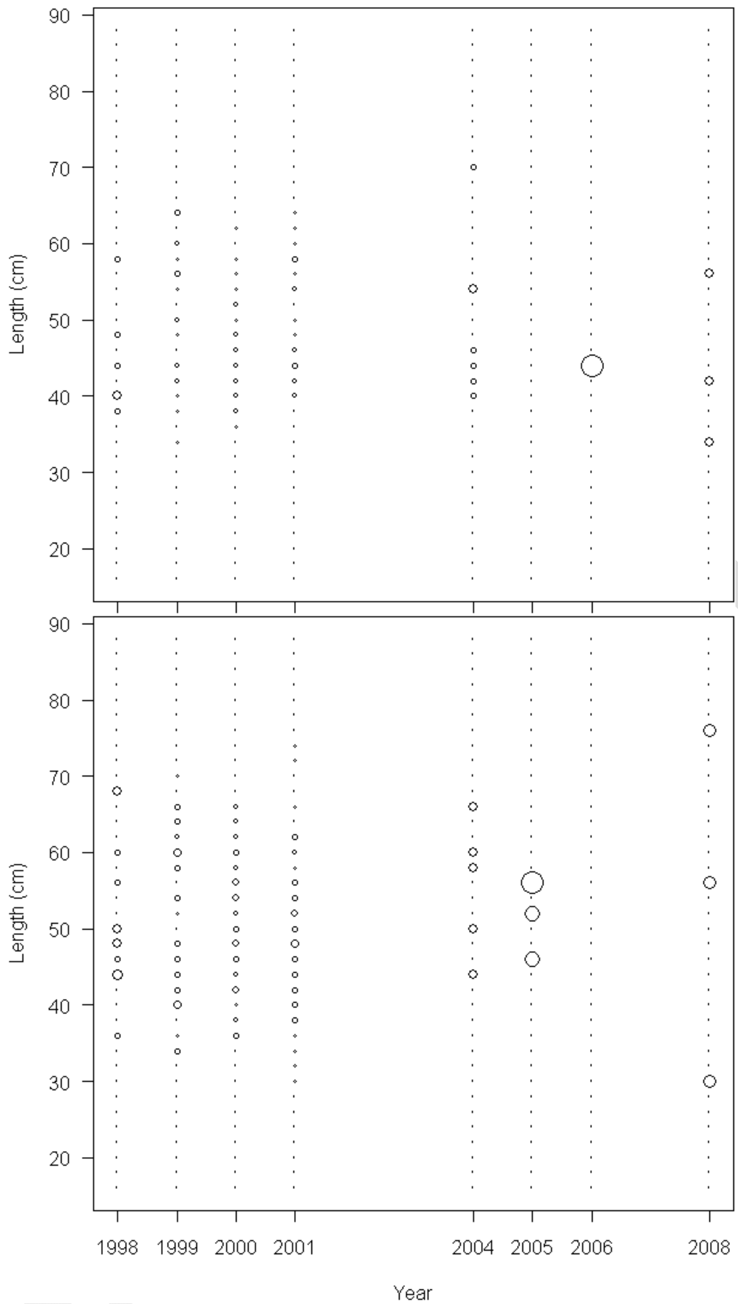

Figure 59. Length-frequency distributions for female (upper panel) and male (lower panel) yelloweye rockfish from the Washington recreational fishery. Distributions sum to 1.0 in each year; the largest bubble sizes indicate proportions of 0.93 (females) and 0.47 (males).

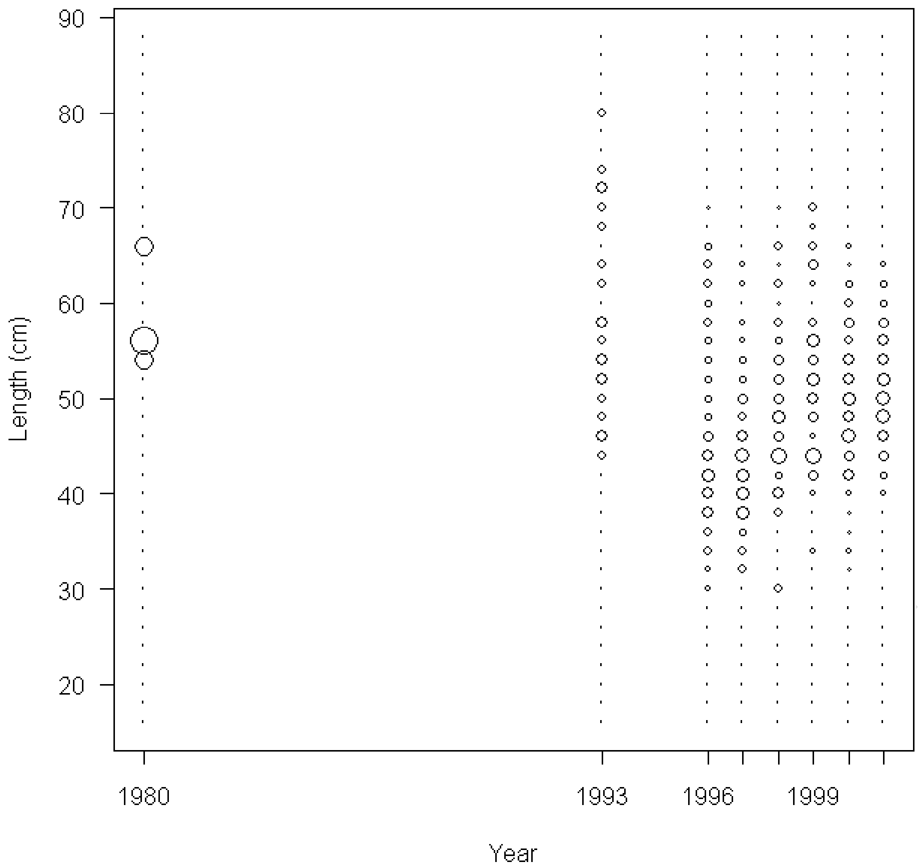

Figure 60. Length-frequency distributions for sexes-combined yelloweye rockfish from the Washington commercial fishery. Distributions sum to 1.0 in each year; the largest bubble sizes indicate a proportion of 0.48.

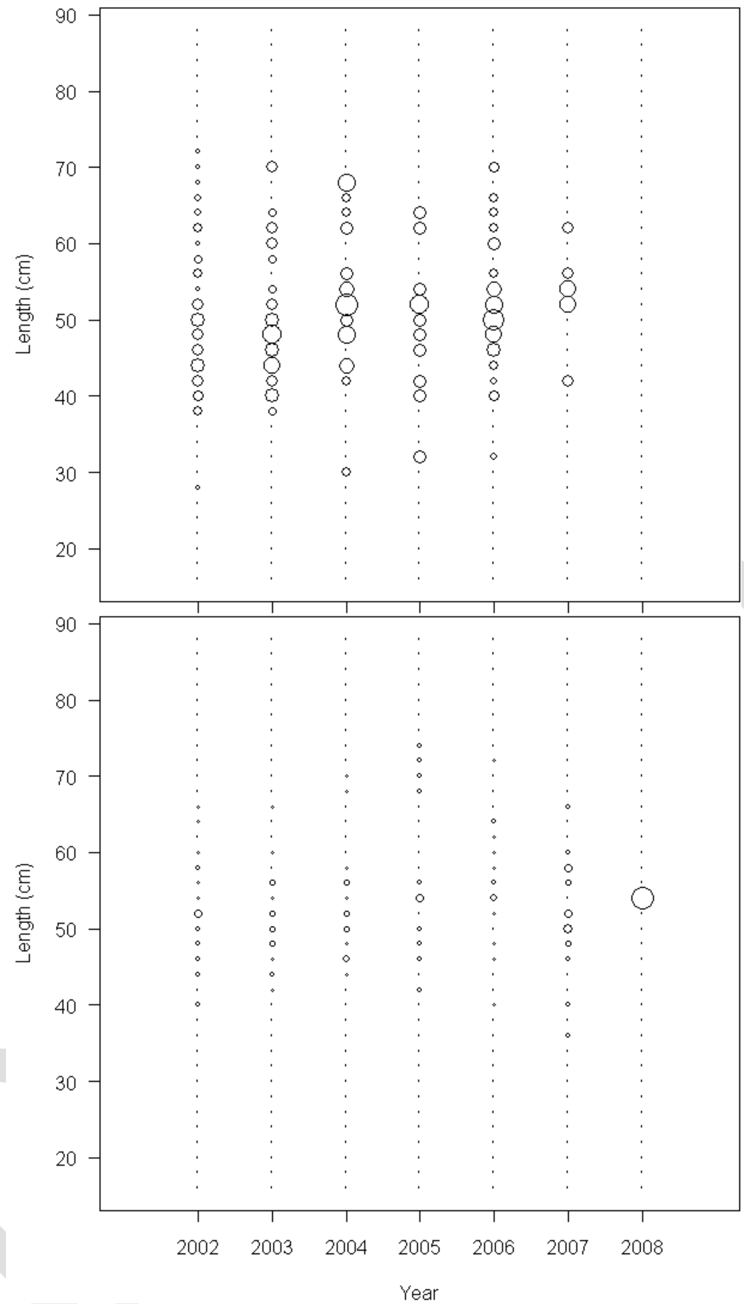

Figure 61. Length-frequency distributions for female (upper panel) and male (lower panel) yelloweye rockfish from the Washington commercial fishery. Distributions sum to 1.0 in each year; the largest bubble sizes indicate proportions of 0.11 (females) and 0.93 (males).

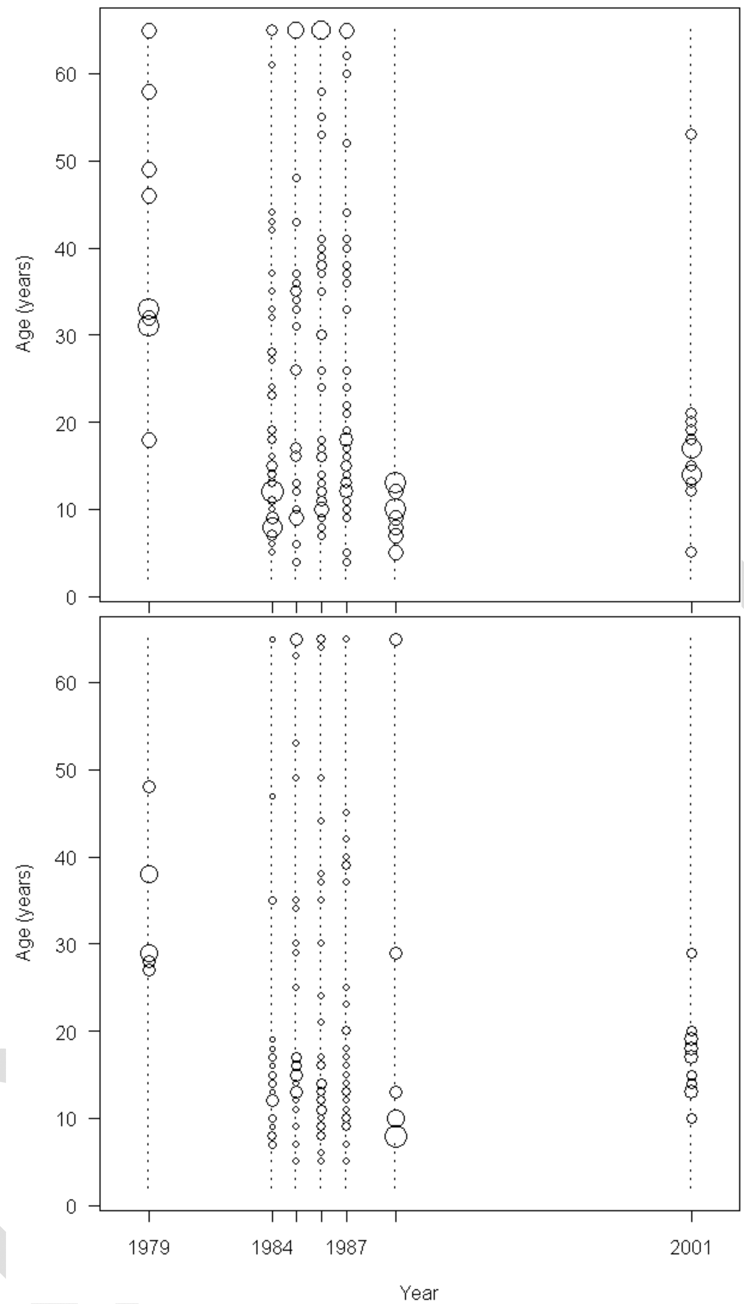

Figure 62. Marginal age-frequency distributions for female (upper panel) and male (lower panel) yelloweye rockfish from the Oregon recreational fishery. Note that these plots are intended for comparison and visual inspection; only the conditional age-frequency distributions are contributing to the total likelihood.

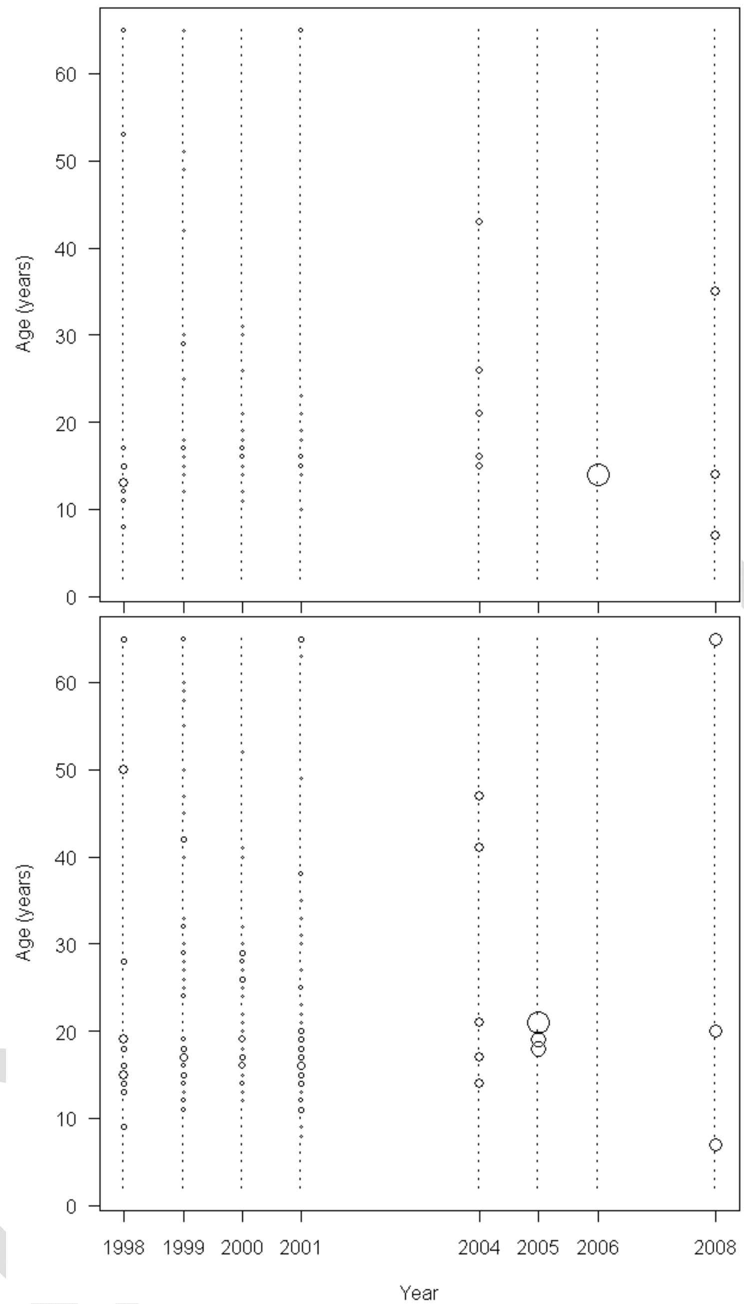

Figure 63. Marginal age-frequency distributions for female (upper panel) and male (lower panel) yelloweye rockfish from the Washington recreational fishery. Note that these plots are intended for comparison and visual inspection; only the conditional age-frequency distributions are contributing to the total likelihood.

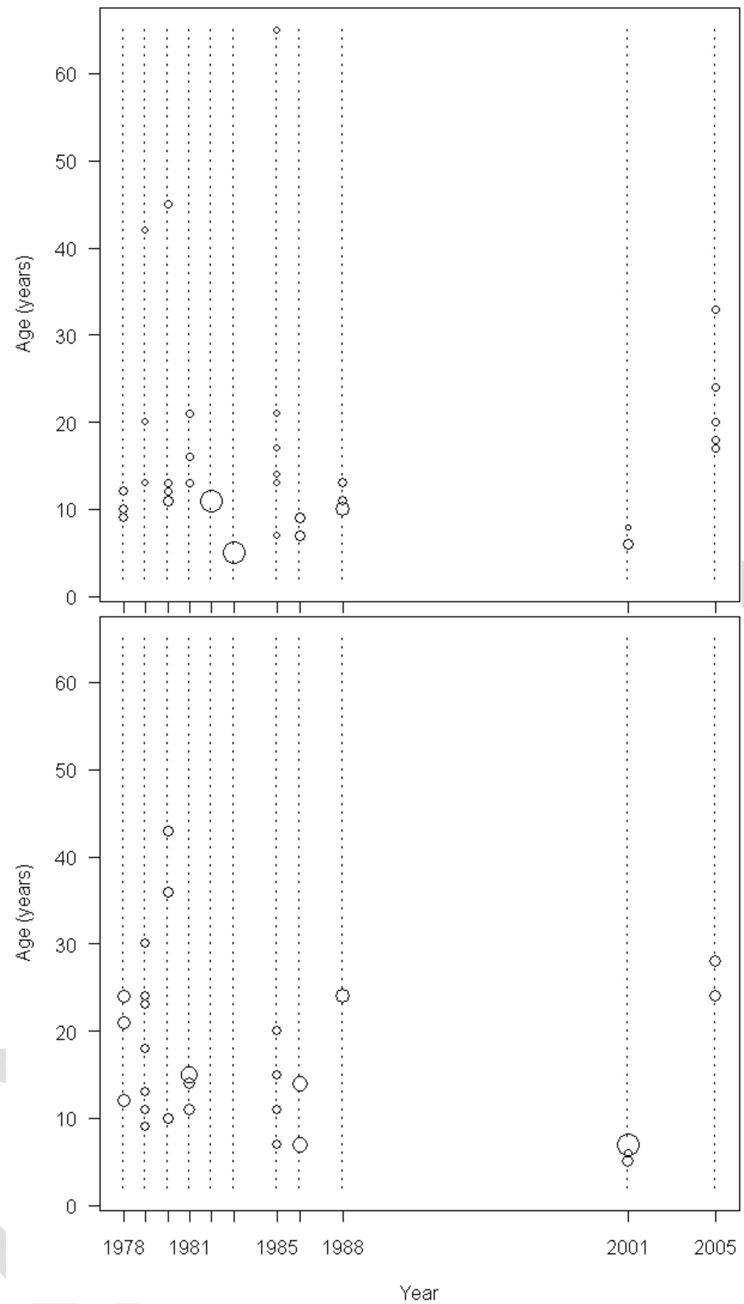

Figure 64. Marginal age-frequency distributions for female (upper panel) and male (lower panel) yelloweye rockfish from the California commercial fishery. Note that these plots are intended for comparison and visual inspection; only the conditional age-frequency distributions are contributing to the total likelihood.

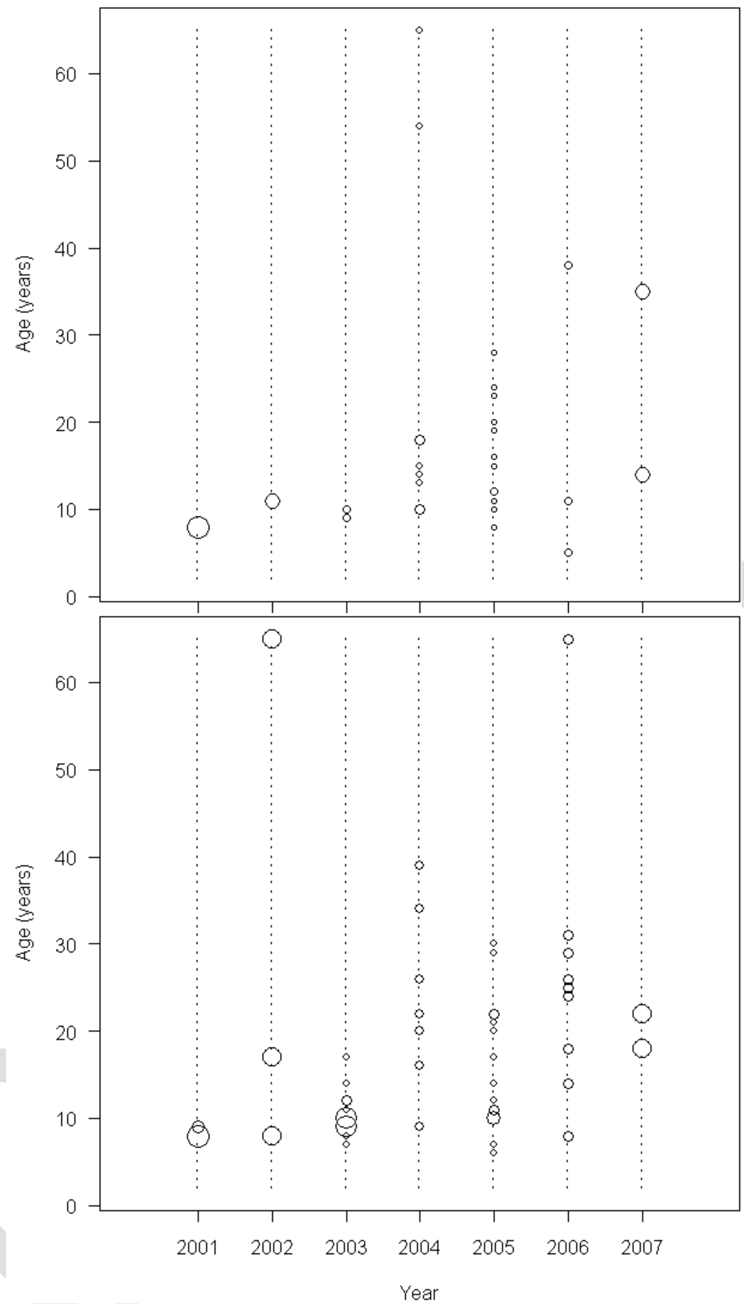

Figure 65. Marginal age-frequency distributions for female (upper panel) and male (lower panel) yelloweye rockfish from the Oregon commercial fishery. Note that these plots are intended for comparison and visual inspection; only the conditional age-frequency distributions are contributing to the total likelihood.

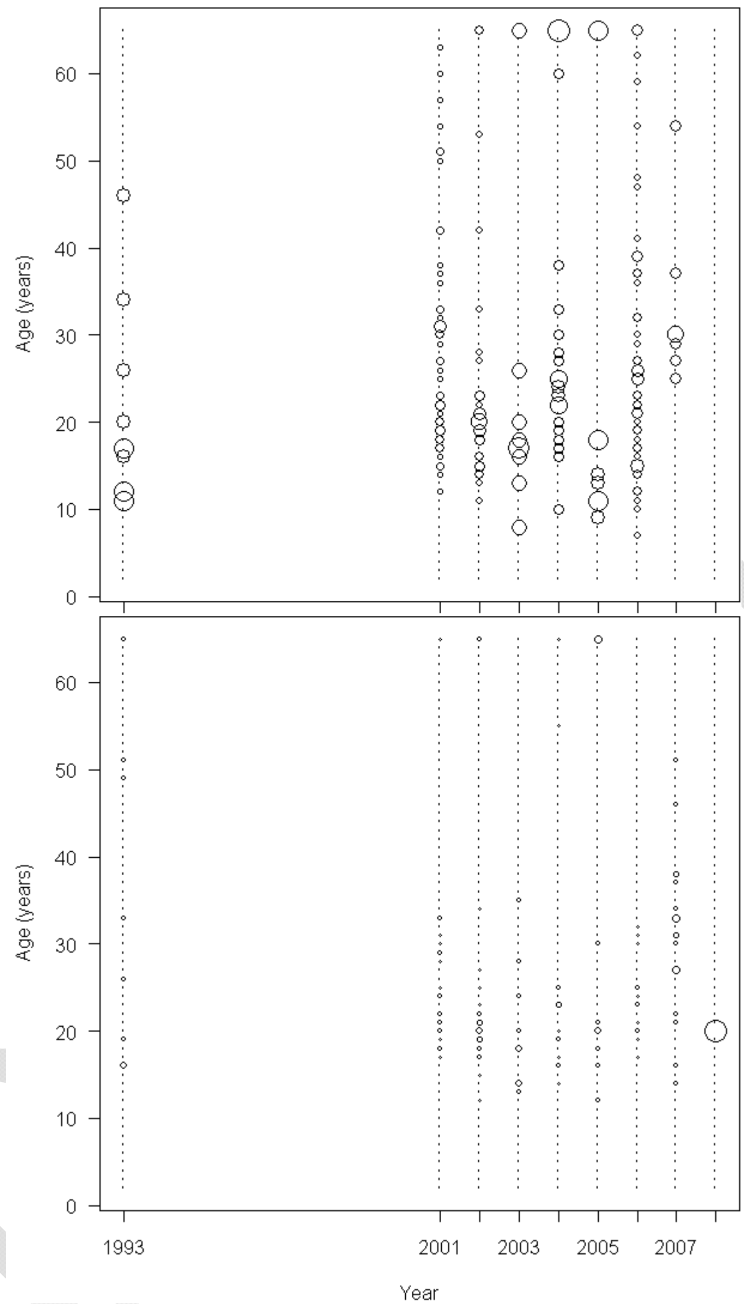

Figure 66. Marginal age-frequency distributions for female (upper panel) and male (lower panel) yelloweye rockfish from the Washington commercial fishery. Note that these plots are intended for comparison and visual inspection; only the conditional age-frequency distributions are contributing to the total likelihood.

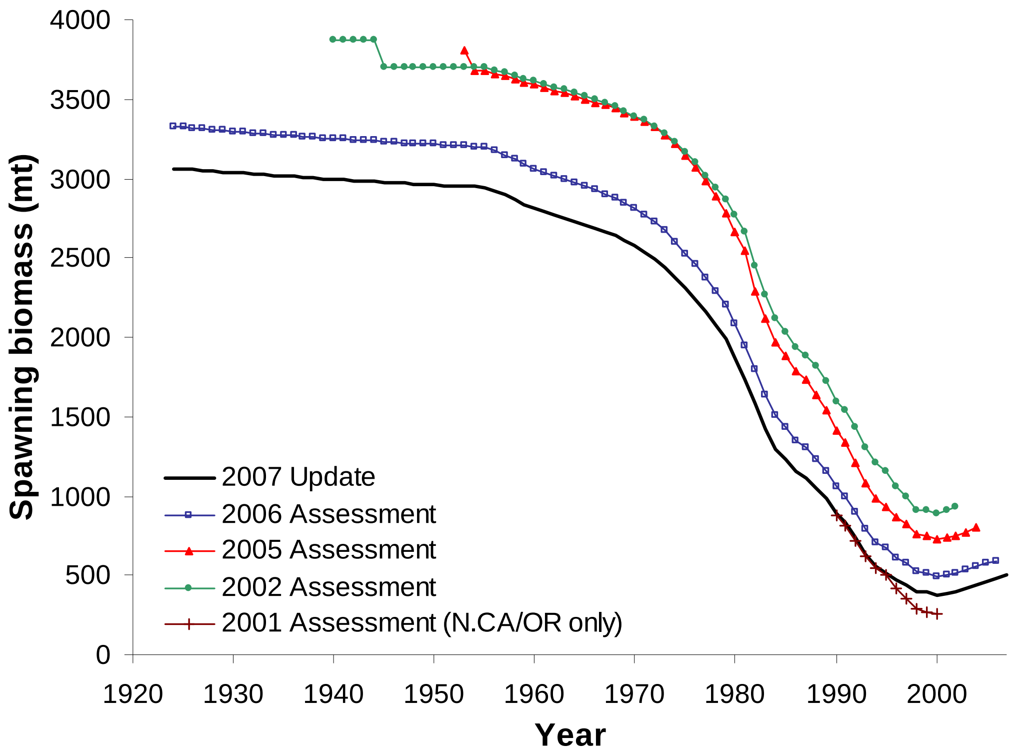

Figure 67. Retrospective analysis across stock assessments for yelloweye rockfish, 2001-2007.

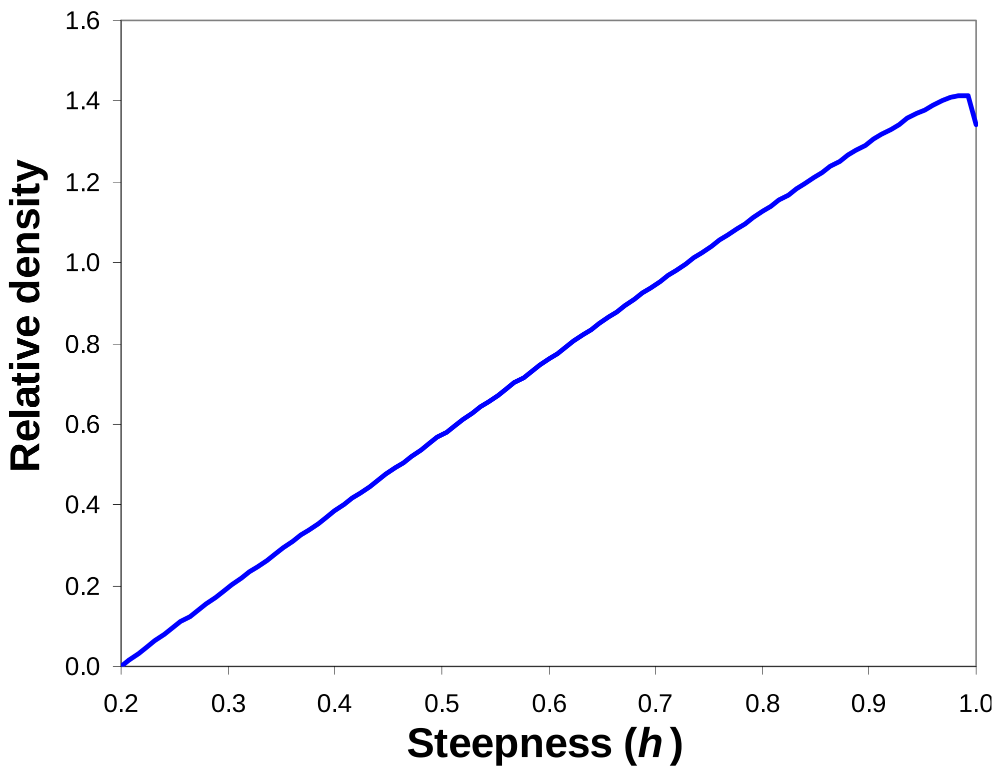

Figure 68. Prior distribution (*Beta*) for stock-recruitment steepness based on a 2009 meta-analysis for west coast rockfish (Martin Dorn, AFSC, personal communication).

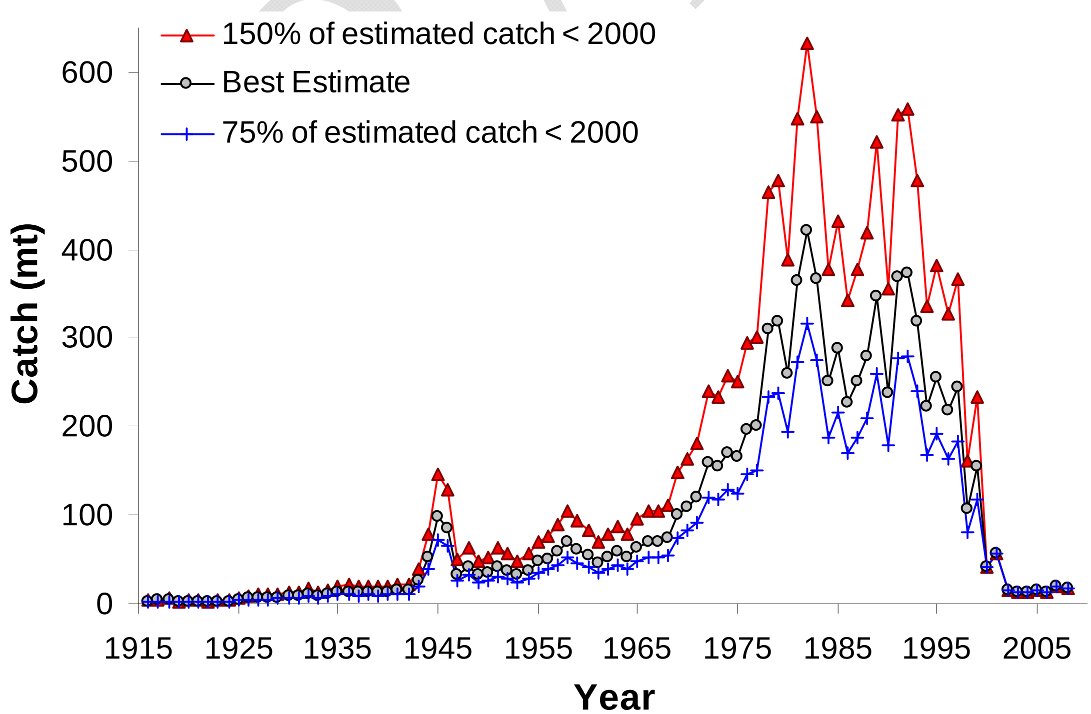

Figure 69. Catch series for the alternate states of nature.

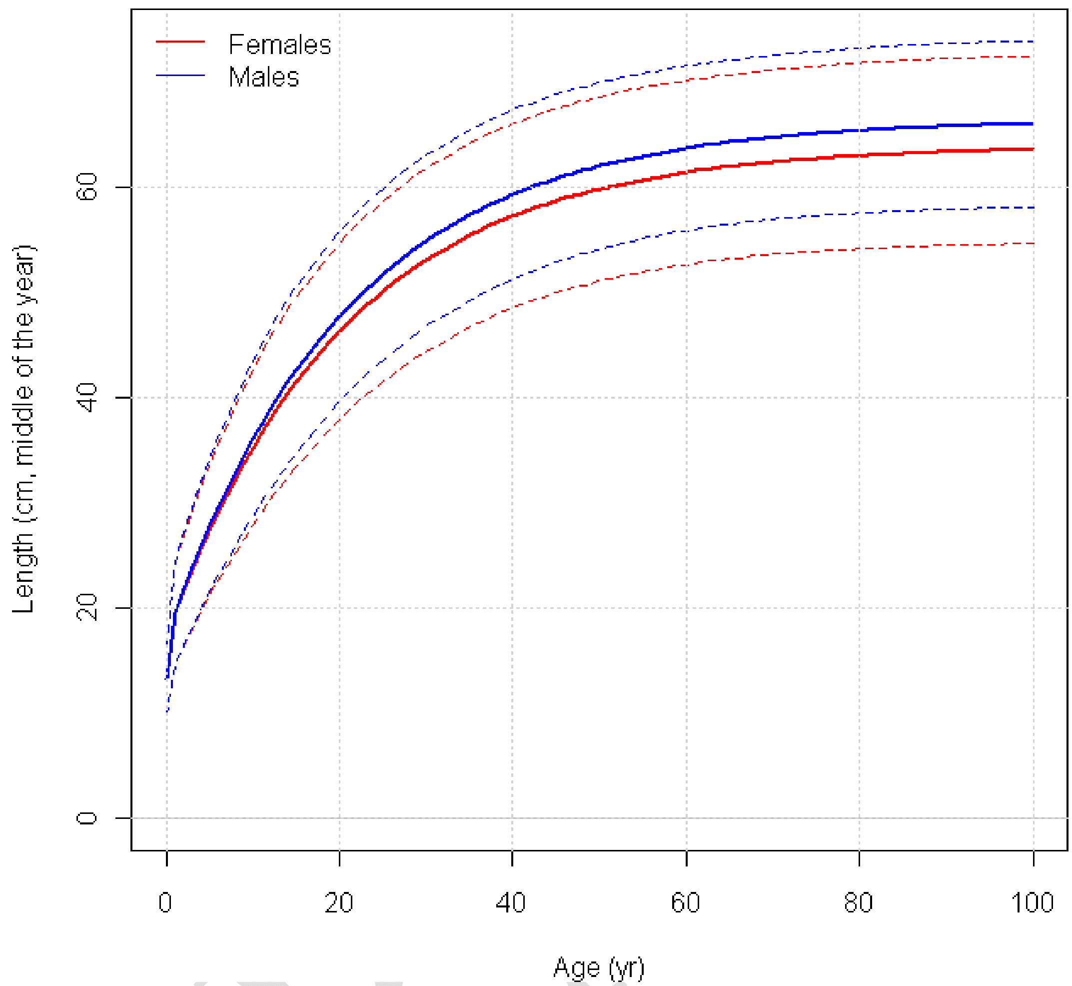

Figure 70. Growth curve for males (upper solid line) and females (lower solid line) with ~95% interval (dashed lines) indicating the expectation and individual variability of length-at-age for the base case model.

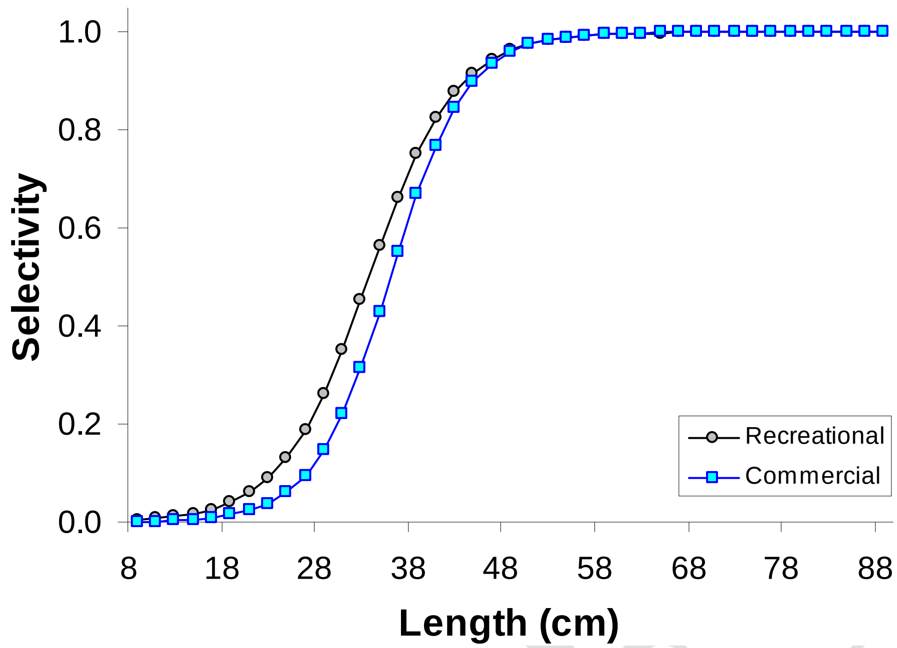

Figure 71. Estimated selectivity for the California fisheries.

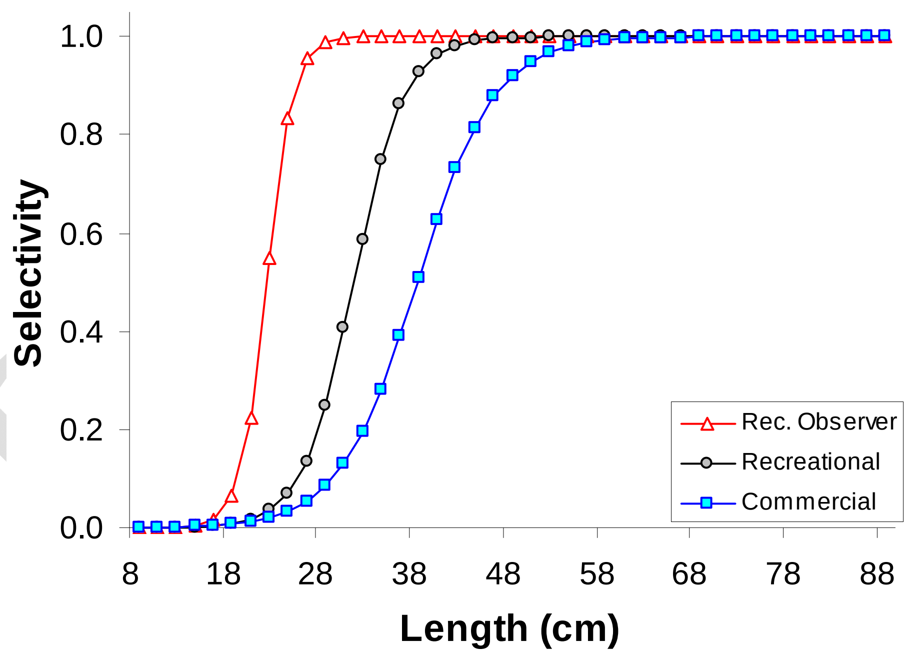

Figure 72. Estimated selectivity for Oregon fisheries.

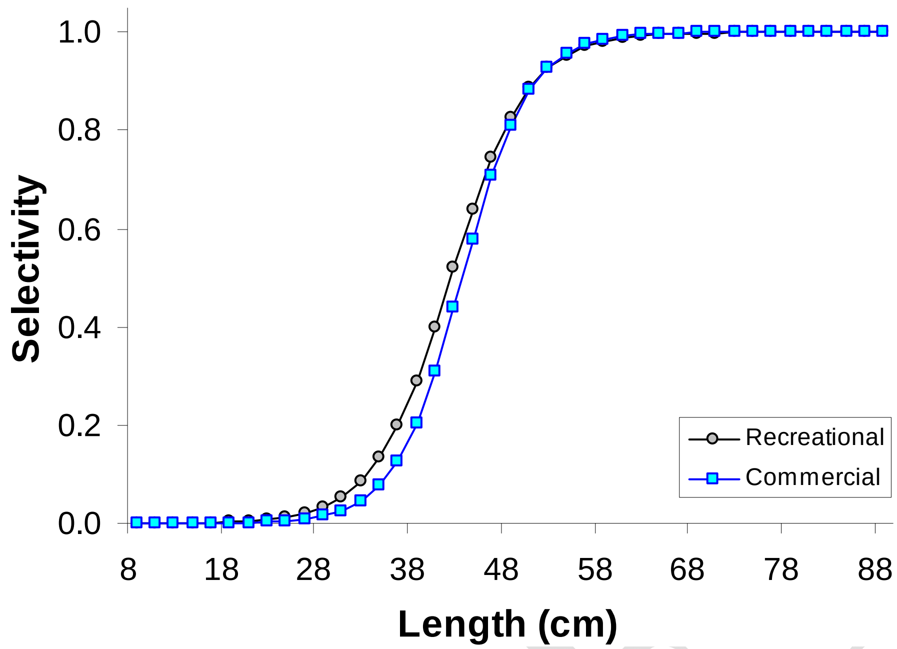

Figure 73. Estimated selectivity for Washington fisheries.

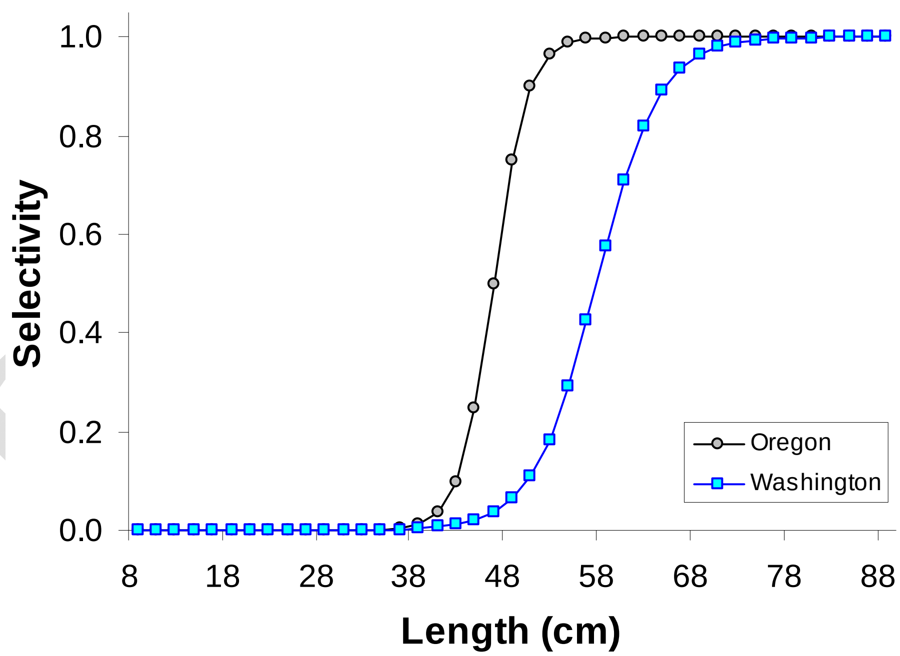

Figure 74. Estimated selectivity for IPHC surveys.

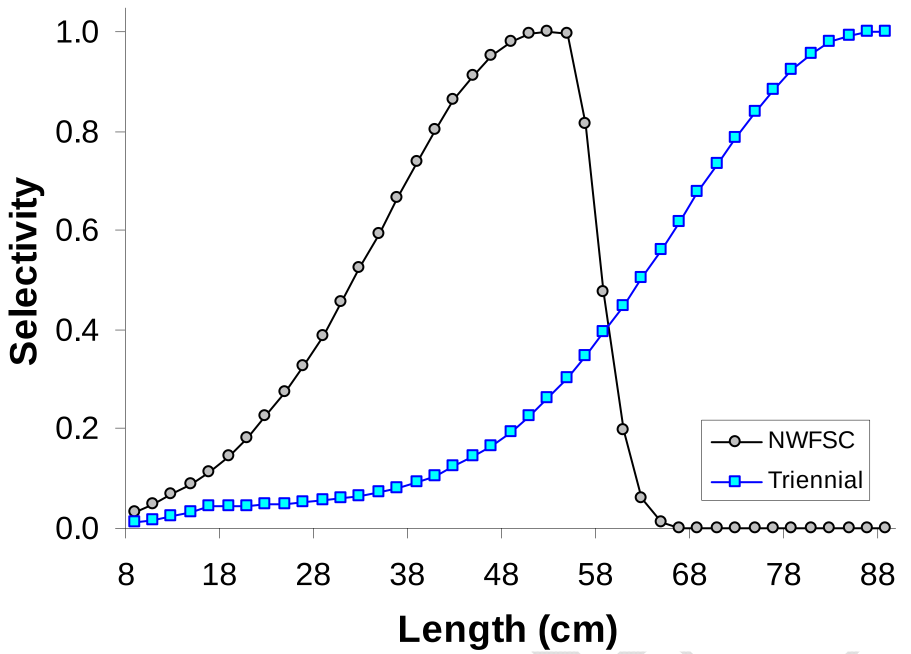

Figure 75. Estimated selectivity for trawl surveys.

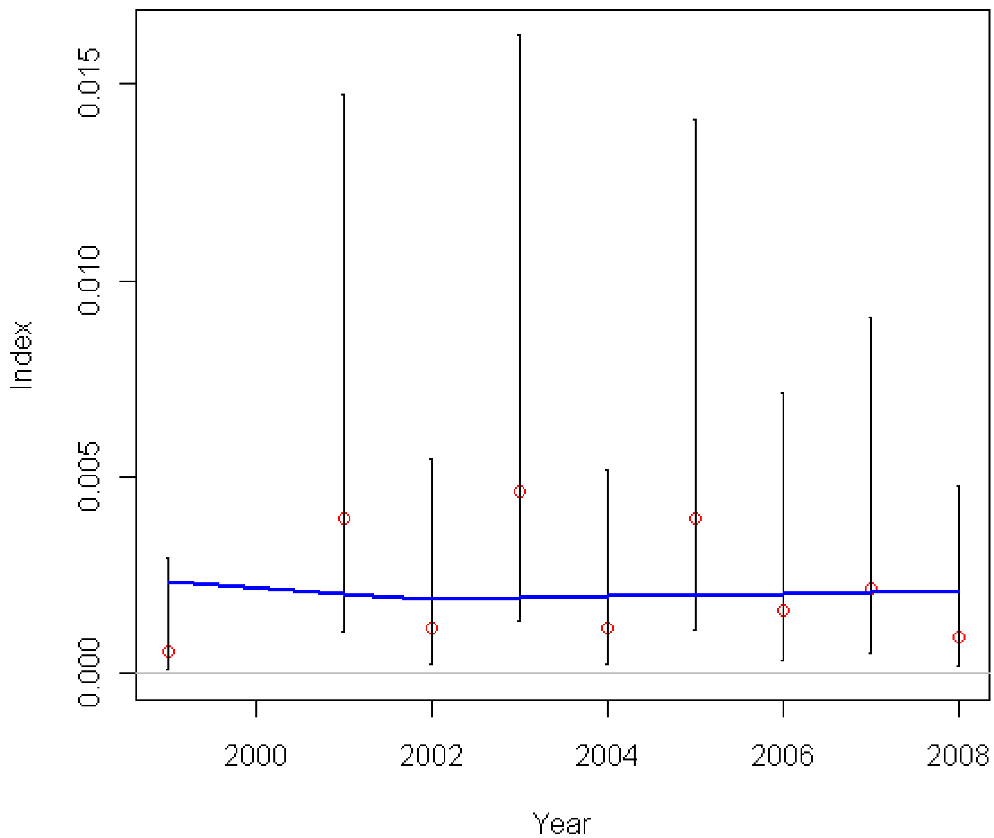

Figure 76. Fit to the IPHC survey index for Washington in the base case model.

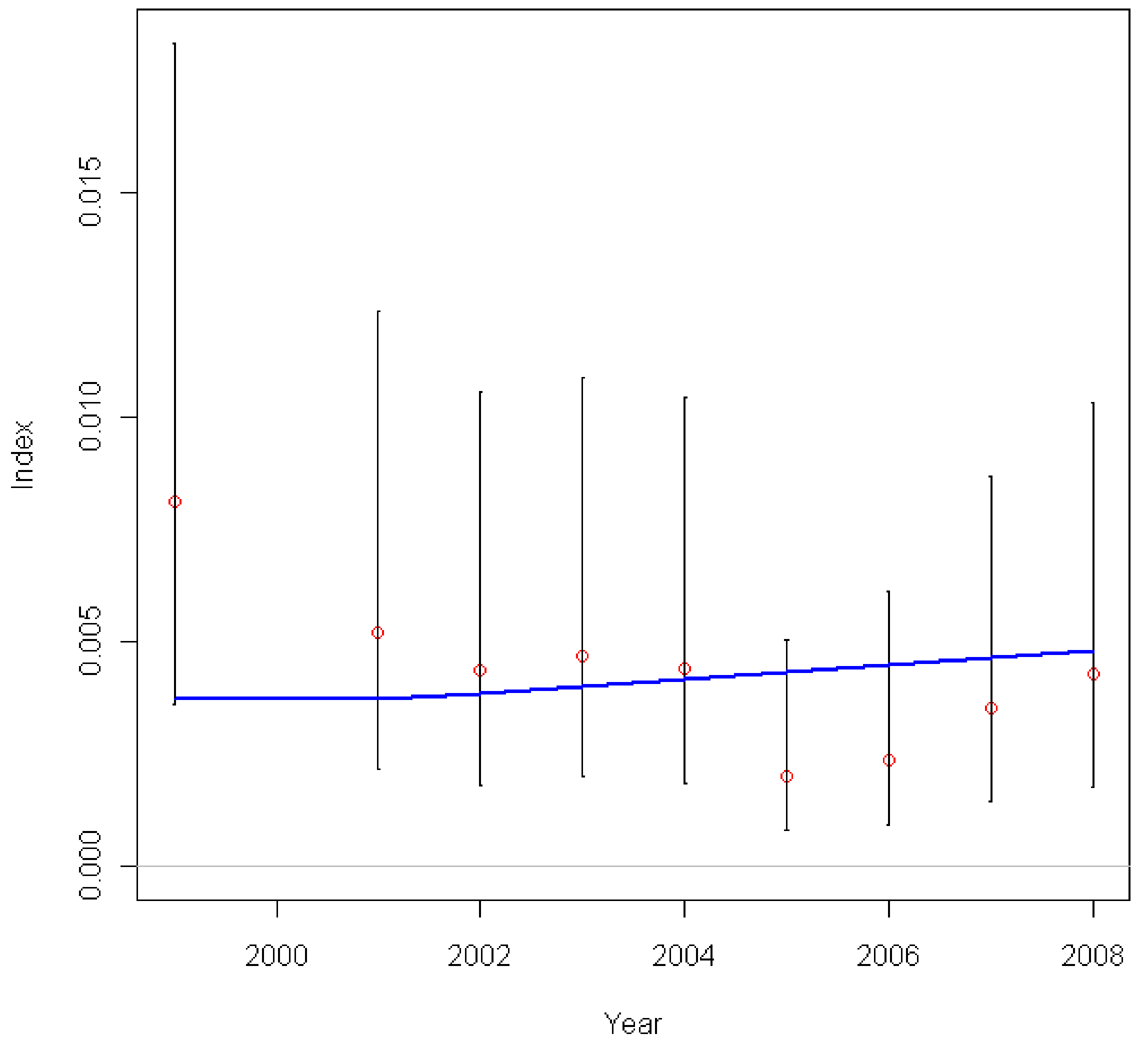

Figure 77. Fit to the IPHC survey index for Oregon in the base case model.

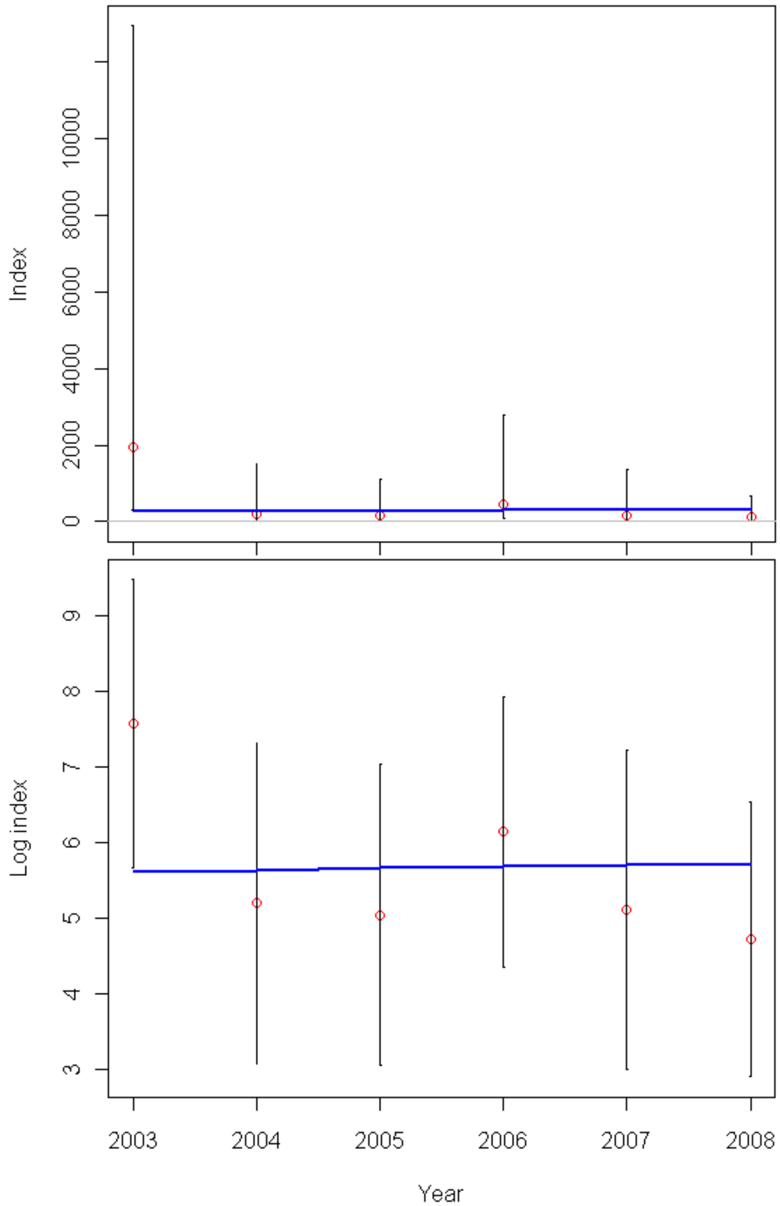

Figure 78. Fit to the NWFSC survey index for Oregon of relative biomass (upper panel) and log(index) for easier evaluation (lower panel) in the base case model.

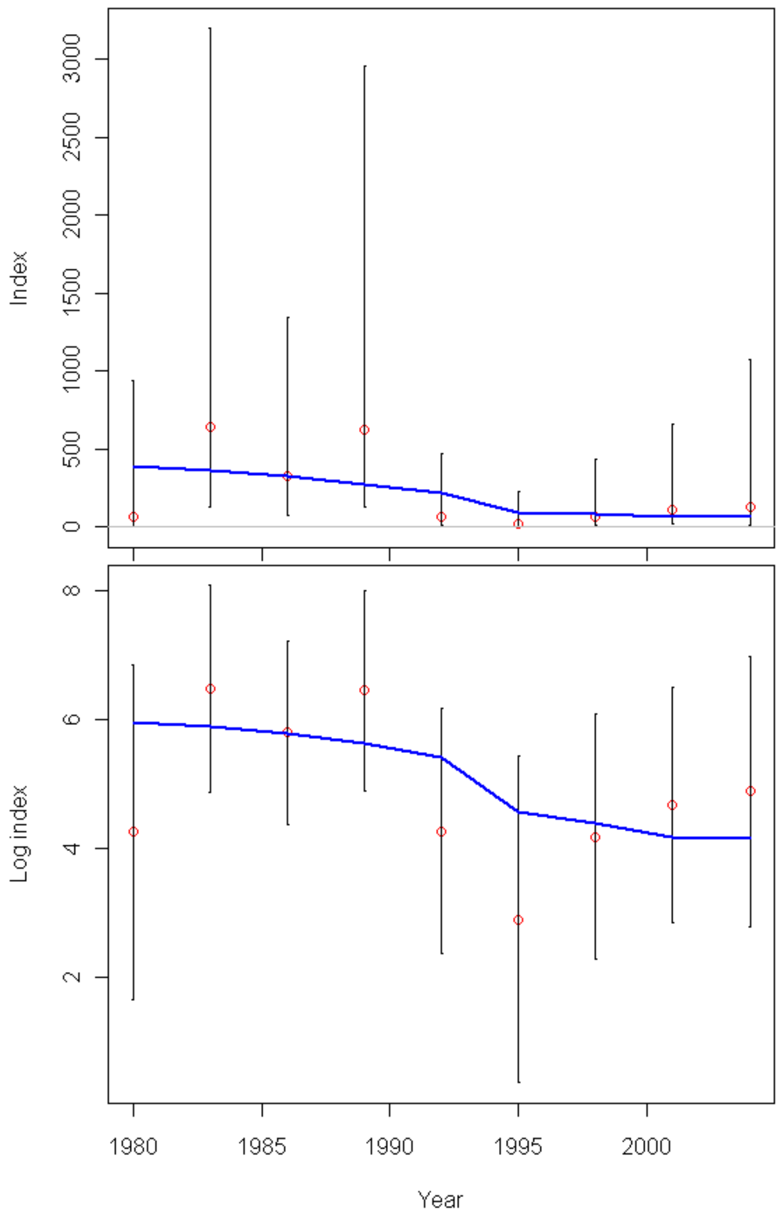

Figure 79. Fit to the triennial survey index for Washington of relative biomass (upper panel) and log(index) for easier evaluation (lower panel) in the base case model.

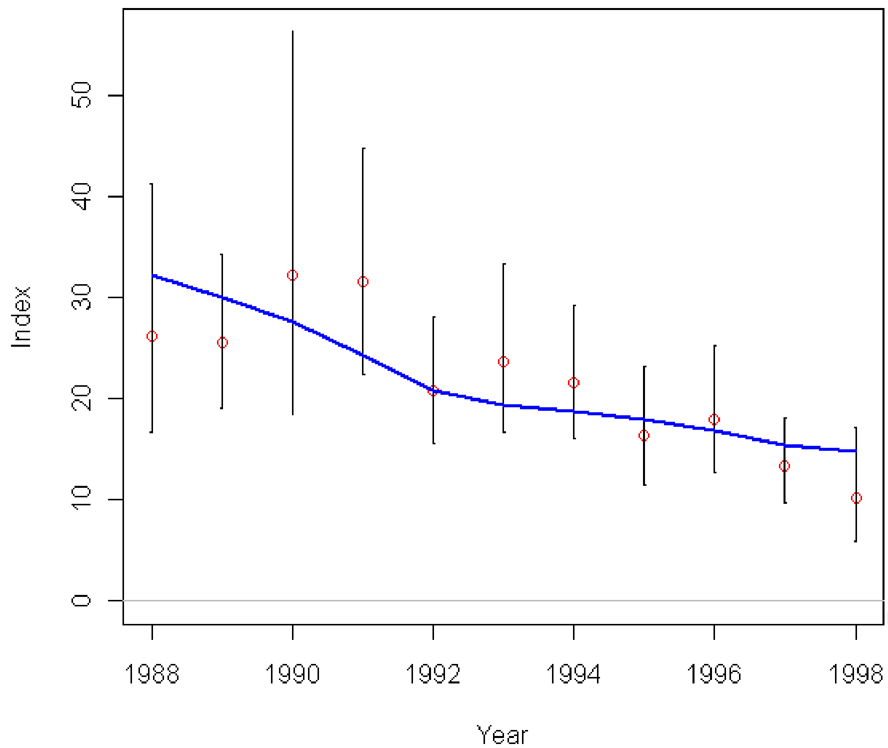

Figure 80. Fit to the recreational observer CPUE index for California in the base case model.

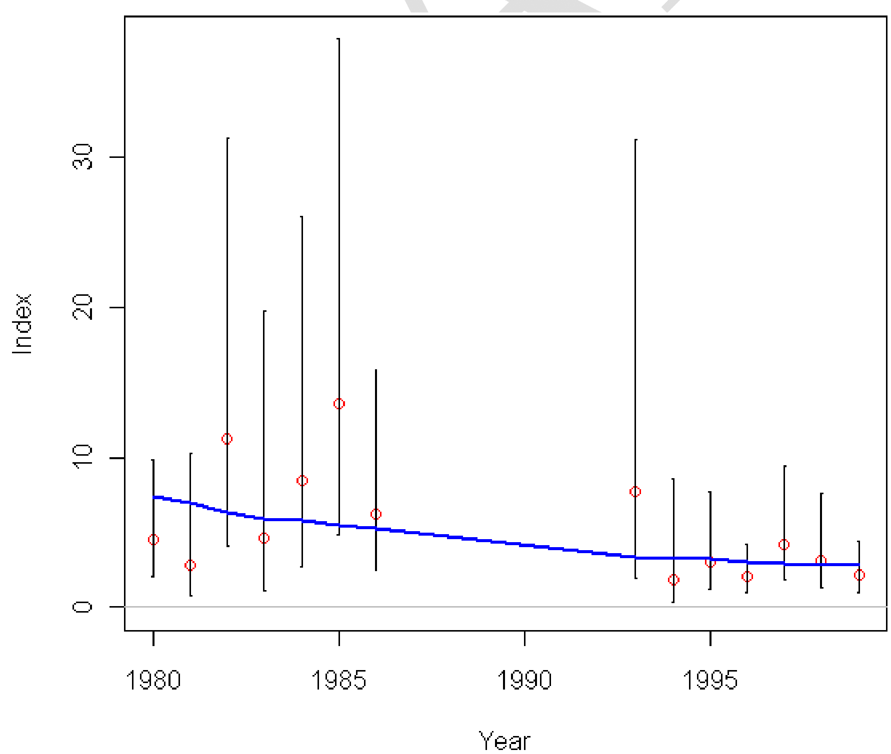

Figure 81. Fit to the recreational CPUE index for California in the base case model.

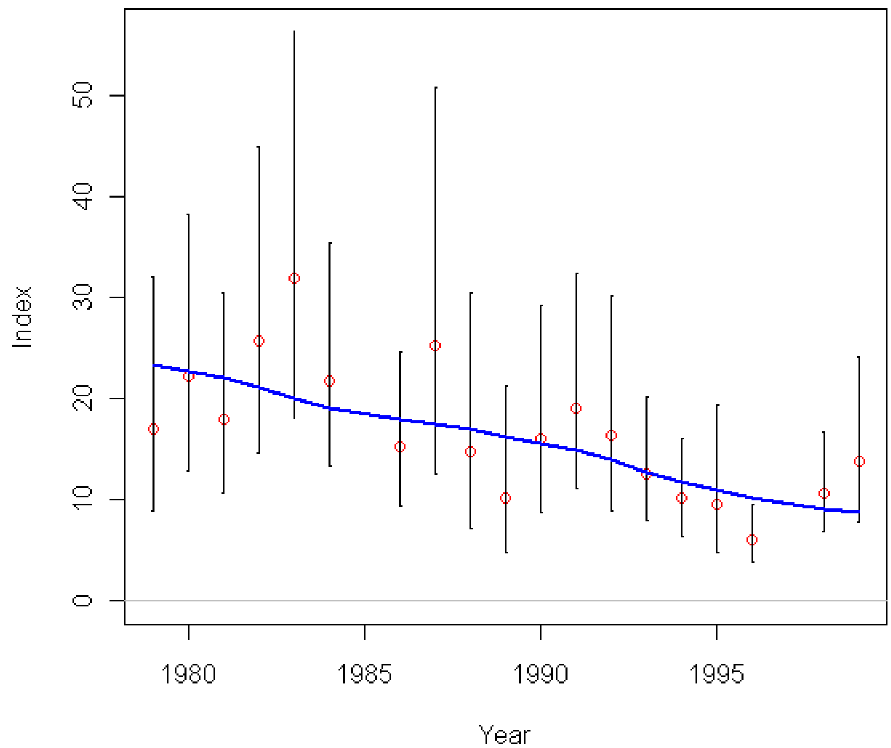

Figure 82. Fit to the recreational CPUE index for Oregon in the base case model.

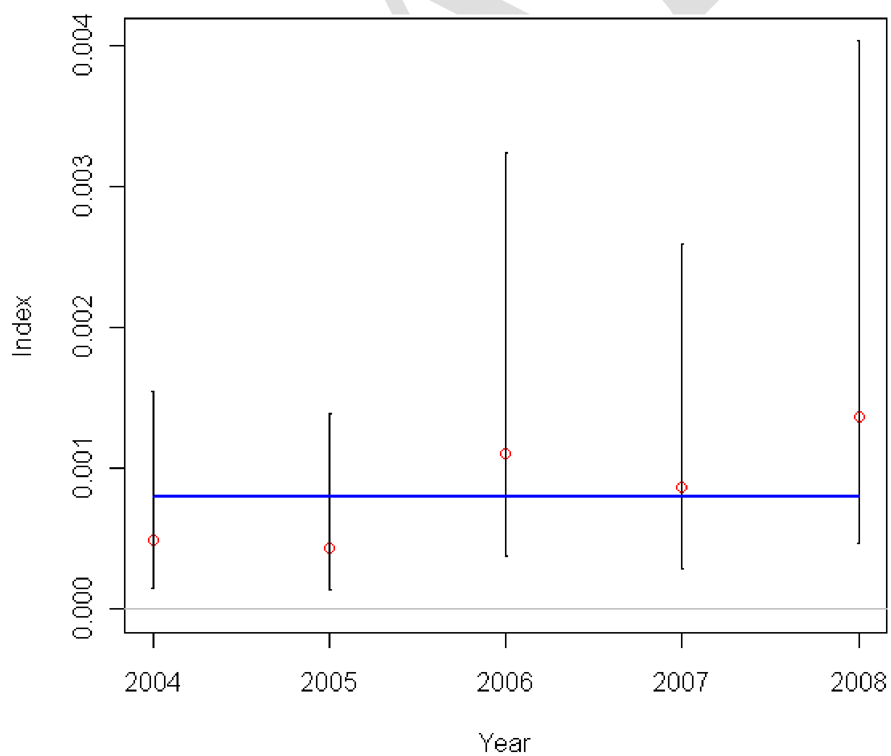

Figure 83. Fit to the recreational observer CPUE index for Oregon in the base case model.

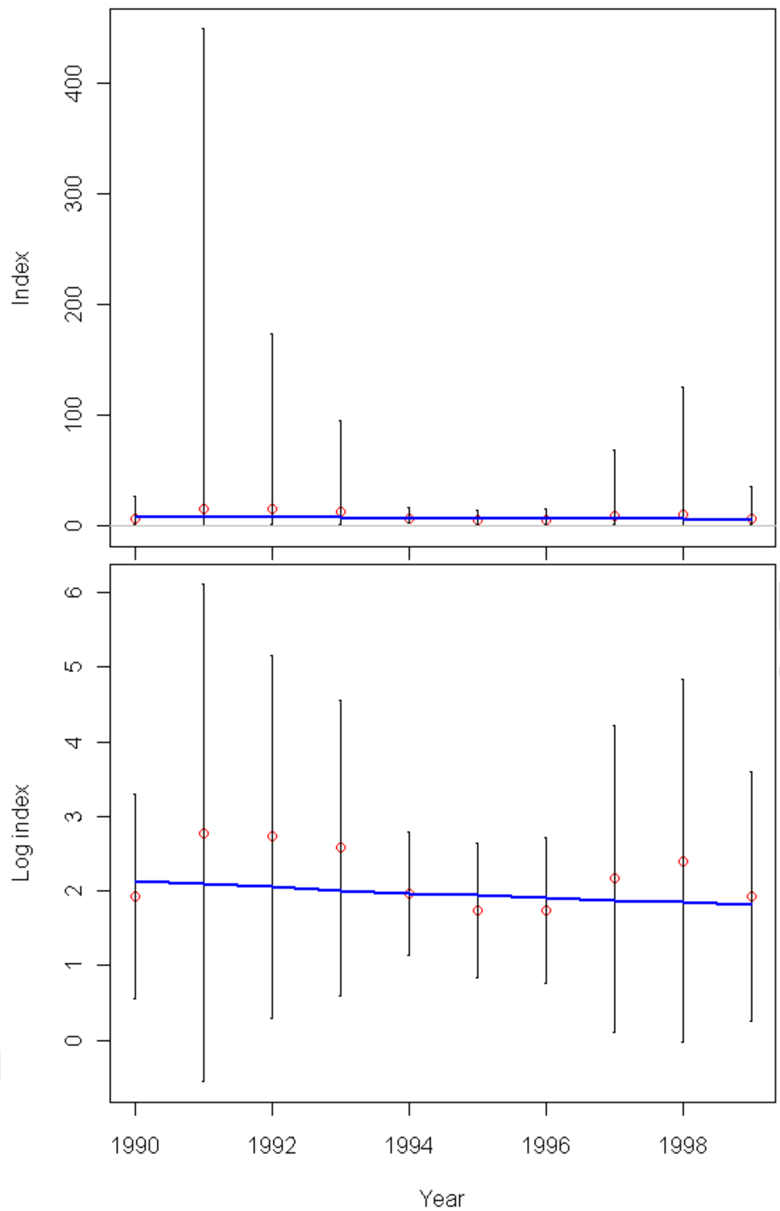

Figure 84. Fit to the recreational CPUE index for Washington (upper panel) and log(index) for easier evaluation (lower panel) in the base case model.

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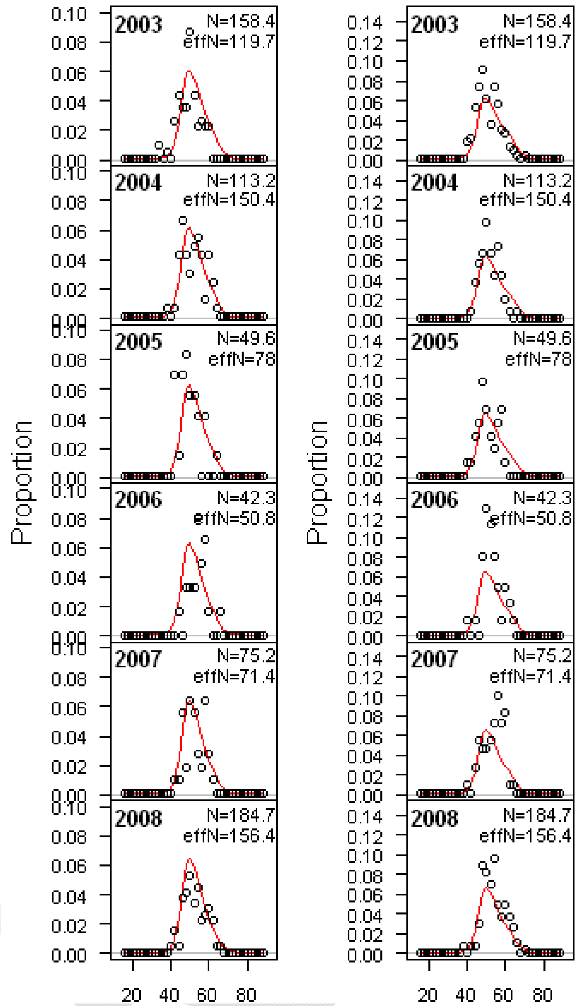

Figure 85. Fit to the Oregon IPHC female (left panels) and male (right panels) length-frequencies.

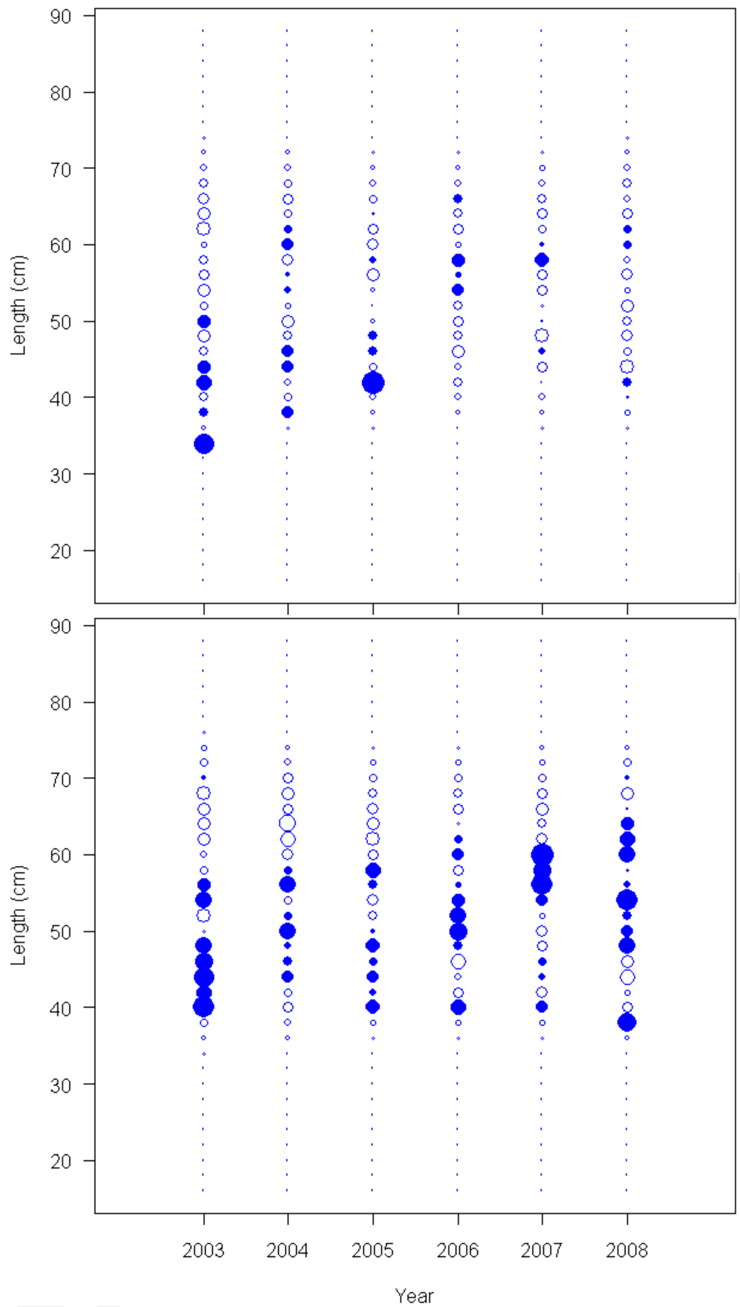

Figure 86. Pearson residuals for the fit to Oregon IPHC female (upper panel, maximum = 3.88) and male (lower panel, maximum = 2.69) length-frequencies. Filled circles represent positive residuals (observed – expected).

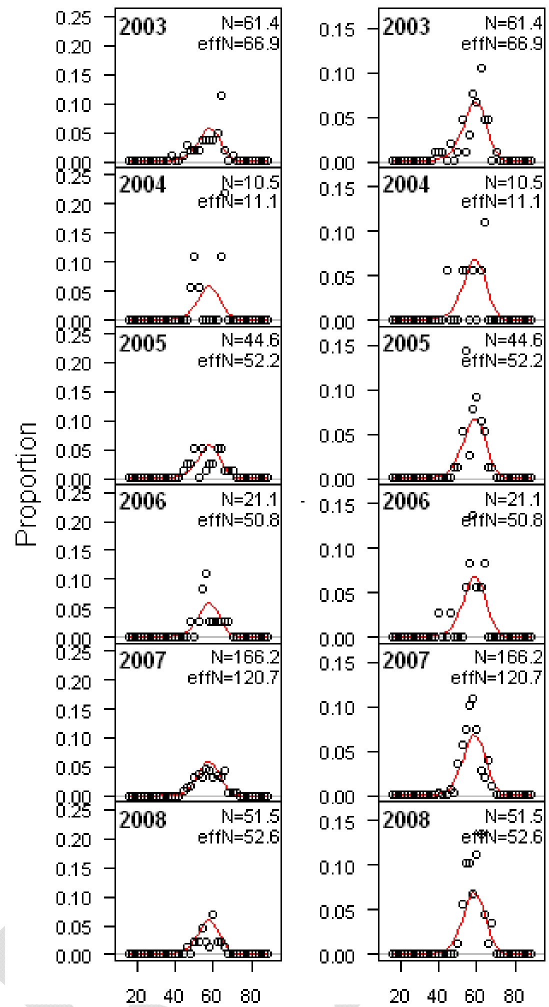

Figure 87. Fit to the Washington IPHC female (left panels) and male (right panels) length-frequencies.

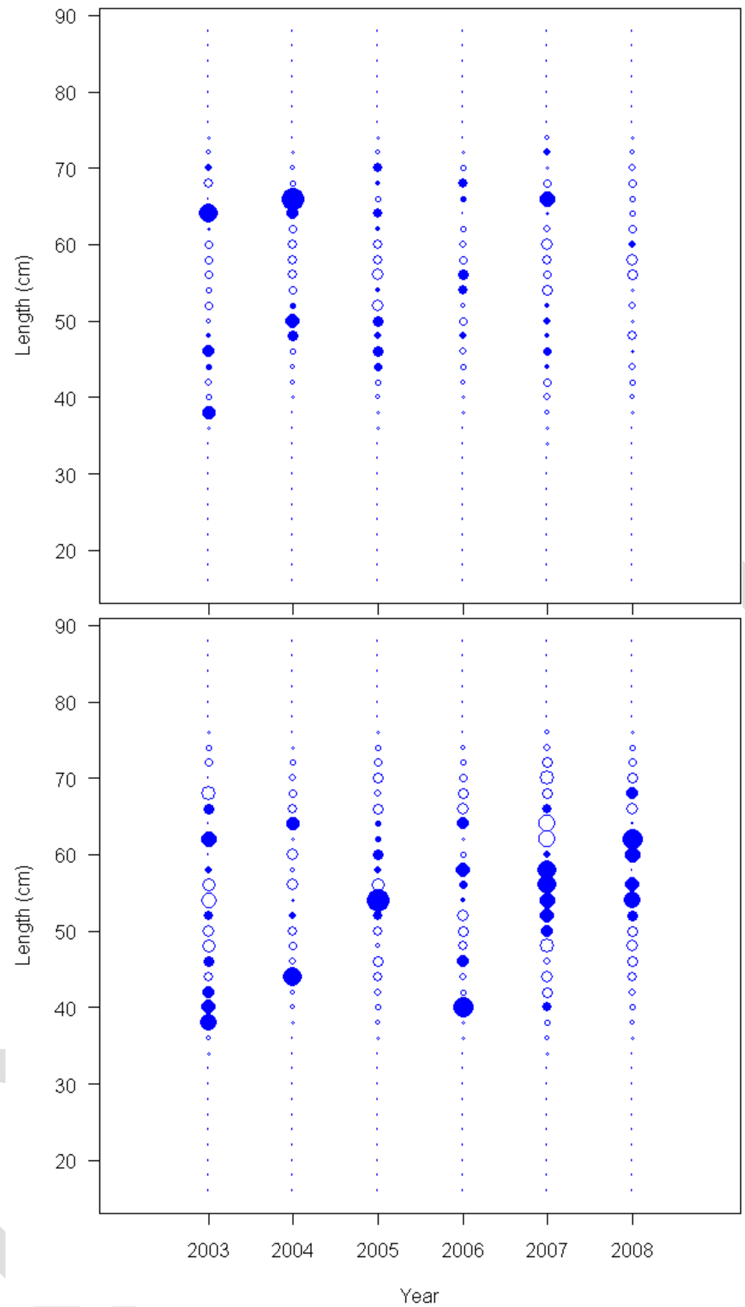

Figure 88. Pearson residuals for the fit to Washington IPHC female (upper panel, maximum = 4.65) and male (lower panel, maximum = 2.85) length-frequencies. Filled circles represent positive residuals (observed – expected).

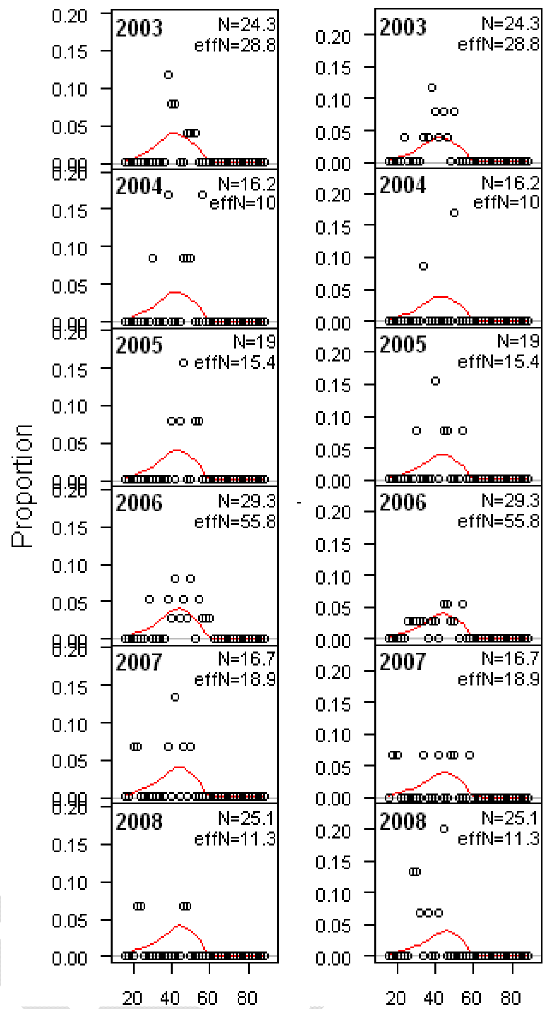

Figure 89. Fit to the Oregon NWFSC female (left panels) and male (right panels) length-frequencies.

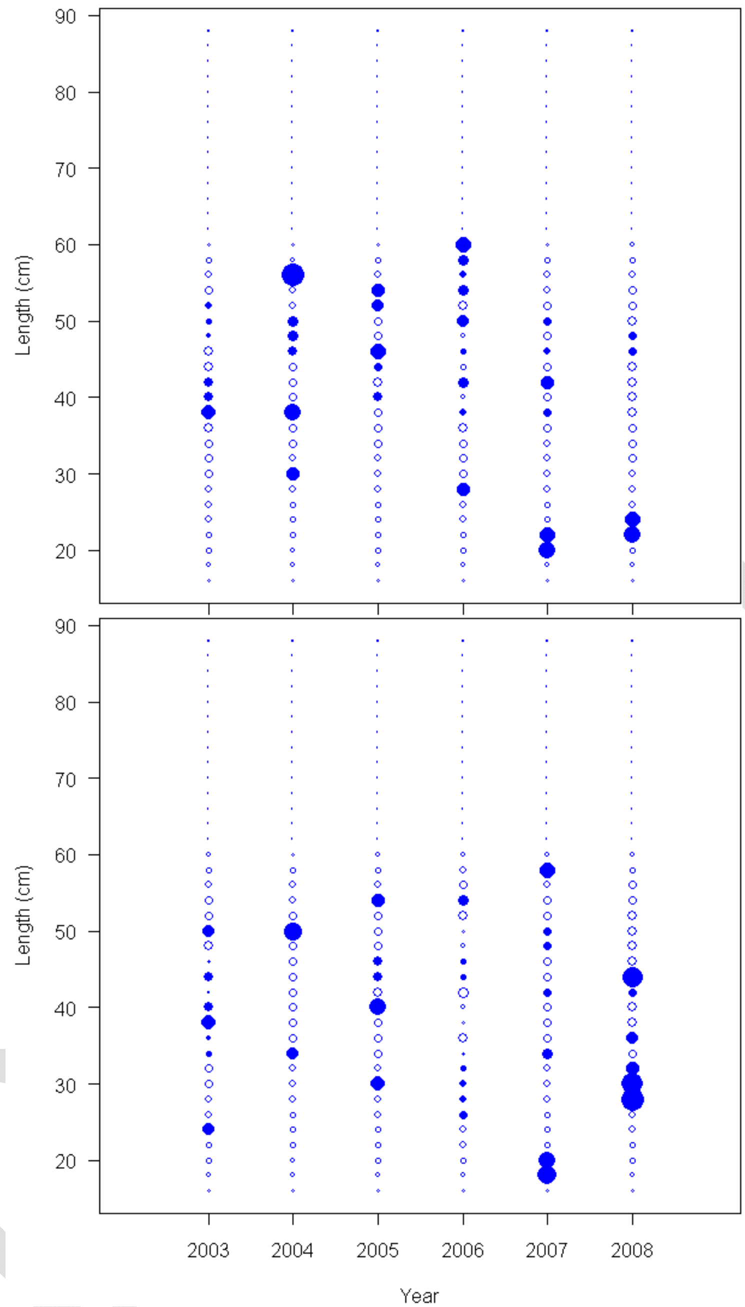

Figure 90. Pearson residuals for the fit to Oregon NWFSC female (upper panel, maximum = 5.31) and male (lower panel, maximum = 5.12) length-frequencies. Filled circles represent positive residuals (observed – expected).

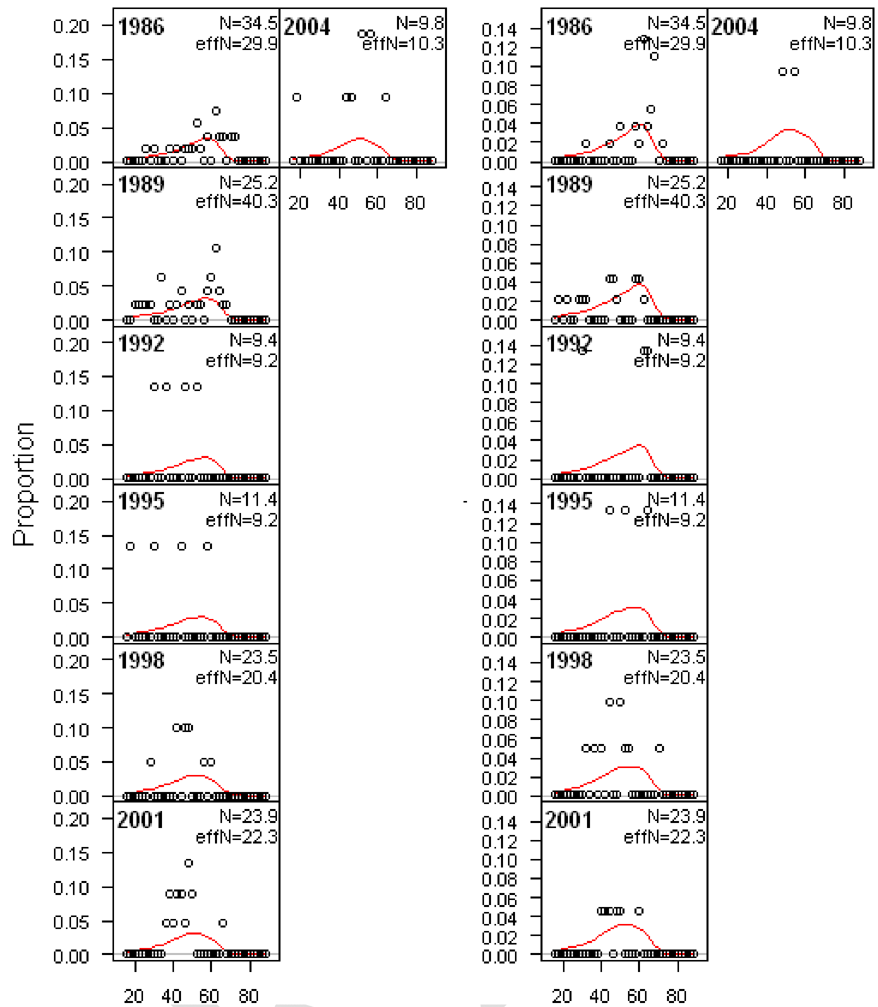

Figure 91. Fit to the Washington triennial female (left panels) and male (right panels) length-frequencies.

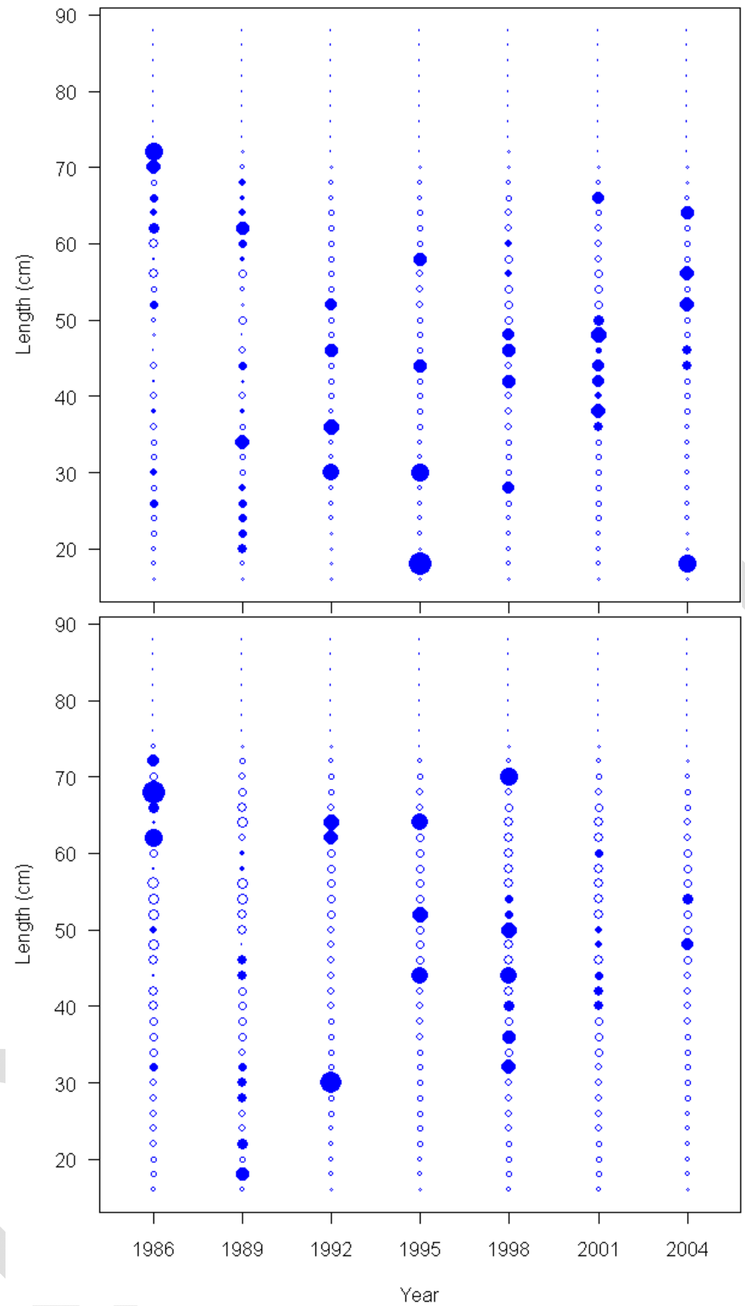

Figure 92. Pearson residuals for the fit to Washington triennial female (upper panel, maximum = 6.53) and male (lower panel, maximum = 4.17) length-frequencies. Filled circles represent positive residuals (observed – expected).

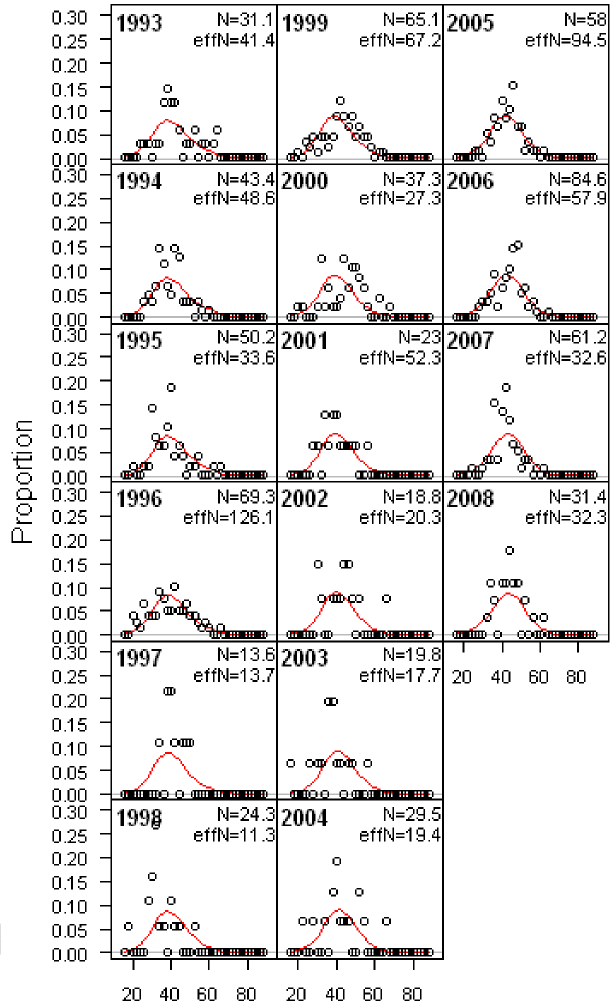

Figure 93. Fit to the California recreational sexes-combined length-frequencies.

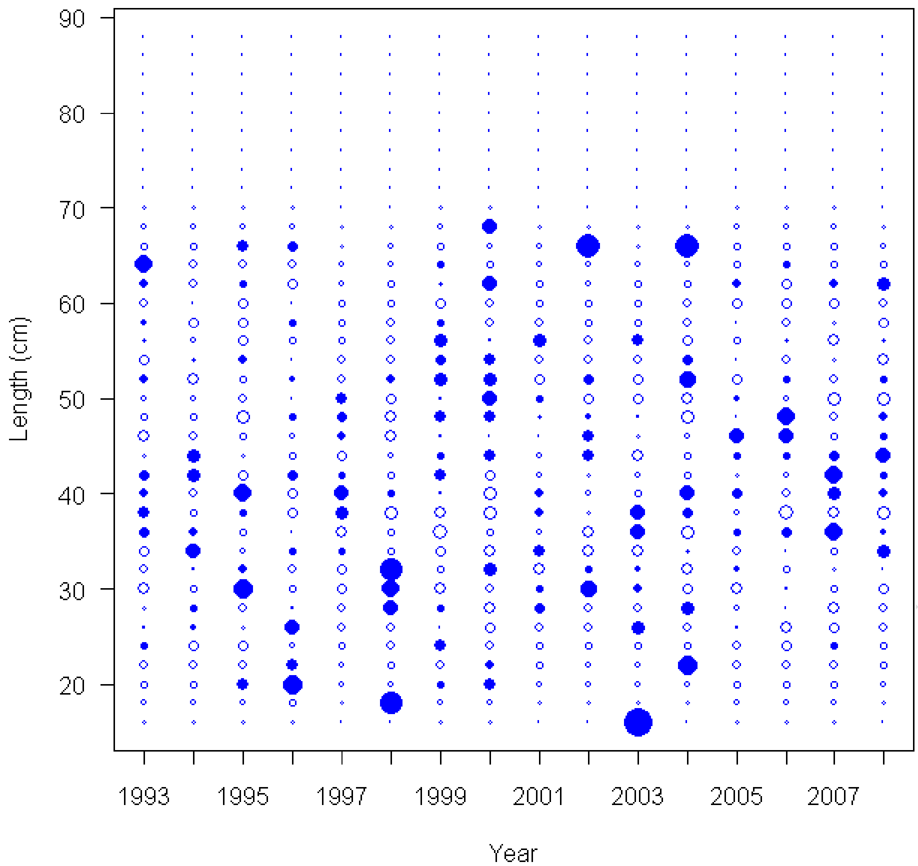

Figure 94. Pearson residuals for the fit to California recreational length-frequencies (maximum = 6.63). Filled circles represent positive residuals (observed – expected).

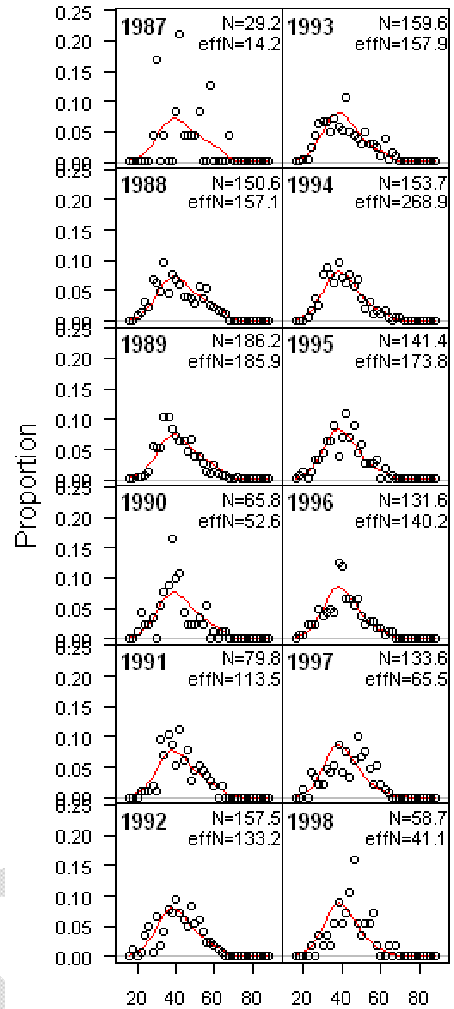

Figure 95. Fit to the California recreational charter vessel sexes-combined length-frequencies.

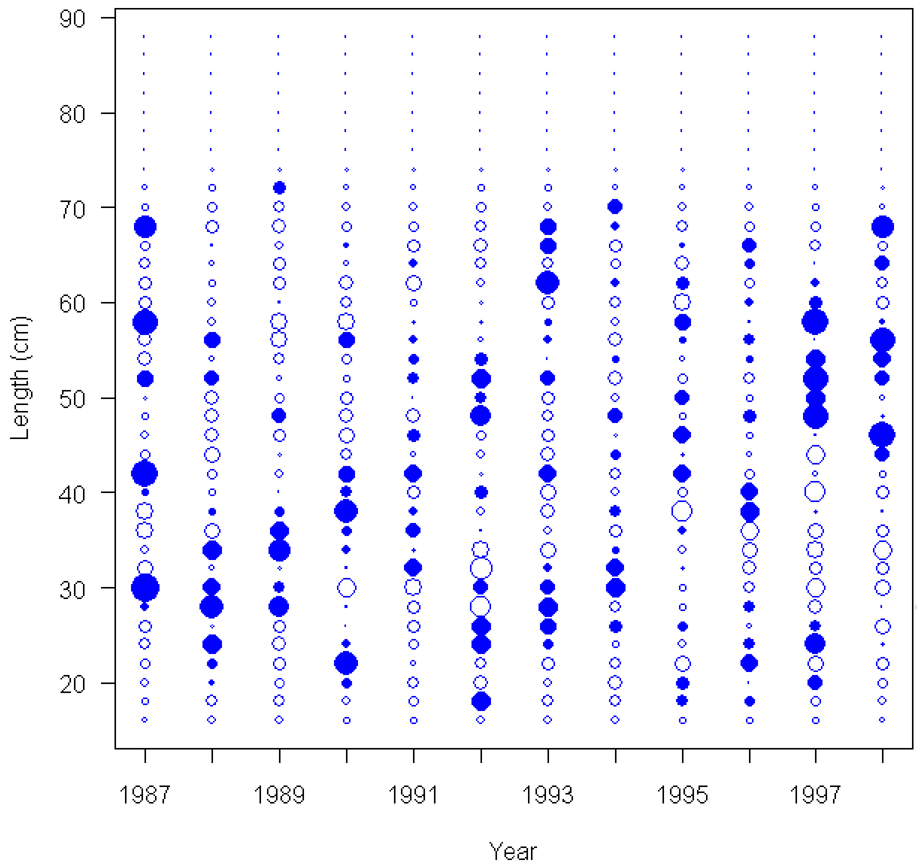

Figure 96. Pearson residuals for the fit to California recreational length-frequencies (maximum = 3.45). Filled circles represent positive residuals (observed – expected).

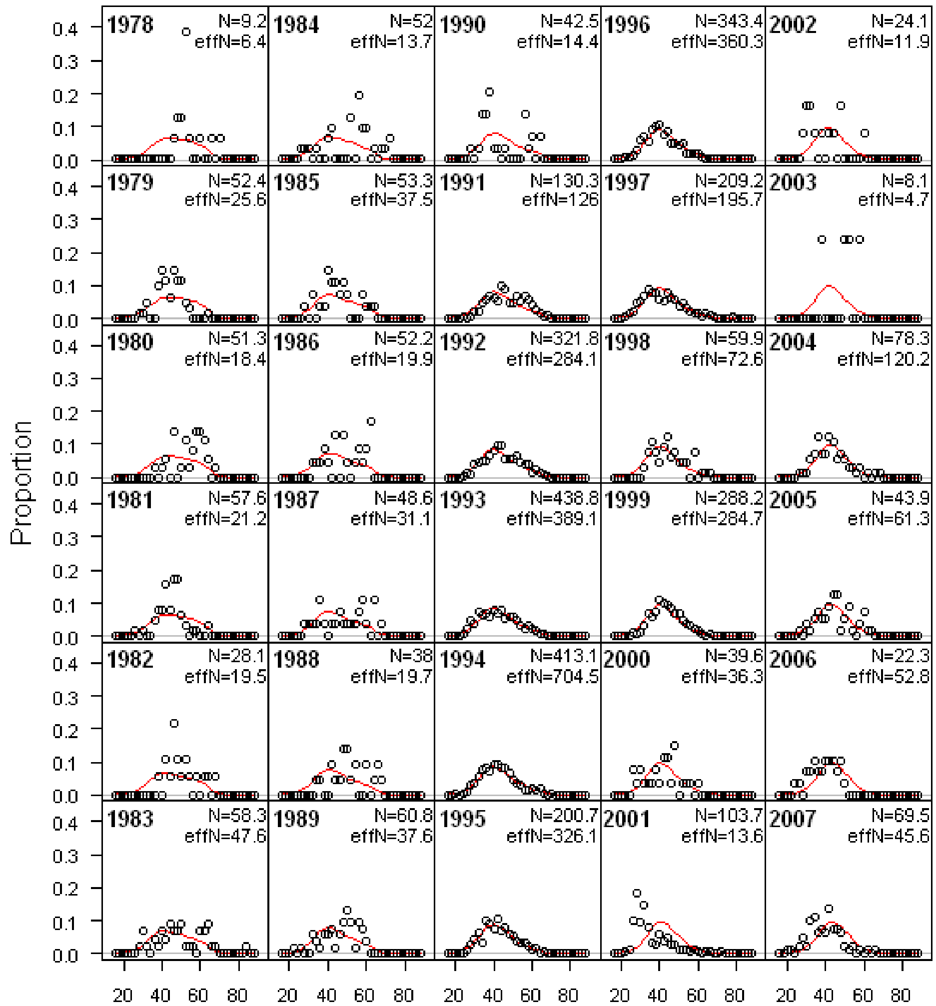

Figure 97. Fit to the California commercial sexes-combined length-frequencies.

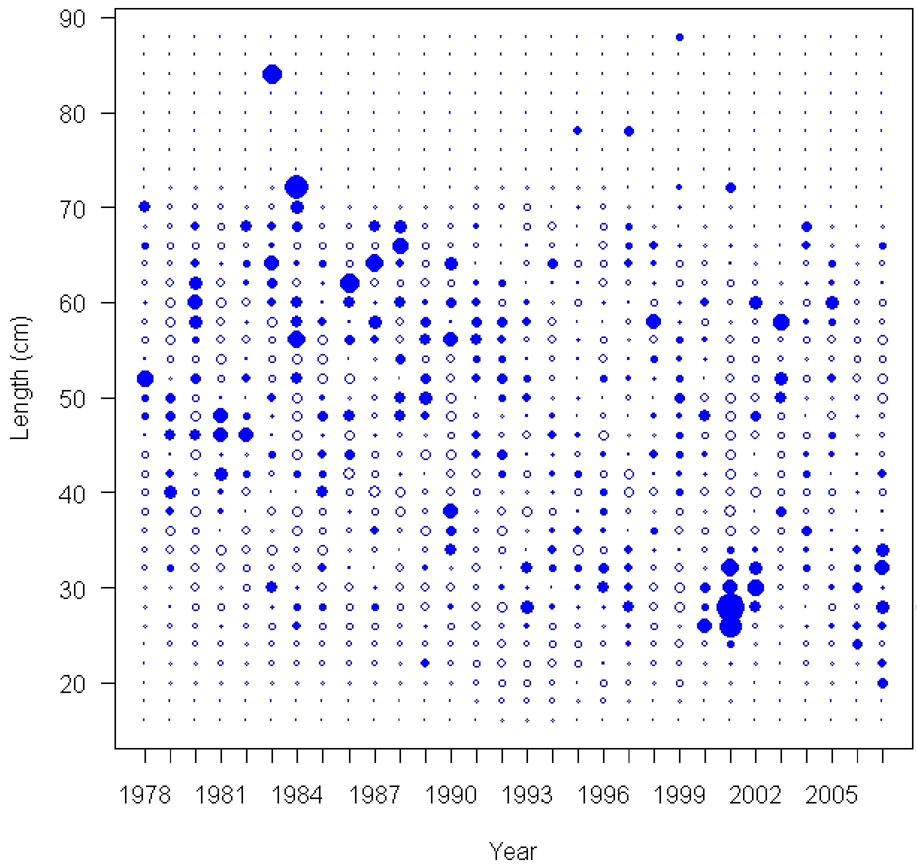

Figure 98. Pearson residuals for the fit to California commercial length-frequencies (maximum = 12.17). Filled circles represent positive residuals (observed – expected).

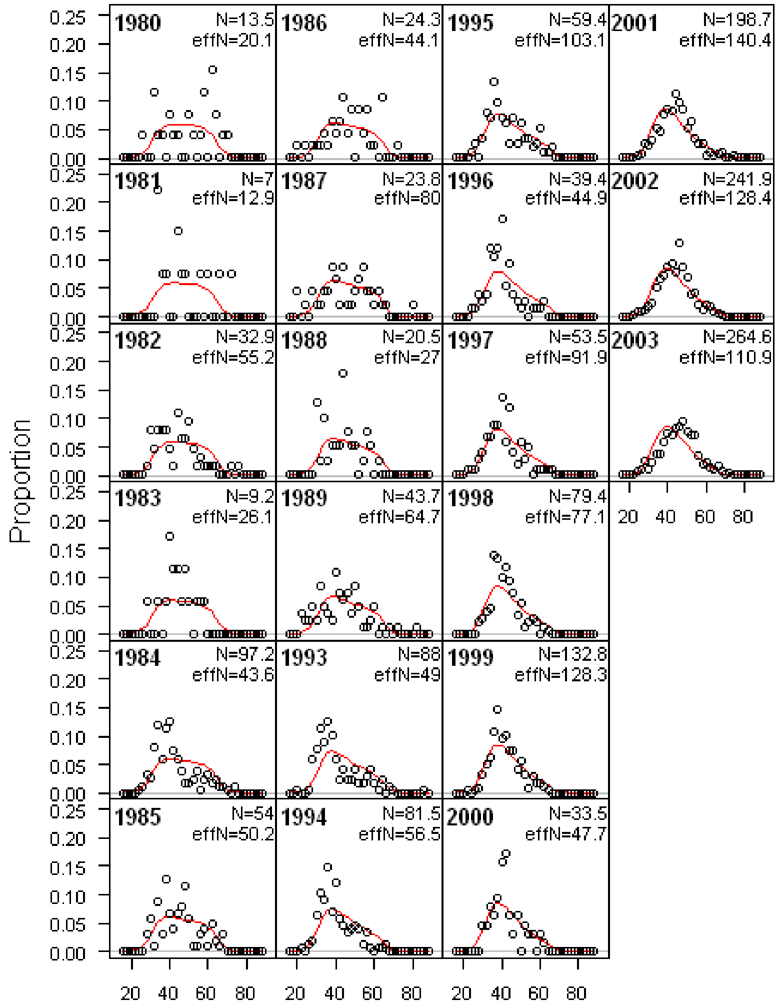

Figure 99. Fit to the Oregon recreational sexes-combined length-frequencies.

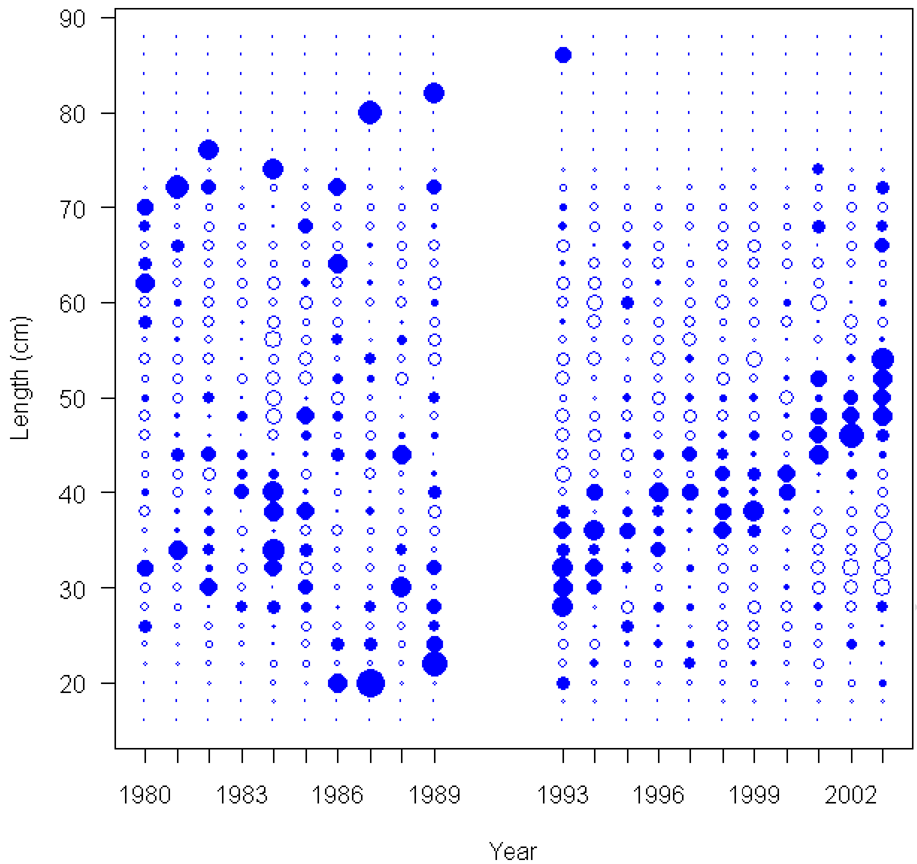

Figure 100. Pearson residuals for the fit to Oregon recreational length-frequencies (maximum = 4.74). Filled circles represent positive residuals (observed – expected).

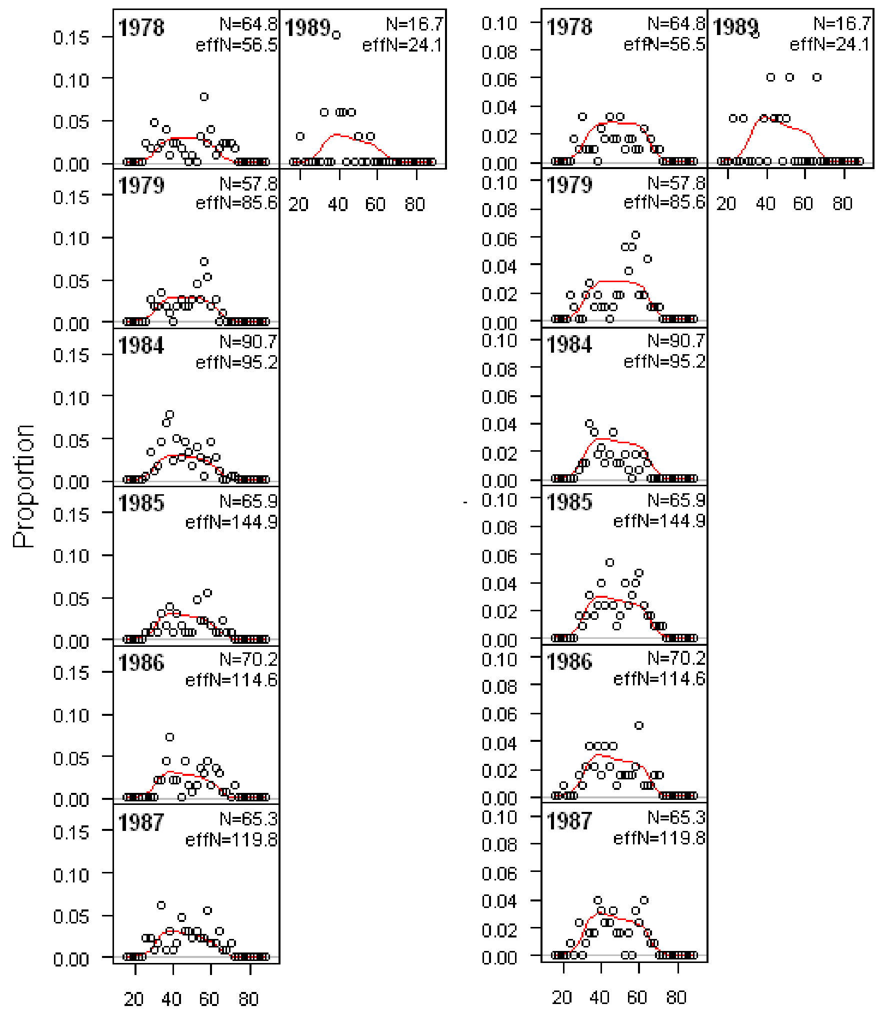

Figure 101. Fit to the Oregon recreational female (left panels) and male (right panels) length-frequencies.

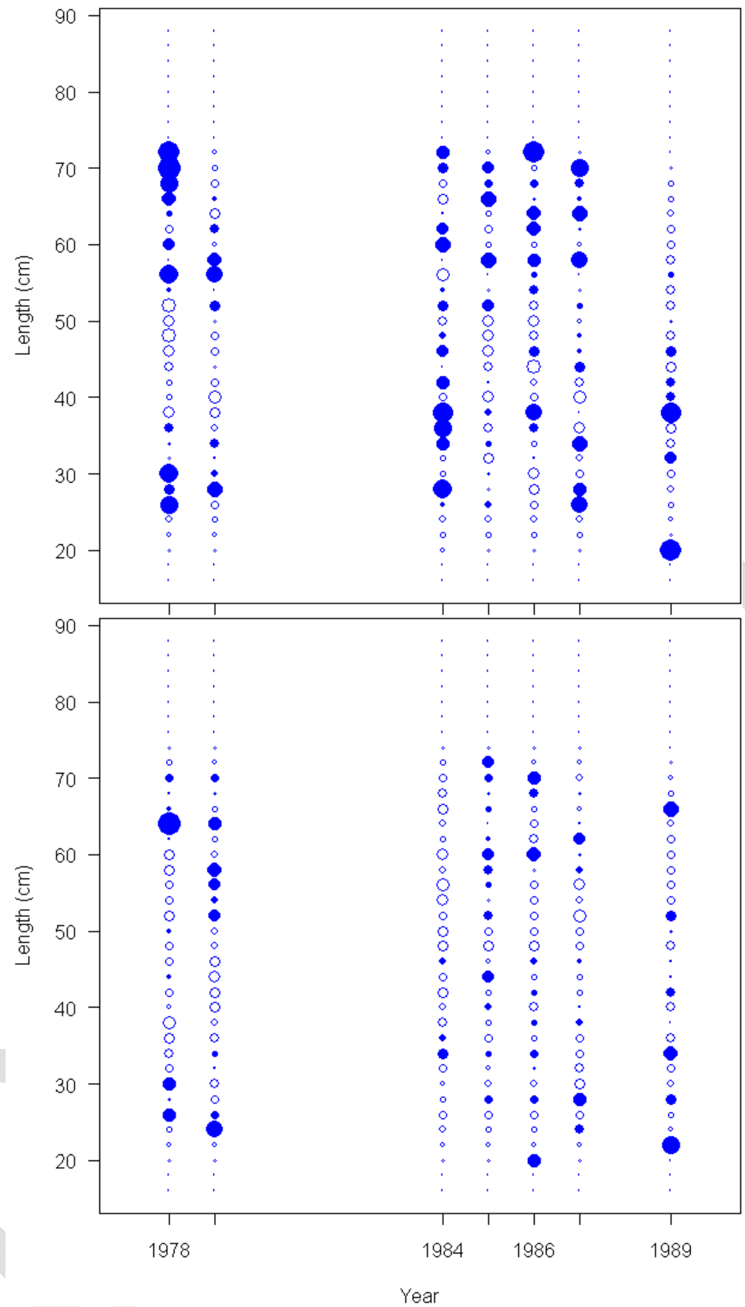

Figure 102. Pearson residuals for the fit to Oregon recreational female (upper panel, maximum = 3.39) and male (lower panel, maximum = 4.00) length-frequencies. Filled circles represent positive residuals (observed – expected).

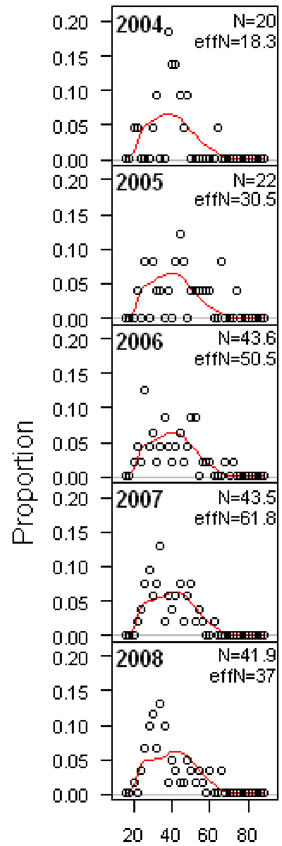

Figure 103. Fit to the Oregon recreational charter observer sexes-combined length-frequencies.

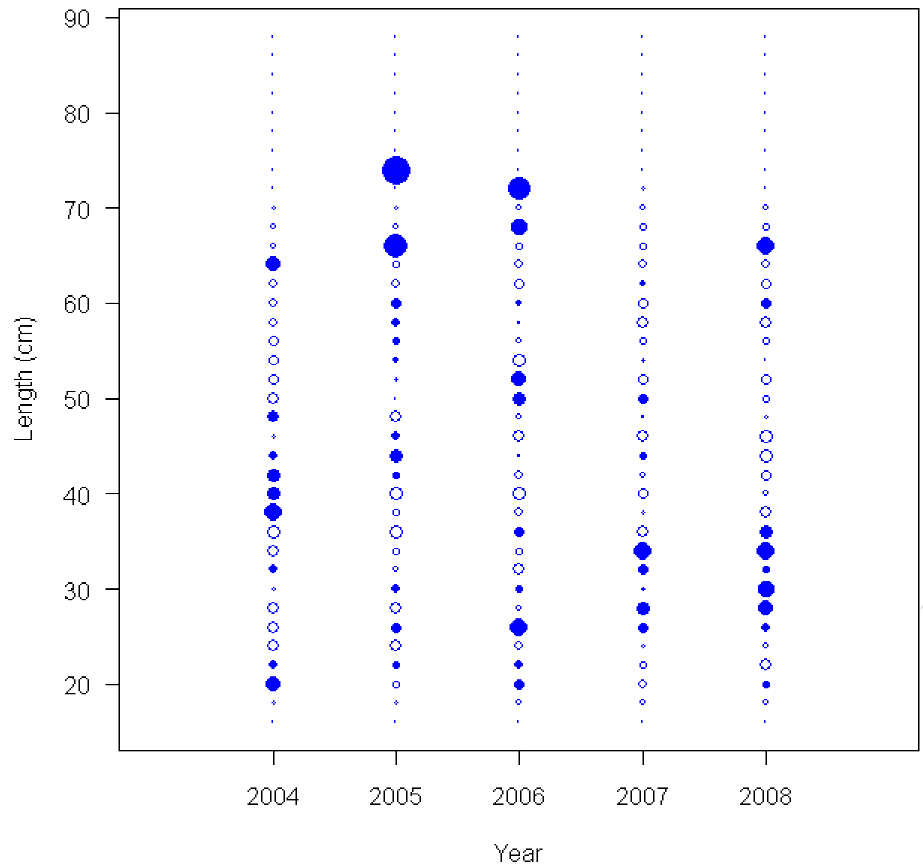

Figure 104. Pearson residuals for the fit to Oregon recreational charter observer length-frequencies (maximum = 5.52). Filled circles represent positive residuals (observed – expected).

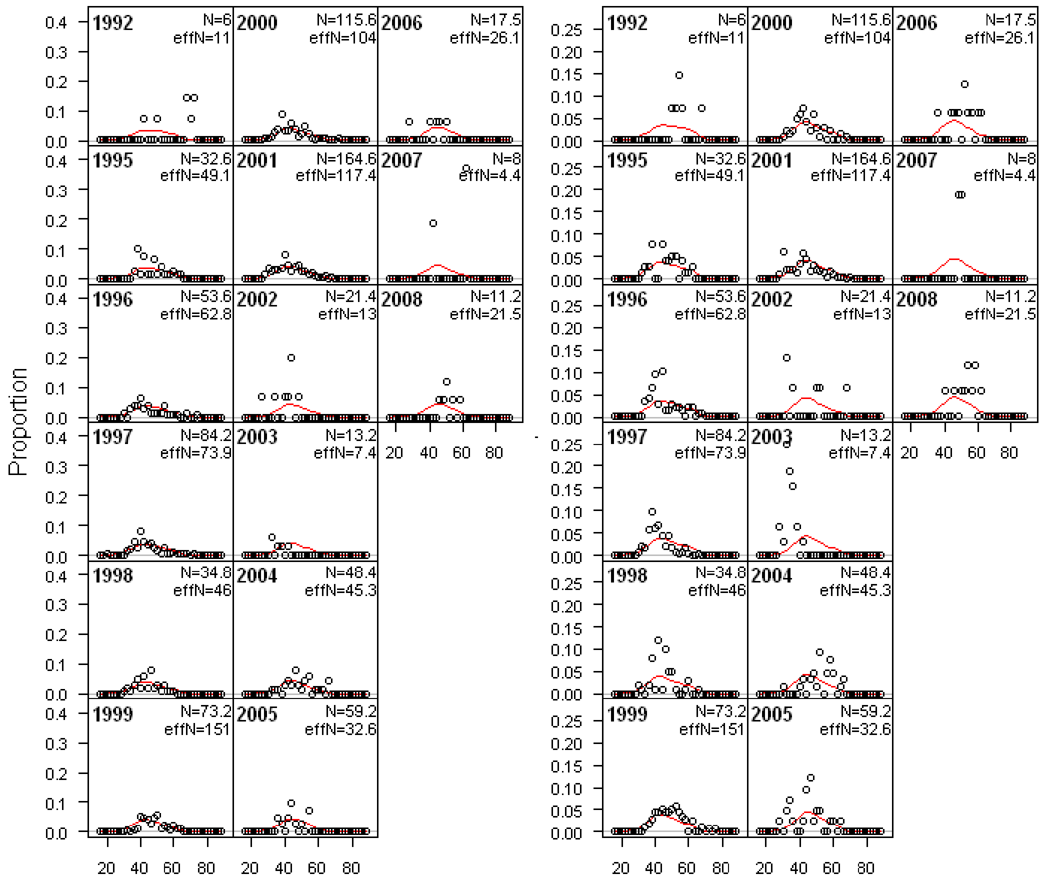

Figure 105. Fit to the Oregon commercial female (left panels) and male (right panels) length-frequencies.

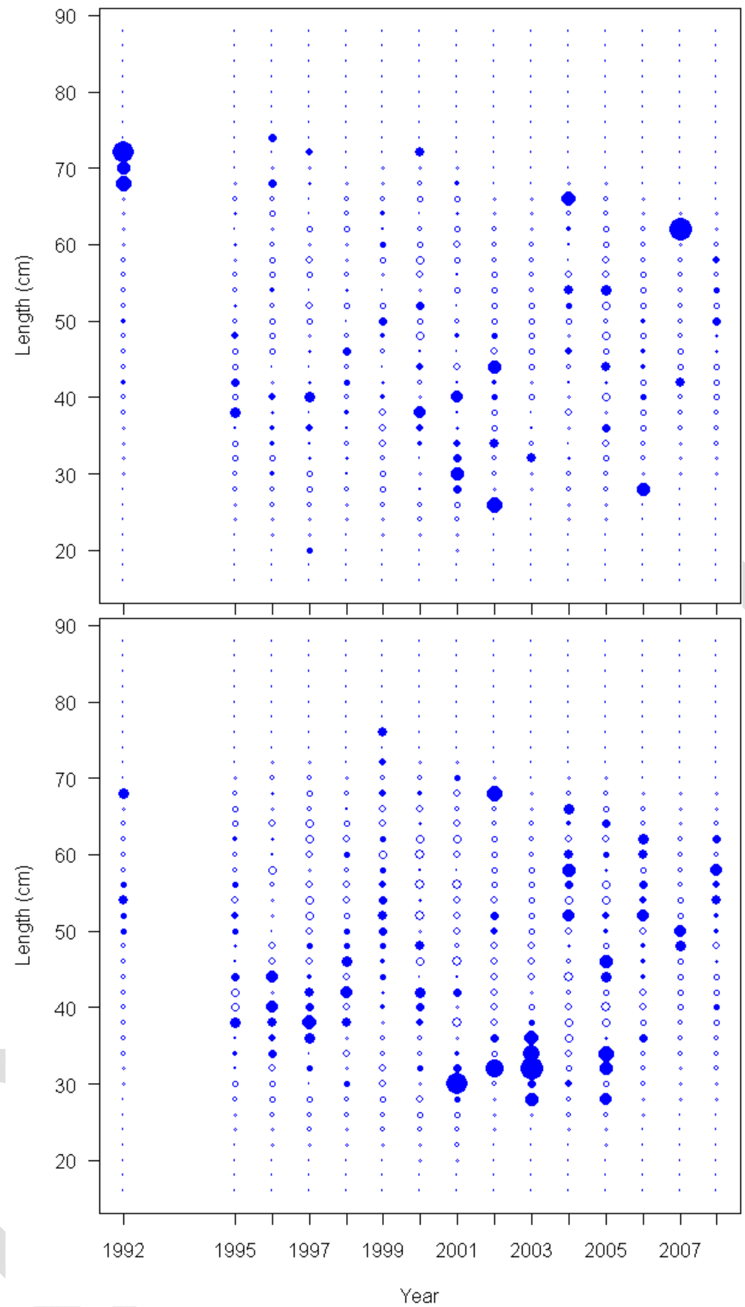

Figure 106. Pearson residuals for the fit to Oregon commercial female (upper panel, maximum = 10.17) and male (lower panel, maximum = 8.12) length-frequencies. Filled circles represent positive residuals (observed – expected).

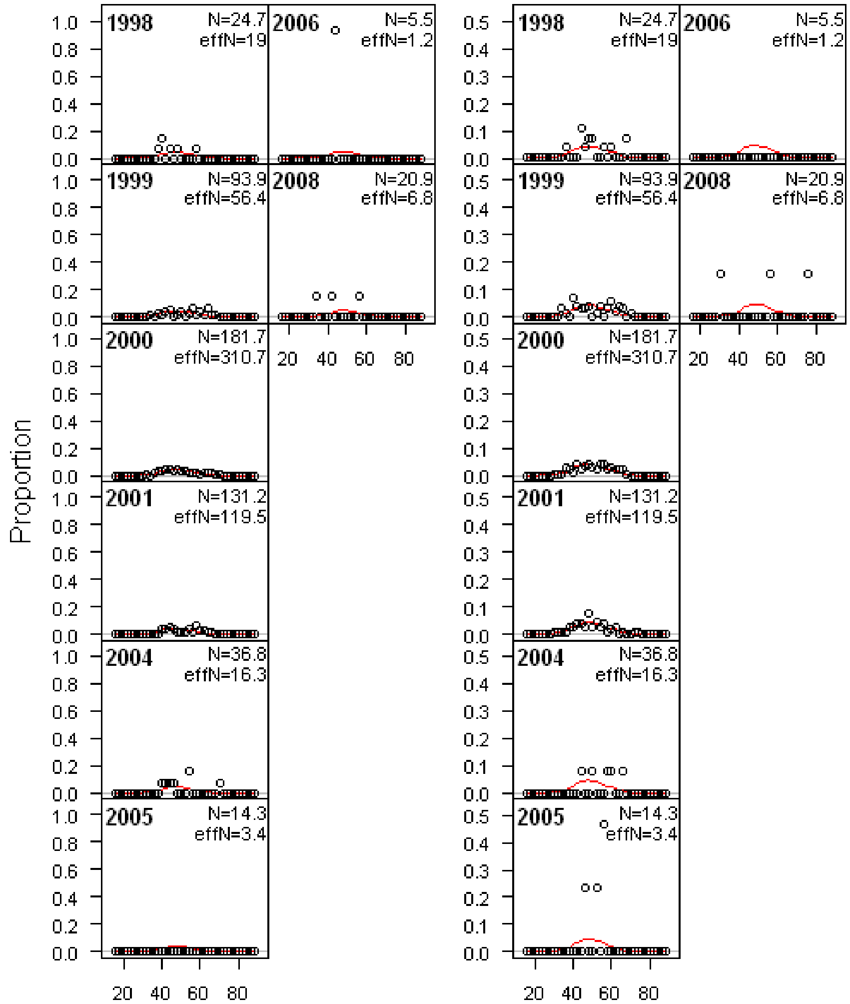

Figure 107. Fit to the Washington recreational female (left panels) and male (right panels) length-frequencies.

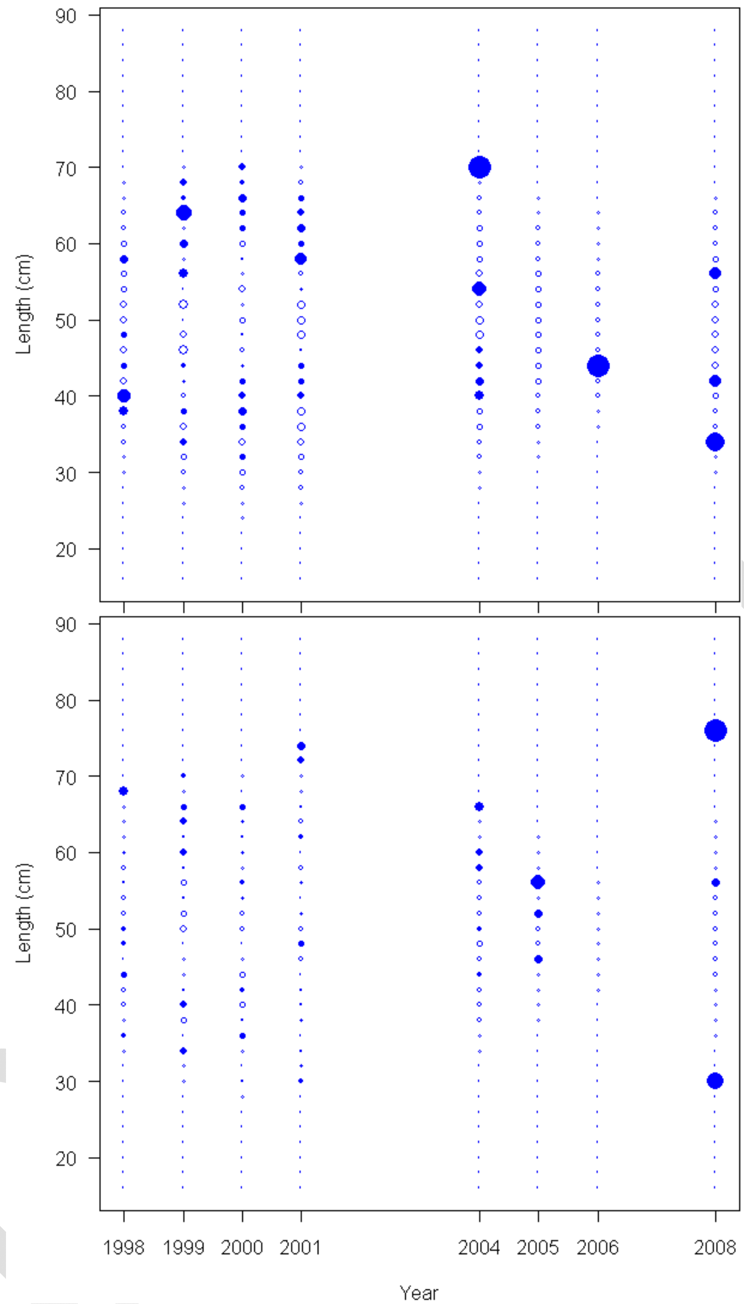

Figure 108. Pearson residuals for the fit to Washington recreational female (upper panel, maximum = 10.55) and male (lower panel, maximum = 22.47) length-frequencies. Filled circles represent positive residuals (observed – expected).

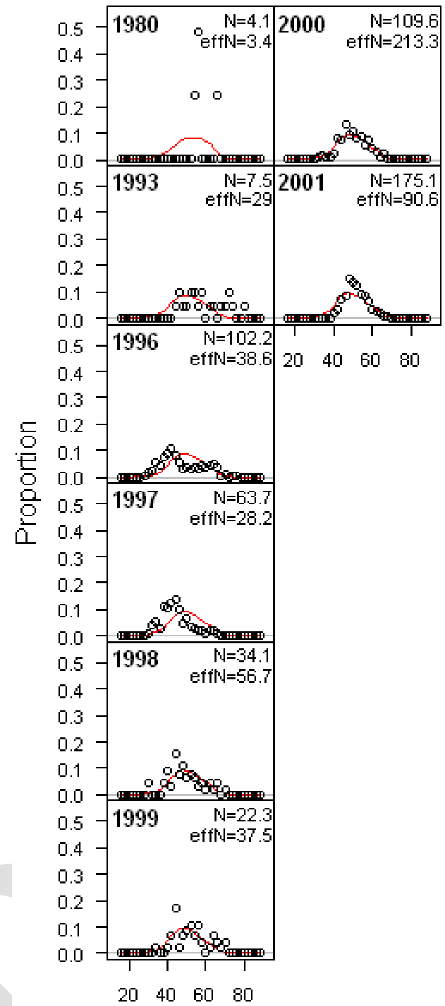

Figure 109. Fit to the Washington commercial sexes-combined length-frequencies.

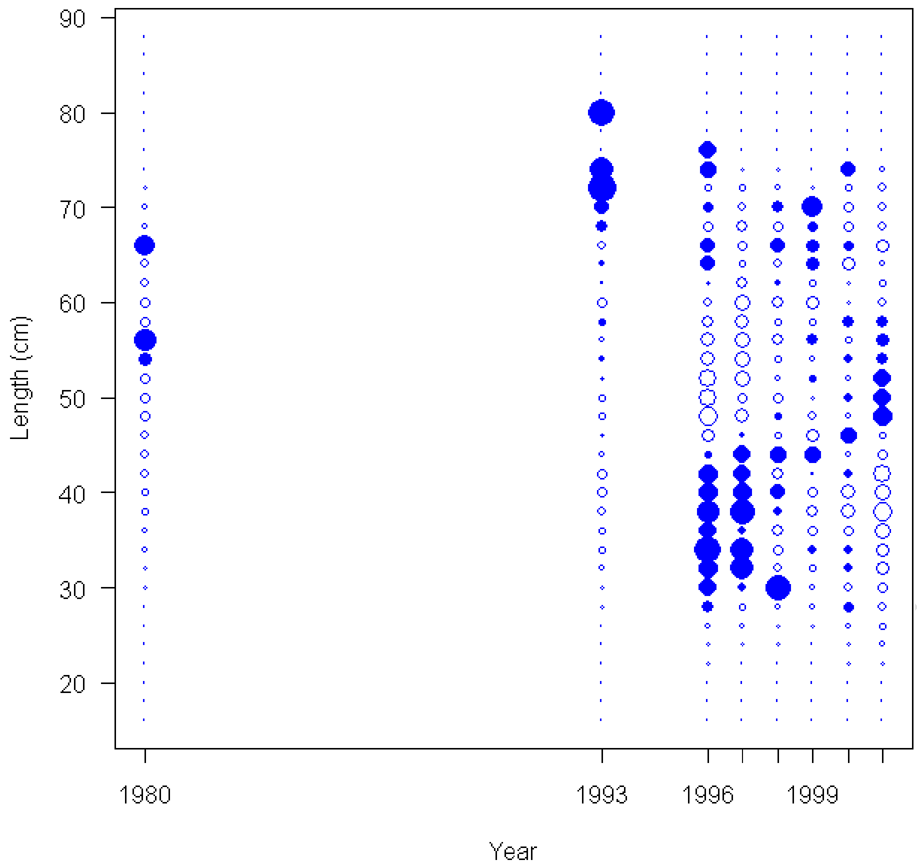

Figure 110. Pearson residuals for the fit to Washington commercial length-frequencies (maximum = 4.54). Filled circles represent positive residuals (observed – expected).

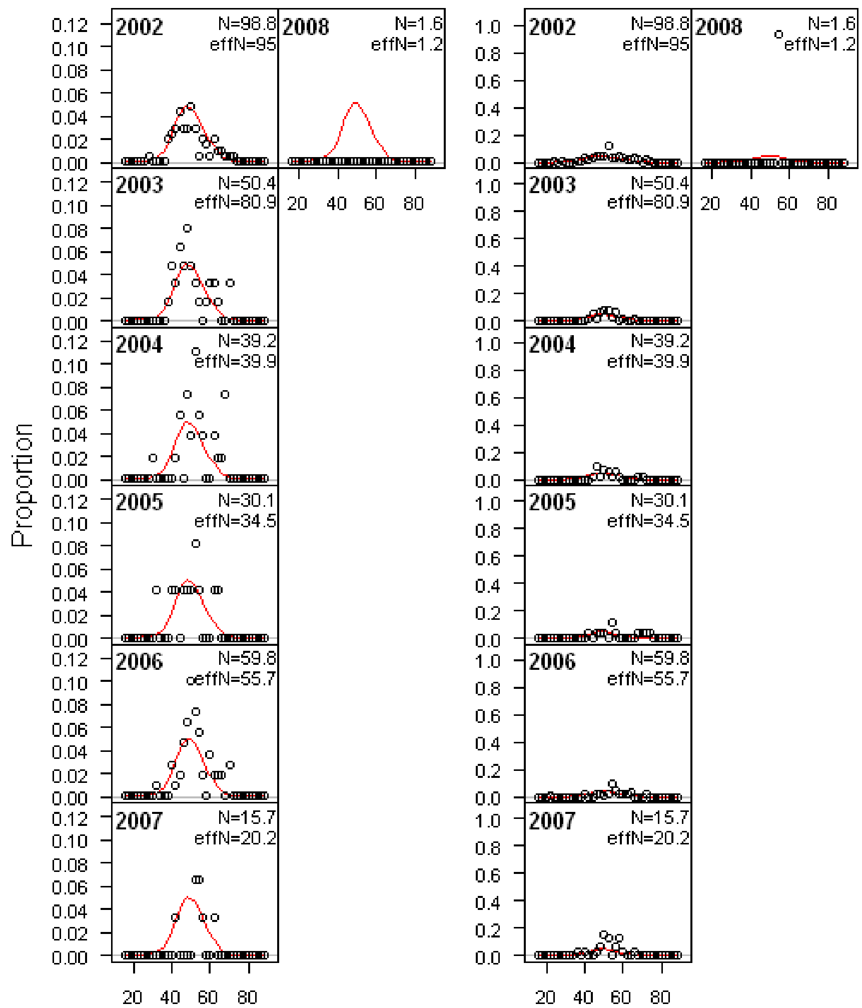

Figure 111. Fit to the Washington commercial female (left panels) and male (right panels) length-frequencies.

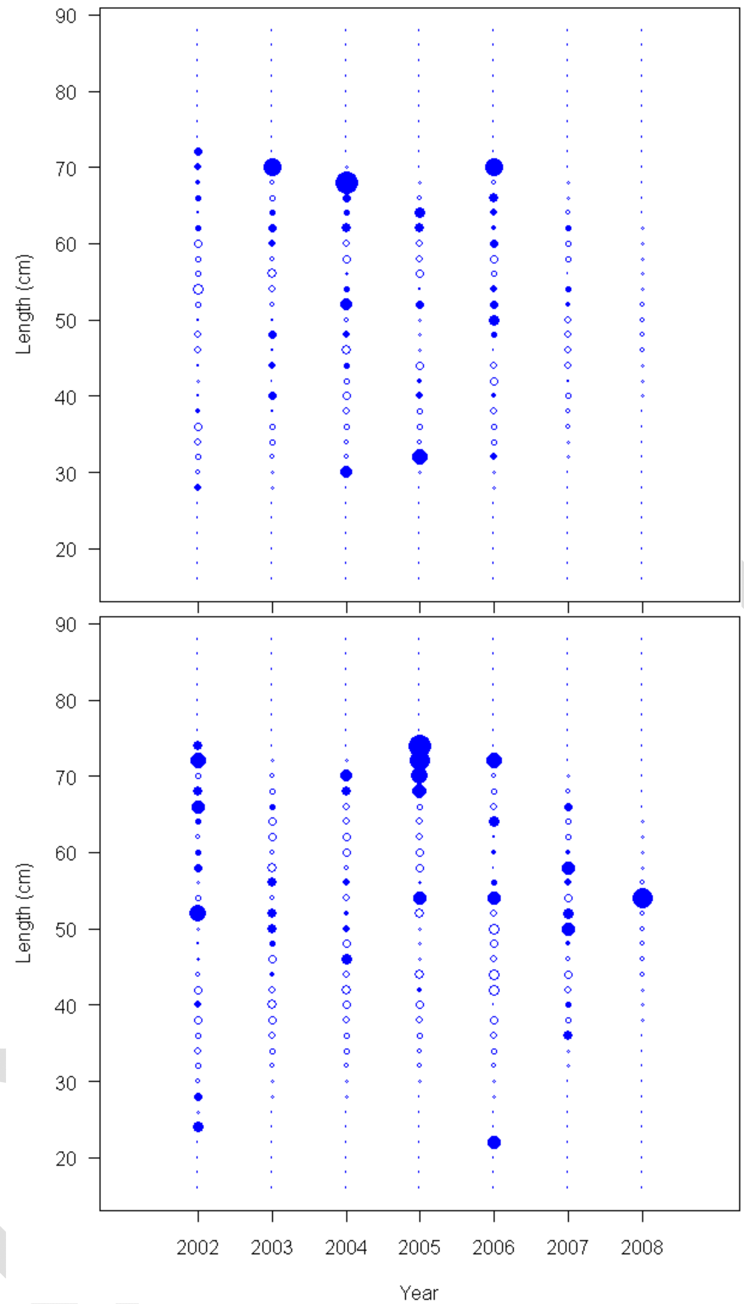

Figure 112. Pearson residuals for the fit to Washington commercial female (upper panel, maximum = 7.56) and male (lower panel, maximum = 6.34) length-frequencies. Filled circles represent positive residuals (observed – expected).

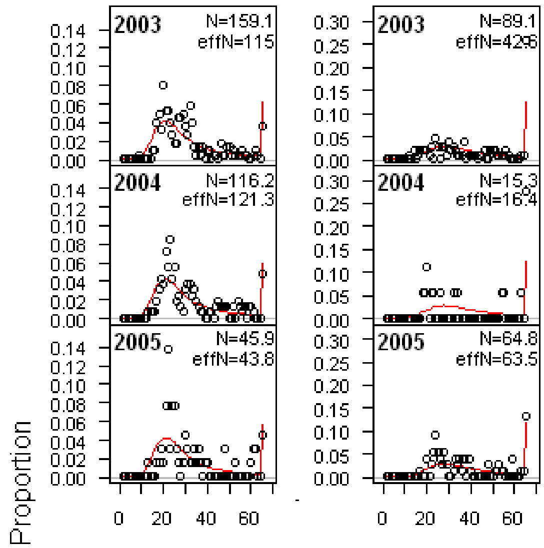

Figure 113. Fit to the Oregon (left panel) and Washington (right panel) IPHC sexes-combined age-frequencies.

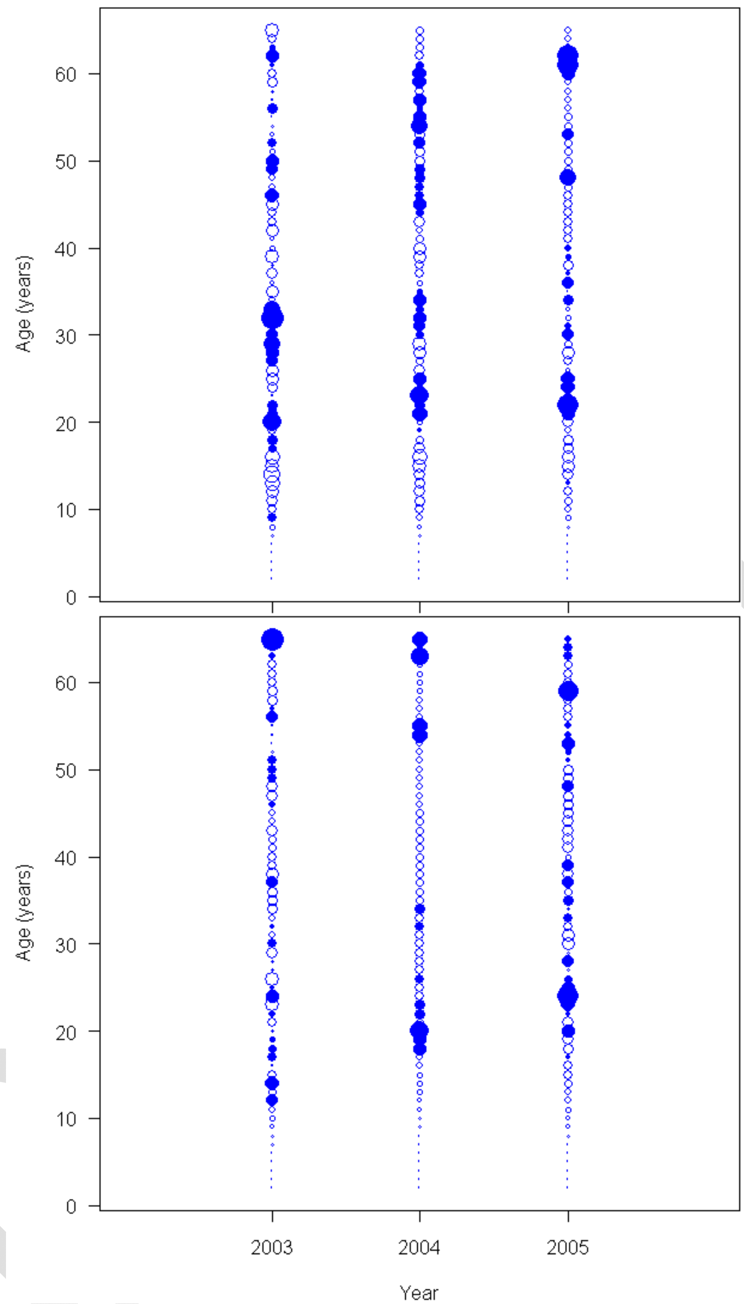

Figure 114. Pearson residuals for the fit to the Oregon (upper panel, maximum = 3.28) and Washington (lower panel, maximum = 3.72) IPHC sexes-combined age-frequencies. Filled circles represent positive residuals (observed – expected).

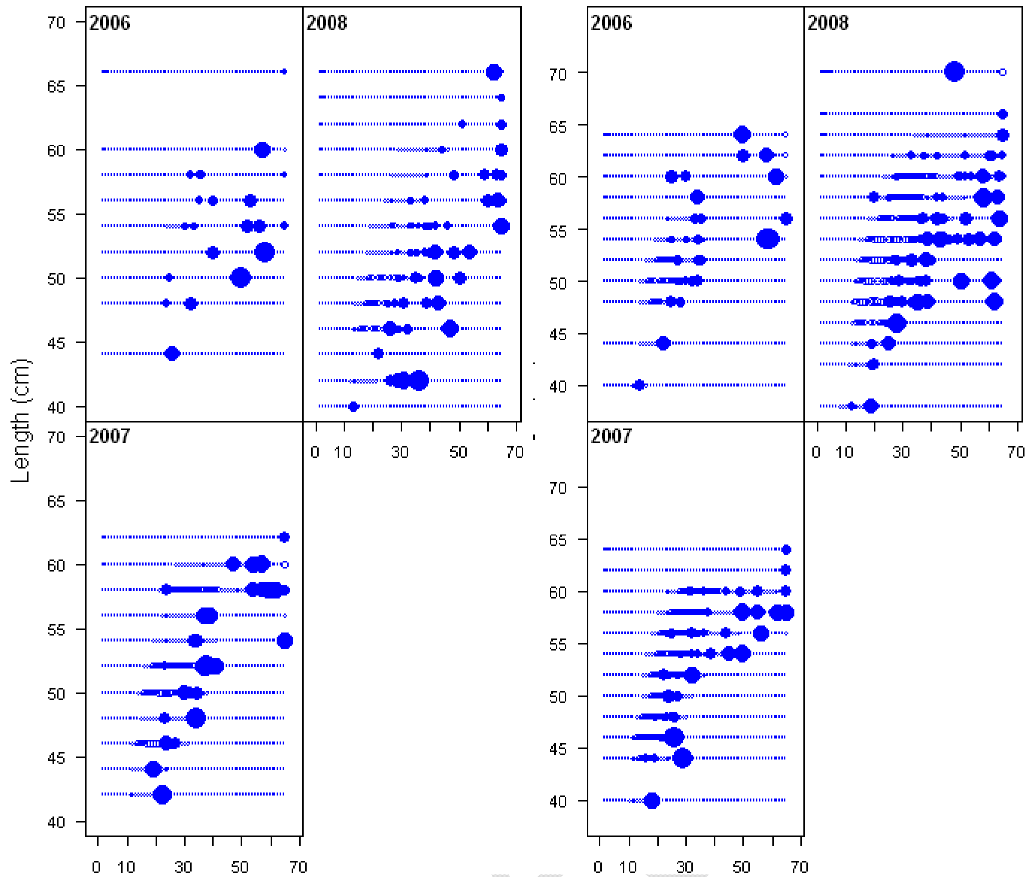

Figure 115. Pearson residuals for the fit to the Oregon female (left panels, maximum = 12.84) and male (right panels, maximum = 8.88) IPHC age-frequencies. Filled circles represent positive residuals (observed – expected).

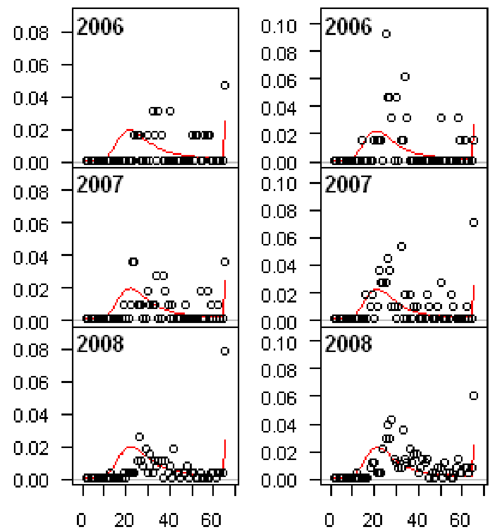

Figure 116. Implied fit to the Oregon female (left panels) and male (right panels) IPHC marginal age-frequencies. Fits are provided for evaluation only, but not included in the model likelihood.

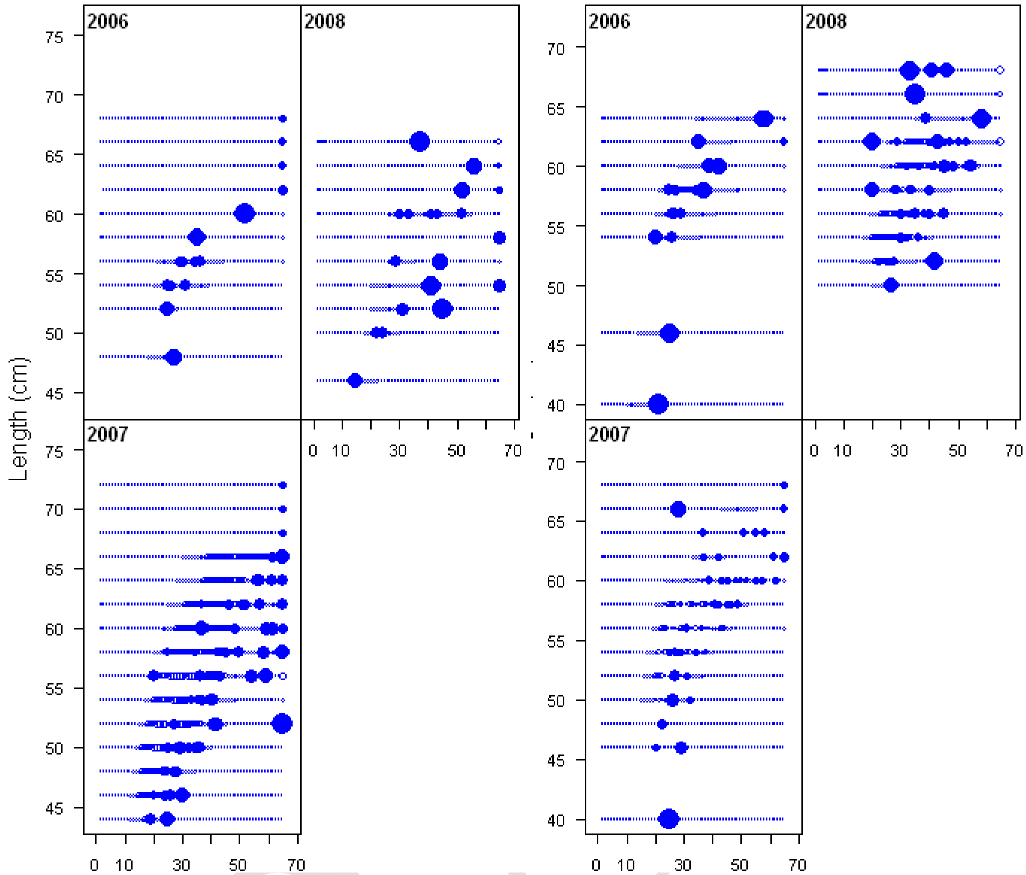

Figure 117. Pearson residuals for the fit to the Washington female (left panels, maximum = 8.10) and male (right panels, maximum = 13.82) IPHC age-frequencies. Filled circles represent positive residuals (observed – expected).

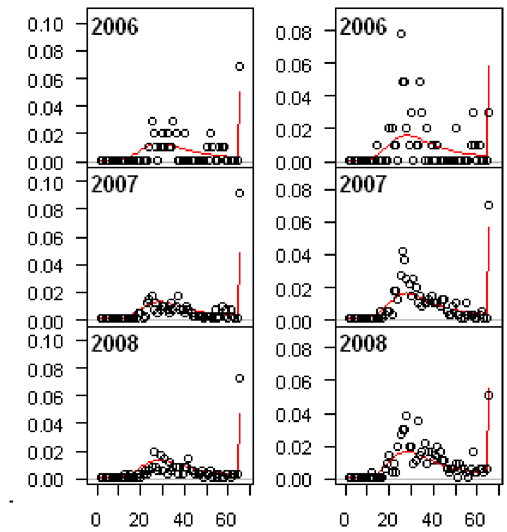

Figure 118. Implied fit to the Washington female (left panels) and male (right panels) IPHC marginal age-frequencies. Fits are provided for evaluation only, but not included in the model likelihood.

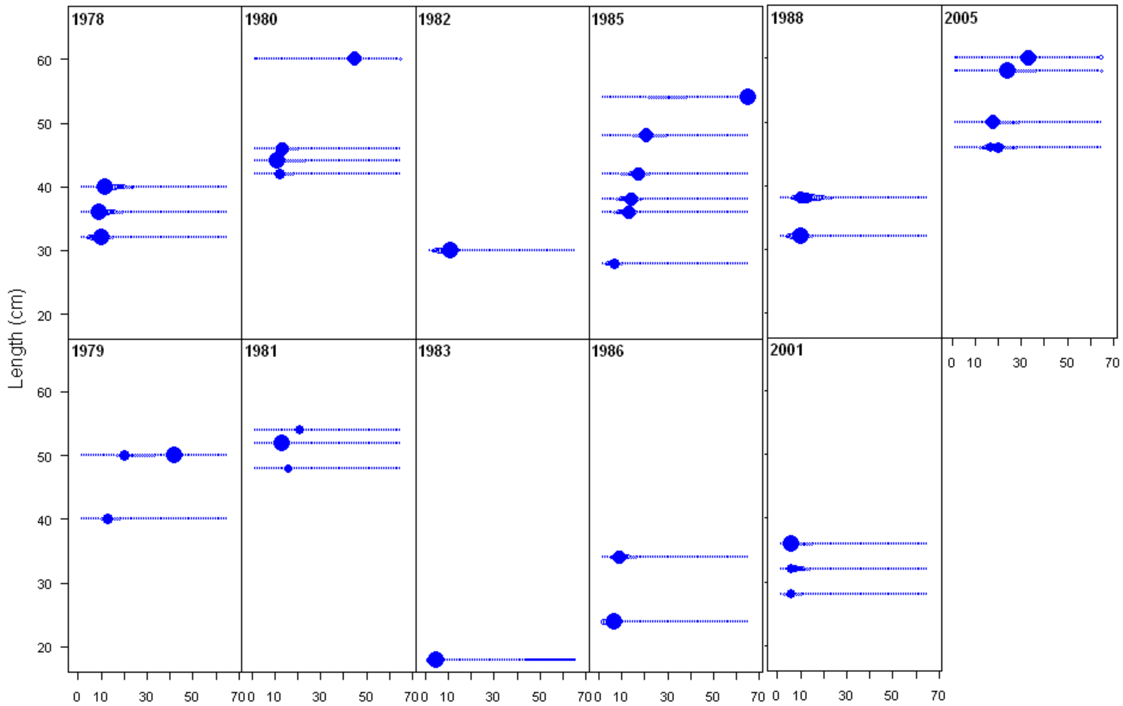

Figure 119. Pearson residuals for the fit to the California commercial female (maximum = 19.51) age-frequencies. Filled circles represent positive residuals (observed – expected).

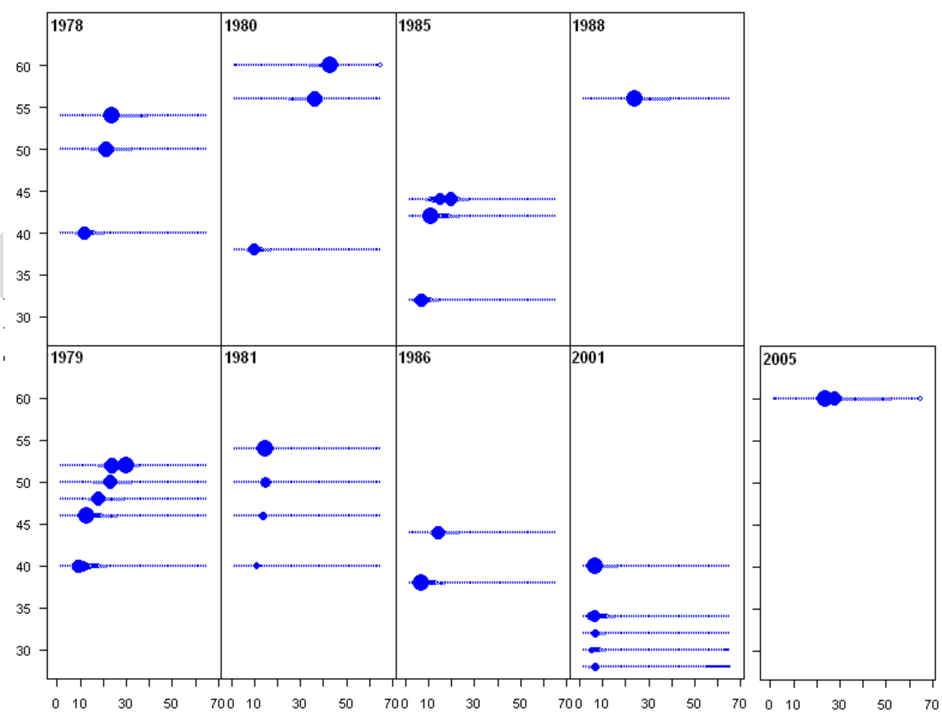

Figure 120. Pearson residuals for the fit to the California commercial male (maximum = 14.77) age-frequencies. Filled circles represent positive residuals (observed – expected).

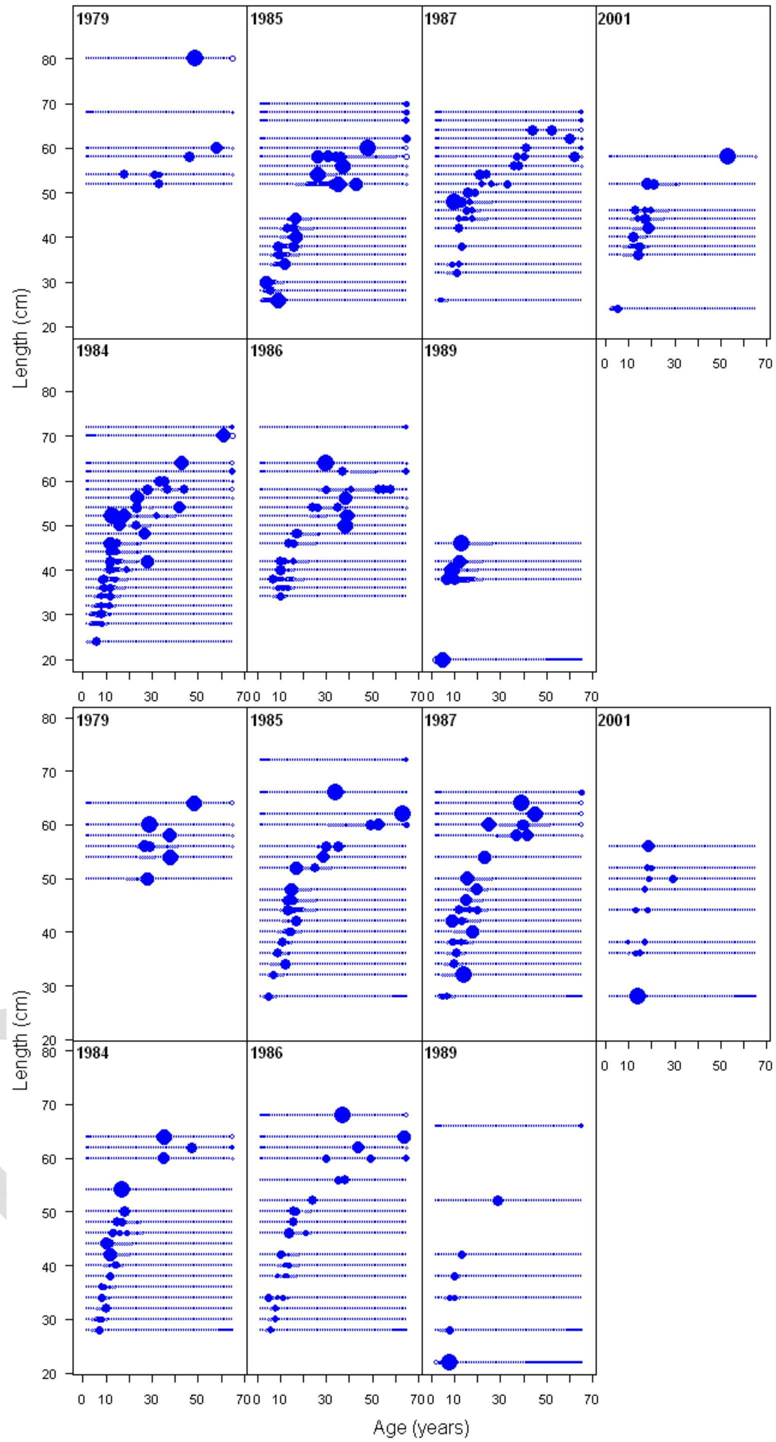

Figure 121. Pearson residuals for the fit to the Oregon recreational female (upper panels, maximum = 14.52) and male (lower panels, maximum = 17.67) age-frequencies. Filled circles represent positive residuals (observed – expected).

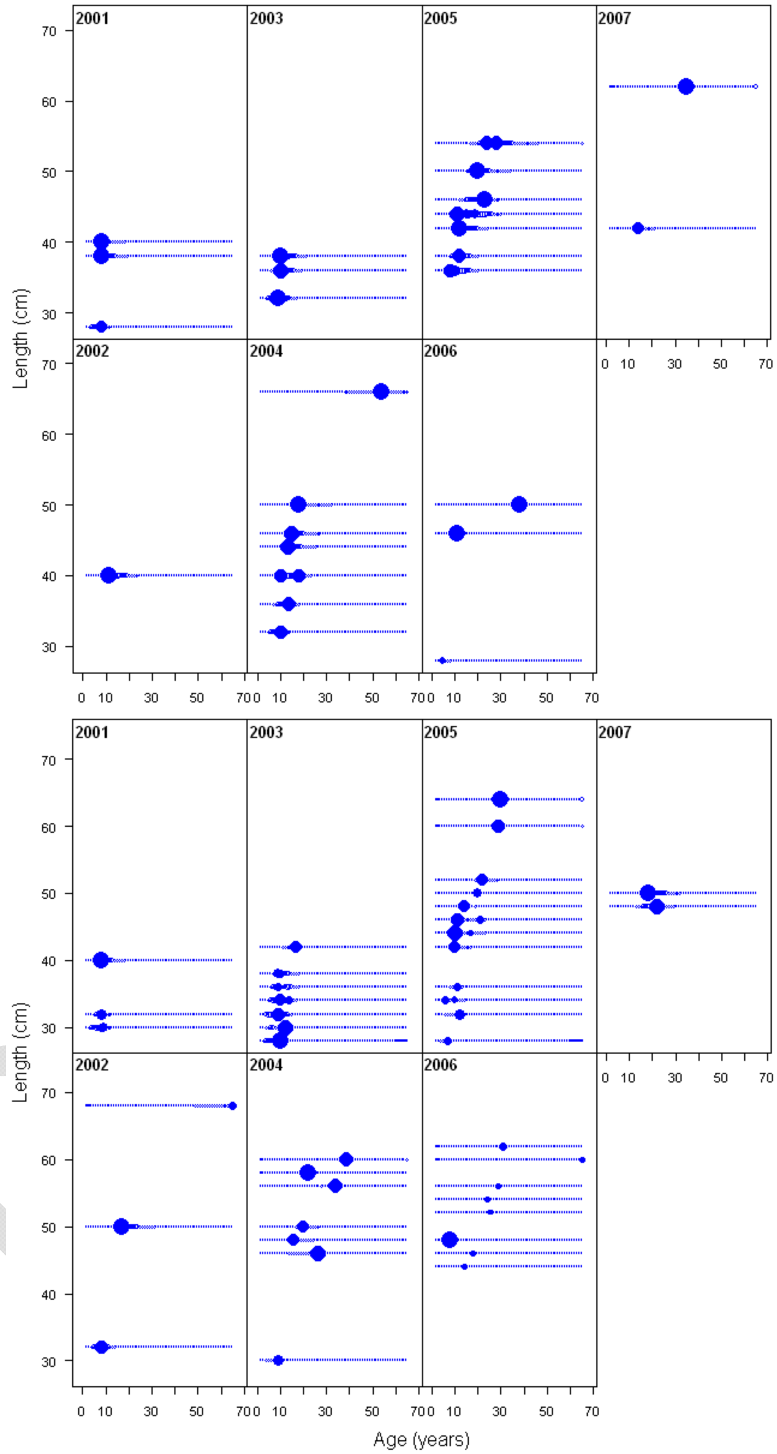

Figure 122. Pearson residuals for the fit to the Oregon commercial female (upper panels, maximum = 10.16) and male (lower panels, maximum = 28.75) age-frequencies. Filled circles represent positive residuals (observed – expected).

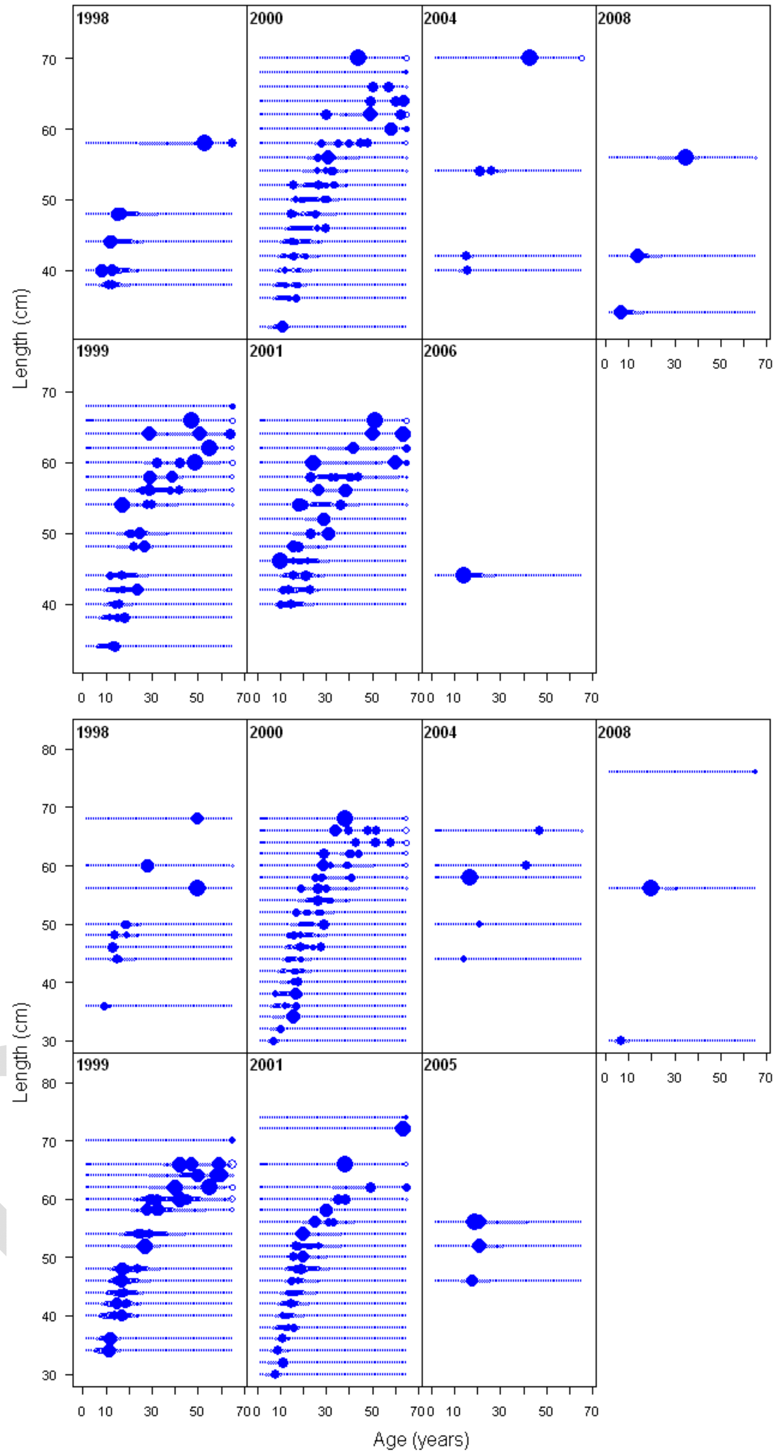

Figure 123. Pearson residuals for the fit to the Washington recreational female (upper panels, maximum = 9.12) and male (lower panels, maximum = 18.23) age-frequencies. Filled circles represent positive residuals (observed – expected).

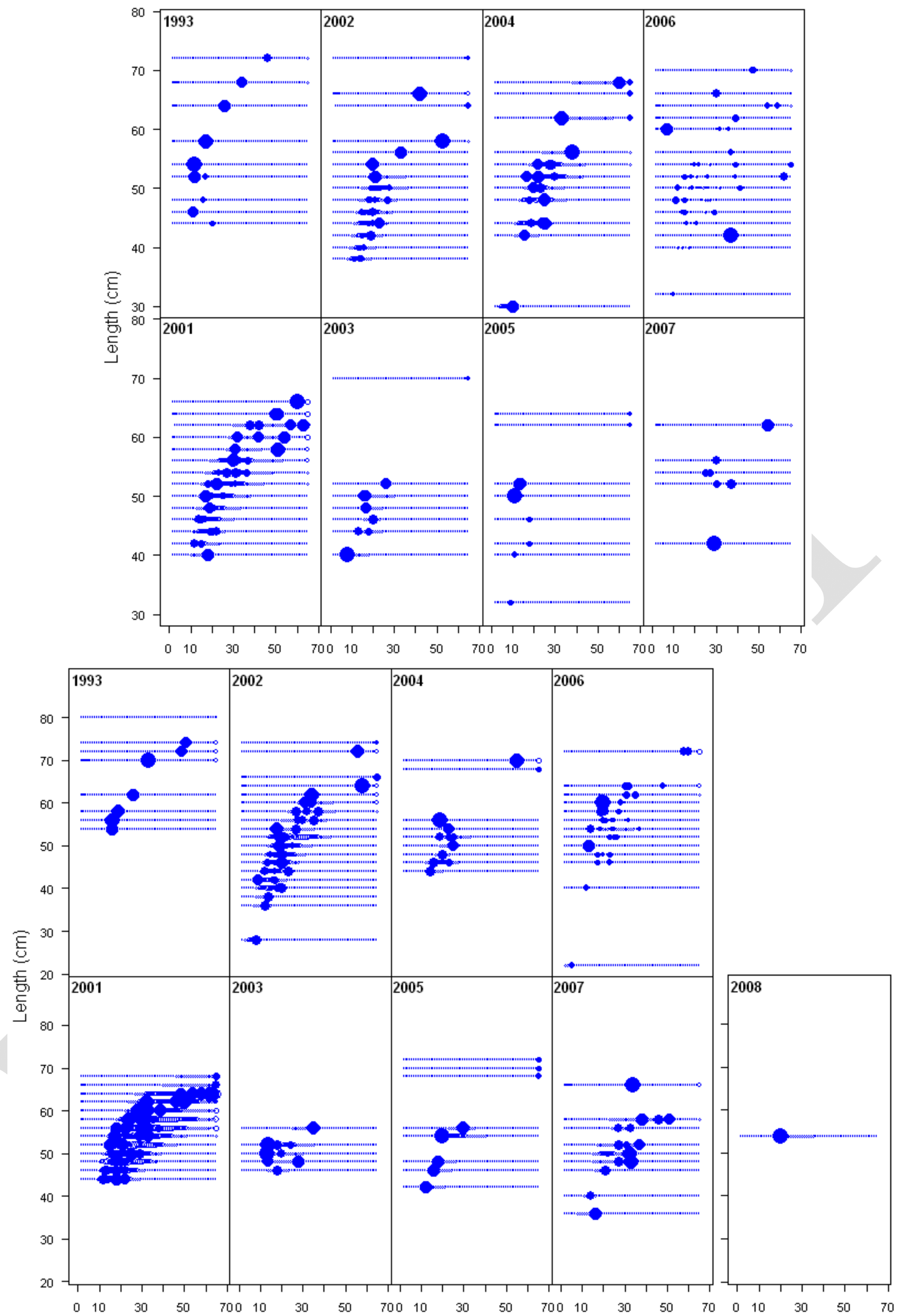

Figure 124. Pearson residuals for the fit to the Washington commercial female (upper panels, maximum =28.44) and male (lower panels, maximum = 19.38) age-frequencies. Filled circles represent positive residuals (observed – expected).

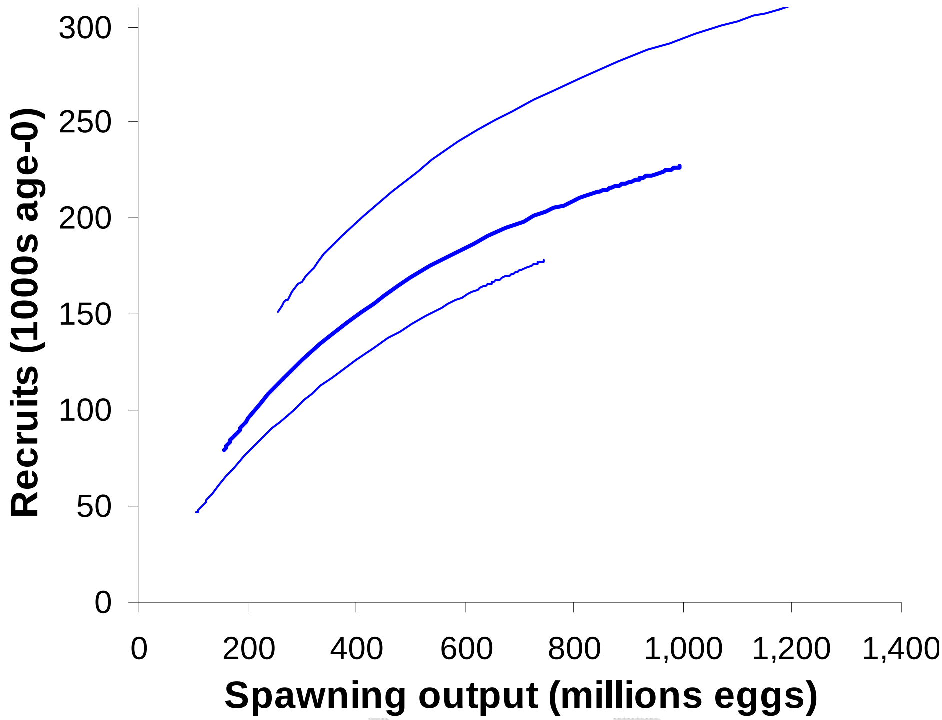

Figure 125. Estimated stock-recruit function for the base case model, and alternate states of nature (light lines).

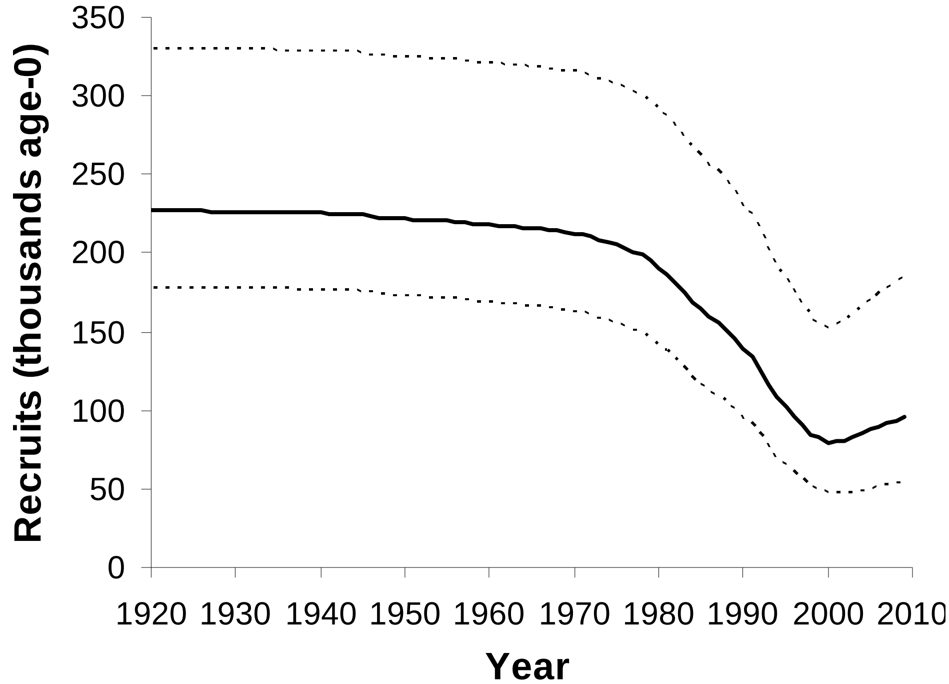

Figure 126. Time series of estimated yelloweye rockfish recruitments for the base case model and alternate states of nature (dashed lines).

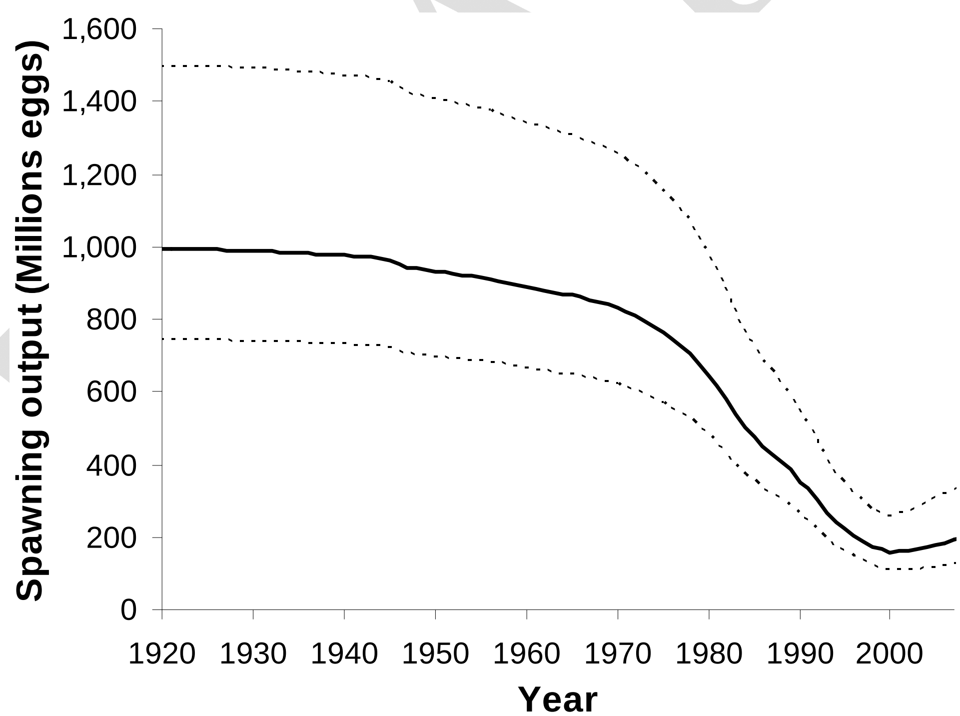

Figure 127. Estimated spawning output time-series (1916-2009) for the base case model (solid line) and alternate states of nature (dashed lines).

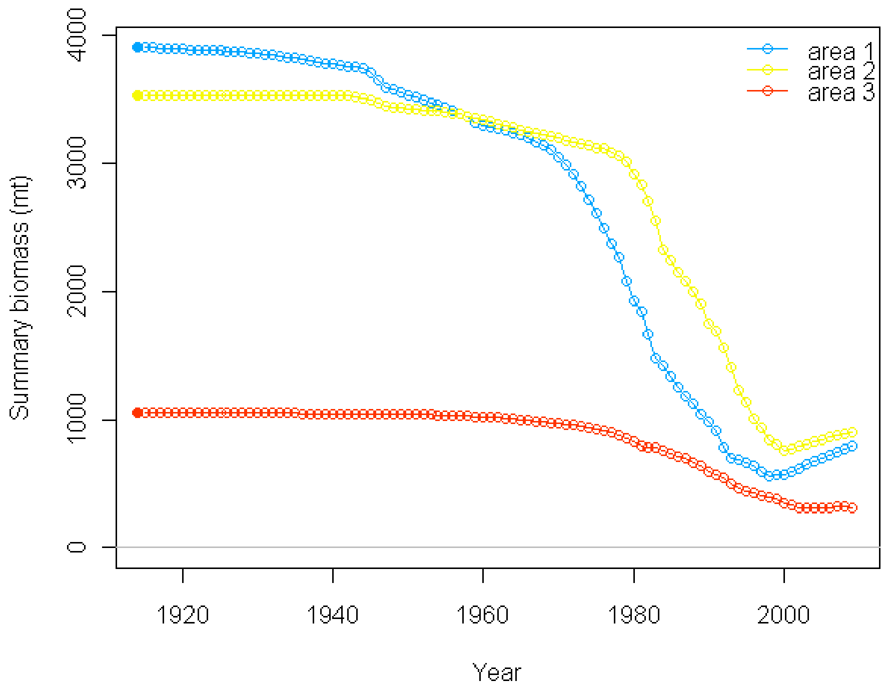

Figure 128. Estimated summary biomass (age-8+) time-series (1916-2009) by state for the base case model. Area 1, upper line (early years) = California; Area 2, middle line (early years) = Oregon; and Area 3, lower line (early years) = Washington.

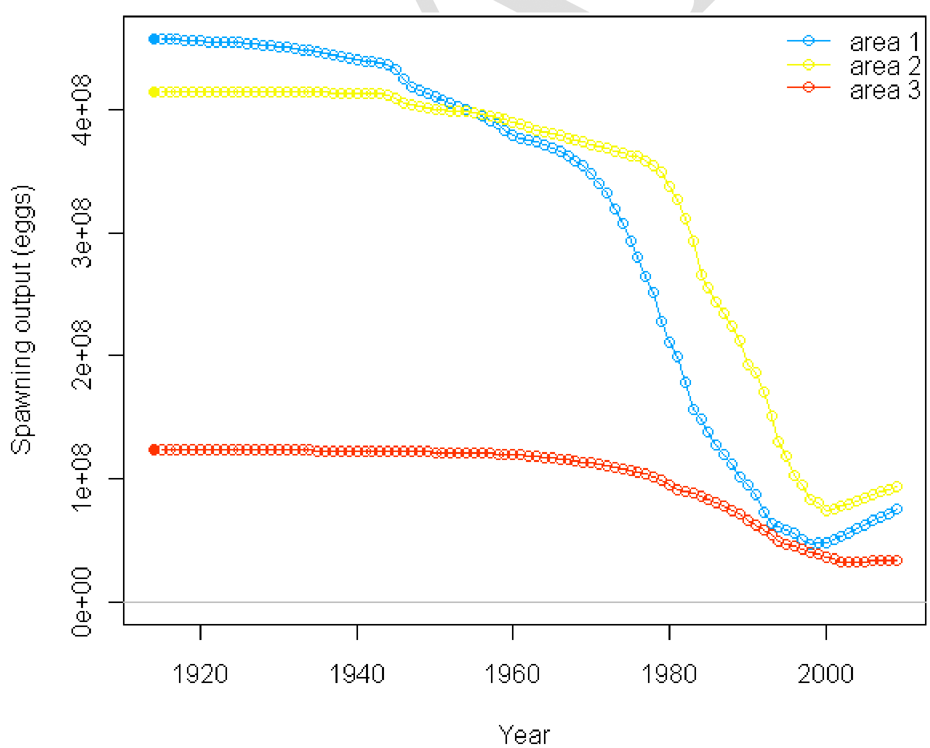

Figure 129. Estimated spawning output time-series (1916-2009) by state for the base case model. Area 1, upper line (early years) = California; Area 2, middle line (early years) = Oregon; and Area 3, lower line (early years) = Washington.

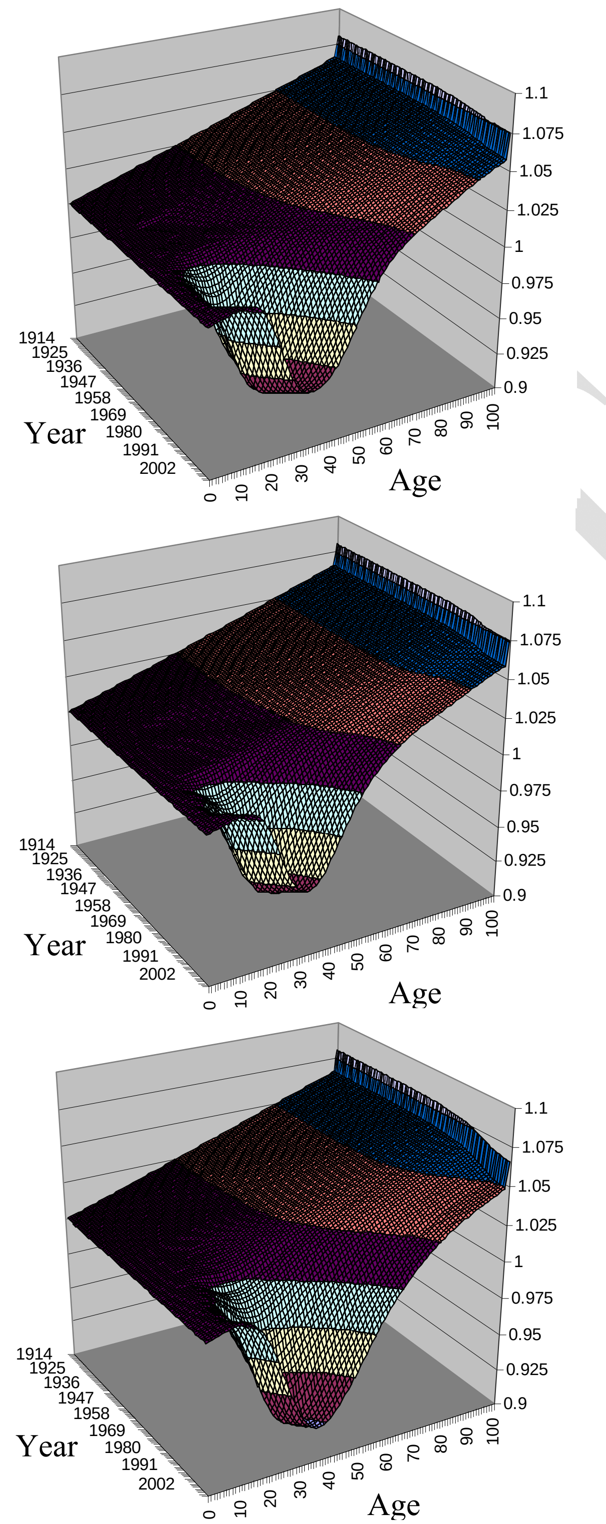

Figure 130. Predicted time-series of male to female ratio (values greater than 1.0 indicate more males than females) at age for California (top panel), Oregon (middle panel) and Washington (bottom panel) for the base case model.

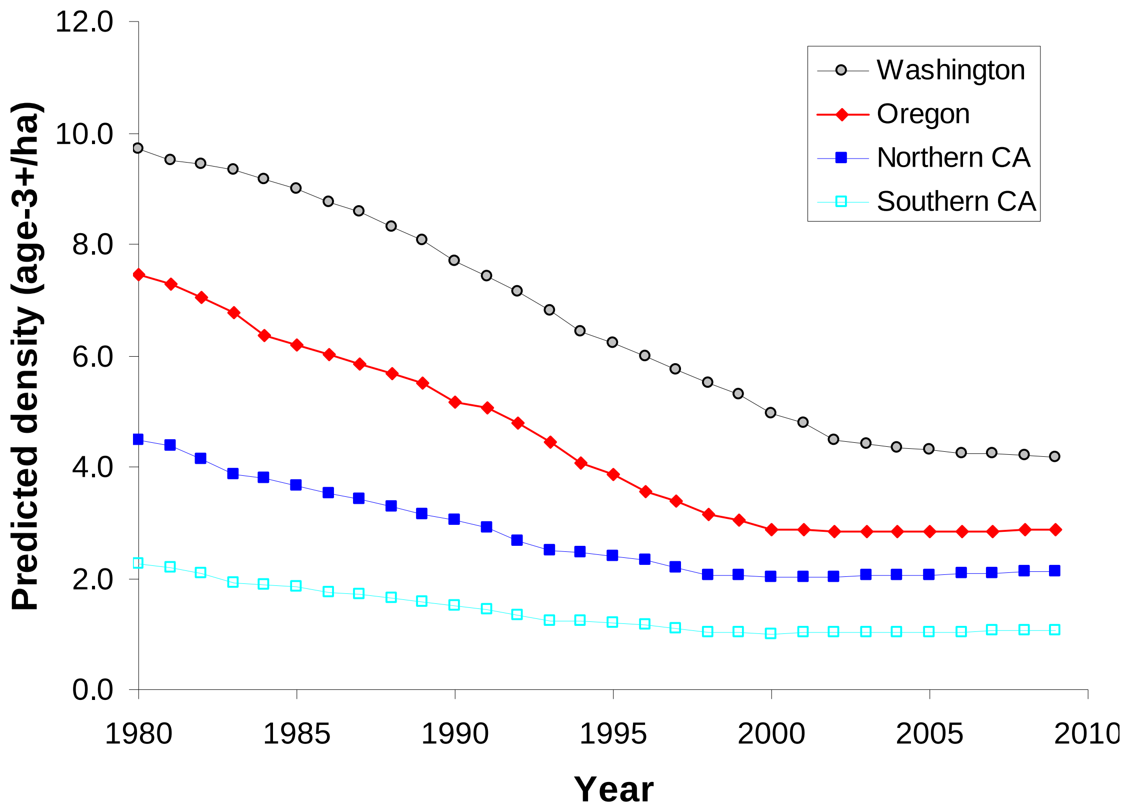

Figure 131. Predicted density of yelloweye rockfish over all ‘suitable’ habitat by state (California divided into southern and northern portions at Point Conception, and 33% of biomass assumed to occur in the south).

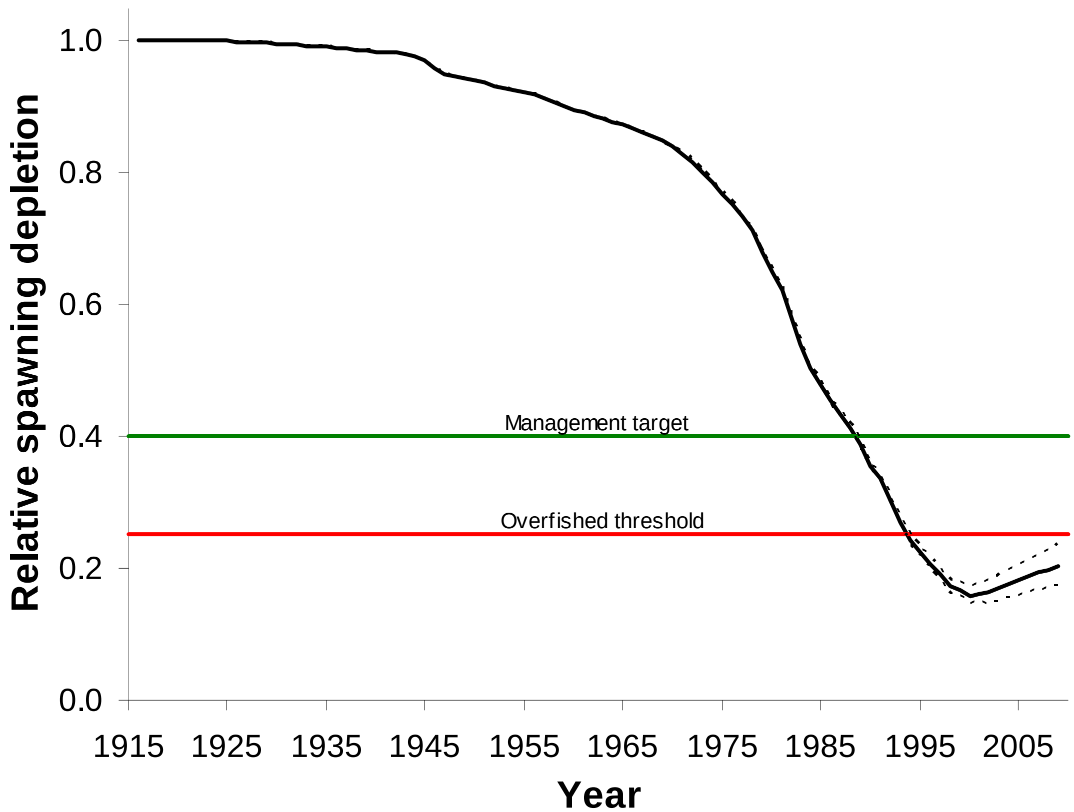

Figure 132. Time-series of relative spawning depletion as estimated in the base case model (round points) with approximate asymptotic 95% confidence interval (dashed lines) and alternate states of nature (light lines).

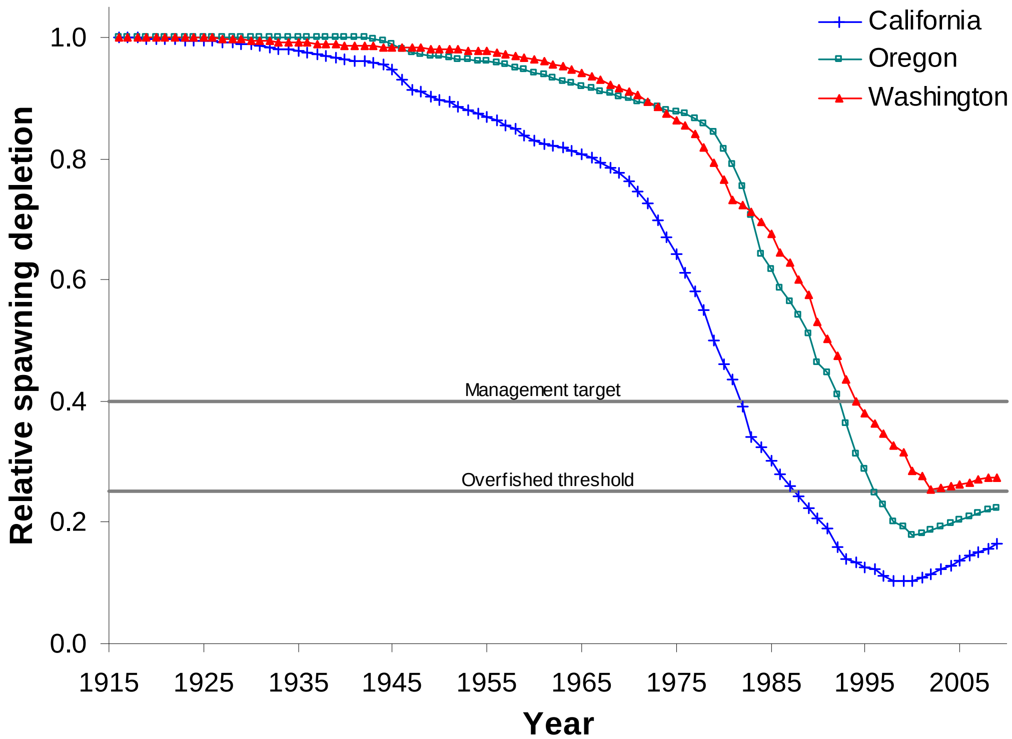

Figure 133. Time-series of relative spawning depletion by state for the base case model.

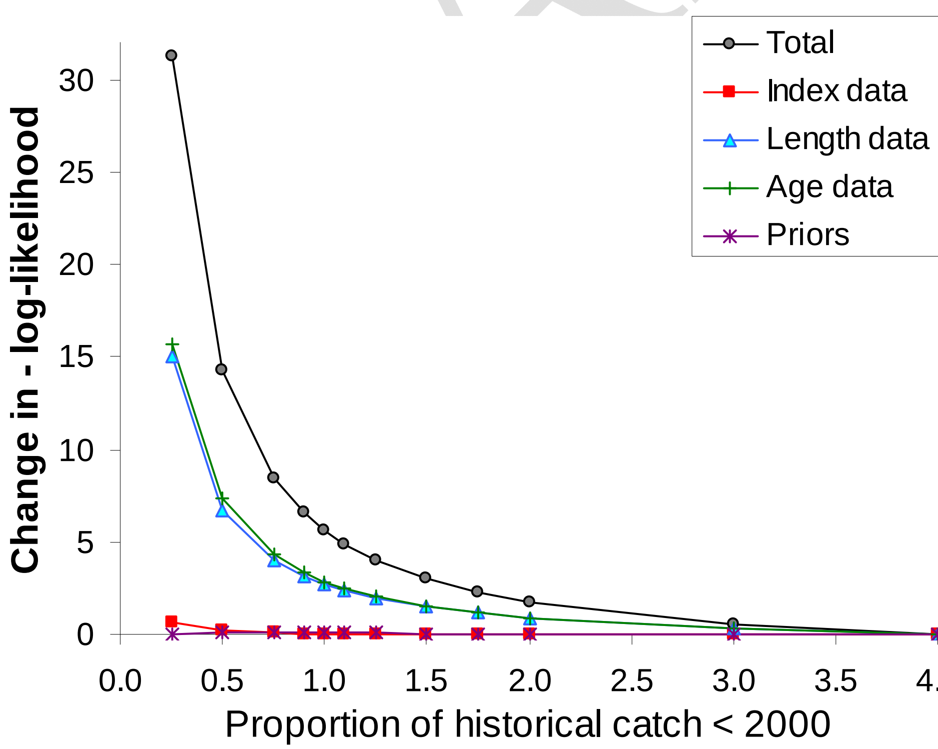

Figure 134. Likelihood profile over the fraction of the best estimate for historical catch.

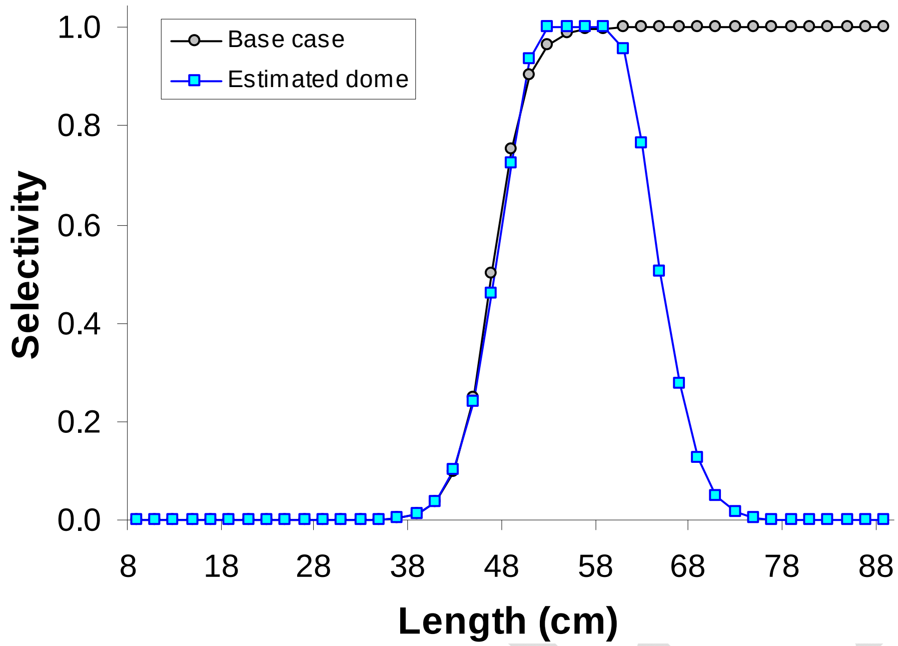

Figure 135. Selectivity curve for the IPHC survey in Oregon for the base case and sensitivity allowing dome-shaped selectivity.

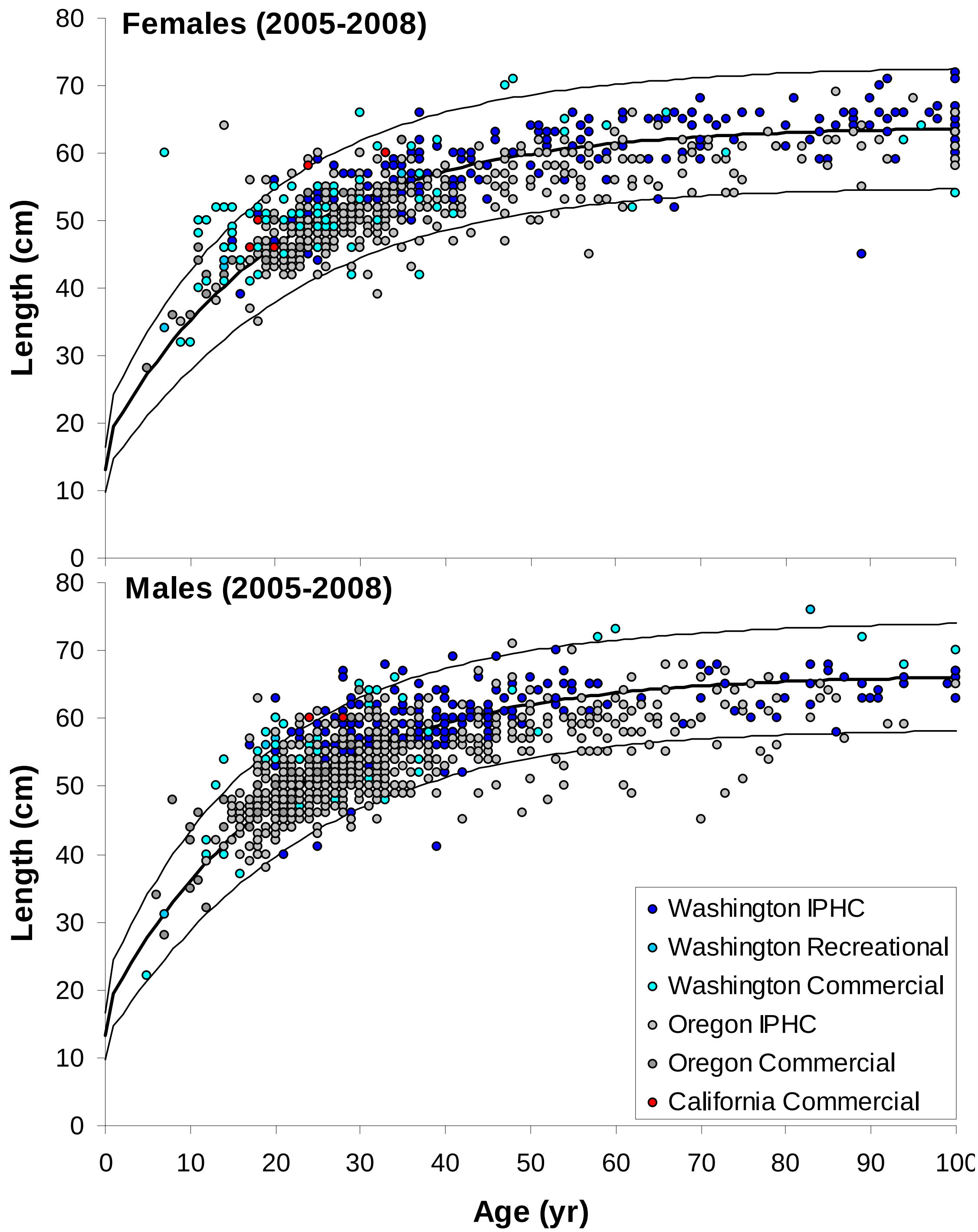

Figure 136. Comparison of recent growth data from California, Oregon and Washington by fleet.

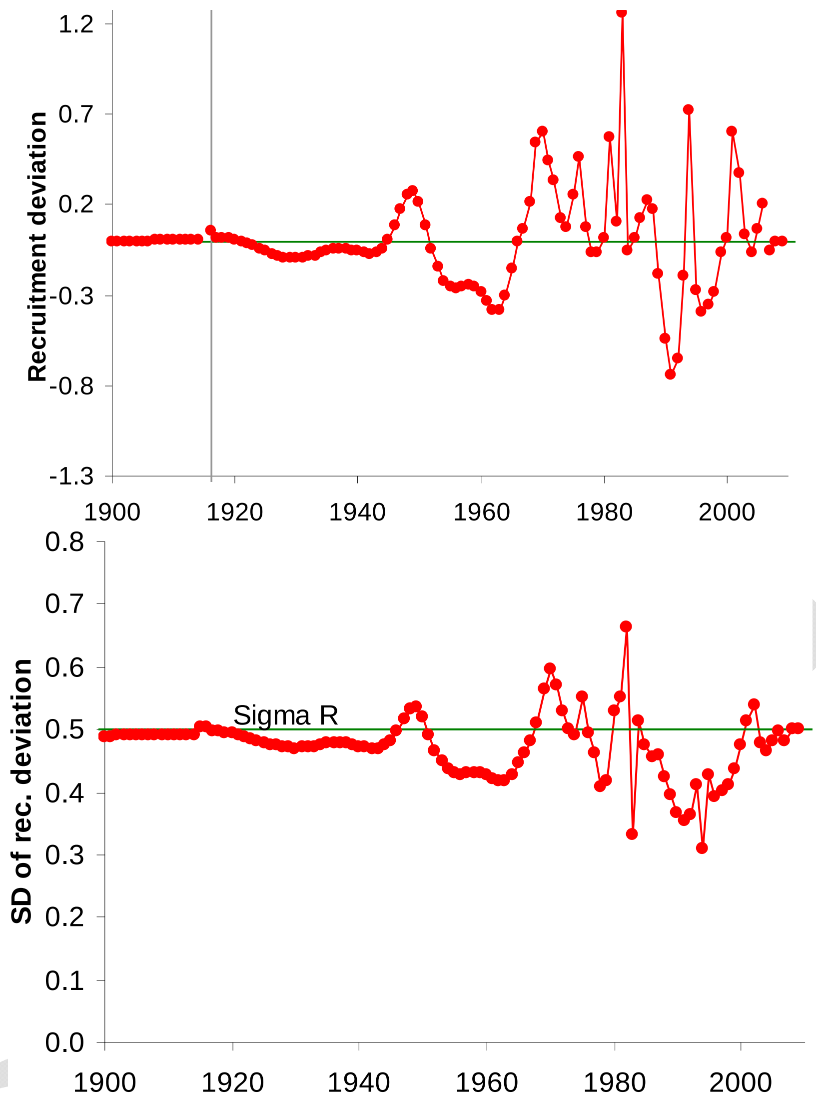

Figure 137. Estimated recruitment time-series (upper panel, horizontal line indicates a value of zero, vertical line indicates the year in which area-specific apportionment of recruitment began) and asymptotic SDs of the estimated deviations (lower panel, horizontal line indicates input σ_r) from pre-STAR sensitivity analysis.

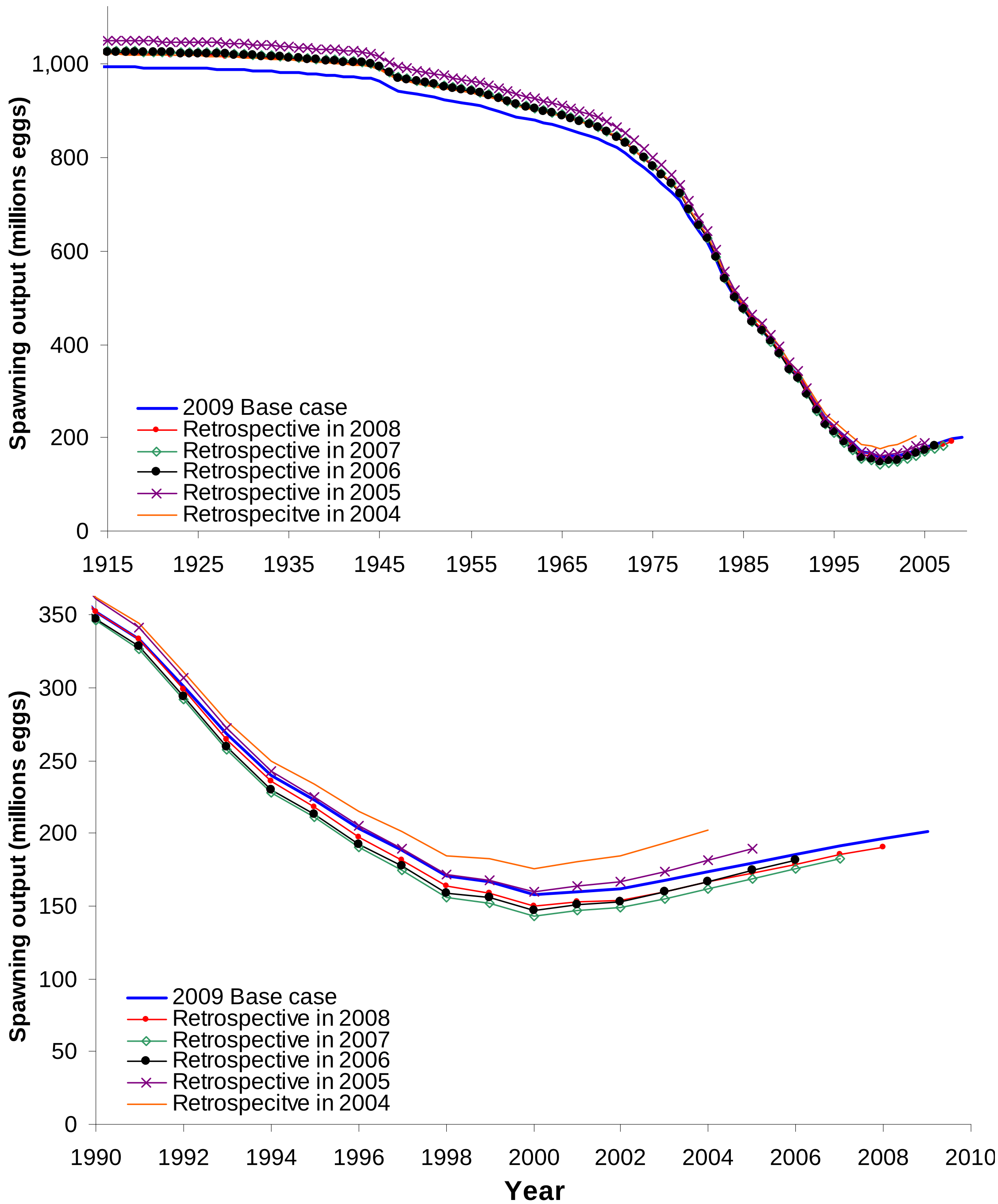

Figure 138. Results from a 5-year retrospective analysis. Each year of retrospective is performed as if the assessment were conducted in that year (i.e., retrospective in 2006 includes data through 2005). Upper panel represents the entire time-series of spawning output, lower panel only the most recent period for easier identification of effects on current status.

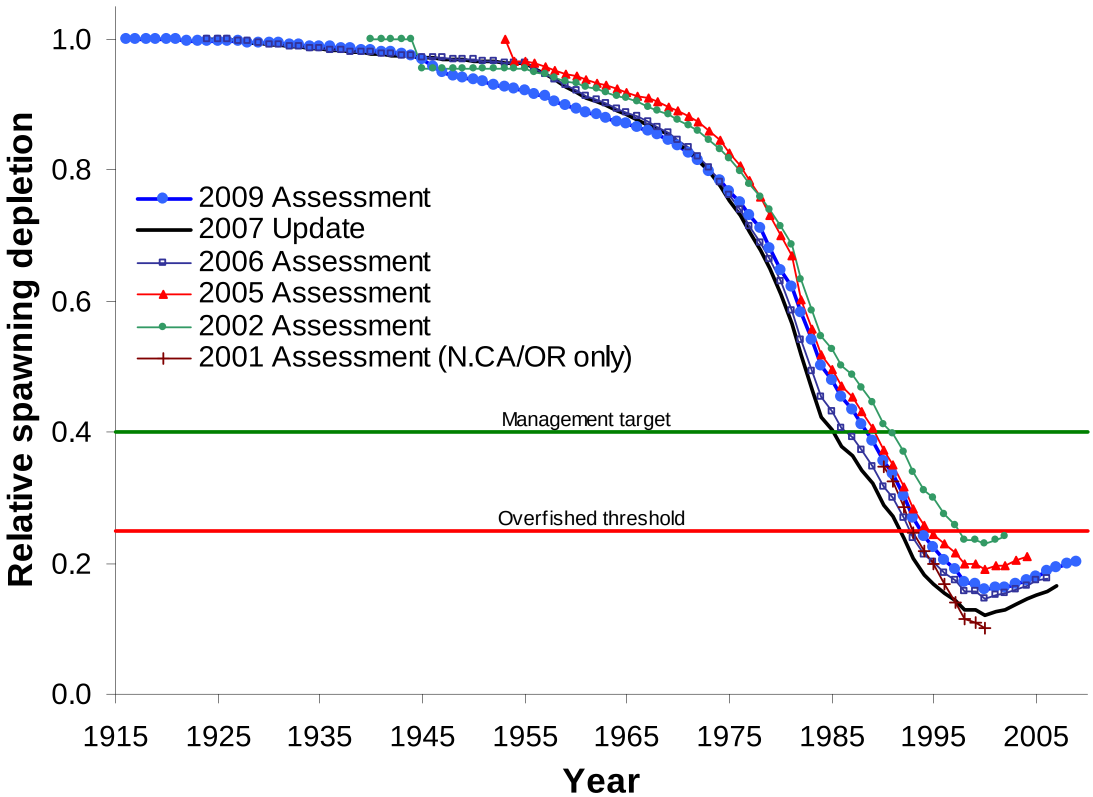

Figure 139. Retrospective pattern in relative depletion among yelloweye rockfish stock assessments.

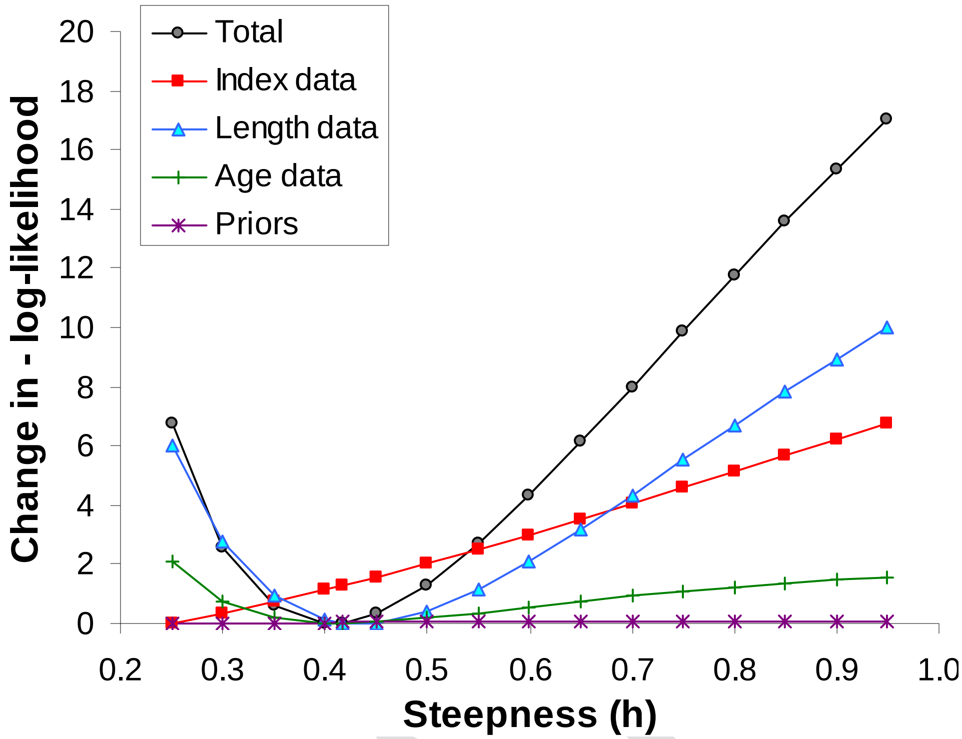

Figure 140. Results of a likelihood profile for steepness of the stock-recruit function, by data type.

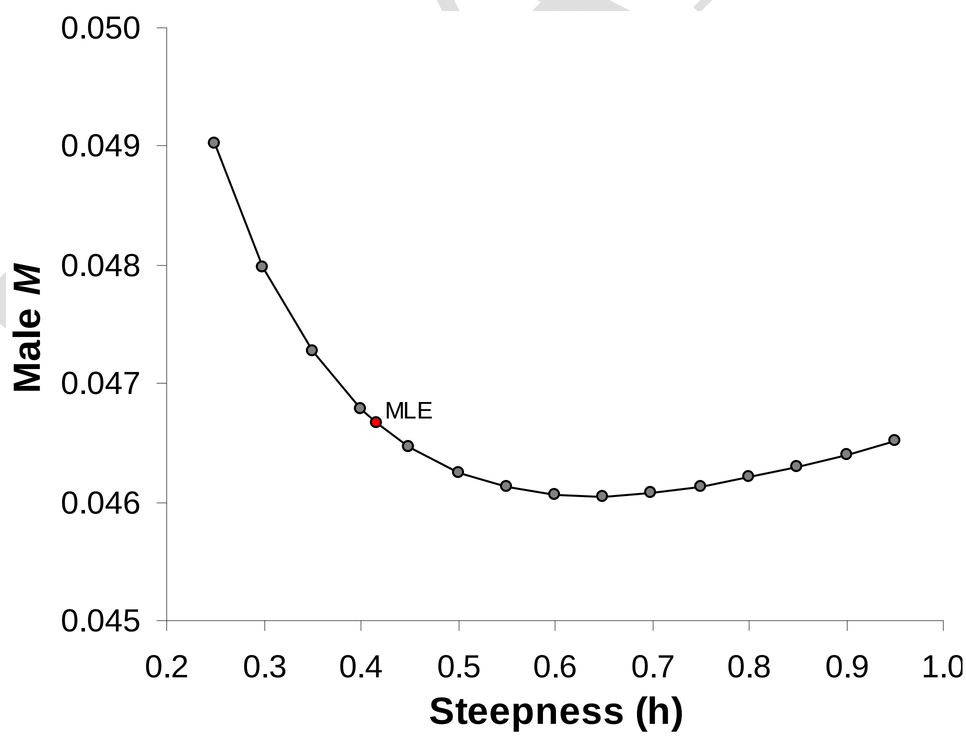

Figure 141. Relationship between steepness and estimated male natural mortality from the likelihood profile on steepness.

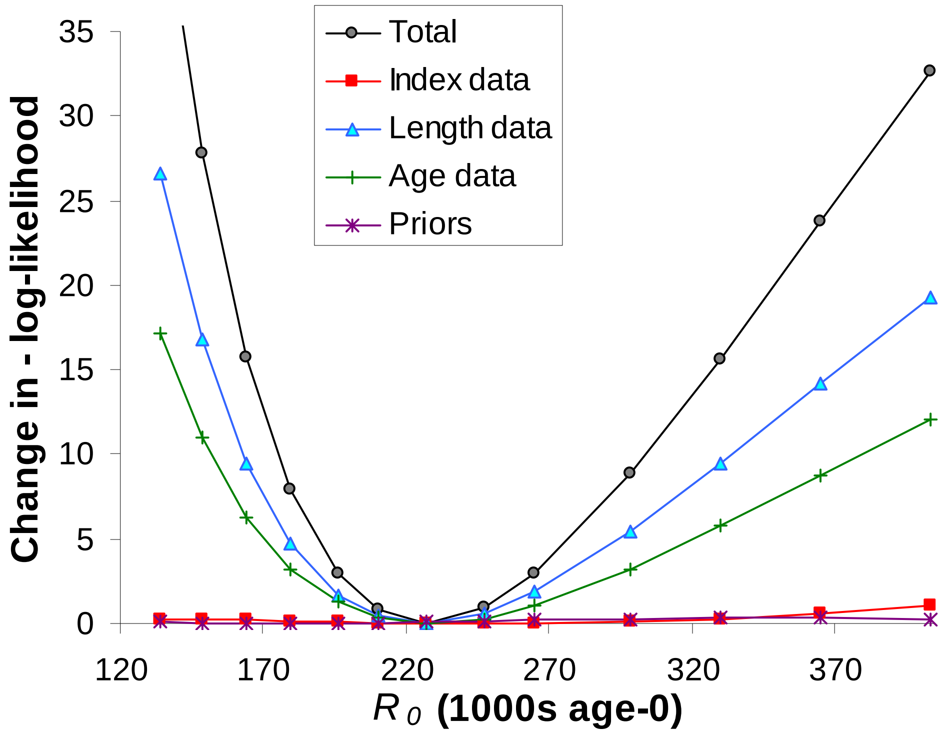

Figure 142. Results of a likelihood profile for unexploited equilibrium recruitment, by data type.

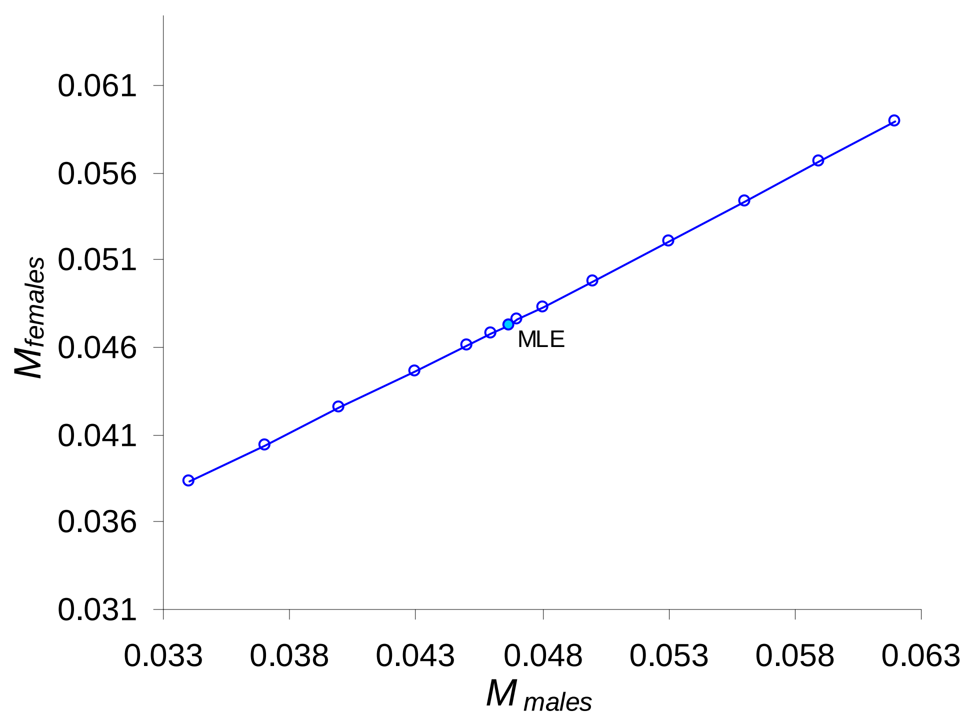

Figure 143. Relationship between estimated male and female natural mortality.

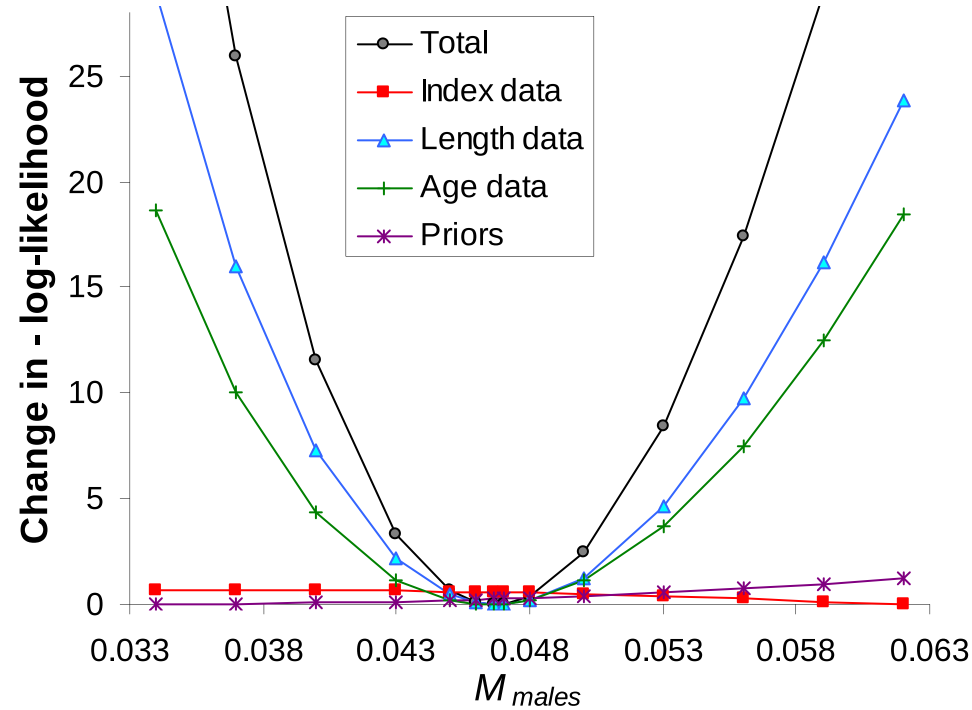

Figure 144. Results of a likelihood profile for male natural mortality (*M*), by data type.

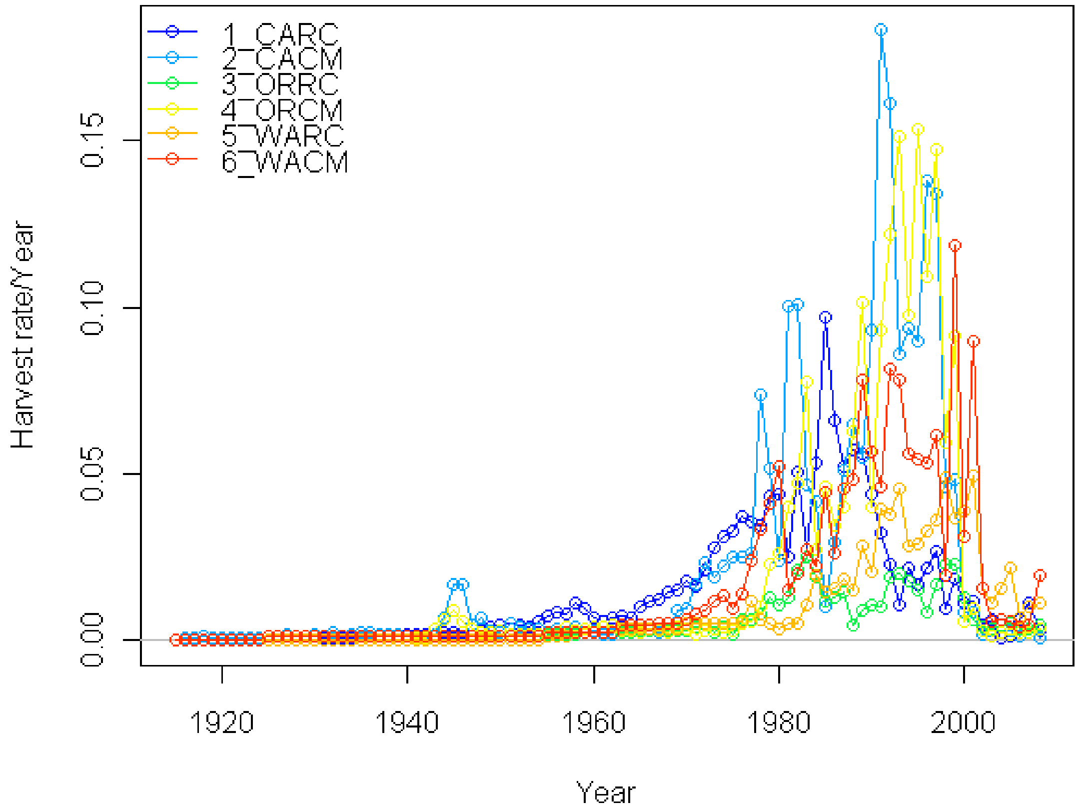

Figure 145. Time-series of harvest rate per year (*F*) for the fishing fleets in the base case model.

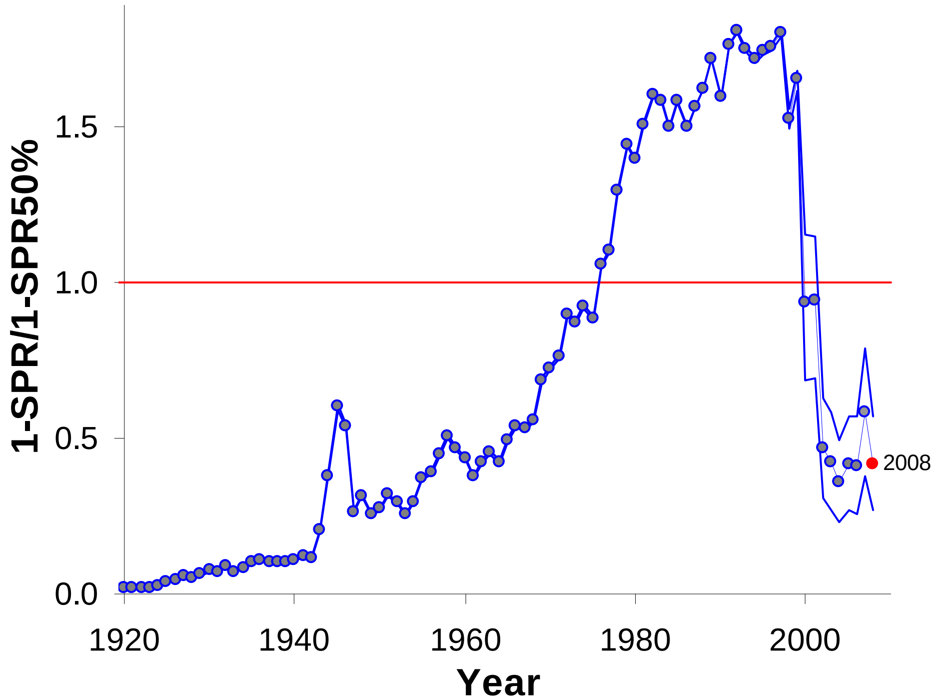

Figure 146. Time series of relative spawning potential ratio (1-SPR/1-SPR$_{Target=0.5}$) for the base case model (round points) and alternate states of nature (light lines). Values of relative SPR above 100% reflect harvests in excess of the current overfishing proxy.

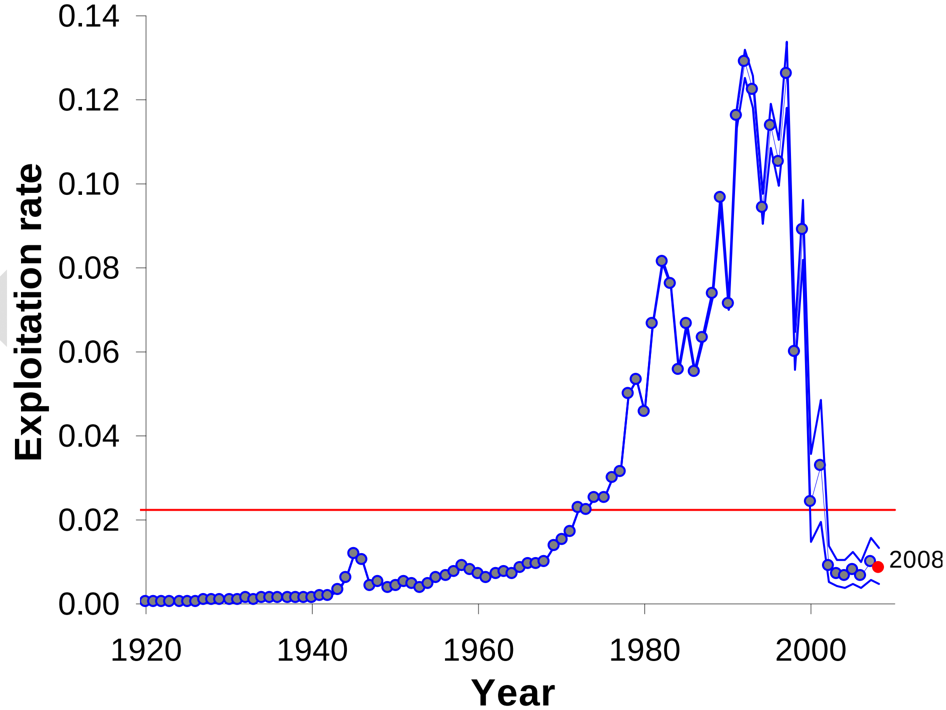

Figure 147. Time series of estimated exploitation rate (catch/age 8 and older biomass) for the base case model (round points) and alternate states of nature (light lines). Horizontal line indicates the overfishing limit/target ($F_{50\%}$) from the base case.

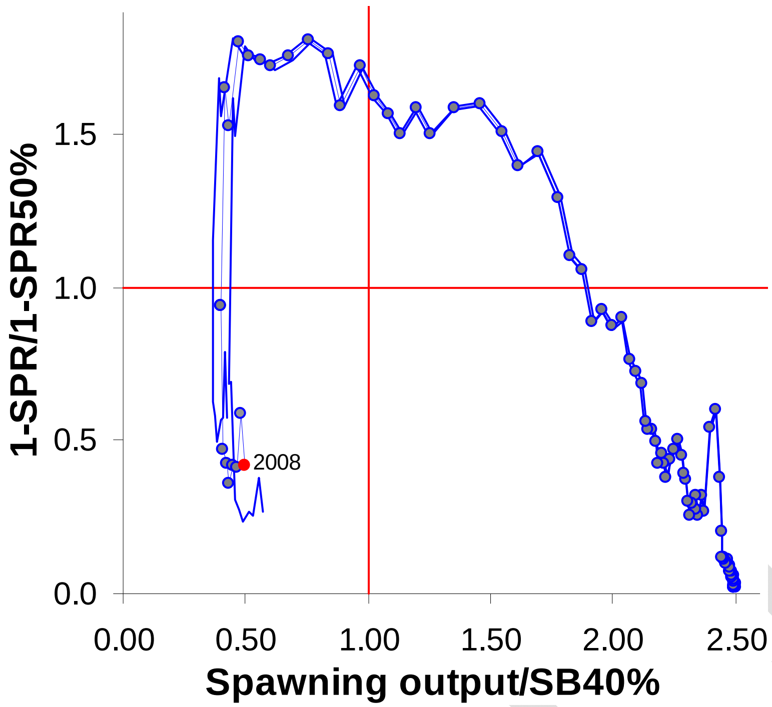

Figure 148. Estimated relative spawning potential ratio relative to the proxy target/limit of 50% vs. estimated spawning biomass relative to the proxy 40% level from the base case model. Higher biomass occurs on the right side of the x-axis, higher exploitation rates occur on the upper side of the y-axis.

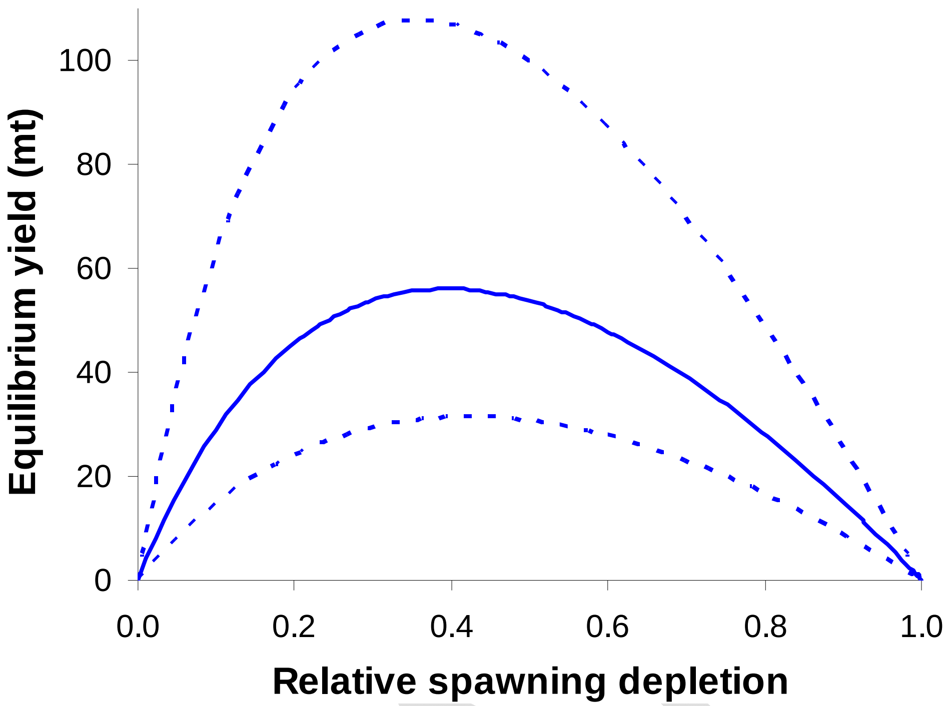

Figure 149. Equilibrium yield curve for the base case model (solid line) and alternate states of nature (dashed lines).

12. Appendices

Please see the supplementary file "Appendices 2009 yelloweye DRAFT 8_26_09".

12. Appendix A: Predicted numbers at age by sex and area

Table A.1. Female numbers at age in California (1000s) predicted by the base case model.

Age (yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1916	52.2	49.8	47.5	45.3	43.2	41.2	39.3	37.5	35.7	34.1	265.1	165.2	102.9	64.1	40.0	24.9	15.5	9.7	16.0
1917	52.2	49.8	47.5	45.3	43.2	41.2	39.3	37.5	35.7	34.1	265.0	165.1	102.9	64.1	39.9	24.9	15.5	9.7	16.0
1918	52.1	49.7	47.5	45.3	43.2	41.2	39.3	37.4	35.7	34.1	264.9	164.9	102.8	64.0	39.9	24.9	15.5	9.6	16.0
1919	52.1	49.7	47.4	45.3	43.2	41.2	39.3	37.4	35.7	34.1	264.7	164.8	102.6	64.0	39.8	24.8	15.5	9.6	15.9
1920	52.1	49.7	47.4	45.3	43.2	41.2	39.3	37.4	35.7	34.1	264.6	164.7	102.6	63.9	39.8	24.8	15.5	9.6	15.9
1921	52.1	49.7	47.4	45.2	43.2	41.2	39.3	37.4	35.7	34.1	264.6	164.6	102.5	63.9	39.8	24.8	15.5	9.6	15.9
1922	52.1	49.7	47.4	45.2	43.2	41.2	39.3	37.4	35.7	34.1	264.5	164.5	102.5	63.8	39.8	24.8	15.4	9.6	15.9
1923	52.1	49.7	47.4	45.2	43.1	41.2	39.3	37.4	35.7	34.1	264.5	164.4	102.4	63.8	39.8	24.8	15.4	9.6	15.9
1924	52.1	49.7	47.4	45.2	43.1	41.2	39.3	37.4	35.7	34.1	264.5	164.4	102.3	63.8	39.7	24.8	15.4	9.6	15.9
1925	52.1	49.7	47.4	45.2	43.1	41.1	39.2	37.4	35.7	34.1	264.5	164.3	102.3	63.7	39.7	24.7	15.4	9.6	15.9
1926	52.1	49.7	47.4	45.2	43.1	41.1	39.2	37.4	35.7	34.0	264.4	164.1	102.2	63.6	39.7	24.7	15.4	9.6	15.9
1927	52.1	49.7	47.4	45.2	43.1	41.1	39.2	37.4	35.7	34.0	264.3	164.0	102.0	63.6	39.6	24.7	15.4	9.6	15.8
1928	52.1	49.7	47.4	45.2	43.1	41.1	39.2	37.4	35.7	34.0	264.1	163.8	101.9	63.5	39.5	24.6	15.3	9.6	15.8
1929	52.1	49.7	47.4	45.2	43.1	41.1	39.2	37.4	35.7	34.0	264.0	163.6	101.7	63.4	39.5	24.6	15.3	9.5	15.8
1930	52.0	49.7	47.4	45.2	43.1	41.1	39.2	37.4	35.7	34.0	263.8	163.4	101.6	63.3	39.4	24.6	15.3	9.5	15.8
1931	52.0	49.6	47.4	45.2	43.1	41.1	39.2	37.4	35.7	34.0	263.6	163.1	101.4	63.1	39.3	24.5	15.3	9.5	15.7
1932	52.0	49.6	47.3	45.2	43.1	41.1	39.2	37.4	35.6	34.0	263.4	162.9	101.2	63.0	39.2	24.5	15.2	9.5	15.7
1933	52.0	49.6	47.3	45.2	43.1	41.1	39.2	37.4	35.6	34.0	263.1	162.6	100.9	62.8	39.1	24.4	15.2	9.5	15.6
1934	52.0	49.6	47.3	45.1	43.1	41.1	39.2	37.4	35.6	34.0	263.0	162.4	100.7	62.7	39.1	24.3	15.2	9.4	15.6
1935	52.0	49.6	47.3	45.1	43.0	41.1	39.2	37.3	35.6	33.9	262.8	162.1	100.5	62.5	39.0	24.3	15.1	9.4	15.6
1936	51.9	49.6	47.3	45.1	43.0	41.0	39.1	37.3	35.6	33.9	262.5	161.8	100.2	62.3	38.8	24.2	15.1	9.4	15.5
1937	51.9	49.5	47.3	45.1	43.0	41.0	39.1	37.3	35.6	33.9	262.2	161.4	99.9	62.1	38.7	24.1	15.0	9.4	15.5
1938	51.9	49.5	47.2	45.1	43.0	41.0	39.1	37.3	35.5	33.9	261.9	161.0	99.6	61.9	38.6	24.0	15.0	9.3	15.4
1939	51.8	49.5	47.2	45.0	43.0	41.0	39.1	37.3	35.5	33.9	261.7	160.7	99.3	61.7	38.4	23.9	14.9	9.3	15.4
1940	51.8	49.5	47.2	45.0	42.9	41.0	39.1	37.3	35.5	33.8	261.5	160.4	99.1	61.5	38.3	23.9	14.9	9.3	15.3
1941	51.8	49.4	47.2	45.0	42.9	40.9	39.1	37.2	35.5	33.8	261.3	160.2	98.8	61.3	38.2	23.8	14.8	9.2	15.3
1942	51.8	49.4	47.1	45.0	42.9	40.9	39.0	37.2	35.5	33.8	261.2	159.9	98.6	61.2	38.1	23.7	14.8	9.2	15.2
1943	51.7	49.4	47.1	45.0	42.9	40.9	39.0	37.2	35.5	33.8	261.1	159.7	98.4	61.0	38.0	23.7	14.7	9.2	15.2
1944	51.7	49.4	47.1	44.9	42.9	40.9	39.0	37.2	35.4	33.8	260.8	159.5	98.1	60.8	37.8	23.6	14.7	9.1	15.1
1945	51.6	49.3	47.1	44.9	42.8	40.8	38.9	37.1	35.4	33.7	259.7	158.4	97.3	60.2	37.5	23.3	14.5	9.1	15.0
1946	51.4	49.2	47.0	44.9	42.8	40.8	38.9	37.0	35.2	33.5	257.0	155.8	95.5	59.1	36.8	22.9	14.3	8.9	14.7
1947	51.2	49.0	46.9	44.8	42.7	40.7	38.8	36.9	35.1	33.4	254.6	153.4	93.8	58.0	36.1	22.5	14.0	8.7	14.4
1948	51.1	48.8	46.7	44.7	42.7	40.7	38.8	36.9	35.2	33.4	254.5	152.9	93.4	57.7	35.8	22.3	13.9	8.7	14.3
1949	51.0	48.8	46.5	44.5	42.6	40.7	38.8	36.9	35.1	33.4	254.0	151.9	92.6	57.1	35.5	22.1	13.8	8.6	14.2
1950	51.0	48.7	46.5	44.4	42.5	40.6	38.8	36.9	35.2	33.4	254.0	151.4	92.1	56.8	35.2	21.9	13.7	8.5	14.1
1951	50.9	48.6	46.4	44.3	42.3	40.5	38.7	36.9	35.1	33.4	254.0	150.9	91.6	56.4	35.0	21.8	13.6	8.5	14.0
1952	50.8	48.6	46.4	44.2	42.2	40.3	38.5	36.8	35.1	33.4	253.4	150.0	90.8	55.9	34.6	21.6	13.4	8.4	13.8
1953	50.8	48.5	46.3	44.2	42.2	40.2	38.4	36.7	35.0	33.4	253.2	149.4	90.2	55.4	34.3	21.4	13.3	8.3	13.7
1954	50.7	48.4	46.2	44.1	42.1	40.2	38.3	36.5	34.9	33.3	253.2	148.9	89.7	55.0	34.1	21.2	13.2	8.2	13.6
1955	50.6	48.4	46.2	44.1	42.1	40.1	38.3	36.5	34.7	33.2	252.9	148.4	89.1	54.6	33.8	21.0	13.1	8.2	13.5
1956	50.5	48.3	46.1	44.0	42.0	40.1	38.2	36.4	34.7	33.0	252.4	147.8	88.5	54.1	33.5	20.8	13.0	8.1	13.3
1957	50.4	48.2	46.0	43.9	41.9	40.0	38.1	36.3	34.6	32.9	251.5	147.1	87.7	53.6	33.1	20.6	12.8	8.0	13.2

Table A.1. Continued. Female numbers at age in California (1000s) predicted by the base case model.

Age (yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1958	50.3	48.1	46.0	43.9	41.9	39.9	38.0	36.3	34.5	32.8	250.6	146.3	87.0	53.0	32.7	20.3	12.7	7.9	13.0
1959	50.2	48.0	45.9	43.8	41.8	39.8	38.0	36.1	34.4	32.7	249.1	145.2	85.9	52.3	32.2	20.0	12.5	7.8	12.8
1960	50.1	47.9	45.8	43.7	41.7	39.8	37.9	36.1	34.3	32.6	248.1	144.4	85.2	51.7	31.8	19.8	12.3	7.7	12.7
1961	50.0	47.8	45.6	43.6	41.6	39.7	37.9	36.1	34.3	32.6	247.7	144.2	84.7	51.3	31.5	19.6	12.2	7.6	12.5
1962	49.9	47.7	45.5	43.5	41.6	39.7	37.8	36.1	34.3	32.6	247.7	144.3	84.4	51.0	31.3	19.4	12.1	7.5	12.5
1963	49.8	47.6	45.4	43.4	41.5	39.6	37.8	36.0	34.3	32.6	247.4	144.2	84.1	50.6	31.1	19.3	12.0	7.5	12.3
1964	49.7	47.5	45.4	43.3	41.4	39.5	37.7	35.9	34.2	32.6	246.8	143.8	83.6	50.2	30.8	19.1	11.9	7.4	12.2
1965	49.6	47.4	45.3	43.2	41.3	39.4	37.6	35.9	34.2	32.5	246.5	143.7	83.3	49.9	30.5	18.9	11.7	7.3	12.1
1966	49.5	47.3	45.2	43.1	41.2	39.3	37.5	35.7	34.1	32.4	245.6	143.0	82.6	49.3	30.2	18.6	11.6	7.2	11.9
1967	49.3	47.2	45.1	43.0	41.1	39.2	37.4	35.6	33.9	32.3	244.5	142.1	82.0	48.8	29.8	18.4	11.4	7.1	11.8
1968	49.2	47.0	45.0	43.0	41.0	39.1	37.3	35.5	33.8	32.2	243.5	141.1	81.3	48.2	29.4	18.1	11.3	7.0	11.6
1969	49.0	46.9	44.8	42.8	40.9	39.0	37.2	35.4	33.7	32.0	242.1	139.9	80.5	47.6	28.9	17.8	11.1	6.9	11.4
1970	48.8	46.8	44.7	42.7	40.8	38.9	37.0	35.2	33.5	31.8	239.6	137.8	79.2	46.6	28.3	17.4	10.8	6.7	11.1
1971	48.6	46.6	44.6	42.6	40.6	38.7	36.9	35.1	33.3	31.6	236.7	135.3	77.7	45.5	27.5	16.9	10.5	6.5	10.8
1972	48.3	46.4	44.4	42.4	40.5	38.6	36.7	34.9	33.1	31.4	233.4	132.3	75.8	44.2	26.7	16.4	10.2	6.3	10.5
1973	47.9	46.1	44.1	42.2	40.3	38.4	36.5	34.7	32.9	31.1	228.5	127.8	73.1	42.4	25.6	15.7	9.7	6.0	10.0
1974	47.6	45.7	43.9	42.0	40.1	38.2	36.3	34.4	32.6	30.8	223.8	123.4	70.3	40.7	24.4	15.0	9.3	5.8	9.5
1975	47.1	45.4	43.5	41.7	39.9	38.0	36.1	34.2	32.3	30.5	218.7	118.5	67.2	38.7	23.2	14.2	8.8	5.5	9.0
1976	46.7	45.0	43.2	41.4	39.6	37.7	35.9	34.0	32.0	30.1	213.6	113.4	64.0	36.8	21.9	13.4	8.3	5.1	8.5
1977	46.2	44.6	42.8	41.0	39.2	37.5	35.6	33.7	31.8	29.8	208.5	108.2	60.6	34.7	20.6	12.6	7.8	4.8	8.0
1978	45.7	44.1	42.4	40.7	38.9	37.1	35.3	33.4	31.5	29.6	204.2	103.4	57.4	32.8	19.4	11.8	7.3	4.5	7.5
1979	44.8	43.6	41.9	40.2	38.5	36.7	34.8	32.9	30.9	28.9	194.6	94.5	51.8	29.5	17.4	10.6	6.5	4.0	6.7
1980	43.8	42.7	41.4	39.8	38.1	36.3	34.4	32.5	30.5	28.5	187.9	87.7	47.4	26.9	15.8	9.6	5.9	3.7	6.0
1981	43.0	41.8	40.6	39.3	37.7	36.0	34.2	32.3	30.3	28.4	185.5	83.9	44.7	25.4	14.8	8.9	5.5	3.4	5.6
1982	41.7	41.0	39.7	38.5	37.2	35.5	33.7	31.8	29.8	27.7	177.1	75.9	39.7	22.4	13.0	7.8	4.8	3.0	4.9
1983	40.2	39.8	38.9	37.6	36.3	34.9	33.1	31.1	29.0	26.9	166.6	67.0	34.2	19.2	11.1	6.7	4.1	2.5	4.2
1984	38.7	38.3	37.9	37.0	35.7	34.4	32.9	31.0	29.1	27.0	166.5	64.5	32.1	18.0	10.3	6.2	3.8	2.3	3.9
1985	37.8	36.9	36.4	35.9	35.0	33.6	32.2	30.7	28.7	26.7	164.0	61.0	29.6	16.4	9.4	5.6	3.4	2.1	3.5
1986	36.7	36.1	35.1	34.5	33.9	32.8	31.3	29.8	28.2	26.2	160.0	57.1	26.9	14.8	8.5	5.0	3.1	1.9	3.1
1987	35.8	35.0	34.3	33.2	32.6	31.9	30.7	29.2	27.6	25.9	157.9	54.5	24.8	13.6	7.7	4.6	2.8	1.7	2.8
1988	34.8	34.1	33.2	32.5	31.4	30.7	29.9	28.6	26.9	25.3	155.4	51.8	22.7	12.3	7.0	4.1	2.5	1.5	2.5
1989	33.6	33.2	32.4	31.5	30.7	29.5	28.6	27.7	26.3	24.6	150.9	48.5	20.4	10.9	6.2	3.6	2.2	1.4	2.2
1990	31.9	32.0	31.5	30.7	29.7	28.9	27.6	26.6	25.5	24.0	147.7	46.3	18.7	9.8	5.5	3.2	2.0	1.2	2.0
1991	30.8	30.4	30.4	29.9	29.0	28.0	26.9	25.6	24.4	23.2	142.4	43.2	16.6	8.6	4.8	2.8	1.7	1.0	1.7
1992	28.9	29.4	28.8	28.8	28.1	27.1	25.9	24.6	23.0	21.7	130.3	37.1	13.5	6.8	3.8	2.2	1.3	0.8	1.3
1993	26.8	27.6	27.9	27.3	27.1	26.3	25.2	23.8	22.4	20.7	122.6	33.3	11.4	5.7	3.2	1.8	1.1	0.7	1.1
1994	24.8	25.5	26.2	26.5	25.9	25.6	24.8	23.6	22.1	20.7	122.7	32.9	10.8	5.2	2.9	1.7	1.0	0.6	1.0
1995	23.6	23.7	24.3	24.9	25.1	24.4	24.0	23.1	21.8	20.3	121.3	32.1	10.0	4.7	2.6	1.5	0.9	0.5	0.9
1996	22.1	22.5	22.5	23.1	23.6	23.7	22.9	22.5	21.4	20.1	120.4	31.7	9.4	4.3	2.3	1.3	0.8	0.5	0.8
1997	20.9	21.1	21.4	21.4	21.8	22.2	22.1	21.2	20.5	19.4	115.3	29.7	8.3	3.7	2.0	1.1	0.7	0.4	0.7
1998	19.4	19.9	20.0	20.3	20.2	20.4	20.7	20.4	19.4	18.6	110.4	27.9	7.4	3.1	1.7	0.9	0.6	0.3	0.6
1999	19.0	18.5	19.0	19.1	19.3	19.1	19.3	19.5	19.2	18.2	113.5	29.2	7.5	3.0	1.6	0.9	0.5	0.3	0.5

Table A.1. Continued. Female numbers at age in California (1000s) predicted by the base case model.

Age (yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
2000	18.2	18.2	17.6	18.0	18.1	18.3	18.1	18.2	18.3	17.9	114.7	30.4	7.5	2.9	1.5	0.9	0.5	0.3	0.5
2001	18.5	17.4	17.3	16.8	17.2	17.2	17.4	17.1	17.3	17.3	118.9	33.0	8.0	2.9	1.5	0.8	0.5	0.3	0.5
2002	18.6	17.6	16.6	16.5	16.0	16.3	16.4	16.5	16.3	16.3	121.8	35.9	8.5	3.0	1.5	0.8	0.5	0.3	0.5
2003	19.1	17.8	16.8	15.8	15.7	15.2	15.6	15.6	15.7	15.5	124.2	39.3	9.1	3.1	1.5	0.8	0.5	0.3	0.5
2004	19.6	18.2	16.9	16.0	15.1	15.0	14.5	14.8	14.8	14.9	125.1	42.9	9.9	3.2	1.5	0.8	0.5	0.3	0.5
2005	20.2	18.7	17.4	16.1	15.3	14.4	14.3	13.8	14.1	14.1	125.3	46.9	10.9	3.3	1.5	0.8	0.5	0.3	0.5
2006	20.6	19.2	17.9	16.6	15.4	14.6	13.7	13.6	13.2	13.4	124.0	51.0	11.9	3.4	1.6	0.8	0.5	0.3	0.5
2007	21.1	19.7	18.3	17.0	15.8	14.7	13.9	13.0	12.9	12.5	121.3	55.1	13.0	3.6	1.6	0.9	0.5	0.3	0.5
2008	21.5	20.2	18.8	17.5	16.2	15.0	13.9	13.2	12.4	12.3	116.7	58.7	14.2	3.8	1.6	0.8	0.5	0.3	0.5
2009	21.9	20.5	19.2	17.9	16.7	15.5	14.3	13.3	12.6	11.8	112.9	62.7	15.7	4.0	1.6	0.9	0.5	0.3	0.4
2009	18.2	18.2	17.6	18.0	18.1	18.3	18.1	18.2	18.3	17.9	114.7	30.4	7.5	2.9	1.5	0.9	0.5	0.3	0.5

Table A.2. Male numbers at age in California (1000s) predicted by the base case model.

Age (yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1916	52.2	49.8	47.5	45.3	43.3	41.3	39.4	37.6	35.9	34.3	267.5	167.8	105.2	66.0	41.4	25.9	16.3	10.2	17.2
1917	52.2	49.8	47.5	45.3	43.3	41.3	39.4	37.6	35.9	34.3	267.4	167.7	105.1	65.9	41.3	25.9	16.3	10.2	17.1
1918	52.1	49.8	47.5	45.3	43.3	41.3	39.4	37.6	35.9	34.3	267.3	167.5	105.0	65.9	41.3	25.9	16.2	10.2	17.1
1919	52.1	49.8	47.5	45.3	43.3	41.3	39.4	37.6	35.9	34.2	267.1	167.3	104.9	65.8	41.3	25.9	16.2	10.2	17.1
1920	52.1	49.8	47.5	45.3	43.3	41.3	39.4	37.6	35.9	34.2	267.0	167.2	104.9	65.8	41.2	25.9	16.2	10.2	17.1
1921	52.1	49.8	47.5	45.3	43.3	41.3	39.4	37.6	35.9	34.2	267.0	167.2	104.8	65.7	41.2	25.8	16.2	10.2	17.1
1922	52.1	49.8	47.5	45.3	43.3	41.3	39.4	37.6	35.9	34.2	266.9	167.1	104.7	65.7	41.2	25.8	16.2	10.2	17.1
1923	52.1	49.7	47.5	45.3	43.3	41.3	39.4	37.6	35.9	34.2	266.9	167.0	104.7	65.6	41.2	25.8	16.2	10.1	17.1
1924	52.1	49.7	47.5	45.3	43.3	41.3	39.4	37.6	35.9	34.2	266.9	166.9	104.6	65.6	41.1	25.8	16.2	10.1	17.1
1925	52.1	49.7	47.5	45.3	43.3	41.3	39.4	37.6	35.9	34.2	266.8	166.8	104.5	65.5	41.1	25.8	16.2	10.1	17.0
1926	52.1	49.7	47.5	45.3	43.2	41.3	39.4	37.6	35.9	34.2	266.7	166.7	104.4	65.5	41.1	25.7	16.1	10.1	17.0
1927	52.1	49.7	47.5	45.3	43.2	41.3	39.4	37.6	35.9	34.2	266.6	166.5	104.3	65.4	41.0	25.7	16.1	10.1	17.0
1928	52.1	49.7	47.5	45.3	43.2	41.3	39.4	37.6	35.9	34.2	266.4	166.3	104.1	65.3	40.9	25.7	16.1	10.1	17.0
1929	52.1	49.7	47.4	45.3	43.2	41.3	39.4	37.6	35.9	34.2	266.3	166.1	104.0	65.2	40.9	25.6	16.1	10.1	16.9
1930	52.0	49.7	47.4	45.3	43.2	41.3	39.4	37.6	35.8	34.2	266.1	165.9	103.8	65.1	40.8	25.6	16.0	10.1	16.9
1931	52.0	49.7	47.4	45.3	43.2	41.2	39.4	37.6	35.8	34.2	265.9	165.6	103.6	64.9	40.7	25.5	16.0	10.0	16.9
1932	52.0	49.7	47.4	45.3	43.2	41.2	39.3	37.5	35.8	34.2	265.7	165.4	103.4	64.8	40.6	25.5	16.0	10.0	16.8
1933	52.0	49.6	47.4	45.2	43.2	41.2	39.3	37.5	35.8	34.2	265.4	165.0	103.1	64.6	40.5	25.4	15.9	10.0	16.8
1934	52.0	49.6	47.4	45.2	43.2	41.2	39.3	37.5	35.8	34.1	265.2	164.8	102.9	64.5	40.4	25.4	15.9	10.0	16.8
1935	52.0	49.6	47.4	45.2	43.2	41.2	39.3	37.5	35.8	34.1	265.0	164.5	102.7	64.3	40.3	25.3	15.9	9.9	16.7
1936	51.9	49.6	47.3	45.2	43.1	41.2	39.3	37.5	35.8	34.1	264.7	164.1	102.4	64.1	40.2	25.2	15.8	9.9	16.7
1937	51.9	49.6	47.3	45.2	43.1	41.2	39.3	37.5	35.7	34.1	264.3	163.7	102.0	63.9	40.1	25.1	15.7	9.9	16.6
1938	51.9	49.5	47.3	45.2	43.1	41.1	39.3	37.4	35.7	34.1	264.1	163.4	101.7	63.7	39.9	25.0	15.7	9.8	16.6
1939	51.8	49.5	47.3	45.1	43.1	41.1	39.2	37.4	35.7	34.0	263.8	163.1	101.4	63.5	39.8	25.0	15.6	9.8	16.5
1940	51.8	49.5	47.2	45.1	43.1	41.1	39.2	37.4	35.7	34.0	263.6	162.8	101.2	63.3	39.7	24.9	15.6	9.8	16.4
1941	51.8	49.5	47.2	45.1	43.0	41.1	39.2	37.4	35.7	34.0	263.5	162.5	100.9	63.1	39.5	24.8	15.5	9.7	16.4
1942	51.8	49.4	47.2	45.1	43.0	41.1	39.2	37.4	35.7	34.0	263.3	162.2	100.6	62.9	39.4	24.7	15.5	9.7	16.3
1943	51.7	49.4	47.2	45.0	43.0	41.0	39.2	37.4	35.6	34.0	263.2	162.0	100.4	62.7	39.3	24.6	15.5	9.7	16.3
1944	51.7	49.4	47.2	45.0	43.0	41.0	39.1	37.3	35.6	34.0	262.9	161.7	100.1	62.5	39.2	24.6	15.4	9.7	16.2
1945	51.6	49.3	47.1	45.0	42.9	41.0	39.1	37.3	35.5	33.9	261.7	160.6	99.3	61.9	38.8	24.3	15.3	9.6	16.1
1946	51.4	49.2	47.1	44.9	42.9	40.9	39.0	37.2	35.4	33.7	258.9	157.9	97.5	60.8	38.1	23.9	15.0	9.4	15.8
1947	51.2	49.0	47.0	44.9	42.8	40.8	38.9	37.1	35.3	33.5	256.2	155.4	95.8	59.6	37.3	23.4	14.7	9.2	15.5
1948	51.1	48.8	46.8	44.8	42.8	40.9	38.9	37.1	35.3	33.6	256.2	154.8	95.3	59.3	37.1	23.2	14.6	9.1	15.4
1949	51.0	48.8	46.6	44.6	42.7	40.8	38.9	37.1	35.3	33.6	255.5	153.8	94.5	58.7	36.7	23.0	14.4	9.1	15.2
1950	51.0	48.7	46.5	44.5	42.6	40.7	38.9	37.1	35.3	33.6	255.6	153.3	94.0	58.3	36.5	22.9	14.3	9.0	15.1
1951	50.9	48.6	46.5	44.4	42.4	40.6	38.8	37.1	35.3	33.6	255.5	152.7	93.4	58.0	36.2	22.7	14.2	8.9	15.0
1952	50.8	48.6	46.4	44.3	42.3	40.4	38.7	37.0	35.3	33.6	255.0	151.8	92.6	57.4	35.8	22.5	14.1	8.8	14.9
1953	50.8	48.5	46.4	44.3	42.3	40.4	38.5	36.8	35.2	33.5	254.8	151.1	92.0	56.9	35.5	22.3	14.0	8.8	14.7
1954	50.7	48.4	46.3	44.2	42.2	40.3	38.5	36.7	35.0	33.5	254.8	150.6	91.4	56.5	35.3	22.1	13.8	8.7	14.6
1955	50.6	48.4	46.2	44.1	42.2	40.2	38.4	36.6	34.9	33.3	254.5	150.0	90.8	56.0	34.9	21.9	13.7	8.6	14.5
1956	50.5	48.3	46.2	44.1	42.1	40.2	38.3	36.5	34.8	33.2	254.0	149.4	90.2	55.6	34.6	21.7	13.6	8.5	14.3
1957	50.4	48.2	46.1	44.0	42.0	40.1	38.3	36.5	34.7	33.1	253.1	148.6	89.4	55.0	34.2	21.4	13.4	8.4	14.2

Table A.2. Continued. Male numbers at age in California (1000s) predicted by the base case model.

Age (yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1958	50.3	48.1	46.0	44.0	42.0	40.0	38.2	36.4	34.7	33.0	252.2	147.8	88.6	54.4	33.8	21.2	13.3	8.3	14.0
1959	50.2	48.0	45.9	43.9	41.9	40.0	38.1	36.3	34.6	32.9	250.6	146.6	87.5	53.6	33.3	20.8	13.1	8.2	13.8
1960	50.1	47.9	45.8	43.8	41.8	39.9	38.0	36.2	34.5	32.8	249.5	145.9	86.7	53.0	32.9	20.6	12.9	8.1	13.6
1961	50.0	47.8	45.7	43.7	41.8	39.9	38.0	36.2	34.4	32.8	249.1	145.6	86.1	52.6	32.6	20.4	12.8	8.0	13.5
1962	49.9	47.7	45.6	43.6	41.7	39.8	38.0	36.2	34.5	32.8	249.1	145.7	85.8	52.3	32.4	20.2	12.7	7.9	13.4
1963	49.8	47.6	45.5	43.5	41.6	39.7	37.9	36.2	34.4	32.8	248.9	145.6	85.5	51.9	32.1	20.1	12.6	7.9	13.2
1964	49.7	47.5	45.4	43.4	41.5	39.6	37.8	36.1	34.4	32.7	248.3	145.2	84.9	51.5	31.8	19.8	12.4	7.8	13.1
1965	49.6	47.4	45.3	43.3	41.4	39.5	37.7	36.0	34.3	32.7	248.0	145.1	84.6	51.1	31.5	19.7	12.3	7.7	13.0
1966	49.5	47.3	45.2	43.2	41.3	39.4	37.6	35.9	34.2	32.6	247.0	144.4	84.0	50.6	31.2	19.4	12.2	7.6	12.8
1967	49.3	47.2	45.1	43.1	41.2	39.3	37.5	35.7	34.1	32.4	245.9	143.4	83.3	50.0	30.7	19.1	12.0	7.5	12.6
1968	49.2	47.1	45.0	43.0	41.1	39.2	37.4	35.6	33.9	32.3	244.8	142.5	82.6	49.4	30.3	18.9	11.8	7.4	12.4
1969	49.0	46.9	44.9	42.9	41.0	39.1	37.3	35.5	33.8	32.1	243.3	141.2	81.8	48.7	29.9	18.5	11.6	7.3	12.2
1970	48.8	46.8	44.8	42.8	40.9	39.0	37.1	35.4	33.6	31.9	240.7	139.1	80.4	47.7	29.2	18.1	11.3	7.1	11.9
1971	48.6	46.6	44.6	42.7	40.7	38.9	37.0	35.2	33.4	31.7	237.7	136.5	78.9	46.6	28.4	17.6	11.0	6.9	11.6
1972	48.3	46.4	44.4	42.5	40.6	38.7	36.9	35.0	33.2	31.5	234.2	133.3	76.9	45.2	27.5	17.1	10.7	6.7	11.2
1973	47.9	46.1	44.2	42.3	40.4	38.5	36.6	34.8	33.0	31.1	229.0	128.8	74.1	43.4	26.4	16.3	10.2	6.4	10.7
1974	47.6	45.8	43.9	42.1	40.2	38.3	36.4	34.5	32.7	30.8	224.0	124.2	71.3	41.6	25.2	15.6	9.7	6.1	10.2
1975	47.1	45.4	43.6	41.8	39.9	38.1	36.2	34.3	32.4	30.5	218.6	119.1	68.1	39.6	23.9	14.7	9.2	5.8	9.7
1976	46.7	45.0	43.2	41.5	39.7	37.8	35.9	34.0	32.1	30.2	213.1	113.8	64.8	37.5	22.6	13.9	8.7	5.4	9.1
1977	46.2	44.6	42.8	41.1	39.3	37.5	35.7	33.7	31.8	29.8	207.7	108.4	61.3	35.4	21.2	13.1	8.1	5.1	8.5
1978	45.7	44.1	42.5	40.7	39.0	37.2	35.4	33.5	31.5	29.6	203.2	103.5	58.1	33.5	20.0	12.3	7.6	4.8	8.0
1979	44.8	43.6	42.0	40.3	38.6	36.8	34.9	32.9	30.9	28.9	193.0	94.3	52.3	30.1	17.9	11.0	6.8	4.3	7.2
1980	43.8	42.7	41.5	39.8	38.2	36.3	34.5	32.5	30.5	28.4	185.9	87.2	47.9	27.5	16.2	9.9	6.2	3.9	6.5
1981	43.0	41.8	40.7	39.4	37.8	36.1	34.2	32.3	30.3	28.3	183.4	83.3	45.1	25.8	15.2	9.3	5.7	3.6	6.0
1982	41.7	41.0	39.7	38.6	37.3	35.6	33.7	31.8	29.7	27.6	174.5	75.1	39.9	22.8	13.4	8.1	5.0	3.1	5.3
1983	40.2	39.8	39.0	37.7	36.4	34.9	33.1	31.1	28.9	26.7	163.5	66.0	34.3	19.5	11.4	6.9	4.3	2.7	4.5
1984	38.7	38.3	37.9	37.0	35.7	34.4	32.9	31.0	29.0	26.8	163.4	63.3	32.2	18.3	10.6	6.4	4.0	2.5	4.1
1985	37.8	37.0	36.5	36.0	35.0	33.7	32.3	30.7	28.7	26.6	160.8	59.6	29.6	16.7	9.7	5.8	3.6	2.2	3.8
1986	36.7	36.1	35.1	34.5	33.9	32.9	31.3	29.8	28.1	26.0	156.8	55.7	26.9	15.1	8.7	5.2	3.2	2.0	3.4
1987	35.8	35.0	34.3	33.3	32.6	31.9	30.7	29.1	27.5	25.7	154.7	53.0	24.7	13.7	7.9	4.7	2.9	1.8	3.0
1988	34.8	34.2	33.3	32.5	31.5	30.7	29.9	28.6	26.9	25.2	152.2	50.2	22.6	12.5	7.1	4.3	2.6	1.6	2.7
1989	33.6	33.2	32.5	31.5	30.7	29.6	28.7	27.7	26.2	24.4	147.6	46.9	20.3	11.0	6.3	3.8	2.3	1.4	2.4
1990	31.9	32.0	31.5	30.8	29.8	28.9	27.6	26.6	25.4	23.9	144.4	44.5	18.4	9.9	5.7	3.3	2.0	1.3	2.1
1991	30.8	30.4	30.4	29.9	29.1	28.0	26.9	25.5	24.3	23.0	138.9	41.4	16.3	8.7	4.9	2.9	1.8	1.1	1.8
1992	28.9	29.4	28.9	28.8	28.1	27.1	25.8	24.5	22.9	21.4	126.3	35.4	13.2	6.9	3.9	2.3	1.4	0.9	1.4
1993	26.8	27.6	28.0	27.4	27.2	26.3	25.2	23.7	22.2	20.4	118.4	31.6	11.2	5.7	3.2	1.9	1.1	0.7	1.2
1994	24.8	25.5	26.3	26.6	25.9	25.7	24.8	23.5	22.0	20.5	118.7	31.2	10.5	5.2	2.9	1.7	1.0	0.6	1.1
1995	23.6	23.7	24.3	24.9	25.2	24.5	24.1	23.1	21.7	20.1	117.3	30.3	9.6	4.7	2.6	1.5	0.9	0.6	0.9
1996	22.1	22.5	22.6	23.1	23.6	23.8	23.0	22.4	21.3	19.9	116.6	29.9	9.0	4.2	2.4	1.4	0.8	0.5	0.8
1997	20.9	21.1	21.4	21.4	21.8	22.2	22.1	21.2	20.5	19.2	111.5	27.9	8.0	3.6	2.0	1.2	0.7	0.4	0.7
1998	19.4	19.9	20.0	20.3	20.2	20.5	20.7	20.4	19.3	18.4	106.7	26.1	7.1	3.1	1.7	1.0	0.6	0.4	0.6
1999	19.0	18.5	19.0	19.1	19.3	19.2	19.4	19.5	19.2	18.0	110.0	27.4	7.1	3.0	1.6	0.9	0.6	0.3	0.6

Table A.2. Continued. Male numbers at age in California (1000s) predicted by the base case model.

Age (yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
2000	18.2	18.2	17.6	18.1	18.1	18.3	18.1	18.2	18.2	17.8	111.5	28.4	7.1	2.9	1.5	0.9	0.5	0.3	0.5
2001	18.5	17.4	17.3	16.8	17.2	17.3	17.4	17.2	17.3	17.3	116.2	31.0	7.5	2.9	1.5	0.9	0.5	0.3	0.5
2002	18.6	17.6	16.6	16.5	16.0	16.4	16.4	16.5	16.3	16.3	119.5	33.7	8.0	2.9	1.5	0.9	0.5	0.3	0.5
2003	19.1	17.8	16.8	15.8	15.8	15.3	15.6	15.6	15.7	15.5	122.5	37.0	8.6	3.0	1.5	0.9	0.5	0.3	0.5
2004	19.6	18.2	16.9	16.1	15.1	15.0	14.5	14.9	14.9	15.0	123.9	40.6	9.3	3.1	1.5	0.9	0.5	0.3	0.5
2005	20.2	18.7	17.4	16.2	15.3	14.4	14.3	13.9	14.2	14.2	124.5	44.6	10.2	3.2	1.5	0.9	0.5	0.3	0.5
2006	20.6	19.2	17.9	16.6	15.4	14.6	13.7	13.7	13.2	13.5	123.6	48.7	11.2	3.3	1.6	0.9	0.5	0.3	0.5
2007	21.1	19.7	18.4	17.1	15.8	14.7	13.9	13.1	13.0	12.6	121.2	52.9	12.3	3.5	1.6	0.9	0.5	0.3	0.5
2008	21.5	20.2	18.8	17.5	16.3	15.1	14.0	13.2	12.4	12.3	116.8	56.6	13.3	3.6	1.6	0.9	0.5	0.3	0.5
2009	21.9	20.6	19.2	17.9	16.7	15.5	14.4	13.3	12.6	11.8	113.2	60.9	14.7	3.8	1.6	0.9	0.5	0.3	0.5
2009	18.2	18.2	17.6	18.1	18.1	18.3	18.1	18.2	18.2	17.8	111.5	28.4	7.1	2.9	1.5	0.9	0.5	0.3	0.5

Table A.3. Female numbers at age in Oregon (1000s) predicted by the base case model.

Age (yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1916	47.2	45.0	43.0	41.0	39.1	37.3	35.6	33.9	32.3	30.9	240.0	149.6	93.2	58.1	36.2	22.5	14.0	8.8	14.5
1917	47.2	45.0	43.0	41.0	39.1	37.3	35.6	33.9	32.3	30.9	240.0	149.6	93.2	58.1	36.2	22.5	14.0	8.8	14.5
1918	47.2	45.0	43.0	41.0	39.1	37.3	35.6	33.9	32.3	30.9	240.0	149.6	93.2	58.1	36.2	22.5	14.0	8.8	14.5
1919	47.2	45.0	43.0	41.0	39.1	37.3	35.6	33.9	32.3	30.9	240.0	149.6	93.2	58.1	36.2	22.5	14.0	8.8	14.5
1920	47.2	45.0	43.0	41.0	39.1	37.3	35.6	33.9	32.3	30.9	240.0	149.6	93.2	58.1	36.2	22.5	14.0	8.8	14.5
1921	47.2	45.0	42.9	41.0	39.1	37.3	35.6	33.9	32.3	30.9	240.0	149.6	93.2	58.1	36.2	22.5	14.0	8.8	14.5
1922	47.2	45.0	42.9	41.0	39.1	37.3	35.6	33.9	32.3	30.9	240.0	149.6	93.2	58.1	36.2	22.5	14.0	8.8	14.5
1923	47.2	45.0	42.9	41.0	39.1	37.3	35.6	33.9	32.3	30.9	240.0	149.6	93.2	58.1	36.2	22.5	14.0	8.8	14.5
1924	47.2	45.0	42.9	41.0	39.1	37.3	35.5	33.9	32.3	30.9	240.0	149.6	93.2	58.1	36.2	22.5	14.0	8.8	14.5
1925	47.2	45.0	42.9	40.9	39.1	37.3	35.5	33.9	32.3	30.9	240.0	149.6	93.2	58.1	36.2	22.5	14.0	8.8	14.5
1926	47.2	45.0	42.9	40.9	39.1	37.3	35.5	33.9	32.3	30.8	240.0	149.6	93.2	58.1	36.2	22.5	14.0	8.8	14.5
1927	47.2	45.0	42.9	40.9	39.1	37.3	35.5	33.9	32.3	30.8	240.0	149.6	93.2	58.1	36.2	22.5	14.0	8.8	14.5
1928	47.1	45.0	42.9	40.9	39.1	37.2	35.5	33.9	32.3	30.8	240.0	149.6	93.2	58.1	36.2	22.5	14.0	8.8	14.5
1929	47.1	45.0	42.9	40.9	39.0	37.2	35.5	33.9	32.3	30.8	240.0	149.5	93.2	58.1	36.2	22.5	14.0	8.8	14.5
1930	47.1	45.0	42.9	40.9	39.0	37.2	35.5	33.9	32.3	30.8	240.0	149.5	93.2	58.1	36.2	22.5	14.0	8.7	14.5
1931	47.1	44.9	42.9	40.9	39.0	37.2	35.5	33.9	32.3	30.8	240.0	149.5	93.2	58.1	36.2	22.5	14.0	8.7	14.5
1932	47.1	44.9	42.9	40.9	39.0	37.2	35.5	33.9	32.3	30.8	239.9	149.5	93.2	58.0	36.2	22.5	14.0	8.7	14.5
1933	47.1	44.9	42.9	40.9	39.0	37.2	35.5	33.9	32.3	30.8	239.9	149.5	93.2	58.0	36.2	22.5	14.0	8.7	14.5
1934	47.1	44.9	42.8	40.9	39.0	37.2	35.5	33.9	32.3	30.8	239.9	149.5	93.2	58.0	36.2	22.5	14.0	8.7	14.5
1935	47.0	44.9	42.8	40.9	39.0	37.2	35.5	33.9	32.3	30.8	239.9	149.5	93.2	58.0	36.2	22.5	14.0	8.7	14.5
1936	47.0	44.9	42.8	40.8	39.0	37.2	35.5	33.8	32.3	30.8	239.8	149.5	93.2	58.0	36.2	22.5	14.0	8.7	14.5
1937	47.0	44.8	42.8	40.8	39.0	37.2	35.5	33.8	32.3	30.8	239.8	149.5	93.2	58.0	36.2	22.5	14.0	8.7	14.5
1938	47.0	44.8	42.8	40.8	38.9	37.2	35.5	33.8	32.3	30.8	239.8	149.5	93.1	58.0	36.2	22.5	14.0	8.7	14.5
1939	46.9	44.8	42.7	40.8	38.9	37.1	35.4	33.8	32.3	30.8	239.7	149.5	93.1	58.0	36.2	22.5	14.0	8.7	14.5
1940	46.9	44.8	42.7	40.8	38.9	37.1	35.4	33.8	32.3	30.8	239.7	149.5	93.1	58.0	36.2	22.5	14.0	8.7	14.5
1941	46.9	44.8	42.7	40.7	38.9	37.1	35.4	33.8	32.2	30.8	239.6	149.4	93.1	58.0	36.1	22.5	14.0	8.7	14.5
1942	46.9	44.7	42.7	40.7	38.9	37.1	35.4	33.8	32.2	30.7	239.5	149.3	93.0	58.0	36.1	22.5	14.0	8.7	14.4
1943	46.8	44.7	42.7	40.7	38.8	37.1	35.4	33.8	32.2	30.7	239.3	149.2	93.0	57.9	36.1	22.5	14.0	8.7	14.4
1944	46.8	44.7	42.6	40.7	38.8	37.0	35.3	33.7	32.2	30.7	238.8	148.7	92.6	57.7	36.0	22.4	14.0	8.7	14.4
1945	46.7	44.6	42.6	40.7	38.8	37.0	35.3	33.7	32.1	30.7	238.1	147.9	92.1	57.4	35.7	22.3	13.9	8.6	14.3
1946	46.5	44.5	42.6	40.6	38.8	37.0	35.3	33.7	32.1	30.6	237.1	146.8	91.3	56.8	35.4	22.1	13.7	8.6	14.2
1947	46.3	44.4	42.5	40.6	38.8	37.0	35.3	33.6	32.1	30.6	236.5	146.1	90.8	56.5	35.2	21.9	13.7	8.5	14.1
1948	46.3	44.2	42.3	40.5	38.7	37.0	35.3	33.6	32.1	30.6	236.4	145.7	90.5	56.3	35.1	21.9	13.6	8.5	14.0
1949	46.2	44.1	42.2	40.3	38.6	36.9	35.2	33.6	32.1	30.6	236.4	145.5	90.3	56.2	35.0	21.8	13.6	8.5	14.0
1950	46.1	44.1	42.1	40.2	38.5	36.9	35.2	33.6	32.1	30.6	236.4	145.3	90.1	56.0	34.9	21.7	13.5	8.4	14.0
1951	46.1	44.0	42.0	40.1	38.3	36.7	35.1	33.6	32.0	30.6	236.3	145.0	89.8	55.9	34.8	21.7	13.5	8.4	13.9
1952	46.0	44.0	42.0	40.1	38.3	36.6	35.0	33.5	32.0	30.5	236.4	144.9	89.7	55.8	34.7	21.6	13.5	8.4	13.9
1953	46.0	43.9	41.9	40.0	38.2	36.5	34.9	33.4	32.0	30.5	236.4	144.9	89.5	55.7	34.7	21.6	13.5	8.4	13.9
1954	45.9	43.8	41.9	40.0	38.2	36.5	34.8	33.3	31.8	30.5	236.5	144.9	89.4	55.6	34.6	21.6	13.4	8.4	13.8
1955	45.8	43.8	41.8	39.9	38.1	36.4	34.8	33.2	31.7	30.3	236.5	144.9	89.3	55.5	34.5	21.5	13.4	8.4	13.8
1956	45.8	43.7	41.8	39.9	38.1	36.4	34.7	33.1	31.6	30.2	235.9	144.6	89.0	55.3	34.4	21.4	13.3	8.3	13.7
1957	45.7	43.6	41.7	39.8	38.0	36.3	34.7	33.1	31.6	30.1	235.4	144.4	88.7	55.1	34.3	21.4	13.3	8.3	13.7

Table A.3. Continued. Female numbers at age in Oregon (1000s) predicted by the base case model.

Age (yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1958	45.6	43.6	41.6	39.8	38.0	36.2	34.6	33.0	31.5	30.1	234.5	143.9	88.3	54.8	34.1	21.2	13.2	8.2	13.6
1959	45.4	43.5	41.5	39.7	37.9	36.2	34.5	33.0	31.5	30.0	233.7	143.6	87.9	54.5	33.9	21.1	13.2	8.2	13.6
1960	45.3	43.3	41.5	39.6	37.9	36.2	34.5	32.9	31.4	30.0	232.9	143.1	87.6	54.2	33.7	21.0	13.1	8.2	13.5
1961	45.2	43.2	41.3	39.5	37.8	36.1	34.5	32.9	31.3	29.9	232.0	142.6	87.1	53.9	33.5	20.9	13.0	8.1	13.4
1962	45.2	43.1	41.2	39.4	37.7	36.0	34.4	32.8	31.3	29.8	231.2	142.1	86.7	53.6	33.3	20.7	12.9	8.1	13.3
1963	45.1	43.1	41.1	39.3	37.6	35.9	34.3	32.8	31.3	29.8	230.4	141.6	86.3	53.2	33.1	20.6	12.8	8.0	13.2
1964	45.0	43.0	41.1	39.2	37.5	35.8	34.2	32.7	31.2	29.8	229.8	141.2	86.0	53.0	32.9	20.5	12.8	8.0	13.1
1965	44.9	42.9	41.0	39.2	37.4	35.7	34.2	32.6	31.1	29.7	229.2	140.8	85.6	52.7	32.7	20.4	12.7	7.9	13.1
1966	44.8	42.8	40.9	39.1	37.4	35.7	34.1	32.5	31.1	29.6	228.8	140.3	85.4	52.5	32.6	20.3	12.6	7.9	13.0
1967	44.7	42.7	40.8	39.0	37.3	35.6	34.0	32.5	31.0	29.6	228.2	139.7	85.1	52.2	32.4	20.2	12.6	7.8	12.9
1968	44.5	42.6	40.7	38.9	37.2	35.5	33.9	32.4	30.9	29.5	227.8	139.2	84.8	51.9	32.2	20.0	12.5	7.8	12.8
1969	44.4	42.5	40.6	38.8	37.1	35.5	33.9	32.3	30.8	29.4	227.3	138.7	84.5	51.7	32.0	19.9	12.4	7.7	12.8
1970	44.2	42.4	40.5	38.7	37.0	35.4	33.8	32.3	30.8	29.3	226.7	138.0	84.1	51.4	31.8	19.8	12.3	7.7	12.7
1971	44.0	42.2	40.4	38.6	36.9	35.3	33.7	32.2	30.7	29.3	226.1	137.4	83.8	51.1	31.6	19.7	12.2	7.6	12.6
1972	43.8	42.0	40.2	38.5	36.8	35.2	33.6	32.1	30.6	29.2	225.5	136.9	83.5	50.9	31.4	19.5	12.2	7.6	12.5
1973	43.4	41.7	40.0	38.4	36.7	35.1	33.5	32.0	30.6	29.1	224.7	136.1	83.1	50.6	31.2	19.4	12.1	7.5	12.4
1974	43.1	41.4	39.8	38.2	36.6	35.0	33.5	32.0	30.5	29.1	224.2	135.7	82.8	50.3	31.0	19.3	12.0	7.5	12.3
1975	42.7	41.1	39.5	38.0	36.4	34.9	33.4	31.9	30.4	29.0	223.7	135.2	82.5	50.1	30.8	19.1	11.9	7.4	12.3
1976	42.3	40.7	39.2	37.7	36.2	34.7	33.2	31.8	30.4	29.0	223.4	135.1	82.2	50.0	30.7	19.1	11.9	7.4	12.2
1977	41.8	40.4	38.8	37.4	35.9	34.5	33.0	31.6	30.2	28.8	222.1	134.0	81.4	49.5	30.4	18.8	11.7	7.3	12.1
1978	41.4	39.9	38.5	37.0	35.6	34.2	32.8	31.4	30.0	28.7	220.7	133.0	80.6	49.0	30.0	18.6	11.6	7.2	11.9
1979	40.5	39.4	38.1	36.7	35.3	33.9	32.5	31.2	29.8	28.5	218.6	131.2	79.3	48.2	29.5	18.3	11.4	7.1	11.7
1980	39.6	38.7	37.6	36.3	34.9	33.6	32.2	30.8	29.5	28.1	214.3	127.3	76.7	46.6	28.5	17.6	11.0	6.8	11.3
1981	38.9	37.8	36.9	35.8	34.5	33.2	31.9	30.5	29.2	27.8	210.5	123.6	74.1	45.1	27.5	17.0	10.6	6.6	10.9
1982	37.8	37.1	36.0	35.1	34.1	32.8	31.5	30.1	28.8	27.4	205.2	118.3	70.5	42.8	26.1	16.1	10.0	6.2	10.3
1983	36.4	36.0	35.4	34.3	33.4	32.4	31.1	29.7	28.3	26.9	198.2	111.6	66.0	40.0	24.3	15.0	9.3	5.8	9.6
1984	35.1	34.7	34.3	33.6	32.6	31.6	30.5	29.2	27.7	26.2	188.4	102.0	59.6	36.1	21.9	13.5	8.4	5.2	8.6
1985	34.2	33.4	33.1	32.7	32.0	31.0	30.0	28.9	27.5	26.0	185.8	98.6	57.1	34.5	20.9	12.9	8.0	5.0	8.2
1986	33.2	32.6	31.9	31.5	31.1	30.4	29.4	28.4	27.2	25.8	182.9	94.5	54.2	32.6	19.8	12.1	7.5	4.7	7.7
1987	32.4	31.7	31.1	30.4	30.0	29.6	28.9	27.8	26.8	25.6	181.4	91.7	52.0	31.2	18.9	11.6	7.2	4.5	7.4
1988	31.5	30.9	30.2	29.6	28.9	28.5	28.0	27.3	26.2	25.1	179.2	88.6	49.5	29.6	17.9	10.9	6.8	4.2	7.0
1989	30.4	30.0	29.5	28.7	28.2	27.5	27.0	26.5	25.7	24.6	176.4	84.9	46.6	27.7	16.7	10.2	6.3	3.9	6.5
1990	28.9	29.0	28.6	28.0	27.3	26.7	26.0	25.4	24.8	23.9	169.6	78.2	42.0	24.7	15.0	9.1	5.6	3.5	5.8
1991	27.9	27.5	27.6	27.2	26.7	26.0	25.4	24.6	24.0	23.4	168.5	76.6	40.3	23.6	14.2	8.7	5.3	3.3	5.5
1992	26.2	26.6	26.2	26.3	25.9	25.3	24.5	23.9	23.0	22.3	162.6	71.6	36.6	21.2	12.8	7.8	4.8	3.0	4.9
1993	24.2	25.0	25.3	24.9	24.9	24.5	23.8	23.0	22.2	21.2	153.2	64.8	32.0	18.4	11.1	6.7	4.1	2.6	4.2
1994	22.5	23.1	23.8	24.1	23.6	23.6	23.0	22.2	21.2	20.3	142.2	57.1	27.0	15.3	9.2	5.6	3.4	2.1	3.5
1995	21.4	21.5	22.0	22.6	22.9	22.4	22.2	21.6	20.7	19.7	137.0	53.6	24.4	13.7	8.2	4.9	3.0	1.9	3.1
1996	20.0	20.4	20.4	20.9	21.4	21.6	21.0	20.8	20.0	19.0	128.5	47.9	20.8	11.5	6.8	4.1	2.5	1.6	2.6
1997	18.9	19.1	19.4	19.4	19.9	20.3	20.4	19.8	19.4	18.6	124.8	45.4	18.9	10.2	6.1	3.7	2.2	1.4	2.3
1998	17.5	18.0	18.2	18.5	18.4	18.8	19.1	19.1	18.3	17.8	118.1	41.2	16.3	8.7	5.1	3.1	1.9	1.2	1.9
1999	17.2	16.7	17.2	17.3	17.6	17.5	17.8	18.0	17.9	17.1	116.7	40.7	15.4	8.0	4.7	2.8	1.7	1.1	1.8

Table A.3. Continued. Female numbers at age in Oregon (1000s) predicted by the base case model.

Age (yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
2000	16.5	16.4	15.9	16.3	16.4	16.6	16.5	16.7	16.7	16.5	113.0	39.0	14.1	7.2	4.2	2.5	1.5	0.9	1.6
2001	16.7	15.7	15.7	15.2	15.6	15.6	15.8	15.6	15.8	15.9	115.3	41.1	14.4	7.1	4.1	2.5	1.5	0.9	1.5
2002	16.8	16.0	15.0	14.9	14.5	14.8	14.9	15.0	14.9	15.0	116.8	43.4	14.8	7.1	4.1	2.4	1.5	0.9	1.5
2003	17.3	16.1	15.2	14.3	14.2	13.8	14.1	14.2	14.3	14.1	117.8	46.1	15.3	7.2	4.1	2.4	1.5	0.9	1.5
2004	17.8	16.5	15.3	14.5	13.7	13.6	13.2	13.5	13.5	13.6	117.8	48.9	16.0	7.2	4.1	2.4	1.5	0.9	1.5
2005	18.3	17.0	15.7	14.6	13.8	13.0	12.9	12.5	12.8	12.8	116.7	51.8	16.8	7.3	4.1	2.4	1.5	0.9	1.5
2006	18.7	17.4	16.2	15.0	13.9	13.2	12.4	12.3	11.9	12.2	114.5	54.7	17.7	7.4	4.1	2.4	1.5	0.9	1.5
2007	19.1	17.8	16.6	15.4	14.3	13.3	12.6	11.8	11.7	11.3	111.5	57.7	18.7	7.6	4.1	2.4	1.5	0.9	1.5
2008	19.5	18.2	17.0	15.8	14.7	13.6	12.7	12.0	11.2	11.2	107.6	60.6	19.8	7.7	4.1	2.4	1.4	0.9	1.4
2009	19.9	18.6	17.4	16.2	15.1	14.0	13.0	12.1	11.4	10.7	103.4	63.2	21.0	7.9	4.1	2.4	1.4	0.9	1.4
2009	16.5	16.4	15.9	16.3	16.4	16.6	16.5	16.7	16.7	16.5	113.0	39.0	14.1	7.2	4.2	2.5	1.5	0.9	1.6

Table A.4. Male numbers at age in Oregon (1000s) predicted by the base case model.

Age (yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1916	47.2	45.1	43.0	41.1	39.2	37.4	35.7	34.1	32.5	31.0	242.2	151.9	95.2	59.7	37.5	23.5	14.7	9.2	15.5
1917	47.2	45.1	43.0	41.1	39.2	37.4	35.7	34.1	32.5	31.0	242.2	151.9	95.2	59.7	37.5	23.5	14.7	9.2	15.5
1918	47.2	45.1	43.0	41.1	39.2	37.4	35.7	34.1	32.5	31.0	242.2	151.9	95.2	59.7	37.5	23.5	14.7	9.2	15.5
1919	47.2	45.1	43.0	41.1	39.2	37.4	35.7	34.1	32.5	31.0	242.2	151.9	95.2	59.7	37.5	23.5	14.7	9.2	15.5
1920	47.2	45.1	43.0	41.1	39.2	37.4	35.7	34.1	32.5	31.0	242.2	151.9	95.2	59.7	37.5	23.5	14.7	9.2	15.5
1921	47.2	45.0	43.0	41.0	39.2	37.4	35.7	34.1	32.5	31.0	242.2	151.9	95.2	59.7	37.5	23.5	14.7	9.2	15.5
1922	47.2	45.0	43.0	41.0	39.2	37.4	35.7	34.1	32.5	31.0	242.2	151.9	95.2	59.7	37.5	23.5	14.7	9.2	15.5
1923	47.2	45.0	43.0	41.0	39.2	37.4	35.7	34.1	32.5	31.0	242.2	151.9	95.2	59.7	37.5	23.5	14.7	9.2	15.5
1924	47.2	45.0	43.0	41.0	39.2	37.4	35.7	34.1	32.5	31.0	242.2	151.9	95.2	59.7	37.5	23.5	14.7	9.2	15.5
1925	47.2	45.0	43.0	41.0	39.2	37.4	35.7	34.1	32.5	31.0	242.2	151.9	95.2	59.7	37.5	23.5	14.7	9.2	15.5
1926	47.2	45.0	43.0	41.0	39.2	37.4	35.7	34.1	32.5	31.0	242.2	151.9	95.2	59.7	37.5	23.5	14.7	9.2	15.5
1927	47.2	45.0	43.0	41.0	39.2	37.4	35.7	34.0	32.5	31.0	242.2	151.9	95.2	59.7	37.5	23.5	14.7	9.2	15.5
1928	47.1	45.0	43.0	41.0	39.2	37.4	35.7	34.0	32.5	31.0	242.2	151.9	95.2	59.7	37.5	23.5	14.7	9.2	15.5
1929	47.1	45.0	43.0	41.0	39.1	37.4	35.7	34.0	32.5	31.0	242.2	151.9	95.2	59.7	37.5	23.5	14.7	9.2	15.5
1930	47.1	45.0	42.9	41.0	39.1	37.4	35.7	34.0	32.5	31.0	242.2	151.9	95.2	59.7	37.5	23.5	14.7	9.2	15.5
1931	47.1	45.0	42.9	41.0	39.1	37.4	35.7	34.0	32.5	31.0	242.1	151.9	95.2	59.7	37.5	23.5	14.7	9.2	15.5
1932	47.1	45.0	42.9	41.0	39.1	37.3	35.7	34.0	32.5	31.0	242.1	151.9	95.2	59.7	37.4	23.5	14.7	9.2	15.5
1933	47.1	44.9	42.9	41.0	39.1	37.3	35.6	34.0	32.5	31.0	242.1	151.9	95.2	59.7	37.4	23.5	14.7	9.2	15.5
1934	47.1	44.9	42.9	41.0	39.1	37.3	35.6	34.0	32.5	31.0	242.1	151.9	95.2	59.7	37.4	23.5	14.7	9.2	15.5
1935	47.0	44.9	42.9	40.9	39.1	37.3	35.6	34.0	32.5	31.0	242.1	151.9	95.2	59.7	37.4	23.5	14.7	9.2	15.5
1936	47.0	44.9	42.9	40.9	39.1	37.3	35.6	34.0	32.5	31.0	242.0	151.9	95.2	59.7	37.4	23.5	14.7	9.2	15.5
1937	47.0	44.9	42.8	40.9	39.1	37.3	35.6	34.0	32.4	31.0	242.0	151.8	95.2	59.7	37.4	23.5	14.7	9.2	15.5
1938	47.0	44.8	42.8	40.9	39.0	37.3	35.6	34.0	32.4	31.0	242.0	151.8	95.2	59.7	37.4	23.5	14.7	9.2	15.5
1939	46.9	44.8	42.8	40.9	39.0	37.3	35.6	34.0	32.4	31.0	241.9	151.8	95.2	59.7	37.4	23.5	14.7	9.2	15.5
1940	46.9	44.8	42.8	40.8	39.0	37.2	35.6	34.0	32.4	30.9	241.9	151.8	95.2	59.7	37.4	23.5	14.7	9.2	15.5
1941	46.9	44.8	42.8	40.8	39.0	37.2	35.5	33.9	32.4	30.9	241.8	151.8	95.2	59.7	37.4	23.5	14.7	9.2	15.5
1942	46.9	44.8	42.7	40.8	39.0	37.2	35.5	33.9	32.4	30.9	241.6	151.7	95.1	59.6	37.4	23.5	14.7	9.2	15.5
1943	46.8	44.7	42.7	40.8	38.9	37.2	35.5	33.9	32.4	30.9	241.5	151.5	95.0	59.6	37.4	23.4	14.7	9.2	15.5
1944	46.8	44.7	42.7	40.8	38.9	37.2	35.5	33.9	32.3	30.9	240.9	151.0	94.7	59.4	37.2	23.3	14.6	9.2	15.4
1945	46.7	44.7	42.7	40.7	38.9	37.1	35.5	33.8	32.3	30.8	240.1	150.2	94.1	59.0	37.0	23.2	14.6	9.1	15.3
1946	46.5	44.6	42.6	40.7	38.9	37.1	35.4	33.8	32.2	30.8	239.0	148.9	93.3	58.5	36.7	23.0	14.4	9.0	15.2
1947	46.3	44.4	42.5	40.7	38.9	37.1	35.4	33.8	32.2	30.7	238.4	148.2	92.8	58.1	36.4	22.9	14.3	9.0	15.1
1948	46.3	44.2	42.4	40.6	38.8	37.1	35.4	33.8	32.2	30.7	238.2	147.8	92.4	57.9	36.3	22.8	14.3	9.0	15.1
1949	46.2	44.2	42.2	40.4	38.7	37.0	35.4	33.8	32.2	30.7	238.2	147.5	92.2	57.8	36.2	22.7	14.2	8.9	15.0
1950	46.1	44.1	42.2	40.3	38.6	37.0	35.3	33.8	32.2	30.7	238.2	147.3	92.0	57.6	36.1	22.7	14.2	8.9	15.0
1951	46.1	44.0	42.1	40.2	38.4	36.8	35.3	33.7	32.2	30.7	238.2	147.0	91.7	57.5	36.0	22.6	14.2	8.9	14.9
1952	46.0	44.0	42.0	40.2	38.4	36.7	35.1	33.7	32.2	30.7	238.3	146.9	91.6	57.4	36.0	22.5	14.1	8.9	14.9
1953	46.0	43.9	42.0	40.1	38.3	36.6	35.0	33.5	32.1	30.7	238.4	146.8	91.4	57.2	35.9	22.5	14.1	8.8	14.9
1954	45.9	43.9	41.9	40.1	38.3	36.6	35.0	33.4	32.0	30.6	238.5	146.8	91.3	57.1	35.8	22.5	14.1	8.8	14.9
1955	45.8	43.8	41.9	40.0	38.2	36.5	34.9	33.4	31.9	30.5	238.4	146.8	91.1	57.0	35.7	22.4	14.1	8.8	14.8
1956	45.8	43.8	41.8	39.9	38.2	36.5	34.8	33.3	31.8	30.4	237.9	146.5	90.8	56.8	35.6	22.3	14.0	8.8	14.8
1957	45.7	43.7	41.8	39.9	38.1	36.4	34.8	33.2	31.7	30.3	237.3	146.3	90.6	56.6	35.5	22.3	14.0	8.7	14.7

Table A.4. Continued. Male numbers at age in Oregon (1000s) predicted by the base case model.

Age (yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1958	45.6	43.6	41.7	39.8	38.1	36.4	34.7	33.2	31.7	30.2	236.4	145.9	90.1	56.3	35.3	22.1	13.9	8.7	14.6
1959	45.4	43.5	41.6	39.8	38.0	36.3	34.7	33.1	31.6	30.2	235.6	145.5	89.7	56.0	35.1	22.0	13.8	8.7	14.6
1960	45.3	43.4	41.5	39.7	38.0	36.3	34.6	33.1	31.6	30.1	234.8	145.1	89.3	55.7	34.9	21.9	13.7	8.6	14.5
1961	45.2	43.3	41.4	39.6	37.9	36.2	34.6	33.0	31.5	30.0	233.8	144.5	88.9	55.4	34.7	21.7	13.6	8.6	14.4
1962	45.2	43.2	41.3	39.5	37.8	36.1	34.5	33.0	31.5	30.0	233.0	144.0	88.4	55.1	34.5	21.6	13.6	8.5	14.3
1963	45.1	43.1	41.2	39.4	37.7	36.0	34.5	32.9	31.4	29.9	232.1	143.4	87.9	54.7	34.2	21.5	13.5	8.4	14.2
1964	45.0	43.0	41.1	39.3	37.6	35.9	34.4	32.8	31.4	29.9	231.5	143.0	87.6	54.4	34.1	21.3	13.4	8.4	14.1
1965	44.9	42.9	41.1	39.3	37.5	35.9	34.3	32.8	31.3	29.9	230.9	142.6	87.3	54.1	33.9	21.2	13.3	8.3	14.0
1966	44.8	42.8	41.0	39.2	37.5	35.8	34.2	32.7	31.2	29.8	230.5	142.2	87.0	53.9	33.7	21.1	13.2	8.3	14.0
1967	44.7	42.7	40.9	39.1	37.4	35.7	34.1	32.6	31.1	29.7	229.9	141.5	86.7	53.6	33.5	21.0	13.2	8.3	13.9
1968	44.5	42.6	40.8	39.0	37.3	35.7	34.1	32.5	31.1	29.6	229.4	140.9	86.4	53.3	33.3	20.9	13.1	8.2	13.8
1969	44.4	42.5	40.7	38.9	37.2	35.6	34.0	32.5	31.0	29.6	229.0	140.4	86.1	53.1	33.1	20.8	13.0	8.2	13.7
1970	44.2	42.4	40.6	38.8	37.1	35.5	33.9	32.4	30.9	29.5	228.3	139.7	85.7	52.7	32.9	20.6	12.9	8.1	13.6
1971	44.0	42.2	40.4	38.7	37.0	35.4	33.9	32.3	30.9	29.4	227.7	139.1	85.4	52.4	32.7	20.5	12.8	8.0	13.5
1972	43.8	42.0	40.3	38.6	36.9	35.3	33.8	32.3	30.8	29.4	227.2	138.6	85.1	52.2	32.5	20.4	12.8	8.0	13.4
1973	43.4	41.8	40.1	38.4	36.8	35.2	33.7	32.2	30.7	29.3	226.3	137.8	84.7	51.9	32.2	20.2	12.7	7.9	13.3
1974	43.1	41.4	39.8	38.2	36.7	35.1	33.6	32.1	30.6	29.2	225.8	137.4	84.4	51.6	32.1	20.1	12.6	7.9	13.3
1975	42.7	41.1	39.5	38.0	36.5	35.0	33.5	32.0	30.6	29.2	225.2	136.9	84.0	51.4	31.9	19.9	12.5	7.8	13.2
1976	42.3	40.7	39.2	37.7	36.3	34.8	33.3	31.9	30.5	29.1	225.0	136.7	83.8	51.3	31.7	19.8	12.4	7.8	13.1
1977	41.8	40.4	38.9	37.4	36.0	34.6	33.2	31.7	30.4	29.0	223.6	135.6	83.0	50.8	31.4	19.6	12.3	7.7	13.0
1978	41.4	39.9	38.5	37.1	35.7	34.3	32.9	31.6	30.2	28.8	222.1	134.5	82.1	50.3	31.0	19.4	12.1	7.6	12.8
1979	40.5	39.5	38.1	36.8	35.4	34.0	32.7	31.3	29.9	28.6	219.9	132.7	80.7	49.5	30.5	19.0	11.9	7.5	12.6
1980	39.6	38.7	37.7	36.3	35.0	33.7	32.3	30.9	29.6	28.2	215.4	128.7	78.0	47.8	29.4	18.3	11.5	7.2	12.1
1981	38.9	37.8	36.9	35.9	34.6	33.3	32.0	30.6	29.3	27.9	211.3	124.8	75.4	46.2	28.4	17.7	11.1	6.9	11.7
1982	37.8	37.1	36.1	35.2	34.2	32.9	31.6	30.2	28.9	27.5	205.5	119.2	71.6	43.9	26.9	16.7	10.5	6.6	11.0
1983	36.4	36.0	35.4	34.4	33.5	32.5	31.1	29.8	28.3	26.9	198.1	112.3	67.0	41.0	25.1	15.6	9.8	6.1	10.3
1984	35.1	34.7	34.4	33.7	32.7	31.7	30.6	29.2	27.7	26.2	187.5	102.3	60.4	36.9	22.6	14.0	8.8	5.5	9.2
1985	34.2	33.5	33.1	32.8	32.1	31.1	30.1	28.9	27.5	26.0	184.8	98.7	57.9	35.3	21.6	13.4	8.4	5.2	8.8
1986	33.2	32.7	31.9	31.6	31.2	30.5	29.4	28.4	27.2	25.8	181.7	94.4	54.8	33.3	20.4	12.6	7.9	4.9	8.3
1987	32.4	31.7	31.2	30.4	30.1	29.7	28.9	27.9	26.8	25.6	180.1	91.4	52.6	31.8	19.4	12.0	7.5	4.7	7.9
1988	31.5	30.9	30.2	29.7	29.0	28.6	28.1	27.4	26.2	25.1	177.9	88.1	50.0	30.2	18.4	11.4	7.1	4.4	7.5
1989	30.4	30.0	29.5	28.8	28.3	27.5	27.1	26.6	25.8	24.6	174.9	84.1	47.0	28.2	17.2	10.6	6.6	4.1	7.0
1990	28.9	29.0	28.6	28.1	27.4	26.8	26.0	25.5	24.8	23.9	167.6	77.2	42.2	25.2	15.4	9.4	5.9	3.7	6.2
1991	27.9	27.5	27.7	27.3	26.7	26.0	25.4	24.6	24.0	23.4	166.6	75.4	40.4	24.0	14.6	9.0	5.6	3.5	5.9
1992	26.2	26.6	26.3	26.3	26.0	25.4	24.6	23.9	23.0	22.3	160.4	70.2	36.6	21.6	13.2	8.1	5.0	3.1	5.3
1993	24.2	25.0	25.4	25.0	25.0	24.5	23.9	23.0	22.2	21.1	150.7	63.1	31.9	18.7	11.4	6.9	4.3	2.7	4.5
1994	22.5	23.1	23.8	24.1	23.7	23.6	23.0	22.2	21.2	20.2	139.2	55.3	26.9	15.6	9.5	5.8	3.6	2.2	3.8
1995	21.4	21.5	22.0	22.6	22.9	22.4	22.3	21.6	20.7	19.6	133.9	51.6	24.2	13.8	8.4	5.1	3.2	2.0	3.3
1996	20.0	20.4	20.4	21.0	21.5	21.7	21.1	20.7	19.9	18.9	125.1	45.9	20.5	11.6	7.0	4.3	2.6	1.6	2.8
1997	18.9	19.1	19.5	19.5	19.9	20.4	20.5	19.8	19.4	18.5	121.4	43.2	18.5	10.3	6.2	3.8	2.3	1.5	2.4
1998	17.5	18.0	18.2	18.5	18.5	18.8	19.1	19.1	18.3	17.7	114.6	39.0	15.9	8.7	5.2	3.2	1.9	1.2	2.0
1999	17.2	16.7	17.2	17.3	17.6	17.5	17.8	18.0	17.8	17.0	113.5	38.5	15.0	8.0	4.8	2.9	1.8	1.1	1.9

Table A.4. Continued. Male numbers at age in Oregon (1000s) predicted by the base case model.

Age (yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
2000	16.5	16.4	16.0	16.4	16.5	16.7	16.5	16.7	16.7	16.4	109.9	36.8	13.7	7.2	4.3	2.6	1.6	1.0	1.7
2001	16.7	15.8	15.7	15.2	15.6	15.7	15.8	15.7	15.8	15.8	112.6	38.8	13.9	7.1	4.2	2.6	1.6	1.0	1.6
2002	16.8	16.0	15.0	15.0	14.5	14.9	14.9	15.1	14.9	15.0	114.7	41.0	14.2	7.1	4.1	2.5	1.5	1.0	1.6
2003	17.3	16.1	15.2	14.3	14.3	13.8	14.2	14.2	14.4	14.2	116.2	43.6	14.7	7.1	4.1	2.5	1.5	1.0	1.6
2004	17.8	16.5	15.3	14.6	13.7	13.6	13.2	13.5	13.5	13.7	116.6	46.4	15.3	7.2	4.1	2.5	1.5	0.9	1.6
2005	18.3	17.0	15.8	14.6	13.9	13.1	13.0	12.6	12.9	12.9	115.9	49.3	16.0	7.2	4.1	2.5	1.5	0.9	1.6
2006	18.7	17.4	16.2	15.0	14.0	13.2	12.4	12.4	12.0	12.2	114.1	52.3	16.8	7.3	4.1	2.5	1.5	0.9	1.6
2007	19.1	17.8	16.6	15.5	14.3	13.3	12.6	11.9	11.8	11.4	111.4	55.4	17.7	7.4	4.1	2.5	1.5	0.9	1.6
2008	19.5	18.3	17.0	15.9	14.7	13.7	12.7	12.0	11.3	11.2	107.7	58.5	18.8	7.5	4.1	2.5	1.5	0.9	1.5
2009	19.9	18.6	17.4	16.2	15.1	14.1	13.0	12.1	11.5	10.7	103.7	61.4	19.9	7.7	4.1	2.5	1.5	0.9	1.5
2009	16.5	16.4	16.0	16.4	16.5	16.7	16.5	16.7	16.7	16.4	109.9	36.8	13.7	7.2	4.3	2.6	1.6	1.0	1.7

Table A.5. Female numbers at age in Washington (1000s) predicted by the base case model.

Age (yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1916	14.1	13.5	12.9	12.3	11.7	11.2	10.6	10.1	9.7	9.2	71.8	44.7	27.9	17.4	10.8	6.7	4.2	2.6	4.3
1917	14.1	13.5	12.9	12.3	11.7	11.2	10.6	10.1	9.7	9.2	71.8	44.7	27.9	17.4	10.8	6.7	4.2	2.6	4.3
1918	14.1	13.5	12.9	12.3	11.7	11.2	10.6	10.1	9.7	9.2	71.8	44.7	27.9	17.4	10.8	6.7	4.2	2.6	4.3
1919	14.1	13.5	12.9	12.3	11.7	11.2	10.6	10.1	9.7	9.2	71.8	44.7	27.9	17.4	10.8	6.7	4.2	2.6	4.3
1920	14.1	13.5	12.8	12.3	11.7	11.2	10.6	10.1	9.7	9.2	71.8	44.7	27.9	17.4	10.8	6.7	4.2	2.6	4.3
1921	14.1	13.5	12.8	12.3	11.7	11.2	10.6	10.1	9.7	9.2	71.8	44.7	27.9	17.4	10.8	6.7	4.2	2.6	4.3
1922	14.1	13.5	12.8	12.3	11.7	11.2	10.6	10.1	9.7	9.2	71.8	44.7	27.9	17.4	10.8	6.7	4.2	2.6	4.3
1923	14.1	13.5	12.8	12.3	11.7	11.1	10.6	10.1	9.7	9.2	71.8	44.7	27.9	17.4	10.8	6.7	4.2	2.6	4.3
1924	14.1	13.5	12.8	12.3	11.7	11.1	10.6	10.1	9.7	9.2	71.8	44.7	27.9	17.4	10.8	6.7	4.2	2.6	4.3
1925	14.1	13.5	12.8	12.3	11.7	11.1	10.6	10.1	9.7	9.2	71.8	44.7	27.9	17.4	10.8	6.7	4.2	2.6	4.3
1926	14.1	13.5	12.8	12.2	11.7	11.1	10.6	10.1	9.7	9.2	71.8	44.7	27.8	17.4	10.8	6.7	4.2	2.6	4.3
1927	14.1	13.5	12.8	12.2	11.7	11.1	10.6	10.1	9.7	9.2	71.8	44.7	27.8	17.3	10.8	6.7	4.2	2.6	4.3
1928	14.1	13.5	12.8	12.2	11.7	11.1	10.6	10.1	9.7	9.2	71.7	44.6	27.8	17.3	10.8	6.7	4.2	2.6	4.3
1929	14.1	13.5	12.8	12.2	11.7	11.1	10.6	10.1	9.7	9.2	71.7	44.6	27.8	17.3	10.8	6.7	4.2	2.6	4.3
1930	14.1	13.4	12.8	12.2	11.7	11.1	10.6	10.1	9.7	9.2	71.7	44.6	27.7	17.3	10.8	6.7	4.2	2.6	4.3
1931	14.1	13.4	12.8	12.2	11.7	11.1	10.6	10.1	9.7	9.2	71.7	44.5	27.7	17.3	10.7	6.7	4.2	2.6	4.3
1932	14.1	13.4	12.8	12.2	11.7	11.1	10.6	10.1	9.7	9.2	71.7	44.5	27.7	17.2	10.7	6.7	4.2	2.6	4.3
1933	14.1	13.4	12.8	12.2	11.7	11.1	10.6	10.1	9.7	9.2	71.7	44.5	27.7	17.2	10.7	6.7	4.2	2.6	4.3
1934	14.1	13.4	12.8	12.2	11.7	11.1	10.6	10.1	9.7	9.2	71.7	44.5	27.6	17.2	10.7	6.7	4.2	2.6	4.3
1935	14.1	13.4	12.8	12.2	11.7	11.1	10.6	10.1	9.7	9.2	71.7	44.5	27.6	17.2	10.7	6.7	4.2	2.6	4.3
1936	14.1	13.4	12.8	12.2	11.7	11.1	10.6	10.1	9.7	9.2	71.7	44.4	27.6	17.2	10.7	6.7	4.1	2.6	4.3
1937	14.1	13.4	12.8	12.2	11.7	11.1	10.6	10.1	9.7	9.2	71.6	44.4	27.6	17.1	10.7	6.7	4.1	2.6	4.3
1938	14.0	13.4	12.8	12.2	11.6	11.1	10.6	10.1	9.7	9.2	71.6	44.4	27.5	17.1	10.7	6.6	4.1	2.6	4.3
1939	14.0	13.4	12.8	12.2	11.6	11.1	10.6	10.1	9.7	9.2	71.6	44.4	27.5	17.1	10.7	6.6	4.1	2.6	4.3
1940	14.0	13.4	12.8	12.2	11.6	11.1	10.6	10.1	9.6	9.2	71.6	44.4	27.5	17.1	10.6	6.6	4.1	2.6	4.3
1941	14.0	13.4	12.8	12.2	11.6	11.1	10.6	10.1	9.6	9.2	71.6	44.4	27.5	17.1	10.6	6.6	4.1	2.6	4.2
1942	14.0	13.4	12.8	12.2	11.6	11.1	10.6	10.1	9.6	9.2	71.6	44.4	27.5	17.1	10.6	6.6	4.1	2.6	4.2
1943	14.0	13.4	12.8	12.2	11.6	11.1	10.6	10.1	9.6	9.2	71.6	44.4	27.5	17.0	10.6	6.6	4.1	2.6	4.2
1944	14.0	13.4	12.8	12.2	11.6	11.1	10.6	10.1	9.6	9.2	71.5	44.4	27.4	17.0	10.6	6.6	4.1	2.6	4.2
1945	14.0	13.4	12.7	12.2	11.6	11.1	10.6	10.1	9.6	9.2	71.5	44.4	27.4	17.0	10.6	6.6	4.1	2.6	4.2
1946	13.9	13.3	12.7	12.2	11.6	11.1	10.6	10.1	9.6	9.2	71.5	44.4	27.4	17.0	10.6	6.6	4.1	2.6	4.2
1947	13.9	13.3	12.7	12.1	11.6	11.1	10.6	10.1	9.6	9.2	71.5	44.4	27.4	17.0	10.6	6.6	4.1	2.6	4.2
1948	13.8	13.2	12.7	12.1	11.6	11.1	10.6	10.1	9.6	9.2	71.4	44.4	27.4	17.0	10.6	6.6	4.1	2.6	4.2
1949	13.8	13.2	12.6	12.1	11.6	11.1	10.6	10.1	9.6	9.2	71.4	44.3	27.4	17.0	10.5	6.6	4.1	2.5	4.2
1950	13.8	13.2	12.6	12.0	11.5	11.0	10.5	10.1	9.6	9.2	71.4	44.3	27.4	16.9	10.5	6.6	4.1	2.5	4.2
1951	13.8	13.2	12.6	12.0	11.5	11.0	10.5	10.1	9.6	9.2	71.3	44.3	27.4	16.9	10.5	6.5	4.1	2.5	4.2
1952	13.8	13.2	12.6	12.0	11.5	10.9	10.5	10.0	9.6	9.2	71.3	44.3	27.4	16.9	10.5	6.5	4.1	2.5	4.2
1953	13.7	13.1	12.5	12.0	11.4	10.9	10.4	10.0	9.6	9.1	71.3	44.3	27.4	16.9	10.5	6.5	4.1	2.5	4.2
1954	13.7	13.1	12.5	12.0	11.4	10.9	10.4	10.0	9.5	9.1	71.2	44.3	27.4	16.9	10.5	6.5	4.1	2.5	4.2
1955	13.7	13.1	12.5	11.9	11.4	10.9	10.4	9.9	9.5	9.1	71.2	44.3	27.4	16.9	10.5	6.5	4.1	2.5	4.2
1956	13.7	13.1	12.5	11.9	11.4	10.9	10.4	9.9	9.5	9.1	71.0	44.2	27.3	16.9	10.4	6.5	4.0	2.5	4.2
1957	13.7	13.1	12.5	11.9	11.4	10.9	10.4	9.9	9.5	9.0	70.9	44.1	27.3	16.8	10.4	6.5	4.0	2.5	4.2

Table A.5. Continued. Female numbers at age in Washington (1000s) predicted by the base case model.

Age (yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1958	13.6	13.0	12.5	11.9	11.4	10.9	10.4	9.9	9.5	9.0	70.7	44.0	27.2	16.8	10.4	6.5	4.0	2.5	4.1
1959	13.6	13.0	12.4	11.9	11.3	10.8	10.3	9.9	9.4	9.0	70.6	43.9	27.1	16.7	10.3	6.4	4.0	2.5	4.1
1960	13.6	13.0	12.4	11.9	11.3	10.8	10.3	9.9	9.4	9.0	70.4	43.8	27.0	16.7	10.3	6.4	4.0	2.5	4.1
1961	13.5	12.9	12.4	11.8	11.3	10.8	10.3	9.9	9.4	9.0	70.2	43.7	26.9	16.6	10.3	6.4	4.0	2.5	4.1
1962	13.5	12.9	12.3	11.8	11.3	10.8	10.3	9.8	9.4	9.0	70.1	43.5	26.8	16.5	10.2	6.3	3.9	2.5	4.1
1963	13.5	12.9	12.3	11.8	11.2	10.8	10.3	9.8	9.4	9.0	69.9	43.4	26.7	16.5	10.2	6.3	3.9	2.4	4.0
1964	13.5	12.9	12.3	11.7	11.2	10.7	10.3	9.8	9.4	8.9	69.7	43.2	26.6	16.4	10.1	6.3	3.9	2.4	4.0
1965	13.4	12.8	12.3	11.7	11.2	10.7	10.2	9.8	9.3	8.9	69.5	43.0	26.4	16.3	10.0	6.2	3.9	2.4	4.0
1966	13.4	12.8	12.2	11.7	11.2	10.7	10.2	9.8	9.3	8.9	69.3	42.8	26.2	16.1	10.0	6.2	3.8	2.4	3.9
1967	13.4	12.8	12.2	11.7	11.2	10.7	10.2	9.7	9.3	8.9	69.2	42.6	26.1	16.0	9.9	6.1	3.8	2.4	3.9
1968	13.3	12.7	12.2	11.7	11.1	10.6	10.2	9.7	9.3	8.9	69.0	42.4	25.9	15.9	9.8	6.1	3.8	2.3	3.9
1969	13.3	12.7	12.2	11.6	11.1	10.6	10.1	9.7	9.3	8.8	68.9	42.2	25.7	15.8	9.7	6.0	3.7	2.3	3.8
1970	13.2	12.7	12.1	11.6	11.1	10.6	10.1	9.7	9.2	8.8	68.7	42.0	25.6	15.7	9.7	6.0	3.7	2.3	3.8
1971	13.2	12.6	12.1	11.6	11.1	10.6	10.1	9.7	9.2	8.8	68.5	41.7	25.4	15.5	9.6	5.9	3.7	2.3	3.8
1972	13.1	12.6	12.0	11.5	11.0	10.5	10.1	9.6	9.2	8.8	68.3	41.4	25.1	15.4	9.5	5.8	3.6	2.3	3.7
1973	13.0	12.5	12.0	11.5	11.0	10.5	10.1	9.6	9.2	8.8	68.1	41.1	24.9	15.2	9.3	5.8	3.6	2.2	3.7
1974	12.9	12.4	11.9	11.4	10.9	10.5	10.0	9.6	9.2	8.7	67.8	40.8	24.5	15.0	9.2	5.7	3.5	2.2	3.6
1975	12.8	12.3	11.8	11.4	10.9	10.4	10.0	9.6	9.1	8.7	67.5	40.4	24.2	14.7	9.0	5.6	3.4	2.1	3.5
1976	12.7	12.2	11.7	11.3	10.8	10.4	10.0	9.5	9.1	8.7	67.4	40.1	24.0	14.5	8.9	5.5	3.4	2.1	3.5
1977	12.5	12.1	11.6	11.2	10.7	10.3	9.9	9.5	9.1	8.7	67.1	39.8	23.6	14.3	8.8	5.4	3.3	2.1	3.4
1978	12.4	11.9	11.5	11.1	10.7	10.2	9.8	9.4	9.0	8.6	66.5	39.0	22.9	13.8	8.5	5.2	3.2	2.0	3.3
1979	12.1	11.8	11.4	11.0	10.6	10.2	9.8	9.4	9.0	8.6	66.0	38.1	22.2	13.3	8.1	5.0	3.1	1.9	3.2
1980	11.9	11.6	11.3	10.9	10.5	10.1	9.7	9.3	8.9	8.5	65.4	37.2	21.3	12.8	7.8	4.8	3.0	1.8	3.0
1981	11.6	11.3	11.0	10.7	10.4	10.0	9.6	9.2	8.9	8.5	64.7	36.0	20.4	12.1	7.4	4.5	2.8	1.7	2.9
1982	11.3	11.1	10.8	10.5	10.2	9.9	9.5	9.1	8.8	8.4	64.7	35.9	20.1	11.9	7.2	4.4	2.7	1.7	2.8
1983	10.9	10.8	10.6	10.3	10.0	9.8	9.4	9.1	8.7	8.4	64.6	35.7	19.8	11.7	7.1	4.3	2.7	1.7	2.7
1984	10.5	10.4	10.3	10.1	9.8	9.6	9.3	9.0	8.6	8.3	64.2	35.2	19.3	11.3	6.8	4.2	2.6	1.6	2.6
1985	10.2	10.0	9.9	9.8	9.6	9.4	9.1	8.9	8.5	8.2	63.6	34.7	18.7	10.9	6.6	4.0	2.5	1.5	2.5
1986	9.9	9.8	9.5	9.4	9.3	9.2	8.9	8.7	8.4	8.1	62.8	33.7	17.9	10.3	6.2	3.8	2.3	1.4	2.4
1987	9.7	9.5	9.3	9.1	9.0	8.9	8.7	8.5	8.3	8.0	62.3	33.3	17.4	10.0	6.0	3.6	2.2	1.4	2.3
1988	9.4	9.2	9.0	8.9	8.7	8.6	8.5	8.3	8.1	7.8	61.3	32.4	16.6	9.4	5.6	3.4	2.1	1.3	2.1
1989	9.1	9.0	8.8	8.6	8.5	8.3	8.2	8.1	7.9	7.7	60.4	31.6	15.9	8.9	5.3	3.2	2.0	1.2	2.0
1990	8.6	8.7	8.6	8.4	8.2	8.1	7.9	7.8	7.7	7.5	58.7	29.8	14.6	8.0	4.7	2.9	1.8	1.1	1.8
1991	8.3	8.2	8.3	8.2	8.0	7.8	7.7	7.5	7.4	7.3	57.6	28.9	13.8	7.5	4.4	2.7	1.6	1.0	1.6
1992	7.8	8.0	7.9	7.9	7.8	7.6	7.4	7.3	7.1	7.0	56.2	27.9	13.0	6.9	4.0	2.4	1.5	0.9	1.5
1993	7.3	7.5	7.6	7.5	7.5	7.4	7.3	7.1	6.9	6.7	54.3	26.3	11.9	6.2	3.6	2.2	1.3	0.8	1.3
1994	6.7	6.9	7.1	7.2	7.1	7.2	7.1	6.9	6.7	6.5	52.4	24.7	10.8	5.5	3.2	1.9	1.2	0.7	1.2
1995	6.4	6.4	6.6	6.8	6.9	6.8	6.8	6.7	6.6	6.4	51.2	24.1	10.3	5.1	2.9	1.7	1.1	0.7	1.1
1996	6.0	6.1	6.1	6.3	6.5	6.6	6.5	6.5	6.4	6.2	50.0	23.6	9.8	4.8	2.7	1.6	1.0	0.6	1.0
1997	5.7	5.7	5.8	5.8	6.0	6.2	6.3	6.2	6.2	6.0	48.8	23.1	9.3	4.5	2.5	1.5	0.9	0.6	0.9
1998	5.2	5.4	5.4	5.5	5.6	5.7	5.9	6.0	5.8	5.8	47.3	22.5	8.8	4.1	2.3	1.3	0.8	0.5	0.8
1999	5.2	5.0	5.1	5.2	5.3	5.3	5.4	5.6	5.7	5.5	46.2	22.3	8.6	3.9	2.1	1.3	0.8	0.5	0.8

Table A.5. Continued. Female numbers at age in Washington (1000s) predicted by the base case model.

Age (yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
2000	4.9	4.9	4.8	4.9	4.9	5.0	5.0	5.2	5.3	5.3	43.9	20.7	7.7	3.4	1.8	1.1	0.6	0.4	0.6
2001	5.0	4.7	4.7	4.6	4.7	4.7	4.8	4.8	4.9	5.0	42.8	20.6	7.6	3.3	1.7	1.0	0.6	0.4	0.6
2002	5.0	4.8	4.5	4.5	4.3	4.5	4.5	4.6	4.5	4.6	40.6	19.4	6.9	2.9	1.5	0.9	0.5	0.3	0.5
2003	5.2	4.8	4.6	4.3	4.3	4.1	4.2	4.3	4.3	4.3	39.8	19.9	7.1	2.9	1.5	0.8	0.5	0.3	0.5
2004	5.3	4.9	4.6	4.3	4.1	4.1	3.9	4.0	4.1	4.1	38.9	20.6	7.4	2.9	1.5	0.8	0.5	0.3	0.5
2005	5.5	5.1	4.7	4.4	4.1	3.9	3.9	3.8	3.9	3.9	37.8	21.1	7.6	3.0	1.5	0.8	0.5	0.3	0.5
2006	5.6	5.2	4.8	4.5	4.2	4.0	3.7	3.7	3.6	3.7	36.3	21.4	7.9	3.0	1.4	0.8	0.5	0.3	0.5
2007	5.7	5.3	5.0	4.6	4.3	4.0	3.8	3.5	3.5	3.4	35.0	22.0	8.3	3.1	1.4	0.8	0.5	0.3	0.5
2008	5.8	5.5	5.1	4.7	4.4	4.1	3.8	3.6	3.4	3.4	33.4	22.5	8.7	3.2	1.5	0.8	0.5	0.3	0.5
2009	5.9	5.6	5.2	4.8	4.5	4.2	3.9	3.6	3.4	3.2	31.6	22.5	9.0	3.2	1.4	0.8	0.5	0.3	0.4
2009	4.9	4.9	4.8	4.9	4.9	5.0	5.0	5.2	5.3	5.3	43.9	20.7	7.7	3.4	1.8	1.1	0.6	0.4	0.6

Table A.6. Male numbers at age in Washington (1000s) predicted by the base case model.

Age (yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1916	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1917	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1918	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1919	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1920	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1921	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1922	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1923	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1924	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1925	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.5	45.4	28.5	17.9	11.2	7.0	4.4	2.8	4.6
1926	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.4	45.4	28.5	17.8	11.2	7.0	4.4	2.8	4.6
1927	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.4	45.4	28.4	17.8	11.2	7.0	4.4	2.8	4.6
1928	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.4	45.3	28.4	17.8	11.2	7.0	4.4	2.8	4.6
1929	14.1	13.5	12.9	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.4	45.3	28.4	17.8	11.2	7.0	4.4	2.8	4.6
1930	14.1	13.5	12.8	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.4	45.3	28.3	17.8	11.1	7.0	4.4	2.7	4.6
1931	14.1	13.5	12.8	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.3	45.2	28.3	17.7	11.1	7.0	4.4	2.7	4.6
1932	14.1	13.4	12.8	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.3	45.2	28.3	17.7	11.1	7.0	4.4	2.7	4.6
1933	14.1	13.4	12.8	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.3	45.2	28.3	17.7	11.1	7.0	4.4	2.7	4.6
1934	14.1	13.4	12.8	12.3	11.7	11.2	10.7	10.2	9.7	9.3	72.3	45.1	28.2	17.7	11.1	7.0	4.4	2.7	4.6
1935	14.1	13.4	12.8	12.2	11.7	11.2	10.7	10.2	9.7	9.3	72.3	45.1	28.2	17.7	11.1	6.9	4.4	2.7	4.6
1936	14.1	13.4	12.8	12.2	11.7	11.2	10.7	10.2	9.7	9.3	72.3	45.1	28.2	17.7	11.1	6.9	4.4	2.7	4.6
1937	14.1	13.4	12.8	12.2	11.7	11.2	10.6	10.2	9.7	9.3	72.3	45.1	28.2	17.6	11.1	6.9	4.3	2.7	4.6
1938	14.0	13.4	12.8	12.2	11.7	11.2	10.6	10.2	9.7	9.3	72.3	45.1	28.1	17.6	11.0	6.9	4.3	2.7	4.6
1939	14.0	13.4	12.8	12.2	11.7	11.1	10.6	10.2	9.7	9.3	72.3	45.1	28.1	17.6	11.0	6.9	4.3	2.7	4.6
1940	14.0	13.4	12.8	12.2	11.7	11.1	10.6	10.2	9.7	9.3	72.2	45.1	28.1	17.6	11.0	6.9	4.3	2.7	4.6
1941	14.0	13.4	12.8	12.2	11.7	11.1	10.6	10.2	9.7	9.3	72.2	45.1	28.1	17.6	11.0	6.9	4.3	2.7	4.6
1942	14.0	13.4	12.8	12.2	11.7	11.1	10.6	10.1	9.7	9.2	72.2	45.0	28.0	17.5	11.0	6.9	4.3	2.7	4.6
1943	14.0	13.4	12.8	12.2	11.7	11.1	10.6	10.1	9.7	9.2	72.2	45.0	28.0	17.5	11.0	6.9	4.3	2.7	4.6
1944	14.0	13.4	12.8	12.2	11.6	11.1	10.6	10.1	9.7	9.2	72.2	45.0	28.0	17.5	11.0	6.9	4.3	2.7	4.5
1945	14.0	13.4	12.8	12.2	11.6	11.1	10.6	10.1	9.7	9.2	72.2	45.0	28.0	17.5	11.0	6.9	4.3	2.7	4.5
1946	13.9	13.3	12.8	12.2	11.6	11.1	10.6	10.1	9.7	9.2	72.1	45.0	28.0	17.5	10.9	6.9	4.3	2.7	4.5
1947	13.9	13.3	12.7	12.2	11.6	11.1	10.6	10.1	9.7	9.2	72.1	45.0	28.0	17.5	10.9	6.9	4.3	2.7	4.5
1948	13.8	13.2	12.7	12.1	11.6	11.1	10.6	10.1	9.7	9.2	72.1	45.0	28.0	17.4	10.9	6.8	4.3	2.7	4.5
1949	13.8	13.2	12.6	12.1	11.6	11.1	10.6	10.1	9.7	9.2	72.0	45.0	28.0	17.4	10.9	6.8	4.3	2.7	4.5
1950	13.8	13.2	12.6	12.1	11.5	11.1	10.6	10.1	9.7	9.2	72.0	45.0	28.0	17.4	10.9	6.8	4.3	2.7	4.5
1951	13.8	13.2	12.6	12.0	11.5	11.0	10.6	10.1	9.6	9.2	72.0	45.0	28.0	17.4	10.9	6.8	4.3	2.7	4.5
1952	13.8	13.2	12.6	12.0	11.5	11.0	10.5	10.1	9.6	9.2	71.9	45.0	28.0	17.4	10.9	6.8	4.3	2.7	4.5
1953	13.7	13.1	12.6	12.0	11.5	11.0	10.5	10.0	9.6	9.2	71.9	45.0	27.9	17.4	10.9	6.8	4.3	2.7	4.5
1954	13.7	13.1	12.5	12.0	11.5	10.9	10.5	10.0	9.6	9.2	71.9	44.9	27.9	17.4	10.9	6.8	4.3	2.7	4.5
1955	13.7	13.1	12.5	12.0	11.4	10.9	10.4	10.0	9.5	9.1	71.8	44.9	27.9	17.4	10.8	6.8	4.3	2.7	4.5
1956	13.7	13.1	12.5	12.0	11.4	10.9	10.4	10.0	9.5	9.1	71.7	44.8	27.9	17.3	10.8	6.8	4.2	2.7	4.5
1957	13.7	13.1	12.5	11.9	11.4	10.9	10.4	10.0	9.5	9.1	71.5	44.7	27.8	17.3	10.8	6.7	4.2	2.7	4.5

Table A.6. Continued. Male numbers at age in Washington (1000s) predicted by the base case model.

Age (yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
1958	13.6	13.0	12.5	11.9	11.4	10.9	10.4	9.9	9.5	9.1	71.4	44.6	27.7	17.2	10.7	6.7	4.2	2.6	4.4
1959	13.6	13.0	12.4	11.9	11.4	10.9	10.4	9.9	9.5	9.1	71.2	44.5	27.7	17.2	10.7	6.7	4.2	2.6	4.4
1960	13.6	13.0	12.4	11.9	11.4	10.9	10.4	9.9	9.5	9.1	71.0	44.4	27.6	17.1	10.6	6.7	4.2	2.6	4.4
1961	13.5	12.9	12.4	11.9	11.3	10.8	10.4	9.9	9.5	9.0	70.8	44.2	27.5	17.0	10.6	6.6	4.2	2.6	4.4
1962	13.5	12.9	12.4	11.8	11.3	10.8	10.3	9.9	9.4	9.0	70.7	44.1	27.4	17.0	10.6	6.6	4.1	2.6	4.4
1963	13.5	12.9	12.3	11.8	11.3	10.8	10.3	9.9	9.4	9.0	70.5	44.0	27.3	16.9	10.5	6.6	4.1	2.6	4.3
1964	13.5	12.9	12.3	11.8	11.3	10.8	10.3	9.9	9.4	9.0	70.3	43.8	27.1	16.8	10.4	6.5	4.1	2.6	4.3
1965	13.4	12.8	12.3	11.7	11.2	10.7	10.3	9.8	9.4	9.0	70.0	43.6	26.9	16.7	10.4	6.5	4.0	2.5	4.3
1966	13.4	12.8	12.3	11.7	11.2	10.7	10.2	9.8	9.4	9.0	69.9	43.3	26.7	16.6	10.3	6.4	4.0	2.5	4.2
1967	13.4	12.8	12.2	11.7	11.2	10.7	10.2	9.8	9.3	8.9	69.7	43.1	26.5	16.4	10.2	6.4	4.0	2.5	4.2
1968	13.3	12.8	12.2	11.7	11.2	10.7	10.2	9.8	9.3	8.9	69.5	42.9	26.4	16.3	10.1	6.3	3.9	2.5	4.2
1969	13.3	12.7	12.2	11.6	11.1	10.7	10.2	9.7	9.3	8.9	69.4	42.6	26.2	16.2	10.0	6.3	3.9	2.5	4.1
1970	13.2	12.7	12.1	11.6	11.1	10.6	10.2	9.7	9.3	8.9	69.2	42.4	26.0	16.1	10.0	6.2	3.9	2.4	4.1
1971	13.2	12.6	12.1	11.6	11.1	10.6	10.1	9.7	9.3	8.9	69.0	42.2	25.8	15.9	9.9	6.1	3.8	2.4	4.0
1972	13.1	12.6	12.0	11.5	11.1	10.6	10.1	9.7	9.2	8.8	68.8	41.8	25.5	15.7	9.8	6.1	3.8	2.4	4.0
1973	13.0	12.5	12.0	11.5	11.0	10.5	10.1	9.7	9.2	8.8	68.5	41.5	25.2	15.5	9.6	6.0	3.7	2.3	3.9
1974	12.9	12.4	11.9	11.4	11.0	10.5	10.1	9.6	9.2	8.8	68.2	41.1	24.9	15.3	9.5	5.9	3.7	2.3	3.9
1975	12.8	12.3	11.8	11.4	10.9	10.5	10.0	9.6	9.2	8.8	67.9	40.7	24.5	15.1	9.3	5.8	3.6	2.3	3.8
1976	12.7	12.2	11.7	11.3	10.9	10.4	10.0	9.6	9.2	8.7	67.8	40.4	24.3	14.9	9.2	5.7	3.6	2.2	3.7
1977	12.5	12.1	11.6	11.2	10.8	10.4	9.9	9.5	9.1	8.7	67.5	40.0	23.9	14.6	9.0	5.6	3.5	2.2	3.7
1978	12.4	11.9	11.5	11.1	10.7	10.3	9.9	9.5	9.1	8.7	66.8	39.1	23.2	14.1	8.7	5.4	3.4	2.1	3.5
1979	12.1	11.8	11.4	11.0	10.6	10.2	9.8	9.4	9.0	8.6	66.2	38.2	22.4	13.6	8.4	5.2	3.2	2.0	3.4
1980	11.9	11.6	11.3	10.9	10.5	10.1	9.7	9.3	9.0	8.6	65.6	37.1	21.5	13.0	8.0	5.0	3.1	1.9	3.2
1981	11.6	11.3	11.0	10.8	10.4	10.0	9.6	9.3	8.9	8.5	64.8	35.9	20.5	12.3	7.6	4.7	2.9	1.8	3.1
1982	11.3	11.1	10.8	10.5	10.3	9.9	9.6	9.2	8.8	8.5	64.8	35.7	20.2	12.1	7.4	4.6	2.9	1.8	3.0
1983	10.9	10.8	10.6	10.3	10.1	9.8	9.4	9.1	8.8	8.4	64.7	35.5	19.9	11.9	7.3	4.5	2.8	1.7	2.9
1984	10.5	10.4	10.3	10.1	9.8	9.6	9.3	9.0	8.7	8.3	64.3	35.0	19.3	11.5	7.0	4.3	2.7	1.7	2.8
1985	10.2	10.0	9.9	9.8	9.6	9.4	9.1	8.9	8.6	8.2	63.7	34.4	18.7	11.0	6.7	4.2	2.6	1.6	2.7
1986	9.9	9.8	9.6	9.5	9.4	9.2	8.9	8.7	8.5	8.1	62.8	33.3	17.8	10.4	6.3	3.9	2.4	1.5	2.5
1987	9.7	9.5	9.3	9.1	9.0	8.9	8.8	8.5	8.3	8.1	62.3	32.9	17.3	10.1	6.1	3.8	2.3	1.5	2.4
1988	9.4	9.3	9.0	8.9	8.7	8.6	8.5	8.4	8.1	7.9	61.3	31.9	16.5	9.5	5.7	3.5	2.2	1.4	2.3
1989	9.1	9.0	8.8	8.6	8.5	8.3	8.2	8.1	7.9	7.7	60.3	31.0	15.7	8.9	5.4	3.3	2.0	1.3	2.1
1990	8.6	8.7	8.6	8.4	8.2	8.1	7.9	7.8	7.7	7.5	58.4	29.1	14.4	8.0	4.8	3.0	1.8	1.1	1.9
1991	8.3	8.2	8.3	8.2	8.0	7.8	7.7	7.5	7.4	7.3	57.3	28.2	13.5	7.5	4.5	2.7	1.7	1.1	1.8
1992	7.8	8.0	7.9	7.9	7.8	7.7	7.5	7.3	7.1	7.0	55.9	27.1	12.7	6.9	4.1	2.5	1.6	1.0	1.6
1993	7.3	7.5	7.6	7.5	7.5	7.4	7.3	7.1	7.0	6.7	53.8	25.3	11.5	6.2	3.6	2.2	1.4	0.8	1.4
1994	6.7	6.9	7.1	7.3	7.1	7.2	7.1	6.9	6.7	6.6	51.8	23.7	10.4	5.5	3.2	1.9	1.2	0.7	1.2
1995	6.4	6.4	6.6	6.8	6.9	6.8	6.8	6.7	6.6	6.4	50.6	23.1	9.9	5.1	2.9	1.8	1.1	0.7	1.1
1996	6.0	6.1	6.1	6.3	6.5	6.6	6.5	6.5	6.4	6.2	49.5	22.5	9.4	4.7	2.7	1.6	1.0	0.6	1.0
1997	5.7	5.7	5.8	5.8	6.0	6.2	6.3	6.2	6.2	6.1	48.2	22.0	8.9	4.4	2.5	1.5	0.9	0.6	1.0
1998	5.2	5.4	5.5	5.6	5.6	5.7	5.9	6.0	5.9	5.8	46.8	21.3	8.4	4.0	2.3	1.4	0.8	0.5	0.9
1999	5.2	5.0	5.2	5.2	5.3	5.3	5.5	5.6	5.7	5.6	45.7	21.2	8.1	3.8	2.1	1.3	0.8	0.5	0.8

Table A.6. Continued. Male numbers at age in Washington (1000s) predicted by the base case model.

Age (yr)	0	1	2	3	4	5	6	7	8	9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
2000	4.9	4.9	4.8	4.9	5.0	5.1	5.1	5.2	5.3	5.4	43.3	19.5	7.2	3.3	1.8	1.1	0.7	0.4	0.7
2001	5.0	4.7	4.7	4.6	4.7	4.7	4.8	4.8	4.9	5.0	42.2	19.4	7.1	3.1	1.7	1.0	0.6	0.4	0.6
2002	5.0	4.8	4.5	4.5	4.3	4.5	4.5	4.6	4.6	4.6	40.1	18.2	6.4	2.8	1.5	0.9	0.5	0.3	0.5
2003	5.2	4.8	4.6	4.3	4.3	4.1	4.3	4.3	4.4	4.3	39.4	18.7	6.6	2.8	1.4	0.8	0.5	0.3	0.5
2004	5.3	4.9	4.6	4.4	4.1	4.1	4.0	4.1	4.1	4.1	38.6	19.4	6.8	2.8	1.4	0.8	0.5	0.3	0.5
2005	5.5	5.1	4.7	4.4	4.2	3.9	3.9	3.8	3.9	3.9	37.6	20.0	7.1	2.8	1.4	0.8	0.5	0.3	0.5
2006	5.6	5.2	4.8	4.5	4.2	4.0	3.7	3.7	3.6	3.7	36.2	20.4	7.3	2.8	1.4	0.8	0.5	0.3	0.5
2007	5.7	5.3	5.0	4.6	4.3	4.0	3.8	3.6	3.5	3.4	34.9	21.1	7.7	2.9	1.4	0.8	0.5	0.3	0.5
2008	5.8	5.5	5.1	4.7	4.4	4.1	3.8	3.6	3.4	3.4	33.4	21.6	8.0	3.0	1.4	0.8	0.5	0.3	0.5
2009	5.9	5.6	5.2	4.9	4.5	4.2	3.9	3.6	3.4	3.2	31.7	21.8	8.3	3.0	1.4	0.8	0.5	0.3	0.5
2009	4.9	4.9	4.8	4.9	5.0	5.1	5.1	5.2	5.3	5.4	43.3	19.5	7.2	3.3	1.8	1.1	0.7	0.4	0.7

13. Appendix B: SS Data file

Data file for 2009 Yelloweye rockfish assessment

Global model specifications
1916 # Start year
2008 # End year
1 # Number of seasons/year
12 # Number of months/season (vector, by season)
1 # Spawning occurs at beginning of season
6 # Number of fishing fleets
6 # Number of surveys
3 # Number of areas

Fleet Section
1_CARC%2_CACM%3_ORRC%4_ORCM%5_WARC%6_WACM%7_ORRCOB%8_CACPFV%9_IPHCWA%10_NWFSCOR%11_IPHCOR%12_WATRI

0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 # Fleet timing (proportion of season)
1 1 2 2 3 3 2 1 3 2 2 3 # Area of each fleet
1 1 1 1 1 1 # Units for catch by fishing fleet: 1=Biomass(mt),2=Numbers(1000s)
0.1 0.1 0.1 0.1 0.1 0.1 # SE of log(catch) by fishing fleet

More global specs
2 # Number of genders (1=combined,2=females and males)
100 # Accumulator age (plus group for population dynamics)

Catch section
Initial equilibrium catch (landings + discard) by fishing fleet
0 0 0 0 0 0

93 # Number of lines catch data

# Catch (by fleet)	Year		Season				
0.00	2.20	0.00	0.00	0.00	0.00	1916	1
0.00	3.62	0.00	0.00	0.00	0.00	1917	1
0.00	4.25	0.00	0.00	0.00	0.00	1918	1
0.00	2.16	0.00	0.00	0.00	0.00	1919	1
0.00	2.38	0.00	0.00	0.00	0.00	1920	1
0.00	2.30	0.00	0.00	0.00	0.00	1921	1
0.00	2.06	0.00	0.00	0.00	0.00	1922	1
0.00	2.21	0.00	0.00	0.00	0.00	1923	1
0.00	2.82	0.00	0.00	0.00	0.00	1924	1
0.00	3.86	0.00	0.00	0.00	1.00	1925	1
0.00	4.87	0.00	0.00	0.00	1.00	1926	1
0.00	5.92	0.00	0.00	0.00	1.00	1927	1
0.00	5.52	0.00	0.12	0.00	1.00	1928	1
0.73	5.66	0.00	0.21	0.00	1.00	1929	1
1.18	6.76	0.00	0.20	0.00	1.00	1930	1
1.76	5.62	0.00	0.15	0.00	1.00	1931	1
2.35	8.13	0.00	0.06	0.00	1.00	1932	1
2.94	4.45	0.00	0.08	0.00	1.00	1933	1
3.53	5.78	0.00	0.09	0.00	1.00	1934	1
4.12	7.99	0.00	0.08	0.00	1.00	1935	1
4.70	8.08	0.00	0.20	0.00	1.00	1936	1
5.61	6.08	0.00	0.26	0.00	1.00	1937	1
5.50	6.36	0.00	0.23	0.00	1.00	1938	1
4.81	6.43	0.00	0.17	0.00	1.00	1939	1
6.85	4.57	0.00	1.04	0.00	1.00	1940	1
6.25	5.35	0.00	2.18	0.00	1.00	1941	1
6.78	3.37	0.00	3.18	0.00	1.00	1942	1
7.30	5.89	0.00	11.61	0.00	1.00	1943	1
7.83	24.88	0.00	19.06	0.00	1.00	1944	1
8.36	58.56	0.00	29.27	0.00	1.00	1945	1
8.88	57.74	0.00	18.22	0.00	1.00	1946	1
5.02	16.28	0.00	11.40	0.00	1.00	1947	1
10.12	23.30	0.00	7.81	0.00	1.00	1948	1
13.09	9.89	0.00	7.94	0.00	1.00	1949	1
15.95	8.03	0.00	9.60	0.00	1.00	1950	1

17.91	16.99	0.00	6.20	0.00	1.00	1951	1
15.95	14.15	0.00	6.34	0.00	1.00	1952	1
13.97	11.77	0.00	5.07	0.00	1.00	1953	1
18.74	11.78	0.00	6.38	0.00	1.00	1954	1
24.06	6.98	6.20	6.70	1.00	2.00	1955	1
27.15	10.40	6.50	4.12	1.00	2.00	1956	1
24.78	13.17	6.70	11.81	1.00	2.00	1957	1
35.91	13.41	7.00	9.08	2.00	2.00	1958	1
30.41	10.25	7.20	9.97	2.00	2.00	1959	1
22.05	8.88	7.50	12.64	2.00	2.00	1960	1
17.68	5.25	7.70	11.52	2.00	2.00	1961	1
22.08	5.43	8.00	13.43	2.00	2.00	1962	1
23.10	10.86	8.20	8.65	3.00	4.00	1963	1
20.82	7.52	8.50	8.68	3.00	4.00	1964	1
31.51	9.38	8.70	7.33	3.00	4.00	1965	1
35.34	8.97	9.00	10.20	3.00	4.00	1966	1
36.60	7.85	9.20	8.74	3.00	4.00	1967	1
42.79	7.66	9.50	7.13	3.00	4.00	1968	1
44.97	25.70	9.70	12.18	3.00	4.00	1969	1
51.89	27.70	10.00	10.43	4.00	5.10	1970	1
46.17	46.50	13.10	4.64	4.00	6.41	1971	1
59.61	63.66	16.30	8.49	4.00	7.31	1972	1
75.02	49.51	7.40	10.58	4.00	9.21	1973	1
80.47	56.38	12.80	6.95	4.00	10.31	1974	1
81.34	60.24	6.20	7.92	4.00	7.10	1975	1
88.56	57.96	19.40	15.18	4.30	10.30	1976	1
79.78	57.45	19.90	16.24	8.80	17.88	1977	1
74.46	154.20	24.50	28.50	4.50	23.90	1978	1
85.49	99.33	38.80	62.20	3.50	28.50	1979	1
80.19	42.07	31.50	68.34	2.40	35.06	1980	1
43.58	169.44	36	102.2	3.4	9.7	1981	1
79.60	154.33	56.9	114.5	3.4	12.6	1982	1
38.36	62.69	63.8	177.41	6.7	16.99	1983	1
71.26	53.66	43.7	57.06	12.2	13.42	1984	1
121.87	12.22	26.8	91.88	8.8	26.41	1985	1
77.31	33.51	27.4	65.62	9	14.94	1986	1
57.83	54.31	29.8	73.72	10.5	25.09	1987	1
60.07	65.44	9.4	110.73	8.3	25.56	1988	1
54.44	51.25	16.9	170.21	14.6	39.5	1989	1
40.06	81.32	18.7	61.12	9.9	26.27	1990	1
27.38	147.3	17.2	137.74	18	20.36	1991	1
16.41	111.1	29.4	165.88	16.2	33.85	1992	1
7.13	52.92	27.73	183.18	18	29.76	1993	1
13.78	56.02	21.57	102.19	10.3	19.58	1994	1
10.08	51.4	16.81	148.34	9.9	18.07	1995	1
12.74	76.54	8.17	92.52	10.8	16.89	1996	1
14.58	68.68	15.38	115.42	11.4	18.68	1997	1
4.84	21.89	18.78	41.47	14.4	5.57	1998	1
9.40	23.49	18.05	61.35	10.6	32.92	1999	1
5.71	4.02	9.52	3.64	10.1	7.86	2000	1
6.37	4.35	4.83	6.23	12.5	21.84	2001	1
2.49	1.07	3.14	1.9	3.7	3.48	2002	1
3.74	0.71	3.02	1.02	2.6	1.3	2003	1
0.60	1.34	3.69	1.50	3.70	1.50	2004	1
0.90	1.86	4.30	1.45	5.20	1.36	2005	1
4.10	0.83	2.85	1.88	1.70	1.01	2006	1
8.00	2.92	3.14	1.95	2.49	1.14	2007	1
2.10	0.43	4.10	2.49	2.80	4.74	2008	1

Abundance indices
92 # Total number of observations (all fleets)

# Year	Seas	Type	Value	s(log space)
# 2007 CA Recreational CPUE from WDFW (2000, 2001 removed for 2009; N=14)				
1980	1	1	4.48	0.240
1981	1	1	2.78	0.506
1982	1	1	11.27	0.361
1983	1	1	4.64	0.579
1984	1	1	8.46	0.413
1985	1	1	13.57	0.363
1986	1	1	6.25	0.314

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1993	1	1	7.72	0.552
1994	1	1	1.87	0.616
1995	1	1	3.06	0.314
1996	1	1	2.08	0.193
1997	1	1	4.23	0.249
1998	1	1	3.12	0.295
1999	1	1	2.14	0.211
# 2007 Oregon Recreational CPUE from WDFW (unchanged for 2009; N=19)
1979	1	3	16.99	0.225
1980	1	3	22.24	0.178
1981	1	3	17.98	0.169
1982	1	3	25.70	0.185
1983	1	3	31.95	0.189
1984	1	3	21.75	0.150
1986	1	3	15.27	0.143
1987	1	3	25.23	0.257
1988	1	3	14.81	0.268
1989	1	3	10.17	0.276
1990	1	3	16.02	0.208
1991	1	3	19.08	0.171
1992	1	3	16.46	0.209
1993	1	3	12.66	0.137
1994	1	3	10.17	0.132
1995	1	3	9.65	0.257
1996	1	3	6.10	0.134
1998	1	3	10.76	0.127
1999	1	3	13.84	0.186
# 2007 WA Recreational CPUE from WDFW (2000, 2001 removed for 2009; N=10)
1990	1	5	6.90	0.70
1991	1	5	16.03	1.70
1992	1	5	15.29	1.24
1993	1	5	13.19	1.01
1994	1	5	7.15	0.42
1995	1	5	5.70	0.46
1996	1	5	5.72	0.50
1997	1	5	8.75	1.05
1998	1	5	11.06	1.24
1999	1	5	6.88	0.85
# 2009 Oregon Recreational Charter observer CPUE new for 2009; N=5)
2004	1	7	0.000493 0.585
2005	1	7	0.000433 0.595
2006	1	7	0.001106 0.548
2007	1	7	0.000862 0.561
2008	1	7	0.001368 0.551
# 2007 CA CPFV CPUE from WDFW (unchanged for 2009; N=11)
1988	1	8	26.19	0.211
1989	1	8	25.52	0.130
1990	1	8	32.16	0.265
1991	1	8	31.59	0.157
1992	1	8	20.88	0.130
1993	1	8	23.63	0.156
1994	1	8	21.67	0.132
1995	1	8	16.33	0.159
1996	1	8	17.90	0.154
1997	1	8	13.31	0.137
1998	1	8	10.13	0.248
# 2009 IPHC Washington-only (N=9)
1999	1	9	0.000572 0.293
2001	1	9	0.003954 0.131
2002	1	9	0.001154 0.253
2003	1	9	0.004636 0.099
2004	1	9	0.001144 0.229
2005	1	9	0.003927 0.112
2006	1	9	0.001605 0.223
2007	1	9	0.002168 0.190
2008	1	9	0.000951 0.282
# 2009 NWFSC Trawl survey Oregon-only (N=6)
2003	1	10	1929.89	0.551
2004	1	10	179.08	0.663
2005	1	10	154.13	0.594
```

2006 1 10 462.93 0.494
2007 1 10 165.86 0.658
2008 1 10 110.93 0.507
2009 IPHC Oregon-only (N=9)
1999 1 11 0.008136 0.055
2001 1 11 0.005207 0.082
2002 1 11 0.004382 0.089
2003 1 11 0.004691 0.069
2004 1 11 0.004420 0.079
2005 1 11 0.002013 0.111
2006 1 11 0.002372 0.125
2007 1 11 0.003533 0.099
2008 1 11 0.004276 0.091
2009 Triennial Trawl survey Washington-only (N=9)
1980 1 12 69.77 0.916
1983 1 12 644.32 0.407
1986 1 12 326.19 0.313
1989 1 12 628.84 0.380
1992 1 12 70.77 0.560
1995 1 12 18.05 0.883
1998 1 12 64.95 0.559
2001 1 12 107.37 0.520
2004 1 12 132.12 0.659

Discard observation section
2 # Type: 1 = biomass (mt),2 = fraction (D/(D+R)) by weight
0 # Number of discard observations all fleets and years

Mean body weight observation section
0 # Number of mean body weight observations

Population size structure
3 # Length bin method: 1=Use data bins,2=generate from min/max/width read below,3=Read count and vector below
41 # N population bins
Lower edge of bins
8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88

-1 # Minimum proportion for compressing tails of observed compositional data
0.001 # Constant added to expected frequencies
0 # Combine males and females at and below this bin number

37 # Number of data length bins

Lower edge of data length bins by bin
16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88

154 # Total number of length observations all fleets and years
Partition: 1=discarded catch, 2=retained catch, 0=whole catch (R+D)
Gender: 0=sexes combined into length bins, 1=females only (0s male bins), 2=males only (0s for female bins), 3=both males and females, total should sum to 1.0

# Year	Seas	Type	Gender	Partition	Nsamp	Data: females then males					
# Fleet 1: 2009 CA recreational (N=16)											
1993	1	1	0	0	9.6	0	0	0	0	1	1
	1	0	1	1	4	5	4	4	2	0	1
	1	2	0	1	1	0	1	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1994	1	1	0	0	13.4	0	0	0	0	0	2
	3	2	4	9	7	4	3	9	8	2	2
	2	0	2	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1995	1	1	0	0	15.5	0	0	1	0	0	1
	1	7	4	3	3	5	9	2	3	2	0
	1	1	2	0	0	0	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1996	1	1	0	0	21.4	0	0	3	2	1	5
	3	3	3	7	6	4	4	8	4	4	5
	3	3	2	1	2	1	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1997	1	1	0	0	4.2	0	0	0	0	0	0
	0	0	0	1	0	2	2	1	0	1	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1998	1	1	0	0	7.5	0	1	0	0	0	0
	2	3	5	1	1	0	2	1	1	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1999	1	1	0	0	20.1	0	0	1	0	3	2
	4	1	4	4	2	4	8	11	8	6	8
	4	6	4	4	2	0	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2000	1	1	0	0	11.5	0	0	1	1	0	0
	0	1	6	1	3	1	1	2	6	3	5
	5	4	3	1	0	0	2	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2001	1	1	0	0	7.1	0	0	0	0	0	0
	1	1	0	2	1	2	2	1	1	1	1
	1	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2002	1	1	0	0	5.8	0	0	0	0	0	0
	0	2	1	0	0	1	1	1	2	2	1
	0	1	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2003	1	1	0	0	6.1	1	0	0	0	0	1
	0	1	1	0	3	3	1	1	0	1	1
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2004	1	1	0	0	9.1	0	0	0	1	0	0
	1	0	0	1	0	2	3	1	1	1	0
	0	2	1	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2005	1	1	0	0	17.9	0	0	0	0	0	1
	1	0	3	2	5	4	7	5	6	9	4
	4	1	2	1	1	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2006	1	1	0	0	26.1	0	0	0	0	0	0
	2	3	3	5	9	2	6	8	10	14	15
	5	6	2	3	1	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2007	1	1	0	0	18.9	0	0	0	0	1	0
	0	1	2	2	9	2	8	11	7	4	3
	1	2	2	0	1	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2008	1	1	0	0	9.7	0	0	0	0	0	0
	0	0	1	3	2	0	3	3	5	3	3
	0	2	0	1	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									

Fleet 2: 2009 CA commercial: Port and observer (N=30)

1978	1	2	0	0	4.1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	2
	2	6	1	0	0	1	0	0	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1979	1	2	0	0	23.3	0	0	0	0	0	0
	1	1	3	0	0	6	9	7	4	9	7
	7	3	2	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1980	1	2	0	0	22.8	0	0	0	0	0	0
	0	0	0	0	1	0	1	2	0	5	0
	1	4	1	3	5	5	4	2	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									

1981	1 0 4 0 0 0 0 0	2 1 2 0 0 0 0 0	0 0 0 0 0 0 0	0 0 1 0 0 0 0	25.6 3 1 0 0 0 0	0 5 0 0 0 0 0	0 5 0 0 0 0 0	0 10 2 0 0 0 0	0 5 0 0 0 0 0	0 11 0 0 0 0 0	1 11 0 0 0 0 0
1982	1 0 1 0 0 0 0 0	2 0 2 0 0 0 0 0	0 0 1 0 0 0 0	0 0 0 0 0 0 0	12.5 0 1 0 0 0 0	0 1 0 0 0 0 0	0 0 1 0 0 0 0	0 2 1 0 0 0 0	0 1 0 0 0 0 0	0 4 1 0 0 0 0	0 2 0 0 0 0 0
1983	1 1 4 0 0 0 0 0	2 3 1 0 0 0 0 0	0 1 1 0 0 0 0	0 0 1 0 0 0 0	25.9 2 0 0 0 0 0	0 1 3 0 0 0 0	0 3 3 1 0 0 0	0 2 4 0 0 0 0	0 4 1 0 0 0 0	0 3 1 0 0 0 0	0 3 0 0 0 0 0
1984	1 1 0 2 0 0 0 0	2 1 4 0 0 0 0 0	0 0 0 0 0 0 0	0 1 6 0 0 0 0	23.1 0 3 0 0 0 0	0 0 3 0 0 0 0	0 2 0 0 0 0 0	0 3 1 0 0 0 0	0 0 0 0 0 0 0	0 0 1 0 0 0 0	1 0 1 0 0 0 0
1985	1 1 2 0 0 0 0 0	2 0 0 0 0 0 0 0	0 2 0 0 0 0 0	0 0 0 0 0 0 0	23.7 1 2 0 0 0 0	0 1 1 0 0 0 0	0 4 1 0 0 0 0	0 3 1 0 0 0 0	0 3 0 0 0 0 0	0 2 0 0 0 0 0	0 3 0 0 0 0 0
1986	1 0 1 0 0 0 0 0	2 0 0 0 0 0 0 0	0 1 1 0 0 0 0	0 1 2 0 0 0 0	23.2 1 1 0 0 0 0	0 2 2 0 0 0 0	0 1 4 0 0 0 0	0 0 0 0 0 0 0	0 3 0 0 0 0 0	0 0 0 0 0 0 0	0 3 0 0 0 0 0
1987	1 1 1 0 0 0 0 0	2 1 1 0 0 0 0 0	0 1 1 0 0 0 0	0 1 2 0 0 0 0	21.6 3 3 0 0 0 0	0 1 1 0 0 0 0	0 0 0 0 0 0 0	0 1 3 0 0 0 0	0 1 0 0 0 0 0	0 2 1 0 0 0 0	0 1 0 0 0 0 0
1988	1 0 3 0 0 0 0 0	2 0 1 0 0 0 0 0	0 0 2 0 0 0 0	0 1 0 0 0 0 0	16.9 1 0 0 0 0 0	0 0 2 0 0 0 0	0 0 0 0 0 0 0	0 2 1 0 0 0 0	0 1 2 0 0 0 0	0 1 1 0 0 0 0	0 3 0 0 0 0 0
1989	1 0 7 0 0 0	2 0 5 0 0 0	0 3 1 0 0 0	0 2 5 0 0 0	27.0 1 4 0 0 0	0 3 2 0 0 0	0 3 0 0 0 0	0 4 0 0 0 0	1 1 0 0 0 0	0 3 0 0 0 0	1 5 0 0 0 0

	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1990	1	2	0	0	18.9	0	0	0	0	0	0
	1	0	1	4	4	6	1	1	0	1	0
	0	0	0	4	1	2	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1991	1	2	0	0	57.9	0	0	0	0	1	0
	1	5	5	11	13	16	15	12	23	21	11
	11	16	12	16	13	10	6	3	1	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1992	1	2	0	0	143.0	0	0	0	0	1	6
	5	21	24	26	25	32	41	48	50	29	27
	29	32	23	21	21	8	12	6	4	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1993	1	2	0	0	195.0	0	0	0	2	5	14
	33	28	54	45	52	43	59	52	57	39	42
	43	35	25	17	24	17	11	6	6	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1994	1	2	0	0	183.6	0	0	1	0	4	7
	21	26	44	60	63	54	69	69	62	61	49
	33	25	21	12	11	13	12	15	3	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1995	1	2	0	0	89.2	0	0	1	0	1	4
	11	16	24	13	40	35	29	41	26	31	22
	20	15	13	12	8	4	6	1	2	1	1
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1996	1	2	0	0	152.6	0	0	0	3	3	7
	14	32	37	30	48	56	57	40	47	26	28
	25	26	11	10	11	10	3	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1997	1	2	0	0	93.0	0	0	0	1	4	6
	14	15	21	27	24	24	17	15	24	19	17
	11	14	9	6	4	5	2	5	3	2	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1998	1	2	0	0	26.6	0	0	0	0	0	0
	0	0	2	5	7	5	3	6	8	4	5
	3	3	3	0	5	0	1	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1999	1	2	0	0	128.1	0	0	0	1	0	6
	4	7	16	36	31	39	58	53	50	45	36
	36	26	19	16	11	8	2	1	3	1	1
	1	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2000	1	2	0	0	17.6	0	0	0	0	0	2
	1	2	1	1	1	2	1	3	3	1	4
	0	1	1	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2001	1	2	0	0	46.1	0	0	0	1	2	15
	28	14	22	12	5	4	9	6	7	4	4
	2	2	2	1	2	1	0	1	1	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2002	1	2	0	0	10.7	0	0	0	0	0	0
	1	2	2	1	0	1	0	1	1	0	2
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2003	1	2	0	0	3.6	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	1	1	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2004	1	2	0	0	34.8	0	0	0	0	0	1
	1	1	4	5	9	5	5	9	8	4	5
	4	2	2	1	2	0	1	0	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2005	1	2	0	0	19.5	0	0	0	0	0	1
	0	2	1	3	4	3	3	5	7	7	1
	3	5	1	0	2	4	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2006	1	2	0	0	9.9	0	0	0	0	1	1
	0	2	2	3	2	2	3	3	3	2	3
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2007	1	2	0	0	30.9	0	0	1	1	0	2
	4	2	8	9	5	6	5	11	6	6	5

	2	1	2	0	1	0	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									

Fleet 3: 2009 OR recreational lengths (N=28)
Sexed

1978	1	3	3	0	120	0	0	0	0	0	3
	2	6	2	3	5	1	3	3	2	1	0
	1	0	4	10	3	5	1	2	3	3	3
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	1	4	1	1	1	0	3
	2	4	2	2	4	1	2	2	1	1	3
	11	2	1	1	0	0	0	0	0	0	0
	0	0									
1979	1	3	3	0	107	0	0	0	0	0	0
	3	2	2	4	2	1	0	2	3	2	2
	3	5	3	8	6	2	3	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	1	0	0	2	3	1	2	1
	1	0	1	2	2	6	4	6	7	2	2
	5	1	1	1	0	0	0	0	0	0	0
	0	0									
1984	1	3	3	0	168	0	0	0	0	0	1
	6	2	3	8	12	14	4	9	5	8	6
	3	7	5	1	4	8	5	2	0	0	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	2	2	7	6	3	4
	2	3	6	2	2	3	1	0	3	1	3
	2	0	0	0	0	0	0	0	0	0	0
	0	0									
1985	1	3	3	0	122	0	0	0	0	0	1
	1	2	1	4	2	5	1	4	2	1	1
	1	6	3	3	7	2	1	1	3	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	1	2	4	2	3	5
	3	7	3	1	2	5	3	4	5	6	3
	2	2	1	1	1	0	0	0	0	0	0
	0	0									
1986	1	3	3	0	130	0	0	0	0	0	0
	0	0	3	3	6	10	3	3	0	6	2
	1	2	5	4	6	2	5	4	1	1	0
	2	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	2	1	3	5	3	5	2
	5	3	5	1	2	2	2	2	3	7	1
	1	1	2	2	0	0	0	0	0	0	0
	0	0									
1987	1	3	3	0	121	0	0	0	0	0	3
	3	1	2	8	1	4	1	2	6	4	4
	3	4	3	3	7	2	2	4	1	1	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	3	0	1	2	2	5	4
	3	3	4	2	2	0	2	0	4	3	5
	2	1	1	0	0	0	0	0	0	0	0
	0	0									
1989	1	3	3	0	31	0	0	1	0	0	0
	0	0	2	0	0	5	2	2	0	2	0
	1	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	1	0	0	3	0	1	0
	2	1	1	0	1	2	0	0	0	0	0
	0	2	0	0	0	0	0	0	0	0	0
	0	0									

Unsexed

1980	1	3	0	0	25	0	0	0	0	0	1
	0	0	3	1	1	0	2	1	1	0	0
	2	1	0	1	3	0	4	2	0	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1981	1	3	0	0	13	0	0	0	0	0	0
	0	0	0	3	1	1	0	0	2	1	1
	0	0	0	1	0	1	0	0	1	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1982	1	3	0	0	61	0	0	0	0	0	0
	1	5	3	5	5	5	3	1	7	4	4
	6	3	1	2	1	1	1	1	0	0	0
	1	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1983	1	3	0	0	17	0	0	0	0	0	0
	1	0	0	1	0	1	3	2	2	1	2
	1	0	1	1	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1984	1	3	0	0	180	0	0	0	0	1	2
	6	5	15	22	11	21	23	14	11	7	3
	3	4	7	1	4	6	3	4	2	2	1
	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1985	1	3	0	0	100	0	0	0	0	0	0
	3	6	1	9	3	13	7	4	7	8	12
	6	1	1	3	4	1	5	2	1	3	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1986	1	3	0	0	45	0	0	1	0	1	0
	1	1	1	2	1	3	2	3	5	2	4
	0	4	2	4	1	1	0	5	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1987	1	3	0	0	44	0	0	2	0	1	0
	2	1	1	2	2	4	3	1	4	1	1
	2	3	4	2	2	1	2	1	1	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1988	1	3	0	0	38	0	0	0	0	0	0
	0	5	1	4	1	2	2	2	7	3	2
	2	0	1	3	2	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1989	1	3	0	0	81	0	0	0	3	2	2
	4	2	7	4	3	2	9	6	5	6	3
	7	4	1	1	2	4	0	1	0	1	0

	1	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1993	1	3	0	0	163	0	0	1	0	0	1
	10	13	19	15	21	17	10	4	7	4	4
	7	3	3	5	7	3	1	4	0	2	1
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1994	1	3	0	0	151	0	0	0	1	0	2
	3	10	16	14	23	11	19	9	7	5	6
	7	6	2	5	1	0	1	1	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1995	1	3	0	0	110	0	0	0	0	1	3
	0	4	9	8	15	11	8	7	3	8	3
	7	4	4	2	3	6	1	1	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1996	1	3	0	0	73	0	0	0	0	1	1
	3	2	3	9	8	9	13	4	7	3	2
	1	2	0	1	1	1	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1997	1	3	0	0	99	0	0	0	1	1	1
	3	4	7	7	9	9	14	6	12	4	2
	6	3	5	0	1	1	1	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1998	1	3	0	0	147	0	0	0	0	0	0
	3	4	6	7	21	20	15	18	14	11	5
	8	2	3	4	3	0	2	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1999	1	3	0	0	246	0	0	0	1	0	1
	2	8	13	16	27	37	24	26	19	19	10
	14	8	2	7	4	4	3	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2000	1	3	0	0	62	0	0	0	0	0	0
	0	3	3	5	4	6	10	11	4	2	4
	0	3	2	2	0	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									

2001	1	3	0	0	368	0	0	0	0	1	3
	10	8	12	20	18	29	32	31	43	37	32
	20	24	13	9	10	2	4	2	3	4	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2002	1	3	0	0	448	0	0	0	1	4	4
	5	8	11	24	31	33	40	43	36	60	40
	32	18	19	9	5	10	8	4	2	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2003	1	3	0	0	490	0	0	1	1	3	5
	13	5	11	19	19	30	37	36	42	44	48
	39	36	36	17	10	12	7	5	8	4	0
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									

Fleet 4: 2009 OR commercial (N=15)

1992	1	4	3	0	2.8	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	1	0	0	0	0	0	0	0	0	2	1
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	1	2	1	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0									
1995	1	4	3	0	15.1	0	0	0	0	0	0
	0	0	0	0	2	8	1	6	1	1	5
	1	3	1	1	1	2	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	2	2	6	0
	0	6	3	3	4	4	0	3	1	1	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1996	1	4	3	0	24.8	0	0	0	0	0	0
	0	2	0	4	5	5	9	4	5	2	2
	2	2	5	1	1	1	1	0	0	2	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	5	6	9	13
	4	14	2	2	4	3	3	2	0	3	3
	0	1	1	0	0	0	0	0	0	0	0
	0	0									
1997	1	4	3	0	39.0	0	0	1	0	0	0
	0	0	4	5	11	7	20	11	9	10	7
	4	2	6	2	1	3	1	2	1	1	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	5	4	14	24	15
	17	11	5	11	4	2	1	2	4	1	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0									
1998	1	4	3	0	16.1	0	0	0	0	0	0
	0	1	2	1	3	5	2	6	2	8	2
	3	1	3	1	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	1	0	2	8	1
	12	1	10	5	5	1	0	0	1	3	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0									
1999	1	4	3	0	33.9	0	0	0	0	0	0
	0	0	1	0	1	2	9	8	7	5	8
	10	2	4	3	1	4	2	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	8
	0	0	0	0	0	0	0	2	3	5	8

	8 0 0	9 0 0	8 2	8 0	9 1	10 0	8 1	6 0	5 0	0 0	4 0
2000	1 1 3 1 0 11 2 0	4 1 7 0 0 6 0 0	3 2 3 0 0 3 1	0 4 1 0 0 9 0	53.5 6 0 0 0 4 0	0 13 1 0 1 1 0	0 5 1 0 3 4 0	0 5 1 0 2 0 0	0 9 0 0 3 3 0	0 6 0 0 7 0 0	0 2 0 0 9 0 0
2001	1 3 6 0 0 13 1 0	4 8 6 0 0 10 1 0	3 6 3 0 0 4 0	0 7 5 0 0 7 1	76.2 7 2 0 2 5 0	0 8 1 0 14 4 0	0 19 1 0 5 3 0	0 10 2 0 5 1 0	0 6 0 0 5 4 0	0 9 1 0 3 2 0	0 10 0 0 8 1 0
2002	1 0 0 0 0 0 0 0	4 0 0 0 0 0 0 0	3 0 0 0 0 0 1	0 1 0 0 0 0 0	9.9 0 0 0 0 1 0	0 0 0 0 0 1 0	0 1 0 0 2 0 0	0 1 0 0 0 0 0	0 3 0 0 1 0 0	0 0 0 0 0 0 0	1 1 0 0 0 0 0
2003	1 0 0 0 0 1 0 0	4 0 0 0 0 0 0 0	3 2 0 0 0 0 0	0 0 0 0 0 0 0	6.1 1 0 0 2 0 0	0 1 0 0 1 0 0	0 0 0 0 8 0 0	0 1 0 0 6 0 0	0 0 0 0 5 0 0	0 0 0 0 2 0 0	0 0 0 0 0 0 0
2004	1 0 1 0 0 2 1 0	4 0 3 0 0 0 2 0	3 1 4 0 0 2 0	0 1 0 0 0 3 0	22.4 1 1 0 0 1 0	0 0 1 0 1 6 0	0 2 1 0 0 0 0	0 3 0 0 0 3 0	0 2 3 0 0 5 0	0 5 0 0 0 3 0	0 2 0 0 1 0 0
2005	1 0 1 0 0 1 1 0	4 0 0 0 0 4 0 0	3 0 3 0 0 5 0	0 0 0 0 0 1 0	27.4 2 0 0 1 2 0	0 1 0 0 0 2 0	0 0 0 0 2 0 0	0 2 0 0 3 0 0	0 4 0 0 1 1 0	0 1 0 0 0 1 0	0 0 0 0 0 0 0
2006	1 1 1 0 0 0 0 0	4 0 0 0 0 1 0 0	3 0 0 0 0 1 0	0 0 0 0 0 1 0	8.1 0 0 0 0 0 0	0 0 0 0 0 2 0	0 1 0 0 0 1 0	0 0 0 0 0 1 0	0 1 0 0 1 0 0	0 1 0 0 0 1 0	0 0 0 0 0 1 0
2007	1 0 0 0 0 0 0 0	4 0 0 0 0 0 0 0	3 0 0 0 0 0 0	0 0 0 0 0 1 0	3.7 0 0 0 0 1 0	0 0 0 0 0 0 0	0 0 2 0 0 0 0	0 1 0 0 0 0 0	0 0 0 0 0 0 0	0 0 0 0 0 0 0	0 0 0 0 0 0 0
2008	1 0 2	4 0 0	3 0 1	0 0 0	5.2 0 1	0 0 0	0 0 0	0 0 0	0 0 0	0 1 0	0 1 0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	1	0	1	1	2	1	2	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0									

Fleet 5: 2009 WA recreational (N=8)

1998	1	5	3	0	4.5	0	0	0	0	0	0
	0	0	0	0	0	2	4	0	2	0	2
	0	0	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	3	1	2	2	0	0	1	0	1	0
	0	0	2	0	0	0	0	0	0	0	0
	0	0									
1999	1	5	3	0	17.1	0	0	0	0	0	0
	0	0	0	2	0	3	2	4	5	0	2
	4	0	3	6	2	4	1	6	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	3	1	0	7
	4	3	3	4	0	1	4	0	3	6	2
	4	3	0	1	0	0	0	0	0	0	0
	0	0									
2000	1	5	3	0	33.1	0	0	0	0	0	0
	0	0	2	0	4	7	8	9	9	7	9
	6	7	4	5	5	2	4	3	3	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	1	6	4	2
	9	4	7	8	6	5	8	8	4	6	4
	4	4	1	0	0	0	0	0	0	0	0
	0	0									
2001	1	5	3	0	23.9	0	0	0	0	0	0
	0	0	0	0	0	0	5	5	6	5	2
	2	1	4	2	7	3	3	2	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	1	1	3	3
	4	4	3	8	3	5	3	4	1	2	3
	0	1	0	0	1	1	0	0	0	0	0
	0	0									
2004	1	5	3	0	6.7	0	0	0	0	0	0
	0	0	0	0	0	0	1	1	1	1	0
	0	0	2	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	1	0	0	0	1	1	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0									
2005	1	5	3	0	2.6	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	1	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2006	1	5	3	0	1.0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2008	1	5	3	0	3.8	0	0	0	0	0	0
	0	0	0	1	0	0	0	1	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0									

Fleet 6: 2009 WA commercial (N=15)
unsexed

1980	1	6	0	0	2.6	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	2	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1993	1	6	0	0	4.8	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	2	1
	1	2	2	1	2	0	1	1	0	1	1
	2	1	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1996	1	6	0	0	65.1	0	0	0	0	0	0
	2	5	8	17	13	24	27	34	26	18	9
	11	9	12	10	13	12	13	16	11	1	3
	0	2	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1997	1	6	0	0	40.6	0	0	0	0	0	0
	0	1	6	8	4	16	15	18	20	14	7
	10	5	4	3	3	1	3	3	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1998	1	6	0	0	21.7	0	0	0	0	0	0
	0	3	0	0	0	3	6	2	10	5	7
	4	5	4	2	3	1	3	1	3	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1999	1	6	0	0	14.2	0	0	0	0	0	0
	0	0	0	1	0	0	1	3	8	1	3
	4	5	3	5	2	0	1	3	2	1	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2000	1	6	0	0	69.8	0	0	0	0	0	0
	2	0	4	6	4	3	8	29	28	50	34
	40	30	32	21	27	16	12	3	9	1	0
	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2001	1	6	0	0	111.5	0	0	0	0	0	0
	0	0	0	1	1	2	13	20	42	52	91
	83	74	56	50	40	21	17	13	3	3	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
# sexed											
2002	1	6	3	0	62.9	0	0	0	0	0	0
	1	0	0	0	0	4	5	6	9	6	6
	10	6	1	4	3	1	4	2	2	1	1

	1	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	1	0	0	0	1	1	7
	3	7	10	10	9	25	6	6	9	6	3
	4	6	3	0	3	1	0	0	0	0	0
	0	0									
2003	1	6	3	0	32.1	0	0	0	0	0	0
	0	0	0	0	0	1	3	2	4	3	5
	3	2	1	0	1	2	2	1	0	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	3	1	4	5	5	2	4	0	1	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0									
2004	1	6	3	0	25.0	0	0	0	0	0	0
	0	1	0	0	0	0	0	1	3	0	4
	2	6	3	2	0	0	2	1	1	4	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	5	1	4	3	1	3	1	0	0
	0	0	1	1	0	0	0	0	0	0	0
	0	0									
2005	1	6	3	0	19.2	0	0	0	0	0	0
	0	0	1	0	0	0	1	1	0	1	1
	1	2	1	0	0	0	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	1	1	1	0	3	1	0	0	0
	0	0	1	1	1	1	0	0	0	0	0
	0	0									
2006	1	6	3	0	38.1	0	0	0	0	0	0
	0	0	1	0	0	0	3	1	2	5	7
	11	8	6	2	0	4	2	2	2	0	3
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	2
	0	0	3	3	1	3	11	5	3	3	2
	4	0	0	0	2	0	0	0	0	0	0
	0	0									
2007	1	6	3	0	10.0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	2	2	1	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	1
	0	0	1	2	5	4	0	2	4	1	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0									
2008	1	6	3	0	1.0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									

Fleet 7: 2009 Oregon recreational observer (N=5)

2004	1	7	0	0	13.9	0	0	1	1	0	0
	0	1	2	0	0	4	3	3	2	1	2
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2005	1	7	0	0	15.3	0	0	0	1	0	2
	0	2	1	1	0	1	0	2	3	2	0
	1	1	1	1	1	1	0	0	2	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									

2006	1	7	0	0	30.3	0	0	1	2	1	6
	2	3	1	2	4	2	1	2	3	1	2
	4	4	0	1	1	1	0	0	0	1	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2007	1	7	0	0	30.2	0	0	0	1	2	4
	5	3	4	7	1	3	2	3	4	1	3
	4	1	2	1	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2008	1	7	0	0	29.1	0	0	1	0	2	4
	6	7	4	8	6	1	3	2	1	1	3
	2	1	2	1	0	2	0	0	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									

Fleet 8: 2009 CA recreational CPFV (N=12)

1987	1	8	0	0	19.2	0	0	0	0	0	0
	1	4	0	1	0	0	2	5	1	1	1
	1	2	0	0	3	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1988	1	8	0	0	99.1	0	0	2	4	9	6
	19	18	14	27	13	22	19	17	11	11	10
	8	16	10	15	7	6	5	4	3	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1989	1	8	0	0	122.5	0	0	1	1	2	4
	16	15	15	30	30	24	21	18	18	13	19
	11	11	8	4	3	7	3	2	2	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1990	1	8	0	0	43.3	0	0	1	4	2	2
	3	0	5	7	8	15	9	10	4	2	2
	2	3	2	5	0	1	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1991	1	8	0	0	52.5	0	0	0	1	1	1
	2	1	11	8	12	10	6	13	7	9	3
	5	6	5	4	3	2	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1992	1	8	0	0	103.6	0	2	0	1	6	8
	1	11	3	7	13	12	16	12	10	8	14
	9	10	7	4	4	3	2	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1993	1	8	0	0	105.0	0	0	1	1	5	9
	13	14	14	10	15	12	11	22	10	9	8
	6	10	6	6	5	2	8	1	3	2	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1994	1	8	0	0	101.1	0	0	0	1	3	7
	5	15	17	15	12	19	14	12	15	11	13
	7	4	6	2	3	2	3	1	0	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1995	1	8	0	0	93.0	0	1	2	0	2	5
	5	7	10	10	14	6	11	17	11	14	7
	9	4	4	4	5	0	3	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1996	1	8	0	0	86.6	0	1	1	4	4	4
	8	6	7	8	7	21	20	11	11	9	11
	6	4	5	5	3	3	1	2	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1997	1	8	0	0	87.9	0	0	2	0	6	5
	3	3	7	6	8	13	6	11	5	9	15
	10	11	7	3	8	3	2	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1998	1	8	0	0	38.6	0	0	0	0	1	0
	2	1	2	1	3	5	3	4	6	9	3
	2	3	3	4	1	0	0	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									

#Fleet 10: 2009 WA IPHC (N=6)

2003	1	9	3	0	99	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	1	3	2
	2	2	4	4	4	4	5	12	2	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	1
	1	0	2	0	1	5	1	3	8	7	11
	5	5	0	1	0	0	0	0	0	0	0
	0	0									
2004	1	9	3	0	17	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	2	1	0	0	0	0	0	2	4	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	1	1	0	1	0	1
	2	0	0	0	0	0	0	0	0	0	0
	0	0									
2005	1	9	3	0	72	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	2	2

	4	0	4	1	2	2	4	4	1	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	4	11	2	6	7	5
	4	1	1	0	0	0	0	0	0	0	0
	0	0									
2006	1	9	3	0	34	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	1	3	4	1	1	1	1	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	1	0	0	0	2	3	5	2	2
	3	0	0	0	0	0	0	0	0	0	0
	0	0									
2007	1	9	3	0	268	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	4	5
	9	11	9	13	12	9	10	9	12	1	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	2	1	10	16	21	29	31	21	8
	6	11	3	0	0	0	0	0	0	0	0
	0	0									
2008	1	9	3	0	83	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	2	2	4	2	1	6	2	2	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	5	9	9	6	10	12
	4	1	3	0	0	0	0	0	0	0	0
	0	0									
#Fleet 11: 2009 NWFSC OR only (N=6)											
2003	1	10	3	0	8.7	0	0	0	0	0	0
	0	0	0	0	0	3	2	2	0	0	1
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	1	1	3	2
	1	2	1	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2004	1	10	3	0	5.8	0	0	0	0	0	0
	0	1	0	0	0	2	0	0	0	1	1
	1	0	0	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2005	1	10	3	0	6.8	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	1	2	0
	0	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	2
	0	1	1	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2006	1	10	3	0	10.5	0	0	0	0	0	0
	2	0	0	0	0	2	1	3	1	2	1
	3	0	2	1	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	1	1	1	0	1	1
	0	2	2	1	1	0	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2007	1	10	3	0	6.0	0	0	1	1	0	0
	0	0	0	0	0	1	0	2	0	1	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	1	0	0	0	0	0	0	1	0	0	0
	1	0	0	1	1	0	0	0	1	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2008	1	10	3	0	9.0	0	0	0	1	1	0
	0	0	0	0	0	0	0	0	0	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	2	1	0	1	0	0
	1	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
#Fleet 12: 2009 OR IPHC (N=6)											
2003	1	11	3	0	217	0	0	0	0	0	0
	0	0	0	2	0	1	0	6	10	8	8
	20	10	5	6	5	5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	4
	5	12	17	21	14	8	17	13	7	6	3
	2	1	0	1	0	0	0	0	0	0	0
	0	0									
2004	1	11	3	0	155	0	0	0	0	0	0
	0	0	0	0	0	1	0	1	7	11	7
	5	8	9	7	2	7	4	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	6	9	11	16	11	7	12	7	3	1
	0	1	0	0	0	0	0	0	0	0	0
	0	0									
2005	1	11	3	0	68	0	0	0	0	0	0
	0	0	0	0	0	0	0	5	1	5	6
	4	4	3	0	3	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	1	3	4	7	5	3	2	4	5	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2006	1	11	3	0	58	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	2
	2	2	5	3	4	1	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	1	0	5	8	7	5	3	1	3	2
	1	0	0	0	0	0	0	0	0	0	0
	0	0									
2007	1	11	3	0	103	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	1	6	2
	7	6	3	2	7	3	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	3	6	5	5	6	8	11	8	9	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0									
2008	1	11	3	0	253	0	0	0	0	0	0
	0	0	0	0	0	0	1	4	1	10	11
	14	9	12	6	7	8	6	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	0
	2	2	8	24	22	19	26	13	10	13	10
	7	3	0	1	0	0	0	0	0	0	0
	0	0									
#Fleet 13: 2009 WA Triennial (N=7)											
1986	1	12	3	0	16.6	0	0	0	0	0	1
	0	1	0	0	0	1	0	1	0	1	1
	1	3	1	0	2	0	4	2	2	0	2
	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	1	0	0	2	0	0	0	2	1	7
	2	3	6	0	1	0	0	0	0	0	0
	0	0									
1989	1	12	3	0	12.1	0	0	1	1	1	1
	1	0	0	3	0	1	0	1	2	0	1

	0	1	1	0	2	3	5	2	1	1	0
	0	0	0	0	0	0	0	0	0	0	1
	0	1	0	0	1	1	1	0	0	0	0
	0	2	2	1	0	0	0	0	2	2	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
1992	1	12	3	0	4.5	0	0	0	0	0	0
	0	1	0	0	1	0	0	0	0	1	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	1	0	0	0	0	0	0	0	0	0	0
	0	0									
1995	1	12	3	0	5.5	0	1	0	0	0	0
	0	1	0	0	0	0	0	0	1	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	1	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0									
1998	1	12	3	0	11.3	0	0	0	0	0	0
	1	0	0	0	0	0	0	2	0	2	2
	0	0	0	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	1	0	1
	0	2	0	0	2	1	1	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0									
2001	1	12	3	0	11.5	0	0	0	0	0	0
	0	0	0	0	1	2	1	2	2	1	3
	2	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	1	1	0	1	1	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									
2004	1	12	3	0	4.7	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	1	1	0
	0	2	0	2	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0									

64 # Number of age bins for data inputs
Lower edge of age bins (first is a minus group, last is a plus group)
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65

1 # Number of ageing error types
Vectors of: Average age at true age (to accumulator age)
SD of ageing precision at true age
Accumulator age = 100

0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5
	12.5	13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5	21.5	22.5
	23.5	24.5	25.5	26.5	27.5	28.5	29.5	30.5	31.5	32.5	33.5
	34.5	35.5	36.5	37.5	38.5	39.5	40.5	41.5	42.5	43.5	44.5
	45.5	46.5	47.5	48.5	49.5	50.5	51.5	52.5	53.5	54.5	55.5
	56.5	57.5	58.5	59.5	60.5	61.5	62.5	63.5	64.5	65.5	66.5
	67.5	68.5	69.5	70.5	71.5	72.5	73.5	74.5	75.5	76.5	77.5
	78.5	79.5	80.5	81.5	82.5	83.5	84.5	85.5	86.5	87.5	88.5
	89.5	90.5	91.5	92.5	93.5	94.5	95.5	96.5	97.5	98.5	99.5
	100.5										
0.343	0.343	0.439	0.534	0.628	0.721	0.812	0.903	0.993	1.082	1.170	1.257
	1.343	1.428	1.512	1.595	1.677	1.758	1.839	1.918	1.997	2.075	2.152
	2.228	2.304	2.378	2.452	2.525	2.597	2.668	2.739	2.808	2.877	2.946
	3.013	3.080	3.146	3.211	3.276	3.340	3.403	3.466	3.527	3.589	3.649

3.709	3.768	3.827	3.885	3.942	3.998	4.055	4.110	4.165	4.219	4.273
4.326	4.378	4.430	4.481	4.532	4.582	4.632	4.681	4.730	4.778	4.825
4.872	4.919	4.965	5.010	5.055	5.100	5.144	5.187	5.230	5.273	5.315
5.357	5.398	5.439	5.479	5.519	5.558	5.597	5.636	5.674	5.712	5.749
5.786	5.822	5.859	5.894	5.930	5.965	5.999	6.033	6.067	6.101	6.134
6.167										

806 # Number of age comp observations
2 # Length bin refers to: 1=population length bin indices; 2=data length bin indices; 3= actual lengths
0 #_combine males into females at or below this bin number

Year Season Type Gender Partition ageerr Lbin_lo Lbin_hi Nsamps Data: females then males
Fleet 1: 2009 CA recreational (N=4)
Conditional

1983	1	1	1	0	1	10	10	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	1	1	0	1	21	21	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

Ghost

1983	1	1	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1996	1	1	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

Fleet 2: 2009 CA commercial (N=70)
Conditional

1978	1	2	1	0	1	9	9	1	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1978	1	2	1	0	1	11	11	1	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1978	1	2	1	0	1	13	13	1	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1978	1	2	2	0	1	13	13	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1978	1	2	2	0	1	18	18	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1978	1	2	2	0	1	20	20	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1979	1	2	1	0	1	13	13	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1979	1	2	2	0	1	13	13	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1979	1	2	2	0	1	16	16	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1979	1	2	2	0	1	17	17	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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2001	1	2	2	0	1	10	10	4	0	0	0
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2001	1	2	2	0	1	13	13	1	0	0	0
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2005	1	2	1	0	1	16	16	2	0	0	0
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2005	1	2	1	0	1	18	18	1	0	0	0
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2005	1	2	1	0	1	22	22	1	0	0	0
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2005	1	2	1	0	1	23	23	1	0	0	0
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2005	1	2	2	0	1	23	23	2	0	0	0
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Ghost

1978	1	2	3	0	1	1	37	-1	0	0	0
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1979	1	2	3	0	1	1	37	-1	0	0	0
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1980	1	2	3	0	1	1	37	-1	0	0	0
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1981	1	2	3	0	1	1	37	-1	0	0	0
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1982	1	2	3	0	1	1	37	-1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1983	1	2	3	0	1	1	37	-1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1985	1	2	3	0	1	1	37	-1	0	0	0
	0	0	1	0	0	0	0	0	1	1	0
	0	1	0	0	0	1	0	0	0	0	0
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	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1986	1	2	3	0	1	1	37	-1	0	0	0
	0	0	1	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1988	1	2	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	2	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	2	3	0	1	1	37	-1	0	0	0
	0	3	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	7	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	2	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	1	0	1	0	0	0	1	0	0
	0	0	0	0	0	0	1	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

Fleet 3: 2009 OR recreational (N=187)
Conditional

1979	1	3	1	0	1	19	19	1	0	0	0
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	0	0	0	0	0	0	1	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1979	1	3	1	0	1	20	20	5	0	0	0
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	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	2	1	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1979	1	3	1	0	1	22	22	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
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	0	0	0	0							
1979	1	3	1	0	1	23	23	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1979	1	3	1	0	1	27	27	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

1979	1	3	1	0	1	33	33	1	0	0	0
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	0	0	0	0							
1979	1	3	2	0	1	18	18	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1979	1	3	2	0	1	20	20	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	1	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1979	1	3	2	0	1	21	21	2	0	0	0
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	0	0	0	0	0	0	0	0	0	1	0
	1	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1979	1	3	2	0	1	22	22	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	1	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1979	1	3	2	0	1	23	23	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1979	1	3	2	0	1	25	25	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1984	1	3	1	0	1	5	5	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1984	1	3	1	0	1	7	7	3	0	0	0
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1984	1	3	1	0	1	8	8	5	0	0	0
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	0	0	0	0							
1984	1	3	1	0	1	9	9	4	0	0	0
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	0	0	0	0							
1984	1	3	1	0	1	10	10	5	0	0	0
	0	0	0	2	0	0	1	2	0	0	0
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	0	0	0	0							
1984	1	3	1	0	1	11	11	5	0	0	0
	0	0	0	0	2	1	0	2	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1984	1	3	1	0	1	12	12	4	0	0	0
	0	0	0	1	2	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0							
1984	1	3	1	0	1	13	13	4	0	0	0
	0	0	0	0	0	0	0	2	1	0	0
	0	0	0	1	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1984	1	3	1	0	1	14	14	4	0	0	0
	0	0	0	0	0	0	0	2	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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1984	1	3	2	0	1	23	23	1	0	0	0
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1986	1	3	1	0	1	29	29	1	0	0	0
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1989	1	3	2	0	1	10	10	2	0	0	0
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1989	1	3	2	0	1	12	12	1	0	0	0
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1989	1	3	2	0	1	19	19	1	0	0	0
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1989	1	3	2	0	1	26	26	1	0	0	0
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2001	1	3	1	0	1	5	5	1	0	0	0
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2001	1	3	1	0	1	11	11	1	0	0	0
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2001	1	3	1	0	1	12	12	2	0	0	0
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2001	1	3	1	0	1	13	13	1	0	0	0
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2001	1	3	1	0	1	14	14	1	0	0	0
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2001	1	3	1	0	1	15	15	3	0	0	0
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2001	1	3	1	0	1	16	16	3	0	0	0
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2001	1	3	1	0	1	19	19	2	0	0	0
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2001	1	3	1	0	1	22	22	1	0	0	0
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2001	1	3	2	0	1	7	7	1	0	0	0
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2001	1	3	2	0	1	11	11	2	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	3	2	0	1	12	12	2	0	0	0
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2001	1	3	2	0	1	15	15	2	0	0	0
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2001	1	3	2	0	1	17	17	1	0	0	0
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	0	0	0	0							

2001	1	3	2	0	1	18	18	2	0	0	0
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	0	0	0	0							
2001	1	3	2	0	1	19	19	2	0	0	0
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2001	1	3	2	0	1	21	21	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
# Ghost											
1979	1	3	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	2	1	2	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	1	0	0	0	0	0	0	0	0	1	0
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	2	0	0	0	0	0	0	0	0	2	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1984	1	3	3	0	1	1	37	-1	0	0	0
	1	1	3	9	4	1	2	11	2	2	3
	1	0	2	2	0	0	0	2	1	0	0
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	0	1	0	0	0	3	0	0	0	0	0
	2	3	1	2	0	5	1	2	2	1	2
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	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1							
1985	1	3	3	0	1	1	37	-1	0	0	1
	0	1	0	0	3	1	0	1	1	0	0
	2	2	0	0	0	0	0	0	0	0	2
	0	0	0	0	1	0	1	1	2	1	1

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	0	0	0	0	0	0	0	0	0	1	0
	0	0	1	0	0	0	0	0	0	0	0
	0	1	0	3							
1986	1	3	3	0	1	1	37	-1	0	0	0
	0	0	1	1	1	4	2	2	1	1	0
	2	1	1	0	0	0	0	0	1	0	1
	0	0	0	2	0	0	0	0	1	0	1
	2	1	1	1	0	0	0	0	0	0	0
	0	0	0	0	1	0	1	0	0	1	0
	0	0	0	0	0	6	0	0	0	1	1
	0	2	2	1	3	2	2	3	0	2	1
	0	0	0	1	0	0	1	0	0	0	0
	0	1	0	0	0	0	1	0	1	1	0
	0	0	0	0	1	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	2							
1987	1	3	3	0	1	1	37	-1	0	0	1
	1	0	0	0	1	1	1	3	2	1	2
	1	1	3	1	0	1	1	0	1	0	1
	0	0	0	0	0	0	1	0	0	1	1
	1	0	1	1	0	0	1	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	1	0	1	0	0	4	0	0	0	1	0
	1	0	2	2	1	1	2	1	1	1	1
	1	0	2	0	0	1	0	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	2
	1	0	1	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1							
1989	1	3	3	0	1	1	37	-1	0	0	0
	1	0	1	1	1	2	0	1	2	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	3	0	2	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1							
2001	1	3	3	0	1	1	37	-1	0	0	0
	1	0	0	0	0	0	0	1	1	3	1
	0	3	1	1	1	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	2	1	1	0	2
	2	2	1	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

Fleet 4: 2009 OR commercial (N=75)
Conditional

2001	1	4	1	0	1	7	7	2	0	0	0
	0	0	0	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	4	1	0	1	12	12	2	0	0	0
	0	0	0	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	4	1	0	1	13	13	1	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	4	2	0	1	8	8	2	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	4	2	0	1	9	9	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	4	2	0	1	13	13	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	4	1	0	1	13	13	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	4	2	0	1	9	9	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	4	2	0	1	18	18	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	4	2	0	1	27	27	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1							
2003	1	4	1	0	1	9	9	2	0	0	0
	0	0	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2003	1	4	1	0	1	11	11	1	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2003	1	4	1	0	1	12	12	1	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2003	1	4	2	0	1	7	7	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2003	1	4	2	0	1	8	8	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2003	1	4	2	0	1	9	9	8	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	1	1	5	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2003	1	4	2	0	1	10	10	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	4	0	0	0	1	0	0	0

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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2003	1	4	2	0	1	11	11	5	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	2	1	1	1	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2003	1	4	2	0	1	12	12	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2003	1	4	2	0	1	14	14	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	4	1	0	1	9	9	1	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	4	1	0	1	11	11	1	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

2004	1	4	1	0	1	13	13	2	0	0	0
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	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	4	1	0	1	15	15	1	0	0	0
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2004	1	4	1	0	1	16	16	1	0	0	0
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2004	1	4	1	0	1	18	18	1	0	0	0
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2004	1	4	1	0	1	26	26	2	0	0	0
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2004	1	4	2	0	1	18	18	1	0	0	0
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2004	1	4	2	0	1	21	21	1	0	0	0
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2005	1	4	1	0	1	11	11	2	0	0	0
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2005	1	4	1	0	1	12	12	1	0	0	0
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2005	1	4	1	0	1	14	14	1	0	0	0
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2005	1	4	1	0	1	15	15	4	0	0	0
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2005	1	4	1	0	1	16	16	1	0	0	0
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2005	1	4	1	0	1	18	18	1	0	0	0
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2005	1	4	1	0	1	20	20	2	0	0	0
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2005	1	4	2	0	1	7	7	1	0	0	0
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2005	1	4	2	0	1	9	9	1	0	0	0
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2005	1	4	2	0	1	10	10	2	0	0	0
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2005	1	4	2	0	1	11	11	1	0	0	0
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2005	1	4	2	0	1	14	14	1	0	0	0
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2005	1	4	2	0	1	15	15	3	0	0	0
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2005	1	4	2	0	1	16	16	2	0	0	0
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2005	1	4	2	0	1	17	17	1	0	0	0
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2005	1	4	2	0	1	18	18	1	0	0	0
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2005	1	4	2	0	1	19	19	2	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	4	2	0	1	23	23	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	4	2	0	1	25	25	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	4	1	0	1	7	7	1	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	4	1	0	1	16	16	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	4	1	0	1	18	18	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	4	2	0	1	15	15	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	4	2	0	1	16	16	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	4	2	0	1	17	17	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	4	2	0	1	19	19	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	1	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	4	2	0	1	20	20	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	4	2	0	1	21	21	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	4	2	0	1	23	23	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1							
2006	1	4	2	0	1	24	24	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	4	1	0	1	14	14	1	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

2007	1	4	1	0	1	24	24	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	4	2	0	1	17	17	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	4	2	0	1	18	18	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
# Ghost											
2001	1	4	3	0	1	1	37	-1	0	0	0
	0	0	0	5	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	3	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2002	1	4	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1							
2003	1	4	3	0	1	1	37	-1	0	0	0
	0	0	0	0	2	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	1	9	9	1	2	0	1	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	4	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	2	0	0	1	1	1
	0	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	1	0
	0	0	1	0	1	0	0	0	1	0	0
	0	0	0	0	0	1	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	4	3	0	1	1	37	-1	0	0	0
	0	0	0	1	0	1	1	2	0	0	1
	1	0	0	1	1	0	0	1	1	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	1	0	0	4	2	1	0	1	0	0	1
	0	0	1	1	2	0	0	0	0	0	0
	1	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	4	3	0	1	1	37	-1	0	0	0
	1	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
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	1	0	0	0	0	0	1	1	1	0	0
	1	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1							
2007	1	4	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

Fleet 5: 2009 WA rec (N=143)
Conditional

1998	1	5	1	0	1	12	12	2	0	0	0
	0	0	0	0	0	0	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	5	1	0	1	13	13	4	0	0	0
	0	0	0	1	0	0	0	0	2	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1998	1	5	1	0	1	15	15	2	0	0	0
	0	0	0	0	0	0	0	1	1	0	0
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1999	1	5	1	0	1	17	17	2	0	0	0
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1999	1	5	1	0	1	18	18	4	0	0	0
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1999	1	5	1	0	1	20	20	3	0	0	0
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1999	1	5	1	0	1	21	21	6	0	0	0
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1999	1	5	1	0	1	22	22	2	0	0	0
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1999	1	5	1	0	1	23	23	4	0	0	0
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1999	1	5	1	0	1	24	24	1	0	0	0
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1999	1	5	1	0	1	25	25	6	0	0	0
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1999	1	5	1	0	1	26	26	1	0	0	0
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1999	1	5	1	0	1	27	27	1	0	0	0
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1999	1	5	2	0	1	10	10	3	0	0	0
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1999	1	5	2	0	1	11	11	1	0	0	0
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2000	1	5	1	0	1	11	11	4	0	0	0
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2000	1	5	1	0	1	12	12	7	0	0	0
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2000	1	5	1	0	1	15	15	9	0	0	0
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2000	1	5	1	0	1	16	16	7	0	0	0
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2000	1	5	1	0	1	17	17	9	0	0	0
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2000	1	5	1	0	1	18	18	6	0	0	0
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2000	1	5	1	0	1	19	19	7	0	0	0
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2000	1	5	1	0	1	20	20	4	0	0	0
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2000	1	5	1	0	1	22	22	5	0	0	0
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2000	1	5	1	0	1	23	23	2	0	0	0
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2000	1	5	2	0	1	17	17	8	0	0	0
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2000	1	5	2	0	1	20	20	8	0	0	0
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2000	1	5	2	0	1	21	21	8	0	0	0
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2000	1	5	2	0	1	22	22	4	0	0	0
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2000	1	5	2	0	1	23	23	6	0	0	0
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2000	1	5	2	0	1	24	24	4	0	0	0
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2000	1	5	2	0	1	25	25	4	0	0	0
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2000	1	5	2	0	1	26	26	4	0	0	0
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2000	1	5	2	0	1	27	27	1	0	0	0
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2001	1	5	1	0	1	13	13	5	0	0	0
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2001	1	5	1	0	1	14	14	5	0	0	0
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2001	1	5	2	0	1	12	12	3	0	0	0
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2001	1	5	2	0	1	13	13	3	0	0	0
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2001	1	5	2	0	1	14	14	4	0	0	0
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2001	1	5	2	0	1	15	15	4	0	0	0
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2001	1	5	2	0	1	16	16	3	0	0	0
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2001	1	5	2	0	1	17	17	8	0	0	0
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2001	1	5	2	0	1	18	18	3	0	0	0
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2001	1	5	2	0	1	19	19	5	0	0	0
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2001	1	5	2	0	1	20	20	3	0	0	0
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2001	1	5	2	0	1	21	21	4	0	0	0
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2001	1	5	2	0	1	22	22	1	0	0	0
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2001	1	5	2	0	1	26	26	1	0	0	0
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2001	1	5	2	0	1	29	29	1	0	0	0
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2001	1	5	2	0	1	30	30	1	0	0	0
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2004	1	5	1	0	1	13	13	1	0	0	0
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2004	1	5	1	0	1	14	14	1	0	0	0
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2004	1	5	1	0	1	20	20	2	0	0	0
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	0	0	0	0							
2004	1	5	1	0	1	28	28	1	0	0	0
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2004	1	5	2	0	1	15	15	1	0	0	0
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2004	1	5	2	0	1	18	18	1	0	0	0
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2004	1	5	2	0	1	22	22	1	0	0	0
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	0	0	0	0							
2004	1	5	2	0	1	23	23	1	0	0	0
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	0	0	0	0							
2004	1	5	2	0	1	26	26	1	0	0	0
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	0	0	0	0							
2005	1	5	2	0	1	16	16	1	0	0	0
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2005	1	5	2	0	1	19	19	1	0	0	0
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	0	0	0	0							
2005	1	5	2	0	1	21	21	2	0	0	0
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	0	0	0	0							
2006	1	5	1	0	1	15	15	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	1	0	1	10	10	1	0	0	0
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	0	0	0	0							
2008	1	5	1	0	1	14	14	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	1	0	1	21	21	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	2	0	1	8	8	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	2	0	1	21	21	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	2	0	1	31	31	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1							
# Ghost											
1998	1	5	3	0	1	1	37	-1	0	0	0
	0	0	0	1	0	0	1	1	4	0	2
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	1	0	0	0	1	1	2	1	0
	1	2	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	2
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1							
1999	1	5	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	0	2	1	2	2
	2	4	3	0	1	1	1	0	1	2	1
	1	1	4	2	0	1	0	0	0	0	0
	1	1	0	0	2	0	0	0	0	1	0
	2	1	2	0	0	0	1	0	0	0	0
	0	0	0	0	1	2	0	0	0	0	0
	0	0	0	0	2	2	1	2	3	2	7
	3	2	0	0	0	0	2	1	1	1	1
	2	1	0	2	1	0	0	0	0	0	0
	1	0	3	0	0	1	0	1	0	0	1
	0	0	0	0	1	0	0	1	1	1	0
	0	0	0	2							
2000	1	5	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	1	4	5	3	4	6
	8	8	5	4	1	4	1	0	0	2	4
	2	2	1	5	4	1	3	1	1	0	0
	0	0	1	0	0	0	1	1	0	0	1
	3	1	0	0	0	0	0	0	1	1	0
	1	0	1	0	1	3	0	0	0	0	0
	1	1	0	1	1	2	3	4	2	8	6
	3	8	2	2	3	1	3	2	7	2	4
	6	3	1	2	0	1	0	0	0	1	1
	3	2	0	1	1	0	0	0	1	0	0
	1	2	0	0	0	0	0	1	0	0	0
	0	0	0	0							
2001	1	5	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	2	1	1	1	2	4
	4	1	3	2	1	2	1	3	1	0	0
	1	0	1	0	1	1	0	1	0	1	0
	1	0	1	1	1	0	1	0	0	0	0
	0	1	1	0	0	0	0	0	0	0	0
	1	0	0	1	0	4	0	0	0	0	0
	0	1	1	0	3	2	1	3	4	6	4
	4	3	4	1	1	1	0	2	0	1	0
	0	1	1	0	1	0	1	0	0	2	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	3							
2004	1	5	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	1	0	0	0	0	1	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	1
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	5	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	1	1	0	2	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	5	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	5	3	0	1	1	37	-1	0	0	0
	0	0	1	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1							

Fleet 6: 2009 WA commercial (N=177)
Conditional

1993	1	6	1	0	1	15	15	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1993	1	6	1	0	1	16	16	2	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1993	1	6	1	0	1	17	17	1	0	0	0
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	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0							
1993	1	6	1	0	1	19	19	2	0	0	0
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	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0							
1993	1	6	1	0	1	20	20	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1993	1	6	1	0	1	22	22	1	0	0	0
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	0	0	0	0							
1993	1	6	1	0	1	25	25	1	0	0	0
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	0	0	0	0							
1993	1	6	1	0	1	27	27	1	0	0	0
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	0	0	0	0							
1993	1	6	1	0	1	29	29	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0							
1993	1	6	2	0	1	20	20	1	0	0	0
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	0	0	0	0							
1993	1	6	2	0	1	21	21	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1993	1	6	2	0	1	22	22	1	0	0	0
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	0	1	0	0	0	0	0	0	0	0	0
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	0	0	0	0							
1993	1	6	2	0	1	24	24	1	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
1993	1	6	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

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1993	1	6	2	0	1	29	29	1	0	0	0
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	0	0	0	0							
1993	1	6	2	0	1	30	30	1	0	0	0
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	0	0	0	0							
1993	1	6	2	0	1	33	33	1	0	0	0
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	0	0	0	1							
2001	1	6	1	0	1	13	13	1	0	0	0
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	0	0	1	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	6	1	0	1	14	14	2	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	6	1	0	1	15	15	3	0	0	0
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	0	0	0	1	1	0	1	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	6	1	0	1	16	16	4	0	0	0
	0	0	0	0	0	0	0	0	0	1	1
	1	1	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2001	1	6	1	0	1	17	17	4	0	0	0
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	0	0	1	2	0	1	0	0	0	0	0
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2001	1	6	1	0	1	20	20	7	0	0	0
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2001	1	6	1	0	1	21	21	7	0	0	0
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2001	1	6	1	0	1	25	25	2	0	0	0
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2001	1	6	1	0	1	26	26	1	0	0	0
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2001	1	6	2	0	1	18	18	7	0	0	0
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2001	1	6	2	0	1	19	19	12	0	0	0
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2001	1	6	2	0	1	20	20	10	0	0	0
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2001	1	6	2	0	1	21	21	13	0	0	0
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2001	1	6	2	0	1	22	22	10	0	0	0
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2001	1	6	2	0	1	23	23	3	0	0	0
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2001	1	6	2	0	1	24	24	4	0	0	0
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2001	1	6	2	0	1	25	25	5	0	0	0
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2001	1	6	2	0	1	26	26	1	0	0	0
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2001	1	6	2	0	1	27	27	1	0	0	0
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2002	1	6	1	0	1	12	12	3	0	0	0
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2002	1	6	1	0	1	13	13	3	0	0	0
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2002	1	6	1	0	1	14	14	4	0	0	0
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2002	1	6	1	0	1	15	15	4	0	0	0
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2002	1	6	1	0	1	16	16	5	0	0	0
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2002	1	6	2	0	1	26	26	2	0	0	0
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2004	1	6	1	0	1	15	15	3	0	0	0
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2004	1	6	1	0	1	17	17	4	0	0	0
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2004	1	6	1	0	1	18	18	2	0	0	0
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2004	1	6	1	0	1	19	19	5	0	0	0
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2004	1	6	1	0	1	20	20	3	0	0	0
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2004	1	6	1	0	1	21	21	1	0	0	0
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2004	1	6	1	0	1	24	24	2	0	0	0
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2004	1	6	1	0	1	26	26	1	0	0	0
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2004	1	6	1	0	1	27	27	4	0	0	0
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2004	1	6	2	0	1	15	15	1	0	0	0
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2004	1	6	2	0	1	16	16	4	0	0	0
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2004	1	6	2	0	1	17	17	1	0	0	0
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2004	1	6	2	0	1	18	18	1	0	0	0
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2004	1	6	2	0	1	27	27	1	0	0	0
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2005	1	6	1	0	1	9	9	1	0	0	0
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2005	1	6	2	0	1	14	14	1	0	0	0
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2005	1	6	2	0	1	16	16	1	0	0	0
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2005	1	6	2	0	1	17	17	1	0	0	0
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2005	1	6	2	0	1	20	20	3	0	0	0
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2005	1	6	2	0	1	21	21	1	0	0	0
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2005	1	6	2	0	1	27	27	1	0	0	0
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2005	1	6	2	0	1	28	28	1	0	0	0
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2005	1	6	2	0	1	29	29	1	0	0	0
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2006	1	6	1	0	1	9	9	1	0	0	0
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2006	1	6	1	0	1	13	13	3	0	0	0
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2006	1	6	1	0	1	14	14	1	0	0	0
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2006	1	6	1	0	1	15	15	2	0	0	0
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2006	1	6	1	0	1	16	16	5	0	0	0
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	0	0	0	0							
2006	1	6	1	0	1	17	17	7	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	6	1	0	1	18	18	11	0	0	0
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	0	1	0	2	0	1	1	1	0	1	1
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2006	1	6	1	0	1	20	20	5	0	0	0
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2006	1	6	1	0	1	21	21	1	0	0	0
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2006	1	6	1	0	1	23	23	4	0	0	0
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2006	1	6	1	0	1	24	24	1	0	0	0
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2006	1	6	1	0	1	25	25	2	0	0	0
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2006	1	6	1	0	1	26	26	2	0	0	0
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2006	1	6	1	0	1	28	28	2	0	0	0
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2006	1	6	2	0	1	4	4	1	0	0	0
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2006	1	6	2	0	1	13	13	1	0	0	0
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2006	1	6	2	0	1	16	16	2	0	0	0
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2006	1	6	2	0	1	17	17	3	0	0	0
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2006	1	6	2	0	1	18	18	1	0	0	0
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	0	0	0	0							
2006	1	6	2	0	1	19	19	3	0	0	0
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2006	1	6	2	0	1	20	20	11	0	0	0
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2006	1	6	2	0	1	21	21	5	0	0	0
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2006	1	6	2	0	1	22	22	3	0	0	0
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2006	1	6	2	0	1	23	23	3	0	0	0
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2006	1	6	2	0	1	24	24	2	0	0	0
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2006	1	6	2	0	1	25	25	4	0	0	0
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2006	1	6	2	0	1	29	29	2	0	0	0
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2007	1	6	1	0	1	14	14	1	0	0	0
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2007	1	6	1	0	1	19	19	2	0	0	0
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2007	1	6	1	0	1	20	20	2	0	0	0
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2007	1	6	1	0	1	21	21	1	0	0	0
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	0	0	0	0							
2007	1	6	1	0	1	24	24	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	6	2	0	1	11	11	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	6	2	0	1	13	13	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	6	2	0	1	16	16	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	6	2	0	1	17	17	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	6	2	0	1	18	18	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	1	1	0	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	6	2	0	1	19	19	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	2	0
	0	0	1	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	6	2	0	1	21	21	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	6	2	0	1	22	22	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	0
	0	0	0	0	0	0	1	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2007	1	6	2	0	1	26	26	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	6	2	0	1	20	20	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
# Ghost											
1993	1	6	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	2	2	0	0	0
	1	2	0	0	1	0	0	0	0	0	1
	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	0
	0	1	0	0	0	0	0	0	1	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0

	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	1							
2001	1	6	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	0	1	0	1	2
	1	3	3	4	3	1	4	2	0	1	1
	2	0	1	3	6	1	2	0	0	1	1
	1	0	0	0	2	0	0	0	0	0	0
	0	1	2	0	0	1	0	0	1	0	0
	1	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	2	2	2	3
	7	4	5	5	8	2	5	4	1	1	3
	6	3	4	2	5	1	1	0	0	1	1
	0	0	0	0	0	0	1	0	1	0	1
	0	0	0	1	0	0	0	1	0	0	0
	1	1	0	3							
2002	1	6	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	1	0	1	2	3
	2	0	3	4	7	4	1	3	0	0	0
	1	1	0	0	0	0	1	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	2	0	0	0	0	0
	0	1	1	0	0	2	1	1	2	1	5
	5	7	9	6	4	2	0	3	0	2	1
	0	1	1	1	0	2	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	1	0	0	0
	0	0	0	4							
2003	1	6	3	0	1	1	37	-1	0	0	0
	0	0	0	1	0	0	0	0	1	0	0
	1	2	1	0	1	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	1	2	0	0	0
	2	0	1	0	0	0	1	0	0	0	1
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	6	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	1	1	1	1	1	0	3	2	2	3	0
	1	1	0	1	0	0	1	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	5	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	2	1
	0	2	1	0	0	3	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	1							
2005	1	6	3	0	1	1	37	-1	0	0	0
	0	0	0	0	1	0	2	0	1	1	0
	0	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	1	0
	1	0	2	1	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3							
2006	1	6	3	0	1	1	37	-1	0	0	0
	0	0	1	0	0	1	1	2	0	2	5
	1	2	1	2	1	3	2	2	0	4	4

	2	0	1	1	0	2	0	0	0	1	2
	0	3	0	1	0	0	0	0	0	1	1
	0	0	0	0	0	1	0	0	0	0	1
	0	0	1	0	0	3	0	0	0	1	0
	0	0	0	0	0	1	1	1	0	0	2
	1	2	4	3	0	4	3	4	1	1	1
	0	2	2	2	0	0	1	0	1	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	1	0	1	0
	0	0	0	0							
2007	1	6	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	1	0	1	2	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	1	0
	0	0	0	1	1	0	0	0	0	4	0
	0	1	2	0	4	1	0	0	1	2	0
	0	0	0	0	0	0	1	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	6	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

Fleet 9: 2009 WA IPHC marginal age (N=72)
Marginal

2003	1	9	0	0	1	1	37	99	0	0	0
	0	0	0	0	0	0	0	1	0	2	0
	1	2	2	2	2	1	3	0	5	3	0
	3	3	1	4	2	3	2	1	1	1	4
	0	1	1	1	1	0	1	1	2	0	0
	2	2	2	1	1	1	1	2	1	0	0
	0	0	0	1	1	27	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	9	0	0	1	1	37	17	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	2	0	1	1	0	0	1
	0	0	0	0	0	1	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	1	0	0	0	0
	0	0	0	1	0	5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	9	0	0	1	1	37	72	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	3	0	2	4	7	4	3
	2	4	2	0	0	1	3	2	3	1	3
	0	3	1	0	0	0	0	0	0	0	2
	0	0	1	1	2	1	1	0	0	0	3

	0	0	0	1	1	10	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
# Conditional											
2006	1	9	1	0	1	17	17	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	9	1	0	1	19	19	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	9	1	0	1	20	20	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	1
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	9	1	0	1	21	21	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	0	0	0	1	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	9	1	0	1	22	22	1	0	0	0
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2006	1	9	2	0	1	13	13	1	0	0	0
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2006	1	9	2	0	1	20	20	2	0	0	0
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2006	1	9	2	0	1	21	21	3	0	0	0
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2006	1	9	2	0	1	22	22	5	0	0	0
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2006	1	9	2	0	1	23	23	2	0	0	0
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2006	1	9	2	0	1	24	24	2	0	0	0
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2006	1	9	2	0	1	25	25	3	0	0	0
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2007	1	9	1	0	1	15	15	2	0	0	0
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2007	1	9	1	0	1	16	16	4	0	0	0
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2007	1	9	1	0	1	17	17	5	0	0	0
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2007	1	9	1	0	1	18	18	9	0	0	0
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2007	1	9	1	0	1	19	19	11	0	0	0
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2007	1	9	1	0	1	20	20	9	0	0	0
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2007	1	9	1	0	1	21	21	13	0	0	0
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2007	1	9	1	0	1	22	22	12	0	0	0
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2007	1	9	1	0	1	23	23	9	0	0	0
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2007	1	9	1	0	1	24	24	10	0	0	0
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2007	1	9	1	0	1	25	25	9	0	0	0
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2007	1	9	1	0	1	26	26	12	0	0	0
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2007	1	9	1	0	1	27	27	1	0	0	0
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2007	1	9	1	0	1	28	28	1	0	0	0
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2007	1	9	1	0	1	29	29	1	0	0	0
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2007	1	9	2	0	1	13	13	1	0	0	0
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2007	1	9	2	0	1	16	16	2	0	0	0
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2007	1	9	2	0	1	18	18	10	0	0	0
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2007	1	9	2	0	1	19	19	16	0	0	0
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2007	1	9	2	0	1	20	20	21	0	0	0
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2007	1	9	2	0	1	21	21	29	0	0	0
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2007	1	9	2	0	1	22	22	31	0	0	0
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2007	1	9	2	0	1	23	23	21	0	0	0
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2007	1	9	2	0	1	24	24	8	0	0	0
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2007	1	9	2	0	1	25	25	6	0	0	0
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2007	1	9	2	0	1	26	26	11	0	0	0
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2007	1	9	2	0	1	27	27	3	0	0	0
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2008	1	9	1	0	1	16	16	1	0	0	0
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2008	1	9	1	0	1	18	18	2	0	0	0
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2008	1	9	1	0	1	19	19	2	0	0	0
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2008	1	9	1	0	1	20	20	4	0	0	0
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2008	1	9	1	0	1	21	21	2	0	0	0
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2008	1	9	1	0	1	22	22	1	0	0	0
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2008	1	9	1	0	1	23	23	6	0	0	0
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2008	1	9	1	0	1	24	24	2	0	0	0
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2008	1	9	1	0	1	25	25	2	0	0	0
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2008	1	9	1	0	1	26	26	1	0	0	0
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2008	1	9	2	0	1	18	18	1	0	0	0
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2008	1	9	2	0	1	19	19	5	0	0	0
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2008	1	9	2	0	1	20	20	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	1	1	0	1	0
	1	2	0	1	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	9	2	0	1	21	21	9	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	2	1	0	1	0	2	0	0	1	0
	1	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	9	2	0	1	22	22	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	1
	1	0	0	0	1	1	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	9	2	0	1	23	23	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	1	0	0	0
	0	1	1	0	0	2	0	0	1	0	0
	0	0	0	1	1	0	0	0	0	0	0
	0	0	0	1							
2008	1	9	2	0	1	24	24	12	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0
	1	1	1	3	0	1	0	1	0	0	1
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	9	2	0	1	25	25	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	2	0	0	0
	0	0	0	1							
2008	1	9	2	0	1	26	26	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2008	1	9	2	0	1	27	27	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	1	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

Ghost

2006	1	9	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	3	2
	1	0	1	2	1	2	1	1	3	2	0
	0	0	2	0	0	0	0	0	0	0	0
	0	1	0	2	1	0	0	1	1	1	0
	0	0	0	0	0	7	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	2	2	1	1	0	8	5	5	2
	1	3	0	1	1	5	3	0	2	0	1
	0	0	1	0	0	0	0	0	0	0	2
	0	0	0	0	0	0	1	3	1	0	1
	0	0	0	3							
2007	1	9	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	2	0	1	5	6	7	3
	5	2	3	4	4	3	2	5	3	4	7
	3	3	2	4	3	2	1	1	1	1	1
	0	1	1	1	0	3	0	1	4	1	3
	0	3	1	0	0	38	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	0
	1	2	2	1	7	7	5	11	17	15	10
	9	6	10	8	4	6	3	4	4	5	6
	4	4	4	3	5	5	2	1	1	3	4
	1	1	0	0	4	1	1	1	0	0	1
	2	0	0	29							
2008	1	9	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	0	0	1	0	1
	0	0	0	1	0	1	2	1	2	3	7
	3	2	6	2	5	1	4	2	3	3	1
	3	1	3	3	5	2	2	1	1	1	2
	0	1	1	2	0	1	0	1	0	0	1
	1	0	1	1	1	27	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	2	3	5	1	3	1	7	10	11	11	14
	7	7	3	4	13	5	6	8	3	6	6
	4	5	7	6	4	4	2	1	2	2	3
	0	3	2	2	1	0	2	6	1	1	2
	2	1	2	19							

Fleet 11: 2009 OR IPHC (N=78)
Marginal

2003	1	11	0	0	1	1	37	215	0	0	0
	0	0	0	0	1	0	0	0	0	0	2
	2	9	11	7	18	12	12	9	6	4	4
	10	10	11	8	6	13	9	3	1	3	1
	3	0	2	2	0	1	1	0	4	1	1
	3	3	1	2	1	1	1	2	1	1	0
	0	1	2	1	0	8	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2004	1	11	0	0	1	1	37	157	0	0	0
	0	0	0	0	0	0	0	0	1	1	1
	1	3	5	7	6	12	9	14	7	9	3
	4	2	1	5	6	6	4	5	3	2	1
	1	0	0	1	1	0	2	3	2	2	2
	2	0	0	2	0	3	2	1	2	0	2
	2	1	0	0	0	8	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2005	1	11	0	0	1	1	37	62	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	1	1	2	1	5	9	2	5	5	2
	1	0	1	3	2	1	1	2	1	2	1
	0	1	1	0	0	0	0	0	0	0	2
	0	0	0	0	1	0	0	0	0	0	0
	1	2	2	0	0	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
# Conditional											
2006	1	11	1	0	1	15	15	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	11	1	0	1	17	17	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	11	1	0	1	18	18	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	11	1	0	1	19	19	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	11	1	0	1	20	20	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	1	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	11	1	0	1	21	21	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	11	1	0	1	22	22	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	1	1	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	11	1	0	1	23	23	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	11	1	0	1	26	26	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	11	2	0	1	13	13	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	11	2	0	1	15	15	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	11	2	0	1	17	17	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	1	0	0	0	2	1	0	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							
2006	1	11	2	0	1	18	18	8	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

2006	1	11	2	0	1	19	19	7	0	0	0
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2006	1	11	2	0	1	21	21	3	0	0	0
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2006	1	11	2	0	1	25	25	1	0	0	0
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2007	1	11	1	0	1	15	15	1	0	0	0
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2007	1	11	1	0	1	16	16	6	0	0	0
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2007	1	11	1	0	1	17	17	2	0	0	0
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2007	1	11	1	0	1	18	18	7	0	0	0
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2007	1	11	1	0	1	19	19	6	0	0	0
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2007	1	11	1	0	1	20	20	3	0	0	0
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2007	1	11	1	0	1	21	21	2	0	0	0
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2007	1	11	1	0	1	22	22	7	0	0	0
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2007	1	11	1	0	1	23	23	3	0	0	0
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2007	1	11	1	0	1	24	24	1	0	0	0
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2007	1	11	2	0	1	13	13	1	0	0	0
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2007	1	11	2	0	1	15	15	3	0	0	0
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2007	1	11	2	0	1	16	16	6	0	0	0
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2007	1	11	2	0	1	17	17	5	0	0	0
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2007	1	11	2	0	1	18	18	4	0	0	0
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2007	1	11	2	0	1	19	19	6	0	0	0
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2007	1	11	2	0	1	20	20	8	0	0	0
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2007	1	11	2	0	1	21	21	10	0	0	0
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2007	1	11	2	0	1	22	22	8	0	0	0
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2007	1	11	2	0	1	23	23	9	0	0	0
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2007	1	11	2	0	1	24	24	1	0	0	0
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2007	1	11	2	0	1	25	25	1	0	0	0
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2008	1	11	1	0	1	13	13	1	0	0	0
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2008	1	11	1	0	1	14	14	4	0	0	0
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2008	1	11	1	0	1	15	15	1	0	0	0
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2008	1	11	1	0	1	16	16	10	0	0	0
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2008	1	11	1	0	1	17	17	11	0	0	0
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2008	1	11	1	0	1	18	18	14	0	0	0
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2008	1	11	1	0	1	19	19	9	0	0	0
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	0	0	0	0							
2008	1	11	1	0	1	20	20	12	0	0	0
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2008	1	11	1	0	1	21	21	6	0	0	0
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	0	0	0	0							
2008	1	11	1	0	1	22	22	6	0	0	0
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2008	1	11	1	0	1	23	23	8	0	0	0
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2008	1	11	1	0	1	24	24	6	0	0	0
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	0	0	0	0							
2008	1	11	1	0	1	25	25	1	0	0	0
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2008	1	11	1	0	1	26	26	1	0	0	0
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2008	1	11	2	0	1	12	12	2	0	0	0
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2008	1	11	2	0	1	14	14	2	0	0	0
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2008	1	11	2	0	1	15	15	2	0	0	0
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2008	1	11	2	0	1	16	16	8	0	0	0
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2008	1	11	2	0	1	17	17	24	0	0	0
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2008	1	11	2	0	1	18	18	22	0	0	0
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2008	1	11	2	0	1	19	19	19	0	0	0
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2008	1	11	2	0	1	20	20	26	0	0	0
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2008	1	11	2	0	1	21	21	13	0	0	0
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2008	1	11	2	0	1	22	22	10	0	0	0
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2008	1	11	2	0	1	23	23	13	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1
	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	1
	0	1	0	1	0	0	0	2	1	0	0
	0	0	1	3							
2008	1	11	2	0	1	24	24	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	1	0	0
	0	0	1	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	1	1
	0	0	0	4							
2008	1	11	2	0	1	25	25	6	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	6							
2008	1	11	2	0	1	26	26	3	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3							
2008	1	11	2	0	1	28	28	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0							

Ghost

2006	1	11	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	1	1
	0	0	0	1	0	2	1	0	2	1	0
	0	0	2	0	0	0	0	0	0	0	0
	0	1	0	1	1	0	0	1	1	1	0
	0	0	0	0	0	3	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0
	0	0	1	1	1	1	0	6	3	3	2
	0	3	0	1	1	4	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	2
	0	0	0	0	0	0	0	2	1	0	1
	0	0	0	1							
2007	1	11	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	1	4	4	1	1
	1	0	0	2	1	1	1	3	0	0	3
	2	1	0	1	0	0	0	0	0	1	0
	0	0	0	0	0	2	0	0	2	0	1
	0	0	1	0	0	4	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	0
	1	2	0	1	4	3	3	3	5	4	1
	1	0	1	6	0	2	0	2	0	1	1
	0	0	0	0	2	1	0	0	0	1	3
	0	0	0	0	2	1	0	0	0	0	0
	1	0	0	8							
2008	1	11	3	0	1	1	37	-1	0	0	0
	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	1	0	1	1	1	1	3	7
	3	2	5	1	4	1	3	2	3	3	0
	3	1	2	0	5	1	1	0	1	1	2
	0	1	1	0	0	1	0	0	0	0	1
	1	0	1	1	1	22	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0
	2	3	3	1	1	1	6	8	11	8	12
	4	3	2	2	10	4	3	6	3	5	5
	1	2	4	3	4	0	1	0	1	2	2
	0	3	1	1	0	0	2	4	1	1	2
	2	1	2	17							

0 # No Mean Size-at-Age observations
0 # Total number of environmental variables
0 # Total number of environmental observations
0 # No Weight frequency data
0 # No tagging data
0 # No morph composition data

999 # End data file

14. Appendix C: SS Control file

Control file for 2009 yelloweye assessment

Yelloweye 2009 control file

Morph setup
1 # Number of growth patterns
1 # N sub morphs within GPs

Area setup
3 # Number of recruitment assignments
0 # Recruitment interaction flag
For each recruitment assignment
GP seas area
 1 1 1
 1 1 2
 1 1 3
0 # Number of movement parameters

Time block setup
0 # Number of block designs

Mortality and growth specifications
0.5 # Fraction female at birth
1 # M setup: 0=single Par,1=N_breakpoints,2=Lorenzen,3=agespecific;_4=agespec_withseasinterpolate
1 # Number of M breakpoints
4 # Ages at M breakpoints
1 # Growth model: 1=VB with L1 and L2, 2=VB with A0 and Linf, 3=Richards, 4=Read vector of L@A
1 # Age for growth Lmin
70 # Age for growth Lmax or 999 = Linf
0 # SD constant added to LAA (0.1 mimics v1.xx for compatibility only)
0 # Variability about growth: 0=CV~f(LAA) [mimic v1.xx], 1=CV~f(A), 2=SD~f(LAA), 3=SD~f(A)
1 # Maturity option: 1=length logistic, 2=age logistic, 3=read age-maturity matrix by growth_pattern
2 # First age allowed to mature
1 # Fecundity option
0 # Hermaphroditic option
1 # mg parm offset option: 1=direct assignment, 2=each pat. x gender offset from pat. 1 gender 1, 3=offsets as SS2 V1.xx with M old and CV old offset from young values
1 # mg parm adjust method 1=do V1.23 approach, 2=use logistic transform between bounds

Mortality and growth parameters

# Lo # bnd	Hi bnd	Init value	Prior mean	Prior type	Prior SD	Param phase	Env var	Use dev	Dev minyr	Dev maxyr	Dev SD	Block design	block switch	
0.01	0.15	0.044	0.0517	0	0.0226	6	0	0	0	0	0	0	0	#F_natM_young
10	35	23	30	-1	99	2	0	0	0	0	0	0	0	#F_Lmin
40	120	61	66	-1	99	2	0	0	0	0	0	0	0	#F_Lmax
0.01	0.2	0.05	0.05	-1	99	2	0	0	0	0	0	0	0	#F_VBK
0.05	0.2	0.13	0.19	-1	99	3	0	0	0	0	0	0	0	#F_CV-young
0.05	0.2	0.09	0.1	-1	99	3	0	0	0	0	0	0	0	#F_CV-old
0.01	0.15	0.056	0.0517	0	0.0226	6	0	0	0	0	0	0	0	#M_natM_young
-1	1	0	0	-1	99	-50	0	0	0	0	0	0	0	#M_Lmin
40	120	63	66	-1	99	2	0	0	0	0	0	0	0	#M_Lmax
0.01	0.2	0.05	0.05	-1	99	2	0	0	0	0	0	0	0	#M_VBK
0.05	0.2	0.11	0.14	-1	99	3	0	0	0	0	0	0	0	#M_CV-young

```
0.05	0.2	0.08	0.4	-1	99	3	0	0	0	0	0
	0	0	#M_CV-old

# Lo	Hi	Init	Prior	Prior	Prior	Param	Env	Use	Dev	Dev	Dev
	Block	block
# bnd	bnd	value	mean	type	SD	phase	var	dev	minyr	maxyr	SD
	design	switch

# 2009 Female W-L
-3	3	0.0000097659 0.000020873 -1 99	-50	0	0	0	0	0
	0	0	#Female	wt-len-1
-3	4	3.17125028	2.96956 -1 99	-50	0	0	0	0	0	0
	0	#Female	wt-len-2
# 2009 Maturity
38	39	38.78	40	-1	99	-50	0	0	0	0	0
	0	0	#Female	mat-len-1
-3	3	-0.437	-0.4	-1	99	-50	0	0	0	0	0
	0	0	#Female	mat-len-2
# 2009 Fecundity
-3	300000	137900	137900	0	1.0	-6	0	0	0	0	0
	0	0	#Female	eggs/gm	intercept
-3	39000	36500	36500	0	1.0	-6	0	0	0	0	0
	0	0	#Female	eggs/gm	slope
# 2009 Male W-L
-3	3	0.0000170424 0.000020873 -1 99	-50	0	0	0	0	0
	0	0	#male	wt-len-1
-3	4	3.02814697 2.96956	-1 99	-50	0	0	0	0	0	0
	0	#male	wt-len-2


# Distribute recruitment (log scale fractions) among growth pattern x area x season
# Lo	Hi	Init	Prior	Prior	Prior	Param	Env	Use	Dev	Dev	Dev
	Block	block
# bnd	bnd	value	mean	type	SD	phase	var	dev	minyr	maxyr	SD
	design	switch
 0	2	1	1	-1	99	-50	0	0	0	0	0
	0	0 # RecrDist_GP_1
#  0	2	1	1	-1	99	-50	0	0	0	0	0
	0	0 # RecrDist_GP_1
#  0	2	1	1	-1	99	-50	0	0	0	0	0
	0	0 # RecrDist_GP_1

 -4	4	0	0	-1	99	-50	0	0	0	0	0
	0	0 # RecrDist_Area_1
 -4	4	-0.1	0	-1	99	1	0	0	1916	2008	0.3
	0	0 # RecrDist_Area_2
 -4	4	-0.4	0	-1	99	1	0	0	1916	2008	0.3
	0	0 # RecrDist_Area_3

 0	2	1	1	-1	99	-50	0	0	0	0	0
	0	0 # RecrDist_Seas_1

 0	2	1	1	-1	99	-50	0	0	0	0	0
	0	0 # Cohort growth deviation parameter

# Cohort growth deviation
 0 0 0 0 0 0 0 0 0 0

#9 # Recruitment split annual deviation phase

# Spawner-recruit parameters
3	# S-R function: 1=B-H w/flat top, 2=Ricker, 3=standard B-H, 4=no steepness or bias adjustment
# Lo	Hi	Init	Prior	Prior	Prior	Param
# bnd	bnd	value	mean	type	SD	phase
3	15	7	5	-1	99	1	# Ln(R0)
### Martins 2009 prior
0.2	1	0.5	0.73	2	0.189	7	# Steepness
###
0	5	0.001	1	-1	99	-50	# Sigma R
-5	5	0	0	-1	99	-50	# Environmental link coefficient
```

-5 5 0 0 -1 99 -50 # Initial equilibrium offset to virgin
-1 2 0 1 -1 99 -50 # Autocorrelation in rec devs
0 # Index of environmental variable to be used for S-R parameter
0 # Env. target parameter: 0=none, 1=rec devs, 2=R0, 3=steepness

Recruitment residuals
1 # Dev type: 0=none, 1=zero-sum, 2=simple deviations (no sum constraint)
1916 # Start year recruitment residuals
1916 # End year recruitment residuals
-8 # Phase
1 # Use advanced recruitment options: 0=no, 1=yes
0 # First year for early rec devs
-8 # Phase for early rec devs
-8 # Phase for forecast recruit deviations
1 # Lambda for forecast recr devs before endyr+1
-1965 # Last year with no bias correction in MPD
-1970 # First year with full bias correction (linear ramp from entry above)
-1990 # Last year for full bias correction in MPD
-1995 # First recent year with no bias correction in MPD
1.0 # max bias adjustment
0 # placeholder
-4 # Lower bound rec devs
4 # Upper bound rec devs
0 # Read N initial values for rec devs

Fishing mortality setup
0.09 # F ballpark for tuning early phases
1999 # F ballpark year (neg value to disable)
1 # F method: 1=Pope's; 2=Instan. F; 3=Hybrid
0.9 # max F or harvest rate, depends on F_Method
#5 # F method=3: N iterations for tuning

Initial F by fleet

# Lo	Hi	Init	Prior	P_type	SD	Phase
0	1	0.00	0.01	-1	99	-1
0	1	0.00	0.01	-1	99	-1
0	1	0.00	0.01	-1	99	-1
0	1	0.00	0.01	-1	99	-1
0	1	0.00	0.01	-1	99	-1
0	1	0.00	0.01	-1	99	-1

Catchability (Q) setup
A=do power: 0=skip, survey is prop. to abundance, 1= add par for non-linearity
B=env. link: 0=skip, 1= add par for env. effect on Q
C=extra SD: 0=skip, 1= add par. for additive constant to input SE (in ln space)
D=type: <0=mirror lower abs(#) fleet, 0=no par Q is median unbiased, 1=no par Q is mean unbiased, 2=estimate par for ln(Q)
3=ln(Q) + set of devs about ln(Q) for all years. 4=ln(Q) + set of devs about Q for indexyr-1
E=Units: 0=numbers, 1=biomass
F=err_type 0=lognormal, >0=T-dist. DF=input value
A B C D E F
1 0 0 0 0 0 #1_CARC
0 0 0 0 0 0 #2_CACM
1 0 0 0 0 0 #3_ORRC
0 0 0 0 0 0 #4_ORCM
1 0 0 0 0 0 #5_WARC
0 0 0 0 0 0 #6_WACM
0 0 0 0 0 0 #7_ORRCOB
1 0 0 0 0 0 #8_CACPFV
0 0 0 0 0 0 #9_IPHCWA
0 0 0 0 1 0 #10_NWFSCOR
0 0 0 0 0 0 #11_IPHCOR
0 0 0 4 1 0 #12_WATRI

Q parameters
1 # Par setup: 0=read one parm for each fleet with random q; 1=read a parm for each year of index

# Lo	Hi	Init	Prior	Prior	Prior	Param
# bnd	bnd	value	mean	type	SD	phase
# Non-linear parameters						
-6	6	0	0	-1	99	1 #1_CARC

```
 -6      6      0        0     -1     99     1 #3_ORRC
 -6      6      0        0     -1     99     8 #5_WARC
 -6      6      0        0     -1     99     1 #8_CACPFV
# Early period
 -10     2      -0.0003  0     -1     99     1   # Triennial (log) base parameter (1980)
 -4      4      0        0     -1     99     -50 # Triennial 1983 deviation
 -4      4      0        0     -1     99     -50 # Triennial 1986 deviation
 -4      4      0        0     -1     99     -50 # Triennial 1989 deviation
 -4      4      0        0     -1     99     -50 # Triennial 1992 deviation
# Late period
 -4      4      -0.6     0     -1     99     1   # Triennial 1995 deviation
 -4      4      0        0     -1     99     -50 # Triennial 1998 deviation
 -4      4      0        0     -1     99     -50 # Triennial 2001 deviation
 -4      4      0        0     -1     99     -50 # Triennial 2004 deviation

# Selectivity section
# Size-based setup
# A=Selex option: 1-24
# B=Do_retention: 0=no, 1=yes
# C=Male offset to female: 0=no, 1=yes
# D=Mirror selex (#)
# A  B C D
 1  0 0 0   #1_CARC
 1  0 0 0   #2_CACM
 1 0 0 0    #3_ORRC
 1  0 0 0   #4_ORCM
 1  0 0 0   #5_WARC
 1  0 0 0   #6_WACM
 1  0 0 0   #7_ORRCOB
 5  0 0 1   #8_CACPFV
 1  0 0 0   #9_IPHCWA
 24 0 0 0   #10_NWFSCOR
 1  0 0 0   #11_IPHCOR
 24  0 0 0  #12_WATRI
#_Age selex
 10 0 0 0  #1_CARC
 10 0 0 0  #2_CACM
 10 0 0 0  #3_ORRC
 10 0 0 0  #4_ORCM
 10 0 0 0  #5_WARC
 10 0 0 0  #6_WACM
 10 0 0 0  #7_ORRCOB
 10 0 0 0  #8_CACPFV
 10 0 0 0  #9_IPHCWA
 10 0 0 0  #10_NWFSCOR
 10 0 0 0  #11_IPHCOR
 10 0 0 0  #12_WATRI
```

Selectivity and retention parameters

# Lo # bnd	Hi Block bnd design	Init block value switch	Prior mean	Prior type	Prior SD	Param phase	Env var	Use dev	Dev minyr	Dev maxyr	Dev SD
#1_CARC											
10	70	30	30	-1	99	4	0	0	0	0	0
	0	0	#infl_for_logistic								
0.001	50	11	15	-1	99	5	0	0	0	0	0
	0	0	#95%width_for_logistic								
#2_CACM											
10	70	38	30	-1	99	4	0	0	0	0	0
	0	0	#infl_for_logistic								
0.001	50	14	15	-1	99	5	0	0	0	0	0
	0	0	#95%width_for_logistic								
#3_ORRC											
10	70	36	30	-1	99	4	0	0	0	0	0
	0	0	#infl_for_logistic								
0.001	50	11	15	-1	99	5	0	0	0	0	0
	0	0	#95%width_for_logistic								

```
#4_ORCM

 10      70      36        30        -1    99    4     0   0   0   0   0
         0       0         #infl_for_logistic
 0.001   50      11        15        -1    99    5     0   0   0   0   0
         0       0         #95%width_for_logistic
#5_WARC

 10      70      33        30        -1    99    4     0   0   0   0   0
         0       0         #infl_for_logistic
 0.001   50      31        15        -1    99    5     0   0   0   0   0
         0       0         #95%width_for_logistic
#6_WACM

 10      70      52        30        -1    99    4     0   0   0   0   0
         0       0         #infl_for_logistic
 0.001   50      18        15        -1    99    5     0   0   0   0   0
         0       0         #95%width_for_logistic
#7_ORRCOB
 10      70      22.1792   22.1792   -1    5     4     0   0   0   0   0
         0       0         #infl_for_logistic
 0.001   50      3.6938    3.6938    -1    5     5     0   0   0   0   0
         0       0         #95%width_for_logistic
#8_CACPFV

 -2      0       -1        5         -1    99    -50   0   0   0   0   0
         0       0         #minsizeBinCaCPFV_8
 -2      0       -1        6         -1    99    -50   0   0   0   0   0
         0       0         #maxsizeBinCaCPFV_8
#9_IPHCWA
 10      70      62        30        -1    99    4     0   0   0   0   0
         0       0         #infl_for_logistic
 0.001   60      10        15        -1    99    5     0   0   0   0   0
         0       0         #95%width_for_logistic
#10_NWFSCOR
 20      70      46        30        -1    99    4     0   0   0   0   0
         0       0         #Peak
 -4      4       -4        0         -1    99    -50   0   0   0   0   0
         0       0         #Top
 0       8       6         4         -1    99    4     0   0   0   0   0
         0       0         #Asc width
 0       12      4.5       4         -1    99    5     0   0   0   0   0
         0       0         #Desc width
 -1000   -998    -999      0         -1    99    -50   0   0   0   0   0
         0       0         #Init
 -1000   -998    -999      0         -1    99    -50   0   0   0   0   0
         0       0         #Final
#11_IPHCOR
 10      70      47        30        -1    99    4     0   0   0   0   0
         0       0         #infl_for_logistic
 0.001   60      6         15        -1    99    5     0   0   0   0   0
         0       0         #95%width_for_logistic
#12_WATRI
 20      87      87        30        -1    99    -4    0   0   0   0   0
         0       0         #Peak
 -4      4       -4        0         -1    99    -50   0   0   0   0   0
         0       0         #Top
 0       8       6         4         -1    99    4     0   0   0   0   0
         0       0         #Asc width
 0       12      12        4         -1    99    -5    0   0   0   0   0
         0       0         #Desc width
 -10     10      -2.88182  -2.88182  -1    2     4     0   0   0   0   0
         0       0         #Init
 -10     10      10        0         -1    99    -50   0   0   0   0   0
         0       0         #Final

#1 # selex block setup: 0=read one line for all, 1=read one line for each
# Time block parameters
#1 # Selex parameter adjustment method: 1=standard,2=logistic transform
```

```
0  # Tagging flag: 0=none,1=read parameters for tagging

### Likelihood related quantities ###
# variance/sample size adjustment by fleet
1 # Do variance adjustments
#1   2    3    4   5    6   7    8   9   10  11  12
 0.16 0.0  0.10 0   0.0  0   0.0  0.02 0.54 0.42 0.36 0.41 # constant added to survey CV
 0   0    0    0   0    0   0    0   0   0   0   0   # constant added to discard SD
 0   0    0    0   0    0   0    0   0   0   0   0   # constant added to body weight SD
 3.24 2.25  0.54  2.16 5.49  1.57 1.44  1.52 0.62 2.79 0.73 2.08 # multiplicative scalar for length comps
 1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  0.90 1   0.74 1   # multiplicative scalar for age comps
 1   1    1    1   1    1   1    1   1   1   1   1   # multiplicative scalar for length at age obs

1000        # DF discard fraction data t-distribution
1000        # DF mean body weight data t-distribution
1           # Max N lambda phases: read this N values for each item below
1           # SD offset (CPUE, discard, mean body weight, recruitment devs): 0=omit log(s) term, 1=include

0 # N changes to default Lambdas = 1.0
# Component codes:
#  1=survey
#  2=discard
#  3=mean body weight
#  4=length frequency
#  5=age frequency
#  6=Weight frequency
#  7=size at age
#  8=catch
#  9=initial equilibrium catch
#  10=rec devs
#  11=parameter priors
#  12=parameter deviations
#  13=Crash penalty
#  14=Morph composition
#  15=Tag composition
#  16=Tag return
# Component fleet/survey  phase  value  wtfreq_method


0 # extra SD reporting placeholder

999 # end of control file
```

15. Appendix D: SS Starter file

2009 Yelloweye assessment starter file

```
yelloweye_data.SS      # Data file
yelloweye_control.SS  # Control file

0       # Read initial values from .par file: 0=no,1=yes
1       # DOS display detail: 0,1,2
2       # Report file detail: 0,1,2
0       # Detailed checkup.sso file (0,1)
0       # Write parameter iteration trace file during minimization
0       # Write cumulative report: 0=skip,1=short,2=full
0       # Include prior likelihood for non-estimated parameters
0       # Use Soft Boundaries to aid convergence (0,1) (recommended)
1       # N bootstrap datafiles to create
25      # Last phase for estimation
1       # MCMC burn-in
1       # MCMC thinning interval
0       # Jitter initial parameter values by this fraction
-1      # Min year for spbio sd_report (-1 for styr, init, virgin)
-2      # Max year for spbio sd_report (-1 for endyr; -2 for endyr+Nforecastyrs)
0       # N individual SD years
0.0001 # Ending convergence criteria
0       # Retrospective year relative to end year
8       # Min age for summary biomass
1       # Depletion basis: denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel X*B_styr
1       # Fraction (X) for Depletion denominator (e.g. 0.4)
1       # (1-SPR)_reporting:  0=skip; 1=(1-SPR)/(1-SPR_tgt); 2=(1-SPR)/(1-
SPR_MSY); 3=(1-SPR)/(1-SPR_Btarget); 4=rawSPR
1       # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num); 3=sum(frates)
0       # F_report_basis: 0=raw; 1=F/Fspr; 2=F/Fmsy ; 3=F/Fbtgt

999 # end of file marker
```

16. Appendix E: SS Forecast file

```
# Forecast specifications - 2009 Yelloweye assessment

1       # Forecast: 0=none; 1=F(SPR); 2=F(MSY) 3=F(Btgt); 4=F(endyr); 5=Ave F (enter yrs); 6=read Fmult
2006    # First year for averaging selex to use in forecast
2008    # Last year for averaging selex to use in forecast
1       # Benchmarks:0=skip, 1=calc Fspr, Fbtgt, Fmsy
2       # MSY: 0=none,1=F(SPR),2=calc F(MSY),3=F(Btgt),4=set to F(endyr)
########
#0.719 is rebuilding SPR from 2007
0.5     # SPR target (e.g. 0.40)
########
0.4     # Biomass target (e.g. 0.40)
1       # Number of forecast years
1       # Read advanced options below: 0=No, 1=Yes
0       # Puntalyzer output: 0=no,1=yes
1999    # Rebuilder:  first year catch could have been set to zero (Ydecl)
2002    # Rebuilder:  year for current age structure (Yinit)
1       # Control rule method (1=west coast adjust catch; 2=adjust F)
0.4     # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40)
0.1     # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)
1       # Control rule fraction of Flimit (e.g. 0.75)
-1      # maximum annual catch during forecast (not coded yet)
0       # 0= no implementation error; 1=implementation error in forecast (not coded yet)
0.1     # stddev of log(realized F/target F) in forecast (not coded yet)
1       # fleet allocation (in terms of F) (1=use endyr pattern, no read; 2=read below)
0       # Number of manual forecast catches to input
1 # basis for forecatch:  1=retained catch; 2=total dead catch (if line above > 0)
# Year Seas Fleet Catch

999 # end of forecast file
```

Agenda Item E.2.a
Attachment 13
September 2009

YELLOWEYE ROCKFISH

STAR Panel Report

August 3-6, 2009

Hotel Deca
4507 Brooklyn Ave NE
Seattle, WA 98105

Panel Reviewers

Stephen Ralston	Panel Chair, Scientific and Statistical Committee (SSC) Representative
Richard Methot	NMFS, Northwest Fisheries Science Center (NWFSC)
Vivian Haist	Center for Independent Experts (CIE)
J. J. Maguire	Center for Independent Experts (CIE)

Panel Advisors

John DeVore	Pacific Fishery Management Council
Robert Alverson	Groundfish Advisory Subpanel (GAP) Representative
Rob Jones	Groundfish Management Team (GMT) Representative

Stock Assessment (STAT) Team members present

Ian Stewart	NMFS, Northwest Fisheries Science Center (NWFSC)
John Wallace	NMFS, Northwest Fisheries Science Center (NWFSC)
Carey McGilliard	University of Washington, School of Aquatic & Fishery Resources

Overview

A draft assessment of yelloweye rockfish (*Sebastes ruberrimus*) stock status off the U. S. west coast (California, Oregon, and Washington) was reviewed by the STAR panel from August 3-6, 2009 in Seattle, WA. Within the model the population is treated as a single stock with separate sub-population structure within each of the three States, allowing for State-specific estimates of unexploited stock size and current depletion. The biological underpinnings of the model structure are that adults are site-attached and do not move appreciably among the three states whereas larval dispersal is widespread, assumptions that are well-supported in the scientific literature. In addition, because the age- and length-compositional data are not informative of the time series of recruitment and because it was infeasible to integrate across the range of uncertainty in these recruitments, stochasticity in the spawner-recruit relationship was not modeled.

The yelloweye stock assessment used the Stock Synthesis platform and incorporated a variety of data sources. Catch, length-frequency, and conditional age-at-length data from six fisheries were used in the assessment, i.e., commercial and recreational fisheries in each of the three states. The fishery-dependent relative abundance (CPUE) indices that were used in the model were developed from recreational fisheries data and were unchanged from the last assessment conducted in 2007. Separate fishery-independent time series of abundance were developed for Oregon and Washington using International Pacific Halibut Commission (IPHC) longline survey data. In addition, time series of yelloweye rockfish abundance in the triennial and NWFSC combined trawl surveys were estimated and incorporated into the base stock assessment model.

The last full assessment of yelloweye rockfish was completed in 2006 (an off-year) and that model was subsequently updated in 2007. Major changes made in this assessment, compared with the previous assessment include:

- Use of SS version 3.03b modeling framework instead of SS2;
- Incorporation of reconstructed landings that extended the modeled period to 1916 instead of 1925;
- Treatment of the population dynamics in an area-based model with recruitment apportioned to areas based on internal parameter estimation;
- Removal of stochasticity in recruitment;
- Addition of NWFSC shelf-slope trawl survey (referred to as NWFSC combined survey in the assessment report) and the triennial trawl survey;
- Incorporation of weight-specific fecundity based on a meta-analysis of rockfish reproduction;
- Revision of aging error estimates using software developed by Punt *et al*. (2008)
- Inclusion of age data as conditional age-at-length compositions;
- Estimation of gender-specific natural mortality and spawner-recruit steepness in the model using newly developed priors.

The STAR panel concluded that the yelloweye rockfish assessment constitutes the best available scientific information on the status of yelloweye rockfish off the U.S. west coast and recommends that it be used for status determination and management in the Council process.

The STAR panel thanks the STAT team members for their exceptional preparation, hard work, and willingness to respond to panel requests.

Panel Requests to the Yelloweye STAT

The following prioritized requests were made by the STAR panel to the yelloweye STAT:

Request 1: In figure 55, verify that observations in bin 70 are real and not the result of an aggregation at 70 – new base.

Rationale: Length-frequency distributions for gender-combined yelloweye rockfish from the Oregon recreational observer program show large observations in bin 70, suggesting that this bin could be an accumulator bin. Data verification request to verify that the data have been correctly used.

Response: Observations at 70 cm for Oregon recreational observer length frequencies were a formatting error. The error was corrected and all other bins remain unchanged.

Request 2: Provide a run with a normal approximation of Hamel's prior for natural mortality (M) on both males and females – new base.

Rationale: Runs where M was estimated with a higher M prior for the males resulted in estimated M for males very close to that estimated for female. Figure 41 in the draft assessment provides the rationale for higher M for males. Dr. Owen Hamel has completed a meta-analysis of M and his results were considered potentially more useful as prior information to be used in the model.

Response: Fixing the OR recreational observer length frequencies and using the Hamel prior for natural mortality resulted in minor changes in the model results. Correcting the error in the LF changed steepness by 0.01. Henceforth the base case is with OR recreational observer LF corrected and using new M priors.

Request 3: Provide a run keeping the observations after 1999 for the recreational CPUE series to estimate the effect of truncating the indices in 1999. Previous analyses had suggested that management measures after 1999 may not have substantially affected the indices until 2001 or so.

Rationale: This is essentially seen as a sensitivity run to document the effects (or not) of including those points in the assessment, inasmuch as they were included in some previous assessments.

Response: There is a difference of opinion between current and previous STAT teams on how to treat those points. The current STAT thinks that regulatory changes after 1999 were sufficient to potentially impact recreational CPUE and it considers that the burden of proof is to demonstrate that they did not. Including the 2000 and 2001 points made little change in the results and the Panel agreed that the base case would not include the recreational CPUE estimates for 2000 and 2001.

Request 4: Provide a run where stock size indices are up-weighted compared with the age / length compositions.

Rationale: This is also seen as a sensitivity run to understand the potential effect of giving more weight to the stock abundance indices compared with the length and age compositions.

Response: This request was addressed by increasing the lambdas on the stock size indices 10-fold. This resulted in lower stock size in 2009 and depletion equal to 15.4%, compared with 20.3% for the base case. Steepness decreased from 0.417 to 0.302. The likelihood of the age and length compositions did not change much suggesting that they were not strongly affected by the index data. This was not intended to change the base case.

Request 5: Provide sensitivity run with the exponential parameter on Q turned off for recreational CPUE time series.

Rationale: Another sensitivity run to understand the effect of allowing a non-linear relationship between abundance and CPUE in the fishery-dependent recreational data.

Response: Assuming that recreational CPUE series were linearly related to stock size had minimal effects on the results. The Panel agrees with the STAT that the potential for catchability to be nonlinearly related to stock size should be retained in the base case. The Panel noted that excluding 2000 and 2001 from the series and allowing for catchability to be nonlinearly related to stock size implied that the recreational CPUE were downweighted.

Request 6: In the GLM for the IPHC, drop the stations where yelloweye have never been caught and estimate a station effect. Plot the two time series versus time to investigate the difference.

Rationale: Given the association of yelloweye rockfish with rocky and other high relief habitats, a relatively strong station effect would be expected. However, because no yelloweye rockfish were caught at many stations it was not possible to estimate the station effect in the GLM when all stations were included in the analysis. Removing stations that had never caught yelloweye was suggested as a possible way of estimating station effects.

Response: Removing the stations where no yelloweye rockfish had ever been caught increased the absolute value of the stock size index, but did not change the trends over time for either the OR of WA indices. Including site effects makes it possible to include covariates in the CPUE modeling. Excluding stations where yelloweye rockfish have never been caught could be counterproductive in the future, however, if as the yelloweye population increases it expands its range and populates new areas. The Panel did not recommend that the base case should be changed to include CPUE standardized with site effects, but noted that this issue should be reviewed in the next update assessment. The Panel also noted that the IPHC longline survey could be a good survey for yelloweye if sampling intensity was higher, but higher sampling intensity could catch a considerable portion of the total OY.

Request 7: IPHC survey and Triennial surveys catch large yelloweye off WA, but neither the IPHC survey nor the NWFSC catch large yelloweye off OR. Does the NWFSC catch large yelloweye off WA?

Rationale: This is a first step in evaluating the selectivity curves for the different areas and gears versus the availability of large yelloweye in the various areas.

Response: There were a few larger yelloweye in the NWFSC survey off WA suggesting that the NWFSC can catch larger yelloweye rockfish if they are present. The Panel concluded that there was insufficient support to change the base case dome-shaped selectivity curve to asymptotic selectivity for the NWFSC trawl survey off OR.

Request 8: Is the IPHC survey off OR potentially dome shaped?

Rationale: This is related to request 7 where the IPHC survey seems not to be catching large yelloweye off OR. The question arose as to whether this is due to lack of large yelloweye in the area or because of dome-shaped selectivity.

Response: With the correction to the OR recreational observer length frequencies the selectivity for the IPHC survey in OR wanted to go dome shaped. The fit to the data with either domed or asymptotic selectivity are similar, although the residual pattern is somewhat improved with domed selectivity. Given that the selectivity for the IPHC in WA was asymptotic and because the absence of large fish in OR could be due to growth differences, the Panel recommended to keep the asymptotic selectivity for the IPHC survey in OR until there is a better understanding of growth and biological parameters. The selectivity pattern for both the trawl surveys and the IPHC longline surveys should be open for further investigation in subsequent assessments.

Request 9: Provide a plot of the gender ratio over time.

Rationale: This is to assess if there are temporal trends in the gender ratio over time.

Response: Expected gender ratio by State, age, and year were plotted. The difference in gender ratios was small, with the ratio of males to females between 0.90 and 1.1. While the difference in gender ratio by State, age, and year may not be sufficient to justify modeling genders separately, it is necessary to do so to accommodate variable female fecundity by size.

Request 10: Overlay length at age, color coded for WA, OR and CA, on the growth plot to estimate if there are differences by area.

Rationale: The intent is to investigate if there are differences in growth in the three areas.

Response: Yelloweye do get somewhat larger off WA, but the Panel did not recommend changing the base case. The Panel recommended that the next assessment evaluate the appropriateness of estimating biological parameters by area.

Request 11: Provide a plot of the profile of steepness as a function of M.

Rationale: The intent is to better understand the joint behavior of M and steepness and to evaluate if steepness should be used as an axis of uncertainty.

Response: The graph reinforced the impression that there is little information to estimate steepness from a one way trip. Steepness has a large effect on the rebuilding potential and the Panel and STAT agreed to use a combination of catch and steepness to provide nine states of nature to depict uncertainty scenarios.

Request 12: The stock assessment report should contain a reference to the proposed listing of yelloweye in Puget Sound as endangered (under the terms of the Endangered Species Act)).

Rationale: A proposed listing of a distinct population segment of yelloweye rockfish is important background information that managers may want to consider when developing management measures for yelloweye rockfish.

Response: Text will be incorporated in the final assessment, similar to what was included in the bocaccio assessment.

Description of base case model and alternative models to bracket uncertainty

- Start year of the model = 1916;
- Spatial structure has coastwide spawner-recruitment pool, with recruitment apportioned among three State areas according to estimated proportions;
- Each fishery and survey is specific to one State area;
- Discard incorporated into total catch;
- Sex-specific ***M*** estimated to be 0.047 yr^{-1} for females and 0.047 yr^{-1} males (with Hamel's normal approximation prior);
- ***h*** estimated to be 0.417 (with Dorn's prior);
- No recruitment deviations estimated in base model;
- von Bertalanffy growth parameters, including dispersion of individual growth, estimated for females and males;
- Fishery CPUE indices fit using density-dependent catchability.

Fisheries:

California commercial (all gears)
California recreational
Oregon commercial (all gears)
Oregon recreational
Washington commercial (all gears)
Washington recreational
Foreign and research catches included in commercial catch

Abundance indices:

IPHC longline survey – WA (1999-2008)
IPHC longline survey – OR (1999-2008)
Triennial trawl survey – WA (1980-2004); break in catchability in 1995
NWFSC shelf-slope trawl survey – OR (2003-2008)
Recreational (CPFV) CPUE – CA (1988-1998)
Recreational CPUE - CA (1980-1986, 1993-1999)
Recreational (CPFV) CPUE – OR (2004-2008)
Recreational CPUE - OR (1979-1999)
Recreational CPUE - WA (1990-1999)

Length compositions:

- Recreational (CPFV)– CA (1988-1998)
- Recreational - CA (1993-2008)
- Commercial - CA (1978-2007)
- Recreational (CPFV) - OR (2004-2008)
- Recreational - OR (1978-1989, 1993-2003)
- Commercial - OR (1992, 1995-2008)
- Recreational - WA (1998-2001, 2004-2008)
- Commercial - WA (1994-2008)
- IPHC – longline survey - OR (2003-2008)
- IPHC – longline survey - WA (2003-2008)
- Triennial trawl survey – WA (1980-2004)
- NWFSC shelf-slope trawl survey – OR (2003-2008)

Age compositions (as conditional age-at-length/sex):

- Recreational - CA (1983, 1996)
- Commercial - CA (1978-1983, 1985-1986, 1988, 2001, 2005)
- Recreational - OR (1979, 1984-1987, 1989, 2001)
- Commercial - OR (2001-2007)
- Recreational - WA (1998-2001, 2004-2008)
- Commercial - WA (1993, 2001-2008)
- IPHC – longline survey - OR (2003-2008)
- IPHC – longline survey - WA (2003-2008)

Uncertainty – The magnitude of historical landings of yelloweye rockfish is a substantial source of uncertainty in this assessment and strongly affects the absolute magnitude of estimated stock abundance, although not the long-term trend and depletion. The assessment was able to obtain reasonable estimates of natural mortality and spawner-recruitment steepness, but the magnitude of the steepness parameter is not precisely determined and is expected to have a substantial effect on projected rates of stock rebuilding. The magnitude of historical catch and spawner-recruitment steepness were selected as two axes of uncertainty for this assessment. The panel recommends that this uncertainty be carried forward into the rebuilding analysis.

Technical merits of the assessment

The yelloweye stock assessment team was exceptionally well prepared and had conducted a wide variety of analyses and sensitivity runs supporting their development of a proposed base-case model. The transition of the assessment to an area-specific model represents a substantial improvement in our understanding of regional variation in stock depletion. Likewise, incorporation of extensive historical catch reconstructions by the STAT provides greater insight into regional yelloweye productive capacity. Of significant concern to the STAR panel was that historical harvests from the State of Washington may be biased low, a concern likely to be addressed when the next assessment is completed.

Explanation of areas of disagreement regarding STAR panel recommendations

A. Among STAR panel members (including concerns raised by the GAP and GMT representatives

There were no areas of disagreement among STAR panel members.

B. Between the STAR panel and the STAT team

There were no areas of disagreement between the STAR panel and the STAT team.

Unresolved problems and major sources of uncertainty

Recently completed historical catch reconstructions had a marked influence on the yelloweye rockfish stock assessment, particularly on regional estimates of B_0. As a consequence, the STAT came to the meeting with a recommendation that uncertainty be bracketed by ranging historical catches ±50%. A particular problem identified by the STAR panel and the STAT is that Washington reconstructions were less well-developed than those from Oregon and California and estimates may be biased low. The panel therefore recommends that work continue on historical catch reconstructions and that updated catch time series from all three States be incorporated into the next stock assessment.

Another major unresolved problem facing the yelloweye stock assessment is the need to develop a good abundance statistic that can be used to track stock recovery. Two avenues worth pursuing were identified during the review: (1) development of *in situ* visual survey abundance measures in yelloweye habitat using ROVs, AUVs, submersibles, etc, and (2) improvement of the IPHC survey yelloweye rockfish bycatch index by increasing sample size and improving the statistical model (e.g., incorporating station effects). Given that Washington and Oregon have taken different approaches to supplementing IPHC survey sample size, the latter issue will be challenging to solve.

The STAR panel, in consultation with the STAT, ultimately identified two axes of uncertainty to carry forward into a decision table, i.e., historical catch reconstructions and statistical error in the estimate of stock productivity ($\boldsymbol{h} = 0.42$). The former was bracketed by 75% and 150% of the base-case reconstruction, whereas the latter was bracketed by assigning 25% of the probability mass to high and low values of steepness equal to 0.34 and 0.51 (based on likelihood profile). The two uncertainty axes were crossed, resulting in nine states of nature that should be carried forward into the rebuilding analysis, each with a specific probability of occurrence.

It is unlikely that the yelloweye rockfish stock assessment can be considerably improved in two years, other than by updating the historical catch reconstructions (especially for Washington) and the IPHC GLM indices to include supplemental sample sites that have been occupied in Oregon and Washington. Both issues, however, have the potential to alter the stock assessment and may exceed the requirements for stock assessment updates as specified in the PFMC's Groundfish Terms of Reference. The panel was therefore unsure whether to recommend that the next assessment should proceed as an update or as a full assessment. From a practical perspective it would be desirable if the Council's process could accommodate an "extended update" that could allow exploration of these two issues in 2011 without requiring a whole week of review.

Management, data, or fishery issues raised by the GAP and the GMT representatives

The yelloweye rockfish stock assessment is spatially explicit, with separate sub-population components modeled for Washington, Oregon, and California. Not surprisingly, given the constraining nature of the yelloweye rockfish resource on the array of groundfish management options available to the Council, there will be considerable interest in the allocative implications of the new assessment. For example, the accepted base model estimates that the stock is less depleted in the north but potential yields are greater in the south due to differences in unexploited stock size. Given the sensitivity of yelloweye rockfish OY allocations to the states, the GMT representative wanted some assurance that regional model scenarios could be run using the base model to better inform the Council as it works to develop yelloweye management measures for the 2011-12 biennial period. The STAT can therefore expect a number of requests from the GMT to model the effect of various state- and fishery-specific catch projections on population growth and recovery.

Prioritized recommendations for future research and data collection

1. Develop and implement an effective visual survey of yelloweye rockfish abundance.

2. Conduct a scientific review of current efforts to develop and improve stock size indices for yelloweye based on IPHC sampling (including the addition of new stations) and make recommendations on the best approach to develop such indices. In particular, divergent 'enhanced' sampling designs (stratified random vs. adaptive fixed stations) in Oregon and Washington makes it difficult to compare results. The next assessment should be able to make direct use of these additional stations, if sampling is continued in 2009 and 2010.

3. Recalculate GLMM estimates from the IPHC survey to explore inclusion of station effects and allow incorporation of sites that differ in occupancy over time.

4. Continue to refine historical catch estimates using ex-vessel prices, etc., particularly in the State of Washington.

5. Investigate the development of a Washington recreational yelloweye CPUE statistic based on trips from the recreational Pacific halibut fishery. Consider a full time series and one ending in 2002, since the yelloweye RCA in waters off northern WA was implemented in 2003.

6. Encourage the collection of specimen samples to refine estimates of biological parameters, particularly maturity and fecundity.

7. Continue to evaluate the spatial aspects of the assessment, including growth, the number and placement of boundaries between areas, as well as the northern boundary with Canada.

8. Sample organization and curation of specimen materials (e.g., otoliths) from the IPHC survey should be revisited. Currently biological samples cannot be linked to the station from which they were collected. Age data for 2003-2005 is disconnected from the

relevant length and sex information and other unknown problems may exist in the data. A thorough evaluation of what data are reliable and a final determination of what information is lost, or can potentially be recovered, is needed

General research recommendations

1. Investigate alternative methods of re-weighting the data series in Stock Synthesis.

2. More work is needed to better understand the performance of maximum likelihood and Bayesian estimators of stock size and trends when large numbers of poorly informed recruitment deviations are estimated. Although it is logically appealing to include such uncertainty, even when there are little coherent data informing cohort strengths, technical and computational issues need to be solved before this approach can be implemented in situations such as yelloweye rockfish.

3. Investigate how best to account for variability in calendar dates in trawl surveys, especially through a meta-analysis of multiple stocks.

4. Continue to refine coast-wide historical catch estimates.

5. Accessing and processing recreational intercept data from RECFIN and the three states is much too cumbersome for the STATs. A single database that holds all the raw recreational data in a consistent format would greatly expedite processing and interpretation of the data and would reduce the potential for introduction of errors.

Acknowledgements

The Panel thanks the Northwest Fisheries Science Center for organizational and logistical support during the meeting at the Hotel Deca, including especially Jim Hastie and Stacey Miller.

Agenda Item E.2.a
Attachment 14
September 2009

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DRAFT
Status of greenstriped rockfish (*Sebastes elongatus*) along the outer coast of California, Oregon, and Washington

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August 26, 2009

Table of Contents

Executive Summary

Stock

Greenstriped rockfish (*Sebastes elongatus*) are a small rockfish (maximum size near 45 cm) named after their slim shape and predominant green stripes. They have also been called strawberry rockfish, watermelons, poinsettas, serena, and reina. These rockfish can be found in abundance from British Columbia to Northern Baja California, but range from Chirikof Island in the Aleutian Islands (Gulf of Alaska) to central Baja California, and inhabit depths between 12 and 500 meters. Data show an increase in mean length with depth, suggesting that maturing fish move to deeper water. This species of rockfish is found with other congeners or alone in a wide range of habitats, including rocky outcroppings, but unlike most other species of rockfish they tend to prefer mud or sand bottoms.

This assessment is concerned with the stock of greenstriped rockfish on the outer west coast of the United States from the California/Mexico border to the Washington/Canada border, excluding Puget Sound, and is the first assessment of the greenstriped rockfish population in this area. A recent genetic study found very little genetic variation along the entire West Coast and the extent of migration is unknown. Therefore, this is a coast-wide, single-area assessment, but fishing fleets are separated geographically when possible in an attempt to capture varying geographic patterns in the fisheries data. Past studies have noted that greenstriped rockfish from Southern California exhibit different growth and maturity patterns when compared to greenstriped rockfish from Northern areas, but more recent survey data do not clearly support regional differences. In addition, data from Southern California that would be necessary to assess that area separately were limited, thus this assessment assumed one area. It is believed that this assessment has captured the overall trend in the greenstriped rockfish population and constitutes the best available science regarding the current status of greenstriped rockfish.

Catches

Greenstriped rockfish have not often been targeted by any fishery, thus discards as well as landings are an important component of the total fishing mortality on the stock. The majority of landings of greenstriped rockfish have occurred in the trawl fishery, but a small proportion has been observed in the hook and line, net, and recreational fisheries.

Landings for five different fleets were determined from species composition data. Landings increased in the mid 1940's, slumped in the early 1960's, then increased substantially in the late 1960's. Foreign trawl fisheries occurred between 1966 and 1976 and contributed to a large proportion of the catches during that time. Throughout the 1990's, landings were at high levels until a dramatic decline in recent years, which is likely due primarily to recent management actions aimed at reducing the bycatch of stocks on rebuilding plans.

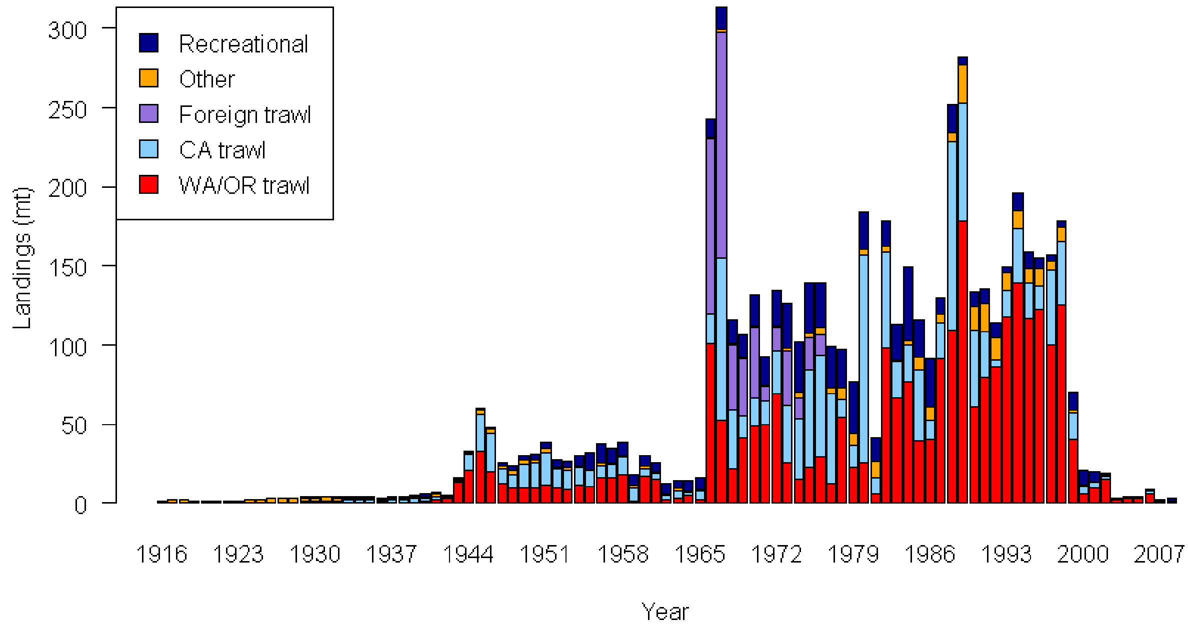

Figure a. Landings (mt) of greenstriped rockfish from five different fleets.

Table a. Recent landings for five fleets (mt).

Year	WA/OR trawl	CA trawl	Foreign	Other-gear	Total commercial	All recreational
1999	40.095	17.019	0.000	1.917	59.030	10.999
2000	5.657	5.146	0.000	0.431	11.234	9.454
2001	10.116	2.962	0.000	0.502	13.580	6.577
2002	15.287	2.229	0.000	0.150	17.666	1.380
2003	2.628	0.080	0.000	0.010	2.717	0.264
2004	2.808	0.177	0.000	0.015	3.000	0.657
2005	2.783	0.083	0.000	0.012	2.878	1.567
2006	5.710	1.840	0.000	0.082	7.632	1.017
2007	0.754	0.212	0.000	0.009	0.975	1.318
2008	1.615	0.066	0.000	0.042	1.723	1.674

Data and Assessment

Greenstriped rockfish off the west coast of the US was assessed here for the first time using the length- and age-structured model called Stock Synthesis (version 3.03a). Population parameters were estimated using fishery landings and length data from five fleets, abundance indices and length data from the National Marine Fisheries Service (NMFS) triennial survey, and abundance indices, length data, and age data from the Northwest Fisheries Science Center (NWFSC) survey. The Triennial survey was split into two series (1980–1992 and 1995–2004) based on changes in survey timing. The NWFSC survey added a considerable amount of information, including age data, which were fit in the model as conditional age-at-length vectors.

The base case model estimated parameters for male and female selectivities of all of the domestic fishing fleets, length-at-age relationships for males and females, and recruitment deviations for the last four decades. Natural mortality and steepness were not estimated and are sources of a considerable amount of uncertainty. Spawning biomass is usually the quantity used in evaluating stock status. However, greenstriped rockfish show an increase in fecundity per kg of body weight with increasing weight, which can lead spawning biomass to be a biased measure of stock productivity when older and larger fish have been removed through fishing. Therefore, the relationship between the number of eggs per kg of body weight and the fish weight was included in the model and the spawning stock quantity of interest that is reported is spawning output, which can be interpreted as the number of eggs which are produced annually by the mature females.

Uncertainty in the parameter estimates was determined in two ways. First, approximate asymptotic 95% confidence intervals were calculated using the base model. Second, fixed values of natural mortality and the fraction of greenstriped rockfish discarded were varied above and below the values assumed in the base model to define a range of the states of nature.

Stock biomass and spawning output

The estimated spawning output started to significantly decline in the 1960's, when the landings increased, and continued to decline until the late 1990's. The spawning output has increased quickly in the last decade from a low near 59% of unfished spawning output in 1999 to approximately 81% of unfished spawning output in 2009. Approximate confidence intervals based on the asymptotic variance estimates showed that the uncertainty in the estimated spawning output is high, but depletion is less uncertain. The various states of nature show that uncertainty in spawning output is much larger than the estimated uncertainty using only the base model.

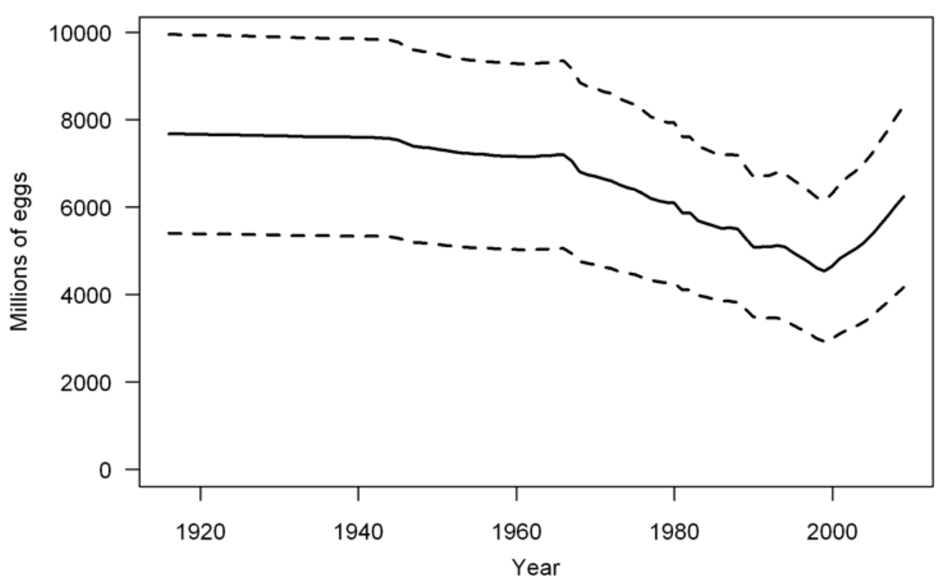

Figure b. Estimated spawning output (1916-2009) for the base case model (solid line) with an approximate asymptotic 95% confidence interval (thick dashed lines). The interval of spawning output over the states of nature is much larger as can be seen in Table b.

Table b. Recent trend in estimated female spawning output (millions of eggs) and relative depletion of spawning output. The range of the states of nature represent the largest amount of uncertainty which includes assumptions regarding the amount of natural mortality and the fraction of greenstriped rockfish discarded.

Output Year	Millions of eggs	~95% confidence interval	Range of states of nature	depletion (%)	~95% confidence interval	Range of states of nature
2000	4,663	3,001-6,324	912-47,435	60.7	51.9–69.5	38.8–92.0
2001	4,827	3,116-6,538	956-48,225	62.9	53.9–71.8	40.6–93.6
2002	4,953	3,206-6,700	993-48,605	64.5	55.5–73.5	42.2–94.3
2003	5,055	3,280-6,830	1,025-48,758	65.8	56.8–74.9	43.6–94.6
2004	5,193	3,383-7,003	1,067-49,115	67.6	58.6–76.6	45.5–95.2
2005	5,370	3,513-7,227	1,117-49,846	69.9	60.9–78.9	47.8–96.5
2006	5,582	3,669-7,495	1,172-50,893	72.7	63.7–81.6	50.3–98.3
2007	5,802	3,832-7,772	1,228-52,041	75.5	66.7–84.4	52.9–100.3
2008	6,029	4,002-8,056	1,287-53,185	78.5	69.8–87.2	55.7–102.2
2009	6,248	4,170-8,325	1,345-54,257	81.4	72.8–89.9	58.4–103.9

Recruitment

Recruitment deviations were estimated starting in 1970 and recruitment before then was assumed equal to mean recruitment as determined by the stock recruitment relationship. The estimates showed that recruitment is highly variable for greenstriped rockfish with high values in 1971, 1984, 1993, and 1998, and low estimates of recruitment in the 1990's, early 1970's, and 2006. The uncertainty in the estimated recruitment was high prior to 1985, but decreased in the 1990's and early 2000's when the age data were most informative. The age data from the NWFSC survey were very consistent with these estimates and precisely showed a very strong 1993 cohort.

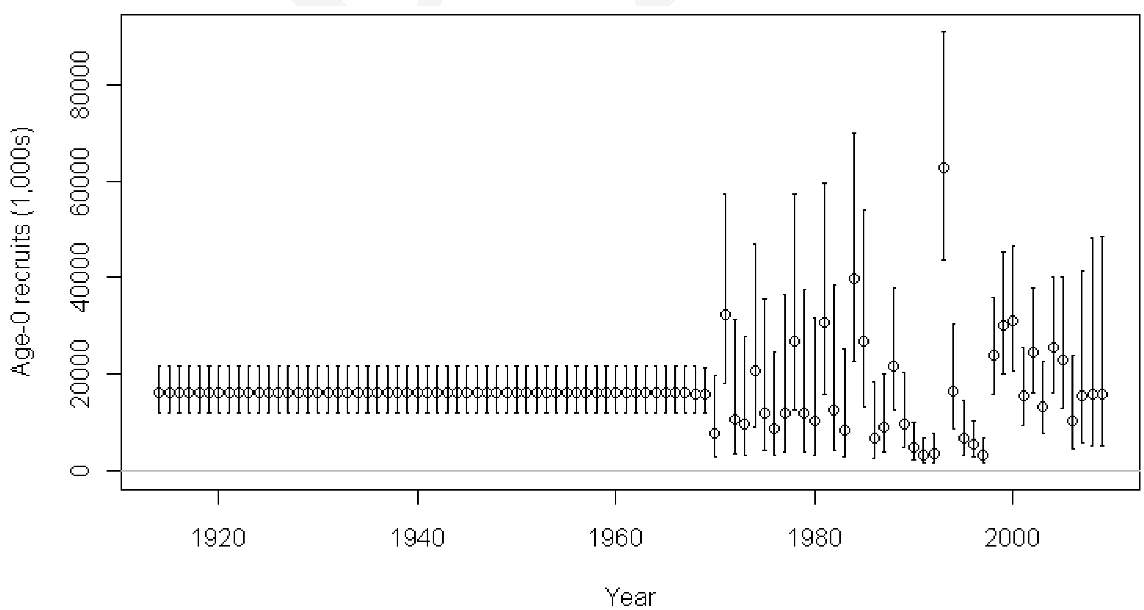

Figure c. Time series of estimated recruitments for the base case model (round points) with approximate asymptotic 95% confidence interval (vertical bars).

Table c. Recent estimated trend in greenstriped rockfish recruitment with approximate 95% confidence intervals determined from the base model and uncertainty in the estimated recruitment determined by varying the value of natural mortality and the fraction discarded.

Year	Estimated recruitment (1000s)	~95% confidence interval	Range of states of nature
2000	30,260	4,088–223,973	4,730–329,445
2001	31,187	4,212–230,944	4,932–333,433
2002	15,712	2,080–118,679	2,461–168,587
2003	24,734	3,327–183,866	3,907–262,380
2004	13,344	1,750–101,777	2,077–142,727
2005	25,531	3,409–191,198	3,942–275,722
2006	22,920	2,978–176,400	3,506–252,179
2007	10,362	1,212–88,576	1,618–114,327
2008	15,455	1,673–142,769	2,487–171,948
2009	15,800	1,575–158,450	2,562–172,960

Reference Points

Reference points were calculated using the estimated selectivities and a fleet distribution based on the proportions of the average landings from each fleet in the last two years. Sustainable total yields (landings plus discards) were 800 mt when using an $SPR_{50\%}$ reference harvest rate and ranged from 173 to 6,844 mt when varying the states of nature. The value for 40% of the unfished spawning output (analogous to $B_{40\%}$) was 3,072 million eggs.

The recent catches (landings plus discards) have been much less than the range of potential long-term yields calculated using an $SPR_{50\%}$ reference point. As a result, the spawning output and biomass of the stock has been steadily increasing over the last decade.

Exploitation status

The spawning output of greenstriped rockfish reached a low in the late 1990's before beginning to increase throughout the last decade. The estimated depletion has remained above the 40% of unfished spawning output target and it is unlikely that the stock has ever fallen below this threshold. Throughout the 1970's, 1980's, and 1990's the exploitation rate and *SPR* have generally increased and occasionally exceeded current estimates of the harvest rate limit ($SPR_{50\%}$). Recent exploitation rates on greenstriped rockfish have been very small, which is primarily due to management actions in the late 1990's and early 2000's to rebuild other species.

Table d. Summary of greenstriped rockfish reference points from the base case model. Values are calculated using a fishery distribution based the average of the landings from 2007 and 2008.

Quantity	**Estimate**	**~95% Confidence interval**	**Range of states of nature**
Unfished spawning output (millions of eggs)	7,680	5,402-9,958	2,179-52,580
Unfished age 2+ biomass (mt)	36,314	25,516-47,112	9,815-261,762
Unfished recruitment (R0, thousands)	16,281	2,242-118,211	2,760-172,741
Depletion (2009)	81.3%	72.8–89.9%	58.4–103.9%
Reference points based on $SB_{40\%}$			
Proxy spawning output ($B_{40\%}$)	3,072	2,161–3,983	872–21,032
SPR resulting in $B_{40\%}$ ($SPR_{B40\%}$)	46.7%	NA	NA
Exploitation rate resulting in $B_{40\%}$	0.0494	0.0483–0.0504	0.0407–0.0571
Yield with $SPR_{B40\%}$ at $B_{40\%}$ (mt)	828	581–1,075	179–7,091
Reference points based on $SPR_{50\%}$			
Spawning output at SPR (SB_{SPR}) (millions of eggs)	3,359	2,363–4,356	953–22,998
$SPR_{50\%}$	50.0%	NA	NA
Exploitation rate corresponding to $SPR_{50\%}$	0.0443	0.0434–0.0452	0.0364–0.0513
Yield with $SPR_{50\%}$ at SB_{SPR} (mt)	800	561–1,038	173-6,844
Reference points based on estimated MSY values			
Spawning output at *MSY* (SB_{MSY}) (millions of eggs)	2,209	1,552–2,866	634–14,940
SPR_{MSY}	36.7%	36.4–36.9	36.3-37
Exploitation rate corresponding to SPR_{MSY}	0.0682	0.0668–0.0696	0.0562–0.0791
MSY (mt)	870	611–1,129	188–7,471

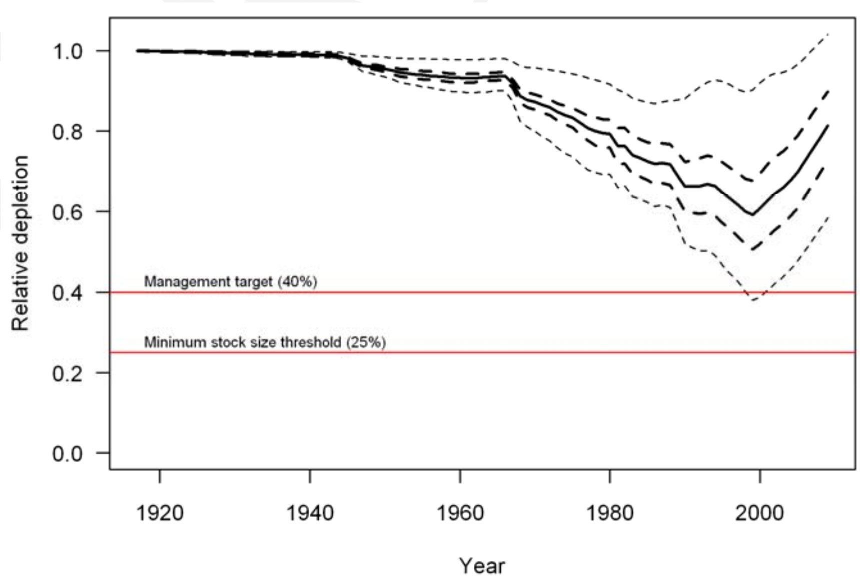

Figure d: Estimated relative depletion with approximate 95% asymptotic confidence intervals (thick dashed lines) for the base case assessment model and estimated depletion over the range of the states of nature (thin dashed lines).

Table e. Recent trend in spawning potential ratio (1-SPR) and summary exploitation rate (catch divided by biomass of age-2 and older fish).

Year	Estimated 1-SPR (%)	~95% confidence interval	Range of states of nature	Summary harvest rate (proportion)	~95% confidence interval	Range of states of nature
1999	75.1	80.1–70.1	94.7–49.7	1.66	1.25-2.07	0.35-3.81
2000	93.0	94.9–91.1	98.6–81.6	0.38	0.28-0.48	0.09-0.88
2001	93.2	94.9–91.6	98.6–82.7	0.37	0.28-0.46	0.09-0.82
2002	92.7	94.7–90.8	98.7–81.3	0.4	0.28-0.51	0.08-0.89
2003	98.9	99.3–98.6	99.8–97.0	0.06	0.04-0.07	0.01-0.12
2004	98.8	99.2–98.4	99.8–96.7	0.06	0.04-0.08	0.01-0.13
2005	98.8	99.2–98.5	99.8–96.7	0.06	0.04-0.08	0.02-0.13
2006	96.8	97.6–96.0	99.4–91.6	0.16	0.13-0.2	0.04-0.36
2007	99.5	99.6–99.4	99.9–98.6	0.02	0.02-0.03	0.01-0.06
2008	99.3	99.5–99.1	99.9–97.9	0.04	0.02-0.05	0.01-0.08

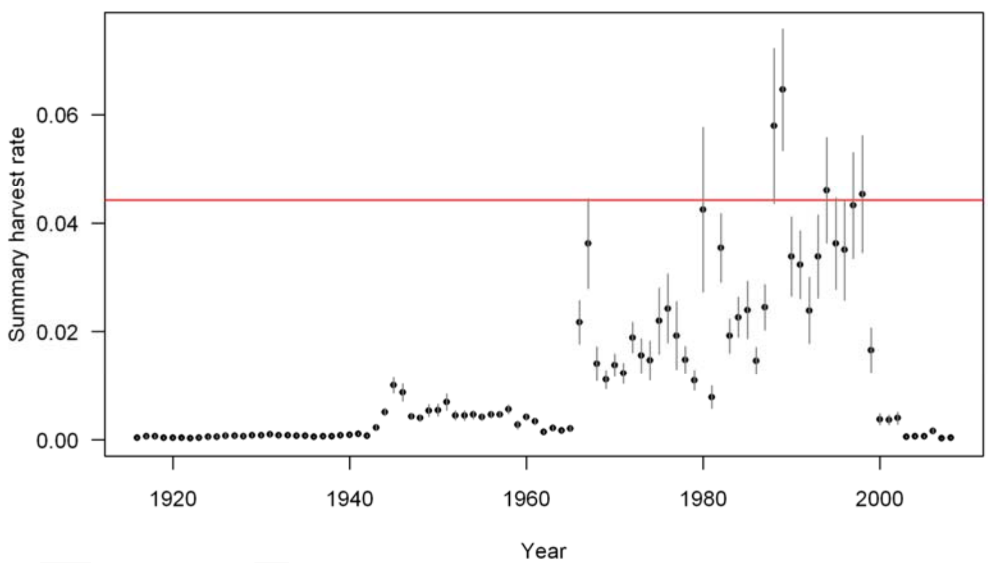

Figure e. Time series of estimated summary harvest rate (total catch divided by age 2 and older biomass) for the base case model (round points) with approximate 95% asymptotic confidence intervals (grey lines). The red line is the harvest rate at the overfishing proxy using $SPR_{50\%}$.

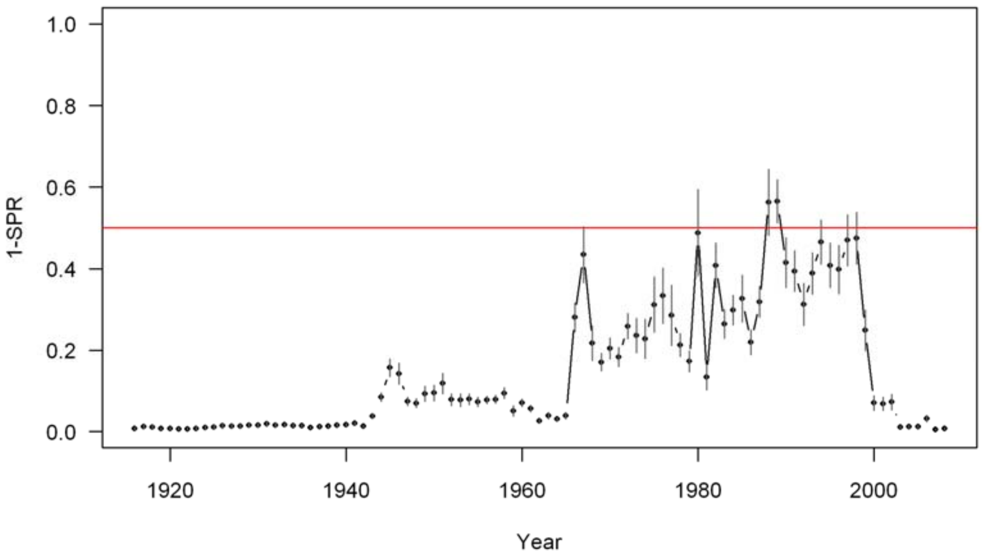

Figure f. Estimated spawning potential ratio (SPR) from the base case model with approximate 95% asymptotic confidence intervals. One minus SPR is plotted so that higher exploitation rates occur on the upper portion of the y-axis. The management target is plotted as a red horizontal line and values above this reflect harvests in excess of the overfishing proxy based on $SPR_{50\%}$.

Management performance

Greenstriped rockfish are currently managed as part of the minor shelf rockfish mixed-species group and have never been managed with a species-specific OY or ABC. Exploitation rates, on greenstriped rockfish in particular, have rarely exceeded the *MSY* proxy levels and the base case model did not predict that the stock has ever fallen below the target biomass defined as 40% of unfished spawning output. Recently, the exploitation rates have fallen drastically due to management measures implemented to reduce the impacts of fishing on other species of rockfish.

Table f. Recent trend in total catch and commercial landings (mt) relative to management guidelines.

Year	ABC (mt)	OY (mt)	Commercial Landings (mt)	Recreational Landings (mt)	Estimated[1] Total Catch (mt)
1999	—	—	59.0	11.0	393.1
2000	—	—	11.2	9.5	90.4
2001	—	—	13.6	6.6	90.7
2002	—	—	17.7	1.4	101.8
2003	—	—	2.7	0.3	14.6
2004	—	—	3.0	0.7	16.8
2005	—	—	2.9	1.6	16.7
2006	—	—	7.6	1.0	48.2
2007	—	—	1.0	1.3	7.3
2008	—	—	1.7	1.7	11.0

[1] Total annual catches reflect the commercial landings plus the model estimated discarded biomass, as well as recreational landings.

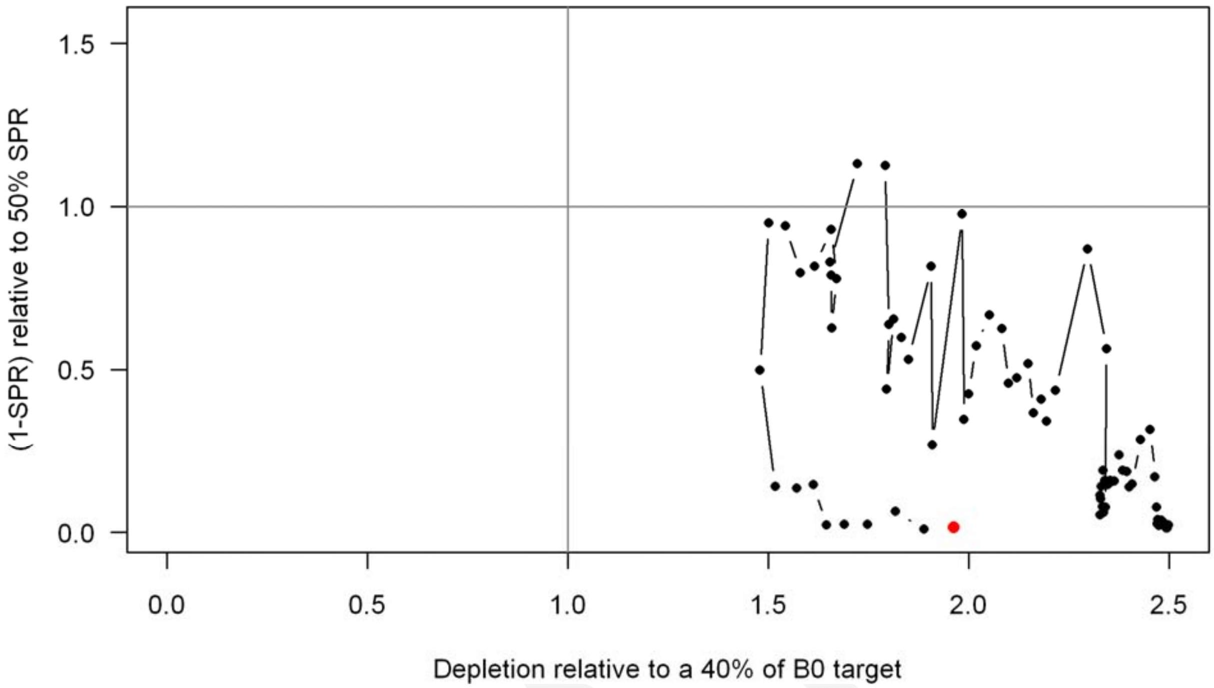

Figure g. Phase plot of estimated relative (1-*SPR*) vs. relative spawning biomass for the base case model. The relative (1-*SPR*) is (1-*SPR*) divided by 0.5 (the harvest rate limit). Relative depletion is the annual spawning output divided by the spawning output corresponding to 40% of the unfished spawning output. The red point indicates the current year (2008).

Unresolved problems and major uncertainties

The base case assessment model for greenstriped rockfish was developed to balance parsimony and realism with the goal of estimating a biomass trajectory for the population of greenstriped rockfish on the outer west coast of the United States. The model contained many assumptions to achieve parsimony and used many sources of data to estimate reality, but there will always be unresolved problems as well as uncertainty in the estimates.

The information in the model on discarding practices came from West Coast Groundfish Observer data collected since 2002 and the historical discarding practices are uncertain. Data are available from a discarding study in the mid-1980's, but due to a small number of samples and unexpected patterns, the data were not included in the model. However, the fraction of the catch that was discarded was included as an axis of uncertainty for the states of nature to provide an insight into the overall uncertainty.

An assumption that affected the estimated stock status was the value of natural mortality. This parameter was fixed in the base model at a value determined from otoliths collected in recent years during the NWFSC groundfish surveys. Changes to this parameter resulted in greater changes to the estimated depletion than any other factor for which model sensitivity was tested. The model with all of the data estimated natural mortality at a lower value than the fixed value of 0.08, and predicted a more depleted stock. As with the base model, though, recent exploitation rates were low and an increasing trend was predicted such that the stock status was forecasted to likely be above the target level within 2 years.

Natural mortality was also included as an axis of uncertainty in the states of nature to characterize this variability in the level of depletion.

One difficulty in the base case assessment was that the estimated length-based selectivity for some fleets showed an increasing selectivity up to the largest size modeled. There may be explanations for why a fleet would show this selectivity pattern for greenstriped rockfish, but the base case model forced the selectivity to reach its peak just before the largest length class modeled. Initial sensitivity analyses to this assumption showed that although the fit to the length frequency data changed, the consequences of bounding selectivity had little effect on the interpretation of current stock status.

An additional uncertainty in the base case model included the accuracy of the reconstructed landings time series. Sensitivity analyses to doubling and halving the landings scaled the population up and down, respectively, but did not change the estimates of stock depletion. However, increasing or decreasing the historical landings resulted in higher or lower predicted potential yields, respectively.

Approximate asymptotic confidence intervals were used to show uncertainty in the estimated parameters of the base model. Natural mortality and the fraction discarded were chosen to characterize states of nature to provide an indication of the overall uncertainty in the model. The base case model showed wide confidence intervals around spawning output throughout the time series, and estimated that depletion has been somewhat uncertain over the last decade. The range of the states of nature resulted in even wider confidence intervals around the estimated parameters, indicating that there is a considerable amount of uncertainty in model. In spite of these issues and uncertainties, it is apparent is that the recent trend in the population is likely increasing, some strong recruitment has occurred within the last 20 years, and the stock is unlikely to be at risk given the current catch levels.

Forecasts

Forecasts and projections of the greenstriped rockfish population up to the year 2020 were constructed under the assumption that future catches would never reach the calculated OY. The average catch from 2007 and 2008 was used for the catches in 2009 and 2010 and allocated to the fisheries based on the average proportion of these catches. The landings and distribution of catches among fleets for 2011 and beyond were assumed equal to the average of the fleet specific landings from 2000–2003. This forecast table is meant to be representative of the status quo, yet still be conservative since landings in 2000–2003 were higher than more recent landings, although not as high as landings observed in the 1980's and 1990's.

Forecasting with these status quo catches resulted in stock and ABC increases over time.

Table g: Projection of potential ABC, OY, landings and catch, summary biomass (age 2 and older), spawning biomass, and depletion for the base case model based on the status quo. Landings in 2009 and 2010 are a total of 9 mt, determined from the average of the 2007 and 2008 landings for each fleet and allocated to each fleet based on the proportion caught in 2007 and 2008. Forecasted landings after 2010 are 20 mt (the average of 2000–2003) and allocated to each fleet based on the average distribution in 2000–2003.

Year	ABC (mt)	OY (mt)	Total Catch (mt)	Landings (mt)	Age 2+ biomass (mt)	Spawning output (million eggs)	Depletion (%)
2009	1,466	1,466	9	3	31,806	6,248	81.4
2010	1,512	1,512	9	3	32,480	6,458	84.1
2011	1,554	1,554	94	20	33,064	6,652	86.6
2012	1,586	1,586	93	20	33,484	6,799	88.5
2013	1,612	1,612	92	20	33,830	6,918	90.1
2014	1,633	1,633	91	20	34,112	7,011	91.3
2015	1,650	1,650	90	20	34,338	7,086	92.3
2016	1,663	1,663	89	20	34,518	7,145	93.0
2017	1,673	1,673	89	20	34,659	7,193	93.7
2018	1,681	1,681	88	20	34,768	7,231	94.2
2019	1,688	1,688	87	20	34,851	7,261	94.5
2020	1,693	1,693	87	20	34,913	7,285	94.9

[1] The ABC here is the calculated total catch determined by F_{SPR}.

Decision table

Table h. Decision table of 12-year projections beginning in 2011 for alternate states of nature based on two axes of uncertainty. Columns range over natural mortality and rows range over the fraction discarded. There are no probabilities associated with these states of nature other than the base model (center square) is the most probable scenario.

				State of nature (natural mortality)					
				M=0.06		M=0.08		M=0.10	
		Year	Landed catch (mt)	Depletion (%)	Spawning output (million)	Depletion (%)	Spawning output (million)	Depletion (%)	Spawning output (million)
State of nature (fraction discarded)	Low fraction discarded	2011	20	66.7	1,453	89.1	3,129	107.0	10,496
		2012	20	68.5	1,493	90.8	3,186	108.0	10,591
		2013	20	70.1	1,528	92.0	3,231	108.6	10,646
		2014	20	71.5	1,559	93.0	3,266	108.8	10,671
		2015	20	72.8	1,586	93.8	3,293	108.8	10,673
		2016	20	73.9	1,611	94.4	3,315	108.7	10,660
		2017	20	74.9	1,633	94.9	3,332	108.5	10,636
		2018	20	75.8	1,653	95.3	3,345	108.1	10,604
		2019	20	76.7	1,671	95.6	3,356	107.8	10,567
		2020	20	77.5	1,688	95.8	3,364	107.3	10,526
	Base fraction discarded	2011	20	63.8	3,671	86.6	6,652	106.3	20,029
		2012	20	65.8	3,788	88.5	6,799	107.5	20,254
		2013	20	67.6	3,890	90.1	6,918	108.2	20,394
		2014	20	69.1	3,981	91.3	7,011	108.6	20,466
		2015	20	70.5	4,061	92.3	7,086	108.7	20,488
		2016	20	71.8	4,134	93.0	7,145	108.7	20,477
		2017	20	72.9	4,199	93.7	7,193	108.5	20,440
		2018	20	74.0	4,259	94.2	7,231	108.2	20,385
		2019	20	74.9	4,314	94.5	7,261	107.8	20,318
		2020	20	75.8	4,364	94.9	7,285	107.4	20,242
	High fraction discarded	2011	20	64.4	8,756	86.4	16,561	106.8	56,150
		2012	20	66.4	9,023	88.3	16,932	108.0	56,761
		2013	20	68.1	9,256	89.9	17,232	108.7	57,139
		2014	20	69.6	9,461	91.1	17,469	109.0	57,329
		2015	20	71.0	9,643	92.1	17,658	109.1	57,384
		2016	20	72.2	9,807	92.9	17,809	109.1	57,343
		2017	20	73.3	9,956	93.5	17,931	108.8	57,232
		2018	20	74.3	10,092	94.0	18,028	108.5	57,072
		2019	20	75.2	10,217	94.4	18,106	108.2	56,876
		2020	20	76.0	10,332	94.7	18,167	107.8	56,657

Research and data needs

There are four topics for which additional research would greatly improve the assessment of greenstriped rockfish.

1. **Landings:** improving certainty of the commercial and recreational landings would result in a better estimate of the total yield as well as an improved understanding of the population dynamics of greenstriped rockfish. The landings have been determined in the best possible manner given the time constraints of this assessment, but there is still uncertainty in the catch reconstruction and in recent landings. The state of California has produced reconstructed and current landings for many species, which have been accepted as the best possible information. However, a similar reconstruction is not available for Oregon and Washington landings, although such a product is of interest to fisheries managers and stock assessors. Additionally, some errors were found in the PacFIN database of recent landings during the current catch reconstruction and are being reconciled. Further error checking may be worthwhile for greenstriped rockfish as well as other species.
2. **Discards:** discarding at sea is common practice for greenstriped rockfish and the levels of historical discards are poorly known due to a lack of data. The West Coast Groundfish Observer Program (WCGOP) has contributed greatly to the understanding of discard rates and size compositions. However, it would be useful to review what information is available from the past to understand discarding practices and to determine how reliable that information is.
3. **Natural mortality:** the value for natural mortality in the base case model was fixed at 0.08, which was determined from the maximum age observed in recent survey data. Other published estimates of natural mortality for greenstriped rockfish range from 0.09 to 0.149 and are based on maximum age, catch curve analyses, and gonadosomatic indices. The data used in the base model supported a natural mortality near 0.065. All of these estimates of natural mortality are uncertain and given the correlation between natural mortality and stock status, it would be useful to have a better understanding of the plausible range of values.
4. **Stock structure:** there is some evidence that the life history of greenstriped rockfish in Southern California may be different from greenstriped rockfish in Northern areas. Understanding and quantifying the differences in length, weight, ages, maturity, and fecundity (as well as the number of broods per year) would be helpful to determine if the model should incorporate these differences.

Table i. Summary of recent trends in estimated greenstriped rockfish exploitation and stock levels from the base case model.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Commercial landings (mt)	59.0	11.2	13.6	17.7	2.7	3.0	2.9	7.6	1.0	1.7	NA
Recreational landings (mt)	11.0	9.5	6.6	1.4	0.3	0.7	1.6	1.0	1.3	1.7	NA
Total catch (mt)	407.7	94.2	93.3	104.3	14.8	17.1	16.9	49.5	7.4	11.1	NA
ABC (mt)	—	—	—	—	—	—	—	—	—	—	—
OY (mt)	—	—	—	—	—	—	—	—	—	—	—
1-SPR	24.9%	7.0%	6.8%	7.3%	1.1%	1.2%	1.2%	3.2%	0.5%	0.7%	0.6%
Exploitation rate (catch/ age 2+ biomass)	0.0166	0.0038	0.0037	0.0040	0.0006	0.0006	0.0006	0.0016	0.0002	0.0004	0.0003
Age 2+ biomass (mt)	23,726	24,001	24,723	25,602	26,375	27,377	28,250	29,259	30,233	31,044	31,806
Spawning output (millions of eggs)	4,545	4,663	4,827	4,953	5,055	5,193	5,370	5,582	5,802	6,029	6,248
~95% confidence interval	2,927–6,163	3,001–6,324	3,116–6,538	3,206–6,700	3,280–6,830	3,383–7,003	3,513–7,227	3,669–7,495	3,832–7,772	4,002–8,056	4,170–8,325
Range of states of nature	890–46,594	912–47,435	956–48,225	993–48,605	1,025–48,758	1,067–49,115	1,117–49,846	1,172–50,893	1,228–52,041	1,287–53,185	1,345–54,257
Recruitment	30,260	31,187	15,712	24,734	13,344	25,531	22,920	10,362	15,455	15,800	15,876
~95% confidence interval	4,088–223,973	4,212–230,944	2,080–118,679	3,327–183,866	1,750–101,777	3,409–191,198	2,978–176,400	1,212–88,576	1,673–142,769	1,575–158,450	1,583–159,209
Range of states of nature	4,730–329,445	4,932–333,433	2,461–168,587	3,907–262,380	2,077–142,727	3,942–275,722	3,506–252,179	1,618–114,327	2,487–171,948	2,562–172,960	2,581–173,337
Depletion (%)	59.2%	60.7%	62.9%	64.5%	65.8%	67.6%	69.9%	72.7%	75.5%	78.5%	81.4%
~95% confidence interval	50.6–67.7	51.9–69.5	53.9–71.8	55.5–73.5	56.8–74.9	58.6–76.6	60.9–78.9	63.7–81.6	66.7–84.4	69.8–87.2	72.8–89.9
Range of states of nature	38.0–90.2	38.8–92.0	40.6–93.6	42.2–94.3	43.6–94.6	45.5–95.2	47.8–96.5	50.3–98.3	52.9–100.3	55.7–102.2	58.4–103.9

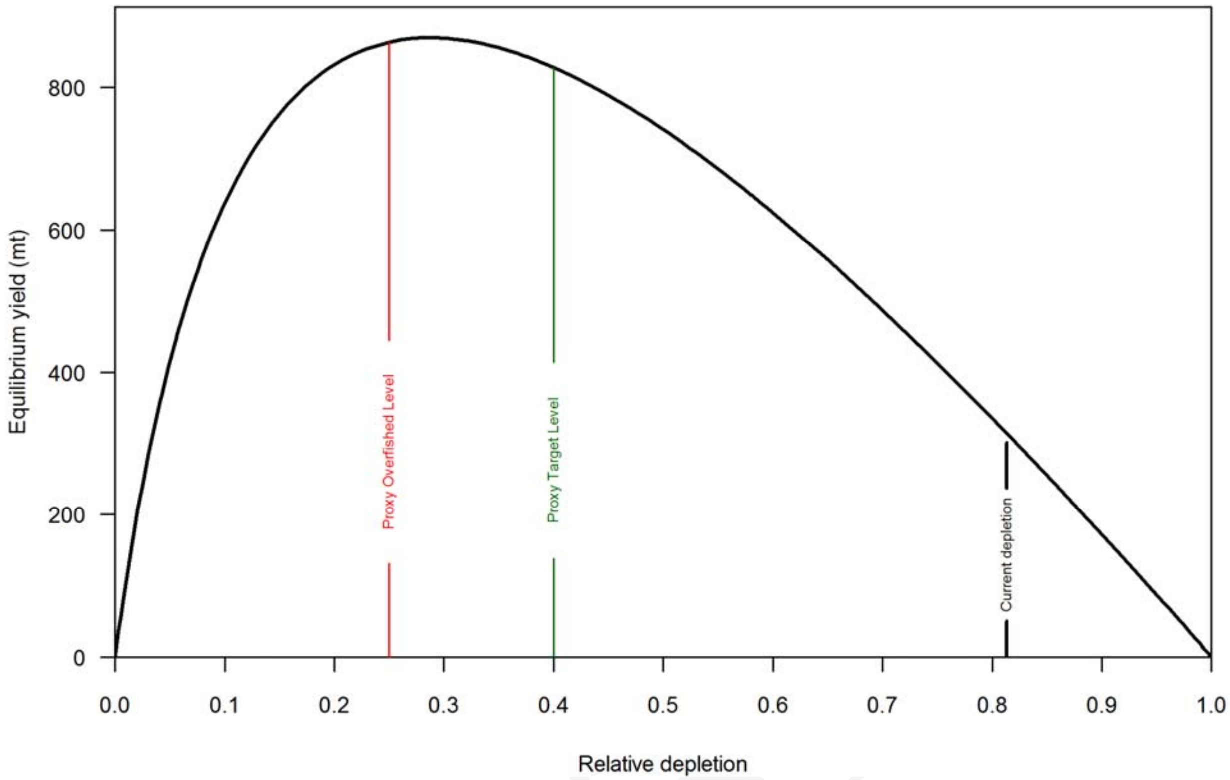

Figure j: Equilibrium yield curve (derived from reference point values reported in table i) for the base case model. Values are based on 2008 fishery selectivity and distribution. The depletion is relative to unfished spawning output.

1 Introduction

Greenstriped rockfish (*Sebastes elongatus*) are a small rockfish (maximum size near 45 cm) named after their slim shape and obvious green stripes. They have also been called strawberry rockfish, watermelons, poinsettas, serena, and reina, and have had the scientific names *Sebastodes elongatus* and *Pteropodus elongatus* (Love et al. 2002, Shaw & Gunderson 2006). This species is often observed in commercial and recreational fisheries, but due to its small size and reputed short shelf life, they are typically discarded (Love et al. 2002, Shaw & Gunderson 2006).

This assessment is focused on the population of greenstriped rockfish on the outer West Coast of the United States. This includes waters off of California, Oregon, and Washington, but does not include Puget Sound or Canadian waters.

1.1 Distribution and stock structure

Greenstriped rockfish can be found in abundance from British Columbia to Northern Baja California, but range from Chirikof Island in the Aleutian Islands (Gulf of Alaska) to central Baja California (Love et al 2002). Adults may inhabit depths between 12 and 500 meters, but are more commonly found between 100 and 250 m, and adults typically move to deeper water as they mature (Love et al 2002, Shaw & Gunderson 2006). This species of rockfish is found with other congeners or alone in a wide range of habitats, which include rocky outcroppings. However, unlike most other species of rockfish they seem to prefer mud or sand bottoms (Love et al 2002, Shaw & Gunderson 2006).

A genetic study of greenstriped rockfish was recently undertaken by Jon Hess (pers comm., NWFSC, NOAA) to study the stock structure of greenstriped rockfish. The genetic variability was remarkably low and showed less variability than most other rockfish species, even when including samples from Puget Sound. However, latitudinal differences in life-history traits have been observed, which are discussed in more detail below.

1.2 Life history and ecosystem interactions

Typical of other species of the genus *Sebastes*, greenstriped rockfish are long-lived with maximum observed ages greater than 50 years (Love et al 2002). Females grow larger than males, but typically mature at about the same length, between 18 and 24 cm, which corresponds to an age between 7 and 10 years. A latitudinal cline in maturity has been observed with fish maturing at a smaller size in the southern areas (Wyllie Echeverria 1987).

Greenstriped rockfish give birth to live young and the fecundity of a 0.5 kilogram female is on average around 200,000 eggs (Dick 2009), although a wide range of fecundity has been reported (Love et al 2002). The reproductive development of males and females is slightly offset with mating occurring in December through February, fertilization occurring in early spring, and parturition occurring about a month later in late spring (Shaw & Gunderson 2006). Females have the ability to store sperm during the time between copulation and fertilization to ensure the availability of spermatozoa when oocyte maturation has occurred (Shaw & Gunderson 2006). However, in southern latitudes, parturition may occur from January to July and females in Southern California may release two broods during this time (Love et al 2002). Juveniles settle to the bottom at about 3 cm in length in autumn and are commonly found along the interface of fine sand and clay. Maturing adults typically move to deeper water (Love et al 2002).

A wide range of prey items make up the diet of greenstriped rockfish. They will feed from the water column or the bottom on such things as fish, krill, shrimps, copepods, amphipods, and squid. Other fish species may prey on greenstriped rockfish. They have been found in the stomachs of king salmon (Love et al 2002) and reefs with small numbers of piscivorous rockfish had much higher numbers of small rockfish, such as greenstriped rockfish, than reefs with high numbers of piscivorous rockfish (PFMC and NMFS 2006).

1.3 Historical and current fishery

Greenstriped rockfish are a bycatch species with little market value mainly due to its small size, and it has been reported that fillets from this species have a short shelf life (Love et al 2002). As a result, there has not been a long-term directed fishery for this species. However, greenstriped rockfish are often observed in landings from various fisheries, although in small proportions. The most common occurrence of greenstriped rockfish is in trawl fisheries, but they are often caught in recreational fisheries, especially when fishing vessels drift off of the rocks.

After many attempts to start trawl fisheries off the west coast of the United States in the late 1800's, the availability of the otter trawl and the diesel engine in the mid-1920's helped the trawl fisheries expand (Douglas 1998). The trawl fisheries really became established during World War II when demand increased for shark livers and bottomfish. A mink food fishery also developed during World War II (Jones & Harry 1961). Foreign fleets began fishing for rockfish in the mid 1960's until the EEZ was implemented in 1977 (Rogers 2003). Since 1977, landings of rockfish were high until management restrictions were implemented in 2000.

Greenstriped rockfish are often caught in bottom trawls, but a long-term directed fishery has not occurred for this species and historical discarding rates are not well known. There have been many reports of greenstriped rockfish occurring in various fisheries, even as early as 1884 (Goode 1884). Fishermen report that greenstriped rockfish are ubiquitous, but are rarely if ever caught in great numbers. More detailed information of the fisheries by state is given in Section 2.1.1. when discussing the reconstructed landings.

1.4 Management history

Greenstriped rockfish outside of Puget Sound have not previously been assessed on the US west coast, and have not had individually specified ABC's or OY's. Beginning in 1983, the species was managed under ABC's and OY's for the Other Rockfish category, and per trip or cumulative limits for the *Sebastes* Complex. Since 2000, greenstriped rockfish have been included in the Minor Shelf Rockfish assemblage, with regard to OY's and cumulative limits. As late as 1998, cumulative limits for the *Sebastes* Complex were as high as 40,000 lb per two months. By 2000, landings of greenstriped rockfish were constrained by shelf rockfish limits of 300–1,000 lb per month.

1.5 Fisheries in Canada and Alaska

The exact details of fisheries in Canada and Alaska are unknown, but greenstriped rockfish is unlikely to have been targeted in either of these fisheries. Greenstriped rockfish are managed as part of a mixed-species category in Alaska, and details of Canada's fisheries for greenstriped rockfish are unknown at this time.

2 Data

The following sources of data were used in building this assessment:

1. Fishery dependent data:
   a. landings by state from various sources,
   b. lengths from port sampling,
   c. discard lengths from at-sea observations,
   d. discard mortality estimates from at-sea observations,
   e. discard mean weights from at-sea observations

2. Fishery independent data:
   a. relative abundance indices from the Triennial and NWFSC surveys,
   b. length frequencies from both surveys, and
   c. conditional age-at-length frequencies from the NWFSC survey.

The data sources and years of availability are summarized in Table 1 and Table 2. Estimates of biological relationships, such as fecundity, maturity, length-weight and length-at-age relationships, were either determined from the published literature or from the survey data.

2.1 Fishery dependent data

Greenstriped rockfish are not often targeted by any fishery, thus discards as well as landings are an important component of the total fishing mortality on the stock. Landings from the Pacific Fishery Information Network (PacFIN, Pacific States Marine Fisheries Commission) show that the majority of landings of greenstriped rockfish have occurred in the trawl fishery, but a small proportion has been seen in the hook and line, net, and recreational fisheries. An even smaller amount has been observed in the shrimp trawl fishery, but is not as substantial as the other fisheries. Table 3 shows the proportion of greenstriped rockfish landings from PacFIN reported for each gear type.

2.1.1 Historical catch reconstruction

Species composition sampling is used to determine the landings of greenstriped rockfish from the general market categories in which they were recorded. PacFIN serves as a clearinghouse for commercial landings data since the early 1980's, and before that, landings for each state were reconstructed using the assumptions described below.

2.1.1.1 Washington

Historical commercial landings of two gear types, trawl and longline, were reconstructed for greenstriped rockfish landed in Washington. No evidence of recreational landings was found and it was assumed that they constitute a negligible amount of the total mortality.

Washington's trawl fishery

Washington's coastal trawl fishery began in the early 1930's off of Cape Flattery and landings increased substantially by the 1940's (Tagart & Kimura 1982). In 1946, rockfish landings experienced a sharp decline, presumably in response to weakened market demand following World War II. After a period of steady landings of around 5,000 metric tons (mt) annually, landings rapidly increased in the 1960's, followed by a decline in the mid-1970's and a further increase in the late 1970's. Before the mid-1970's, most of the rockfish and POP catch came from Canadian waters. The implementation of the EEZ brought higher landings in WA from US waters and US landings rose to over 10,000 mt up until 1983. After that time, rockfish landings declined to around a 500 mt in the late 1990's.

Most of the rockfish landed in the Washington trawl fishery were historically categorized into two market categories: "Pacific Ocean Perch" (POP) or "other rockfish" (URCK). Additional market categories were added in the mid-1980's, but only POP and URCK were used to determine the landings of greenstriped rockfish. Figure 2 shows the amount landed in each category before proportioning out the species.

WDF began sampling rockfish landings for species composition in November 1966 and Tagart & Kimura (1982) reported the estimated landings of various rockfish species, including greenstriped rockfish when it was observed, for the years 1966–1979. Greenstriped rockfish were not often reported and the highest proportion of greenstriped observed in POP and other rockfish landings was 0.0012 in 1977.

Theresa Tsou (pers comm., WDFW) provided species composition data from landings for 1967–2009. From these data, the years 1968–1994 were used to calculate average proportions of greenstriped rockfish in the UPOP and URCK market categories from which greenstriped rockfish landings were calculated using historical landings. These years were chosen because landings in these two market categories were consistently sampled for species compositions. The average proportion of greenstriped in UPOP landings between 1968–1994 was 0.000840 and the average proportion of greenstriped in URCK landings between 1968–1994 was 0.000864. The average proportion of greenstriped in the sum of UPOP and URCK landings between 1968–1994 was 0.000860. The proportion of greenstriped rockfish in the URCK category substantially increased after 1994, when additional market categories were available (Figure 3).

A database of historical Washington landings (Greg Lippert, WDFW, pers comm.) contained landings from Puget Sound and was used to calculate a proportion of the US and Canadian rockfish landings (without POP) that were not from Puget Sound. POP was excluded because it was assumed all POP were caught outside of Puget Sound. From 1949 to 1969, the proportion of landings outside of Puget Sound were greater than 0.95 (Table 4). These estimates agreed closely with estimates calculated using data from research reports on the Washington trawl fishery (Holmberg et al. 1962, Holmberg et al. 1967). Prior to 1949, when POP and rockfish landings were not separated, it was assumed that 99% of the landings came from outside of Puget Sound.

Catches from US waters were derived from Forrester (1967) and Tagart & Kimura (1982). Forrester (1967) reports the separate US vessel and Canadian vessel catches of POP and rockfish for PSMFC areas near British Columbia in the years 1954–1965. Catches south of PSMFC area 3B were not reported, but it is likely that a large proportion of the catch south of 3B came from Oregon vessels. The proportion of Washington landings caught in US waters was calculated as the ratio between the US vessel catch in area 3B and the total catch by US vessels. It is unclear if area 3C as used by Forrester (1967) includes a portion of US waters. Tagart & Kimura (1982) report catches by PSMFC area for the years 1966–1979 and there was little catch in the areas south of 3B.

Historical landings of greenstriped rockfish were determined as follows for the periods shown.

< 1930: Assumed no catch of greenstriped rockfish.

1930–1934: The Pacific Fisherman Yearbook rockfish landings were used and it was assumed that all landings were caught in US waters. It was assumed that 1% of the total catch was from

Puget Sound, thus was removed (1% was used because POP could have been aggregated with rockfish). The proportion of greenstriped rockfish used was 0.00086.

1935–1941: Dept. of Fisheries WA reported landings (1955 Commercial Fishing Statistics, WA Dept Fisheries) were used instead of the Pacific Fisherman Yearbook. The sources are quite different, and the Pacific Fisherman Yearbook states it is reporting foodfish only (there was a substantial mink food fishery). I used 0.00086 as the proportion of greenstriped rockfish in the landings since POP landings were not separated. For US catches, I assumed a linear decrease from 100% of the catches in US waters in 1934 to 17.65% catches from US waters in 1946 (calculated from the average percentage of catch of rockfish+POP in US waters between 1954-1974, see Forrester 1967 and Tagart & Kimura 1982). However, it is likely that fishing vessels stayed closer to home during the war years. Puget Sound catches were assumed to comprise 1% of the total landings and were removed.

1942–1948: Fish & Wildlife Service reports (Pacific Coast Fisheries) were used to determine rockfish landings instead of the Pacific Fisherman Yearbook or Dept of Fisheries WA reported landings (1955 Commercial Fishing Statistics, WA Dept Fisheries). The Pacific Fisherman Yearbook was typically less than the other two sources, which were not much different. The value 0.00086 was used as the proportion of greenstriped rockfish in the landings. For US catches, the linear decrease to 17.65%, as above, was used and it was furthermore assumed that 17.65% of the catch came from US waters between 1946–1948. It was also assumed that 1% of the total catch came from Puget Sound.

1949–1951: A database of Washington landings provided by Greg Lippert (pers comm., WDFW) was used to determine landings of combined rockfish and POP for these years. The value 0.00086 was used as the proportion of greenstriped rockfish in the landings. For US catches, it was furthermore assumed that 17.65% of the catch came from US waters between 1946–1948. The proportion of landings that occurred outside of Puget Sound were determined from the database and ranged between 99.2% and 99.7% for these years.

1952–1965: The database of Washington landings was used for separated rockfish and POP landings. Values of 0.000864 and 0.00084 were used as the proportion of greenstriped rockfish in the other rockfish and POP categories, respectively. The proportion of landings from US waters were determined for the years 1954–1965 using data reported by Forrester (1967) and ranged from 3.1–40.2% for rockfish landings and 9.9–46.4% for POP landings. The proportions of rockfish and POP landings from US waters for the years 1952–1953 were 0.215 and 0.143, respectively, which were the averages of the proportions from US waters in the years 1954–1974 (before the proportion of landings caught in US waters began steadily increasing). Tagart & Kimura 1982 report that prior to 1968, POP landings were invariably 100% Pacific Ocean perch and species composition does not need to be applied. However, after discussions with Fish & Wildlife Biologists and noticing that greenstriped rockfish have been landed with POP catches after 1968, it was considered unreasonable given the large catch of POP prior to 1968 that no greenstriped rockfish would have been caught or landed in this category.

1966–1979: Landings of POP and rockfish were obtained from Tagart & Kimura (1982) for US waters only. Proportion of 0.00084 and 0.001097 were applied to the POP and rockfish landings, respectively, to obtain the landings of greenstriped rockfish. Tagart & Kimura report area specific landings, thus catches from US waters were calculated directly. The estimated landings of greenstriped rockfish increase rapidly near the end of this series, which is due to the domestic fleet taking more catch from US waters.

1980–1980: The estimate of greenstriped rockfish landings for this single year was obtained from a spreadsheet supplied to me by Vlada Gertsvena (pers comm., NWFSC, NOAA) which was supplied to her by Jack Tagart. This spreadsheet is called ROCKFI~2.xls and has the catch of greenstriped rockfish listed. Therefore, no proportions needed to be applied.

1980–2006: The estimates of greenstriped rockfish landings were obtained from PacFIN (extraction on May 11, 2009). These landings matched very closely with the spreadsheet called ROCKFI~2.xls supplied by Jack Tagart by way of Vladlena Gertseva (pers comm., NWFSC, NOAA).

The historical landings of greenstriped rockfish in the Washington trawl fishery were low until the late 1970's when the EEZ was implemented and US vessels fished more often in US waters. The various data sources are mostly in close agreement (Figure 4).

Washington longline fishery

The longline fishery contributes a small amount of greenstriped rockfish landings when compared to the trawl fishery. However, total rockfish landings were available from the Washington landings database for longline gear between 1949 and 1969, and from the Washington fish ticket data between 1970 and 1980 (pers comm., Theresa Tsou, WDFW).

Jack Tagart provided Vlada Gertsvena (NWFSC, NOAA Fisheries) with a spreadsheet containing species composition data for longline gear (called LLSPP~2.xls). Using these data from the period 1994–1998, the proportion of greenstriped rockfish observed in longline landings was 0.001863, and greenstriped rockfish were observed in three of the five years. This value is quite a bit higher than the proportion of greenstriped rockfish observed in Washington trawl landings, which may be due to the small number of years and the highest proportion of greenstriped rockfish observed in 1997 at 0.0073.

Longline landings of greenstriped rockfish have always been a small proportion of the total landings when compared to the trawl fishery (Figure 4).

Washington recreational landings

Historical recreational landings of greenstriped rockfish from Washington were not available. The mortality of recreational fisheries on greenstriped rockfish in Washington is uncertain, but it is likely to be a small proportion of the total mortality.

2.1.1.2 Oregon

Oregon's trawl fishery

Most of the rockfish landed from the Oregon trawl fishery were historically categorized into two market categories: "Pacific Ocean Perch" (POP) and "other rockfish" (UNRK). Both groups contained many species of *Sebastes* and *Sebastolobus* (Douglas 1998). In 1984, new market categories were created for widow rockfish (*Sebastes entomelas*), thornyhead rockfish (*Sebastolobus sp.*), and small rockfish. A yellowtail rockfish (*Sebastes flavidus*) category was added in 1985.

Landings have been sampled since 1962 to determine species composition in the market categories. Prior to about 1991, this consisted of taking random samples from the landings. Since then, cluster sampling has been employed to determine the species composition of the landings. Species compositions determined from Oregon trawl landings between 1963 and 1993 were used to determine the proportion of greenstriped rockfish in the various market categories. The historical reconstruction of the trawl fishery landings of greenstriped rockfish is given below. No reconstruction was attempted for other fisheries in Oregon.

< 1928: Landings of greenstriped rockfish were assumed to be minimal and set equal to zero for this time period.

1928–1949: Cleaver (1951) reported the landings of rockfish caught by trawl and longline gear. Trawl catches mainly consisted of black rockfish (*Sebastes melanops*), yellowtail rockfish (*S. flavidus*), canary rockfish (*S. pinniger*), and Pacific ocean perch (*S. alutus*), while the longline fishery primarily caught yelloweye rockfish (*S. ruberrimus*). Pacific ocean perch were first fished regularly in 1945 and recorded separately in mid-1949. The proportion of greenstriped applied to the total rockfish landings from 1928–1949 was calculated by dividing the total expanded sample weight of greenstriped rockfish by the total landed weight of the sampled landings for Pacific ocean perch and rockfish between 1963 and 1983 (see Douglas 1998). The estimated proportion was 0.003526. Scrapfish or landings for minkfood were first recorded in 1941 and increased greatly in the late 1940's. Cleaver (1951) reported that approximately 12% of these landings were rockfish. Therefore, the same proportion as above was applied to 12% of the scrapfish (minkfood) landings, which amounts to about 317 mt of greenstriped in 1948.

1950–1953: Smith (1956) reported Pacific ocean perch and other rockfish landings for this period as well as scrapfish landings. Separate proportions of greenstriped in the POP and UNRK categories were calculated using data from 1963–1983 (Douglas 1998) and applied to the landings. Scrapfish was assumed to be composed of 12% rockfish except for in 1953 when Jones & Harry reported scrapfish to be composed of 13% rockfish (scrapfish landings in 1953 also came from Jones & Harry 1961). The proportion of greenstriped rockfish in the UNRK category was applied to these percentages of the scrapfish landings to determine the weight of the greenstriped rockfish landed. The proportion of greenstriped rockfish in the POP and UNRK categories was estimated at 0.00136 and 0.004258, respectively.

1954–1955: Pacific ocean perch and rockfish landings were compiled from Pacific Coast States Fisheries reports (C.F.S. No. 1366 and C.F.S. No. 1580). The same proportions for greenstriped rockfish used in the POP and UNRK categories for the data from 1950–1953 were used here. Scrapfish landings came from Jones & Harry (1961) as well as the percentage of rockfish in the scrapfish landings (1954=23% and 1955=15%). The proportion of greenstriped rockfish in the rockfish category was applied to the estimated rockfish weight in the scrapfish landings.

1956–1962: The publication called "The Big Book" was used for landings of Pacific ocean perch and rockfish landings between 1956 and 1962. There were two categories for rockfish: one called "other rockfish" and the other called "rockfish". The "other rockfish" category listed commercial as its use while the use for the "rockfish" category was labeled as animal food. These categories were treated the same and summed before applying the rockfish proportion for greenstriped landings as was done for 1950–1953 landings. The proportion of greenstriped in the POP category was used as above. Scrapfish landings were reported by Jones & Harry (1961) for the years 1956-1957 and by Niska (1969) for the years 1958-1962. The proportion of rockfish in the scrapfish landings from 1956 was reported by Jones & Harry (1961) as 0.30, and the proportions for 1958–1962 were reported by Niska (1969).

The proportion for 1957 was unavailable, thus the average of the proportions of rockfish landed in scrapfish landings for the years 1958–1965 (Niska 1969) was used (0.094).

1963–1983: Douglas (1998) reported expanded weights of greenstriped rockfish in the POP and UNRK landings by PSMFC area. These weights were summed over all PSMFC areas to find the weight of greenstriped rockfish for each year. The proportion of greenstriped rockfish in each category was calculated by dividing the weight of sampled greenstriped rockfish by the total weight of the samples. The total landings of greenstriped in each year was calculated as the year specific proportion of greenstriped in the market category times the yearly total landings in the market category, summed over POP and UNRK market categories. Scrapfish landings as well as the proportion of rockfish in these landings for the years 1963–1965 were taken from Niska (1969). The scrapfish landings for the years 1966–1977 were calculated by adding the animal food category landings for PSMFC areas 2A, 2B, 2C, and 3A in the Big Book. The Big Book scrapfish landings for the years 1956–1962 were similar to those reported by Niska (1969). The average of the proportions of rockfish landed in scrapfish landings for the years 1958–1965 (Niska 1969) was used to estimate the weight of rockfish (0.094). It was assumed that there were no scrapfish landings after 1977.

1984–1986: In 1984 widow rockfish (*Sebastes entomelas*) and small rockfish market categories were introduced and the year specific proportions of greenstriped rockfish were calculated for these two market categories. The market categories for yellowtail rockfish (*Sebastes flavidus*) and thornyheads (*Sebastolobus sp.*) were not used in this reconstruction as they observed a very small proportion of greenstriped rockfish. The year specific proportions were multiplied by the yearly landings in each market category, and then summed over market categories to obtain the total landings of greenstriped rockfish.

Figure 5 shows the reconstructed landings series and how it is similar to the recent landings from PacFIN. Landings were generally small until the 1980's. Figure 6 shows the estimated landings for each market category used in the reconstruction. Most of the landings come from the general rockfish categories, but there is one year with a large amout of greenstriped rockfish estimated to have been landed in the widow category and may be the result of an error or limited sampling.

Oregon recreational landings

Oregon Department of Fish & Wildlife (ODFW) has collected recreational landings for the period 1973–1992, but has reported only numbers of total rockfish for the years 1973–1978 and numbers for each species between 1979–1992. Converting these numbers to weight would require an estimate of average weight and a species proportion for the years reporting only total numbers, resulting in extra uncertainty. Therefore, given the small number of recreational landings, a historical reconstruction of Oregon's recreational fisheries prior to 1979 was not done. The landings from 1979 to present are described in section 2.1.2.2.

2.1.1.3 California

California's commercial fisheries

Historical commercial fishery landings were obtained from the California Cooperative Groundfish Survey, also know as CALCOM (pers comm., Don Pearson, NMFS). Reconstructed landings for the gear categories trawl (TWL), other (OTH), and unknown (UNK) were provided for 1916–1968. All trawl landings were used to reconstruct the trawl fishery. The landings for the other (OTH) gear pertain to nets, diving, and spears (CalCOM documentation) and there were considerable landings in the early period (Figure 7). The gear type “OTH” showed an increase landings in later years. Because the total mortality of both of these gears appeared to be substantial, the landings were added together to create a non-trawl gear type.

California’s recreational fisheries

Reconstructed landings for recreational fisheries were provided by John Field (pers comm., SWFSC, NOAA; June 26, 2009) for the years 1928–1980. These landings were recently revised and are slightly less than the recreational landings downloaded from CalCOM (Figure 8).

2.1.2 Recent commercial and recreational landings

An extraction on May 11, 2009 from the PacFIN system, administered by the Pacific States Fishery Management Council, was used to determine the landings of greenstriped rockfish for the recent time period from 1981–2008. Recreational landings for 1980–2008 were downloaded from the RecFIN website (Pacific State Marine Fisheries Commission, 2009) and included estimated retained catch as well as estimated discarded dead catch. Historical and recent landings are reported in Table 5 and Table 6.

2.1.2.1 Washington

Washington’s commercial landings

All landings of greenstriped rockfish in the PacFIN database were listed under the species group GSRK and trawl gear (TWL). Landings reconstructed from Tagart & Kimura (1982) match closely with the PacFIN landings except for two years in the early 1990’s where the PacFIN landings were quite a bit lower (Figure 4). In general, Washington landings increased throughout the 1980’s, declined significantly in the late 1990’s, and since 2005, have been very small. The trawl landings of greenstriped rockfish in Washington have been a small proportion of the total coastwide landings (Figure 9).

Washington’s recreational landings

The only year for which recreational landings were available in ocean only areas of Washington was 1981, and were small compared to recreational landings from Oregon and California.

2.1.2.2 Oregon

Oregon’s recent commercial landings

Landings since 1987 were available for Oregon commercial fisheries from the PacFIN system. No landings from Oregon before 1987 were reported in this extraction. All catches landed at Oregon ports were reported specifically as greenstriped rockfish (code GSRK), which were determined by applying species compositions to the landings in the shelf rockfish category (pers. comm.., Mark Karnowski, ODFW). Landings were listed by the gear types HKL (hook and line), TWL (trawl), and TWS (shrimp trawl). TWL landings comprised 92% of the total landings reported for these three gear types. The TWS landings made up 7% of the landings, but the landings reported in 1996 were 86.9% of the landings reported for all years of TWS (87.4 mt in 1996 and the average of other years was 1.0 mt). It is likely that this large amount in 1996 reported for TWS is the result of a recording error where yellowtail rockfish were accidentally listed as greenstriped rockfish (pers comm., Mark Karnowski, ODFW). Without the TWS landings, HKL landings comprised 1.1% of the total TWL and HKL landings for all years from 1987 to 2008.

Recent trawl landings of greenstriped rockfish in Oregon were high in the late 1980's and throughout the 1990's. Landings greatly decreased in 2000 and have remained low (averaged 2,725 tons). As with Washington landings, PacFIN catches matched closely with overlapping historical reconstruction, except in the early 1990's when PacFIN landings were lower than the reconstructed landings (Figure 5). Oregon trawl landings of greenstriped rockfish have been a major component of the coastwide trawl landings (Figure 9).

Landings of greenstriped rockfish from gears other than trawl gear were a small proportion of the total coastwide other-gear landings and most landings in Oregon occurred in the 1990's (Figure 11).

Oregon's recent recreational landings and discards

RecFIN (Pacific State Marine Fisheries Commission, 2009) did not have recreational landings available for all years since 1979, but numbers of fish were available from ODFW (pers comm., Mark Karnowski, ODFW). Therefore, an average weight of all recreational landings was determined using the numbers of fish provided by ODFW and the weights provided by RecFIN. The numbers of fish provided by ODFW were then converted to weight by multiplying by this average weight, resulting in estimates of the recreational landings for years missing from the RecFIN data.

Oregon recreational landings of greenstriped rockfish have averaged around 500 kg per year over this period, and have been low compared to recreational landings from California (Figure 10).

2.1.2.3 California

California's recent commercial landings

Estimated landings from 1969–2008 were provided for California from CalCOM (pers comm., Don Pearson, NOAA) and were determined from actual landings and species compositions. Five gear types were reported in these data: FPT refers to pots and traps, HKL is troll, hook and line, and longline, MDT refers to midwater trawls, NET is gillnets, and TWL refers to all bottom type trawls including bottomfish and shrimp gear. These gear types were summarized in trawl and other-gear categories. Trawl gear included any landings labeled TWL or MDT. Midwater trawls were included because some greenstriped rockfish appeared in this gear category and Oregon samples from the widow market category showed greenstriped, which likely contained some midwater trawling. The other-gear category included NET and HKL gear types. The FPT gear category showed a very small amount of landings and was not included.

The trawl landings of greenstriped rockfish in California were large prior to 1980, reduced but substantial in the 1980's and 1990's, and minimal since 2001 (averaging less than 1 ton per year). Figure 9 shows these landings relative to the three states. Landings from other gears were substantial in the 1970's and 1980's, increased in the 1990's, and reduced to a very small amount in the recent decade (Figure 11).

California's recent recreational catches

Recreational catches in California were extracted from RecFIN (Pacific State Marine Fisheries Commission, 2009) since 1981 and included estimated landed weight and estimated discarded dead weight for ocean only areas. A large amount of greenstriped rockfish were landed in the recreational fishery in the early 1980's, and then decreased, but remained substantial, in the 1990's. Landings have been very small since 2003, which coincides both with numerous management restrictions as well as a change from the Marine Recreational Fisheries Statistic Survey (MRFSS) to the California Recreational Fisheries Survey (CRFS).

2.1.3 Discards

Greenstriped rockfish have not had any significant market in the past and have likely been discarded at sea. Two sources of data were available with discard information. These included three years of data collected from Oregon vessels in the mid-1980's (Pikitch et al 1988; data obtained from John Wallace, NWFSC, NOAA) and recent data since 2002 collected as part of the West Coast groundfish observer program (WCGOP data obtained from Eliza Heery, NWFSC, NOAA).

The data used in the study by Pikitch et al (1988) contained retained and discarded weights of the catch for trawl fisheries targeting bottomfish, deepwater dover, near shore mixed species, or shrimp in the years 1985–1987. Lengths were taken from a small number of tows in 1986 and 1987. The ratio of the observed discards to the total observed catch for each year and strategy is shown in Table 7 and ranged from 0.23 to 0.62. The length frequencies showed a strong size selection to retain greenstriped rockfish larger than 29 cmwith none discarded above 30 cm (Figure 12). This size selective discarding resulted in large average weights for the retained portion of the catch with discards averaging close to 0.25 kg and retained catch averaging more than 0.41 kg (Table 8).

Landed and discarded mortality estimates, mean weights of discards, and length frequencies of discarded greenstriped rockfish were available from WCGOP data for the trawl, limited entry fixed gear (longline and pot), and shrimp fisheries. The shrimp fishery did not show any landed greenstriped rockfish in the years 2004, 2005, and 2007, but the WCGOP reported 6.44, 2.74, and 2.76 metric tons of discarded greenstriped rockfish in these years, respectively. These data were not used in this assessment. The discard rates (discard weight divided by total catch weight) for the trawl and fixed gear fisheries are shown in Table 9 and ranged from 0.78 to 0.98 for trawl fisheries north of 40° 10' N and from 0.90 to 1.0 for trawl fisheries south of 40° 10' N. Fixed gear fisheries showed very high discard rates greater than 0.98. All of these discard rates are much larger than the discard rates from the Pikitch et al (1988) data.

Length frequencies were estimated for the trawl fishery in Oregon and Washington combined, the trawl fishery in California, and the coastwide fixed gear fishery. Table 10 shows the number of samples available for years and gears with length data. The discard length frequencies from the WCGOP showed a large proportion of fish greater than 20 cm, unlike the Pikitch et al (1988) data, suggesting that the recent fishery is not size selective (Figure 13). Furthermore, the fixed gear fishery appears to discard only large fish, which is possibly due to the selection of only large fish.

The mean weight of the discards from the WCGOP for the Oregon and Washington trawl fishery, the California trawl fishery, and the fixed gear fishery are shown in Table 11. The California trawl fishery had the smallest mean weights and the fixed gear fishery had the highest mean weights, which were more than twice the California trawl fishery.

2.1.4 Foreign catches

Foreign catches in US water were available by INPFC area from Rogers (2003) and occurred between 1966 and 1976. Reported catches of greenstriped rockfish from the Soviet Union, Japan, Poland, Bulgaria, and East Germany were summed and tabulated by INPFC area (Table 12). The Soviet Union caught the highest proportion of greenstriped rockfish in all years except in 1975 when Poland caught a slightly higher amount, and total foreign landings peaked in 1967 at 143 metric tons (Table 12).

Rogers (2003) reported that there were unlikely any discards of rockfish in the foreign catch (based on observations by United States fishermen and biologists). At the start of the series (1966–1970) the foreign catches comprise a very large proportion of the total domestic and foreign landings of greenstriped rockfish, which may be due to the lack of discarding by the foreign fleet (Figure 14).

2.1.5 Fishery logbooks

Logbook data for greenstriped rockfish were downloaded from PacFIN on May 11, 2009. There were 349 observations for the years 1993–2007 from different types of trawl gear, and all observations were reported by California. Table 13 shows the number of logbook observations by year and the small percentage of observed catch in most years (except 2003–2005). Due to the small sample sizes and changes in management over the period represented, it is unlikely that these data index the coastwide abundance of greenstriped rockfish. Therefore, no further analyses were done using these data.

2.1.6 Abundance indices

Due to the small sample sizes by year, the small proportion of the landings that were observed, the complication of discards, and changes in management over the period represented, it is unlikely that the logbook data adequately index the coastwide abundance of greenstriped rockfish. Therefore, a catch-per-unit-effort series was not calculated.

2.1.7 Fishery biological sampling

Biological data from commercial fisheries for greenstriped rockfish were extracted from PacFIN (PSMFC) on July 6, 2009. The only useful data available in this extraction were lengths taken during port sampling in California, Oregon, and Washington. The data were classified as groundfish trawl (TWL), shrimp trawl (TWS), hook and line (HKL), or net (NET), and 309 observations could not be classified as a particular gear. There were 60 observations removed that had a missing length, and 10 observations were removed that recorded a length of 55 cm or greater. There were no hauls outside of US waters in this extraction.

Table 14 shows the number of landings sampled as well as the number of lengths taken for each year since 1978 trawl and non-trawl gear, and the three states. California has regularly sampled a large number of landings during this time period. Oregon and Washington started regularly sampling trawl landings in 1996 and non-trawl (all hook and line) landings in 2000. Oregon, however, has sampled few landings compared to California and Washington. The number of lengths recorded by sex and gear are shown in Table 15 and Table 16.

Length frequencies for trawl and non-trawl gear were estimated using these data (Figure 15). Samples were weighted up to the total landing then combined into state specific length frequencies. Washington did not have the total weight of the landing recorded, thus was expanded to the total landing weight by a factor of 6.3, which is the median expansion for the Oregon landings. Oregon and Washington trawl length frequencies were combined by simply adding the expanded numbers at length and sex together for each year. They were not expanded to total state landings because the sparse samples from Oregon would swamp the length frequency and cause peaks at particular lengths. The expansion factors for the non-trawl gear length samples were much less than the trawl gear landing expansions and the Washington lengths were not arbitrarily expanded. The predicted numbers at length for each state were added to create a coast-wide length frequency. The majority of the samples came from California landings and it is uncertain whether or not this introduced any a bias to be concerned of (Table 16).

In some years, the gender of the sampled fish was not recorded. Therefore, length samples with an average number of males per tow less than 0.5 or a large percentage of unsexed samples were estimated for both sexes combined.

Shaw & Gunderson (2006) aged 123 greenstriped rockfish from Oregon landings in 1995. However, these data were unavailable at the time of this report. Also, there are length data available from commercial passenger fishing vessel (CPFV) surveys in California, but these data were made available after the model was finalized and could not be included.

A summary of the biological data available for greenstriped rockfish, reported by PacFIN on June 19, 2009, reports that there are maturity data available. The data available for this assessment did not contain maturity information (every observation was coded 'U'), but these data are typically macroscopic samples, when available, and can be subject to a large amount of error.

2.2 Fishery independent data

2.2.1 NWFSC trawl survey

The NWFSC fishery-independent shelf and slope trawl survey produces three sources of information: an index of relative abundance, length-frequency distributions, and age-frequency distributions. Only years in which the NWFSC survey included the continental shelf are considered (2003-2008).

The NWFSC survey is based on a random-grid design; covering the coastal waters from a depth of 55 m to 1,280 m (Keller et al. 2007). This design uses four industry chartered vessels per year, assigned to a roughly equal number of randomly selected grid cells and is divided into two 'passes' of the coast which are executed from north to south. Two vessels fish during each pass, which have been conducted from late-May to early-October each year. This design therefore incorporates both vessel-to-vessel differences in catchability as well as variance associated with selecting a relatively small number (~700) of possible cells from a very large population of possible cells spread from the Mexican to the Canadian border. Much effort has been expended on appropriate analysis methods for this type of data, culminating in the West Coast trawl survey workshop held in Seattle in November 2006 (see background materials).

The NWFSC survey commonly encounters greenstriped rockfish along the U.S. west coast (Table 17, Figure 16). The survey did not fish shallower than 54 meters and no greenstriped rockfish were caught deeper than 450 meters in any year. Figure 17 shows that the percentage of positive tows and the catch rate over depth peak around 180 meters and decline as depth increases. Figure 17 also shows that the prevalence and density of greenstriped are generally higher in the northern latitudes.

Figure 18 displays the mean fish length per tow of greenstriped rockfish against tow depth and shows large variation in length for both sexes in the shallow to middle depths with both the occurrence of small and large greenstriped rockfish. As depth increases, the range in lengths decreases with the majority of observations being composed of larger fish.

A Generalized Linear Mixed Model (GLMM) model based approach was used to estimate index of abundance for greenstriped, which was endorsed by the trawl survey workshop for use in West Coast stock assessments. The GLMM approach, which includes both fixed and random effects, explicitly captures vessel-specific differences in catchability (due to engine power, trawling experience of the skipper, etc.) via inclusion of random effects. The GLMM approach explicitly models both the zero catches as well as allows for skewness in the distribution of catch rates through the use of a Gamma or lognormal error structure. These factors result in the GLMM approach being robust to a few large tows and likely more reflective of actual trends in population abundance.

When implementing the GLMM approach, it is recommended that there are at least three positive tows in each stratum/year combination. Since the Conception, Monterey, and Eureka areas had fewer than three observations in some years by depth strata, the original stratification of five INPFC areas and three depth zones was collapsed. Because depth showed a strong trend in catch rates and with lower catch rates in the south, the five INPFC strata were collapsed into three areas by state: California (south of 42N), Oregon (42N – 46N), and Washington (north of 46N). Three splits by depth remained with breaks creating a shallow depth (54.864-125 m), a middle depth (125 m-182.88 m) and a deep depth (182.88 m – 500 m). The predicted values plotted against the residuals for the positive tow model are shown in Figure 19.

The biomass index from the GLMM showed a fluctuating trend with the highest biomass estimate peaking around 20,500 metric tons in 2008 (Table 18, Figure 20). The biomass by area, estimated by GLMM analysis, shows the highest biomass in the middle depth for each of the three areas with the largest contribution from the Oregon middle depth (Figure 21). Also, an increasing trend in biomass for each of the three depths within the Washington strata compared to the reference year of 2003 was estimated. The biomass trends in each of the other two areas by depth were relatively constant or slightly lower than the biomass estimated in the reference year.

Length bins from 10 to 40 cm in increments of 1 cm were used to summarize the length frequency of the survey catches in each year. Table 17 shows the number of lengths sampled during the survey. The first bin includes all observations less than 11 cm and the last bin includes all fish larger than 40 cm. The length frequency distributions for the NWFSC survey from 2003–2008 are plotted in Figure 22.

Age-frequency data from the NWFSC survey (Table 17, Figure 23) were included in the model as conditional age-at-length distributions by sex and year. Age-at-length observations can be thought of as entries in an age-length key (matrix), with age across the columns and length down the rows. The approach consists of tabulating the sums within rows as the standard length-frequency distribution and, instead of also tabulating the sums to the age margin, the distribution of ages in each row of the age-length key is treated as a separate observation conditioned on the row (length) from which it came. This approach has several benefits for analysis above the standard use of marginal age compositions. First, age structures are generally collected as a subset of the fish that have been measured. If the ages are to be used to create an external age-length key to transform the lengths to ages, then the uncertainty due to sampling and missing data in the key are not included in the resulting age-compositions used in the stock assessment. If the marginal age compositions are used with the length compositions in the assessment, the information content on sex-ratio and year class strength is largely double-counted as the same fish are contributing to likelihood components that are assumed to be independent. Using conditional age-distributions for each length bin allows only the additional information provided by the limited age data (relative to the generally far more numerous length observations) to be captured, without creating a 'double-counting' of the data in the total likelihood. The second major benefit of using conditional age-composition observations is that in addition to being able to estimate the basic growth parameters (L_{minAge}, L_{maxAge}, K) inside the assessment model, the distribution of lengths at a given age, governed by two parameters for the standard deviation of length at a young age and the standard deviation at an older age, are also quite reliably estimated. This information could only be reliably derived from marginal age-composition observations where very strong and well-separated cohorts exist and where they were quite accurately aged and measured. By fully estimating the growth specifications within the stock assessment model, this major source of uncertainty is included in the assessment results, and bias due to size-based selectivity is avoided. Therefore, to retain objective weighting of the length and age data, and to fully include the uncertainty in growth parameters (and avoid potential bias due to external estimation where size-based selectivity is operating) conditional age-at-length compositions were developed using the NWFSC trawl survey age data.

Age distributions included bins from age 1 to age 45, with the last bin including all fish aged 45 or greater (Figure 23). Approximately 3,472 fish were sampled for age, compared to 17,678 fish sampled for length (Table 17). These data show the growth trajectory of females reaching a maximum size near 34 cm and males reaching a maximum size of about 29 cm (Figure 24). It is often useful to compute the marginal age-compositions to allow for easier visual tracking of strong cohorts and offer a more familiar summary view of the data, although this information is still imparted to the model using conditional age-at-length observations. The NWFSC age distributions show a strong 1993 cohort through the years, starting at age ten in 2003 and ending at age 15 in 2008 (Figure 23). There is also indication of a strong cohort or a number of years of strong cohorts in the late 1990's (Figure 23).

2.2.2 Triennial trawl survey

The triennial shelf trawl survey conducted by NMFS starting in 1977 is the second source of fishery-independent data regarding the abundance of greenstriped rockfish (Dark and Wilkins 1994). The sampling methods used in the survey over the 24-year period are most recently described in Weinberg et al. (2002). The basic design was a series of equally spaced transects from which searches for tows in a specific depth range were initiated (Figure 25). The survey design has changed slightly over the period of time (Table 19, Figure 26). In general, all of the surveys were conducted in the mid-summer through early fall: the survey in 1977 was conducted from early July through late September; the surveys from 1980 through 1989 ran from mid-July to late September; the survey in 1992 spanned from mid-July through early October; the survey in 1995 was conducted from early June to late August; the 1998 survey ran from early June through early August; and the 2001, 2004 surveys were conducted in May-July (Figure 26). Haul depths ranged from 91–457 m during the 1977 survey with no hauls shallower than 91 m. The surveys in 1980, 1983, and 1986 covered the West Coast south to 36.8°N latitude and a depth range of 55–366 meters. The surveys in 1989 and 1992 covered the same depth range but extended the southern range to 34.5°N (near Point Conception). From 1995–2004, the surveys covered the depth range 55–500 meters and surveyed south to 34.5°N. In the final year of the triennial series (2004), the Fishery Resource and Monitoring division (FRAM) at the NWFSC undertook the survey from the AFSC and followed very similar protocols as the AFSC.

Given the different depths surveyed during 1977 the results from the 1977 survey were not included in this assessment. Water hauls (Zimmermann et al. 2003) and tows located in Canadian and Mexican waters were also excluded from the analysis of this survey and the Conception area (south of 36°N latitude) was removed from the analysis since it was not surveyed in the early years.

Similarly to the NWFSC trawl survey, greenstriped rockfish were encountered throughout the West Coast (Table 20, Figure 27). Larger catch rates were observed around depths of 180 m with an increase in positive tows and catch rates with increasing latitude (Figure 28). An analysis of the mean length by depth showed a similar pattern to the observations in the NWFSC trawl survey (Figure 29) and the same depth stratification was used for the triennial survey (54.864–125 m, 125–182.88 m and 182.88–500 m). The same latitudinal stratification was also used for the analysis of the triennial survey (36°N-42°N, 42°N-46°N, and 46°N-49°N).

A GLMM based estimator, similar to the GLMM used for the NWFSC survey, was used to estimate a triennial index of abundance for greenstriped rockfish over the years 1980–2004. The estimated total biomass by stratum for each survey index is given in Table 18 and Figure 30, and range from 1,575 metric tons in 1980 to 5,551 metric tons in 2004. A general trend of increasing biomass was observed over the triennial trawl survey time-series. These estimates of biomass were smaller than the swept area estimates of biomass from the NWFSC survey and showed larger standard errors (Table 18, Figure 30).

Size distributions (fork length in cm) were calculated following the same procedures as the NWFSC survey. The numbers of fish and number of hauls represented in each year of the survey are presented in Table 20. The length frequency distributions generally show evidence of larger fish in 1980, 1983, and 1986 compared to the latter years, some very small fish in 1998, and an increase in mean length from 1998 to 2004 (Figure 31). There may be information on strong cohorts in these data.

Age data for greenstriped rockfish from the Triennial survey were not available at this time, although Shaw & Gunderson (2006) reported having analyzed 342 ages.

2.2.3 Additional fishery independent data

There have been other surveys along the west coast of the United States, but these have typically covered the slope area whereas greenstriped rockfish are more commonly distributed along the continental shelf. Therefore, no additional fishery independent sources of data were considered.

2.2.4 Research removals

Research removals have historically been a very small proportion of the total removals by all fisheries. However, with greatly reduced fisheries landings, the research removals have been greater than fisheries landings for the last two years, although they have remained small relative to historical landings (Table 21).

2.3 Biological Data

Biological relationships were determined mostly from results published in the literature and data collected recently in the NWFSC survey.

2.3.1 Weight-at-length

Published relationships between weight and length were available from Shaw & Gunderson (2006) and Love et al (1990). Love et al (1990) used data collected between 1980 and 1987 from trawling (1 cm mesh in the cod end) and hook and line sampling in the Southern California Bight (south of Point Conception). It is unclear exactly which data Shaw and Gunderson (2006) used to determine weight at length, but they were definitely collected north of Point Conception. Data from the NWFSC survey for the years 2003–2008 were also available to predict weight-at-length relationships. One observation in 2003 was omitted as an obvious outlier (29 cm fish at 0.09 kg).

Weight-at-length relationships from Shaw & Gunderson (2006) predicted larger fish than the Love et al (1990) weight-at-length relationship for sexes combined (Figure 32). The NWFSC survey predicted weight-at-length was in between the Shaw & Gunderson (2006) and Love et al (1990) predictions. Shaw & Gunderson (2006) used nonlinear regression to estimate the parameters of the relationship whereas Love et al (1990) and the analysis of the NWFSC survey data used linear regression of the log transformed data. However, the differences seen are likely due to sampling error, area differences, year differences, or all of the above.

Sex-specific weight-at-length relationships were estimated using data from all years of the NWFSC survey south and north of the CA/OR border (Figure 33). Southern fish are on average smaller than northern fish, and a greater difference was observed between southern and northern females than for southern and northern males (Figure 34). Yearly weight-at-length relationships were predicted from the NWFSC survey data (Figure 35). The 2003 relationship predicted the smallest fish and the 2004 relationship predicted the largest fish, on average, although the difference between years was small (Figure 36).

2.3.2 Maturity and fecundity

Shaw & Gunderson (2006) reported the results of a microscopic maturity study using commercial samples from Oregon collected in 1995. The length at 50% mature ($L_{0.5}$) was 23.04 and 20.97 cm for males and females, respectively. They also reported that very few fish of either sex were mature by a length of 15 cm. Other sources have published information on maturity showing maturity at a smaller size in southern samples (Table 23). Love et al (1990) report maturity at a very small size in California, but these samples came from the California Bight. Wyllie Echeverria (1987) used samples taken mostly from central and northern California and reported maturity at size estimates similar to Shaw & Gunderson (2006). The estimates provided by Shaw & Gunderson (2006) are used in this assessment.

A meta-analysis on the relationship between fecundity (eggs per weight as a function of weight) was performed by Dick (2009) on many species of rockfish. The estimated intercept and slope in the linear relationship for greenstriped rockfish were 371,200 and 63,300, respectively.

2.3.3 Natural mortality

The only published estimates of natural mortality found were from Shaw & Gunderson (2006). They provided estimates of M based on three methods: maximum age using the method of Hoenig (1983) (M=0.092), a catch curve analysis (M=0.149 and 0.142 for females and males, respectively), and GSI methods (M=0.149 for females). A natural mortality rate of 0.145 would be synonymous with a maximum age of 29 using Hoenig's (1983) method, which is approximately the maximum age reported by Love et al (1990) for both males and females.

Based on the maximum ages observed for female and male fish from the NWFSC survey (51 and 49 years, respectively), the Hoenig (1983) method predicts natural mortality values of 0.08118 for females and 0.08452 for males (Table 25).

2.3.4 Length at age

Age data were only available from the NWFSC survey and were used to investigate length-at-age relationships. Shaw & Gunderson (2006) report ages from the 1995 triennial survey and Oregon landings sampled in 1995. However, these data were not available at the time of this assessment.

Length-at-age relationships for female and male greenstriped rockfish were estimated using the NWFSC survey data. Ages were determined by the Cooperative Ageing Project laboratory in Newport, OR and a discussion of the aging error is given below. The maximum ages for females and males were 51 and 49, respectively. Figure 24 shows the length at age for females and males as well as the predicted parameters of the von Bertalanffy growth curve. The maximum length is estimated at 33.64 and 28.48 for females and males, respectively. Figure 24 also show the standard deviation at age and the coefficient of variation (CV) at age. The CV at age shows a more linear trend over age than the standard deviation.

Splitting the survey data at the Oregon/California border into northern and southern areas shows a higher occurrence of older fish in the northern area (Figure 37). In addition, the northern fish are predicted to grow larger at a slower rate (Table 24). Estimated growth curves using data from each year of the survey showed very small differences.

2.3.5 Sex ratios

Greenstriped rockfish are small fish and show dimorphic growth. These qualities can result in skewed sex ratios observed in the commercial and survey landings if females and males are differentially selected. The commercial trawl data, based on sexed length data, show a higher percentage of females, but the survey data show a more equal ratio of males to females (Table 26).

2.3.6 Ageing precision and bias

The greenstriped rockfish age data are limited to the NWFSC survey ages recently completed by the Cooperative Ageing Project (CAP) laboratory in Newport, Oregon. Additionally, one limited study produced ages for greenstriped rockfish from commercial samples. However, the authors are not able to obtain those data at this time. All of the survey otoliths are aged using the break and burn method and one set of double reads are available from the CAP to estimate ageing bias and imprecision for this stock assessment. This analysis uses simultaneous estimation of bias and imprecision in a rigorous statistical framework programmed in AD Model Builder (Otter Research Ltd. 2005) by A. Punt, University of Washington (Punt et al. 2008). This program estimates the underlying age distribution of a sample from up to three double- or cross-reads for each age structure, and can do this for multiple samples simultaneously. The most important assumption of the estimation technique is that at least one ageing method must be unbiased, so it is therefore not an age-validation. Functional forms can be explored for each method for both the bias (none, linear, type 2) and the imprecision (constant CV, or type 2 increase in CV with age). Because the technique requires that the underlying age structure of each sample be estimated, a reasonably large quantity of data spread over the entire range of ages present in the sample is needed (Punt et al. 2008). A few very old ages do not contribute appreciable information but require many more parameters in the underlying model and create instability during estimation. For this reason, each analysis must be truncated at a maximum age that is reasonably well represented in all samples. The ageing error estimation also requires that one reader be specified as unbiased.

Ages of less than 40 years are well represented in the data and there are not strong differences between the ages from reader 1 and reader 2 (Figure 39 and Figure 40). Greenstriped rockfish ages have not been validated to determine reader biases and both readers were specified as unbiased in the ageing error models. Table 27 shows the different model fits to the data as well as the likelihoods, with the best model highlighted. The best model for the greenstriped break and burn ages included nonlinear standard deviation (Table 27). The observed number of ages plotted against the predicated number of ages show that the final model selected fits the data well (Figure 41). Generally, greenstriped rockfish ages from the CAP are accurate and have a low level of imprecision (Table 28, Figure 42). The standard deviation for the greenstriped rockfish ages increases from 0.134 to an asymptote of 0.974 at age 23.

3 History of Modeling Approaches

3.1.1 Previous assessments

Greenstriped rockfish are not a species targeted by any large fishery and have not been assessed as a single species in the past. However, an assessment on the species complex called “other slope rockfish” in the Gulf of Alaska, in which greenstriped rockfish is considered one of 17 different species, was done in 1999. This assessment basically consisted of determining the current exploitable biomass by calculating the average biomass of the complex from the three most recent surveys. In early 2007, a petition was submitted to list greenstriped rockfish in Puget Sound as an endangered or threatened species. However, it was determined that listing greenstriped was not warranted (Federal Register April 23, 2009).

3.1.2 GAP and GMT input

The Groundfish Advisory Subpanel (GAP) representative (Bob Alverson) and Groundfish Management Team (GMT) representative (Rob Jones) were contacted in the early stages of the assessment. Bob Alverson (Fishing Vessels Owner’s Association) noted that greenstriped rockfish are not often seen in the fisheries that he is familiar with. Rob Jones (Northwest Indian Fisheries Commission) noted that the PFMC has a policy of managing stock regionally to the extent possible and encouraged investigating an area specific model. He also provided advice on species compositions of the POP complex and thought that the catches were likely not 100% POP, although he made the suggestion to contact more knowledgeable people. Finally, Rob thought that it was worth trying to include as many fisheries as possible and remove them if evidence suggests they are incompatible.

3.1.3 Response to previous review panel recommendations in 2005

This is the first time that greenstriped rockfish have been assessed. Hence, there are no recommendations from previous assessments.

4 Model Description

An age-structured stock assessment model was used to predict the biomass trajectory of greenstriped rockfish. An approach of parsimony was attempted because this was a first assessment and data were limited for many of the fisheries. This allowed for the determination of general trends in the biomass over time instead of getting caught up in details that may not be relevant.

Stock Synthesis v3.03a was used to estimate the parameters of the model. R4SS, revision 259, along were R version 2.9.1 were used to investigate and plot model fits.

4.1 New modeling approaches

This is the first time that West Coast greenstriped rockfish have been assessed thus is a new modeling approach for this stock. The modeling approach used in this assessment is similar to recent assessments done at the NWFSC for other species of rockfish.

4.2 General model specifications and assumptions

Stock Synthesis has many options when setting up a model and the assessment model for greenstriped rockfish was set up in the following manner.

4.2.1 Definitions of fleets and areas

The availability of data was the main determination of fleets and areas. Greenstriped rockfish are frequently observed in West Coast fisheries and surveys, but have not always been sampled or have been recorded as part of another species complex. Therefore, accurate data are often limited.

Trawl fisheries had sufficient data to split the West Coast into two fleets: Oregon and Washington (WA/OR) and California (CA). Splitting at the California/Oregon border was chosen because landings were available by state and sampling programs differ between states. Oregon and Washington were combined because there were few length samples available from Oregon (Table 14). The foreign trawl fleet (1966–1976) was kept separate from the domestic trawl fleet because it was reported that no discarding had occurred. However, even though high catches came from all along the West Coast, this fleet was treated as a coast-wide fleet with the same selectivity as the California trawl fleet, which was chosen because there were earlier length frequencies from California which more closely matched the time period in which the foreign fleet was fishing.

The other-gear and recreational fisheries were treated as separate fleets covering the entire West Coast. These fleets were not split by states because there were limited data from Oregon and Washington for these fisheries. Therefore, California landings and length frequencies provided most of the information for these fleets. It is likely that more landings occurred in Oregon and Washington than are being accounted for, and it may be worthwhile to further investigate the impact of the Oregon and Washington fisheries on greenstriped rockfish.

4.2.2 Other specifications

The specifications of the assessment are listed in Table 29. Basically, the model is a two-sex, age-structured model starting in 1916 with ages pooled at 50 years. The Triennial survey was split into an early and a late series based mostly on timing of the survey (Figure 26), and the timing of the early series was specified to occur 60% of the way through the year instead of half way through, as with the late Triennial series, NWFSC survey, and all fleets.

The specification of when to estimate recruitment deviations is an assumption that may drive some of the model uncertainty. The earliest length-composition data occur in 1978 and it was decided to begin estimating recruitment deviations in 1970 after consideration of starting earlier. Furthermore, recruitment deviations in the 1970's were not precisely estimated, thus the bias correction was linearly ramped into the model between 1970 and 1986. The full bias correction occurred between 1986 and 2005, with no bias correction occurring for 2008 and onward into the forecasts.

The recommended selectivity type in Stock Synthesis is the double normal and was used in this assessment with separate selectivity-at-length relationships for females and males. Estimating a separate curve for males did not greatly improve the likelihood in initial runs, but keeping them separate helped control the variation in recruitment (σ_R). This is discussed more in section 4.8.2.

4.3 Data sources and weighting

The data are explained in detail in Section 2 and summarized in Table 1and Table 2. Briefly, there is one survey split into two series with length data for each year, a recent survey series with length and age data, length frequencies of retained and discarded catch from four fisheries, estimates of average weights of discards in recent years, and estimates of discarded catch from observer data. It is important to properly weight these data relative to each other so that each contributes to the likelihood appropriately. This was done in an iterative manner of mainly adjusting the effective sample size of the length frequency data. The data were weighted as follows.

The survey indices were standardized using a generalized linear mixed model and Markov chain Monte Carlo was used to estimate the variances of the estimates for each year. The effective sample sizes for the length frequencies were initially chosen based on an analysis performed by Ian Stewart (pers comm.)NWFSC, NOAA). He provided an estimate of the maximum effective sample size for each length frequency from the NWFSC survey data from which the effective number of samples per tow was calculated, which is typically much less than the total number of length samples taken. Figure 43 shows that the effective sample size is approximately a monotonic function of the number of greenstriped rockfish measured and that measuring more than 20 fish per tow does not offer much gain in effective sampling effort.

The Triennial survey sampled a minimum of 27 greenstriped rockfish per tow, when the species was measured. Because a large number of greenstriped rockfish were measured per tow, but a small percentage of tows were measured in some years, the starting effective sample sizes for the Triennial length compositions were determined by multiplying the number of tows by 4.5. This value is approximately the maximum expansion from the number of tows to the effective sample size seen in the analysis on NWFSC survey data done by Ian Stewart. The effective sample size for the Triennial survey length-composition data were then tuned from there. These initial values were not assumed to be the maximum effective sample sizes because of differences between the surveys and when they chose to measure greenstriped rockfish. Also, because few tows were measured, there is less possibility of observing rare size classes and biases could occur due to sampling tows with a larger catch of greenstriped rockfish. These concerns lead to omitting the 1980 length frequency data from this assessment.

4.4 Estimated and fixed parameters

There are 102 estimated parameters in the greenstriped rockfish base assessment model, of which 36 are recruitment deviates prior to 2006 and 15 are forecast recruitment deviates. The estimated parameters other than recruitment deviates represent initial recruitment, length-at-age, selectivity, and retention. Fixed parameters include natural mortality, steepness, and dome-shaped selectivity parameters. A listing of all parameters, whether or not they were fixed, initial values for these parameters, as well as bounds and priors are shown in Table 29, Table 30, and Table 31.

4.5 Model selection and evaluation

The base case assessment model for greenstriped rockfish was developed to balance parsimony and realism, and the goal was to estimate a biomass trajectory for the population of greenstriped rockfish on the outer west coast of the United States. The model contains many assumptions to achieve parsimony and uses many different sources of data to estimate reality. A series of investigative model runs were done to achieve the final base case model.

4.5.1 Models explored

Many models were explored before selecting the initial base case model. Despite some evidence of geographical differences in growth and maturity (Love et al 2002, NWFSC survey data), only coast-wide models were developed, due to the paucity of region-specific data and the observation that the greatest differences in growth and maturity originated from samples south of Point Conception, where the density of greenstriped rockfish is much lower than north of Point Conception. The trawl fishery was split into northern and southern fleets to capture some of the geographic differences in exploitation.

Other explorations included determining the significance of dome-shaped selectivity, separate female and male selectivity, the use of discard ratios vs. specifying discard amounts, and the year in which the estimation of recruitment deviations was initiated. Dome-shaped selectivity was not significant in any models that we tested. Separating female and male selectivity did not drastically improve the overall likelihood, but when there were not separate selectivities the estimated recruitment deviations were ill-behaved, thus sex specific selectivities were retained. Estimates of the total discard mortality were used because these are estimates that are not explicitly related to the landings of greenstriped rockfish (discard total mortality is expanded to the fleet using total landings of groundfish). Therefore, when the catch history is changed as a sensitivity, the estimate of total discards will remain the same instead of scaling it up or down by a ratio. Finally, it was determined to start estimating recruitment deviations in 1970 because patterns emerged in the deviations before that time. These patterns were not cleared up by changing the amount of bias correction applied.

4.5.2 Investigating key assumptions and structural choices

A number of sensitivities were done to investigate the major areas of concern and are reported later. During the model exploration phase, many of the key assumptions were explored and decisions were made that made the most sense when attempting to balance parsimony and reality.

4.5.3 Convergence status

Proper convergence was determined by starting the minimization process from dispersed values of the maximum likelihood estimates to determine if the model found a better minimum. This was repeated 50 times and a better minimum was not found. The model does not appear to have convergence issues, the final maximum gradient was low (Table 32), and the Hessian was always inverted. It was not expected that this model would have convergence issues, especially since natural mortality and steepness were fixed.

4.6 Response to STAR panel recommendations

The STAR panel made a number of recommendations that were adopted into the base case model. These recommendations were:

- remove the 1980 triennial survey length-frequency data (but not the 1980 survey index),
- re-run the ageing-precision and bias-estimation model assuming no bias in the ageing process,
- ramp in the recruitment bias correction from 1970 to 1986, and
- fix recruitment variability at 0.6,

There was considerable discussion regarding two areas that were incorporated into the states of nature. These were the use of early discard data that showed no discarding of large greenstriped rockfish, and whether or not natural mortality should be estimated. The early discard data covered a small period of time in the mid 1980's, a small area of the coast, and there were few length samples. However, this early data showed a very different pattern of discarding than recent data. It was decided to omit these data and to instead incorporate the fraction of discards into the model uncertainty.

The data supported values of natural mortality that were less than the fixed value of 0.08. Due to uncertainty whether or not the estimates of female and male natural mortality were realistic or were caused by model mis-specification, it was decided to keep natural mortality fixed at 0.08 and to incorporate it as an additional source of model uncertainty.

Overall, the STAR process went smoothly and there were no disagreements that could not be resolved.

4.7 Base case model results

The base case model parameter estimates along with approximate asymptotic standard errors are shown in Table 33 and the likelihood components are shown in Table 32. The peak selectivity parameters for the WA/OR trawl and other-gear fleets were estimated at the upper bound of 44 cm. This parameter defines at what length the fish are fully selected by the fleet and an estimate at the upper bound signifies that the selectivity continues to increase to the largest modeled size class. Estimates of key derived parameters and approximate 95% asymptotic confidence intervals are shown in Table 34. Many of the derived parameters related to productivity (such as unfished spawning output and *MSY*) were highly correlated with the estimated unfished recruitment (R_0).

4.7.1 Appropriateness of the parameter estimates

The parameter estimates seemed reasonable, based on previous publications describing the biology of greenstriped rockfish and previous assessments of other species of groundfish. The estimated initial recruitment parameter results in an unfished biomass of age 2+ individuals of 32,600 metric tons.

The estimates of survey catchability for the NWFSC survey catchability were 2.6 times the late Triennial survey series and over 4 times the catchability of the early Triennial survey. Much of the difference can be accounted for by differences between the survey designs, area covered, net configurations, and skipper experience. In addition, it is likely that there were improvements made in the Triennial survey implementation that may have improved catchability over time. It is believed that these estimates of catchability are reasonable for greenstriped rockfish, which are less associated with rocks than other species of rockfish. But, more importantly, the estimate of catchability is greatly influenced by the methods used to expand the catch rates up to a biomass estimate. The choices of strata areas, the total area of interest, and the effective swept area of the net can all cause large biases in the resulting estimate of biomass. This model analytically estimates the catchability parameter, treating it as a nuisance parameter, and is focused on fitting the trend in the survey rather than the absolute biomass. Catchability is a scaling parameter and accounts for any overall bias in the time series that may have occurred during the analysis.

It was anticipated that the retention curves would have a low asymptote due to expected high discard rates, and this was verified in the parameter estimates (Figure 45). Selectivity curves for the WA/OR trawl and other-gear fleets did not asymptote at 1, which is unintuitive, but is likely related to estimating the appropriate "kept fish" curve with a low propensity to keep fish of any size class. The "kept fish" curves are shown in Figure 46 and are more intuitive than looking at selectivity and retention. Stock Synthesis provided a warning when the upper bound on peak selectivity was set larger than the largest observed length bin, and due to fear that calculations may not be correct, the peak selectivity parameter was bounded at 44 cm. Sensitivity analyses showed that lowering the bound on the peak parameter had little effect on the overall conclusions.

Survey selectivity curves showed 50% selectivity around 15–20 cm (Figure 44). However, the early Triennial selectivity was shifted to the right of the other survey selectivity curves, which may be an artifact of the short time series and the split of the series at the years 1992 and 1995. A large year class was estimated in 1993 and the shift in selectivity may actually be related to the large influx of smaller fish seen in the later Triennial series.

If related to recruitment, the shift in the Triennial selectivity curves would cause a loss of information about recruitment in the early 1990's. Nonetheless, the recruitment estimate in 1993 was the second largest recruitment in the time series (Figure 47), and was strongly supported by age data from the NWFSC survey. Other strong years of recruitment were 1971, 1984, and 1998, which were all within a year or two of strong El Niño events (1973, 1983, 1992, 1998, from NOAA_CIRES CDC). Low recruitment occurred in a number of years in the late 1970's, throughout the 1990's, and in 2006 (Figure 47). The uncertainty in the estimates of recruitment was large except for during the 1990's, when recruitment was strongly informed by the NWFSC age data. It is of mild concern that there were higher than average recruitments in 1992 and 1993, but very small recruitments for 3 years before and 4 years after these strong events. This could be indicative of true recruitment variability, but there is a slight possibility that this could be a result of bias towards a single cohort in the ageing data (as was seen in the hake assessment; pers comm., Owen Hamel & Ian Stewart). The recruitment variability was fixed at 0.6 to account for the possibility that the data pertaining to the strongest cohorts were biased high, which would result in a upward biased estimate of recruitment variability.

There were no surprises in the estimated growth parameters (Figure 48). The model estimated length-at-age curve is steeper at young ages than the empirical growth curve, which is expected because of selectivity. The asymptote of the growth curve is clearly defined. The CV of the length-at-age is fit as a linear function with age in the model, and although the empirical CV is noisy, the fit is as good as expected.

4.7.2 Fits to the data

There are four types of data for which the fits are discussed: survey abundance indices, discard biomass and discard average weight estimates, length composition data (lfs), and conditional age-at-length observations.

Fits to the three series of survey abundances are shown in Figure 49. The increasing trend in the early Triennial survey is fit poorly with a slightly decreasing predicted population trajectory. The late Triennial series is fit well, and in spite of the variability in the NWFSC survey, the increasing trend is captured by the model.

The total discards showed a lot of variability between years and were not given a lot of weight in the model. They were included to guide the model and to provide comparisons of how the model was able to fit these data. The model was able to somewhat closely fit the discards in only some years (Figure 50). It appears that total discarded biomass may better be fit with a skewed probability distribution function. Fits to the mean weight of discards are relatively good for the trawl fisheries, but are mostly underestimated for the other-gear fleet (Figure 51).

Fits to the length-composition data are displayed in two different ways: the fitted line is drawn over the plotted proportions at length, and the Pearson residuals at length are shown for each year. Also shown is the estimated effective sample size plotted against the actual sample size used in the likelihood and input sample sizes are compared to the calculated effective sample sizes in Table 35.

The WA/OR trawl predicted length frequencies showed few serious departures from the observed length frequencies. The 2003 and 2008 fitted sex-specific length frequencies were shifted to the right of the observations (Figure 52), and the combined sex length frequencies showed opposite biases in the fits for the years 1996 and 1997 (Figure 53). The discard length frequencies were very noisy and it was difficult to tell where lack of fit may have occurred. The lack of fit to the 2003 and 2008 length frequencies may be due to a difference in discarding practices, but few 2003 discard length observations were available and 2008 discard length observations were not available at the time of this assessment. The input sample sizes were mostly similar to the calculated effective sample sizes (Figure 54).

There were many years of length frequency data for the CA Trawl fleet and the observed sizes of fish in the years 1993, 2003, and 2004 were much smaller fish than predicted (Figure 55 and Figure 56). The length frequencies for 2003 and 2004 contained few observations and are likely a poor representation of the actual landings. The discard length frequencies were noisy, but the general pattern seemed to be fit (Figure 55). The input sample sizes matched well with the calculated effective sample sizes (Figure 57).

Length frequencies for the other-gear fleet were estimated for combined sexes and were available for all but one year since 1979. The predicted length frequencies for years with the largest sample sizes (1985, 1989, 1994, 1996, and 1998) captured the overall trend very well (Figure 58 and Figure 59). Recent years (20052008) had fewer sample sizes than most of the other years (Table 35) and typically observed larger fish than were predicted, except in 2008 when a large number of small fish were observed (Figure 58 and Figure 59). The discard length frequency from 2007 underpredicted some of the larger length classes (Figure 58 and Figure 59). The input sample sizes were similar to the effective sample sizes and captured the same trend (Figure 60).

Recreational length frequencies were estimated for combined sexes and were comprised of landings and discards combined. The model captured the general trend in the length frequencies for years with the largest sample sizes (1993–2001), except in 1997 when a few specific lengths dominated the data (Figure 61 and Figure 62). No serious lack of fit was observed for other years. The input sample sizes mostly matched the effective sample sizes (Figure 63) except in 1997 when the effective sample is much smaller than the input, and 2001 and 2002 when small input sample sizes produce large effective sample sizes (Table 35).

The early Triennial survey took few lengths of greenstriped rockfish in the early years, but sampling increased over time. However, fewer than 50% of the tows with greenstriped rockfish in any year were sampled for lengths (Table 20). The fit was visually best to the length frequency in the last year (1992) of the series (Figure 64). A trend in the lack of fit was apparent for females, with a progression from under-predicting large fish early in the time series to the slight over-prediction of large fish in 1989 (Figure 65). The general trend in the effective sample size compared to the predicted sample size was captured although a rather large effective sample size was calculated for 1992 (Figure 66).

The proportion of tows with greenstriped rockfish sampled for lengths was much higher in the late Triennial survey series (Table 20). Fits to these length frequencies were decent and captured the observed bimodal distribution in later years due to the strong 1993 year class (Figure 67). However, the predicted length frequencies did not quite reach the high proportions in these peaks (Figure 68). The input sample sizes matched the effective sample sizes in all years except that the effective sample size for the 1995 length frequency (the unimodal length frequency) was double the input sample size (Figure 69).

Many length samples were used to estimate the length frequencies in recent years from the NWFSC survey. There were no strong patterns in the length frequencies, but some cohorts were apparent (Figure 70). The general patterns in the length frequencies were fit and no obvious biases were seen (Figure 71). The input sample sizes were determined by an analysis done by Ian Stewart (pers comm., NWFSC, NOAA) and were entered as the maximum sample size and were expected to only be tuned downward. The effective sample sizes were greater than the input sample sizes in all years except 2007 (Table 35, Figure 76).

Pearson residuals for the conditional age-at-length reveal no obvious biases in the fit to these data, although there are some large residuals for older ages-at-length (Figure 73). The conditional age-at-length data and fits are often difficult to visualize, thus the implied fits to the marginal age compositions were calculated and shown in Figure 74 and Figure 75. The trends of strong cohorts in the age data are captured by the predicted age composition, but the high frequencies of the 1993 and 1998 cohorts are often under-predicted. Input sample sizes were simply the number of fish observed at each length, and were similar to calculated effective sample sizes (Figure 76).

4.7.3 Population trajectory

The predicted spawning output in millions of eggs (a proxy for spawning biomass) is given in Table 36 and plotted in Figure 77 and shows a decline starting near 1960 and reaching a low in the late 1990's before dramatically increasing. The predicted summary biomass (age 2+) shows a similar pattern (Figure 77). Estimated depletion possibly dips below the 40% of unfished spawning output in the late 1990's with a very small probability (Figure 78).

Estimated recruits showed strong cohorts in 1971, 1981, 1984, 1993, and 1998–2000 (Table 36, Figure 47). Lower than average recruitment events occurred throughout the period for which recruits were estimated, with extremely low recruitment occurring throughout most of the 1990's. However, the strong recruitment events balance these low recruitment events and the population is predicted to increase in the last decade after rockfish landings decreased.

Approximate asymptotic standard deviations are given in Table 37.

4.8 Uncertainty and sensitivity analysis

Two types of uncertainty are presented for the assessment of greenstriped rockfish. First, uncertainty in the parameter estimates was determined using approximate asymptotic estimates of the standard error. These estimates were based on the likelihood theory that the inverse of the Hessian matrix (the second derivative of the parameter vector) approaches the true uncertainty of the parameter estimates as the sample size approaches infinity. This approach takes into account the uncertainty in the data and supplies correlation estimates between parameters, but does not capture possible skewness in the error distribution of the parameters and may not accurately estimate the standard error in some cases.

The second type of uncertainty that is presented is related to modeling error. This uncertainty cannot be captured in the base case model as it is related to errors in the assumptions used in the base case model. Therefore, sensitivity analyses were done where assumptions were modified to determine the effect they have on the model results.

4.8.1 Parameter uncertainty

Parameter estimates are shown in Table 33 along with approximate asymptotic standard errors. None of the parameters showed large uncertainty. Correlations between parameters were mostly below 0.9, except that correlations between the male offset selectivity parameters were around 0.95. Estimates of key derived parameters are given in Table 34 along with approximate 95% asymptotic confidence intervals. There is a considerable amount of uncertainty in the estimates of biomass and the coefficient of variation (CV) on the 2009 estimate of depletion was 5.3%. The confidence interval on current depletion is entirely above the management target of 40% of the unfished spawning output level.

4.8.2 Sensitivity analysis

Sensitivity analysis was performed to determine the model behavior under different assumptions than those of the base case model. Six sensitivities were conducted to explore the potential differences in model structure and assumptions such as uncertainty in reconstructed landings, the values assumed for steepness and natural mortality, and the amount of discarding. Likelihood values and estimates of key parameters are shown in Table 38 and predicted population trajectories are shown in Figure 79**Error! Reference source not found.**.

Most of the sensitivity analyses had little effect on the current status of the stock. Doubling or halving the landings did not significantly change the overall fit to the data and current depletion remained approximately the same, but the estimated biomass and potential yield from the stock significantly increased or decreased, respectively. The estimated steepness parameter was 1 (the upper bound) suggesting that there is not enough contrast in the data to estimate the reduction in recruitment at low population sizes. At this unrealistically high value, the overall likelihood improved slightly and estimated depletion increased by 0.03.

Using early (1980's) discard data and estimating natural mortality had the greatest effect on the model results. Using early discard data resulted in a lower discard fraction prior to 2000, along with lower spawning output and lower sustainable yields, but did not change the overall depletion much. The estimates of sex-specific natural mortality were lower than the fixed value of 0.08 in the base case model, and resulted in lower estimates of biomass, spawning output, potential yield, and depletion.

4.8.3 Retrospective analysis

A retrospective analysis was conducted by running the model using data only through 2003, 2004, 2005, 2006, and 2007 and estimating current values for the start of the year after data ends (Table 39, Figure 80). The unfished spawning output estimated in the 2009 assessment was intermediate when compared to retrospective model runs finishing in 2004-2008. The lowest estimated trajectory of unfished spawning output was in the 2004 retrospective run, but also showed the fastest rate of increase for the recent trajectory. In this run, the NWFSC survey had only one abundance estimate (2003), thus the data point was removed and no abundance estimates from the NWFSC survey were fitted. Overall, the retrospective analysis did not show any severe patterns and also indicated that the NWFSC survey data adds important information regarding the recent trend in the population.

4.8.4 Likelihood profiles

Likelihood profiles were developed for the steepness parameter and the female and male natural mortality parameters. The model estimated steepness at 1.0, but the likelihood profile (Figure 81) showed that the confidence interval of estimated steepness extends to a lower value near 0.4 and that depletion is not largely affected over the range of steepness. Figure 82 shows a joint likelihood profile over female natural mortality (x-axis) and the difference between male and female natural mortalities (y-axis). The data show that it is highly probable that male natural mortality is greater than female natural mortality and that it is likely that natural mortality is less than the assumed value of 0.08. Estimated depletion increases with the value of natural mortality, but does not change much with an increasing difference between male and female natural mortalities.

5 Reference points

Reference points were calculated using the estimated selectivities and a fleet distribution based on the proportions of the average landings from each fleet in the last two years. The last two years were used to determine the fleet distribution because landings of greenstriped rockfish were variable and the last two years better captures reality. Reference points were based on different scenarios: 1) a target spawning biomass of 40% ($B_{40\%}$), 2) a target SPR of 50% ($SPR_{50\%}$), and 3) a target of estimated *MSY*. Estimates of spawning output, exploitation rates, and long-term sustainable yield for each of these paradigms are shown in Table 34.

With a $B_{40\%}$ target, the MSY-proxy spawning output was 3,072 millions of eggs, producing a long-term yield of 828 mt (95% CI = 581–1,075 mt). This corresponds to an exploitation rate around 4.9% and an SPR of 46.7%. When using $SPR_{50\%}$ as a proxy for *MSY,* the target spawning output was greater (3,359 million eggs) and the long-term sustainable yield was less (800 mt with an approximate 95% confidence interval of 561–1,038). The corresponding exploitation rate was about 4.4%. The spawning output at maximum sustainable yield was lower than the other two paradigms, at about 29% of unfished spawning output (2,209 mt). *MSY* was therefore estimated at 870 mt (95% CI = 611–1,129), corresponding to an SPR_{MSY} of 36.7% and an exploitation rate near 6.8%.

Historically, exploitation rates have exceeded the overfishing threshold based on $SPR_{50\%}$ in six separate years, all occurring between 1980 and 2000 (Figure 83). Harvest rates, calculated by dividing the entire catch by the age 2+ biomass, exceed the threshold harvest rate based on $SPR_{50\%}$ more often (Figure 84). Also shown (Figure 85) is the phase plot of the trajectory for greenstriped rockfish relative to the threshold $SPR_{50\%}$ exploitation level and the $B_{40\%}$ biomass target. The trajectory has mostly been in the low exploitation rate and high biomass quadrant, although exploitation levels have exceeded the target in six separate years. More recently, exploitation on greenstriped rockfish has been low and the population size has been increasing, which is likely a result of management measures implemented to lower the exploitation of overfished rockfish stocks.

The estimated equilibrium curve is shown in Figure 86 with target thresholds based on $B_{40\%}$ and target thresholds based on *MSY* plotted. Current depletion is also plotted and is currently much greater than any target level.

6 Harvest projections and decision tables

Forecasts and projections of the greenstriped rockfish population up to the year 2020 were constructed under the assumption that future catches would never reach the calculated OY. The average catch from 2007 and 2008 was used for the catches in 2009 and 2010 and distributed among the fisheries based on the average proportion of these catches by fleet. The landings and fleet distribution for 2011 and beyond were assumed equal to the average of the fleet specific landings from 2000–2003. This forecast table is meant to be representative of the status quo, yet still be conservative since landings in 2000–2003 were higher than more recent landings, although not as high as landings observed in the 1980's and 1990's.

Forecasting with these status quo catches resulted in the stock and the ABC increasing over time (Table 40). Fleet catch distribution was determined from the years 2000–2003 and allocated more to the trawl fisheries than would have been the case if based on 2007 and 2008 landings. The resulting discard fraction is much higher, with almost 5 times the biomass being discarded as landed, illustrating the importance of the assumed distribution of catch in the projection process.

A decision table was constructed using two axes of uncertainty which are considered to be the areas of the assessment that are most uncertain. The first axis of uncertainty was the fraction of the catch that is discarded, with low and high levels of discarding when compared to the base case. The low level of discarding was set to be similar to the level of discarding determined from the sensitivity analysis using early discard data. These data indicated that all fish over about 30 cm were retained whereas the later discard data used in the base case model showed that a high proportion of fish over 30 cm were discarded. The high level of discarding was determined by increasing the fraction discarded from the base case model by an amount proportional to the low fraction case. The retention asymptote for the WA/OR trawl fishery was increased by a factor of 2.5 and the CA trawl retention asymptote was increased by a factor of 3. The second axis of uncertainty used low and high values of natural mortality. The low value of 0.06 was near the value of natural mortality that would be estimated if allowed to in the base case model. The high value of natural mortality (0.10) was the same distance from the base case value as the low value, except in the opposite direction, and meant to agree somewhat with values seen in published reports. No probabilities are associated with the states of nature other than that the base case model is the most probable.

As seen in the sensitivity runs, the fraction discarded influenced the spawning output and size of the stock, and the natural mortality influenced both the size of the stock as well as the level of depletion. Forecasts of spawning output and depletion are presented in Table 41 for all 9 possible combinations of the base model and the two axes of uncertainty. The worst-case scenario in terms of depletion was when the fraction of discarding is high and the natural mortality was low, but the stock is still forecasted to increase and maintain a status greater than the 40% of unfished spawning output. The best case scenarios are when natural mortality was high. The stock was predicted to exceed unfished spawning output because of recent large recruitments.

7 Regional management considerations

The outer West Coast population of greenstriped rockfish was modeled as a single stock and spatial aspects of this coast-wide population were addressed through the geographic separation of data sources where possible. There is little genetic evidence of biologically distinct stocks throughout the West Coast and although there is evidence that mature fish move into deeper water, there is no information on latitudinal movement. Studies of greenstriped rockfish in Southern California indicate that the life-history of these fish may differ from fish found north of Point Conception (see Love et al 1990). However, the greater proportion of biomass is found north of Point Conception and trying to account for these differences may prove to be futile. Additionally, the data showed that greenstriped rockfish in California did not commonly reach the older ages commonly seen in Oregon and Washington greenstriped rockfish, and it is uncertain whether or not this is due to a difference in natural mortality, fishing pressure, or both. With the continued collection of regional data on greenstriped rockfish, regional patterns may emerge and a spatially explicit model may be an option for future assessments.

8 Research needs

There are four topics for which additional research would greatly improve the assessment of greenstriped rockfish.

1. **Landings:** improving certainty of the commercial and recreational landings would result in a better estimate of the total yield as well as an improved understanding of the population dynamics of greenstriped rockfish. The landings have been determined in the best possible manner given the time constraints of this assessment, but there is still uncertainty in the catch reconstruction and in recent landings. The state of California has produced reconstructed and current landings for many species, which have been accepted as the best possible information. However, a similar reconstruction is not available for Oregon and Washington landings, although such a product is of interest to fisheries managers and stock assessors. Additionally, some errors were found in the PacFIN database of recent landings during the current catch reconstruction and are being reconciled. Further error checking may be worthwhile for greenstriped rockfish as well as other species.
2. **Discards:** discarding at sea is common practice for greenstriped rockfish and the levels of historical discards are poorly known due to a lack of data. The West Coast Groundfish Observer Program (WCGOP) has contributed greatly to the understanding of discard rates and size compositions. However, it would be useful to review what information is available from the past to understand discarding practices and to determine how reliable that information is.
3. **Natural mortality:** the value for natural mortality in the base case model was fixed at 0.08, which was determined from the maximum age observed in recent survey data. Other published estimates of natural mortality for greenstriped rockfish range from 0.09 to 0.149 and are based on maximum age, catch curve analyses, and gonadosomatic indices. The data used in the base model supported a natural mortality near 0.065. All of these estimates of natural mortality are uncertain and given the correlation between natural mortality and stock status, it would be useful to have a better understanding of the plausible range of values.
4. **Stock structure:** there is some evidence that the life history of greenstriped rockfish in Southern California may be different from greenstriped rockfish in Northern areas. Understanding and quantifying the differences in length, weight, ages, maturity, and fecundity (as well as the number of broods per year) would be helpful to determine if the model should incorporate these differences.

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11 Tables

Table 1: Summary of data sources used in the greenstriped rockfish assessment for the years 1916 to 1990. "C" refers to combined sexes and "S" refers to separate sexes.

	1916-1927	1928-1965	1966-1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Landings																	
WA/OR trawl																	
CA trawl																	
Foreign																	
Other-gear																	
Recreational																	
Abundance indices																	
Triennial																	
NWFSC																	
Length Frequencies																	
WA/OR trawl																	
CA trawl					S	S	C	C	S	S	S	S	S	S	S	S	S
Other-gear						C	C	C		C	C	C	C	C	C	C	C
Recreational							C		C		C	C	C	C	C		
Triennial										S			S			S	
NWFSC																	
Discards LFs																	
WA/OR trawl																	
CA trawl																	
Other-gear																	
Discard mean weight & total mortality																	
WA/OR trawl																	
CA trawl																	
Other-gear																	
Age-at-length																	
NWFSC																	

Table 2: Summary of data sources used in the greenstriped rockfish assessment for the years 1991 to 2008. "C" refers to combined sexes and "S" refers to separate sexes.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Landings																		
WA/OR trawl																		
CA trawl																		
Foreign																		
Other-gear																		
Recreational																		
Abundance indices																		
Triennial																		
NWFSC																		
LFs																		
WA/OR trawl						C	C	S	S	S	S	S	S	S		S	S	S
CA trawl	C	C	S	S	S	S	S	S	S	S	S	S	C	C	C	C	C	
Other-gear	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Recreational			C	C	C	C	C	C	C	C	C	C	C					
Triennial		S			S			S			S			S				
NWFSC													S	S	S	S	S	S
Discards LFs																		
WA/OR trawl													C		C	C	C	
CA trawl												C				C	C	
Other-gear															C		C	
Discard mean weight & total mortality																		
WA/OR trawl												C	C	C	C	C	C	
CA trawl												C	C	C	C	C	C	
Other-gear												C	C	C	C	C	C	
Age-at-length																		
NWFSC													S	S	S	S	S	S

Table 3: Percentage of greenstriped rockfish landings in each gear category as reported by PacFIN.

Year	Hook & line	Net	Pot	Trawl	Shrimp trawl
1981	0.36	0.05	0.00	0.58	0.00
1982	0.04	0.02	0.00	0.94	0.00
1983	0.05	0.01	0.00	0.94	0.00
1984	0.05	0.07	0.00	0.88	0.00
1985	0.03	0.06	0.00	0.91	0.00
1986	0.30	0.01	0.00	0.69	0.00
1987	0.04	0.00	0.00	0.95	0.00
1988	0.02	0.00	0.00	0.97	0.01
1989	0.08	0.01	0.00	0.90	0.01
1990	0.10	0.02	0.00	0.87	0.01
1991	0.13	0.01	0.00	0.85	0.01
1992	0.12	0.01	0.00	0.86	0.01
1993	0.06	0.01	0.00	0.93	0.00
1994	0.05	0.00	0.00	0.94	0.00
1995	0.05	0.00	0.00	0.93	0.02
1996	0.07	0.00	0.00	0.93	0.00
1997	0.03	0.00	0.00	0.97	0.00
1998	0.05	0.00	0.00	0.95	0.00
1999	0.03	0.00	0.00	0.97	0.00
2000	0.04	0.00	0.00	0.96	0.01
2001	0.04	0.00	0.00	0.96	0.00
2002	0.01	0.00	0.00	0.99	0.00
2003	0.00	0.00	0.10	0.90	0.00
2004	0.01	0.00	0.00	0.99	0.00
2005	0.00	0.00	0.00	1.00	0.00
2006	0.01	0.00	0.00	0.99	0.00
2007	0.01	0.00	0.01	0.98	0.00
2008	0.02	0.00	0.00	0.98	0.00
All years	0.07	0.01	0.00	0.92	0.01

Table 4: Proportion of rockfish catches that were caught outside of Puget Sound used in the catch reconstruction for Washington.

Year	Non-PS	Year	Non-PS
1949	0.9946	1960	0.9788
1950	0.9969	1961	0.9891
1951	0.9920	1962	0.9920
1952	0.9899	1963	0.9772
1953	0.9579	1964	0.9765
1954	0.9742	1965	0.9837
1955	0.9892	1966	0.9933
1956	0.9813	1967	0.9890
1957	0.9774	1968	0.9958
1958	0.9859	1969	0.9969
1959	0.9855		

Table 5: Commercial landings (mt) of greenstriped rockfish for each state and gear.

	Domestic trawl			Foreign trawl			Other-gear			
Year	**WA**	**OR**	**CA**	**WA**	**OR**	**CA**	**WA**	**OR**	**CA**	**Total**
1916	0.000	0.000	0.207	0.000	0.000	0.000	0.000	0.000	1.287	1.49
1917	0.000	0.000	0.321	0.000	0.000	0.000	0.000	0.000	2.084	2.41
1918	0.000	0.000	0.377	0.000	0.000	0.000	0.000	0.000	1.983	2.36
1919	0.000	0.000	0.262	0.000	0.000	0.000	0.000	0.000	1.148	1.41
1920	0.000	0.000	0.267	0.000	0.000	0.000	0.000	0.000	1.252	1.52
1921	0.000	0.000	0.220	0.000	0.000	0.000	0.000	0.000	1.115	1.34
1922	0.000	0.000	0.190	0.000	0.000	0.000	0.000	0.000	1.080	1.27
1923	0.000	0.000	0.205	0.000	0.000	0.000	0.000	0.000	1.398	1.60
1924	0.000	0.000	0.118	0.000	0.000	0.000	0.000	0.000	1.872	1.99
1925	0.000	0.000	0.084	0.000	0.000	0.000	0.000	0.000	2.134	2.22
1926	0.000	0.000	0.302	0.000	0.000	0.000	0.000	0.000	2.628	2.93
1927	0.000	0.000	0.494	0.000	0.000	0.000	0.000	0.000	2.278	2.77
1928	0.000	0.129	0.667	0.000	0.000	0.000	0.000	0.000	1.961	2.76
1929	0.000	0.224	1.455	0.000	0.000	0.000	0.000	0.000	1.891	3.57
1930	0.000	0.208	1.198	0.000	0.000	0.000	0.000	0.000	1.988	3.39
1931	0.000	0.159	1.476	0.000	0.000	0.000	0.000	0.000	2.416	4.05
1932	0.000	0.058	1.525	0.000	0.000	0.000	0.000	0.000	1.852	3.43
1933	0.000	0.085	2.239	0.000	0.000	0.000	0.000	0.000	1.268	3.59
1934	0.003	0.093	1.936	0.000	0.000	0.000	0.000	0.000	1.208	3.24
1935	0.104	0.085	1.910	0.000	0.000	0.000	0.000	0.000	1.025	3.12
1936	0.174	0.212	1.349	0.000	0.000	0.000	0.000	0.000	0.585	2.32
1937	0.145	0.269	1.982	0.000	0.000	0.000	0.000	0.000	0.532	2.93
1938	0.166	0.244	1.990	0.000	0.000	0.000	0.000	0.000	0.570	2.97
1939	0.157	0.182	2.617	0.000	0.000	0.000	0.000	0.000	0.717	3.67
1940	0.152	1.083	2.124	0.000	0.000	0.000	0.000	0.000	0.860	4.22
1941	0.226	2.280	1.635	0.000	0.000	0.000	0.000	0.000	1.413	5.55
1942	0.315	3.325	0.314	0.000	0.000	0.000	0.000	0.000	0.687	4.64
1943	0.864	12.133	1.774	0.000	0.000	0.000	0.000	0.000	0.804	15.57
1944	1.223	19.947	9.777	0.000	0.000	0.000	0.000	0.000	1.051	32.00
1945	2.411	30.547	23.677	0.000	0.000	0.000	0.000	0.000	2.402	59.04
1946	0.875	19.036	24.322	0.000	0.000	0.000	0.000	0.000	2.781	47.01
1947	0.457	11.974	9.707	0.000	0.000	0.000	0.000	0.000	1.841	23.98
1948	0.742	8.496	9.178	0.000	0.000	0.000	0.000	0.000	2.419	20.83
1949	0.867	8.628	15.377	0.000	0.000	0.000	0.255	0.000	1.992	27.12
1950	0.832	8.825	15.582	0.000	0.000	0.000	0.167	0.000	1.984	27.39
1951	0.682	10.630	20.552	0.000	0.000	0.000	0.257	0.000	2.341	34.46
1952	0.905	8.737	11.825	0.000	0.000	0.000	0.180	0.000	1.306	22.95
1953	0.498	8.465	12.294	0.000	0.000	0.000	0.075	0.000	1.013	22.35
1954	1.121	10.333	10.980	0.000	0.000	0.000	0.136	0.000	1.190	23.76
1955	0.929	10.079	9.423	0.000	0.000	0.000	0.156	0.000	0.732	21.32
1956	0.947	15.594	7.540	0.000	0.000	0.000	0.056	0.000	0.992	25.13
1957	0.822	15.708	8.198	0.000	0.000	0.000	0.095	0.000	1.042	25.87
1958	1.353	16.437	11.570	0.000	0.000	0.000	0.028	0.000	1.092	30.48
1959	0.756	0.724	8.466	0.000	0.000	0.000	0.067	0.000	1.349	11.36
1960	0.933	15.792	5.497	0.000	0.000	0.000	0.074	0.000	1.631	23.93
1961	1.104	14.607	3.196	0.000	0.000	0.000	0.041	0.000	1.110	20.06

Year	WA	Domestic trawl OR	CA	WA	Foreign trawl OR	CA	WA	Other-gear OR	CA	Total
1962	1.020	1.490	2.725	0.000	0.000	0.000	0.047	0.000	0.999	6.28
1963	0.927	1.917	5.316	0.000	0.000	0.000	0.030	0.000	1.247	9.44
1964	1.130	3.478	2.706	0.000	0.000	0.000	0.040	0.000	0.918	8.27
1965	0.616	1.556	5.395	0.000	0.000	0.000	0.030	0.000	1.149	8.75
1966	2.937	1.037	4.519	37.000	60.000	14.000	0.018	0.000	0.888	120.40
1967	1.155	0.559	10.245	21.000	30.000	92.000	0.015	0.000	1.012	155.99
1968	3.291	2.800	11.540	7.750	8.250	25.000	0.008	0.000	1.037	59.68
1969	3.979	0.376	13.708	9.250	27.750	0.000	0.025	0.000	0.913	56.00
1970	2.052	2.684	18.239	11.000	33.000	0.000	0.001	0.000	0.926	67.90
1971	2.226	38.186	15.592	4.500	4.500	0.000	0.000	0.000	1.160	66.16
1972	1.642	57.249	23.895	4.750	5.250	4.000	0.000	0.000	1.743	98.53
1973	0.988	2.690	22.850	7.750	14.250	13.000	0.000	0.000	2.039	63.57
1974	0.985	6.207	33.306	2.750	5.250	5.000	0.002	0.000	3.609	57.11
1975	2.065	12.337	48.643	2.000	6.000	13.000	0.007	0.000	2.479	86.53
1976	6.028	19.605	55.321	1.000	3.000	9.000	0.000	0.000	4.265	98.22
1977	10.738	1.592	57.335	0.000	0.000	0.000	0.085	0.000	2.968	72.72
1978	16.128	38.455	11.287	0.000	0.000	0.000	0.143	0.000	6.933	72.95
1979	18.608	4.501	13.140	0.000	0.000	0.000	0.152	0.000	7.904	44.30
1980	7.547	17.714	131.475	0.000	0.000	0.000	0.056	0.000	3.468	160.26
1981	2.177	4.087	10.230	0.000	0.000	0.000	0.000	0.000	10.411	26.91
1982	2.591	96.000	59.965	0.000	0.000	0.000	0.000	0.000	3.749	162.30
1983	18.055	48.833	22.725	0.000	0.000	0.000	0.000	0.000	1.236	90.85
1984	1.629	75.300	23.003	0.000	0.000	0.000	0.000	0.000	3.233	103.17
1985	20.571	18.510	45.325	0.000	0.000	0.000	0.000	0.000	8.081	92.49
1986	9.497	31.350	11.237	0.000	0.000	0.000	0.000	0.000	9.144	61.23
1987	8.027	83.820	22.527	0.000	0.000	0.000	0.000	0.124	4.960	119.46
1988	9.599	99.675	119.639	0.000	0.000	0.000	0.000	0.000	5.635	234.55
1989	37.377	140.589	74.919	0.000	0.000	0.000	0.000	0.000	23.748	276.63
1990	14.032	47.353	47.915	0.000	0.000	0.000	0.000	0.000	15.190	124.49
1991	18.438	60.700	29.551	0.000	0.000	0.000	0.000	4.854	12.836	126.38
1992	18.881	67.112	4.891	0.000	0.000	0.000	0.000	1.456	11.902	104.24
1993	4.470	113.257	17.167	0.000	0.000	0.000	0.000	2.236	8.352	145.48
1994	3.353	135.850	34.879	0.000	0.000	0.000	0.000	0.178	10.506	184.77
1995	18.638	98.583	22.326	0.000	0.000	0.000	0.000	0.559	8.568	148.67
1996	10.313	112.512	14.548	0.000	0.000	0.000	0.000	0.768	10.564	148.71
1997	5.420	94.892	47.149	0.000	0.000	0.000	0.000	2.592	2.871	152.92
1998	11.201	113.979	40.162	0.000	0.000	0.000	0.000	0.125	8.720	174.19
1999	3.668	36.427	17.038	0.000	0.000	0.000	0.000	0.205	1.712	59.05
2000	0.484	5.172	5.156	0.000	0.000	0.000	0.000	0.045	0.385	11.24
2001	6.807	3.309	2.962	0.000	0.000	0.000	0.000	0.273	0.229	13.58
2002	11.802	3.485	2.229	0.000	0.000	0.000	0.000	0.003	0.147	17.67
2003	1.631	0.997	0.080	0.000	0.000	0.000	0.000	0.010	0.000	2.72
2004	1.693	1.115	0.177	0.000	0.000	0.000	0.000	0.015	0.000	3.00
2005	0.002	2.781	0.083	0.000	0.000	0.000	0.000	0.000	0.012	2.88
2006	0.410	5.300	1.840	0.000	0.000	0.000	0.000	0.000	0.082	7.63
2007	0.001	0.753	0.212	0.000	0.000	0.000	0.000	0.000	0.009	0.98
2008	0.000	1.615	0.066	0.000	0.000	0.000	0.000	0.001	0.041	1.72

Table 6: Recreational landings (mt) of greenstriped rockfish for each state. Also shown are the total recreational landings for each year and the proportion of landings from the recreational fishery compared to total landings from commercial and recreational fisheries.

				Recreational	
Year	WA	OR	CA	Total	Prop
1928	0.000	0.000	0.143	0.143	0.05
1929	0.000	0.000	0.286	0.286	0.07
1930	0.000	0.000	0.342	0.342	0.09
1931	0.000	0.000	0.456	0.456	0.10
1932	0.000	0.000	0.570	0.570	0.14
1933	0.000	0.000	0.684	0.684	0.16
1934	0.000	0.000	0.798	0.798	0.20
1935	0.000	0.000	0.911	0.911	0.23
1936	0.000	0.000	1.006	1.006	0.30
1937	0.000	0.000	1.241	1.241	0.30
1938	0.000	0.000	1.215	1.215	0.29
1939	0.000	0.000	1.049	1.049	0.22
1940	0.000	0.000	1.395	1.395	0.25
1941	0.000	0.000	1.289	1.289	0.19
1942	0.000	0.000	0.685	0.685	0.13
1943	0.000	0.000	0.655	0.655	0.04
1944	0.000	0.000	0.538	0.538	0.02
1945	0.000	0.000	0.717	0.717	0.01
1946	0.000	0.000	1.234	1.234	0.03
1947	0.000	0.000	1.250	1.250	0.05
1948	0.000	0.000	2.671	2.671	0.11
1949	0.000	0.000	3.340	3.340	0.11
1950	0.000	0.000	4.107	4.107	0.13
1951	0.000	0.000	4.303	4.303	0.11
1952	0.000	0.000	4.343	4.343	0.16
1953	0.000	0.000	4.153	4.153	0.16
1954	0.000	0.000	6.775	6.775	0.22
1955	0.000	0.000	10.803	10.803	0.34
1956	0.000	0.000	12.442	12.442	0.33
1957	0.000	0.000	8.616	8.616	0.25
1958	0.000	0.000	8.487	8.487	0.22
1959	0.000	0.000	6.711	6.711	0.37
1960	0.000	0.000	6.267	6.267	0.21
1961	0.000	0.000	5.564	5.564	0.22
1962	0.000	0.000	5.750	5.750	0.48
1963	0.000	0.000	5.313	5.313	0.36
1964	0.000	0.000	5.957	5.957	0.42
1965	0.000	0.000	7.923	7.923	0.48
1966	0.000	0.000	11.365	11.365	0.09
1967	0.000	0.000	14.532	14.532	0.09
1968	0.000	0.000	14.854	14.854	0.20
1969	0.000	0.000	13.867	13.867	0.20
1970	0.000	0.000	19.645	19.645	0.22
1971	0.000	0.000	17.508	17.508	0.21
1972	0.000	0.000	21.800	21.800	0.18
1973	0.000	0.000	27.823	27.823	0.30
1974	0.000	0.000	31.618	31.618	0.36
1975	0.000	0.000	31.920	31.920	0.27
1976	0.000	0.000	28.122	28.122	0.22
1977	0.000	0.000	26.410	26.410	0.27
1978	0.000	0.000	24.266	24.266	0.25
1979	0.000	0.464	31.531	31.994	0.42
1980	0.000	0.671	22.734	23.405	0.13
1981	0.112	0.559	14.006	14.677	0.35
1982	0.000	0.869	15.204	16.072	0.09
1983	0.000	0.980	21.333	22.313	0.20
1984	0.000	0.352	46.046	46.398	0.31
1985	0.000	1.316	22.089	23.405	0.20
1986	0.000	0.177	30.212	30.390	0.33
1987	0.000	0.236	9.947	10.183	0.08
1988	0.000	0.084	17.087	17.171	0.07
1989	0.000	0.319	4.330	4.650	0.02
1990	0.000	0.482	8.600	9.082	0.07
1991	0.000	0.519	8.600	9.119	0.07
1992	0.000	0.904	8.600	9.504	0.08
1993	0.000	1.334	2.928	4.261	0.03
1994	0.000	1.484	10.120	11.604	0.06
1995	0.000	0.643	9.395	10.037	0.06
1996	0.000	0.785	5.611	6.396	0.04
1997	0.000	0.574	3.586	4.159	0.03
1998	0.000	0.774	3.790	4.564	0.03
1999	0.000	0.637	10.362	10.999	0.16
2000	0.000	0.342	9.112	9.454	0.46
2001	0.000	0.321	6.256	6.577	0.33
2002	0.000	0.159	1.221	1.380	0.07
2003	0.000	0.157	0.108	0.264	0.09
2004	0.329	0.099	0.230	0.657	0.18
2005	0.783	0.090	0.694	1.567	0.35
2006	0.508	0.094	0.414	1.017	0.12
2007	0.659	0.083	0.576	1.318	0.57
2008	0.837	0.081	0.756	1.674	0.49

Table 7: Estimates of the proportion of greenstriped rockfish discarded (divided by landings + discards) by year from different fishing strategies from the Pikitch et al (1988) data. BRF: bottom rockfish, DWD: deepwater dover; NSM: nearshore mixed species, SHR: shrimp, and NON-SHR combines the BRF, DWD, and NSM strategies.

Year	BRF	DWD	NSM	SHR	NON-SHR
1985	0.253	0.419	0.434		0.366
1986	0.596	0.376	0.225	0.391	0.395
1987	0.568	0.620	0.284	0.567	0.463

Table 8: Average weights (kg) of the discarded and retained portions of the catch in the Pikitch et al (1988) data.

Year	Type	BRF	DWD	NSM	SHR	NON-SHR
1985	Discard	0.2758	0.3183	0.2487		0.2583
	Retained	0.3238	0.4944	0.5340		0.4147
1986	Discard	0.2388	0.2652	0.2403	0.0863	0.2468
	Retained	0.5028	0.4629	0.9060	0.4320	0.6041
1987	Discard	0.2998	0.2778	0.1980	0.2056	0.2608
	Retained	0.4943	0.5139	0.4876	0.5131	0.4922

Table 9: Estimates of the proportion of greenstriped rockfish discarded (divided by landings + discards) by year and stratum (north and south of 40°10') for trawl and fixed gears as estimated from the WCGOP data.

	Trawl		Fixed Gear
Year	North	South	Coastwide
2002	0.777	0.913	0.999
2003	0.984	0.980	0.993
2004	0.843	0.997	0.997
2005	0.955	0.993	0.994
2006	0.807	1.000	0.999
2007	0.943	0.899	0.988

Table 10: The number of trips, number of tows, and number of lengths used to estimate the WCGOP discard length frequencies.

Year	Fishery	# trips	# tows	# samples
2003	WA/OR Trawl	4	11	33
2005	WA/OR Trawl	2	4	5
2006	WA/OR Trawl	54	103	381
2007	WA/OR Trawl	32	43	145
2002	CA Trawl	3	5	20
2006	CA Trawl	33	44	156
2007	CA Trawl	21	38	165
2008	CA Trawl	3	4	10
2005	Fixed gear	1	2	5
2006	Fixed gear	1	1	2
2007	Fixed gear	7	12	27

Table 11: Mean weight of discards for the different gear types from the WCGOP data.

Year	OR/WA Trawl	CA Trawl	Fixed gear
2002	0.2463	0.1862	0.5022
2003	0.2796	0.1749	0.5035
2004	0.2421	0.2120	0.3646
2005	0.3420	0.1848	0.4851
2006	0.2943	0.2002	0.4300
2007	0.2864	0.2259	0.4485

Table 12: Foreign catches (mt) of greenstriped rockfish by INPFC area (from Rogers (2003)).

Year	Monterey	Eureka	Columbia	US Vancouver	Total
1966	14	0	80	17	111
1967	92	0	40	11	143
1968	17	8	11	5	41
1969	0	0	37	0	37
1970	0	0	44	0	44
1971	0	0	6	3	9
1972	0	4	7	3	14
1973	2	11	19	3	35
1974	0	5	7	1	13
1975	2	11	8	0	21
1976	1	8	4	0	13

Table 13: Number of logbook observations for greenstriped rockfish and the percentage of observed catch compared to the total landings in CA.

Year	1993	1994	1995	1996	1997	1998	1999
Number of observations	30	11	77	62	14	9	12
Percentage of CA landings	1.57	1.57	8.47	3.50	0.48	0.20	2.19

Year	2000	2001	2002	2003	2004	2005	2006	2007
Number of observations	37	15	15	6	32	18	9	2
Percentage of CA landings	10.61	3.02	3.91	38.07	60.77	41.53	3.90	1.50

Table 14: The number of landings sampled by commercial trawl and other (net and hook and line) gears used to estimate length frequencies. Also shown are which years use a sex-specific length frequencies (FM) or a combined sex length frequency (B). The other-gear uses combined sex length frequencies for every year.

	Trawl			Trawl LF type		Other-gear		
Year	**WA**	**OR**	**CA**	**WA/OR**	**CA**	**WA**	**OR**	**CA**
1978	0	0	26		FM	0	0	1
1979	0	0	12		FM	0	0	6
1980	0	0	28		B	0	0	2
1981	0	0	13		B	0	0	5
1982	0	0	28		FM	0	0	0
1983	0	0	56		FM	0	0	5
1984	0	0	51		FM	0	0	5
1985	0	0	83		FM	0	0	17
1986	0	0	43		FM	0	0	6
1987	0	0	43		FM	0	0	17
1988	0	0	41		FM	0	0	9
1989	0	0	34		FM	0	0	25
1990	0	0	45		FM	0	0	4
1991	0	0	47		B	0	0	7
1992	0	0	23		B	0	0	18
1993	0	0	20		FM	0	0	26
1994	0	0	30		FM	0	0	33
1995	0	1	24	B	FM	0	0	11
1996	33	4	27	B	FM	0	0	30
1997	30	6	42	B	FM	0	0	14
1998	27	2	33	FM	FM	0	0	22
1999	15	6	28	FM	FM	1	0	5
2000	6	1	18	FM	FM	1	2	2
2001	9	4	13	FM	FM	0	1	7
2002	37	3	14	FM	FM	6	0	3
2003	18	3	4	FM	B	6	0	0
2004	9	3	8	FM	B	1	1	0
2005	0	1	5	FM	B	3	0	0
2006	1	5	3	FM	B	0	0	3
2007	1	4	5	FM	B	1	1	0
2008				FM	B	0	1	6

Table 15: Number of lengths recorded by state and sex for trawl gear.

	WA			OR			CA		
Year	**F**	**M**	**U**	**F**	**M**	**U**	**F**	**M**	**U**
1978	0	0	0	0	0	0	47	38	1
1979	0	0	0	0	0	0	34	23	0
1980	0	0	0	0	0	0	41	8	1
1981	0	0	0	0	0	0	21	1	0
1982	0	0	0	0	0	0	82	31	0
1983	0	0	0	0	0	0	128	67	0
1984	0	0	0	0	0	0	124	39	1
1985	0	0	0	0	0	0	259	143	1
1986	0	0	0	0	0	0	97	49	0
1987	0	0	0	0	0	0	109	35	1
1988	0	0	0	0	0	0	71	41	2
1989	0	0	0	0	0	0	91	41	2
1990	0	0	0	0	0	0	88	51	2
1991	0	0	0	0	0	0	112	17	5
1992	0	0	0	0	0	0	28	11	10
1993	0	0	0	0	0	0	39	13	10
1994	0	0	0	0	0	0	46	28	32
1995	0	0	0	2	0	0	91	58	61
1996	0	0	539	180	84	0	61	28	22
1997	0	0	382	227	141	0	194	65	101
1998	406	108	3	83	38	0	146	100	21
1999	108	27	2	240	119	0	95	103	16
2000	150	25	0	77	1	0	349	50	2
2001	67	24	166	177	97	0	240	56	1
2002	1194	819	41	30	5	0	76	46	4
2003	166	114	19	61	53	0	9	1	70
2004	196	59	2	39	13	0	25	12	181
2005	0	0	0	23	7	0	29	8	1
2006	1	0	0	150	42	0	37	7	0
2007	1	0	0	48	26	0	38	3	1
2008	0	0	0	89	19	0	0	1	1

Table 16: Number of lengths recorded by state and sex for the other-gear fleet.

	WA			OR			CA		
Year	**F**	**M**	**U**	**F**	**M**	**U**	**F**	**M**	**U**
1978	0	0	0	0	0	0	0	0	1
1979	0	0	0	0	0	0	1	0	16
1980	0	0	0	0	0	0	0	0	6
1981	0	0	0	0	0	0	0	1	5
1983	0	0	0	0	0	0	0	0	7
1984	0	0	0	0	0	0	0	0	22
1985	0	0	0	0	0	0	11	5	34
1986	0	0	0	0	0	0	1	0	10
1987	0	0	0	0	0	0	8	7	22
1988	0	0	0	0	0	0	1	2	15
1989	0	0	0	0	0	0	10	2	116
1990	0	0	0	0	0	0	0	0	6
1991	0	0	0	0	0	0	5	1	3
1992	0	0	0	0	0	0	6	0	62
1993	0	0	0	0	0	0	9	1	52
1994	0	0	0	0	0	0	7	1	152
1995	0	0	0	0	0	0	0	0	35
1996	0	0	0	0	0	0	0	0	216
1997	0	0	0	0	0	0	3	0	42
1998	0	0	0	0	0	0	0	0	210
1999	1	1	0	0	0	0	0	0	46
2000	0	0	3	11	6	0	2	0	1
2001	0	0	0	1	0	0	1	0	22
2002	148	26	24	0	0	0	0	0	3
2003	145	10	2	0	0	0	0	0	0
2004	34	11	0	2	2	0	0	0	0
2005	3	2	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	5
2007	1	0	0	11	1	0	0	0	0
	0	0	0	1	0	0	0	0	17

Table 17: Summary of the tow data and samples of greenstriped rockfish for the NWFSC survey.

Year	Number of tows	Number of tows with greenstriped	Percent of tows with greenstriped
2003	558	134	24.0
2004	497	142	28.6
2005	674	185	27.4
2006	652	182	27.9
2007	696	168	24.1
2008	685	150	21.9

Year	Number of tows with lengths taken	Percent greenstriped tows with lengths taken	Number of male lengths	Number of female lengths	Number of unsexed lengths
2003	133	99.3	1754	1757	46
2004	140	98.6	1256	1449	13
2005	182	98.4	1961	2015	32
2006	182	100.0	1521	1628	18
2007	168	100.0	1144	1184	34
2008	150	100.0	929	877	60

Year	Number of tows with ages taken	Percent greenstriped tows with ages taken	Number of male ages	Number of female ages	Number of unsexed ages
2003	65	48.5	294	289	9
2004	139	97.9	248	277	9
2005	180	97.3	278	300	12
2006	182	100.0	255	267	8
2007	167	99.4	288	357	15
2008	149	99.3	276	261	29

Table 18: Estimates of biomass (mt) and standard errors (of the natural log of biomass) for the Triennial and NWFSC surveys.

	Triennial			NWFSC		
Year	Estimate (B)	log(B)	SE(logB)	Estimate (B)	log(B)	SE(logB)
1980	1,575	3.20	0.3038			
1981						
1982						
1983	3,084	3.49	0.2314			
1984						
1985						
1986	3,944	3.60	0.2457			
1987						
1988						
1989	5,044	3.70	0.2539			
1990						
1991						
1992	5,184	3.71	0.2506			
1993						
1994						
1995	4,583	3.66	0.2417			
1996						
1997						
1998	4,545	3.66	0.2541			
1999						
2000						
2001	5,546	3.74	0.2402			
2002						
2003				14,377	4.16	0.2211
2004	5,551	3.74	0.2544	10,012	4.00	0.2363
2005				17,807	4.25	0.2296
2006				11,083	4.04	0.2095
2007				14,547	4.16	0.2245
2008				20,636	4.31	0.2292

Table 19: Depth ranges and limits of the southern latitude in the Triennial survey for the different years.

Years	Depth range (m)	Southern latitude
1977	91–457	34.05
1980–1986	55–366	36.8
1989–1992	55–366	34.5
1995–2004	55–500	34.5

Table 20: Summary of the tow data and samples of greenstriped rockfish from the Triennial survey.

Year	Number of Tows	Number of Tows with Greenstriped	Percent of Tows with Greenstriped
1980	301	123	40.9
1983	479	260	54.3
1986	483	239	49.5
1989	410	228	55.6
1992	403	202	50.1
1995	398	175	44.0
1998	422	214	50.7
2001	419	180	43.0
2004	346	149	43.1

Year	Number of tows with lengths taken	Percentage of greenstriped tows with lengths taken	Number of male lengths	Number of female lengths	Number of unsexed lengths
1980	3	2.4	52	42	0
1983	20	7.7	500	723	0
1986	33	13.8	493	709	0
1989	102	44.7	1864	1992	41
1992	44	21.8	1075	1133	8
1995	141	80.6	2454	2149	204
1998	188	87.9	2476	2598	8
2001	171	95.0	2297	2605	141
2004	146	98.0	2204	2002	97

Table 21: Research removals (mt) compared to landings (no discards) from all fisheries. The right column shows the percentage of research removals compared to the fisheries landings.

Year	All fisheries	Triennial	NWFSC	% Research
1977	72.72	0.52		0.71
1980	160.26	0.35		0.22
1983	90.85	1.39		1.53
1986	61.23	1.45		2.36
1989	276.63	1.93		0.70
1992	104.24	1.58		1.52
1995	148.67	1.51		1.02
1998	174.19	1.46		0.84
2001	13.58	2.10		15.43
2003	2.72		1.87	68.68
2004	3.00	1.78	1.06	94.80
2005	2.88		2.12	73.81
2006	7.63		1.42	18.65
2007	0.98		2.13	218.66
2008	1.72		2.47	143.22

Table 22: Weight-at-length parameters for greenstriped rockfish from three different sources. Weight is in kg and length is in cm.

	Love et al (1990)	Shaw & Gunderson (2006)		NWFSC survey	
Year scollected	1980-1987		1995		2003-2008
	Both sexes	Female	Male	Female	Male
a	7.90E-06	6.49E-06	5.69E-06	7.40E-06	8.24E-06
b	3.127	3.2145	3.2597	3.167	3.131

Table 23: Estimates of length (cm) at 50% maturity and length (cm) at 100% maturity from various sources.

		Love et al (1990)		Love et al (2002)		Shaw & Gunderson (2006)		Wyllie Echeverria (1987)	
	Year collected	1980-1987				1995			
		Female	Male	Female	Male	Female	Male	Female	Male
OR/WA	L50%			24	22	21	23		
	L100%			29	31	28	30		
CA	L50%	19	18	18	18			23*	23*
	L100%	25	26	26	26			27*	27*

* Length in total length

Table 24: Estimated parameters of the von Bertalanffy growth curve for greenstriped rockfish from various sources.

		Love et al (1990)		Shaw & Gunderson (2006)		Westrheim & Harling (1975)*		NWFSC survey	
	Year collected	1980-1987		1995		1963–1974		2003-2008	
		Female	Male	Female	Male	Female	Male	Female	Male
North (OR/WA/BC)	Linf			37.5	30.1	35.2	37.0	33.9	29.0
	k			0.08	0.11	0.12	0.077	0.11	0.13
	t0			-3.47	-3.27	-0.1	-2.7	-3.25	-3.08
South (CA)	Linf	37.3	29.7					31.9	26.7
	k	0.10	0.12					0.13	0.17
	t0	-2.36	-2.73					-2.51	-2.20

*Ages based on surface reads

Table 25: Estimates of natural mortality (M) based on Hoenig's (1983) method using maximum age.

Maximum Age	M	Maximum Age	M
27	0.154	49	0.085
29	0.144	51	0.081
31	0.134	53	0.078
33	0.126	55	0.075
35	0.119	57	0.073
37	0.112	59	0.070
39	0.106	61	0.068
41	0.101	63	0.066
43	0.096	65	0.064
45	0.092	67	0.062
47	0.088	69	0.060

Table 26: **Percentage of females in length samples from the commercial trawl data and the survey data.**

	WA/OR trawl		CA trawl		Triennial survey		NWFSC survey	
Year	**# tows**	**% female**	**# tows**	**% female**	**# tows**	**% female**	**# tows**	**% female**
1978			25	61				
1979			12	62				
1980					3	53		
1981								
1982			28	74				
1983			56	60	20	57		
1984			50	76				
1985			82	72				
1986			43	74	33	60		
1987			42	79				
1988			40	64				
1989			33	71	102	52		
1990			44	65				
1991								
1992					44	51		
1993			15	77				
1994			19	58				
1995	1	100	16	74	141	47		
1996			17	68				
1997			30	67				
1998	28	76	28	55	188	51		
1999	19	71	28	48				
2000	7	93	17	77				
2001	10	69	13	74	171	57		
2002	39	60	13	40				
2003	20	56					133	52
2004	12	76			146	48	140	52
2005	1	78					182	53
2006	8	65					182	53
2007	5	68					168	49
2008	8	78					150	52

Table 27: Model runs used for model selection. Bias options are 0=none, 1=linear, 2=type 2. Standard deviation options are 1=constant CV, 2=type 2 increase in CV with age. The line colored in green represents the best model chosen.

Likeli-hood	Min Age	Max Age	Reference Age	Minus Group	Plus Group	Bias Options	Standard Deviation Options	Maximum Standard Deviation	Maximum Age Error
1932.9	1	48	10	1	35	0, 0	1, -1	10	10
1932.9	1	48	8	1	35	0, 0	1, -1	10	10
1932.9	1	48	6	1	35	0, 0	1, -1	10	10
1932.9	1	48	12	1	35	0, 0	1, -1	10	10
1960.4	1	48	14	1	35	0, 0	1, -1	10	10
1932.9	1	48	10	1	40	0, 0	1, -1	10	10
1944.6	1	48	10	1	45	0, 0	1, -1	10	10
1941.7	1	48	10	1	30	0, 0	1, -1	10	10
1876.5	1	48	10	1	40	0, 0	1, 2	10	10

Table 28: Estimated aging error determined from double reads of ages collected in the NWFSC survey. Ageing error was assumed to be unbiased.

True Age	Standard Deviation	True Age	Standard Deviation	True Age	Standard Deviation
1	0.134	18	0.971	35	0.974
2	0.366	19	0.972	36	0.974
3	0.534	20	0.973	37	0.974
4	0.655	21	0.973	38	0.974
5	0.743	22	0.973	39	0.974
6	0.807	23	0.974	40	0.974
7	0.853	24	0.974	41	0.974
8	0.887	25	0.974	42	0.974
9	0.911	26	0.974	43	0.974
10	0.928	27	0.974	44	0.974
11	0.941	28	0.974	45	0.974
12	0.95	29	0.974	46	0.974
13	0.957	30	0.974	47	0.974
14	0.962	31	0.974	48	0.974
15	0.965	32	0.974	49	0.974
16	0.968	33	0.974	50	0.974
17	0.97	34	0.974		

Table 29: Specifications of the assessment model.

Starting year	1916
Population characteristics	
Maximum age	50
Genders	2
Population lengths	5-45 cm by 1 cm bins
Summary biomass (mt)	Age 2+
Data characteristics	
Data lengths	10-40 cm by 1 cm bins
Data ages	1-45
Minimum age for growth calcs	1
Maximum age for growth calcs	45
First mature age	2
Starting year of estimated recruitment	1970
Fishery characteristics	
Fishery timing	0.5
Early Triennial survey timing	0.6
Late Triennial survey timing	0.5
NWFSC survey timing	0.5
Fishing mortality method	Exploitation rate
Maximum exploitation rate	0.9
Catchability	linear and analytic calc
Selectivity	Double normal

Table 30: Description of recruitment, survey, and fishery parameters in the base case assessment model.

Parameter	Initial value	Number estimated	Bounds (low, high)	Prior distribution
Stock and recruitment				
Ln(R0)	9	1	(1, 99)	
Steepness (h)	0.692	0	(0.2, 1.0)	Beta(0.692, 0.205)
σ_r	0.60	0	(0, 2)	
Ln(Main Recruitment Deviations): 1970-2005	0	36	(-3, 3)	
Ln(Forecast Recruitment Deviations): 2006-2020	0	15	(-3, 3)	
Catchability				
ln(q) – NWFSC survey	Analytic solution			
ln(q) – early Triennial survey	Analytic solution			
ln(q) – late Triennial survey	Analytic solution			
Selectivity (asympotitc, sex specific, some with retention curves)				
Fisheries:				
Length at peak selectivity	34	4	(12, 44)	
Width of top	3	0	(-5, 3)	
Ascending width	4.1	4	(-4, 12)	
Descending width	6	0	(-2, 6)	
Initial selectivity	-5	4	(-15, 5)	
Final selectivity	-4[1]	0	(-5, 5)	
Male peak offset	0	2	(-15, 15)	
Male ascending width offset	0	2	(-15, 15)	
Male descending width offset	0	0	(-15, 15)	
Male final offset	0	0	(-15, 15)	
Retention inflection	25	3	(10, 39)	
Retention slope	3	3	(0.1, 10)	
Retention asymptote	0.3	3	(0.001, 0.7)	
Retention male offset	0	0	(-10, 10)	
Time block parameters	--	0	--	
Surveys:				
Length at peak selectivity	21	3	(12, 44)	
Width of top	3	0	(-5, 3)	
Ascending width	3.7	3	(-4, 12)	
Descending width	6	0	(-2, 6)	
Initial selectivity	-5	3	(-15, 5)	
Final selectivity	-4[1]	0	(-5, 5)	
Male peak offset	0	3	(-15, 15)	
Male ascending width offset	0	3	(-15, 15)	
Male descending width offset	0	0	(-15, 15)	
Male final offset	0	0	(-15, 15)	

[1]: When not estimated, was set to -999 which causes the curve to decline like a normal curve

Table 31: Description of biological parameters in the base case assessment model.

Parameter	Initial value	Number estimated	Bounds (low, high)	Prior distribution
Biological				
Females:				
Natural mortality (M, female)	0.08	0	(0.02, 0.4)	N(0.08, 0.035)
Length at age 1	11.9	1	(3, 25)	
Length at age 45	33.4	1	(25, 60)	
von Bertalanffy K	0.105	1	(0.03, 0.8)	
SD of length at age 1	0.09	1	(0.001, 1)	
SD of length at age 45	0.09	1	(0.001, 1)	
Maturity inflection	20.97	0	(10, 50)	
Maturity slope	-0.66	0	(-3, 3)	
Fecundity intercept	371200	0	(-3, 3e6)	
Fecundity slope	63300	0	(-3, 3e6)	
Males:				
Natural mortality (M, male)	0.08	0	(0.02, 0.4)	N(0.08, 0.035)
Length at age 1	11.8	1	(3, 25)	
Length at age 45	28.4	1	(25, 60)	
von Bertalanffy K	0.136	1	(0.03, 0.8)	
SD of length at age 1	0.08	1	(0.001, 1)	
SD of length at age 45	0.08	1	(0.001, 1)	

[1]: When not estimated, was set to -999 which causes the curve to decline like a normal curve

Table 32: Likelihood components and other quantities related to the minimization of the base case model.

Description	Values
Nparameters	102
Gradient	0.00007
Negative log-likelihoods	
Total	4078.77
Indices	-10.66
Length-frequency data	1700.22
Age-frequency data	2380.89
Discard biomass	39.77
Discard mean weight	-43.15
Recruitment	11.56
Priors	0.0
Forecast recruitment	0.12

Table 33: Parameter estimates and approximate asymptotic standard deviations for the base case model.

Stock and recruitment	Est	SD
Ln(R0)	9.70	0.15

Catchability

	early Triennial	late Triennial	NWFSC
ln(q)	0.20	0.32	0.84

Selectivity (asympotitc, sex specific, some with retention curves)

Fisheries:	WA/OR trawl		CA trawl		Other		Recreational	
	Est	SD	Est	SD	Est	SD	Est	SD
Length at peak selectivity	43.97	0.88	24.62	1.04	44.00	0.04	26.97	0.80
Ascending width	5.03	0.16	3.56	0.55	4.87	0.06	3.77	0.20
Initial selectivity	-5.48	1.61	-10.36	69.11	-12.74	41.26	-9.29	27.31
Male peak offset	4.43	4.61	3.73	2.47	NA	NA	NA	NA
Male ascending width offset	0.84	0.45	1.10	1.09	NA	NA	NA	NA
Retention inflection	30.57	1.16	30.95	0.55	22.69	0.29	NA	NA
Retention slope	3.08	0.32	2.65	0.17	0.39	0.21	NA	NA
Retention asymptote	0.40	0.08	0.33	0.10	0.11	0.03	NA	NA

Surveys:	early Triennial		late Triennial		NWFSC	
	Est	SD	Est	SD	Est	SD
Length at peak selectivity	27.67	0.77	24.95	0.98	26.74	0.70
Ascending width	3.88	0.20	3.82	0.24	4.02	0.16
Initial selectivity	-6.01	2.14	-5.51	0.93	-4.67	0.73
Male peak offset	0.22	1.08	0.34	1.09	-0.71	0.95
Male ascending width offset	0.01	0.28	0.14	0.30	-0.13	0.26

Biological

	Females		Males	
	Est	SD	Est	SD
Length at age 1	9.26	0.21	9.21	0.21
Length at age 45	33.68	0.14	28.48	0.12
von Bertalanffy K	0.11	0.003	0.15	0.004
CV at age 1	0.09	0.003	0.07	0.003
CV at age 45	0.07	0.003	0.09	0.005

Table 34: Estimates of key derived parameters and reference points with approximate 95% asymptotic confidence intervals.

Quantity	**Estimate**	**~95% Confidence interval**	**Range of states of nature**
Unfished spawning output (millions of eggs)	7,680	5,402-9,958	2,179-52,580
Unfished age 2+ biomass (mt)	36,314	25,516-47,112	9,815-261,762
Unfished recruitment (R0, thousands)	16,281	2,242-118,211	2,760-172,741
Depletion (2009)	81.3%	72.8–89.9%	58.4–103.9%
Reference points based on $SB_{40\%}$			
Proxy spawning output ($B_{40\%}$)	3,072	2,161–3,983	872–21,032
SPR resulting in $B_{40\%}$ ($SPR_{B40\%}$)	46.7%	NA	NA
Exploitation rate resulting in $B_{40\%}$	0.0494	0.0483–0.0504	0.0407–0.0571
Yield with $SPR_{B40\%}$ at $B_{40\%}$ (mt)	828	581–1,075	179–7,091
Reference points based on $SPR_{50\%}$			
Spawning output at SPR (SB_{SPR}) (millions of eggs)	3,359	2,363–4,356	953–22,998
$SPR_{50\%}$	50.0%	NA	NA
Exploitation rate corresponding to $SPR_{50\%}$	0.0443	0.0434–0.0452	0.0364–0.0513
Yield with $SPR_{50\%}$ at SB_{SPR} (mt)	800	561–1,038	173-6,844
Reference points based on estimated MSY values			
Spawning output at *MSY* (SB_{MSY}) (millions of eggs)	2,209	1,552–2,866	634–14,940
SPR_{MSY}	36.7%	36.4–36.9	36.3-37
Exploitation rate corresponding to SPR_{MSY}	0.0682	0.0668–0.0696	0.0562–0.0791
MSY (mt)	870	611–1,129	188–7,471

Table 35: Input sample sizes compared to calculated effective sample size for the length composition data.

	WA/OR Trawl		CA Trawl		Other-gear		Recreational		Triennial		NWFSC	
Year	**N**	**effN**	**N**	**effN**	**N**	**effN**	**N**	**effN**	**N**	**effN**	**N**	**effN**
1978			75	25								
1979			36	26	12	4						
1980			28	50	4	5	6	12				
1981			13	7	10	5						
1982			84	59			3	4				
1983			168	99	10	4			140	217		
1984			150	65	10	11	18	18				
1985			246	372	34	43	24	20				
1986			129	150	12	21	12	5	231	223		
1987			126	99	34	26	6	2				
1988			120	115	18	10	15	6				
1989			99	89	50	64			714	508		
1990			132	88	8	4						
1991			141	185	14	4						
1992			69	24	36	35			308	1212		
1993			45	27	52	27	27	12				
1994			57	71	66	40	90	61				
1995			48	41	22	29	51	35	564	1202		
1996	198	269	51	76	60	61	45	90				
1997	180	112	90	180	28	18	36	5				
1998	196	151	84	97	44	37	27	30	752	767		
1999	133	217	84	42	12	97	75	122				
2000	49	28	51	65	10	10	27	23				
2001	70	141	39	35	16	19	21	57	684	474		
2002	273	385	39	23	18	11	9	59				
2003	140	114	4	5	12	11	9	6			611	649
2004	84	45	8	7	4	14			584	551	649	789
2005			5	8	6	4					605	927
2006	56	61	3	14	6	2					595	641
2007	35	53	5	7	4	5					447	446
2008	56	43			14	7					191	238
ratio of means		1.101		0.966		1.005		1.128		1.296		1.191

Table 36: Time-series of population estimates from the base case model.

Year	Total biomass (mt)	Spawning output (million eggs)	Depletion	Age-0 recruits	Total catch (mt)	SPR	Relative exploitation rate
1916	36,474	7,680	1.00	16,281	13.5	0.0071	0.0004
1917	36,462	7,676	1.00	16,280	21.7	0.0113	0.0006
1918	36,444	7,671	1.00	16,279	21.2	0.0111	0.0006
1919	36,426	7,666	1.00	16,278	12.6	0.0066	0.0003
1920	36,418	7,663	1.00	16,277	13.6	0.0072	0.0004
1921	36,409	7,660	1.00	16,276	12.0	0.0063	0.0003
1922	36,402	7,658	1.00	16,276	11.4	0.0060	0.0003
1923	36,395	7,656	1.00	16,275	14.5	0.0076	0.0004
1924	36,387	7,654	1.00	16,275	18.2	0.0095	0.0005
1925	36,376	7,650	1.00	16,274	20.3	0.0106	0.0006
1926	36,363	7,647	1.00	16,273	26.6	0.0139	0.0007
1927	36,346	7,641	1.00	16,272	24.9	0.0130	0.0007
1928	36,331	7,637	0.99	16,271	24.0	0.0126	0.0007
1929	36,318	7,633	0.99	16,270	30.1	0.0157	0.0008
1930	36,299	7,628	0.99	16,269	29.0	0.0152	0.0008
1931	36,282	7,624	0.99	16,268	35.0	0.0183	0.0010
1932	36,261	7,618	0.99	16,266	29.8	0.0157	0.0008
1933	36,245	7,614	0.99	16,265	30.2	0.0160	0.0008
1934	36,229	7,610	0.99	16,264	27.4	0.0145	0.0008
1935	36,216	7,607	0.99	16,264	26.1	0.0138	0.0007
1936	36,205	7,604	0.99	16,263	18.7	0.0098	0.0005
1937	36,202	7,604	0.99	16,263	23.5	0.0124	0.0007
1938	36,193	7,602	0.99	16,262	23.9	0.0126	0.0007
1939	36,185	7,600	0.99	16,262	29.6	0.0156	0.0008
1940	36,172	7,598	0.99	16,261	31.6	0.0163	0.0009
1941	36,158	7,594	0.99	16,261	38.6	0.0195	0.0011
1942	36,139	7,589	0.99	16,259	26.2	0.0127	0.0007
1943	36,132	7,588	0.99	16,259	81.7	0.0381	0.0023
1944	36,076	7,573	0.99	16,256	184.0	0.0849	0.0051
1945	35,926	7,537	0.98	16,247	359.5	0.1574	0.0101
1946	35,617	7,461	0.97	16,228	308.9	0.1421	0.0087
1947	35,365	7,399	0.96	16,213	151.6	0.0741	0.0043
1948	35,274	7,376	0.96	16,207	139.6	0.0694	0.0040
1949	35,200	7,356	0.96	16,202	188.6	0.0933	0.0054
1950	35,083	7,327	0.95	16,194	191.0	0.0947	0.0055
1951	34,969	7,299	0.95	16,187	242.2	0.1182	0.0070
1952	34,812	7,261	0.95	16,177	155.8	0.0785	0.0045
1953	34,745	7,244	0.94	16,173	152.6	0.0774	0.0044
1954	34,684	7,229	0.94	16,169	158.7	0.0795	0.0046
1955	34,623	7,214	0.94	16,165	144.4	0.0727	0.0042
1956	34,578	7,202	0.94	16,162	158.4	0.0777	0.0046
1957	34,525	7,189	0.94	16,158	160.7	0.0791	0.0047
1958	34,474	7,176	0.93	16,155	193.0	0.0945	0.0056
1959	34,395	7,157	0.93	16,150	93.7	0.0507	0.0027
1960	34,411	7,161	0.93	16,151	143.3	0.0706	0.0042

1961	34,385	7,153	0.93	16,149	114.6	0.0565	0.0033
1962	34,388	7,153	0.93	16,149	48.7	0.0262	0.0014
1963	34,452	7,169	0.93	16,153	72.5	0.0389	0.0021
1964	34,490	7,179	0.93	16,155	57.7	0.0303	0.0017
1965	34,542	7,191	0.94	16,159	71.7	0.0386	0.0021
1966	34,578	7,201	0.94	16,161	747.3	0.2813	0.0217
1967	33,989	7,056	0.92	16,122	1226.3	0.4345	0.0362
1968	32,941	6,810	0.89	16,053	460.5	0.2177	0.0140
1969	32,663	6,742	0.88	16,033	362.7	0.1707	0.0112
1970	32,487	6,699	0.87	7,716	446.8	0.2045	0.0138
1971	32,231	6,641	0.86	32,388	394.5	0.1834	0.0123
1972	32,090	6,598	0.86	10,683	600.7	0.2591	0.0189
1973	31,752	6,512	0.85	9,708	492.9	0.2364	0.0156
1974	31,514	6,452	0.84	20,721	460.5	0.2282	0.0147
1975	31,323	6,399	0.83	12,215	683.2	0.3120	0.0219
1976	30,894	6,303	0.82	8,846	746.2	0.3333	0.0242
1977	30,378	6,203	0.81	11,965	583.5	0.2857	0.0193
1978	30,008	6,143	0.80	26,953	441.8	0.2123	0.0148
1979	29,828	6,108	0.80	12,027	324.8	0.1726	0.0110
1980	29,749	6,095	0.79	10,437	1259.2	0.4878	0.0425
1981	28,776	5,866	0.76	30,889	225.0	0.1342	0.0079
1982	28,905	5,858	0.76	12,715	1013.2	0.4077	0.0354
1983	28,304	5,683	0.74	8,564	541.9	0.2650	0.0192
1984	28,211	5,630	0.73	39,834	635.7	0.2987	0.0226
1985	28,177	5,569	0.73	26,864	666.3	0.3266	0.0240
1986	28,205	5,515	0.72	6,889	407.8	0.2196	0.0146
1987	28,510	5,534	0.72	9,136	696.9	0.3189	0.0245
1988	28,548	5,504	0.72	21,826	1646.5	0.5629	0.0579
1989	27,670	5,293	0.69	9,915	1774.5	0.5654	0.0646
1990	26,666	5,084	0.66	4,902	899.2	0.4148	0.0338
1991	26,394	5,090	0.66	3,435	851.6	0.3939	0.0323
1992	26,047	5,095	0.66	3,804	621.2	0.3129	0.0239
1993	25,877	5,131	0.67	62,870	871.0	0.3886	0.0338
1994	25,622	5,092	0.66	16,521	1155.1	0.4649	0.0460
1995	25,158	4,963	0.65	7,023	905.9	0.4083	0.0362
1996	24,970	4,855	0.63	5,533	872.9	0.3979	0.0351
1997	24,798	4,739	0.62	3,305	1070.4	0.4698	0.0433
1998	24,383	4,612	0.60	23,914	1101.8	0.4747	0.0453
1999	23,972	4,545	0.59	30,260	393.1	0.2488	0.0166
2000	24,299	4,663	0.61	31,187	90.4	0.0701	0.0038
2001	25,003	4,827	0.63	15,712	90.7	0.0678	0.0037
2002	25,771	4,953	0.64	24,734	101.8	0.0726	0.0040
2003	26,598	5,055	0.66	13,344	14.6	0.0108	0.0006
2004	27,528	5,193	0.68	25,531	16.8	0.0121	0.0006
2005	28,496	5,370	0.70	22,920	16.7	0.0116	0.0006
2006	29,462	5,582	0.73	10,362	48.2	0.0320	0.0016
2007	30,344	5,802	0.76	15,455	7.3	0.0048	0.0002
2008	31,197	6,029	0.79	15,800	11.0	0.0070	0.0004
2009	31,961	6,248	0.81	15,876	9.1	0.0056	0.0003

Table 37: Asymptotic standard deviation estimates for spawning biomass and recruitment.

Year	Spawning output (millions)	Age-0 recruits	Year	Spawning output (millions)	Age-0 recruits	Year	Spawning output (millions)	Age-0 recruits
1916	1,162	2,473	1947	1,124	2,463	1978	938	10,802
1917	1,162	2,473	1948	1,120	2,462	1979	936	7,615
1918	1,162	2,473	1949	1,117	2,462	1980	895	6,471
1919	1,161	2,473	1950	1,112	2,460	1981	894	10,644
1920	1,161	2,472	1951	1,108	2,459	1982	869	7,792
1921	1,161	2,472	1952	1,101	2,457	1983	863	5,145
1922	1,161	2,472	1953	1,098	2,457	1984	857	11,624
1923	1,160	2,472	1954	1,095	2,456	1985	850	9,865
1924	1,160	2,472	1955	1,093	2,455	1986	857	3,717
1925	1,160	2,472	1956	1,092	2,455	1987	858	3,844
1926	1,160	2,472	1957	1,090	2,455	1988	831	6,289
1927	1,159	2,472	1958	1,089	2,454	1989	815	3,785
1928	1,159	2,472	1959	1,086	2,454	1990	823	1,906
1929	1,159	2,472	1960	1,087	2,454	1991	834	1,286
1930	1,158	2,472	1961	1,086	2,454	1992	848	1,479
1931	1,157	2,472	1962	1,087	2,454	1993	853	11,862
1932	1,157	2,471	1963	1,090	2,454	1994	846	5,292
1933	1,156	2,471	1964	1,091	2,455	1995	839	2,701
1934	1,155	2,471	1965	1,093	2,455	1996	832	1,852
1935	1,155	2,471	1966	1,094	2,456	1997	823	1,243
1936	1,154	2,471	1967	1,082	2,452	1998	825	5,001
1937	1,154	2,471	1968	1,045	2,442	1999	848	6,274
1938	1,153	2,471	1969	1,034	2,439	2000	873	6,504
1939	1,153	2,471	1970	1,031	3,963	2001	891	3,983
1940	1,152	2,470	1971	1,025	9,656	2002	906	5,393
1941	1,152	2,470	1972	1,021	6,371	2003	924	3,643
1942	1,151	2,470	1973	1,010	5,632	2004	947	6,001
1943	1,151	2,470	1974	1,001	9,010	2005	976	6,647
1944	1,150	2,470	1975	992	7,231	2006	1,005	4,616
1945	1,145	2,469	1976	974	4,929	2007	1,034	8,275
1946	1,134	2,466	1977	956	7,392	2008	1,060	9,785

Table 38: Results from the sensitivity runs.

Description	Base Case	Half landings	Double landings	Estimate steepness	Estimate mortality	Early discard data
Nparameters	102	102	102	103	104	102
Gradient	0.00007	0.00008	0.00011	0.00015	0.00008	0.00001
Negative log-likelihoods						
Total	4078.77	4078.39	4079.07	4078.05	4067.97	4082.81
Indices	-10.66	-10.58	-10.72	-10.88	-8.98	-10.98
Length-frequency data	1700.22	1699.22	1701.44	1699.63	1687.44	1703.9
Age-frequency data	2380.89	2381.13	2380.68	2381.43	2376.28	2379.71
Discard biomass	39.77	39.74	39.81	39.77	40.26	40.53
Discard mean weight	-43.15	-42.83	-43.68	-43.16	-42.57	-43.56
Recruitment	11.56	11.57	11.39	11.4	15.14	13.06
Priors	0	0	0	-0.275	0.252	0
Forecast recruitment	0.12	0.113	0.133	0.112	0.133	0.126
Select parameters						
Stock-recruit, productivity						
R_0	9.70	9.58	9.90	9.71	8.88	9.13
Steepness (*h*)	0.69	0.69	0.69	1.00	0.69	0.69
Recruitment Variability (out)	0.84	0.84	0.84	0.84	0.85	0.83
Female M	0.080	0.080	0.080	0.080	0.060	0.080
Male M	0.080	0.080	0.080	0.080	0.070	0.080
Survey catchability & selectivity						
Early Triennial catchability (*q*)	0.16	0.19	0.13	0.16	0.28	0.28
Late Triennial catchability (*q*)	0.22	0.26	0.18	0.21	0.47	0.37
NWFSC catchability (*q*)	0.57	0.66	0.46	0.54	1.17	0.97
Individual growth						
Female length at age min	9.26	9.26	9.25	9.26	9.32	9.27
Female length at age max	33.68	33.69	33.68	33.69	33.58	33.75
Female von Bertalanffy *K*	0.11	0.11	0.11	0.11	0.12	0.11
Female CV of length-at-age min	0.09	0.09	0.09	0.09	0.09	0.09
Female CV of length-at-age max	0.07	0.07	0.07	0.07	0.07	0.07
Male length at age min	9.21	9.21	9.21	9.22	9.20	9.16
Male length at Linf	28.48	28.48	28.47	28.48	28.57	28.46
Male von Bertalanffy *K*	0.15	0.15	0.15	0.15	0.15	0.15
Male CV of length-at-age min	0.07	0.07	0.07	0.07	0.07	0.07
Male CV of length-at-age max	0.09	0.09	0.09	0.09	0.08	0.09
Management quantities						
Spawning Output (million eggs)	7,680	6,806	9,434	7,748	5,880	4,379
2009 Spawning output	6,248	5,471	7,793	6,655	3,258	3,613
2009 Depletion	0.81	0.80	0.83	0.86	0.55	0.83
2009 1-*SPR*	0.99	0.99	0.99	0.99	0.99	0.99
2008 exploitation rate	0.0004	0.0003	0.0004	0.0003	0.0006	0.0006
SSB MSY	2,209	1,960	2,708	1,124	1,676	1,263
MSY	870	772	1,066	1,302	466	496

Table 39. Results from the retrospective model runs.

Year Assessed	Last year of data	Unfished Spawning Output (millions of eggs)	Year assessed SO (millions of eggs)	Assessed Depletion	2009 Depletion
2009	2008	7,680	6,248	81.4%	81.4%
2008	2007	7,280	5,434	74.7%	77.7%
2007	2006	6,547	4,511	68.9%	76.8%
2006	2005	8,335	5,616	67.4%	76.4%
2005	2004	7,635	4,786	62.7%	73.7%
2004	2003	4,662	2,266	48.6%	64.9%

Table 40: Projection of potential ABC, OY, landings and catch, summary biomass (age 2 and older), spawning biomass, and depletion for the base case model based on the status quo. Landings in 2009 and 2010 are a total of 9 mt, determined from the average of the 2007 and 2008 landings for each fleet and allocated to each fleet based on the proportion caught in 2007 and 2008. Forecasted landings after 2010 are 20 mt (the average of 2000–2003) and allocated to each fleet based on the average allocation in 2000–2003.

Year	ABC (mt)	OY (mt)	Total Catch (mt)	Landings (mt)	Age 2+ biomass (mt)	Spawning output (million eggs)	Depletion
2009	1,466	1,466	9	3	31,806	6,248	81.4
2010	1,512	1,512	9	3	32,480	6,458	84.1
2011	1,554	1,554	94	20	33,064	6,652	86.6
2012	1,586	1,586	93	20	33,484	6,799	88.5
2013	1,612	1,612	92	20	33,830	6,918	90.1
2014	1,633	1,633	91	20	34,112	7,011	91.3
2015	1,650	1,650	90	20	34,338	7,086	92.3
2016	1,663	1,663	89	20	34,518	7,145	93.0
2017	1,673	1,673	89	20	34,659	7,193	93.7
2018	1,681	1,681	88	20	34,768	7,231	94.2
2019	1,688	1,688	87	20	34,851	7,261	94.5
2020	1,693	1,693	87	20	34,913	7,285	94.9

[1] The ABC here is the calculated total catch determined by $F_{SPR50\%}$.

Table 41: Decision table of 12-year projections beginning in 2011 for alternate states of nature based on two axes of uncertainty. Columns range over natural mortality and rows range over the fraction discarded. There are no probabilities associated with these states of nature other than the base model (center square) is the most probable scenario.

State of nature (fraction discarded)		Year	Landed catch (mt)	M=0.06 Depletion (%)	M=0.06 Spawning output (million)	M=0.08 Depletion (%)	M=0.08 Spawning output (million)	M=0.10 Depletion (%)	M=0.10 Spawning output (million)
	Low fraction discarded	2011	20	66.7	1,453	89.1	3,129	107.0	10,496
		2012	20	68.5	1,493	90.8	3,186	108.0	10,591
		2013	20	70.1	1,528	92.0	3,231	108.6	10,646
		2014	20	71.5	1,559	93.0	3,266	108.8	10,671
		2015	20	72.8	1,586	93.8	3,293	108.8	10,673
		2016	20	73.9	1,611	94.4	3,315	108.7	10,660
		2017	20	74.9	1,633	94.9	3,332	108.5	10,636
		2018	20	75.8	1,653	95.3	3,345	108.1	10,604
		2019	20	76.7	1,671	95.6	3,356	107.8	10,567
		2020	20	77.5	1,688	95.8	3,364	107.3	10,526
	Base fraction discarded	2011	20	63.8	3,671	86.6	6,652	106.3	20,029
		2012	20	65.8	3,788	88.5	6,799	107.5	20,254
		2013	20	67.6	3,890	90.1	6,918	108.2	20,394
		2014	20	69.1	3,981	91.3	7,011	108.6	20,466
		2015	20	70.5	4,061	92.3	7,086	108.7	20,488
		2016	20	71.8	4,134	93.0	7,145	108.7	20,477
		2017	20	72.9	4,199	93.7	7,193	108.5	20,440
		2018	20	74.0	4,259	94.2	7,231	108.2	20,385
		2019	20	74.9	4,314	94.5	7,261	107.8	20,318
		2020	20	75.8	4,364	94.9	7,285	107.4	20,242
	High fraction discarded	2011	20	64.4	8,756	86.4	16,561	106.8	56,150
		2012	20	66.4	9,023	88.3	16,932	108.0	56,761
		2013	20	68.1	9,256	89.9	17,232	108.7	57,139
		2014	20	69.6	9,461	91.1	17,469	109.0	57,329
		2015	20	71.0	9,643	92.1	17,658	109.1	57,384
		2016	20	72.2	9,807	92.9	17,809	109.1	57,343
		2017	20	73.3	9,956	93.5	17,931	108.8	57,232
		2018	20	74.3	10,092	94.0	18,028	108.5	57,072
		2019	20	75.2	10,217	94.4	18,106	108.2	56,876
		2020	20	76.0	10,332	94.7	18,167	107.8	56,657

State of nature (natural mortality)

12 Figures

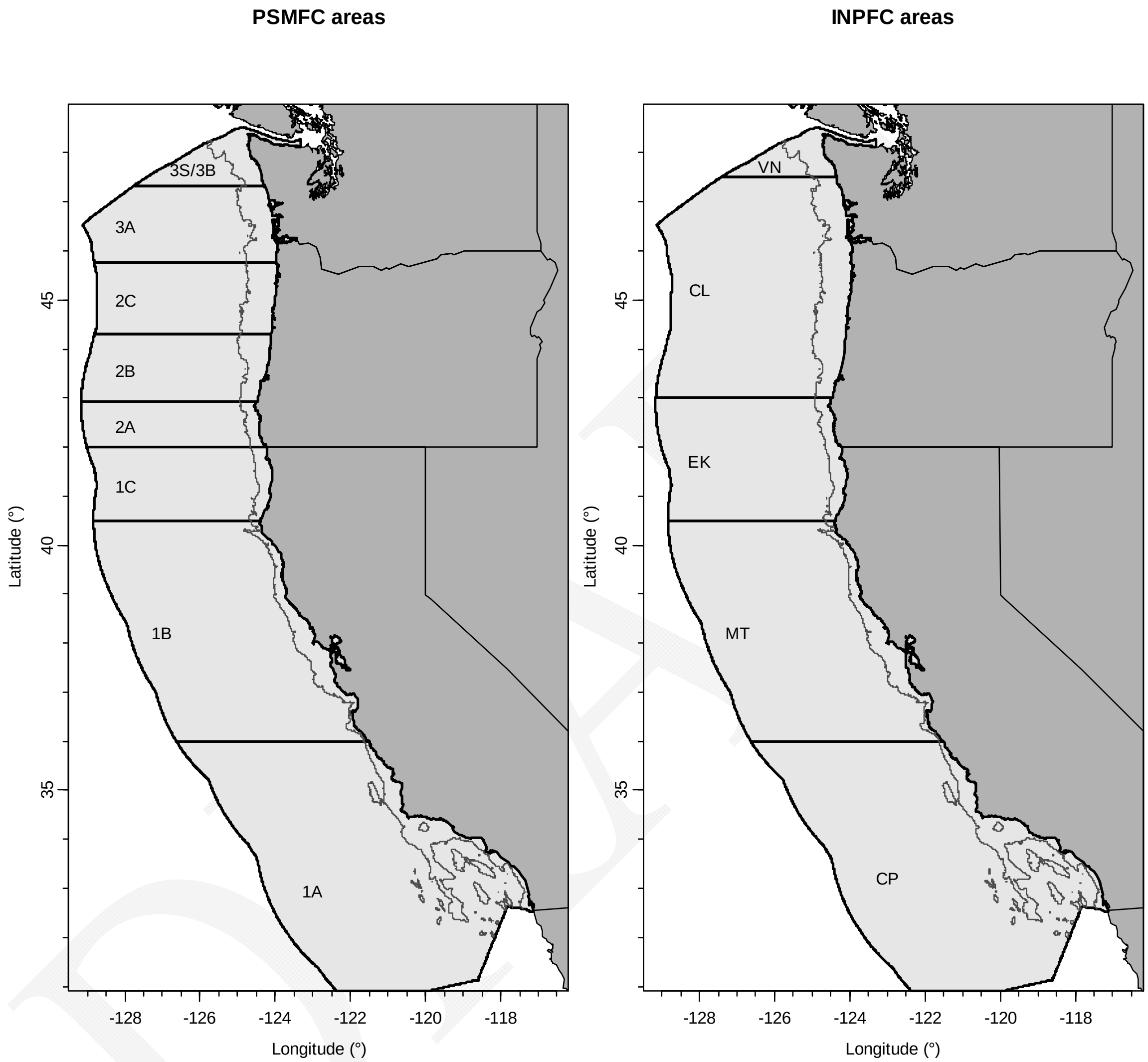


Figure 1: Map showing PSMFC and INPFC boundaries used in the 2009 assessment. The solid gray line off the coast is the 300 fathom depth contour.

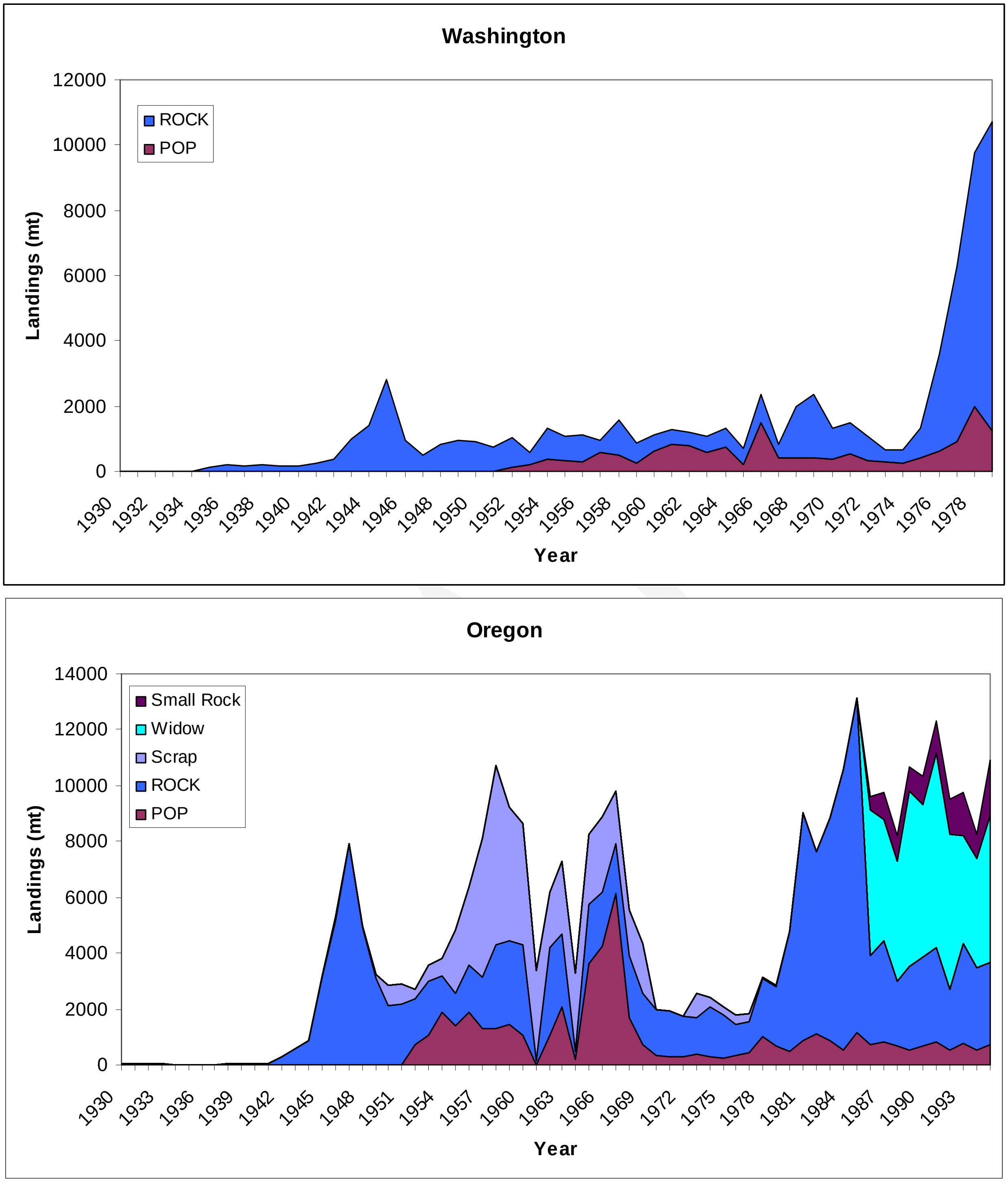


Figure 2: Landings for Washington and Oregon of each market category used in the historical catch reconstruction. Different proportions were applied to each market category to estimate the landings of greenstriped rockfish.

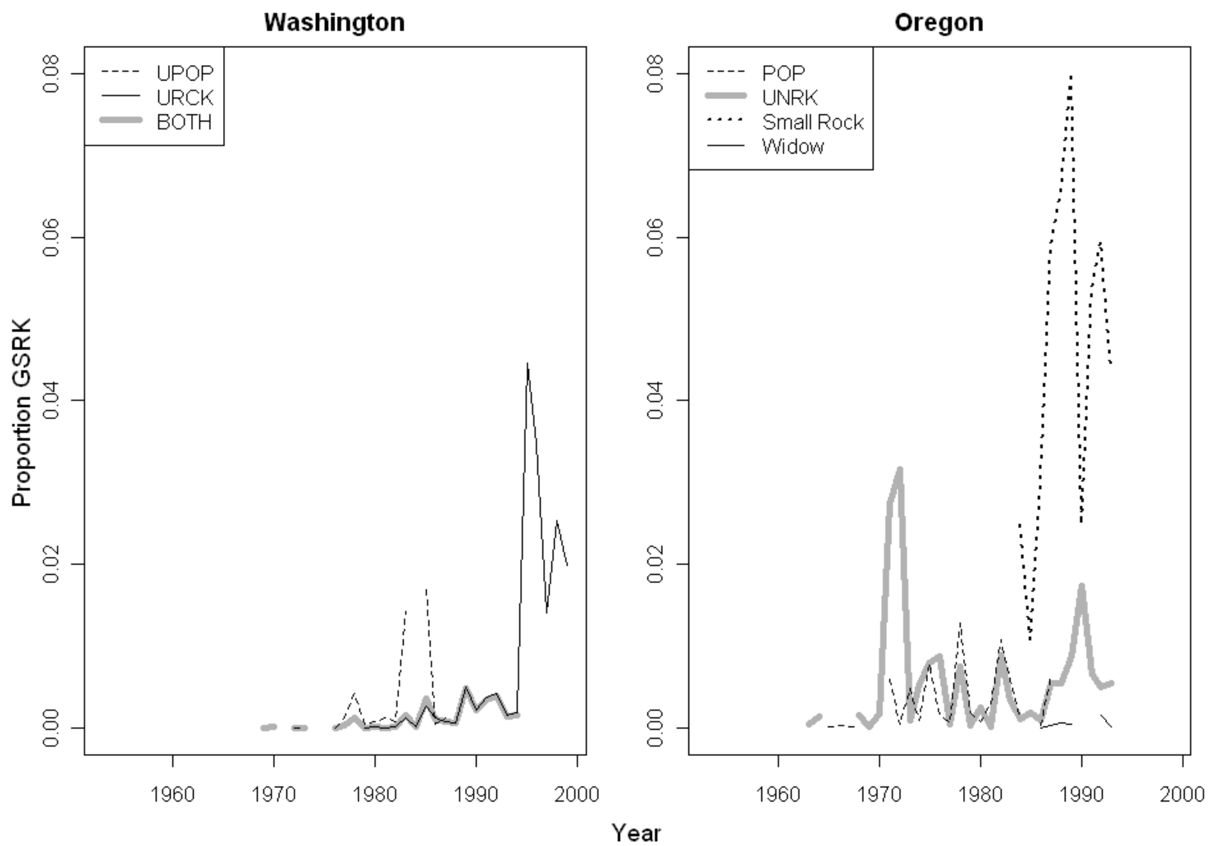


Figure 3: Proportion of greenstriped rockfish (GSRK) used to construct the historical landings as estimated from species composition sampling of different market categories for Oregon and Washington. See text for a full explanation of how these proportions were used.

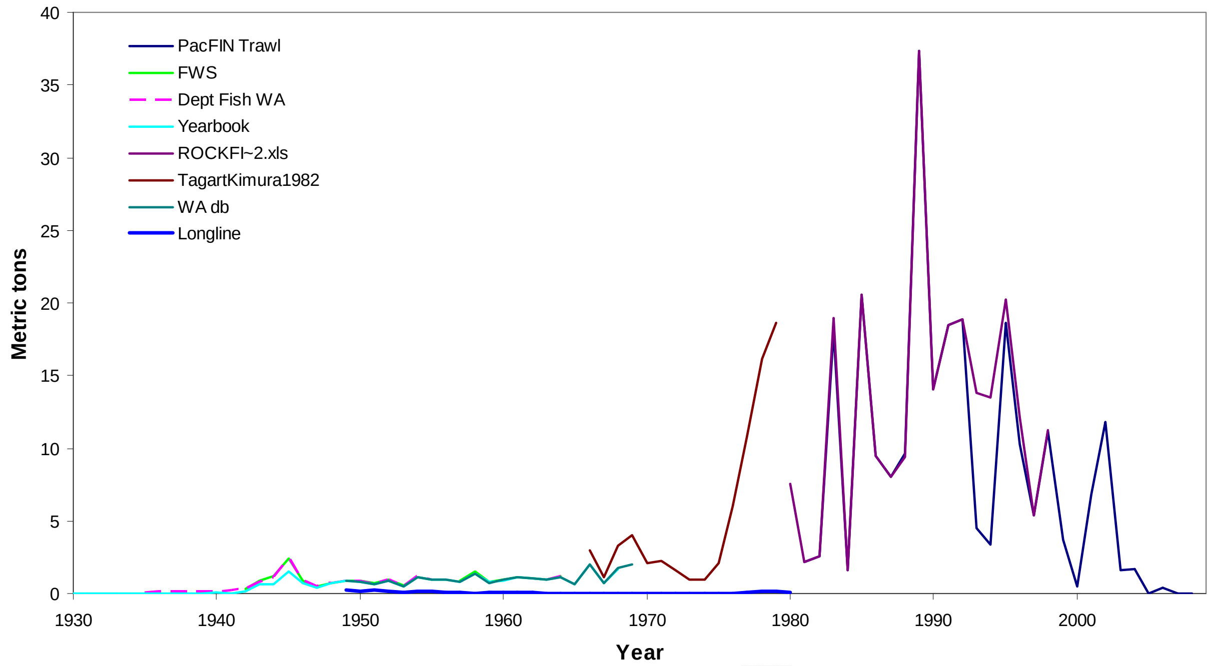


Figure 4: Landings of greenstriped rockfish from Washington trawl vessels as determined from different data sources.

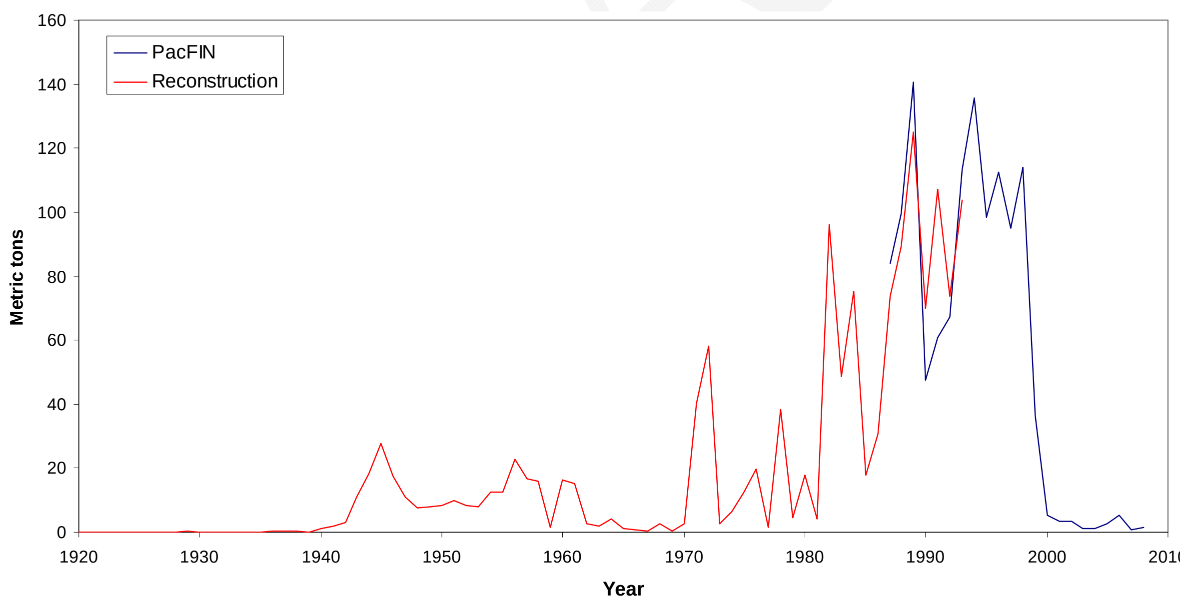


Figure 5: Landings of greenstriped rockfish from Oregon trawl vessels as determined from different data sources.

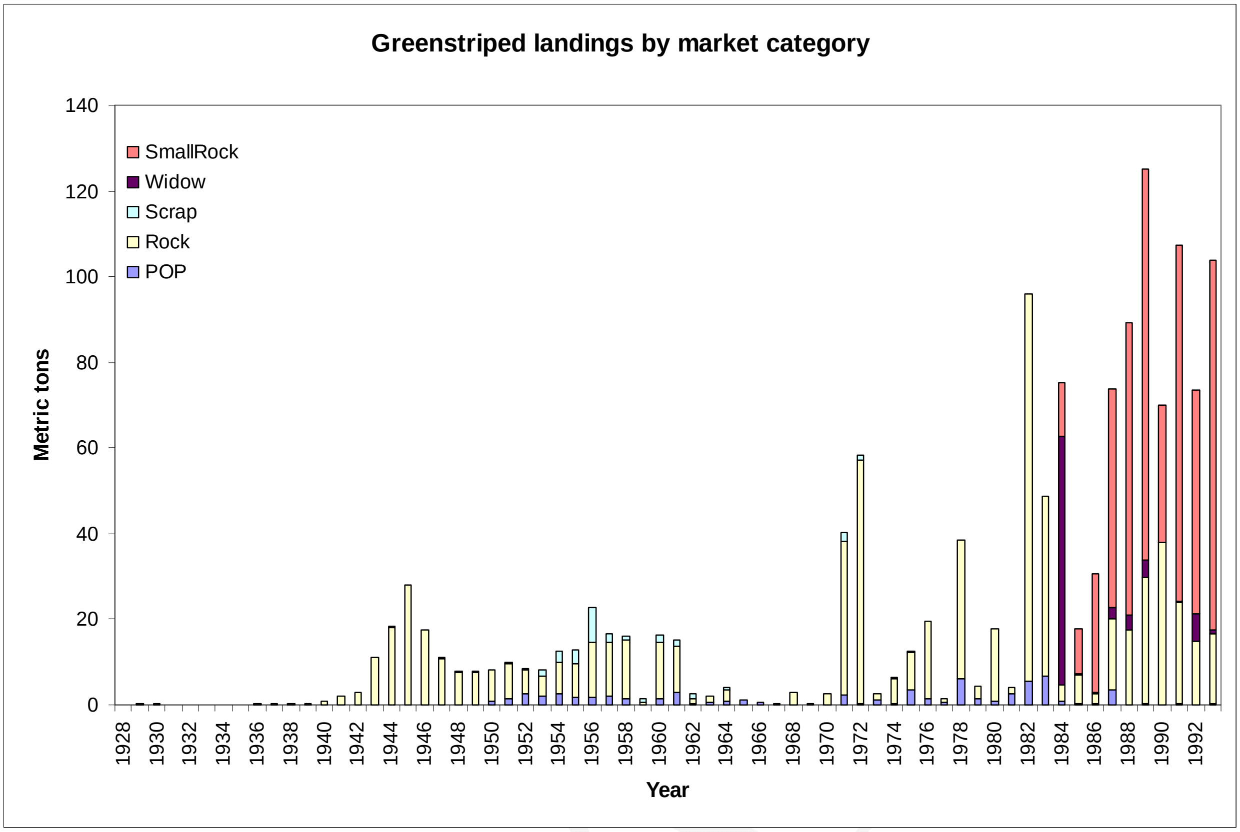


Figure 6: Landings of greenstriped rockfish in Oregon as determined from the different market categories.

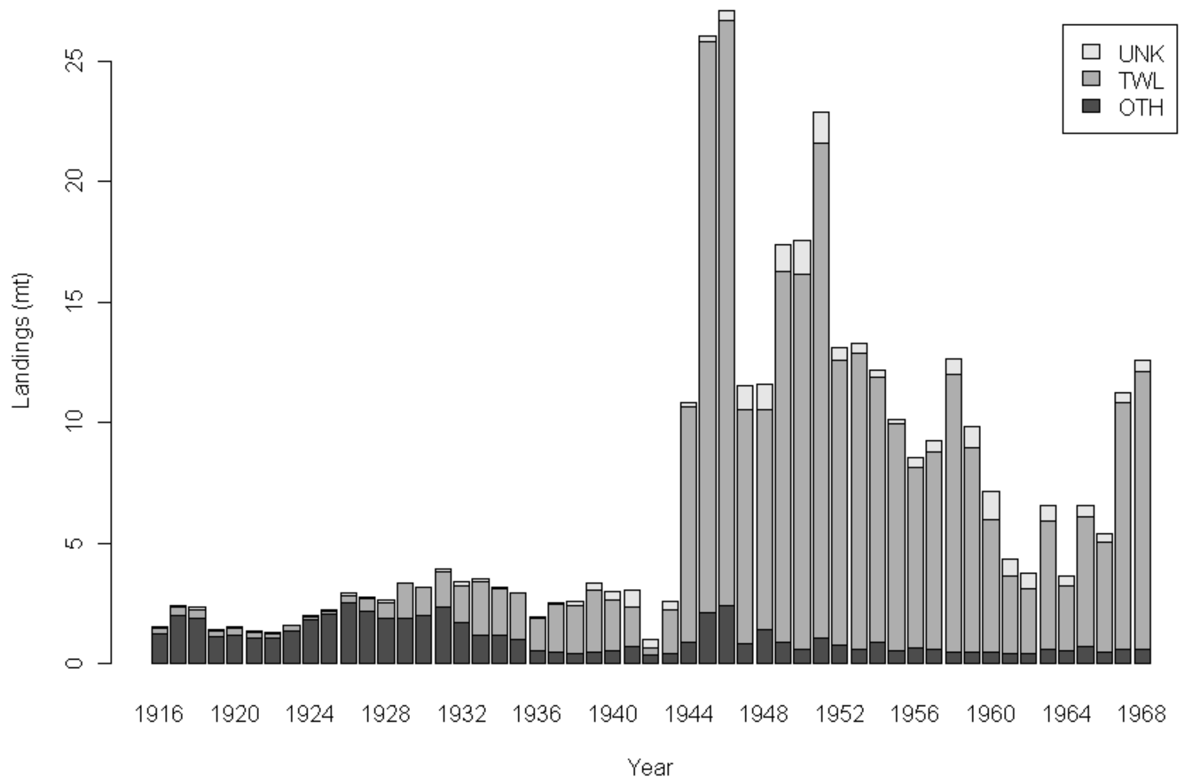


Figure 7: California reconstructed landings (tons) for the three gear categories unknown (UNK), trawl (TWL), and other (OTH).

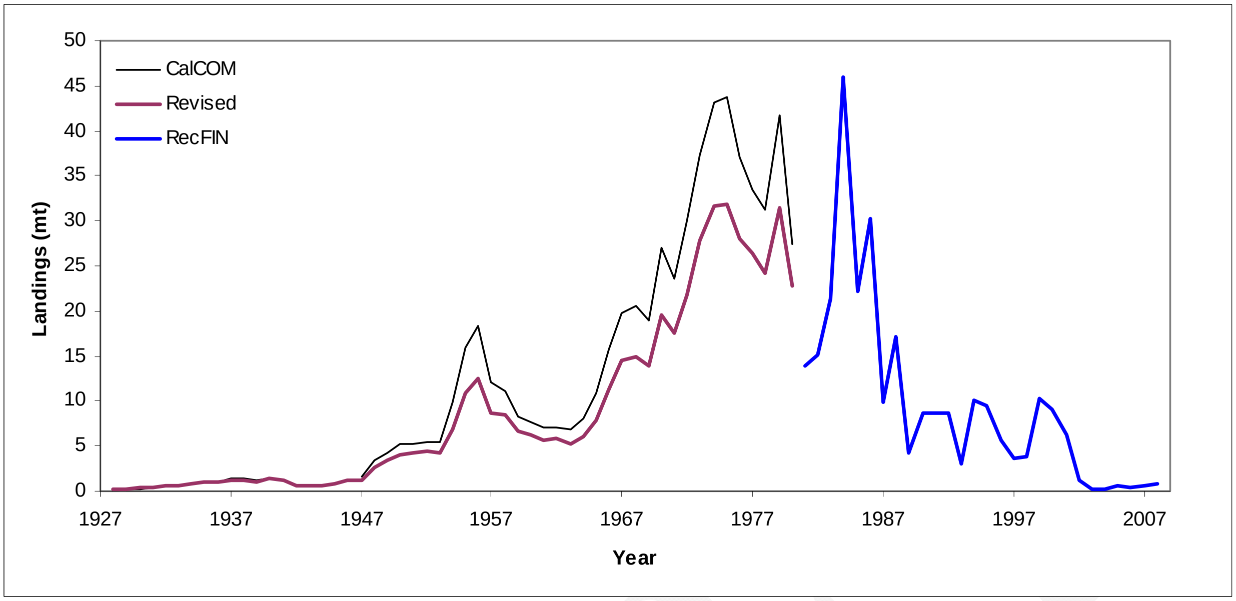


Figure 8: Reconstructed California recreational landings downloaded from CalCOM and revised by John Field (SWFSC, NOAA). Recent landings from RecFIN are also shown.

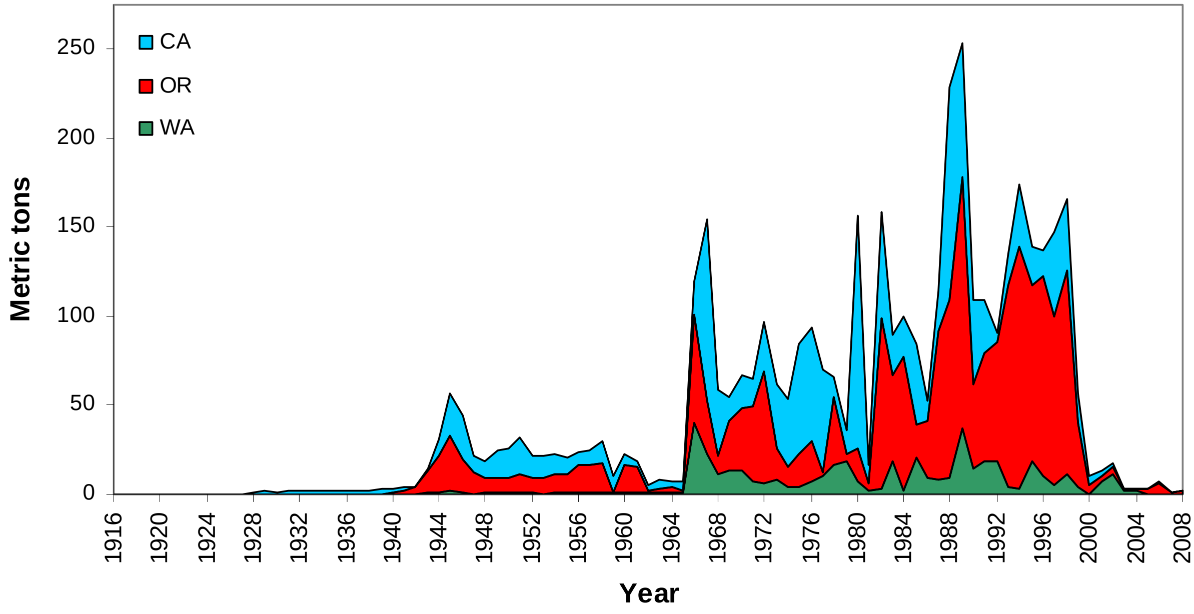


Figure 9: Full time series of trawl landings for each state.

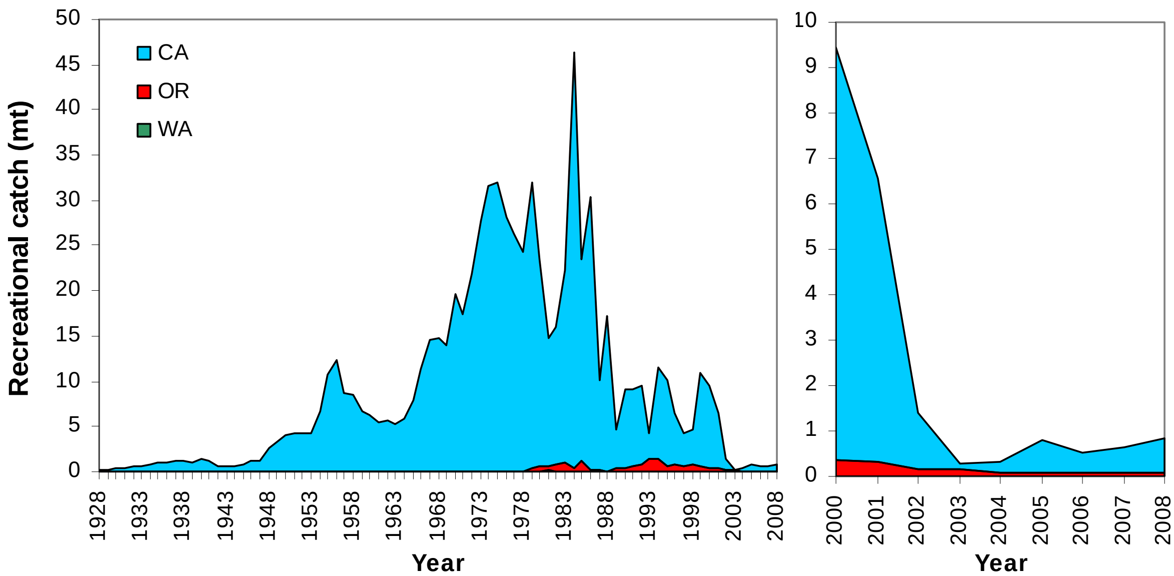


Figure 10: Recreational catches from California, Oregon, and Washington. The full time series is shown on the left and the current decade is shown on the right.

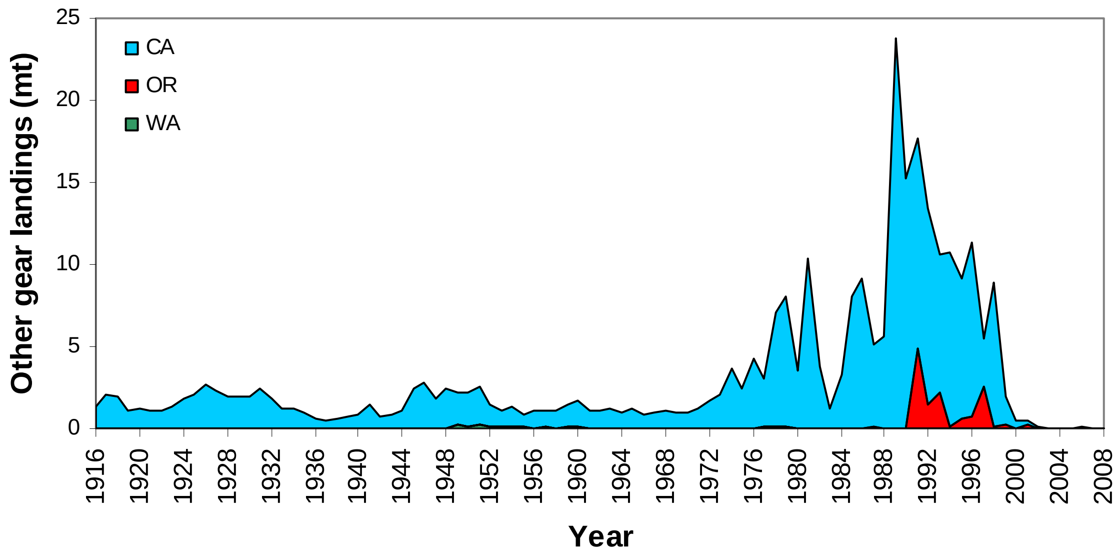


Figure 11: The full time series of landings from gears other than trawl for each state.

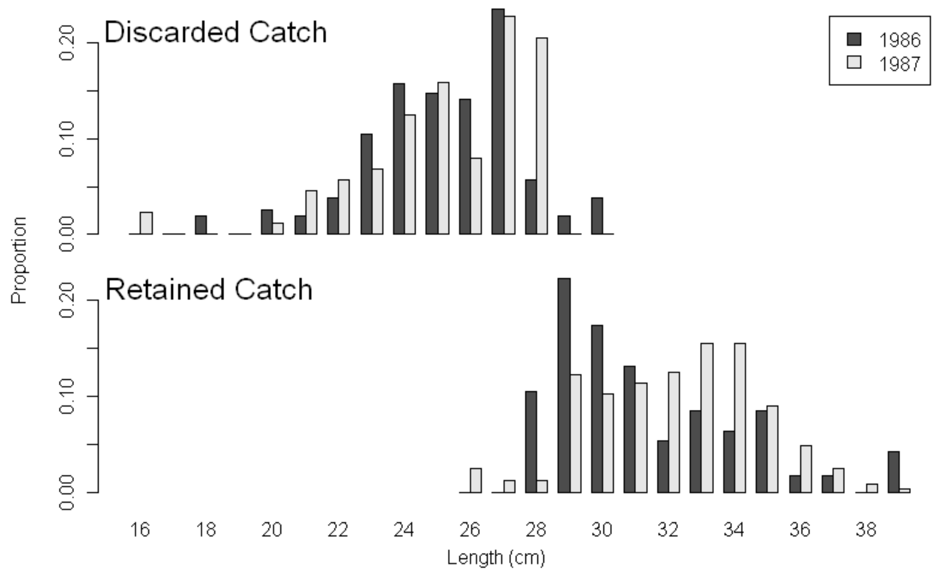


Figure 12: Length frequencies of discarded and retained catch from the Pikitch et al (1988) data.

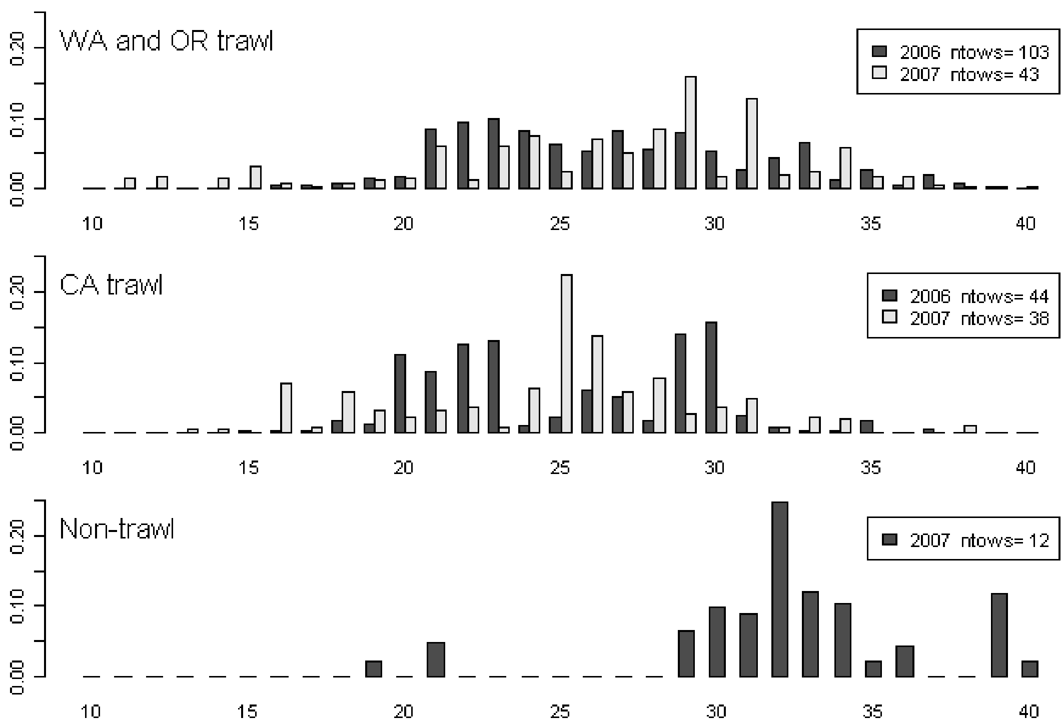


Figure 13: WCGOP length frequencies of discards from the Washington and Oregon trawl fisheries, California trawl fisheries, and coastwide non-trawl (fixed gear) fisheries. Only years with the largest number of sampled tows are shown.

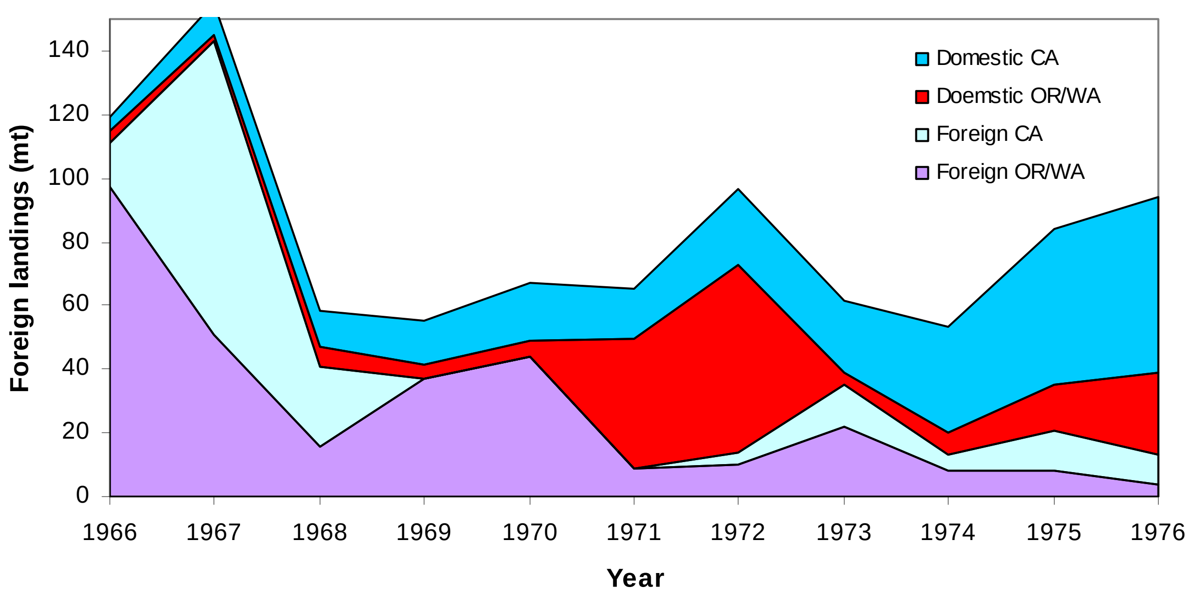


Figure 14: Foreign and domestic landings of greenstriped rockfish for the years 1966–1976.

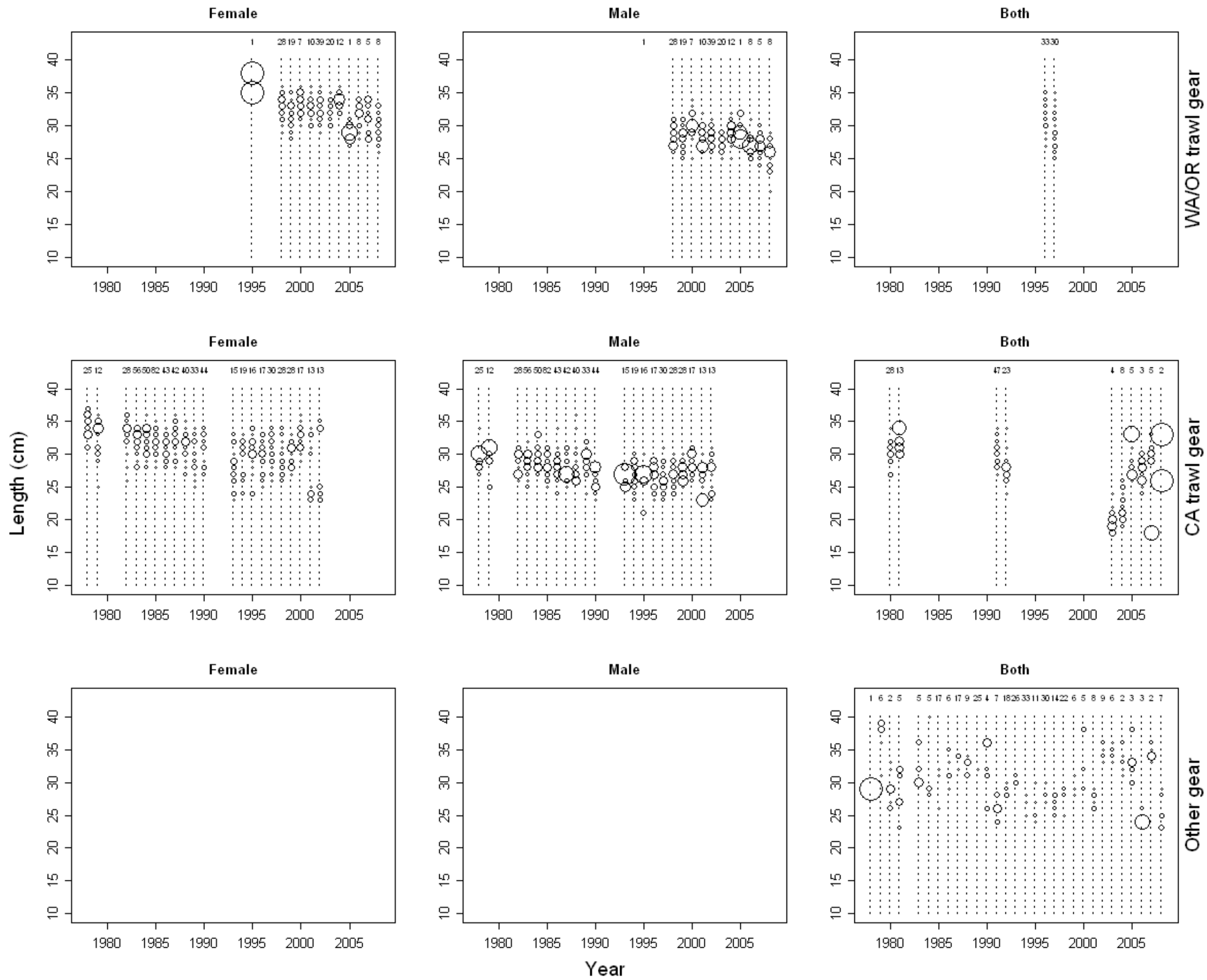


Figure 15: Estimated commercial length frequencies for three different gears and females, males, or both sexes combined, depending on how they were used in the model. The numbers of tows are listed above each length frequency (length frequencies with 1 tow were not fit by the model).

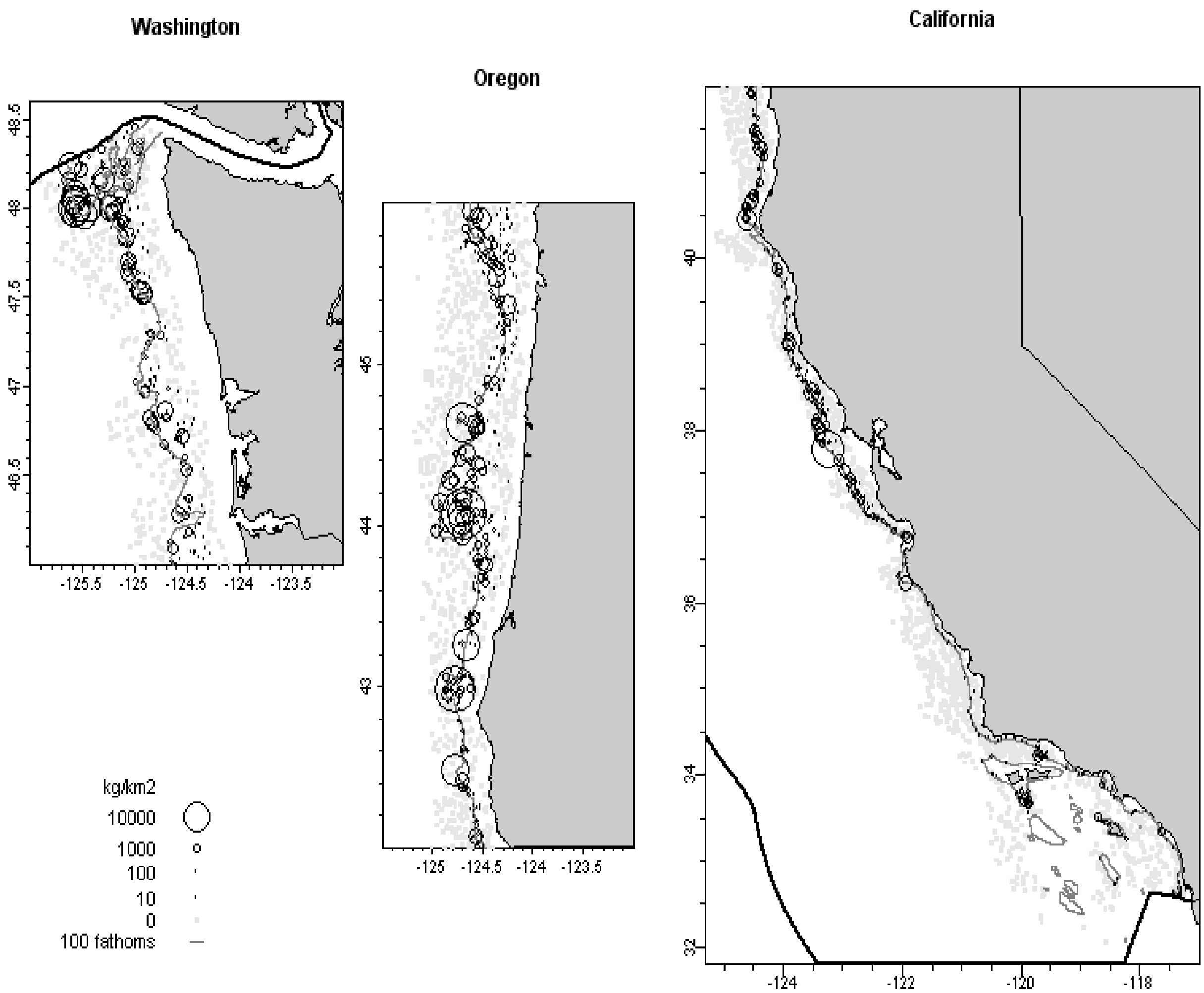


Figure 16: Catch rates over all years for the NWFSC survey.

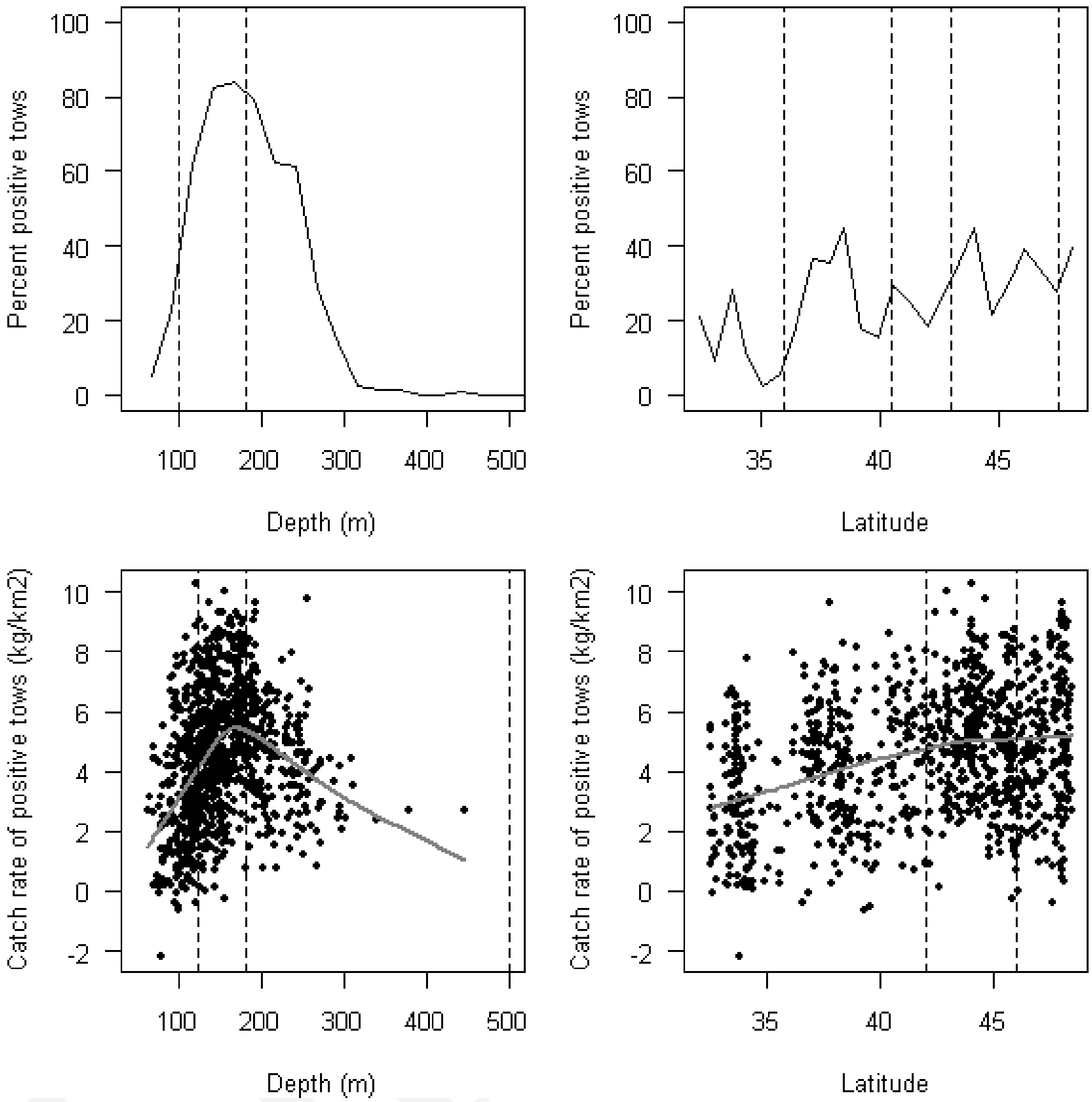


Figure 17: Plots of the percentage of positive tows and the catch rates for positive tows over depth and latitude.

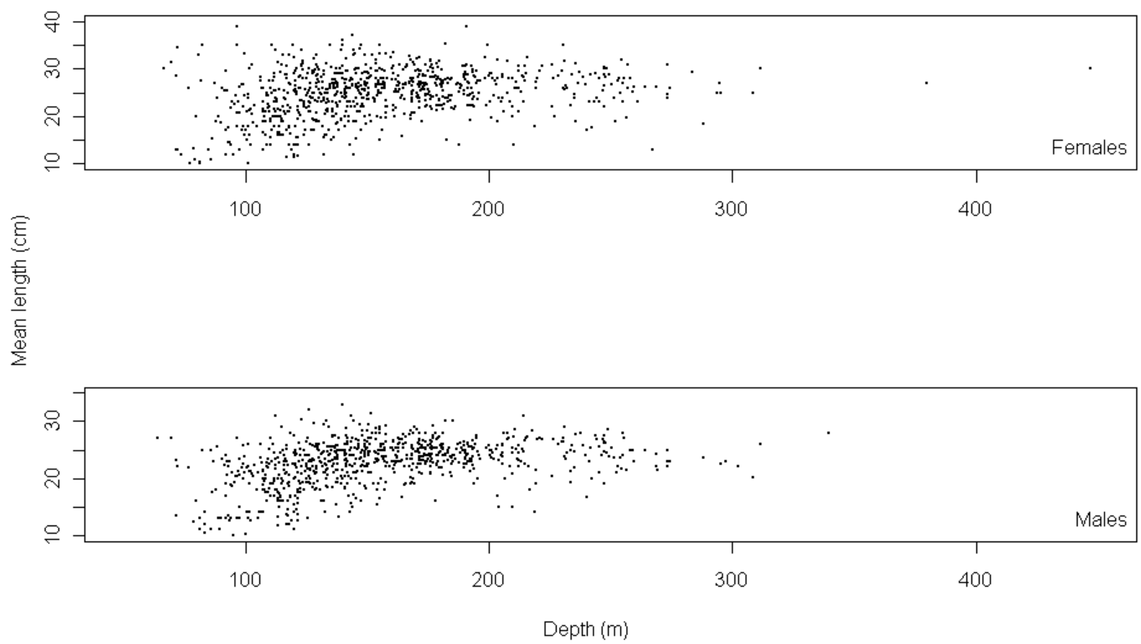


Figure 18: NWFSC survey mean length per tow by depth for females and males.

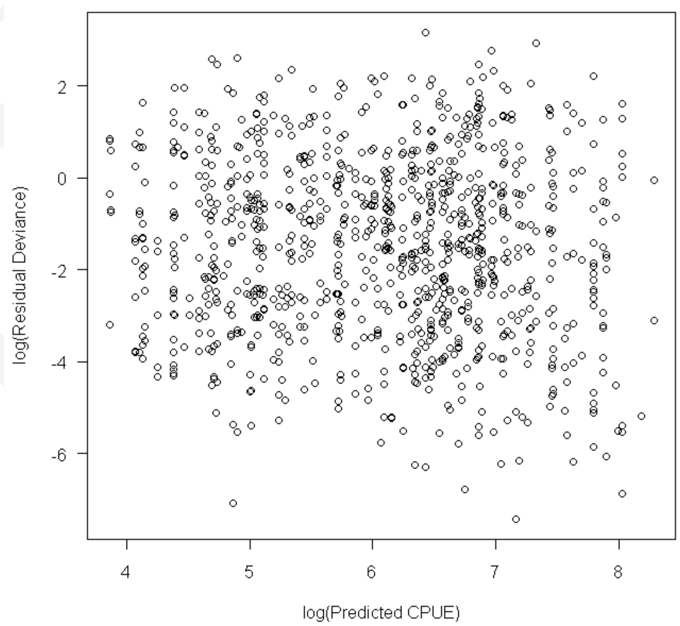


Figure 19: Plot of the predicted values against residuals for the positive tow model used in the GLMM.

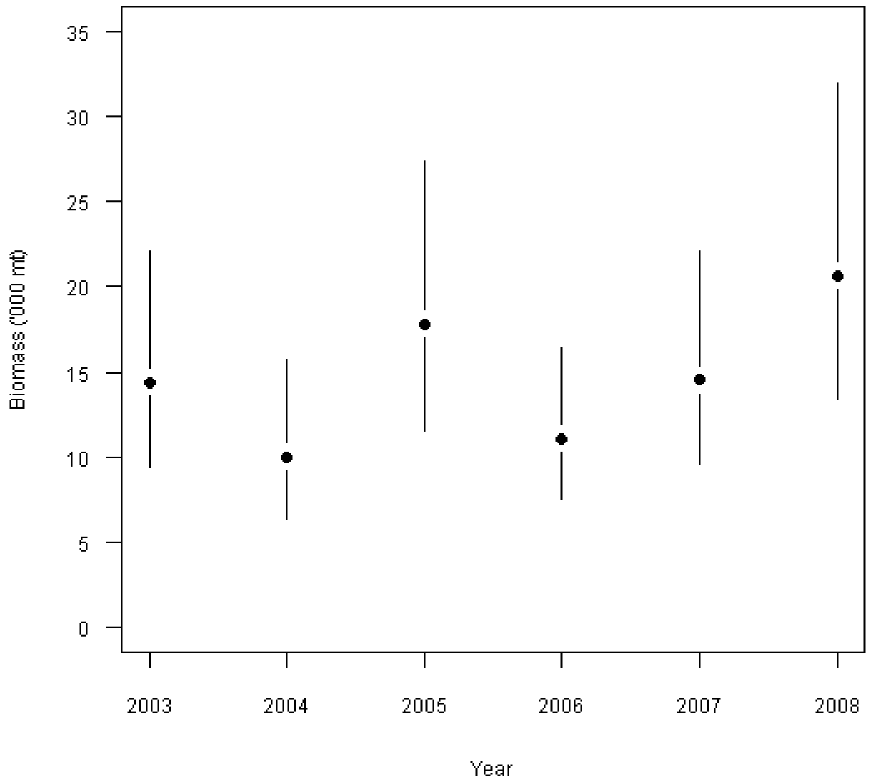


Figure 20: GLMM biomass estimates for the NWFSC survey.

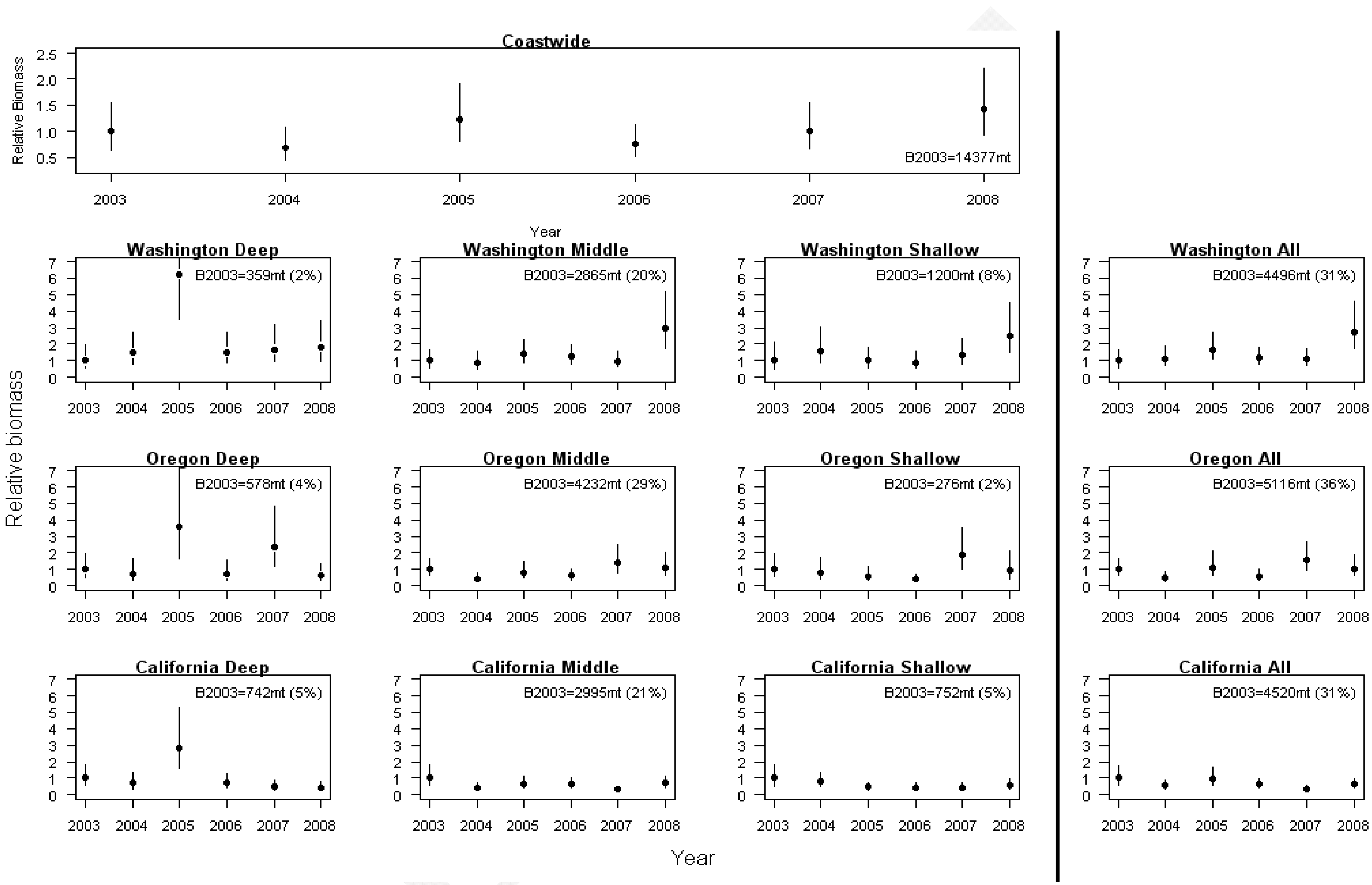


Figure 21: Plots of the estimated biomass relative to the year 2003 for each strata chosen for the GLMM using the NWFSC survey. The top wide plot is the entire coast and the plots to the right of the solid line are summer over depth.

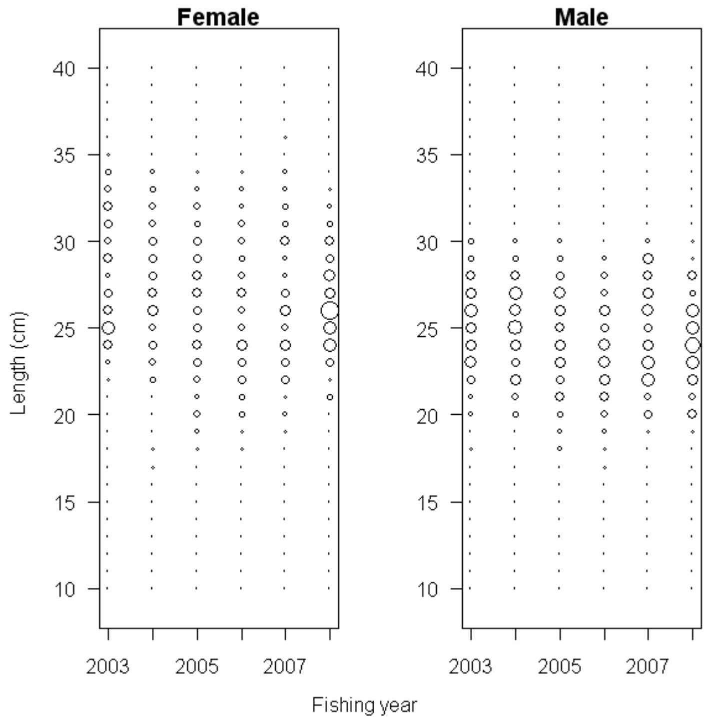


Figure 22: Length frequencies for the NWFSC survey.

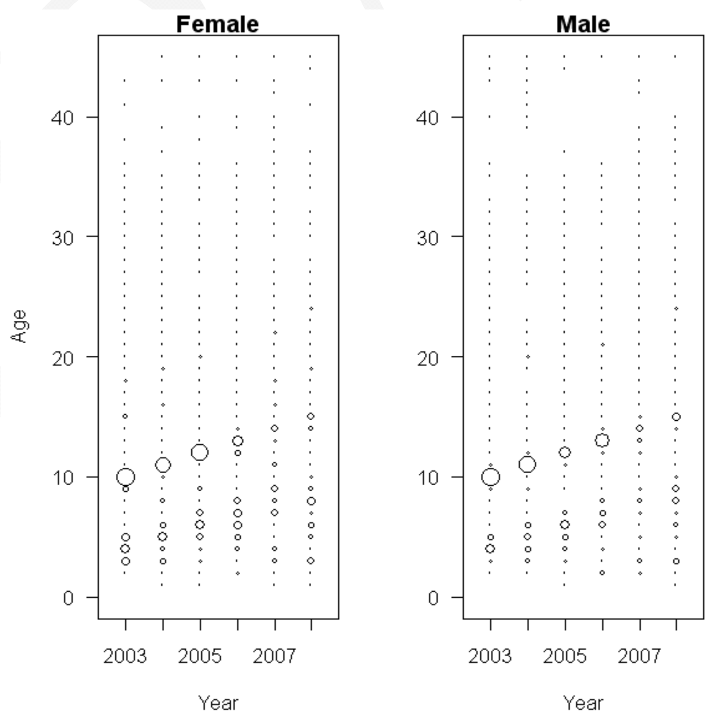


Figure 23: Age frequencies from the NWFSC survey. The omission of a circle indicates that no observation occurred at that age.

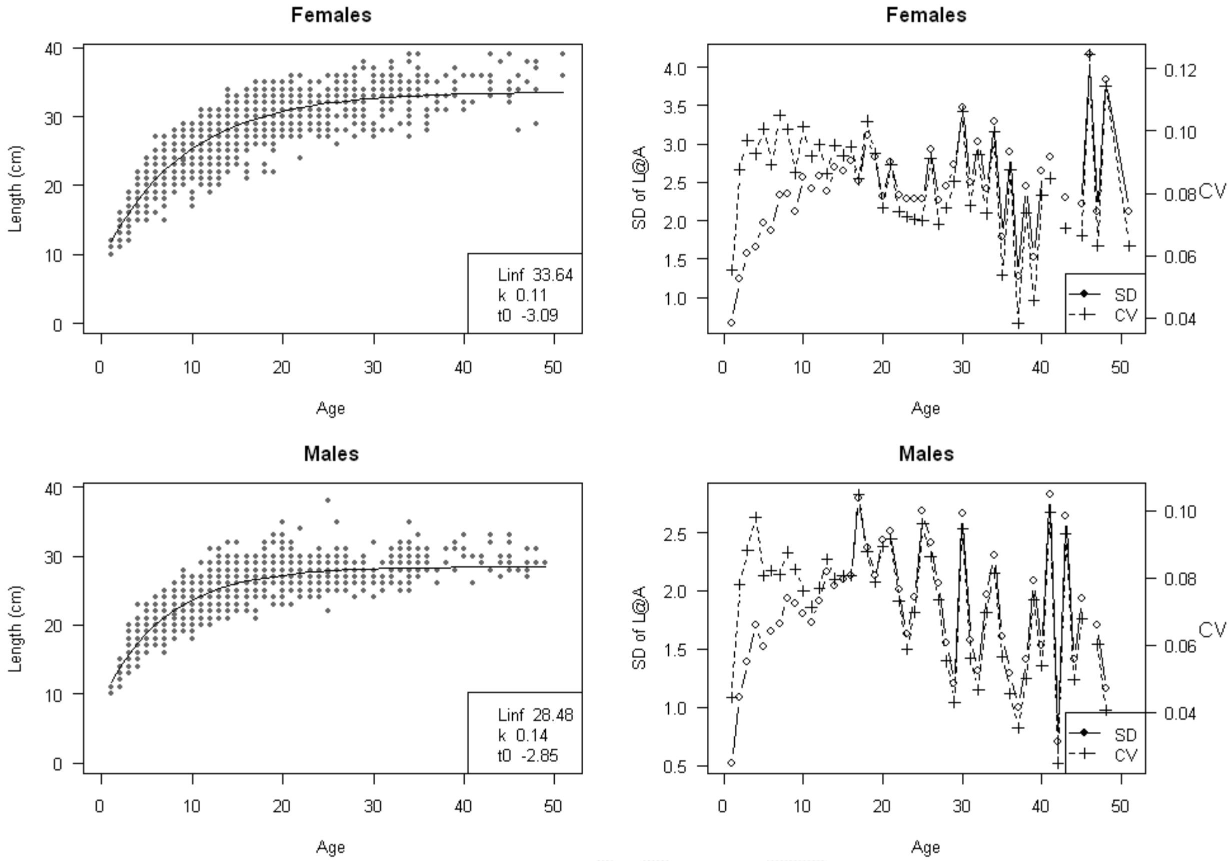


Figure 24: Length-at-age, standard deviation at age, and CV at age from all years of the NWFSC survey.

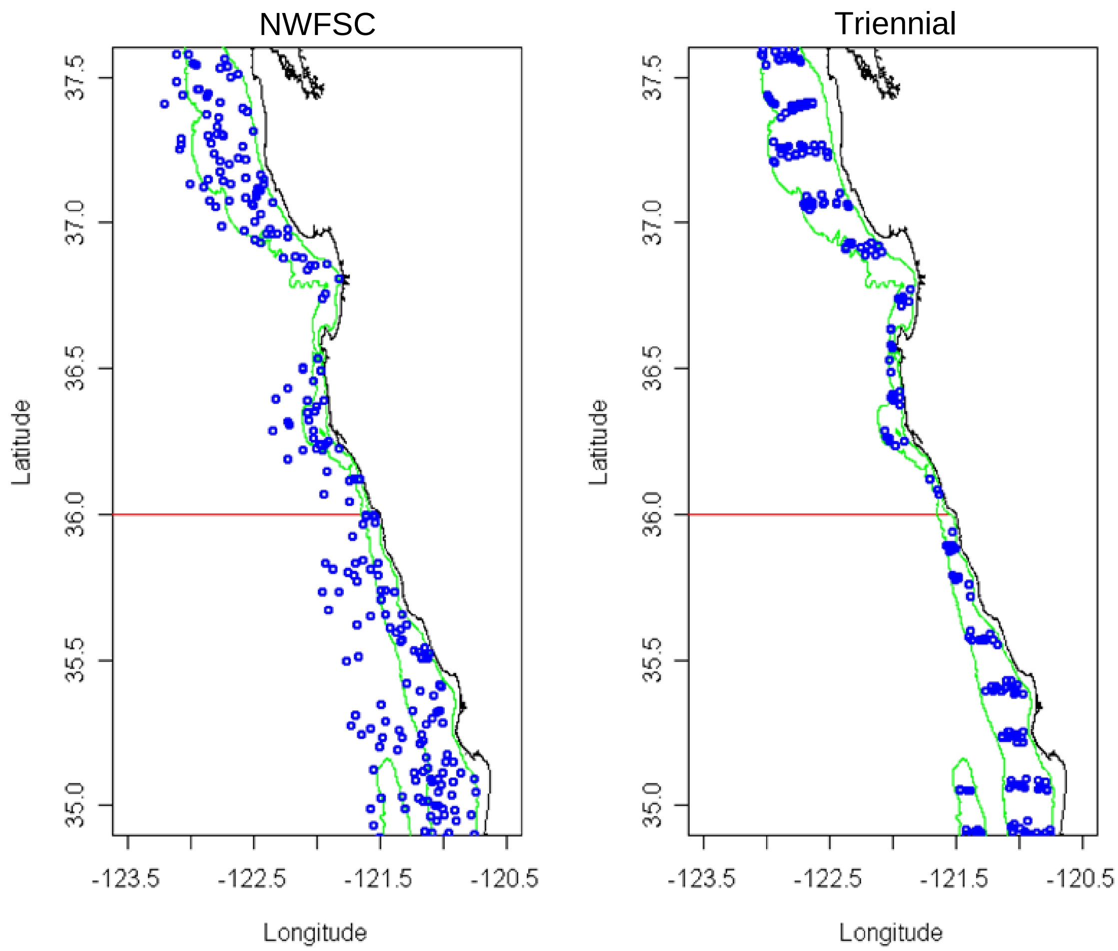


Figure 25: Survey tow locations in 2004, showing the difference in station design for the NWFSC survey relative to the Triennial trawl survey (Figure from Stewart (2007)).

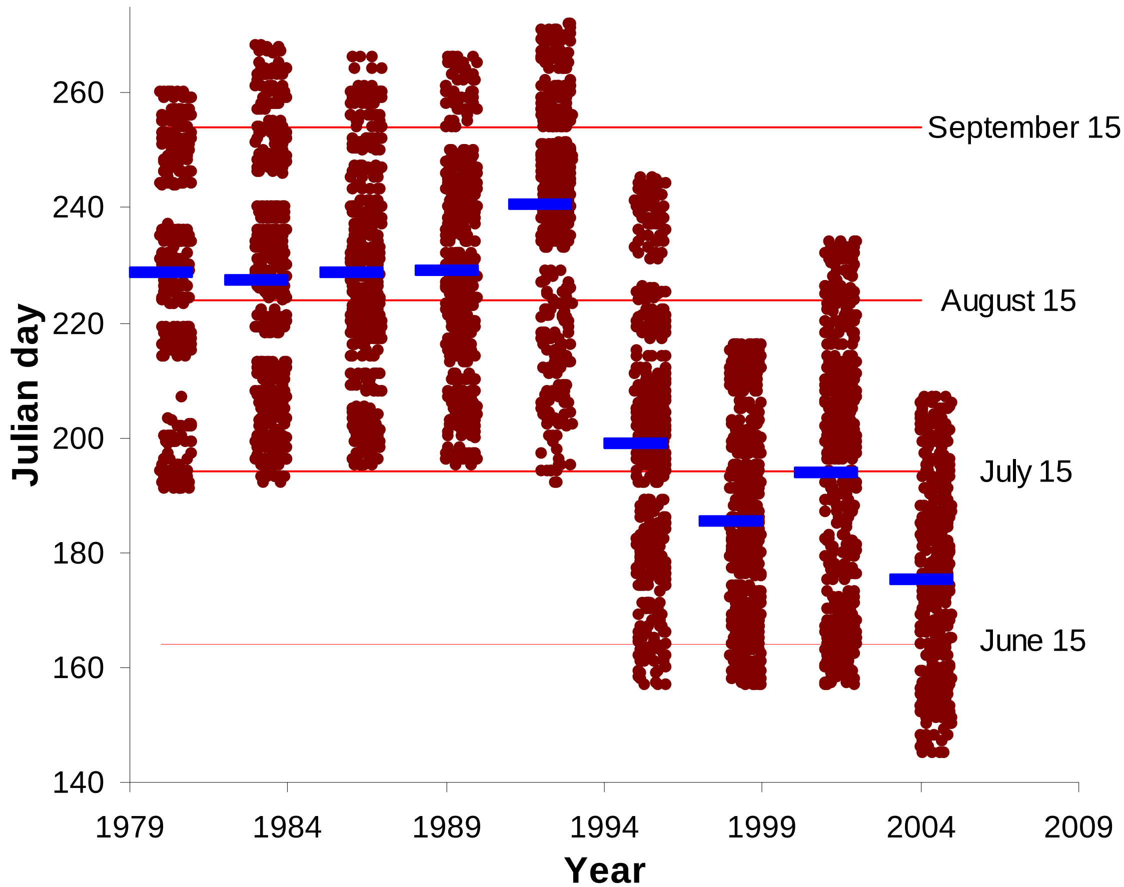


Figure 26: Distribution of dates of operation for the triennial survey (1980-2004). Solid bars show the mean date for each survey year, points represent individual hauls dates, but are jittered to allow better delineation of the distribution of individual points (Figure from Stewart (2007)).

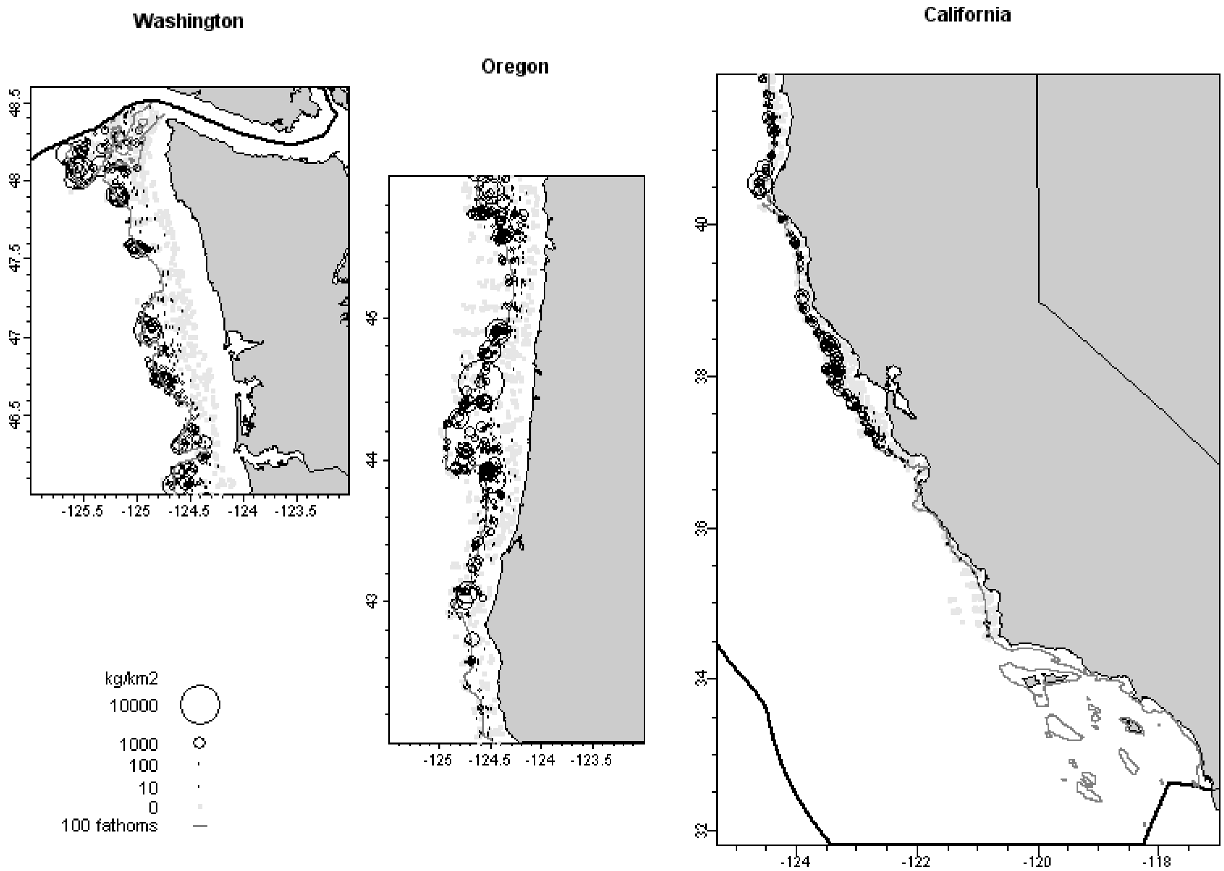


Figure 27: Catch rates over all years for the Triennial survey.

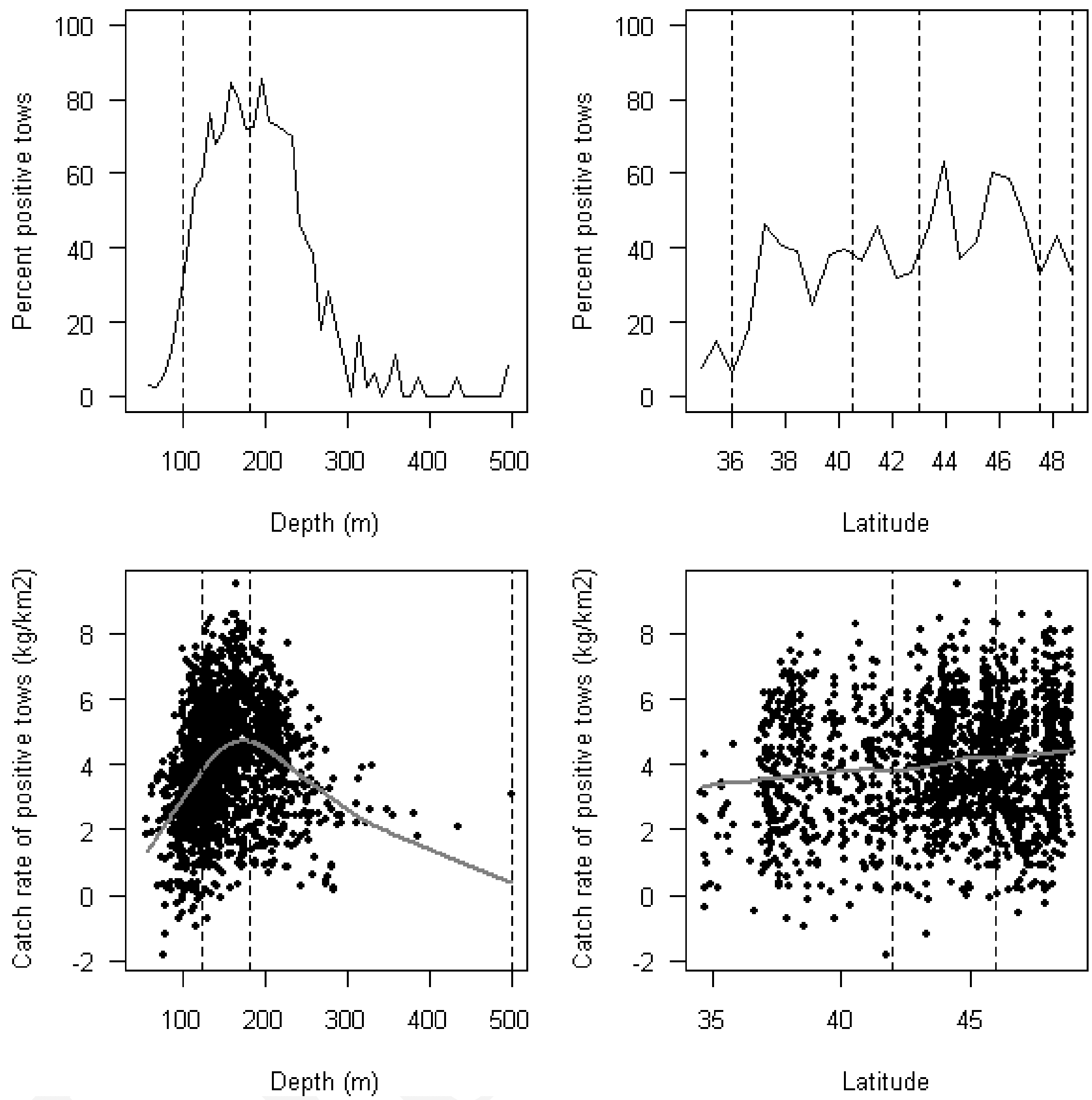


Figure 28: Plots of the percentage of positive tows and the catch rates for positive tows over depth and latitude.

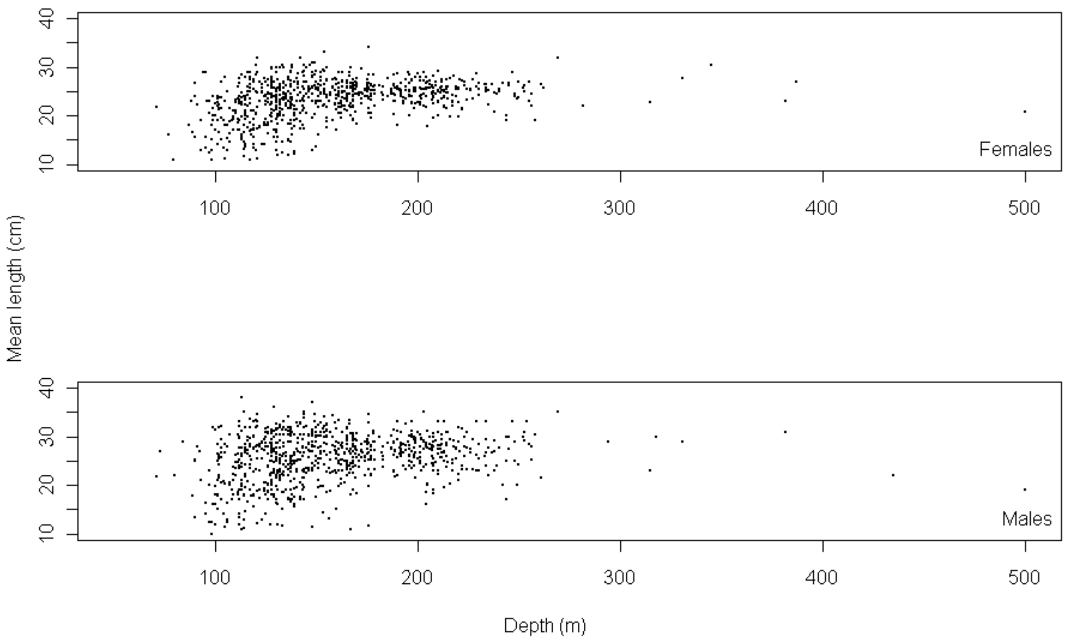


Figure 29: The mean length per tow from the Triennial survey data plotted over depth for females and males.

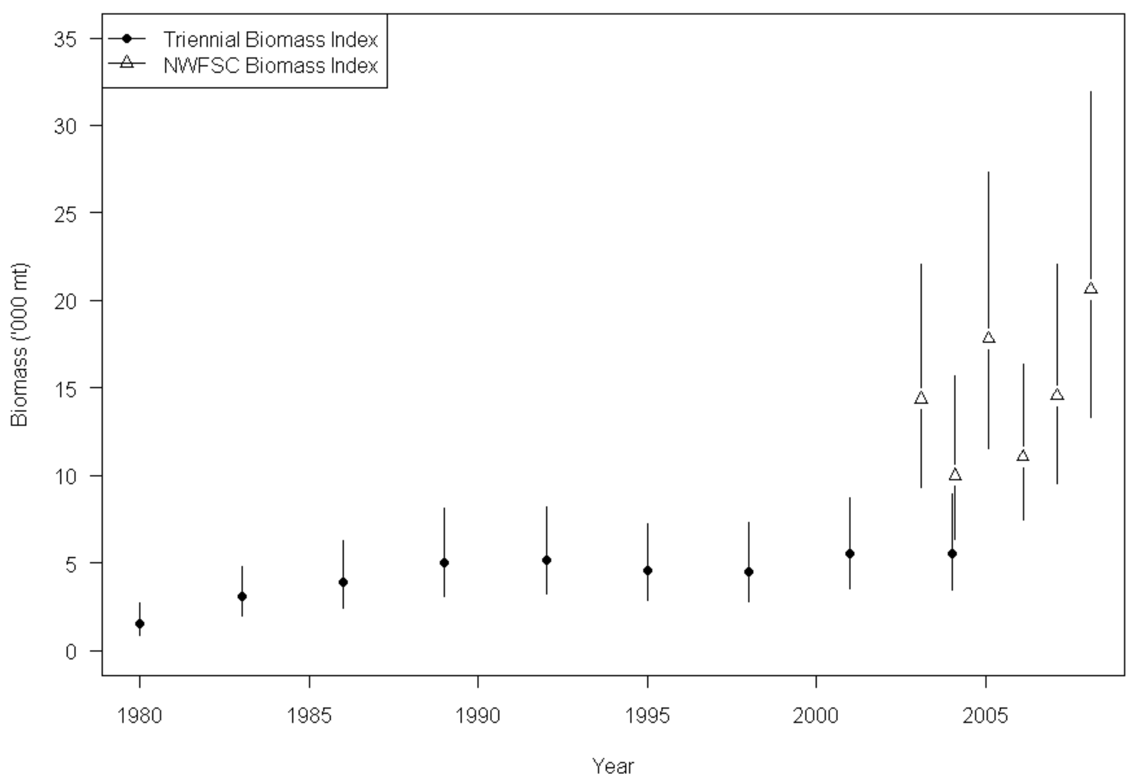


Figure 30: GLMM biomass estimates for the Triennial survey and the NWFSC survey.

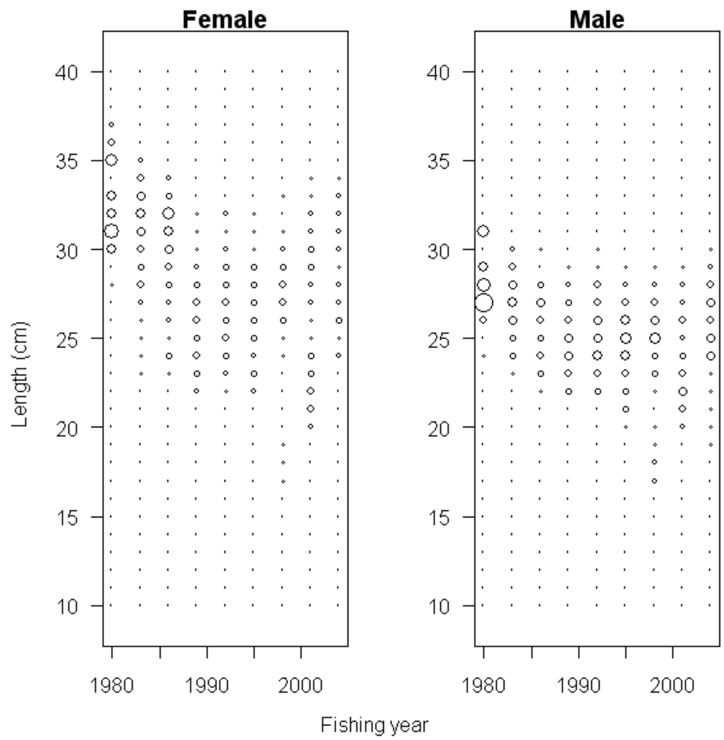


Figure 31: Plots of length frequencies from the Triennial survey.

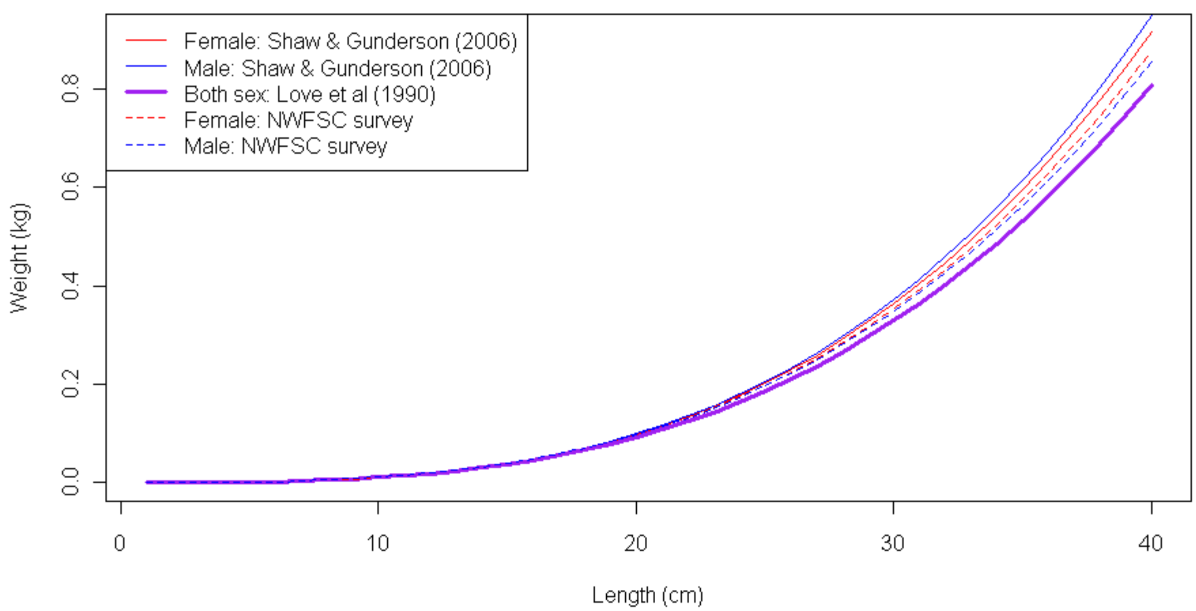


Figure 32: Weight- length relationships from Shaw and Gunderson (2006), Love et al (1990), and data collected during the NWFSC survey.

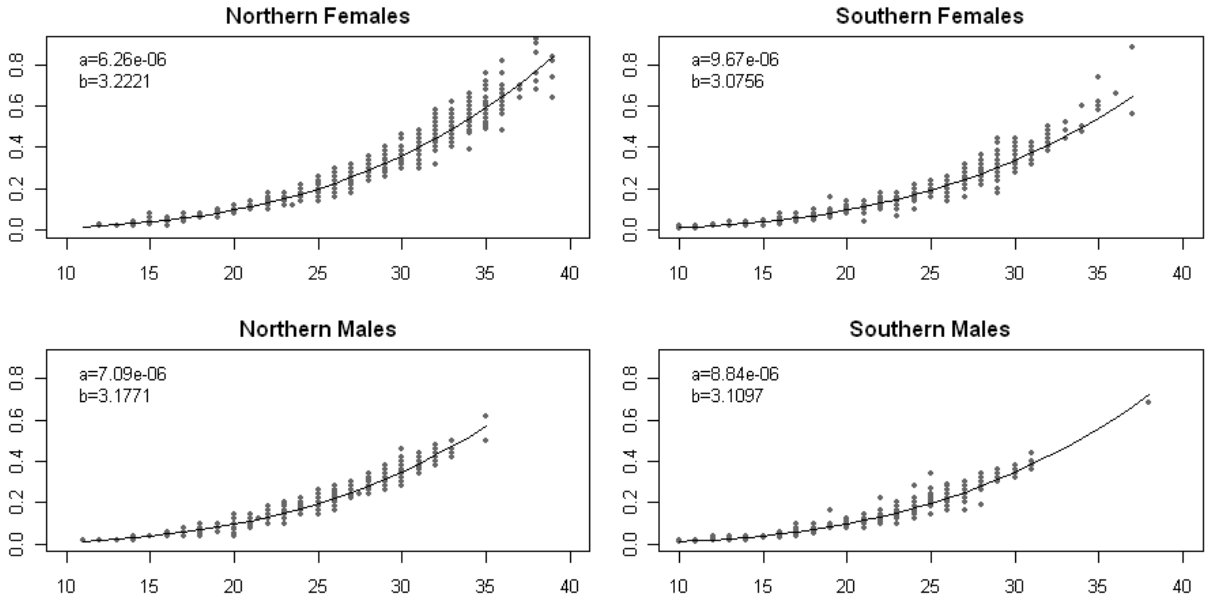


Figure 33: Weight-length relationships for females and males north and south of 42°N (CA/OR border).

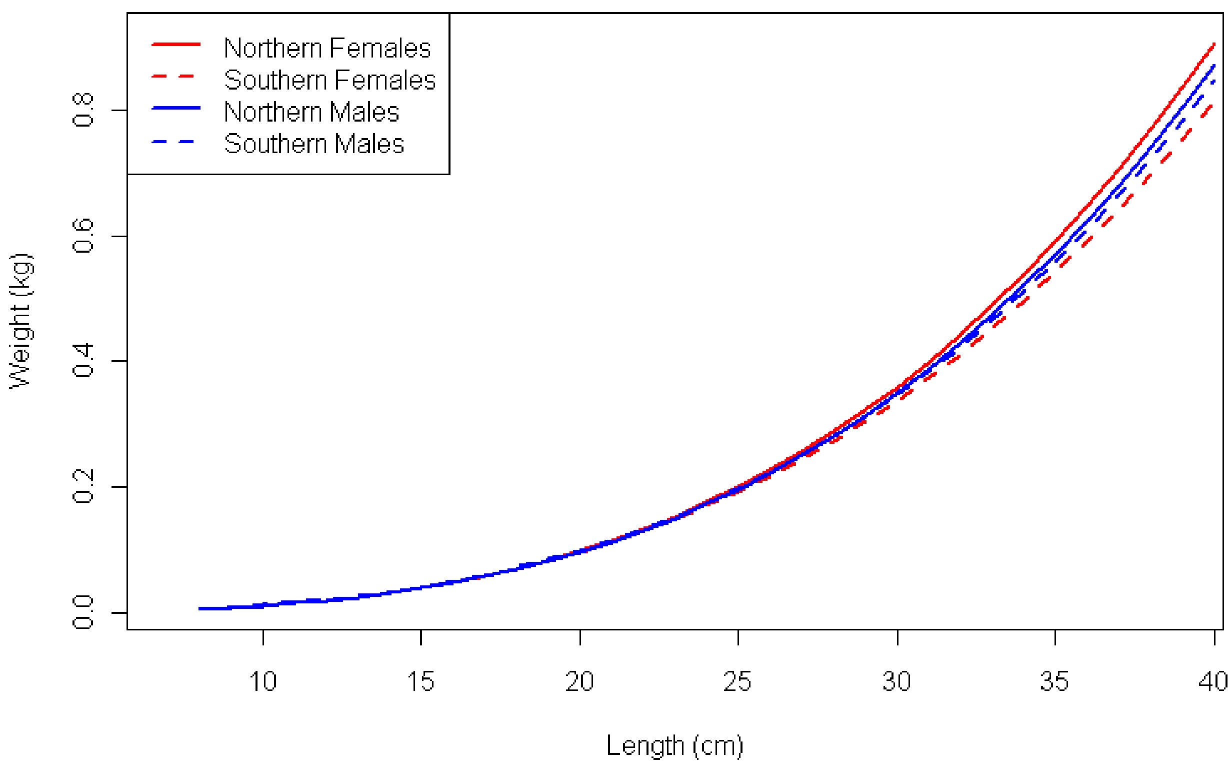


Figure 34: Weight length relationships north and south of 42°N by sex from the NWFSC survey data.

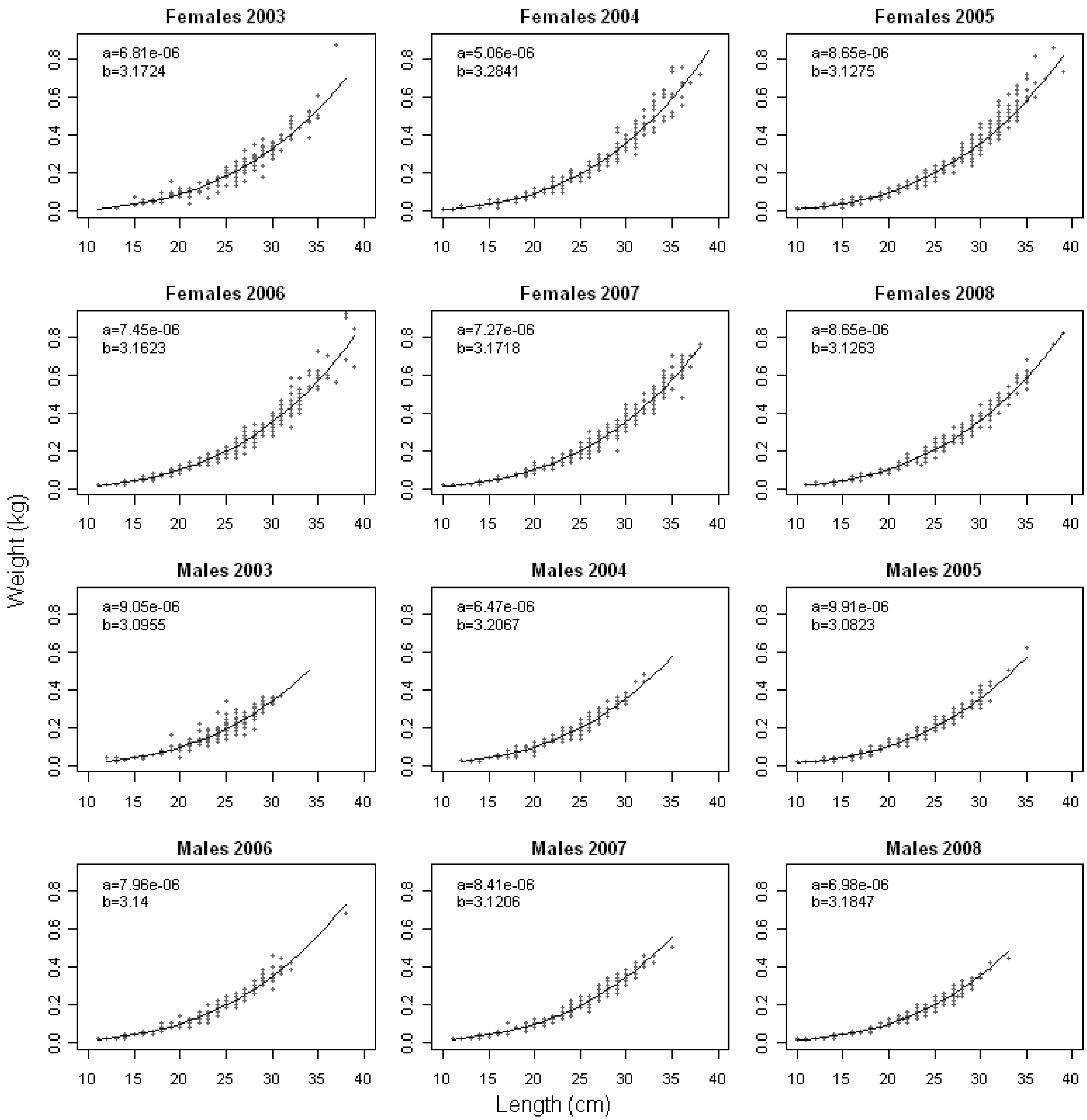


Figure 35: Yearly estimates of the weight-at-length relationship for greenstriped rockfish using NWFSC survey data.

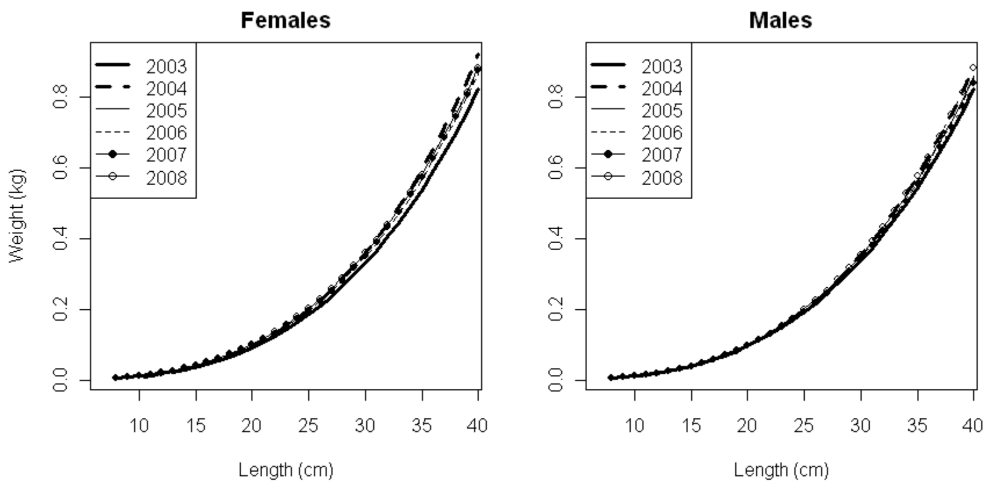


Figure 36: Comparison of yearly estimates, by sex, of the weight-at-length relationship for greenstriped rockfish using NWFSC survey data.

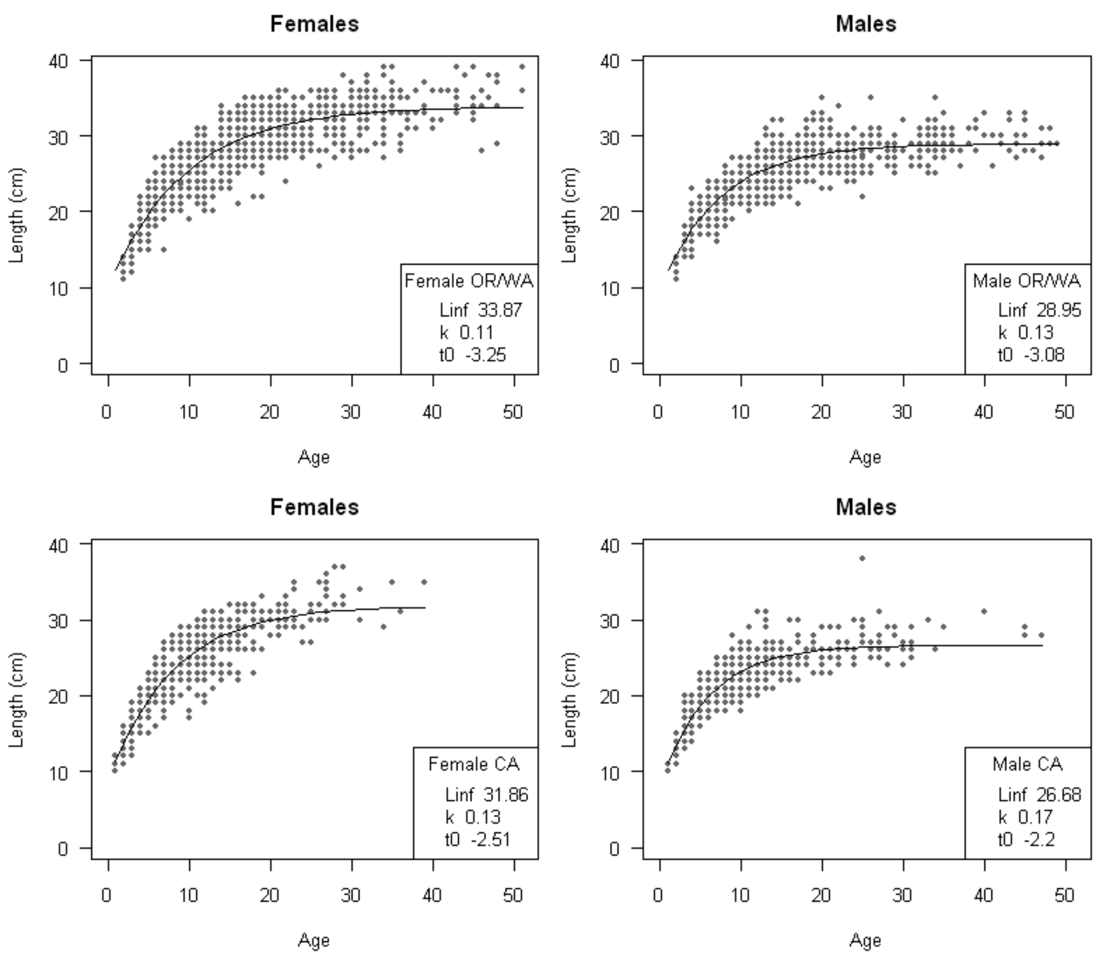


Figure 37: Length-at-age and predicted von Bertalanffy growth curves for female and male greenstriped rockfish sampled in the NWFSC survey from OR/WA (North) and CA (South).

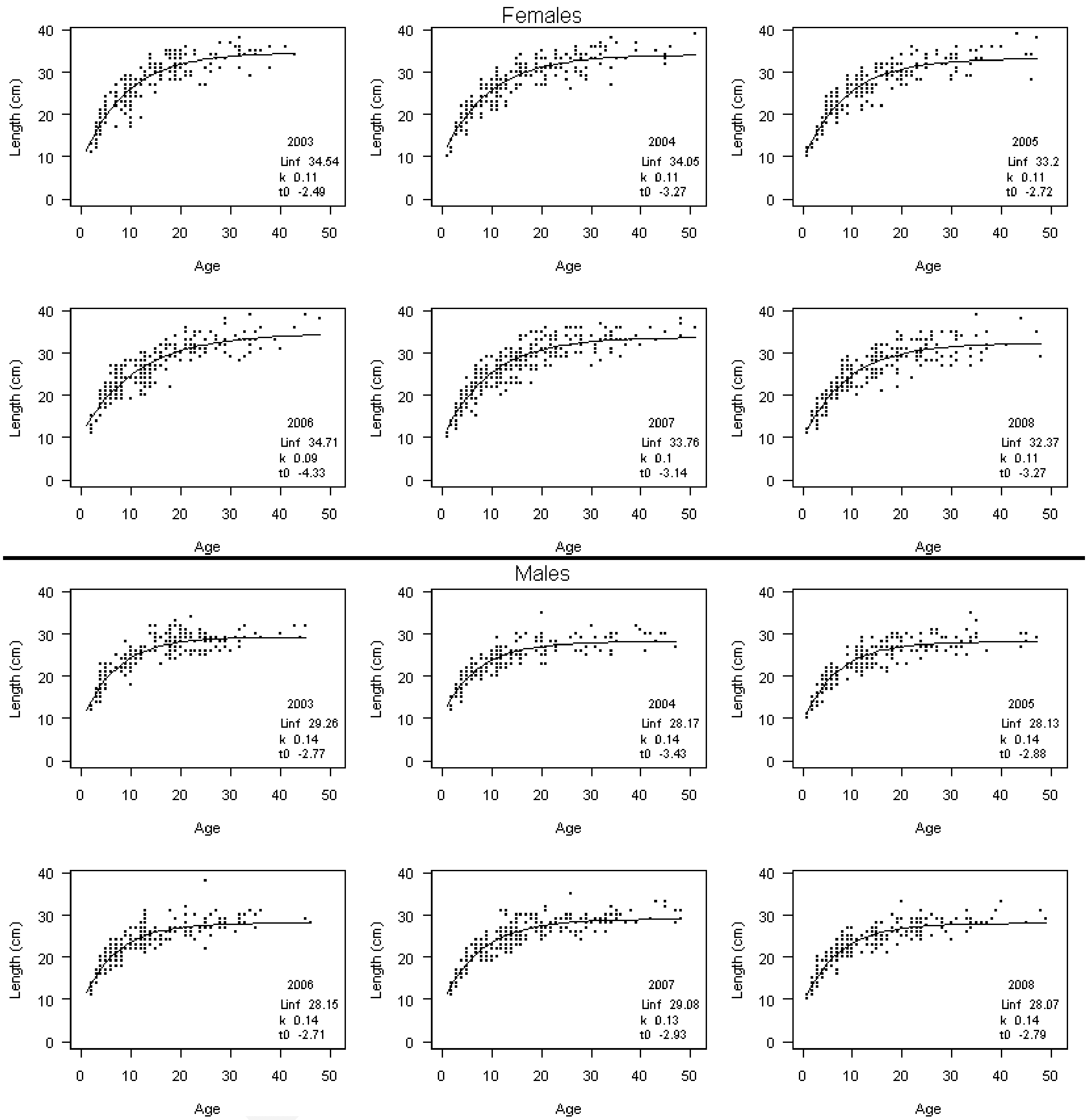


Figure 38: Estimated von Bertalanffy growth curves by year for females and males using the age data from the NWFSC survey.

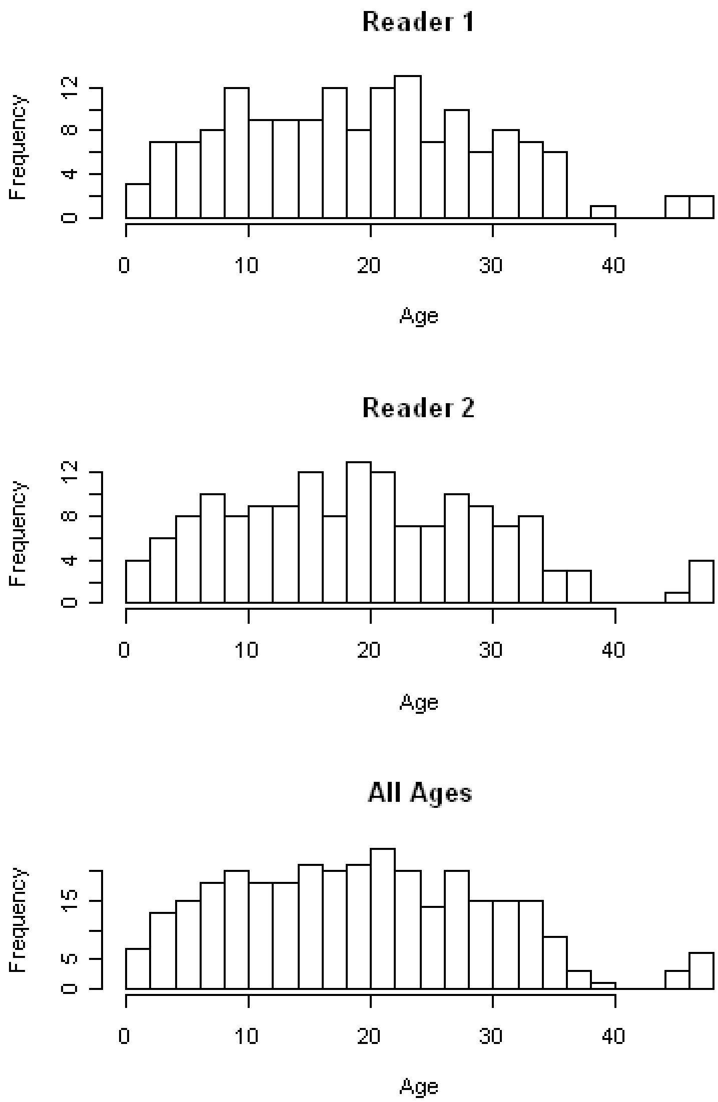


Figure 39: Histograms of greenstriped rockfish double reads for each age reader and all ages combined.

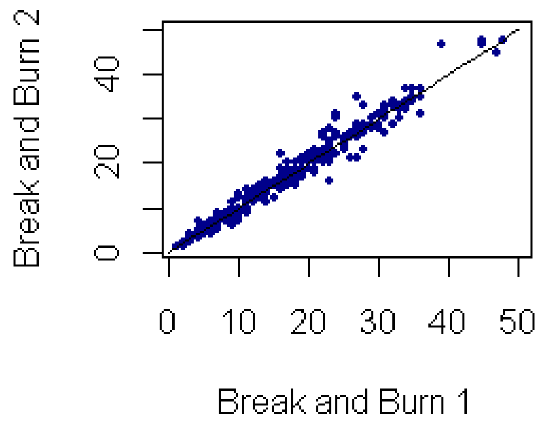


Figure 40: Scatter plot of the double read data from readers 1 and 2. The black line is the one-to-one line.

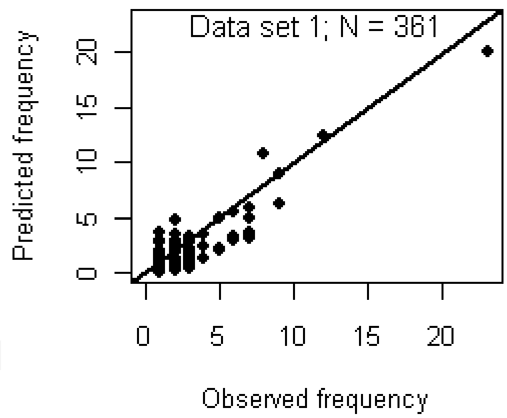


Figure 41: Points show the observed versus predicted number of ages. The black line is the one-to-one line and indicates a perfect fit.

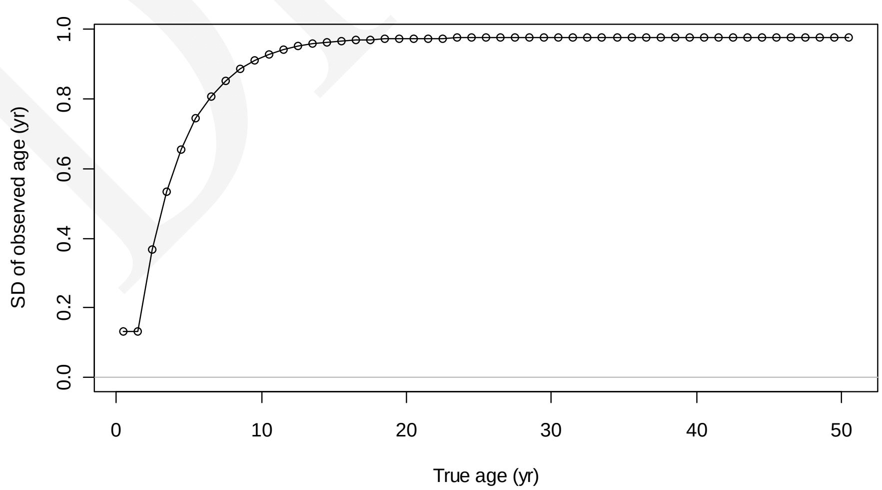


Figure 42: Model estimates of the standard deviation for the ageing error.

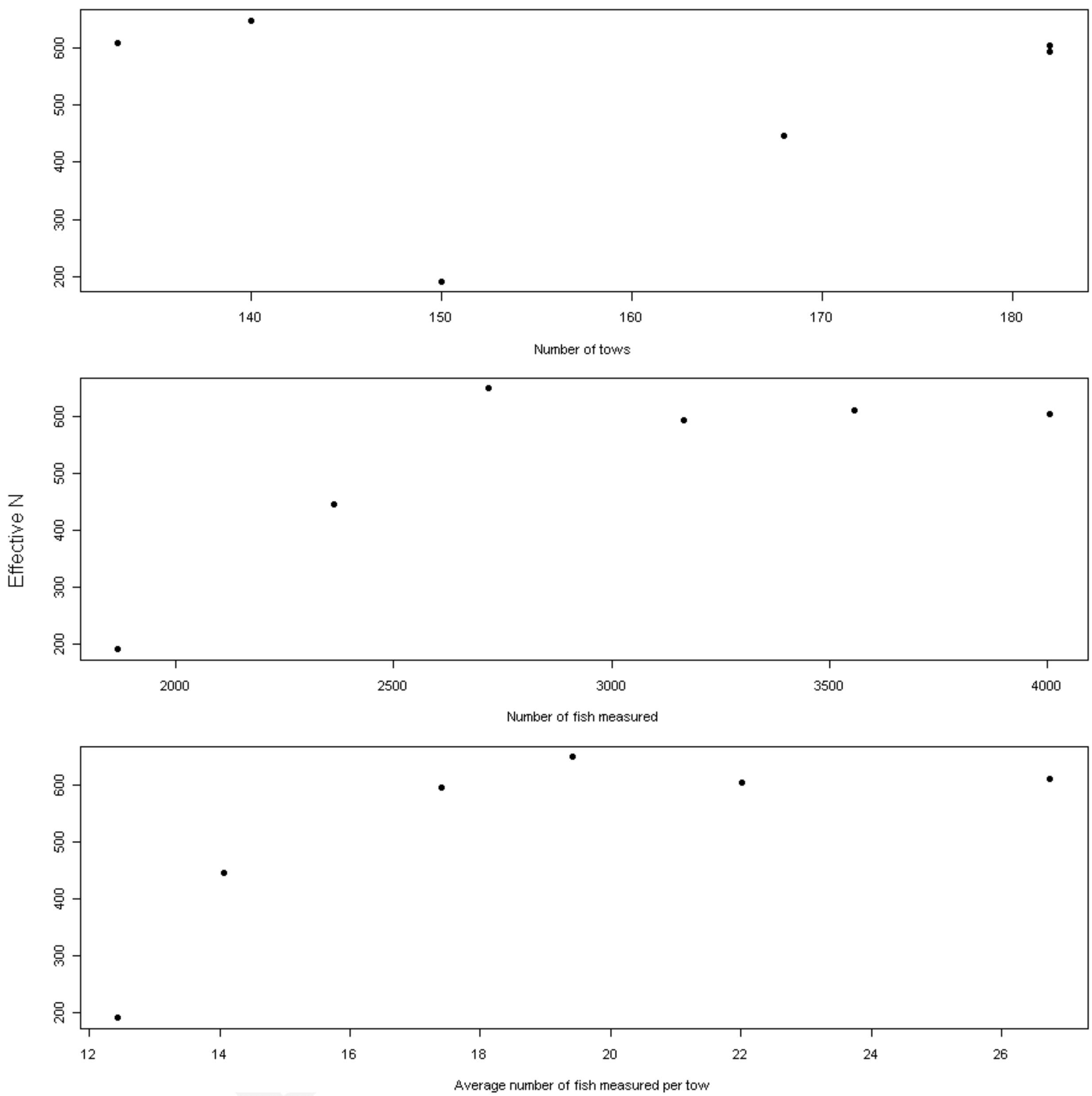


Figure 43: Effective N determined from the NWFSC survey plotted against the number of tows, the number of greenstriped rockfish measured, and the average number of greenstriped rockfish measured per tow.

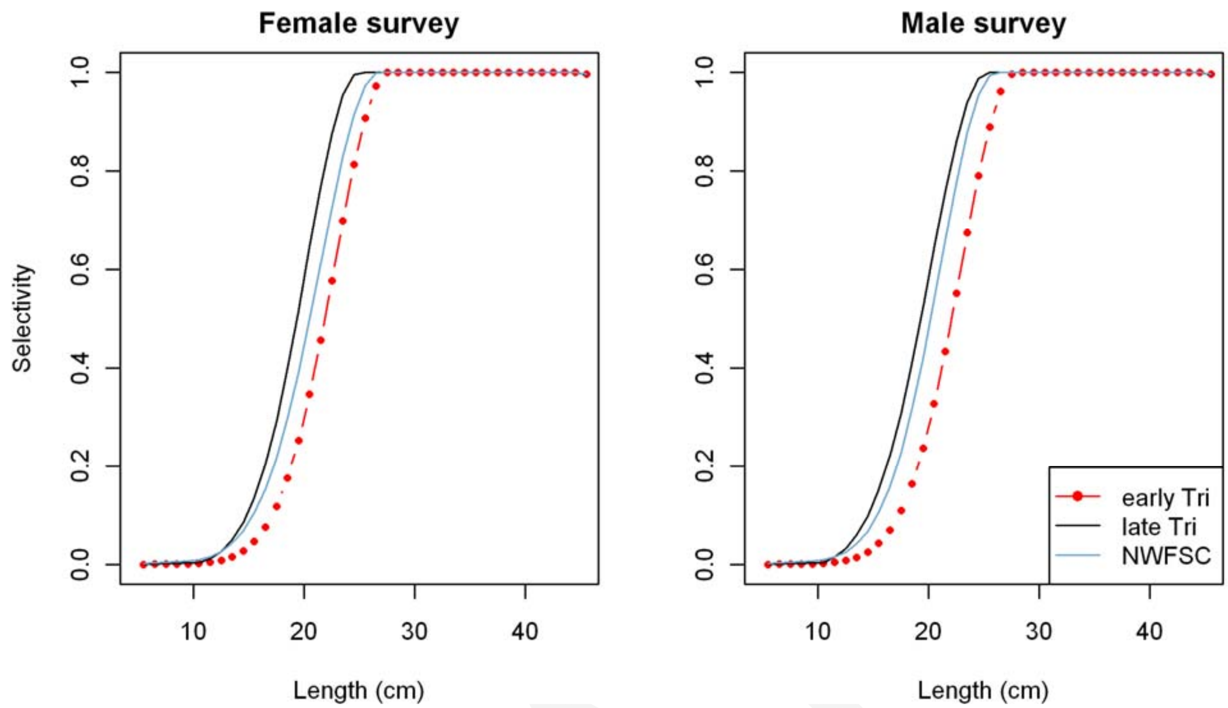


Figure 44: Estimated survey selectivity curves for females and males.

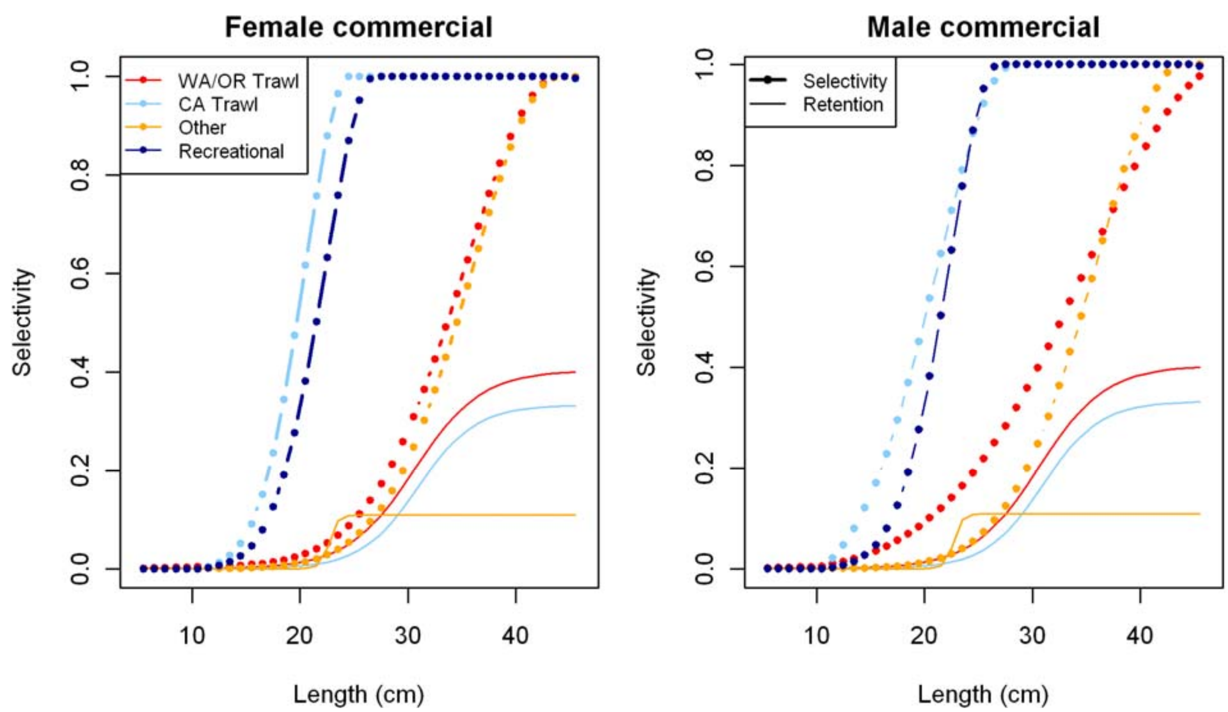


Figure 45: Estimated selectivity and retention curves for the domestic commercial fleets. The foreign fleet mirrors the CA Trawl selectivity without retention. The recreational fleet has discards included in the catch, thus does not model retention separate from selectivity. The fish at size kept by the fleet are determined from the product of selectivity and retention.

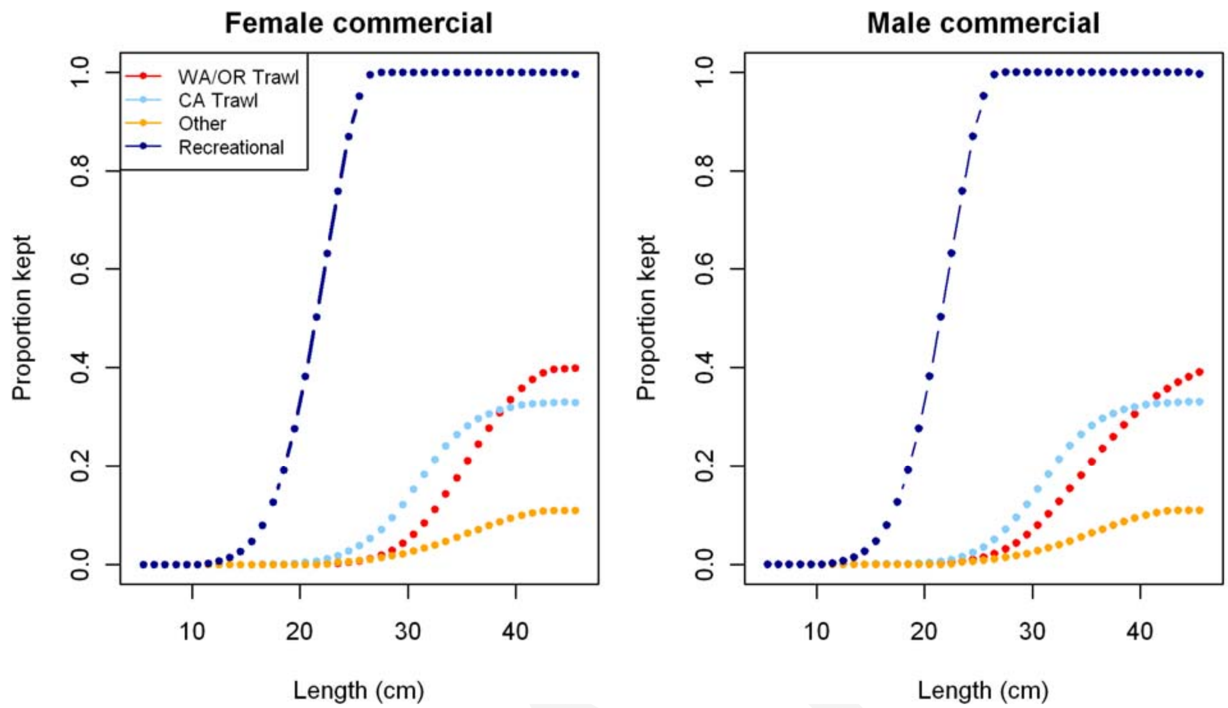


Figure 46: The kept fish selectivity curves determined from the product of selectivity and retention for each domestic fleet. Landings for recreational fisheries include discards thus are not explicitly modeled.

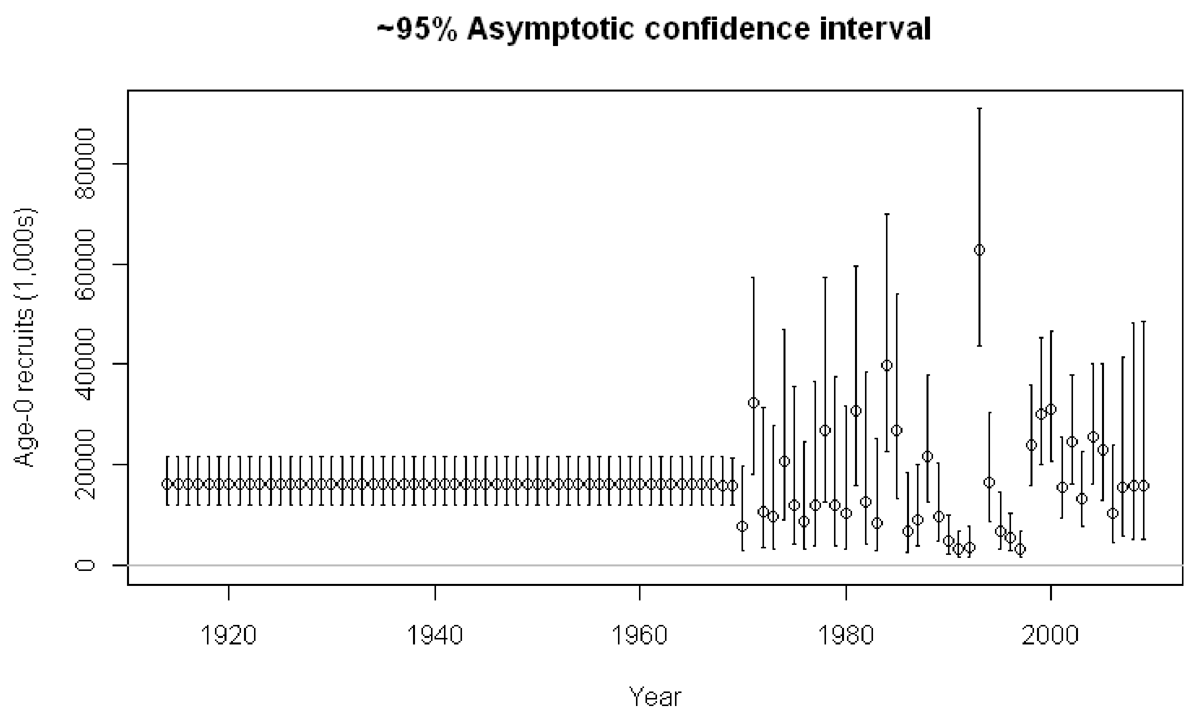


Figure 47: Estimated recruitment with approximate 95% asymptotic confidence intervals.

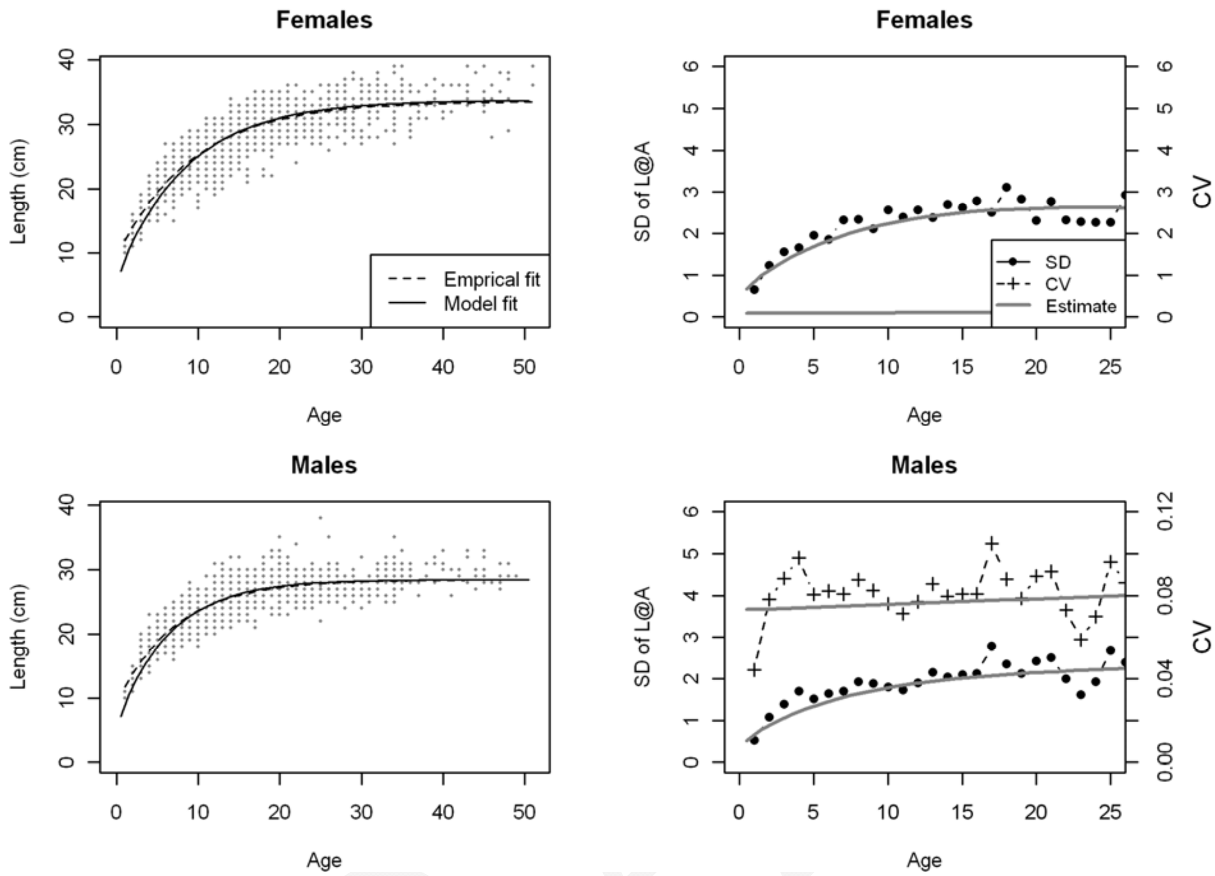


Figure 48: Fits to the length-at-age for females and males (left plots). Also shown are the fits to the CV of the growth curve as a function of age (fit directly in the model) and implied fits to the standard deviation (SD) of the growth curve at age.

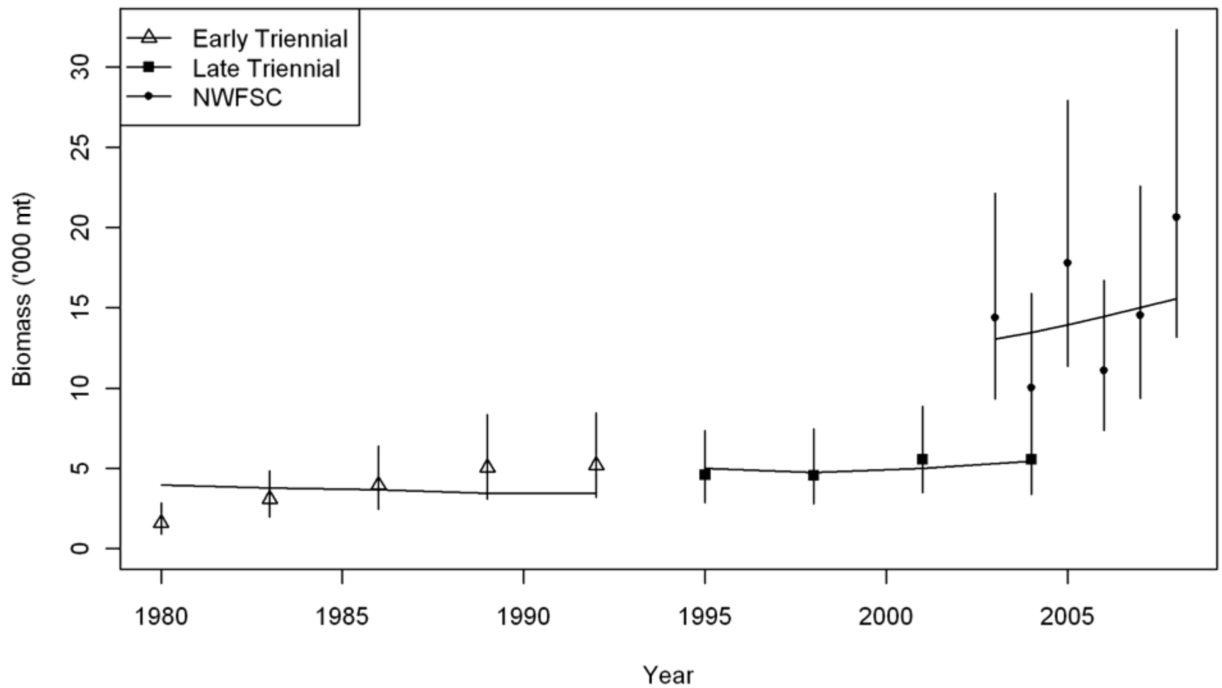


Figure 49: Fits from the base case model to the survey abundance indices with 95% confidence intervals on the observations.

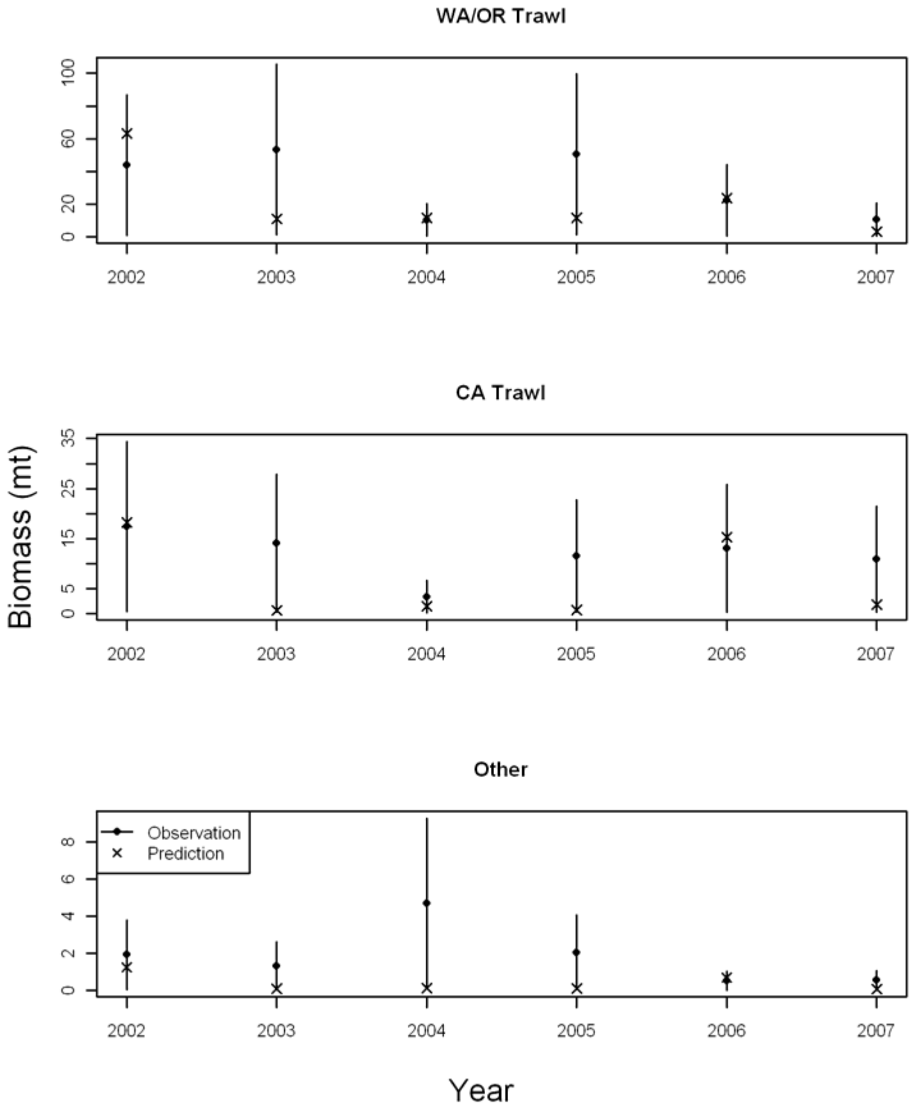


Figure 50: Fits to the total discards (mt) by fleet and year.

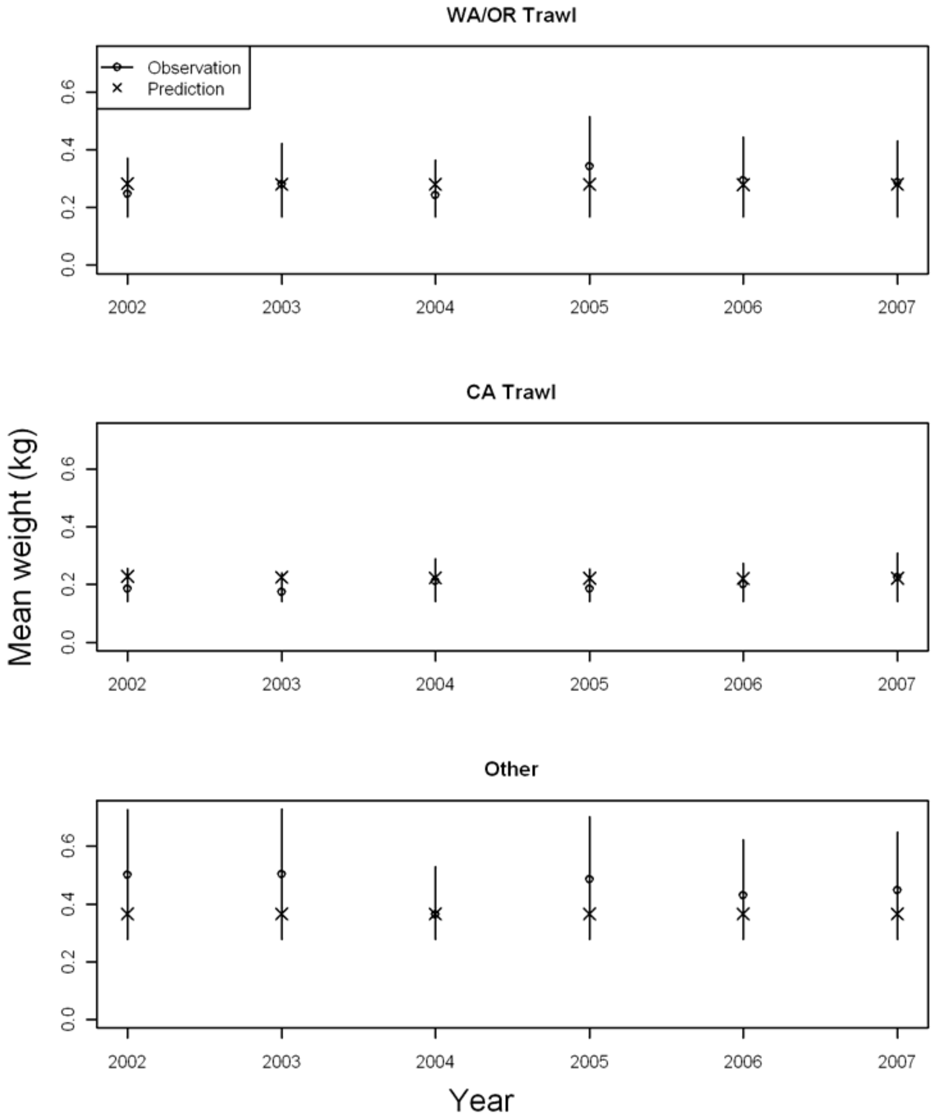


Figure 51: Fits to the mean weight of discards.

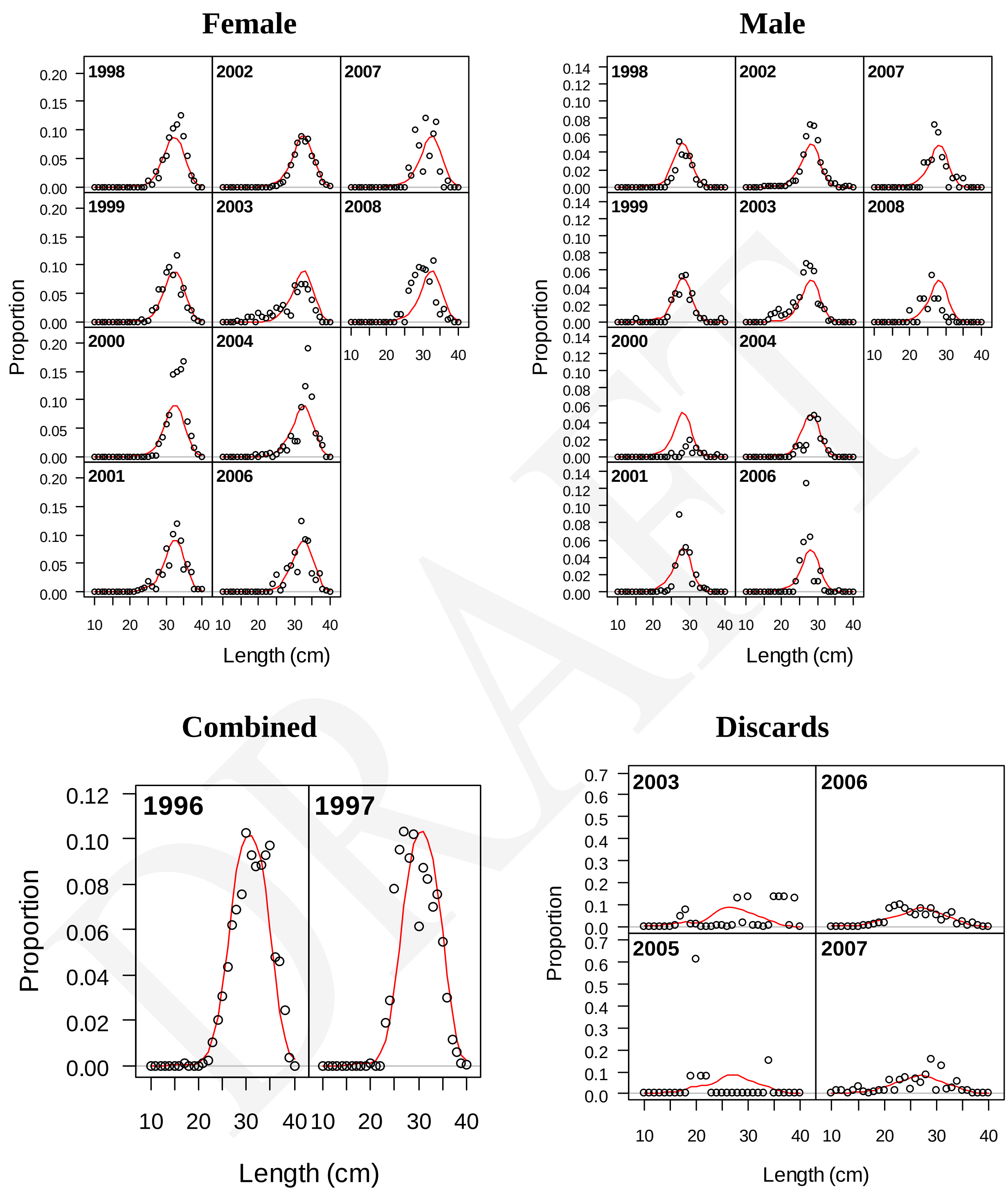


Figure 52: Fits to length compositions from the WA/OR trawl fleet.

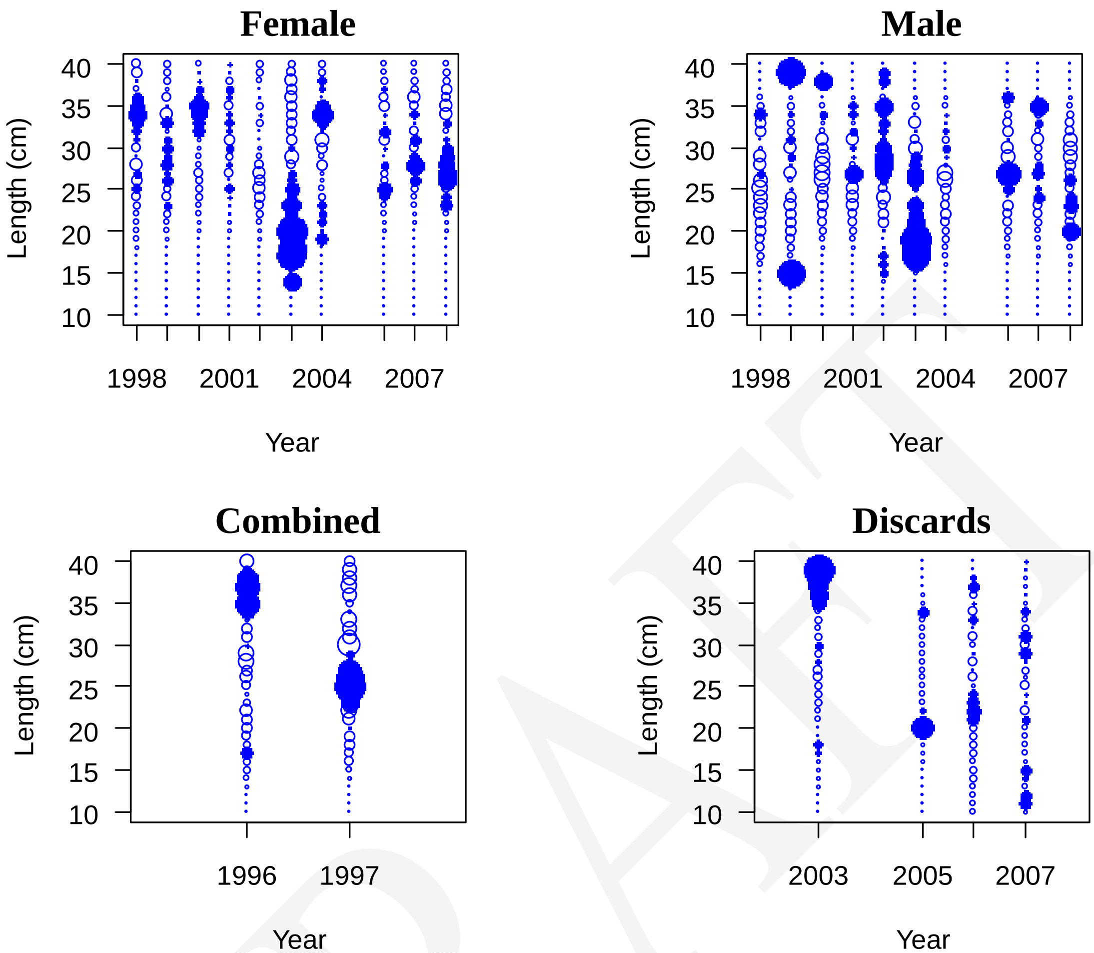


Figure 53: Pearson residuals for the retained and discarded length composition data from the WA/OR trawl fleet.

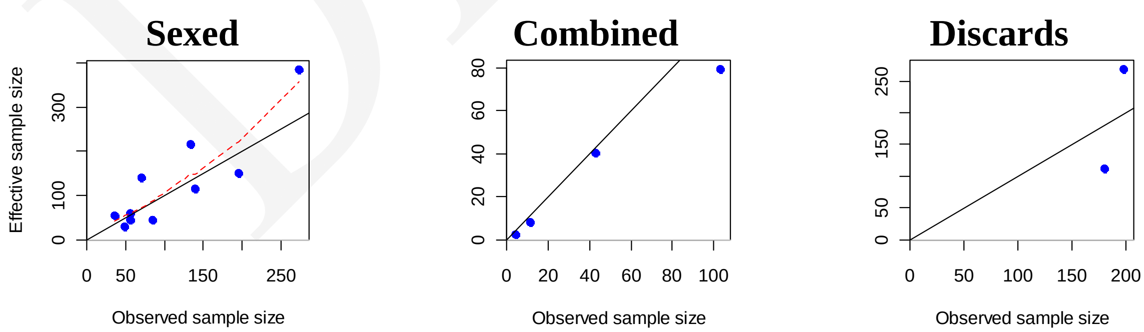


Figure 54: Effective sample size plotted against the entered sample size in the model for the WA/OR trawl fleet.

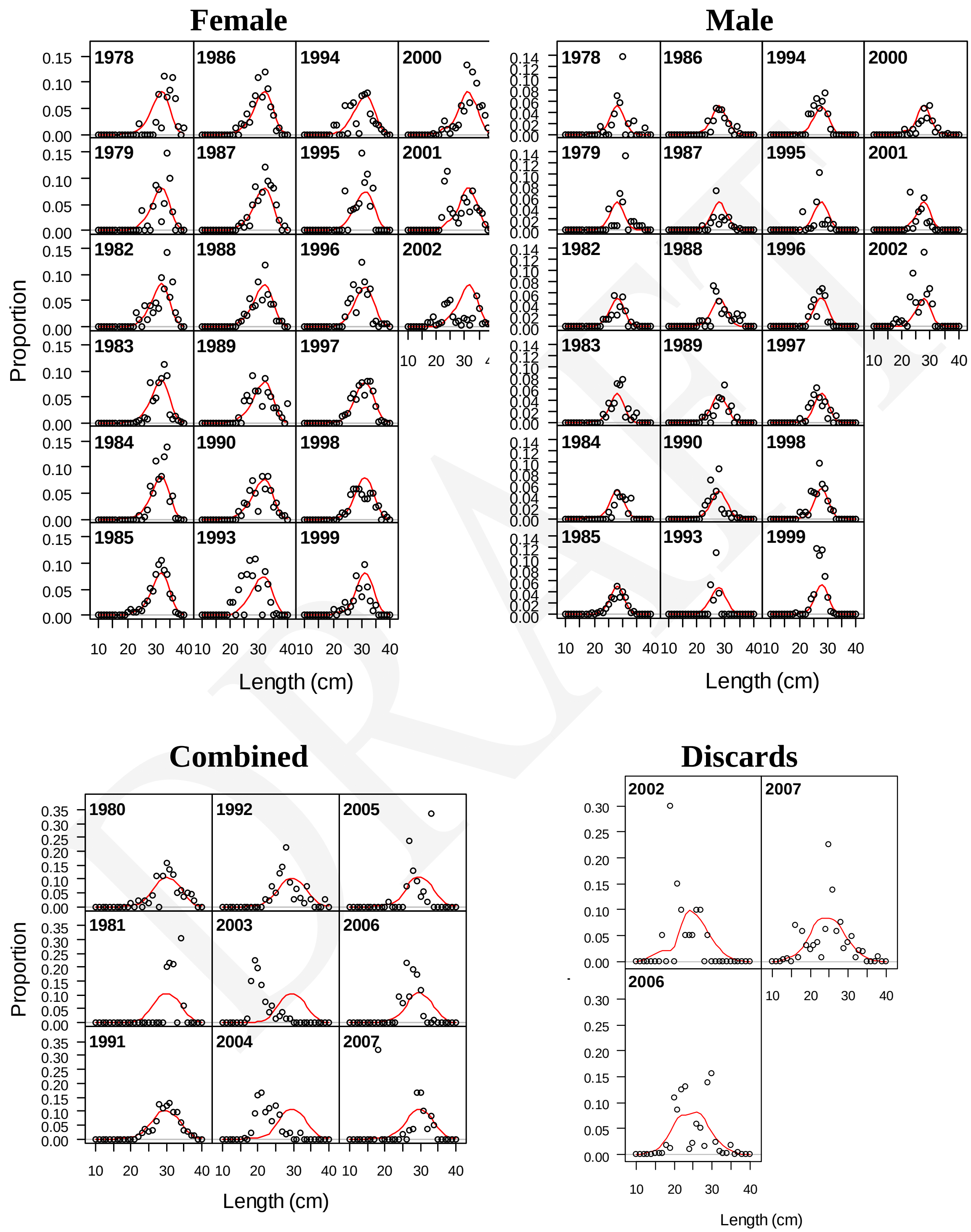


Figure 55: Fits to length compositions from the CA trawl fleet.

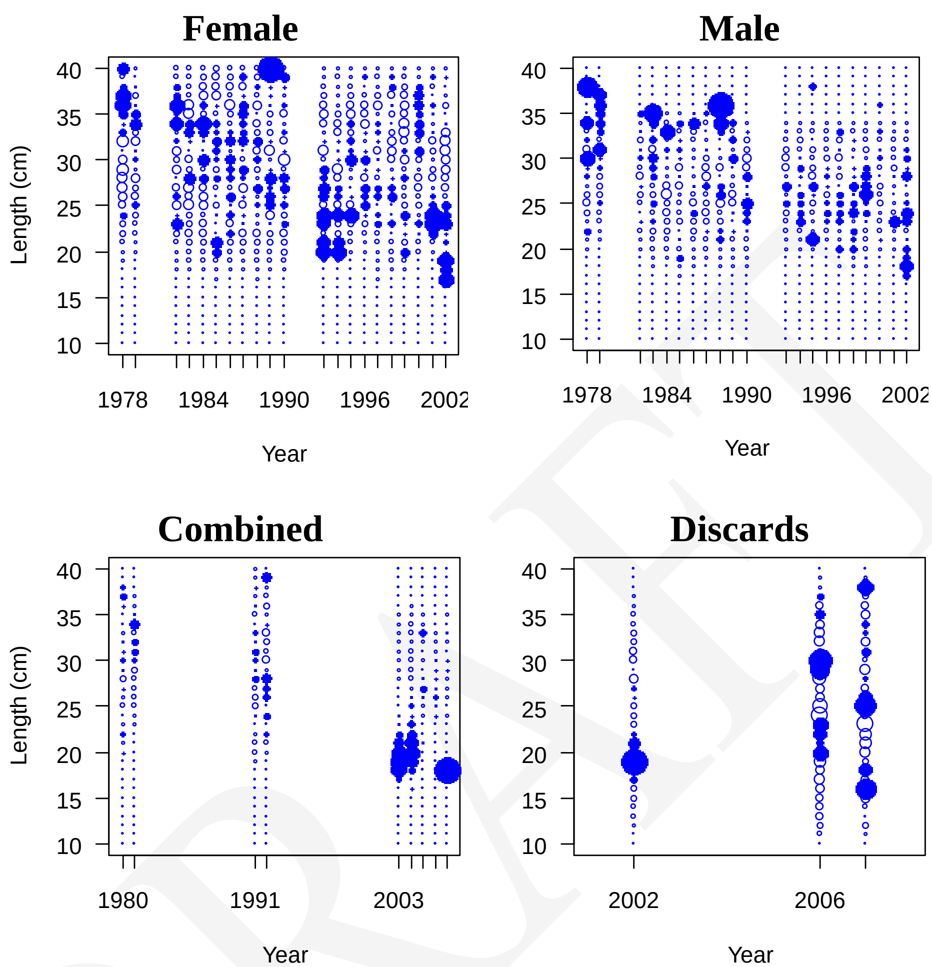


Figure 56: Pearson residuals for the retained and discarded length composition data from the CA trawl fleet.

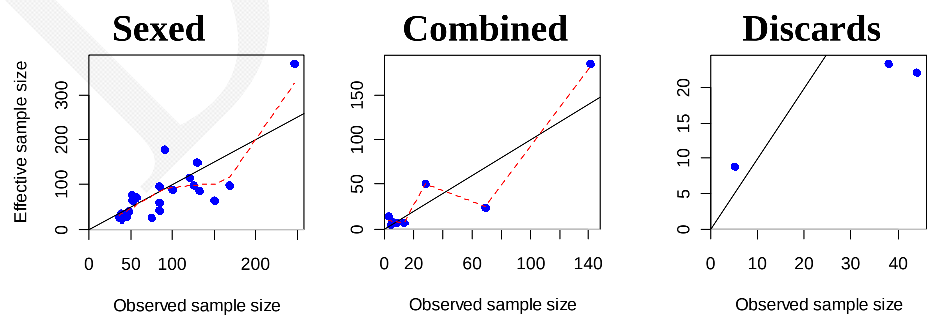


Figure 57: Effective sample size plotted against the entered sample size in the model for the CA trawl fleet.

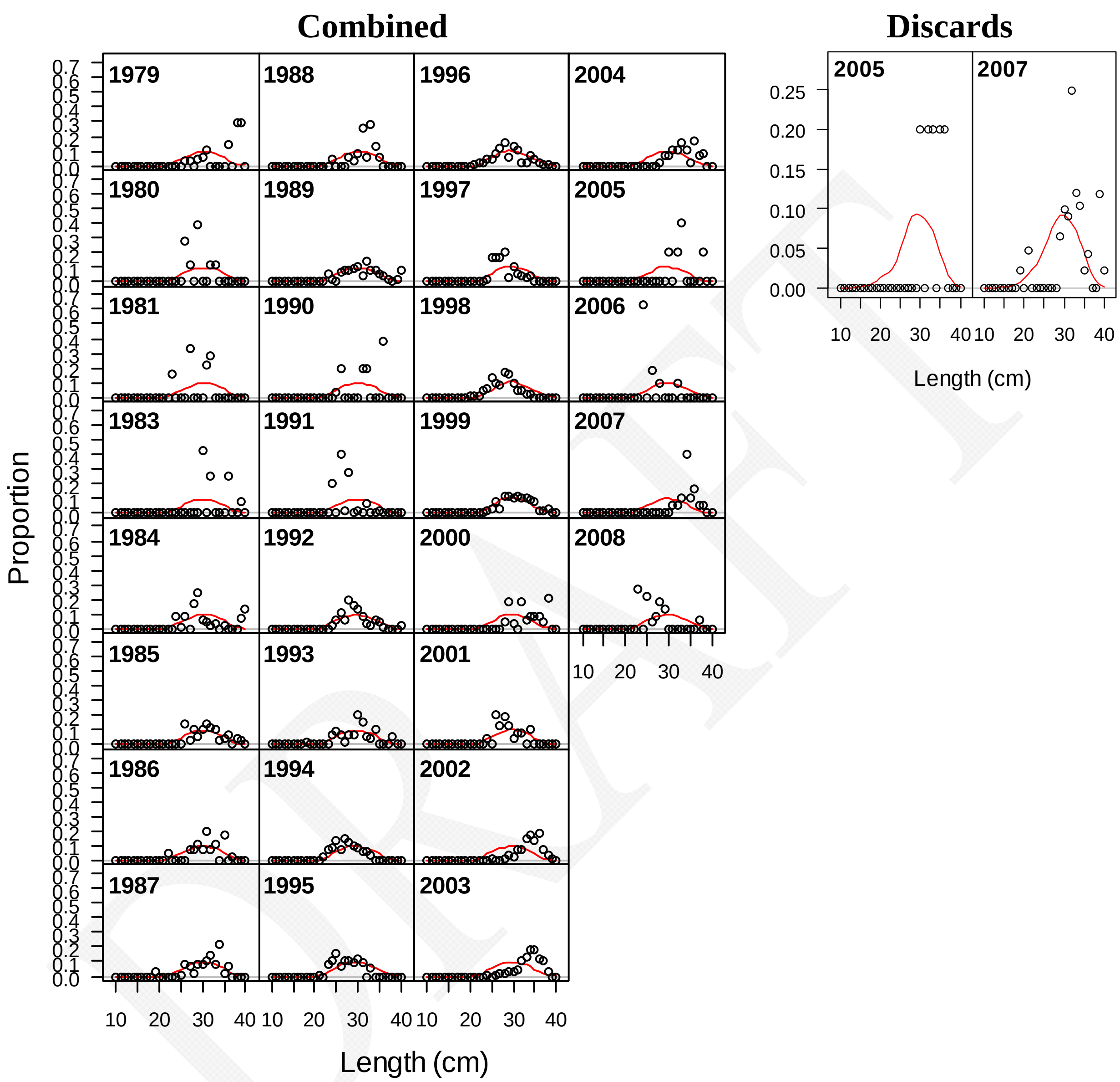


Figure 58: Fits to length compositions from the other-gear fleet.

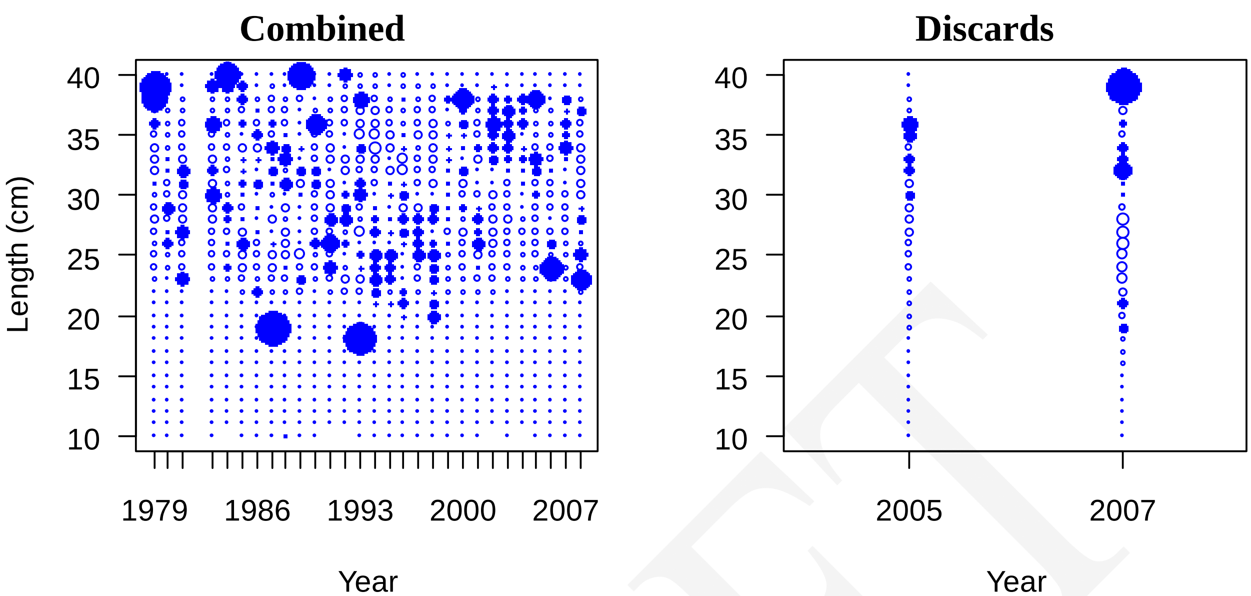


Figure 59: Pearson residuals for the retained and discarded length composition data from the other-gear fleet.

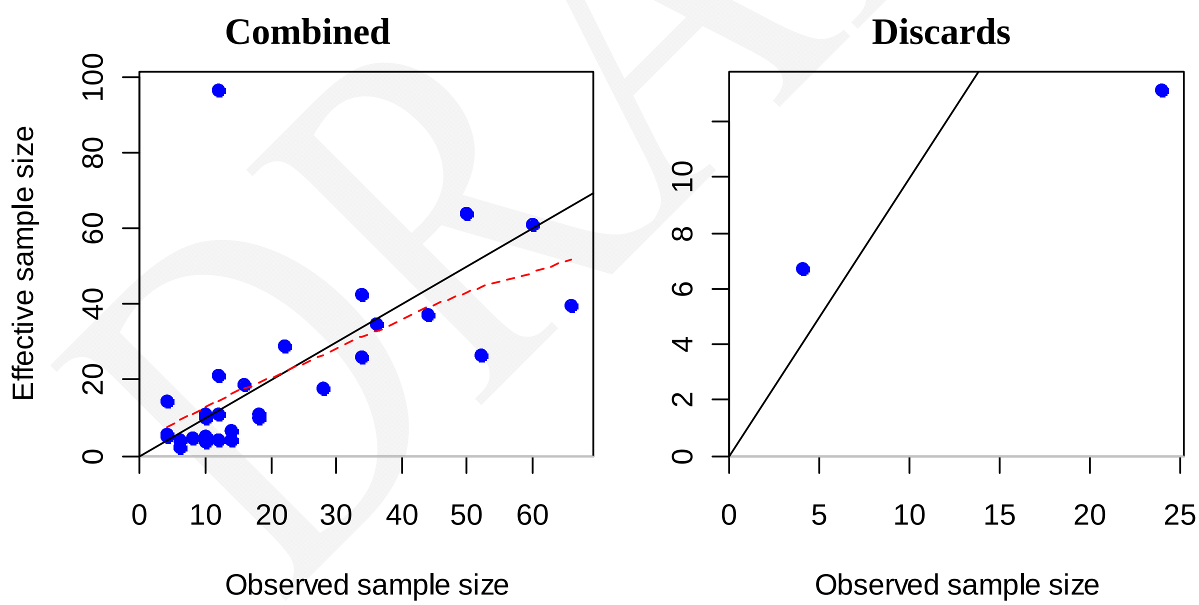


Figure 60: Effective sample size plotted against the entered sample size in the model for the other-gear fleet.

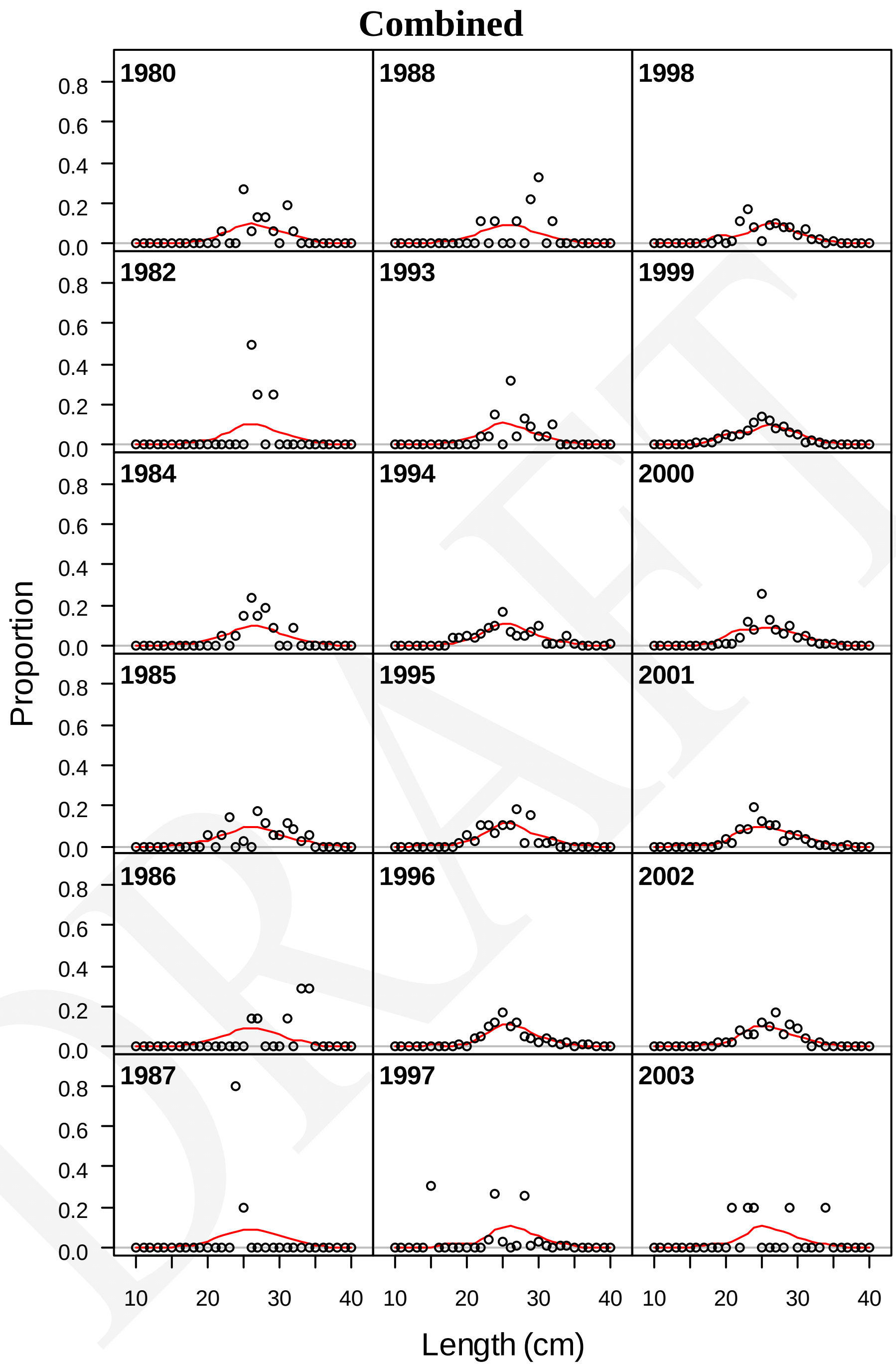


Figure 61: Fits to length compositions from the Recreational fleet.

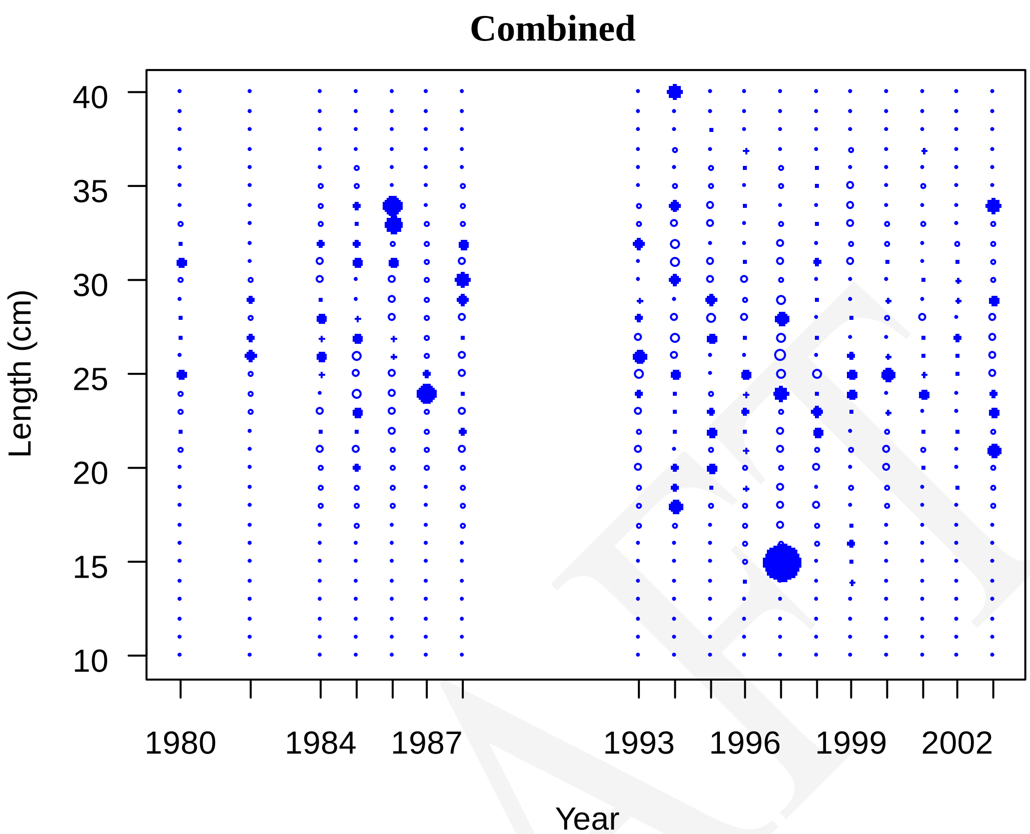


Figure 62: Pearson residuals for the combined sex length composition data from the Recreational fleet.

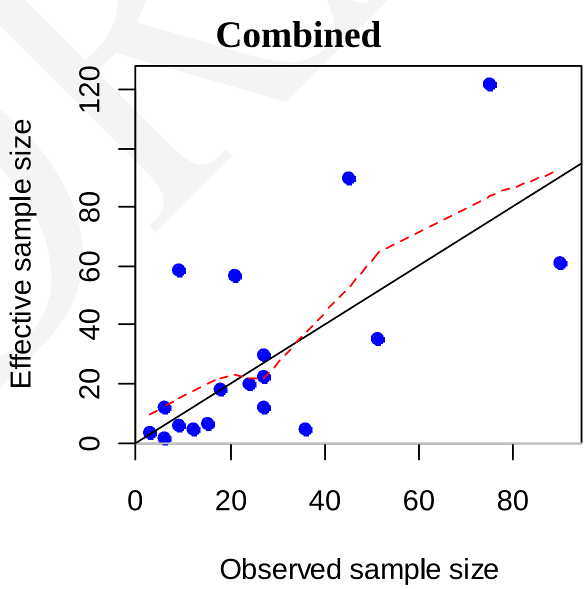


Figure 63: Effective sample size plotted against the entered sample size in the model for the ecreational fleet.

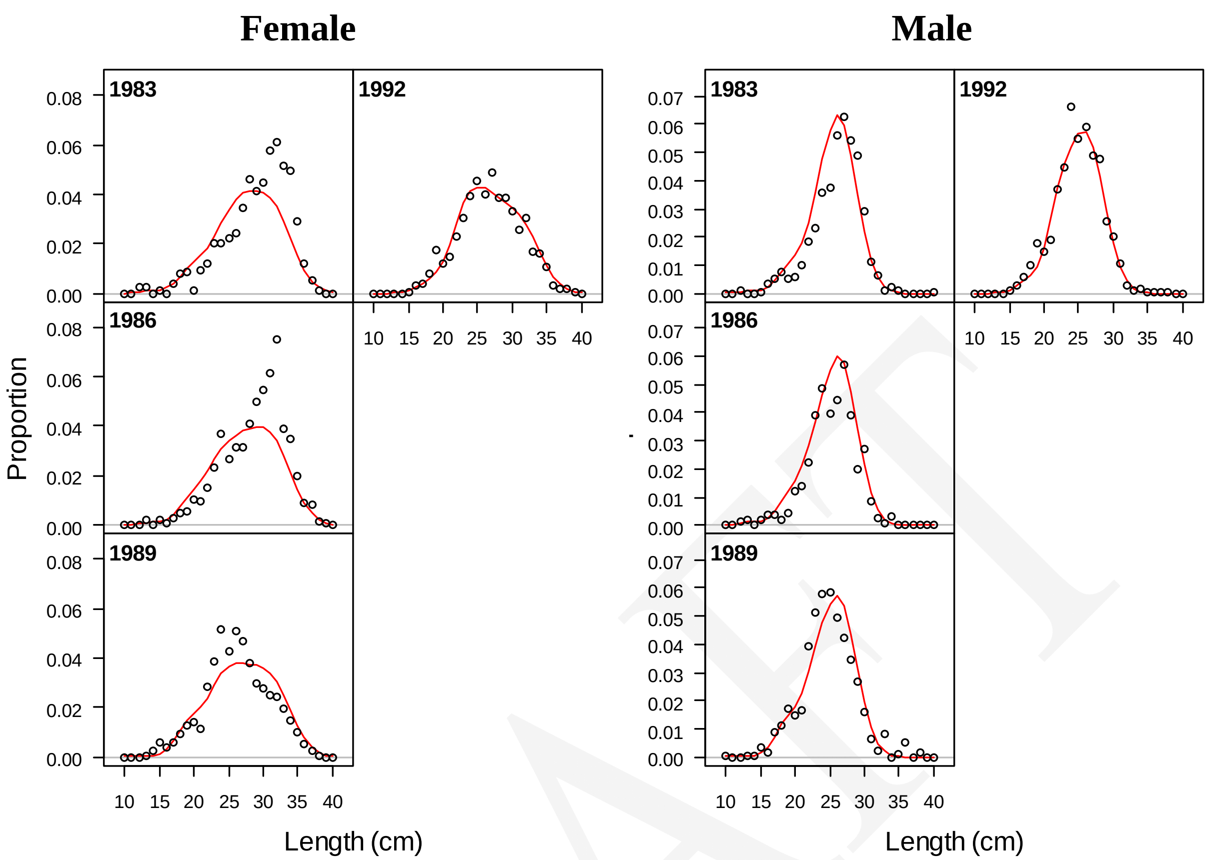


Figure 64: Fits to length compositions from the early Triennial survey.

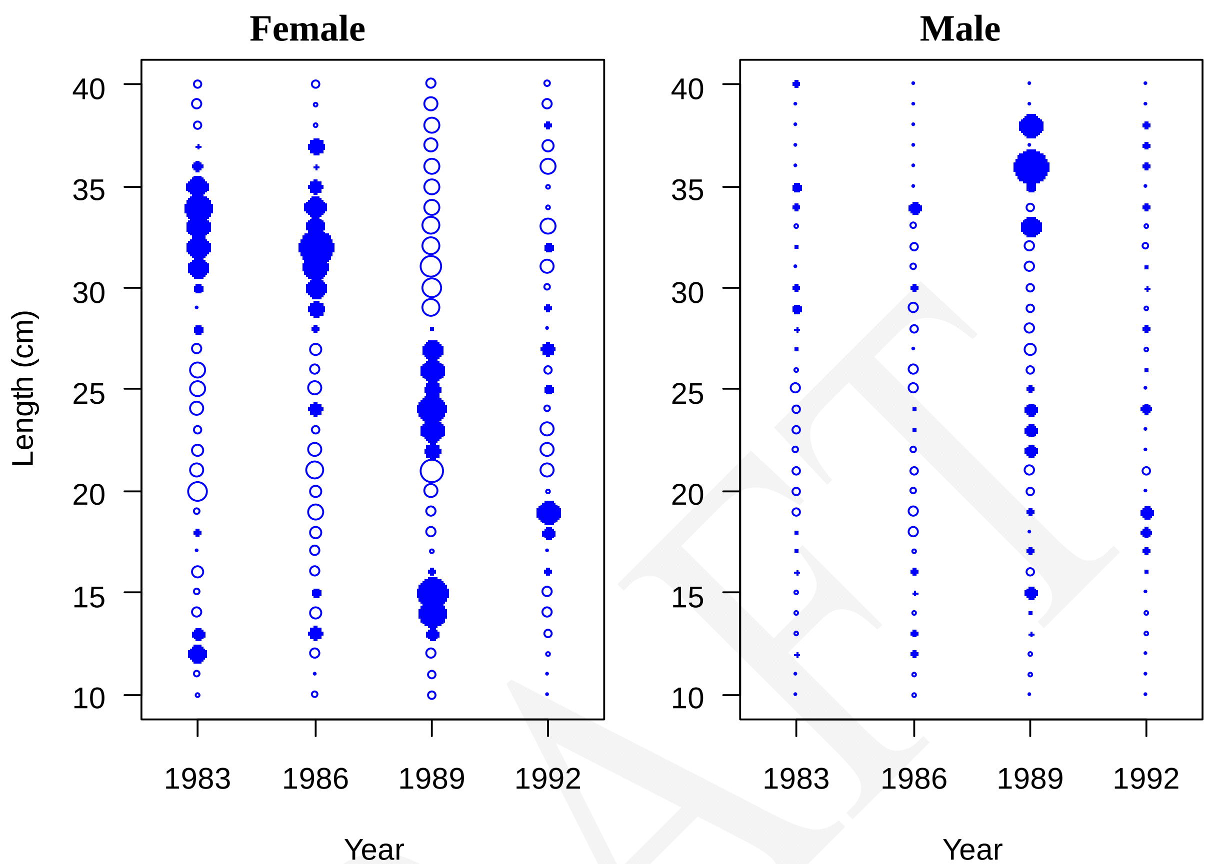


Figure 65: Pearson residuals for the length composition data from the early Triennial survey.

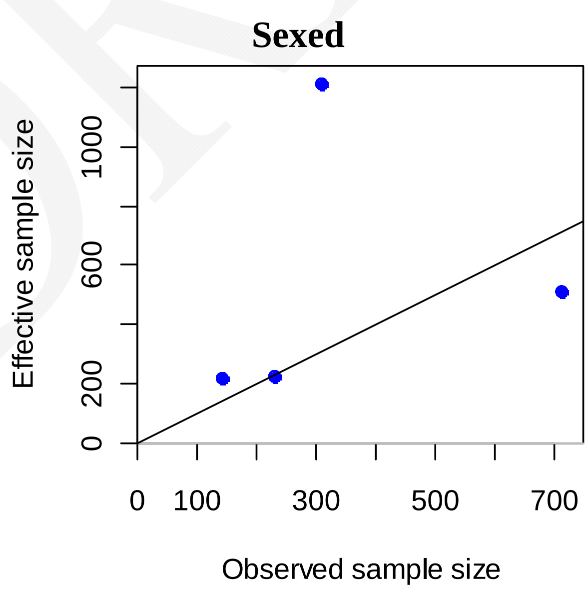


Figure 66: Effective sample size plotted against the entered sample size in the model for the early Triennial survey.

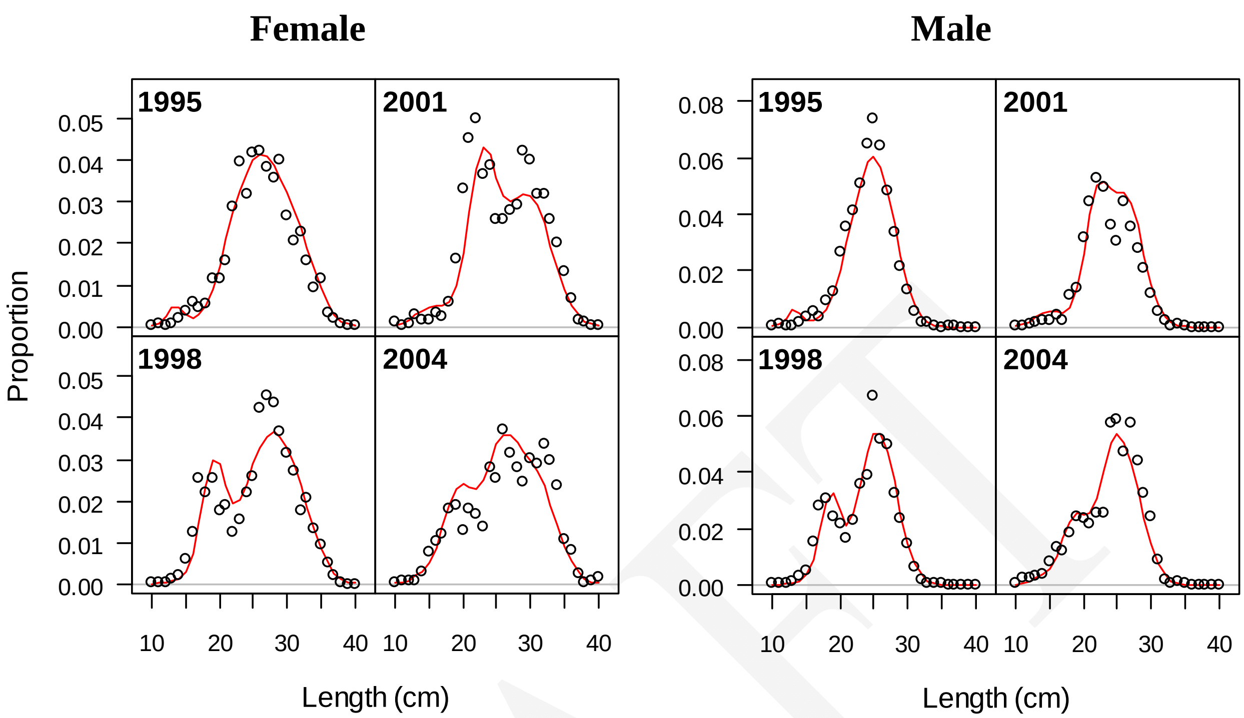


Figure 67: Fits to length compositions from the late Triennial survey.

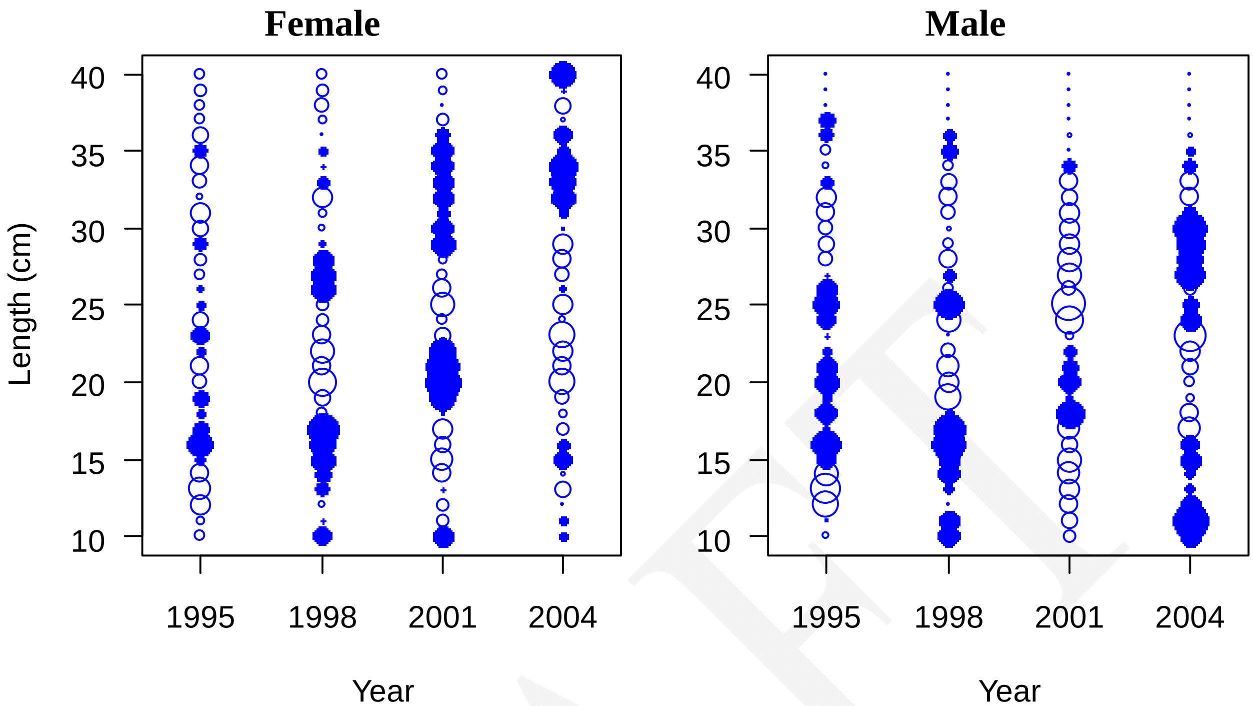


Figure 68: Pearson residuals for the length composition data from the late Triennial survey.

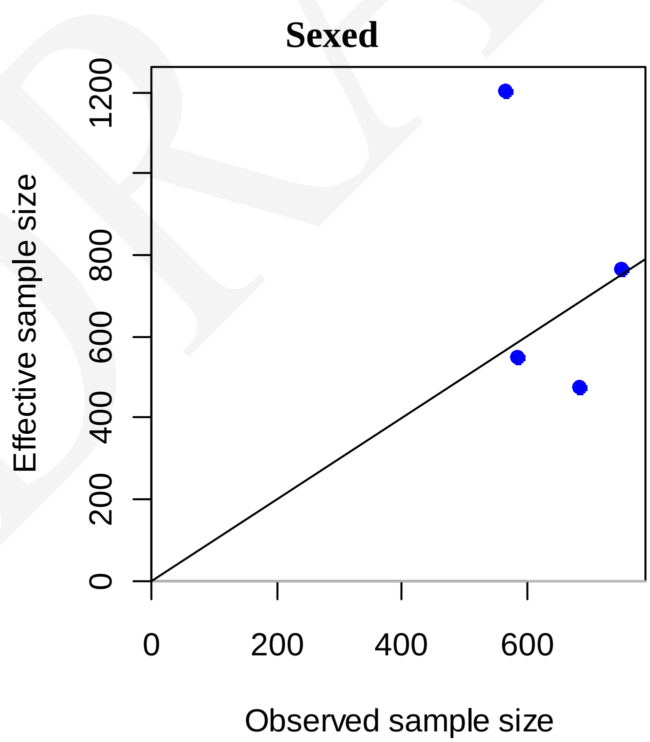


Figure 69: Effective sample size plotted against the entered sample size in the model for the late Triennial survey.

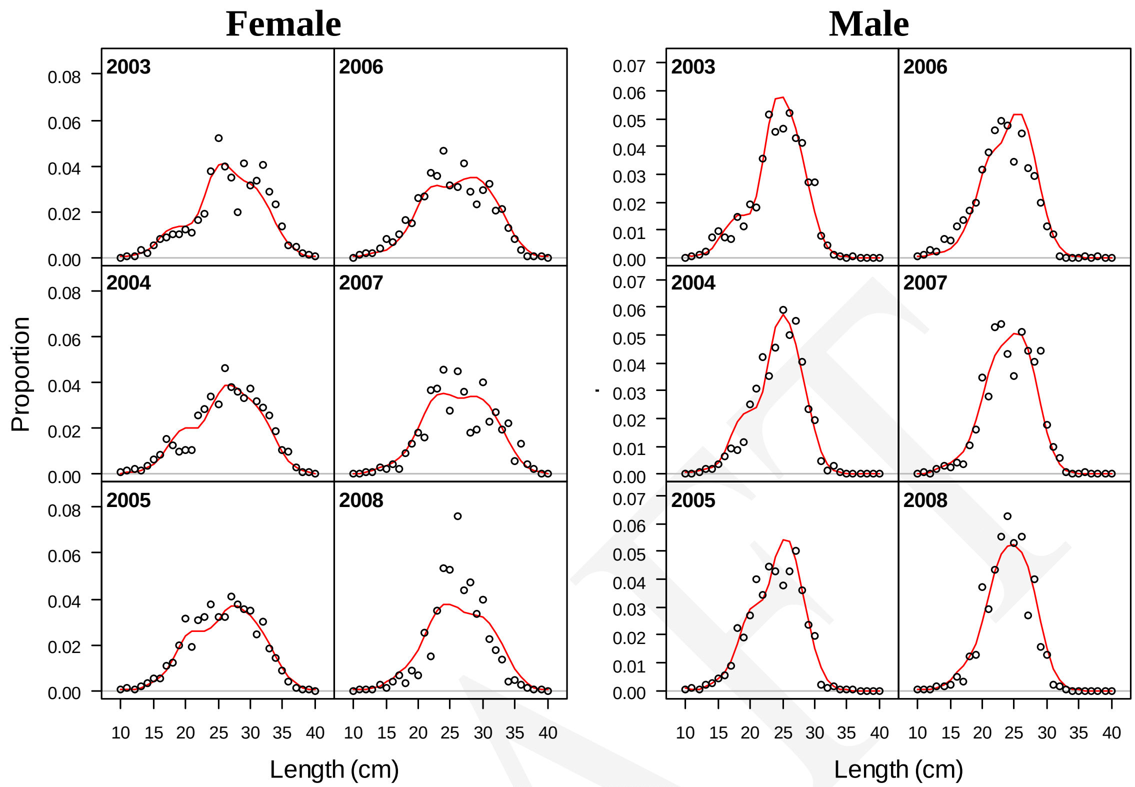


Figure 70: Fits to length compositions from the NWFSC survey.

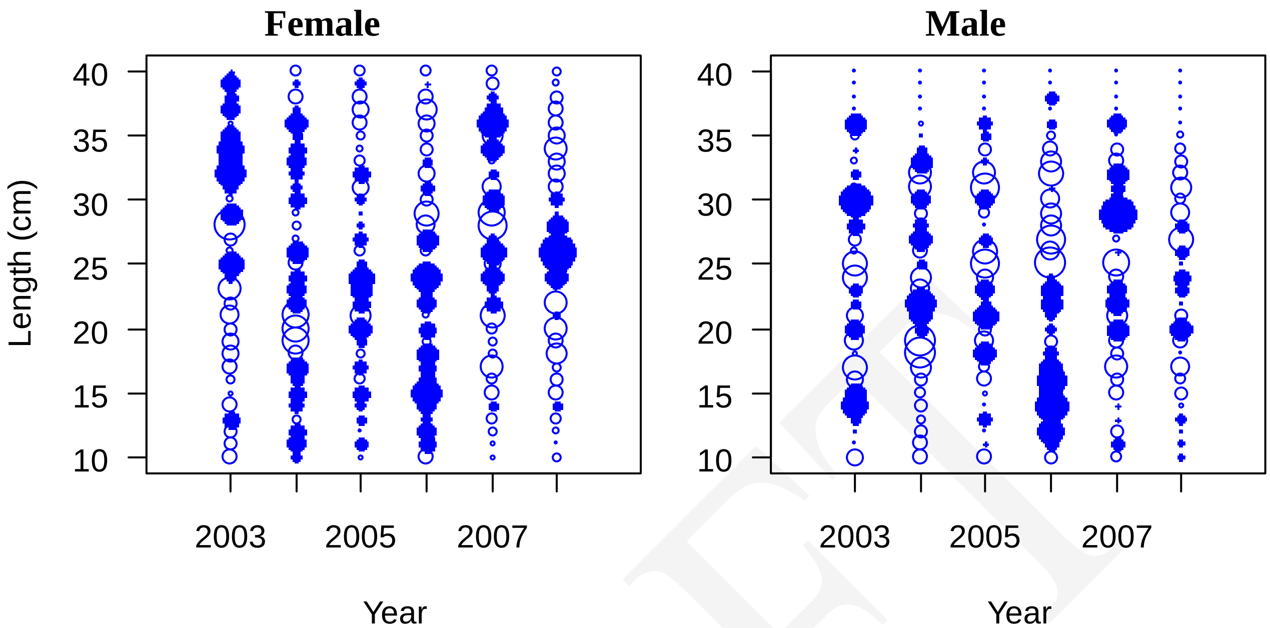


Figure 71: Pearson residuals for the length composition data from the NWFSC survey.

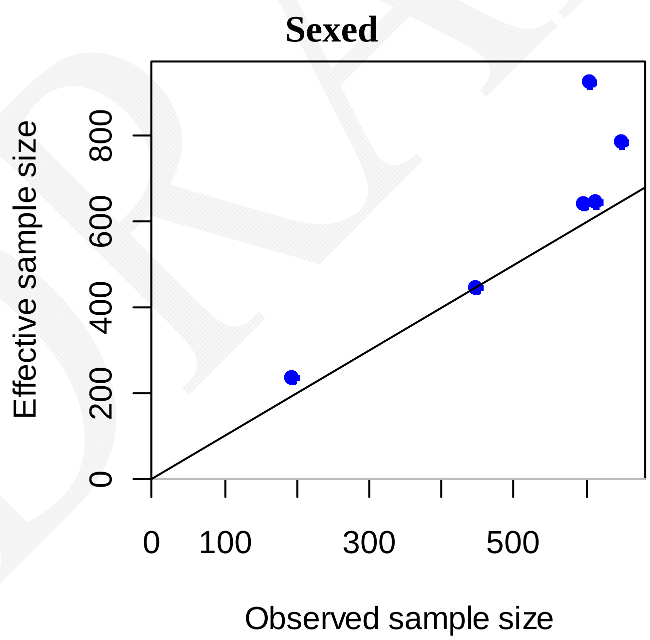


Figure 72: Effective sample size plotted against the entered sample size in the model for the NWFSC survey.

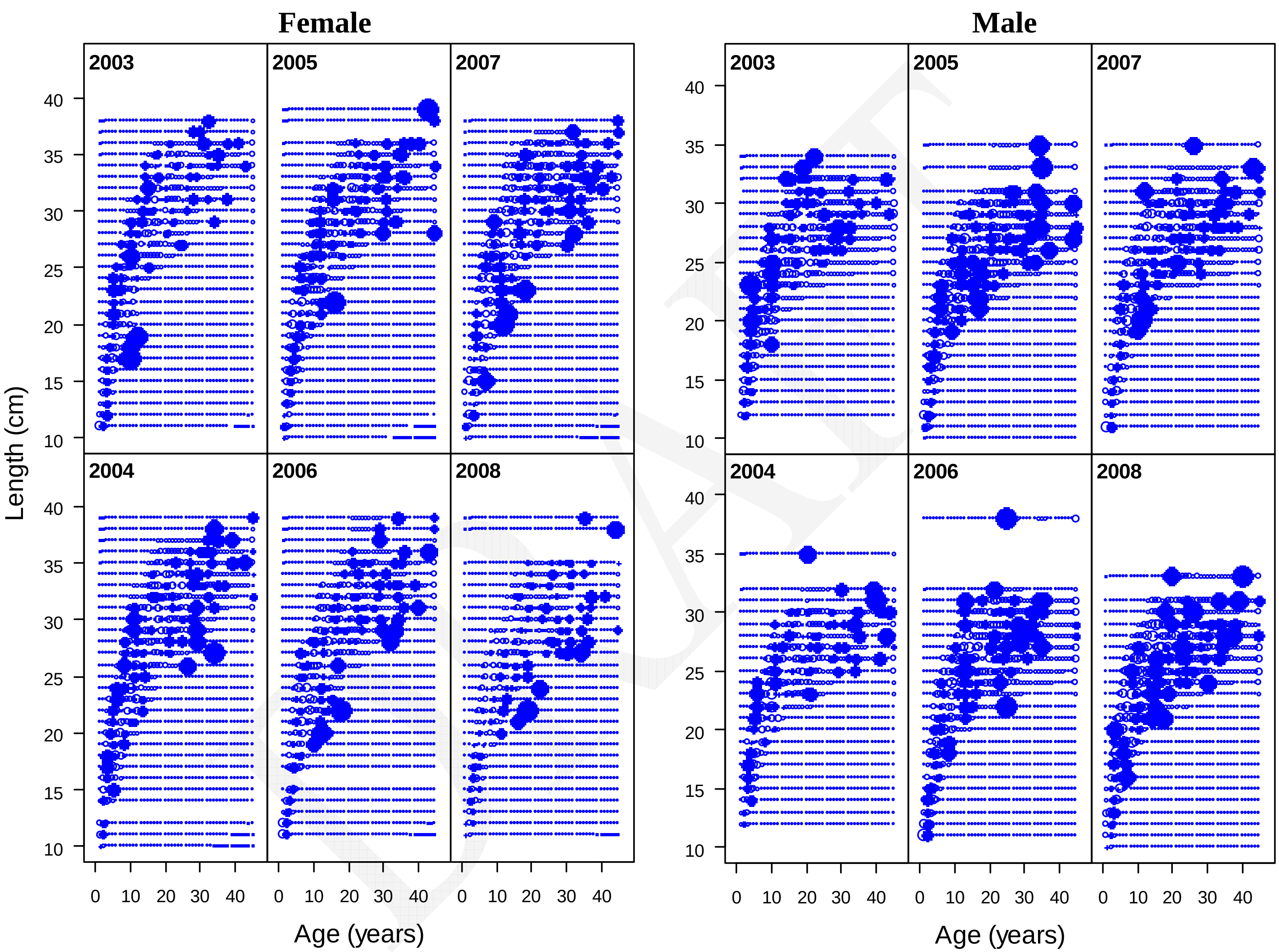


Figure 73: Pearson residuals for the fits to conditional age-at-length compositions from the NWFSC survey.

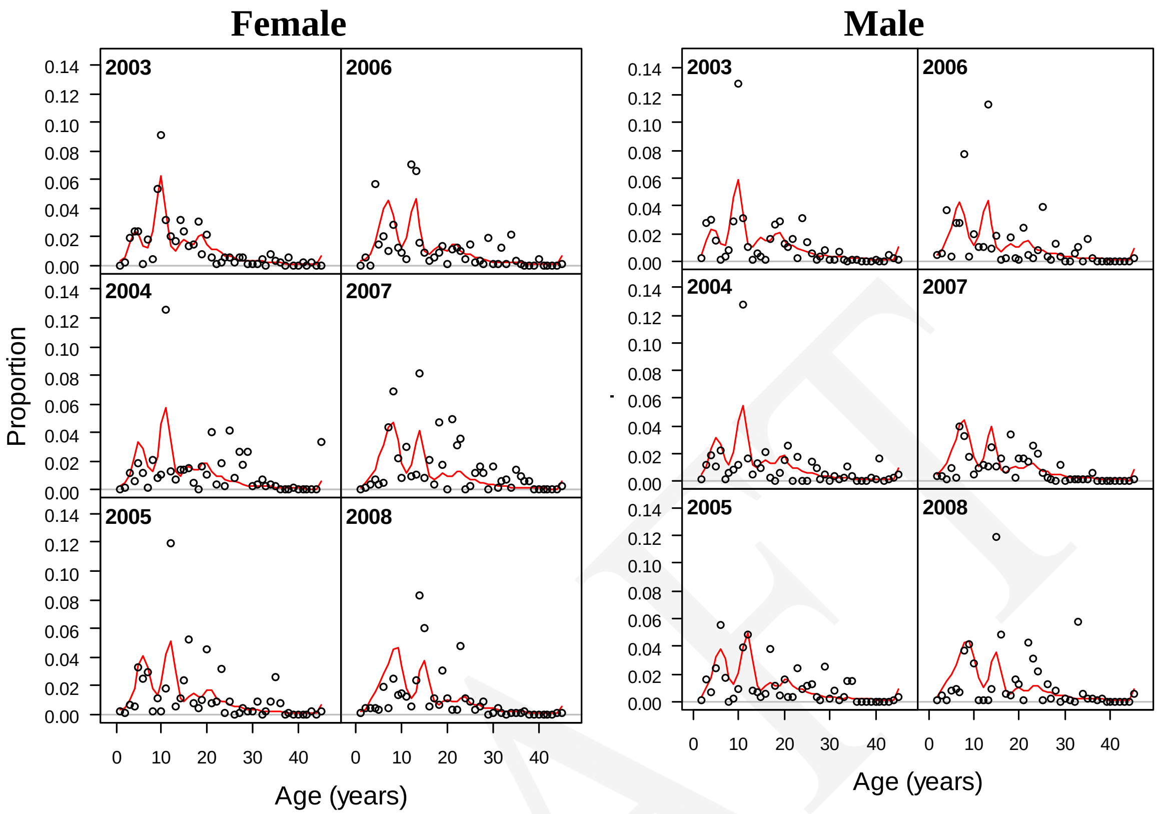


Figure 74: Implied fits to age compositions from the NWFSC survey. These are plotted for reference as the conditional age-at-length compositions are fit by the model.

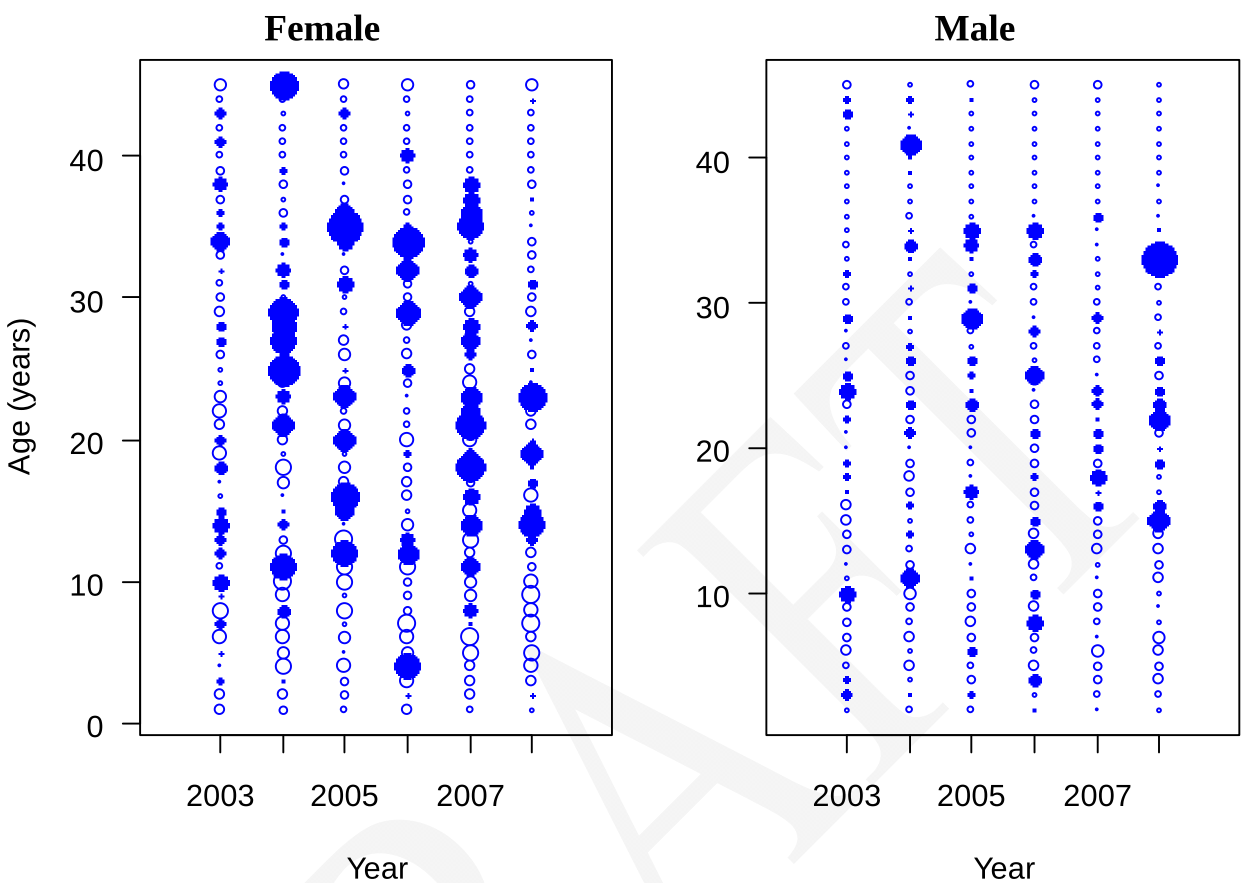


Figure 75: Pearson residuals for the implied fits to the age composition data from the NWFSC survey. These are presented for reference as the conditional age-at-length composition data are fitted by the model.

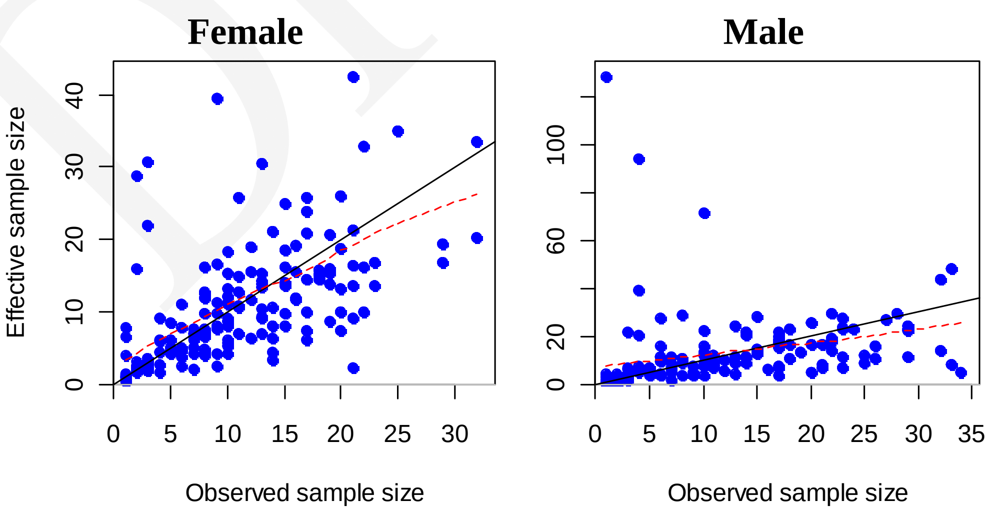


Figure 76: Effective sample size plotted against the entered sample size in the model for the NWFSC survey.

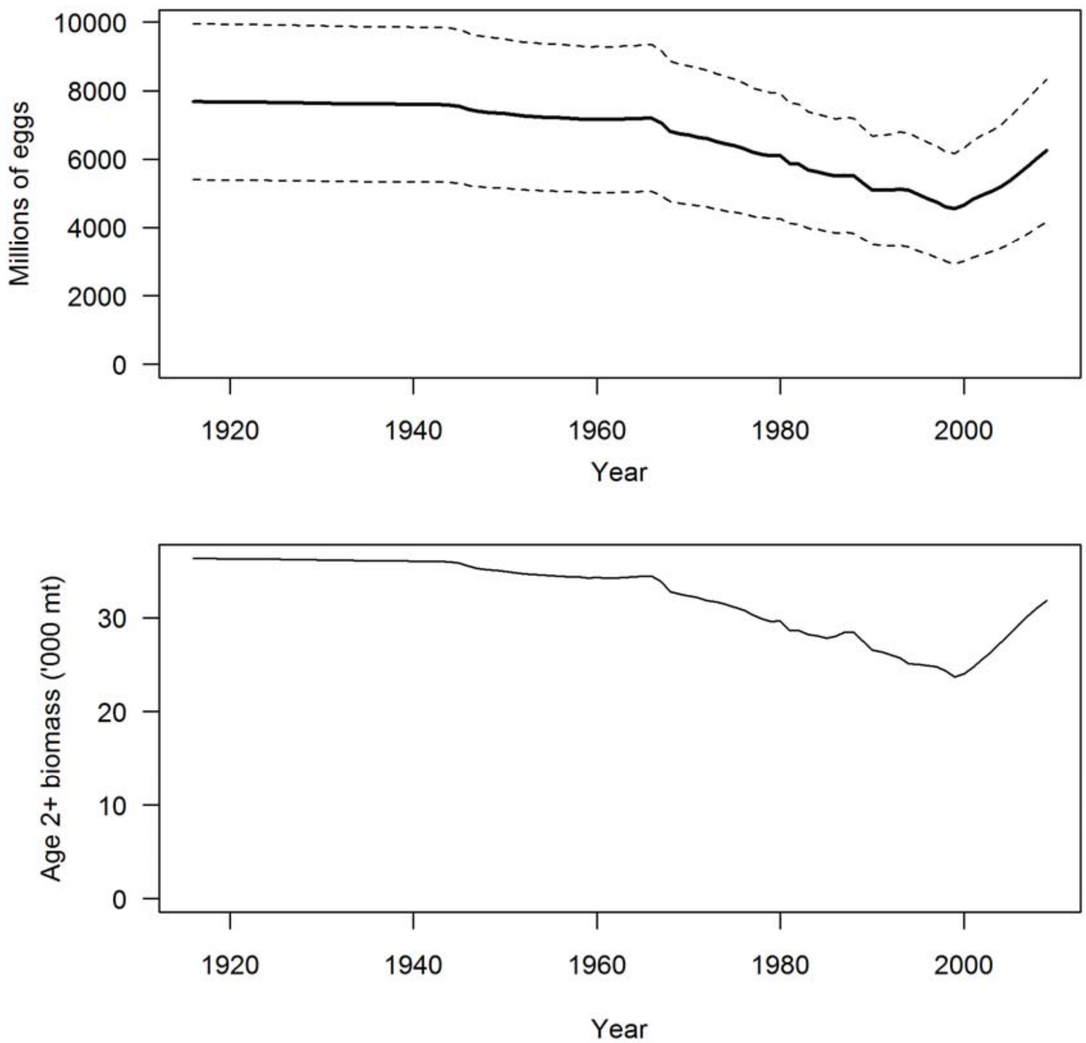


Figure 77: The predicted trajectory of spawning output in millions of eggs with approximate 95% asymptotic confidence intervals (top panel) and the predicted summary biomass (age 2+, bottom panel).

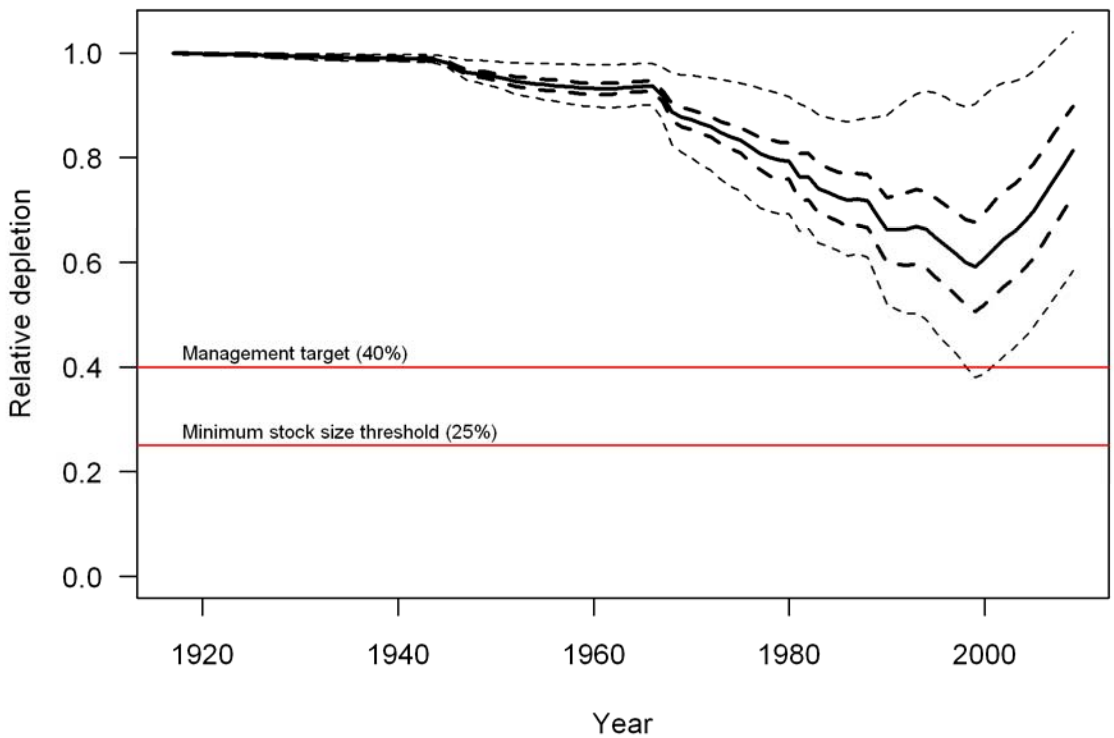
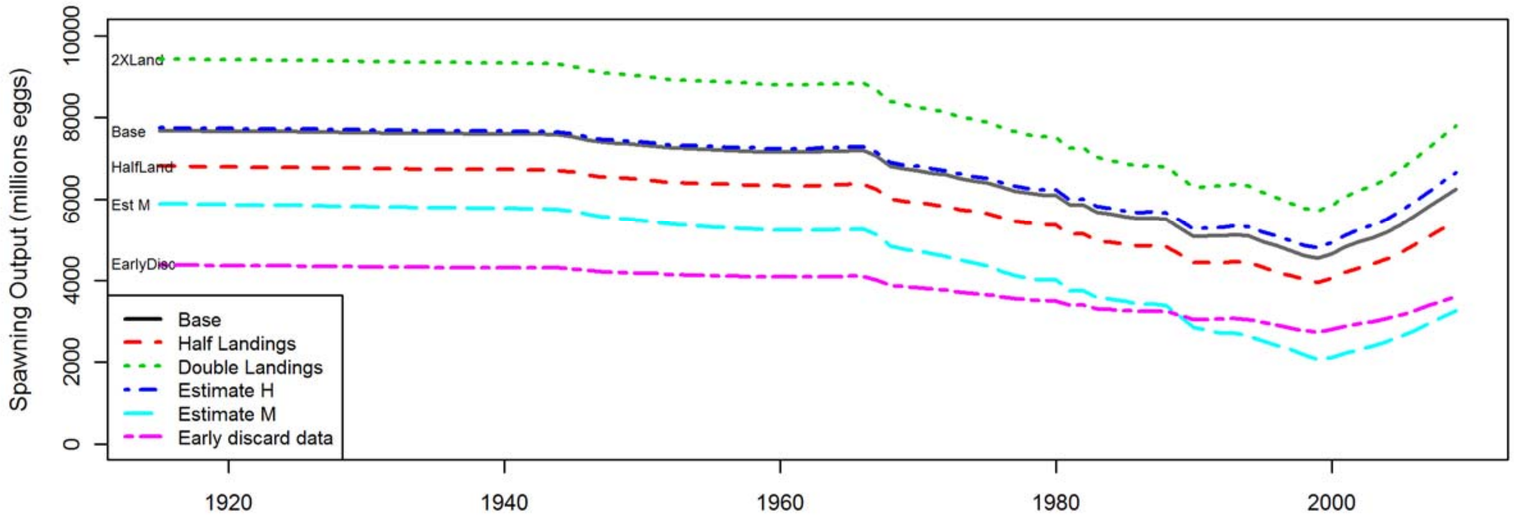
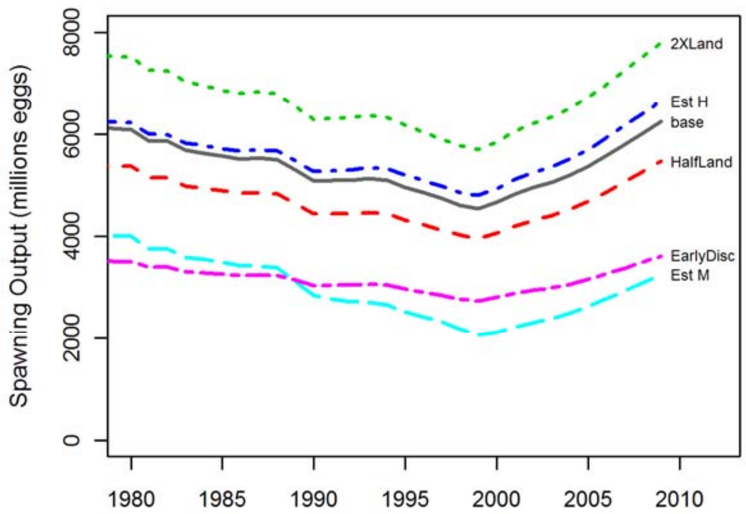


Figure 78: Estimated depletion as a function of unfished spawning output (solid line) with approximate 95% asymptotic confidence intervals (thick dashed lines) and the extreme range over the states of nature (thin dashed lines). Management thresholds are drawn as red horizontal lines.





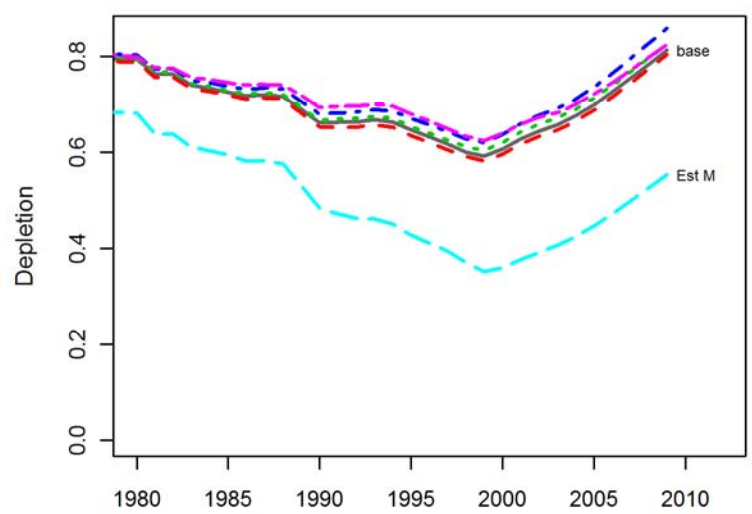


Figure 79: Sensitivity runs.

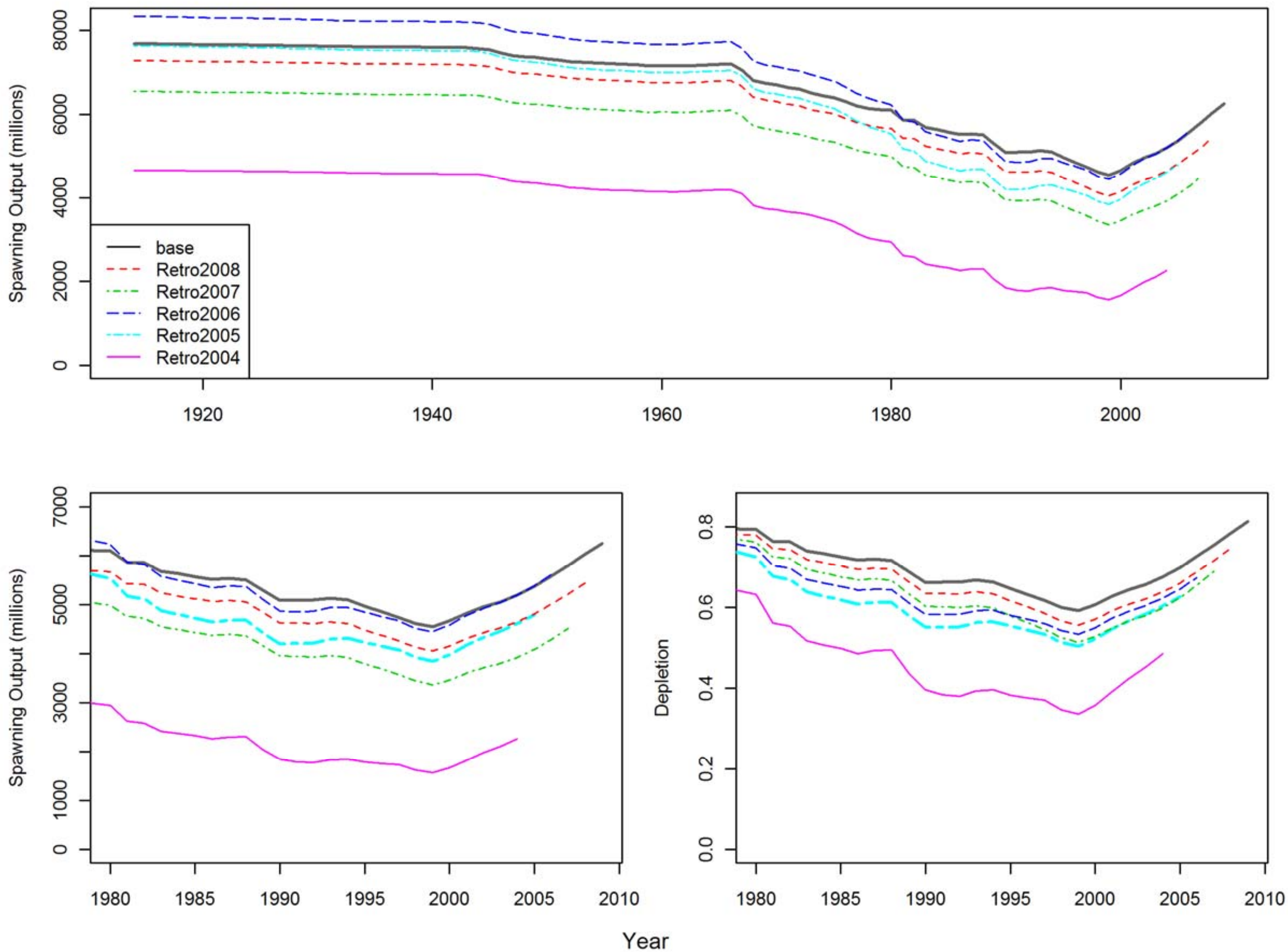


Figure 80. Results from a 5-year retrospective analysis. Each year of retrospective is performed as if the assessment were conducted in that year (i.e., retrospective in 2007 includes data through 2006).

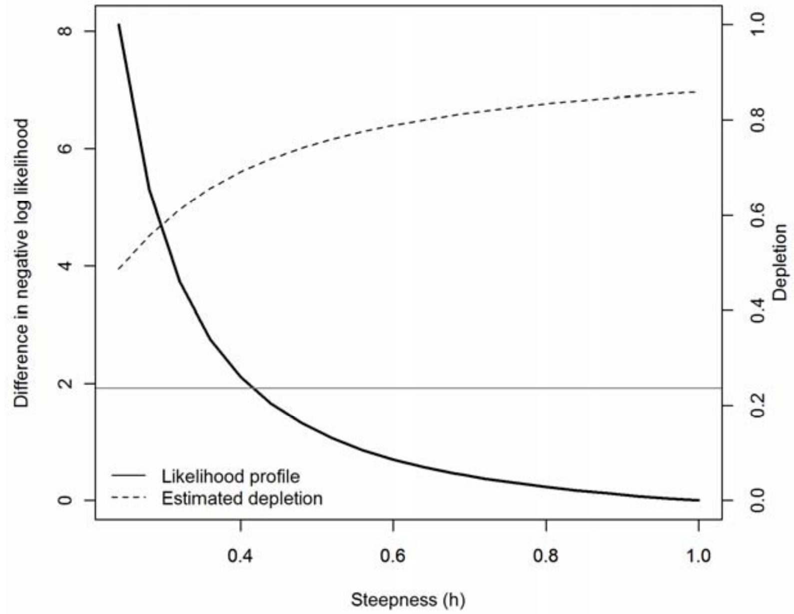


Figure 81: Likelihood profile on steepness (h). The horizontal line is the approximate 95% confidence interval and the dashed line show estimated depletion over steepness.

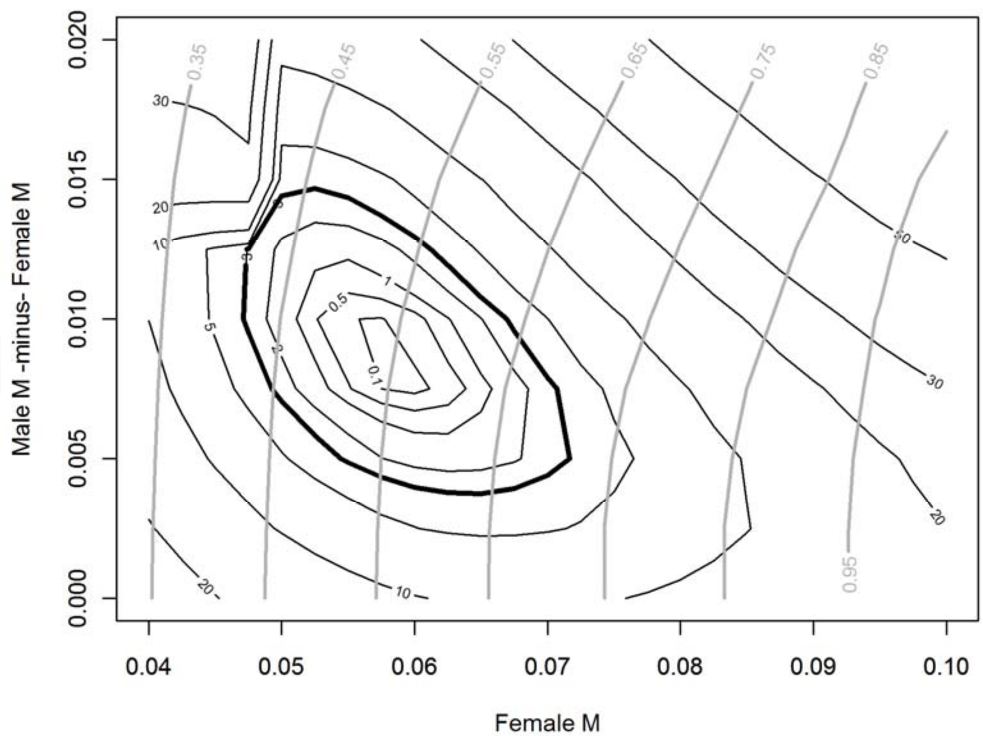


Figure 82: Likelihood profile on female natural mortality and the difference between male and female natural mortality. Black contour lines are the difference in negative log-likelihood and the bold line indicates an approximate 95% joint confidence interval. The gray, nearly vertical contour lines indicate the estimated level of depletion at that combination of male and female natural mortality.

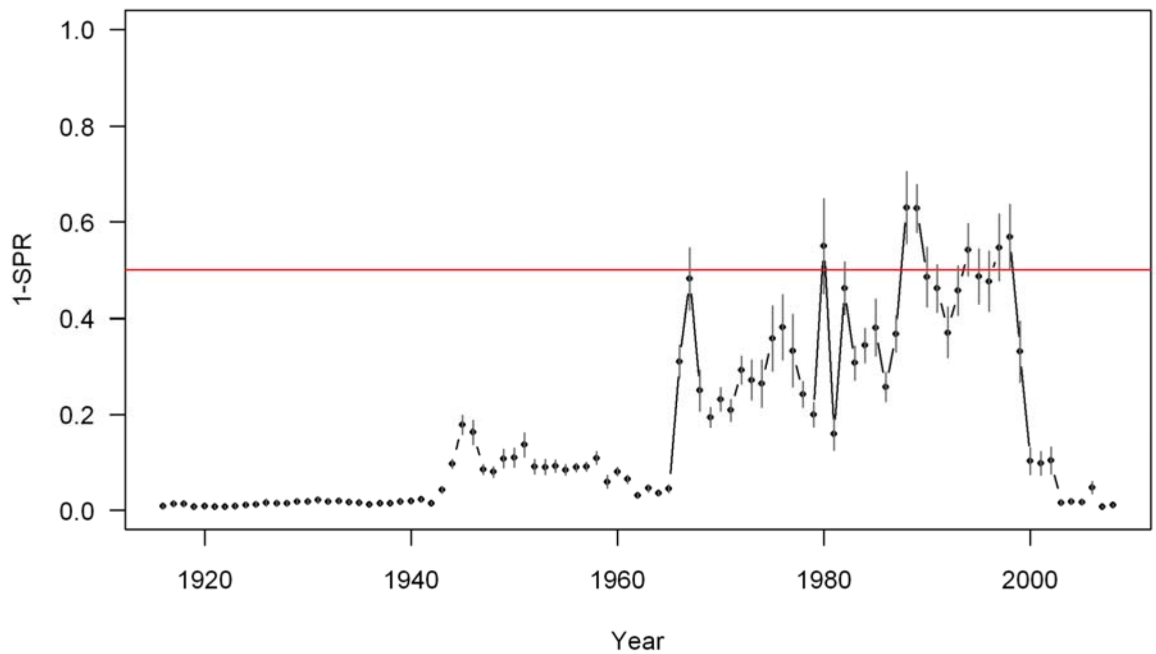


Figure 83: Estimated spawning potential ratio (shown as 1-SPR) from the base case model with approximate 95% asymptotic confidence intervals. One minus SPR is plotted so that higher exploitation rates occur on the upper portion of the y-axis. The management target is plotted as a red horizontal line and values above this reflect harvests in excess of the overfishing proxy based on $SPR_{50\%}$.

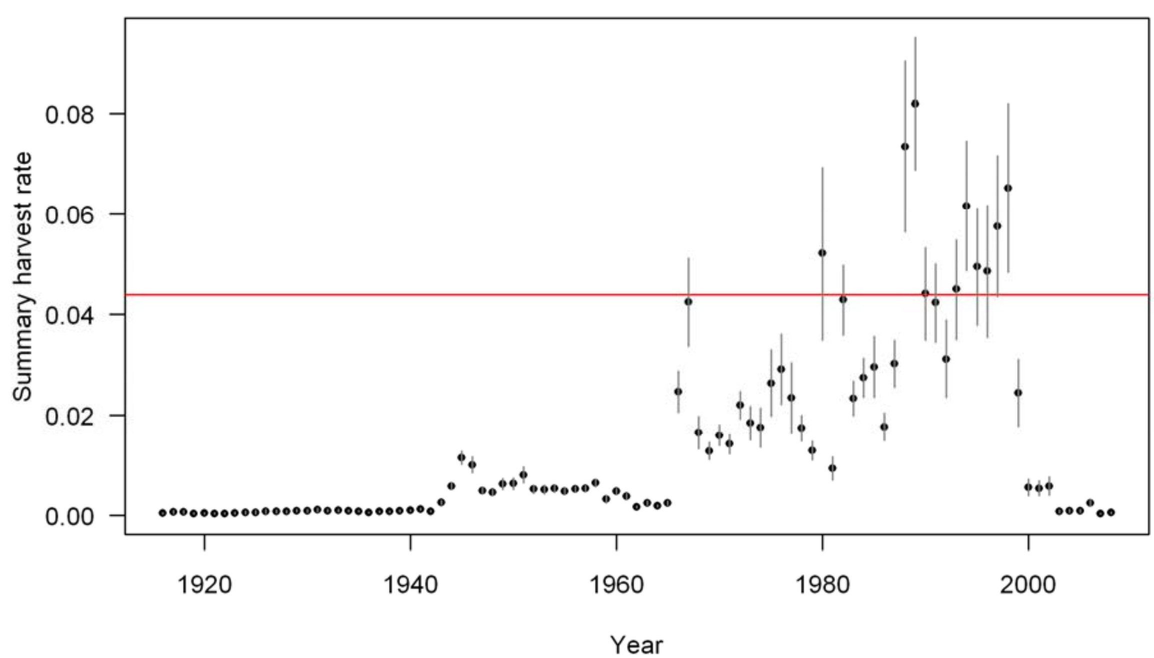


Figure 84: Time series of estimated summary harvest rate (total catch divided by age 2 and older biomass) for the base case model (round points) with approximate 95% asymptotic confidence intervals (grey lines). The red line is the harvest rate at the overfishing proxy using $SPR_{50\%}$.

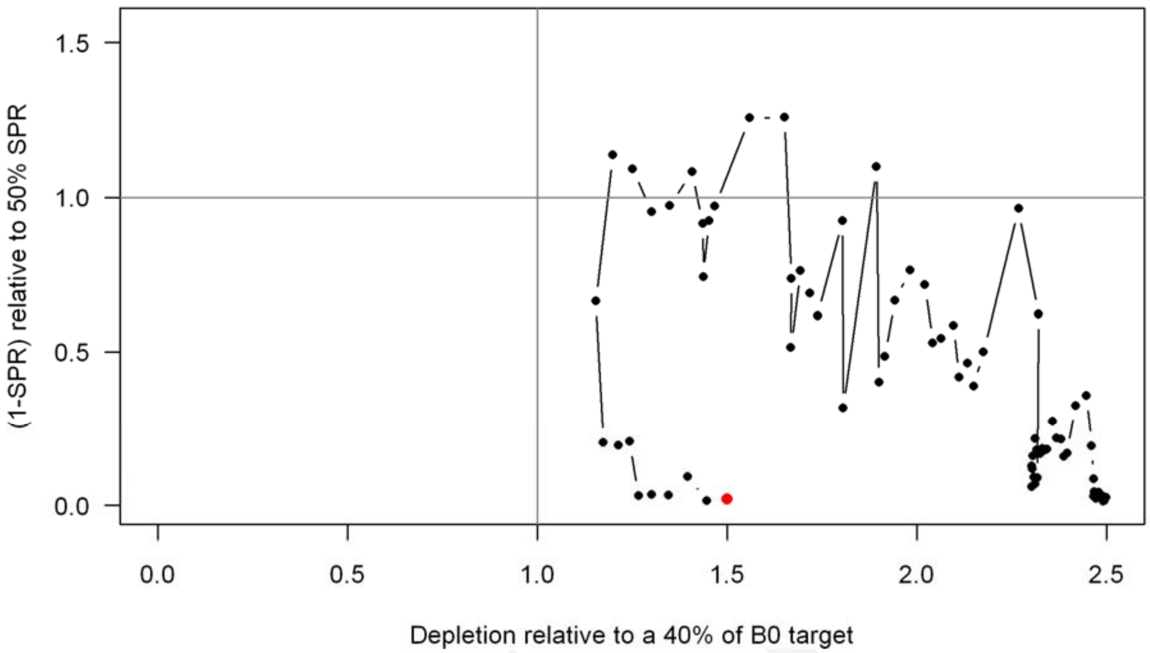


Figure 85: Phase plot of the predicted trajectory for greenstriped rockfish relative to the $SPR_{50\%}$ harvest rate and $B_{40\%}$ target. The red dot shows the current value (2008).

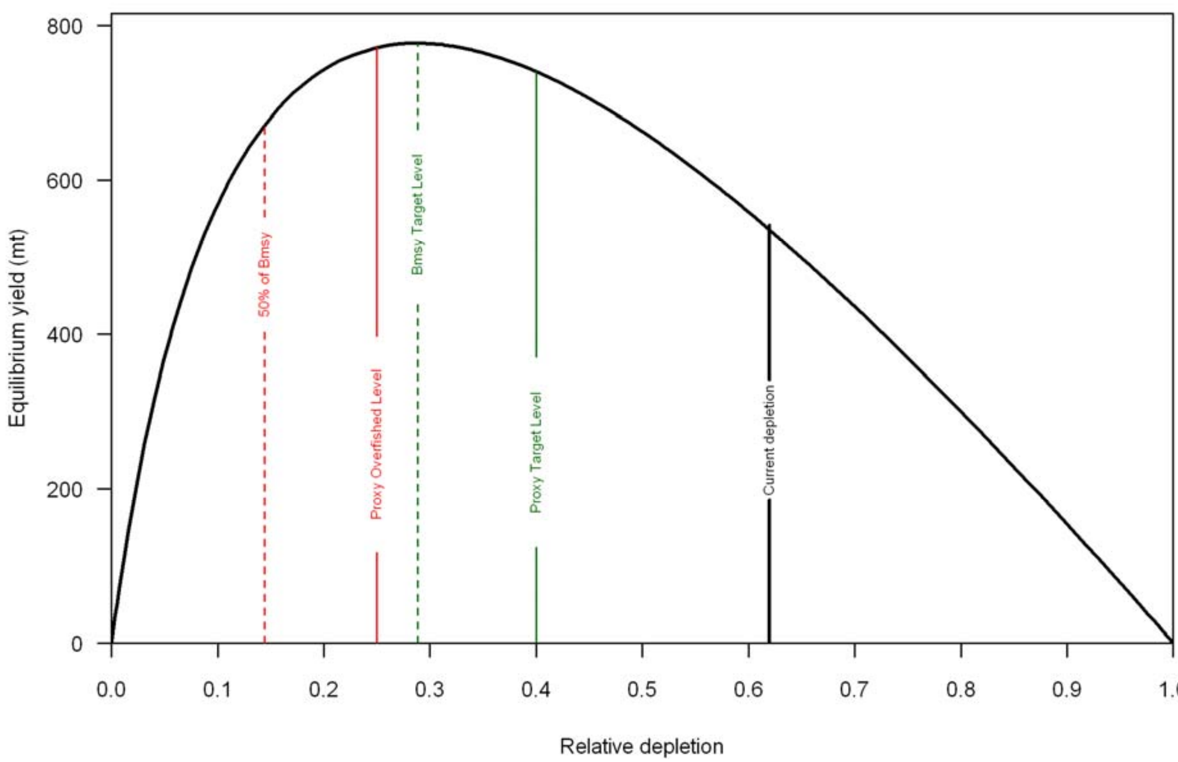


Figure 86: Estimated equilibrium yield with target levels based on 40% of unfished spawning output (solid lines) and target levels based on the spawning output at *MSY* (dashed lines).

Appendix A: Numbers at age matrix

```
Bio_Pattern Gender Year  0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34
35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
1 1 1916  8140.45 7514.58 6936.83 6403.5 5911.18 5456.71 5037.17 4649.9 4292.4 3962.38 3657.74 3376.52 3116.92 2877.28
2656.06 2451.86 2263.35 2089.33 1928.7 1780.41 1643.53 1517.17 1400.52 1292.84 1193.45 1101.69 1016.99 938.798 866.62
799.991 738.485 681.707 629.295 580.913 536.25 495.021 456.962 421.829 389.397 359.459 331.823 306.311 282.761 261.021
240.953 222.427 205.326 189.54 174.968 161.515 1938.66
1 1 1917  8140.45 7514.58 6936.83 6403.5 5911.18 5456.71 5037.17 4649.9 4292.4 3962.38 3657.74 3376.52 3116.92 2877.28
2656.06 2451.86 2263.35 2089.33 1928.7 1780.41 1643.53 1517.17 1400.52 1292.84 1193.45 1101.69 1016.99 938.798 866.62
799.991 738.485 681.707 629.295 580.913 536.25 495.021 456.962 421.829 389.397 359.459 331.823 306.311 282.761 261.021
240.953 222.427 205.326 189.54 174.968 161.515 1938.71
1 1 1918  8140.45 7514.58 6936.83 6403.5 5911.18 5456.71 5037.17 4649.9 4292.4 3962.38 3657.74 3376.52 3116.92 2877.28
2656.06 2451.86 2263.35 2089.33 1928.7 1780.41 1643.53 1517.17 1400.52 1292.84 1193.45 1101.69 1016.99 938.798 866.62
799.991 738.485 681.707 629.295 580.913 536.25 495.021 456.962 421.829 389.397 359.459 331.823 306.311 282.761 261.021
240.953 222.427 205.326 189.54 174.968 161.515 1938.75
1 1 1919  8140.45 7514.58 6936.83 6403.5 5911.18 5456.71 5037.17 4649.9 4292.4 3962.38 3657.74 3376.52 3116.92 2877.28
2656.06 2451.86 2263.35 2089.33 1928.7 1780.41 1643.53 1517.17 1400.52 1292.84 1193.45 1101.69 1016.99 938.798 866.62
799.991 738.485 681.707 629.295 580.913 536.25 495.021 456.962 421.829 389.397 359.459 331.823 306.311 282.761 261.021
240.953 222.427 205.326 189.54 174.968 161.515 1938.79
1 1 1920  8140.45 7514.58 6936.83 6403.5 5911.18 5456.71 5037.17 4649.9 4292.4 3962.38 3657.74 3376.52 3116.92 2877.28
2656.06 2451.86 2263.35 2089.33 1928.7 1780.41 1643.53 1517.17 1400.52 1292.84 1193.45 1101.69 1016.99 938.798 866.62
799.991 738.485 681.707 629.295 580.913 536.25 495.021 456.962 421.829 389.397 359.459 331.823 306.311 282.761 261.021
240.953 222.427 205.326 189.54 174.968 161.515 1938.83
1 1 1921  8140.45 7514.58 6936.83 6403.5 5911.18 5456.71 5037.17 4649.9 4292.4 3962.38 3657.74 3376.52 3116.92 2877.28
2656.06 2451.86 2263.35 2089.33 1928.7 1780.41 1643.53 1517.17 1400.52 1292.84 1193.45 1101.69 1016.99 938.798 866.62
799.991 738.485 681.707 629.295 580.913 536.25 495.021 456.962 421.829 389.397 359.459 331.823 306.311 282.761 261.021
240.953 222.427 205.326 189.54 174.968 161.515 1938.86
1 1 1922  8140.45 7514.59 6936.84 6403.51 5911.18 5456.71 5037.17 4649.9 4292.4 3962.38 3657.74 3376.52 3116.92 2877.28
2656.06 2451.86 2263.35 2089.33 1928.7 1780.41 1643.53 1517.17 1400.52 1292.84 1193.45 1101.69 1016.99 938.798 866.62
799.991 738.485 681.707 629.295 580.913 536.25 495.021 456.962 421.829 389.397 359.459 331.823 306.311 282.761 261.021
240.953 222.427 205.326 189.54 174.968 161.515 1938.89
1 1 1923  8140.45 7514.59 6936.84 6403.51 5911.18 5456.71 5037.17 4649.9 4292.4 3962.38 3657.74 3376.52 3116.92 2877.28
2656.06 2451.86 2263.35 2089.33 1928.7 1780.41 1643.53 1517.17 1400.52 1292.84 1193.45 1101.69 1016.99 938.798 866.62
799.991 738.485 681.707 629.295 580.913 536.25 495.021 456.962 421.829 389.397 359.459 331.823 306.311 282.761 261.021
240.953 222.427 205.326 189.54 174.968 161.515 1938.92
1 1 1924  8140.46 7514.59 6936.84 6403.51 5911.18 5456.71 5037.18 4649.9 4292.4 3962.38 3657.74 3376.52 3116.92 2877.28
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1 1 1964 8140.46 7514.6 6936.85 6403.52 5911.19 5456.72 5037.18 4649.91 4292.4 3962.39 3657.75 3376.53 3116.93 2877.28
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1 1 1967 8140.46 7514.6 6936.85 6403.52 5911.19 5456.72 5037.18 4649.91 4292.4 3962.39 3657.75 3376.53 3116.93 2877.28
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1 1 2005 12055.1 12451.9 6033.31 10360.5 6101.47 11240 10104.7 7350.51 934.086 1438.86 1681.18 3636.26 12754.4 712.612
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1 1 2006 5425.42 11128.2 11494.6 5569.44 9563.99 5632.37 10375.8 9327.85 6785.37 862.27 1328.24 1551.93 3356.69
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1 1 2007 8058.9 5008.29 10272.7 10610.8 5141.24 8828.67 5199.33 9578.07 8610.69 6263.69 795.975 1226.12 1432.61
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1 1 2008 8206.46 7439.3 4623.24 9482.86 9795.04 4745.97 8149.89 4799.59 8841.68 7948.67 5782.11 734.778 1131.85
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1 1 2009 8218.06 7575.51 6867.34 4267.79 8753.78 9041.96 4381.08 7523.3 4430.58 8161.9 7337.55 5337.56 678.285 1044.83
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1 1 2010 8228.96 7586.22 6993.08 6339.35 3939.66 8080.76 8346.78 4044.25 6944.88 4089.94 7534.38 6773.41 4927.19
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1 1 2011 8238.37 7596.29 7002.96 6455.43 5851.96 3636.77 7459.48 7705.05 3733.31 6410.93 3775.49 6955.11 6252.65
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1 1 2012 8245.27 7604.98 7012.26 6464.55 5959.11 5402.04 3357.16 6885.97 7112.66 3446.28 5918.04 3485.21 6420.38
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1 1 2013 8249.54 7611.35 7020.28 6473.13 5967.53 5500.95 4986.71 3099.05 6356.55 6565.81 3181.32 5463.04 3217.26
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1 1 2014 8251.67 7615.29 7026.16 6480.53 5975.45 5508.73 5078.02 4603.31 2860.78 5867.83 6061.01 2936.73 5043.02
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1 1 2015 8252.22 7617.25 7029.79 6485.96 5982.29 5516.04 5085.2 4687.6 4249.39 2640.84 5416.69 5595.01 2710.94 4655.29
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1 1 2016 8251.59 7617.76 7031.61 6489.32 5987.3 5522.35 5091.95 4694.23 4327.2 3922.69 2437.8 5000.24 5164.85 2502.51
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1 1 2017 8250.06 7617.18 7032.08 6491 5990.4 5526.97 5097.77 4700.46 4333.32 3994.51 3621.1 2250.37 4615.8 4767.76
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1 1 2018 8247.84 7615.77 7031.54 6491.43 5991.94 5529.83 5102.04 4705.83 4339.07 4000.16 3687.4 3342.69 2077.35
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1 1 2019 8245.09 7613.72 7030.24 6490.93 5992.34 5531.26 5104.68 4709.78 4344.03 4005.47 3692.61 3403.9 3085.69
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1 1 2020 8241.94 7611.18 7028.35 6489.73 5991.88 5531.63 5106 4712.21 4347.67 4010.05 3697.51 3408.71 3142.19 2848.45
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1 2 1916 8140.45 7514.58 6936.83 6403.5 5911.18 5456.71 5037.17 4649.9 4292.4 3962.38 3657.74 3376.52 3116.92 2877.28
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799.992 738.486 681.709 629.296 580.914 536.251 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761 261.021
240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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799.993 738.486 681.709 629.296 580.914 536.251 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761 261.021
240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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2656.07 2451.86 2263.35 2089.34 1928.7 1780.42 1643.53 1517.17 1400.52 1292.85 1193.45 1101.69 1016.99 938.8 866.622
799.993 738.486 681.709 629.296 580.914 536.251 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761 261.021
240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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5823.38 1279.29 2451.86 2263.35 2089.34 1928.7 1780.42 1643.53 1517.17 1400.52 1292.85 1193.45 1101.69 1016.99 938.8
866.622 799.993 738.486 681.709 629.296 580.914 536.251 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761
261.021 240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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5375.66 1180.93 2263.35 2089.34 1928.7 1780.42 1643.53 1517.17 1400.53 1292.85 1193.45 1101.69 1016.99 938.8 866.622
799.993 738.486 681.709 629.296 580.914 536.251 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761 261.021
240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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799.993 738.486 681.709 629.296 580.914 536.251 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761 261.021
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240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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866.622 799.993 738.486 681.709 629.296 580.914 536.251 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761
261.021 240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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1601.1 2036.95 3186.38 1376.55 1395.91 3903.53 857.534 1643.53 1517.17 1400.53 1292.85 1193.45 1101.69 1016.99 938.8
866.622 799.993 738.486 681.709 629.296 580.914 536.251 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761
261.021 240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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799.993 738.486 681.709 629.296 580.914 536.251 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761 261.021
240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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261.021 240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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866.622 799.993 738.486 681.709 629.296 580.914 536.251 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761
261.021 240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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799.993 738.486 681.709 629.296 580.914 536.251 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761 261.021
240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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866.622 799.993 738.486 681.709 629.296 580.914 536.251 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761
261.021 240.953 222.428 205.327 189.54 174.968 161.516 1939.26

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799.993 738.486 681.709 629.296 580.914 536.251 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761 261.021
240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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6751.35 1338.41 1827.26 4098.88 1272.13 1352.95 2796.81 1144.52 779.339 991.489 1550.98 670.038 679.463 1900.05 417.407
799.993 738.486 681.709 629.296 580.914 536.251 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761 261.021
240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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4559.82 6232.28 1235.51 1686.77 3783.75 1174.33 1248.93 2581.78 1056.53 719.42 915.26 1431.73 618.523 627.224 1753.97
385.315 738.486 681.709 629.296 580.914 536.251 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761 261.021
240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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1681.96 1171.1 4209.24 5753.12 1140.52 1557.08 3492.84 1084.04 1152.91 2383.28 975.298 664.109 844.892 1321.66 570.969
579 1619.12 355.691 681.709 629.296 580.914 536.251 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761
261.021 240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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1552.64 1081.06 3885.62 5310.8 1052.83 1437.37 3224.3 1000.69 1064.27 2200.05 900.313 613.05 779.933 1220.04 527.071
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3713.68 1433.27 997.949 3586.88 4902.49 971.886 1326.86 2976.4 923.758 982.446 2030.9 831.094 565.916 719.969 1126.24
486.547 493.392 1379.72 303.1 580.914 536.251 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761 261.021
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1698.36 3428.16 1323.07 921.223 3311.11 4525.57 897.164 1224.85 2747.56 852.736 906.912 1874.76 767.196 522.406 664.615
1039.65 449.14 455.458 1273.64 279.796 536.251 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761 261.021
240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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613.517 959.72 414.608 420.441 1175.72 258.284 495.022 456.963 421.83 389.398 359.46 331.823 306.311 282.761 261.021
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445.165 566.348 885.933 382.732 388.116 1085.33 238.427 456.963 421.83 389.398 359.46 331.823 306.311 282.761 261.021
240.953 222.428 205.327 189.54 174.968 161.516 1939.26
1 2 2006  5425.42 11128.2 11494.6 5569.44 9563.99 5632.37 10375.8 9327.85 6785.37 862.27 1328.24 1551.93 3356.69
11773.8 657.823 547.93 720.914 1335.98 2696.68 1040.77 724.659 2604.61 3559.94 705.734 963.498 2161.31 670.786 713.402
1474.74 603.498 410.939 522.805 817.82 353.306 358.276 1001.88 220.095 421.83 389.398 359.46 331.823 306.311 282.761
261.021 240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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3098.61 10868.6 607.247 505.803 665.488 1233.26 2489.35 960.748 668.945 2404.36 3286.24 651.475 889.421 1995.14 619.213
658.553 1361.35 557.099 379.345 482.61 754.943 326.142 330.73 924.855 203.174 389.398 359.46 331.823 306.311 282.761
261.021 240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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1322.46 2860.38 10033 560.56 466.915 614.323 1138.44 2297.96 886.882 617.514 2219.5 3033.58 601.387 821.039 1841.75
571.606 607.921 1256.69 514.267 350.18 445.505 696.9 301.067 305.303 853.748 187.553 359.46 331.823 306.311 282.761
261.021 240.953 222.428 205.327 189.54 174.968 161.516 1939.26
1 2 2009 8218.06 7575.51 6867.34 4267.79 8753.78 9041.96 4381.08 7523.3 4430.58 8161.9 7337.55 5337.56 678.285 1044.83
1220.79 2640.46 9261.6 517.462 431.017 567.091 1050.92 2121.29 818.696 570.037 2048.86 2800.35 555.15 757.915 1700.15
527.659 561.182 1160.07 474.728 323.256 411.253 643.32 277.92 281.83 788.109 173.133 331.823 306.311 282.761 261.021
240.953 222.428 205.327 189.54 174.968 161.516 1939.26
1 2 2010 8228.96 7586.22 6993.08 6339.35 3939.66 8080.76 8346.78 4044.25 6944.88 4089.94 7534.38 6773.41 4927.19
626.136 964.499 1126.93 2437.46 8549.53 477.678 397.879 523.491 970.117 1958.2 755.751 526.211 1891.33 2585.04 512.468
699.643 1569.43 487.091 518.036 1070.88 438.229 298.403 379.634 593.859 256.553 260.162 727.516 159.822 306.311 282.761
261.021 240.953 222.428 205.327 189.54 174.968 161.516 1939.26
1 2 2011 8238.37 7596.29 7002.96 6455.43 5851.96 3636.77 7459.48 7705.05 3733.31 6410.93 3775.49 6955.11 6252.65
4548.37 577.997 890.345 1040.29 2250.06 7892.21 440.952 367.288 483.243 895.531 1807.64 697.646 485.754 1745.92 2386.3
473.068 645.852 1448.77 449.641 478.208 988.545 404.537 275.461 350.447 548.201 236.828 240.159 671.582 147.534 282.761
261.021 240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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5926.75 5328.15 3875.87 492.536 758.702 886.474 1917.37 6725.3 375.755 312.982 411.793 763.121 1540.37 594.495 413.932
1487.78 2033.47 403.122 550.359 1234.56 383.159 407.502 842.382 344.724 234.732 298.631 467.146 201.812 204.65 572.285
125.721 240.953 222.428 205.327 189.54 174.968 161.516 1939.26
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2969.9 5471.08 4918.51 3577.88 454.668 700.37 818.319 1769.96 6208.23 346.865 288.919 380.133 704.45 1421.94 548.788
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528.285 116.055 222.428 205.327 189.54 174.968 161.516 1939.26
1 2 2015 8252.22 7617.25 7029.79 6485.96 5982.29 5516.04 5085.2 4687.6 4249.39 2640.84 5416.69 5595.01 2710.94 4655.29
2741.57 5050.45 4540.35 3302.8 419.712 646.523 755.404 1633.88 5730.92 320.197 266.706 350.907 650.289 1312.62 506.595
352.73 1267.8 1732.81 343.518 468.985 1052.02 326.507 347.25 717.831 293.754 200.026 254.476 398.076 171.972 174.392
487.669 107.132 205.327 189.54 174.968 161.516 1939.26
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4297.38 2530.79 4662.15 4191.27 3048.86 387.443 596.816 697.325 1508.26 5290.31 295.579 246.201 323.928 600.292 1211.7
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160.984 450.175 98.8953 189.54 174.968 161.516 1939.26
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2310.11 3966.98 2336.21 4303.71 3869.03 2814.46 357.655 550.93 643.713 1392.3 4883.57 272.854 227.272 299.023 554.14
1118.54 431.692 300.576 1080.35 1476.6 292.726 399.643 896.475 278.231 295.907 611.695 250.321 170.451 216.851 339.218
146.545 148.607 415.564 91.2918 174.968 161.516 1939.26
1 2 2018 8247.84 7615.77 7031.54 6491.43 5991.94 5529.83 5102.04 4705.83 4339.07 4000.16 3687.4 3342.69 2077.35
4260.92 4401.19 2132.5 3661.98 2156.59 3972.82 3571.57 2598.07 330.157 508.573 594.222 1285.25 4508.1 251.876 209.798
276.033 511.535 1032.54 398.502 277.467 997.286 1363.07 270.221 368.917 827.55 256.839 273.157 564.666 231.075 157.346
200.178 313.137 135.278 137.181 383.614 84.273 161.516 1939.26

1 2 2019 8245.09 7613.72 7030.24 6490.93 5992.34 5531.26 5104.68 4709.78 4344.03 4005.47 3692.61 3403.9 3085.69
1917.64 3933.33 4062.81 1968.55 3380.44 1990.79 3667.38 3296.97 2398.32 304.773 469.472 548.536 1186.44 4161.5 232.511
193.668 254.811 472.207 953.156 367.864 256.134 920.611 1258.28 249.445 340.553 763.925 237.092 252.155 521.252 213.309
145.248 184.788 289.062 124.878 126.634 354.12 77.7938 1939.26
1 2 2020 8241.94 7611.18 7028.35 6489.73 5991.88 5531.63 5106 4712.21 4347.67 4010.05 3697.51 3408.71 3142.19 2848.45
1770.21 3630.92 3750.45 1817.2 3120.54 1837.73 3385.42 3043.49 2213.93 281.341 433.377 506.362 1095.22 3841.55 214.634
178.778 235.22 435.902 879.874 339.581 236.442 849.831 1161.54 230.267 314.37 705.192 218.864 232.769 481.176 196.909
134.081 170.581 266.838 115.277 116.898 326.894 1861.98

Appendix B: SS2 Data file

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#C Greenstriped rockfish assessment, 2009. A Hicks, M Haltuch, C Wetzel

1916 #_styr
2008 #_endyr
1 #_nseas
12 #_months/season
1 #_spawn_seas
5 #N fisheries
3 #N surveys
1 #N_areas
WO_TWL%CA_TWL%Foreign%OTH%Rec%earlyTri%lateTri%NWFSC
0.5 0.5 0.5 0.5 0.5 0.6 0.5 0.5 #timing_in_season
1 1 1 1 1 1 1 1 #_area_assignments_for_each_fishery_and_survey
1 1 1 1 1 #_units of catch:  1=bio; 2=num
0.01 0.01 0.01 0.01 0.01 #_se of log(catch) only used for init_eq_catch and for Fmethod 2 and 3
2 #_Ngenders
50 #_Nages

0 0 0 0 0 #_init_equil_catch_for_each_fishery
93          #_N_lines_of_catch_to_read
#WO-TWL     CA_TWL Foreign      Other  All_Rec      Year   Season
0.000000    0.206838    0.000000    1.287295    0.000000    1916   1
0.000000    0.321143    0.000000    2.084257    0.000000    1917   1
0.000000    0.376482    0.000000    1.982652    0.000000    1918   1
0.000000    0.261723    0.000000    1.147589    0.000000    1919   1
0.000000    0.267166    0.000000    1.251461    0.000000    1920   1
0.000000    0.220446    0.000000    1.114930    0.000000    1921   1
0.000000    0.189602    0.000000    1.079550    0.000000    1922   1
0.000000    0.204570    0.000000    1.398425    0.000000    1923   1
0.000000    0.117934    0.000000    1.872429    0.000000    1924   1
0.000000    0.084368    0.000000    2.133698    0.000000    1925   1
0.000000    0.301639    0.000000    2.627661    0.000000    1926   1
0.000000    0.494416    0.000000    2.277487    0.000000    1927   1
0.128931    0.667234    0.000000    1.961333    0.142972    1928   1
0.224276    1.454671    0.000000    1.890573    0.285718    1929   1
0.207636    1.197937    0.000000    1.988095    0.341918    1930   1
0.158899    1.475990    0.000000    2.416287    0.455815    1931   1
0.058645    1.524524    0.000000    1.851564    0.569757    1932   1
0.085209    2.238932    0.000000    1.268244    0.683654    1933   1
0.095751    1.935479    0.000000    1.207463    0.797597    1934   1
0.189520    1.909624    0.000000    1.025119    0.911494    1935   1
0.386220    1.348530    0.000000    0.584681    1.006068    1936   1
0.413546    1.981745    0.000000    0.531610    1.241029    1937   1
0.410689    1.990363    0.000000    0.570166    1.214993    1938   1
```

0.338487	2.617228	0.000000	0.717130	1.049159	1939	1
1.234997	2.123719	0.000000	0.859558	1.394706	1940	1
2.505555	1.635200	0.000000	1.412940	1.289064	1941	1
3.640470	0.314340	0.000000	0.687192	0.684834	1942	1
12.996952	1.774000	0.000000	0.803766	0.654942	1943	1
21.169484	9.776730	0.000000	1.050973	0.537779	1944	1
32.958021	23.677068	0.000000	2.401772	0.716948	1945	1
19.910900	24.321623	0.000000	2.780521	1.233862	1946	1
12.431419	9.707330	0.000000	1.841131	1.249511	1947	1
9.238229	9.177988	0.000000	2.418555	2.671387	1948	1
9.494813	15.377235	0.000000	2.246783	3.339846	1949	1
9.657031	15.582259	0.000000	2.151000	4.107460	1950	1
11.310997	20.551817	0.000000	2.598838	4.302732	1951	1
9.642494	11.824699	0.000000	1.486098	4.343419	1952	1
8.962830	12.294168	0.000000	1.088164	4.152684	1953	1
11.453113	10.979657	0.000000	1.325416	6.775445	1954	1
11.007927	9.422474	0.000000	0.887469	10.802801	1955	1
16.540943	7.540066	0.000000	1.047198	12.441993	1956	1
16.530095	8.198229	0.000000	1.136870	8.616032	1957	1
17.789249	11.569781	0.000000	1.119794	8.486759	1958	1
1.479384	8.466302	0.000000	1.415691	6.710627	1959	1
16.725012	5.497086	0.000000	1.705533	6.267240	1960	1
15.710971	3.196012	0.000000	1.151243	5.564172	1961	1
2.510220	2.725183	0.000000	1.045791	5.750009	1962	1
2.843932	5.316103	0.000000	1.277806	5.312882	1963	1
4.607643	2.705678	0.000000	0.957266	5.956756	1964	1
2.171382	5.394574	0.000000	1.179347	7.923488	1965	1
100.974050	18.519141	111.000000	0.905762	11.365210	1966	1
52.714036	102.244837	143.000000	1.027412	14.531512	1967	1
22.091180	36.540297	41.000000	1.044301	14.854061	1968	1
41.355214	13.708015	37.000000	0.937563	13.866682	1969	1
48.735581	18.238496	44.000000	0.927221	19.644541	1970	1
49.411813	15.592238	9.000000	1.159836	17.507532	1971	1
68.890640	27.894792	14.000000	1.742749	21.800420	1972	1
25.677728	35.850169	35.000000	2.039207	27.822948	1973	1
15.191105	38.305473	13.000000	3.611005	31.618427	1974	1
22.400987	61.643246	21.000000	2.486301	31.919930	1975	1
29.632708	64.321033	13.000000	4.265129	28.122228	1976	1
12.330196	57.334529	0.000000	3.052775	26.410008	1977	1
54.583324	11.286739	0.000000	7.075718	24.265786	1978	1
23.108548	13.139664	0.000000	8.056267	31.994485	1979	1
25.261276	131.474656	0.000000	3.523705	23.404743	1980	1
6.264192	10.229869	0.000000	10.410852	14.677474	1981	1
98.590500	59.754898	0.000000	3.748941	16.072291	1982	1
66.887771	22.704566	0.000000	1.236039	22.312702	1983	1
76.929174	22.875117	0.000000	3.233206	46.398345	1984	1
39.081161	45.316146	0.000000	8.080748	23.404875	1985	1
40.846914	11.236844	0.000000	9.144422	30.389683	1986	1

```
91.846700    22.527211    0.000000    5.084333     10.183350    1987   1
109.273300   119.638616   0.000000    5.635432     17.170577    1988   1
177.965400   74.919398    0.000000    23.747829    4.649984     1989   1
61.385700    47.914776    0.000000    15.190355    9.082392     1990   1
79.138400    29.551089    0.000000    17.689657    9.119499     1991   1
85.993100    4.890633     0.000000    13.357810    9.504342     1992   1
117.726900   17.166657    0.000000    10.588250    4.261421     1993   1
139.202200   34.878532    0.000000    10.684406    11.604128    1994   1
117.220200   22.228294    0.000000    9.141253     10.037456    1995   1
122.825700   14.027344    0.000000    11.331666    6.396238     1996   1
100.312000   46.976747    0.000000    13.480286    4.159257     1997   1
125.179400   40.161068    0.000000    9.335813     4.563740     1998   1
40.094500    17.018786    0.000000    1.916858     10.999129    1999   1
5.656700     5.146459     0.000000    0.430500     9.453923     2000   1
10.116100    2.961958     0.000000    0.502164     6.577154     2001   1
15.287400    2.228953     0.000000    0.149710     1.380499     2002   1
2.627600     0.079832     0.000000    0.009500     0.264404     2003   1
2.808200     0.176901     0.000000    0.015000     0.657211     2004   1
2.782800     0.083007     0.000000    0.011793     1.566750     2005   1
5.709800     1.839771     0.000000    0.082100     1.016868     2006   1
0.754300     0.212281     0.000000    0.008618     1.318406     2007   1
1.615200     0.065771     0.000000    0.041723     1.673739     2008   1


#Abundance indices
15
#Year  Seas   Fleet  Value  SE(log(B))
1980   1      6      1575   0.3038
1983   1      6      3084   0.2314
1986   1      6      3944   0.2457
1989   1      6      5044   0.2569
1992   1      6      5184   0.2506
1995   1      7      4583   0.2417
1998   1      7      4545   0.2541
2001   1      7      5546   0.2402
2004   1      7      5551   0.2544
2003   1      8      14377  0.2211
2004   1      8      10012  0.2363
2005   1      8      17807  0.2296
2006   1      8      11083  0.2095
2007   1      8      14547  0.2245
2008   1      8      20636  0.2294


#_Discards
1      #disc_type   #(1=biomass,2=fraction)
18     #nobs_disc
```

```
#Year  Seas   Fleet  Biomass      CV
2002   1      1      43.86177056  0.5
2003   1      1      53.29386781  0.5
2004   1      1      10.20911305  0.5
2005   1      1      50.47125921  0.5
2006   1      1      22.37683188  0.5
2007   1      1      10.48218693  0.5
2002   1      2      17.40984386  0.5
2003   1      2      14.05822074  0.5
2004   1      2      3.348662521  0.5
2005   1      2      11.49649226  0.5
2006   1      2      13.02483862  0.5
2007   1      2      10.87963754  0.5
2002   1      4      1.913925787  0.5
2003   1      4      1.317844337  0.5
2004   1      4      4.680108314  0.5
2005   1      4      2.042349887  0.5
2006   1      4      0.512297389  0.5
2007   1      4      0.541259598  0.5


#_Mean_BodyWt
18     #nobs_mnwt   #N_observations
#from Eliza Heery. Observer data.
#converted pounds to kilograms
#cv's: double the between year cv
#YEAR  SEASON Fleet  Partition    Value  CV
2002   1      1      1      0.246346343  0.26
2003   1      1      1      0.279586332  0.26
2004   1      1      1      0.242089111  0.26
2005   1      1      1      0.342013119  0.26
2006   1      1      1      0.29432019   0.26
2007   1      1      1      0.286386059  0.26
2002   1      2      1      0.186162224  0.19
2003   1      2      1      0.17486449   0.19
2004   1      2      1      0.211989129  0.19
2005   1      2      1      0.184787021  0.19
2006   1      2      1      0.200210541  0.19
2007   1      2      1      0.225933345  0.19
2002   1      4      1      0.502204958  0.23
2003   1      4      1      0.503522616  0.23
2004   1      4      1      0.364592765  0.23
2005   1      4      1      0.48506137   0.23
2006   1      4      1      0.430045559  0.23
2007   1      4      1      0.448477454  0.23
```

```
#Population length bins
2      # length bin method: 1=use databins; 2=generate from binwidth,min,max below; 3=read vector
1      # binwidth for population size comp
5      # minimum size in the population (lower edge of first bin and size at age 0.00)
45     # maximum size in the population (lower edge of last bin)

#Length bins
-1     #min_tail     #min_proportion_for_compressing_tails_of_observed_composition
0.0001 #min_comp     #constant_added_to_expected_frequencies
0 #_combine males into females at or below this bin number
#_Length_Composition_Data



31     #nlength      #N_length_bins



#len_bins(1,nlength)       #_lower_edge_of_length_bins
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

#LENGTH_COMPOSITIONS:Replicates_(by_state)_must_be_contigent_within_Year-Seas-Fleet-Sex



#lendata(1,nobsl,1,6+gender*nlength)    #Sorted_by_year_fleet_mkt:_0:Survey_1:Discard_2:Fisheries
120    #nobs length
#WO LFs


                                                                                                    nTows
#7     year   Season Fleet  gender partition     nSamps F10    F11    F12    F13    F14    F15    F16    F17    F18    F19    F20
       F21    F22    F23    F24    F25    F26    F27    F28    F29    F30    F31    F32    F33    F34    F35    F36    F37    F38
       F39    F40    M10    M11    M12    M13    M14    M15    M16    M17    M18    M19    M20    M21    M22    M23    M24    M25
       M26    M27    M28    M29    M30    M31    M32    M33    M34    M35    M36    M37    M38    M39    M40

       -1995  1      1      3      2      7      0      0      0      0      0      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0      0      30     0      0      30     0      0      0
       0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0             #      1
       1998   1      1      3      2      196    0      0      0      0      0      0      0      0      0      0      0      0      0
       0      0      45.66  18.9   114.898715    66.14  204.576145    226.451004    364.927149    431.252289    461.089719
       527.373574    371.59743     231.52 80.278715     48.778715     0      0      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      23.62  40.94  83.46  220.398715    155.81743     152.533574    154.113574    105.52
       36.178715     12.6   25.2   0      0      0      0      0      0                    #      28
       1999   1      1      3      2      133    0      0      0      0      0      0      0      0      0      0      0      0      0
       22.684825     0      11.221996     102.561633    124.087706    288.946739    293.714797    444.585349    481.89076
```

417.041034 596.841541 239.747973 302.458316 126.150716 99.510716 29.343478 6.3 0 0 0 0
0 0 22.68482 0 0 0 0 0 0 0 0 28.984825 127.937661 165.2674
160.426299 264.656245 277.106665 125.903121 168.24439 51.567451 20.553224 19.28 0 0 0 0
19.28 0 # 19
2000 1 1 3 2 49 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 6.3 6.3 53.732471 85.126166 139.177551 181.528025 356.862355 366.966072
382.320992 415.829155 151.564942 89.995554 37.8 12.6 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 12.6 0 0 12.6 31.5 48.863083 12.6 25.2 12.6 12.6 0
0 0 6.3 0 0 # 7
2001 1 1 3 2 70 0 0 0 0 0 0 0 0 0 0 0 0
2.998353 4.497529 8.995058 21.595058 12.177082 4.497529 41.099951 35.797441 90.079915
55.85427 120.822695 141.777402 107.19556 47.743724 57.633858 41.56256 4.661355 6.3
4.661355 0 0 0 0 0 0 0 0 0 0 0 1.499176 0
1.499176 7.495881 35.39094 106.302486 54.025616 61.734798 53.741227 10.103186 23.247064
6.3 6.3 3.070866 0 0 0 0 0 # 10
2002 1 1 3 2 273 0 0 0 0 0 0 0 0 0 0 0 0 0
0 18.9 25.2 69.3 113.4 257.28143 485.1 740.462562 986.960501 1145.842105 1026.655237 1088.763158
704.58143 554.021053 296.49486 114.434483 37.8 11.960377 0 0 0 0 0 6.3 12.6
12.6 6.3 6.3 18.9 6.3 44.1 94.5 88.2 233.1 478.8 762.3 945.655535 918.520755 704.960377 359.1
239.4 126 56.7 50.4 0 0 6.3 6.3 0 # 39
2003 1 1 3 2 140 0 0 0 0 6.3 0 0 25.2 25.2 0 40.061111
21.16111 14.861111 42.639867 27.569444 65.338748 62.930386 78.499773 50.523398 29.362287
178.474948 144.604313 182.649252 180.535205 159.47041 107.316667 56.7 25.2 0 0 0 0 0
0 0 0 0 6.3 25.2 29.72222 40.27042 18.9 25.2 33.904423 61.981776 49.149178
77.814159 156.90309 185.383293 176.929138 164.105628 56.606918 52.463492 39.863492 2.063492
6.3 0 0 0 0 0 0 # 20
2004 1 1 3 2 84 0 0 0 0 0 0 0 0 0 6.3 1.048387
6.3 6.3 12.641463 0 7.348387 21.927826 35.600473 18.941463 67.100473 52.438107
52.446387 161.584494 227.848387 351.523826 196.380927 76.689851 57.698 37.8 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 6.341463 20.938107 26.231183 13.58972
25.2 83.031314 89.248387 81.941463 37.8 32.589851 12.6 6.3 0 0 0 0 0 0
12
-2005 1 1 3 2 7 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 32.666667 81.666667 125.801418 58.035461 27.801418 0 13.900709
13.900709 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 41.702128 30.234043 13.900709 0 16.333333 0 0 0
0 0 0 0 0 # 1
2006 1 1 3 2 56 0 0 0 0 0 0 0 0 0 0 0 0 0
0 30.798 70.292308 7.342154 27.746394 102.030702 109.483337 166.704654 81.171835 297.948676
223.589137 215.697926 77.038642 49.049272 76.754863 12.36 4.12 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 30.798 89.4 140.58462 305.359779 154.346154 30.815625
30.798 60.598 4.12 0.998 0 0 5.346154 0 0 0 0 # 8
2007 1 1 3 2 35 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 3.340538 1.996 9.716689 7.027613 2.689076 11.61844 5.296634 8.956537
10.957903 2.634731 0 0.998 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 2.689076 2.689076 2.994 7.027613 6.029613 3.340538 2.342538 0
0.998 1.111111 0 0.998 0 0 0 0 0 # 5

```
2008 1 1 3 2 56 0 0 0 0 0 0 0 0 0 0 0 0 0
30 30 0 120 150 181.311475 210 204.398154 197.972218 154.38332 231.833283 76.091889
29.26882 47.895589 11.116279 11.658537 0 1.034483 0 0 0 0 0 0 0 0
0 0 30 0 0 60 60 31.311475 120 60 60 30 12.150762 0 11.658537 0
0 0 0 0 0 0 0 # 8
#WO LFs

nTows
#6 year Season Fleet gender partition nSamps F10 F11 F12 F13 F14 F15 F16 F17 F18 F19 F20
F21 F22 F23 F24 F25 F26 F27 F28 F29 F30 F31 F32 F33 F34 F35 F36 F37 F38
F39 F40 M10 M11 M12 M13 M14 M15 M16 M17 M18 M19 M20 M21 M22 M23 M24 M25
M26 M27 M28 M29 M30 M31 M32 M33 M34 M35 M36 M37 M38 M39 M40

1996 1 1 0 2 198 0 0 0 0 0 0 0 6.28 0 0 0 6.76
12.56 50.34 101.08 153.04 220.16 310.74 346.72 379.78 515.74 465.58 441.6 446 467.66 488.36 240.32 232.92 124.22 18.9 0
0 0 0 0 0 0 0 6.28 0 0 0 6.76 12.56 50.34 101.08 153.04 220.16 310.74
346.72 379.78 515.74 465.58 441.6 446 467.66 488.36 240.32 232.92 124.22 18.9 0 # 33
1997 1 1 0 2 180 0 0 0 0 0 0 0 0 0 12.6 0 0
180.316206 274.690514 752.764822 920.20365 994.443915 885.18433 985.04448 590.211769 838.137498
793.750174 671.925238 729.715903 526.759849 286.66 113.4 55.2 12.6 6.3 0 0 0 0 0
0 0 0 0 12.6 0 0 180.316206 274.690514 752.764822 920.20365 994.443915
885.18433 985.04448 590.211769 838.137498 793.750174 671.925238 729.715903 526.759849 286.66 113.4
55.2 12.6 6.3 # 30
#CA commercial LFs. 2003-2007 has bothsex LFs.

#
#3 year Season Fleet gender partition nSamps F10 F11 F12 F13 F14 F15 F16 F17 F18 F19 F20
F21 F22 F23 F24 F25 F26 F27 F28 F29 F30 F31 F32 F33 F34 F35 F36 F37 F38
F39 F40 M10 M11 M12 M13 M14 M15 M16 M17 M18 M19 M20 M21 M22 M23 M24 M25
M26 M27 M28 M29 M30 M31 M32 M33 M34 M35 M36 M37 M38 M39 M40 #

1978 1 2 3 2 75 0 0 0 0 0 0 0 0 0 0 0 0 0
0 30 0 0 0 0 0.00E+00 36.7 115.087481 16.76923 170.4484 110.01827
129.99174 166.769231 103.40485 23.469231 0 16.76923 0 0 0 0 0 0 0 0
0 0 0 0 19.95098 6.7 0 0 26.8 53.469231 103.4 83.63846 208.58748 0
30 0 36.869231 0 0 0 16.76923 0 0 # 25 FM 1978
1979 1 2 3 2 36 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 30 0 6.511111 0 36.511111 66.51111 60 13.02222 39.89048 113.98413
76.40159 26.868254 0 6.511111 1.547619 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 30 6.511111 6.511111 6.511111 50.35714 39.89048
101.81343 0 13.02222 13.022222 6.511111 6.511111 6.511111 0 0 0 #
12 FM 1979
1982 1 2 3 2 84 0 0 0 0 0 0 0 0 0 0 0 0 0
60 30 0 90 30 90 60 102.80135 80.36 213.8628 162.86635 320.62074 126.60857
194.624341 60 30 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

30 30 30 44.257778 123.464286 43.242063 80.08582 118.78632 60 0 16.27357 0
8.72 0 0 0 0 0 # 28 FM 1982
1983 1 2 3 2 168 0 0 0 0 0 0 0 0 0 0 0 0 0
6.416667 18.83333 0 38.878205 30 266.991699 146.471698 166.83087 270.211029 301.57851
393.87772 317.84975 54.93722 25.883187 42.45699 18.242408 4.692308 0 0 0 0 0
0 0 0 0 0 0 0 0 0 48.83333 30 123.695402 86.521739 122.198179
238.719715 237.08534 268.28455 30 83.414872 18.83333 30 57.625187 0 0 0 0 0
56 FM 1983
1984 1 2 3 2 150 0 0 0 0 0 0 0 0 0 0 0 0 0
0 15.66667 0 13.396226 44.465316 152.704338 119.8719 275.64105 185.0431 201.66246
292.43806 341.17626 85.5371 110.82907 5.8 1.118812 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 30 2.963636 55.379284 112.133858 96.56518
94.17528 80.68674 22.291528 90 0 0 0 0 0 0 0 # 50 FM
1984
1985 1 2 3 2 246 0 0 0 0 0 0 0 0 0 0 30
62.616863 29.69551 41.076863 68.86069 57.490196 129.364717 160.958563 316.00972 273.528571
468.78892 583.279547 641.6573 520.60067 475.4446 250.34034 199.906405 41.50305 13.49619 0
0 0 0 0 0 0 0 0 0 0 17.86 0 18.9 27.36 21.79333 59.29959
103.273333 188.318343 173.328876 310.087778 180.79948 245.69259 181.56884 90 13.63636 30 0
0 0 0 0 0 # 82 FM 1985
1986 1 2 3 2 129 0 0 0 0 0 0 0 0 0 0 0
30 0 51.68627 44.894737 99.387407 62.385628 149.631765 188.179051 283.58649 185.172542
309.39356 224.61828 139.18886 93.26281 15.921569 30 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 62.59615 10.48 60 121.38723 115.892999
111.38883 76.463 48.83068 13.802241 0 38.169071 2.22 0 0 0 0 0 #
43 FM 1986
1987 1 2 3 2 126 0 0 0 0 0 0 0 0 0 0 0 0 0
30 47.50962 23.017145 90 31.048544 176.28314 290.788462 196.26637 260.721321 423.10647
329.41913 300.25437 282.43962 174.93 64.38614 0 29.32 0 0 0 0 0 0 0 0
0 0 0 0 0 30 0 0 45.643499 84.93 245.072043 35.300971 78.55816
65.39737 84.93 30 17.50962 0 7.54902 0 0 0 0 0 # 42 FM
1987
1988 1 2 3 2 120 0 0 0 0 0 0 0 0 0 0 0 0 0
21.06383 29.87 68.676566 60 156.210196 111.02 120 247.75569 150.22 339.73524 179.84 124.87388
123.10383 30 30 30 0 0 0 0 0 0 0 0 0 0 0 0 0
30 30 0 30 0 210 183.06 132.04 63.06 83.26242 60 30 38.70076 62.242424 30
60 0 0 0 0 # 40 FM 1988
1989 1 2 3 2 99 0 0 0 0 0 0 0 0 0 0 0 0 0
30 0 131.44 165.728627 131.44 287.796669 193.75451 196.49499 98.577255 269.39604 188.39803
164.62657 94.28863 90 60 30 0 120 0 0 0 0 0 0 0 0 0 0
0 0 30 30 54.88636 0 41.44 94.288627 142.145882 132.86588 215.71451 60
90.283137 0 30 0 0 0 0 0 0 # 33 FM 1989
1990 1 2 3 2 132 0 0 0 0 0 0 0 0 0 0 0 0 0
60 30 120 106.74 206.883495 272.831957 180 60 303.727409 216.49966 308.52801 203.03329
86.8835 120 47.33 30 30 0 0 0 0 0 0 0 0 0 0 0 0 0
30 90 120 253.53 145.824176 180 327.517843 58.10784 31.5289 33.42105 3.421053 30
2.126437 2.126437 0 0 0 0 0 # 44 FM 1990

1991 1 2 0 2 141 0 0 0 0 0 0 0 0 0 0 0 0
20.82 48.52857 90 60 78.496522 158.81296 306.884141 269.498467 297.2265 309.691498
233.48917 232.55494 143.16404 69.88 68.38 24.627451 24.627451 0 0 0 0 0 0 0
0 0 0 0 0 0 0 20.82 48.52857 90 60 78.496522 158.81296 306.884141
269.498467 297.2265 309.691498 233.48917 232.55494 143.16404 69.88 68.38 24.627451 24.627451 0
0 # 47 B 1991
1992 1 2 0 2 69 0 0 0 0 0 0 0 0 0 0 0 0
30 24.375 78.75 54.375 134.888614 158.67157 238.026468 96.24 30 69.87415 33.08163 11.19346
81.66327 30 0 0 0 30 0 0 0 0 0 0 0 0 0 0
0 30 24.375 78.75 54.375 134.888614 158.67157 238.026468 96.24 30 69.87415 33.08163
11.19346 81.66327 30 0 0 0 30 0 # 23 B 1992
1993 1 2 3 2 45 0 0 0 0 0 0 0 0 0 0 30 30 0
60 90 0 95.08 125.08 90 130.16 60.4 0 100.16 70.48 30 0 5.08 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 64.147059 30 130.16
44.170909 0 0 0 0 0 0 0 0 0 0 0 0 # 15 FM
1993
1994 1 2 3 2 57 0 0 0 0 0 0 0 0 0 0 30 30 0
0 90 2.28 90 97.717391 34.92 2.28 120 122.46 128.39914 62.46 40.80154 32.46 30
15.48077 4.92 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
60 60 85.198367 105.480769 75.480769 97.38 120 60 15.48077 0 0 0 0 0 0
0 0 0 # 19 FM 1994
1995 1 2 3 2 48 0 0 0 0 0 0 0 0 0 0 0 0 0
0 67.11 1.68 35.04 36.72 38.66 46.03 132.34653 83.300297 97.04653 40.73 72.15 1.81 1.68 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 30 1.81 3.62 3.49 6.85
45.77 91.94 10.21 8.79 15.38 3.49 8.69 0 0 0 0 0 1.81 0 0 # 16
FM 1995

1996 1 2 3 2 51 0 0 0 0 0 0 0 0 0 0 0 0 0
0 30 74.509804 90 133.529412 43.529412 119.019608 205.82757 143.745098 104.9334
120.98107 9.4 18.0665 1.757282 10.21569 9.153061 9.153061 0 0 0 0 0 0
0 0 0 0 0 0 0 0 30 60 80.889804 29.019608 104.509804 113.745098
91.64857 14.5098 10.91034 1.757282 0 0 0 0 0 0 0 0 #
17 FM 1996
1997 1 2 3 2 90 0 0 0 0 0 0 0 0 0 0 0 0 0
60 77.68 89.3 227.008421 273.54 217.205 340.606809 371.39961 257.099608 391.384 388.22246
295.80471 146.43798 10.219592 18.01881 16.259608 0 0 0 0 0 0 0 0 0
0 0 0 30 0 8.84 126.965 167.68 239.06 298.125 216.965 139.06 181.6 30
106.25961 0 56.34 0 0 0 0 0 0 0 # 30 FM 1997
1998 1 2 3 2 84 0 0 0 0 0 0 0 0 0 0 0 0
18.584906 78.5 55.5 90 277 341.691373 336.364906 338.344906 277.76 221.76 231.5 289.62626
284.39265 128.06626 143.917574 0 60 23.252525 0 0 0 0 0 0 0 0 0
0 0 60 30 60 30 288.5 262.52 259.78 574.02 351.48 318.62626 180 90 85.22 0 0 0
0 0 0 0 0 # 28 FM 1998
1999 1 2 3 2 84 0 0 0 0 0 0 0 0 0 0 37.38 0
30 39.7 88.30941 23.360784 63.470196 98.750196 274.200784 185.511978 126.34925 348.738824
191.1 94.36072 35.13131 65.91412 0 0 0 0 0 0 0 0 0 0 0 0
0 0 9.7 0 0 0 30 99.26 125.58 420.569412 371.668235 412.918824 243.02941
105.86941 18.52 7.38 0 0 0 0 0 0 0 0 # 28 FM 1999

```
2000	1	2	3	2	51	0	0	0	0	0	0	0	0	0	0.998	0	0
12.26	34.38	13.78	3.04	18.94	15.954593	22.228396	74.063187	60.87061	176.928319	79.13909
159.49862	131.15116	71.19724	72.152329	47.63812	17.04006	0	0	0	0	0	0	0
0	0	0	0	0	0	12.26	0	2.12	12.26	2.12	26.3	31.2	60.696	38.68	68.46	32.59703
5.18	14.38	0	0	2.12	0	0	0	0		#	17	FM	2000
2001	1	2	3	2	39	0	0	0	0	0	0	0	0	0	0	0	0
20.88	80.8	97.52	36.48	28.524242	22.224242	13.142485	28.030727	52.91013	47.938182	30.04497
64.74867	37.92648	33.96873	28.554	9.518	0	4.26	0	0	0	0	0	0	0
0	0	0	0	2.14	59.66	2.14	13.984242	28.724242	32.884242	50.948421	10.92224	13.058
4.16	0	0	0	0	0	0	0	0	0		#	13	FM	2001
2002	1	2	3	2	39	0	0	0	0	0	0	0	4	3.769231	7.538462	1
2.769231	3.769231	18.449231	19.76	21.4	7.777778	4	4.769231	1	6.56	5.26	1	7.12
25.66	15.18	2.86	3	1.86	1.86	0	0	0	0	0	0	0	0	2	5.769231	3	4
2	0	22.44923	40.56	17.68	11.098462	18.529231	55.909231	24.16	28.72	16.6	0	0	0	0
0	0	0	0	0		#	13	FM	2002
#CA commercial LFs. 2003-2007 has bothsex LFs.

																		#

#1	year	Season	Fleet	gender	partition	nSamps	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19	F20
	F21	F22	F23	F24	F25	F26	F27	F28	F29	F30	F31	F32	F33	F34	F35	F36	F37	F38
	F39	F40	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25
	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36	M37	M38	M39	M40		#

1980	1	2	0	2	28	0	0	0	0	0	0	0	0	0	0	13.36	0
30	0	30	16.34146	53.173077	143.17308	0	145.632653	210	175.632653	150	66.68
79.71571	47.23913	62.861772	60	30	0	0	0	0	0	0	0	0	0	0
0	13.36	0	30	0	30	16.34146	53.173077	143.17308	0	145.632653	210	175.632653
150	66.68	79.71571	47.23913	62.861772	60	30	0	0		#	28	B	1980
1981	1	2	0	2	13	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	110.55556	118.411111	116.18644	0.998	165.78644	32.64783	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	110.55556	118.411111	116.18644	0.998	165.78644	32.64783	0	0	0
0	0		#	13	B	1981
2003	1	2	0	2	4	0	0	0	0	0	0	0.998	11.982	17.98	15.974	10.986
5.99	2.998	4.992	1	1.998	2.996	1.252747	1.252747	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0.998	11.982	17.98	15.974	10.986	5.99	2.998	4.992	1
1.998	2.996	1.252747	1.252747	0	0	0	0	0	0	0	0	0	0	0		#
4	B	2003
2004	1	2	0	2	8	0	0	0	0	0	0	1	0	5	21	36	39
22	25	15	27.32	20	6	4	5	0	0	4.48	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	5	21	36	39	22	25	15	27.32	20	6	4
5	0	0	4.48	0	0	0	0	0	0	0	0		#	8	B	2004
2005	1	2	0	2	5	0	0	0	0	0	0	0	0	0	0	0	0.998	0
0	0	0	3.992	12.974	6.986	4.99	1.996	2.994	1	18.36308	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0.998	0	0	0	0	3.992	12.974
```

```
6.986	4.99	1.996	2.994	1	18.36308	0	0	0	0	0	0	0		#	5	B
	2005
	2006	1	2	0	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	16.66667	12.5	37.5	16.66667	33.333333	30.164667	20.83333	4.166667	0	0	1.998	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	16.66667	12.5	37.5	16.66667	33.333333	30.164667	20.83333	4.166667	0	0	1.998	0	0
	0	0	0	0		#	3	B	2006
	2007	1	2	0	2	5	0	0	0	0	0	0	0	0	19.375	0	0	0	0
	0	0	0.998	0	1.996	1.998	9.998	10	6	2.04	5	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	19.375	0	0	0	0	0	0	0.998	0	1.996	1.998
	9.998	10	6	2.04	5	3	0	0	0	0	0	0	#	5	B	2007
	-2008	1	2	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.998	0	0	0	0	0	0	0.998	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.998	0	0	0
	0	0	0	0.998	0	0	0	0	0	0	0		#	2	B	2008
#OTH LFs: all bothsex LFs


																#
#2	year	Season	Fleet	gender	partition	nSamps	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19	F20
	F21	F22	F23	F24	F25	F26	F27	F28	F29	F30	F31	F32	F33	F34	F35	F36	F37	F38
	F39	F40	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25
	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36	M37	M38	M39	M40		#	nTows

	-1978	1	4	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.5	0	0	0	0	0	0	0	0	0	0	0		#	1	-1978
	1979	1	4	0	2	12	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.016030218	0.016030218	0	0.02058917	0.029070972	0.056091647	0	0	0	0
	0.072437551	0	0.144875119	0.144875106	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0.016030218	0.016030218	0	0.02058917	0.029070972	0.056091647	0	0	0
	0	0.072437551	0	0.144875119	0.144875106	0		#	6	1979
	1980	1	4	0	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.135685726	0.057157143	0	0.192842845	0	0	0.057157143	0.057157143	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0.135685726	0.057157143	0	0.192842845	0	0	0.057157143	0.057157143	0	0	0	0	0
	0	0		#	2	1980
	1981	1	4	0	2	10	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.082125154	0	0	0	0.16436565	0	0	0	0.109364367	0.144144829	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.082125154	0
	0	0	0.16436565	0	0	0	0.109364367	0.144144829	0	0	0	0	0	0	0	0
		#	5	1981
	1983	1	4	0	2	10	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0.214135582	0	0.124860897	0	0	0	0.124860897	0	0
	0.036142625	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0.214135582	0	0.124860897	0	0	0	0.124860897	0	0	0.036142625	0
		#	5	1983
```

1984 1 4 0 2 10 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0.040862442 0.003661121 0.040862442 0 0.085386005 0.126248449 0.029439012 0.024254925 0.013958023
0.020593804 0 0.010296902 0 0 0 0.034812291 0.069624583 0 0 0 0 0 0
0 0 0 0 0 0 0 0.040862442 0.003661121 0.040862442 0 0.085386005 0.126248449
0.029439012 0.024254925 0.013958023 0.020593804 0 0.010296902 0 0 0 0.034812291 0.069624583
5 1984
1985 1 4 0 2 34 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0.072446171 0.016411649 0.050923433 0.025465298 0.051092934 0.068790489 0.056382005
0.054063982 0.014999549 0.024057001 0.032647759 0 0.020691228 0.012028501 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0.072446171 0.016411649 0.050923433
0.025465298 0.051092934 0.068790489 0.056382005 0.054063982 0.014999549 0.024057001 0.032647759 0
0.020691228 0.012028501 0 # 17 1985
1986 1 4 0 2 12 0 0 0 0 0 0 0 0 0 0 0 0
0.025372853 0 0 0 0 0.038687992 0.038687992 0.057975461 0.038687992 0.10149297 0.038687992
0.057975461 0 0.087860693 0 0.014570595 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0.025372853 0 0 0 0.038687992 0.038687992 0.057975461 0.038687992
0.10149297 0.038687992 0.057975461 0 0.087860693 0 0.014570595 0 0 0 # 6
1986
1987 1 4 0 2 34 0 0 0 0 0 0 0 0 0 0.014009383 0 0
0 0 0 0.005818254 0.038189006 0.034791093 0.011084851 0.042584835 0.039036182 0.050059021
0.071845848 0.042715527 0.108418674 0.009576414 0.031870912 0 0 0 0 0 0 0 0
0 0 0 0 0.014009383 0 0 0 0 0 0.005818254 0.038189006 0.034791093
0.011084851 0.042584835 0.039036182 0.050059021 0.071845848 0.042715527 0.108418674 0.009576414 0.031870912 0
0 0 0 # 17 1987
1988 1 4 0 2 18 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0.023403677 0 0 0 0.027992082 0.013996041 0.040836768 0.130562123 0.027581441 0.141249782
0.067537359 0.026840727 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0.023403677 0 0 0 0.027992082 0.013996041 0.040836768 0.130562123
0.027581441 0.141249782 0.067537359 0.026840727 0 0 0 0 0 # 9 1988
1989 1 4 0 2 50 0 0 0 0 0 0 0 0 0 0 0 0 0
0.023338446 0.009991295 0 0.03164546 0.038437631 0.040796605 0.043213102 0.048610467 0.021393677
0.071450012 0.039158302 0.040607806 0.023196551 0.017237547 0.007669656 0 0.006187761 0.037065681 0 0
0 0 0 0 0 0 0 0 0 0 0 0.023338446 0.009991295 0 0.03164546
0.038437631 0.040796605 0.043213102 0.048610467 0.021393677 0.071450012 0.039158302 0.040607806 0.023196551
0.017237547 0.007669656 0 0.006187761 0.037065681 # 25 1989
1990 1 4 0 2 8 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0.014831262 0.099333869 0 0 0 0 0.099333869 0.097444366 0 0 0
0.189056633 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0.014831262 0.099333869 0 0 0 0 0.099333869 0.097444366 0 0 0
0.189056633 0 0 0 0 # 4 1990
1991 1 4 0 2 14 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0.10184781 0 0.20369562 0.009558532 0.13579708 0 0.009558532 0 0.034330011 0 0
0.005212415 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0.10184781 0 0.20369562 0.009558532 0.13579708 0 0.009558532 0 0.034330011 0 0
0.005212415 0 0 0 0 0 # 7 1991
1992 1 4 0 2 36 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0.01430957 0.027810104 0.05288389 0.031500526 0.099155201 0.077004823 0.065808303 0.040359532
0.015355394 0.010659887 0.027501854 0.021173213 0.004842067 0 0 0 0.011635636 0 0 0 0

0 0 0 0 0 0 0 0 0 0 0.01430957 0.027810104 0.05288389 0.031500526
0.099155201 0.077004823 0.065808303 0.040359532 0.015355394 0.010659887 0.027501854 0.021173213 0.004842067 0
0 0 0.011635636 # 18 1992
1993 1 4 0 2 52 0 0 0 0 0 0 0 0 0.010087966 0 0 0
0 0 0.030758591 0.044947065 0.035823283 0.006416027 0.035619419 0.031218451 0.100951595 0.077835427
0.028940165 0.018486056 0.050488017 0 0 0 0.028427938 0 0 0 0 0 0
0 0 0.010087966 0 0 0 0 0 0.030758591 0.044947065 0.035823283 0.006416027
0.035619419 0.031218451 0.100951595 0.077835427 0.028940165 0.018486056 0.050488017 0 0 0
0.028427938 0 0 # 26 1993
1994 1 4 0 2 66 0 0 0 0 0 0 0 0 0 0 0
0.00075336 0.010825706 0.039031179 0.044469227 0.066735737 0.037383658 0.072032725 0.059977141 0.050047378
0.042130895 0.028461988 0.030020383 0.016031904 0.000699573 0.000699573 0.000699573 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0.00075336 0.010825706 0.039031179 0.044469227
0.066735737 0.037383658 0.072032725 0.059977141 0.050047378 0.042130895 0.028461988 0.030020383 0.016031904
0.000699573 0.000699573 0.000699573 0 0 0 0 # 33 1994
1995 1 4 0 2 22 0 0 0 0 0 0 0 0 0 0 0
0.001383826 0 0.039080652 0.054583233 0.079470507 0.03374237 0.054891811 0.053491362 0.044460281
0.060124079 0.049381231 0 0.029390648 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0.001383826 0 0.039080652 0.054583233 0.079470507 0.03374237
0.054891811 0.053491362 0.044460281 0.060124079 0.049381231 0 0.029390648 0 0 0 0 0 0
0 # 11 1995
1996 1 4 0 2 60 0 0 0 0 0 0 0 0 0 0 0.000367147
0.002359549 0.007574552 0.010497428 0.020001437 0.025316059 0.043071285 0.062904933 0.079693167 0.0304532
0.068276403 0.053717168 0.008346542 0.012062644 0.034508332 0.02208991 0.010234632 0.004262805 0.004262806 0
0 0 0 0 0 0 0 0 0 0 0.000367147 0.002359549 0.007574552
0.010497428 0.020001437 0.025316059 0.043071285 0.062904933 0.079693167 0.0304532 0.068276403 0.053717168
0.008346542 0.012062644 0.034508332 0.02208991 0.010234632 0.004262805 0.004262806 0 0 #
30 1996
1997 1 4 0 2 28 0 0 0 0 0 0 0 0 0 0 0 0
0 0.007207079 0.07919189 0.081927424 0.083820133 0.103897715 0.011737891 0.049717576 0.02901972
0.018683294 0.014046856 0.020750422 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0.007207079 0.07919189 0.081927424 0.083820133 0.103897715
0.011737891 0.049717576 0.02901972 0.018683294 0.014046856 0.020750422 0 0 0 0 0 0
14 1997
1998 1 4 0 2 44 0 0 0 0 0 0 0 0 0 0.00181855
0.00278002 0.004021508 0.022381581 0.02962796 0.063947646 0.048312266 0.044432384 0.084344195 0.077096563
0.047198525 0.025928952 0.023621136 0.011994326 0.010232289 0.001131049 0.000377016 0.000377016 0 0
0.000377016 0 0 0 0 0 0 0 0 0 0 0.00181855 0.00278002 0.004021508
0.022381581 0.02962796 0.063947646 0.048312266 0.044432384 0.084344195 0.077096563 0.047198525 0.025928952
0.023621136 0.011994326 0.010232289 0.001131049 0.000377016 0.000377016 0 0 0.000377016 #
22 1998
1999 1 4 0 2 12 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0.005151048 0.01257301 0.037719032 0.01257301 0.055443092 0.055718719 0.053447802 0.055443092
0.050707878 0.050292044 0.048572078 0.038601562 0.005151048 0.005151048 0.01345554 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0.005151048 0.01257301 0.037719032
0.01257301 0.055443092 0.055718719 0.053447802 0.055443092 0.050707878 0.050292044 0.048572078 0.038601562
0.005151048 0.005151048 0.01345554 0 0 # 6 1999

2000 1 4 0 2 10 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0.024846609 0.093479032 0.015212212 0 0.090690125 0.027635517 0.040058822
0.040058822 0.040058822 0.024846609 0.103113429 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0.024846609 0.093479032 0.015212212 0 0.090690125
0.027635517 0.040058822 0.040058822 0.040058822 0.024846609 0.103113429 0 0 # 5 2000
2001 1 4 0 2 16 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0.021307785 0 0.100031535 0.061754225 0.097900758 0.061754225 0.02301241 0.040484794 0.040484794 0
0.053269473 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0.021307785 0 0.100031535 0.061754225 0.097900758 0.061754225 0.02301241 0.040484794
0.040484794 0 0.053269473 0 0 0 0 0 # 8 2001
2002 1 4 0 2 18 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0.008481532 0 0.002479246 0.004958492 0.015503251 0.014875476 0.039667935 0.034709443
0.071898132 0.084294361 0.069418886 0.094211345 0.034709443 0.019833967 0.004958492 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0.008481532 0 0.002479246 0.004958492
0.015503251 0.014875476 0.039667935 0.034709443 0.071898132 0.084294361 0.069418886 0.094211345 0.034709443
0.019833967 0.004958492 0 # 9 2002
2003 1 4 0 2 12 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0.003184713 0 0.003184713 0.006369427 0.006369427 0.012738854 0.015923567 0.022292994 0.050955414
0.066878981 0.092356688 0.092356688 0.057324841 0.054140127 0.015923567 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0.003184713 0 0.003184713 0.006369427 0.006369427
0.012738854 0.015923567 0.022292994 0.050955414 0.066878981 0.092356688 0.092356688 0.057324841 0.054140127
0.015923567 0 0 # 6 2003
2004 1 4 0 2 4 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0.012777829 0.032845513 0.034674838 0.054742522 0.054742522 0.078468856
0.056571847 0.010948504 0.087588036 0.032845513 0.043794018 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0.012777829 0.032845513 0.034674838
0.054742522 0.054742522 0.078468856 0.056571847 0.010948504 0.087588036 0.032845513 0.043794018 0 0
2 2004
2005 1 4 0 2 6 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0.1 0 0.1 0.2 0 0 0 0 0.1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0.1 0 0.1 0.2 0 0 0 0 0.1 0 0 # 3 2005
2006 1 4 0 2 6 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0.318511797 0 0.090744102 0 0.045372051 0 0 0 0.045372051 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0.318511797 0 0.090744102 0 0.045372051 0 0 0 0.045372051 0 0 0 0 0 0
0 0 # 3 2006
2007 1 4 0 2 4 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0.027385247 0.027385247 0.054770522 0.198762196 0.054770522
0.08215577 0.027385247 0.027385247 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0.027385247 0.027385247 0.054770522 0.198762196
0.054770522 0.08215577 0.027385247 0.027385247 0 0 # 2 2007
2008 1 4 0 2 14 0 0 0 0 0 0 0 0 0 0 0 0 0
0.133644856 0 0.112149536 0.022429907 0.044859814 0.089719629 0.067289722 0 0 0 0 0 0
0 0.029906535 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0.133644856 0 0.112149536 0.022429907 0.044859814 0.089719629 0.067289722 0 0 0 0 0 0
0 0.029906535 0 0 0 # 7

```
#3	#Rec LFs	Season	Fleet	gender	partition	nSamps	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19
	F20	F21	F22	F23	F24	F25	F26	F27	F28	F29	F30	F31	F32	F33	F34	F35	F36	F37
	F38	F39	F40	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24
	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36	M37	M38	M39	M40
	nSamps
	1980	1	5	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0
	0.06818182	0	0	0.272727273	0.068181818	0.13636364	0.13068182	0.0625	0	0.193181818	0.068181818	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.06818182	0	0	0.272727273	0.068181818	0.13636364	0.13068182	0.0625	0	0.193181818	0.068181818	0
	0	0	0	0	0	0	0		#	2
	1982	1	5	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.5	0.25	0	0.25	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.25	0
	0.25	0	0	0	0	0	0	0	0	0	0	0		#	1
	1984	1	5	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0
	0.05263158	0	0.05263158	0.144736842	0.236842105	0.14473684	0.18421053	0.09210526	0	0
	0.092105263	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.05263158	0	0.05263158	0.144736842	0.236842105	0.14473684	0.18421053	0.09210526	0
	0	0.092105263	0	0	0	0	0	0	0	0		#	6
	1985	1	5	0	0	24	0	0	0	0	0	0	0	0	0	0	0.058333333	0
	0.05952381	0.14880952	0	0.029761905	0	0.17619048	0.11785714	0.05833333	0.05833333	0.116666667
	0.088095238	0.029761905	0.058333333	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.058333333	0	0.05952381	0.14880952	0	0.029761905	0	0.17619048	0.11785714
	0.05833333	0.05833333	0.116666667	0.088095238	0.029761905	0.058333333	0	0	0	0	0	0
	#	8
	1986	1	5	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.142857143	0.14285714	0	0	0	0.142857143	0	0.285714286	0.285714286	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0.142857143	0.14285714	0	0	0	0.142857143	0	0.285714286	0.285714286	0	0	0	0
	0	0		#	4
	1987	1	5	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0.8	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0.2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0		#	2
	1988	1	5	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0
	0.11111111	0	0.11111111	0	0	0.11111111	0	0.22222222	0.33333333	0	0.111111111	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.11111111	0	0.11111111	0	0	0.11111111	0	0.22222222	0.33333333	0	0.111111111	0	0
	0	0	0	0	0	0		#	5

	1993	1	5	0	0	27	0	0	0	0	0	0	0	0	0	0	0	0
	0.03768888	0.03768888	0.14955906	0.003262751	0.313697226	0.03932026	0.13310756	0.09511956	0.03768888
	0.039320258	0.102768818	0	0	0.004572423	0.004572423	0.001633008	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0.03768888	0.03768888	0.14955906	0.003262751	0.313697226
	0.03932026	0.13310756	0.09511956	0.03768888	0.039320258	0.102768818	0	0	0.004572423	0.004572423
	0.001633008	0	0	0		#	9
	1994	1	5	0	0	90	0	0	0	0	0	0	0	0	0.04329532	0.034172896
	0.044308925	0.034462497	0.06023697	0.08383944	0.10107419	0.167968473	0.072287511	0.05302044	0.04817303
```

```
0.06522029	0.10240737	0.006959118	0.006342547	0.008734926	0.047951654	0.00550662	0.003560386	0.000446145	0
0	0.01003126	0	0	0	0	0	0	0	0	0.04329532	0.034172896	0.044308925
0.034462497	0.06023697	0.08383944	0.10107419	0.167968473	0.072287511	0.05302044	0.04817303	0.06522029
0.10240737	0.006959118	0.006342547	0.008734926	0.047951654	0.00550662	0.003560386	0.000446145	0	0
0.01003126		#	30
1995	1	5	0	0	51	0	0	0	0	0	0	0	0	0	0.013310716
0.053269511	0.02664808	0.10040279	0.10763057	0.06663352	0.101754963	0.106570958	0.18427513	0.020336
0.15607605	0.01703551	0.014106031	0.027443394	0.001458077	0.000795315	0.000729039	0	0	0.001524353	0
0	0	0	0	0	0	0	0	0	0	0.013310716	0.053269511	0.02664808	0.10040279
0.10763057	0.06663352	0.101754963	0.106570958	0.18427513	0.020336	0.15607605	0.01703551	0.014106031
0.027443394	0.001458077	0.000795315	0.000729039	0	0.001524353	0	0		#	17
1996	1	5	0	0	45	0	0	0	0	0.008691607	0	0	0	0	0	0.015297228
0.006373845	0.046471125	0.05180198	0.10592172	0.11762641	0.172789144	0.100822639	0.11984532	0.05499718
0.04602413	0.02185318	0.044638952	0.024110204	0.017900519	0.019011128	0.004988669	0.010857692	0.009977339	0
0	0	0	0	0	0	0.008691607	0	0	0	0.015297228	0.006373845	0.046471125
0.05180198	0.10592172	0.11762641	0.172789144	0.100822639	0.11984532	0.05499718	0.04602413	0.02185318
0.044638952	0.024110204	0.017900519	0.019011128	0.004988669	0.010857692	0.009977339	0	0	0		#
15
1997	1	5	0	0	36	0	0	0	0	0	0.3055488	0	0	0	0	0	0
0	0.03888803	0.27082735	0.031154901	0.004182459	0.01589335	0.26073475	0.01171089	0.03199139
0.008364919	0	0.00846948	0.012233694	0	0	0	0	0	0	0	0	0
0.3055488	0	0	0	0	0	0	0.03888803	0.27082735	0.031154901	0.004182459
0.01589335	0.26073475	0.01171089	0.03199139	0.008364919	0	0.00846948	0.012233694	0	0	0	0
0	0		#	12
1998	1	5	0	0	27	0	0	0	0	0	0	0	0	0	0.025169243	0
0.012584621	0.11324901	0.17617212	0.07998554	0.017049846	0.097022799	0.10739368	0.0880546	0.08472726
0.04221909	0.07663303	0.025187676	0.026307129	0.008955618	0.012572037	0.006716714	0	0	0	0	0
0	0	0	0	0	0	0	0	0.025169243	0	0.012584621	0.11324901	0.17617212
0.07998554	0.017049846	0.097022799	0.10739368	0.0880546	0.08472726	0.04221909	0.07663303	0.025187676
0.026307129	0.008955618	0.012572037	0.006716714	0	0	0	0		#	9
1999	1	5	0	0	75	0	0	0	0	0.00268554	0.00268554	0.01074216	0.01074216
0.01385827	0.026656399	0.049348976	0.042665253	0.05098603	0.06596528	0.11481815	0.137396448	0.123786194
0.08565265	0.09419415	0.06284314	0.05156856	0.015611475	0.022597586	0.008514382	0.003088927	0.000440008
0.003152729	0	0	0	0	0	0	0	0	0.00268554	0.00268554	0.01074216	0.01074216
0.01385827	0.026656399	0.049348976	0.042665253	0.05098603	0.06596528	0.11481815	0.137396448	0.123786194
0.08565265	0.09419415	0.06284314	0.05156856	0.015611475	0.022597586	0.008514382	0.003088927	0.000440008
0.003152729	0	0	0	0		#	25
2000	1	5	0	0	27	0	0	0	0	0	0	0	0.007349769
0.006858655	0.007349769	0.04027131	0.11357293	0.07487919	0.257533693	0.130231166	0.07516635	0.05796636
0.09388658	0.0429823	0.049701195	0.014356267	0.007071641	0.013751181	0.006858655	0	0.000212986	0	0
0	0	0	0	0	0	0	0	0	0	0.007349769	0.006858655	0.007349769	0.04027131
0.11357293	0.07487919	0.257533693	0.130231166	0.07516635	0.05796636	0.09388658	0.0429823	0.049701195
0.014356267	0.007071641	0.013751181	0.006858655	0	0.000212986	0	0	0		#	9
2001	1	5	0	0	21	0	0	0	0	0	0	0	0	0	0.010202317
0.039017263	0.020404635	0.08822004	0.08642803	0.19685311	0.1206274	0.106824265	0.10352352	0.03060695
0.05161172	0.05582108	0.037208452	0.021144055	0.010502386	0.010502386	0	0	0.010502386	0	0	0
0	0	0	0	0	0	0	0	0	0.010202317	0.039017263	0.020404635	0.08822004
```

```
        0.08642803   0.19685311   0.1206274    0.106824265  0.10352352   0.03060695   0.05161172   0.05582108   0.037208452
        0.021144055  0.010502386  0.010502386  0      0     0.010502386  0      0      0             #      7
        2002   1      5      0      0      9      0      0      0      0      0      0      0      0      0      0.019230399
        0.019230399  0.019230399  0.08048278   0.06481357   0.06125238   0.118943582  0.106835552  0.17521031   0.0648328
        0.11395792   0.09116634   0.045583169  0      0.019230399  0      0      0      0      0      0      0      0      0      0
        0      0      0      0      0      0      0.019230399  0.019230399  0.019230399  0.08048278   0.06481357   0.06125238
        0.118943582  0.106835552  0.17521031   0.0648328    0.11395792   0.09116634   0.045583169  0      0.019230399  0      0
        0      0      0      0      0             #      3
        2003   1      5      0      0      9      0      0      0      0      0      0      0      0      0      0
        0.200039968  0      0.20003997   0.20003997   0      0      0      0      0.19984013   0      0      0      0
        0.200039968  0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
        0.200039968  0      0.20003997   0.20003997   0      0      0      0      0.19984013   0      0      0      0
        0.200039968  0      0      0      0      0      0             #      3
#1      PikitchLFs     Season Fleet  gender partition     nSamps F10    F11    F12    F13    F14    F15    F16    F17    F18    F19
        F20    F21    F22    F23    F24    F25    F26    F27    F28    F29    F30    F31    F32    F33    F34    F35    F36    F37
        F38    F39    F40    M10    M11    M12    M13    M14    M15    M16    M17    M18    M19    M20    M21    M22    M23    M24
        M25    M26    M27    M28    M29    M30    M31    M32    M33    M34    M35    M36    M37    M38    M39    M40
        -1986  1      1      0      1      6      0      0      0      0      0      0      0      0      0.01890948   0
        0.02599534   0.01890948   0.03781896   0.10479814   0.1572779    0.147079     0.14090114   0.2348537    0.05672845
        0.01890948   0.03781896   0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
        0      0      0      0.01890948   0      0.02599534   0.01890948   0.03781896   0.10479814   0.1572779    0.147079
        0.14090114   0.2348537    0.05672845   0.01890948   0.03781896   0      0      0      0      0      0      0      0      0
        0             #      6
        -1987  1      1      0      1      3      0      0      0      0      0      0      0.02272727   0      0      0
        0.01136364   0.04545455   0.05681818   0.06818182   0.125  0.1590909    0.07954545   0.2272727    0.20454545   0      0
        0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0.02272727   0
        0      0      0.01136364   0.04545455   0.05681818   0.06818182   0.125  0.1590909    0.07954545   0.2272727
        0.20454545   0      0      0      0      0      0      0      0      0      0      0      0             #      3
#1      #WO trawl discard LFs


                                                                                                                          # trips       #
tows/sets     # samples
        2003   1      1      0      1      11     0      0      0      0      0      0      0.006726457  0.045964126  0.07455157
        0.012612108  0.012612108  0      0      0      0.003363229  0.003363229  0      0.003363229  0.131165919  0.013452915
        0.134529148  0.003363229  0.006726457  0      0.003363229  0.137892377  0.137892377  0.134529148  0.003363229
        0.131165919  0      0      0      0      0      0      0      0.006726457  0.045964126  0.07455157   0.012612108
        0.012612108  0      0      0      0.003363229  0.003363229  0      0.003363229  0.131165919  0.013452915  0.134529148
        0.003363229  0.006726457  0      0.003363229  0.137892377  0.137892377  0.134529148  0.003363229  0.131165919  0
        #      4      11     33
        2005   1      1      0      1      4      0      0      0      0      0      0      0      0      0      0.076923077
        0.615384615  0.076923077  0.076923077  0      0      0      0      0      0      0      0      0      0      0
        0.153846154  0      0      0      0      0      0      0      0      0      0      0      0      0      0
        0.076923077  0.615384615  0.076923077  0.076923077  0      0      0      0      0      0      0      0      0      0      0
        0.153846154  0      0      0      0      0      0             #      2      4      5
        2006   1      1      0      1      103    0      0      0.000437097  0.000874194  0      0.000568226  0.004283553
        0.005318016  0.007722051  0.013564583  0.01716335   0.083835245  0.094872749  0.099701874  0.083073551  0.061853712
        0.053063601  0.081199222  0.05424085   0.080309328  0.053694564  0.027025148  0.043272624  0.063816193  0.01252625
```

0.025126136 0.004877049 0.019275987 0.006512748 0.001311292 0.000480807 0 0 0.000437097 0.000874194 0
0.000568226 0.004283553 0.005318016 0.007722051 0.013564583 0.01716335 0.083835245 0.094872749 0.099701874
0.083073551 0.061853712 0.053063601 0.081199222 0.05424085 0.080309328 0.053694564 0.027025148 0.043272624
0.063816193 0.01252625 0.025126136 0.004877049 0.019275987 0.006512748 0.001311292 0.000480807 #
54 103 381
2007 1 1 0 1 43 0 0.013333601 0.017265331 0 0.014221554 0.031581865 0.006113039
0.002437672 0.006764524 0.011719067 0.01522728 0.061099081 0.01266017 0.060419611 0.075852897 0.023078972
0.07014206 0.05078181 0.084654771 0.158448711 0.01579202 0.127083903 0.018250312 0.024555867 0.057930219
0.015812461 0.016027228 0.004146728 0.000971193 0.001648705 0.001979345 0 0.013333601 0.017265331 0
0.014221554 0.031581865 0.006113039 0.002437672 0.006764524 0.011719067 0.01522728 0.061099081 0.01266017
0.060419611 0.075852897 0.023078972 0.07014206 0.05078181 0.084654771 0.158448711 0.01579202 0.127083903
0.018250312 0.024555867 0.057930219 0.015812461 0.016027228 0.004146728 0.000971193 0.001648705 0.001979345
32 43 145
#1 #CA trawl discard LFs

trips
tows/sets # samples
2002 1 2 0 1 5 0 0 0 0 0 0 0 0.05 0 0.3 0 0.15
0.1 0.05 0.05 0.05 0.1 0.1 0 0.05 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0.05 0 0.3 0 0.15 0.1 0.05 0.05 0.05 0.1 0.1 0
0.05 0 0 0 0 0 0 0 0 0 0 0 # 3 5 20
2006 1 2 0 1 44 0 0 0 0 0.00042302 0.001353664 0.001626276 0.002538119
0.017350866 0.010920964 0.109693937 0.086219767 0.125703612 0.130800062 0.010378088 0.022476457 0.059470178
0.051363707 0.016413172 0.138850739 0.157055875 0.023266094 0.006768318 0.002876535 0.002453515 0.017597628 0
0.003976387 0.00042302 0 0 0 0 0 0.00042302 0.001353664 0.001626276 0.002538119
0.017350866 0.010920964 0.109693937 0.086219767 0.125703612 0.130800062 0.010378088 0.022476457 0.059470178
0.051363707 0.016413172 0.138850739 0.157055875 0.023266094 0.006768318 0.002876535 0.002453515 0.017597628 0
0.003976387 0.00042302 0 0 0 # 33 44 156
2007 1 2 0 1 38 0 0 0 0.004058743 0.004754527 0.00057982 0.070158267
0.007653629 0.057699131 0.030240854 0.022629561 0.030990817 0.036586666 0.007802366 0.062968494 0.225061064
0.13741237 0.057467203 0.075918031 0.025547508 0.037111143 0.047661236 0.008065946 0.020641606 0.019366001 0
0 0 0.009625018 0 0 0 0 0 0.004058743 0.004754527 0.00057982 0.070158267
0.007653629 0.057699131 0.030240854 0.022629561 0.030990817 0.036586666 0.007802366 0.062968494 0.225061064
0.13741237 0.057467203 0.075918031 0.025547508 0.037111143 0.047661236 0.008065946 0.020641606 0.019366001 0
0 0 0.009625018 0 0 # 21 38 165
#2 #OTH discard LFs

trips # sets
samples
2005 1 4 0 1 4 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0.2 0 0.2 0.2 0 0.2 0.2 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0.2 0 0.2 0.2 0 0.2 0.2 0 0 0 0 # 1 2 5
-2006 1 4 0 1 2 0 0 0.5 0 0 0 0 0 0.5 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

```
0	0.5	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0		#	1	1	2
2007	1	4	0	1	24	0	0	0	0	0	0	0	0	0	0.021480502	0
0.047257105	0	0	0	0	0	0	0	0.064441507	0.098810311	0.09021811	0.249173827
0.120290813	0.103106411	0.021480502	0.042961005	0	0	0.119299405	0.021480502	0	0	0	0	0
0	0	0	0	0.021480502	0	0.047257105	0	0	0	0	0	0	0.064441507
0.098810311	0.09021811	0.249173827	0.120290813	0.103106411	0.021480502	0.042961005	0	0	0.119299405
0.021480502	#	7	12	27
#7	Triennial	season	fleet	gender	partition	Nsamp	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19
F20	F21	F22	F23	F24	F25	F26	F27	F28	F29	F30	F31	F32	F33	F34	F35	F36	F37
F38	F39	F40	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24
M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36	M37	M38	M39	M40
nTows	4.5 times ntows is about the max seen in Ian's analysis of effective sample size

-1980	1	6	3	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1.929114	0.3714314	2.239427	0	6.541043	9.717526	6.602161	6.602161
1.9291138	7.7884123	4.9833601	3.1153649	1.55768247	0	0	0	0	0	0.37143136	0	0
0	0	0	0	1.8679952	0	0	0	2.610858	0.9920568	4.417734	12.206147
8.780469	6.657161	0.9309382	7.7884123	0	0	0	0	0	0	0	0	0		#
3
1983	1	6	3	0	140	0	0	0.226326271	0.22632627	0	0.08933525	0	0.3887245
0.8011203	0.8362707	0.08933525	0.9327506	1.221452	2.034108	2.001538	2.242589	2.475857
3.4803672	4.646195	4.170651	4.517709	5.766701	6.106775	5.211646	4.9775702	2.9395052
1.2121657	0.5460978	0.126441	0	0	0	0.089335248	0	0	0.0450827	0.3425697
0.526665	0.761743	0.4915468	0.5664963	0.981078	1.845008	2.300777	3.595259	3.7409019
5.648497	6.308554	5.468165	4.920537	2.9034089	1.1266986	0.6309182	0.07556877	0.19391562
0.11884648	0	0	0	0	0.05087224	#	20
1986	1	6	3	0	231	0	0.02980703	0	0.24760257	0	0.21542289	0.1000837
0.2700387	0.4745536	0.5808799	1.02412656	0.9782412	1.544523	2.363202	3.718319	2.708609
3.145357	3.1646422	4.090699	5.031476	5.476977	6.190824	7.563696	3.935828	3.519433
1.9733032	0.9209025	0.8002101	0.17552014	0.065860239	0	0	0	0.141487185	0.21223078
0.03700109	0.17264251	0.3585739	0.3527107	0.1799611	0.4188901	1.2212821	1.387574	2.228897
3.910215	4.851295	3.9937451	4.479305	5.718406	3.895358	1.972904	2.7090332	0.8328868
0.2213605	0.06871941	0.3253837	0	0	0	0	0	0		#	33

1989	1	6	3	0	714	0	0	0	0.0759914	0.282662	0.56784898	0.3650342
0.6177382	0.9490945	1.281808	1.40568812	1.1638044	2.830246	3.8856	5.147772	4.30682
5.104657	4.6939468	3.800431	3.002956	2.754439	2.492599	2.468575	1.956285	1.4862104
0.9818316	0.5056929	0.2475539	0.05293053	0	0.008129875	0.01588	0	0	0.04890286
0.06362992	0.33194904	0.1513198	0.8973443	1.1334919	1.7033358	1.4639122	1.662406	3.926039
5.133918	5.818979	5.8567983	4.956435	4.252763	3.480439	2.665931	1.5963623	0.6546728
0.2087039	0.79961625	0	0.06847271	0.4876966	0	0.1846614	0	0		#	102

1992	1	6	3	0	308	0	0	0	0	0	0.04031529	0.2991579	0.4020495
0.7947556	1.7634174	1.22648203	1.5006771	2.278953	3.048258	3.919363	4.550648	4.03405
4.9224453	3.869494	3.890469	3.348001	2.587267	3.066285	1.664554	1.6429851	1.0824263
0.309587	0.1907126	0.19266935	0.013897935	0.012783069	0	0	0	0	0	0.08540427
0.2683799	0.5803159	1.0296567	1.77926	1.4894736	1.894045	3.696399	4.465038	6.642037
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5.4932591	5.918703	4.925363	4.781561	2.586168	2.0479537	1.0337016	0.2735988	0.10463804
0.13748371	0.01401043	0.0339489	0.0339489	0.0339489	0	0		#	44

#4	Triennial	season fleet	gender partition	Nsamp	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19
F20	F21	F22	F23	F24	F25	F26	F27	F28	F29	F30	F31	F32	F33	F34	F35	F36	F37
F38	F39	F40	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24
M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36	M37	M38	M39	M40
nTows	4.5 times ntows is about the max seen in Ian's analysis of effective sample size

1995	1	7	3	0	564	0	0.04556199	0.009592339	0.05718982	0.1945807	0.36684876
0.5706273	0.4614608	0.5598155	1.1630056	1.16760865	1.6001331	2.875052	3.965582	3.215946
4.218284	4.254362	3.8437851	3.5871 4.029101	2.65923	2.057025	2.304456	1.585195
0.9439792	1.1660608	0.3059178	0.2007445	0.08540253	0.010962091	0	0.01358	0.07872538
0.009592339	0.04040713	0.19367752	0.3676455	0.5353776	0.3498392	0.9574984	1.2725876	2.6712552
3.60071	4.158581	5.115958	6.556397	7.3989836	6.453281	4.858789	3.371324	2.188903
1.3078498	0.5534802	0.1611144	0.19674452	0.03817546	0	0.02165585	0.0232552	0	0	0
#	141
1998	1	7	3	0	752	0.04214282	0.01389631	0.015257334	0.12253804	0.2249278	0.61225597
1.2551388	2.5451996	2.2185892	2.5490438	1.75811589	1.893212	1.239839	1.539979	2.1858
2.615129	4.250804	4.535355	4.38777	3.688151	3.180757	2.737064	1.76189	2.094227
1.3493888	0.9256345	0.489973	0.2136089	0.04931299	0.007570938	0	0.04541	0.05230457
0.026920405	0.10264645	0.27789357	0.51179376	1.5495318	2.7982624	3.0743802	2.4581767	2.1633101
1.651312	2.30225	3.580523	3.886436	6.7635396	5.185077	4.976247	3.25619	2.388459
1.4610065	0.6448628	0.1925781	0.06147363	0.02679646	0.04403092	0.01601642	0	0	0	0
#	188
2001	1	7	3	0	684	0.127	0.02984677	0.066191318	0.27914529	0.162141	0.14863954
0.3190304	0.2289152	0.601892	1.6328815	3.31684667	4.5594066	5.004676	3.679	3.878629
2.582621	2.586741	2.7918044	2.955758	4.225502	4.011672	3.21084	3.188308	2.567751
2.0267604	1.3302573	0.681052	0.1623939	0.1099532	0.021317976	0	0.007734	0.01999913
0.069096488	0.17094259	0.2280819	0.24158071	0.3964838	0.2141742	1.1189088	1.3999136	3.1798696
4.474259	5.304557	5.014745	3.643561	3.0532054	4.45621	3.547925	2.826701	2.085682
1.1679692	0.5287323	0.2248301	0.0434872	0.08308112	0.01127006	0	0	0	0	0		#
171
2004	1	7	3	0	584	0.02886225	0.05667161	0.088643682	0.06337708	0.2909071	0.77770714
1.0142427	1.1872569	1.7931102	1.8879389	1.2924348	1.8266252	1.674093	1.39962	2.812173
2.571172	3.731649	3.1669016	2.821798	2.481794	3.023749	2.881844	3.398994	2.989447
2.3812345	1.0924387	0.8007927	0.2501281	0.01535444	0.054519538	0.148080288	0.06468263	0.24714374
0.215119625	0.2968275	0.39161853	0.82096484	1.3269117	1.2100237	1.8507094	2.4188054	2.3641819
2.190688	2.526842	2.544111	5.742231	5.9061532	4.709998	5.771834	4.408517	3.284227
2.4534614	0.9149242	0.1967146	0.02873853	0.08751787	0.02349303	0	0	0	0	0		#
146
#1	NWFSC	Season	Fleet	gender	partition	nSamps	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19	F20
F21	F22	F23	F24	F25	F26	F27	F28	F29	F30	F31	F32	F33	F34	F35	F36	F37	F38
F39	F40	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25
M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36	M37	M38	M39	M40			nSamps

2003	1	8	3	0	611	0	0.01518784	0.03407803	0.29135197	0.1998197	0.5345429
0.7769233	0.8855414	0.986772	1.040631	1.1890995	1.074411	1.67248	1.900239	3.765033
```

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5.238265	3.998875	3.484828	1.988694	4.125877	3.127503	3.380346	4.062595	2.868021
2.345776	1.3536676	0.5529992	0.48531903	0.19384473	0.13052637	0.0283802	0	0.06013208
0.07504851	0.1999401	0.7025151	0.9590589	0.7439348	0.6904753	1.4645048	1.102938	1.940659
1.777761	3.594236	5.190614	4.529133	4.664583	5.241652	4.319586	4.147546	2.714612
2.707058	0.7902208	0.43248078	0.12253679	0.053469	0	0.0436789	0	0	0	0		#
610	133	610
2004	1	8	3	0	649	0.06339911	0.12295476	0.18522087	0.14171218	0.3872081	0.602596
0.8481998	1.5532564	1.2726658	0.9590487	1.0259573	1.047911	2.536072	2.814122	3.37909
3.086286	4.621874	3.801745	3.574192	3.3631 3.728632	3.182832	2.908621	2.536198
1.863284	1.0698282	0.9537357	0.31752994	0.04870867	0.06051138	0	0	0	0.04962072
0.1585248	0.1777498	0.3579171	0.6543697	0.9254518	0.8545867	1.12748	2.50282	3.088837
4.243786	3.517249	4.550749	5.915517	5.040721	5.546848	4.025236	2.315364	1.963667
0.4665899	0.10990601	0.27136217	0.06349417	0.01566159	0	0	0	0	0		#	649
140	649
2005	1	8	3	0	605	0.05161683	0.10583221	0.07089331	0.15258036	0.2959939	0.5547591
0.5165981	1.1019572	1.2489772	1.9995507	3.1557262	1.916505	3.057988	3.251281	3.750985
3.242535	3.242741	4.108334	3.785607	3.550931	3.517297	2.450259	2.987885	1.854235
1.422432	0.8832508	0.408853	0.13473407	0.0445325	0.07707867	0	0.009643536	0.06421911
0.05680788	0.1928949	0.2393919	0.4206667	0.5202258	0.9174088	2.2305218	1.928182	2.687618
4.050524	3.427168	4.454893	4.287548	3.794744	4.290189	5.029548	3.64106	2.381554
1.9537 0.1781557	0.08643466	0.15535598	0.01166396	0.02460676	0.02332791	0	0	0	0		#
604	182	604
2006	1	8	3	0	595	0	0.13606171	0.21488465	0.21099746	0.3824409	0.7953277
0.6898728	1.0497256	1.6632414	1.5248685	2.6298843	2.676742	3.728883	3.588865	4.680447
3.136194	3.078269	4.151106	2.912694	2.359396	2.975683	3.223648	2.053339	2.127089
1.288461	0.8106138	0.3312925	0.06214001	0.04479529	0.05711456	0	0.01810423	0.09197299
0.28068581	0.206703	0.664489	0.5993475	1.1442053	1.3731298	1.710694	1.952824	3.172072
3.820685	4.602643	4.94467	4.766819	3.43307	4.49652	3.214068	2.931727	1.94779
1.12472	0.8305791	0.06215833	0	0	0	0.01039705	0	0.01585011	0	0		#
594	182	594
2007	1	8	3	0	447	0.01712272	0.02722212	0.04942167	0.10334259	0.3084881	0.2267037
0.4218456	0.2252965	0.9197015	1.3302846	1.8133408	1.572232	3.668786	3.722058	4.608307
2.789593	4.53248	3.579098	1.781929	1.967949	4.045169	2.315753	2.689167	1.929951
2.225998	0.5331688	1.335864	0.45914157	0.18548282	0	0	0	0.06418466	0.0312922
0.1903187	0.2831503	0.2623053	0.4243234	0.3487613	1.0476879	1.606798	3.469544	2.796282
5.289385	5.416524	4.322472	3.550475	5.109694	4.425211	4.055225	4.456309	1.800741
0.9630667	0.59878617	0.04816283	0	0.00965267	0.04475009	0	0	0	0		#	446
168	446
2008	1	8	3	0	191	0	0.02721223	0.02459759	0.03144266	0.2664089	0.1353796
0.3619978	0.6663395	0.2992864	0.8659887	0.6487891	2.512347	1.480334	3.476381	5.392469
5.317777	7.64524	4.411358	4.771525	3.335769	3.955814	2.262313	1.778616	1.332965
0.398316	0.4693919	0.2807606	0.09812714	0.02984567	0.02338957	0	0.057389289	0.0468708
0.0449248	0.1560699	0.1743512	0.2333081	0.48382	0.3361757	1.2031057	1.286172	3.757559
2.91301	4.384377	5.536756	6.296894	5.327316	5.534986	2.691175	4.009081	1.569383
1.275305	0.2185087	0.1352139	0.02806654	0	0	0	0	0	0	0		#	191
150	191
```

```
#_AGE_DATA
```

```
45     #n_abins      #_N_agebins  #(<=_#_of_age,_the_model_always_start_at_age_0)
#age_bins1(1,n_abins)      #_lower_age_of_agebins
1      2      3      4      5      6      7      8      9      10     11     12     13     14     15     16     17 18 19 20 21 22 23
24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45

#_Age_error


1      #N_ageerr
#age_err(1,N_ageerr,1,2,0,nages) #_vector_with_stddev_of_ageing_precision_for_each_AGE_and_type


#perfect_age_(ageerr=1_given_but_not_used)


#-1    -1     -1     -1     -1     -1     -1     -1     -1     -1     -1     -1     -1     -1     -1     -1     -1     -1     -1     -
1      -1     -1     -1     -1     -1     -1     -1     -1     -1     -1     -1     -1     -1     -1     -1     -1     -1     -1     -
1      -1     -1
#0.001 0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001
       0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001
       0.001  0.001  0.001  0.001
-1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -
1.0    -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -
1.0    -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0   -1.0 -1.0

0.134  0.134  0.366  0.534  0.655  0.743  0.807  0.853  0.887  0.911  0.928  0.941  0.950  0.957  0.962  0.965  0.968  0.970  0.971
       0.972  0.973  0.973  0.973  0.974  0.974  0.974  0.974  0.974  0.974  0.974  0.974  0.974  0.974  0.974  0.974  0.974  0.974
       0.974  0.974  0.974  0.974  0.974  0.974  0.974  0.974  0.974  0.974  0.974  0.974 0.974 0.974



#_AGE_COMPOSITIONS(duplicates_must_be_contigent_within_Year-Seas-Fleet-Sex_because_of_ageerr_and_states)


315    #nobsa
3 #_Lbin_method: 1=poplenbins; 2=datalenbins; 3=lengths
1 #_combine males into females at or below this bin number
#NWFSC_F      year   Season Fleet  gender partition     ageErr LbinLo LbinHi nSamps F1     F2     F3     F4     F5     F6     F7
       F8     F9     F10    F11    F12    F13    F14    F15    F16    F17    F18    F19    F20    F21    F22    F23    F24    F25
       F26    F27    F28    F29    F30    F31    F32    F33    F34    F35    F36    F37    F38    F39    F40    F41    F42    F43
       F44    F45    F1.1   F1.2   F1.3   F1.4   F1.5   F1.6   F1.7   F1.8   F1.9   F1.10  F1.11  F1.12  F1.13  F1.14  F1.15  F1.16
       F1.17  F1.18  F1.19  F1.20  F1.21  F1.22  F1.23  F1.24  F1.25  F1.26  F1.27  F1.28  F1.29  F1.30  F1.31  F1.32  F1.33  F1.34
       F1.35  F1.36  F1.37  F1.38  F1.39  F1.40  F1.41  F1.42  F1.43  F1.44  F1.45
       2003   1      8      1      0      1      11     11     1      0      100    0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
       0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      100    0
       0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0      0
```

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2003	1	8	1	0	1	12	12	1	0	0	100	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2003	1	8	1	0	1	13	13	3	0	33.33333		66.66667		0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33.33333		66.66667		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0											
2003	1	8	1	0	1	14	14	4	0	0	100	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2003	1	8	1	0	1	15	15	4	0	0	75	25	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
75	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2003	1	8	1	0	1	16	16	10	0	0	60	40	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
60	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2003	1	8	1	0	1	17	17	10	0	0	50	30	0	0	10	0	0	
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	30	0	0	10	0	0	10	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2003	1	8	1	0	1	18	18	19	0	0	15.78947		57.894737		15.789474		0	0
0	0	10.526316		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	15.78947		57.894737		15.789474		0	0	0	0	10.526316		0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0							
2003	1	8	1	0	1	19	19	9	0	0	0	33.333333		44.444444		0	0	0
0	11.111111		0	11.111111		0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	33.333333		44.444444		0	0	0	0	11.111111		0	11.111111		0	0

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
2003 1 8 1 0 1 20 20 10 0 0 0 30 60 0 0 0 10 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
30 60 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2003 1 8 1 0 1 21 21 14 0 0 0 21.428571 64.285714 0 0
7.142857 0 7.142857 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 21.428571 64.285714 0 0 7.142857 0 7.142857 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0
2003 1 8 1 0 1 22 22 4 0 0 0 0 25 0 25 0 25
25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 25 0 25 0 25 25 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2003 1 8 1 0 1 23 23 8 0 0 0 0 25 0 37.5 12.5 12.5
12.5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 25 0 37.5 12.5 12.5 12.5 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2003 1 8 1 0 1 24 24 11 0 0 0 0 9.090909 0 18.181818 0
18.181818 36.363636 9.090909 9.090909 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 9.090909 0 18.181818 0 18.181818 36.363636
9.090909 9.090909 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2003 1 8 1 0 1 25 25 16 0 0 0 0 0 6.25 6.25 0 31.25
37.5 6.25 0 0 0 12.5 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 6.25 6.25 0 31.25 37.5 6.25 0 0 0 12.5 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2003 1 8 1 0 1 26 26 21 0 0 0 0 0 0 0 0
14.285714 85.714286 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 14.285714 85.714286 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
2003 1 8 1 0 1 27 27 21 0 0 0 0 0 0 4.761905 0
4.761905 47.619048 14.285714 4.761905 0 4.761905 9.52381 0 0 0 0 0 0
0 0 4.761905 4.761905 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 4.761905 0 4.761905

```
47.619048	14.285714	4.761905	0	4.761905	9.52381	0	0	0	0	0	0	0	0
4.761905	4.761905	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0
2003	1	8	1	0	1	28	28	19	0	0	0	0	0	0	0	5.263158
5.263158	31.578947	15.789474	10.526316	5.263158	0	0	5.263158	0	5.263158
5.263158	10.526316	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5.263158	5.263158	31.578947	15.789474	10.526316	5.263158	0	0	5.263158	0
5.263158	5.263158	10.526316	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
2003	1	8	1	0	1	29	29	20	0	0	0	0	0	0	0	0	10
25	0	0	20	10	0	10	0	0	5	0	5	10	0	0	0	0	0	0
0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	10	25	0	0	20	10	0	10	0	0	5	0	5
10	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0
0	0	0	0	0
2003	1	8	1	0	1	30	30	11	0	0	0	0	0	0	0	0	0	0
0	0	18.181818	0	18.181818	18.181818	0	9.090909	9.090909	0	9.090909
9.090909	0	0	0	9.090909	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.181818	0	18.181818	18.181818	0	9.090909	9.090909	0	9.090909	9.090909	0	0
0	9.090909	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0
2003	1	8	1	0	1	31	31	17	0	0	0	0	0	0	0	0	0	0
0	5.882353	0	11.764706	11.764706	5.882353	0	11.764706	11.764706	11.764706	0	0
0	0	5.882353	0	0	11.764706	0	0	0	5.882353	0	0	0	0	0
5.882353	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	5.882353	0	11.764706	11.764706	5.882353	0	11.764706	11.764706	11.764706	0	0
0	0	5.882353	0	0	11.764706	0	0	0	5.882353	0	0	0	0	0
5.882353	0	0	0	0	0	0	0
2003	1	8	1	0	1	32	32	14	0	0	0	0	0	0	0	0	0	0
0	0	0	14.285714	35.714286	14.285714	0	0	7.142857	14.285714	7.142857	0	0
0	0	7.142857	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14.285714	35.714286	14.285714	0	0	7.142857	14.285714	7.142857	0	0	0	0
7.142857	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0
2003	1	8	1	0	1	33	33	8	0	0	0	0	0	0	0	0	0	0
0	0	0	12.5	0	0	0	37.5	12.5	12.5	0	0	0	0	0	0	12.5	0
12.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	12.5	0	0	0	37.5	12.5	12.5	0
0	0	0	0	0	12.5	0	12.5	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0
2003	1	8	1	0	1	34	34	14	0	0	0	0	0	0	0	0	0	0
0	0	0	7.142857	0	0	7.142857	7.142857	7.142857	7.142857	7.142857	0
14.285714	0	0	7.142857	7.142857	0	0	0	0	7.142857	7.142857	0
7.142857	0	0	0	0	0	0	0	7.142857	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	7.142857	0	0	7.142857	7.142857	7.142857
```

7.142857 7.142857 0 14.285714 0 0 7.142857 7.142857 0 0 0 0
7.142857 7.142857 0 7.142857 0 0 0 0 0 0 7.142857 0 0
2003 1 8 1 0 1 35 35 11 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 9.090909 18.181818 9.090909 9.090909 0 0 9.090909 0
0 0 0 0 0 0 0 9.090909 0 9.090909 18.181818 9.090909 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 9.090909 18.181818 9.090909 9.090909 0 0 9.090909 0 0 0 0
0 0 0 0 9.090909 0 9.090909 18.181818 9.090909 0 0 0 0 0 0
0 0 0
2003 1 8 1 0 1 36 36 6 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 16.666667 0 0 0 0 0 0 0
0 0 33.333333 16.666667 0 0 0 0 0 16.666667 0 0 16.66667 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 16.666667 0 0 0 0 0 0 0 0 0 33.333333 16.666667 0
0 0 0 0 16.666667 0 0 16.66667 0 0 0 0
2003 1 8 1 0 1 37 37 2 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 50 0
50 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 50 0 50 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2003 1 8 1 0 1 38 38 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 100 0 0 0 0 0 0 0 0 0
0 0 0 0
2004 1 8 1 0 1 10 10 1 100 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 100 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2004 1 8 1 0 1 11 11 1 0 100 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 100 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2004 1 8 1 0 1 12 12 2 0 100 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 100 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2004 1 8 1 0 1 14 14 2 0 100 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 100 0

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2004	1	8	1	0	1	15	15	3	0	0	33.33333		0	66.666667		0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	33.33333		0	66.666667		0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0											
2004	1	8	1	0	1	16	16	9	0	0	44.44444		44.444444		11.111111		0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	44.44444		44.444444		11.111111		0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0									
2004	1	8	1	0	1	17	17	7	0	0	71.42857		28.571429		0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	71.42857		28.571429		0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0											
2004	1	8	1	0	1	18	18	14	0	0	42.85714		14.285714		42.857143		0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	42.85714		14.285714		42.857143		0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0									
2004	1	8	1	0	1	19	19	6	0	0	0	16.666667		50	16.666667		0	
16.666667		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	16.666667		50	16.666667		0	16.666667		0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0								
2004	1	8	1	0	1	20	20	13	0	0	0	38.461538		38.461538		15.384615		0
7.692308		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	38.461538		38.461538		15.384615		0	7.692308		0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0							
2004	1	8	1	0	1	21	21	9	0	0	0	0	44.444444		33.333333		0	0
0	11.111111		11.111111		0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	44.444444		33.333333		0	0	0	11.111111		11.111111		0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0							
2004	1	8	1	0	1	22	22	14	0	0	0	7.142857		42.857143		7.142857		
14.285714		7.142857		0	7.142857		7.142857		0	7.142857		0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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7.142857 0 7.142857 7.142857 0 7.142857 0 0 0 0 0 0 0 0 0
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0 0 0 0
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5.882353 5.882353 11.764706 23.529412 0 5.882353 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 11.764706 35.294118 0 5.882353 5.882353
11.764706 23.529412 0 5.882353 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0
2004 1 8 1 0 1 24 24 12 0 0 0 0 0 25 0 25
8.333333 0 33.333333 8.333333 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 25 0 25 8.333333 0 33.333333 8.333333 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
2004 1 8 1 0 1 25 25 6 0 0 0 0 0 0 0 0 0
16.666667 66.666667 0 0 16.666667 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 16.666667 66.666667 0 0 16.666667 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
2004 1 8 1 0 1 26 26 21 0 0 0 0 0 0 0 19.047619
4.761905 14.285714 38.095238 4.761905 9.52381 0 4.761905 0 0 0 0 0 0
0 0 0 0 4.761905 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 19.047619 4.761905
14.285714 38.095238 4.761905 9.52381 0 4.761905 0 0 0 0 0 0 0 0
0 0 4.761905 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2004 1 8 1 0 1 27 27 19 0 0 0 0 0 0 5.263158
10.526316 5.263158 31.578947 5.263158 10.526316 0 5.263158 5.263158 0 0
5.263158 5.263158 5.263158 0 0 0 0 0 0 0 0 0 0 0 0
5.263158 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 5.263158 10.526316 5.263158 31.578947 5.263158 10.526316 0 5.263158 5.263158 0
0 5.263158 5.263158 5.263158 0 0 0 0 0 0 0 0 0 0 0 0
5.263158 0 0 0 0 0 0 0 0 0 0 0
2004 1 8 1 0 1 28 28 13 0 0 0 0 0 0 0 7.692308 0
7.692308 23.076923 23.076923 7.692308 0 0 0 0 0 0 0 15.384615 0 0
0 7.692308 0 0 0 7.692308 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 7.692308 0 7.692308
23.076923 23.076923 7.692308 0 0 0 0 0 0 0 15.384615 0 0 0
7.692308 0 0 0 7.692308 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2004 1 8 1 0 1 29 29 20 0 0 0 0 0 0 0 0 0 0
40 0 5 0 0 15 5 5 0 0 10 0 5 0 0 0 0 5
10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 40 0 5 0 0 15 5 5 0 0

```
10	0	5	0	0	0	0	5	10	0	0	0	0	0	0	0	0	0	0
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2004	1	8	1	0	1	30	30	15	0	0	0	0	0	0	0	0	0	0
33.333333	0	0	6.666667	6.666667	6.666667	6.666667	0	13.333333	6.666667	0	0
0	0	6.666667	0	6.666667	6.666667	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33.333333	0	0	6.666667	6.666667	6.666667	6.666667	0	13.333333	6.666667	0	0
0	0	6.666667	0	6.666667	6.666667	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0
2004	1	8	1	0	1	31	31	15	0	0	0	0	0	0	0	0	0	0
13.333333	0	0	0	0	6.666667	6.666667	0	6.666667	6.666667	6.666667
13.333333	6.666667	6.666667	0	0	6.666667	0	13.333333	0	0	0	0
6.666667	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	13.333333	0	0	0	0	6.666667	6.666667	0	6.666667
6.666667	6.666667	13.333333	6.666667	6.666667	0	0	6.666667	0	13.333333	0	0
0	0	6.666667	0	0	0	0	0	0	0	0	0	0	0
2004	1	8	1	0	1	32	32	12	0	0	0	0	0	0	0	0	0	0
0	0	0	0	8.333333	16.666667	16.666667	0	16.666667	0	0	16.666667	0
8.333333	0	0	0	0	0	0	0	8.333333	0	0	0	0	0	0	0	0
0	0	0	0	8.333333	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	8.333333	16.666667	16.666667	0	16.666667	0	0	16.666667	0	8.333333	0	0
0	0	0	0	0	8.333333	0	0	0	0	0	0	0	0	0	0	0	0	0
8.333333
2004	1	8	1	0	1	33	33	17	0	0	0	0	0	0	0	0	0	0
0	0	0	0	5.882353	0	0	0	11.764706	17.647059	5.882353	0	5.882353
5.882353	0	5.882353	0	11.764706	0	5.882353	5.882353	0	0	0	5.882353	0
5.882353	0	0	0	0	0	0	0	5.882353	0	0	0	0	0	0	0	0
0	0	0	0	0	0	5.882353	0	0	0	11.764706	17.647059	5.882353	0
5.882353	5.882353	0	5.882353	0	11.764706	0	5.882353	5.882353	0	0	0
5.882353	0	5.882353	0	0	0	0	0	0	0	5.882353
2004	1	8	1	0	1	34	34	11	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	9.090909	0	0	9.090909	0	0	0	9.090909	0
9.090909	0	18.181818	9.090909	18.181818	0	0	9.090909	0	0	0	0	0	0
0	0	0	0	0	0	9.090909	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	9.090909	0	0	9.090909	0	0	0	9.090909	0	9.090909	0
18.181818	9.090909	18.181818	0	0	9.090909	0	0	0	0	0	0	0	0	0
0	0	0	9.090909
2004	1	8	1	0	1	35	35	7	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	14.285714	0	0	28.571429	0	0	0
14.285714	0	0	0	0	0	14.285714	0	0	0	0	0	14.285714	0	0	0
14.285714	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	14.285714	0	0	28.571429	0	0	0	14.285714	0	0	0	0
0	14.285714	0	0	0	0	0	14.285714	0	0	0	14.285714	0	0
2004	1	8	1	0	1	36	36	6	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16.666667	0
0	16.666667	16.666667	16.666667	16.666667	0	0	0	0	0	0	0	0	0	0
0	16.666667	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
```

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16.666667 16.666667 0 0 0 0 0 0 0 0 0 0 0 16.666667
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0 0 33.333333 0 0 33.333333 0 0 0 33.333333 0 0 0 0 0 0
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0 0 33.333333 0 0 0 0 0 0
2004 1 8 1 0 1 38 38 1 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 100 0 0 0 0 0 0 0
0 0 0 0
2004 1 8 1 0 1 39 39 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 100 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 100
2005 1 8 1 0 1 10 10 2 100 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 100 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2005 1 8 1 0 1 11 11 6 100 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 100 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0
2005 1 8 1 0 1 12 12 2 50 50 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0
2005 1 8 1 0 1 13 13 2 0 100 0 0 0 0 0 0 0 0
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0 0 0 0
2005 1 8 1 0 1 14 14 1 0 0 100 0 0 0 0 0 0 0
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100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

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2005 1 8 1 0 1 15 15 4 0 0 75 25 0 0 0 0 0 0
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75 25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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75 25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2005 1 8 1 0 1 17 17 4 0 0 25 75 0 0 0 0 0 0
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50 40 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0
2005 1 8 1 0 1 19 19 10 0 0 0 10 60 0 30 0 0 0
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10 60 0 30 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0
2005 1 8 1 0 1 20 20 20 0 0 0 0 30 50 15 0 5 0
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0 30 50 15 0 5 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2005 1 8 1 0 1 21 21 13 0 0 0 0 23.076923 38.461538
15.384615 15.384615 0 0 0 7.692308 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 23.076923 38.461538 15.384615 15.384615 0 0 0
7.692308 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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7.692308 7.692308 7.692308 0 0 15.384615 0 7.692308 0 7.692308 0 0 0
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7.692308 7.692308 0 0 15.384615 0 7.692308 0 7.692308 0 0 0 0 0
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11.764706 5.882353 17.647059 17.647059 11.764706 5.882353 0 0 0 0 0 0 0
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0 0 0
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17.647059 0 5.882353 52.941176 5.882353 5.882353 0 0 0 5.882353 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 5.882353 0 17.647059 0
5.882353 52.941176 5.882353 5.882353 0 0 0 5.882353 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0
2005 1 8 1 0 1 27 27 19 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0
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5.882353 0 5.882353 47.058824 0 0 0 0 5.882353 0 5.882353 5.882353 0
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2005 1 8 1 0 1 29 29 29 0 0 0 0 0 0 0 0
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3.448276 3.448276 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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6.896552 3.448276 0 10.344828 3.448276 3.448276 0 0 0 0 0 0 0
3.448276 0 0 3.448276 3.448276 0 0 0 0 0 0 0 0 0 0 0
2005 1 8 1 0 1 30 30 18 0 0 0 0 0 0 0 0 0 0
0 22.222222 0 0 5.555556 0 5.555556 5.555556 11.111111 11.111111 16.666667
16.666667 0 0 0 0 0 0 0 0 5.555556 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
22.222222 0 0 5.555556 0 5.555556 5.555556 11.111111 11.111111 16.666667
16.666667 0 0 0 0 0 0 0 0 5.555556 0 0 0 0 0 0 0
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2005 1 8 1 0 1 31 31 9 0 0 0 0 0 0 0 0 0 0
0 11.111111 0 0 22.222222 22.222222 0 11.111111 0 0 0 0 11.111111 0
11.111111 0 0 0 0 0 11.111111 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11.111111 0 0
22.222222 22.222222 0 11.111111 0 0 0 0 11.111111 0 11.111111 0 0 0
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2005 1 8 1 0 1 32 32 18 0 0 0 0 0 0 0 0 0 0
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5.555556 0 11.111111 0 0 11.111111 5.555556 0 0 0 0 5.555556 0 0
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5.555556 0 11.111111 0 0 11.111111 5.555556 0 0 0 0 5.555556 0 0
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2005 1 8 1 0 1 33 33 7 0 0 0 0 0 0 0 0 0 0
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2005 1 8 1 0 1 34 34 8 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 12.5 0 12.5 0 0 12.5 0 12.5 0 0
12.5 12.5 0 0 0 0 0 0 0 0 0 0 0 0 0 25 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 12.5 0
12.5 0 0 12.5 0 12.5 0 0 12.5 12.5 0 0 0 0 0 0 0 0 0
0 0 0 0 25
2005 1 8 1 0 1 35 35 4 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 25 0 0 0 25 0 0
0 0 0 0 25 25 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
25 0 0 0 25 0 0 0 0 0 0 25 25 0 0 0 0 0 0
0 0 0 0
2005 1 8 1 0 1 36 36 5 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 20 0 0 0 0 0 0 0
0 20 0 0 0 0 20 0 20 0 20 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
20 0 0 0 0 0 0 0 0 20 0 0 0 0 20 0 20 0
20 0 0 0 0 0

2005	1	8	1	0	1	38	38	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	100															
2005	1	8	1	0	1	39	39	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	100	0	0															
2006	1	8	1	0	1	11	11	1	0	100	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2006	1	8	1	0	1	12	12	6	0	100	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2006	1	8	1	0	1	13	13	3	0	100	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2006	1	8	1	0	1	14	14	1	0	0	100	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2006	1	8	1	0	1	15	15	3	0	33.33333		0	66.666667		0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33.33333		0	66.666667		0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0											
2006	1	8	1	0	1	17	17	7	0	0	0	71.428571		28.571429		0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	71.428571		28.571429		0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0											

```
2006	1	8	1	0	1	18	18	5	0	0	0	20	40	40	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	40	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0
2006	1	8	1	0	1	19	19	11	0	0	0	27.272727	27.272727	18.181818
9.090909	9.090909	0	9.090909	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	27.272727	27.272727	18.181818	9.090909	9.090909	0
9.090909	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	1	8	1	0	1	20	20	10	0	0	0	10	10	40	10	10	0	0
0	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	10	40	10	10	0	0	0	10	10	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0
2006	1	8	1	0	1	21	21	13	0	0	0	7.692308	30.769231	23.076923
7.692308	23.076923	0	0	0	7.692308	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	7.692308	30.769231	23.076923	7.692308	23.076923	0	0
0	7.692308	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	1	8	1	0	1	22	22	22	0	0	0	0	9.090909	31.818182
31.818182	13.636364	0	0	0	0	4.545455	4.545455	0	0	0	4.545455	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	9.090909	31.818182	31.818182	13.636364	0
0	0	0	4.545455	4.545455	0	0	0	4.545455	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0
2006	1	8	1	0	1	23	23	20	0	0	0	0	10	20	15	25	0	0
5	10	5	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	10	20	15	25	0	0	5	10	5	5	5	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0
2006	1	8	1	0	1	24	24	23	0	0	0	0	0	0	26.086957
4.347826	13.043478	4.347826	4.347826	21.73913	17.391304	8.695652	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	26.086957	4.347826
13.043478	4.347826	4.347826	21.73913	17.391304	8.695652	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0
2006	1	8	1	0	1	25	25	8	0	0	0	0	0	12.5	25	12.5	0	0
0	12.5	25	12.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	12.5	25	12.5	0	0	0	12.5	25	12.5	0	0	0	0	0	0	0	0
```

```
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0 0 0 0
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17.647059 0 0 0 11.764706 23.529412 11.764706 5.882353 0 17.647059 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 11.764706 17.647059 0 0 0
11.764706 23.529412 11.764706 5.882353 0 17.647059 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0
2006 1 8 1 0 1 27 27 21 0 0 0 0 0 4.761905 4.761905
4.761905 4.761905 0 9.52381 19.047619 38.095238 4.761905 4.761905 4.761905 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 4.761905 4.761905
4.761905 4.761905 0 9.52381 19.047619 38.095238 4.761905 4.761905 4.761905 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2006 1 8 1 0 1 28 28 16 0 0 0 0 0 0 0 0 6.25
12.5 6.25 6.25 37.5 0 6.25 0 6.25 0 0 6.25 0 6.25 0 0 0 0 0 0
0 0 0 6.25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 6.25 12.5 6.25 6.25 37.5 0 6.25 0 6.25 0 0 6.25 0
6.25 0 0 0 0 0 0 0 0 0 6.25 0 0 0 0 0 0 0 0
0 0 0 0 0
2006 1 8 1 0 1 29 29 10 0 0 0 0 0 0 0 0 0 0
0 0 30 10 0 10 0 10 10 0 0 0 0 10 0 0 0 0 0
10 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 30 10 0 10 0 10 10 0 0 0
0 10 0 0 0 0 0 10 0 0 10 0 0 0 0 0 0 0 0
0 0 0 0
2006 1 8 1 0 1 30 30 12 0 0 0 0 0 0 0 0 0 0
0 8.333333 8.333333 0 8.333333 8.333333 0 8.333333 8.333333 0
8.333333 16.666667 0 8.333333 0 0 0 8.333333 0 0 0 0 8.333333 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 8.333333 8.333333 0 8.333333 8.333333 0 0 8.333333 8.333333 0
8.333333 16.666667 0 8.333333 0 0 0 8.333333 0 0 0 0 8.333333 0
0 0 0 0 0 0 0 0 0 0
2006 1 8 1 0 1 31 31 13 0 0 0 0 0 0 0 0 0 0
0 0 0 0 7.692308 0 15.384615 0 7.692308 0 7.692308 15.384615
7.692308 7.692308 7.692308 0 7.692308 0 0 0 0 0 0 0 0
7.692308 0 0 0 7.692308 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 7.692308 0 15.384615 0 7.692308 0 7.692308
15.384615 7.692308 7.692308 7.692308 0 7.692308 0 0 0 0 0 0 0 0
7.692308 0 0 0 7.692308 0 0 0 0 0
2006 1 8 1 0 1 32 32 12 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 8.333333 8.333333 8.333333 8.333333 0 16.666667 16.666667
8.333333 0 0 0 0 8.333333 8.333333 0 0 0 0 8.333333 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 8.333333 8.333333 8.333333 8.333333 0 16.666667 16.666667
```

8.333333 0 0 0 0 8.333333 8.333333 0 0 0 0 8.333333 0 0 0
0 0 0 0 0 0 0 0
2006 1 8 1 0 1 33 33 13 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 7.692308 0 0 0 7.692308 15.384615 0 0
7.692308 0 7.692308 0 15.384615 0 0 7.692308 7.692308 7.692308 7.692308 0
0 0 7.692308 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 7.692308 0 0 0 7.692308 15.384615 0 0
7.692308 0 7.692308 0 15.384615 0 0 7.692308 7.692308 7.692308 7.692308 0
0 0 7.692308 0 0 0 0 0 0
2006 1 8 1 0 1 34 34 5 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 20 0 0 0 40 0 0 0 20 0 0
0 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 20 0 0 0
40 0 0 0 20 0 0 0 20 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2006 1 8 1 0 1 35 35 7 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 28.571429 0 14.285714 14.285714 0
14.285714 0 0 0 0 0 0 14.285714 0 14.285714 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 28.571429 0 14.285714 14.285714 0 14.285714 0 0 0 0
0 0 14.285714 0 14.285714 0 0 0 0 0 0 0 0 0 0
2006 1 8 1 0 1 36 36 3 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 33.333333 0 0 0 0 0 0 0
0 0 0 0 0 0 0 33.333333 0 0 0 0 0 0 33.333333 0 0
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0 33.333333 0 0 0 0 0 0 0 0 0 0 0 0 0 0
33.333333 0 0 0 0 0 0 33.333333 0 0
2006 1 8 1 0 1 37 37 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 100 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2006 1 8 1 0 1 38 38 2 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 50 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 50
2006 1 8 1 0 1 39 39 2 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 50 0 0 0 0 0 0 0 0 0 0 50 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 50 0 0 0 0 0 0 0
0 0 0 50
2007 1 8 1 0 1 10 10 1 100 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 100 0 0

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0	0	0	0															
2007	1	8	1	0	1	11	11	1	100	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2007	1	8	1	0	1	12	12	1	0	0	100	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2007	1	8	1	0	1	13	13	3	0	66.66667		33.33333		0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66.66667		33.33333		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0											
2007	1	8	1	0	1	14	14	10	0	50	50	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2007	1	8	1	0	1	15	15	7	0	0	71.42857		14.285714		0	0		
14.285714		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	71.42857		14.285714		0	0	14.285714		0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0							
2007	1	8	1	0	1	16	16	8	0	0	50	37.5	0	12.5	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
50	37.5	0	12.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2007	1	8	1	0	1	17	17	3	0	0	33.33333		33.333333		33.333333		0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	33.33333		33.333333		33.333333		0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0									
2007	1	8	1	0	1	18	18	9	0	0	11.11111		44.444444		22.222222		0	
22.222222		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

0 0 0 0 11.11111 44.444444 22.222222 0 22.222222 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 8 1 0 1 19 19 9 0 0 0 55.555556 11.111111 22.222222
11.111111 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2007 1 8 1 0 1 20 20 8 0 0 0 25 12.5 25 0 25 0 0
0 12.5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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25 12.5 25 0 25 0 0 0 12.5 0 0 0 0 0 0 0 0 0 0
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2007 1 8 1 0 1 21 21 5 0 0 0 20 20 20 0 20 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
20 20 20 0 20 0 0 0 0 20 0 0 0 0 0 0 0 0 0
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0 0 0 0
2007 1 8 1 0 1 22 22 14 0 0 0 0 7.142857 14.285714
42.857143 7.142857 7.142857 7.142857 14.285714 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 7.142857 14.285714 42.857143 7.142857
7.142857 7.142857 14.285714 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0
2007 1 8 1 0 1 23 23 19 0 0 0 0 0 5.263158 15.789474
15.789474 15.789474 0 15.789474 5.263158 5.263158 5.263158 5.263158 5.263158 0
5.263158 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5.263158
15.789474 15.789474 15.789474 0 15.789474 5.263158 5.263158 5.263158 5.263158
5.263158 0 5.263158 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 8 1 0 1 24 24 23 0 0 0 0 4.347826 0 17.391304
8.695652 26.086957 8.695652 13.043478 4.347826 0 13.043478 4.347826 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 4.347826 0 17.391304 8.695652
26.086957 8.695652 13.043478 4.347826 0 13.043478 4.347826 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2007 1 8 1 0 1 25 25 15 0 0 0 0 0 0 33.333333
6.666667 26.666667 6.666667 20 6.666667 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 33.333333 6.666667 26.666667 6.666667
20 6.666667 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

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2007 1 8 1 0 1 26 26 32 0 0 0 0 0 0 12.5 25 18.75 0
9.375 3.125 9.375 12.5 0 3.125 0 3.125 3.125 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 12.5 25 18.75 0 9.375 3.125 9.375 12.5 0 3.125 0 3.125 3.125 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2007 1 8 1 0 1 27 27 32 0 0 0 0 0 0 3.125 0 15.625 0
6.25 6.25 15.625 18.75 3.125 6.25 6.25 3.125 3.125 0 6.25 3.125 0 0 0 0 0 0 0
3.125 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 3.125 0 15.625 0 6.25 6.25 15.625 18.75 3.125 6.25 6.25 3.125 3.125 0 6.25
3.125 0 0 0 0 0 0 0 3.125 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2007 1 8 1 0 1 28 28 16 0 0 0 0 0 0 0 6.25 0 0
12.5 6.25 0 18.75 12.5 18.75 12.5 0 0 0 6.25 0 0 0 0 0 0 0 0
0 0 6.25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 6.25 0 0 12.5 6.25 0 18.75 12.5 18.75 12.5 0 0 0 6.25 0
0 0 0 0 0 0 0 0 0 6.25 0 0 0 0 0 0 0 0 0
0 0 0 0
2007 1 8 1 0 1 29 29 25 0 0 0 0 0 0 0 0 12 4
0 8 12 12 8 8 4 4 4 0 0 8 4 4 4 0 0 0 0
0 0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 12 4 0 8 12 12 8 8 4 4 4 0 0 8
4 4 4 0 0 0 0 0 0 0 0 0 0 4 0 0 0 0 0
0 0 0 0
2007 1 8 1 0 1 30 30 29 0 0 0 0 0 0 0 0 0 0
0 3.448276 0 24.137931 3.448276 3.448276 0 10.344828 6.896552 0 3.448276
6.896552 10.344828 0 10.344828 0 3.448276 3.448276 0 0 6.896552 0 0
3.448276 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 3.448276 0 24.137931 3.448276 3.448276 0 10.344828
6.896552 0 3.448276 6.896552 10.344828 0 10.344828 0 3.448276 3.448276 0 0
6.896552 0 0 3.448276 0 0 0 0 0 0 0 0 0 0 0
2007 1 8 1 0 1 31 31 15 0 0 0 0 0 0 0 0 0 0
0 0 13.333333 6.666667 0 6.666667 0 20 0 6.666667 13.333333 0
13.333333 6.666667 0 0 0 0 0 0 6.666667 0 0 6.666667 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 13.333333 6.666667 0 6.666667 0 20 0 6.666667 13.333333 0 13.333333
6.666667 0 0 0 0 0 0 6.666667 0 0 6.666667 0 0 0 0 0
0 0 0 0 0 0
2007 1 8 1 0 1 32 32 10 0 0 0 0 0 0 0 0 0 0
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0 10 0 0 0 0 0 10 0 0 10 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 10 0 0
20 0 0 0 10 0 20 0 0 10 0 0 0 0 0 10 0 0
10 0 0 0 0 0
2007 1 8 1 0 1 33 33 21 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 4.761905 0 0 9.52381 4.761905 0 19.047619 4.761905 0
0 4.761905 0 4.761905 0 0 0 4.761905 4.761905 4.761905 9.52381 9.52381
4.761905 4.761905 0 0 0 0 4.761905 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 4.761905 0 0 9.52381 4.761905 0
19.047619 4.761905 0 0 4.761905 0 4.761905 0 0 0 4.761905 4.761905
4.761905 9.52381 9.52381 4.761905 4.761905 0 0 0 0 4.761905 0 0
2007 1 8 1 0 1 34 34 20 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 5 5 0 0 0 10 15 5 0 10 0 5 5 0
10 0 0 10 5 0 0 0 0 10 0 0 0 0 0 5 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 5 5 0 0 0 10
15 5 0 10 0 5 5 0 10 0 0 10 5 0 0 0 0 10 0
0 0 0 0 5
2007 1 8 1 0 1 35 35 8 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 25 12.5 12.5 0 0 12.5 0 0 0 0 0 0
0 0 0 0 12.5 0 0 0 0 0 0 0 0 0 0 25 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 25 12.5 12.5 0 0
12.5 0 0 0 0 0 0 0 0 0 0 12.5 0 0 0 0 0 0 0
0 0 0 25
2007 1 8 1 0 1 36 36 10 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 10 0 0 0 10 10 10 10 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 0
0 0 10 10 10 10 0 0 0 0 10 0 10 10 0 0 0 0 0
10 0 0 10
2007 1 8 1 0 1 37 37 2 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 50 0 0 0 0 0 0 0 0 0
0 0 0 50
2007 1 8 1 0 1 38 38 1 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 100
2008 1 8 1 0 1 11 11 1 100 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 100 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2008 1 8 1 0 1 12 12 2 50 0 50 0 0 0 0 0 0 0
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50 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2008 1 8 1 0 1 13 13 1 0 0 100 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0														
2008	1	8	1	0	1	14	14	7	0	57.14286	42.85714	0	0	0	0	0		
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57.14286	42.85714	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0											
2008	1	8	1	0	1	15	15	5	0	40	20	20	20	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	
20	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2008	1	8	1	0	1	16	16	9	0	11.11111	77.77778	0	11.111111	0	0			
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	11.11111	77.77778	0	11.111111	0	0	0	0	0	0	0	0	0	0	0			
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0									
2008	1	8	1	0	1	17	17	8	0	0	50	12.5	37.5	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
50	12.5	37.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2008	1	8	1	0	1	18	18	3	0	0	33.33333	0	66.666667	0	0	0		
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	33.33333	0	66.666667	0	0	0	0	0	0	0	0	0	0	0	0	0		
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0											
2008	1	8	1	0	1	19	19	9	0	0	11.11111	22.222222	22.222222					
33.333333	11.111111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	11.11111	22.222222	22.222222	33.333333	11.111111	0	0	0					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
2008	1	8	1	0	1	20	20	8	0	0	0	12.5	37.5	25	12.5	0	0	0
12.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12.5	37.5	25	12.5	0	0	0	12.5	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2008	1	8	1	0	1	21	21	16	0	0	0	0	6.25	31.25	18.75	31.25	6.25	0
0	0	0	0	0	6.25	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

0 6.25 31.25 18.75 31.25 6.25 0 0 0 0 0 0 6.25 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2008 1 8 1 0 1 22 22 15 0 0 0 0 0 26.666667 13.333333
13.333333 6.666667 13.333333 6.666667 13.333333 0 0 0 0 0 0 6.666667 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 26.666667 13.333333 13.333333
6.666667 13.333333 6.666667 13.333333 0 0 0 0 0 0 6.666667 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2008 1 8 1 0 1 23 23 15 0 0 0 0 0 13.333333 6.666667
26.666667 33.333333 6.666667 0 0 13.333333 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 13.333333 6.666667 26.666667 33.333333
6.666667 0 0 13.333333 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2008 1 8 1 0 1 24 24 15 0 0 0 0 0 0 20 26.666667
13.333333 13.333333 0 0 6.666667 6.666667 6.666667 0 0 0 0 0 0
6.666667 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 20 26.666667 13.333333
13.333333 0 0 6.666667 6.666667 6.666667 0 0 0 0 0 0 6.666667 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2008 1 8 1 0 1 25 25 11 0 0 0 0 0 0 0 18.181818 0
9.090909 27.272727 0 0 9.090909 18.181818 9.090909 0 0 9.090909 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 18.181818 0 9.090909 27.272727 0
0 9.090909 18.181818 9.090909 0 0 9.090909 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2008 1 8 1 0 1 26 26 18 0 0 0 0 0 0 0 11.111111
5.555556 16.666667 0 11.111111 11.111111 5.555556 22.222222 5.555556 0 0
11.111111 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11.111111
5.555556 16.666667 0 11.111111 11.111111 5.555556 22.222222 5.555556 0 0
11.111111 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
2008 1 8 1 0 1 27 27 13 0 0 0 0 0 0 0 15.384615
7.692308 15.384615 0 15.384615 0 0 0 0 7.692308 7.692308 0 0 0 0
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7.692308 15.384615 0 15.384615 0 0 0 0 7.692308 7.692308 0 0 0 0
0 7.692308 0 0 0 7.692308 0 7.692308 0 0 0 7.692308 0 0 0
0 0 0 0 0 0 0 0
2008 1 8 1 0 1 28 28 22 0 0 0 0 0 0 0 4.545455
4.545455 0 4.545455 0 0 18.181818 27.272727 0 0 0 4.545455 0 0 0
4.545455 0 9.090909 9.090909 4.545455 0 0 0 4.545455 0 0 0 0
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4.545455 4.545455 0 4.545455 0 0 18.181818 27.272727 0 0 0 4.545455 0

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0 0 4.545455 0 9.090909 9.090909 4.545455 0 0 0 4.545455 0 0 0
0 4.545455 0 0 0 0 0 0 0 0 0
2008 1 8 1 0 1 29 29 21 0 0 0 0 0 0 0 0
4.761905 0 0 0 4.761905 14.285714 14.285714 4.761905 9.52381 4.761905
4.761905 4.761905 4.761905 0 4.761905 4.761905 0 0 0 4.761905 0
4.761905 0 0 0 4.761905 0 0 0 0 0 0 0 0 0 0
4.761905 0 0 0 0 0 0 0 0 4.761905 0 0 0 4.761905
14.285714 14.285714 4.761905 9.52381 4.761905 4.761905 4.761905 4.761905 0
4.761905 4.761905 0 0 0 4.761905 0 4.761905 0 0 0 4.761905 0 0
0 0 0 0 0 0 0 0 4.761905
2008 1 8 1 0 1 30 30 10 0 0 0 0 0 0 0 0 0 0
0 0 0 0 20 10 0 0 10 0 0 0 20 10 0 0 10 0 0
0 10 0 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 20 10 0 0 10 0 0 0
20 10 0 0 10 0 0 0 10 0 0 0 0 10 0 0 0 0 0
0 0 0 0
2008 1 8 1 0 1 31 31 16 0 0 0 0 0 0 0 0 0 0
0 0 0 12.5 6.25 0 0 6.25 12.5 12.5 6.25 0 0 25 6.25 0 0 0 0
0 0 0 0 6.25 0 0 6.25 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 12.5 6.25 0 0 6.25 12.5 12.5 6.25 0
0 25 6.25 0 0 0 0 0 0 0 0 6.25 0 0 6.25 0 0 0 0
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2008 1 8 1 0 1 32 32 10 0 0 0 0 0 0 0 0 0 0
0 0 0 0 20 20 10 0 0 0 0 0 0 0 10 0 10 0 0
0 0 0 0 0 0 0 20 0 0 0 10 0 0 0 0 0 0 0
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10 0 0 0 0
2008 1 8 1 0 1 33 33 10 0 0 0 0 0 0 0 0 0 0
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0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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10 10 10 20 10 0 0 0 0 10 0 0 0 0 0 0 0 0 0
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2008 1 8 1 0 1 34 34 6 0 0 0 0 0 0 0 0 0 0
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0 0 0 16.666667 16.666667 0 0 16.666667 0 0 0 0 0 0 0 0
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0 0 16.666667 0 0 0 0 0 33.333333 0 0 0 0 16.666667
16.666667 0 0 16.666667 0 0 0 0 0 0 0 0 0 0
2008 1 8 1 0 1 35 35 8 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 12.5 0 0 0 0 12.5 0 12.5 0 12.5 0
12.5 12.5 0 0 0 0 0 12.5 0 0 0 0 0 0 0 12.5 0 0 0
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0 0 0 12.5
2008 1 8 1 0 1 38 38 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	100	0															
	2008	1	8	1	0	1	39	39	1	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0
	0	0	0	0															
#NWFSC_M		year	Season	Fleet	gender	partition		ageErr	LbinLo	LbinHi	nSamps	M1	M2	M3	M4	M5	M6	M7	
	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	
	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36	M37	M38	M39	M40	M41	M42	M43	
	M44	M45	M1.1	M1.2	M1.3	M1.4	M1.5	M1.6	M1.7	M1.8	M1.9	M1.10	M1.11	M1.12	M1.13	M1.14	M1.15	M1.16	
	M1.17	M1.18	M1.19	M1.20	M1.21	M1.22	M1.23	M1.24	M1.25	M1.26	M1.27	M1.28	M1.29	M1.30	M1.31	M1.32	M1.33	M1.34	
	M1.35	M1.36	M1.37	M1.38	M1.39	M1.40	M1.41	M1.42	M1.43	M1.44	M1.45								
	2003	1	8	2	0	1	12	12	2	0	100	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0															
	2003	1	8	2	0	1	13	13	2	0	100	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0															
	2003	1	8	2	0	1	14	14	3	0	0	66.666667		33.333333		0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	66.666667		33.333333		0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0											
	2003	1	8	2	0	1	15	15	6	0	0	66.666667		33.333333		0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	66.666667		33.333333		0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0											
	2003	1	8	2	0	1	16	16	8	0	0	75	25	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	75	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0														
	2003	1	8	2	0	1	17	17	7	0	0	42.857143		42.857143		14.285714		0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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0 0 42.857143 42.857143 14.285714 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0
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0 7.692308 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 69.230769 23.076923 0 0 0 0 7.692308 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
2003 1 8 2 0 1 19 19 16 0 0 0 50 50 0 0 0 0 0
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50 50 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0
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5.882353 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 47.058824 47.058824 0 0 0 5.882353 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0
2003 1 8 2 0 1 21 21 11 0 0 0 9.090909 18.181818 18.181818 0
27.272727 0 27.272727 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 9.090909 18.181818 18.181818 0 27.272727 0 27.272727 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0
2003 1 8 2 0 1 22 22 12 0 0 0 0 8.333333 0 8.333333
16.666667 8.333333 58.333333 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 8.333333 0 8.333333 16.666667 8.333333 58.333333 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2003 1 8 2 0 1 23 23 23 0 0 0 4.347826 4.347826 4.347826 0
0 8.695652 56.521739 17.391304 0 0 0 0 4.347826 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 4.347826 4.347826 4.347826 0 0 8.695652
56.521739 17.391304 0 0 0 0 4.347826 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0
2003 1 8 2 0 1 24 24 34 0 0 0 0 0 0 0 5.882353
8.823529 64.705882 11.764706 2.941176 0 0 0 0 0 2.941176 2.941176 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 5.882353 8.823529 64.705882
11.764706 2.941176 0 0 0 0 0 2.941176 2.941176 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0
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12.121212 48.484848 9.090909 3.030303 0 0 0 0 9.090909 3.030303 0
3.030303 0 3.030303 0 3.030303 3.030303 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
3.030303 0 12.121212 48.484848 9.090909 3.030303 0 0 0 0 9.090909
3.030303 0 3.030303 0 3.030303 0 3.030303 3.030303 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0
2003 1 8 2 0 1 26 26 20 0 0 0 0 0 0 0 0 0
15 5 5 0 5 5 0 0 10 5 0 5 10 5 10 5 5 0 5
0 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 15 5 5 0 5 5 0 0 10 5 0 5
10 5 10 5 5 0 5 0 5 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2003 1 8 2 0 1 27 27 15 0 0 0 0 0 0 0 0 0
20 0 6.666667 6.666667 0 20 0 0 6.666667 13.333333 6.666667 0 0 0
0 0 0 6.666667 0 6.666667 0 0 6.666667 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 20 0
6.666667 6.666667 0 20 0 0 6.666667 13.333333 6.666667 0 0 0 0 0
0 6.666667 0 6.666667 0 0 6.666667 0 0 0 0 0 0 0 0 0
0 0 0 0
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5.555556 0 0 0 0 5.555556 0 5.555556 11.111111 16.666667 5.555556 0
0 5.555556 0 5.555556 5.555556 0 5.555556 16.666667 0 0 11.111111 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
5.555556 0 0 0 0 5.555556 0 5.555556 11.111111 16.666667 5.555556 0
0 5.555556 0 5.555556 5.555556 0 5.555556 16.666667 0 0 11.111111 0 0
0 0 0 0 0 0 0 0 0 0 0
2003 1 8 2 0 1 29 29 24 0 0 0 0 0 0 0 0 0 0
0 0 0 0 12.5 4.166667 0 4.166667 8.333333 8.333333 8.333333 4.166667 0
4.166667 16.666667 4.166667 4.166667 0 4.166667 0 4.166667 0 4.166667 0 0
4.166667 0 0 0 0 0 0 0 4.166667 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 12.5 4.166667 0 4.166667 8.333333 8.333333
8.333333 4.166667 0 4.166667 16.666667 4.166667 4.166667 0 4.166667 0
4.166667 0 4.166667 0 0 4.166667 0 0 0 0 0 0 0 4.166667 0
2003 1 8 2 0 1 30 30 15 0 0 0 0 0 0 0 0 0 0
0 0 0 6.666667 6.666667 0 13.333333 6.666667 0 20 6.666667 13.333333 0
6.666667 6.666667 0 0 0 0 0 0 0 0 0 6.666667 0 0 0 0
6.666667 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 6.666667 6.666667 0 13.333333 6.666667 0 20 6.666667 13.333333 0
6.666667 6.666667 0 0 0 0 0 0 0 0 0 6.666667 0 0 0 0
6.666667 0 0 0 0 0
2003 1 8 2 0 1 31 31 5 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 20 0 20 20 0 0 20 0 0 0 0 0
0 0 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 20 0 20 20 0
0 20 0 0 0 0 0 0 0 20 0 0 0 0 0 0 0 0 0
0 0 0 0
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2003	1	8	2	0	1	32	32	8	0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	12.5	12.5	0	0	12.5	12.5	12.5	0	0
0	0	0	0	0	0	0	0	0	0	12.5	0	0	0	0	0	0	0	0
0	12.5	0	12.5															
2003	1	8	2	0	1	33	33	1	0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2003	1	8	2	0	1	34	34	1	0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2004	1	8	2	0	1	12	12	1	0	100	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2004	1	8	2	0	1	13	13	2	0	100	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2004	1	8	2	0	1	14	14	1	0	0	0	100	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2004	1	8	2	0	1	15	15	7	0	14.28571		71.428571		14.285714		0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	14.28571		71.428571		14.285714		0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0									
2004	1	8	2	0	1	16	16	6	0	0	66.666667		33.333333		0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	66.666667		33.333333		0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0											

2004 1 8 2 0 1 17 17 7 0 0 71.428571 28.571429 0 0 0 0
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0 0 0 0 0 0 0 0
2004 1 8 2 0 1 18 18 10 0 0 10 70 20 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
10 70 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2004 1 8 2 0 1 19 19 8 0 0 0 25 37.5 25 0 12.5 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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25 37.5 25 0 12.5 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2004 1 8 2 0 1 20 20 17 0 0 0 5.882353 47.058824 23.529412
5.882353 5.882353 0 5.882353 5.882353 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 5.882353 47.058824 23.529412 5.882353 5.882353 0
5.882353 5.882353 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2004 1 8 2 0 1 21 21 17 0 0 0 5.882353 47.058824 17.647059
5.882353 5.882353 5.882353 0 11.764706 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 5.882353 47.058824 17.647059 5.882353 5.882353
5.882353 0 11.764706 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0
2004 1 8 2 0 1 22 22 23 0 0 0 0 13.043478 21.73913 0
4.347826 17.391304 0 30.434783 8.695652 4.347826 0 0 0 0 0 0 0 0
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30.434783 8.695652 4.347826 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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11.538462 3.846154 23.076923 15.384615 3.846154 3.846154 0 3.846154 0 0 0
7.692308 7.692308 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 15.384615 3.846154 0
11.538462 3.846154 23.076923 15.384615 3.846154 3.846154 0 3.846154 0 0 0
7.692308 7.692308 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
2004 1 8 2 0 1 24 24 20 0 0 0 0 0 5 0 5 10 5
60 5 0 5 0 5 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 5 0 5 10 5 60 5 0 5 0 5 0 0 0 0 0 0

```
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7.692308 7.692308 0 0 0 0 0 0 0 3.846154 0 0 0 0
3.846154 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 3.846154 0 3.846154 42.307692 3.846154 3.846154 3.846154 3.846154 7.692308
3.846154 0 0 7.692308 7.692308 0 0 0 0 0 0 0 3.846154 0 0
0 0 3.846154 0 0 0 0 0 0 0 0 0 0 0
2004 1 8 2 0 1 26 26 29 0 0 0 0 0 0 0 0 0
6.896552 27.586207 13.793103 0 3.448276 3.448276 6.896552 0 0 10.344828 0
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0 0 0 0 0 0 7.142857 0 0 0 0 0 0 0 0 0 0
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14.285714 0 0 0 0 0 7.142857 0 7.142857 0 0 0 0 0 0 0
0 0 0 0 0 0 7.142857
2004 1 8 2 0 1 28 28 8 0 0 0 0 0 0 0 0 0 0
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12.5 12.5 0 0 0 0 0 0 0 0 0 0 0 12.5 0 0 0 0 0
0 0 12.5 0 0
2004 1 8 2 0 1 29 29 11 0 0 0 0 0 0 0 0 0 0
9.090909 0 0 0 0 9.090909 0 0 9.090909 9.090909 0 0 0 0 0
9.090909 0 9.090909 0 0 9.090909 0 18.181818 18.181818 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9.090909 0
0 0 0 9.090909 0 0 9.090909 9.090909 0 0 0 0 0 9.090909 0
9.090909 0 0 9.090909 0 18.181818 18.181818 0 0 0 0 0 0 0 0
0 0 0
2004 1 8 2 0 1 30 30 11 0 0 0 0 0 0 0 0 0 0
0 0 0 0 9.090909 0 9.090909 0 0 18.181818 0 0 0 0 0 0
9.090909 0 0 0 0 0 0 9.090909 9.090909 0 0 0 0 0
9.090909 9.090909 0 9.090909 9.090909 0 0 0 0 0 0 0 0 0 0
0 0 0 0 9.090909 0 9.090909 0 0 18.181818 0 0 0 0 0 0
9.090909 0 0 0 0 0 0 9.090909 9.090909 0 0 0 0 0
9.090909 9.090909 0 9.090909 9.090909
2004 1 8 2 0 1 31 31 1 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0	50	0	0
0	0	0	0															
2004	1	8	2	0	1	35	35	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2005	1	8	2	0	1	10	10	1	100	0	0	0	0	0	0	0	0	0
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0	0	0	0															
2005	1	8	2	0	1	11	11	3	100	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2005	1	8	2	0	1	12	12	3	0	100	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2005	1	8	2	0	1	13	13	4	0	50	50	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2005	1	8	2	0	1	14	14	4	0	25	50	25	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	
50	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2005	1	8	2	0	1	15	15	3	0	33.33333		66.666667		0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33.33333		66.666667		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2005 1 8 2 0 1 16 16 7 0 0 71.428571 28.571429 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 71.428571 28.571429 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2005 1 8 2 0 1 17 17 9 0 0 0 66.666667 22.222222 11.111111 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 66.666667 22.222222 11.111111 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
2005 1 8 2 0 1 18 18 15 0 0 6.666667 33.333333 40 13.333333
6.666667 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 6.666667 33.333333 40 13.333333 6.666667 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0
2005 1 8 2 0 1 19 19 10 0 0 0 30 30 20 10 0 10 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
30 30 20 10 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2005 1 8 2 0 1 20 20 17 0 0 0 5.882353 35.294118 23.529412
29.411765 0 0 0 0 5.882353 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 5.882353 35.294118 23.529412 29.411765 0 0 0 0
5.882353 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2005 1 8 2 0 1 21 21 21 0 0 0 0 9.52381 52.380952
14.285714 0 0 0 9.52381 9.52381 0 0 0 0 4.761905 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 9.52381 52.380952 14.285714 0 0 0
9.52381 9.52381 0 0 0 0 4.761905 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2005 1 8 2 0 1 22 22 32 0 0 0 0 9.375 34.375 15.625 0 3.125
9.375 3.125 6.25 3.125 3.125 0 6.25 6.25 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 9.375 34.375 15.625 0 3.125 9.375 3.125 6.25 3.125 3.125 0 6.25 6.25 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2005 1 8 2 0 1 23 23 22 0 0 0 0 0 18.181818 0 0
4.545455 4.545455 9.090909 31.818182 9.090909 4.545455 9.090909 0 0 0
4.545455 0 4.545455 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 18.181818 0 0

4.545455 4.545455 9.090909 31.818182 9.090909 4.545455 9.090909 0 0 0
4.545455 0 4.545455 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
2005 1 8 2 0 1 24 24 17 0 0 0 0 0 0 0 0 0 0
17.647059 52.941176 5.882353 5.882353 0 0 0 11.764706 0 0 0 0 0
5.882353 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 17.647059 52.941176
5.882353 5.882353 0 0 0 11.764706 0 0 0 0 0 5.882353 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2005 1 8 2 0 1 25 25 25 0 0 0 0 0 0 0 0 8 0
4 44 4 8 12 0 4 8 0 0 0 0 0 0 0 0 0 0 0
0 4 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 8 0 4 44 4 8 12 0 4 8 0 0 0 0
0 0 0 0 0 0 0 0 4 0 4 0 0 0 0 0 0 0 0
0 0 0 0
2005 1 8 2 0 1 26 26 17 0 0 0 0 0 0 0 0 0 0
11.764706 29.411765 5.882353 0 0 0 0 5.882353 0 11.764706 0 5.882353
5.882353 0 5.882353 0 5.882353 0 5.882353 0 0 0 0 0 0 0
5.882353 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 11.764706 29.411765 5.882353 0 0 0 0 5.882353 0 11.764706 0
5.882353 5.882353 0 5.882353 0 5.882353 0 5.882353 0 0 0 0 0 0
0 5.882353 0 0 0 0 0 0 0
2005 1 8 2 0 1 27 27 27 0 0 0 0 0 0 0 0
3.703704 0 3.703704 14.814815 0 3.703704 3.703704 3.703704 7.407407 3.703704
3.703704 14.814815 0 0 0 3.703704 7.407407 7.407407 3.703704 0 0
3.703704 3.703704 3.703704 0 0 0 0 0 0 0 0 0
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3.703704 3.703704 3.703704 7.407407 3.703704 3.703704 14.814815 0 0 0
3.703704 7.407407 7.407407 3.703704 0 0 3.703704 3.703704 3.703704 0 0 0
0 0 0 0 0 0 0 0 3.703704 0
2005 1 8 2 0 1 28 28 12 0 0 0 0 0 0 0 0 0 0
0 8.333333 0 0 0 16.666667 8.333333 0 0 16.666667 0 0 0
8.333333 0 0 0 0 0 0 0 8.333333 0 16.666667 0 0 0 0 0
0 0 0 0 0 16.666667 0 0 0 0 0 0 0 0 0 0 0
8.333333 0 0 0 16.666667 8.333333 0 0 16.666667 0 0 0 8.333333 0
0 0 0 0 0 0 8.333333 0 16.666667 0 0 0 0 0 0 0 0
0 0 16.666667
2005 1 8 2 0 1 29 29 14 0 0 0 0 0 0 0 0 0 0
0 7.142857 0 7.142857 0 0 7.142857 7.142857 7.142857 14.285714 0
7.142857 0 0 0 0 0 7.142857 7.142857 0 7.142857 0 0 7.142857
7.142857 0 0 0 0 0 0 0 0 0 7.142857 0 0 0 0 0 0
0 0 0 0 0 7.142857 0 7.142857 0 0 7.142857 7.142857 7.142857
14.285714 0 7.142857 0 0 0 0 0 7.142857 7.142857 0 7.142857 0 0
7.142857 7.142857 0 0 0 0 0 0 0 0 0 7.142857
2005 1 8 2 0 1 30 30 10 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 20 0 0 0 0 0 0 0 0 10 10 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 10 0 10 0

0 10 0 10 10 0 0 0 0 0 0 0 20 0 0 0 0 0 0
0 0 10 10
2005 1 8 2 0 1 31 31 3 0 0 0 0 0 0 0 0 0 0
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33.333333 0 0 0 0 0 33.333333 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 33.333333 33.333333 0 0 0 0 0
33.333333 0 0 0 0 0 0 0 0 0 0 0 0
2005 1 8 2 0 1 33 33 1 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0
2005 1 8 2 0 1 35 35 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 100 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 100 0 0 0 0 0 0 0
0 0 0 0
2006 1 8 2 0 1 11 11 1 0 100 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 100 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2006 1 8 2 0 1 12 12 5 0 100 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 100 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2006 1 8 2 0 1 13 13 3 0 100 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 100 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2006 1 8 2 0 1 14 14 6 0 83.33333 16.666667 0 0 0 0 0
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83.33333 16.666667 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0
2006 1 8 2 0 1 15 15 3 0 0 100 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2006 1 8 2 0 1 16 16 3 0 0 33.333333 33.333333 33.333333 0 0
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0 0 33.333333 33.333333 33.333333 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0
2006 1 8 2 0 1 17 17 6 0 0 16.666667 50 16.666667 16.666667 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 16.666667 50 16.666667 16.666667 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
2006 1 8 2 0 1 18 18 9 0 0 0 55.555556 0 11.111111
11.111111 22.222222 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 55.555556 0 11.111111 11.111111 22.222222 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006 1 8 2 0 1 19 19 10 0 0 0 10 10 40 10 30 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
10 10 40 10 30 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2006 1 8 2 0 1 20 20 14 0 0 0 14.285714 14.285714 50
7.142857 14.285714 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 14.285714 14.285714 50 7.142857 14.285714 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006 1 8 2 0 1 21 21 13 0 0 0 0 15.384615 15.384615
38.461538 23.076923 0 0 0 0 7.692308 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 15.384615 15.384615 38.461538 23.076923 0 0 0
0 7.692308 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006 1 8 2 0 1 22 22 22 0 0 0 0 4.545455 18.181818
18.181818 13.636364 4.545455 4.545455 4.545455 4.545455 18.181818 0 4.545455 0 0
0 0 0 0 0 0 0 4.545455 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 4.545455 18.181818
18.181818 13.636364 4.545455 4.545455 4.545455 4.545455 18.181818 0 4.545455 0 0
0 0 0 0 0 0 0 4.545455 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
2006 1 8 2 0 1 23 23 23 0 0 0 0 0 4.347826 21.73913
13.043478 0 4.347826 17.391304 8.695652 21.73913 4.347826 0 4.347826 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

```
0	0	0	0	0	0	0	0	0	0	0	0	4.347826	21.73913	13.043478	0
4.347826	17.391304	8.695652	21.73913	4.347826	0	4.347826	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0
2006	1	8	2	0	1	24	24	29	0	0	0	0	0	6.896552	6.896552
3.448276	0	3.448276	6.896552	6.896552	31.034483	13.793103	3.448276	3.448276
3.448276	3.448276	0	0	0	0	6.896552	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6.896552	6.896552	3.448276	0	3.448276	6.896552	6.896552	31.034483	13.793103
3.448276	3.448276	3.448276	3.448276	0	0	0	0	6.896552	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	1	8	2	0	1	25	25	21	0	0	0	0	0	0	0	0
4.761905	4.761905	0	9.52381	52.380952	9.52381	0	4.761905	0	0	0	0
4.761905	4.761905	0	0	0	4.761905	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.761905	4.761905	0	9.52381	52.380952	9.52381	0	4.761905	0	0	0	0
4.761905	4.761905	0	0	0	0	4.761905	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
2006	1	8	2	0	1	26	26	29	0	0	0	0	0	0	0	0
3.448276	0	0	10.344828	31.034483	13.793103	6.896552	0	3.448276	3.448276
3.448276	0	6.896552	6.896552	0	6.896552	0	0	0	0	0	0	3.448276	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	3.448276	0	0	10.344828	31.034483	13.793103	6.896552	0	3.448276
3.448276	3.448276	0	6.896552	6.896552	0	6.896552	0	0	0	0	0	0
3.448276	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	1	8	2	0	1	27	27	22	0	0	0	0	0	0	0	0	0
4.545455	4.545455	4.545455	4.545455	0	4.545455	0	0	4.545455	4.545455
13.636364	9.090909	4.545455	0	4.545455	13.636364	4.545455	0	4.545455	4.545455	0
0	0	0	0	9.090909	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	4.545455	4.545455	4.545455	4.545455	0	4.545455	0	0
4.545455	4.545455	13.636364	9.090909	4.545455	0	4.545455	13.636364	4.545455	0
4.545455	4.545455	0	0	0	0	0	9.090909	0	0	0	0	0	0	0	0
0	0
2006	1	8	2	0	1	28	28	13	0	0	0	0	0	0	0	0	0	0
0	7.692308	7.692308	0	0	0	0	0	0	0	23.076923	0	0	0
7.692308	0	0	7.692308	23.076923	0	0	7.692308	7.692308	0	0	0	0	0
0	0	0	0	0	0	7.692308	0	0	0	0	0	0	0	0	0	0	0	0
7.692308	7.692308	0	0	0	0	0	0	0	23.076923	0	0	0	7.692308	0
0	7.692308	23.076923	0	0	7.692308	7.692308	0	0	0	0	0	0	0	0
0	0	0	7.692308
2006	1	8	2	0	1	29	29	9	0	0	0	0	0	0	0	0	0	0
0	0	22.222222	0	0	0	0	0	11.111111	0	0	0	0	0	11.111111	0
0	22.222222	11.111111	0	0	11.111111	0	0	0	0	0	0	0	0	0	0
0	0	11.111111	0	0	0	0	0	0	0	0	0	0	0	0	22.222222	0
0	0	0	0	11.111111	0	0	0	0	0	11.111111	0	0	22.222222
11.111111	0	0	11.111111	0	0	0	0	0	0	0	0	0	0	0	0
11.111111
```

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14.285714	0	0	0	0	0	14.285714	14.285714	0	14.285714	0	0	0	0	0				
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
14.285714	0	0	0	0	0	0	0	14.285714	0	14.285714	0	0	14.285714	0				
0	0	0	0	14.285714	14.285714	0	14.285714	0	0	0	0	0	0	0	0			
0	0																	
2006	1	8	2	0	1	31	31	5	0	0	0	0	0	0	0	0	0	0
0	0	20	0	0	0	0	20	0	0	0	0	0	0	0	0	20	0	0
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0	0	0	0	20	0	0	0	0	0	0	20	0	20	0	0	0	0	0
0	0	0	0															
2006	1	8	2	0	1	32	32	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2006	1	8	2	0	1	38	38	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2007	1	8	2	0	1	11	11	2	0	100	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2007	1	8	2	0	1	12	12	1	0	100	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2007	1	8	2	0	1	13	13	6	0	83.33333	16.666667	0	0	0	0	0		
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
83.33333	16.666667	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0											
2007	1	8	2	0	1	14	14	14	0	50	50	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2007	1	8	2	0	1	15	15	5	0	0	80	20	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
80	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2007	1	8	2	0	1	16	16	10	0	0	40	50	10	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
40	50	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2007	1	8	2	0	1	17	17	6	0	0	16.666667	33.333333	50	0	0	0		
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	16.666667	33.333333	50	0	0	0	0	0	0	0	0	0	0	0	0	0		
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0											
2007	1	8	2	0	1	18	18	1	0	0	0	0	100	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2007	1	8	2	0	1	19	19	7	0	0	0	14.285714	14.285714	14.285714	0			
28.571429	14.285714	14.285714	0	0	0	0	0	0	0	0	0	0	0	0	0			
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	14.285714	14.285714	14.285714	0	28.571429	14.285714							
14.285714	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2007	1	8	2	0	1	20	20	10	0	0	0	0	10	30	0	20	10	
10	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	10	30	0	20	10	10	20	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2007	1	8	2	0	1	21	21	11	0	0	0	0	27.272727	0	27.272727			
9.090909	9.090909	0	0	0	18.181818	9.090909	0	0	0	0	0	0	0	0	0			
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	27.272727	0	27.272727	9.090909	9.090909	0	0					
0	18.181818	9.090909	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
2007	1	8	2	0	1	22	22	18	0	0	0	0	5.555556	0	33.333333			
16.666667	0	11.111111	16.666667	5.555556	5.555556	5.555556	0	0	0	0	0	0						
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	5.555556	0	33.333333	16.666667	0				

11.111111 16.666667 5.555556 5.555556 5.555556 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2007 1 8 2 0 1 23 23 23 0 0 0 0 0 17.391304 8.695652
17.391304 17.391304 4.347826 0 13.043478 4.347826 4.347826 8.695652 4.347826 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 17.391304 8.695652
17.391304 17.391304 4.347826 0 13.043478 4.347826 4.347826 8.695652 4.347826 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2007 1 8 2 0 1 24 24 32 0 0 0 0 0 0 6.25 12.5 12.5 0
12.5 3.125 9.375 15.625 12.5 6.25 3.125 0 0 3.125 0 0 0 0 0 0 0 3.125 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 6.25 12.5 12.5 0 12.5 3.125 9.375 15.625 12.5 6.25 3.125 0 0 3.125 0 0
0 0 0 0 0 3.125 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2007 1 8 2 0 1 25 25 21 0 0 0 0 0 0 0 0 9.52381
0 0 9.52381 9.52381 28.571429 4.761905 4.761905 4.761905 0 0 9.52381
14.285714 0 0 0 0 0 4.761905 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9.52381 0
0 9.52381 9.52381 28.571429 4.761905 4.761905 4.761905 0 0 9.52381
14.285714 0 0 0 0 0 4.761905 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2007 1 8 2 0 1 26 26 33 0 0 0 0 0 0 0 0
6.060606 0 3.030303 9.090909 18.181818 21.212121 6.060606 6.060606 0 0
3.030303 3.030303 0 3.030303 0 6.060606 0 3.030303 3.030303 3.030303 0 0
3.030303 0 3.030303 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 6.060606 0 3.030303 9.090909 18.181818 21.212121
6.060606 6.060606 0 0 3.030303 3.030303 0 3.030303 0 6.060606 0
3.030303 3.030303 3.030303 0 0 3.030303 0 3.030303 0 0 0 0 0 0
0 0 0 0 0 0
2007 1 8 2 0 1 27 27 18 0 0 0 0 0 0 0 0 0 0
0 5.555556 5.555556 16.666667 5.555556 0 0 5.555556 5.555556 11.111111
5.555556 16.666667 0 5.555556 11.111111 0 0 0 5.555556 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 5.555556 5.555556 16.666667 5.555556 0 0 5.555556 5.555556
11.111111 5.555556 16.666667 0 5.555556 11.111111 0 0 0 5.555556 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 8 2 0 1 28 28 20 0 0 0 0 0 0 0 0 0 0
0 0 0 10 5 0 5 0 10 5 0 5 10 0 0 0 5 0
10 5 0 5 5 5 0 0 5 0 5 0 0 0 0 0 5 0 0
0 0 0 0 0 0 0 0 0 0 0 10 5 0 5 0 10 5 0
5 10 0 0 0 5 0 10 5 0 5 5 5 0 0 5 0 5 0
0 0 0 0 5
2007 1 8 2 0 1 29 29 22 0 0 0 0 0 0 0 0 0 0
0 0 0 0 4.545455 0 0 4.545455 9.090909 0 0 0 18.181818
4.545455 9.090909 9.090909 0 4.545455 4.545455 0 4.545455 9.090909 4.545455 0
4.545455 0 0 0 0 0 0 4.545455 0 0 4.545455 0 0 0 0 0

0 0 0 0 0 0 0 0 0 4.545455 0 0 4.545455 9.090909 0 0
0 18.181818 4.545455 9.090909 9.090909 0 4.545455 4.545455 0 4.545455
9.090909 4.545455 0 4.545455 0 0 0 0 0 0 4.545455 0 0
4.545455
2007 1 8 2 0 1 30 30 15 0 0 0 0 0 0 0 0 0 0
0 0 6.666667 0 6.666667 6.666667 6.666667 6.666667 6.666667 0 0 0 0
0 13.333333 6.666667 0 0 6.666667 0 0 0 6.666667 13.333333 6.666667
6.666667 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 6.666667 0 6.666667 6.666667 6.666667 6.666667 6.666667 0 0
0 0 0 13.333333 6.666667 0 0 6.666667 0 0 0 6.666667 13.333333
6.666667 6.666667 0 0 0 0 0 0 0 0 0
2007 1 8 2 0 1 31 31 7 0 0 0 0 0 0 0 0 0 0
0 14.285714 14.285714 0 0 0 0 0 0 0 14.285714 0 0 0 0 0
0 0 0 0 0 0 0 0 14.285714 0 0 14.285714 0 0 0 0 0
0 28.571429 0 0 0 0 0 0 0 0 0 0 14.285714 14.285714 0
0 0 0 0 0 0 14.285714 0 0 0 0 0 0 0 0 0 0 0
0 0 14.285714 0 0 14.285714 0 0 0 0 0 0 28.571429
2007 1 8 2 0 1 32 32 3 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 33.333333 0 0 0 0 0 0 0
0 0 0 0 0 33.333333 0 0 0 0 0 0 0 0 0 0
33.333333 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 33.333333 0 0 0 0 0 0 0 0 0 0 0 0
33.333333 0 0 0 0 0 0 0 0 0 0 33.333333
2007 1 8 2 0 1 33 33 2 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 50 0 50 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 50 0 50
2007 1 8 2 0 1 35 35 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 100 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2008 1 8 2 0 1 10 10 4 100 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 100 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2008 1 8 2 0 1 11 11 4 75 25 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 75 25 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0

2008	1	8	2	0	1	12	12	1	0	100	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0															
2008	1	8	2	0	1	13	13	5	0	40	60	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2008	1	8	2	0	1	14	14	4	0	25	75	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2008	1	8	2	0	1	15	15	10	0	20	50	30	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	
50	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0														
2008	1	8	2	0	1	16	16	6	0	0	50	33.333333	0	0	16.666667	0		
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	50	33.333333	0	0	16.666667	0	0	0	0	0	0	0	0	0	0	0		
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0											
2008	1	8	2	0	1	17	17	6	0	0	50	16.666667	16.666667	0				
16.666667	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	50	16.666667	16.666667	0	16.666667	0	0	0	0	0	0	0			
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0							
2008	1	8	2	0	1	18	18	9	0	0	11.111111	0	33.333333	55.555556	0			
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	11.111111	0	33.333333	55.555556	0	0	0	0	0	0	0	0	0	0			
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0									
2008	1	8	2	0	1	19	19	13	0	0	7.692308	7.692308	30.769231					
46.153846	7.692308	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	7.692308	7.692308	30.769231	46.153846	7.692308	0	0	0					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

2008 1 8 2 0 1 20 20 10 0 0 10 0 20 10 20 20 10
10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
10 0 20 10 20 20 10 10 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2008 1 8 2 0 1 21 21 28 0 0 0 0 3.571429 14.285714
14.285714 14.285714 25 14.285714 0 3.571429 0 7.142857 0 0 3.571429 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 3.571429 14.285714 14.285714
14.285714 25 14.285714 0 3.571429 0 7.142857 0 0 3.571429 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2008 1 8 2 0 1 22 22 17 0 0 0 0 0 11.764706 5.882353
29.411765 17.647059 23.529412 0 0 0 0 11.764706 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 11.764706 5.882353 29.411765 17.647059
23.529412 0 0 0 0 11.764706 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2008 1 8 2 0 1 23 23 19 0 0 0 0 0 0 10.526316
5.263158 26.315789 5.263158 5.263158 0 5.263158 21.052632 10.526316 5.263158 0 0
5.263158 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10.526316
5.263158 26.315789 5.263158 5.263158 0 5.263158 21.052632 10.526316 5.263158 0 0
5.263158 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
2008 1 8 2 0 1 24 24 23 0 0 0 0 0 0 4.347826
21.73913 17.391304 4.347826 4.347826 0 8.695652 0 8.695652 13.043478 4.347826 0
0 0 0 4.347826 0 4.347826 0 0 0 0 0 4.347826 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
4.347826 21.73913 17.391304 4.347826 4.347826 0 8.695652 0 8.695652 13.043478
4.347826 0 0 0 0 4.347826 0 4.347826 0 0 0 0 0 4.347826 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0
2008 1 8 2 0 1 25 25 29 0 0 0 0 0 0 0 17.241379
6.896552 3.448276 0 3.448276 0 3.448276 34.482759 6.896552 3.448276 0 0
3.448276 3.448276 0 3.448276 6.896552 0 3.448276 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
17.241379 6.896552 3.448276 0 3.448276 0 3.448276 34.482759 6.896552 3.448276 0
0 3.448276 3.448276 0 3.448276 6.896552 0 3.448276 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0
2008 1 8 2 0 1 26 26 25 0 0 0 0 0 0 0 4 0 0
0 0 4 8 36 0 0 4 8 0 4 8 8 8 0 0 0 0 4
0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 4 0 0 0 0 4 8 36 0 0 4 8 0 4 8
8 8 0 0 0 0 4 0 0 0 4 0 0 0 0 0 0 0 0
0 0 0 0
2008 1 8 2 0 1 27 27 20 0 0 0 0 0 0 0 0 5
10 0 0 0 10 10 0 0 5 0 5 0 15 10 15 5 0 0 5

```
	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	5	10	0	0	0	10	10	0	0	5	0	5	0
	15	10	15	5	0	0	5	0	0	0	0	0	5	0	0	0	0	0	0
	0	0	0	0	0
	2008	1	8	2	0	1	28	28	17	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	11.764706	5.882353	0	0	5.882353	0	0	5.882353	11.764706
	5.882353	0	0	0	5.882353	0	5.882353	0	0	0	5.882353	5.882353
	5.882353	11.764706	0	0	0	0	0	0	0	11.764706	0	0	0	0	0
	0	0	0	0	0	0	0	11.764706	5.882353	0	0	5.882353	0	0
	5.882353	11.764706	5.882353	0	0	0	5.882353	0	5.882353	0	0	0
	5.882353	5.882353	5.882353	11.764706	0	0	0	0	0	0	0	11.764706
	2008	1	8	2	0	1	29	29	17	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	5.882353	17.647059	0	5.882353	11.764706
	11.764706	5.882353	0	5.882353	5.882353	0	0	5.882353	0	5.882353	5.882353	0
	0	0	5.882353	0	0	0	0	0	0	5.882353	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	5.882353	17.647059	0	5.882353
	11.764706	11.764706	5.882353	0	5.882353	5.882353	0	0	5.882353	0	5.882353
	5.882353	0	0	0	5.882353	0	0	0	0	0	0	5.882353
	2008	1	8	2	0	1	30	30	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	33.333333	0	0	0	0	0	0	0	66.666667	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33.333333	0
	0	0	0	0	0	0	66.666667	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	2008	1	8	2	0	1	31	31	4	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0
	0	0	0	25	0	0	0	0	0	25	0	0	0	0	0	25	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	25	0	0	0	0	0	0	0	0	25	0	0	0	0	0	25	0	0
	0	0	0	25
	2008	1	8	2	0	1	33	33	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0
	0	0	0	0
#NWFSC	marginalAgeCompsToSeeFit	Season	Fleet	gender	partition	ageErr	LbinLo	LbinHi	nSamps	F1	F2	F3	F4	F5
	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19	F20	F21	F22	F23
	F24	F25	F26	F27	F28	F29	F30	F31	F32	F33	F34	F35	F36	F37	F38	F39	F40	F41
	F42	F43	F44	F45	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14
	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32
	M33	M34	M35	M36	M37	M38	M39	M40	M41	M42	M43	M44	M45
#negative sample size means it predict values, but doesn't include them in likelihood
	2003	1	8	3	0	1	-1	-1	-1	0	0.1684609	1.91076175	2.3378802	2.4393571
	0.1247426	1.8488839	0.4024796	5.3670328	9.1655683	3.1531643	2.0669476	1.6441454	3.148978
	2.363701	1.386132	1.4665968	3.08153889	0.7470274	2.10298486	0.5694276	0.1003579	0.2271473
	0.56433317	0.5984852	0.1870479	0.59248649	0.5752332	0.04271165	0.07071722	0.14143445	0.3907266
	0.02828531	0.80307989	0.2953173	0.23874672	0	0.4976052	0	0	0.23874672	0	0.23874672	0
```

0 0 0.19503825 2.8273808 2.9768765 1.5303993 0.08185365 0.3215046 0.7710594 2.9035392
12.9204938 3.06806406 1.04829019 0.08107747 0.5808556 0.3265301 0.10772374 1.5998971 2.6727336
2.8737468 1.24477442 0.98717673 1.55347597 0.1721606 3.126632 1.349025 0.5043091 0.09117374
0.2728987 0.817890376 0.05995706 0.03415198 0.6598192 0.1143154 0 0.03018243 0.02963083 0 0
0 0.03415198 0 0 0.42273127 0.2387467 0.04271165
2004 1 8 3 0 1 -1 -1 -1 0.02244955 0.1248884 1.1750461 0.6537071
1.8484838 1.1947921 0.1887075 2.0535001 0.8659826 1.0177351 12.7163276 1.2887098 0.7277019
1.43633 1.394322 1.5277313 0.5424393 0.03868648 1.643111 1.06385773 4.0534722 0.3734726
1.9130365 0.22514445 4.1778374 0.8683656 2.6978319 1.7592012 2.64349589 0.22468273 0.41614773
0.7307005 0.24407215 0.40660052 0.2633179 0 0.07741144 0 0.18692994 0 0 0
0.02840566 0 3.39920586 0 0.1188682 1.2394834 1.8400139 1.1172164 2.24558585 0.08598906
0.5727123 0.8340115 1.1369958 12.87288708 1.60566599 0.44557942 1.3594546 0.9886369 2.12583013
0.2399706 0 0.62948 1.58987281 2.641431 0.05159651 1.7853419 0 0 1.412998
0.9459976 0.14616318 0.454341718 0.03189672 0.40739312 0.129957 0.3103665 1.01979741 0.36331742 0
0 0 0.213491306 0.18720184 1.617127 0.08037154 0.16800737 0.2261192 0.54498895
2005 1 8 3 0 1 -1 -1 -1 0.1129301 0.1091984 0.66947504 0.5174699
3.2437167 2.457091 2.9744212 0.2202126 1.1456337 0.2411908 1.8116457 12.091771 0.5960283
1.111288 2.326187 5.2548518 0.7324615 0.37441602 1.046853 4.55522406 0.8133989 0.911302
3.1365541 0.04829039 0.8279476 0 0.08646057 0.4746541 0.17479306 0.19107406 0.87312574 0
0.18972136 0.90602175 2.5803887 0.80629377 0 0.1046302 0 0.01891961 0 0 0.22728427 0
0.22206623 0.0517807 0.09254697 1.6538928 0.7128116 2.4642052 5.60183267 1.76254615 0
0.2142901 0.9497849 3.98604176 4.83275414 0.79472673 0.699614 0.3680548 0.55516036 3.8638553
1.0980796 0.4381236 1.57691022 0.34455789 0.27909988 2.4594639 0.942276 1.1452966 1.2483084
0.28490845 0.06070762 2.519113327 0.24359563 0.83433159 0.1144802 0.2831291 1.46593706 1.45203505 0
0.012435444 0 0 0 0 0 0 0.1254065 0.28291355
2006 1 8 3 0 1 -1 -1 -1 0 0.5346896 0.02064028 5.6992075 1.5039036
2.0676459 1.0478924 2.8428844 1.2227701 0.8899352 0.3837285 7.0666936 6.6367254 1.553552
0.878794 0.2732665 0.5369687 0.90709168 1.3356089 0.04463412 1.1231502 1.2301508 0.9842847
0.40347541 1.5206958 0.1725049 0.34233599 0.03688511 1.9276408 0.02939454 0.04445504 1.26669
0.14109583 2.12184622 0.3261705 0.03658598 0 0 0.02020684 0.40513388 0 0 0.0201987 0
0.04472162 0 0.43910904 0.5491152 3.6516646 0.3498123 2.76462106 2.80037882 7.7962215
0.2655256 1.9556719 1.02033748 0.98825277 11.40950938 0.9074519 1.8390115 0.07504409 0.1506315
1.7575737 0.1680118 0.07133848 2.38847067 0.44141665 0.2573065 0.733207 3.9488557 0.3274688
0.11233618 1.30791966 0.273885073 0 0.01486312 0.5157974 1.0377931 0.01797656 1.64131621
0.18514592 0 0 0 0 0 0 0 0 0.19270364
2007 1 8 3 0 1 -1 -1 -1 0.03307023 0.1062836 0.35425671 0.6845311
0.4207272 0.4421434 4.4419205 6.9365297 2.1934478 0.792326 2.981139 0.9156027 1.0847627
8.134581 0.782379 2.0726534 0.3557474 4.77783552 1.7750687 0.05081813 4.9892027 3.0842691
3.5964882 0.02830914 0.2027356 1.1462258 1.63439469 1.21951027 0 1.60580919 0.17168508
0.5994868 0.72855895 0.10177206 1.3969166 0.99183698 0.60048798 0.5817989 0.02340277 0.01236462 0
0.009626404 0.01429433 0 0.26625313 0 0.33290839 0.41289 0.1880086 1.0168205 0.21704887
4.01668482 3.2852045 1.7704466 0.4570584 0.92646397 1.2055523 1.12822998 2.4804965 1.0734956
1.62735806 0.849028 3.432383 0.2537306 1.60889798 1.69471604 1.42716645 2.5698076 2.040062
0.5534756 0.2563867 0.10786436 0.06306116 1.19774348 0.01868906 0.10080879 0.1035312 0.1277804
0.14811492 0.12137701 0.55322607 0.009847482 0.01380795 0.042852972 0 0 0.01476333 0.0152797 0
0.195678443
2008 1 8 3 0 1 -1 -1 -1 0.03347094 0.3957489 0.46509031 0.4450802
0.3577377 1.8758146 0.3703152 2.4694815 1.3046985 1.472012 1.2207224 0.5383509 2.3651519

```
       8.303457     6.040476     0.5789263    1.1220445    0.64213718   3.0202229    1.13609818   0.2993177    0.3477174
       4.7828732    1.11792771   0.8994291    0.3592127    0.58636013   0.92159529   0      0.13267341   0.47180426
       0.1123763    0      0.04268791   0.1209287    0.08430781   0.18916914   0      0      0      0.01024383   0      0
       0.1123763    0.07850308   0.07856073   0.11211635   0.3997611    0.1228883    0.7799707    0.93330118   0.71930172
       3.6943502    4.1134367    2.7831234    0.07101871   0.03132313   0.13365557   0.9428428    11.9900475   4.83329012
       0.5210062    0.4098379    1.6255107    1.29973833   0.07032355   4.2910882    3.0667089    2.182357     0.1322029
       1.2189663    0.197818     0.75911962   0.008399493  0.15502422   0.02301774   0      5.7859215    0.54234542
       0.25429844   0.14123287   0.044349935  0.14123287   0.006950372  0.01003328   0      0      0      0      0.546986834


0      #nobsal       #_Number_of_size_at_age_observations    #Skip_reading
#2003  2      2      2      2      3      110    10     10     10     10     10     10     10     10     10     10     10     10
       10     10     10     10     10     4      30     62     42     18     19     7      10     1      10     10     10     10
       10     10
#      10     10     10     10     10     10     10     10     10     10     10     10     10     10     10     10     10     4
       30     62     42     18     19     7      10     1      10     10     10     10     10     10


#_environmental_data
0      #N_envvar
0      #N_observations
#1980  1      1      #env_temp(1,N_envdata,1,3) #Skip


0      # N sizefreq methods to read
#25    #Sizefreq N bins per method
#2     #Sizetfreq units(bio/num) per method
#3     #Sizefreq scale(kg/lbs/cm/inches) per method
#1e-005       #Sizefreq mincomp per method
#0     #Sizefreq N obs per method
#_Sizefreq bins
#26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 68 72 76 80 90
#_Year season Fleet Partition Gender SampleSize <data>
#1 1971 1 1 3 0 125  0 0 0 0 0 0 0 0 0 4 1 1 2 4 1 5 6 2 3 11 8 4 5 0 0 0 0 0 0 0 0 0 0 1 0 1 3 0 3 4 2 4 5 9 17 8 3 8 0 0

0 # no tag data

0 # no morphcomp (stock) data

999

ENDDATA
```

Appendix C: SS2 Control file

```
#C 2009 coastwide greenstriped rockfish assessment in SS3

1      #_N_Growth_Patterns
1      #_N_Morphs_Within_GrowthPattern
#_Cond 1 #_Morph_between/within_stdev_ratio (no read if N_morphs=1)
#_Cond  1 #vector_Morphdist_(-1_in_first_val_gives_normal_approx)

#_Cond 0 # N_movement_definitions goes here if N_areas > 1
#_Cond 1.0 # first age that moves (real age at begin of season, not integer) also cond on do_migration>0
#_Cond 1 1 1 2 4 10 # example move definition for seas=1, morph=1, source=1 dest=2, age1=4, age2=10

0 #_Nblock_Patterns
#3 2 #_blocks_per_pattern
# begin and end years of blocks
#1977 1985 1986 1997 1998 2008
#1986 1997 1998 2008

0.5    #_fracfemale
0      #_natM_type:_0=1Parm; 1=N_breakpoints;_2=Lorenzen;_3=agespecific;_4=agespec_withseasinterpolate
#2 #_N_breakpoints
# 4 15 # age(real) at M breakpoints


1       # GrowthModel: 1=vonBert with L1&L2; 2=Richards with L1&L2; 3=not implemented; 4=not implemented
1.0     #_Growth_Age_for_L1 (minimum age for growth calcs)
45.0 #_Growth_Age_for_L2 (999 to use as Linf) (maximum age for growth calcs)
0.0     #_SD_add_to_LAA (set to 0.1 for SS2 V1.x compatibility)
1       #_CV_Growth_Pattern:  0 CV=f(LAA); 1 CV=F(A); 2 SD=F(LAA); 3 SD=F(A)    #plots of sd at age support a constant sd
across ages
1       #_maturity_option:  1=length logistic; 2=age logistic; 3=read age-maturity matrix by growth_pattern; 4=read age-
fecundity
#_placeholder for empirical age-maturity by growth pattern
2      #_First_Mature_Age
1      #_fecundity option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b
0      #hermaphrodite
1      #_parameter_offset_approach (1=none, 2= M, G, CV_G as offset from female-GP1, 3=like SS2 V1.x)
1      #_env/block/dev_adjust_method (1=standard; 2=with logistic trans to keep within base parm bounds)


#_growth_parms
#GP_1_Female
#LO          HI           INIT   PRIOR  PR_type      SD           PHASE  env-var      use_dev      dev_minyr dev_maxyr
dev_stddev   Block  Block_Fxn
```

```
0.02   0.40   0.08   0.08   0          0.035  -5          0          0          0              0          0.5
              0             0                  #1 F_M_young
3             25            11.9   14.0   -1          10          2          0          0          0              0
              0.5                  0                  0                  #2 F_L@Amin (Amin is age entered above)
25            60            33.4   33.4   -1          10          3          0          0          0              0
              0.5                  0                  0                  #3 F_L@Amax
0.03   0.8           0.105  0.105  -1          0.8         2          0          0          0          0
       0.5                  0                  0                  #4 F_VBK
0.001  1.00   0.09   3.00   -1          0.8         3          0          0          0          0
       0.5                  0                  0                  #5 F_CV@AFIX
0.001  1.00   0.09   3.00   -1          0.8         4          0          0          0          0
       0.5                  0                  0                  #6 F_CV@AFIX2=ln(SD@AFIX2/SD@AFIX)
#GP_1:::Male (Direct Estimation)
0.02   0.70   0.08   0.08   0          0.035  -5          0          0          0              0          0.5
              0             0                  #7 M_young
3             25            11.8   14.0   -1          10          2          0          0          0              0
              0.5                  0                  0                  #8 M_L@Amin
25            60            28.4   28.5   -1          10          3          0          0          0              0
              0.5                  0                  0                  #9 M_L@Amax
0.03   0.8           0.136  0.136  -1          0.8         2          0          0          0          0
       0.5                  0                  0                  #10 M_VBK
0.001  1.00   0.08   2.50   -1          0.8         3          0          0          0          0
       0.5                  0                  0                  #11 M2_CV@AFIX
0.001  1.00   0.08   2.50   -1          0.8         4          0          0          0          0
       0.5                  0                  0                  #12 M2_CV@AFIX2

#LW_female
#LO           HI            INIT          PRIOR         PR_type       SD     PHASE  env-var       use_dev       dev_minyr dev_maxyr
dev_stddev    Block  Block_Fxn
-3            3             7.4016E-06    2.05E-06      0             0.8    -3            0             0             0      0
       0.5    0      0      #WL_intercept_female
1             5             3.167         3.165         0             0.8    -3            0             0             0      0
       0.5    0      0      #WL_slope_female
#Female_maturity
10            50            20.97         20.97         0             0.8    -3     0      0      0      0      0.5    0      0
       #mat_intercept   #From Shaw and Gunderson 2006
-3            3             -0.66         -0.66         0             0.8    -3     0      0      0      0      0.5    0      0
       #mat_slope           #From Shaw and Gunderson 2006 (converted to cm)
#Fecundity #use EJ's meta-analysis
#-3           3             1             1                   0             1      -3     0      0      0      0      0.5    0
       0      #intercept
#-3           3             0             0                   0             1      -3     0      0      0      0      0.5    0
       0      #slope
-3            3000000       371200        1                   0             1      -3     0      0      0      0      0.5    0      0
       #intercept
-3            3000000       63300         0                   0             1      -3     0      0      0      0      0.5    0      0
       #slope
```

```
#LW_Male
-3          3           8.2378E-06    3.12E-06     0           0.8    -3     0     0     0     0     0.5    0     0
      #WL_intercept_male
-3          5           3.131         3.131        0           0.8    -3     0     0     0     0     0.5    0     0
      #WL_slope_slope_male


#LO     HI      INIT    PRIOR   PR_type SD  PHASE   env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
#Allocate_R_by_areas_x_gmorphs
0      1      1      0.2    0      9.8    -3     0      0      0      0      0.5    0      0      #frac to GP 1 in area 1
#Allocate_R_by_areas_(1_areain_this_case)
0      1      1      1      0      9.8    -3     0      0      0      0      0.5    0      0      #frac R in area 1
#Allocate_R_by_season_(2seasons_in_this_case)
#LO          HI           INIT          PRIOR         PR_type       SD     PHASE  env-var      use_dev      dev_minyr dev_maxyr
dev_stddev    Block  Block_Fxn
-4          4            0                    1                    0             9.8    -3           0            0
      0            0                   0.5          0      0      #frac R in season 1 (in log space)

#CohortGrowDev
#SS3 manual says it must be given a value of 1 and a negative phase
#LO    HI     INIT   PRIOR  PR_type      SD     PHASE  env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
0      1      1      1      -1     0      -4     0      0      0      0      0      0      0

#_Cond 0  #custom_MG-env_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no MG-environ parameters

#_Cond 0  #custom_MG-block_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no MG-block parameters

#_seasonal_effects_on_biology_parms
0 0 0 0 0 0 0 0 0 0 #_femwtlen1,femwtlen2,L1,K,Malewtlen1,malewtlen2,L1,K
????????????????????????????????????????????????????
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no seasonal MG parameters

#_Cond -4 #_MGparm_Dev_Phase

#_Spawner-Recruitment
3      #_SR_function
#_LO   HI     INIT   PRIOR  PR_type      SD     PHASE
1             99     9             9             -1           10           1            #Ln(R0)
0.2           1      0.692  0.692  2             0.205  -5          #steepness(h)---base_case  #Prior from Dorn (his mu=, sd= in
beta space)
0             2      0.6           0.6    0             5            -99          #sigmaR
-5            5      0             0             0            1            -99          #Env_link_parameter
-5            5      0             0             0            0.2          -2           # SR_R1_offset
0             0      0             0             -1           0            -99                 # SR_autocorr
0      #_SR_env_link
```

```
0      #_SR_env_target_0=none;1=devs;_2=R0;_3=steepness

1      #do_recdev:  0=none; 1=devvector; 2=simple deviations

1987   # first year of main recr_devs; early devs can preceed this era
2005   # last year of main recr_devs; forecast devs start in following year
3      #_recdev phase
1      # (0/1) to read 11 advanced options
1970   #_Cond 0 #_recdev_early_start (0=none; neg value makes relative to recdev_start)
4      #_recdev_early_phase
5      #_Cond 0 #_forecast_recruitment phase (incl. late recr) (0 value resets to maxphase+1)
1      #_Cond 1 #_lambda for prior_fore_recr occurring before endyr+1
1970   #_last_early_yr_nobias_adj_in_MPD
1987   #_first_yr_fullbias_adj_in_MPD
2005   #_last_yr_fullbias_adj_in_MPD
2008   #_first_recent_yr_nobias_adj_in_MPD
1      #max bias
0      #reserved for future use
-3     #min rec_dev
3      #max rec_dev
0      #_read_recdevs
#_end of advanced SR options

#Fishing Mortality info
0.1    # F ballpark for tuning early phases
-2001  # F ballpark year (neg value to disable)
1      # F_Method:  1=Pope; 2=instan. F; 3=hybrid (hybrid is recommended)
0.9    # max F or harvest rate, depends on F_Method
# no additional F input needed for Fmethod 1
# read overall start F value; overall phase; N detailed inputs to read for Fmethod 2
# NUM ITERATIONS, FOR CONDITION 3
#5     # read N iterations for tuning for Fmethod 3 (recommend 3 to 7)
#Fleet Year Seas F_value se phase (for detailed setup of F_Method=2)

#_initial_F_parms
#_LO HI INIT PRIOR PR_type       SD PHASE
0      1      0      0.0001 0            99     -1     #Fleet1_(WO_TWL)
0      1      0      0.0001 0            99     -1     #Fleet2_(CA_TWL)
0      1      0      0.0001 0            99     -1     #Fleet3_(FOR)
0      1      0      0.0001 0            99     -1     #Fleet4_(OTH)
0      1      0      0.0001 0            99     -1     #Fleet5_(REC)

#_Q_setup
# A=do power, B=env-var, C=extra SD,
#D=devtype(<0=mirror, 0/1=none, 2=cons, 3=rand, 4=randwalk)
#E=0=num/1=bio, F=err_type
#A     B      C      D      E      F
```

```
0	0	0	0	1	0	#Fleet1_(WO_TWL)
0	0	0	0	1	0	#Fleet2_(CA_TWL)
0	0	0	0	1	0	#Fleet3_(For)
0	0	0	0	1	0	#Fleet4_(Oth)
0	0	0	0	1	0	#Fleet5_(REC)
0	0	0	0	1	0	#Late Triennial
0	0	0	0	1	0	#Early Triennial
0	0	0	0	1	0	#NWFSC

#_Cond 0 #_If q has random component, then 0=read one parm for each fleet with random q; 1=read a parm for each year of index
#_Q_parms(if_any)
# LO HI INIT PRIOR PR_type SD PHASE
#-5	5	-0.4462	-0.4	0	5	1	#

#Seltype(1,2*Ntypes,1,4)  #SELEX_&_RETENTION_PARAMETERS
#Size_Slectivity,_enter_4_cols
#N_sel Do_retain	Do_male	Special
24	1	3	0	#Fleet1_(WO_TWL)
24	1	3	0	#Fleet2_(CA_TWL)
5	0	0	2	#Fleet3_(For)	#mirrors CA, no discards
24	1	0	0	#Fleet4_(OTH)
24	0	0	0	#Fleet5_(REC)
24	0	3	0	#Late Triennial
24	0	3	0	#Early Triennial
24	0	3	0	#NWFSC
#Age_selectivity	#set_to_1
10	0	0	0	#Fleet1_(WO_TWL)is Logistic
10	0	0	0	#Fleet2_(CA_TWL)is Logistic
10	0	0	0	#Fleet3_(For)	is Logistic
10	0	0	0	#Fleet4_(OTH)	is Logistic
10	0	0	0	#Fleet5_(REC)	is Logistic
10	0	0	0	#Late Triennial is Logistic
10	0	0	0	#Early Triennialis Logistic
10	0	0	0	#NWFSC

#Selectivity parameters
#LO	HI	INIT	PRIOR	PR_TYPE	SD	PHASE	env-var	use_dev	dev_yr1	dev_yr2	dev_sd nblks	blk_pat
	#
#Size_selectivity for FISHERY WO TRAWL
#FEMALE
#LO	HI	INIT	PRIOR	PR_TYPE	SD	PHASE	env-var	use_dev	dev_yr1	dev_yr2	dev_sd nblks
	blk_pat	#
12	44	34.0	43.1	-1	5	1	0	0	0	0	0.5	0	0	#PEAK (see
Selex24.xls)
-5	3	3.0	0.7	-1	5	-4	0	0	0	0	0.5	0	0	#TOP
(see Selex24.xls)
```

```
-4      12    4.1         3.42  -1        5     2     0     0     0     0     0.5   0     0     #ASC_WIDTH
(see Selex24.xls)
-2      6     6.0         0.21  -1        5     -4    0     0     0     0     0.5   0     0     #DSC_WIDTH
(see Selex24.xls)
-15     5     -5.0  -8.9  -1        5     3     0     0     0     0     0.5   0     0     #INIT (see
Selex24.xls)
-5      5     -999  0.15  -1        5     -5    0     0     0     0     0.5   0     0     #FINAL (see
Selex24.xls)
#-5     5     -4.0  0.15  -1        5     4     0     0     0     0     0.5   0     0     #FINAL (see
Selex24.xls)
#RETENTION
10      39    25          15        -1          9     2     0     0     0     0     0     0     0     #
Retain_1 Inflection
0.1     10    3           3         -1          9     2     0     0     0     0     0     0     0     #
Retain_2 Slope
0.001  0.7    0.30  1           -1        9     1     0     0     0     0     0     0     0     # Retain_3 Asymptote
-10     10    0           0         -1          9     -2    0     0     0     0     0     0     0     #
Retain_4 Male offset (additive)
#...DO_MALE (AS OFFSET)
-15     15          0           0     -1          5     3     0     0     0     0     0.5   0     0     #PEAK
(see Selex24.xls)
-15     15          0           0     -1          5     4     0     0     0     0     0.5   0     0
    #ASC_WIDTH (see Selex24.xls)
-15     15          0           0     -1          5     -4    0     0     0     0     0.5   0     0
    #DSC_WIDTH (see Selex24.xls)
-15     15          0           0     -1          5     -4    0     0     0     0     0.5   0     0     #FINAL
(see Selex24.xls)
#Size_selectivity for FISHERY CA TRAWL
#FEMALE
#LO     HI    INIT  PRIOR PR_TYPE   SD    PHASE env-var     use_dev     dev_yr1     dev_yr2     dev_sd nblks
    blk_pat   #
12      44    34.0  43.1  -1        5     1     0     0     0     0     0.5   0     0     #PEAK (see
Selex24.xls)
-5      3     3.0         0.7       -1          5     -4    0     0     0     0     0.5   0     0     #TOP
(see Selex24.xls)
-4      12    4.1         3.42  -1        5     2     0     0     0     0     0.5   0     0     #ASC_WIDTH
(see Selex24.xls)
-2      6     6.0         0.21  -1        5     -4    0     0     0     0     0.5   0     0     #DSC_WIDTH
(see Selex24.xls)
-15     5     -5.0  -8.9  -1        5     3     0     0     0     0     0.5   0     0     #INIT (see
Selex24.xls)
-5      5     -999  0.15  -1        5     -5    0     0     0     0     0.5   0     0     #FINAL (see
Selex24.xls)
#-5     5     -4.0  0.15  -1        5     4     0     0     0     0     0.5   0     0     #FINAL (see
Selex24.xls)
#RETENTION
```

```
10           39     25          15          -1          9      2      0      0      0      0      0      0      0      #
Retain_1 Inflection
0.1          10     3           3           -1          9      2      0      0      0      0      0      0      0      #
Retain_2 Slope
0.001  0.7   0.30   1           -1          9      1      0      0      0      0      0      0      0      # Retain_3 Asymptote
-10          10     0           0           -1          9      -2     0      0      0      0      0      0      0      #
Retain_4 Male offset (additive)
#...DO_MALE (AS OFFSET)
-15          15            0            0      -1          5      3      0      0      0      0      0.5    0      0      #PEAK
(see Selex24.xls)
-15          15            0            0      -1          5      4      0      0      0      0      0.5    0      0
      #ASC_WIDTH (see Selex24.xls)
-15          15            0            0      -1          5      -4     0      0      0      0      0.5    0      0
      #DSC_WIDTH (see Selex24.xls)
-15          15            0            0      -1          5      -4     0      0      0      0      0.5    0      0      #FINAL
(see Selex24.xls)
#Size_selectivity for FISHERY FOREIGN TRAWL
#FEMALE
#LO          HI     INIT   PRIOR  PR_TYPE     SD     PHASE  env-var       use_dev       dev_yr1       dev_yr2       dev_sd nblks
      blk_pat       #
-2 60 0 0 -1 0.2 -4 0 0 0 0 0.5 0 0 #MinBin_#_in_Fishery_1
-2 60 0 0 -1 0.2 -4 0 0 0 0 0.5 0 0 #MaxBin_#_in_Fishery_1
#Size_selectivity for FISHERY OTH
#LO          HI     INIT   PRIOR  PR_TYPE     SD     PHASE  env-var       use_dev       dev_yr1       dev_yr2       dev_sd nblks
      blk_pat       #
12           44     34.0   43.1   -1          5      1      0      0      0      0      0.5    0      0      #PEAK (see
Selex24.xls)
-5           3      3.0         0.7         -1          5      -4     0      0      0      0      0.5    0      0      #TOP
(see Selex24.xls)
-4           12     4.1         3.42   -1          5      2      0      0      0      0      0.5    0      0      #ASC_WIDTH
(see Selex24.xls)
-2           6      6.0         0.21   -1          5      -4     0      0      0      0      0.5    0      0      #DSC_WIDTH
(see Selex24.xls)
-15          5      -5.0   -8.9   -1          5      3      0      0      0      0      0.5    0      0      #INIT (see
Selex24.xls)
-5           5      -999   0.15   -1          5      -5     0      0      0      0      0.5    0      0      #FINAL (see
Selex24.xls)
#-5          5      -4.0   0.15   -1          5      4      0      0      0      0      0.5    0      0      #FINAL (see
Selex24.xls)
#RETENTION
10           39     25          15          -1          9      2      0      0      0      0      0      0      0      #
Retain_1 Inflection
0.1          10     3           3           -1          9      2      0      0      0      0      0      0      0      #
Retain_2 Slope
0.001  0.7   0.20   1           -1          9      1      0      0      0      0      0      0      0      # Retain_3 Asymptote
-10          10     0           0           -1          9      -2     0      0      0      0      0      0      0      #
Retain_4 Male offset (additive)
```

```
#Size_selectivity for FISHERY RECREATIONAL COASTWIDE (both sex combined)
#LO     HI    INIT   PRIOR  PR_TYPE    SD    PHASE  env-var    use_dev    dev_yr1    dev_yr2    dev_sd nblks
     blk_pat     #
15      44    28.0   43.1   -1         5     1      0     0    0    0    0.5   0    0    #PEAK (see
Selex24.xls)
-5      3     3.0           0.7        -1           5     -3   0    0    0     0    0.5  0    0    #TOP
(see Selex24.xls)
-4      12    4.1           3.42  -1         5      2     0    0    0    0     0.5  0    0    #ASC_WIDTH
(see Selex24.xls)
-2      6     6.0           0.21  -1         5      -3    0    0    0    0     0.5  0    0    #DSC_WIDTH
(see Selex24.xls)
-15     5     -5.0   -8.9   -1         5     3      0     0    0    0    0.5   0    0    #INIT (see
Selex24.xls)
-5      5     -999   0.15   -1         5     -4     0     0    0    0    0.5   0    0    #FINAL (see
Selex24.xls)
#-5     5     -4.0   0.15   -1         5     4      0     0    0    0    0.5   0    0    #FINAL (see
Selex24.xls)
#Size_selectivity for SURVEY EARLY TRIENNIAL
#FEMALE
#LO     HI    INIT   PRIOR  PR_TYPE    SD    PHASE  env-var    use_dev    dev_yr1    dev_yr2    dev_sd nblks
     blk_pat     #
15      44    21.0   43.1   -1         5     1      0     0    0    0    0.5   0    0    #PEAK (see
Selex24.xls)
-5      3     3.0           0.7        -1           5     -2   0    0    0     0    0.5  0    0    #TOP
(see Selex24.xls)
-4      12    3.7           3.42  -1         5      1     0    0    0    0     0.5  0    0    #ASC_WIDTH
(see Selex24.xls)
-2      6     6.0           0.21  -1         5      -2    0    0    0    0     0.5  0    0    #DSC_WIDTH
(see Selex24.xls)
-15     5     -5.0   -8.9   -1         5     3      0     0    0    0    0.5   0    0    #INIT (see
Selex24.xls)
-5      5     -999   0.15   -1         5     -4     0     0    0    0    0.5   0    0    #FINAL (see
Selex24.xls)
#...DO_MALE (AS OFFSET)
-15   15   0        0        -1      5    3      0      0      0      0
      0.5     0        0          #PEAK (see Selex24.xls)
-15   15   0        0        -1      5    3      0      0      0      0
      0.5     0        0          #ASC_WIDTH (see Selex24.xls)
-15   15   0        0        -1      5    -3     0      0      0      0
      0.5     0        0          #DSC_WIDTH (see Selex24.xls)
-15   15   0        0        -1      5    -3     0      0      0      0
      0.5     0        0          #FINAL (see Selex24.xls)
#Size_selectivity for SURVEY LATE TRIENNIAL
#FEMALE
#LO     HI    INIT   PRIOR  PR_TYPE    SD    PHASE  env-var    use_dev    dev_yr1    dev_yr2    dev_sd nblks
     blk_pat     #
```

```
15          44     21.0   43.1   -1           5      1      0      0      0      0      0.5    0      0      #PEAK (see
Selex24.xls)
-5          3      3.0           0.7          -1            5      -2     0      0      0      0      0.5    0      0      #TOP
(see Selex24.xls)
-4          12     3.7           3.42   -1           5      1      0      0      0      0      0.5    0      0      #ASC_WIDTH
(see Selex24.xls)
-2          6      6.0           0.21   -1           5      -2     0      0      0      0      0.5    0      0      #DSC_WIDTH
(see Selex24.xls)
-15         5      -5.0   -8.9   -1           5      3      0      0      0      0      0.5    0      0      #INIT (see
Selex24.xls)
-5          5      -999   0.15   -1           5      -4     0      0      0      0      0.5    0      0      #FINAL (see
Selex24.xls)
#...DO_MALE (AS OFFSET)
-15    15     0             0             -1           5      3             0             0             0             0
       0.5           0             0             #PEAK (see Selex24.xls)
-15    15     0             0             -1           5      3             0             0             0             0
       0.5           0             0             #ASC_WIDTH (see Selex24.xls)
-15    15     0             0             -1           5      -3            0             0             0             0
       0.5           0             0             #DSC_WIDTH (see Selex24.xls)
-15    15     0             0             -1           5      -3            0             0             0             0
       0.5           0             0             #FINAL (see Selex24.xls)
#Size_selectivity for SURVEY NWFSC
#FEMALE
#LO         HI     INIT   PRIOR  PR_TYPE      SD     PHASE  env-var       use_dev       dev_yr1       dev_yr2       dev_sd nblks
       blk_pat       #
15          44     21.0   43.1   -1           5      1      0      0      0      0      0.5    0      0      #PEAK (see
Selex24.xls)
-5          3      3.0           0.7          -1            5      -2     0      0      0      0      0.5    0      0      #TOP
(see Selex24.xls)
-4          12     3.7           3.42   -1           5      1      0      0      0      0      0.5    0      0      #ASC_WIDTH
(see Selex24.xls)
-2          6      6.0           0.21   -1           5      -2     0      0      0      0      0.5    0      0      #DSC_WIDTH
(see Selex24.xls)
-15         5      -5.0   -8.9   -1           5      3      0      0      0      0      0.5    0      0      #INIT (see
Selex24.xls)
-5          5      -999   0.15   -1           5      -4     0      0      0      0      0.5    0      0      #FINAL (see
Selex24.xls)
#...DO_MALE (AS OFFSET)
-15    15     0             0             -1           5      3             0             0             0             0
       0.5           0             0             #PEAK (see Selex24.xls)
-15    15     0             0             -1           5      3             0             0             0             0
       0.5           0             0             #ASC_WIDTH (see Selex24.xls)
-15    15     0             0             -1           5      -3            0             0             0             0
       0.5           0             0             #DSC_WIDTH (see Selex24.xls)
-15    15     0             0             -1           5      -3            0             0             0             0
       0.5           0             0             #FINAL (see Selex24.xls)
```

```
#0 #_custom block setup (0/1)
#-20 20 0 0 -1 99 4
#2    #logistic bounding

# Tag loss and Tag reporting parameters go next
0  # TG_custom:  0=no read; 1=read if tags exist
#_Cond -6 6 1 1 2 0.01 -4 0 0 0 0 0 0 0  #_placeholder if no parameters

0 #_Variance_adjustments_to_input_values
#_1 2 3
#  0 0 0 #_add_to_fleet and survey_CV
#  0 0 0 #_add_to_discard_stddev
#  0 0 0 #_add_to_bodywt_CV
#  1 1 1 #_mult_by_lencomp_N
#  1 1 1 #_mult_by_agecomp_N
#  1 1 1 #_mult_by_size-at-age_N
30 #_DF_for_discard_like
30 #_DF_for_meanbodywt_like

15 #_maxlambdaphase
1 #_sd_offset

0 # number of changes to make to default Lambdas (default value is 1.0)
# Like_comp codes:  1=surv; 2=disc; 3=mnwt; 4=length; 5=age; 6=SizeFreq; 7=sizeage; 8=catch;
# 9=init_equ_catch; 10=recrdev; 11=parm_prior; 12=parm_dev; 13=CrashPen; 14=Morphcomp; 15=Tag-comp; 16=Tag-negbin
#like_comp fleet/survey  phase  value  sizefreq_method
#5 1 1 0.5 1  #commercial age comps
#5 2 1 0.5 1  #commercial age comps
#5 3 1 0.5 1  #commercial age comps
#5 4 1 0.5 1  #commercial age comps
#5 5 1 0.5 1  #commercial age comps
#5 6 1 0.5 1  #commercial age comps
#4 1 1 0.5 1  #commercial lgth comps
#4 2 1 0.5 1  #commercial lgth comps
#4 3 1 0.5 1  #commercial lgth comps
#4 4 1 0.5 1  #commercial lgth comps
#4 5 1 0.5 1  #commercial lgth comps
#4 6 1 0.5 1  #commercial lgth comps
#5 8 1 0.1 1  #survey Age conditionals
#4 8 1 0.1 1  #survey lgth comps
#4 7 1 0.1 1  #triennial survey lgth comps
#2 1 1 20 1
#2 2 1 20 1
#2 3 1 20 1
#2 4 1 20 1
#2 5 1 20 1
#2 6 3 20 1
```

```
#2 1 3 5 1
#2 2 3 5 1
#2 3 3 5 1
#2 4 3 5 1
#2 5 3 5 1
#2 6 3 5 1
#2 1 4 1 1
#2 2 4 1 1
#2 3 4 1 1
#2 4 4 1 1
#2 5 4 1 1
#2 6 4 1 1
#3 1 1 10 1
#3 2 1 10 1
#3 3 1 10 1
#3 4 1 10 1
#3 5 1 10 1
#3 6 1 10 1
#4 1 1 1 1
#4 2 1 1 1
#4 3 1 1 1
#5 1 1 1 1
#5 2 1 1 1

0 # (0/1) read specs for more stddev reporting
# 1 1 -1 5 1 5 # selex type, len/age, year, N selex bins, Growth pattern, N growth ages
# -5 16 27 38 46 # vector with selex std bin picks (-1 in first bin to self-generate)
# 1 2 14 26 40 # vector with growth std bin picks (-1 in first bin to self-generate)

999
```

Appendix D: SS2 Starter file

```
#C Greenstriped 2009 assessment (Allan Hicks, Melissa Haltuch, Chantel Wetzel)
gsrk09.dat
gsrk09.ctl
0 # 0=use init values in control file; 1=use ss3.par
1 # run display detail (0,1,2)
1 # detailed age-structured reports in REPORT.SSO (0,1)
0 # write detailed checkup.sso file (0,1)
0 # write parm values to ParmTrace.sso (0=no,1=good,active; 2=good,all; 3=every_iter,all_parms; 4=every,active)
1 # Cumulative Report
0 # Include prior_like for non-estimated parameters (0,1)
1 # Use Soft Boundaries to aid convergence (0,1) (recommended)
1 # Number of bootstrap datafiles to produce (N-2), 1 means reporduce data, 2 means add expected values
10 # Turn off estimation for parameters entering after this phase
1 # MCMC burn interval
1 # MCMC thin interval
0.0001 # jitter initial parm value by this fraction
-1 # min yr for sdreport outputs (-1 for styr)
-2 # max yr for sdreport outputs (-1 for endyr; -2 for endyr+Nforecastyrs
0 # N individual STD years
#vector of year values
# 1973 1976
0.0001 # final convergence criteria (e.g. 1.0e-04)
0 # retrospective year relative to end year (e.g. -4)
2 # min age for calc of summary biomass
1 # Depletion basis:  denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel X*B_styr
1 # Fraction (X) for Depletion denominator (e.g. 0.4)
4 # (1-SPR)_reporting:  0=skip; 1=rel(1-SPR); 2=rel(1-SPR_MSY); 3=rel(1-SPR_Btarget); 4=notrel
1 # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num); 3=sum(frates)
0 # F_report_basis: 0=raw; 1=rel Fspr; 2=rel Fmsy ; 3=rel Fbtgt
999 # check value for end of file
```

Appendix E: SS2 Forecast file

```
1 # Forecast: 0=none; 1=F(SPR); 2=F(MSY) 3=F(Btgt); 4=F(endyr); 5=Ave F (enter yrs);
6=read Fmult
# -4  # first year for recent ave F for option 5 (not yet implemented)
# -1  # last year for recent ave F for option 5 (not yet implemented)
# 0.74  # F multiplier for option 6 (not yet implemented
0 # first year to use for averaging selex to use in forecast (e.g. 2004; or use -x to
be rel endyr)
0 # last year to use for averaging selex to use in forecast
1 # Benchmarks: 0=skip; 1=calc F_spr,F_btgt,F_msy
2 # MSY: 1= set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt); 4=set to F(endyr)
0.5 # SPR target (e.g. 0.40)
0.4 # Biomass target (e.g. 0.40)
12 # N forecast years
1 # read 10 advanced options
 0 # Do West Coast gfish rebuilder output (0/1)
 2000 # Rebuilder:  first year catch could have been set to zero (Ydecl)(-1 to set to
endyear+1)
 2002 # Rebuilder:  year for current age structure (Yinit) (-1 to set to endyear+1)
 1 # Control rule method (1=west coast adjust catch; 2=adjust F)
 0.4 # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40)
 0.1 # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)
 1 # Control rule fraction of Flimit (e.g. 0.75)
 0 # basis for max forecast catch by seas and area (0=none; 1=deadbio; 2=retainbio;
3=deadnum; 4=retainnum)
 0 # 0= no implementation error; 1=use implementation error in forecast (not coded
yet)
 3.19 # stddev of log(realized F/target F) in forecast (not coded yet)
# end of advanced options
# max forecast catch
# rows are seasons, columns are areas
#use fleet allocation determined from average catches over last 2 years
2 # fleet allocation (in terms of F) (1=use endyr pattern, no read; 2=read below)
0.416429556   0.048866457   0      0.008847217   0.525856769

10 # Number of forecast catch levels to input (rest calc catch from forecast F
1 # basis for input forecatch:  1=retained catch; 2=total dead catch
#catches for 2009 and 2010 are average of 2007 and 2008 (last 2 years)
#Year  Season Fleet  Catch
2009   1      1      1.185
2009   1      2      0.139
2009   1      3      0.000
2009   1      4      0.025
2009   1      5      1.496
2010   1      1      1.185
2010   1      2      0.139
2010   1      3      0.000
2010   1      4      0.025
2010   1      5      1.496


999 # verify end of input
```

GREENSTRIPED ROCKFISH

STAR Panel Report

August 3-6, 2009

Hotel Deca
4507 Brooklyn Ave NE
Seattle, WA 98105

Panel Reviewers

Stephen Ralston	Panel Chair, Scientific and Statistical Committee (SSC) Representative
Richard Methot	NMFS, Northwest Fisheries Science Center (NWFSC)
Vivian Haist	Center for Independent Experts (CIE)
J. J. Maguire	Center for Independent Experts (CIE)

Panel Advisors

John DeVore	Pacific Fishery Management Council
Robert Alverson	Groundfish Advisory Subpanel (GAP) Representative
Rob Jones	Groundfish Management Team (GMT) Representative

Stock Assessment (STAT) Team members present

Allan C. Hicks	NMFS, Northwest Fisheries Science Center (NWFSC)
Melissa A. Haltuch	NMFS, Northwest Fisheries Science Center (NWFSC)
Chantel Wetzel	University of Washington, School of Aquatic & Fishery Resources

Overview

A draft assessment of greenstriped rockfish (*Sebastes elongatus*) stock status off the U. S. west coast (California, Oregon, and Washington) was reviewed by the STAR panel from August 3-6, 2009 in Seattle, WA. Within the model the population is treated as a single homogeneous stock, but with fisheries that vary spatially. Greenstriped rockfish is a diminutive, low-value bycatch species and, as a consequence, there is great uncertainty about historical discarding practices. Recent data on discards collected by the West Coast Groundfish Observer Program from 2002-2007 were used in the assessment to model retention throughout the modeled period (1916-2008), although discard data collected during the 1980s were considered during the development of a base-model.

The assessment utilized the Stock Synthesis modeling platform and included a wide variety of data sets. Five fisheries were modeled, including: (1) Washington-Oregon (WA/OR) trawl, (2) California (CA) trawl, (3) foreign catches from 1966-1976, (4) "other" commercial gears, and (5) recreational harvests. Three fishery-independent time series of abundance were developed using Δ-GLMM analyses, i.e., early (1980-1992) and late (1995-2004) triennial trawl survey and the NWFSC combined trawl survey (2003-2008). Length compositional data were available to inform estimation of fishery and survey selectivities and conditional age-at-length data were obtained from the combined trawl survey.

This is the first assessment of greenstriped rockfish and a number of structural assumptions were evaluated and incorporated into the final model, including:

- Use of SS3 version 3.03a modeling framework;
- Inclusion of reconstructed landings with the modeled period beginning in 1916;
- Full bias-corrected stochastic recruitment from 1987-2005 with ramped bias corrections before (1970-1986) and after (2006-2020);
- Estimation of retention curves and discards for trawl and "other" commercial gears;
- Incorporation of weight-specific fecundity;
- Unbiased aging error estimates based on the method of Punt *et al*. (2008);
- Fixed $\boldsymbol{M}$ (0.08 yr^{-1}) based on longevity and Hoenig (1983);
- Fixed steepness ($\boldsymbol{h}$ = 0.69) based on Dorn's prior for an unobserved rockfish.

Results of the base assessment model indicate that depletion of the greenstriped rockfish stock (81%) is well above the Council's target for groundfish (40%) and that recent harvests (9-94 mt) are substantially below the potential yield. Uncertainty about the final base model was bracketed by jointly varying natural mortality and the discard retention curve. While decision table results vary widely over the range of possibilities considered, all indications are that the stock is in good condition. Given the robust conclusion that this stock is not currently in jeopardy, nor is it likely to be in the foreseeable future, the STAR panel recommends that this stock not be reassessed until such time that conditions within the fishery have changed substantially (e.g., targeting on greenstriped rockfish occurs) and/or fishery-independent survey statistics indicate a decline in stock abundance.

The STAR panel concluded that the greenstriped rockfish stock assessment developed by the STAT constitutes the best available scientific information on the status of this species off the U.S. west coast and recommends that it be used for status determination and management in the Council process. The STAR panel thanks the STAT team members for their exceptional preparation, hard work, and willingness to respond to panel requests.

Panel Requests to the Greenstriped Rockfish STAT

The following prioritized requests were made by the STAR panel to the greenstriped rockfish STAT:

1) Proposed new base case model. Beginning with the August 2nd version (which included minor updates to landings data, which the Panel endorsed), make the following changes:

   - Remove 1980 triennial survey length-frequency data (but not the 1980 survey index).
   - Re-run the ageing precision and bias estimation model assuming no bias in the ageing process; use the revised precision estimate in the new base case.
   - Use recruitment bias correction ramp (1970-1986).
   - All changes can be done in a single revised run.

Rationale: Sample sizes are small and there is potential bias in favor of mid-sized and more common fish in the early triennial survey length-frequency data. The calculation of both precision and bias in the ageing analysis was inappropriate. The difference between age readers was small and a better estimate of ageing imprecision is obtained by running the analysis with no bias between the readers. Research that is currently underway indicates the ramp-up bias correction method generates less biased estimates of recruitment.

Response: Tuning was done on the new base model for σ_R and resulted in a $\sigma_{R,in}$ of 1.05 and a $\sigma_{R,out}$ of 1.02. It is likely that σ_R increased because the main recruit deviation period from which $\sigma_{R,out}$ is calculated is shorter (1987–2005) and contains highly variable recruitments without the earlier recruitments dampening them. When $\sigma_{R,in}$ was 0.85 (prior to tuning), the estimated current depletion was 0.71, but when $\sigma_{R,in}$ was increased to 1.05, the estimated current depletion was 0.61, which is similar to the estimated depletion from the original base case model without the ramping in of the bias adjustment. So, even though originally it looked liked adjusting the bias adjustment may have an effect on current depletion, the model suggested tuning would bring it back to the same space. Other model parameter estimates were similar to those from the previous base case.

2) Two sensitivity runs that are modifications of the proposed base case model: The first, has a common selectivity for the WA/OR and CA trawl fisheries, but has different retention functions. The second run has a common WA/OR and CA trawl fishery retention function and different selectivity functions.

Rationale: It is difficult to disentangle the combined influence of the selectivity and retention functions on the residual pattern in the fits to the length-frequency data.

Response: The run with the mirrored retention function fit the data slightly worse, mostly in the length-frequency and mean-weight datasets. The overall results of the run were similar to the new base run. The asymptote of the retention curve was estimated at 0.4154 and selectivity curves were similar to the new base.

Somewhat different results were seen for the run with common selectivity for the WA/OR and CA trawl fisheries, but different retention functions. In comparison to the base model this model has poorer fits to the length and discards biomass data. The combined selectivity is most similar to the WA/OR trawl selectivity from the base model. The CA trawl fishery is now selecting fewer small fish in comparison to the base model but the WA/OR trawl selectivity is no longer having a problem with the peak parameter hitting the bound. The retention curve for the CA trawl suggests that the fishery is retaining more fish than the base model.

3) Two sensitivity runs to investigate uncertainty in historical retention rates. For both runs modify the proposed base case model to have a common WA/OR and CA trawl fishery retention function. These sensitivity runs have two time blocks with different retention functions: 1916-1999 and 2000-2008. The WCGOP discard data will apply to the 2000-2008 retention period.

   The first sensitivity run uses the Pikitch discard data for estimating retention parameters for the first time block. The second sensitivity run decreases the estimated asymptote of the retention curve (as estimated for the WCGOP data) by 50% for application to the first time period.

Rationale: The Pikitch data shows very different discard rates to the later WCGOP data, with much lower discarding rates. It seems unlikely that this Oregon data represents the full historical coastwide period, given the perception that historically greenstriped rockfish landings were a small fraction of the catch. These two sensitivity runs are constructed to bound the potential range of historical discards.

Response: The sample sizes for the Pikitch length-frequencies were set at 5 times the number of tows sampled, which resulted in 30 and 15 for 1986 and 1987, respectively. This was done as a tuning exercise as well as to increase the weight on the two length-frequencies which are the only information to inform a long time period. In addition, when just the number of tows was used for sample size, the retention asymptote was estimated at 0.05 and did not fit the length-frequencies at all. The results of the run with the Pikitch data resulted in a retention asymptote of 1.0 for the early time block and the fits to the Pikitch length-frequencies were reasonable. The unfished spawning output was 2,888 million eggs and the current depletion was estimated at 0.63. The retention asymptote for the later time block (WCGOP data) was 0.54. CA selectivity was still shifted to the left and WA/OR selectivity was shifted to the right. The discard fraction in the early time block was around 0.5-0.65 and in the later years was above 0.8.

The run with the retention asymptote fixed at 0.2077 estimated the discard fraction near 0.9 for the entire time period. The unfished spawning output was 10,700 million eggs and the estimated current depletion was 0.62.

4) Two sensitivity runs were requested to investigate the lack of fit to the 1993 year-class signal in the marginal age-composition data. For the first run, all research trawl length-

frequency data will be weighted lower. A maximum sample size of 200 will be used. For the second run, the marginal age-composition from the NWFS survey will be fitted and the length-frequency data removed.

Rationale: To investigate potential conflict between the length-frequency and marginal age-composition data.

Response: Decreasing the effective sample sizes of the survey length frequency data (maximum sample sizes of 200) produced better fits to the conditional age data in comparison to the base model, however visually the fit to the 1993 year class was not substantially improved. In this model run the $\sigma_{R,in}$ was 1.05 and $\sigma_{R,out}$ was 1.08. One run was completed to look at tuning σ_R up to 1.1 but the $\sigma_{R,out}$ was still higher than the input indicating that further tuning could be done.

The second model run removed the length-frequency from the NWFSC survey while retaining the marginal age composition data from that survey. With the length composition data removed the model was still unable to fit the high proportions in the age data from the 1993 cohort. The removal of the length-frequency data resulted in a new selectivity curve for the NWFSC that was shifted to the right with the peak parameter estimated at 43cm for females and 40cm for males which in turn result in a higher q for the NWFSC of 2.55. Due to this difficulty with the estimated selectivity, the length data were put back into the model with lambdas of 0.5 on the length frequencies and marginal age compositions from the NWFSC survey to improve the selectivity estimation. This resulted in a selectivity estimate similar to the base model and a q of 1 for the NWFSC survey. The model still failed to fit the large proportions of the 1993 year-class observed in multiple years. The final depletion estimated in this model was 0.58 compared to the base model estimate of 0.61.

During the meeting, an additional model run was conducted with ageing error turned off. This run resulted in substantially improved fits to the high proportions observed for the 1993 year class in the marginal age frequency data. With tuning, σ_R was estimated at 0.6 which is lower than the estimate of 0.85 for the base case model run. Because there certainly is error in ageing, and a potential for bias in the ageing data (from assigning more fish to a known strong year-class) the Panel decided that ageing error should be maintained in the base case model formulation. But, the lower σ_R (0.6) was considered more appropriate for this stock, and the base case model should fix σ_R at this value.

5) Check the discard ratio values presented in Table 9.

Rationale: Tabulated values appear suspicious because of similarity among the annual estimates for WA, OR, and CA.

Response: The formula used to calculate the discard ratios was incorrect (because data had been provided based on a North/South split, rather than a State-based split), and revised values for northern and southern regions were presented.

6) Provide model estimates of annual total catch and total retained catch from the base case and the two alternative retention scenarios.

Rationale: To determine how discard ratios vary between the base case and alternative retention scenario model runs.

Response: Results were presented in conjunction with the sensitivity runs discussed above.

7) Check data input for 2003 WA/OR trawl landings and discard length-frequency.

Rationale: Residuals for the landings and discard length-frequencies have opposite patterns.

Response: The data had been entered correctly and the suspicious residual pattern was the result of small sample sizes for the discard data.

8) Requested change to the assessment document: authors to document that the foreign fishery did not begin prior to 1966.

Rationale: Foreign fleet catches were high in 1966, suggesting the fishery could have begun earlier.

Response: The Rogers foreign catch reconstruction document states there was no foreign catch in US waters in 1965. The only catches reported in 1966 were from Soviet vessels, from the Monterey, Columbia, and US. Vancouver INPFC areas.

Description of base case model and alternative models to bracket uncertainty

- Start year of the model = 1916;
- Spatial structure: coastwide, single-area model;
- Discard for trawl and other-gear fisheries estimated within model from retention function;
- M set to 0.08 yr^{-1} for females and 0.08 yr^{-1} males following sensitivity analysis;
- h set to 0.692 on the basis of Dorn's prior;
- σ_R set to 0.6 following investigation of interaction with ageing imprecision;
- von Bertalanffy growth parameters, including dispersion of individual growth, estimated for females and males;

Fisheries:

Washington/Oregon trawl
California trawl
Foreign
Other commercial gears
Coastwide recreational

Abundance indices:

Early Triennial trawl survey (1980-1992)
Late Triennial trawl survey (1995-2004)
NWFSC shelf-slope trawl survey (2003-2008)

Discard data [mt discarded]:

Washington/Oregon trawl (2002-2007)
CA trawl (2002-2007)
Other commercial gears (2002-2007)

Discard data [mean body weight]:

Washington/Oregon trawl (2002-2007)
CA trawl (2002-2007)
Other commercial gears (2002-2007)

Length composition[1]:

Washington/Oregon trawl (1996-2008)
California trawl (1978-2007)
Other commercial gears (1979-2008)
Coastwide recreational (1980-2003)
Triennial trawl survey (1980-2004; triennial)
NWFSC shelf-slope trawl survey (2003-2008)
Washington/Oregon trawl discards (2003-2007)
CA trawl discards (2002-2007)
Other commercial gear discards (2005-2007)

Age composition (as conditional age-at-length by sex):

NWFSC shelf/slope trawl survey (2003-2008)

Uncertainty – Greenstriped rockfish are small bodied and have only sporadically been caught but never targeted by the fishery and fishery sampling programs; much of the catch is discarded (about 80% by weight in recent years). There is much uncertainty in both the reconstruction of historical landings and especially in historical levels of discard. The effect of this uncertainty is bracketed by setting the historical retention curve to higher and lower values than the base-case value estimated from recent (2002-2008) observer data. The higher historical retention curve is supported by the discard observations obtained by Pikitch for the Oregon trawl fishery in the mid 1980s. The lower retention curve is supported by the widespread occurrence of greenstriped rockfish in fishery-independent trawl surveys, yet their low landed catch in some areas. Higher retention, hence less discard and lower historical total catch, scales historical stock abundance lower and vice versa for the lower retention curve. In addition, the natural mortality is not precisely determined and the base model uses a value of 0.08. The high end of the range is set to 0.10 based on high values predicted from life history characteristics and the low end is set to 0.06 based upon values of natural mortality estimated from the data included in the assessment.

[1] Some years have no samples, see assessment document for details of sample availability.

The choice of natural mortality affects the estimated depletion, but even when M = 0.06, results still indicate that the stock is above the target stock size. The assessment finds that greenstriped rockfish have never been substantially reduced in abundance so the spawner-recruitment steepness cannot be estimated. Steepness is set equal to the mean of the prior derived from other rockfish species and the assessment result for greenstriped is not sensitive to this value.

Technical merits of the assessment

The greenstriped rockfish stock assessment team was very well prepared and had completed a thorough analysis, including a variety of sensitivity runs, in advance of the STAR panel meeting. Efforts to reconstruct landings for the States of Washington and Oregon were comprehensive and formed an essential component of the stock assessment, although additional work on landings reconstructions is expected to further improve our understanding of this species. Because greenstriped rockfish is essentially a non-targeted bycatch species, use of data from the West Coast Groundfish Observer Program (and the Pikitch study) to inform estimation of retention functions and total discards was a noteworthy technical accomplishment of the assessment.

Explanation of areas of disagreement regarding STAR panel recommendations

A. Among STAR panel members (including concerns raised by the GAP and GMT representatives

There were no areas of disagreement among STAR panel members.

B. Between the STAR panel and the STAT team

There were no areas of disagreement between the STAR panel and the STAT team.

Unresolved problems and major sources of uncertainty

It was the STAR panel's view that the principal source of uncertainty in the assessment relates to historical discarding practices. Recent data show significant discarding of all sizes of greenstriped rockfish, whereas data from Pikitch show both a lower overall discard rate and virtually no discarding of fish larger than 30cm. Given the ubiquity of this species in fishery-independent trawl surveys and relatively low reported landings over many years of observations, the Pikitch data were viewed with some skepticism and, as a consequence, were not included in the final assessment model. Nonetheless, the panel was concerned about application of discard data from the last decade, a time period of intense management, to the preceding historical period that started in 1916. While it is not clear how this issue can be resolved through further study, this remains a major source of uncertainty for greenstriped rockfish, for which discarding is generally acknowledged to be high.

Another source of uncertainty identified by the STAR panel is the estimate of greenstriped rockfish natural mortality (***M***), which in the base model was fixed at 0.08 yr^{-1}. Given observed longevities of male (49 yr) and female (51 yr) fish, which are relatively easy to age, the adopted value is reasonable. However, likelihood profiling indicates that a much better fit occurs at a lower value ($M \cong 0.06\ yr^{-1}$). Importantly, the difference between these two estimates has a considerable effect on estimates of stock size and potential production.

Management, data, or fishery issues raised by the GAP and the GMT representatives

No specific issues or concerns pertaining to the greenstriped rockfish stock assessment were raised by the GAP and/or GMT representatives during the meeting. It was acknowledged by industry participants at the meeting that on occasion catches were retained and landed during the course of normal fishing operations, but that targeting was unlikely to have occurred.

Prioritized recommendations for future research and data collection

Specific to greenstriped rockfish:

1. Develop alternative methods to deal with historical discards, where information is limited or non-existent. Co-occurrence of greenstriped rockfish with other species in fishery-independent trawl survey catches may provide a basis for estimating relative fishing effort trends.

2. Conduct a blind re-read of ageing structures from the strong 1993 year-class to ascertain if there is ageing bias resulting from an expectation of a strong year-class.

3. Explore stock structure and potential differences in northern/southern greenstriped rockfish life history characteristics.

General:

1. Continue to develop standardized landings reconstruction methodologies over all three west coast states.

2. Explore a GLMM approach with a calendar date covariate to estimate CPUE indices for the entire triennial survey time series. A species assemblage meta-analysis approach could be used to develop priors for the ratios of q among the early triennial, the late triennial and the NWFSC surveys.

3. Explore the relationship between ageing precision, recruitment variability, and bias adjustment (and effects on depletion estimates) using simulation methods, and develop recommended procedures for appropriate methods to follow.

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Agenda Item E.2.c
Supplemental SSC Report
September 2009

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON PART II OF STOCK ASSESSMENTS FOR 2011-2012 GROUNDFISH FISHERIES

INTRODUCTION

The Scientific and Statistical Committee (SSC) completed a review of seven stock assessments and Stock Assessment Review (STAR) panel reports, including petrale sole, widow rockfish, yelloweye rockfish, greenstriped rockfish, bocaccio, cabezon, and lingcod. With the exception of petrale sole, these assessments were completed over the summer following the Council's June meeting. At that meeting the petrale sole assessment was referred to a SSC groundfish subcommittee meeting to be held later in the summer for further consideration and evaluation. Having now reviewed the entire set of full and updated stock assessments that were scheduled this year, the SSC is very pleased to inform the Council that the process performed very well this year. All the stock assessment teams submitted well-prepared documents in a timely manner and were responsive to all requests during the review process. As witness to that conclusion we note that no assessments were referred to the mop-up panel. For that reason the SSC would like to commend all the personnel and staff involved in this major effort for having performed at such a high level.

FULL STOCK ASSESSMENTS

Petrale Sole

At its June 2009 meeting, the SSC reviewed the new petrale sole assessment and, based on a number of concerns, was unable to endorse the assessment at that time. The STAR Panel report also recommended that the estimates of F_{MSY} and B_{MSY} produced by the assessment be investigated as alternatives to the currently used proxies of $F_{40\%}$ and $B_{40\%}$. The SSC developed a list of analytical requests for the petrale sole Stock Assessment Team (STAT) to address these issues, and the SSC's groundfish subcommittee met with the STAT on August 31st to review the response to these requests.

Dr. Melissa Haltuch provided the SSC with a brief overview of the petrale sole assessment, and presented the STAT's response to the SSC groundfish subcommittee requests. Dr. Stephen Ralston presented the report of the SSC groundfish subcommittee, which endorsed the petrale sole model that was approved by the STAR panel, and recommended that proxies of $B_{25\%}$ for B_{MSY} and $F_{30\%}$ for F_{MSY} be established for west coast flatfish.

The SSC revisited the issues that had already been considered in detail during the subcommittee meeting. The SSC agreed that the base petrale sole model represents the best available scientific information, and endorsed its use for status determination and management in the Council process.

The SSC concluded that there is no basis for rejecting the assessment based on the estimate of catchability coefficient (q) for Northwest Fisheries Science Center (NWFSC) trawl survey. However the SSC encourages further investigation of the catchability coefficient of the survey by experimental evaluation of trawl performance, quantification of trawlable and untrawlable habitat off the west coast, or by synthesis of available information and expert knowledge through development of an informative prior, as had been anticipated from the 2008 survey catchability workshop.

The raw catch per unit of effort (CPUE) presented in the petrale sole assessment suggests a potential discrepancy between the assessment results and the experience of the groundfish fleet. It is important to note that limited conclusions can be drawn from un-standardized CPUE data, and that standardization of these data will be difficult due to the many management changes in the groundfish fishery. Nevertheless, the SSC encourages further evaluation of fishery CPUE data in the next petrale sole assessment, if only to better understand and potentially reconcile these differences.

During its meeting, the SSC groundfish committee addressed the suggestion of the petrale sole STAR Panel to investigate the species-specific estimates of F_{MSY} and B_{MSY} as alternatives to the currently used proxies. The SSC endorses the groundfish subcommittee's recommendation to establish new proxies of $B_{25\%}$ for B_{MSY} and $F_{30\%}$ for F_{MSY} for west coast flatfish. These values are based on a number of considerations, including evaluation of information on flatfish productivity (steepness) for assessed west coast flatfish, published meta-analyses of other flatfish stocks, and recommendations on appropriate proxies for B_{MSY} and F_{MSY} in the scientific literature. The SSC does not at this time endorse the use of species-specific estimates of B_{MSY} and F_{MSY} for petrale sole because of high variability in these estimates between repeat assessments for other stocks and the sensitivity of these estimates to assumptions concerning stock structure. Instead, the SSC recommends that this issue be dealt with in a comprehensive way, perhaps through development of guidelines during an off-year harvest policy workshop.

Other aspects of the Council's harvest policy, such as the overfished threshold and the point at which the precautionary reduction for optimum yield (OY) becomes zero (40-10), are policy decisions that are at the discretion of the Council. A policy that mimics the Council's default proxies for groundfish would be to set the minimum stock size threshold (MSST) to $B_{15\%}$, which is 60 percent of the target stock size, and to implement a 25-6.25 precautionary adjustment for OY. Alternatively, the Council could set the MSST to 50 percent of $B_{25\%}$, which is the lowest value recommended by the National Standard 1 guidelines.

Finally, the SSC notes that the process of addressing a STAR panel recommendation with potentially broad ramifications has been less than ideal. Again, addressing harvest policy issues during an off-year science workshop would allow a more comprehensive approach to be developed. Such a workshop would also provide opportunity for outside review, which may be an important consideration given that SSC members are likely to be involved in technical analyses.

Widow Rockfish

Dr. Xi He presented the widow rockfish stock assessment to the Scientific and Statistical Committee (SSC). Dr. Martin Dorn summarized the report of the Stock Assessment Review (STAR) Panel of the widow rockfish assessment, held in Santa Cruz, California July 13-17, 2009.

The last full assessment of widow rockfish was conducted in 2005, with an update in 2007. The 2009 assessment differed from the previous assessment in several respects: a) the assessment used Stock Synthesis 3 (SS3) rather than a custom-designed model, b) the catch history was revised and extended back to 1916, c) catch, age, and survey data were updated with data from 2007 and 2008, and d) data from the NWFSC trawl survey were included in the assessment. Widow rockfish were modeled as a single stock with two areas and four fisheries. Additional work regarding how to model this species remains a priority given the sparseness of recent fishery data and the need to further explore spatial stock structure.

The STAR Panel considered the current assessment to be the best available scientific information and recommended its use in management. Much attention was given during the STAR Panel to refining the new data sets so that the base model is reasonably well developed. Less time was available to explore alternative model configurations and tuning. For example, the SSC observed that length selectivity patterns were not consistent among data sources and selectivity patterns for the triennial and NWFSC trawl surveys were unexpected. The SSC recommends that the next assessment should be a full assessment because several key problems remain unresolved.

The 2007 assessment identified a large partially-recruited 2002 year class that led to predictions of rapid rebuilding by 2009. This year class was less evident in the recent data and is not now estimated to be a strong year class. Nonetheless, there has been a gradual rise in the modeled depletion rate to 38.5 percent, just short of the 40 percent rebuilding threshold. The SSC endorses the use of the 2009 widow rockfish stock assessment for status determination and management in the Council process.

In general the SSC notes that estimates of recruitment for the most recent years of an assessment are often the most uncertain, yet can have a considerable impact on the outcomes of rebuilding projections. The SSC recommends that the STAT and STAR Panels consider imposing constraints on the estimates of recent year-classes to the extent we have lower confidence in these estimates.

The SSC is also generally concerned about the lack of data to inform the rate of stock rebuilding in recent years for several assessments of overfished rockfish. Specifically, fundamental assumptions about stock productivity are made in these models that will lead to a conclusion of stock recovery if catches are reduced markedly. The SSC notes that in a number of instances, recent predicted increases in abundance of overfished stocks are largely due to properties of the models and not to robust observational data.

Yelloweye Rockfish

Dr. Ian Stewart presented the yelloweye rockfish assessment to the Scientific and Statistical Committee (SSC). Dr. Stephen Ralston summarized the report of the Stock Assessment and Review (STAR) Panel of the yelloweye rockfish assessment, held in Seattle, Washington, August 3-6, 2009.

The last full assessment of yelloweye rockfish was conducted in 2006 with an assessment update in 2007. The 2009 assessment differed from these previous assessments in terms of assumed population structure and the data used to fit the model. The 2009 assessment was based on three regions (California, Oregon and Washington) under the assumptions that adults are sedentary, density-dependence is a function of coastwide egg production, and the proportion of recruits settling in each area is constant over time. This spatial structure is consistent with our understanding of the behavior of yelloweye rockfish, and reflects a compromise between a coastwide assessment and separate assessments for each state. This compromise allows for some regional differences to be captured within the model without requiring large numbers of additional parameters.

Even with a large number of changes to data inputs, the results from the 2009 yelloweye rockfish assessment are consistent with those from the 2006 and 2007 assessments. All of these assessments suggest that yelloweye rockfish experienced a substantial decline in abundance between 1980 and 2000, with a best estimate of stock depletion in 2009 from the current assessment of 20.3 percent.

In contrast to the 2006 and 2007 assessments, the 2009 assessment makes use of data from the NWFSC and Triennial trawl surveys as well as data on discarded yelloweye rockfish collected by observers in the Oregon recreational charter fishery. However, the International Pacific Halibut Commission (IPHC) survey data remain the most important index in the assessment, although IPHC survey data are only available for Washington and Oregon and not California where the largest potential biomass of yelloweye rockfish is estimated to occur. Unlike previous assessments, the relationship between fishery-dependent catch-rates and abundance is allowed to be non-linear. The assessment authors also reviewed and updated assumptions regarding growth, maturity and fecundity.

The catch history was revised as part of the 2009 assessment. However, the revised time-series of catches was not markedly different from that on which the 2006 and 2007 assessments were based. Considerable uncertainty regarding the time-series of historical catches remains, and this was identified as a key source of uncertainty in the assessment.

The assessment estimates trends in abundance by region. The SSC cautions against making use of these trends as the sole basis for the spatial allocation of harvest guidelines because the trend in abundance at the coastwide level is much more robust than those at the regional level. Reasons for this include that the time-series of historical catches by region are more uncertain than the coastwide totals and that the catch reconstructions for Washington are still somewhat incomplete. Given that the trends in abundance by region are driven to a considerable extent by the time-series of historical catches, uncertainty in the split of total catches to region will be reflected more in uncertainty in regional depletion than in total depletion.

The SSC endorses the research recommendations of the assessment authors and the STAR Panel, and identified two data sources which, if investigated, could provide additional indices of abundance: (a) the catch and effort data from the Oregon live-fish fishery, and (b) yelloweye rockfish catch rates from the recreational fishery for Pacific halibut. The SSC also highlights the continuing need for an index of abundance that can be used to reliably detect changes in yelloweye rockfish abundance. It also notes that visual survey techniques have the potential to index yelloweye rockfish abundance without inducing mortality which might hinder recovery.

The SSC recommends that the following be considered as potential items for workshops during the 2010 “off-year”: (a) review of efforts to develop stock size indices based on the IPHC surveys, including how to add stations to augment the survey and, (b) analyses to construct indices of abundance for yelloweye rockfish and other groundfish. Given the potential importance of the IPHC index to the assessment of yelloweye rockfish, the SSC also recommends participation by IPHC scientists at any workshops to review the use of the IPHC data in yelloweye rockfish assessments and at future STAR Panels. Finally, the SSC highlights the value of collecting biological data, such as age-length and maturation information, for yelloweye rockfish during the IPHC surveys.

The SSC recommends that the yelloweye rockfish assessment be an update during the 2011 assessment cycle unless off-year research leads to a marked change to how the IPHC survey data are analyzed or the development of a new index of abundance based on the discards in Oregon recreational charter fishery. The SSC notes that the assessment author plans to refine how the IPHC survey data are analyzed. In principle, changing the analytical method used to summarize survey data falls outside of the terms of reference for an assessment update. However, given that this is a stable assessment, this change can be accommodated within the scope of an assessment update, but this will require extra time for review.

The SSC endorses the use of the 2009 yelloweye rockfish assessment for status determination and management in the Council process. The SSC also endorses the approach used to quantify uncertainty, which will form the basis for the rebuilding analysis for this species.

Greenstriped Rockfish

Mr. Allan Hicks and Dr. Melissa Haltuch presented the greenstriped rockfish assessment to the Scientific Statistical Committee (SSC). Dr. Stephen Ralston summarized the report of the Stock Assessment and Review (STAR) Panel of the greenstriped rockfish assessment, held in Seattle, Washington, August 3-6, 2009.

This is the first assessment of the greenstriped rockfish off the US West Coast from US/Canada border to US/Mexico border. Greenstriped rockfish is a small, low-value bycatch species found in a wide range of habitats with a preference of mud or sand bottoms. The population is treated as one single stock in the assessment. There have been no fisheries targeting this species, thus discards constitute the main component of total fishing mortality on the stock. There is great uncertainty about historical discarding practices. Five fisheries and three fishery-independent surveys were modeled using Stock Synthesis 3.03a modeling framework.

An error in domestic catches was discovered and corrected after the STAR Panel. Revised results were presented to the SSC. In general, the revised results were very similar to those in the previous version. The estimated 2009 depletion remained the same at 81 percent, which is well above the Council's management target for groundfish (40 percent). Estimated total catches (landings plus estimated discards) in the past five years ranged between 3-78 mt and were substantially lower than the potential catch.

Uncertainty in states of nature was bracketed jointly by natural mortality and fraction discarded. There is only one harvest scenario in the decision table. The SSC noted that discards were not handled appropriately in two of the sensitivity runs (double and half of the landings) due to the fixed fraction of discards in model configuration. However, this does not affect the information provided in the decision table. It was also noted that the within assessment uncertainty is relatively high compared to other west coast groundfish assessments.

In this assessment, historical WA/OR catches were estimated by applying a fixed proportion to the documented landings of other rockfishes. However, due to the weighed-back issue of greenstriped catches, the historical removal requires further investigation.

The SSC noted that, in contrast to other rockfishes, trawl surveys provide reliable abundance indices for greenstriped rockfish. Given the high uncertainty in landings and discards in the assessment, establishing a tier system that allows a simpler approach for setting harvest control rules for greenstriped rockfish and other data-poor species is desired.

The SSC endorses the use of the 2009 greenstriped rockfish assessment for status determination and management in the Council process.

Bocaccio

Dr. John Field presented the bocaccio assessment and Dr. Martin Dorn summarized the report of the July 13-17, 2009 STAR Panel. The last full assessment of bocaccio was conducted in 2003, and it was subsequently updated in 2005 and 2007. The 2009 assessment: (a) used the SS3 modeling framework instead of SS1, (b) extended the northern boundary from Cape Mendocino to Cape Blanco, and (c) extended the period modeled from one beginning in 1951 to one beginning in 1892. There is evidence of two demographic clusters off the west coast centered off southern/central California and British Columbia. Although the bocaccio range extends considerably further north of Cape Blanco, abundance is low between Cape Mendocino and the Columbia River. Evidence also exists for a diffusion of young bocaccio from southern California northward as they age.

Major data changes for the 2009 assessment compared to previous assessments included a revised catch history and modeling of the trawl fishery as northern and southern components rather than as a single fishery. The 2009 assessment incorporated the NWFSC shelf-slope trawl survey for the first time, and also revised triennial trawl survey estimates. The 2009 assessment also used the NWFSC Southern California Bight hook and line survey and revised juvenile indices from the recreational pier index and juvenile trawl survey index.

The best estimate of current stock depletion in the 2009 assessment is 28 percent. The results of the 2009 assessment are consistent with those of the 2007 update, except for a smaller estimated starting biomass. The change in the estimated starting biomass resulted primarily from extension of the assessment period back to 1892 when spawning output was estimated to be close to unfished levels.

The SSC endorses the research and data collection recommendations of the assessment authors and the STAR Panel. While there are unresolved issues with the assessment, progress on these problems is likely to be difficult and incremental without additional biological data and information on stock structure. The SSC concurs with the STAR Panel recommendation that the next bocaccio assessment be an update rather than a full assessment.

The SSC endorses the use of the 2009 bocaccio assessment for status determination and management in the Council process.

The SSC supports extension of the assessment north of Cape Mendocino as biologically appropriate given our current understanding of stock structure, but also recognizes that this boundary extension raises issues with respect to area management. Approximately 6 percent of the coastwide bocaccio catch has occurred historically between Cape Mendocino and Cape Blanco while only 1 percent has been taken from the California/Oregon border to Cape Blanco. There is not a conservation issue at this time north of the $40^0$10' management boundary based on these low bocaccio catches in this area. Therefore, the SSC does not recommend changing the area where bocaccio are designated as overfished. Management should be based on a pro-rata allocation using the historical catch distribution north and south of $40^0$10'.

Cabezon

Dr. Jason Cope presented the cabezon stock assessment to the SSC. Dr. Vidar Wespestad presented the report of the Cabezon STAR Panel, held in Seattle, Washington on July 27-31, 2009.

The last full assessment of cabezon was conducted in 2005. The 2009 assessment extends the spatial range of the assessment to include Oregon as a third sub-stock, while retaining the two sub-stocks within California, north and south of Point Conception. Each of these sub-stocks was modeled separately, and a fourth scenario considered California as a single sub-stock. Several stock definition techniques support there being two or more stocks in California.

Notable changes in data from the 2005 assessment include a longer time series of catches and additional RecFIN length composition data prior to 1990. Conditional age-at-length data was used for the first time allowing for growth estimation internal to each model.

The stock assessment team (STAT) considered all available potential indices of abundance, but few were useful for assessment purposes due to a lack of appropriate spatial and temporal coverage. Consequently, only one index of abundance was used for each sub-stock (CPFV for California and the Oregon Recreational Boat Survey (ORBS) for Oregon). The SSC discussed the need for further review of local indices of abundance and their incorporation into stock assessment models.

The results of the 2009 assessment are consistent with the 2005 assessment for the Northern California sub-stock (NCS), but somewhat different for the Southern California sub-stock (SCS) mainly due to additional length composition data from the 1980s for the latter. A California coast-wide model estimated current depletion to be below either of the sub-area estimates. The SSC agrees with the STAT and STAR Panel that the NCS and SCS models best reflect the dynamics in each area, and that the results of the two sub-stock models should be combined in providing management advice for California.

The SSC endorses the use of the 2009 cabezon assessment for status determination and management in the Council process. A full assessment is not recommended in the next few assessment cycles in the absence of additional appropriate survey indices or better estimates of the natural mortality rate and/or growth parameters.

Lingcod

Dr. Owen Hamel presented the lingcod stock assessment to the SSC. Dr. Vidar Wespestad presented the report of the Lingcod STAR Panel, held in Seattle, Washington during July 27-31, 2009.

The assessment utilized data from the entire west coast of the contiguous United States (waters off Washington, Oregon and California). The lingcod population in these areas was modeled as two stocks in two separate assessment models covering [1] waters off Oregon and Washington (northern stock) and [2] waters off California (southern stock). This spatial delineation differed slightly from that used in the last stock assessment (2005) in which the stocks were separated at Cape Blanco (43° N vs. 42° N). The spatial change was necessary to facilitate access to existing databases for an analysis of candidate stock structures that was carried out prior to the assessment modeling.

Notable data differences from the 2005 assessment were (i) inclusion of four additional years of fisheries data (2005-08), (ii) extension of the catch time series back to 1928 (vs. 1956), and (iii) use of two new indices of abundance (NWFSC trawl survey and recreational dockside CPUE). Modeling changes included use of the SS3 software and other model structure refinements.

Key results of the 2009 assessment of the northern stock (B_0=33,000mt and depletion=62 percent) are generally consistent with the 2005 assessment. Further, sensitivity analysis demonstrated that these results are quite robust to the inclusion/exclusion of the various indices of abundance and other data sources. In contrast, results of the 2009 assessment of the southern stock (B_0=25,000mt and depletion=74 percent) are considerably more optimistic than the 2005 assessment; but are not nearly as robust as results from the northern stock. For example, exclusion of the recreational CPUE index from the southern base case reduced the depletion ratio estimate to 38 percent – a level more comparable to that estimated in the 2005 assessment, while inclusion of the age sampling data increased the depletion ratio estimate to 90 percent. Given these differences in uncertainty of the northern and southern stock results, the SSC concurs with the STAT that the respective decision tables should be structured differently. While natural mortality may serve as a reasonable major axis of uncertainty for the northern stock, the inclusion/exclusion of indices and data sources better characterizes the major uncertainty axis for the southern stock.

The NWFSC trawl survey index is highly variable and could not be well fit in either the northern or southern assessment model. The northern survey index is highly variable and without trend. However, while equally imprecise, the southern index exhibits a consistently declining trend over its six year history. As this trend is inconsistent with the assessment results, future work should investigate whether alternative model structures and/or assumptions can reproduce this trend; or whether re-analysis of the survey data may be warranted.

The considerable set of age sampling data was not incorporated in the base case for either the northern or southern lingcod assessment. The results for the southern stock were sensitive to the inclusion/exclusion of these data. Age validation and possible biases in age reading should be investigated. However, age sampling should continue until these issues can be resolved.

The SSC endorses the use of the 2009 lingcod assessment for status determination and management in the Council process. An updated assessment should be sufficient for the next lingcod assessment unless substantial progress can be made on ageing validation. Finally, the SSC endorses the research recommendations of the STAT and STAR Panel.

PFMC
09/14/09

SSC Groundfish Subcommittee Report on Petrale Sole
AFSC, Seattle WA – August 31, 2009

Background

This year an assessment of the petrale sole (*Eopsetta jordani*) stock off the U.S. west coast was conducted and a scientific review was held at a Stock Assessment Review (STAR) panel meeting May 4-8th in Newport, OR. The assessment concluded that since 1943 the stock has experienced chronic annual overfishing, defined as fishing mortality rates in excess of $F_{40\%}$, which is the rate that would reduce the expected lifetime egg production of a new recruit to 40% of that expected to occur in the absence of fishing. Moreover, the assessment concluded that the abundance of the stock has been below the minimum stock size threshold (MSST) since 1953, which would require the development of a stock rebuilding plan. For all Council groundfish stocks, the MSST is defined to be 25% of the biomass if there were no fishing ($B_{25\%}$). In contrast to these conclusions, the assessment also showed that the stock has supported very steady annual catches in excess of 2,000 mt for the last half century. Moreover, the stock assessment team (STAT) argued that the Council's proxy flatfish reference points ($F_{40\%}$ and $B_{25\%}$) were inappropriate, given the estimated productivity of the stock. The STAR panel review concurred with the STAT's evaluation and recommended that the reference points (B_{msy} and F_{msy}) developed specifically for petrale sole be used by the Council in developing ABC and OY recommendations for the 2011-2012 biennial management cycle.

The SSC reviewed the stock assessment and the STAR panel report at the Council's June 2009 meeting in Spokane, WA and, based on a number of concerns that were identified at that time, was unable to endorse a re-definition of reference points specific to petrale sole. Instead, the SSC developed a list of analytical requests and asked that the STAT conduct further analysis and report its findings to a meeting of the SSC's groundfish subcommittee to be held sometime later in the summer. This report summarizes the deliberations of the subcommittee meeting, which was held August 31st at the Alaska Fisheries Science Center in Seattle, WA and provides several recommendations regarding the petrale sole stock.

The Problem

The Council has used a harvest control rule for its assessed groundfish stocks since passage of Amendment 11 to the FMP in 1998. The control rule specifies proxy F_{msy} harvest rates for flatfish and Pacific whiting ($F_{40\%}$), roundfish ($F_{45\%}$), and rockfish ($F_{50\%}$)[1]. The Council adopted these three taxon-specific proxy fishing mortality rates, due to perceived differences in the productivity among these groups. However, at the same time the Council has used a single "target" stock biomass as its nominal B_{msy} proxy ($B_{40\%}$), as well as a single MSST ($B_{25\%}$). The use of proxy estimates of F_{msy} and B_{msy} was adopted by the Council due to inherent statistical difficulties in estimating these quantities in any single stock assessment and because of a well-developed scientific

[1] Note that an $F_{40\%}$ harvest rate is greater than an $F_{45\%}$ harvest rate, which in turn is greater than an $F_{50\%}$ harvest rate, i.e., flatfish are expected to achieve MSY at greater fishing pressure than rockfish.

literature supporting the use of proxies. Nonetheless, the Council has previously been confronted with peculiarities associated with the use of its proxies. For example, in the case of Pacific whiting where, if fished at the proxy harvest rate, the spawning biomass would be expected to drop below the MSST with some regularity. Fundamentally, as the productivity of a stock increases, the fishing mortality rate that produces MSY increases and, concomitantly, the relative biomass of the stock when fished at that rate decreases. Hence, flatfishes would be expected to have a lower relative B_{msy} value than rockfishes and logically might have a lower MSST than rockfishes as well. However, all Council groundfish stocks are currently judged identically with respect to being overfished.

Requests to the Petrale Sole Analytical Team

In June the SSC developed a list of analyses for the petrale sole STAT that were divided into two major areas. The first set of analyses was designed to explore the extent of parameter confounding and the influence of Canadian catches on the stock assessment model, including: (1) generating MCMC outputs for key model parameters, (2) evaluating the effect of Canadian removals on stock status, (3) incorporating a new "prior" on spawner-recruit productivity, also termed steepness (h), and (4) altering the prior on the natural mortality rate (M) to make it more informative. The second set of requests dealt specifically with the use of generalized proxies versus petrale-specific management quantities, including: (1) characterization of uncertainty in estimates of B_0, B_{msy}, $B_{40\%}$, and F_{msy}, (2) evaluating the effect of time-blocked selectivities on the estimate of B_{msy}, and (3) providing a clear argument to support the use stock-specific estimates.

Response to the SSC Groundfish Subcommittee

The petrale sole STAT attempted to complete all the requested analyses but was unable to generate a converged MCMC chain from the base model due to a technical difficulty with the Stock Synthesis modeling platform. This precluded a detailed evaluation of parameter confounding and prevented a thorough description of uncertainty in some of the key assessment outputs, including the stock-specific estimates of B_{msy} and F_{msy}. The STAT reported that the technical difficulty has now been solved but that there was insufficient time available to conduct an MCMC analysis before the subcommittee meeting. The team did succeed in developing a Canadian petrale sole catch history, but was unsuccessful in its attempt to incorporate those data into the base model, primarily because the Canadian compositional data were unavailable until just before the subcommittee meeting and when reviewed they differed markedly from the lengths and ages from Washington. The subcommittee agreed with the STAT that incorporation of the Canadian data in the assessment would require considerable additional work and should be done in collaboration with Canadian scientists. With respect to incorporating priors on h and M, the STAT was successful, but the effect of those analyses on the assessment was minimal, as was the effect of time-varying selectivity blocks on the model's estimate of B_{msy}.

Given the information and analyses that were presented, the subcommittee found no fault with the base petrale sole model that was approved by the STAR panel and recommends that it be used as the basis for setting an ABC and OY. However, in light of the base model's stock-specific estimates of B_{msy} (19% of B_0) and F_{msy} (equivalent to $F_{20\%}$) the subcommittee discussed at some length the wisdom of using the Council's flatfish harvest control rule proxies for petrale sole.

In addition, with respect to survey catchability, during the SSC review of the assessment in June, the catchability coefficient for the NWFSC combined trawl survey was considered. In particular, the parameter estimate was considered high (q = 3.07) and reasons for this were discussed. During the groundfish subcommittee meeting the STAT team presented additional information to help the subcommittee interpret the estimate, including video showing the Aberdeen trawl footrope and the response of flatfish and rockfish to the approaching net. Although the subcommittee concluded that there was no basis for rejecting the assessment based on the estimate of q, the development of a prior for survey catchability, as had been anticipated from the 2008 survey catchability workshop, may have been useful.

The subcommittee also received comment from industry representatives present at the meeting regarding petrale sole fishery-dependent logbook CPUE data that evidently have increased substantially. When petrale sole is next assessed, it would be helpful to document and reconcile this increase in CPUE with the trends estimated by the model.

SSC Groundfish Subcommittee Recommendations

The SSC groundfish subcommittee still endorses the use of proxies as a general practice for two important reasons. First, as noted previously, it is usually quite difficult to obtain reliable stock-specific estimates of B_{msy} and F_{msy} in any particular assessment (Haltuch *et al*. 2008). From a meta-analytical perspective there is no doubt that useful inference about stock productivity can be drawn by comparative analysis of information drawn from studies of related species in comparable habitats. Second, the use of proxies has a stabilizing influence on stock reference points, which is beneficial to the management process. However, given the marked discrepancies between the Council's existing flatfish proxies and the stock-specific reference points derived from the approved base model ($F_{20\%}$ and 19% depletion), the subcommittee recommends that new flatfish proxies be developed for Council management. To that end, the subcommittee reviewed an analysis of productivity parameters for west coast flatfish (Dover sole, petrale sole, English sole, arrowtooth flounder, and starry flounder) developed by Dr. Martin Dorn and concluded that steepness was at least h = 0.80. Moreover, recent results presented in Punt *et al*. (2008) show that for a diverse set of west coast groundfish stocks (Pacific whiting, sablefish, petrale sole, and canary rockfish), a steepness value of 0.80 is associated with an F_{msy} value that is roughly equivalent to $F_{30\%}$ when the stock-recruit relationship has a Beverton-Holt form (see Figure 1). Moreover, the level of stock depletion associated with fishing at F_{msy} is approximately $B_{25\%}$ (see Figure 2). The subcommittee noted that use of the Beverton-Holt stock-recruitment relationship is appropriate in this case because: (a) all stock assessments for west coast groundfish are based on this relationship and (b) the data for petrale sole support the Beverton-Holt curve over the Ricker relationship.

Based on these considerations the SSC's groundfish subcommittee recommends that the Council tentatively adopt those values as new west coast flatfish MSY proxies. In addition, given that the current MSST ($B_{25\%}$) for groundfish is 62.5% of the target biomass ($B_{40\%}$), the subcommittee recommends that for west coast flatfish under Council management, the MSST be set at $B_{15\%}$, which is 60% of the target stock size. Because the estimate of petrale sole stock depletion in 2009 from the STAT's base model is 11.6%, if this MSST is adopted the stock would be declared overfished.

The subcommittee also recommends that a more comprehensive analysis of the PFMC's harvest control rule proxies be undertaken as soon as practicable, which may influence and/or supersede these recommendations. In particular, biomass targets and thresholds should be established that are consistent with expected stock productivities and in accordance with expected levels of intrinsic stock variability. The subcommittee recognizes that this will be a major undertaking, which logically should be conducted as a full management strategy evaluation, but these issues and concerns are fundamental to proper utilization, conservation, and stewardship of groundfish resources.

Haltuch, M.A., Punt, A.E. and M.W. Dorn. 2008. Simulation testing alternative estimators of unfished stock size. *Fish. Res.* 94:290-303.

Punt, A.E., M.W. Dorn, and M.A. Haltuch. 2008. Evaluation of threshold management strategies for groundfish off the U.S. west coast. *Fish. Res.* 94:251-266.

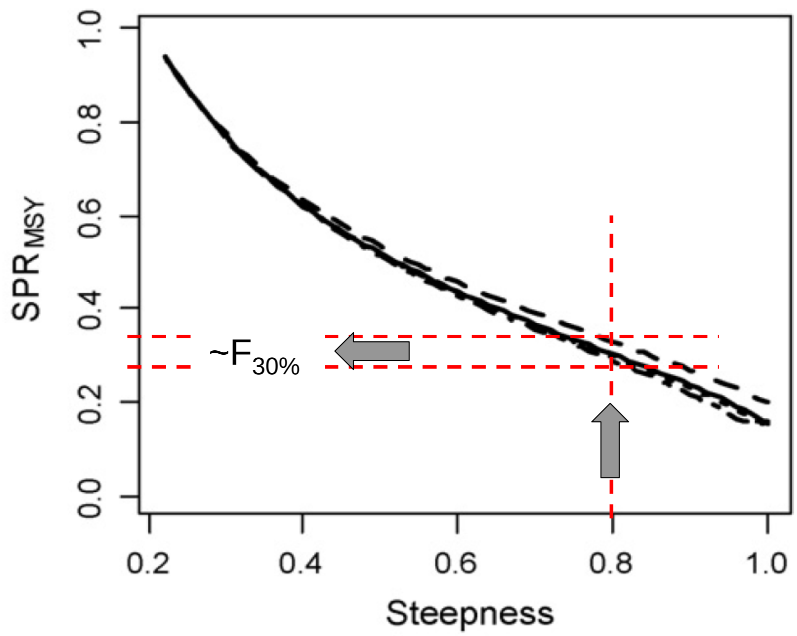


Figure 1. Relationship between spawner-recruit steepness (***h***) and the fishing mortality rate, expressed as spawning potential ratio (SPR), that maximizes sustainable yield among four west coast groundfish stocks (taken from Punt *et al*. 2008).

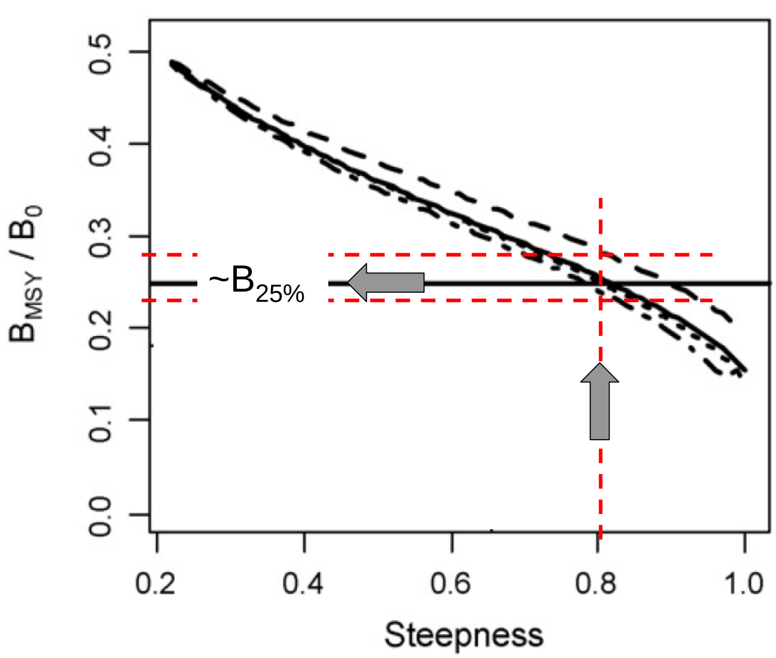
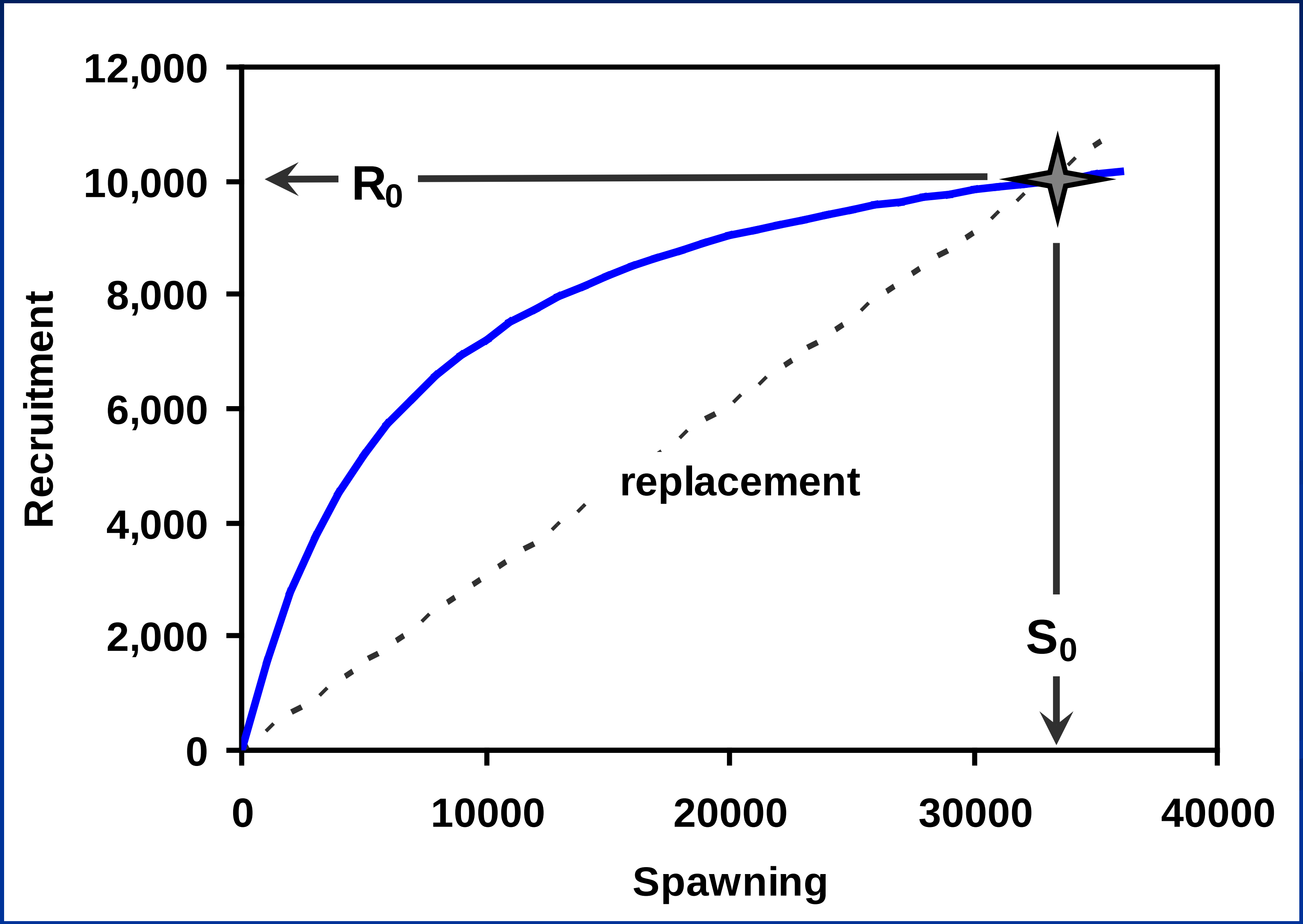


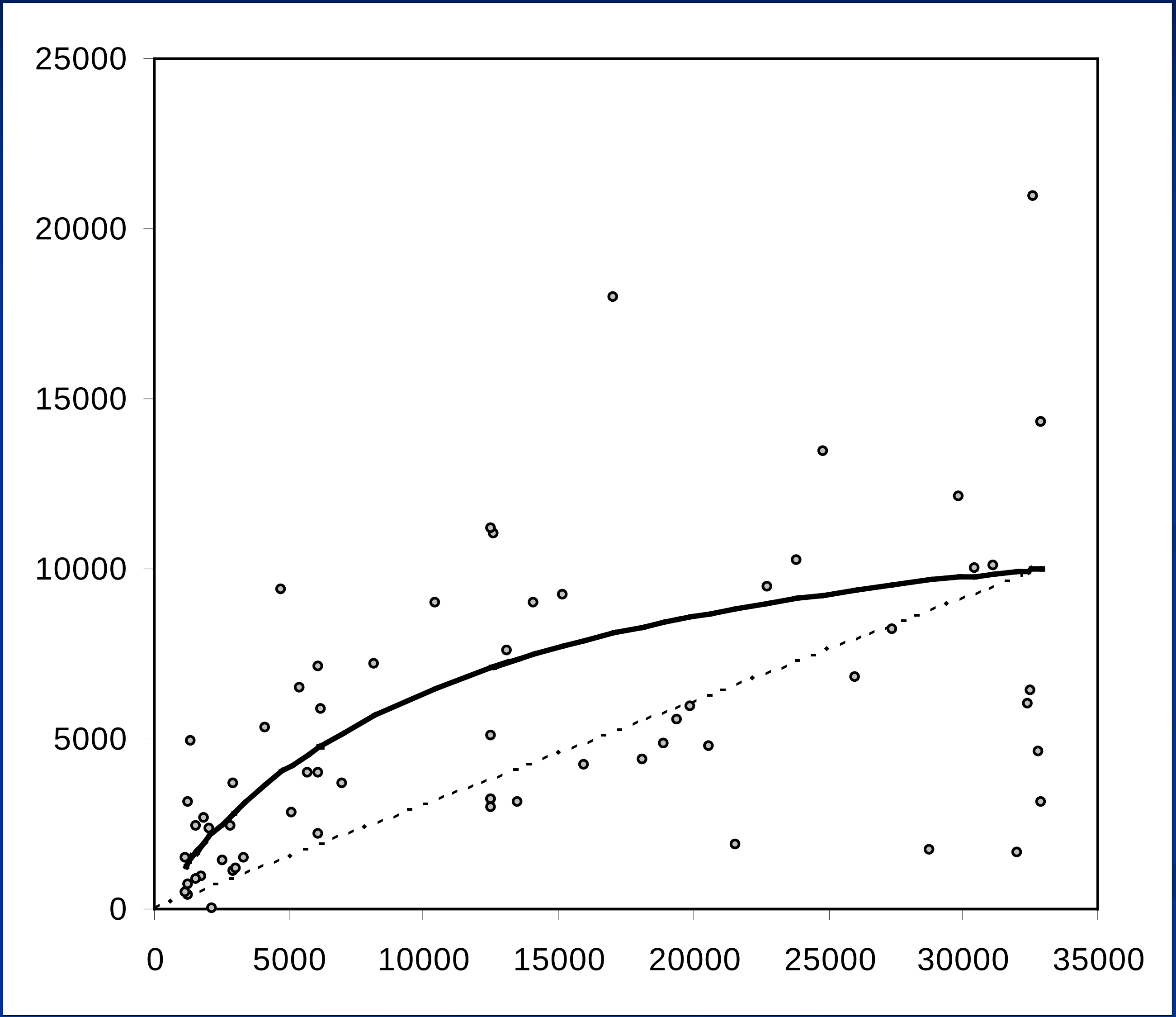
Figure 2. Relationship between spawner-recruit steepness (***h***) and the level of stock depletion that is consistent with attainment of MSY among four west coast groundfish stocks (taken from Punt *et al*. 2008).

Figures to Follow on Next Pages

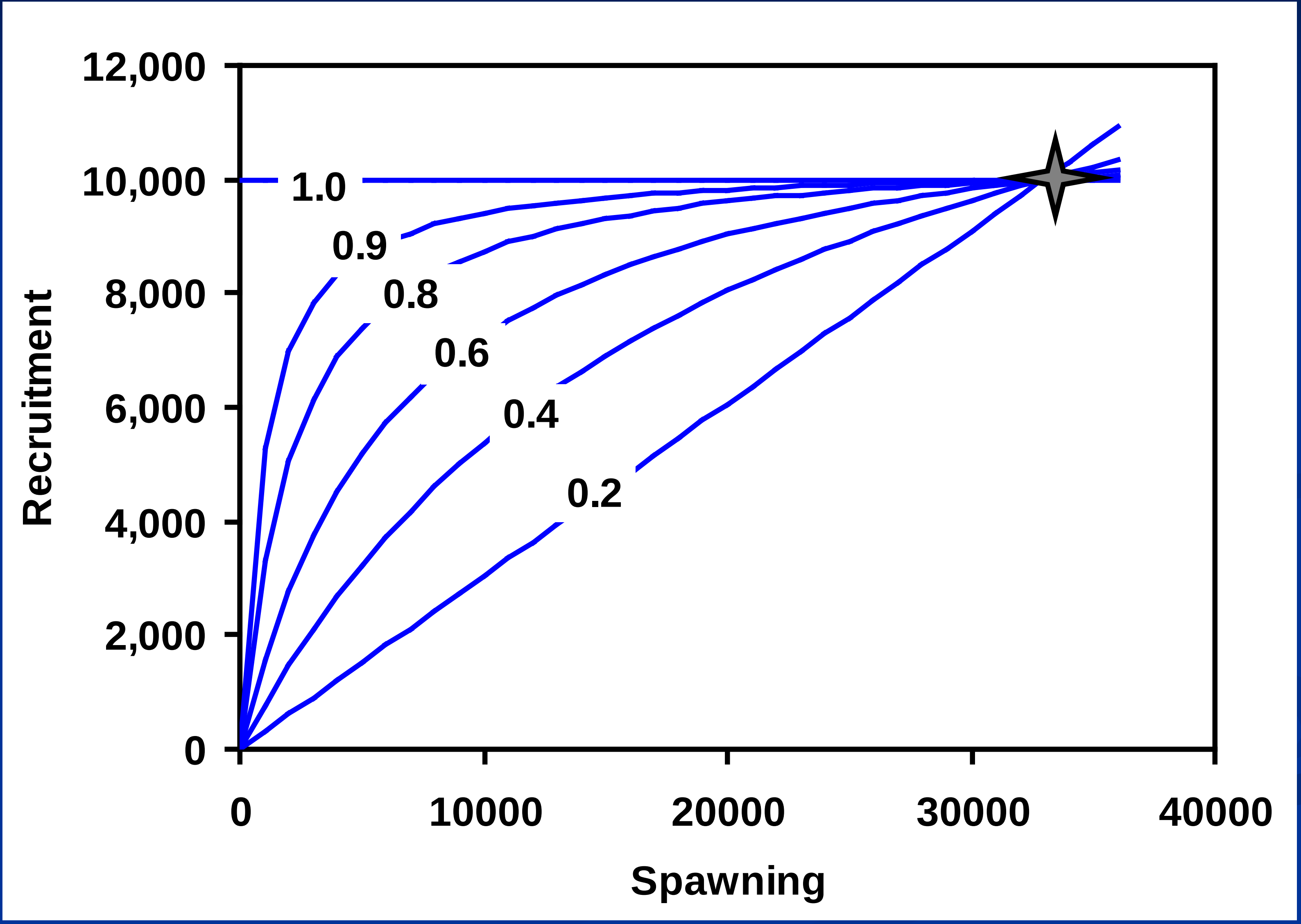
A Beverton-Holt Spawner-Recruit Curve



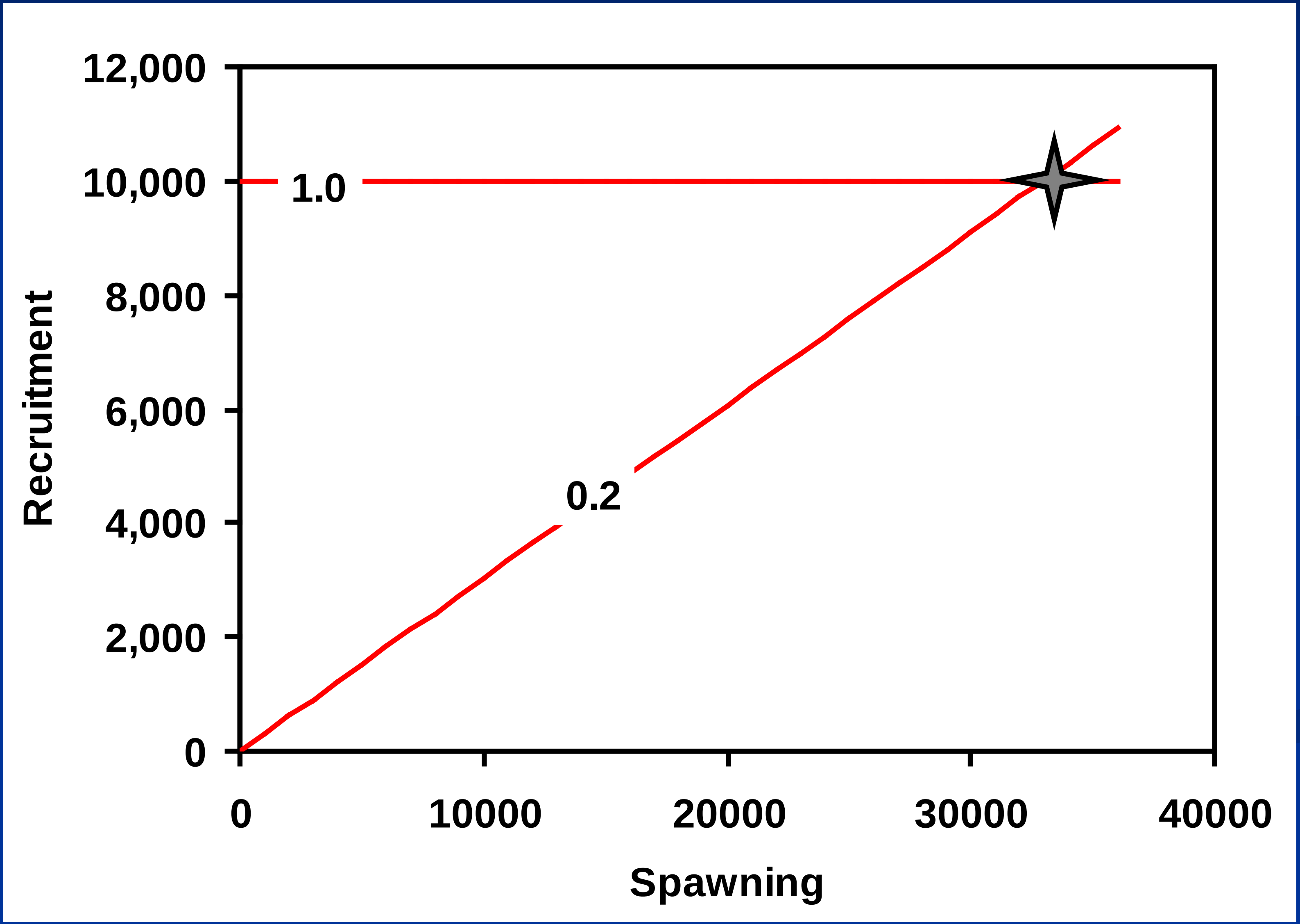
Estimate the Curvature With Noise



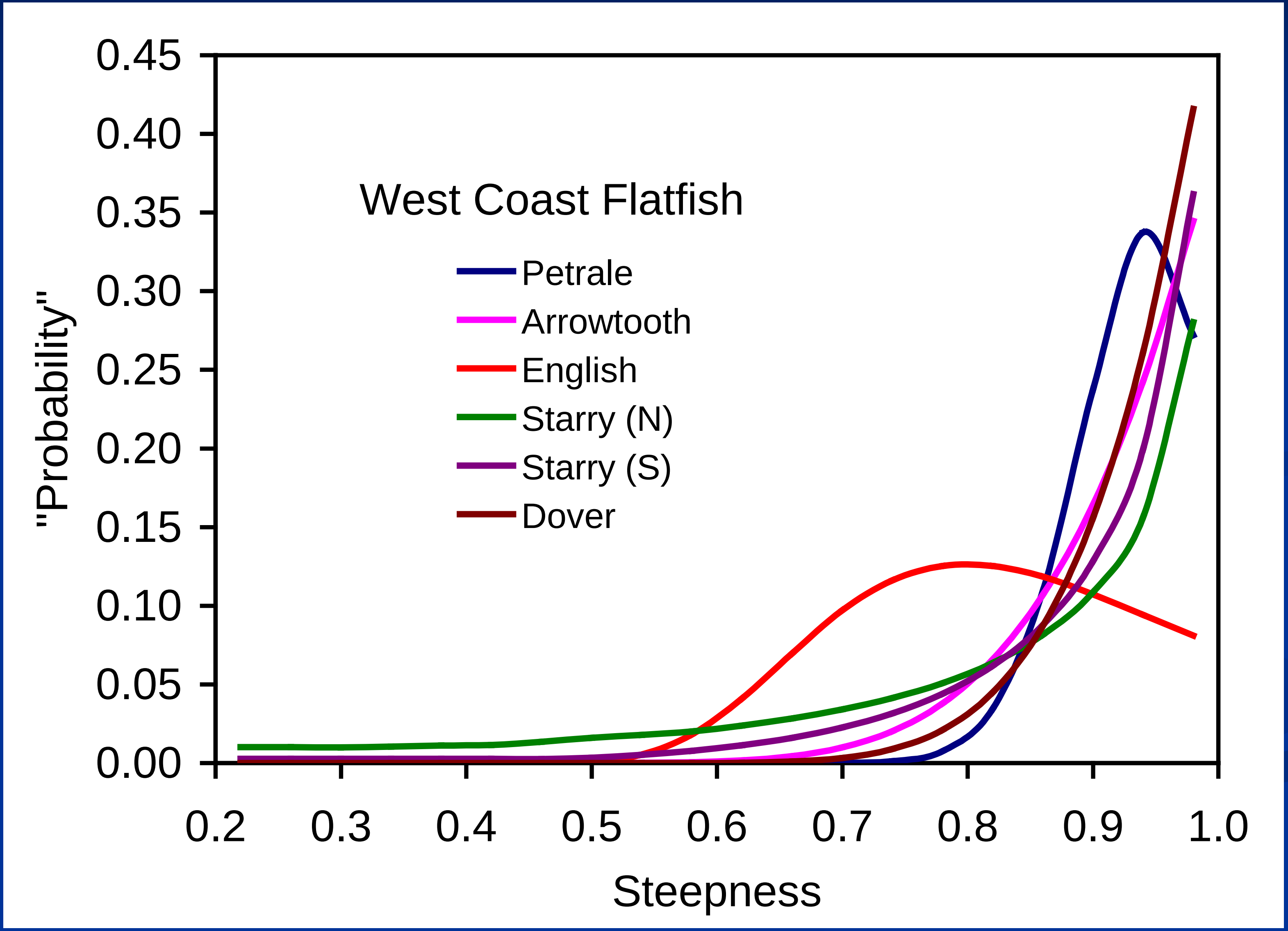
Different Values of "Steepness"



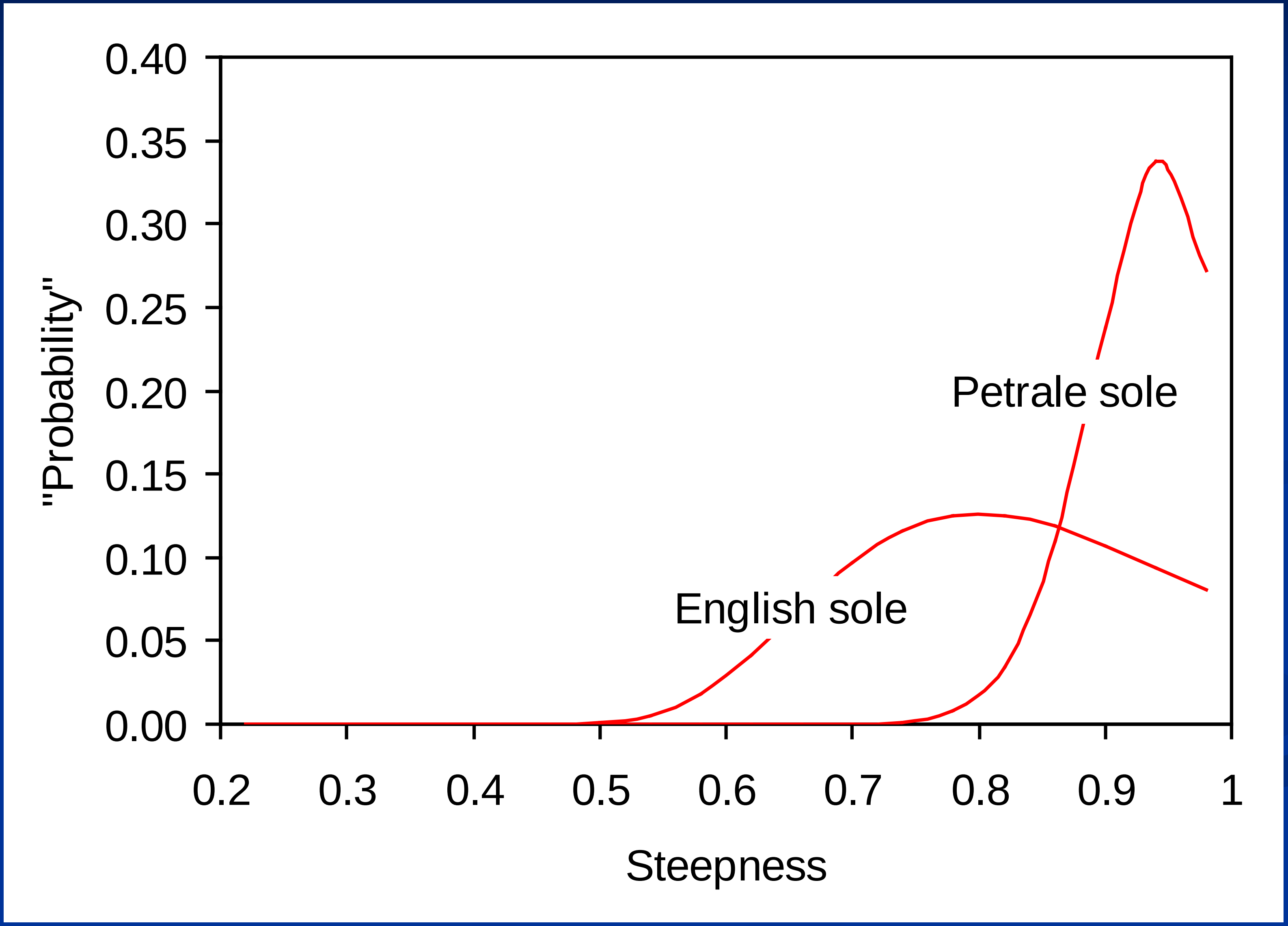
Biologically Implausible Values of "Steepness"

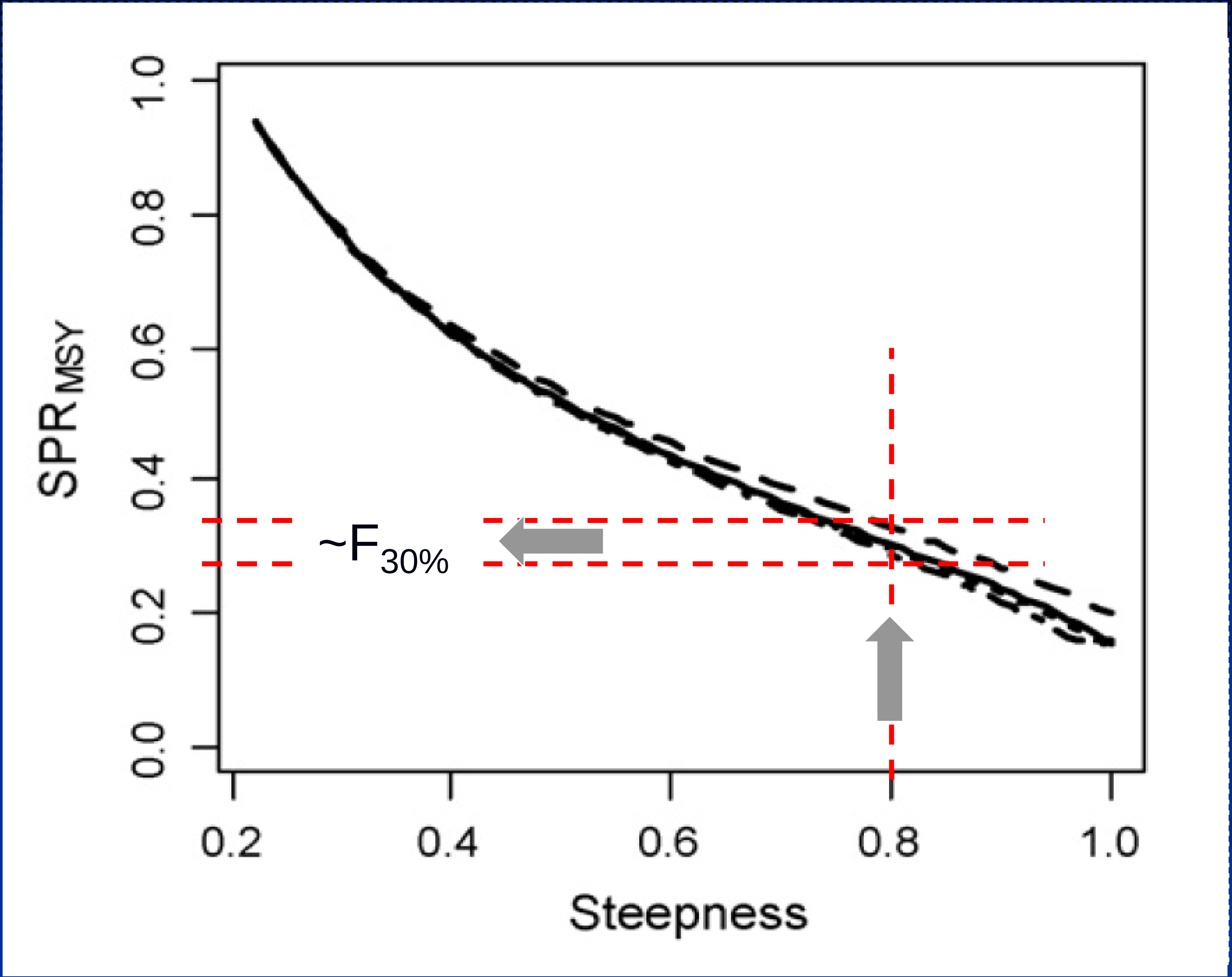


What Do We Think We Know?

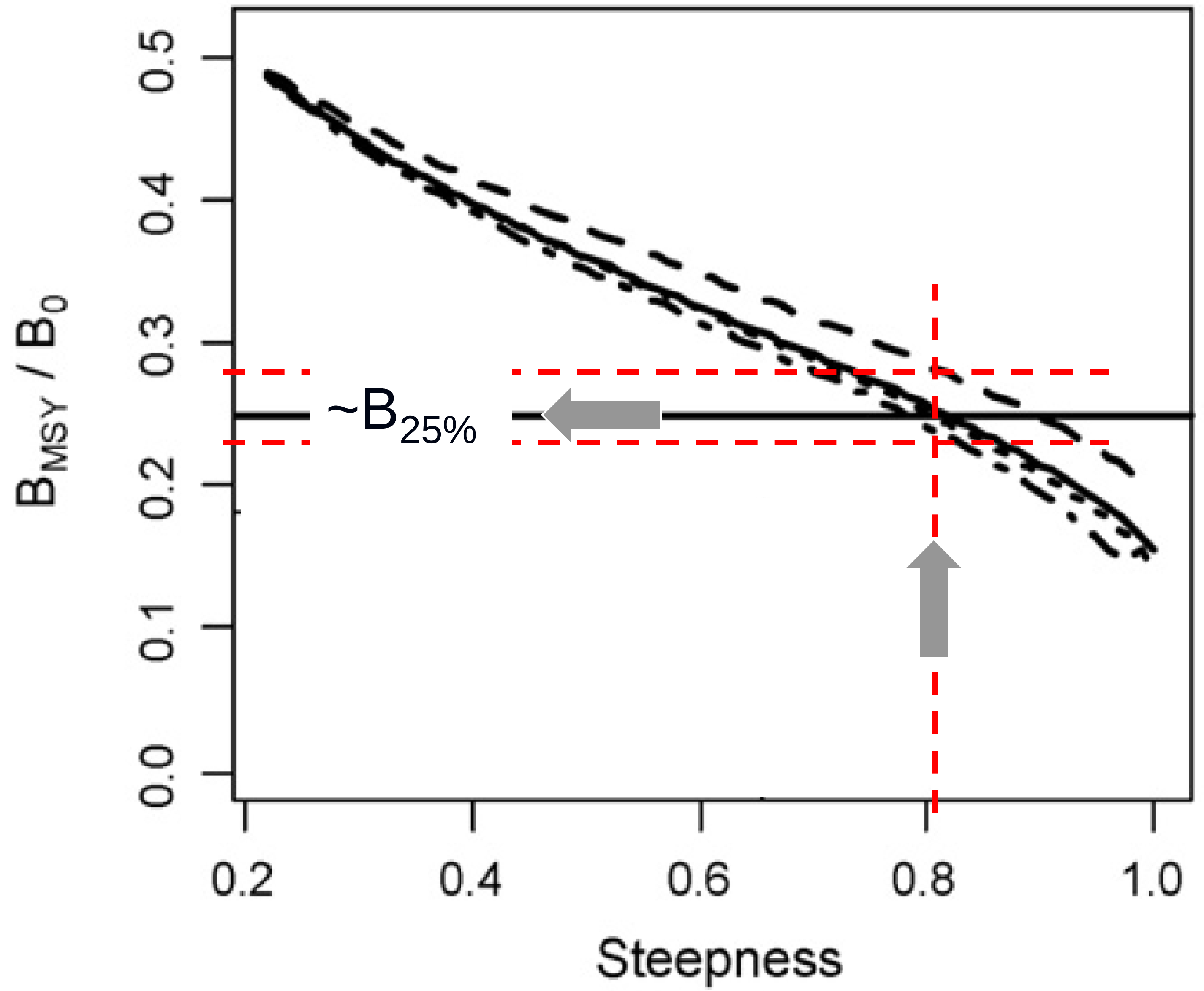


Proposed Proxy Flatfish Steepness = 0.8





SPR MSY
1.0
0.8
0.6
0.4
0.2
0.0
~F30%
0.2
0.4
0.6
0.8
1.0
Steepness



0.0
0.1
0.2
0.3
0.4
0.5
B_{MSY} / B_0
~$B_{25\%}$
0.2
0.4
0.6
0.8
1.0
Steepness

Restrepo, V. R, G. G. Thompson, P. M. Mace, W. L. Gabriel, L. L. Low, A. D. MacCall, R. D. Methot, J. E. Powers, B. L. Taylor, P. R. Wade, and J. F. Witzig. 1998. Technical Guidance on the Use of Precautionary Approaches to Implementing National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act. NOAA Technical Memorandum NMFS-F/SPO-31. 54 p.

Proxies for B_{MSY}

The equilibrium biomasses corresponding to the above-mentioned fishing mortality reference points can be used as proxies for B_{MSY}. In addition, B_{MSY} has been approximated by various percentages of the unfished biomass, B_0, usually in the range 30-60% B_0 (higher percentages being used for less resilient species, and lower percentages for more resilient species). Referring (in the preamble) to estimates based on two shapes of production models, the NSGs recommend $0.4B_0$ as a reasonable proxy for B_{MSY}. However, this value may be too low for species with low fecundity such as many species of sharks.

Another class of reference points that has gained prominence are those based on $F_{\%SPR}$. In particular, values in the range $F_{20\%}$ to $F_{30\%}$ have frequently been used to characterize recruitment overfishing thresholds (Rosenberg *et. al.* 1994), while values in the range $F_{30\%}$ to $F_{40\%}$ have been used as proxies for F_{MSY}. These uses are supported by Goodyear (1993); by Mace and Sissenwine (1993), who advocated $F_{20\%}$ as a recruitment overfishing threshold for well-known stocks with at least average resilience and $F_{30\%}$ as a recruitment overfishing threshold for less well-known stocks or those believed to have low resilience; and by Clark (1991; 1993), who advocated $F_{35\%}$ as a robust estimator of F_{MSY} applicable over a wide range of life histories, or $F_{40\%}$ if there is strong serial correlation in recruitment. Note, however, that much of the work on $F_{\%SPR}$ has presupposed a moderate amount of resilience to fishing pressure. Moderate resilience may not be a viable assumption for long-lived species and those with low reproductive output. For example, recent analyses of west coast rockfish (*Sebastes* spp.) stocks are showing the high SPR levels in the range of 50% to 60% are needed to sustain these fisheries (A. MacCall, personal communication). Similar high SPR levels may be necessary to protect many species of sharks and other species that have low productivity.

Agenda Item E.2.d
Supplemental GAP Report
September 2009

GROUNDFFISH ADVISORY SUBPANEL REPORT ON
PART II OF STOCK ASSESSMENTS FOR 2011-2012 GROUNDFISH FISHERIES

The Groundfish Advisory Subpanel (GAP) reviewed the new petrale assessment and received an overview from Mr. John DeVore on the Scientific and Statistical Committee (SSC) recommendations regarding new reference points for managing the stock. The GAP offers the following comments and recommendations.

The GAP does not believe the new petrale assessment result, especially the very high virgin biomass estimate driven by implausibly high historical catch estimates. The biomass trend in the assessment indicates that extremely high harvest in the 1930s and 1940s reduced biomass to an overfished level by 1951 according to the proxy $B_{25\%}$ threshold. This result suspends belief since the petrale fishery was not fully developed then. The deepwater winter petrale fishery did not even begin on the west coast until the mid to late 1950s leading the GAP to conclude the uncertain catch levels prior to this period to be implausibly high.

The GAP also recommends a lower biomass target than the $B_{40\%}$ proxy for petrale sole. The stock is clearly more productive as evidenced by the stock's continued high productivity under a 60-year harvest regime where the annual harvest has averaged the estimated maximum sustainable yield (MSY) in the new petrale assessment (see attached figure). If MSY was much lower, which is implied with biomass targets as high as $B_{40\%}$, the stock would have been driven to extinction in the 60 years of harvest at the estimated MSY. Specifically, the GAP recommends the estimated B_{MSY} of $B_{19\%}$ from the new petrale assessment as a management target. The petrale STAR Panel recommended the estimated B_{MSY} is a viable target given that the estimate is statistically robust to the assumed stock-recruitment relationship. That is, the B_{MSY} estimates are similar regardless of whether a Beverton-Holt or a Ricker relationship are assumed despite the fact that the current relative biomass or depletion estimates are dramatically different under these two assumptions.

Further, the GAP recommends the overfished level be set at 50 percent of the estimated B_{MSY} level (i.e., $B_{9.5\%}$) for petrale sole, a reference point allowed in the fishery management plan. The GAP is trying to avoid an overfished declaration for petrale sole- first because the GAP does not believe the stock is overfished for the reasons stated above, and second because of the severe negative socioeconomic consequences of a petrale rebuilding plan to west coast fishing communities. Petrale sole is the single most important target stock for the current west coast trawl fishery. An unnecessary overfished declaration and rebuilding plan is likely to eliminate the trawl industry by forcing the fleet into bankruptcy. This is an especially egregious outcome on the eve of implementing trawl rationalization. The threat of losing the entire fleet due to an ill-advised petrale rebuilding plan and the consequent impacts to shoreside processors will ripple through all west coast fishing communities as the groundfish trawl fishery is the foundation for shoreside processing. Losing a petrale target will make the trawl fishery unprofitable, imposing dramatically negative economic impacts to fishing communities that threaten the continued existence of the west coast groundfish fishery and perhaps non-groundfish fisheries as well.

The GAP is aware of the SSC's recommendations for new proxy biomass reference points for flatfish including petrale sole. Beyond underscoring the rationale for using the biomass targets estimated in the new assessment, the GAP is troubled that the SSC's recommendations are based on the lowest estimated values of steepness for flatfish assessed on the west coast. The new recommended flatfish biomass proxies are based on a steepness of 0.8 while the estimated steepness for petrale sole is 0.95. The higher petrale steepness means the stock is more productive and a lower biomass target than the recommended proxy is biologically responsible. The GAP believes the SSC recommendation for a new flatfish proxy biomass target is overly precautionary for petrale and strongly recommends the estimated biomass target from the assessment and an overfished level of half that amount for managing the stock. This recommendation is based on the best available science and avoids the dire socioeconomic consequences of an overfished declaration.

PFMC
09/14/09

The Attachment will be added as soon as I receive an electronic copy.
Thanks for your patience, Sandra.

Agenda Item E.2.d
Supplemental GMT Report
September 2009

THE GROUNDFISH MANAGEMENT TEAM (GMT) REPORT ON PART II OF STOCK ASSESSMENTS FOR 2011-2012 GROUNDFISH FISHERIES

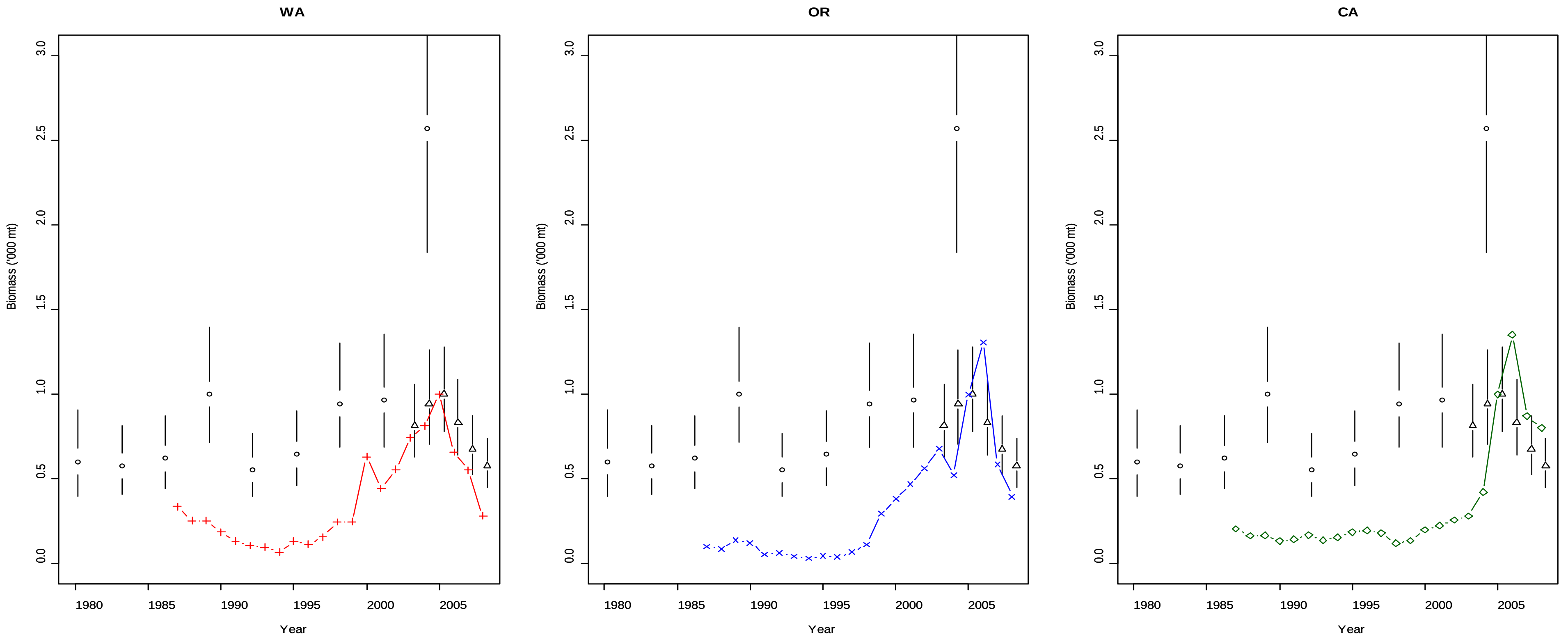
The Groundfish Management Team (GMT) discussed the stock assessments conducted for petrale sole, lingcod, and cabezon; and bocaccio, widow, yelloweye, and greenstriped rockfish for the 2011-2012 specification and management measures cycle. While several of these new assessments may have considerable implications for management in the next biennial cycle, the GMT thought it more appropriate to focus more on those issues when harvest specifications are discussed in November.

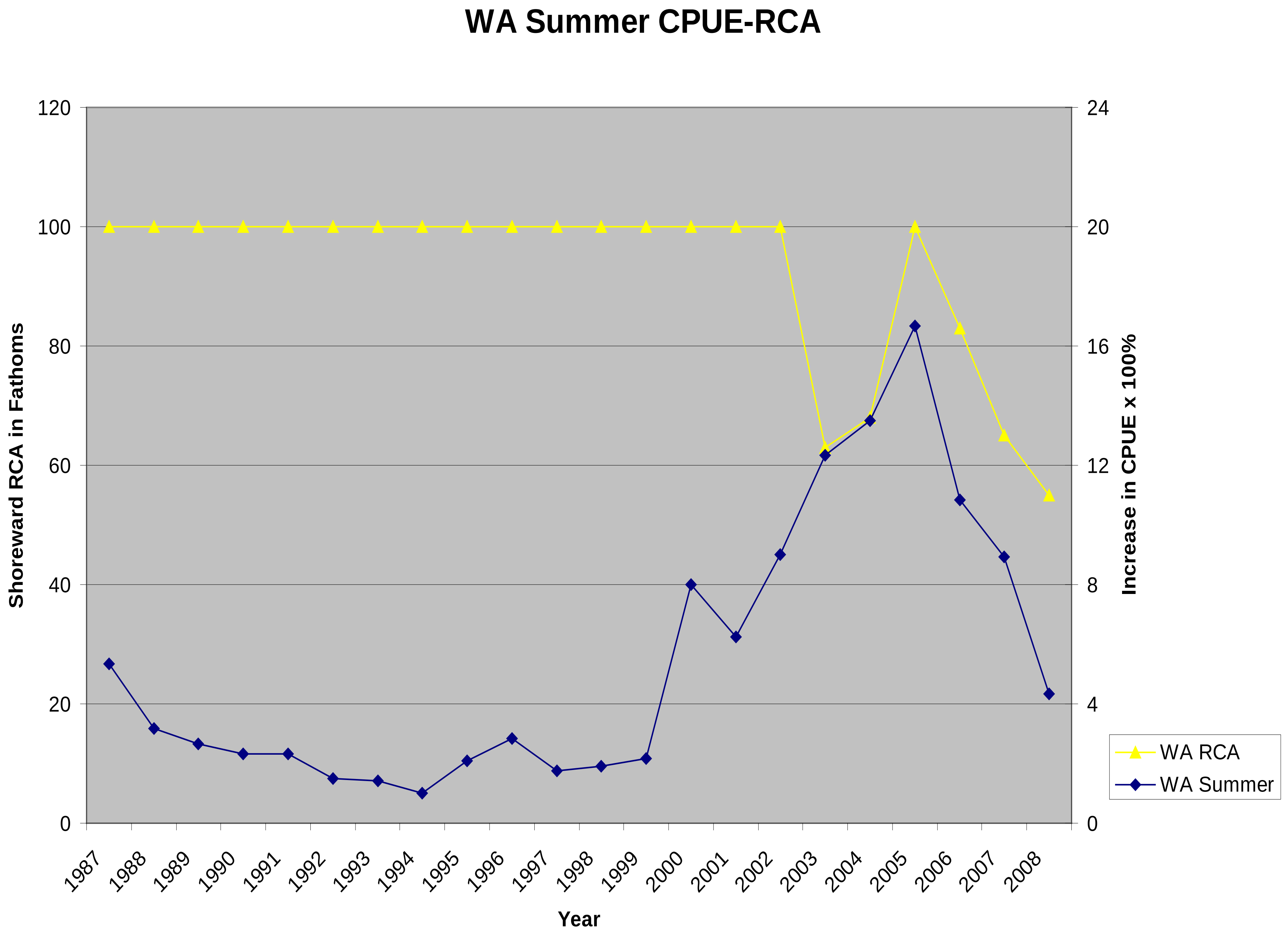
We did note, however, that with regard to bocaccio, extension of the range for the southern stock from a northern boundary at 40°10’ North latitude to 43° North latitude could have numerous management implications (i.e. potentially involving interstate catch agreements, individual quotas, etc.) with little change in our understanding of the status of the stock. In other words, the trend in abundance was not affected by exclusion of the area north of Cape Mendocino, and there was only a one percent decrease in depletion from limiting the spatial coverage of the assessment to 40°10’.

As such, the GMT requests that alternative rebuilding analyses extending to Cape Mendocino and Cape Blanco be presented to the Council for consideration in determining the geographic region managed using the bocaccio assessment results when setting harvest specifications for 2011-2012.

PFMC
09/14/09

8: Plot raw CPUE with surveys





WA Summer CPUE-RCA
Shoreward RCA in Fathoms
Increase in CPUE x 100%
Year
0
20
40
60
80
100
120
4
8
12
16
20
24
1987
1988
1989
1990
1991
1992
1993
1994
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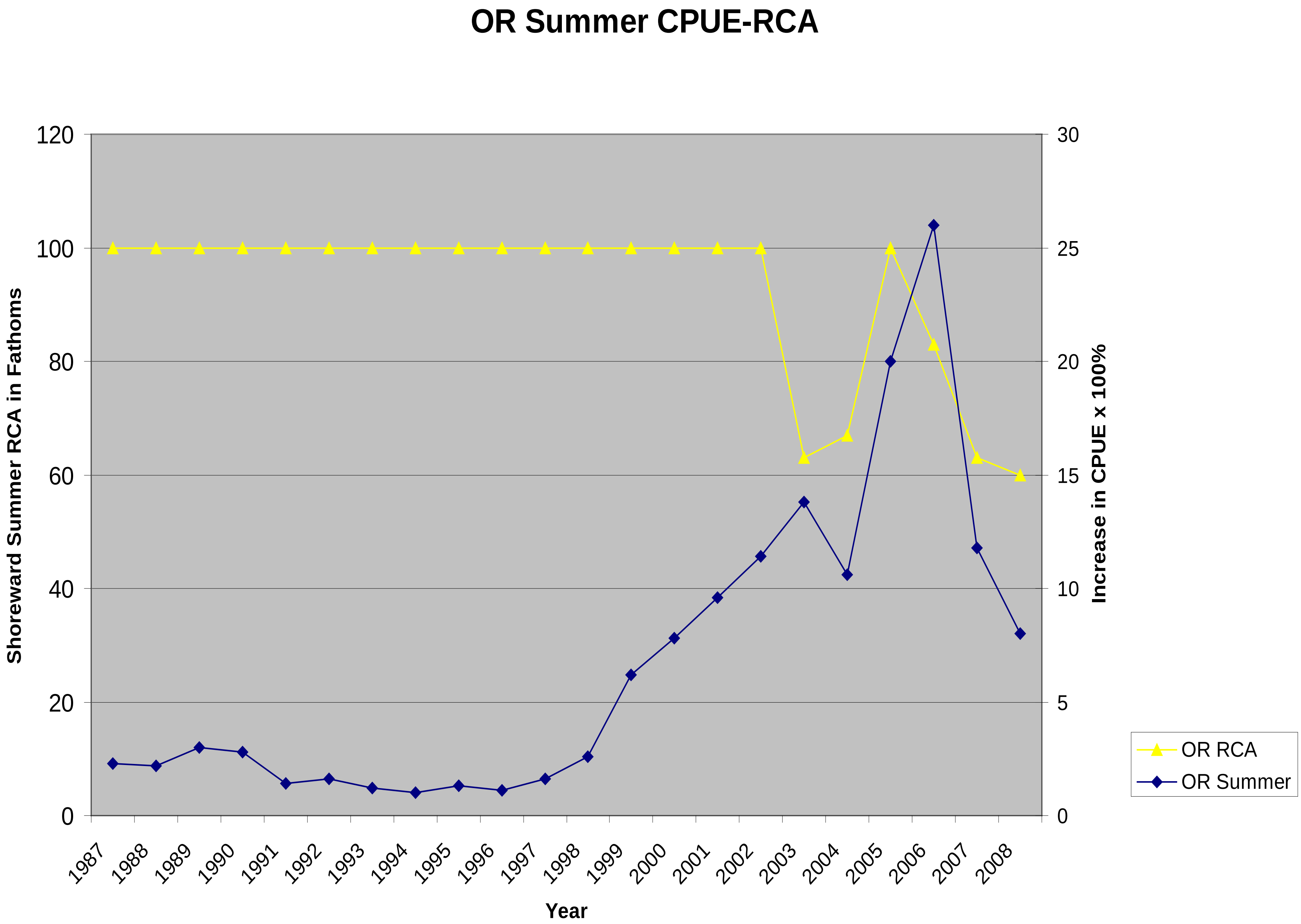
2007
2008
WA RCA
WA Summer


OR Summer CPUE-RCA
Shoreward Summer RCA in Fathoms
Increase in CPUE x 100%
Year
120
100
80
60
40
20
0
30
25
20
15
10
5
0
1987
1988
1989
1990
1991
1992
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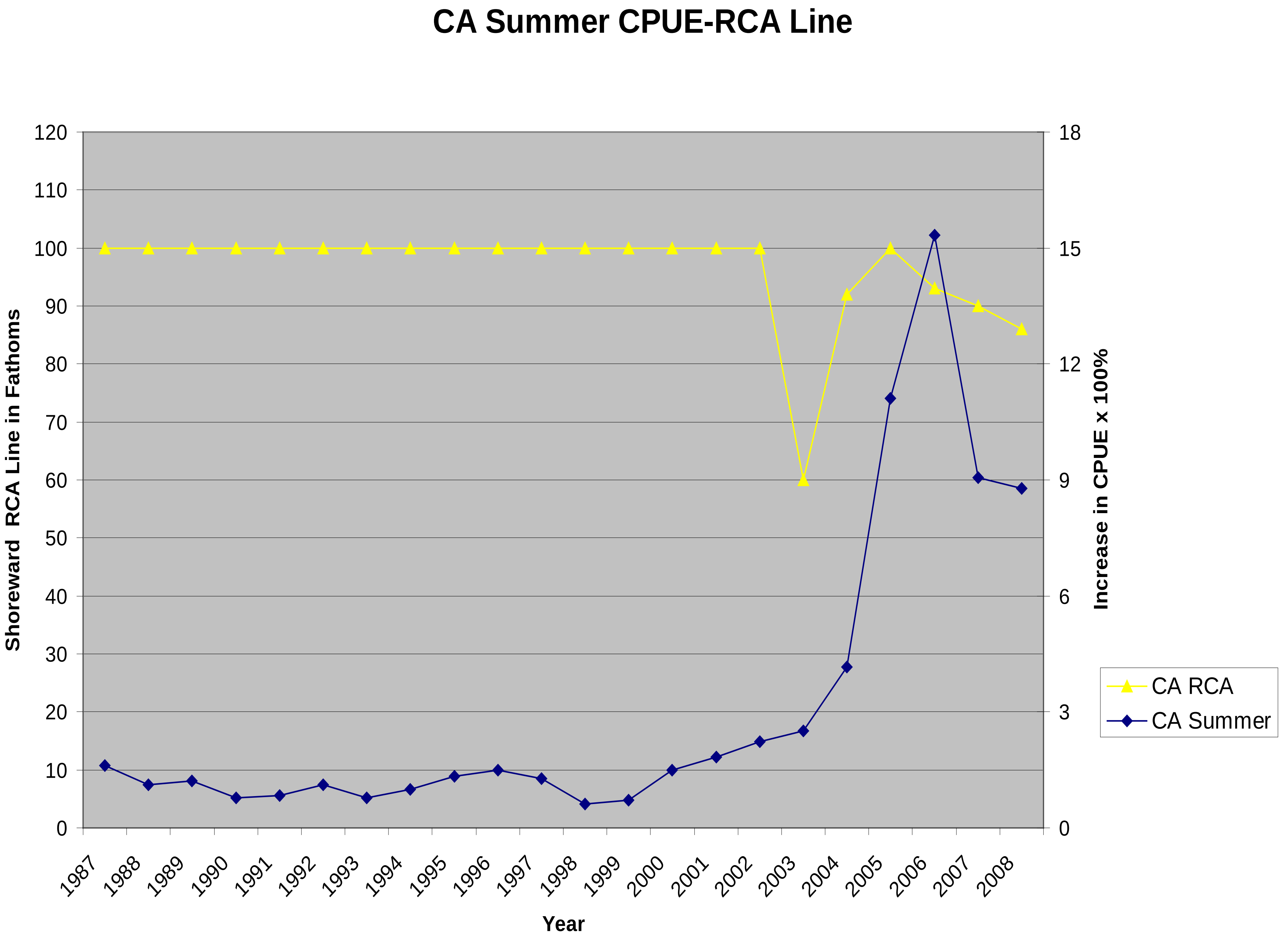
2008
OR RCA
OR Summer



CA Summer CPUE-RCA Line
Shoreward RCA Line in Fathoms
Increase in CPUE x 100%
Year
0
10
20
30
40
50
60
70
80
90
100
110
120
0
3
6
9
12
15
18
1987
1988
1989
1990
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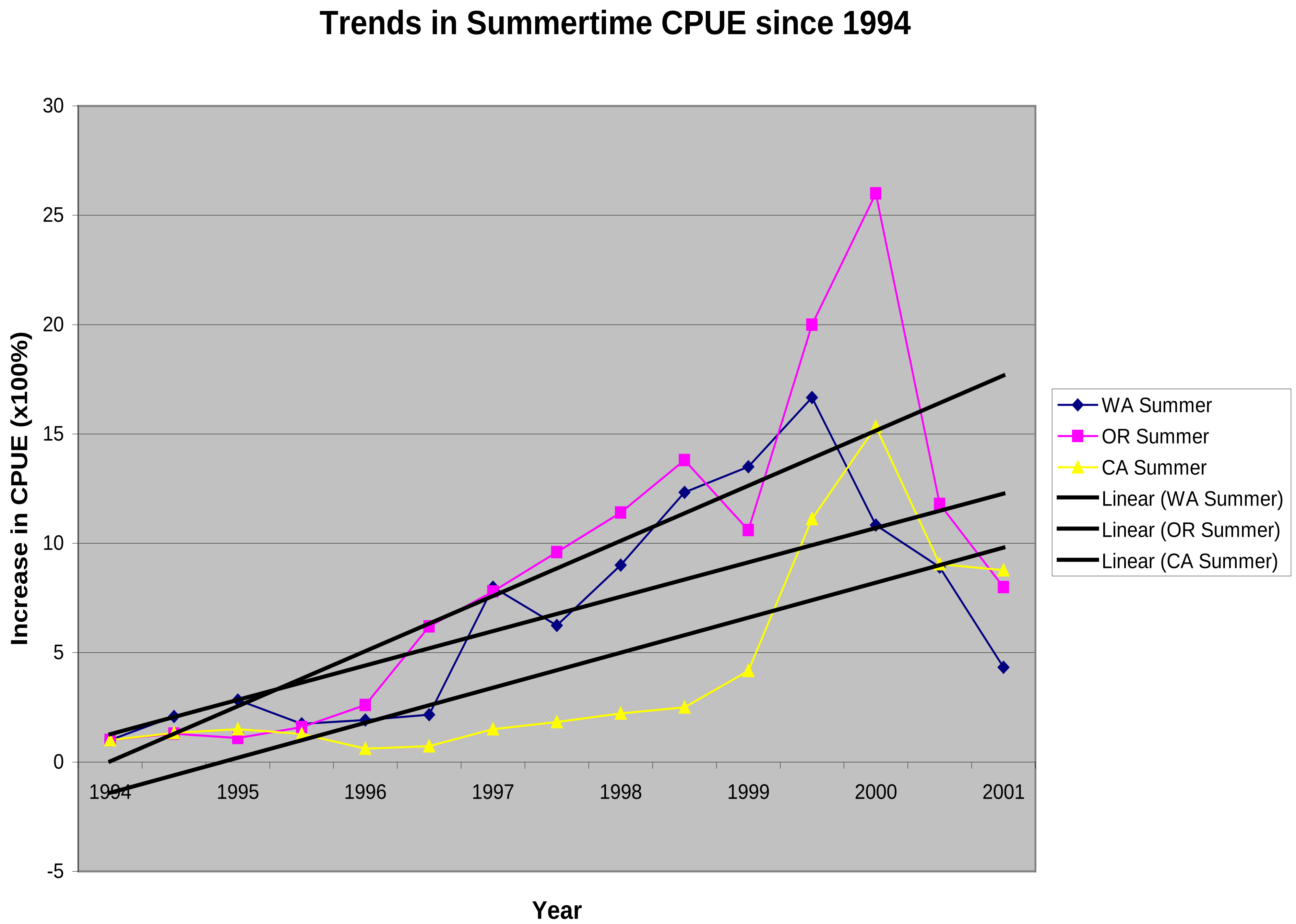
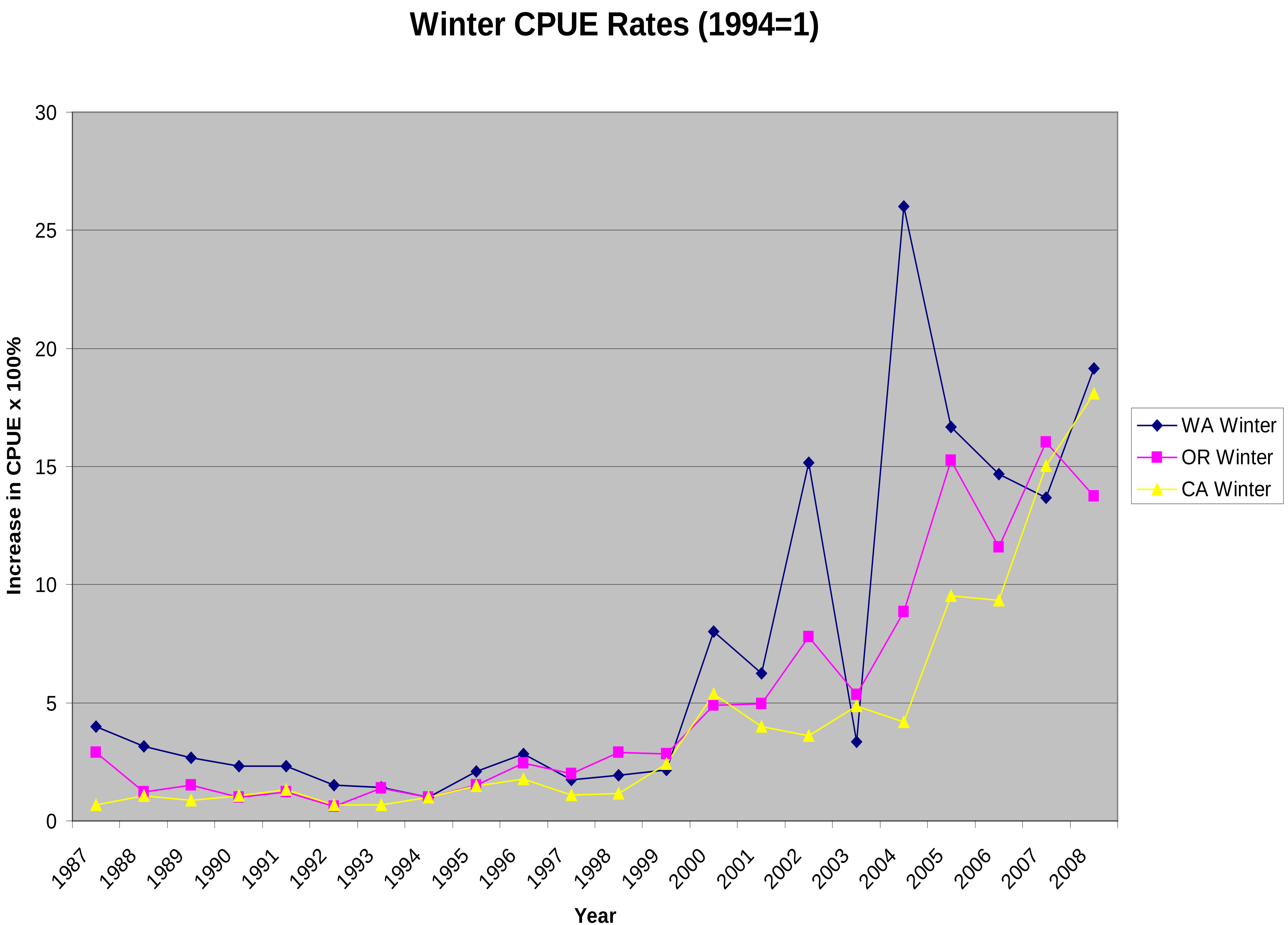
2007
2008
CA RCA
CA Summer


Trends in Summertime CPUE since 1994
Increase in CPUE (x100%)
30
25
20
15
10
5
0
-5
1994
1995
1996
1997
1998
1999
2000
2001
Year
WA Summer
OR Summer
CA Summer
Linear (WA Summer)
Linear (OR Summer)
Linear (CA Summer)


Winter CPUE Rates (1994=1)
Increase in CPUE x 100%
Year
30
25
20
15
10
5
0
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
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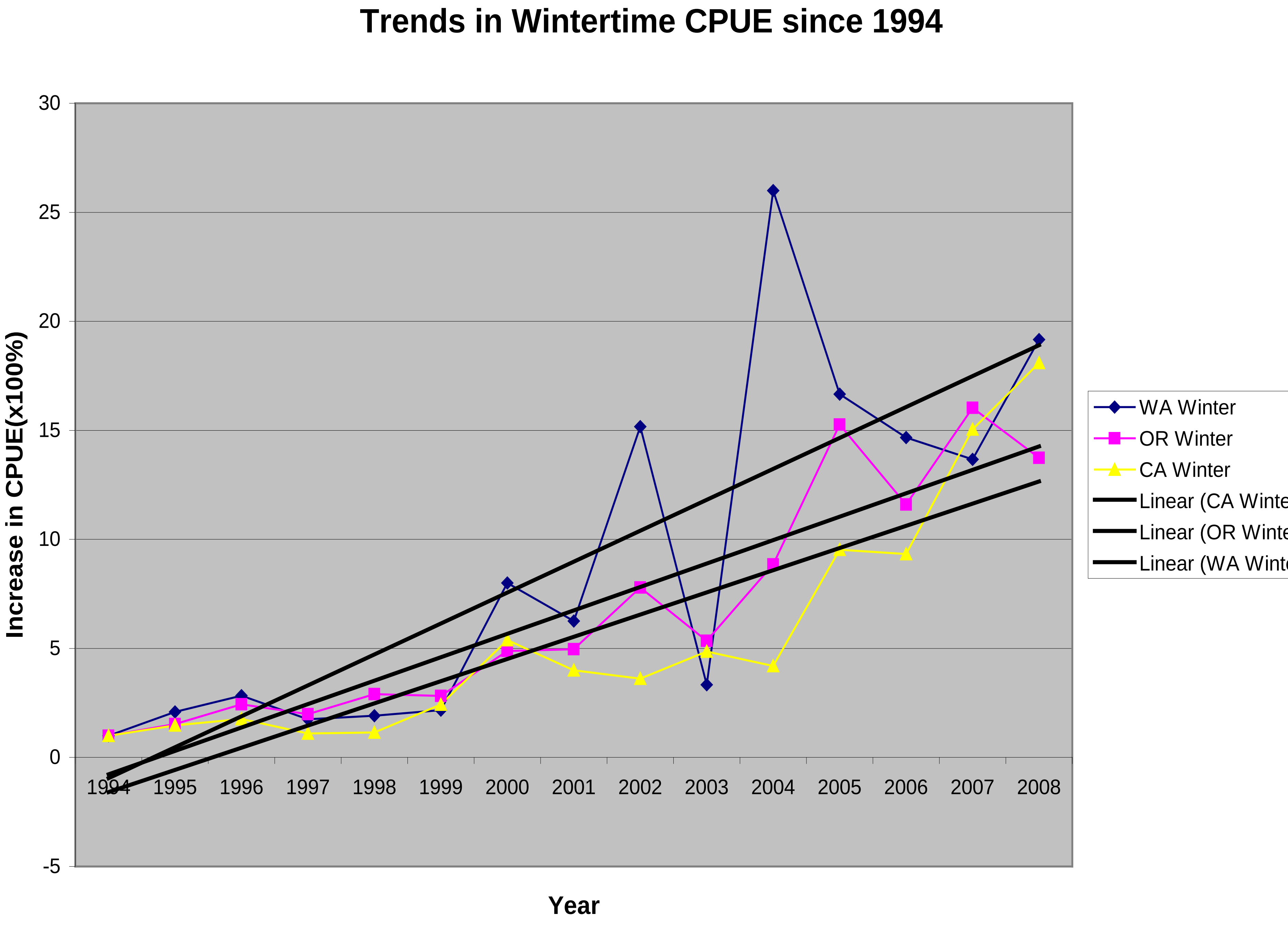
2005
2006
2007
2008
WA Winter
OR Winter
CA Winter



Trends in Wintertime CPUE since 1994
Increase in CPUE(x100%)
30
25
20
15
10
5
0
-5
1994
1995
1996
1997
1998
1999
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2002
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WA Winter
OR Winter
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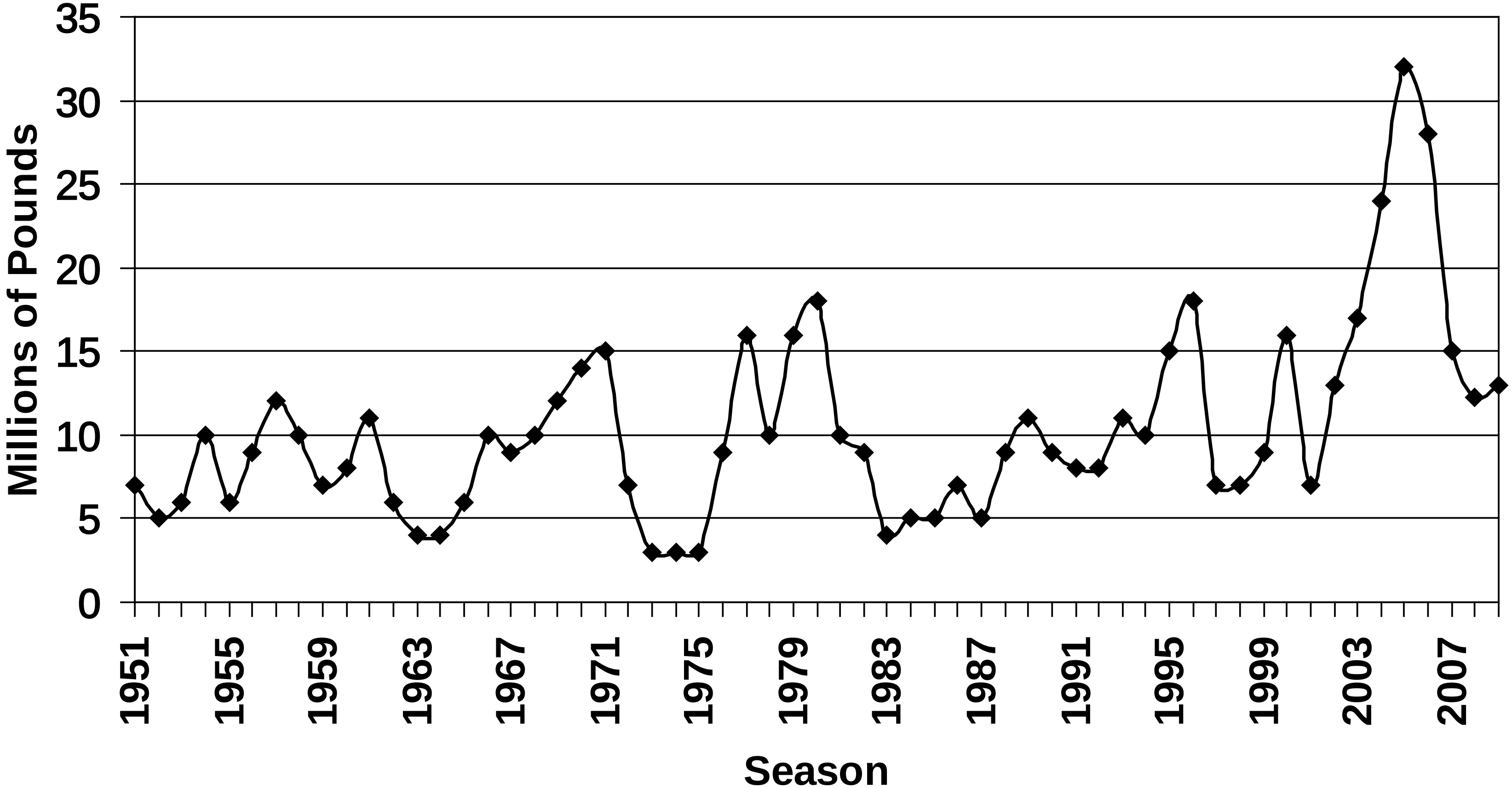
Annual Landings of Dungeness Crab in Oregon



OFF-YEAR SCIENCE IMPROVEMENTS

This year is considered the "on-year" for intensive science activities as new groundfish stock assessments and rebuilding analyses are formally approved for fishery management decision-making for 2011 and 2012 groundfish fisheries. While it is not entirely accurate to characterize the biennial management cycle in terms of an "on-year" and "off-year" for science, it is correct to distinguish the year in which stock assessments are conducted (the "on year") and the year other science activities are planned to prepare for the following assessment cycle and to resolve scientific issues that play a significant role in groundfish decision-making.

There are many activities that should be considered for "off-year" science improvements. Some of these activities may be planned and sponsored by the National Marine Fisheries Service fishery science centers; some activities may be planned and sponsored by the Council or the Council's Scientific and Statistical Committee (SSC) (e.g., a post-assessment review workshop to review how well the assessment process worked this year and a second harvest policy evaluation workshop); and some activities have been recommended by Stock Assessment Review Panels this year (Agenda Item E.3.a, Attachment 1).

The Council should consider the proposals and advice of the Northwest Fisheries Science Center, Council advisory bodies, other agencies, and the general public regarding off-year science improvements, and plan and prioritize science activities for 2010.

Council Action:

Prioritize and Plan Science Activities for 2010.

Reference Materials:

1. Agenda Item E.3.a, Attachment 1: Recommendations for off-year science improvements.

Agenda Order:

a. Agenda Item Overview — John DeVore
b. Northwest Fisheries Science Center Report — Elizabeth Clarke
c. Reports and Comments of Management Entities and Advisory Bodies
d. Public Comment
e. **Council Action:** Prioritize and Plan for 2010 Activities

PFMC
08/28/09

RECOMMENDATIONS FOR OFF-YEAR SCIENCE IMPROVEMENTS

Council Staff Recommendations

- Conduct a stock assessment review (i.e., "post-mortem") workshop to review the 2009 stock assessment review (STAR) process and discuss improvements for the 2011 STAR process.
- Conduct the second harvest policy evaluation workshop to review the current groundfish management framework and seek refinements.

NMFS Science Center Recommendations

- Continue efforts to develop, evaluate, and apply data-poor assessment methodologies to groundfish stocks that have yet to be assessed.
- Investigate, evaluate, and verify the appropriateness of various methods of "tuning" stock assessment models and, in particular, procedures for: (1) estimating input sample sizes of compositional information, (2) adjusting input sample sizes of compositional information to an "effective" sample size, (3) increasing the input variance of trend statistics to match model expectation, and (4) altering input estimates of recruitment process error (σ_r).
- Conduct a comprehensive investigation of the effect of calendar date on groundfish catch rates in the triennial trawl survey. The study should include a wide variety of stocks and should evaluate various statistical standardization procedures that would allow the survey to be maintained as a single time series from 1980-2004.
- Review the contents and recommendations of the NOAA Fisheries Habitat Assessment Improvement Plan (HAIP) and develop a process that would facilitate incorporation of habitat information into groundfish stock assessments.
- Consolidation, analysis, and evaluation of any habitat data, maps, and research relevant to west coast groundfish stocks that have become available since the 2005 Pacific Groundfish essential fish habitat (EFH) process. Such an evaluation is necessary and critical prior to the Council's first 5-year EFH Review, which is scheduled for 2011.

General Recommendations of STAR Panels

- A Management Strategy Evaluation (MSE) approach is needed to evaluate the 40-10 harvest control rule when applied to a stock with dramatically episodic recruitment, such as Pacific hake stock. An MSE is recommended for petrale sole because the estimates of B_0 and $B_{CURRENT}$ are sensitive to the assumed stock-recruitment relationship, making these reference points more uncertain, while B_{MSY} estimates are consistent among all the model run results. (MSE efforts are related to the harvest policy evaluation workshop)
- SS3 implements new options for bias adjustment of stock recruit relationships that have been used with little or no peer review. Simulation testing is needed to confirm that bias adjustment is justified in all cases. Guidelines should be developed on how to configure bias adjustment settings to reflect the biological characteristics of the stock and the available assessment information.

- Develop methods to incorporate uncertainty in natural mortality and/or steepness in model configurations in which these parameters are fixed. The delta method for propagating uncertainty (McCall in prep.) is a promising approach that warrants further evaluation.
- The comprehensive catch reconstructions currently underway in Washington and Oregon need to be completed (as well as the effort to reconstruct California catches). The mixing of U.S. and Canadian catches is of particular concern for the Washington fleets.
- The current assessment platform (SS3) is structurally complex, making it difficult to understand how individual data elements are affecting outcomes. The panel recommends investigating simpler, less structured models, including statistical catch/length models, to compare and contrast results as data and assumptions are changed.
- Explore a Generalized Linear Mixed Method (GLMM) approach with a calendar date covariate to estimate catch per unit of effort (CPUE) indices for the entire triennial survey time series. A species assemblage meta-analysis approach could be used to develop priors for the ratios of *q* among the early triennial, the late triennial and the Northwest Fisheries Science Center (NWFSC) surveys.
- Explore the relationship between ageing precision, recruitment variability, and bias adjustment (and effects on depletion estimates) using simulation methods, and develop recommended procedures for appropriate methods to follow.
- Investigate alternative methods of re-weighting the data series in Stock Synthesis.
- More work is needed to better understand the performance of maximum likelihood and Bayesian estimators of stock size and trends when large numbers of poorly informed recruitment deviations are estimated. Although it is logically appealing to include such uncertainty, even when there are little coherent data informing cohort strengths, technical and computational issues need to be solved before this approach can be implemented in situations such as yelloweye rockfish.
- Accessing and processing recreational intercept data from Recreational Fishery Information Network (RECFIN) and the three states is much too cumbersome for the stock assessment teams (STATs). A single database that holds all the raw recreational data in a consistent format would greatly expedite processing and interpretation of the data and would reduce the potential for introduction of errors.

PFMC
08/28/09

Agenda Item E.3.c
Supplemental GAP Report
September 2009

GROUNDFISH ADVISORY SUBPANEL REPORT ON OFF-YEAR SCIENCE IMPROVEMENTS

The Groundfish Advisory Subpanel (GAP) received a presentation from Mr. John DeVore on off-year science improvements and offers the following recommendations and considerations for improving groundfish science.

The GAP believes convening a second harvest policy evaluation workshop is a high priority off-year science activity and is needed to seek improved harvest control rules that are more responsive to the life history characteristics of our groundfish stocks. In particular, the GAP believes it would be helpful to complete management strategy evaluations (MSEs) for a number of species in advance of a harvest policy workshop to facilitate progress. The GAP notes that recent Stock Assessment Review (STAR) panels, including the one that reviewed the new petrale sole assessment, have recommended MSEs to better understand the sensitivity of stocks to different management reference points and harvest control rules. A suite of MSEs prepared for the recommended workshop should also help to critically evaluate current harvest policies and decide refinements tailored to the diverse stocks managed under the groundfish FMP. While the first workshop held in December 2006 was an interesting investigation of current harvest policies, the GAP strongly encourages the objective of the next workshop to be to derive new policies that can be implemented as soon as possible.

Pacific whiting is another stock recommended for an MSE by STAR panels, stock assessment teams, and the SSC. The stock's dependence on dramatically episodic recruitments make the current harvest control rules particularly ineffective strategies for managing the stock. Given the stock's extreme life history patterns, it may be a challenge to develop effective harvest control rules. Therefore, the GAP recommends a separate harvest policy evaluation workshop for Pacific whiting.

Finally the GAP recommends reinstituting data modeling workshops in advance of the next round of assessments. The quality of assessments is often limited by the exclusion of available data and data treatments that could be solicited, discussed, and vetted more thoroughly prior to assembling data and developing the assessment model. As thorough and conscientious as many stock assessment teams are in preparing their assessments, data modeling workshops could only benefit data explorations that would improve assessment quality.

PFMC
09/14/09

THE GROUNDFISH MANAGEMENT TEAM (GMT) REPORT ON OFF-YEAR SCIENCE IMPROVEMENTS

The Groundfish Management Team (GMT) discussed science activities necessary to prepare for the next stock assessment cycle and possible projects to resolve scientific issues that play a significant role in groundfish decision-making. The GMT identified management strategy evaluation (MSE) of current target reference points and harvest control rules, completion of catch reconstruction efforts, development of alternative assessment methods, and improved access to and documentation of raw recreational data and derived quantities as key issues.

The GMT supports the Scientific and Statistical Committee’s (SSC) recommendation for an evaluation of proxy reference points and harvest control rules. This effort should look at taxon-specific life history traits and include examination of alternative stock-recruitment relationships, recruitment compensation, natural mortality, growth, and other factors affecting stock productivity. As has been recognized for a number of years, current proxy reference points may still be appropriate to rockfishes, while other reference points may better capture the relationship between yield and stock productivity for flatfishes, Pacific whiting, or other non-rockfish taxa.

The historical catch reconstruction for California was completed during the previous off-year period, and results from that study were incorporated into multiple stock assessments this cycle. The GMT supports the reconstruction efforts currently underway in Washington and Oregon, and continued refinement of the California reconstruction.

The GMT supports the ongoing development of alternative assessment methods useful in data-limited situations to inform Council decisions regarding the setting of annual catch limits.

The GMT recognizes the need for improved access to raw recreational data and documentation of the methods (metadata) and parameters used for derived quantities. Access and interpretation of RecFIN data was an issue for multiple Stock Assessment Teams during this stock assessment cycle. Specifically, a single database providing tables of all raw (i.e., not summarized) recreational data would help analysts identify potential outliers and other factors that may lead to questionable estimated quantities. Clearer documentation and availability of parameters used in the development of summary statistics is needed by stock assessors and the GMT. These steps would facilitate investigation of quantities used for inseason management, such as outlier catch estimates resulting from inflated effort, average weight or cost per unit of effort estimates.

In addition to historical catch reconstruction efforts, the GMT would also support organization of a workshop focusing on the identification and utilization of historical databases (e.g. discard studies) not already commonly provided for use in stock assessments. Discard and catch were major sources of uncertainty in the assessment of greenstriped rockfish and will likely be so for many rockfish that have yet to be assessed. The workshop could produce a guide to the use and availability of these alternative databases.

PFMC
09/14/09

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON OFF-YEAR SCIENCE IMPROVEMENTS

The Scientific and Statistical Committee (SSC) reviewed a number of off-year research proposals submitted by Council Staff, National Marine Fisheries Service (NMFS) Fisheries Science Centers, and Stock Assessment Review (STAR) Panels. The SSC found a significant degree of overlap between proposals and grouped them into categories for analysis and response.

The SSC did not find it necessary to conduct a review of the STAR process as proposed by Council Staff. The 2009 Panels worked well with a high degree of consistency and the overall quality of stock assessments was much improved, followed the Terms of Reference and promptly produced the analyses and information needed by the SSC.

The second Council Staff proposal suggests a harvest policy evaluation workshop to review the current groundfish management framework. The SSC supports this proposal and notes that the idea is repeated in the STAR Panel recommendations contained in Item E.3.a, Attachment 1. The SSC places a high priority on a harvest policy workshop to evaluate a range of harvest control rules and to develop a management strategy evaluation (MSE). One area of interest is establishment of a tiered system of control rules based on data quantity and quality.

There are several recommendations related to the use and potential modification of the Stock Synthesis model. The recommended research relates to instituting changes and additions to the SS3 model. The SSC supports this as a high to medium priority and suggests that the proposed work be brought forward through a series of mini workshops of assessment scientists actively engaged in the topics.

The SSC places a high priority on the establishment of a working group to assess alternative assessment methods for data poor stocks. The SSC is seeking simpler, robust assessment methods to track data poor stocks.

The SSC endorses the NMFS Science Center proposal for standardization of the triennial trawl survey calendar date effect, and the STAR Panel proposal for the same work and an examination of q priors as high priority items. The SSC hopes this may reduce some of the uncertainty in trawl survey estimates.

The recommendation for catch reconstruction in Washington and Oregon is a high priority for the SSC. Catch reconstruction worked well for California and the SSC encourages Oregon and Washington to complete their reconstructions. High quality catch data is a critical element for stock assessment.

The SSC places medium priority on STAR Panel recommendations related to model development, but encourages further evaluation. A STAR Panel recommendation to explore model parameters and data treatment via simulations methods is an item that ought to provide insights into model performance.

The SSC in its review of the recommendations determined that there is a need for additional high priority items:

A workshop or working group to evaluate the use of the International Pacific Halibut Commission (IHPC) survey in the yelloweye rockfish assessment and to develop recommendations on how to incorporate supplemental samples being collected by the States of Oregon and Washington.

A working group to explore the development of spatial modeling methods. The SSC notes that spatial modeling and data handling was handled in several different ways in the assessments completed this year. More guidance is needed on establishing criteria for developing spatially explicit models.

The SSC notes that both the cabezon and lingcod assessments reported results of indices of local abundance produced by small-scale monitoring programs distributed along the coast. While these monitoring programs have potential utility for stock assessment, at present it unclear how this information can be used in stock assessments, which typically are conducted at a larger scale than these local monitoring programs. A workshop to consider methods of incorporating this information in stock assessments, and promoting greater coordination of these monitoring programs would be valuable.

The SSC concurs with the STAR Panel recommendation regarding the need for a standardized repository of recreational data required for use by stock assessment analysts. These include catch per unit of effort (CPUE), age and length data, and total catch data. This is a long standing problem that once again should be brought to the attention of RecFIN and the contributing agencies

PFMC
09/15/09

INSEASON ADJUSTMENTS TO 2009 AND 2010 GROUNDFISH FISHERIES – PART I

Management measures for the 2009 and 2010 groundfish season were set by the Council with the understanding these measures would likely need to be adjusted throughout the biennial period to attain, but not exceed, the optimum yields (OYs). This agenda item will consider inseason adjustments to ongoing 2009 fisheries, and preliminary adjustments to 2010 fisheries.

As part of this agenda item, the Council will discuss more precautionary approaches to managing petrale sole and canary rockfish within the current biennium. At the June Council meeting the Council considered recent information on the status of both petrale sole and canary rockfish. During this meeting the Council adopted preliminary measures for reducing the mortality of petrale sole in 2009 and 2010 pending further analysis, and also indicated the intention to reduce the canary rockfish OY in 2010. The most recent stock assessments for petrale sole and canary rockfish are relatively more pessimistic than the previous assessments used in the 2009 and 2010 harvest specifications process, raising the possibility of needing to take a mid-course action to protect the status of these stocks and to remain on target to meet rebuilding plan goals. Included within this agenda item is a draft Environmental Assessment (EA) outlining the biological and socioeconomic effects of reducing the petrale sole OY. Also included within this EA is an analysis showing the type of impacts that may be expected to occur from possible reductions in the 2010 canary rockfish OY.

The Groundfish Management Team (GMT) and the Groundfish Advisory Subpanel (GAP) will meet prior to this agenda item to discuss and recommend inseason adjustments to 2009 groundfish fisheries. After hearing this advisory body advice and public comments, the Council will consider preliminary or final inseason adjustments. Agenda Item E.7 is scheduled for Thursday, September 17, should further analysis or clarification be needed.

Council Task:

1. **Adopt initial or final inseason adjustments.**
2. **Consider revised management measures for petrale sole and canary rockfish, if appropriate.**

Reference Materials:

1. Agenda Item E.4.b, NMFS Report: Draft Environmental Assessment. Proposed Interim 2009 and 2010 Harvest Specifications and Management Measures for Petrale Sole and Canary Rockfish off the Pacific Coast.

Agenda Order:

a. Agenda Item Overview — Merrick Burden
b. Reports and Comments of Management Entities and Advisory Bodies
c. Public Comment
d. **Council Action:** Adopt Preliminary or Final Recommendations for Adjustments to 2009 and 2010 Groundfish Fisheries

PFMC
08/27/09

Agenda Item E.4.b
NMFS Report
September 2009

PROPOSED INTERIM 2009 AND 2010 HARVEST SPECIFICATIONS AND MANAGEMENT MEASURES FOR PETRALE SOLE AND CANARY ROCKFISH OFF THE PACIFIC COAST

DRAFT ENVIRONMENTAL ASSESSMENT

Prepared by the
National Marine Fisheries Service
7600 Sand Point Way NE
Seattle, WA98115-0070
206-526-6150

August 2009

Table of Contents

List of Tables

List of Figures

1 Chapter 1 Introduction

This document provides background information and analyses of revisions to 2009 management measures and 2010 harvest specifications and management measures for petrale sole (*Eopsetta jordani*) and canary rockfish (*Sebastes pinniger*) in fisheries covered by the Pacific Coast Groundfish Fishery Management Plan (FMP). The groundfish harvest specifications are set every two years. Harvest specifications for all groundfish species for the 2009 and 2010 biennium, including petrale sole and canary rockfish, were analyzed in a previous Environmental Impact Statement (PFMC and NMFS 2009) and were based on the best scientific information available at that time.

Petrale sole has been a relatively healthy stock off the West Coast, harvested primarily by the limited entry trawl fleet during winter months when the stock is aggregated on the slope. Petrale sole is not currently subject to overfishing, nor is it overfished. In recent stock assessments the status of the stock has fluctuated from 42 percent of its unfished biomass (1999 Assessment), 29 percent of its unfished biomass (2001 Assessment), and 32 percent of its unfished biomass (2004 Assessment). A new full assessment for petrale sole was prepared during 2009 to inform the process for establishing 2011-2012 Pacific Coast groundfish harvest specifications and management measures.

Canary rockfish are incidentally caught coastwide in all sectors of the West Coast groundfish fishery. Canary rockfish is an overfished shelf rockfish species that is currently subject to a rebuilding plan. A stock assessment update for canary rockfish was prepared during 2009 to inform the process for establishing 2011-2012 Pacific Coast groundfish harvest specifications and management measures.

In response to the new stock assessments NMFS has determined the need to reevaluate the 2009-2010 groundfish harvest specifications and management measures for petrale sole and canary rockfish. The Council reviewed a new stock assessment for petrale sole in June 2009, considered questions raised by the Stock Assessment and Review Panel (STAR Panel) and the Scientific and Statistical Committee (SSC), and asked the SSC to review the open issues and report back to the Council in September 2009. While there is uncertainty regarding the results of the final stock assessment, it is likely that, under any outcome, the stock will be overfished at the beginning of 2011 if the entire current petrale optimum yields (OYs) are taken in 2009 and 2010. The canary rockfish assessment was an update of the prior assessment, incorporating revised historic catch data. This assessment concluded that the stock is more depleted than the previous assessment had indicated. The Council approved the new stock assessment, and the assessment authors will develop a rebuilding analysis for consideration by the Council in November. The Council will use the results of the rebuilding analysis to consider likely revisions to the rebuilding plan for 2011 and to consider OY and harvest revisions in 2010.

This EA tiers from the Proposed Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for the 2009-2010 Pacific Coast Groundfish Fishery EIS (January 2009 EIS) (PFMC and NMFS 2009) and provides new analysis and alternatives for managing petrale sole and canary rockfish in 2009 and 2010. Unless otherwise noted, all of the information used in this EA is from the January 2009 EIS (PFMC and NMFS 2009).

1.1 Purpose and Need for the Proposed Action

The proposed action includes: reducing total fishing mortality of petrale sole for the remainder of 2009; specifying 2010 optimum yield (OY) values for petrale sole and canary rockfish and establishing management measures to constrain total fishing mortality consistent with these specifications. These specifications and management measures are proposed in response to the stock status estimates in the 2009 assessments for these two species.

The need for the proposed action is to ensure that petrale sole and canary rockfish are maintained at, or restored to, sizes and structures that will produce the highest net benefit to the nation, while taking into account environmental and social values. New stock assessments for canary rockfish and petrale sole were conducted in 2009 that changed the understanding of stock status. The new stock assessments are more pessimistic than the stock assessments used to determine the 2009 and 2010 harvest specifications (OYs) and management measures. Action is needed to respond to the most recently available stock status information during the remainder of 2009 and in 2010, while NMFS and the Council complete the stock assessments, rebuilding analyses, EIS, and rulemaking for the 2011 and 2012 specifications and management measures.

The purpose of the proposed action is to prevent petrale sole from being in an overfished status in 2011, or to speed the rebuilding of petrale if it is found to be overfished. The purpose of the proposed action is also to facilitate rebuilding of canary rockfish and easing the negative impact on industry from the reduced canary rockfish harvest specifications that will likely result in 2011-2012 from the new stock assessment and rebuilding analysis.

2 Chapter 2 Alternatives Including the Proposed Action

There are two sets of alternatives analyzed in this EA. The first set of alternatives provides a range of harvest specifications and management measures that reduce total mortality of petrale sole in the limited entry trawl fishery in order to prevent this species' stock status from falling below the overfished threshold in 2011, or to speed rebuilding if it does fall below the threshold. The second set of alternatives is a range of harvest specifications and management measures that reduce total mortality of canary rockfish to facilitate rebuilding and to ease negative impacts on industry from lower 2011-2012 harvest specifications, and more restrictive management measures.

2.1 Harvest Specifications and Management Measures for Petrale Sole

2.1.1 Alternative P1/No Action:

Alternative P1 is the no action alternative, which would leave the current specifications and management measures in place for petrale sole in 2009 and 2010. Harvest specifications and projected impacts to the petrale sole stock for Alternative P1 are outlined below in Table 2-1.

Management measures that pertain specifically to controlling catch of petrale sole in the limited entry trawl fishery include modified trawl rockfish conservation area (RCA) boundary lines and bi-monthly cumulative limits and/or sub-limits for petrale sole. The modified trawl RCA lines keep areas of petrale aggregation on the slope open to the trawl fishery in winter months (January-March and November-December). Depending on the type of trawl gear used and the time of year, petrale sole trip limits are either species specific, for example "25,000 lb [of petrale sole] per 2 months", or are a sublimit of the other flatfish trip limit, for example "110,000 lb [of other flatfish, English sole, and starry flounder], per 2 months, no more than 25,000 lb per 2 months of which may be petrale sole". Management measures associated with the no action alternative are listed in the trip limit tables from the July 6, 2009 inseason action rule (74 FR 31874), and are shown in Appendix A for reference. Projected impacts to petrale sole under current management measures, as of July 1, 2009, are listed in Table 2-1.

If no action is taken to reduce catches of petrale sole in 2009-2010, it is likely that petrale sole will be overfished at the start of 2011.

Table 2-1. Alternative P1: No action alternative for petrale sole

	Coastwide ABC (mt)	Coastwide OY (mt)	Projected Impacts (mt)[/a]		
			LE Non-Whiting Trawl Fishery	Other Groundfish Fisheries	Total
2009	2,811	2,433	2,393	0	2,393
2010	2,751	2,393	2,393	0	2,393

/a Projected impacts for 2009 are the projected impacts after inseason adjustments to fishery management measures on July 1, 2009 (74 FR 31874). Projected impacts for 2010 assume that the same management measures that are currently in place for the 2009 calendar year are repeated in 2010.

2.1.2 Alternative P2/Preferred Alternative

Alternative P2 is an action alternative to implement management measures that would reduce projected catch of petrale sole in 2009, and decrease the 2010 petrale sole OY and implement management measures to keep projected impacts below the new 2010 OY.

In June, 2009 the Council's Groundfish Management Team (GMT) coordinated with 2009 petrale sole stock assessment authors to model how a range of reductions in petrale catch during 2009 and 2010 would affect the projected stock abundance levels at the beginning of 2011, using the base case model. As a means of avoiding an overfished status at the beginning of 2011, or to speed the rebuilding of petrale if it is found to be overfished, the Council considered measures that would: reduce the catch of petrale sole to a level of approximately 2,000 mt in 2009, or roughly 400 mt below the 2009 OY; and reduce the catch to approximately 1,200 mt in 2010, or approximately 1,200 mt below the current 2010 OY of 2,393. It is estimated that by making these reductions in catch during 2009 and 2010, the stock status in 2011 would be improved by 4 percent of $B_{unfished}$ and by 20 percent of the directly-estimated B_{MSY}. See Table 2-5 for a comparison of the effects of different catch scenarios on 2011 petrale sole stock abundance.

Therefore, the Council and NMFS developed Alternative P2 to: reduce projected catches by 400 mt during the remainder of 2009; reduce the 2010 petrale sole OY by 1,200 mt; and implement management measures to keep projected impacts below the new 2010 OY of 1,193 mt. Alternative P2 harvest specifications are outlined below in Table 2-2.

NMFS and the Council considered options for revisions to management measures that reduce projected impacts to petrale sole in 2009 and 2010 in order to reduce the likelihood of petrale sole being considered overfished at the start of 2011, or to speed the rebuilding if it is found to be overfished, based on the new 2009 petrale sole stock assessment. Management measure revisions include removal of the open areas for fishing petrale aggregations on the slope in winter months. This will be done by using the un-modified 200 fm RCA boundary line that does not include cut-outs that open known areas of petrale sole abundance North of 40°10' N. lat. Revisions will also include reductions to cumulative limits and sub-limits for petrale sole coastwide, for all limited entry trawl gear types. Revisions to management measures are proposed for November-December (Period 6) of 2009 and for all of 2010. Figure 2-1 presents proposed management measures for Period 6 of 2009 to reduce projected mortality of petrale sole by approximately 400 mt. Figure 2-2 presents proposed management measures for 2010 to reduce projected mortality of petrale sole by approximately 1,200 mt. Projected impacts to petrale sole under these Alternative P2 management measures are listed in Table 2-2.

Table 2-2. Alternative P2: Reduced harvest specifications for petrale sole

	Coastwide ABC (mt)	Coastwide OY (mt)	**Projected Impacts (mt)** [a]		
			LE Non-Whiting Trawl Fishery	Other Groundfish Fisheries	Total
2009	2,811	2,433	1,995	0	1,995
2010	2,751	1,193	1,178	0	1,178

/a Projected impacts are calculated based on the preliminary preferred Council alternative management measures for petrale sole. Projected impacts listed here include changes to projected impacts to petrale sole that resulted from management measures implemented in the July 6, 2009 inseason action final rule (74 FR 31874).

Figure 2-1. Alternative P2 management measures for Period 6 of 2009 to reduce projected mortality of petrale sole by 400 mt. BOLD text is what is different from Alternative P1.

	NOV-DEC
Rockfish Conservation Area (RCA):	
North of 48°10' N. lat.	shore - **200 fm line**
48°10' N. lat. - 45°46' N. lat.	75 fm line - **200 fm line**
45°46' N. lat. - 40°10' N. lat.	75 fm line - **200 fm line**
South of 40°10' N. lat.	100 fm line - 150 fm line
Flatfish North of 40°10' N. Lat. (except Dover sole and Arrowtooth flounder)	
Other flatfish, English sole, starry flounder, & Petrale sole	
large & small footrope gear for Other flatfish, English sole, & starry flounder	110,000 lb/ 2 months
large & small footrope gear for Petrale sole	**2,000 lb/ 2 months**
selective flatfish trawl gear for Other flatfish, English sole, & starry flounder	90,000 lb/ 2 months, **no more than 2,000 lb/ 2 months of which may be petrale sole.**
selective flatfish trawl gear for Petrale sole	90,000 lb/ 2 months, **no more than 2,000 lb/ 2 months of which may be petrale sole.**
multiple bottom trawl gear	90,000 lb/ 2 months, **no more than 2,000 lb/ 2 months of which may be petrale sole.**
Flatfish South of 40°10' N. Lat. (except Dover sole and Arrowtooth flounder)	
Other flatfish[3/], English sole, & starry flounder	110,000 lb/ 2 months
Petrale sole	**2,000 lb/ 2 months**

Figure 2-2. Alternative P2 management measures for 2010 to reduce projected mortality of petrale sole by 1,200 mt. BOLD text is what is different from Alternative P1.

	JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
Rockfish Conservation Area (RCA)						
North of 48°10' N. lat.	shore - **200 fm line**		shore - 150 fm line		shore - **200 fm line**	
48°10' N. lat. - 45°46' N. lat.	75 fm line - **200 fm line**		75 fm line - 150 fm line	100 fm line - 150 fm line	75 fm line - **200 fm line**	
45°46' N. lat. - 40°10' N. lat.			75 fm line - 200 fm line	100 fm line - 200 fm line		
South of 40°10' N. lat.	100 fm line - **200 fm line**					
Flatfish North of 40°10' N. Lat. (except Dover sole and Arrowtooth flounder)						
Other flatfish, English sole, starry flounder, & Petrale sole						
large & small footrope gear for Other flatfish, English sole, & starry flounder	110,000 lb/ 2 months	110,000 lb/ 2 months, **no more than 18,000 lb/ 2 months of which may be petrale sole.**				110,000 lb/ 2 months
large & small footrope gear for Petrale sole	**1,000 lb/ 2 months**					**1,000 lb/ 2 months**
selective flatfish trawl gear for Other flatfish, English sole, & starry flounder	90,000 lb/ 2 months, **no more than 1,000 lb/ 2 months of which may be petrale sole.**	90,000 lb/ 2 months, no more than 18,000 lb/ 2 months of which may be petrale sole.				90,000 lb/ 2 months, **no more than 1,000 lb/ 2 months of which may be petrale sole.**
selective flatfish trawl gear for Petrale sole						
multiple bottom trawl gear	90,000 lb/ 2 months, **no more than 1,000 lb/ 2 months of which may be petrale sole.**	90,000 lb/ 2 months, no more than 18,000 lb/ 2 months of which may be petrale sole.				90,000 lb/ 2 months, **no more than 1,000 lb/ 2 months of which may may be petrale sole.**
Flatfish South of 40°10' N. Lat. (except Dover sole and Arrowtooth flounder)						
Other flatfish, English sole, & starry flounder	110,000 lb/ 2 months	110,000 lb/ 2 months, **no more than 18,000 lb/ 2 months of which may be petrale sole.**				110,000 lb/ 2 months
Petrale sole	**1,000 lb/ 2 months**					**1,000 lb/ 2 months**

2.2 Harvest Specifications and Management Measures for Canary Rockfish

2.2.1 Alternative C1

Alternative C1 is the no action alternative, which would leave the current specifications and management measures in place for canary rockfish in 2009 and 2010.

The 2010 canary rockfish OY of 105 mt is based in the base case model in the 2007 stock assessment and the associated rebuilding plan. The rebuilding plan maintained the 2007-2008 SPR harvest rate of F88.7%, and specified a target rebuilding year of 2021, which is earlier than the year in the prior rebuilding plan. The 105 mt OY comes from a more conservative SPR rate of 92.2 percent. For additional information on the rationale for the 2010 canary rockfish OY of 105 mt and the associated revisions made to the canary rockfish rebuilding plan, see the January 2009 EIS (PFMC and NMFS 2009), particularly Sections 2.1.1.2, and 4.3.1.1.

Harvest specifications and projected impacts to canary rockfish under Alternative C1 are outlined below in Table 2-3.

Table 2-3. Projected impacts to canary rockfish under Alternative C1, or the no action alternative

	Coastwide ABC (mt)	Coastwide OY (mt)	Projected Impacts (mt) [a]							
			LE Non-Whiting Trawl Fishery	Non-Tribal Whiting Trawl Fishery [b]	LE Fixed Gear and Open Access Fisheries	Other (Tribal fisheries, Non-whiting EFPs, Research, etc.)	Recreational [c]			Total
							WA	OR	CA	
2009	937	105	22.1	18.0	7.0	17.3	19.3		21.3	105.0
2010	940	105	22.1	18.0	7.0	17.3	19.3		21.3	105.0

/a Projected impacts for 2009 are the projected impacts after inseason adjustments to fishery management measures on July 1, 2009 (74 FR 31874). Projected impacts for 2010 assume that the same management measures that are currently in place for the 2009 calendar year are repeated in 2010.

/b Values for the non-tribal whiting trawl fishery reflect the total of sector-specific bycatch limits adopted in regulations, not projected impacts.

/c Values listed for recreational fisheries are the state-specific harvest guidelines (WA/OR=20.9 and CA=22.9), minus 1.6 mt that were not projected to be harvested, consistent with final council action at their June 2009 meeting.

Status quo management measures for commercial fisheries that catch canary rockfish were published in the trip limit tables from the July 6, 2009 inseason action rule (74 FR31874) and are provided in Appendix A for reference. Status quo management measures for recreational fisheries that catch canary rockfish are listed in Federal Regulations at 50 CFR 660.384 and are provided in Appendix B for reference. Projected impacts to canary rockfish under status quo management measures, as of July 1, 2009, are listed in Table 2-3.

Canary rockfish rebuilding parameters based on the 2007 stock assessment, catch sharing, and analysis of how the stock would be rebuilding as quickly as possible taking into account the appropriate factors, are described in the January 2009 EIS (PFMC and NMFS 2009). If catches in 2009 and 2010 are equivalent to the 2009 and 2010 OYs (105 mt), then, according to the 2009 stock assessment, the status of the stock at the beginning of 2011 will be at 25.2 percent depletion. The stock assessment update presented at the June 2009 Council meeting also predicted that using an SPR of 92.2%, which approximates the SPR for the harvest level in the 2009 and 2010 specifications, results in a 2011 coastwide canary rockfish OY of approximately 69 mt. A rebuilding analysis will be completed in September/October 2009, which will provide a range of potential OYs and rebuilding time periods for the Council to consider as it develops the 2011-2012 specifications. Based on the new, more pessimistic stock assessment, more restrictive management measures will most likely be needed in 2011 to rebuild canary rockfish as quickly as possible, taking into account the appropriate factors.

Table 2-4. Yield amounts (mt) of canary rockfish available to groundfish sectors in 2010 (after deducting projected set-asides) for each canary rockfish OY alternative.

Groundfish Sector	Catch Share (%)	Yield Amounts (mt)		
		C1 = 105 mt	C2 = 85 mt	C3 = 44 mt
LE Non-Whiting Trawl	22.9	19.7	15.1	5.7
LE Whiting Trawl	20.9	18	13.8	5.2
LE Fixed Gear	2.6	2.2	1.7	0.6
Directed OA	2.9	2.5	1.9	0.7
WA Rec	5.7	4.9	3.8	1.4
OR Rec	18.6	16	12.3	4.7
CA Rec	26.6	22.9	17.6	6.7

Excerpted from Tables 2-8 and 2-9 of the 2009-2010 FEIS (PFMC and NMFS 2009)

2.2.2 Canary Rockfish Action Alternatives

The OY values associated with Alternatives C2 and C3 are a subset of the OY values analyzed in the January 2009 EIS (PFMC and NMFS 2009). Supplemental description of these alternatives in this EA is necessary to reflect the new information on stock status, and therefore the same OY alternatives are now presented in the context of the updated 2009 stock assessment.

2.2.3 Alternative C2:

Alternative C2 proposes to reduce the 2010 canary rockfish OY to 85 mt. Alternative C2 also considers a range of potential modifications to management measure that may be necessary to keep total mortality of canary rockfish below 85 mt.

Preliminary information prior to the rebuilding analysis indicates that constraining catches of canary rockfish to 85 mt in 2010 has the following effects on canary rockfish stock abundance at the start of 2011, according to the 2009 stock assessment model: the depletion level will be unchanged, at 25.2 percent depletion, with a 2011 OY of approximately 69 mt (Stewart, pers. comm.).

Both canary rockfish action alternatives (C2 and C3) assume that the catch sharing of canary rockfish that was described in the January 2009 EIS (PFMC and NMFS 2009) will be unchanged. Therefore, for each alternative, the coastwide OY is apportioned among sectors and states in the same manner as in the no action alternative (Table 2-4).

Potential management measures that reduce canary rockfish total mortality to 85 mt may include: expansion of the trawl RCA to close areas with high canary bycatch for parts of the year; expansion of the non-trawl RCA; reductions in trip limits for co-occurring shelf species in both the LE trawl fishery and in the LE fixed gear fishery and open access commercial fishery; reductions in trip limits for vessels using selective flatfish trawl gear; reductions in recreational fishery season length; closures of recreational fisheries in some areas of the coast for a portion of the year; reduction in recreational bag limits for rockfish or other co-occurring species; and a reduction in the bycatch limit for canary rockfish in the LE non-tribal whiting fishery.

The Council will consider the range of management measure alternatives presented in Alternatives C2 and C3 for reducing canary rockfish impacts at the November 2009 Council meeting, following review of the new canary rockfish rebuilding analysis. Projected OYs for 2011 and 2012 and estimates of spawning stock abundance in a new rebuilding analysis will allow the Council to recommend interim measures that would reduce canary rockfish impacts in 2010, resulting in less disruption to 2011 and 2012 fisheries. A description of the final preferred alternative for canary rockfish harvest specifications and management measures in 2010 will be provided as a supplement to the EA after the November 2009 Council meeting.

2.2.4 Alternative C3:

Alternative C3 proposes to reduce the 2010 canary rockfish OY to 44 mt. Alternative C3 also considers a range of potential management measure modifications that may be necessary to keep total mortality of canary rockfish below 44 mt.

Preliminary information prior to the rebuilding analysis indicates that constraining catches of canary rockfish to 44 mt in 2010 has the following effects on canary rockfish stock abundance at the start of 2011, according to the 2009 stock assessment model: the depletion level will improve from 25.2 percent to 25.3 percent and the 2011 OY will increase to approximately 70 mt.

Potential management measures to reduce canary rockfish total mortality to 44 mt would include the same types of changes as outlined above in Alternative C2. However, the duration of commercial area restrictions and trip limit reductions may increase and the reductions in trip limits would likely be more severe. The canary rockfish bycatch limit in the LE non-tribal whiting trawl fishery may be severely reduced. The non-whiting Exempted Fishing Permits (EFPs) may also be restricted or terminated in 2010 to reduce their projected catch of canary rockfish (approximately 2.7 mt). Recreational fisheries seasons may be shortened further, or closed entirely, for some portions of the coast.

The Council will consider the range of management measure alternatives presented in Alternatives C2 and C3 for reducing canary rockfish impacts at the November 2009 Council meeting, following review of the new canary rockfish rebuilding analysis. Projected OYs for 2011 and 2012 and estimates of spawning stock abundance in a new rebuilding analysis will allow the Council to recommend interim measures that would reduce canary rockfish impacts in 2010 and result in less disruption to 2011 and 2012 fisheries that will be operating under OYs set using a revised rebuilding plan. A description of the final preferred alternative for canary rockfish harvest specifications and management measures in 2010 will be provided as a supplemental to the EA after the November 2009 Council meeting.

2.3 Alternatives Considered but Rejected from Further Analysis

NMFS and the Council considered reducing the 2009 petrale sole OY. However, this is an ongoing fishery, and 10 out of 12 months of the 2009 fishery will have concluded before this action takes effect, so this option was removed from further consideration. Changing the trip limits, as proposed in alternative P2 would have the same effect on the harvest levels.

NMFS and the Council considered reducing impacts to petrale sole by varying amounts for 2009. Specifically, they considered what the overfished status of petrale sole would be if no changes were made to reduce catches in 2009. Comparing "Rejected 1" abundance levels with "Alternative 2" abundance levels in Table 2-5 shows that there is a slight increase in abundance when catches are reduced in 2009. However, if catches in 2009 were only reduced by approximately 200 mt, there was no appreciable improvement in stock status relative to the percent of $B_{unfished}$, and only a minor improvement relative to the directly-estimated B_{MSY}. Therefore, since neither of these scenarios had an appreciable difference from Alternative P2 in improving the petrale sole stock status for 2011, they did not meet the purpose and need, and therefore were rejected from further consideration.

Table 2-5. Base case model projections of 2011 petrale stock abundance under four 2009-2010 catch scenarios.

	2009/2010 Catch Scenarios (mt)			
2011 abundance	Alt. P1 (No Action) (2,433/2,393)	Rejected 1 (2,433/1,200)	Rejected 2 (2,200/1,200)	Alt. P2 (2,000/1,200)
% of $B_{unfished}$	9%	12%	12%	13%
% of directly-estimated B_{MSY}	48%	63%	66%	68%

The GMT, an advisory body to the Council, considered implications of setting cumulative trip limits for petrale sole to zero in winter months (or "CLOSED"), as this could potentially be an option for reducing projected impacts to petrale sole. A complete closure would induce regulatory discarding of co-occurring petrale sole, and the associated mortality of those discards. Therefore, we want to allow some retention, though reduce trip limits enough to discourage targeting of petrale sole. Keeping winter trip limits at 1,000-2,000 lb is designed to allow retention of some incidental take of petrale sole when vessels are targeting co-occurring flatfish and slope species. Since a complete closure of the winter petrale fishery would not result in appreciable difference in projected impacts, due to discard mortality of incidentally caught petrale sole, this alternative did not meet the purpose and need, and therefore was not recommended for Council consideration by the GMT.

NMFS and the Council considered analyzing interim canary rockfish OYs lower than 44 mt. The last time the canary rockfish stock status was more pessimistic was in the 2006 assessment. During the 2007-2008 harvest specifications and management measures process, considerable analysis was conducted. That analysis revealed that setting the canary rockfish OY below 44 mt would have required a variety of fisheries to be either severely constrained or closed (71 FR 57764), and made a modest difference in the rebuilding parameters. The updated 2009 stock assessment is similar in that it is more pessimistic than the 2009 assessment. To date, the final rebuilding analysis based on the 2009 stock assessment is not complete, so it is uncertain how the alternative interim harvest specifications and management measures would affect rebuilding parameters for canary rockfish. However, the situation is similar to what occurred in 2007. Therefore, interim alternative OYs lower than 44 mt were not considered for 2010. For more information on the economic impacts of setting the canary rockfish OY below 44 mt, see the 2007-2008 Harvest Specifications and Management Measures EIS (PFMC and NMFS 2006) and the preamble to the Proposed Rule (71 FR 577764).

3 Chapter 3 Affected Environment

A description of west coast marine ecosystems and the affected essential fish habitat are available in volume 1 of the Council's 2008 Stock Assessment and Fishery Evaluation (SAFE) document. Volume 1 of the 2008 SAFE document is available by request to the Council office or online at www.pcouncil.org/groundfish/gfsafe.html.

The affected environment for proposed action is the same as the affected environment considered in the January 2009 EIS (PFMC and NMFS 2009). The affected environment chapter (Chapter 3), of that EIS is incorporated by reference and not repeated in this EA. That analysis considered the ecosystem in terms of physical and biological oceanography, climate, biogeography, essential fish habitat (EFH), marine protected areas, and the role of depleted species' rebuilding in the marine ecosystem.

It should be noted that the scale of the proposed action in this EA is smaller than the action in the January 2009 EIS due to the change in focus from setting specifications and management measures for all species in the FMP to setting specifications and management measures as they pertain particularly to canary rockfish and petrale sole.

Petrale sole is one of the main target species for the non-whiting trawl fishery. Arguably, the two species most important to the trawl fishery are petrale sole and sablefish. Markets are readily available for these two species and nearly every trawl vessel along the west coast relies upon petrale sole and sablefish as a source of revenue. These two species have relatively high prices per pound. Petrale sole fetches approximately $0.95 to $0.99 per pound at the dock depending upon the year. This compares to a less desirable flatfish species that may fetch on the order of $0.30 per pound.

Petrale sole is important both to harvesters and to processors. Anecdotal information indicates that the economic margin for petrale sole is greater in the consumer and wholesale market place than for other species. Since petrale sole is sought after in the market, petrale has both a higher profit margin than other species, and there is relatively more certainty regarding the ability to sell petrale into the market place. This fact is evidenced in other types of industry practices. Anecdotal information indicates that, while harvesters deliver a wide array of species, the purchase of many species by the processor is conditional on the fact that harvesters deliver petrale sole and sablefish with those other species. This can be explained by the concept that the processor knows he/she will generate a given amount of revenue from petrale. Since the expected amount of revenue from other species is less certain and comes at a lower profit margin, the processor often cannot afford to rely on species other than sablefish and petrale alone. Reliance on species other than petrale and sablefish is therefore relatively "risky" as the processor will likely realize lower margins on those other species and there is relative uncertainty regarding the ability to sell those species at all. In some ways, having petrale sole and sablefish available allows harvesters and processors to take on the risk of harvesting and processing these other, less desirable species.

All of the rebuilding strategies used to reduce mortality of depleted species on the west coast are used to help rebuild canary rockfish. Management of this stock has tended to constrain more west coast fisheries than any other groundfish stock since canary rockfish are distributed coastwide, are found in a variety of habitats, and are caught by a variety of different fishing gears. Canary rockfish are distributed from nearshore areas as juveniles out to about 150 fm as adults and are found at times suspended off the bottom or in atypical soft-bottom habitats for rockfish. Canary rockfish are not allowed to be retained in commercial and recreational hook and line or fixed gear fisheries and a small, incidental landing limit is allowed in the limited entry trawl fishery to account for unavoidable incidental bycatch. Mandating the use of the selective flatfish trawl shoreward of the RCA north of 40°10' N latitude has helped reduce bycatch in the trawl fishery. The midwater trawl fishery for whiting, which is not currently restricted in the trawl RCA, also catches canary rockfish. Implementation of a canary rockfish bycatch cap, where, if attained, the non-tribal fishery would close inseason even if whiting quotas have not been attained, has successfully reduced canary rockfish mortality. Canary is also taken in recreational fisheries. Table 4-4 below illustrates the various commercial and recreational fisheries that take canary as bycatch.

4 Chapter 4 Environmental Consequences

The impacts described in the January 2009 EIS (PFMC and NMFS 2009) remain the same except for the changes related to the alternatives presented in this EA which are described below.

4.1 Discussion of Direct and Indirect Impacts

4.1.1 Petrale sole Alternatives

Petrale sole is primarily caught in the limited entry trawl fishery. Therefore, analysis of alternatives for changes to harvest specifications and management measures for petrale sole are considered in the context of the coastwide limited entry non-whiting trawl fishery for Pacific Coast groundfish and the effects of changes to management measures in that sector of the fishery.

4.1.1.1 Alternative P1/No Action

4.1.1.1.1 Impacts to the petrale sole resource

If no action is taken to reduce fishery impacts to petrale sole in 2009 or 2010, then the fishing mortality on the stock through 2010 will be the same as described in the January 2009 EIS (PFMC and NMFS 2009). However, if no action is taken to reduce catches of petrale sole in 2009-2010, it is likely that petrale sole will be overfished at the start of 2011, according to the new 2009 stock assessment. Projected impacts to petrale sole under Alternative P1 are listed in Table 2-1.

Under Alternative P1, no action is taken to change fishery impacts to petrale sole in 2009 and 2010. Under this alternative, the results of the new petrale sole stock assessment will be used to develop the 2011 and 2012 harvest specifications only, and will not be used to take interim measures in 2009 and 2010.

4.1.1.1.2 Socioeconomic Impacts

If no action is taken to reduce fishery impacts to petrale sole in 2009 or 2010, then the short term socioeconomic impacts would be very similar to those described in the January 2009 EIS (PFMC and NMFS 2009). As the purpose of the proposed action is to prevent petrale sole from being in an overfished status in 2011, or to speed the rebuilding of petrale if it is found to be overfished, the long term impacts of maintaining the status quo will be reduced OYs and potentially more severe rebuilding plans if petrale sole is found to be overfished. As a result, management of the fishery will become more complex, revenues from the fishery will decline and costs will increase as a result of more restrictive management measures, and less income will be generated in the associated fishing communities.

The January 2009 EIS used the best available information available at that time. Since the publication of that document, routine updates of fishery information have been made to catch projection models. The catch projection models are used to project fishery impacts under current management measures, and to see how projected fishery impacts may change if routine management measures are adjusted inseason. The relatively minor changes to fishery information have an indirect effect on the socioeconomic environment, and results in slightly different economic impacts (particularly projected ex-vessel revenue) than those predicted in the January 2009 EIS. Updated projections of ex-vessel revenue in limited entry non-whiting trawl fishery under Alternative P1 are shown in Table 4-2. The indirect effects of these changes in fishery information raised projected ex-vessel revenue in the non-whiting trawl fishery by 1.8 million dollars, or approximately 4 percent. Comparison of the action alternatives are made to the updated projected ex-vessel revenue in the non-whiting trawl fishery under the No Action alternative.

Fishery information that is routinely updated includes West Coast Groundfish Observer Program data and logbook and fish ticket information from the three west coast states.

4.1.1.1.3 Impacts to Other Groundfish Species

If no action is taken to reduce fishery impacts to petrale sole in 2009 or 2010, then the impacts to other groundfish species would be very similar to those described in the January 2009 EIS (PFMC and NMFS 2009). However, impacts to overfished groundfish species are slightly different than those listed in the January 2009 EIS.

The January 2009 EIS used the best available information available at that time. Since the publication of that document, routine updates of fishery information (listed in section 4.1.1.1.2 of this EA) have been made to catch projection models that result in slightly different projected impacts to some overfished and target groundfish species than what were predicted in the January 2009 EIS. These updated projected impacts are listed in Table 4-1.

Table 4-1: Projected Impacts to Rebuilding and Target Species in the Limited Entry Non-Whiting Trawl Fishery, Coastwide, Under Alternative P2

		Projected Impacts for Alt. P1 – No Action (mt)
		2009/2010
Rebuilding Species:	Canary Rockfish	22.3
	POP	106.8
	Darkblotched Rockfish	239.0
	Widow Rockfish	20.8
	Bocaccio	12.7
	Yelloweye Rockfish	0.6
	Cowcod	1.3
Target Species:	Sablefish	3,253.0
	Longspine Thornyheads	1,006.4
	Shortspine Thornyheads	1,308.5
	Dover Sole	13,752.4
	Arrowtooth Flounder	4,000.7
	Petrale Sole	2,393.4
	Other Flatfish	2,370.7
	Slope Rockfish	278.6

4.1.1.2 Alternative P2/Preferred Alternative

4.1.1.2.1 Impacts to the petrale sole resource

The petrale sole OY alternative and the 2009-2010 management measure alternative (Alternative P2) that the Council chose for analysis is based on the need to prevent the petrale sole stock status from falling below the overfishing threshold at the beginning of 2011. It is based on the immediate need to reduce catches, and how those reductions in projected catches in 2009-2010 affect the stock status in 2011, based on the new 2009 stock assessment.

A new full assessment for petrale sole was presented to the Council in June 2009. The draft assessment indicates the stock is depleted to 11.6% of its unfished biomass. The Groundfish FMP defines the overfished level at 25% of the unfished biomass when the proxy B_{MSY} .is used. This means that the stock may be overfished under this standard. However, the stock assessment review panel recommended using the biomass that would support maximum sustainable yield (B_{MSY}), as determined from the assessment (the directly-estimated Bmsy), as a management target because B_{MSY} is believed to be well estimated (Cook et. al 2009). The Groundfish FMP allows use of the directly-estimated Bmsy (also referred to as a deterministic B_{MSY}) target and defines the overfished level as no less than 50% of the directly-estimated B_{MSY}. The draft 2009 assessment estimates the stock spawning biomass is at 61% of the directly-estimated B_{MSY} and therefore may not be overfished under a directly-estimated B_{MSY} target. The Council's Scientific and Statistical Committee (SSC) did not recommend the petrale sole assessment for management decision-making pending further review of the assessment this summer. The SSC will also further explore the use of a directly-estimated B_{MSY} target for the stock when they meet this summer. While the petrale sole assessment is not yet adopted for use in making management decisions, projections from the draft assessment indicate that stock spawning biomass will be driven to a lower level of depletion if the entire 2009 and 2010 OYs are taken in this management cycle. Spawning biomass is projected to decline to less than 50% of the directly-estimated B_{MSY} by 2011 if the entire 2009 and 2010 OYs are taken, which is an overfished state even under a directly-estimated B_{MSY} target.

The Council's choice of catch reductions of approximately 400 mt in 2009 and the lower coastwide OY for 2010 of 1,193 mt is based on the need to prevent the stock status from falling below the overfished threshold at the beginning of 2011, or to speed the rebuilding of petrale if it is found to be overfished. Using the base model from the 2009 assessment, model runs were made assuming different catches of petrale in 2009 and 2010. It was estimated by the GMT that catches could be reduced by approximately 1,200 mt in 2010 if the winter target fishery for petrale sole was severely restricted. Therefore, the remainder of the current 2010 OY, 1,193 mt, was treated as the preferred OY for 2010 in this action.

The Council also considered making no changes to 2009 management measures, and therefore not reducing petrale sole projected impacts in 2009. If no reduction were made for 2009, model runs indicated that an increase of between a 0-1 percent of $B_{unfished}$ and between a 3-5 percent of the directly-estimated B_{MSY} would be sacrificed (Table 2-5). The Council felt that the potential for a small increase in abundance, in an attempt to prevent the stock from falling below the overfished status in 2011, or to speed the rebuilding of petrale if it is found to be overfished was a better alternative than taking no reduction in 2009 (See Section 2.3 for more detail).

4.1.1.2.2 Socioeconomic Impacts

This section describes the economic implications of reducing the allowable catch of petrale sole in the 2009 and 2010 biennium. Both qualitative and quantitative information is used to show the overall effect to the industry, and the distributional effect of that reduction to west coast communities. Below is a description of the importance of petrale sole to the west coast harvesting and processing industry as a whole and how petrale sole affects the industry relative to other species. Quantitative information is used to illustrate the effects of petrale sole reductions to west coast communities (Table 4-2).

4.1.1.2.2.1 Effects of Petrale Sole Reductions to West Coast Trawl Harvesters

As indicated above, petrale sole is important to nearly every trawler along the west coast. In this section we simulate the effects of reducing petrale sole opportunities on trawl harvesters. This is done by using the GMT trawl model to estimate the effects (in revenue terms) upon west coast trawl harvesters under status quo conditions and under the Council's preliminary 2009 and 2010 measures to reduce petrale sole impacts. We illustrate this information in a histogram showing the effect these impacts will have to west coast trawl vessels in percentage terms.

The Council's preliminary option for reducing petrale sole impacts in 2009 and 2010 restricts the fishery during period 1 and period 6 (the period 1 reduction is limited to 2010). Reducing the petrale sole fishing opportunities during this period maintains the summer petrale sole fishery. During the summer months, petrale sole fetches a higher price per pound than during the winter fishery. Furthermore, restricting petrale sole fishing opportunities in the winter months affects fewer trawlers than if the fishing opportunities were restricted during the summer. This is because several trawlers cannot fish in the deeper areas where petrale are found during the winter, so their catches of petrale are limited to periods when petrale are on the shelf. In other cases, trawlers that are able to prosecute winter activities engage in the Dungeness crab fishery rather than the winter trawl fishery. In any event, the number of trawl vessels relying on winter petrale sole opportunities is smaller than the number of trawl vessels relying on summer petrale opportunities. However, for those vessels that rely on winter opportunities, the effect of the winter restriction is fairly large. Figure 4-1 is based on the current GMT model that estimates that there are about 139 trawlers participating in the non-whiting trawl fishery, and describes the number of limited entry non-whiting trawl vessels that may have a reduction in ex-vessel revenue. As shown in the figure below, a large number of vessels may have a relatively small decrease in revenue. However, a few vessels may have a relatively large decrease in revenue. For example: around 20 vessels may see their revenues decline by 5 to 9 percent, 5 to 19 vessels may see their revenues decline by 10 to 14 percent (depending on the year), and some vessels may see their revenues decline by over 20 percent.

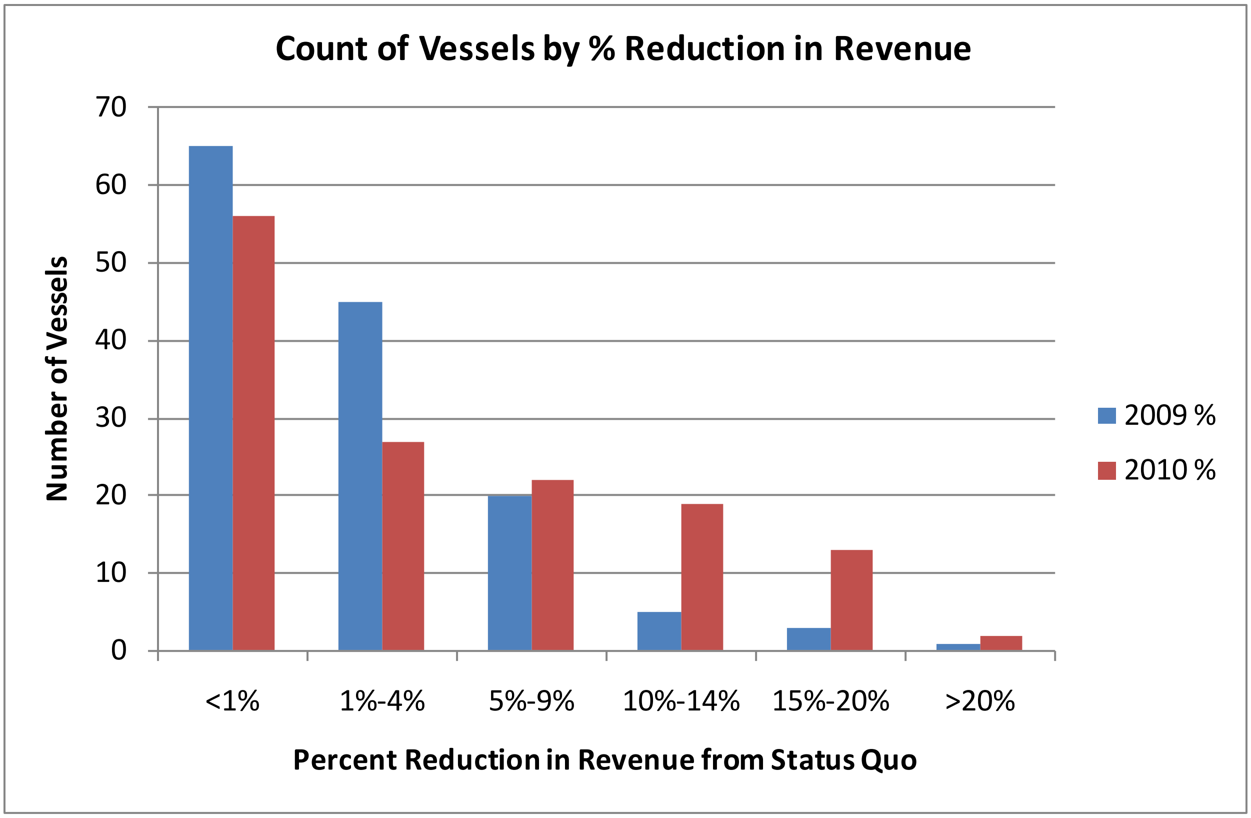


Figure 4-1: Count of Limited Entry Trawl Vessels by Percent Reduction in Ex-vessel Revenue Under Alternative P2

4.1.1.2.2.2 Effects of Petrale Sole Reductions to West Coast Communities

The effect of these petrale sole reductions on west coast communities is estimated by simulating the Council's preliminary options for reducing petrale catches on individual vessels, and by tying those impacts to each vessels principal port. Principal port is defined as the port which a vessel makes the majority of its landings to in a given year. Based on this approach, Figure 4-2 and Table 4-2 were developed. From this information it is apparent that some communities may be affected to a greater degree than others. The ports of Astoria, Bellingham, Coos Bay, Eureka, Moss Landing, Newport, Princeton/Half Moon Bay, and San Francisco all see reductions that are greater than or equal to 6 percent.

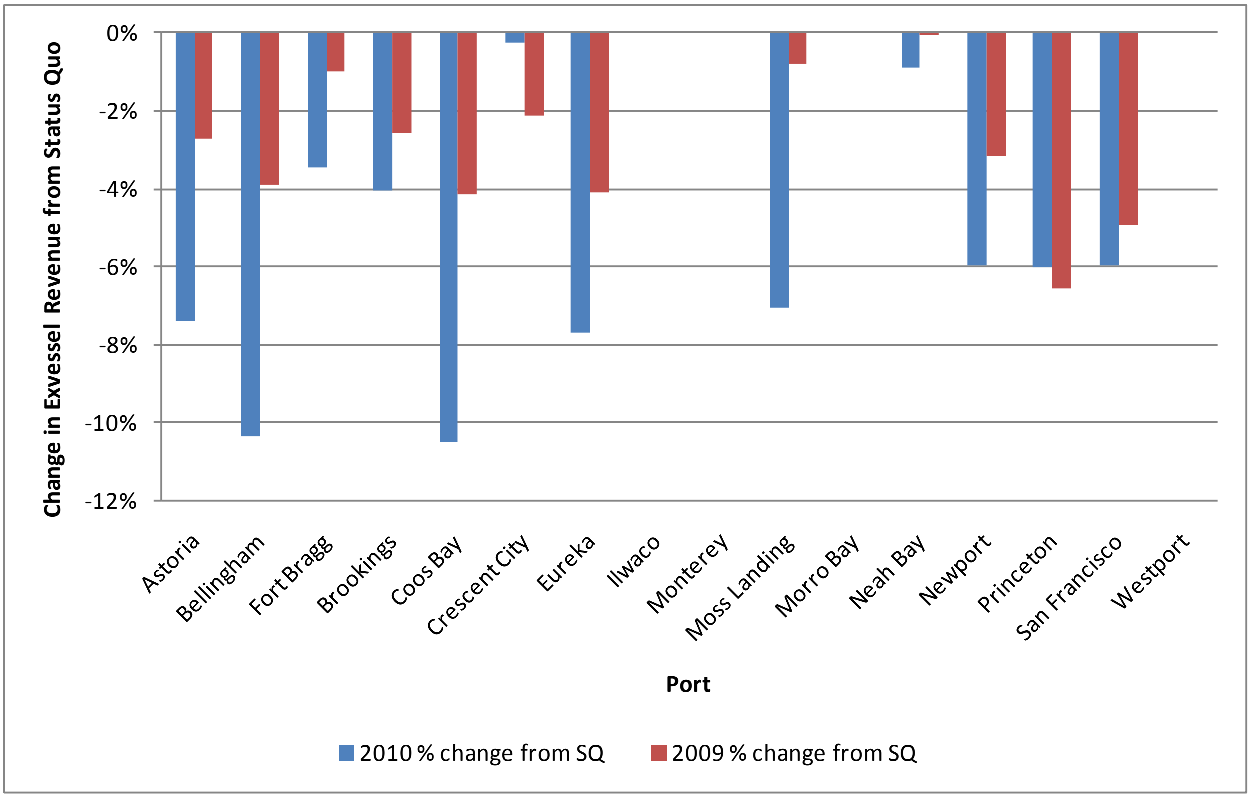


Figure 4-2: Change in Ex-vessel Revenue by Port

Table 4-2: Estimated Ex-vessel Revenue in the Limited Entry Non-Whiting Trawl Fishery by Port and Petrale Reductions for 2009 and 2010

	Alternative P1 – No Action[1/]	Alternative P2		2010 % change from SQ	2009 % change from SQ
	2009 Status Quo value	2009 Reduction	2010 Reduction		
Astoria	7,724,858	7,513,840	7,154,725	-7%	-3%
Bellingham	1,727,561	1,660,028	1,549,055	-10%	-4%
Fort Bragg	1,912,275	1,893,647	1,845,945	-3%	-1%
Brookings	1,783,032	1,737,319	1,710,638	-4%	-3%
Coos Bay	4,639,084	4,447,377	4,151,693	-11%	-4%
Crescent City	904,296	885,099	902,042	0%	-2%
Eureka	3,050,099	2,925,889	2,815,065	-8%	-4%
Ilwaco	-	-	-		
Monterey	C	C	C		
Moss Landing	513,353	509,292	477,255	-7%	-1%
Morro Bay	C	C	C		
Neah Bay	339,740	339,656	336,717	-1%	0%
Newport	3,313,028	3,208,242	3,115,855	-6%	-3%
Princeton	307,017	286,856	288,507	-6%	-7%
San Francisco	680,435	646,717	639,748	-6%	-5%
Westport	C	C	C		
Total	28,190,988	27,249,505	26,109,063	-7%	-3%

Note: "C" indicates data is withheld due to confidentiality. The results included in the "Total" row includes these data.

1/ The projected ex-vessel revenue under Alternative P1 – No Action shows slightly different impacts that those described in Table 7-52 in the January 2009 EIS (PFMC and NMFS 2009). These are due to the indirect effects of the updates in fishery information and catch projection models. See discussion in section 4.1.1.2.2.

4.1.1.2.3 Impacts to Other Groundfish Species

In addition to the routine addition of new fishery information, described in sections 4.1.1.1.2 and 4.1.1.1.3, alternative P2 further changes projected impacts to overfished species because of the associated reduction in fishing effort as a result of more restrictive management measures for petrale sole. Because the level of proposed catch reductions in 2009 and 2010 are different, associated impacts for each year are also different. The projected impacts to overfished species from the fishery under Alternative P2 for 2009 and for 2010 are listed below in Table 4-3.

Table 4-3: Projected Impacts to Rebuilding and Target Species in the Limited Entry Non-Whiting Trawl Fishery, Coastwide, Under Alternative P2

		Projected Impacts of Alternative P2 (mt)	
		2009	2010
	Canary Rockfish	22.2	22.1
	POP	95.0	77.3
Rebuilding Species	Darkblotched Rockfish	202.8	146.5

	Widow Rockfish	19.4	17.3
	Bocaccio	12.7	12.7
	Yelloweye Rockfish	0.6	0.6
	Cowcod	1.4	1.4
Target Species	Sablefish	3,246.1	3,237.2
	Longspine Thornyheads	1,006.5	1,005.6
	Shortspine Thornyheads	1,301.2	1,287.9
	Dover Sole	13,716.7	13,688.0
	Arrowtooth Flounder	3,976.0	3,818.5
	Petrale Sole	1,995.0	1,178.3
	Other Flatfish	2,353.6	2,312.9
	Slope Rockfish	273.7	263.5

4.1.2 Canary rockfish Alternatives

The Council expressed concerns that the new 2009 stock assessment update, that was adopted for use in management at their June 2009 meeting, is more pessimistic than the 2007 stock assessment. The 2007 stock assessment was the basis of the rebuilding analysis and rebuilding plan and establishment of the 2009-2010 harvest specifications. In June 2009 the Council preliminarily recommended that actions in 2010, to restrict fisheries that catch canary rockfish incidentally, should be considered. Stock status information in the 2009 canary rockfish stock assessment update will be used to generate a rebuilding analysis in August and September 2009. The results of the rebuilding analysis will be considered by the Council at their November 2009 meeting. The results of the rebuilding analysis will provide the Council more information on the effects of Alternatives C1, C2, and C3 on rebuilding parameters, including time to rebuild. Because the results of the rebuilding analysis are not known at this time, much of the analysis in this section is qualitative in nature, or uses only the existing rebuilding parameters run through the new 2009 stock assessment as a baseline for estimating impacts of each alternative.

During the 2009-2010 harvest specifications and management measure process, various OY alternatives were considered for canary rockfish, including 85 mt and 44 mt (PFMC and NMFS 2009). Unless otherwise noted, all of the information used in this EA is from the January 2009 EIS (PFMC and NMFS 2009).

4.1.2.1 Alternative C1/No Action

4.1.2.1.1 Impacts to canary rockfish

The 2010 canary rockfish OY of 105 mt is based in the base case model in the 2007 stock assessment and the associated rebuilding analysis. If catches in 2009 and 2010 are equivalent to the 2009 and 2010 OYs (105 mt), then, according to the 2009 stock assessment, the status of the stock at the beginning of 2011 will be at 25.2 percent depletion.

If no action is taken to respond to the new 2009 stock assessment update, and to reduce harvest specifications and management measures for canary rockfish in 2010, then the fishing mortality on the stock in 2010 will be similar to that described in the January 2009 EIS (PFMC and NMFS 2009) under the Council's final preferred alternative. However, in 2011 and beyond, once the 2009 stock assessment update is incorporated for use in management, retrospective impacts to canary rockfish from the 2010 fishery would be higher, because the new stock assessment estimates a smaller biomass. In addition to the impacts described in the January 2009 EIS, the routine addition of new fishery information slightly changed the projected impacts to canary rockfish under the no action alternative. These projected impacts are listed in Table 2-3. Even with the incorporation of new fishery information, routine management measures are available to keep projected impacts within the 2009-2010 rebuilding OY of 105 mt.

Under Alternative C1, no action is taken to change the 2010 canary rockfish OY. Under this alternative, the results of the canary rockfish stock assessment update will be used to develop the 2011 and 2012 harvest specifications only, and will not be used to take interim measures in 2010.

4.1.2.1.2 Socioeconomic Impacts

Socioeconomic impacts of the 2010 management measures that keep projected impacts of canary rockfish below the 2010 OY of 105 mt are described in Section 7.2.8 the January 2009 EIS (PFMC and NMFS 2009). In that EIS, the impacts of a canary rockfish OY of 105 mt are considered as part of rebuilding alternative 5b and as the Council Preferred Alternative.

The quantitative analysis of socioeconomic impacts for the Pacific coast groundfish fishery is done on the management measures that keep projected impacts below harvest specifications. In this EA, the discussion of socioeconomic impacts for the canary rockfish alternatives is solely qualitative. This is because this draft EA does not propose a specific suite of management measures associated with the canary rockfish action alternative OYs in C2 and C3. Therefore, the socioeconomic impacts of the action alternatives cannot be accurately quantified at this time, as the specific management measures have not been identified.

While we describe the types of management measures that could be used, and in which sectors of the groundfish fishery they could be implemented (Section 2.2.2) the Council will provide guidance on which management measures to implement, depending on the available harvest (or OY), at the November 2009 Council meeting. The Council will use the socioeconomic analysis presented in the January 2009 EIS to generate a preferred suite of management measures for each OY alternative. Once the management measures that would be associated with each of the alternatives has been outlined, the quantitative socioeconomic analysis will be presented as a supplement to this EA.

The action alternatives are evaluated qualitatively in this draft EA; therefore, the No Action alternative must also be characterized in a qualitative manner, to allow direct comparison between the No Action alternative and the action alternatives (C2 and C3). In order to be able to directly compare the two action alternatives to the No Action alternative, no changes to fishery information that indirectly affect the socioeconomic environment are incorporated in the socioeconomic analysis at this time.

We refer the readers to the economic analysis in Section 7.2.8 of the January 2009 EIS (PFMC and NMFS 2009). The January 2009 EIS analyzed how the estimates of ex-vessel revenue change under alternative 2009-2010 harvest specifications and management measures. The EIS also analyzed impacts on the recreational fishery. In that EIS, alternative 5a looks at the socioeconomic impacts of a rebuilding alternative that includes a canary rockfish OY of 85 mt and the associated management measures. This alternative in the EIS can provide us with an initial starting place for a qualitative comparison between the No Action alternative in this EA and alternatives C2 and C3. This will be the source for the qualitative discussion of the economic effects of the action alternatives.

4.1.2.1.3 Impacts to Other Groundfish Species

If no action is taken to reduce fishery impacts to canary in 2010, then the impacts to other resources would be very similar to those described in the January 2009 EIS (PFMC and NMFS 2009). However, impacts to overfished groundfish species are slightly different than those listed in the January 2009 EIS.

The January 2009 EIS used the best available information available at that time. Since the publication of that document, several updates have been made to bycatch projection models that result in slightly different biological impacts to overfished species than what were predicted in the January 2009 EIS. For more information on these updates, see section 4.1.1.1.3 of this EA. As a result of these updates, projected impacts to overfished species are slightly different under the No Action alternative than those described in the January 2009 EIS. These updated projected impacts for canary rockfish are listed in Table 2-3. Updated projected impacts for all other overfished species are listed below in Table 4-4.

Table 4-4: Projected mortality impacts (mt) of overfished groundfish species updated with most recent research estimates and fishery projections through June and Council Final Action from June 2009 Inseason Under Agenda Item E.9.

Fishery	Bocaccio b/	Canary	Cowcod	Dkbl	POP	Widow	Yelloweye
Limited Entry Trawl- Non-whiting	12.6	22.1	1.3	202.8	95.0	19.4	0.6
Limited Entry Trawl- Whiting							
At-sea whiting motherships a/		4.3		6.0	0.5	60.0	0.0
At-sea whiting cat-proc a/		6.1		8.5	0.5	85.0	0.0
Shoreside whiting a/		7.6		10.5	0.1	105.0	0.0
Tribal whiting		1.4		0.0	0.7	3.7	0.0
Tribal							
Midwater Trawl		3.6		0.0	0.0	40.0	0.0
Bottom Trawl		0.8		0.0	3.7	0.0	0.0
Troll		0.5		0.0	0.0		0.0
Fixed gear		0.3		0.0	0.0	0.0	2.3
Fixed Gear Sablefish	0.2	2.8	0.0	4.2	0.5	0.1	0.9
Fixed Gear Nearshore	0.3	3.3	0.0	0.0	0.0	0.3	1.2
Fixed Gear Other	5.0	0.0	0.0	9.0	0.0	0.7	0.0
Open Access: Incidental Groundfish	2.0	0.9	0.0	0.0	0.0	4.0	0.3
Recreational Groundfish e/							
WA		19.3					5.2
OR						1.0	
CA	67.3	21.3	0.1			6.2	2.8
EFPs	13.7	2.7	0.3	1.3	0.0	5.5	0.3
Research: Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs.							
	2.0	8.0	0.2	2.0	2.0	5.7	1.9
TOTAL	103.1	105.0	1.9	244.3	103.0	336.6	15.5
2009 OY f/	288	105	4.0	285	189	522	17
Difference	184.9	0.0	2.1	40.7	86.0	185.4	1.5

Percent of OY	35.8%	100.0%	47.5%	85.7%	54.5%	64.5%	91.2%
Key		= either not applicable; trace amount (<0.01 mt); or not reported in available data sources.					

a/ Non-tribal whiting values for canary, darkblotched, and widow reflect bycatch limits for the non-tribal whiting sectors. The widow bycatch limit is the difference between the OY and the projected impacts in all non-whiting fisheries. All other species' impacts are projected from the GMT's whiting impact projection model. The Council may elect to change these bycatch limits when setting final whiting management measures in March of 2009 or 2010 or under any inseason action at any of their future meetings.

b/ South of 40°10' N. lat.

c/ Mortality estimates are not hard numbers; based on the GMT's best professional judgment.

d/ Bycatch amounts by species unavailable, but bocaccio occurred in 0.1% of all port samples and other rockfish in another 0.1% of all port samples (and squid fisheries usually land their whole catch).

e/ Values in scorecard represent projected impacts for all species except canary and yelloweye rockfish, which are the prescribed harvest guidelines. For canary rockfish, the projected impacts from the WA/OR and CA recreational fisheries are the harvest guidelines minus 1.6 mt that were not projected to be harvested.

f/ 2009 and 2010 OYs are the same except for darkblotched (291 mt in 2010), POP (200 mt in 2010), and widow (509 mt in 2010).

4.1.2.2 Alternative C2

4.1.2.2.1 Impacts to Canary Rockfish

The Alternative C2 OY (2010 canary rockfish OY of 85 mt) is the same canary rockfish OY that was analyzed as a part of rebuilding alternative 5a in the January 2009 EIS (PFMC and NMFS 2009). The analysis in the January 2009 EIS was based on the 2007 canary rockfish stock assessment and rebuilding analysis, and the OY alternative of 85 mt was based on an SPR harvest rate of F96.2%. For additional information on the rationale for the canary rockfish OY of 85 mt based on the 2007 assessment, see the January 2009 EIS (PFMC and NMFS 2009), particularly Section 2.1.1.2.

In order to get a sense of the magnitude of the effects on the canary rockfish stock from a reduction in the 2010 OY from 105 to 85 mt, this reduction in the 2010 catch was run through the 2009 canary rockfish assessment model to see how the projection of potential 2011 OYs and depletion level might change if Alternative C2 is adopted. The stock assessment update presented at the June Council meeting predicted that using an SPR of 92.2% in 2011, which approximates the SPR for the harvest level in the 2009 and 2010 specifications, results in a 2011 coastwide canary rockfish OY of approximately 69 mt and a depletion level of 25.2% when 105 mt and 85 mt of canary rockfish are taken in 2009 and 2010, respectively (Stewart Pers. Comm.). It should be noted that the OY and depletion values generated by the base case stock assessment model do not account for uncertainty in the stock assessment like the rebuilding analysis will. Therefore, these point estimates are uncertain, with an unknown confidence interval, and are presented to facilitate comparison of alternatives in a qualitative manner.

4.1.2.2.2 Socioeconomic Impacts

As stated in section 4.1.2.1.2, the socioeconomic impacts of Alternative C2 will depend on the final suite of associated management measures that the Council will recommend in November 2009. Therefore the following discussion is qualitative in nature, and refers to the analysis in Section 7.2.8 of the January 2009 EIS (PFMC and NMFS 2009). In that EIS, alternative 5a looks at the socioeconomic impacts of a rebuilding alternative that includes a canary rockfish OY of 85 mt and the associated management measures, which may differ from what the Council selects in November. However, this alternative in the

EIS can provide us with an initial starting place for a qualitative comparison between alternatives C1 and C2 in this draft EA.

Table 4-5 shows how the change in the canary rockfish OY from 105 mt to 85 mt in 2010 could impact the overall level of ex-vessel revenue in the Pacific Coast groundfish fishery, coastwide. The reduction in revenue of approximately 8.54 percent would likely impact all of the sectors described in section 2.2.2. However, the suite of management measures that the Council recommends may change the distribution of the economic effects from status quo. Once the Council has adopted their preferred suite of management measures for each action alternative, the quantitative socioeconomic analysis will be completed. This analysis will describe the impact of the action alternatives on the ex-vessel revenue of each affected fishery sector.

Table 4-5 Percent Change in Total Ex-vessel Revenue of the Coastwide Groundfish Fishery Alternative Canary Rockfish OYs

	No Action	Action Alternatives		
Alternative in this EA:	Alternative C1 - 105 mt	Alternative C2 – 85 mt	Alternative C3 – 44 mt	
Alternative in the January 2009 EIS[1/]:	Final Council-Preferred Alternative	Rebuilding Alternative 5a	Rebuilding Alternative 2	Rebuilding Alternative 3
Total ex-vessel revenue ($ million)[2/]	105.42	96.42	94.32	81.32
Change in ex-vessel revenue from "No Action" (%)	**0**	**-08.54%**	**-10.53%**	**-22.86%**

1/ The EIS had two alternatives that included a canary rockfish OY of 44 mt: Rebuilding Alternatives 2 and 3. The differences between rebuilding alternatives 2 and 3 occur in the other overfished species OYs that were considered, and in the associated management measures. The ex-vessel revenue under each of these EIS alternatives is incorporated for informational purposes.

2/ The dollar amounts of ex-vessel revenue listed in this table are incorporated from Tables 7-50a and b in the January 2009 EIS (PFMC and NMFS 2009). The actual dollar amounts associated with the alternatives in this EA may be different than those from the EIS due to the indirect effects of incorporating routine fishery information to catch projection models since publication of the EIS. A quantitative analysis and description of changes to dollar amounts associated with these alternatives will occur in a supplemental to this EA, once the preliminary management measures are determined.

4.1.2.2.3 Impacts to Other Groundfish Species

Canary rockfish are a shelf species that co-occur with many healthy target species and are encountered in almost every sector of the groundfish fishery, coastwide. If the coastwide OY is reduced to 85 mt in

2010, it would reduce access to healthy stocks to a level lower than those considered in this EA under the No Action Alternative (C1).

As canary rockfish are distributed most heavily in the north (north being north of 38 degrees north latitude), we assume that measures taken to reduce canary impacts will be principally targeted toward portions of each fishery that operates in this northern area. In general we expect that achieving reductions in canary rockfish catch will be achieved by restricting the following fisheries: LE non-whiting trawl; LE whiting trawl; Northern California, Oregon, and Washington recreational groundfish; and nearshore commercial groundfish.

While the actual impacts of the action alternatives for canary rockfish (Alternatives C2 and C3) cannot be quantified without further Council specificity on how to keep projected impacts below those OYs, we can discuss the effect of the types of management measures that will be necessary to arrive at these numbers and the subsequent effect these management measures will have on other affected species.

As management measures affecting shelf opportunities become more restrictive, fishing effort may shift offshore, where fishing opportunities are unchanged via this action, due to lower canary rockfish abundance offshore. Effort shifts from the shelf to the slope could increase impacts of fisheries on all slope species, including overfished slope species such as darkblotched and Pacific Ocean perch (POP). Effort shifts will increase as the canary rockfish OY decreases, due to the restrictive management measures that will be associated with keeping projected impacts within lower OYs.

4.1.2.3 Alternative C3

4.1.2.3.1 Impacts to Canary Rockfish

The Alternative C3 OY (2010 canary rockfish OY of 44 mt) is the same canary rockfish OY that was analyzed as a part of rebuilding alternatives 2 and 3 in the January 2009 EIS (PFMC and NMFS 2009). The 44 mt OY was the No Action alternative OY for canary rockfish and had an associated SPR harvest rate of F93.6% in the rebuilding analysis that was based on the 2007 stock assessment. For additional information on the rationale for the canary rockfish OY of 44 mt, based on the 2007 assessment, see the January 2009 EIS (PFMC and NMFS 2009), particularly Section 2.1.1.2.

In order to get a sense of the magnitude of the effects on the canary rockfish stock from a reduction in the 2010 OY from 105 to 44 mt, this reduction in the 2010 catch was run through the 2009 canary rockfish assessment model to see how the projection of potential 2011 OYs and stock depletion might change if Alternative C3 is adopted. The stock assessment update presented at the June Council meeting predicted that using an SPR of 92.2% in 2011, which approximates the SPR for the harvest level in the 2009 and 2010 specifications, results in a 2011 coastwide canary rockfish OY of approximately 70 mt and a depletion level of 25.3% when 105 mt and 44 mt of canary rockfish are taken in 2009 and 2010, respectively (Stewart Pers. Comm.). It should be noted that the OY and depletion values generated by the base case stock assessment model do not account for uncertainty in the stock assessment like the rebuilding analysis will. Therefore, these point estimates are uncertain, with an unknown confidence interval, and are presented to facilitate comparison of alternatives in a qualitative manner.

4.1.2.3.2 Socioeconomic Impacts

As stated in section 4.1.2.1.2, the socioeconomic impacts of Alternative C3 will depend on the final suite of associated management measures that the Council will recommend in November 2009. Therefore the following discussion is qualitative in nature, and refers to the analysis in Section 7.2.8 of the January 2009 EIS (PFMC and NMFS 2009). In that EIS, rebuilding alternatives 2 and 3 look at the socioeconomic impacts of rebuilding alternatives that includes a canary rockfish OY of 44 mt and associated management measures. These alternatives in the EIS can provide us with an initial starting place for a qualitative comparison between alternatives C1 and C3 in this draft EA.

Table 4-5 shows how the change in the canary rockfish OY from 105 mt to 44 mt in 2010 could impact the overall level of ex-vessel revenue in the Pacific Coast groundfish fishery, coastwide. The reduction in revenue described in Table 4-5 range from 11 percent to 23 percent pending on the rebuilding alternative. This alternative would likely impact all of the sectors described in section 2.2.2, but to a larger degree than under alternative C2. The suite of management measures that the Council recommends may change the distribution of the economic effects from what occurs under status quo. Once the Council has adopted their preferred suite of management measures for each action alternative, the quantitative socioeconomic analysis will be completed. This analysis will describe the impact of the action alternatives on the ex-vessel revenue of each affected fishery sector.

4.1.2.3.3 Impacts to Other Groundfish Species

Canary rockfish are a shelf species that co-occur with many healthy target species and are encountered in almost every sector of the groundfish fishery, coastwide. If the coastwide OY is reduced to 44 mt in 2010, it would reduce access to healthy stocks to a level lower than those considered in this EA under both the No Action Alternative (C1) and Alternative C2. See section 4.1.2.2.3 for more information.

5 Chapter 5 Cumulative Effects

Generally speaking, the proposed action alternatives would restrict fishing activities that take petrale sole and canary rockfish, and therefore may reduce fishing effort in some areas of the coast.

Alternative P2 would reduce fishing opportunities for petrale sole. With the reduction in fishing opportunities, a corresponding reduction in fishing effort is expected. This is because it is unlikely that effort previously targeting on petrale sole will be displaced from the area seaward of the trawl rockfish conservation area (RCA) to the area shoreward of the trawl RCA because target opportunities in the area shoreward of the RCA are very limited in winter months. Reduced trawl fishing effort could have positive impacts on habitat, and would reduce the likelihood of impacts to ESA-listed species or marine mammals that could be encountered in the limited entry trawl fishery off Washington, Oregon, and California.

Alternatives C2 and C3 would likely reduce fishing opportunities in several sectors of the groundfish fishery. Depending on how the management measures are designed, there may be a reduction in overall fishing effort in these sectors, or there may be effort shifts to areas of the coast or to depths where canary rockfish are less abundant. A decrease in fishing effort may reduce negative impacts to EFH from both commercial and recreational groundfish fishing activities off West Coast states. Shifts in fishing effort to different areas in order to reduce incidental catch of canary rockfish could have a differing effect on the ecosystem from the no action alternative; however, those differences are not quantifiable.

If the Council chooses an action alternative for both petrale sole and for canary rockfish, these actions are not completely independent of each other. This is because petrale sole is caught primarily in the limited entry non-whiting trawl fishery, and this sector of the fishery also has impacts on canary rockfish. If Alternative P2 is adopted, projected impacts to canary rockfish in the limited entry non-whiting trawl fishery are reduced by 0.1 mt from the No Action Alternatives (P1 and C1). Qualitatively, if the canary rockfish OY is reduced in 2010 from 105 mt, effort could shift to the area seaward of the trawl RCA. Petrale sole are primarily caught seaward of the RCA. If, in combination with one of the canary rockfish action alternatives, Alternative P2 is adopted, then there will be less petrale sole available for harvest for those vessels displaced by restrictive management measures in the area seaward of the trawl RCA.

It should be noted that the scale of the proposed action in this EA is smaller than the January 2009 EIS (PFMC and NMFS 2009) due to the change in focus from setting specifications and management measures for all species in the FMP to setting specifications and management measures as they pertain particularly to canary rockfish and petrale sole. This, combined with the fact that the action alternatives all reduce available harvest from the No Action alternative, means that the cumulative effects of this action are within or below those estimated in the January 2009 EIS (PFMC and NMFS 2009)

6 Chapter 6 List of Preparers

Name	Affiliation	Participation
Ms. Gretchen Arentzen	NMFS, Northwest Region	Principal author
Mr. Merrick Burden	PFMC Staff	Contributing author, Chapter 4
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Mr. Kevin Duffy	NMFS, Northwest Region	Principal reviewer
Ms. Shelby L. Mendez	NOAA NEPA Coordinator	Principal reviewer
Dr. Ian Stewart	NMFS Northwest Fisheries Science Center	Principal author of the canary rockfish stock assessment and rebuilding analysis

7 Chapter 7 Acronyms and Glossary

Acronym	Definition
ABC	Acceptable biological catch. The ABC is a scientific calculation of the sustainable harvest level of a fishery and is used to set the upper limit of the annual total allowable catch. It is calculated by applying the directly-estimated (or proxy) harvest rate that produces maximum sustainable yield to the estimated exploitable stock biomass (the portion of the fish population that can be harvested).
B_{MSY}	The biomass that allows maximum sustainable yield to be taken.
$B_{unfished}$	Estimated unfished biomass
EA	Environmental Assessment
EFH	Essential Fish Habitat
EFP	Exempted Fishing Permit
EIS	Environmental Impact Statement
FMP	Fishery Management Plan
FR	*Federal Register*
GMT	Groundfish Management Team
IPHC	International Pacific Halibut Commission
lb	Pounds
LE	Limited entry fishery
PFMC	Pacific Fishery Management Council
mt	metric tons
NMFS	National Marine Fisheries Service
NOAA	National Oceanic & Atmospheric Administration; The parent agency of National Marine Fisheries Service
OA	Open access fishery

OY	Optimum Yield
POP	Pacific Ocean perch
RCA	Rockfish Conservation Area
SAFE	Stock Assessment and Fishery Evaluation
SPR	Spawning biomass per recruit
STAR Panel	Stock Assessment Review Panel. A panel set up to review stock assessments for particular fisheries. In the past there have been STAR panels for sablefish, rockfish, squid, and other species
Status quo	Same as the “No Action” alternative
SSC	Scientific and Statistical Committee

8 Chapter 8 Literature Cited

PFMC (Pacific Fishery Management Council) and NMFS (National Marine Fisheries Service). 2009. Proposed Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for the 2009-2010 Pacific Coast Groundfish Fishery Final Environmental Impact Statement Including Regulatory Impact Review and Initial Regulatory Flexibility Analysis. Pacific Fishery Management Council, Portland, OR. January 2009.

Proposed Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for the 2007-2008 Pacific Coast Groundfish Fishery, and Amendment 16-4: Rebuilding Plans For Seven Depleted Pacific Coast Groundfish Species; Final Environmental Impact Statement Including Regulatory Impact Review and Initial Regulatory Flexibility Analysis. Pacific Fishery Management Council, Portland, OR. October 2006.

Cook, R., X. He, J. Maguire, T. Tsou. 2009. Stock Assessment Review (STAR) Panel Report on Petrale Sole, as presented at the Pacific Fishery Management Council June 2009 meeting. Agenda Item E.6.a, Attachment 2. June 2009.

Stewart, Dr. Ian. Northwest Fisheries Science Center. Personal Communication. July 20, 2009.

9 Appendix A - No Action Trip Limit Tables

Trip limit tables (Tables 3 (North), 3 (South), 4 (North), 4 (South), 5 (North), and 5 (South), as updated in the July 6, 2009 inseason action rule (74 FR31874), are provided here for reference.

Table 3 (North) to Part 660, Subpart G -- 2009-2010 Trip Limits for Limited Entry Trawl Gear North of 40°10' N. Lat.

Other Limits and Requirements Apply -- Read § 660.301 - § 660.399 before using this table

061509

TABLE 3 (North)

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area (RCA)[6/]:						
1	North of 48°10' N. lat.	shore - modified[7/] 200 fm line[6/]	shore - 200 fm line[6/]	shore - 150 fm line[6/]		shore - 200 fm line[6/]	shore - modified[7/] 200 fm line[6/]
2	48°10' N. lat. - 45°46' N. lat.	75 fm line[6/] - modified[7/] 200 fm line[6/]	75 fm line[6/] - 200 fm line[6/]	75 fm line[6/] - 150 fm line[6/]	100 fm line[6/] - 150 fm line[6/]	75 fm line[6/] - 200 fm line[6/]	75 fm line[6/] - modified[7/] 200 fm line[6/]
3	45°46' N. lat. - 40°10' N. lat.			75 fm line[6/] - 200 fm line[6/]	100 fm line[6/] - 200 fm line[6/]		

Selective flatfish trawl gear is required shoreward of the RCA; all trawl gear (large footrope, selective flatfish trawl, and small footrope trawl gear) is permitted seaward of the RCA. Large footrope and small footrope trawl gears (except for selective flatfish trawl gear) are prohibited shoreward of the RCA. Midwater trawl gear is permitted only for vessels participating in the primary whiting season.

See § 660.370 and § 660.381 for Additional Gear, Trip Limit, and Conservation Area Requirements and Restrictions. See §§ 660.390-660.394 and §§ 660.396-660.399 for Conservation Area Descriptions and Coordinates (including RCAs, YRCA, CCAs, Farallon Islands, Cordell Banks, and EFHCAs).

State trip limits and seasons may be more restrictive than federal trip limits, particularly in waters off Oregon and California.

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
4	**Minor slope rockfish[2/] & Darkblotched rockfish**	1,500 lb/ 2 months					
5	**Pacific ocean perch**	1,500 lb/ 2 months					
6	**DTS complex**						
7	Sablefish						
8	large & small footrope gear	18,000 lb/ 2 months		22,000 lb/ 2 months	24,000 lb/ 2 months		20,000 lb/ 2 months
9	selective flatfish trawl gear	5,000 lb/ 2 months	7,500 lb/ 2months		11,000 lb/ 2 months		
10	multiple bottom trawl gear[8/]	5,000 lb/ 2 months	7,500 lb/ 2months		11,000 lb/ 2 months		
11	Longspine thornyhead						
12	large & small footrope gear	22,000 lb/ 2 months					
13	selective flatfish trawl gear	3,000 lb/ 2 months	5,000 lb/ 2 months				3,000 lb/ 2 months
14	multiple bottom trawl gear[8/]	3,000 lb/ 2 months	5,000 lb/ 2 months				3,000 lb/ 2 months
15	Shortspine thornyhead						
16	large & small footrope gear	17,000 lb/2 months					
17	selective flatfish trawl gear	3,000 lb/ 2 months					
18	multiple bottom trawl gear[8/]	3,000 lb/ 2 months					
19	Dover sole						
20	large & small footrope gear	110,000 lb/ 2 months					
21	selective flatfish trawl gear	40,000 lb/ 2 months	45,000 lb/ 2 months				40,000 lb/ 2 months
22	multiple bottom trawl gear[8/]	40,000 lb/ 2 months	45,000 lb/ 2 months				40,000 lb/ 2 months

Table 3 (North). Continued

23	**Whiting**						
24	midwater trawl	Before the primary whiting season: CLOSED. -- During the primary season: mid-water trawl permitted in the RCA. See §660.373 for season and trip limit details. -- After the primary whiting season: CLOSED.					
25	large & small footrope gear	Before the primary whiting season: 20,000 lb/trip. -- During the primary season: 10,000 lb/trip. -- After the primary whiting season: 10,000 lb/trip.					
26	**Flatfish** (except Dover sole)						
27	Arrowtooth flounder						
28	large & small footrope gear	150,000 lb/ 2 months					
29	selective flatfish trawl gear	90,000 lb/ 2 months					
30	multiple bottom trawl gear [8/]	90,000 lb/ 2 months					
31	Other flatfish [3/], English sole, starry flounder, & Petrale sole						
32	large & small footrope gear for Other flatfish[3/], English sole, & starry flounder	110,000 lb/ 2 months	110,000 lb/ 2 months, no more than 25,000 lb/ 2 months of which may be petrale sole.	110,000 lb/ 2 months, no more than 30,000 lb/ 2 months of which may be petrale sole.		110,000 lb/ 2 months, no more than 5,000 lb/ 2 months of which may be petrale sole.	110,000 lb/ 2 months
33	large & small footrope gear for Petrale sole	25,000 lb/ 2 months					40,000 lb/ 2 months
34	selective flatfish trawl gear for Other flatfish[3/], English sole, & starry flounder	90,000 lb/ 2 months, no more than 16,000 lb/ 2 months of which may be petrale sole.	90,000 lb/ 2 months, no more than 18,000 lb/ 2 months of which may be petrale sole.			90,000 lb/ 2 months, no more than 5,000 lb/ 2 months of which may be petrale sole.	90,000 lb/ 2 months, no more than 16,000 lb/ 2 months of which may be petrale sole.
35	selective flatfish trawl gear for Petrale sole						
36	multiple bottom trawl gear [8/]	90,000 lb/ 2 months, no more than 16,000 lb/ 2 months of which may be petrale sole.	90,000 lb/ 2 months, no more than 18,000 lb/ 2 months of which may be petrale sole.			90,000 lb/ 2 months, no more than 5,000 lb/ 2 months of which may be petrale sole.	90,000 lb/ 2 months, no more than 16,000 lb/ 2 months of which may be petrale sole.
37	**Minor shelf rockfish[1/], Shortbelly, Widow & Yelloweye rockfish**						
38	midwater trawl for Widow rockfish	Before the primary whiting season: CLOSED. -- During primary whiting season: In trips of at least 10,000 lb of whiting, combined widow and yellowtail limit of 500 lb/ trip, cumulative widow limit of 1,500 lb/ month. Mid-water trawl permitted in the RCA. See §660.373 for primary whiting season and trip limit details. -- After the primary whiting season: CLOSED.					
39	large & small footrope gear	300 lb/ 2 months					
40	selective flatfish trawl gear	300 lb/ month		1,000 lb/ month, no more than 200 lb/ month of which may be yelloweye rockfish			300 lb/ month
41	multiple bottom trawl gear [8/]	300 lb/ month		300 lb/ 2 months, no more than 200 lb/ month of which may be yelloweye rockfish			300 lb/ month

TABLE 3 (North) con't

Table 3 (North). Continued

#							
42	**Canary rockfish**						
43	large & small footrope gear	CLOSED					
44	selective flatfish trawl gear	100 lb/ month		300 lb/ month		100 lb/ month	
45	multiple bottom trawl gear 8/	CLOSED					
46	**Yellowtail**						
47	midwater trawl	Before the primary whiting season: CLOSED. -- During primary whiting season: In trips of at least 10,000 lb of whiting: combined widow and yellowtail limit of 500 lb/ trip, cumulative yellowtail limit of 2,000 lb/ month. Mid-water trawl permitted in the RCA. See §660.373 for primary whiting season and trip limit details. -- After the primary whiting season: CLOSED.					
48	large & small footrope gear	300 lb/ 2 months					
49	selective flatfish trawl gear	2,000 lb/ 2 months					
50	multiple bottom trawl gear 8/	300 lb/ 2 months					
51	**Minor nearshore rockfish & Black rockfish**						
52	large & small footrope gear	CLOSED					
53	selective flatfish trawl gear	300 lb/ month					
54	multiple bottom trawl gear 8/	CLOSED					
55	**Lingcod** 4/						
56	large & small footrope gear			4,000 lb/ 2 months			
57	selective flatfish trawl gear	1,200 lb/ 2 months		1,200 lb/2 months			
58	multiple bottom trawl gear 8/						
59	**Pacific cod**	30,000 lb/ 2 months		70,000 lb/ 2 months			30,000 lb/ 2 months
60	**Spiny dogfish**	200,000 lb/ 2 months		150,000 lb/ 2 months	100,000 lb/ 2 months		
61	**Other Fish** 5/	Not limited					

TABLE 3 (North) con't

1/ Bocaccio, chilipepper and cowcod are included in the trip limits for minor shelf rockfish.
2/ Splitnose rockfish is included in the trip limits for minor slope rockfish.
3/ "Other flatfish" are defined at § 660.302 and include butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, and sand sole.
4/ The minimum size limit for lingcod is 22 inches (56 cm) total length North of 42^{o} N. lat.
5/ "Other fish" are defined at § 660.302 and include sharks, skates (including longnose skate), ratfish, morids, grenadiers, and kelp greenling. Cabezon is included in the trip limits for "other fish."
6/ The Rockfish Conservation Area is an area closed to fishing by particulary gear types, bounded by lines specifically defined by latitude and longitude coordinates set out at §§ 660.391-660.394. This RCA is not defined by depth contours, and the boundary lines that define the RCA may close areas that are deeper or shallower than the depth contour. Vessels that are subject to the RCA restrictions may not fish in the RCA, or operate in the RCA for any purpose other than transiting.
7/ The "modified" fathom lines are modified to exclude certain petrale sole areas from the RCA.
8/ If a vessel has both selective flatfish gear and large or small footrope gear on board during a cumulative limit period (either simultaneously or successively), the most restrictive cumulative limit for any gear on board during the cumulative limit period applies for the entire cumulative limit period.

To convert pounds to kilograms, divide by 2.20462, the number of pounds in one kilogram.

Table 3 (South) to Part 660, Subpart G -- 2009-2010 Trip Limits for Limited Entry Trawl Gear South of 40°10' N. Lat.

Other Limits and Requirements Apply -- Read § 660.301 - § 660.399 before using this table

061509

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area (RCA)[6/]:						
1	South of 40°10' N. lat.	100 fm line[6/] - 150 fm line[6/ 7/]					
	All trawl gear (large footrope, selective flatfish trawl, midwater trawl, and small footrope trawl gear) is permitted seaward of the RCA. Large footrope trawl gear and midwater trawl gear are prohibited shoreward of the RCA.						
	See § 660.370 and § 660.381 for Additional Gear, Trip Limit, and Conservation Area Requirements and Restrictions. See §§ 660.390-660.394 and §§ 660.396-660.399 for Conservation Area Descriptions and Coordinates (including RCAs, YRCA, CCAs, Farallon Islands, Cordell Banks, and EFHCAs).						
	State trip limits and seasons may be more restrictive than federal trip limits, particularly in waters off Oregon and California.						
2	**Minor slope rockfish[2/] & Darkblotched rockfish**						
3	40°10' - 38° N. lat.	15,000 lb/ 2 months			10,000 lb/ 2 months		15,000 lb/ 2 months
4	South of 38° N. lat.	55,000 lb/ 2 months					
5	**Splitnose**						
6	40°10' - 38° N. lat.	15,000 lb/ 2 months			10,000 lb/ 2 months		15,000 lb/ 2 months
7	South of 38° N. lat.	55,000 lb/ 2 months					
8	**DTS complex**						
9	Sablefish	20,000 lb/ 2 months					
10	Longspine thornyhead	22,000 lb/ 2 months					
11	Shortspine thornyhead	17,000 lb/ 2 months					
12	Dover sole	110,000 lb/ 2 months					
13	**Flatfish** (except Dover sole)						
14	Other flatfish[3/], English sole, & starry flounder	110,000 lb/ 2 months	110,000 lb/ 2 months, no more than 30,000 lb/ 2 months of which may be petrale sole.			110,000 lb/ 2 months, no more than 5,000 lb/ 2 months of which may be petrale sole.	110,000 lb/ 2 months
15	Petrale sole	50,000 lb/ 2 months					50,000 lb/ 2 months
16	Arrowtooth flounder	10,000 lb/ 2 months					
17	**Whiting**						
18	midwater trawl	Before the primary whiting season: CLOSED. -- During the primary season: mid-water trawl permitted in the RCA. See §660.373 for season and trip limit details. -- After the primary whiting season: CLOSED.					
19	large & small footrope gear	Before the primary whiting season: 20,000 lb/trip. -- During the primary season: 10,000 lb/trip. -- After the primary whiting season: 10,000 lb/trip.					

TABLE 3 (South)

Table 3 (South). Continued

20	**Minor shelf rockfish[1/], Chilipepper, Shortbelly, Widow, & Yelloweye rockfish**					
21	large footrope or midwater trawl for Minor shelf rockfish & Shortbelly	300 lb/ month				
22	large footrope or midwater trawl for Chilipepper	5,000 lb/ 2 months		12,000 lb/ 2 months		
23	large footrope or midwater trawl for Widow & Yelloweye	CLOSED				
24	small footrope trawl for Minor Shelf, Shortbelly, Widow & Yelloweye	300 lb/ month				
25	small footrope trawl for Chilipepper	5,000 lb/ 2 months		12,000 lb/ 2 months		
26	**Bocaccio**					
27	large footrope or midwater trawl	300 lb/ 2 months				
28	small footrope trawl	CLOSED				
29	**Canary rockfish**					
30	large footrope or midwater trawl	CLOSED				
31	small footrope trawl	100 lb/ month	300 lb/ month		100 lb/ month	
32	**Cowcod**	CLOSED				
33	**Bronzespotted rockfish**	CLOSED				
34	**Minor nearshore rockfish & Black rockfish**					
35	large footrope or midwater trawl	CLOSED				
36	small footrope trawl	300 lb/ month				
37	**Lingcod[4/]**					
38	large footrope or midwater trawl	1,200 lb/ 2 months	4,000 lb/ 2 months			
39	small footrope trawl		1,200 lb/ 2 months			
40	**Pacific cod**	30,000 lb/ 2 months	70,000 lb/ 2 months			30,000 lb/ 2 months
41	**Spiny dogfish**	200,000 lb/ 2 months	150,000 lb/ 2 months	100,000 lb/ 2 months		
42	**Other Fish[5/] & Cabezon**	Not limited				

TABLE 3 (South) con't

1/ Yellowtail is included in the trip limits for minor shelf rockfish. Bronzespotted rockfish have a species specific trip limit.
2/ POP is included in the trip limits for minor slope rockfish
3/ "Other flatfish" are defined at § 660.302 and include butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, and sand sole.
4/ The minimum size limit for lingcod is 24 inches (61 cm) total length South of 42° N. lat.
5/ Other fish are defined at § 660.302 and include sharks, skates (including longnose skate), ratfish, morids, grenadiers, and kelp greenling.
6/ The Rockfish Conservation Area is an area closed to fishing by particulary gear types, bounded by lines specifically defined by latitude and longitude coordinates set out at §§ 660.391-660.394. This RCA is not defined by depth contours, and the boundary lines that define the RCA may close areas that are deeper or shallower than the depth contour. Vessels that are subject to the RCA restrictions may not fish in the RCA, or operate in the RCA for any purpose other than transiting.
7/ South of 34°27' N. lat., the RCA is 100 fm line - 150 fm line along the mainland coast; shoreline - 150 fm line around islands.
To convert pounds to kilograms, divide by 2.20462, the number of pounds in one kilogram.

Table 4 (North) to Part 660, Subpart G -- 2009-2010 Trip Limits for Limited Entry Fixed Gear North of 40°10' N. Lat.

Other Limits and Requirements Apply -- Read § 660.301 - § 660.399 before using this table 061509

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area (RCA)[6/]:						
1	North of 46°16' N. lat.	shoreline - 100 fm line[6/]					
2	46°16' N. lat. - 45°03.83' N. lat.	30 fm line[6/] - 100 fm line[6/]					
3	45°03.83' N. lat. - 43°00' N. lat.	30 fm line[6/] - 125 fm line [6/ 7/]					
4	43°00' N. lat. - 42°00' N. lat.	20 fm line[6/] - 100 fm line[6/]					
5	42°00' N. lat. - 40°10' N. lat.	20 fm depth contour - 100 fm line[6/]					
	See § 660.370 and § 660.382 for Additional Gear, Trip Limit, and Conservation Area Requirements and Restrictions.						
	State trip limits and seasons may be more restrictive than federal trip limits, particularly in waters off Oregon and California.						
6	**Minor slope rockfish [2/] & Darkblotched rockfish**	4,000 lb/ 2 months					
7	**Pacific ocean perch**	1,800 lb/ 2 months					
8	**Sablefish**	300 lb/ day, or 1 landing per week of up to 1,000 lb, not to exceed 5,000 lb/ 2 months		500 lb/ day, or 1 landing per week of up to 1,500 lb, not to exceed 5,500 lb/ 2 months	500 lb/ day, or 1 landing per week of up to 1,500 lb, not to exceed 6,000 lb/ 2 months		500 lb/ day, or 1 landing per week of up to 1,500 lb, not to exceed 5,500 lb/ 2 months
9	**Longspine thornyhead**	10,000 lb/ 2 months					
10	**Shortspine thornyhead**	2,000 lb/ 2 months					
11	**Dover sole**	5,000 lb/ month South of 42° N. lat., when fishing for "other flatfish," vessels using hook-and-line gear with no more than 12 hooks per line, using hooks no larger than "Number 2" hooks, which measure 11 mm (0.44 inches) point to shank, and up to two 1 lb (0.45 kg) weights per line are not subject to the RCAs.					
12	**Arrowtooth flounder**						
13	**Petrale sole**						
14	**English sole**						
15	**Starry flounder**						
16	**Other flatfish[1/]**						
17	**Whiting**	10,000 lb/ trip					
18	**Minor shelf rockfish[2/], Shortbelly, Widow, & Yellowtail rockfish**	200 lb/ month					
19	**Canary rockfish**	CLOSED					
20	**Yelloweye rockfish**	CLOSED					
21	**Minor nearshore rockfish & Black rockfish**						
22	North of 42° N. lat.	5,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black or blue rockfish [3/]					
23	42° - 40°10' N. lat.	6,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black or blue rockfish [3/]			7,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black rockfish [3/]		
24	**Lingcod[4/]**	CLOSED		800 lb/ 2 months			400 lb/ month; CLOSED
25	**Pacific cod**	1,000 lb/ 2 months					
26	**Spiny dogfish**	200,000 lb/ 2 months		150,000 lb/ 2 months	100,000 lb/ 2 months		
27	**Other fish[5/]**	Not limited					

TABLE 4 (North)

1/ "Other flatfish" are defined at § 660.302 and include butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, and sand sole.
2/ Bocaccio, chilipepper and cowcod are included in the trip limits for minor shelf rockfish and splitnose rockfish is included in the trip limits for minor slope rockfish.
3/ For black rockfish north of Cape Alava (48°09.50' N. lat.), and between Destruction Is. (47°40' N. lat.) and Leadbetter Pnt. (46°38.17' N. lat.), there is an additional limit of 100 lb or 30 percent by weight of all fish on board, whichever is greater, per vessel, per fishing trip.
4/ The minimum size limit for lingcod is 22 inches (56 cm) total length North of 42° N. lat. and 24 inches (61 cm) total length South of 42° N. lat.
5/ "Other fish" are defined at § 660.302 and include sharks, skates (including longnose skates), ratfish, morids, grenadiers, and kelp greenling. Cabezon is included in the trip limits for "other fish."
6/ The Rockfish Conservation Area is an area closed to fishing by particular gear types, bounded by lines specifically defined by latitude and longitude coordinates set out at §§ 660.391-660.394. This RCA is not defined by depth contours (with the exception of the 20-fm depth contour boundary south of 42° N. lat.), and the boundary lines that define the RCA may close areas that are deeper or shallower than the depth contour. Vessels that are subject to RCA restrictions may not fish in the RCA, or operate in the RCA for any purpose other than transiting.
7/ The 125 fm line restriction is in place all year, except on days when the directed halibut fishery is open. On those days the 100 fm line restriction is in effect.
To convert pounds to kilograms, divide by 2.20462, the number of pounds in one kilogram.

Table 4 (South) to Part 660, Subpart G -- 2009-2010 Trip Limits for Limited Entry Fixed Gear South of 40°10' N. Lat.

Other Limits and Requirements Apply -- Read § 660.301 - § 660.399 before using this table 061509

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area (RCA)[5/]:						
1	40°10' - 34°27' N. lat.	30 fm line[5/] - 150 fm line[5/]					
2	South of 34°27' N. lat.	60 fm line[5/] - 150 fm line[5/] (also applies around islands)					
	See § 660.370 and § 660.382 for Additional Gear, Trip Limit, and Conservation Area Requirements and Restrictions. See §§ 660.390-660.394 and §§ 660.396-660.399 for Conservation Area Descriptions and Coordinates (including RCAs, YRCA, CCAs, Farallon Islands, Cordell Banks, and EFHCAs).						
	State trip limits and seasons may be more restrictive than federal trip limits, particularly in waters off Oregon and California.						
3	**Minor slope rockfish[2/] & Darkblotched rockfish**	40,000 lb/ 2 months					
4	**Splitnose**	40,000 lb/ 2 months					
5	**Sablefish**						
6	40°10' - 36° N. lat.	300 lb/ day, or 1 landing per week of up to 1,000 lb, not to exceed 5,000 lb/ 2 months		500 lb/ day, or 1 landing per week of up to 1,500 lb, not to exceed 5,500 lb/ 2 months	500 lb/ day, or 1 landing per week of up to 1,500 lb, not to exceed 6,000 lb/ 2 months		500 lb/ day, or 1 landing per week of up to 1,500 lb, not to exceed 5,500 lb/ 2 months
7	South of 36° N. lat.	400 lb/ day, or 1 landing per week of up to 1,500 lb					
8	**Longspine thornyhead**	10,000 lb / 2 months					
9	**Shortspine thornyhead**						
10	40°10' - 34°27' N. lat.	2,000 lb/ 2 months					
11	South of 34°27' N. lat.	3,000 lb/ 2 months					
12	**Dover sole**	5,000 lb/ month South of 42° N. lat., when fishing for "other flatfish," vessels using hook-and-line gear with no more than 12 hooks per line, using hooks no larger than "Number 2" hooks, which measure 11 mm (0.44 inches) point to shank, and up to two 1 lb (0.45 kg) weights per line are not subject to the RCAs.					
13	**Arrowtooth flounder**						
14	**Petrale sole**						
15	**English sole**						
16	**Starry flounder**						
17	**Other flatfish[1/]**						
18	**Whiting**	10,000 lb/ trip					
19	**Minor shelf rockfish[2/], Shortbelly, Widow rockfish, and Bocaccio (including Chilipepper between 40°10' - 34°27' N. lat.)**						
20	40°10' - 34°27' N. lat.	Minor shelf rockfish, shortbelly, widow rockfish, bocaccio & chilipepper: 2,500 lb/ 2 months, of which no more than 500 lb/ 2 months may be any species other than chilipepper.					
21	South of 34°27' N. lat.	3,000 lb/ 2 months	CLOSED	3,000 lb/ 2 months			
22	**Chilipepper rockfish**						
23	40°10' - 34°27' N. lat.	Chilipepper included under minor shelf rockfish, shortbelly, widow and bocaccio limits - - See above					
24	South of 34°27' N. lat.	2,000 lb/ 2 months, this opportunity only available seaward of the nontrawl RCA					
25	**Canary rockfish**	CLOSED					
26	**Yelloweye rockfish**	CLOSED					
27	**Cowcod**	CLOSED					
28	**Bronzespotted rockfish**	CLOSED					
29	**Bocaccio**						
30	40°10' - 34°27' N. lat.	Bocaccio included under Minor shelf rockfish, shortbelly, widow & chilipepper limits -- See above					
31	South of 34°27' N. lat.	300 lb/ 2 months	CLOSED	300 lb/ 2 months			

TABLE 4 (South)

Table 4 (South). Continued

32	**Minor nearshore rockfish & Black rockfish**						
33	Shallow nearshore	600 lb/ 2 months	CLOSED	800 lb/ 2 months	900 lb/ 2 months	800 lb/ 2 months	600 lb/ 2 months
34	Deeper nearshore						
35	40°10' - 34°27' N. lat.	700 lb/ 2 months	CLOSED	700 lb/ 2 months		600 lb/ 2 months	700 lb/ 2 months
36	South of 34°27' N. lat.	500 lb/ 2 months		600 lb/ 2 months			
37	California scorpionfish	600 lb/ 2 months	CLOSED	600 lb/ 2 months	1,200 lb/ 2 months		
38	**Lingcod**[3/]	CLOSED		800 lb/ 2 months			400 lb/ month, CLOSED
39	**Pacific cod**	1,000 lb/ 2 months					
40	**Spiny dogfish**	200,000 lb/ 2 months		150,000 lb/ 2 months	100,000 lb/ 2 months		
41	**Other fish**[4/] **& Cabezon**	Not limited					

TABLE 4 (South)

1/ "Other flatfish" are defined at § 660.302 and include butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, and sand sole.

2/ POP is included in the trip limits for minor slope rockfish. Yellowtail is included in the trip limits for minor shelf rockfish. Bronzespotted rockfish have a species specific trip limit.

3/ The minimum size limit for lingcod is 24 inches (61 cm) total length South of 42° N. lat.

4/ "Other fish" are defined at § 660.302 and include sharks, skates (including longnose skates), ratfish, morids, grenadiers, and kelp greenling.

5/ The Rockfish Conservation Area is an area closed to fishing by particular gear types, bounded by lines specifically defined by latitude and longitude coordinates set out at §§ 660.391-660.394. This RCA is not defined by depth contours (with the exception of the 20-fm depth contour boundary south of 42° N. lat.), and the boundary lines that define the RCA may close areas that are deeper or shallower than the depth contour. Vessels that are subject to RCA restrictions may not fish in the RCA, or operate in the RCA for any purpose other than transiting.

To convert pounds to kilograms, divide by 2.20462, the number of pounds in one kilogram.

Table 5 (North) to Part 660, Subpart G -- 2009-2010 Trip Limits for Open Access Gears North of 40°10' N. Lat.

Other Limits and Requirements Apply -- Read § 660.301 - § 660.399 before using this table 061509

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area (RCA)[6/]:						
1	North of 46°16' N. lat.	shoreline - 100 fm line[6/]					
2	46°16' N. lat. - 45°03.83' N. lat.	30 fm line[6/] - 100 fm line[6/]					
3	45°03.83' N. lat. - 43°00' N. lat.	30 fm line[6/] - 125 fm line [6/ 7/]					
4	43°00' N. lat. - 42°00' N. lat.	20 fm line[6/] - 100 fm line[6/]					
5	42°00' N. lat. - 40°10' N. lat.	20 fm depth contour - 100 fm line[6/]					

See § 660.370 and § 660.383 for Additional Gear, Trip Limit, and Conservation Area Requirements and Restrictions. See §§ 660.390-660.394 and §§ 660.396-660.399 for Conservation Area Descriptions and Coordinates (including RCAs, YRCA, CCAs, Farallon Islands, Cordell Banks, and EFHCAs).

State trip limits and seasons may be more restrictive than federal trip limits, particularly in waters off Oregon and California.

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
6	**Minor slope rockfish[1/] & Darkblotched rockfish**	Per trip, no more than 25% of weight of the sablefish landed					
7	**Pacific ocean perch**	100 lb/ month					
8	**Sablefish**	300 lb/ day, or 1 landing per week of up to 800 lb, not to exceed 2,400 lb/ 2 months			300 lb/ day, or 1 landing per week of up to 950 lb, not to exceed 2,750 lb/ 2 months		
9	**Thornyheads**	CLOSED					
10	**Dover sole**	3,000 lb/month, no more than 300 lb of which may be species other than Pacific sanddabs. South of 42° N. lat., when fishing for "other flatfish," vessels using hook-and-line gear with no more than 12 hooks per line, using hooks no larger than "Number 2" hooks, which measure 11 mm (0.44 inches) point to shank, and up to two 1 lb (0.45 kg) weights per line are not subject to the RCAs.					
11	**Arrowtooth flounder**						
12	**Petrale sole**						
13	**English sole**						
14	**Starry flounder**						
15	**Other flatfish[2/]**						
16	**Whiting**	300 lb/ month					
17	**Minor shelf rockfish[1/], Shortbelly, Widow, & Yellowtail rockfish**	200 lb/ month					
18	**Canary rockfish**	CLOSED					
19	**Yelloweye rockfish**	CLOSED					
20	**Minor nearshore rockfish & Black rockfish**						
21	North of 42° N. lat.	5,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black or blue rockfish [3/]					
22	42° - 40°10' N. lat.	6,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black or blue rockfish [3/]			7,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black rockfish [3/]		
23	**Lingcod[4/]**	CLOSED		400 lb/ month			CLOSED
24	**Pacific cod**	1,000 lb/ 2 months					
25	**Spiny dogfish**	200,000 lb/ 2 months		150,000 lb/ 2 months	100,000 lb/ 2 months		
26	**Other Fish[5/]**	Not limited					

TABLE 5 (North)

Table 5 (North). Continued

27	**PINK SHRIMP NON-GROUNDFISH TRAWL** *(not subject to RCAs)*		TABLE 5 (North) con't
28	North	**Effective April 1 - October 31:** Groundfish: 500 lb/day, multiplied by the number of days of the trip, not to exceed 1,500 lb/trip. The following sublimits also apply and are counted toward the overall 500 lb/day and 1,500 lb/trip groundfish limits: lingcod 300 lb/month (minimum 24 inch size limit); sablefish 2,000 lb/month; canary, thornyheads and yelloweye rockfish are PROHIBITED. All other groundfish species taken are managed under the overall 500 lb/day and 1,500 lb/trip groundfish limits. Landings of these species count toward the per day and per trip groundfish limits and do not have species-specific limits. The amount of groundfish landed may not exceed the amount of pink shrimp landed.	
29	**SALMON TROLL**		
30	North	Salmon trollers may retain and land up to 1 lb of yellowtail rockfish for every 2 lbs of salmon landed, with a cumulative limit of 200 lb/month, both within and outside of the RCA. This limit is within the 200 lb per month combined limit for minor shelf rockfish, widow rockfish and yellowtail rockfish, and not in addition to that limit. Salmon trollers may retain and land up to 1 lingcod per 15 Chinook, plus 1 lingcod up to a trip limit of 10 lingcod, both within and outside of the RCA. This limit is within the 400 lb per month limit for lingcod, and not in addition to that limit. All groundfish species are subject to the open access limits, seasons, size limits and RCA restrictions listed in the table above.	

1/ Bocaccio, chilipepper and cowcod rockfishes are included in the trip limits for minor shelf rockfish. Splitnose rockfish is included in the trip limits for minor slope rockfish.

2/ "Other flatfish" are defined at § 660.302 and include butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, and sand sole.

3/ For black rockfish north of Cape Alava (48°09.50' N. lat.), and between Destruction Is. (47°40' N. lat.) and Leadbetter Pnt. (46°38.17' N. lat.), there is an additional limit of 100 lbs or 30 percent by weight of all fish on board, whichever is greater, per vessel, per fishing trip.

4/ The minimum size limit for lingcod is 22 inches (56 cm) total length North of 42^{o} N. lat. and 24 inches (61 cm) total length South of 42^{o} N. lat.

5/ "Other fish" are defined at § 660.302 and include sharks, skates (including longnose skates), ratfish, morids, grenadiers, and kelp greenling. Cabezon is included in the trip limits for "other fish."

6/ The Rockfish Conservation Area is an area closed to fishing by particular gear types, bounded by lines specifically defined by latitude and longitude coordinates set out at §§ 660.391-660.394. This RCA is not defined by depth contours (with the exception of the 20-fm depth contour boundary south of 42^{o} N. lat.), and the boundary lines that define the RCA may close areas that are deeper or shallower than the depth contour. Vessels that are subject to RCA restrictions may not fish in the RCA, or operate in the RCA for any purpose other than transiting.

7/ The 125 fm line restriction is in place all year, except on days when the directed halibut fishery is open. On those days the 100 fm line restriction is in effect.

To convert pounds to kilograms, divide by 2.20462, the number of pounds in one kilogram.

Table 5 (South) to Part 660, Subpart G -- 2009-2010 Trip Limits for Open Access Gears South of 40°10' N. Lat.

Other Limits and Requirements Apply -- Read § 660.301 - § 660.399 before using this table 061509

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area (RCA)[5/]:						
1	40°10' - 34°27' N. lat.	30 fm line[5/] - 150 fm line[5/]					
2	South of 34°27' N. lat.	60 fm line[5/] - 150 fm line[5/] (also applies around islands)					
	See § 660.370 and § 660.383 for Additional Gear, Trip Limit, and Conservation Area Requirements and Restrictions.						
	State trip limits and seasons may be more restrictive than federal trip limits, particularly in waters off Oregon and California.						
3	**Minor slope rockfish[1/] & Darkblotched rockfish**						
4	40°10' - 38° N. lat.	Per trip, no more than 25% of weight of the sablefish landed					
5	South of 38° N. lat.	10,000 lb/ 2 months					
6	**Splitnose**	200 lb/ month					
7	**Sablefish**						
8	40°10' - 36° N. lat.	300 lb/ day, or 1 landing per week of up to 800 lb, not to exceed 2,400 lb/ 2 months			300 lb/ day, or 1 landing per week of up to 950 lb, not to exceed 2,750 lb/ 2 months		
9	South of 36° N. lat.	400 lb/ day, or 1 landing per week of up to 1,500 lb, not to exceed 8,000 lb/ 2 months					
10	**Thornyheads**						
11	40°10' - 34°27' N. lat.	CLOSED					
12	South of 34°27' N. lat.	50 lb/ day, no more than 1,000 lb/ 2 months					
13	**Dover sole**	3,000 lb/month, no more than 300 lb of which may be species other than Pacific sanddabs. South of 42° N. lat., when fishing for "other flatfish," vessels using hook-and-line gear with no more than 12 hooks per line, using hooks no larger than "Number 2" hooks, which measure 11 mm (0.44 inches) point to shank, and up to two 1 lb (0.45 kg) weights per line are not subject to the RCAs.					
14	**Arrowtooth flounder**						
15	**Petrale sole**						
16	**English sole**						
17	**Starry flounder**						
18	**Other flatfish[2/]**						
19	**Whiting**	300 lb/ month					
20	**Minor shelf rockfish[1/], Shortbelly, Widow & Chilipepper rockfish**						
21	40°10' - 34°27' N. lat.	300 lb/ 2 months	CLOSED	200 lb/ 2 months		300 lb/ 2 months	
22	South of 34°27' N. lat.	750 lb/ 2 months	CLOSED	750 lb/ 2 months			
23	**Canary rockfish**	CLOSED					
24	**Yelloweye rockfish**	CLOSED					
25	**Cowcod**	CLOSED					
26	**Bronzespotted rockfish**	CLOSED					
27	**Bocaccio**						
28	40°10' - 34°27' N. lat.	200 lb/ 2 months	CLOSED	100 lb/ 2 months		200 lb/ 2 months	
29	South of 34°27' N. lat.	100 lb/ 2 months	CLOSED	100 lb/ 2 months			

TABLE 5 (South)

Table 5 (South). Continued

30	**Minor nearshore rockfish & Black rockfish**						
31	Shallow nearshore	600 lb/ 2 months	CLOSED	800 lb/ 2 months	900 lb/ 2 months	800 lb/ 2 months	600 lb/ 2 months
32	Deeper nearshore						
33	40°10' - 34°27' N. lat.	700 lb/ 2 months	CLOSED	700 lb/ 2 months		600 lb/ 2 months	700 lb/ 2 months
34	South of 34°27' N. lat.	500 lb/ 2 months		600 lb/ 2 months			
35	California scorpionfish	600 lb/ 2 months	CLOSED	600 lb/ 2 months	1,200 lb/ 2 months		
36	**Lingcod**[3/]	CLOSED		400 lb/ month			CLOSED
37	**Pacific cod**	1,000 lb/ 2 months					
38	**Spiny dogfish**	200,000 lb/ 2 months		150,000 lb/ 2 months	100,000 lb/ 2 months		
39	**Other Fish**[4/] **& Cabezon**	Not limited					
40	**RIDGEBACK PRAWN AND, SOUTH OF 38°57.50' N. LAT., CA HALIBUT AND SEA CUCUMBER NON-GROUNDFISH TRAWL**						
41	**NON-GROUNDFISH TRAWL Rockfish Conservation Area (RCA) for CA Halibut, Sea Cucumber & Ridgeback Prawn:**						
42	40°10' - 38° N. lat.	100 fm - modified 200 fm [6/]	100 fm - 150 fm				100 fm - modified 200 fm [6/]
43	38° - 34°27' N. lat.	100 fm - 150 fm					
44	South of 34°27' N. lat.	100 fm - 150 fm along the mainland coast; shoreline - 150 fm around islands					
45		Groundfish: 300 lb/trip. Trip limits in this table also apply and are counted toward the 300 lb groundfish per trip limit. The amount of groundfish landed may not exceed the amount of the target species landed, except that the amount of spiny dogfish landed may exceed the amount of target species landed. Spiny dogfish are limited by the 300 lb/trip overall groundfish limit. The daily trip limits for sablefish coastwide and thornyheads south of Pt. Conception and the overall groundfish "per trip" limit may not be multiplied by the number of days of the trip. Vessels participating in the California halibut fishery south of 38°57.50' N. lat. are allowed to (1) land up to 100 lb/day of groundfish without the ratio requirement, provided that at least one California halibut is landed and (2) land up to 3,000 lb/month of flatfish, no more than 300 lb of which may be species other than Pacific sanddabs, sand sole, starry flounder, rock sole, curlfin sole, or California scorpionfish (California scorpionfish is also subject to the trip limits and closures in line 31).					
46	**PINK SHRIMP NON-GROUNDFISH TRAWL GEAR** *(not subject to RCAs)*						
47	South	**Effective April 1 - October 31:** Groundfish: 500 lb/day, multiplied by the number of days of the trip, not to exceed 1,500 lb/trip. The following sublimits also apply and are counted toward the overall 500 lb/day and 1,500 lb/trip groundfish limits: lingcod 300 lb/ month (minimum 24 inch size limit); sablefish 2,000 lb/ month; canary, thornyheads and yelloweye rockfish are PROHIBITED. All other groundfish species taken are managed under the overall 500 lb/day and 1,500 lb/trip groundfish limits. Landings of these species count toward the per day and per trip groundfish limits and do not have species-specific limits. The amount of groundfish landed may not exceed the amount of pink shrimp landed.					

TABLE 5 (South) con't

1/ Yellowtail rockfish is included in the trip limits for minor shelf rockfish. POP is included in the trip limits for minor slope rockfish. Bronzespotted rockfish have a species specific trip limit.

2/ "Other flatfish" are defined at § 660.302 and include butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, and sand sole.

3/ The size limit for lingcod is 24 inches (61 cm) total length South of 42° N. lat.

4/ "Other fish" are defined at § 660.302 and include sharks, skates (including longnose skates), ratfish, morids, grenadiers, and kelp greenling.

5/ The Rockfish Conservation Area is an area closed to fishing by particular gear types, bounded by lines specifically defined by latitude and longitude coordinates set out at §§ 660.391-660.394. This RCA is not defined by depth contours (with the exception of the 20-fm depth contour boundary south of 42° N. lat.), and the boundary lines that define the RCA may close areas that are deeper or shallower than the depth contour. Vessels that are subject to RCA restrictions may not fish in the RCA, or operate in the RCA for any purpose other than transiting.

6/ The "modified 200 fm" line is modified to exclude certain petrale sole areas from the RCA.

To convert pounds to kilograms, divide by 2.20462, the number of pounds in one kilogram.

10 Appendix B - No Action Recreational Management Measures

Management measures for recreational fisheries under the No Action alternative are listed in Federal Regulations at 50 CFR 660.384 and are provided here.

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50 CFR § 660.384 Recreational fishery management measures.

(a) General. Federal recreational groundfish regulations are not intended to supersede any more restrictive state recreational groundfish regulations relating to federally-managed groundfish. The bag limits include fish taken in both state and Federal waters.

(b) Gear restrictions. The only types of fishing gear authorized for recreational fishing are hook-and-line and spear. Spears may be propelled by hand or by mechanical means. More fishery-specific gear restrictions may be required by state as noted in paragraph (c) of this section (e.g. California's recreational "other flatfish" fishery).

(c) State-specific recreational fishery management measures. Federal recreational groundfish regulations are not intended to supersede any more restrictive State recreational groundfish regulations relating to federally-managed groundfish. Off the coast of Washington, Oregon, and California, boat limits apply, whereby each fisher aboard a vessel may continue to use angling gear until the combined daily limits of groundfish for all licensed and juvenile anglers aboard has been attained (additional state restrictions on boat limits may apply).

(1) Washington. For each person engaged in recreational fishing off the coast of Washington, the groundfish bag limit is 15 groundfish per day, including rockfish and lingcod, and is open year-round (except for lingcod). In the Pacific halibut fisheries, retention of groundfish is governed in part by annual management measures for Pacific halibut fisheries, which are published in the Federal Register. South of Leadbetter Point, WA to the Washington/Oregon border, when Pacific halibut are onboard the vessel, no groundfish may be taken and retained, possessed or landed, except sablefish and Pacific cod. The following sub-limits and closed areas apply:

(i) Recreational Groundfish Conservation Areas off Washington.

(A) North Coast Recreational Yelloweye Rockfish Conservation Area. Recreational fishing for groundfish and halibut is prohibited within the North Coast Recreational Yelloweye Rockfish Conservation Area (YRCA).It is unlawful for recreational fishing vessels to take and retain, possess, or land groundfish taken with recreational gear within the North Coast Recreational YRCA.A vessel fishing in the North Coast Recreational YRCA may not be in possession of any groundfish. Recreational vessels may transit through the North Coast Recreational YRCA with or without groundfish on board. The North Coast Recreational YRCA is defined by latitude and longitude coordinates specified at §660.390.

(B) South Coast Recreational Yelloweye Rockfish Conservation Area. Recreational fishing for groundfish and halibut is prohibited within the South Coast Recreational YRCA .It is unlawful for recreational fishing

vessels to take and retain, possess, or land groundfish taken with recreational gear within the South Coast Recreational YRCA.A vessel fishing in the South Coast Recreational YRCA may not be in possession of any groundfish. Recreational vessels may transit through the South Coast Recreational YRCA with or without groundfish on board. The South Coast Recreational YRCA is defined by latitude and longitude coordinates specified at §660.390.

(C) Westport Offshore Recreational Yelloweye Rockfish Conservation Area. Recreational fishing for groundfish and halibut is prohibited within the Westport Offshore Recreational YRCA. It is unlawful for recreational fishing vessels to take and retain, possess, or land groundfish taken with recreational gear within the Westport Offshore Recreational YRCA. A vessel fishing in the Westport Offshore Recreational YRCA may not be in possession of any groundfish. Recreational vessels may transit through the Westport Offshore Recreational YRCA with or without groundfish on board. The Westport Offshore Recreational YRCA is defined by latitude and longitude coordinates specified at §660.390.

(D) Recreational Rockfish Conservation Area. Fishing for groundfish with recreational gear is prohibited within the recreational RCA. It is unlawful to take and retain, possess, or land groundfish taken with recreational gear within the recreational RCA.A vessel fishing in the recreational RCA may not be in possession of any groundfish. [For example, if a vessel participates in the recreational salmon fishery within the RCA, the vessel cannot be in possession of groundfish while in the RCA. The vessel may, however, on the same trip fish for and retain groundfish shoreward of the RCA on the return trip to port.]

(1) Between the U.S. border with Canada and the Queets River, recreational fishing for groundfish is prohibited seaward of a boundary line approximating the 20-fm (37-m) depth contour from May 21 through September 30, except on days when the Pacific halibut fishery is open in this area. Days open to Pacific halibut recreational fishing off Washington are announced on the NMFS hotline at (206) 526–6667 or (800) 662–9825. Coordinates for the boundary line approximating the 20-fm (37-m) depth contour are listed in §660.391.

(2) Between the Queets River and Leadbetter Point, recreational fishing for groundfish is prohibited seaward of a boundary line approximating the 30-fm (55-m) depth contour from March 15 through June 15, except that recreational fishing for sablefish and Pacific cod is permitted within the recreational RCA from May 1 through June 15. Retention of lingcod seaward of the boundary line approximating the 30-fm (55-m) depth contour south of 46°58' N. lat. is prohibited on Fridays and Saturdays from July 1 through August 31. For additional regulations regarding the Washington recreational lingcod fishery, see paragraph (c)(1)(iii) of this section. Coordinates for the boundary line approximating the 30-fm (55-m) depth contour are listed in §660.391.

(ii) Rockfish. In areas of the EEZ seaward of Washington that are open to recreational groundfish fishing, there is a 10 rockfish per day bag limit. Taking and retaining canary rockfish and yelloweye rockfish is prohibited.

(iii) Lingcod. In areas of the EEZ seaward of Washington that are open to recreational groundfish fishing and when the recreational season for lingcod is open, there is a bag limit of 2 lingcod per day, which may

be no smaller than 22 in (56 cm) total length. The recreational fishing season for lingcod is open as follows:

(A) Between the U.S./Canada border to 48°10' N. lat. (Cape Alava) (Washington Marine Area 4), recreational fishing for lingcod is open, for 2009, from April 16 through October 15, and for 2010, from April 16 through October 15.

(B) Between 48°10' N. lat. (Cape Alava) and 46°16' N. lat. (Washington/Oregon border) (Washington Marine Areas 1–3), recreational fishing for lingcod is open for 2009, from March 14 through October 17, and for 2010, from March 13 through October 16.

(2) Oregon —(i) Recreational Groundfish Conservation Areas off Oregon. (A) Stonewall Bank Yelloweye Rockfish Conservation Area. Recreational fishing for groundfish and halibut is prohibited within the Stonewall Bank YRCA. It is unlawful for recreational fishing vessels to take and retain, possess, or land groundfish taken with recreational gear within the Stonewall Bank YRCA.A vessel fishing in the Stonewall Bank YRCA may not be in possession of any groundfish. Recreational vessels may transit through the Stonewall Bank YRCA with or without groundfish on board. The Stonewall Bank YRCA is defined by latitude and longitude coordinates specified at §660.390.

(B) Recreational Rockfish Conservation Area. Fishing for groundfish with recreational gear is prohibited within the recreational RCA, a type of closed area or GCA. It is unlawful to take and retain, possess, or land groundfish taken with recreational gear within the recreational RCA. A vessel fishing in the recreational RCA may not be in possession of any groundfish. [For example, if a vessel participates in the recreational salmon fishery within the RCA, the vessel cannot be in possession of groundfish while in the RCA. The vessel may, however, on the same trip fish for and retain groundfish shoreward of the RCA on the return trip to port.] Off Oregon, from April 1 through September 30, recreational fishing for groundfish is prohibited seaward of a recreational RCA boundary line approximating the 40 fm (73 m) depth contour. Coordinates for the boundary line approximating the 40 fm (73 m) depth contour are listed at §660.391.

(C) Essential Fish Habitat Conservation Areas. The Essential Fish Habitat Conservation Areas (EFHCAs) are closed areas, defined by specific latitude and longitude coordinates at §§660.396 through 660.399, where specified types of fishing are prohibited. Prohibitions applying to specific EFHCAs are found at §660.306.

(ii) Seasons. Recreational fishing for groundfish is open from January 1 through December 31, subject to the closed areas described in paragraph (c)(2) of this section.

(iii) Bag limits, size limits. The bag limits for each person engaged in recreational fishing in the EEZ seaward of Oregon are three lingcod per day, which may be no smaller than 22 in (56 cm) total length; and 10 marine fish per day, which excludes Pacific halibut, salmonids, tuna, perch species, sturgeon, sanddabs, flatfish, lingcod, striped bass, hybrid bass, offshore pelagic species and baitfish (herring, smelt, anchovies and sardines), but which includes rockfish, greenling, cabezon and other groundfish species. The bag limit for all flatfish is 25 fish per day, which excludes Pacific halibut, but which includes all soles,

flounders and Pacific sanddabs. In the Pacific halibut fisheries, retention of groundfish is governed in part by annual management measures for Pacific halibut fisheries, which are published in the Federal Register. Between the Oregon border with Washington and Cape Falcon, when Pacific halibut are onboard the vessel, groundfish may not be taken and retained, possessed or landed, except sablefish and Pacific cod. Between Cape Falcon and Humbug Mountain, during days open to the Oregon Central Coast "all-depth" sport halibut fishery, when Pacific halibut are onboard the vessel, no groundfish may be taken and retained, possessed or landed, except sablefish and Pacific cod. "All-depth" season days are established in the annual management measures for Pacific halibut fisheries, which are published in the Federal Register and are announced on the NMFS halibut hotline, 1–800–662–9825. The minimum size limit for cabezon retained in the recreational fishery is 16-in (41-cm), and for greenling is 10-in (26-cm). Taking and retaining canary rockfish and yelloweye rockfish is prohibited at all times and in all areas.

(3) California. Seaward of California, California law provides that, in times and areas when the recreational fishery is open, there is a 20 fish bag limit for all species of finfish, within which no more than 10 fish of any one species may be taken or possessed by any one person.[Note: There are some exceptions to this rule. The following groundfish species are not subject to a bag limit: petrale sole, Pacific sanddab and starry flounder.]For groundfish species not specifically mentioned in this paragraph, fishers are subject to the overall 20–fish bag limit for all species of finfish and the depth restrictions at paragraph (c)(3)(i) of this section. Recreational spearfishing for all federally-managed groundfish, except lingcod during January, February, March, and December, is exempt from closed areas and seasons, consistent with Title 14 of the California Code of Regulations. This exemption applies only to recreational vessels and divers provided no other fishing gear, except spearfishing gear, is on board the vessel. California state law may provide regulations similar to Federal regulations for the following state-managed species: ocean whitefish, California sheephead, and all greenlings of the genus Hexagrammos. Kelp greenling is the only federally-managed greenling .Retention of cowcod, yelloweye rockfish, and canary rockfish is prohibited in the recreational fishery seaward of California all year in all areas. For each person engaged in recreational fishing in the EEZ seaward of California, the following closed areas, seasons, bag limits, and size limits apply:

(i) Recreational Groundfish Conservation Areas off California. A Groundfish Conservation Area (GCA), a type of closed area, is a geographic area defined by coordinates expressed in degrees latitude and longitude. The following GCAs apply to participants in California's recreational fishery.

(A) Recreational Rockfish Conservation Areas. The recreational RCAs are areas that are closed to recreational fishing for groundfish. Fishing for groundfish with recreational gear is prohibited within the recreational RCA, except that recreational fishing for "other flatfish" is permitted within the recreational RCA as specified in paragraph (c)(3)(iv) of this section. It is unlawful to take and retain, possess, or land groundfish taken with recreational gear within the recreational RCA, unless otherwise authorized in this section. A vessel fishing in the recreational RCA may not be in possession of any species prohibited by the restrictions that apply within the recreational RCA. [For example, if a vessel participates in the recreational salmon fishery within the RCA, the vessel cannot be in possession of rockfish while in the RCA. The vessel may, however, on the same trip fish for and retain rockfish shoreward of the RCA on the return trip to port.]

(1) Between 42° N. lat. (California/Oregon border) and 40°10.00' N. lat. (North Region), recreational fishing for all groundfish (except "other flatfish" as specified in paragraph (c)(3)(iv) of this section) is prohibited seaward of the 20-fm (37-m) depth contour along the mainland coast and along islands and offshore seamounts from May 15 through September 15; and is closed entirely from January 1 through May 14 and from September 16 through December 31 (i.e., prohibited seaward of the shoreline).

(2) Between 40°10' N. lat. and 38°57.50' N. lat. (North-Central North of Point Arena Region), recreational fishing for all groundfish (except "other flatfish" as specified in paragraph (c)(3)(iv) of this section) is prohibited seaward of the 20-fm (37-m) depth contour along the mainland coast and along islands and offshore seamounts from May 15 through August 15; and is closed entirely from January 1 through May 14 and from August 16 through December 31 (i.e. , prohibited seaward of the shoreline).

(3) Between 38°57.50' N. lat. and 37°11' N. lat. (North-Central South of Point Arena Region), recreational fishing for all groundfish (except "other flatfish" as specified in paragraph (c)(3)(iv) of this section) is prohibited seaward of the boundary line approximating the 30-fm (55-m) depth contour along the mainland coast and along islands and offshore seamounts from June 13 through October 31; and is closed entirely from January 1 through June 12 and from November 1 through December 31 (i.e. , prohibited seaward of the shoreline). Closures around the Farallon Islands (see paragraph (c)(3)(i)(C) of this section) and Cordell Banks (see paragraph (c)(3)(i)(D) of this section) also apply in this area. Coordinates for the boundary line approximating the 30-fm (55-m) depth contour are listed in §660.391.

(4) Between 37°11' N. lat. and 36° N. lat. (Monterey South-Central Region), recreational fishing for all groundfish (except "other flatfish" as specified in paragraph (c)(3)(iv) of this section) is prohibited seaward of a boundary line approximating the 40-fm (73-m) depth contour along the mainland coast and along islands and offshore seamounts from May 1 through November 15; and is closed entirely from January 1 through April 30 and from November 16 through December 31 (i.e. , prohibited seaward of the shoreline). Coordinates for the boundary line approximating the 40-fm (73-m) depth contour are specified in §660.391.

(5) Between 36° N. lat. and 34°27' N. lat. (Morro Bay South-Central Region), recreational fishing for all groundfish (except "other flatfish" as specified in paragraph (c)(3)(iv) of this section) is prohibited seaward of a boundary line approximating the 40-fm (73-m) depth contour along the mainland coast and along islands and offshore seamounts from May 1 through November 15; and is closed entirely from January 1 through April 30 and from November 16 through December 31 (i.e., prohibited seaward of the shoreline). Coordinates for the boundary line approximating the 40-fm (73-m) depth contour are specified in §660.391.

(6) South of 34°27' N. latitude (South Region), recreational fishing for all groundfish (except California scorpionfish as specified below in this paragraph and in paragraph (v) of this section and "other flatfish" as specified in paragraph (c)(3)(iv) of this section) is prohibited seaward of a boundary line approximating the 60-fm (110-m) depth contour from March 1 through December 31 along the mainland coast and along islands and offshore seamounts, except in the CCAs where fishing is prohibited seaward of the 20-fm (37-m) depth contour when the fishing season is open (see paragraph (c)(3)(i)(B) of this

section). Recreational fishing for all groundfish (except California scorpionfish and "other flatfish") is closed entirely from January 1 through February 28 (i.e., prohibited seaward of the shoreline). Recreational fishing for California scorpionfish south of 34°27' N. lat. is prohibited seaward of a boundary line approximating the 40-fm (73-m) depth contour from January 1 through February 28, and seaward of the 60-fm (110-m) depth contour from March 1 through December 31, except in the CCAs where fishing is prohibited seaward of the 20-fm (37-m) depth contour when the fishing season is open. Coordinates for the boundary line approximating the 40-fm (73-m) and 60-fm (110-m) depth contours are specified in §§660.391 and 660.392.

(B) Cowcod Conservation Areas. The latitude and longitude coordinates of the Cowcod Conservation Areas (CCAs) boundaries are specified at §660.390. In general, recreational fishing for all groundfish is prohibited within the CCAs, except that fishing for "other flatfish" is permitted within the CCAs as specified in paragraph (c)(3)(iv) of this section. However, recreational fishing for the following species is permitted shoreward of the 20 fm (37 m) depth contour when the season for those species is open south of 34°27' N. lat.: Minor nearshore rockfish, cabezon, kelp greenling, lingcod, California scorpionfish, and "other flatfish" (subject to gear requirements at paragraph (c)(3)(iv) of this section during January–February). [NOTE:California state regulations also permit recreational fishing for California sheephead, ocean whitefish, and all greenlings of the genus Hexagrammos shoreward of the 20 fm (37 m) depth contour in the CCAs when the season for the RCG complex is open south of 34°27' N. lat.] It is unlawful to take and retain, possess, or land groundfish within the CCAs, except for species authorized in this section.

(C) Farallon Islands. Under California state law, recreational fishing for groundfish is prohibited between the shoreline and the 10–fm (18–m) depth contour around the Farallon Islands, except that recreational fishing for "other flatfish" is permitted around the Farallon Islands as specified in paragraph (c)(3)(iv) of this section. (Note: California state regulations also prohibit the retention of other greenlings of the genus Hexagrammos, California sheephead and ocean whitefish.) For a definition of the Farallon Islands, see §660.390.

(D) Cordell Banks. Recreational fishing for groundfish is prohibited in waters less than 100 fm (183 m) around Cordell Banks as defined by specific latitude and longitude coordinates at §660.390, except that recreational fishing for "other flatfish" is permitted around Cordell Banks as specified in paragraph (c)(3)(iv) of this section. [Note: California state regulations also prohibit fishing for all greenlings of the genus Hexagrammos , California sheephead and ocean whitefish.]

(E) Point St. George Yelloweye Rockfish Conservation Area (YRCA). Recreational fishing for groundfish is prohibited within the Point St. George YRCA, as defined by latitude and longitude coordinates at §660.390, on dates when the closure is in effect. The closure is not in effect at this time, and recreational fishing for groundfish is open within the Point St. George YRCA from January 1 through December 31. This closure may be imposed through inseason adjustment.

(F) South Reef YRCA. Recreational fishing for groundfish is prohibited within the South Reef YRCA, as defined by latitude and longitude coordinates at §660.390, on dates when the closure is in effect. The

closure is not in effect at this time, and recreational fishing for groundfish is open within the South Reef YRCA from January 1 through December 31. This closure may be imposed through inseason adjustment.

(G) Reading Rock YRCA. Recreational fishing for groundfish is prohibited within the Reading Rock YRCA, as defined by latitude and longitude coordinates at §660.390, on dates when the closure is in effect. The closure is not in effect at this time, and recreational fishing for groundfish is open within the Reading Rock YRCA from January 1 through December 31. This closure may be imposed through inseason adjustment.

(H) Point Delgada (North) YRCA. Recreational fishing for groundfish is prohibited within the Point Delgada (North) YRCA, as defined by latitude and longitude coordinates at §660.390, on dates when the closure is in effect. The closure is not in effect at this time, and recreational fishing for groundfish is open within the Point Delgada (North) YRCA from January 1 through December 31. This closure may be imposed through inseason adjustment.

(I) Point Delgada (South) YRCA. Recreational fishing for groundfish is prohibited within the Point Delgada (South) YRCA, as defined by latitude and longitude coordinates at §660.390, on dates when the closure is in effect. The closure is not in effect at this time, and recreational fishing for groundfish is open within the Point Delgada (South) YRCA from January 1 through December 31. This closure may be imposed through inseason adjustment.

(J) Essential Fish Habitat Conservation Areas. The Essential Fish Habitat Conservation Areas (EFHCAs) are closed areas, defined by specific latitude and longitude coordinates at §§660.396 through 660.399, where specified types of fishing are prohibited. Prohibitions applying to specific EFHCAs are found at §660.306.

(ii) RCG Complex. The California rockfish, cabezon, greenling complex (RCG Complex), as defined in state regulations (Section 1.91, Title 14, California Code of Regulations), includes all rockfish, kelp greenling, rock greenling, and cabezon. This category does not include California scorpionfish, also known as "sculpin.

(A) Seasons. When recreational fishing for the RCG Complex is open, it is permitted only outside of the recreational RCAs described in paragraph (c)(3)(i) of this section.

(1) Between 42° N. lat. (California/Oregon border) and 40°10' N. lat. (North Region), recreational fishing for the RCG complex is open from May 15 through September 15 (i.e. it's closed from January 1 through May 14 and from September 16 through December 31).

(2) Between 40°10' N. lat. and 38°57.50' N. lat. (North Central North of Point Arena Region), recreational fishing for the RCG Complex is open from May 15 through August 15 (i.e. it's closed from January 1 through May 14 and May 16 through December 31).

(3) Between 38°57.50' N. lat. and 37°11' N. lat. (North Central South of Point Arena Region), recreational fishing for the RCG Complex is open from June 13 through October 31 (i.e. it's closed from January 1 through June 12 and November 1 through December 31.

(4) Between 37°11' N. lat. and 36° N. lat. (Monterey South-Central Region), recreational fishing for the RCG Complex is open from May 1 through November 15 (i.e. it's closed from January 1 through April 30 and from November 16 through December 31).

(5) Between 36' N. lat. and 34°27' N. lat. (Morro Bay South-Central Region), recreational fishing for the RCG Complex is open from May 1 through November 15 (i.e. it's closed from January 1 through April 30 and from November 16 through December 31).

(6) South of 34°27' N. latitude (South Region), recreational fishing for the RCG Complex is open from March 1 through December 31 (i.e. it's closed from January 1 through February 28.

(B) Bag limits, hook limits. In times and areas when the recreational season for the RCG Complex is open, there is a limit of 2 hooks and 1 line when fishing for rockfish. The bag limit is 10 RCG Complex fish per day coastwide. Retention of canary rockfish, yelloweye rockfish, bronzespotted and cowcod is prohibited. Within the 10 RCG Complex fish per day limit, no more than 2 may be bocaccio, no more than 2 may be greenling (kelp and/or other greenlings) and no more than 2 may be cabezon. Multi-day limits are authorized by a valid permit issued by California and must not exceed the daily limit multiplied by the number of days in the fishing trip.

(C) Size limits. The following size limits apply: bocaccio may be no smaller than 10 in (25 cm) total length; cabezon may be no smaller than 15 in (38 cm) total length; and kelp and other greenling may be no smaller than 12 in (30 cm) total length.

(D) Dressing/Fileting. Cabezon, kelp greenling, and rock greenling taken in the recreational fishery may not be fileted at sea. Rockfish skin may not be removed when fileting or otherwise dressing rockfish taken in the recreational fishery. The following rockfish filet size limits apply: bocaccio filets may be no smaller than 5 in (12.8 cm) and brown-skinned rockfish fillets may be no smaller than 6.5 in (16.6 cm). "Brown-skinned" rockfish include the following species: brown, calico, copper, gopher, kelp, olive, speckled, squarespot, and yellowtail.

(iii) Lingcod —(A) Seasons. When recreational fishing for lingcod is open, it is permitted only outside of the recreational RCAs described in paragraph (c)(3)(i) of this section.

(1) Between 42° N. lat. (California/Oregon border) and 40°10.00' N. lat. (North Region), recreational fishing for lingcod is open from May 15 through September 15 (i.e. it's closed from January 1 through May 14 and from September 16 through December 31).

(2) Between 40°10' N. lat. and 38°57.50' N. lat. (North Central North of Point Arena Region), recreational fishing for lingcod is open from May 15 through August 15 (i.e. it's closed from January 1 through May 14 and May 16 through December 31).

(3) Between 38°57.50' N. lat. and 37°11' N. lat. (North Central South of Point Arena Region), recreational fishing for lingcod is open from June 13 through October 31 (i.e. it's closed from January 1 through June 12 and November 1 through December 31.

(4) Between 37°11' N. lat. and 36° N. lat. (Monterey South-Central Region), recreational fishing for lingcod is open from May 1 through November 15 (i.e. it's closed from January 1 through April 30 and from November 16 through December 31).

(5) Between 36' N. lat. and 34°27' N. lat. (Morro Bay South-Central Region), recreational fishing for lingcod is open from May 1 through November 15 (i.e. it's closed from January 1 through April 30 and from November 16 through December 31).

(6) South of 34°27' N. latitude (South Region), recreational fishing for lingcod is open from April 1 through November 30 (i.e. it's closed from January 1 through March 31 and from December 1 through 31).

(B) Bag limits, hook limits. In times and areas when the recreational season for lingcod is open, there is a limit of 2 hooks and 1 line when fishing for lingcod. The bag limit is 2 lingcod per day. Multi-day limits are authorized by a valid permit issued by California and must not exceed the daily limit multiplied by the number of days in the fishing trip.

(C) Size limits. Lingcod may be no smaller than 24 in (61 cm) total length.

(D) Dressing/Filleting. Lingcod filets may be no smaller than 16 in (41 cm) in length.

(iv) "Other flatfish". Coastwide off California, recreational fishing for "other flatfish" is permitted both shoreward of and within the closed areas described in paragraph (c)(3)(i) of this section. "Other flatfish" are defined at §660.302 and include butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, and sand sole. Recreational fishing for "other flatfish" is permitted within the closed areas. "Other flatfish," except Pacific sanddab, are subject to the overall 20-fish bag limit for all species of finfish, of which there may be no more than 10 fish of any one species. There is no season restriction or size limit for "other flatfish;" however, it is prohibited to filet "other flatfish" at sea.

(v) California scorpionfish. California scorpionfish predominately occur south of 40°10' N. lat.

(A) Seasons. When recreational fishing for California scorpionfish is open, it is permitted only outside of the recreational RCAs described in paragraph (c)(3)(i) of this section.

(1) Between 40°10' N. lat. and 37°11' N. lat. (North Central Region), recreational fishing for California scorpionfish is open from June 1 through November 30 (i.e., it's closed from January 1 through May 31 and from December 1 through December 31).

(2) Between 37°11' N. lat. and 36° N. lat. (Monterey South Central Region), recreational fishing for California scorpionfish is open from May 1 through November 30 (i.e., it's closed from January 1 through April 30 and from December 1 through December 31).

(3) Between 36° N. lat. and 34°27' N. lat. (Morro Bay South Central Region), recreational fishing for California scorpionfish is open from May 1 through November 30 (i.e., it's closed from January 1 through April 30 and from December 1 through December 31).

(4) South of 34°27' N. lat. (South Region), recreational fishing for California scorpionfish is open from January 1 through December 31.

(B) Bag limits, hook limits. South of 40°10.00' N. lat., in times and areas where the recreational season for California scorpionfish is open, the bag limit is 5 California scorpionfish per day. California scorpionfish do not count against the 10 RCG Complex fish per day limit. Multi-day limits are authorized by a valid permit issued by California and must not exceed the daily limit multiplied by the number of days in the fishing trip.

(C) Size limits. California scorpionfish may be no smaller than 10 in (25 cm) total length.

(D) Dressing/Fileting. California scorpionfish filets may be no smaller than 5 in (12.8 cm) and must bear an intact 1 in (2.6 cm) square patch of skin.

GROUNDFISH ADVISORY SUBPANEL REPORT ON INSEASON ADJUSTMENTS TO 2009 AND 2010 GROUNDFISH FISHERIES – PART I

The Groundfish Advisory Subpanel (GAP) received a presentation on inseason adjustments from Mr. Rob Jones and the Groundfish Management Team (GMT) and has the following recommendations:

1) Eliminate the daily-trip-limit in the limited entry fixed gear (LEFG) sablefish fishery North of 36° N latitude for the remainder of the year. The daily-trip-limit leads to increased regulatory discards and limited trip viability.
2) Increase the weekly limit in the LEFG sablefish fishery north of 36° from 1500 lbs. / week to 2000 lbs. / week. The rationale is that under the current weekly limit the optimum yield (OY) will not be attained and fish will be left on the table. Under the proposed limit there is a greater likelihood that the full OY or something close to it might be achieved.
3) Increase the bimonthly limit in the LEFG sablefish fishery north of 36° from 6000 lbs. / 2 months to 8000 lbs. / 2 months. This change would provide greater opportunity to the fleet without the risk of exceeding the OY because there is only one period left in the year and many of the participants in the fishery are likely to begin fishing for crab, thereby reducing overall sablefish effort.
4) Do away with the daily-trip-limit for LEFG sablefish south of 36° and increase the weekly limit to a cumulative limit of 3000 lbs. / week. This change will reduce regulatory discards and provide more economic opportunity for a fishery that is currently unlikely to reach the OY. The GMT's preliminary proposal suggested changing the weekly limit to one landing of 3000 lbs. / week which might disadvantage small boats that are unable to carry that much fish.
5) Increase the open access trip limits for sablefish south of 36° to 2500 lbs. / week with no daily or bimonthly limit for the remainder of the year. The current limits are 400 lbs. / day 1500 lbs. / week and 8000 lbs. / 2 months.
6) Subject to the availability of canary rockfish in the scorecard, increase the limited entry and open access rockfish trip limits south of 40°10' north to 800 lbs. / 2 months for the remainder of the year. The current limit is 600 lbs. / 2 months.
7) Adopt option 1 of the proposed specifications for sablefish and petrale sole for the remainder of the year. The GAP also believes that closing the petrale cutouts will free up Pacific ocean perch and darkblotched in the scorecard which could provide additional opportunity for lingcod, arrowtooth, and slope rockfish. Those opportunities should be analyzed.

PFMC
09/15/09

requirements of Executive Order 13175, entitled *Consultation and Coordination with Indian Tribal Governments* (65 FR 67249, November 6, 2000), do not apply to this proposed rule.

G. Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

This action is not subject to Executive Order 13045, entitled *Protection of Children from Environmental Health Risks and Safety Risks* (62 FR 19885, April 23, 1997), because this is not an economically significant regulatory action as defined by Executive Order 12866, and this action does not address environmental health or safety risks disproportionately affecting children.

H. Executive Order 13211: Actions that Significantly Affect Energy Supply, Distribution, or Use

This proposed rule is not subject to Executive Order 13211, entitled *Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use* (66 FR 28355, May 22, 2001), because this action is not expected to affect energy supply, distribution, or use.

I. National Technology Transfer Advancement Act

Since this action does not involve any technical standards; section 12(d) of the National Technology Transfer and Advancement Act of 1995 (NTTAA), Public Law 104–113, section 12(d) (15 U.S.C. 272 note), does not apply to this action.

J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

This action does not entail special considerations of environmental justice related issues as delineated by Executive Order 12898, entitled *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629, February 16, 1994).

List of Subjects in 40 CFR Part 721

Environmental protection, Chemicals, Hazardous substances, Reporting and recordkeeping requirements

Dated: August 25, 2009.

Wendy C. Hamnett,

Acting Director, Office of Pollution Prevention and Toxics.

Therefore, it is proposed that 40 CFR chapter I be amended as follows:

PART 721—[AMENDED]

■ 1. The authority citation for part 721 continues to read as follows:

Authority: 15 U.S.C. 2604, 2607, 2625(c).

■ 2. Section 721.10068 is amended by revising paragraph (a) and adding a new paragraph (b)(2)(vii) to read as follows:

§ 721.10068 Elemental mercury.

(a) *Definitions.* The definitions in §721.3 apply to this section. In addition, the following definition applies:

(1) *Motor vehicle* has the meaning found at 40 CFR 85.1703.

(2) *Flow meter* means an instrument used in various applications to measure the flow rate of liquids or gases.

(3) *Natural gas manometer* means an instrument used in the natural gas industry to measure gas pressure.

(4) *Pyrometer* means an instrument used in various applications to measure extremely high temperatures.

(b)* * *

(2)* * *

(vii) Manufacturing or processing of elemental mercury for use in flow meters, natural gas manometers, and pyrometers except for use in these articles when they are in service as of September 11, 2009.

* * * * *

[FR Doc. E9–21894 Filed 9–10–09; 8:45 am]

BILLING CODE 6560–50–S

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 660

[Docket No. 0907301200–91202–01]

RIN 0648–AY07

Magnuson-Stevens Act Provisions; Fisheries off West Coast States; Pacific Coast Groundfish Fishery; 2009–2010 Biennial Specifications and Management Measures for Canary Rockfish and Petrale Sole

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; request for comments.

SUMMARY: NMFS proposes a rule to revise the 2009 management measures for petrale sole and to revise the 2010 harvest specifications and management measures for petrale sole and canary rockfish taken in the U.S. exclusive economic zone (EEZ) off the coasts of Washington, Oregon, and California.

DATES: Comments on this proposed rule must be received no later than 5 p.m., local time on October 13, 2009.

ADDRESSES: You may submit comments, identified by RIN 0648–AY07 by any one of the following methods:

- Electronic Submissions: Submit all electronic public comments via the Federal eRulemaking Portal *http://www.regulations.gov*.
- Fax: 206–526–6736, Attn: Gretchen Arentzen
- Mail: Barry A. Thom, Acting Regional Administrator, Northwest Region, NMFS, 7600 Sand Point Way NE, Seattle, WA 98115–0070, Attn: Gretchen Arentzen.

Instructions: All comments received are a part of the public record and will generally be posted to *http://www.regulations.gov* without change. All Personal Identifying Information (for example, name, address, etc.) voluntarily submitted by the commenter may be publicly accessible. Do not submit Confidential Business Information or otherwise sensitive or protected information.

NMFS will accept anonymous comments (enter N/A in the required fields if you wish to remain anonymous). Attachments to electronic comments will be accepted in Microsoft Word, Excel, WordPerfect, or Adobe PDF file formats only.

Copies of the Draft Environmental Assessment (DEA) prepared for this action is available from the NMFS Northwest Region website at *http://www.nwr.noaa.gov* or from the mailing and street addresses listed above.

FOR FURTHER INFORMATION CONTACT: Gretchen Arentzen (Northwest Region, NMFS), phone: 206–526–6147, fax: 206–526–6736 and e-mail *gretchen.arentzen@noaa.gov*.

SUPPLEMENTARY INFORMATION:

Electronic Access

This proposed rule is accessible via the Internet at the Office of the Federal Register's Website at *http://www.gpoaccess.gov/fr/index.html*. Background information and documents are available at the Pacific Fishery Management Council's website at *http://www.pcouncil.org/*.

Background

The 2009 and 2010 ABCs, OYs and HGs for Pacific coast groundfish species were established in the final rule for the 2009–2010 groundfish harvest specifications and management measures (74 FR 9874, March 6, 2009). This rule proposes interim measures for two species. For petrale sole this action would reduce catches in 2009 by implementing more restrictive management measures, lower the 2010 OY for petrale sole, and implement more restrictive management measures in 2010 to keep projected impacts below the new 2010 OY. For canary rockfish this action would lower the 2010 OY and implement more restrictive 2010 management measures to keep projected impacts below the new 2010 OY. These changes are being proposed because the PFMC received new stock assessments that indicate the stocks are in worse shape than we had thought at the beginning of 2009.

The Council reviewed a new stock assessment for petrale sole in June, considered questions raised by the Stock Assessment and Review Panel (STAR Panel) and the Scientific and Statistical Committee (SSC), and asked the SSC to review the open issues and report back to the Council in September. While there is uncertainty regarding the results of the final stock assessment, it is likely that, under any outcome, the stock will be overfished at the beginning of 2011 if the entire current petrale OYs are taken in 2009 and 2010. In September the Council will consider the updated information and make a final recommendation for the petrale changes in 2009 and 2010, and make its initial recommendations for management for 2011 and beyond. NMFS anticipates implementing a final rule for 2009 and 2010 in October. The canary rockfish assessment was an update of the prior assessment, incorporating revised historic catch data. This assessment concluded that the stock is more depleted than the previous assessment had indicated. The Council approved the new stock assessment, and the assessment authors will develop a rebuilding analysis. The Council will use the results of the rebuilding analysis in November to consider likely revisions to the rebuilding plan for 2011 and beyond and to recommend OY and harvest revisions in 2010. NMFS anticipates implementing the final rule for 2010 in December 2009.

This action is needed to respond to the most recently available stock status information during the remainder of 2009 and in 2010, while NMFS and the Council complete the stock assessments, revised rebuilding plans, EIS, and full rulemaking for the 2011 and 2012 specifications and management measures for the entire groundfish fishery.

The interim measures being proposed in this rule in combination with the existing regulations are designed to prevent the stock status of petrale sole from falling below the overfished threshold at the beginning of 2011, or to speed the rebuilding of petrale sole if it is found to be overfished. These interim measures are also intended to facilitate rebuilding and to ease negative impacts on industry from the anticipated lower 2011–2012 canary rockfish harvest specifications, and more restrictive management measures.

The Council's policies on setting ABCs, OYs, other harvest specifications, and management measures are discussed in the preamble to the December 31, 2008, proposed rule (73 FR 80516) for 2009–2010 harvest specifications and management measures.

Routine management measures, as described in the preamble to the 2009–2010 harvest specifications and management measure proposed rule (73 FR 80516, December 31, 2008), will continue to be adjusted to modify fishing behavior during the fishing year to allow a harvest specification to be achieved, or to prevent a harvest specification from being exceeded.

The following preamble discussion is divided into two parts: harvest specifications and management measures for petrale sole in 2009 and 2010; and harvest specifications and management measures for canary rockfish in 2010.

Harvest Specifications and Management Measures for Petrale Sole in 2009–2010

2004 Petrale Sole Stock Assessment

Petrale sole was last assessed in 2004. The result of that stock assessment was the best available science at the time that the 2007–2008 and the 2009–2010 harvest specifications were developed. For additional discussion of the results of the 2004 petrale sole stock assessment, see the September 29, 2006 proposed rule (71 FR 57764). The 2009–2010 ABCs are based on the 2004 stock assessment which used the default F 40 percent FMSY proxy and the 2009–2010 OYs are derived using the 40–10 harvest policy applied to the ABC for both the northern and southern assessment areas. Also an additional 25 percent reduction was made in the OY contribution for the southern area due to assessment uncertainty, as a precautionary measure. The March 6, 2009 final rule (74 FR 9874) established the 2009 and 2010 coastwide petrale sole harvest specifications, including the OYs of 2,433 mt in 2009 and 2,393 mt in 2010.

2009 Petrale Sole Stock Assessment

A new, full stock assessment for petrale sole was presented to the Council at their June 2009 meeting. The draft assessment indicated the stock is depleted to 11.6 percent of its unfished biomass. If the Bmsy management target remained the same as in the 2004 assessment, at 40 percent of the unfished biomass using the proxy for BMSY, the 2009 stock assessment indicates that petrale sole would be overfished in 2011. However, the stock assessment review panel recommended establishing a management target using the biomass that would support maximum sustainable yield (BMSY) as determined from the assessment (referred to as a directly-estimated Bmsy, as opposed to proxy BMSY). This management target was recommended, rather than the standard proxy BMSY, given that BMSY is well estimated. The Groundfish FMP allows use of a directly-estimated BMSY target and defines the overfished level as no less than 50 percent of the directly-estimated BMSY. The draft assessment estimates the stock spawning biomass is at 61 percent of the directly-estimated BMSY and therefore may not be overfished under a directly-estimated BMSY target.

The Council's Scientific and Statistical Committee (SSC) did not recommend the petrale sole assessment for management decision-making at their June 2009 meeting, but will review it further during summer 2009, and it will be presented for final adoption at the Council's September 2009 meeting. The SSC will also further explore the use of a deterministic BMSY target for the stock when they meet this summer. While the petrale sole assessment is not yet adopted for use in making management decisions, projections from the draft assessment indicate that stock spawning biomass will be driven to a lower level of depletion if the entire 2009 and 2010 OYs are taken. If the entire current 2009 and 2010 OYs are taken, by 2011 the spawning biomass is projected to decline to less than 50 percent of directy-estimated BMSY in this case, which is an overfished state even under a deterministic BMSY target.

Changes to Petrale Sole Harvest Specifications

At their June 2009 meeting, the Council identified a point of concern under FMP section 6.2.2 and recommended that NMFS take action to reduce harvest of petrale sole in 2009 and 2010 in response to the preliminary results of the new 2009 stock assessment. The primary purpose of this recommendation is to prevent the status of the petrale sole stock from falling below the overfished threshold at the start of 2011.

In June 2009, the Groundfish Management Team (GMT), an advisory body to the Council, prepared a preliminary analysis of a range of petrale sole harvest levels for Council consideration. This analysis examined how different levels of petrale sole harvest in 2009 and 2010 affected the petrale sole stock status at the beginning of 2011, under the base case model in the preliminary 2009 petrale sole stock assessment. Based on the results of the GMTs preliminary analysis, the Council chose a preliminary preferred alternative to reduce the existing 2010 petrale sole coastwide OY by 1,200 mt. This action proposes to establish a new 2010 petrale sole coastwide OY of 1,193 mt (Table 2a).

Though this action does not propose a change in harvest specifications for petrale sole in 2009, it does propose changes to management measures in order to reduce projected mortality of petrale sole in 2009 by approximately 400 mt. Implementing management measures that reduce petrale sole catch in 2009, when combined with reductions in the petrale sole OY for 2010 (and concurrent changes to management measures), results in an increase from 9 percent unfished biomass to 13 percent unfished biomass and from 48 percent to 68 percent of the directy-estimated BMSY under the base case model in the preliminary 2009 stock assessment.

Based on the analysis presented above, the Council recommended and NMFS is proposing the following changes to petrale sole harvest specifications: reducing the 2010 petrale sole coastwide OY of 2,393 mt by 1,200 mt, resulting in a new 2010 coastwide petrale sole OY of 1,193 mt. This proposed change is listed in Table 2a to 50 CFR 660, Subpart G.

Changes to Management Measures Affecting Petrale Sole

Petrale sole is almost exclusively caught in the limited entry non-whiting commercial trawl fishery. Therefore, proposed changes to management measures are only considered in the limited entry non-whiting trawl fishery. The Council recommended preliminary preferred alternative management measures for November-December 2009 and for January-December 2010 to reduce projected catch of petrale sole by approximately 400 mt in 2009 and to prevent projected mortality of petrale sole from exceeding the preliminary preferred 2010 petrale sole OY. In order to reduce projected catches of petrale sole in 2009 and 2010 this proposed rule adjusts management measures that are routinely adjusted during the year to respond to updated fishery information, as described at § 660.370, and does not impose any new management measures. The Council's preliminary preferred alternative management measures result in approximately 1,995 mt projected catch of petrale sole in 2009 and approximately 1,178 mt projected catch of petrale sole in 2010. Changes to management measures include adjusting the seaward boundary of the trawl RCA coastwide and reducing petrale sole cumulative trip limits and/or sub-limits for all trawl gears coastwide.

Based on the need to reduce catches in 2009 and 2010 to prevent petrale sole stock status from falling below the overfished threshold at the beginning of 2011, the Council recommended and NMFS is proposing changes to management measures in November-December 2009 and for all of 2010. For November-December (Period 6) 2009, the Council recommended and NMFS is proposing the following: shifting the seaward boundary of the trawl RCA to a boundary line approximating the 200–fm (366–m) depth contour North of 40 10' N. lat.; and reducing petrale sole cumulative trip limits and/or sub-limits to 2,000 lb (907 kg) per two months for vessels using all limited entry trawl gear types, coastwide. These proposed 2009 changes are shown in 2009 tables 3 (North) and 3 (South). For 2010, the Council recommended and NMFS is proposing the following: shifting the seaward boundary of the trawl RCA to a boundary line approximating the 200–fm (366–m) depth contour from January-April (Periods 1 and 2) and September-December (Periods 5 and 6) North of 40 10' N. lat.; shifting the seaward boundary of the trawl RCA to a boundary line approximating the 200–fm (366–m) depth contour from January-December South of 40 10' N. lat.; reducing petrale sole cumulative trip limits and/or sub-limits to 1,000 lb (454 kg) per two months for vessels using all limited entry trawl gear types, coastwide, during January-February (Period 1) and November-December (Period 6); reducing petrale sole sub-limits to 18,000 lb (8,165 kg) per two months for vessels using all limited entry trawl gear types, coastwide, from March-October (Periods 2 through 5). These proposed changes to 2010 trip limits are shown in 2010 Tables 3 (North) and 3 (South).

Harvest Specifications and Management Measures for Canary Rockfish in 2010

2007 Canary Rockfish Stock Assessment

Canary rockfish was last assessed in 2007. The results of that stock assessment and rebuilding analysis were the basis for the 2009–2010 harvest specifications, and represented the best available science at that time. For additional discussion of the results of the 2007 canary rockfish stock assessment, see the December 31, 2008 proposed rule, 73 FR 80516. The 2009–2010 harvest specifications and revisions to the rebuilding plan for canary rockfish were established on March 1, 2009. The approach used for setting the 2009–2010 harvest specifications for canary rockfish was the same as that used for setting the 2007–2008 harvest specifications under FMP Amendment 16–4. The 2007 stock assessment fundamentally changed the understanding of stock productivity. The SSC, therefore, recommended changing the Am. 16–4 rebuilding plan. In the rebuilding plan, the Council revised the target rebuilding year from 2063 to 2021 (which was two years longer than F0), but maintained the existing SPR of 88.7%. Nonetheless, the adopted OY for 2009 and 2010 of 105 mt was based on a more conservative SPR of 92.2%. The March 6, 2009 final rule (74 FR 9874) established the 2009 and 2010 coastwide canary rockfish harvest specifications, including the OYs of 105 mt in 2009 and 2010.

2009 Canary Rockfish Stock Assessment

An updated stock assessment for canary rockfish was presented to the Council at their June 2009 meeting. The stock assessment indicated the canary rockfish stock is depleted to 23.7 percent of its unfished biomass, compared with a 32.4 percent depletion in 2007. The stock is increasing, but based on the new information in the new stock assessment, the rebuilding plan will need to be revised, and it is anticipated that lower OYs will be required. The Council's SSC recommended the canary rockfish assessment for management decision-making at their June 2009 meeting. At the November Council meeting the PFMC will receive the rebuilding analysis for canary rockfish based on the 2009 stock assessment, for use in the 2011–2012 specifications process. At that time the Council will also decide whether to recommend a revision to the 2010 canary rockfish OY in order to smooth the transition to the revised rebuilding plan and to facilitate rebuilding.

Changes to 2010 Canary Rockfish OY

At their June 2009 meeting, the Council recommended that NMFS take action to reduce catches of canary rockfish in 2010 in response to the results of the new 2009 stock assessment update. The primary purpose of taking precautionary measures is to facilitate rebuilding of canary rockfish, and to reduce the socioeconomic impacts of a sudden reduction in harvest specifications that will likely be implemented in 2011. Under the FMP, harvest specifications for species subject to rebuilding requirements may be modified during the biennium if the Council determines they are not adequately conservative to meet rebuilding plan goals. FMP Section 5.5.1

Canary rockfish is currently overfished and subject to a rebuilding plan. The results of the new rebuilding analysis, that will be based on the new stock assessment update, are scheduled to be presented to the Council at their October 31–November 5, 2009, meeting. At that time, while the Council is considering revisions to the rebuilding plan for 2011 and beyond, they will also consider whether changes should be made in 2010 for the reasons explained above.

Based on the need to first consider the new rebuilding analysis for 2011–2012 OYs, the Council has not chosen a preferred canary rockfish OY alternative for 2010. Therefore, a range of OYs between 44 mt and 105 mt is proposed in Table 2a of this proposed rule. No changes to catch apportionment of the new 2010 OY are proposed at this time; however, the Council may consider changes to canary rockfish catch apportionment at their September or November 2009 meetings. A final preferred alternative for canary rockfish OY in 2010 will be considered in a supplement to the EA. Changes to 2010 canary rockfish harvest specifications would be implemented in a separate final rule, after the November 2009 Council meeting. Any revisions are anticipated to be in effect on January 1, 2010.

Changes to Management Measures Affecting Canary Rockfish

Canary rockfish are caught incidentally in almost every sector of the Pacific Coast groundfish fishery, North of 34° 27' N. lat. To reduce projected catch of canary rockfish below a lower 2010 OY would likely require that additional restrictions be placed on the following fisheries: limited entry non-whiting trawl; limited entry non-tribal whiting trawl; Washington, Oregon, and northern California recreational groundfish; and nearshore commercial non-trawl. The types of potential management changes include, but are not limited to: expansion of the trawl RCA to close areas with high canary bycatch for all or part of the year; expansion of the non-trawl RCA to close areas with high canary bycatch for all or part of the year; reductions in trip limits for co-occurring shelf species in both the LE trawl fishery and in the LE fixed gear fishery and open access commercial fishery; reductions in trip limits for vessels using selective flatfish trawl gear; reductions in recreational fishery season length; closures of recreational fisheries in some areas of the coast for a portion of the year; reduction in recreational bag limits for rockfish or other co-occurring species; a reduction in the bycatch limit for canary rockfish in the LE non-tribal whiting fishery; and the non-whiting Exempted Fishing Permits (EFPs) may also be restricted or terminated in 2010 to reduce their projected catch of canary rockfish (approximately 2.7 mt).

At their November 2009 meeting where the Council will consider potential changes to the 2010 OY, the Council will consider a wide range of routine management measure alternatives for reducing projected catches of canary rockfish to stay within the new OY. Consideration of new rebuilding information and potential changes to routine management measures will allow the Council to recommend interim measures that would reduce canary rockfish impacts in 2010. A final preferred alternative for canary rockfish management measures in 2010 will be considered in a supplement to the EA. Changes to management measures to reduce projected catch of canary rockfish will be implemented in a separate final rule, after the November 2009 Council meeting. These management measures are anticipated to be in effect on January 1, 2010.

Classification

At this time, NMFS has preliminarily determined that the revisions to 2009–2010 harvest specifications and management measures for canary rockfish and petrale sole proposed in this rule are consistent with the national standards of the Magnuson-Stevens Act and other applicable laws. NMFS, in making the final determination, will take into account the data, views, and comments received during the comment period.

A DEA was prepared for the revisions to the 2009–2010 harvest specifications and management measures for petrale sole and canary rockfish. A copy of the DEA is available online at *http://www.nwr.noaa.gov/*.

The Council considered two sets of alternatives for revising the 2009–2010 harvest specifications and management measures for petrale sole and canary rockfish. The first set of alternatives considered more restrictive management measures to reduce catch of petrale sole in 2009 and new harvest specifications for petrale sole in 2010 and management measures necessary to keep projected impacts to petrale sole below the new 2010 OY. The second set of alternatives considered new harvest specifications for canary rockfish in 2010 and a range of management measures necessary to keep projected impacts to canary rockfish below the alternative 2010 OYs.

The range of management measure alternatives intended to keep total catch of canary at the low end of the ABC/OY alternatives are considered here, since these were the alternatives the Council evaluated in the 2009 and 2010 rulemaking for their effects on small entities.

NMFS has initially determined that this proposed rule is not significant for purposes of Executive Order 12866.

An IRFA was prepared, as required by section 603 of the Regulatory Flexibility Act (RFA). The IRFA describes the economic impact this proposed rule, if adopted, would have on small entities. A summary of the analysis follows. A copy of this analysis is available from NMFS (see ADDRESSES).

The Small Business Administration has established size criteria for all major industry sectors in the US including fish harvesting and fish processing businesses. The RFA recognizes and defines three kinds of small entities: small businesses, small organizations, and small governmental jurisdictions.

Most permit owners and vessel owners are independent fishermen who are owner/operators of their vessel or members of family owned businesses or members of small partnerships. As such, they are considered to be a small business. Because canary rockfish is taken as bycatch in most groundfish fisheries the description of small entities associated with the 2009 EIS (73 FR 80516) is applicable. The Council estimates that nearly 2,600 small entities harvest groundfish. These entities include those that either target groundfish or harvest groundfish as bycatch and include limited entry trawlers and fixed gear, open access participants, the west coast charterboat fleet, and the tribal fleets. Included in this estimate are businesses, probably fewer than 30, that should be classified as ''large'' businesses as they are affiliates or components of large processing companies. Following past practice, the Council classifies the four catcher-processors that fish and process in the whiting fishery ''large'' entities as they are components of large international seafood companies. Noting the exceptions above, the Council has classified all harvesters in the groundfish fishery as ''small businesses.''

In summary, using Small Business Administration standards, most of the estimated 2,600 entities that harvest groundfish are small businesses. The exceptions are the catcher vessels who also fish off Alaska, some shoreside processors, and all catcher-processors and motherships (less than 30) that are affiliated with larger processing companies or large international seafood companies.

Under the no action petrale sole alternative, groundfish revenues by the non-whiting trawl fleet would be about $28 million in 2009 and in 2010. Under the Council's preferred alternative (P2), the 139 vessels in this fishery would collectively earn $27 million in 2009 and $26 million in 2010. Between 30 and 35 of these vessels would see their revenues fall by more than 5 percent.

By reducing the 2009 petrale sole harvest and the 2010 petrale sole OY, we may prevent petrale sole from being in an overfished status in 2011, or speed the rebuilding of petrale if it is found to be overfished. By reducing the 2010 canary OY we may facilitate rebuilding of canary rockfish and ease the negative impact on industry from the reduced canary rockfish harvest specifications that will likely result in 2011–2012 from the new stock assessment and rebuilding analysis.

There are no reporting, recordkeeping or other compliance requirements in the proposed rule.

No Federal rules have been identified that duplicate, overlap, or conflict with this action.

NMFS issued Biological Opinions under the ESA on August 10,1990, November 26,1991, August 28,1992, September 27,1993, May 14, 1996, and December 15, 1999 pertaining to the effects of the Pacific Coast groundfish FMP fisheries on Chinook salmon (Puget Sound, Snake River spring/summer, Snake River fall, upper Columbia River spring, lower Columbia River, upper Willamette River, Sacramento River winter, Central Valley spring, California coastal), coho salmon (Central California coastal, southern Oregon/northern California coastal), chum salmon (Hood Canal summer, Columbia River), sockeye salmon (Snake River, Ozette Lake), and steelhead (upper, middle and lower Columbia River, Snake River Basin, upper Willamette River, central California coast, California Central Valley, south/central California, northern California, southern California). These biological opinions have concluded that implementation of the FMP for the Pacific Coast groundfish fishery was not expected to jeopardize the continued existence of any endangered or threatened species under the jurisdiction of NMFS, or result in the destruction or adverse modification of critical habitat.

NMFS reinitiated a formal section 7 consultation under the ESA in 2005 for both the Pacific whiting midwater trawl fishery and the groundfish bottom trawl fishery. The December 19, 1999, Biological Opinion had defined an 11,000 Chinook incidental take threshold for the Pacific whiting fishery. During the 2005 Pacific whiting season, the 11,000 fish Chinook incidental take threshold was exceeded, triggering reinitiation. Also in 2005, new data from the West Coast Groundfish Observer Program became available, allowing NMFS to complete an analysis of salmon take in the bottom trawl fishery.

NMFS prepared a Supplemental Biological Opinion dated March 11, 2006, which addressed salmon take in both the Pacific whiting midwater trawl and groundfish bottom trawl fisheries. In its 2006 Supplemental Biological Opinion, NMFS concluded that catch rates of salmon in the 2005 whiting fishery were consistent with expectations considered during prior consultations. Chinook bycatch has averaged about 7,300 fish over the last 15 years and has only occasionally exceeded the reinitiation trigger of 11,000 fish.

Since 1999, annual Chinook bycatch has averaged about 8,450 fish. The Chinook ESUs most likely affected by the whiting fishery has generally improved in status since the 1999 section 7 consultation. Although these species remain at risk, as indicated by their ESA listing, NMFS concluded that the higher observed bycatch in 2005 does not require a reconsideration of its prior ''no jeopardy'' conclusion with respect to the fishery. For the groundfish bottom trawl fishery, NMFS concluded that incidental take in the groundfish fisheries is within the overall limits articulated in the Incidental Take Statement of the 1999 Biological Opinion. The groundfish bottom trawl limit from that opinion was 9,000 fish annually. NMFS will continue to monitor and collect data to analyze take levels. NMFS also reaffirmed its prior determination that implementation of the Groundfish FMP is not likely to jeopardize the continued existence of any of the affected ESUs.

Lower Columbia River coho (70 FR 37160, June 28, 2005) were recently listed and Oregon Coastal coho (73 FR 7816, February 11, 2008) were recently relisted as threatened under the ESA. The 1999 biological opinion concluded that the bycatch of salmonids in the Pacific whiting fishery were almost entirely Chinook salmon, with little or no bycatch of coho, chum, sockeye, and steelhead. The Southern Distinct Population Segment (DPS) of green sturgeon (71 FR 17757, April 7, 2006) were also recently listed as threatened under the ESA. As a consequence, NMFS has reinitiated its Section 7 consultation on the PFMC's Groundfish FMP.

After reviewing the available information, NMFS concluded that, in keeping with Sections 7(a) (2) and 7(d) of the ESA, the proposed action would not result in any irreversible or irretrievable commitment of resources that would have the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative measures.

With regards to marine mammals, sea turtles, and seabirds, we are reviewing the available data on fishery interactions and have entered into pre-consultation with the United States Fish and Wildlife Service, NMFS and other Federal agencies. In additions, we have begun discussions with Council staff on the process to address the concerns, if any, that arise from our review of the data.

Pursuant to Executive Order 13175, this proposed rule was developed after meaningful consultation and collaboration with tribal officials from the area covered by the FMP. Under the Magnuson-Stevens Act at 16 U.S.C. 1852(b)(5), one of the voting members of the Pacific Council must be a representative of an Indian tribe with federally recognized fishing rights from the area of the Council's jurisdiction.

List of Subjects in 50 CFR Part 660

Fisheries, Fishing, Indian Fisheries.

Dated: September 8, 2009.

Samuel D. Rauch III,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR part 660 is proposed to be amended as follows:

PART 660—FISHERIES OFF WEST COAST STATES

1. The authority citation for part 660 continues to read as follows:

Authority: 16 U.S.C. 1801 *et seq.* and 16 U.S.C. 773 *et seq.*

2. Tables 2a and 2c to part 660, subpart G, and footnotes ''/k'' and ''/r'' are revised to read as follows:

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Table 2a. To Part 660, Subpart G-2010, Specifications of ABCs, OYs, and HGs, by Management Area (weights in metric tons).

Species	ABC Specifications						OY	HG b/	
	ABC Contributions by Area					ABC			
	Vancouver a/	Columbia	Eureka	Monterey	Conception			Commercial	Recreational
ROUNDFISH:									
Lingcod c/									
N of 42 N. lat.	4,058		771			4,829	4,829		
S of 42 N. lat.									
Pacific Cod e/	3,200		d/			3,200	1,600		
Pacific Whiting f/	f/					f/	134,773 - 404,318		
Sablefish g/									
N of 36 N. lat.	9,217					9,217	6,471		
S of 36 N. lat.							1,258		
Cabezon h/									
S of 42 N. lat.	d/		86		25	111	79		
FLATFISH:									
Dover sole	28,582					28,582	16,500		
English sole j/	9,745					9,745	9,745	-	
Petrale sole k/	1,514		1,237			2,751	1,193	-	
Arrowtooth flounder l/	10,112					10,112	10,112	-	
Starry Flounder m/	1,578					1,578	1,077		
Other flatfish n/	6,731					6,731	4,884	-	
ROCKFISH:									
Pacific Ocean Perch o/	1,173					1,173	200	198	

Species	ABC Specifications						OY	HG b/	
	ABC Contributions by Area					ABC		Commercial	Recreational
	Vancouver a/	Columbia	Eureka	Monterey	Conception				
Shortbelly p/	6,950					6,950	6,950		
Widow q/	6,937					6,937	509	447.4	7.2
Canary r/	940					940	44 - 105		
Chilipepper s/	d/			2,576		2,576	2,447	2,447	
Bocaccio t/	d/			793		793	288	206.4	67.3
Splitnose u/	d/			615		615	461		
Yellowtail v/	4,562			d/		4,562	4,562		
Shortspine thornyhead w/ N of 34 27' N. lat.	2,411					2,411	1,591	1,591	
S of 34 27' N. lat.							410		
Longspine thornyhead x/ N of 34 27' N. lat.	3,671					3,671	2,175		
S of 34 27' N. lat.							385		
Cowcod y/	d/			14		14	4		
Darkblotched z/	440					440	291	288.05	
Yelloweye aa/						32	17	3.1	8.0
California Scorpionfish bb/					155	155	155		
Black cc/ N of 46 16' N. lat.	464					464	464		
S of 46 16' N. lat.			1,317			1,317	1,000		

* * * * *

Species	ABC Specifications						OY	HG b/	
	ABC Contributions by Area					ABC			
	Vancouver a/	Columbia	Eureka	Monterey	Conception			Commercial	Recreational
Minor Rockfish dd/ N of 40 10' N. lat.		3,678		--		3,678	2,283		
Minor Rockfish ee/ S of 40 10' N. lat.		--		3,382		3,382	1,990		
Remaining		1,640		1,318					
bank ff/		d/		350					
blackgill gg/		d/		292					
blue		28		211					
bocaccio north		318		--					
chilipepper north		32		--					
redstripe		576		d/					
sharpchin		307		45					
silvergrey		38		d/					
splitnose north		242		--					
yellowmouth		99		d/					
yellowtail		--		116					
gopher		d/		302					
Other rockfish hh/		2,038		2,066					
SHARKS/SKATES/RATFISH/MORIDS/GRENADIERS/KELP GREENLING:									
Longnose Skate ii/			3,269			3,269	1,349		
Other fish jj/			11,200			11,200	5,600		

* * * * *

Table 2c. To Part 660, Subpart G - 2010, and beyond, Open Access and Limited Entry Allocations by Species or Species Group. (Weights in Metric Tons)

Species	Commercial Total Catch HGs	Commercial Total Catch HGs			
		Limited Entry		Open Access	
		Mt	%	Mt	%
Lingcod N of 42° N. lat. S of 42° N. lat.	--	--	81.0	--	19.0
Sablefish kk/ N of 36° N. lat.	6,471	5,863	90.6	608	9.4
Widow ll/	--	--	97.0	--	3.0
Canary ll/	--	--	87.7	--	12.3
Chilipepper	2,447	1,363	55.7	1,084	44.3
Bocaccio ll/	206.4	--	55.7	--	44.3
Yellowtail	--	--	91.7	--	8.3
Shortspine thornyhead N of 34°27' N. lat.	1,591	1,586	99.7	5	0.27
Minor Rockfish N of 40°10' N. lat.	--	--	91.7	--	8.3
S of 40°10' N. lat.	--	--	55.7	--	44.3

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/k A petrale sole stock assessment was prepared for 2005. In 2005 the petrale sole stock was estimated to be at 32 percent of its unfished biomass coastwide (34 percent in the northern assessment area and 29 percent in the southern assessment area). The 2010 ABC of 2,751 mt is based on the 2005 assessment with a F40% FMSY proxy. To derive the 2010 OY, the 40 10 harvest policy was applied to the ABC for both the northern and southern assessment areas. As a precautionary measure, an additional 25 percent reduction was made in the OY contribution for the southern area due to assessment uncertainty. As another precautionary measure, an additional 1,200 mt reduction was made in the coastwide OY due to preliminary results of the more pessimistic 2009 stock assessment. The coastwide OY is 1,193 mt in 2010.

* * * * *

/r A canary rockfish stock assessment was completed in 2007 and the stock was estimated to be at 32.7 percent of its unfished biomass coastwide in 2007. The coastwide ABC of 940 mt is based on a FMSY proxy of F50%. The OY of 105 mt is based on a rebuilding plan with a target year to rebuild of 2021 and a SPR harvest rate of 88.7 percent. An OY of 44 mt or 85 mt would be based on a new rebuilding analysis to be considered in November 2009.

* * * * *

3. Beginning November 1, 2009, Tables 3 (North) and 3 (South) to part 660, subpart G are revised to read as follows:

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Table 3 (North) to Part 660, Subpart G -- 2009 Trip Limits for Limited Entry Trawl Gear North of 40°10' N. Lat.

Other Limits and Requirements Apply -- Read § 660.301 - § 660.399 before using this table

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		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area (RCA)[6/]:						
1	North of 48°10' N. lat.	shore - modified[7/] 200 fm line[6/]	shore - 200 fm line[6/]	shore - 150 fm line[6/]		shore - 200 fm line[6/]	shore - 200 fm line[6/]
2	48°10' N. lat. - 45°46' N. lat.	75 fm line[6/] - modified[7/] 200 fm line[6/]	75 fm line[6/] - 200 fm line[6/]	75 fm line[6/] - 150 fm line[6/]	100 fm line[6/] - 150 fm line[6/]	75 fm line[6/] - 200 fm line[6/]	75 fm line[6/] - 200 fm line[6/]
3	45°46' N. lat. - 40°10' N. lat.			75 fm line[6/] - 200 fm line[6/]	100 fm line[6/] - 200 fm line[6/]		

Selective flatfish trawl gear is required shoreward of the RCA; all trawl gear (large footrope, selective flatfish trawl, and small footrope trawl gear) is permitted seaward of the RCA. Large footrope and small footrope trawl gears (except for selective flatfish trawl gear) are prohibited shoreward of the RCA. Midwater trawl gear is permitted only for vessels participating in the primary whiting season.

See § 660.370 and § 660.381 for Additional Gear, Trip Limit, and Conservation Area Requirements and Restrictions. See §§ 660.390-660.394 and §§ 660.396-660.399 for Conservation Area Descriptions and Coordinates (including RCAs, YRCA, CCAs, Farallon Islands, Cordell Banks, and EFHCAs).

State trip limits and seasons may be more restrictive than federal trip limits, particularly in waters off Oregon and California.

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
4	**Minor slope rockfish[2/] & Darkblotched rockfish**	1,500 lb/ 2 months					
5	**Pacific ocean perch**	1,500 lb/ 2 months					
6	**DTS complex**						
7	Sablefish						
8	large & small footrope gear	18,000 lb/ 2 months		22,000 lb/ 2 months	24,000 lb/ 2 months		20,000 lb/ 2 months
9	selective flatfish trawl gear	5,000 lb/ 2 months	7,500 lb/ 2months		11,000 lb/ 2 months		
10	multiple bottom trawl gear[8/]	5,000 lb/ 2 months	7,500 lb/ 2months		11,000 lb/ 2 months		
11	Longspine thornyhead						
12	large & small footrope gear	22,000 lb/ 2 months					
13	selective flatfish trawl gear	3,000 lb/ 2 months	5,000 lb/ 2 months				3,000 lb/ 2 months
14	multiple bottom trawl gear[8/]	3,000 lb/ 2 months	5,000 lb/ 2 months				3,000 lb/ 2 months
15	Shortspine thornyhead						
16	large & small footrope gear	17,000 lb/2 months					
17	selective flatfish trawl gear	3,000 lb/ 2 months					
18	multiple bottom trawl gear[8/]	3,000 lb/ 2 months					
19	Dover sole						
20	large & small footrope gear	110,000 lb/ 2 months					
21	selective flatfish trawl gear	40,000 lb/ 2 months	45,000 lb/ 2 months				40,000 lb/ 2 months
22	multiple bottom trawl gear[8/]	40,000 lb/ 2 months	45,000 lb/ 2 months				40,000 lb/ 2 months

TABLE 3 (North)

Table 3 (North). Continued

TABLE 3 (North) con't

#						
23	**Whiting**					
24	midwater trawl	Before the primary whiting season: CLOSED. -- During the primary season: mid-water trawl permitted in the RCA. See §660.373 for season and trip limit details. -- After the primary whiting season: CLOSED.				
25	large & small footrope gear	Before the primary whiting season: 20,000 lb/trip. -- During the primary season: 10,000 lb/trip. -- After the primary whiting season: 10,000 lb/trip.				
26	**Flatfish** (except Dover sole)					
27	Arrowtooth flounder					
28	large & small footrope gear	150,000 lb/ 2 months				
29	selective flatfish trawl gear	90,000 lb/ 2 months				
30	multiple bottom trawl gear [8/]	90,000 lb/ 2 months				
31	Other flatfish [3/], English sole, starry flounder, & Petrale sole					
32	large & small footrope gear for Other flatfish[3/], English sole, & starry flounder	110,000 lb/ 2 months	110,000 lb/ 2 months, no more than 25,000 lb/ 2 months of which may be petrale sole.	110,000 lb/ 2 months, no more than 30,000 lb/ 2 months of which may be petrale sole.	110,000 lb/ 2 months, no more than 5,000 lb/ 2 months of which may be petrale sole.	110,000 lb/ 2 months
33	large & small footrope gear for Petrale sole	25,000 lb/ 2 months				2,000 lb/ 2 months
34	selective flatfish trawl gear for Other flatfish[3/], English sole, & starry flounder	90,000 lb/ 2 months, no more than 16,000 lb/ 2 months of which may be petrale sole.	90,000 lb/ 2 months, no more than 18,000 lb/ 2 months of which may be petrale sole.		90,000 lb/ 2 months, no more than 5,000 lb/ 2 months of which may be petrale sole.	90,000 lb/ 2 months, no more than 2,000 lb/ 2 months of which may be petrale sole.
35	selective flatfish trawl gear for Petrale sole					
36	multiple bottom trawl gear [8/]	90,000 lb/ 2 months, no more than 16,000 lb/ 2 months of which may be petrale sole.	90,000 lb/ 2 months, no more than 18,000 lb/ 2 months of which may be petrale sole.		90,000 lb/ 2 months, no more than 5,000 lb/ 2 months of which may be petrale sole.	90,000 lb/ 2 months, no more than 2,000 lb/ 2 months of which may be petrale sole.
37	**Minor shelf rockfish[1/], Shortbelly, Widow & Yelloweye rockfish**					
38	midwater trawl for Widow rockfish	Before the primary whiting season: CLOSED. -- During primary whiting season: In trips of at least 10,000 lb of whiting, combined widow and yellowtail limit of 500 lb/ trip, cumulative widow limit of 1,500 lb/ month. Mid-water trawl permitted in the RCA. See §660.373 for primary whiting season and trip limit details. -- After the primary whiting season: CLOSED.				
39	large & small footrope gear	300 lb/ 2 months				
40	selective flatfish trawl gear	300 lb/ month		1,000 lb/ month, no more than 200 lb/ month of which may be yelloweye rockfish		300 lb/ month
41	multiple bottom trawl gear [8/]	300 lb/ month		300 lb/ 2 months, no more than 200 lb/ month of which may be yelloweye rockfish		300 lb/ month

Table 3 (North). Continued

TABLE 3 (North) con't

42	**Canary rockfish**					
43	large & small footrope gear	CLOSED				
44	selective flatfish trawl gear	100 lb/ month	300 lb/ month		100 lb/ month	
45	multiple bottom trawl gear 8/	CLOSED				
46	**Yellowtail**					
47	midwater trawl	Before the primary whiting season: CLOSED. -- During primary whiting season: In trips of at least 10,000 lb of whiting: combined widow and yellowtail limit of 500 lb/ trip, cumulative yellowtail limit of 2,000 lb/ month. Mid-water trawl permitted in the RCA. See §660.373 for primary whiting season and trip limit details. -- After the primary whiting season: CLOSED.				
48	large & small footrope gear	300 lb/ 2 months				
49	selective flatfish trawl gear	2,000 lb/ 2 months				
50	multiple bottom trawl gear 8/	300 lb/ 2 months				
51	**Minor nearshore rockfish & Black rockfish**					
52	large & small footrope gear	CLOSED				
53	selective flatfish trawl gear	300 lb/ month				
54	multiple bottom trawl gear 8/	CLOSED				
55	**Lingcod** 4/					
56	large & small footrope gear	1,200 lb/ 2 months	4,000 lb/ 2 months			
57	selective flatfish trawl gear		1,200 lb/2 months			
58	multiple bottom trawl gear 8/					
59	**Pacific cod**	30,000 lb/ 2 months	70,000 lb/ 2 months			30,000 lb/ 2 months
60	**Spiny dogfish**	200,000 lb/ 2 months	150,000 lb/ 2 months	100,000 lb/ 2 months		
61	**Other Fish** 5/	Not limited				

1/ Bocaccio, chilipepper and cowcod are included in the trip limits for minor shelf rockfish.
2/ Splitnose rockfish is included in the trip limits for minor slope rockfish.
3/ "Other flatfish" are defined at § 660.302 and include butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, and sand sole.
4/ The minimum size limit for lingcod is 22 inches (56 cm) total length North of 42° N. lat.
5/ "Other fish" are defined at § 660.302 and include sharks, skates (including longnose skate), ratfish, morids, grenadiers, and kelp greenling. Cabezon is included in the trip limits for "other fish."
6/ The Rockfish Conservation Area is an area closed to fishing by particular gear types, bounded by lines specifically defined by latitude and longitude coordinates set out at §§ 660.391-660.394. This RCA is not defined by depth contours, and the boundary lines that define the RCA may close areas that are deeper or shallower than the depth contour. Vessels that are subject to the RCA restrictions may not fish in the RCA, or operate in the RCA for any purpose other than transiting.
7/ The "modified" fathom lines are modified to exclude certain petrale sole areas from the RCA.
8/ If a vessel has both selective flatfish gear and large or small footrope gear on board during a cumulative limit period (either simultaneously or successively), the most restrictive cumulative limit for any gear on board during the cumulative limit period applies for the entire cumulative limit period.

To convert pounds to kilograms, divide by 2.20462, the number of pounds in one kilogram.

Table 3 (South) to Part 660, Subpart G -- 2009 Trip Limits for Limited Entry Trawl Gear South of 40°10' N. Lat.

Other Limits and Requirements Apply -- Read § 660.301 - § 660.399 before using this table

110109

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area (RCA)[6/]**:**						
1	South of 40°10' N. lat.	100 fm line[6/] - 150 fm line[6/ 7/]					
	All trawl gear (large footrope, selective flatfish trawl, midwater trawl, and small footrope trawl gear) is permitted seaward of the RCA. Large footrope trawl gear and midwater trawl gear are prohibited shoreward of the RCA.						
	See § 660.370 and § 660.381 for Additional Gear, Trip Limit, and Conservation Area Requirements and Restrictions. See §§ 660.390-660.394 and §§ 660.396-660.399 for Conservation Area Descriptions and Coordinates (including RCAs, YRCA, CCAs, Farallon Islands, Cordell Banks, and EFHCAs).						
	State trip limits and seasons may be more restrictive than federal trip limits, particularly in waters off Oregon and California.						
2	**Minor slope rockfish**[2/] **& Darkblotched rockfish**						
3	40°10' - 38° N. lat.	15,000 lb/ 2 months			10,000 lb/ 2 months		15,000 lb/ 2 months
4	South of 38° N. lat.	55,000 lb/ 2 months					
5	**Splitnose**						
6	40°10' - 38° N. lat.	15,000 lb/ 2 months			10,000 lb/ 2 months		15,000 lb/ 2 months
7	South of 38° N. lat.	55,000 lb/ 2 months					
8	**DTS complex**						
9	Sablefish	20,000 lb/ 2 months					
10	Longspine thornyhead	22,000 lb/ 2 months					
11	Shortspine thornyhead	17,000 lb/ 2 months					
12	Dover sole	110,000 lb/ 2 months					
13	**Flatfish** (except Dover sole)						
14	Other flatfish[3/], English sole, & starry flounder	110,000 lb/ 2 months	110,000 lb/ 2 months, no more than 30,000 lb/ 2 months of which may be petrale sole.			110,000 lb/ 2 months, no more than 5,000 lb/ 2 months of which may be petrale sole.	110,000 lb/ 2 months
15	Petrale sole	50,000 lb/ 2 months					2,000 lb/ 2 months
16	Arrowtooth flounder	10,000 lb/ 2 months					
17	**Whiting**						
18	midwater trawl	Before the primary whiting season: CLOSED. -- During the primary season: mid-water trawl permitted in the RCA. See §660.373 for season and trip limit details. -- After the primary whiting season: CLOSED.					
19	large & small footrope gear	Before the primary whiting season: 20,000 lb/trip. -- During the primary season: 10,000 lb/trip. -- After the primary whiting season: 10,000 lb/trip.					

TABLE 3 (South)

Table 3 (South). Continued

TABLE 3 (South) con't

20	**Minor shelf rockfish[1/], Chilipepper, Shortbelly, Widow, & Yelloweye rockfish**						
21	large footrope or midwater trawl for Minor shelf rockfish & Shortbelly	300 lb/ month					
22	large footrope or midwater trawl for Chilipepper	5,000 lb/ 2 months			12,000 lb/ 2 months		
23	large footrope or midwater trawl for Widow & Yelloweye	CLOSED					
24	small footrope trawl for Minor Shelf, Shortbelly, Widow & Yelloweye	300 lb/ month					
25	small footrope trawl for Chilipepper	5,000 lb/ 2 months			12,000 lb/ 2 months		
26	**Bocaccio**						
27	large footrope or midwater trawl	300 lb/ 2 months					
28	small footrope trawl	CLOSED					
29	**Canary rockfish**						
30	large footrope or midwater trawl	CLOSED					
31	small footrope trawl	100 lb/ month		300 lb/ month		100 lb/ month	
32	**Cowcod**	CLOSED					
33	**Bronzespotted rockfish**	CLOSED					
34	**Minor nearshore rockfish & Black rockfish**						
35	large footrope or midwater trawl	CLOSED					
36	small footrope trawl	300 lb/ month					
37	**Lingcod[4/]**						
38	large footrope or midwater trawl	1,200 lb/ 2 months		4,000 lb/ 2 months			
39	small footrope trawl			1,200 lb/ 2 months			
40	**Pacific cod**	30,000 lb/ 2 months		70,000 lb/ 2 months			30,000 lb/ 2 months
41	**Spiny dogfish**	200,000 lb/ 2 months		150,000 lb/ 2 months	100,000 lb/ 2 months		
42	**Other Fish[5/] & Cabezon**	Not limited					

1/ Yellowtail is included in the trip limits for minor shelf rockfish. Bronzespotted rockfish have a species specific trip limit.
2/ POP is included in the trip limits for minor slope rockfish
3/ "Other flatfish" are defined at § 660.302 and include butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, and sand sole.
4/ The minimum size limit for lingcod is 24 inches (61 cm) total length South of 42° N. lat.
5/ Other fish are defined at § 660.302 and include sharks, skates (including longnose skate), ratfish, morids, grenadiers, and kelp greenling.
6/ The Rockfish Conservation Area is an area closed to fishing by particulary gear types, bounded by lines specifically defined by latitude and longitude coordinates set out at §§ 660.391-660.394. This RCA is not defined by depth contours, and the boundary lines that define the RCA may close areas that are deeper or shallower than the depth contour. Vessels that are subject to the RCA restrictions may not fish in the RCA, or operate in the RCA for any purpose other than transiting.
7/ South of 34°27' N. lat., the RCA is 100 fm line - 150 fm line along the mainland coast; shoreline - 150 fm line around islands.

* * * * *

4. Beginning January 1, 2010, Tables 3 (North) and 3 (South) to part 660, subpart G are revised to read as follows:

* * * * *

Table 3 (North) to Part 660, Subpart G -- 2010 Trip Limits for Limited Entry Trawl Gear North of 40°10' N. Lat.

Other Limits and Requirements Apply -- Read § 660.301 - § 660.399 before using this table

010110

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area (RCA)[6/]:						
1	North of 48°10' N. lat.	shore - 200 fm line[6/]		shore - 150 fm line[6/]		shore - 200 fm line[6/]	shore - 200 fm line[6/]
2	48°10' N. lat. - 45°46' N. lat.	75 fm line[6/] - 200 fm line[6/]		75 fm line[6/] - 150 fm line[6/]	100 fm line[6/] - 150 fm line[6/]	75 fm line[6/] - 200 fm line[6/]	75 fm line[6/] - 200 fm line[6/]
3	45°46' N. lat. - 40°10' N. lat.			75 fm line[6/] - 200 fm line[6/]	100 fm line[6/] - 200 fm line[6/]		

Selective flatfish trawl gear is required shoreward of the RCA; all trawl gear (large footrope, selective flatfish trawl, and small footrope trawl gear) is permitted seaward of the RCA. Large footrope and small footrope trawl gears (except for selective flatfish trawl gear) are prohibited shoreward of the RCA. Midwater trawl gear is permitted only for vessels participating in the primary whiting season.

See § 660.370 and § 660.381 for Additional Gear, Trip Limit, and Conservation Area Requirements and Restrictions. See §§ 660.390-660.394 and §§ 660.396-660.399 for Conservation Area Descriptions and Coordinates (including RCAs, YRCA, CCAs, Farallon Islands, Cordell Banks, and EFHCAs).

State trip limits and seasons may be more restrictive than federal trip limits, particularly in waters off Oregon and California.

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
4	**Minor slope rockfish[2/] & Darkblotched rockfish**	1,500 lb/ 2 months					
5	**Pacific ocean perch**	1,500 lb/ 2 months					
6	**DTS complex**						
7	Sablefish						
8	large & small footrope gear	18,000 lb/ 2 months		22,000 lb/ 2 months	24,000 lb/ 2 months		20,000 lb/ 2 months
9	selective flatfish trawl gear	5,000 lb/ 2 months	7,500 lb/ 2months		11,000 lb/ 2 months		
10	multiple bottom trawl gear[8/]	5,000 lb/ 2 months	7,500 lb/ 2months		11,000 lb/ 2 months		
11	Longspine thornyhead						
12	large & small footrope gear	22,000 lb/ 2 months					
13	selective flatfish trawl gear	3,000 lb/ 2 months	5,000 lb/ 2 months				3,000 lb/ 2 months
14	multiple bottom trawl gear[8/]	3,000 lb/ 2 months	5,000 lb/ 2 months				3,000 lb/ 2 months
15	Shortspine thornyhead						
16	large & small footrope gear	17,000 lb/2 months					
17	selective flatfish trawl gear	3,000 lb/ 2 months					
18	multiple bottom trawl gear[8/]	3,000 lb/ 2 months					
19	Dover sole						
20	large & small footrope gear	110,000 lb/ 2 months					
21	selective flatfish trawl gear	40,000 lb/ 2 months	45,000 lb/ 2 months				40,000 lb/ 2 months
22	multiple bottom trawl gear[8/]	40,000 lb/ 2 months	45,000 lb/ 2 months				40,000 lb/ 2 months

TABLE 3 (North)

Table 3 (North). Continued

23	**Whiting**			
24	midwater trawl	Before the primary whiting season: CLOSED. -- During the primary season: mid-water trawl permitted in the RCA. See §660.373 for season and trip limit details. -- After the primary whiting season: CLOSED.		
25	large & small footrope gear	Before the primary whiting season: 20,000 lb/trip. -- During the primary season: 10,000 lb/trip. -- After the primary whiting season: 10,000 lb/trip.		
26	**Flatfish** (except Dover sole)			
27	Arrowtooth flounder			
28	large & small footrope gear	150,000 lb/ 2 months		
29	selective flatfish trawl gear	90,000 lb/ 2 months		
30	multiple bottom trawl gear 8/	90,000 lb/ 2 months		
31	Other flatfish 3/, English sole, starry flounder, & Petrale sole			
32	large & small footrope gear for Other flatfish 3/, English sole, & starry flounder	110,000 lb/ 2 months	110,000 lb/ 2 months, no more than 18,000 lb/ 2 months of which may be petrale sole.	110,000 lb/ 2 months
33	large & small footrope gear for Petrale sole	1,000 lb/ 2 months		1,000 lb/ 2 months
34	selective flatfish trawl gear for Other flatfish 3/, English sole, & starry flounder	90,000 lb/ 2 months, no more than 1,000 lb/ 2 months of which may be petrale sole.	90,000 lb/ 2 months, no more than 18,000 lb/ 2 months of which may be petrale sole.	90,000 lb/ 2 months, no more than 1,000 lb/ 2 months of which may be petrale sole.
35	selective flatfish trawl gear for Petrale sole			
36	multiple bottom trawl gear 8/	90,000 lb/ 2 months, no more than 1,000 lb/ 2 months of which may be petrale sole.	90,000 lb/ 2 months, no more than 18,000 lb/ 2 months of which may be petrale sole.	90,000 lb/ 2 months, no more than 1,000 lb/ 2 months of which may be petrale sole.
37	**Minor shelf rockfish 1/, Shortbelly, Widow & Yelloweye rockfish**			
38	midwater trawl for Widow rockfish	Before the primary whiting season: CLOSED. -- During primary whiting season: In trips of at least 10,000 lb of whiting, combined widow and yellowtail limit of 500 lb/ trip, cumulative widow limit of 1,500 lb/ month. Mid-water trawl permitted in the RCA. See §660.373 for primary whiting season and trip limit details. -- After the primary whiting season: CLOSED.		
39	large & small footrope gear	300 lb/ 2 months		
40	selective flatfish trawl gear	300 lb/ month	1,000 lb/ month, no more than 200 lb/ month of which may be yelloweye rockfish	300 lb/ month
41	multiple bottom trawl gear 8/	300 lb/ month	300 lb/ 2 months, no more than 200 lb/ month of which may be yelloweye rockfish	300 lb/ month

TABLE 3 (North) con't

Table 3 (North). Continued

42	**Canary rockfish**						
43	large & small footrope gear	CLOSED					
44	selective flatfish trawl gear	100 lb/ month		300 lb/ month		100 lb/ month	
45	multiple bottom trawl gear 8/	CLOSED					
46	**Yellowtail**						
47	midwater trawl	Before the primary whiting season: CLOSED. -- During primary whiting season: In trips of at least 10,000 lb of whiting: combined widow and yellowtail limit of 500 lb/ trip, cumulative yellowtail limit of 2,000 lb/ month. Mid-water trawl permitted in the RCA. See §660.373 for primary whiting season and trip limit details. -- After the primary whiting season: CLOSED.					
48	large & small footrope gear	300 lb/ 2 months					
49	selective flatfish trawl gear	2,000 lb/ 2 months					
50	multiple bottom trawl gear 8/	300 lb/ 2 months					
51	**Minor nearshore rockfish & Black rockfish**						
52	large & small footrope gear	CLOSED					
53	selective flatfish trawl gear	300 lb/ month					
54	multiple bottom trawl gear 8/	CLOSED					
55	**Lingcod** 4/						
56	large & small footrope gear	1,200 lb/ 2 months		4,000 lb/ 2 months			
57	selective flatfish trawl gear			1,200 lb/2 months			
58	multiple bottom trawl gear 8/						
59	**Pacific cod**	30,000 lb/ 2 months		70,000 lb/ 2 months			30,000 lb/ 2 months
60	**Spiny dogfish**	200,000 lb/ 2 months		150,000 lb/ 2 months	100,000 lb/ 2 months		
61	**Other Fish** 5/	Not limited					

TABLE 3 (North) con't

1/ Bocaccio, chilipepper and cowcod are included in the trip limits for minor shelf rockfish.
2/ Splitnose rockfish is included in the trip limits for minor slope rockfish.
3/ "Other flatfish" are defined at § 660.302 and include butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, and sand sole.
4/ The minimum size limit for lingcod is 22 inches (56 cm) total length North of 42° N. lat.
5/ "Other fish" are defined at § 660.302 and include sharks, skates (including longnose skate), ratfish, morids, grenadiers, and kelp greenling. Cabezon is included in the trip limits for "other fish."
6/ The Rockfish Conservation Area is an area closed to fishing by particular gear types, bounded by lines specifically defined by latitude and longitude coordinates set out at §§ 660.391-660.394. This RCA is not defined by depth contours, and the boundary lines that define the RCA may close areas that are deeper or shallower than the depth contour. Vessels that are subject to the RCA restrictions may not fish in the RCA, or operate in the RCA for any purpose other than transiting.
7/ The "modified" fathom lines are modified to exclude certain petrale sole areas from the RCA.
8/ If a vessel has both selective flatfish gear and large or small footrope gear on board during a cumulative limit period (either simultaneously or successively), the most restrictive cumulative limit for any gear on board during the cumulative limit period applies for the entire cumulative limit period.

To convert pounds to kilograms, divide by 2.20462, the number of pounds in one kilogram.

Table 3 (South) to Part 660, Subpart G -- 2010 Trip Limits for Limited Entry Trawl Gear South of 40°10' N. Lat.

Other Limits and Requirements Apply -- Read § 660.301 - § 660.399 before using this table

010110

TABLE 3 (South)

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area (RCA)[6/]:						
1	South of 40°10' N. lat.	100 fm line[6/] - 200 fm line[6/ 7/]					
	All trawl gear (large footrope, selective flatfish trawl, midwater trawl, and small footrope trawl gear) is permitted seaward of the RCA. Large footrope trawl gear and midwater trawl gear are prohibited shoreward of the RCA.						
	See § 660.370 and § 660.381 for Additional Gear, Trip Limit, and Conservation Area Requirements and Restrictions. See §§ 660.390-660.394 and §§ 660.396-660.399 for Conservation Area Descriptions and Coordinates (including RCAs, YRCA, CCAs, Farallon Islands, Cordell Banks, and EFHCAs).						
	State trip limits and seasons may be more restrictive than federal trip limits, particularly in waters off Oregon and California.						
2	**Minor slope rockfish[2/] & Darkblotched rockfish**						
3	40°10' - 38° N. lat.	15,000 lb/ 2 months			10,000 lb/ 2 months		15,000 lb/ 2 months
4	South of 38° N. lat.	55,000 lb/ 2 months					
5	**Splitnose**						
6	40°10' - 38° N. lat.	15,000 lb/ 2 months			10,000 lb/ 2 months		15,000 lb/ 2 months
7	South of 38° N. lat.	55,000 lb/ 2 months					
8	**DTS complex**						
9	Sablefish	20,000 lb/ 2 months					
10	Longspine thornyhead	22,000 lb/ 2 months					
11	Shortspine thornyhead	17,000 lb/ 2 months					
12	Dover sole	110,000 lb/ 2 months					
13	**Flatfish** (except Dover sole)						
14	Other flatfish[3/], English sole, & starry flounder	110,000 lb/ 2 months	110,000 lb/ 2 months, no more than 18,000 lb/ 2 months of which may be petrale sole.				110,000 lb/ 2 months
15	Petrale sole	1,000 lb/ 2 months					1,000 lb/ 2 months
16	Arrowtooth flounder	10,000 lb/ 2 months					
17	**Whiting**						
18	midwater trawl	Before the primary whiting season: CLOSED. -- During the primary season: mid-water trawl permitted in the RCA. See §660.373 for season and trip limit details. -- After the primary whiting season: CLOSED.					
19	large & small footrope gear	Before the primary whiting season: 20,000 lb/trip. -- During the primary season: 10,000 lb/trip. -- After the primary whiting season: 10,000 lb/trip.					

Table 3 (South). Continued

20	**Minor shelf rockfish[1/], Chilipepper, Shortbelly, Widow, & Yelloweye rockfish**					
21	large footrope or midwater trawl for Minor shelf rockfish & Shortbelly	300 lb/ month				
22	large footrope or midwater trawl for Chilipepper	5,000 lb/ 2 months		12,000 lb/ 2 months		
23	large footrope or midwater trawl for Widow & Yelloweye	CLOSED				
24	small footrope trawl for Minor Shelf, Shortbelly, Widow & Yelloweye	300 lb/ month				
25	small footrope trawl for Chilipepper	5,000 lb/ 2 months		12,000 lb/ 2 months		
26	**Bocaccio**					
27	large footrope or midwater trawl	300 lb/ 2 months				
28	small footrope trawl	CLOSED				
29	**Canary rockfish**					
30	large footrope or midwater trawl	CLOSED				
31	small footrope trawl	100 lb/ month	300 lb/ month		100 lb/ month	
32	**Cowcod**	CLOSED				
33	**Bronzespotted rockfish**	CLOSED				
34	**Minor nearshore rockfish & Black rockfish**					
35	large footrope or midwater trawl	CLOSED				
36	small footrope trawl	300 lb/ month				
37	**Lingcod[4/]**					
38	large footrope or midwater trawl	1,200 lb/ 2 months	4,000 lb/ 2 months			
39	small footrope trawl		1,200 lb/ 2 months			
40	**Pacific cod**	30,000 lb/ 2 months	70,000 lb/ 2 months			30,000 lb/ 2 months
41	**Spiny dogfish**	200,000 lb/ 2 months	150,000 lb/ 2 months	100,000 lb/ 2 months		
42	**Other Fish[5/] & Cabezon**	Not limited				

TABLE 3 (South) con't

1/ Yellowtail is included in the trip limits for minor shelf rockfish. Bronzespotted rockfish have a species specific trip limit.
2/ POP is included in the trip limits for minor slope rockfish
3/ "Other flatfish" are defined at § 660.302 and include butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, and sand sole.
4/ The minimum size limit for lingcod is 24 inches (61 cm) total length South of 42° N. lat.
5/ Other fish are defined at § 660.302 and include sharks, skates (including longnose skate), ratfish, morids, grenadiers, and kelp greenling.
6/ The Rockfish Conservation Area is an area closed to fishing by particulary gear types, bounded by lines specifically defined by latitude and longitude coordinates set out at §§ 660.391-660.394. This RCA is not defined by depth contours, and the boundary lines that define the RCA may close areas that are deeper or shallower than the depth contour. Vessels that are subject to the RCA restrictions may not fish in the RCA, or operate in the RCA for any purpose other than transiting.
7/ South of 34°27' N. lat., the RCA is 100 fm line - 200 fm line along the mainland coast; shoreline - 200 fm line around islands.

* * * * *

[FR Doc. E9–21960 Filed 9–10–09; 8:45 am]

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GROUNDFISH MANAGEMENT TEAM (GMT) REPORT ON CONSIDERATION OF INSEASON ADJUSTMENTS

The Groundfish Management Team (GMT) considered requests from industry representatives, the most recent information from the West Coast Groundfish Observer Program and the status of ongoing fisheries. The following considerations and recommendations are offered.

SCIENTIFIC RESEARCH UPDATES

The greatest amount of research catch of canary rockfish is from the Northwest Fisheries Science Center Annual Bottom Trawl Survey. The survey is currently 70 percent complete, and catch through September 2, 2009 of canary rockfish totals less than 0.1 mt. In 2008 the bottom trawl survey took 1.7 mt of canary rockfish. As a precautionary approach, and to leave an adequate buffer in the scorecard in the case of unexpected canary catch during the remainder of the survey, the GMT assumes that up to double this amount could be caught in the bottom trawl survey (total of 3.4 mt). This assumption leads to a total catch estimate of canary rockfish for all research of approximately 4.5 mt. This is a decrease from the 8.0 mt that was in the scorecard at the start of the year which assumed the highest canary catch that was seen in the bottom trawl survey in recent years (7.2 mt in 2006).

The International Pacific Halibut Commission (IPHC) survey has been completed for this year. The total take of yelloweye rockfish in that survey was 0.5 mt. That brings the total projected research catch of yelloweye to 0.7 mt.

RECREATIONAL UPDATES

The Oregon recreational fishery is estimated to come in below preseason estimates for canary rockfish. This results in a 9 mt savings. Likewise, the California recreational fishery is projected not to exceed 15 mt, down from 21.3 mt. The Washington recreational fishery is currently tracking as projected.

Routine Adjustments to Management Measures

Limited Entry Fixed Gear Sablefish North of 36° N. lat.

The GMT received a request to increase the weekly and monthly limits in the limited entry fixed gear sablefish daily-trip-limit (DTL) fishery north of 36° N. lat. The GMT also received a request to eliminate the daily trip limit for this northern fishery. Available information indicates that catches in the limited entry DTL portion of the sablefish fishery have been substantially less than the allocations in recent years (Table 8). The GMT notes that even though modest inseason increases to daily, weekly, and bimonthly limits were made effective May 1 and July 1, 2009 (Table 9), trends in catch data suggest that unless additional increases are made, the 2009 harvest will be much lower than the 2009 allocation (Figure 1).

Table 8. Limited Entry Fixed Gear Sablefish DTL allocation, catch, and proportion of allocation for 2006 – 2008 north of 36° N. lat.

Year	Allocation (mt)	Catch (mt)	Proportion of Allocation
2006	356	106	0.30
2007	276	116	0.42
2008	276	159	0.54
2009	351		

Table 9. Daily, weekly, and cumulative trip limits for the Limited Entry Fixed Gear Sablefish DTL north of 36° N. lat.

Date	2008	2009
1 January	300 lbs / day, or 1 landing / week to 1000 lbs; 5000 lbs / 2 months	300 lbs / day, or 1 landing / week to 1000 lbs; 5000 lbs / 2 months
1 May		500 lbs / day, or 1 landing / week to 1500 lbs; 5500 lbs / 2 months
1 July	500 lbs / day, or 1 landing / week to 1000 lbs; 6500 lbs / 2 months	500 lbs / day, or 1 landing / week to 1500 lbs; 6000 lbs / 2 months
1 November	500 lbs / day, or 1 landing / week to 1500 lbs; 6500 lbs / 2 months	

Monthly catches shown in Figure 1 were taken from the quota species monitoring (QSM) system catch reports. This figure illustrates total catch north of 36° N lat. for 2008 and catches through August 31, 2009. Data from previous months and previous years were used to estimate September catches for all three states (Figure 1). This estimation procedure is conservative because bimonthly limits were more restrictive during these months of 2009 than during 2008 (Table 2) and because effort is restricted and does not widely fluctuate as fishing opportunities are adjusted for this limited entry sector. In addition, RCAs were larger during 2009 than during 2008, resulting in even more restrictive management during 2009. Nonetheless, catch was higher during winter and spring 2009 than during 2008; these higher rates were accounted for in the September 2009 estimate.

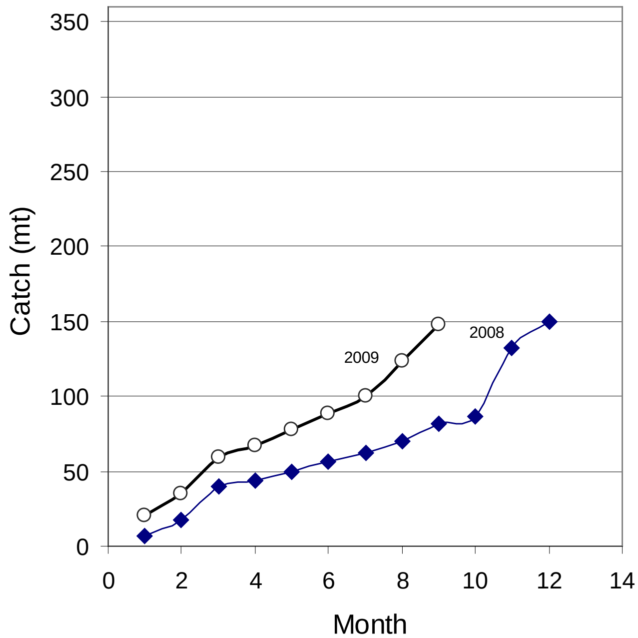

Figure 1. Monthly sablefish catch (mt) by the Limited Entry Fixed Gear sablefish DTL fleet for 2008 and 2009. Catches reported through the last day of each month are shown. Allocations were 276 mt and 351 mt for 2008 and 2009, respectively.

PacFIN data indicate that the total number of limited entry vessels participating in the DTL fishery in the past several years has ranged from 37 to 43 vessels north of the Conception area (36° N. lat.). Using this historic participation and catch information, the GMT evaluated a potential increase in the weekly and bimonthly limit for October 1 through December 31, 2009. Assuming all 43 vessels participate in the fishery and attain their bimonthly limit, the GMT estimated that the bimonthly limit could be raised from 6,000 lbs to 7,000 lbs and catches would remain within the limited entry DTL allocation. Elimination of the daily trip limit is not predicted to exceed the allocation. The daily limit was put in place when regulations were the same for LEFG and open access (OA) and the OA fishery relied on the daily limit to control effort. That same concern does not exist for a limited entry fishery. Changing the weekly limit to 2,000 pounds per week is not predicted to exceed the allocation because these specified parameters are for a short period of time (approximately 10 weeks).

Based on the projections described above, the GMT recommends the Council consider increasing the bimonthly cumulative limit from 6,000 lbs to 7,000 lbs, increasing the weekly limit from 1,500 lbs to 2,000 lbs, and eliminating the daily limit through the end of the year.

Limited Entry Sablefish Fishery South of 36° N. lat.

The GMT received a request to examine an increase in limits for sablefish in the DTL south of 36° N. lat. from 400 lb/day or 1,500 lb/week to 3,000 lb/week with no daily limit for the remainder of the year. In 2009, the optimum yield (OY) increased significantly in the Conception area due to a more optimistic stock assessment. The latest QSM indicates that 313 mt have been caught out of a 1371 mt OY. Without any inseason adjustment, the limited entry and/or open access fisheries are expected to fall short of their allocation.

Elimination of the daily trip limit is not predicted to exceed the allocation. The daily limit was put in place when regulations were the same for LEFG and OA and the OA fishery relied on the daily limit to control effort. That same concern does not exist for a limited entry fishery. The GMT estimates that these increases to sablefish trip limits will not increase impacts to overfished species because the model assumes that the entire Conception area OY is taken. Impacts to co-occurring target species are not expected to exceed OYs.

The GMT recommends consideration of increasing trip limits from "400 lb / day, one landing per week up to 1,500 lb" to a "weekly limit of 3,000 lb", with no daily limit.

Open Access Sablefish South of 36° N. lat

The GMT received a request to examine an increase in limits for sablefish in the DTL fishery south of 36° N. lat. from 400 lb/day, 1,500 lb/week, and 8,000 lb per/ 2 months to 400 lb/day, 2,500 lb/week and no bi-monthly limit.

Although the open access fishery is more dynamic and significant changes to trip limits can induce shifts and increases in effort, discussions with industry indicate that this is not likely to materialize because many of the open access fishermen in this area would have left to participate in other fisheries. Consultation with NMFS staff indicate that the soonest a trip limit increase could be in place is mid-October 2009, resulting in approximately 10 weeks of available fishing.

The GMT recommends the Council consider increasing the trip limits from "400 lb/day, 1,500 lb/week, and 8,000 lb per/ 2 months" to "400 lb/day, 2,500 lb/week" and no bi-monthly limit for the remainder of the year.

Limited Entry and Open Access Deeper Nearshore Rockfish South of 40° 10' N. lat.

The GMT received a request to increase the deeper nearshore rockfish trip limits in the limited entry and open access fishery in California south of 40°10' N. lat for the remainder of the year to allow conversion of discarded catch into landed catch.

Current trip limits for deeper nearshore rockfish south of 40°10' N lat. are as follows:

		SEP-OCT		NOV-DEC	
Minor nearshore rockfish & Black rockfish					
	Deeper nearshore				
	40°10' - 34°27' N. lat.	600 lb/ 2 months		700 lb/ 2 months	
	South of 34°27' N. lat.	600 lb/ 2 months			

Industry request to increase deeper nearshore rockfish trip limits for the entire area south of 40°10’ N lat. to 800 lb/2 months for the remainder of the year are depicted here:

		SEP-OCT		NOV-DEC	
Minor nearshore rockfish & Black rockfish					
	Deeper nearshore				
	South of 40°10' N. lat.	800 lb/ 2 months			

The deeper nearshore rockfish trip limit is comprised of black, blue and deeper nearshore rockfish species, so any increase in this trip limit can result in an increase in landings in any one or all of those species. Black rockfish is a healthy stock and has been under harvested over the last few years. If the trip limit is increased, black rockfish is projected to attain only 17 percent of its harvest guideline south of 40°10’ N lat. Blue rockfish are less common south of 40°10’ N. lat. and any potential increase in their landings as a result of increasing the deeper nearshore trip limits are not expected to exceed the statewide harvest guideline of 220 mt. The deeper nearshore rockfish and shallow nearshore rockfish are managed as part of the minor nearshore rockfish, with a combined HG of 138 mt. This increase in deeper nearshore rockfish trip limits is expected to result in attainment of 76 percent of the harvest guideline.

Previous discussions of increasing nearshore opportunities have raised concerns over the potential impact on overfished species – canary in particular south of 40°10’ N lat. The nearshore model, unlike other models, is a landings-based model which estimates overfished species impacts based on the previous year’s landings, not on attainment of a harvest guideline. Projected impacts, prior to changes to the nearshore fishery, in the scorecard is 3.3 mt of canary. Increasing the trip limits as requested by industry is expected to increase canary impacts to 3.6 mt.

The GMT recommends the Council consider increasing the deeper nearshore rockfish trip limits for the entire area south of 40°10’ N lat. to 800 lb/2 months for the remainder of the year.

Limited Entry Non-Whiting Trawl Fishery

Inseason opportunities in the limited entry trawl fishery are influenced by the Council’s decision on petrale opportunities in 2009. Leaving the petrale areas open affects the catch of several groundfish stocks, specifically, it increases the impacts on darkblotched rockfish and Pacific Ocean perch, reducing the ability to increase opportunities on other target species. As a result, the GMT developed two options for Council consideration that respond to whether the Council elects to finalize the preliminary measures for 2009 petrale opportunities adopted in June. One inseason option assumes the Council restricts the period 6 petrale fishery, while the other inseason option assumes that the period 6 petrale areas remain open and cumulative limits are less restrictive in period 5 and 6. In addition to the petrale matter, the GMT received a request to examine increasing opportunities for sablefish, arrowtooth, and slope rockfish in the non-whiting portion of the limited entry trawl fishery. Since many target species become less available to vessels using selective flatfish gear in the north late in the year, the focus was on opportunities for vessels using large footrope gear in the north and for vessels using all types of bottom trawl gear in the south.

The most recent fish ticket data indicates that catch of sablefish in the trawl fishery is roughly 1,300 metric tons below the trawl sector allocation and is projected to be approximately 300 metric tons below the allocation without any inseason adjustments, which is well below the expected catch level for the fishery at the time when management measures were initially developed. Therefore, there appear to be substantial opportunities to increase sablefish cumulative limits in this fishery, provided doing so would keep the fishery within acceptable overfished species impacts.

The catch of arrowtooth flounder is expected to reach approximately half of the OY without inseason adjustments. The GMT received a request to examine an increase in arrowtooth, principally as a means of reducing regulatory discard in the fishery. Option 1 increases arrowtooth in the north from 150,000 lbs to 180,000 lbs per two months in period 5 and 6 in order to reduce discard. This trip limit increase is not expected to increase arrowtooth impacts.

Recent fish ticket information also indicates that catch of petrale sole in the trawl fishery is below what was projected in June 2009. Therefore, if the Council does not elect to reduce catches of petrale sole at the end of 2009 in response to the point of concern, then the Council could consider increasing cumulative limits for petrale sole through the remainder of 2009 while keeping projected impacts below the 2009 petrale sole OY.

Table 3. Status Quo Cumulative limits and RCA boundaries (assumes Council finalizes preliminary action on petrale in period 6).

Subarea	Period	RCA Config Inline	RCA Config Outline	Sablefish	Longspine	Shortspine	Dover	Other Flat	Petrale	Arrowtooth	Slope Rk
No 40 10 Large & small footrope	1	See Attached Table		18,000	22,000	17,000	110,000	110,000	50,000	150,000	2,000
	2			18,000	22,000	17,000	110,000	110,000	2,000	150,000	2,000
	3			22,000	22,000	17,000	110,000	110,000	30,000	150,000	2,000
	4			24,000	22,000	17,000	110,000	110,000	30,000	150,000	2,000
	5			24,000	22,000	17,000	110,000	110,000	5,000	150,000	2,000
	6			20,000	22,000	17,000	110,000	110,000	2,000	150,000	2,000
No 40 10 SFFT	1	See Attached Table		5,000	3,000	3,000	40,000	90,000	16,000	90,000	2,000
	2			7,500	5,000	3,000	45,000	90,000	18,000	90,000	2,000
	3			7,500	5,000	3,000	45,000	90,000	18,000	90,000	2,000
	4			11,000	5,000	3,000	60,000	90,000	18,000	90,000	2,000
	5			11,000	5,000	3,000	60,000	90,000	5,000	90,000	2,000
	6			11,000	3,000	3,000	60,000	90,000	2,000	90,000	2,000
38 to 40 10	1	100	150	20,000	22,000	17,000	110,000	110,000	50,000	10,000	15,000
	2	100	150	20,000	22,000	17,000	110,000	110,000	30,000	10,000	15,000
	3	100	150	20,000	22,000	17,000	110,000	110,000	30,000	10,000	15,000
	4	100	150	20,000	22,000	17,000	110,000	110,000	30,000	10,000	10,000
	5	100	150	20,000	22,000	17,000	110,000	110,000	5,000	10,000	10,000
	6	100	200	20,000	22,000	17,000	110,000	110,000	2,000	10,000	15,000
S 38	1	100	150	20,000	22,000	17,000	110,000	110,000	50,000	10,000	55,000
	2	100	150	20,000	22,000	17,000	110,000	110,000	30,000	10,000	55,000
	3	100	150	20,000	22,000	17,000	110,000	110,000	30,000	10,000	55,000
	4	100	150	20,000	22,000	17,000	110,000	110,000	30,000	10,000	55,000
	5	100	150	20,000	22,000	17,000	110,000	110,000	5,000	10,000	55,000
	6	100	200	20,000	22,000	17,000	110,000	110,000	2,000	10,000	55,000

Table 4. Status quo RCA boundaries in the north.

	Jan - Feb	Mar - Apr	May - Jun	Jul - Aug	Sep - Oct	Nov - Dec
North of 48 10	0 - 200*	0 - 200	0 - 150	0 - 150	0 - 200	0 - 200
48 10 to 45 46	75 - 200*	75 - 200	75 - 150	100 - 150	75 - 200	75 - 200
45 46 to 40 10			75 - 150	100 - 200	75 - 200	

Table 5. Projected impacts prior to the proposed inseason action.

	North	South	Total	OY/HG/Allocation
Canary	18.1	3.7	21.8	
POP	94.0	0.8	94.8	
Darkblotch	169.4	32.0	201.4	
Widow	10.0	9.2	19.3	
Bocaccio	2.9	11.9	14.8	
Yelloweye	0.6	-	0.6	
Cowcod	-	1.3	1.3	
Sablefish	2,438.5	521.8	2,960.2	3,280
Longspine	721.7	284.8	1,006.5	2,231
Shortspine	1,046.2	255.0	1,301.2	1,608
Dover	11,524.4	1,781.2	13,305.5	16,500
Arrowtooth	4,794.1	175.4	4,969.5	11,267
Petrale	1,578.5	285.6	1,864.0	2,433
Other Flat	1,572.9	579.3	2,152.2	4,884
Slope Rock	96.1	177.6	273.7	1160N/626S

The GMT developed cumulative limits for the trawl fishery that attempt to increase opportunities on target species while staying within acceptable impacts to overfished stocks. Option 1 assumes the period 6 petrale fishery is restricted, while Option 2 leaves the period 6 petrale fishery open. Option 1 increases sablefish cumulative limits to 27,000 lbs in period 5 and 6 for vessels in the north using large and small footrope trawl gear, and in the south for all bottom trawl gear. Option 1 also increases arrowtooth in the north (for vessels using large and small footrope) to 180,000 lbs per two months starting in period 5, increases slope rockfish in the north to 4,000 lbs per two months beginning period 5, increases slope rockfish between 38 degrees N lat and 40 degrees 10 minutes N lat to 15,000 lbs in period 5 and to 18,000 lbs in period 6. Option 2 increases petrale cumulative limits to 30,000 lbs and 50,000 lbs in periods 5 and 6 respectively (except for vessels using SFFT in the north), while increasing sablefish limits to 26,000 lbs in periods 5 and 6 (except for vessels using SFFT in the north).

Table 6. Proposed Cumulative Limits and RCA Boundaries – Option 1

		RCA Config									
Subarea	Period	Inline	Outline	Sablefish	Longspine	Shortspine	Dover	Other Flat	Petrale	Arrowtooth	Slope Rk
No 40 10 Large & small footrope	1	See Attached Table		18,000	22,000	17,000	110,000	110,000	50,000	150,000	2,000
	2			18,000	22,000	17,000	110,000	110,000	2,000	150,000	2,000
	3			22,000	22,000	17,000	110,000	110,000	30,000	150,000	2,000
	4			24,000	22,000	17,000	110,000	110,000	30,000	150,000	2,000
	5			27,000	22,000	17,000	110,000	110,000	5,000	180,000	4,000
	6			27,000	22,000	17,000	110,000	110,000	2,000	180,000	4,000
No 40 10 SFFT	1	See Attached Table		5,000	3,000	3,000	40,000	90,000	16,000	90,000	2,000
	2			7,500	5,000	3,000	45,000	90,000	18,000	90,000	2,000
	3			7,500	5,000	3,000	45,000	90,000	18,000	90,000	2,000
	4			11,000	5,000	3,000	60,000	90,000	18,000	90,000	2,000
	5			11,000	5,000	3,000	60,000	90,000	5,000	90,000	4,000
	6			11,000	3,000	3,000	60,000	90,000	2,000	90,000	4,000
38 to 40 10	1	100	150	20,000	22,000	17,000	110,000	110,000	50,000	10,000	15,000
	2	100	150	20,000	22,000	17,000	110,000	110,000	30,000	10,000	15,000
	3	100	150	20,000	22,000	17,000	110,000	110,000	30,000	10,000	15,000
	4	100	150	20,000	22,000	17,000	110,000	110,000	30,000	10,000	10,000
	5	100	150	27,000	22,000	17,000	110,000	110,000	5,000	10,000	15,000
	6	100	200	27,000	22,000	17,000	110,000	110,000	2,000	10,000	18,000
S 38	1	100	150	20,000	22,000	17,000	110,000	110,000	50,000	10,000	55,000
	2	100	150	20,000	22,000	17,000	110,000	110,000	30,000	10,000	55,000
	3	100	150	20,000	22,000	17,000	110,000	110,000	30,000	10,000	55,000
	4	100	150	20,000	22,000	17,000	110,000	110,000	30,000	10,000	55,000
	5	100	150	27,000	22,000	17,000	110,000	110,000	5,000	10,000	55,000
	6	100	200	27,000	22,000	17,000	110,000	110,000	2,000	10,000	55,000

Table 7. Proposed RCA Boundaries in the North – Option 1

<table>
<tr><th></th><th>Jan - Feb</th><th colspan="2">Mar - Apr</th><th>May - Jun</th><th>Jul - Aug</th><th>Sep - Oct</th><th>Nov - Dec</th></tr>
<tr><td>North of 48 10</td><td colspan="2">0 - 200*</td><td>0 - 200</td><td>0 - 150</td><td>0 - 150</td><td>0 - 200</td><td>0 - 200</td></tr>
<tr><td>48 10 to 45 46</td><td colspan="2" rowspan="2">75 - 200*</td><td rowspan="2">75 - 200</td><td>75 - 150</td><td>100 - 150</td><td>75 - 200</td><td rowspan="2">75 - 200</td></tr>
<tr><td>45 46 to 40 10</td><td>75 - 150</td><td>100 - 200</td><td>75 - 200</td></tr>
</table>

Table 8. Proposed Cumulative Limits and RCA Boundaries – Option 2

Subarea	Period	RCA Config Inline	RCA Config Outline	Sablefish	Longspine	Shortspine	Dover	Other Flat	Petrale	Arrowtooth	Slope Rk
No 40 10 Large & small footrope	1	See Attached Table		18,000	22,000	17,000	110,000	110,000	50,000	150,000	2,000
	2			18,000	22,000	17,000	110,000	110,000	2,000	150,000	2,000
	3			22,000	22,000	17,000	110,000	110,000	30,000	150,000	2,000
	4			24,000	22,000	17,000	110,000	110,000	30,000	150,000	2,000
	5			26,000	22,000	17,000	110,000	110,000	30,000	150,000	2,000
	6			26,000	22,000	17,000	110,000	110,000	50,000	150,000	2,000
No 40 10 SFFT	1	See Attached Table		5,000	3,000	3,000	40,000	90,000	16,000	90,000	2,000
	2			7,500	5,000	3,000	45,000	90,000	18,000	90,000	2,000
	3			7,500	5,000	3,000	45,000	90,000	18,000	90,000	2,000
	4			11,000	5,000	3,000	60,000	90,000	18,000	90,000	2,000
	5			11,000	5,000	3,000	60,000	90,000	18,000	90,000	2,000
	6			11,000	3,000	3,000	60,000	90,000	16,000	90,000	2,000
38 to 40 10	1	100	150	20,000	22,000	17,000	110,000	110,000	50,000	10,000	15,000
	2	100	150	20,000	22,000	17,000	110,000	110,000	30,000	10,000	15,000
	3	100	150	20,000	22,000	17,000	110,000	110,000	30,000	10,000	15,000
	4	100	150	20,000	22,000	17,000	110,000	110,000	30,000	10,000	10,000
	5	100	150	26,000	22,000	17,000	110,000	110,000	30,000	10,000	10,000
	6	100	150	26,000	22,000	17,000	110,000	110,000	50,000	10,000	15,000
S 38	1	100	150	20,000	22,000	17,000	110,000	110,000	50,000	10,000	55,000
	2	100	150	20,000	22,000	17,000	110,000	110,000	30,000	10,000	55,000
	3	100	150	20,000	22,000	17,000	110,000	110,000	30,000	10,000	55,000
	4	100	150	20,000	22,000	17,000	110,000	110,000	30,000	10,000	55,000
	5	100	150	26,000	22,000	17,000	110,000	110,000	30,000	10,000	55,000
	6	100	150	26,000	22,000	17,000	110,000	110,000	50,000	10,000	55,000

Table 9. Proposed RCA Boundaries in the North – Option 2

<table>
<tr><th></th><th>Jan - Feb</th><th>Mar - Apr</th><th>May - Jun</th><th>Jul - Aug</th><th>Sep - Oct</th><th>Nov - Dec</th></tr>
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<tr><td>45 46 to 40 10</td><td>75 - 150</td><td>100 - 200</td><td>75 - 200</td></tr>
</table>

note: a " * " means petrale areas (modified seaward RCA boundaries with petrale cut-outs) are open

Table 10. Projected impacts from Option 1 (sable, arrow, slope rock, petrale area closed)

	North	South	Total	OY/HG/Allocation
Canary	18.1	3.7	21.8	
POP	94.6	0.8	95.5	
Darkblotch	170.8	32.3	203.1	
Widow	10.1	9.2	19.3	
Bocaccio	2.9	11.9	14.8	
Yelloweye	0.6	-	0.6	
Cowcod	-	1.3	1.3	
Sablefish	2,632.6	580.1	3,212.7	3,280
Longspine	721.7	284.8	1,006.5	2,231
Shortspine	1,046.2	255.0	1,301.2	1,608
Dover	11,524.4	1,781.2	13,305.5	16,500
Arrowtooth	4,794.1	175.4	4,969.5	11,267
Petrale	1,578.5	285.6	1,864.0	2,433
Other Flat	1,572.9	579.3	2,152.2	4,884
Slope Rock	96.7	186.0	282.7	1160N/626S

Table 11. Projected impacts from Option 2 (petrale areas open, sablefish)

	North	South	Total	OY/HG/Allocation
Canary	18.2	3.9	22.2	
POP	106.6	0.8	107.4	
Darkblotch	204.9	34.9	239.8	
Widow	11.4	9.3	20.7	
Bocaccio	3.1	12.3	15.3	
Yelloweye	0.6	-	0.6	
Cowcod	-	1.3	1.3	
Sablefish	2,601.9	573.8	3,175.6	3,280
Longspine	721.7	284.8	1,006.4	2,231
Shortspine	1,053.3	255.2	1,308.5	1,608
Dover	11,553.6	1,784.0	13,337.6	16,500
Arrowtooth	4,818.7	175.5	4,994.2	11,267
Petrale	2,032.1	361.5	2,393.6	2,433
Other Flat	1,589.2	580.0	2,169.3	4,884
Slope Rock	97.2	181.4	278.6	1160N/626S

Table 12. Comparison of projected impacts under various trawl alternatives.

	Staus Quo	Option 1	Option 2
Canary	21.8	21.8	22.2
POP	94.8	95.5	107.4
Darkblotch	201.4	203.1	239.8
Widow	19.3	19.3	20.7
Bocaccio	14.8	14.8	15.3
Yelloweye	0.6	0.6	0.6
Cowcod	1.3	1.3	1.3
Sablefish	2,960.2	3,212.7	3,175.6
Longspine	1,006.5	1,006.5	1,006.4
Shortspine	1,301.2	1,301.2	1,308.5
Dover	13,305.5	13,305.5	13,337.6
Arrowtooth	4,969.5	4,969.5	4,994.2
Petrale	1,864.0	1,864.0	2,393.6
Other Flat	2,152.2	2,152.2	2,169.3
Slope Rock	273.7	282.7	278.6

Petrale Sole and Canary Rockfish Interim Measures

In June, 2009 the Council identified a point of concern under FMP section 6.2.2 and recommended that NMFS take action to reduce harvest of petrale sole in 2009 and 2010 in response to the preliminary results of the new 2009 stock assessment. The Council also recommended that NMFS take action to reduce catches of canary rockfish in 2010 in response to the results of the new 2009 stock assessment update. Under the FMP Section 5.5.1, harvest specifications for species subject to rebuilding requirements may be modified during the biennium if the Council determines they are not adequately conservative to meet rebuilding plan goals.

Based on the Council recommendations in June 2009, NMFS developed and analyzed the potential impacts of two petrale sole alternatives, and three canary rockfish alternatives (including status quo/no action). NMFS published a Draft EA (Agenda Item E.4.b NMFS Report) and a proposed rule (Agenda Item E.4.b Supplemental NMFS Report 2) for changes to harvest specifications and management measures for these two species on September 11, 2009.

As a means of avoiding an overfished status at the beginning of 2011, or to speed the rebuilding of petrale if it is found to be overfished, the Council considered measures that would: reduce the catch of petrale sole to a level of approximately 2,000 mt in 2009, or roughly 400 mt below the 2009 OY of 2,433 mt; and reduce the catch to approximately 1,200 mt in 2010, or approximately 1,200 mt below the current 2010 OY of 2,393. Alternative P2 from the Draft EA results in impacts of 1,995 mt in 2009 and 1,178 mt in 2010 with a commensurate estimated depletion of 13 percent in 2011 (compared to 9 percent for P1, the no action alternative). In June, the Council preliminarily recommended modifications to petrale sole trip limits and sub-limits, and closure of petrale areas by modifying the trawl RCA as described in Table 13 below. These are reflected in the options put forward by the GMT for the LE non-whiting trawl earlier in this document.

Table 13. Proposed management measures to reduce petrale sole projected impacts by approximately 400 mt at the end of 2009. (Figure 2-1 in the Draft EA)

	NOV-DEC
Rockfish Conservation Area (RCA):	
North of 48°10' N. lat.	shore - **200 fm line**
48°10' N. lat. - 45°46' N. lat.	75 fm line - **200 fm line**
45°46' N. lat. - 40°10' N. lat.	
South of 40°10' N. lat.	100 fm line - 150 fm line
Flatfish North of 40°10' N. Lat. (except Dover sole and Arrowtooth flounder)	
Other flatfish, English sole, starry flounder, & Petrale sole	
large & small footrope gear for Other flatfish, English sole, & starry flounder	110,000 lb/ 2 months
large & small footrope gear for Petrale sole	**2,000 lb/ 2 months**
selective flatfish trawl gear for Other flatfish, English sole, & starry flounder	90,000 lb/ 2 months, **no more than 2,000 lb/ 2 months of which may be petrale sole.**
selective flatfish trawl gear for Petrale sole	
multiple bottom trawl gear	90,000 lb/ 2 months, **no more than 2,000 lb/ 2 months of which may be petrale sole.**
Flatfish South of 40°10' N. Lat. (except Dover sole and Arrowtooth flounder)	
Other flatfish[3/], English sole, & starry flounder	110,000 lb/ 2 months
Petrale sole	**2,000 lb/ 2 months**

Several alternative canary OYs are considered in the Draft EA. Preliminary estimates of changes in depletion from reducing the canary OY in 2010 are presented in Table 14.

Table 14. Canary Rockfish 2010 OY Alternatives – excerpted from Draft EA

Alternative	2010 OY	Estimated 2011 % Depletion [a/]
C1 – No Action	105 mt	25.2
C2	85 mt	25.2
C3	44 mt	25.3

a/ NOTE: These point estimates are presented to facilitate comparison of the alternative 2010 OYs. The depletion values are generated in the base case stock assessment (assuming the same harvest rate adopted under Amendment 16-4) and do not account for uncertainty in the assessment like the rebuilding analysis will. These point estimates are uncertain, with an unknown confidence interval.

The Council is scheduled to take final action at this meeting on management measures for the end of 2009 relative to petrale sole. The Council may choose to finalize their preliminary recommendation, as described in Table 13 and the LE trawl Option 1 presented in this report.

In November the Council is scheduled to consider the rebuilding analysis for canary rockfish, which will illustrate the rebuilding trade-offs of the three alternative 2010 OYs and make a final recommendation on a 2010 canary rockfish OY, and associated management measures. The Council will also make a final recommendation on a 2010 petrale sole OY, and associated management measures. This may include considering the rebuilding analysis for petrale sole (assuming the stock is overfished), which will illustrate the rebuilding trade-offs of the two alternative 2010 OYs.

GMT Recommendations:

1. Consider increasing the LEFG sablefish DTL limits north of 36° N.lat. from “1,500 lbs per week, and 6,000 lbs per 2 months” to “2,000 lbs per week, and 7,000 lbs per 2 months” and eliminating the daily limit for the remainder of the year.
2. Consider increasing LEFG sablefish DTL weekly limit South of 36° N. lat from “400 lb / day, one landing per week up to 1,500 lb” to a “weekly limit of 3,000 lb”, with no daily limit.
3. Consider increasing the OA sablefish DTL trip limits South of 36° N. lat from “400 lb per day, one landing per week of up to 1,500 lb, and 8,000 lb per/ 2 months” to “400 lb/day, one landing per week of up to 2,500 lb” and eliminating the bi-monthly limit for the remainder of the year.
4. Consider increasing the LE and OA deeper nearshore rockfish trip limits south of 40°10’ N lat. to “800 lb/2 months” for the remainder of the year.
5. Consider changes to petrale sole, sablefish, arrowtooth, and slope rockfish cumulative limits and RCA boundaries for the LE non-whiting trawl fishery.
6. Provide notice of the intention to implement measures for 2010 groundfish fisheries that impact petrale sole and canary rockfish at the November meeting.

Projected mortality impacts (mt) of overfished groundfish species updated with most recent research estimates and fishery projections through June 2009.

Fishery	Bocaccio b/	Canary	Cowcod	Dkbl	POP	Widow	Yelloweye
Limited Entry Trawl- Non-whiting	**14.8**	**21.8**	1.3	**201.4**	**94.8**	**19.3**	0.6
Limited Entry Trawl- Whiting							
At-sea whiting motherships a/		4.3		6.0	0.5	60.0	0.0
At-sea whiting cat-proc a/		6.1		8.5	0.5	85.0	0.0
Shoreside whiting a/		7.6		10.5	0.1	105.0	0.0
Tribal whiting		1.4		0.0	0.7	3.7	0.0
Tribal							
Midwater Trawl		3.6		0.0	0.0	40.0	0.0
Bottom Trawl		0.8		0.0	3.7	0.0	0.0
Troll		0.5		0.0	0.0		0.0
Fixed gear		0.3		0.0	0.0	0.0	2.3
Fixed Gear Sablefish	0.2	2.8	0.0	4.2	0.5	0.1	0.9
Fixed Gear Nearshore	0.3	3.3	0.0	0.0	0.0	0.3	1.2
Fixed Gear Other	5.0	0.0	0.0	9.0	0.0	0.7	0.0
Open Access: Incidental Groundfish	2.0	0.9	0.0	0.0	0.0	4.0	0.3
Recreational Groundfish e/							
WA		**10.3**					5.2
OR						1.0	
CA	67.3	**15.0**	**0.3**			**6.0**	2.8
EFPs	13.7	2.7	0.3	1.3	0.0	5.5	0.3
Research: Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs.							
	2.0	**4.5**	0.2	2.0	2.0	5.7	**0.7**
TOTAL	105.3	85.9	2.1	242.9	102.8	336.3	14.3
2009 OY f/	288	105	4.0	285	189	522	17
Difference	182.7	19.1	1.9	42.1	86.2	185.7	2.7
Percent of OY	36.6%	81.8%	52.5%	85.2%	54.4%	64.4%	84.1%
Key		= either not applicable; trace amount (<0.01 mt); or not reported in available data					

a/ Non-tribal whiting values for canary, darkblotched, and widow reflect bycatch limits for the non-tribal whiting sectors. The widow bycatch limit is the difference between the OY and the projected impacts in all non-whiting fisheries. All other species' impacts are projected from the GMT's whiting impact projection model. The Council may elect to change these bycatch limits when setting final whiting management measures in March of 2009 or 2010 or under any inseason action at any of their future meetings.

b/ South of 40°10' N. lat.

c/ Mortality estimates are not hard numbers; based on the GMT's best professional judgment.

d/ Bycatch amounts by species unavailable, but bocaccio occurred in 0.1% of all port samples and other rockfish in another 0.1% of all port samples (and squid fisheries usually land their whole catch).

e/ Values in scorecard represent projected impacts for all species except canary and yelloweye rockfish, which are the prescribed harvest guidelines.

f/ 2009 and 2010 OYs are the same except for darkblotched (291 mt in 2010), POP (200 mt in 2010), and widow (509 mt in 2010).

FISHERY MANAGEMENT PLAN AMENDMENT 23 – ANNUAL CATCH LIMITS AND ACCOUNTABILITY MEASURES

The Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 (MSRA) established several new fishery management provisions pertaining to National Standard 1 (NS1) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), which states, "Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield (OY) from each fishery for the United States fishing industry." On January 16, 2009, the National Marine Fisheries Service (NMFS) published a final rule in the Federal Register to implement the new MSRA requirements and amend the guidelines for NS1.

The MSRA and amended NMFS guidelines introduce new fishery management concepts including overfishing levels (OFLs), annual catch limits (ACLs), annual catch targets (ACTs), and accountability measures (AMs) that are designed to better account for scientific and management uncertainty and to prevent overfishing. One important change in the final guidelines is that ACTs are no longer mandatory, rather they are included as an optional accountability tool intended for the management of fisheries without inseason monitoring and harvest controls. These important aspects of the MSRA are required to be implemented by 2011 for most species and by 2010 for those species designated as being subject to overfishing. There are no groundfish species currently subject to overfishing, so 2011 is the implementation goal.

Precautionary harvest control rules exist for the actively managed species in the fishery management plan (FMP), control rules which provide a solid foundation for the implementation of new fishery management provisions such as the OFL and the ACL, which are analogous to the current definition of acceptable biological catch (ABC) and OY, respectively in the FMP. However, a new definition and control rules for specifying an ABC which, under the new NS1 guidelines, factors scientific uncertainty into the specification, will likely take considerably more thought.

The Council decided in April to proceed with Amendment 23 to incorporate these new NS1 guidelines in the FMP. The Council decided to pursue frameworking these guidelines in the FMP under an ambitious amendment schedule so as to reach finality at the November, 2009 Council meeting in order to synchronize with the biennial specifications process which starts at that meeting. The Scientific and Statistical Committee (SSC) provided a conceptual framework in April for factoring scientific uncertainty in the ABC rule for stocks with a history of multiple assessments. They recommended quantifying assessment variability as a basis for evaluating the size of a scientific uncertainty buffer (i.e., the difference in yield between the OFL and the ABC) and the risk of overfishing the stock. Further Council guidance in June for advancing Amendment 23 included tasking the GMT and Council staff to document the performance of the inseason groundfish catch monitoring and adjustment mechanism to evaluate the efficacy of these accountability measures. The SSC and Council staff will also coordinate development of alternative ABC control rules to synchronize with the 2011-12 biennial specifications process. Development of ABC control rules and ACL considerations for target and overfished species will be prioritized, with unassessed species as the next priority. The Council asked for ABC control rules that are based on relatively simple and understandable metrics.

The Groundfish Subcommittee of the SSC met on September 1 and 2 to further develop the conceptual framework for an ABC control rule. Their recommendations will be brought forward at this meeting to the full SSC and the Council.

Council staff and the GMT are also evaluating the efficacy of current catch monitoring tools to decide if these are adequate AMs to prevent overfishing. This evaluation and the GMT recommendations will be forthcoming in a supplemental GMT report under this agenda item.

Finally, there may be consideration for classifying some FMP species as Ecosystem Component species. According to the new NS1 guidelines, Ecosystem Component species do not require specification of reference points (i.e., OFLs, ABCs, and ACLs) but should be monitored to the extent that any new pertinent scientific information becomes available (e.g., catch trends, vulnerability, etc.) to determine changes in their status or their vulnerability to the fishery. For this classification, such species should: 1) be a non-target species or stock; 2) not be determined to be subject to overfishing, approaching overfished, or overfished; 3) not be likely to become subject to overfishing or overfished, according to the best available information, in the absence of conservation and management measures; and 4) not generally be retained for sale or personal use. There are a number of dwarf rockfish species that are largely unexploited and appear to meet the criteria for an Ecosystem Component classification (Agenda Item E.5.a, Attachment 1).

The Council should consider the new NS1 guidelines and consider the comments of Council advisory bodies and the public before providing guidance for further development of Amendment 23. Further, the Council should discuss and give guidance on a realistic schedule for reaching a final decision on this amendment package.

Council Action:

Provide guidance on further development of Amendment 23.

Reference Materials:

1. Agenda Item E.5.a, Attachment 1: Table of west coast groundfish species that are candidate "ecosystem component" species.

Agenda Order:

a. Agenda Item Overview — John DeVore
b. Reports and Comments of Management Entities and Advisory Bodies
c. Public Comment
d. **Council Action:** Provide guidance on further development of Amendment 23.

PFMC
08/28/09

West coast groundfish species that are candidate "ecosystem component" species.

Common name	Scientific name	Comments
Calico Rockfish	*Sebastes dalli*	Some are caught and discarded in southern CA rec. fisheries
Puget Sound Rockfish	*Sebastes emphaeus*	Small size; rarely caught
Shortbelly Rockfish	*Sebastes jordani*	Small size; not targeted; some trawl and line gear bycatch
Freckled Rockfish	*Sebastes lentiginosus*	Small size; some incid. rec. catch in southern CA
Dwarf-red Rockfish	*Sebastes rufinanus*	Small size; no record of west coast catch
Pygmy Rockfish	*Sebastes wilsoni*	Small size; not taken in fisheries

Agenda Item E.5.b
Supplemental GMT Report
September 2009

GROUNDFISH MANAGEMENT TEAM (GMT) REPORT ON
FISHERY MANAGEMENT PLAN AMENDMENT 23 – ANNUAL CATCH LIMITS
AND ACCOUNTABILITY MEASURES

Council staff presented the Groundfish Management Team (GMT) with an overview of a proposed schedule for incorporation of the annual catch limits (ACL) requirements and revised national standard 1 (NS1) guidelines into the groundfish fishery management plan (FMP) and implementation of the ACL framework during the 2011-2012 harvest specifications and management measures process. The new ACL framework largely matches with the Council's acceptable biological catch (ABC) and optimum yield (OY) reference points; however, the addition of a new reference point could create some timing issues.

As it has been presented to the Council at previous meetings, the major difference between the new ACL framework and the Council's current groundfish FMP relates to the overfishing threshold. Currently, the Council's best estimate of that overfishing threshold is identified as the ABC. The NS1 guidelines, however, now designate the overfishing threshold as the overfishing limit (OFL), with the ABC reduced from the OFL to reduce the probability of overfishing by taking into account scientific uncertainty around the estimate of a stock's biomass and its maximum fishing mortality threshold.

To facilitate the Council's preferred schedule of finalizing biennial harvest specifications at the April 2010 meeting, Council staff has recommended completion of the ACL framework (Amendment 23) and finalization of ABCs at the March 2010 meeting. The ABC is the upper limit for the ACL. The ACL can be no higher than the ABC yet can be set lower based on considerations beyond scientific uncertainty (e.g., 40-10 adjustment).

The Scientific and Statistical Committee (SSC) is currently evaluating alternative methods for deriving ABC control rules that create a scientific uncertainty buffer from the OFL. The GMT understands that the SSC may use these alternative methods to recommend a range of ABCs in November. In past cycles, the Council has identified a single ABC for each stock and a range of OYs derived from that ABC. This cycle will involve consideration of a range of ACLs from a range of ABCs, which could create challenges if the Council chooses to set ACLs below the ABC.[1] The GMT therefore agrees that the identification of final preferred ABCs in March 2010 would likely aid the Council's identification of final preferred ACLs in April 2010. At the same

[1] The GMT does not expect the ACL framework to further complicate the Council's considerations of ACLs for rebuilding species. As occurs under status quo, rebuilding ACLs will continue to be based on estimates of uncertainty in the time to rebuild estimated from the rebuilding analysis and not on the method for factoring in scientific uncertainty between the OFL and the ABC.

time, the GMT understands that the March meeting is traditionally full and focused primarily on non-groundfish items.

In June, the Council asked Council staff and a subgroup of the GMT to evaluate the team's role in Amendment 23, specifically regarding the evaluation of management uncertainty and use of annual catch targets (ACTs). We have had preliminary discussions on this topic and will begin the analysis at our October 5-9 meeting in Portland, Oregon. At that meeting, we also plan to begin an evaluation of the 90+ species in the groundfish FMP, as well as species encountered in the groundfish fisheries but not currently managed by the FMP, against the new NS1 criteria for determining whether a stock should be included "in the fishery" and managed with an ACL. The GMT has reviewed and plans to evaluate the FMP species using an assessment method developed by the NMFS Vulnerability Evaluation Work Group (VEWG) that looks at the susceptibility and resilience (i.e., productivity) of each stock to fishing mortality.[2] This vulnerability analysis will also help inform an evaluation of the FMP's current stock complexes against the standards in the revised NS1 guidelines and will help guide the Council in deciding whether to incorporate ecosystem component species into the FMP. We have had initial discussion with the NWFSC and West Coast Groundfish Observer Program about data to use in the analysis and will be asking Council staff to make formal requests for data at our October meeting. Lastly, we will also analyze the use of sector-specific ACLs and ACTs and evaluate current accountability measures in the FMP. We will present the results of our preliminary analyses and evaluation to the Council for consideration in November.

PFMC
09/16/09

[2] *See* http://www.nmfs.noaa.gov/msa2007/vulnerability.htm.

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON FISHERY MANAGEMENT PLAN AMENDMENT 23 – ANNUAL CATCH LIMITS

The Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 (MSRA) established several new fishery management provisions pertaining to National Standard 1 (NS1) of the Magnuson-Stevens Fishery Conservation and Management Act. On January 16, 2009, the National Marine Fisheries Service (NMFS) published a final rule in the Federal Register to amend the guidelines for NS1 that provide guidance to the Councils in revising their Fisheries Management Plans (FMPs) to conform to the new MSRA requirements. Specifically, there is now a need to implement overfishing levels (OFLs), annual catch limits (ACLs), annual catch targets (ACTs), and accountability measures (AMs) by 2011 for most species, and by 2010 for those species designated as being subject to overfishing. The major task for the Scientific and Statistical Committee (SSC), however, is to satisfy provisions of the MSRA to redefine the Acceptable Biological Catch (ABC) to account for scientific uncertainty.

The Council has decided to framework how ABCs will be calculated in its groundfish and coastal pelagic species (CPS) fishery management plans (FMPs). The SSC provided a conceptual framework in April 2009 to account for scientific uncertainty when calculating ABCs for "data-rich" stocks with a history of multiple assessments. They recommended quantifying the variability in biomass estimates from stock assessments as a basis for evaluating the size of a scientific uncertainty buffer (i.e., the difference between the OFL and the ABC) and the risk of overfishing the stock.

The groundfish and coastal pelagic species subcommittees of the SSC met in Seattle, Washington September 1-2, 2009 to discuss implementation of the NMFS guidelines and, in particular, how to calculate the scientific uncertainty buffer that defines the difference between the OFL and the ABC. That meeting considered three general approaches to defining scientific buffers for groundfish and CPS species, and agreed that defining these buffers based on a value of P^* (the probability of exceeding the OFL) was most appropriate. This scientific buffer would be based on a tier system, with different tiers for species with different levels of information. The size of the buffer for data-rich stocks would be determined using information on "between" and "within" assessment variation in biomass estimates, and with buffers for data-poor species being set larger than data-rich species. While this is only a first step in quantifying scientific uncertainty, the SSC endorses this approach.

The SSC recommends that the method of translating a value of P^* into a scientific buffer should be frameworked in the environmental assessment (EA) because methods for doing this translation are still evolving and because no methods currently exist that can capture all sources of scientific uncertainty. The SSC intends to use the approach it outlined in April as the basis for providing ABC recommendations at the March 2010 meeting. While not perfect, in particular because it does not address assessment bias, this approach captures many key sources of scientific uncertainty to the extent currently possible. Specifically, two sources of scientific uncertainty will be computed: (a) the statistical uncertainty that is captured within each stock assessment and (b) a measure of the remaining scientific uncertainty which cannot be captured within a stock assessment, but can be inferred from changes over time in estimates of biomass from stock assessments. Dr Stephen Ralston and assessment authors will be working to collate the information needed to compute the between-assessment variation in biomass estimates for data-rich species, and hence the magnitude of this second source of uncertainty, with a view to providing an example at the November meeting of how the approach can be applied to calculate scientific buffers.

The SSC concurs with the need to revisit the OFL and ABC values for: (a) species with ABCs computed by multiplying survey swept-area biomass estimates by $0.75*M$, (b) Restrepo's method of computing 50% of the average catch over a period of years when catches are stable, and (c) species complexes that are aggregates of single species. This task will need to be completed at the March 2010 meeting and may involve a special meeting of the SSC groundfish subcommittee in early 2010.

The SSC notes that it has focused its attention on approaches for determining scientific uncertainty and calculating scientific buffers, given a measure of scientific uncertainty and a choice for $P*$. The SSC expects that the Council will choose values of $P*$ for each tier level; the SSC is willing to work with Council staff to develop tools to illustrate the trade-offs between the probability of overfishing and the size of scientific buffers.

Finally, the SSC notes that it is in the somewhat unusual role of developing methods and also reviewing them. However, methods development has occurred primarily by members of the groundfish and CPS subcommittee and additional review can be provided by SSC members who are not on these subcommittees. The methodology will likely be presented at the National SSC meeting in November, and further review of the methods will also occur as part of the review of the EA.

SSC Groundfish and CPS Subcommittee Report on Implementation of National Standard 1 for West Coast Groundfish and Coastal Pelagic Species.

September 1-2, 2009 Seattle, WA

Background:

The Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 (MSRA) established several new fishery management provisions pertaining to National Standard 1 (NS1) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), which states, "Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield (OY) from each fishery for the United States fishing industry." On January 16, 2009, the National Marine Fisheries Service (NMFS) published a final rule in the Federal Register to amend the guidelines for NS1 that provide guidance to the Councils in revising their Fisheries Management Plans (FMPs) to conform to the new MSRA requirements.

The MSRA and amended NMFS guidelines introduce new fishery management concepts including overfishing levels (OFLs), annual catch limits (ACLs), annual catch targets (ACTs), and accountability measures (AMs) that are designed to better account for scientific and management uncertainty and to prevent overfishing. These important aspects of the MSRA are required to be implemented by 2011 for most species and by 2010 for those species designated as being subject to overfishing. A new definition and control rules for specifying an Acceptable Biological Catch (ABC) which, under the new NS1 guidelines, factors scientific uncertainty into the specification, will likely take considerably more thought.

The Council decided to framework these guidelines in its groundfish and coastal pelagic FMPs under an ambitious amendment schedule targeting the November, 2009 Council meeting to synchronize with the groundfish biennial specifications process which starts at that meeting. The Scientific and Statistical Committee (SSC) provided a conceptual framework in April for factoring scientific uncertainty in the ABC rule for stocks with a history of multiple assessments. They recommended quantifying variability in assessment outcomes as a basis for evaluating the size of a scientific uncertainty buffer (i.e., the difference in yield between the OFL and the ABC) and the risk of overfishing the stock. The SSC and Council staff will also coordinate development of ABC control rules to synchronize with the 2011-12 biennial specifications process. Development of ABC control rules and ACL considerations for target and overfished species will be prioritized, with unassessed species as the next priority. The Council asked for ABC control rules that are based on relatively simple and understandable metrics.

Considerations:

The Groundfish and Coastal Pelagic Species (CPS) subcommittees of the Pacific Fisheries Management Council's (PFMC's) Scientific and Statistical Committee (SSC) met in Seattle Washington on September 1-2, 2009 to discuss implementation of the NMFS guidelines under the Council process, and particularly how to implement the scientific uncertainty buffer which defines the difference between OFL and ABC.

Dr. Richard Methot presented the NOAA Fisheries Office of Science and Technology view on how ABC, ACL and ACTs will relate to OFLs under the new NS1 guidelines. All of these are expressed in terms of total catch (i.e. landings and discards combined), whether in biomass or numbers. The talk focused on incorporating scientific uncertainty to define the difference between the OFL and the ABC. Dr. Andre Punt presented methods considered for the Bering Sea and Aleutian Islands crab stock given uncertainty estimates.

The three general approaches to defining buffers for groundfish and CPS species considered were:

1. Create a Tier system whether the size of the buffer between the OFL and the ABC will the same for all species in each tier but differ among tiers; the size of the buffer would increase with increasing tier number (from well-assessed Tier 1 species up through increasingly data poor species).
2. Use P* (a probability of exceeding "true" OFL (the OFL level which would be defined given perfect information about the stock and the proxy SPR fishing rate)). This can include a tier system as above. The relationship between P* and the size of the buffer would be calculated using the Tier 1 (well assessed) species.
3. Use a decision-theoretic approach.

The meeting agreed that the decision-theoretic approach required too much information and was too complex to implement in the limited timeframe. It was also not clear that the example presented for crab was defining its objective in a way that reflects avoidance of overfishing. The meeting also noted that adopting approach 1 (fixed buffers by tier) would mean that species would differ a tier in terms of the probability of exceeding "true" OFL which adopting approach 2 (fixed P* by tier) would mean that species within a tier would differ in terms of the buffer applied.

The P* approach associated with a tier system appears the most appropriate approach at this time. One additional difficulty is that currently projections can only correctly estimate buffer for a single year forecast. While methods to approximate the correct buffer in multi-year forecasts were discussed, the subcommittees concluded that forecasting while using the buffer for the single year forecast for multiple years would be acceptable until appropriate multi-year forecasting software is developed.

Dr. Stephen Ralston presented a method for estimating historical between-assessment variability as one component of uncertainty to consider. The subcommittees agreed that this was a reasonable way to estimate uncertainty external to individual assessments. However, a number of improvements to the method were suggested, and further discussion of the method is needed prior to it being used. These suggestions include:

1. using only full assessments (or the most recent update of a full assessment in lieu of the full assessment itself);
2. limiting the time frame for comparison between assessments (certainly not considering the earliest periods which may generally reflect B_0, and perhaps more limited than that); and
3. not including early assessments that used considerably less sophisticated assessment methods, or which were severely data limited.

Dr. Ralston agreed to work on the method and to produce results for a larger suite of species using several approaches, while assessment authors and others would be tasked with producing the retrospective time series as well as the measures of uncertainty from the most recent assessments.

General Conclusions:
The SSC subcommittees propose the following method for determining the scientific uncertainty in OFL values: for species with successful assessments develop estimates of between (external) assessment uncertainty (using retrospective multi-species meta-analyses) and within (internal) assessment uncertainty (using asymptotic estimates of uncertainty)

within individual assessments. For CPS stocks, consider grouping with groundfish or analyzing separately (the latter less likely to be successful due to the few assessed species within CPS).

The SSC subcommittees suggest providing the council with graphs of isopleths for the relationship of P* to buffer (proportion of catch) given internal and external variance estimates, using log-normal approximation (see figures 1 and 2 for examples) to aid in Council decision making. These figures could be annotated with lines denoting the internal assessment uncertainty.

While the P* values chosen by the Council will determine buffers for future assessments, there should be some flexibility for specific decisions about ABC within this framework to account for perceived unaccounted for of uncertainties. Given greater uncertainty with a greater number of forecast years, there is more incentive to do new assessments for species important to the fishery.

The SSC subcommittees suggest revisiting OFL and ABC values for species with ABCs defined via Roger's method of considering survey area swept biomass estimates and applying $F = 0.75*M$ or Restrepo's method of half of average catch over a period of years, and for species complexes which are made up largely of such species. Revisiting, updating and improving these methods, as well as examining uncertainty associated with them would be a key off-year science project. The results of the uncertainty examination will provide a stronger basis for developing buffers which are at least as risk-averse as those developed based on assessment uncertainty. Since OFL and ABC values for many data-poor species are based on analyses that have not been updated for some time, consideration should be given to establishing an additional buffer that reflects the timeliness of the information used to establish the OFL and ABC values.

There are species for which only one full assessment has been conducted. The buffer for these species will also be computed using the outcome of the further application of Ralston's method.

For many species within complexes, discard, often from fisheries without observers, is the largest component of catch which may therefore be poorly known. For those species with low vulnerability due to closures and other fishery management actions, this may be of little concern in the near term.

The SSC subcommittees note that vulnerability scores would affect ACLs rather than ABCs, and factors such as in-season tracking issues would affect ACTs. Since being in the precautionary zone of relative spawning output is in a sense an indication of increased vulnerability, the 40-10 rule and similar catch-reduction rules could be applied to ABCs as part of the determination of the ACLs.

Finally, the SSC subcommittees note that any system for defining scientific uncertainty is necessarily approximate. Specifically, although the method outlines attempt to capture all quantifiable scientific uncertainty, there are sources of uncertainty (e.g. caused by climate change, stock structure uncertainty, the validity of F_{MSY} proxies, etc.) which cannot be addressed at present (and probably not in the foreseeable future). Many of these sources of uncertainty should be more important on a longer time-scale.

Near-term Approach:
The following stock assessment authors and Council Staff will be asked to provide retrospective assessment time series as well as biomass CV's from the most recent assessments and a description of parameters estimated or fixed within those assessments to Steve Ralston by October 2, 2009:

- Jason Cope: Cabezon
- Paul Crone: Pacific mackerel
- John DeVore: Sablefish and Dover sole
- John Field: Chilipepper rockfish and Bocaccio
- Melissa Haltuch: Petrale sole
- Owen Hamel: Darkblotched rockfish, Pacific ocean perch, shortspine thornyhead and lingcod
- Xi He: Widow rockfish
- Kevin Hill: Pacific sardine
- Ian Stewart: Pacific hake and canary rockfish
- John Wallace: Yellowtail rockfish

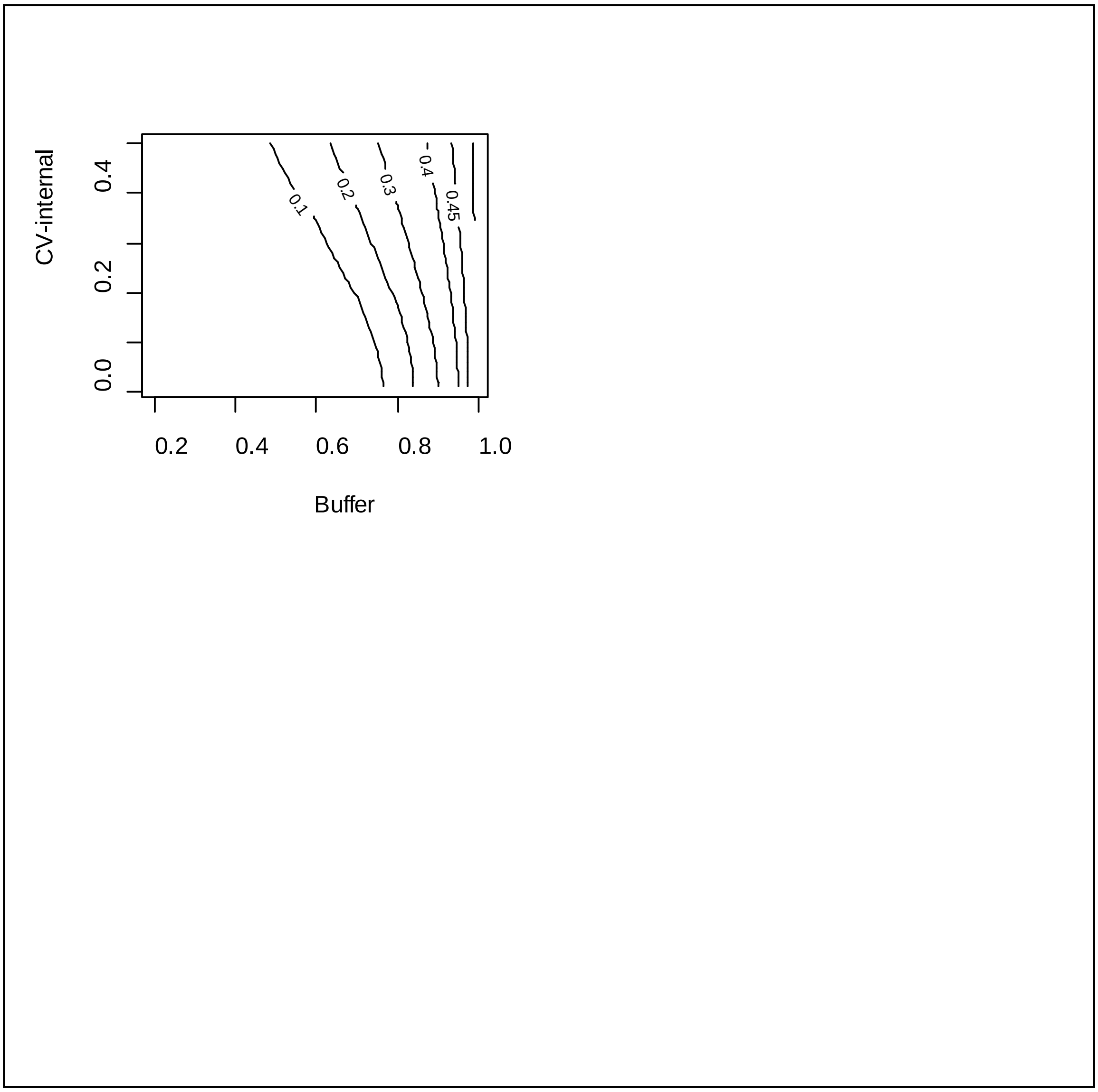
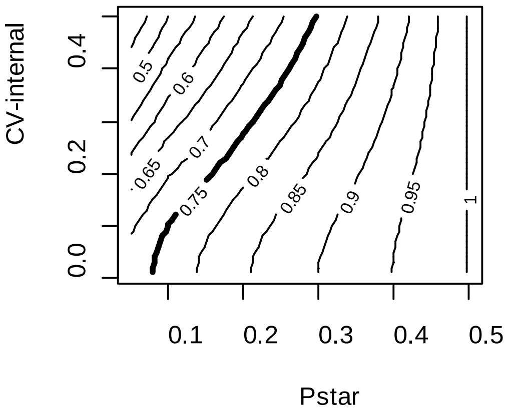


Figure 1. Isopleths of P* values associated with a buffer (Proportion that ABC is of OFL) and the internal (to the assessment) CV and the external CV (to be provided by Ralston's analysis). The value of P* is computed as the cumulative probability below the buffer for a lognormal distribution with median 1 and CV^2 given by the sum of the internal and extra variances.

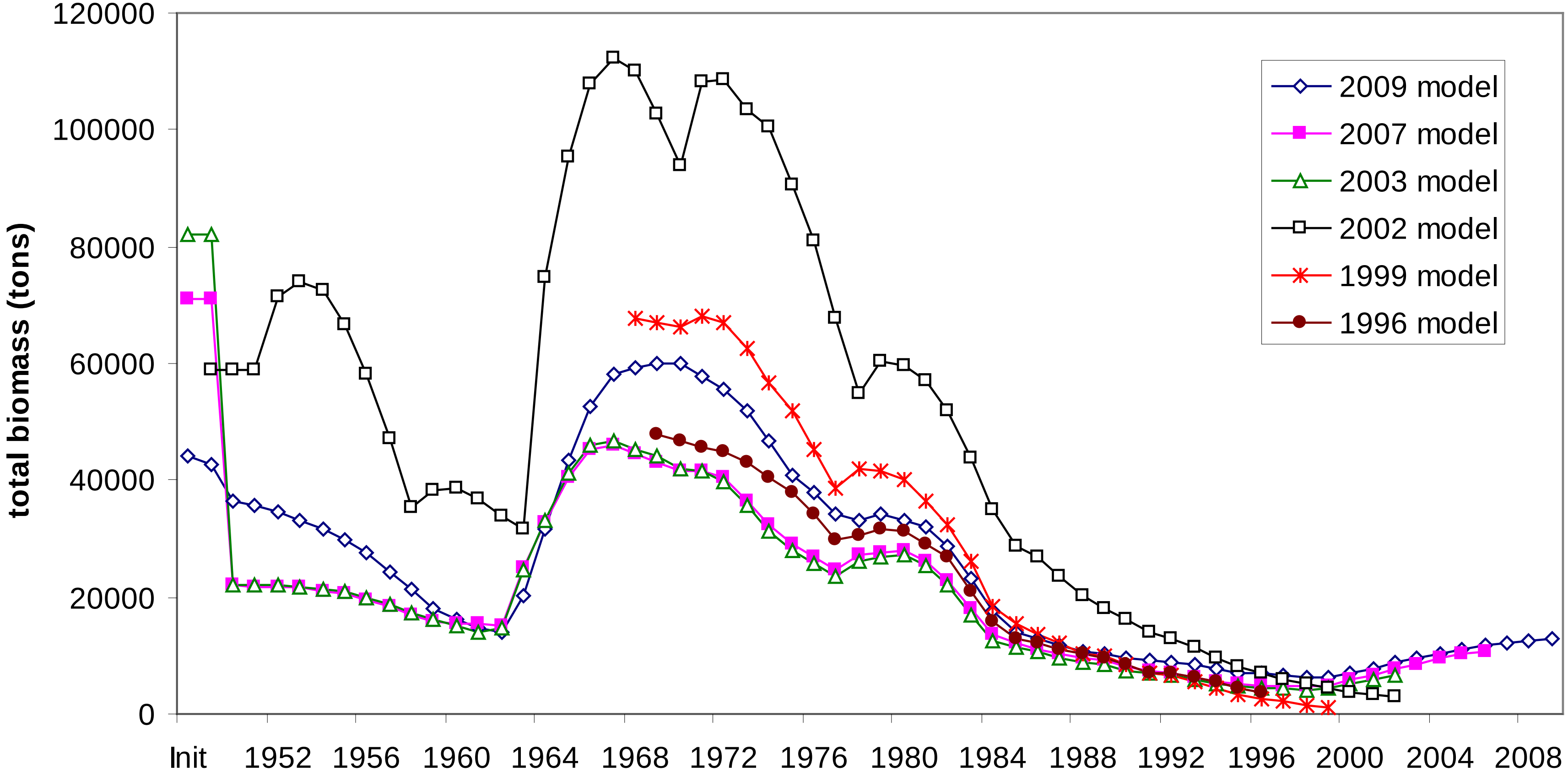

CV-internal
0.0
0.2
0.4
0.1
0.2
0.3
0.4
0.5
Pstar
0.5
0.6
0.65
0.7
0.75
0.8
0.85
0.9
0.95
1

Expressing Scientific Uncertainty in PFMC Groundfish Stock Assessments

Two Key Assertions

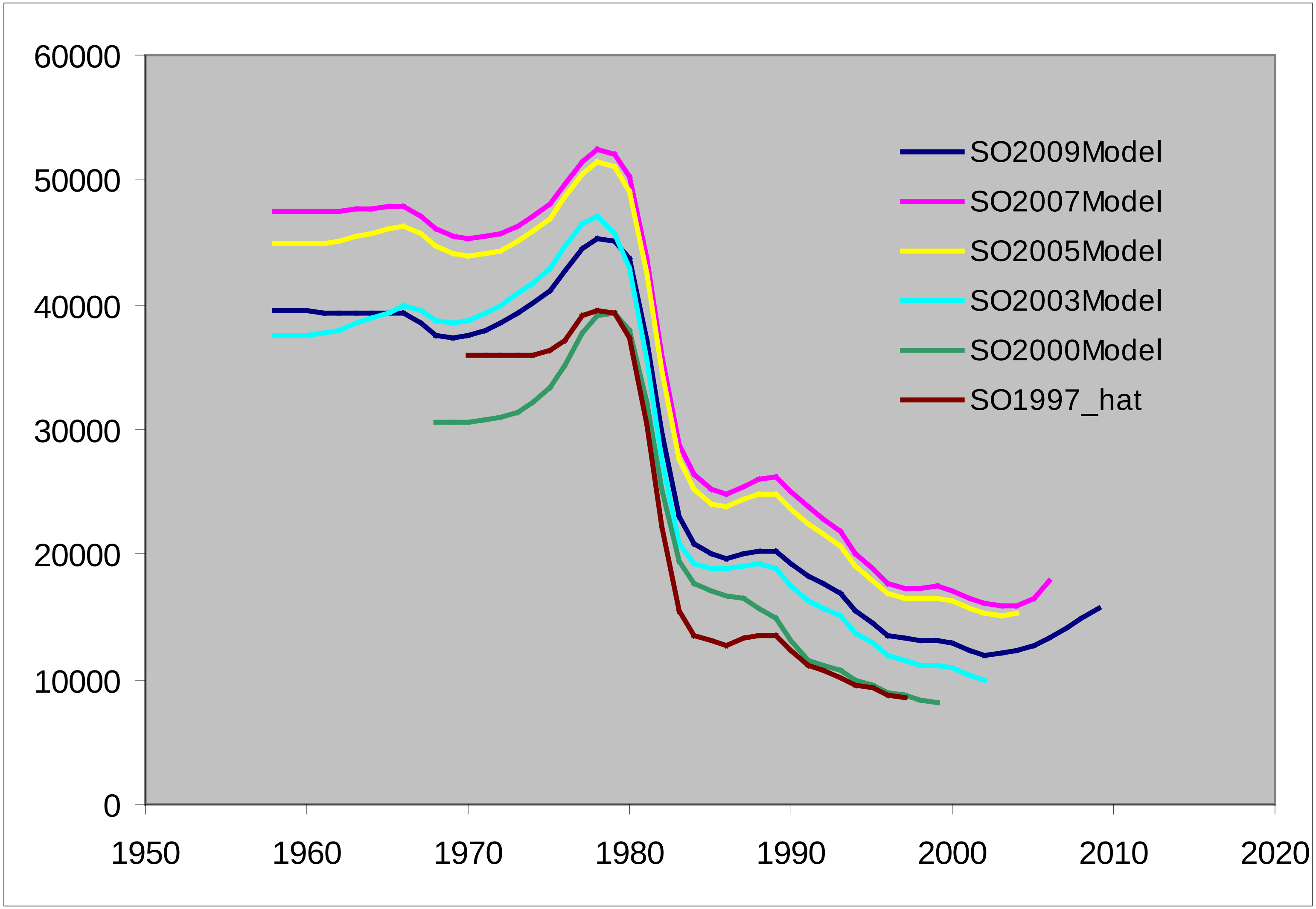
- Data-poor assessments cannot be more certain than data-rich assessments
- Variation “among” stock assessments captures a wide variety of sources of uncertainty, including:
  - Data used (e.g., NWFSC combined trawl survey)
  - Model software (e.g., SS1 vs. SS3)
  - Model specification (dome-shaped or asymptotic)
  - Parameter priors (e.g., Dorn prior on ***h***)
  - STAT team composition
  - STAR panel composition

Repeats of the bocaccio stock assessment



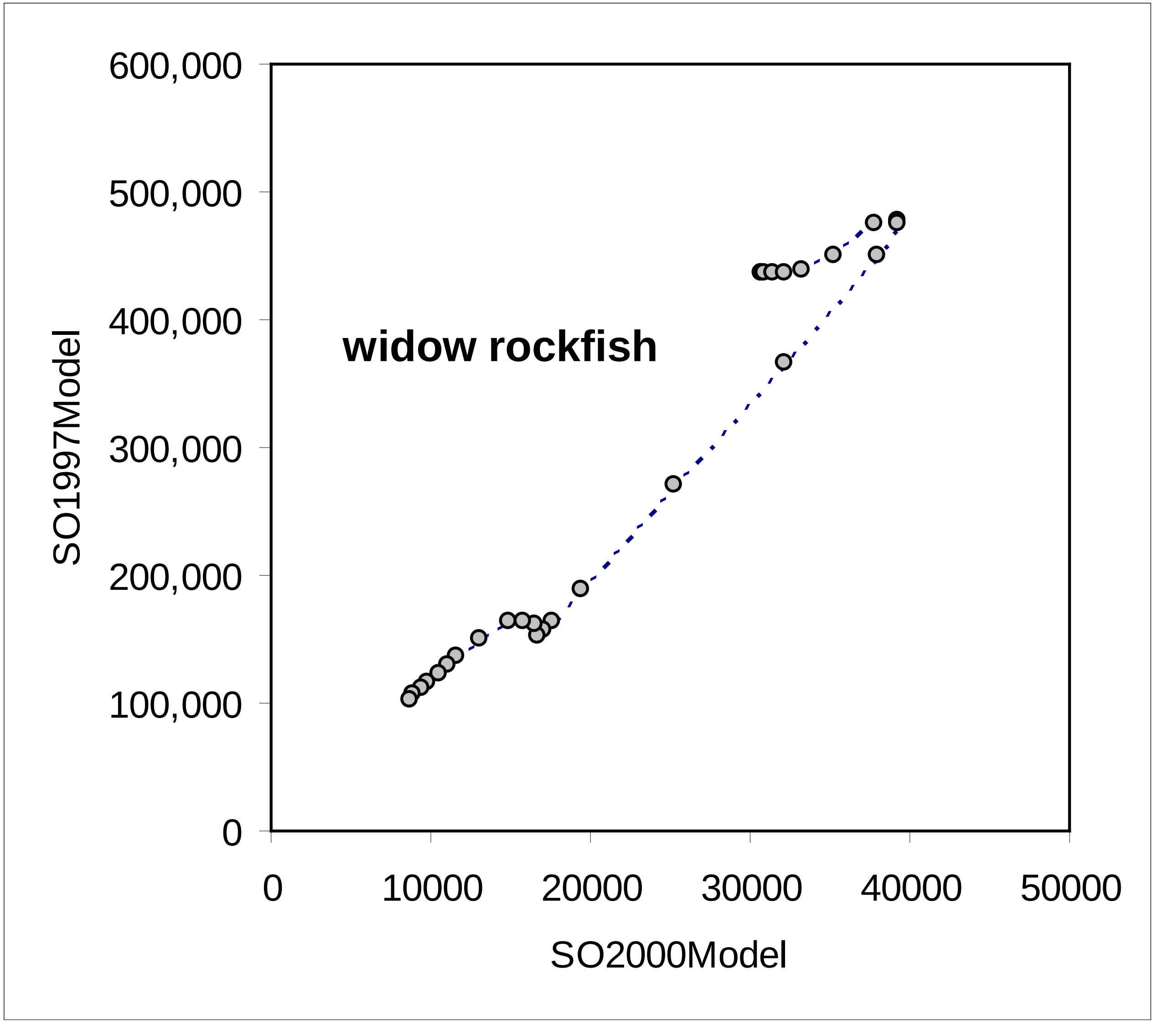
thanks to John Field

Repeats of the widow rockfish assessment

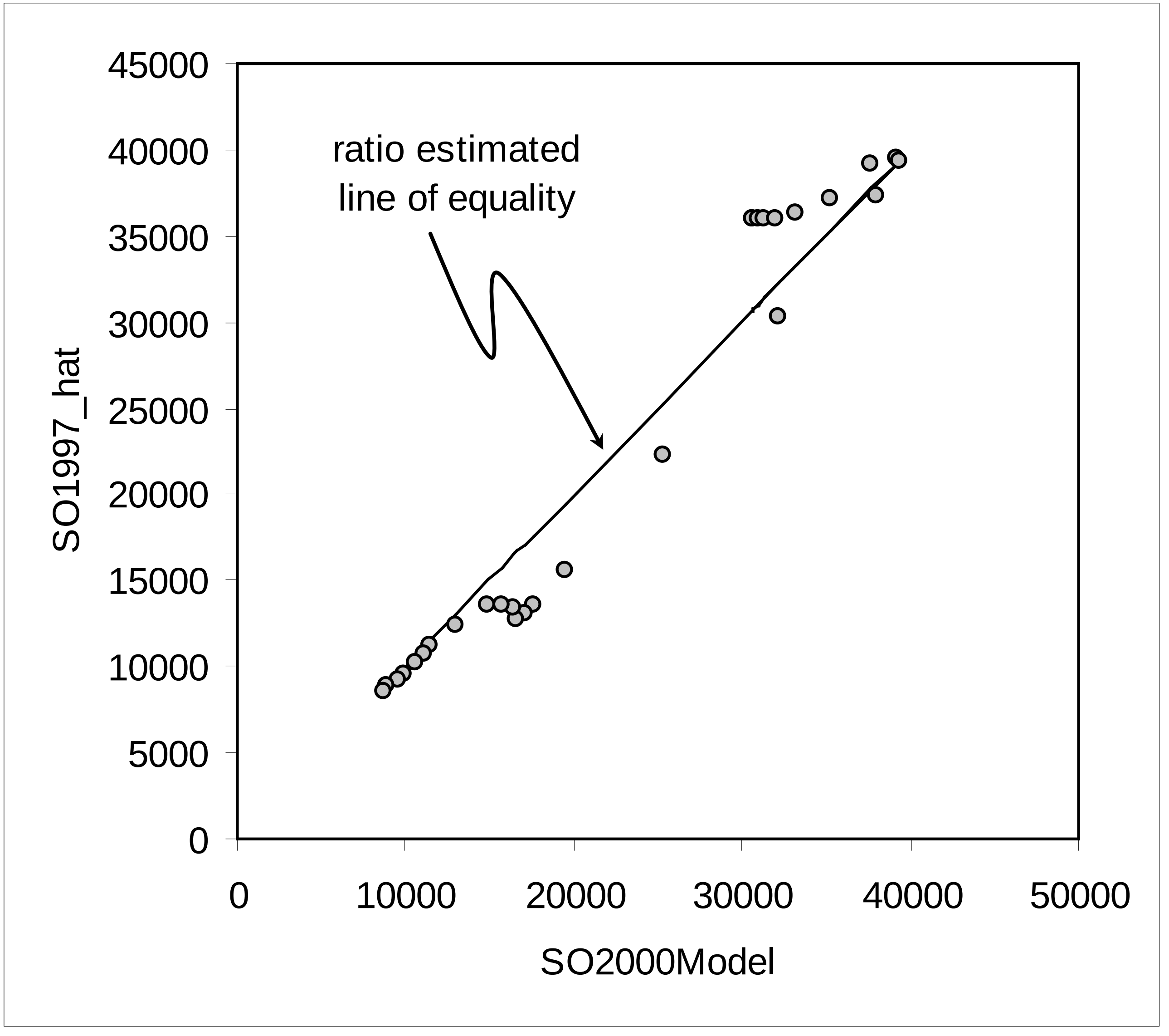


thanks to Xi He

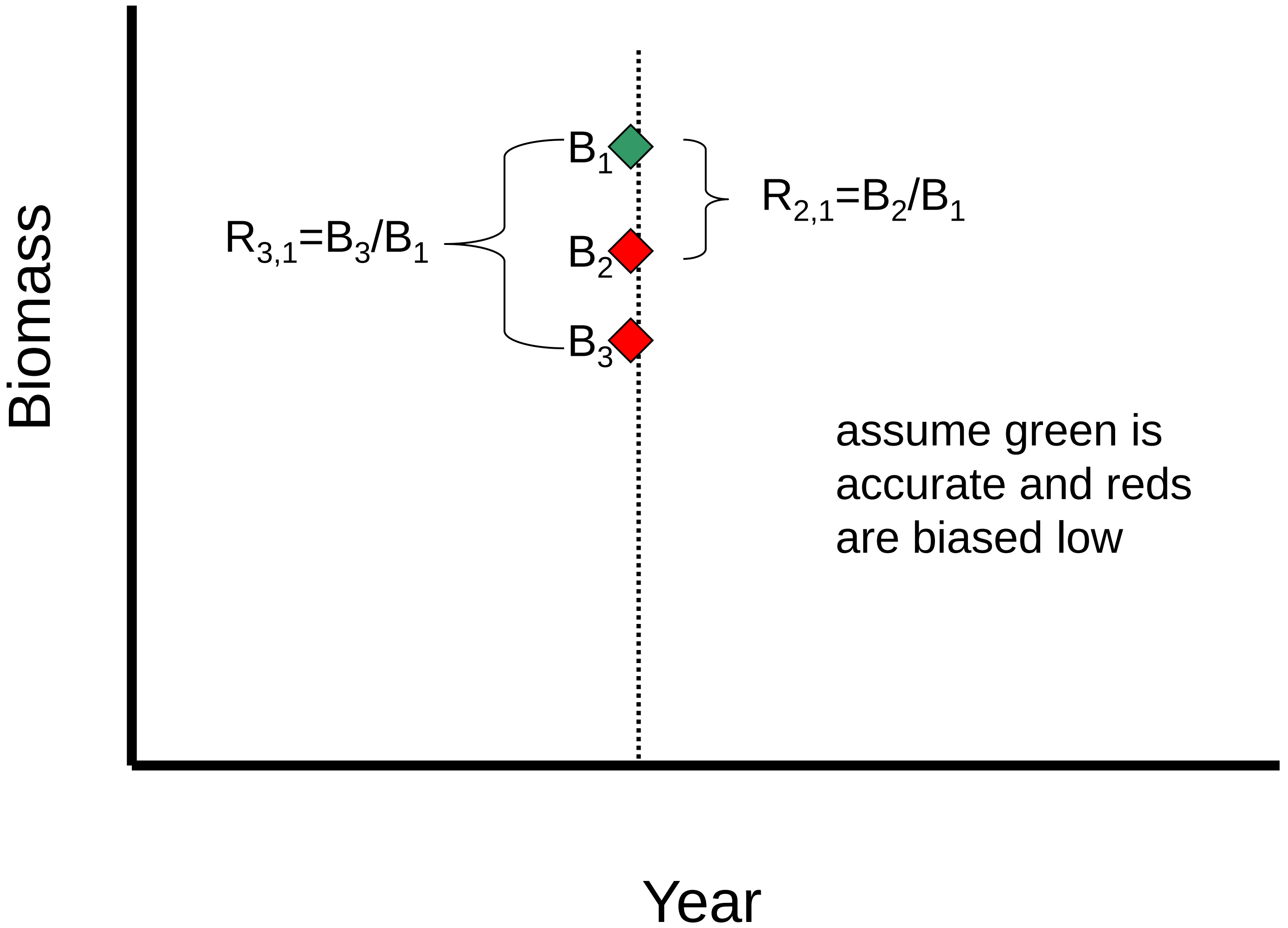
Sometimes biomass metrics change from one assessment to the next



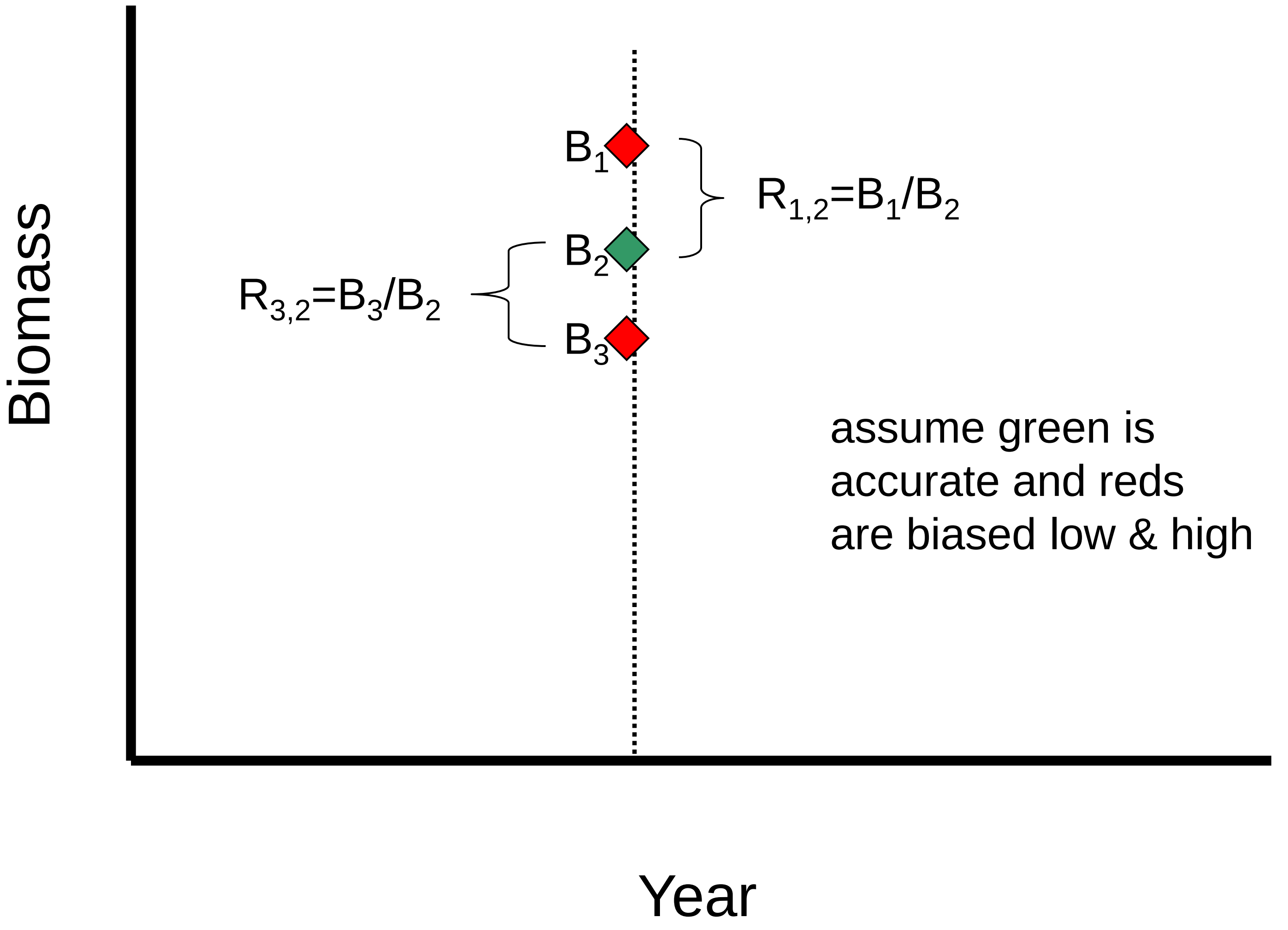
Standardize using ratio estimator



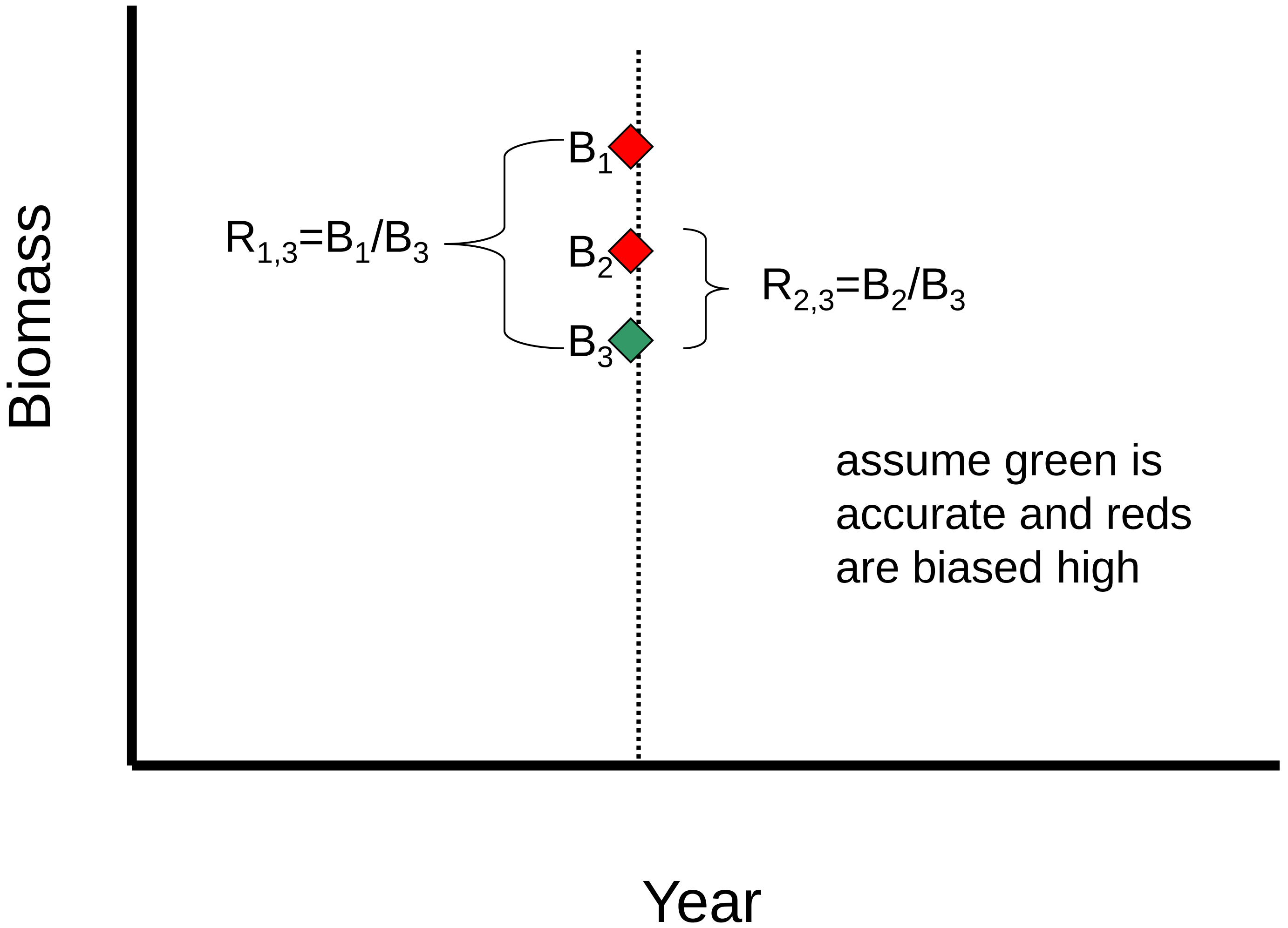
Form ratios of all possible permutations of biomass estimates in a year



Form ratios of all possible permutations of biomass estimates in a year

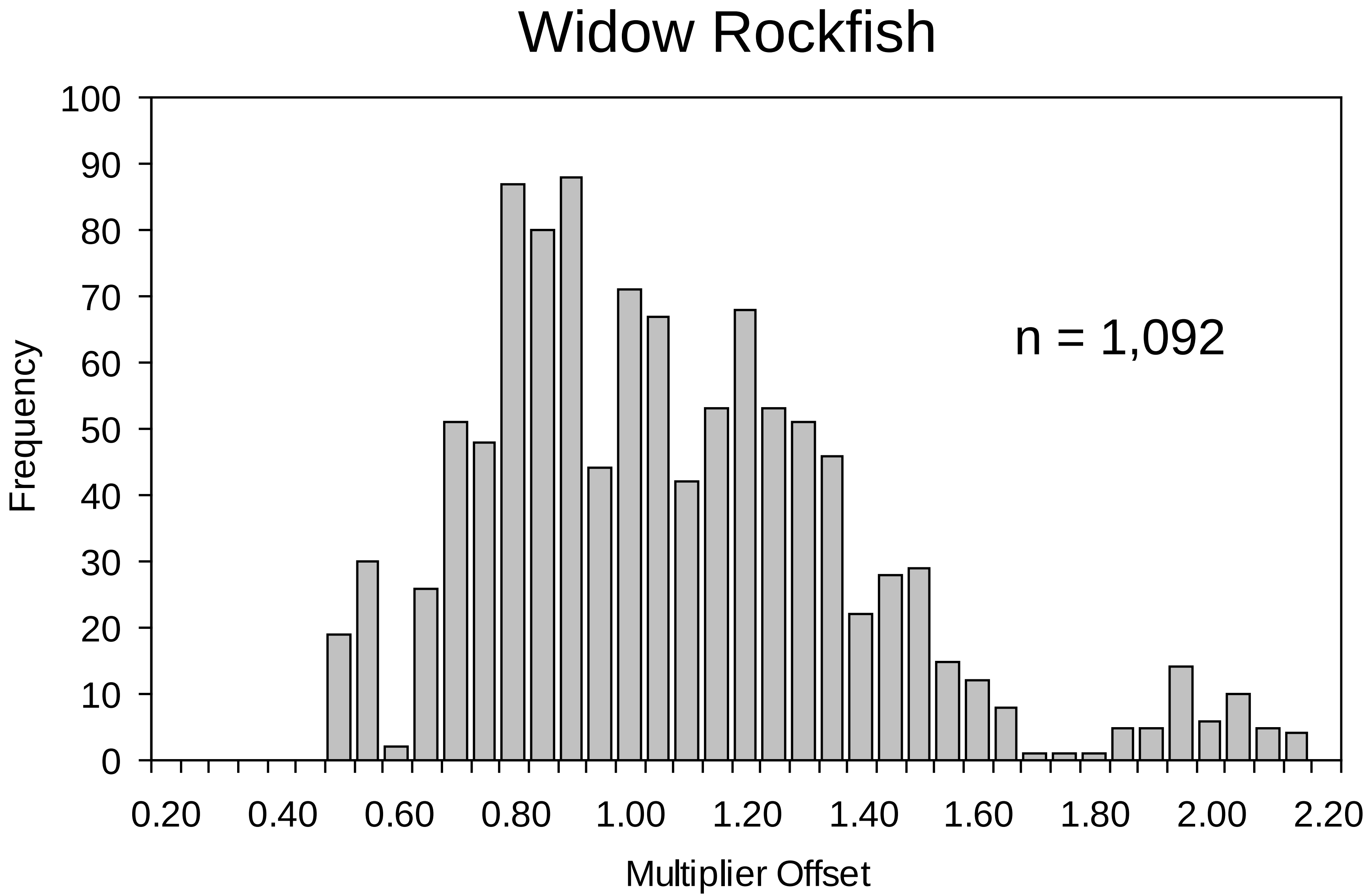


There are six different permutations of ratios for three observations of biomass in a year



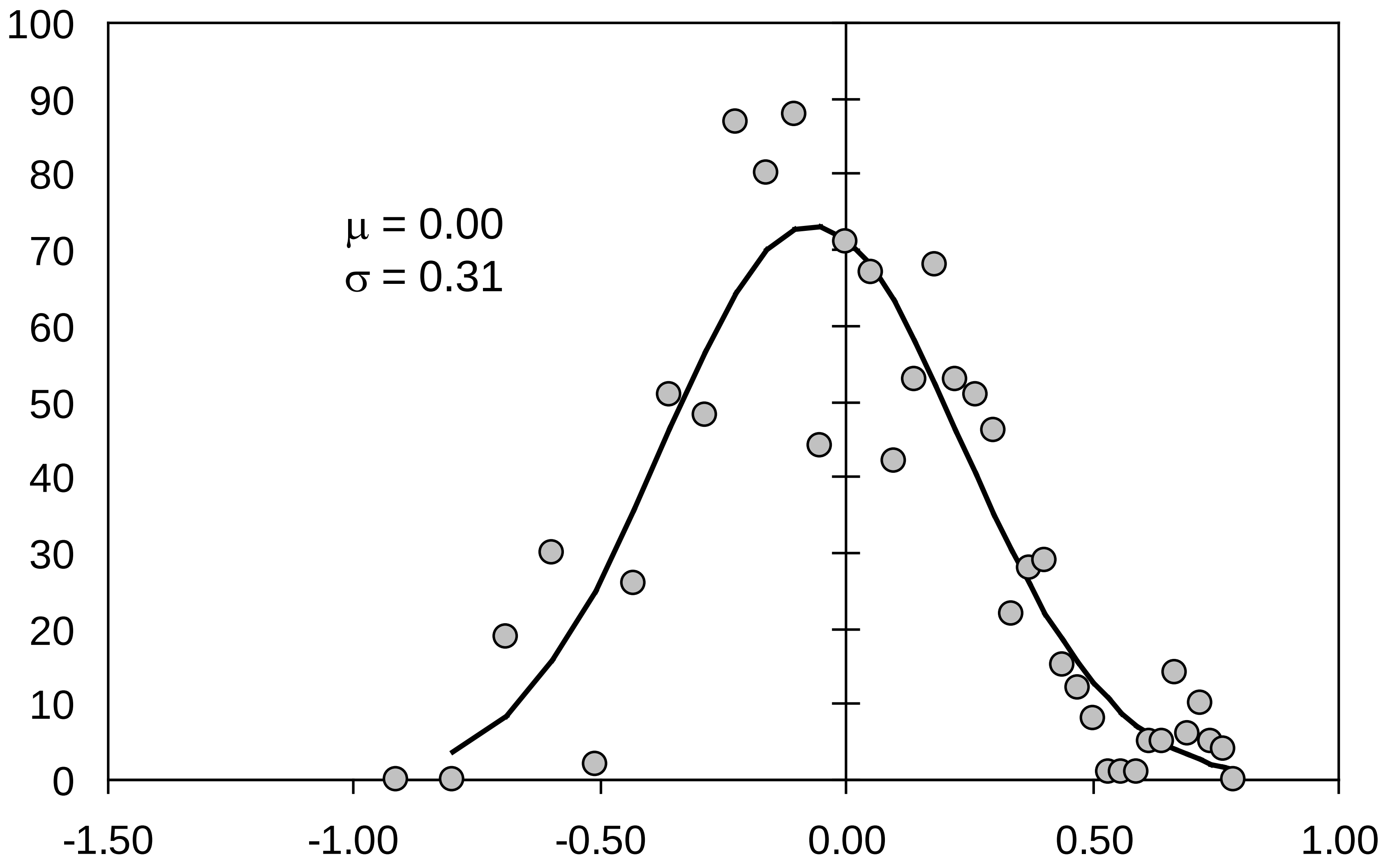
In general the number of permutations of ***"n"*** objects taken ***"r"*** at a time is:

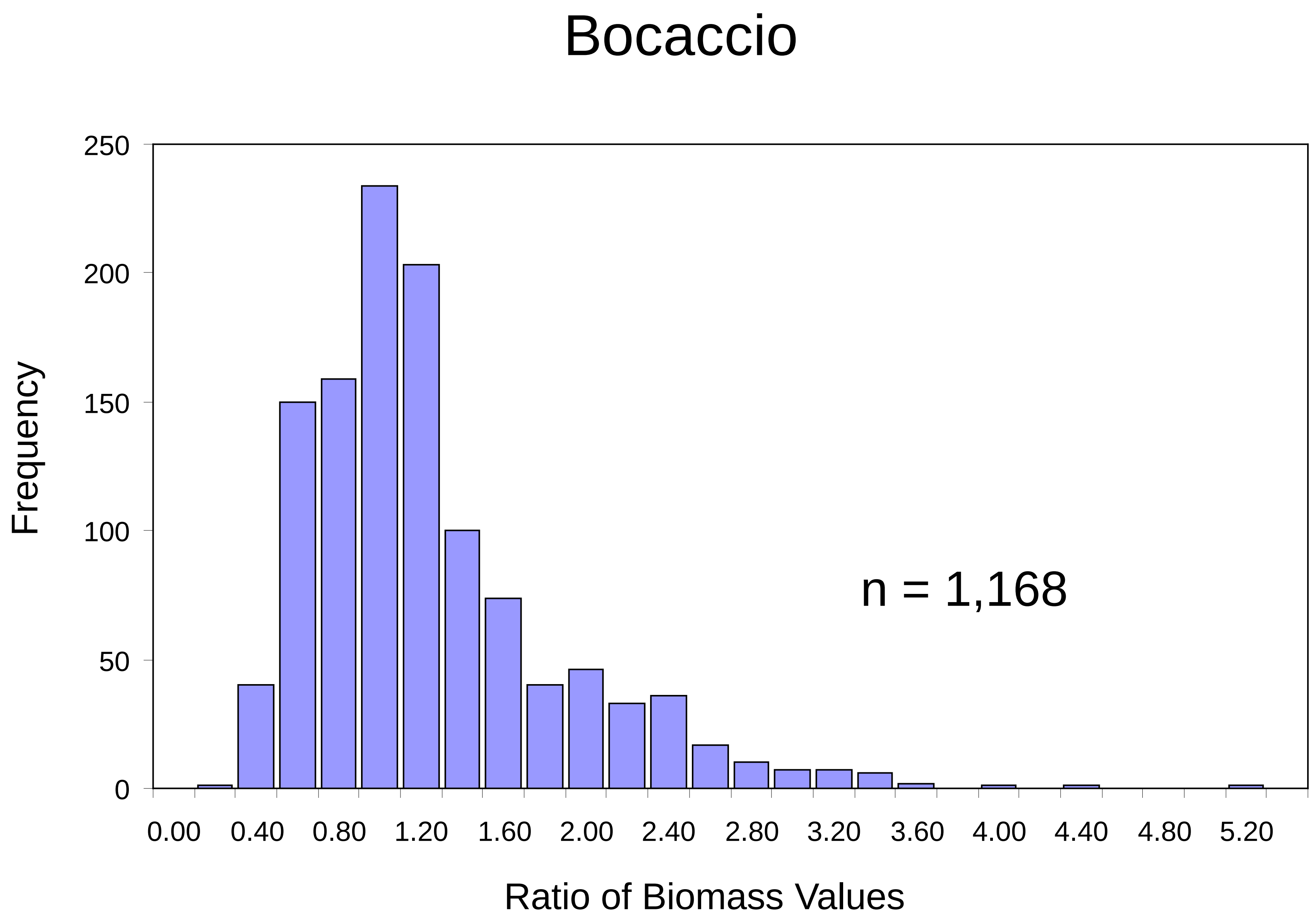
$$\text{Permutations} = \frac{n!}{(n-r)!} = \frac{n!}{(n-2)!}$$



Widow Rockfish
n = 1,092
Frequency
0
10
20
30
40
50
60
70
80
90
100
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
2.00
2.20
Multiplier Offset

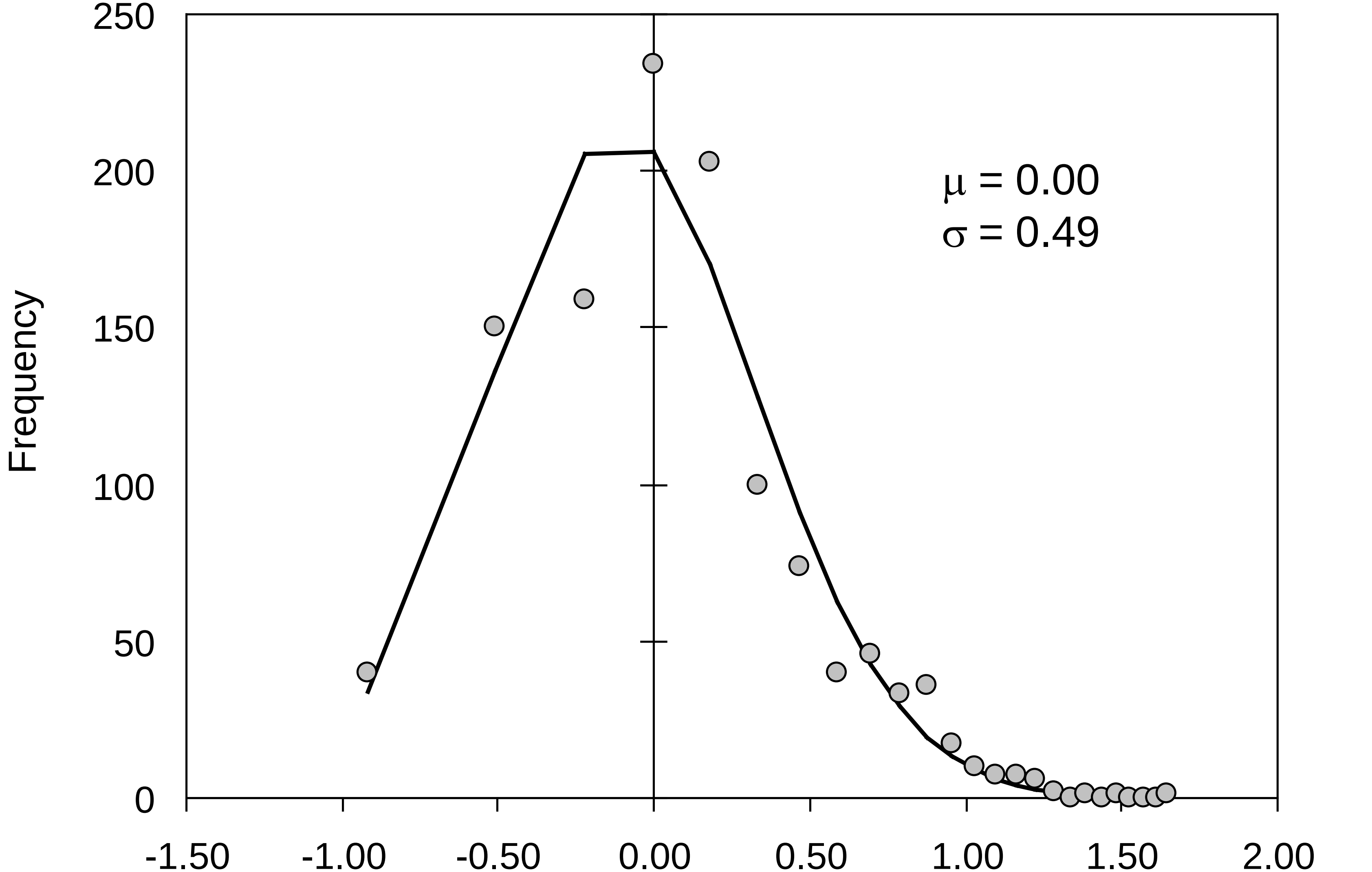
Widow rockfish – normal fit to log-transformed data

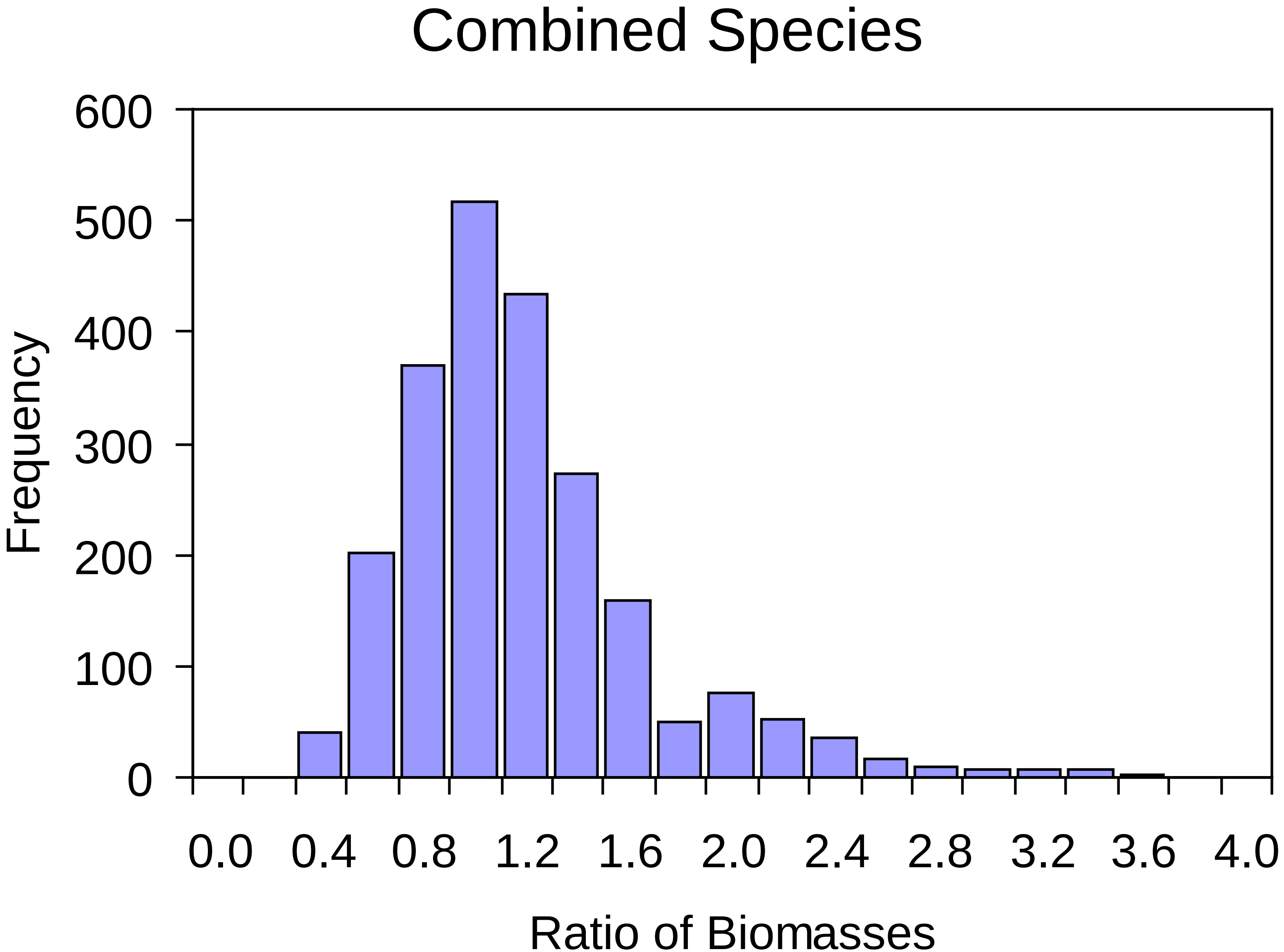




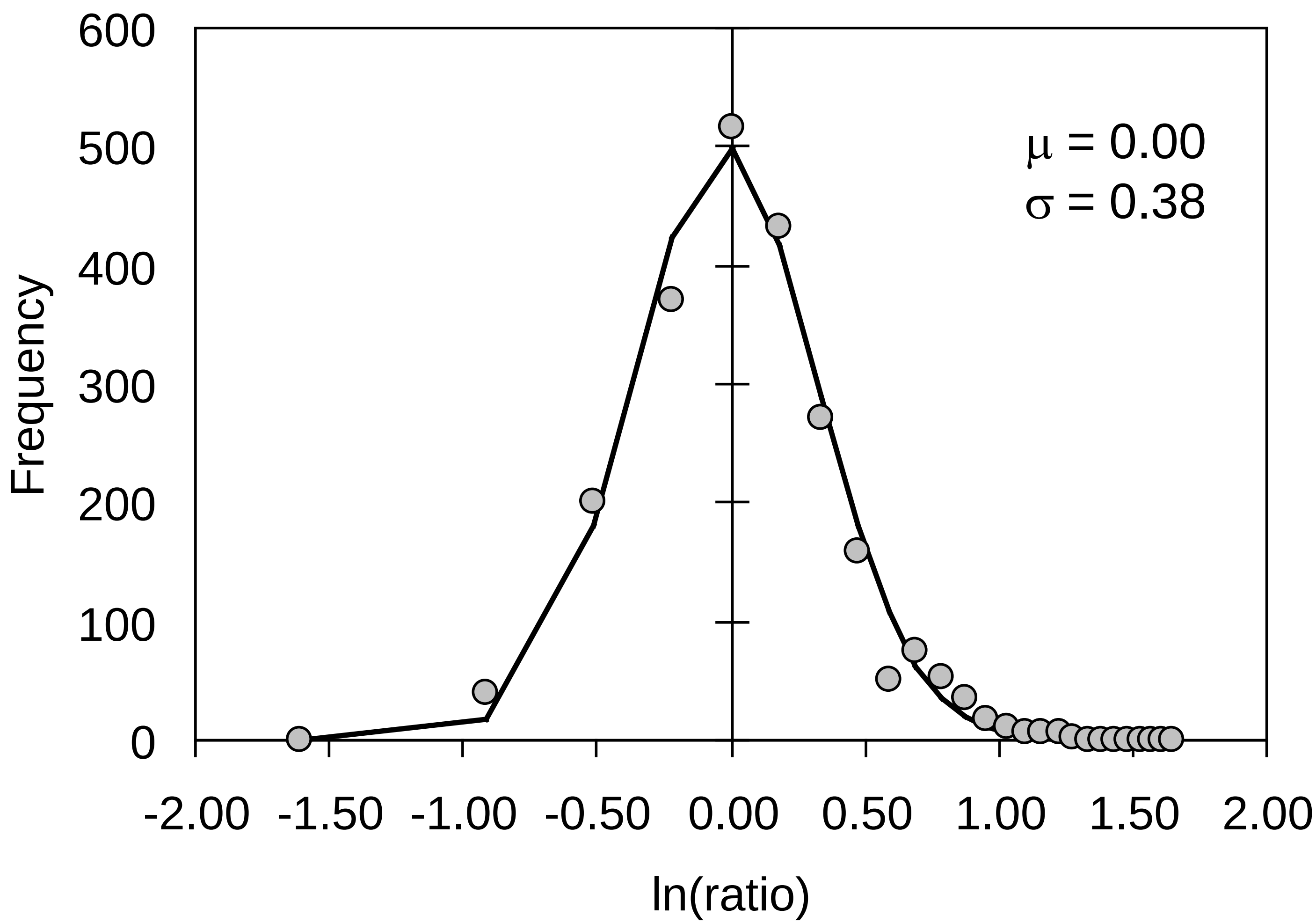
Bocaccio
250
200
150
100
50
0
Frequency
n = 1,168
0.00
0.40
0.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
4.00
4.40
4.80
5.20
Ratio of Biomass Values

Bocaccio – normal fit to log-transformed data

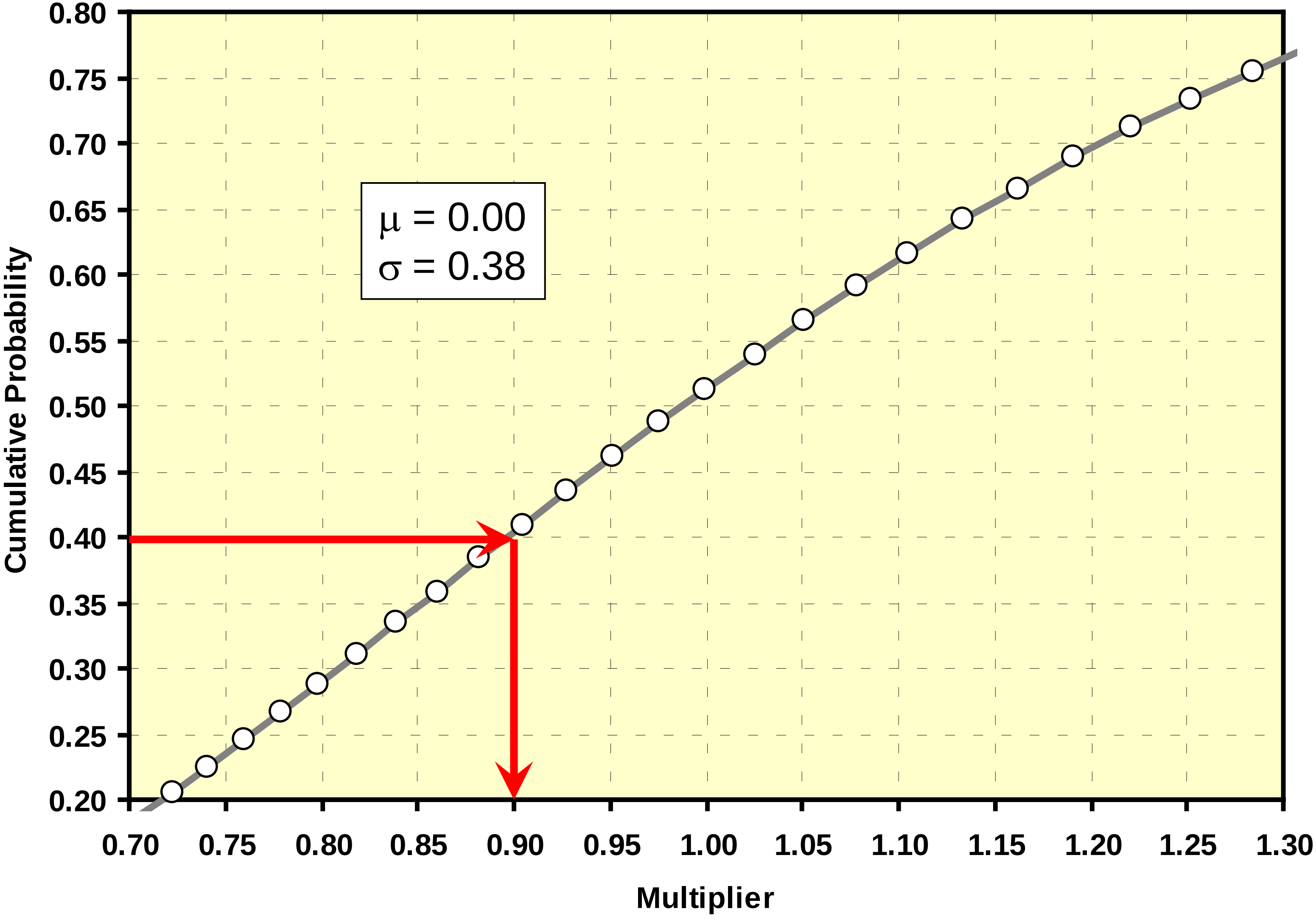



Combined Species
Frequency
600
500
400
300
200
100
0
0.0
0.4
0.8
1.2
1.6
2.0
2.4
2.8
3.2
3.6
4.0
Ratio of Biomasses

Combine stocks – normal fit to log-transformed data



Create a Lookup Table



FISHERY MANAGEMENT PLAN AMENDMENT 20 – TRAWL RATIONALIZATION REGULATION LANGUAGE REVIEW AND MISCELLANEOUS IMPLEMENTATION MATTERS

The Council adopted its final recommendations on trawl rationalization at its June 2009 meeting (E.6.a, Attachment 1). Over the summer, the Council staff has been working to update the preliminary draft environmental impact statement (EIS) to reflect the Council's final action and National Marine Fisheries Service (NMFS) Northwest Region (NWR) has been reviewing the Council action and the updated draft EIS.

At this meeting, NMFS is scheduled to present the Council with an update on the implementation process, including any regulatory language it has developed and any initial questions that may have arisen regarding Council intent (Agenda Item E.6.b, NMFS Report).

Following this meeting, the approval process calls for the following to occur this fall: continued review of and revisions to the draft EIS, transmittal of the draft EIS to the Environmental Protection Agency (EPA), and the start of the public comment period on the draft EIS (to commence upon EPA publication of the notice of availability of the document). The Council's Amendment 20 recommendations are tentatively scheduled for official transmittal in the spring of 2010. Assuming the Council recommendations are approved, it is anticipated that the program will be implemented at the start of the 2011.

Directly following the June Council meeting, the Council staff released to permit holders the analysis estimates of quota share (QS) allocations for each permit and an example conversion of those QS to quota pounds based on application of trawl allocations to the 2010 OYs. After release of the QS estimates used in the analysis, many permit owners expressed substantial concern about the initial QS allocation. In response to these concerns an "airing" session is scheduled to occur Saturday morning (September 12) at the Groundfish Advisory Subpanel meeting. There has been some talk among industry representatives about asking that the Council reconsider the initial allocation formula. Public testimony to the Council on this issue may also come up under the open public comment period just prior to this agenda item. If the Council decides to reopen this issue, it could not do so at this meeting but would have to take the matter up under Agenda Item J.4, Future Council Meeting Agenda and Workload Planning, and schedule the question of reconsideration on Amendment 20 for a subsequent meeting.

Council Task:

1. Review NMFS submissions and respond to questions.

Reference Materials:

1. Agenda Item E.6.a, Attachment 1: Appendix D Council Preferred Groundfish Trawl Rationalization Alternative.
2. Agenda Item E.6.b, NMFS Report.

Agenda Order:

a. Agenda Item Overview — Jim Seger, Kit Dahl, Merrick Burden
b. Reports and Comments of Management Entities and Advisory Bodies
c. Public Comment
d. **Council Action:** Provide Guidance as Appropriate

PFMC
08/24/09

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APPENDIX D
Council Preferred Groundfish Trawl Rationalization Alternative

RATIONALIZATION OF THE PACIFIC COAST GROUNDFISH LIMITED ENTRY TRAWL FISHERY PRELIMINARY DRAFT ENVIRONMENTAL IMPACT STATEMENT

PREPARED BY
THE PACIFIC FISHERY MANAGEMENT COUNCIL
7700 NE AMBASSADOR PLACE, SUITE 101
PORTLAND, OR 97220
503-820-2280
WWW.PCOUNCIL.ORG

AND THE

NATIONAL MARINE FISHERIES SERVICE
7600 SAND POINT WAY NE, BIN C15700
SEATTLE, WA 98115-0070
206-526-6150

OCTOBER 2008

Revised and printed on September 1, 2009

1. Overview of Recommendations by Sector

The Pacific Fishery Management Council's (Council) sector specific recommendations for rationalizing the trawl fishery are provided here and will be finalized and forwarded to the National Marine Fisheries (NMFS) for approval later in 2009. The recommendations were adopted at the Council's November 2008 meeting. In general, the Council recommends the following:

Shoreside Trawl Sector (nonwhiting groundfish species and whiting):

Manage with IFQs.

Provide 90% of the initial allocation of nonwhiting IFQ to holders of vessel permits; and set aside 10% of the initial allocation for an adaptive management program that may benefit processors and communities, among others.

Provide 80% of the initial allocation of whiting IFQ to holders of vessel permits; and provide 20% of the initial allocation of whiting to processors.

Mothership Trawl Sector (whiting and groundfish bycatch species):

Manage with a harvester co-op system and limited entry for mothership processors.

Require that vessels declare preseason the mothership processor for which they will fish in a coming year.

Catcher Processor Sector (whiting and groundfish bycatch species):

Create a permit endorsement to prevent expansion of the number of participants.

Allocate whiting and bycatch to the existing voluntary co-op.[1]

Provide an IFQ program if the voluntary co-op fails (initially allocate IFQ equally among all permit holders).

[1] When the Council took final action, NMFS indicated its preliminary intent to license the voluntary co-op. However, this was not part of the Council's final action.

The amount of allocation available for these sectors will be determined through the intersector allocation process. IFQ for the shoreside fishery may not be delivered to at-sea processors, nor may quota allocated to the mothership or catcher-processor sectors be delivered shoreside.

The following sections provide a general summary of the program for each sector, followed by a complete description that also identifies trailing actions the Council has been working on in 2009. These actions will be completed prior the time it submits the package to NMFS for approval.[2] *The trailing actions pertain to eligibility to own IFQ, accumulation limits, and adaptive management. Implementation is not expected earlier than 2011.*

2. Shoreside Trawl Sector: IFQ Program (Appendix A of the EIS)

This section details the IFQ program that the Council is recommending for the shoreside sector of the groundfish fishery. The first part of the section describes major components of the program. Table 1, which starts on page 6, presents complete details on elements of the recommended IFQ program.

2.1. Overview of the IFQ Program Elements

Under this program, most status quo management tools would remain in place. The main exceptions are cumulative landing limits for nonwhiting groundfish species and a closure period to control whiting harvest at the start of the year.[3] Other measures, such as RCA boundaries, may be adjusted as experience is gained with the IFQ program.

An IFQ will grant an entity the privilege to catch a specified portion of the trawl sector's allocation. Within the IFQ program, vessels will be allowed to use a variety of directed groundfish commercial gear (including nontrawl gear) to take the shoreside trawl sector allocation, which will thus allow for "gear switching." IFQs will be created for most species of groundfish under the Groundfish FMP (although some will still be managed collectively at the stock complex level, e.g. remaining minor slope rockfish). Some groundfish species rarely caught by trawl gear and dogfish will be excluded from the IFQ program. To ensure that optimum yields (OY) for species not covered by IFQ are not exceeded, catch of those species will be monitored and deductions made from the OY in anticipation of the expected level of shoreside trawl sector catch. For trips targeted on whiting, IFQ will be required only for whiting and the main bycatch species.

Halibut individual bycatch quota (IBQ) will be required to cover the incidental catch[4] of Pacific halibut in the groundfish trawl shoreside fishery. Under an IBQ program, retention would not be allowed.

The following sections describe the major provisions of the IFQ program.

2.1.1. Initial Allocation

The program will initially allocate IFQ as quota share (QS) to fishery participants based mainly on their historic involvement in the fishery. Following the initial allocation, transfers (described below) will

[2] During its March and April 2009 meetings the Council also clarified a number of its recommendations. These clarifications are reflected in the version of the trawl rationalization recommendation provided here.
[3] This closure period is necessary because of Endangered Species Act concerns related to salmon.
[4] At its June meeting the Council will consider a recommendation by the GAC to interpret previous Council action under Amendment 21 as creating an IBQ program to cover incidental mortality rather than catch.

allow for others to also participate in the fishery as quota holders. The initial allocation can be viewed in two segments:

First, in developing its recommendation the Council considered the groups that should be included in the initial allocation, and the proportional split among the groups. The Council recommended that harvesters (those holding limited entry permits for trawl vessels) be given an initial allocation of 90% of the nonwhiting QS and 80% of the whiting QS. Ten percent of the QS for nonwhiting species would be made available for an adaptive management program and processors would receive 20% of the whiting QS.

Second, the Council considered specific allocation formulas that will determine the amount of QS each eligible entity will receive. These calculations are based primarily on the delivery history associated with a vessel permit or processing company over a set number of years. For the allocation to permits, the QS associated with the history of permits retired in the buyback program will be distributed equally among the remaining qualified permits (just less than 45% of the QS will be allocated in this fashion). A special calculation is provided for incidentally caught overfished species. For these species the allocation will be based on the QS recipient's need to cover incidental catch under current fishing practices (as measured by bycatch rates, individual permit logbooks for recent years, and the amount of target species QS that an entity receives). None of the QS for these species will be allocated equally among harvesters. A similar approach would be used for the allocation of halibut IBQ.

2.1.2. Stock Management Units for IFQs

QS will be issued for the species groups and areas for which there are OYs (management units). However, QS will not be required for some rarely-caught species. Catch of these species would be monitored to ensure they don't exceed any established allocations. There may be further area subdivisions for species for which there is an area specific precautionary harvest policy. There are also provisions that provide for both species group and area subdivision of QS after initial allocation.

2.1.3. Annual Issuance, Holding Requirements and Transfer Rules

In designing the management regime for the IFQ program, the Council is balancing the benefits of flexibility and individual accountability with program costs and the constraints of the very low allowable catch levels of overfished species. Prior to the start of each fishing year, NMFS will issue quota pounds (QP) to entities based on the amount of QS they hold and the shoreside trawl sector allocation. The QP would have to be transferred to a vessel account in order to be used. When a vessel goes fishing under the IFQ program, all catch must be recorded (including discards) and must be matched by an equal amount of QP from the vessel's QP account. If there is not enough QP to cover the catch from a trip, there is a 30-day grace period during which adequate QP must be transferred into the vessel's account. A vessel's fishing will be limited, and its permit cannot be sold, until the overage is covered. A carryover provision will allow for an overage in one year to be covered by up to 10 percent of the following year's QP; likewise, the provision also will allow QP that were not used in one year to be carried over into the following year, up to 10 percent.

Bycatch reduction and greater efficiency are expected to occur in the groundfish fishery under the IFQ program because of the transferability of QS and QP. Through the transfer of QS/QP (bought and sold or "leased" through private contract), it is anticipated that those best able to avoid catching overfished species, and those who are most efficient, will increase the amount of QS/QP registered to them, while those who consistently have high bycatch rates or operate less efficiently might choose to sell their QS and leave the fishery. Generally, anyone eligible to own a U.S.-documented fishing vessel could also acquire QS and QP, and the QS and QP could be acquired in very small increments.[5] These provisions will allow for new entrants into the fishery; for example, a crew member could slowly purchase amounts of quota. The also allow for ownership of QS by entities that do not otherwise participate in the fishery. *In early 2009,during its trailing actions the Council considered but rejected substantially modifying provisions pertaining to who is eligible to own the QS.*

While transferability is an important component, in order to protect against unintended consequences some provisions limit transferability. For example, there will be accumulation limits on the amount of QS or QP that can be controlled by an entity, and accumulation limits on the amount of QP registered to a vessel. The intent of these limits is to prevent excessive control of quota by a participant. *The exact percentages which will be used in these limits will be determined through a trailing action.*

An adaptive management provision will allow the Council to use 10 percent of the trawl allocation to provide incentives, support, or other compensation to offset adverse impacts of the program. This program may benefit communities and processors, among others. *Details will be the subject of a trailing action.*

2.1.4. Tracking and Monitoring

A tracking and monitoring program is necessary to assure that all catch (including discards) is documented and matched against QP. At-sea observers would be required on all vessels and shoreside monitoring during all off-loading (100 percent coverage). Cameras may be used to augment the observers and assure compliance. Compared to status quo monitoring, this will be a significant increase for a large portion of the trawl fleet, particularly non-whiting shoreside vessels. More accurate estimates of total mortality will benefit stock conservation goals. Discarding will be allowed, though all fish discarded will also have to be covered by QP. There would be 100 percent shoreside monitoring; and there may be limited landing hours to control costs. Additionally, a program for the mandatory submission of economic data is included to facilitate monitoring program performance.

2.1.5. Costs and Fee Structure

Program costs are of concern and ongoing Federal administrative costs are estimated in the EIS at $2.4 to $2.9 million per year for the entire trawl rationalization program, including the co-ops for the at-sea segment of the fishery (see Section 3). Program benefits are expected to significantly exceed costs. The costs listed here do not include initial implementation costs or the costs that industry will bear for observers. Fee structures will be proposed to recover program costs from industry, up to the limit of 3% of exvessel value.

2.1.6. Program Monitoring, Review and Future Auction

The Council will conduct a formal review of program performance no later than 5 years after implementation and every four years thereafter. The result of the evaluation could include dissolution of the program, revocation of all or part of quota shares, or other fundamental changes to the program. At the time of its first review, the Council will consider also the use of an auction or other non-history based method when distributing quota share that may become available after the initial allocation.

2.2. Detailed Specification of IFQ Program Elements and Options

Table 1 provides a complete description of the IFQ program.

[5] To be eligible to own QS the person need not actually own a U.S. documented fishing vessel.

Table 1. Full description of the IFQ Program for shoreside trawl deliveries.

	Element	SubElement	
A. *Trawl Sector Management*			
A-1.1	Scope for IFQ Management, Including Gear Switching		For trips delivered shoreside, QP will be required to cover catch of all groundfish (including all discards) by LE trawl vessels with certain gear and species exceptions. Gear Exception: Vessels with an LE trawl permit using the following gears would not be required to cover their groundfish catch with QP: exempted trawl, [a] gear types defined in the coastal pelagic species FMP, gear types defined in the highly migratory species FMP, salmon troll, crab pot, and LE fixed gear when the vessel also has a LE permit endorsed for fixed-gear (longline or fishpot) AND has declared that they are fishing in the LE fixed-gear fishery. Species Exception: The following would be excepted from the QP requirement longspine thornyheads south of 34º27' N latitude, minor nearshore rockfish (north and south), black rockfish (WOC), California scorpionfish, cabezon, kelp greenling, shortbelly rockfish, and the "Other Fish" category of groundish. *This definition of the scope allows an LE trawl vessel to switch between trawl and nontrawl groundfish gears, including fixed-gear, for the purpose of catching their QP ("gear switching"). It also allows a nontrawl vessel to acquire a trawl permit, and thereby use trawl QP to catch the LE trawl allocation using nontrawl gear.*[b]

Table 1. Full description of the IFQ program (continued).

	Element	SubElement	
A-1.2	IFQ Management Units, Including Latitudinal Area Management		QS will carry designations for the species/species group, area, and trawl sector to which it applies (see A-1.3 for the list of trawl sectors). The QP will have the same species/species group, area, and sector designations as the QS on the basis of which the QP was issued. QP will not be used in a trawl sector other than that for which it was issued,[c] and will not be used in a nontrawl sector (i.e. by vessels without trawl permits).[d] QP will not be used in a catch area or for a species/species group other than that for which it is designated. For those species within the scope of the program, the QS/QP species groupings and area subdivisions will be those for which OYs are specified in the ABC/OY table that is generated through the groundfish biennial specifications process and those for which there is an area-specific precautionary harvest policy[e] QS for remaining minor rockfish will be aggregated for the shelf and slope depth strata (nearshore are excluded from the scope, see Section A-1.1). Changing the management units. After initial QS allocation the Council may alter the management units by changing the management areas or subdividing species groups. Section A-2.1.6 provides methods for reallocating QS when such changes are made after initial implementation of the program.[f] *Hereafter, all references to species include species and species group, unless otherwise indicated.*
A-1.3	General Management and Trawl Sectors		Unless otherwise specified, status quo regulations, other than trip limits for species within the scope of the IFQ program, will remain in place. If individual vessel overages (catch not covered by QP) make it necessary, area restrictions, season closures, or other measures will be used to prevent the trawl sector (in aggregate or the individual trawl sectors listed here) from going over allocations.[g] The IFQ fishery may also be restricted or closed as a result of overages in other sectors. There will be three trawl sectors: shoreside, mothership, and catcher-processors. However, as per Section A-1.1, IFQ will be required only for the shoreside trawl sector. The mothership and catcher-processor sectors will be managed using co-ops, as specified in the co-op section of the trawl rationalization program. If the industry organized voluntary co-op program for the catcher-processor sector collapses, IFQ will be required for the catcher-processor sector, as specified in the co-op program described for that sector. *Allocation among trawl sectors has been determined in FMP Amendment 21. Those allocations not covered by Amendment 21 will be addressed in the biannual specifications process.* *Trawl vessels fishing IFQ with nontrawl gear will be required to comply with the RCA lines applicable for that gear. Such restrictions, as necessary, will be determined in a separate process.*
A-1.4	Management of NonWhiting Trips		Nonwhiting trips are those with less than 50% whiting. No changes to management measures, other than those identified in Section A-1.3, have been identified at this time.
A-1.5	Management of Whiting Trips[h]		Whiting seasons will not be changed under the IFQ program, and so the current spring openings will be maintained to control impacts on ESA-listed salmon.[i] When the primary whiting season is closed for shoreside deliveries, cumulative whiting catch limits will apply and shoreside QP will be required to cover whiting incidental catch.

Table 1. Full description of the IFQ program (continued).

	Element	SubElement	
A-1.6	Groundfish Permit Length Endorsements		Length endorsement restrictions on LE permits endorsed for groundfish gear will be retained; however, the provision that requires that the size endorsements on trawl permits transferred to smaller vessels be reduced to the size of that smaller vessel will be eliminated (i.e., length endorsements will not change when a trawl-endorsed permit is transferred to a smaller vessel).
A-2. ***<u>IFQ System Details</u>***			
A-2.1	**Initial Allocation and Direct Reallocation**		
A-2.1.1	Eligible Groups	a Groups and Initial Split of QS	***Eligible Groups*** The initial allocation of QS will be made either only to permit owners and processors, as follows. Whiting QS: 80% to permits, 20% to processors and 0% for adaptive management. Nonwhiting QS: 90% to permits, 0% to processors, and 10% for adaptive management. *After initial allocation, trading will likely result in changes in the distribution of shares among permit owners and processors. Additionally, entities that are neither permit owners nor processors may acquire QS (see below: "IFQ/Permit Holding Requirements and IFQ Acquisition").*
		b Permits	Landing history will accrue to the permit under which the landing was made. The owner of a groundfish LE permit at the time of initial allocation will receive the QS issued based on the permit. (Also, see Section A-2.1.4 on permit combinations and other exceptional situations.)
		c Processors and Processing Definition	A special definition of "processor" and "processing" will be used for initial QS allocation. A main intent of the definition is to specify that only the first processor of the fish be credited for the history of that delivery when the initial allocation formula is applied (see footnote for definition).[j]
		d Attributing and Accruing Processing History	For an allocation for **shoreside processors (applies only to whiting):** attribute history to the receiver reported on the landing receipt (i.e. the entity responsible for filling out the state fish ticket), except history may be reassigned to an entity not on the landings receipt, if parties agree or through an agency appeals process. *The intent of this option is to provide an opportunity for catch history to be assigned to the entity that actually processed the fish.* For shoreside processors, allocations go to the processing business and successor-in-interest will be recognized. NMFS will develop criteria for use in determining the successor in interest with respect to the entities listed on the landings receipts or otherwise eligible for an initial QS allocation based on being the first processor of the fish.[k]
A-2.1.2	Recent Participation	a Permits (including CP permits)	Recent participation is not required in order for a permit to qualify for an initial allocation of QS.
		b Processors (motherships)	Not applicable because a co-op program was provided for this sector rather than IFQs. *(This header is being left in the document so that paragraph numbering will correspond to numbering in the analysis.)*

Table 1. Full description of the IFQ program (continued).

	Element	SubElement	
		c Processors (shoreside)	Recent participation is required to qualify for an initial allocation of whiting QS: 1 mt or more of deliveries from whiting trips in each of any two years from 1998-2004.
A-2.1.3	Allocation Formula	a Permits with catcher vessel history	QS will be issued for all fish management units within the scope of the program (see Section A-1.2) based on equal division and permit history, as follows:[l] **Equal Division:** There will be an equal division of the buy-back permits' pool of QS among all qualifying permits *(except the incidentally caught overfished species)*. Qualifying permits include all catcher vessel permits, including those that have been used only in the mothership sector. (The QS pool associated with the buyback permits will be the buyback permit history as a percent of the total fleet history for the allocation period. The calculation will be based on total absolute pounds with no other adjustments and no dropped years.) **Permit History:** The remaining QS *(including all QS for overfished species)* will be allocated based on each permit's history (see following formulas). **For the portion of the allocation based on each permit's history .** For **non-whiting** trips, permit history used for QS allocation will be calculated: **For non-overfished species**: using an allocation period of 1994-2003. Within that period use relative history and drop the three worst years.[m] **For overfished species taken incidentally:[n]** use target species QS as a proxy based on the following approach: Apply fleet average bycatch rates to each permit's depth and latitude distributions and target species QS allocations. Fleet average bycatch rates for latitudinal areas[o] divided shoreward and seaward of the RCA will be developed from West Coast Observer Program data for 2003-06. For the purposes of the allocation, a permit's QS for each target species will be distributed shoreward and seaward of the RCA and latitudinally based on the permit's logbook information for 2003-06. If a permit does not have any logbooks for 2003-06, fleetwide averages will be used.[p] For **whiting** trips, permit history used for QS allocation will be calculated as follows: **For whiting**, use an allocation period of 1994-2003. Within that period, use relative history and drop the two worst years. [q] **For bycatch species** (if IFQ is used for bycatch species): use the whiting history as a proxy (i.e., allocation will be pro rata based on the whiting allocation). **Area Assignments:** Landings history will be assigned to catch areas based on port of landing.[r] **Relative history (%).** For each sector, the permit history for each year is measured as a percent of the sector's total for the year. **In some situations the Initial allocations may be constrained by accumulation limits.** See Section A-2.2.3.e for a discussion of the limits and divestiture requirements.

Table 1. Full description of the IFQ program (continued).

	Element	SubElement	
.		b Permits with catcher-processor history	Not applicable because a co-op program was provided for this sector rather than IFQs. *(This header is being left in the document so that paragraph numbering will correspond to numbering in the analysis).*
		c Processors (motherships)	Not applicable because a co-op program was provided for this sector rather than IFQs *(This header is being left in the document so that paragraph numbering will correspond to numbering in the analysis).*
		d Processors (shoreside)	For whiting: • Allocate whiting QS based on the entity's history for the allocation period of 1994-2004 (drop two worst years) and use relative history. **Initial allocations will be cosntrained by accumulation limits.** See Section A-2.2.3.e for a discussion of the limits and divestiture requirements.
A-2.1.4	History for Combined Permits and Other Exceptional Situations		Permit history for combined permits will include the history for all the permits that have been combined. For history occurring when two or more trawl permits were stacked, split the history evenly between the stacked permits. History for illegal landings will not count toward an allocation of QS. Landings made under nonwhiting Experimental Fishing Permits (EFPs) that are in excess of the cumulative limits in place for the non-EFP fishery will not count toward an allocation of QS. Compensation fish will not count toward an allocation of QS.
A-2.1.5	Initial Issuance Appeals		There will be no Council appeals process on the initial issuance of IFQ. NMFS will develop a proposal for an internal appeals process and bring it to the Council for consideration. Any revisions to an entity's fish tickets must be approved by the state in order to be accepted. Any proposed revisions to fish tickets should undergo review by state enforcement personnel prior to finalization of the revisions.

Table 1. Full description of the IFQ program (continued).

	Element	SubElement	
A-2.1.6	Direct Reallocation and Future Allocations After Initial Issuance		**Reallocation With Change in Overfished Status**: When an overfished species is rebuilt or a species becomes overfished there may be a change in the QS allocation within a sector (allocation between sectors is addressed in the intersector allocation process). When a stock becomes rebuilt, the reallocation will be to facilitate the re-establishment of historic target fishing opportunities. When a stock becomes overfished, QS may be reallocated to maintain target fisheries to the degree possible. That change may be based on a person's holding of QS for target species associated with the rebuilt species or other approaches deemed appropriate by the Council. **Reallocation With Changes in Area Management** (Changes in management lines are expected to be rare; however, when they occur the following provides for the reallocation of QS in a manner that will give individual QS holders with the same amounts of total QP before and after the line changes.) **Area Subdivision**: If at any time after the initial allocation an IFQ management unit is geographically subdivided, those holding QS for the unit being subdivided will receive an amount of QS for each newly created area that is equivalent to the amount they held for the area before it was subdivided. **Area Recombination**: When two areas are combined, the QS held by individuals in each area will be adjusted proportionally such that (1) the total QS for the area sums to 100%, and (2) a person holding QS in the newly created area will receive the same amount of total QP as they would if the areas had not been combined. **Area Line Movement**: When a management boundary line is moved, the QS held by individuals in each area will be adjusted proportionally such that they each maintain their same share of the trawl allocation on a coastwide basis (a fishing area may expand or decrease, but the individual's QP for both areas combined wouldn't change because of the change in areas). In order to achieve this end, the holders of QS in the area being reduced will receive QS for the area being expanded, such that the total QP they would be issued will not be reduced as a result of the area reduction.[s] Those holding QS in the area being expanded will have their QS reduced such that the total QP they receive in the year of the line movement will not increase as a result of the expansion (nor will it be reduced). **Reallocation With Subdivision of a Species Group**: If at any time after the initial allocation an IFQ management unit for a species group is subdivided, those holding QS for the unit being subdivided will receive an amount of QS for each newly created IFQ management units that is equivalent to the amount they held for the species group before it was subdivided. For example, if a person holds 1% of a species group before the subdivision, that person will hold 1% of the QS for each of the groups resulting from the subdivision. **Future Allocation of Groundfish Outside the Scope of the IFQ Program:** For the "Other Fish," category of groundfish, if at some time in the future the Council adds it to the IFQ system, the initial allocation would be determined using the same history criteria as was used for other IFQ species (i.e. 1994-2003 history), unless otherwise specified by a future Council action.

Table 1. Full description of the IFQ program (continued).

	Element	SubElement	
A-2.2	**Permit/IFQ Holding Requirements and Acquisition** **(after initial allocation)**		
A-2.2.1	Permit/IFQ Holding Requirement		1. Only vessels with LE trawl permits are allowed to fish in the trawl IFQ fishery. 2. For a vessel to use QP, the QP must be in the vessel's QP account. 3. All catch a vessel takes on a trip must be covered with QP within 30 days of the landing for that trip unless the overage is within the limits of the carryover provision (Section A-2.2.2.b), in which case the vessel has 30 days or a reasonable time (to be determined) after the QP for the following year are issued, whichever is greater.[t] 4. For any vessel with an overage (catch not covered by QP), fishing that is within the scope of the IFQ program (Section A-1.1) will be prohibited until the overage is covered, regardless of the amount of the overage. Vessels which have not adequately covered their overage within the time limits specified in paragraph 3, must still cover the overage before resuming fishing, using QP from the following year(s), if necessary. If a vessel covers its overage, but coverage occurs outside the specified time limit (paragraph 3), the vessel may still be cited for a program violation. 5. For vessels with an overage, the LE permit may not be sold or transferred until the deficit is cleared.
A-2.2.2	IFQ Annual Issuance	a Annual Quota Pound Issuance	QP will be issued annually to QS holders based on the amount of QS held.[u] *As specified above, QS holders will have to transfer their QP to a vessel account in order for those QP to be used.*

Table 1. Full description of the IFQ program (continued).

	Element	SubElement	
		b Carryover (Surplus or Deficit)	To the extent allowed by the conservation requirements of the MSA, a carryover allowance will allow surplus QP in a vessel's QP account to be carried over from one year to the next or allow a deficit in a vessel's QP account for one year to be carried over and covered with QP from a subsequent year. Surplus QP may not be carried over for more than one year. A vessel with a QP **surplus** at the end of the current year will be able to use that QP in the immediately following year, up to the limit of the carryover allowance (see below). However, if there is a decline in the OY, the amount of QP carried over as a surplus will be reduced in proportion to the reduction in the OY. A vessel with a QP **deficit** in the current year will be able to cover that deficit with QP from the following year without incurring a violation if (1) the amount of QP it needs from the following year is within the carryover allowance (see below), and (2) the QP are acquired within the time limits specified in A-2.2.1.[v] **Carryover Allowance**: Limit of up to 10 percent carryover for each species. This applies to both non-overfished species and overfished species. The percentage is calculated based on the total pounds (used and unused) in a vessel's QP account for the current year. The percentage used for the carryover provision may be changed during the biennial specifications process.
		c QS Use-or-Lose Provisions (Deleted)	*This section has been deleted but the numbering is being maintained as a placeholder so as not to change section numbering and corresponding references in the analysis.*[w]
		d Entry Level Opportunities	Under the MSA, the Council is required to consider entry level fishermen, small vessel owners, and crew members, and in particular the possible allocation of a portion of the annual harvest to individuals falling in those categories. No special provisions have been identified for analysis. New entry is addressed indirectly by allowing crew, captains and others to acquire QS in small increments.
A-2.2.3	IFQ Transfer Rules	a Eligible to Own or Hold	No person can acquire quota shares or quota pounds other than 1) a United States citizen, 2) a permanent resident alien, or 3) a corporation, partnership, or other entity established under the laws of the United States or any State, that is eligible to own and control a US fishing vessel with a fishery endorsement pursuant to 46 USC 12113 (general fishery endorsement requirements and 75% citizenship requirement for entities). However, there is an exception for any entity that owns a mothership that participated in the West Coast groundfish fishery during the allocation period and is eligible to own or control that US fishing vessel with a fishery endorsement pursuant to sections 203(g) and 213(g) of the AFA.

Table 1. Full description of the IFQ program (continued).

	Element	SubElement	
		b Transfers and Leasing	QS/QP will be transferable and transfers must be registered with NMFS. NMFS will not differentiate between a transfer for a lease and a permanent transfer.[x] Each year, all QP must be transferred to a vessel account. A penalty for not meeting this transfer requirement has not been recommended; however, this requirement is intended to encourage its availability for use by the fleet. QP can only be transferred into vessel accounts. Once in a vessel account QP can be transferred from one vessel account to another.
		c Temporary Transfer Prohibition	NMFS may establish temporary prohibitions on the transfer of QS, as necessary to facilitate program administration. QS will not be transferred in the first two years of the program (QP will be transferable).
		d Divisibility	QS will be highly divisible and the QP will be transferred in whole pound units (i.e. fractions of a pound may not be transferred).

Table 1. Full description of the IFQ program (continued).

	Element	SubElement	
		e Accumulation Limits (Vessel and Control)	Limits[y] may vary by species/species group, areas, and sector. The values for the limits are provided in Table 2. The vessel unused QP limits may be revisited in the first biennial specifications process after implementation of the program. **Vessel Use Limit (Vessel Limit)**: A limit on the total QP that may be registered for a single vessel during the year. This element will mean that a vessel could not have more used and unused quota pounds registered for the vessel than a predetermined percentage of the QP pool. **Vessel Unused QP Limit**: A limit on the amount of unused QP that may be registered to the vessel at any time. This limit applies only for overfished species and Pacific halibut. **QS Control Limit:** A person, individually or collectively, may not control QS in excess of the specified limit (because there is no the grandfather clause). QS controlled by a person shall include those registered to that person, plus those controlled by other entities in which the person has a direct or indirect ownership interest, as well as shares that the person controls through other means.[z] The calculation of QS controlled by a person will follow the “individual and collective” rule. Individual and Collective Rule: The QS that counts toward a person's accumulation limit will include 1) the QS or QP owned by them, and 2) a portion of the QS owned by any entity in which that person has an interest. The person's share of interest in that entity will determine the portion of that entity's QS that counts toward the person's limit.[aa] **Grandfather Clause and Divestiture:** There will not be a grandfather clause for the QS control limits, however, an adjustment period is provided through the following divestiture rules. QS will be issued for amounts in excess of aggregate and species control limits only for holders of permits transferred by November 8, 2008, if such transfers have been registered with NMFS by November 30, 2008. The holder of any permit transferred after that time will be eligible to receive an initial allocation for that permit of only those QS that are within the aggregate and individual species control limits. Anyone who qualifies for an initial allocation of QS in excess of the control limits will be allowed to receive that allocation but required to divest themselves of that excess QS sometime during years 3 and 4 of the IFQ program (the two years after the QS transfer moratorium specified in Section A-2.2.3.c). Holders of QS in excess of the limits may receive and use the QP associated with that excess, up to the time their divestiture is completed. However, QP for year 5 of the program will not be issued for QS held in excess of the limits. At the end of year 4, any QS still held in excess of the species or aggregate limits in place at the time of the initial QS allocation will be revoked and redistributed to the remainder of the QS holders in proportion to their QS holdings. No compensation will be due for any revoked shares. Divestiture transfers will be allowed in accordance with the provisions established here and the transfer rules and processes implemented by NMFS. Permit transfers will not be limited or required by the divestiture provision. **Calculation of Aggregate Nonwhiting QS Holdings:** To determining how much aggregate nonwhiting QS an entity holds, an entity’s QS for each species will be converted to pounds. This conversion will always be conducted using the trawl allocations applied to the 2010 OYs, until such time as the Council recommends otherwise. Specifically, each entity’s QS for each species will be multiplied by the shoreside trawl allocation for that species. The entity’s pounds for all nonwhiting species will then be summed and divided by the shoreside trawl allocation of all nonwhiting species to get the entity’s share of the aggregate nonwhiting trawl quota. *Note: QS that is not allocated because of the accumulation limits and absence of the grandfather clause will be distributed to other eligible recipients in a manner that maintains the distribution among groups specified in A-2.1.1 and based on the allocation formulas specified in A-2.1.3.*

Table 1. Full description of the IFQ program (continued).

	Element	SubElement	
A-2.3	**Program Administration**		
A-2.3.1	Tracking, Monitoring and Enforcement		It is the Council intent to provide NMFS flexibility sufficient to design and implementation a tracking and monitoring program that will achieve the goals and objectives of the trawl rationalization program. **Discarding by Shoreside Sector** Non-whiting – Discarding of IFQ species allowed, discarding of IBQ species required, discarding of non-groundfish species allowed. Whiting Maximized retention vessels: Discarding of fish covered by IFQ or IBQ, and non-groundfish species prohibited. Vessels sorting at-sea: Same as for non-whiting. **At-Sea Catch Monitoring for Shoreside Sector** Nonwhiting – The sorting of catch, the weighing and discarding of any IBQ and IFQ species, and the retention of IFQ species must be monitored by the observer. Whiting For maximized retention vessels: video monitoring as proposed under Amendment 10. Observers would be required in addition to or as a replacement for video monitoring. For vessels that sort at-sea: The sorting, weighing and discarding of any IFQ or IBQ species must be monitored by an observer with supplemental video monitoring. Shoreside Landings Monitoring The sorting, weighing and reporting of any IFQ species must be monitored by a shoreside landings monitor (IBQ will have been discarded at sea). (Description continued on next page.)

Table 1. Full description of the IFQ program (continued).

	Element	SubElement	
			(...continued from previous page) **Catch Tracking Mechanisms for Shoreside Sector** **Electronic vessel logbook report** VMS-based electronic logbook required to be transmitted from vessel. At-sea entry by vessel personnel required including catch weight by species and if retained or discarded. **Vessel landing declaration report** Mandatory declaration reports. **Electronic ITQ landing report** Mandatory reports completed by processors and similar to electronic fish ticket report. **Processor production report** Mandatory reports (possible inclusion of proprietary data included to be recommended as option is fleshed out). **Cost Control Mechanisms for Shoreside Sector** **Shoreside landing hour restrictions** Landing hours may be restricted. **Shoreside site Licenses** Mandatory license for shoreside deliveries. License can be issued to any site that meets the monitoring requirements. **Vessel Certification** Mandatory certification. Certificate can be issued to any vessel that meets the monitoring requirements. **Program Performance Measures for Shoreside Sector** Integrate into the tracking and monitoring program the collection of data on cost, earnings and profitability; economic efficiency and stability; capacity measures; net benefits to society; distribution of net benefits; product quality; functioning of quota market; incentives to reduce bycatch; market power; spillover effects into other fisheries; contribution to regional economies (income and employment); distributional effects/community impacts; employment in seafood catching and processing; safety; bycatch and discards; administrative, enforcement, and management costs. (See A-2.3.2)
A-2.3.2	Socio-Economic Data Collection		The data collection program will be expanded and submission of economic data by harvesters and processors will be mandatory. Random and targeted audits may be used to validate mandatory data submissions. See footnote for a full description[bb] Information on QS transaction prices, will be included in a central QS ownership registry. *NOTE: Data collection started before the first year of implementation would be beneficial, in order to have a baseline for comparison.*
A-2.3.3	Program Costs	a Cost Recovery	Fees up to 3% of exvessel value, consistent with 303A(e) of the MSA may be assessed. Cost recovery shall be for costs of management, data collection, analysis, and enforcement activities.
		b Fee Structure	To be determined. The TIQC recommended a fee structure that reflects usage. A fee structure that allows for equitable sharing of observer costs for smaller vessels may be developed.

Table 1. Full description of the IFQ program (continued).

	Element	SubElement	
A-2.3.4	Program Duration and Modification		The Council shall begin a review of the IFQ program no later than 5 years after implementation of the program. The review will evaluate the progress the IFQ program has made in achieving the goal and objectives of Amendment 20. The result of this evaluation could include dissolution of the program, revocation of all or part of quota shares, or other fundamental changes to the program. Holders of quota shares should remain cognizant of this fact when making decisions regarding their quota shares, including buying selling, and leasing of these shares. The Council shall consider the use of an auction or other non-history based methods when distributing quota share that may become available after initial allocation. This may include quota created when a stock transitions from overfished to non-overfished status, quota not used by the adaptive management program, quota forfeited to “use it or lose it” provisions, and any quota that becomes available as a result of the initial or subsequent reviews of the program. The specific form of the auction or other method of distribution shall be designed to achieve the goals of Amendment 20, specifically including minimizing the adverse effects from an IFQ program on fishing communities to the extent practical. After the initial review, there will be a review process every four years. A community advisory committee will take part in the review of IFQ program performance.

Table 1. Full description of the IFQ program (continued).

	Element	SubElement	
A-3	***Adaptive Management** (also see Section A-9)*		Ten percent of the non-whiting QS will be reserved to facilitate adaptive management in the shoreside non-whiting sector. Therefore, each year 10% of the shoreside trawl sector nonwhiting quota pounds will be available for use in adaptive management (adaptive management QP). The set aside will be used to address the following objectives. o Community stability o Processor stability o Conservation o Unintended/Unforeseen consequences of IFQ management. o Facilitating new entrants. **Years 1 and 2.** During the first 2 years in which the IFQ program is in place, the method to be used in distributing QP in years 3 through 5 will be determined, including. o The decision making and organization structure to be used in distributing the QP set aside[cc] o The formula for determining community and processor eligibility, as well as methods for allocation, consistent with additional goals. o The division of QP among the states. o Whether to allow the multi-year commitment of QP to a particular project. **Years 3 through 5.** QP will be distributed through the organizational structure, decision process, formulas and criteria developed in years 1 and 2 and implemented through subsequent Council recommendation and NMFS rule making processes. Consideration will be given to the multiyear commitment of QP to particular projects (3 year commitments). **Review and Duration.** The set aside of QP for the identified objectives will be reviewed as part of the year 5 comprehensive review and a range of sunset dates will be considered, including 10, 15, 20 year and no sunset date options.
A-4	***Pacific Halibut IBQ—non-retention***		IBQ for Pacific halibut bycatch in the trawl fishery will be established. The IBQ will be required to cover legal and sublegal sized Pacific halibut bycatch mortality in the area north of 40°10 N latitude. It is the intent of the Council that halibut IBQ mortality be estimated on an individual vessel basis. Such IBQ will be issued on the basis of a bycatch rate applied to the target species QS an entity receives in a manner similar to that described in Section A-2.1.3.a, for overfished species caught incidentally. Area-specific bycatch rates may be used for allocation but halibut IBQ will not be geographically subdivided.

[a] California halibut gear of 7.5" or greater used in state waters would be exempted.

[b] Mandatory gear conversion (the permanent switching from trawl to some other gear) was considered but not included at this time.

Table 1. Full description of the IFQ program (continued).

[c] Since the shoreside trawl sector covers all shoreside deliveries, this implies that IFQ issued for the shoreside trawl sector may not be used for at-sea deliveries (i.e. may not be used to cover deliveries made to motherships or catch by catcher-processors).

[d] Not withstanding this provision, a vessel with a LE trawl permit may catch the trawl QP with a nontrawl gear, as per Section A-1.1.

[e] At present there are no groundfish species for which the harvest in the trawl fishery is managed differently by geographic area. An example of an area specific precautionary policy from outside trawl fishery management is the geographic differential recommended by the SSC for lingcod. Lingcod is monitored and managed differently in different geographic areas though there is a single coastwide ABC and OY for lingcod. Since there are no geographic subdivisions in the trawl management measures for lingcod, it is assumed that lingcod trawl IFQ will not be geographically subdivided.

[f] Such changes in latitudinal area management may occur as a result of changes in the management areas for species/species complexes in the ABC/OY table or as a result of separate Council action to change the trawl QS by area. In either case, specific Council action will be required to change the management areas and such action will be accompanied by appropriate supporting analysis and public comment opportunity.

[g] The Council authority to establish or modify RCAs will not be changed by this program.

[h] A whiting QP rollover provision was considered but rejected from further analysis. This provision would have allowed unused QP to be reclassified so that they could be used in any whiting sector.

[i] The current process for changing the whiting fishery opening dates involves a regulatory amendment developed under the FMP through a framework process. Implementation of an IFQ program should not change this process.

[j] "**Processors**" are defined as follows:

An at-sea processor is a vessel that operates as a mothership in the at-sea whiting fishery or a permitted vessel operating as a catcher-processor in the at-sea whiting fishery.

A shoreside processor is an operation, working on US soil, that takes delivery of trawl-caught groundfish that has not been "processed at-sea" and that has not been "processed shoreside"; and that thereafter engages that particular fish in "shoreside processing." Entities that received fish that have not undergone "at-sea processing" or "shoreside processing" (as defined in this paragraph) and sell that fish directly to consumers shall not be considered a "processor" for purposes of QS allocations.

"Shoreside Processing" is defined as either of the following:

1. Any activity that takes place shoreside; and that involves: cutting groundfish into smaller portions; OR freezing, cooking, smoking, drying groundfish; OR packaging that groundfish for resale into 100 pound units or smaller for sale or distribution into a wholesale or retail market.

OR

2. The purchase and redistribution into a wholesale or retail market of live groundfish from a harvesting vessel.

[k] Transfer of physical assets alone should not be considered a basis for successor in interest. Business relationships such as transfer of the company name and customer base might be reasonable evidence of successor in interest.

Table 1. Full description of the IFQ program (continued).

[l] Due to the divestiture provision of Section A-2.3.2.e, it is relatively unlikely that accumulation limits will constrain the amount of QS an entity recieves in the initial allocaiton. However, if an entity qualifies for QS in excess of accumulation limits and it does not qualify to receive that QS under the divestiture provision, the initial allocation will be constrained by first applying the aggregate limits and then, if necessary, the individual species limits. In using this approach, the entity's QS allocation should not be scaled back more than necessary to stay within limits and any QS not allocated will be reallocated to other QS recipients.

[m] State landings receipts (fish tickets) will be used to assess landings history for shoreside deliveries. In some cases, fish ticket records do not identify species to the same level of detail used for the IFQ management units (e.g. reports "unspecified rockfish"). Standard species composition routines usually used at the port level have been applied to vessel level data to estimate the species composition of such landings. In some instances, even after applying species composition information there may be some fish ticket records with a species groundfish categorization that does not match with one of the IFQ management units (primarily "unspecified rockfish"). Under such circumstances, when the initial allocations are made other information on the landings records and in logbooks might be used to assign the landing to its most probable species category.

[n] The intent is to provide an allocation method for QS for overfished species which addresses the vessel's need to have the QS to cover incidental catch in fisheries that target healthy stocks. The method would attempt to allocate the species to those who will be receiving QS for related target species. By allocating overfished species QS to those most in need of it, such an allocation would be expected to reduce disruption and transition costs. Currently, the list of overfished species that fall into this category is as follows: bocaccio, canary rockfish, cowcod, darkblotched rockfish, Pacific Ocean perch, widow rockfish, and yelloweye rockfish. This list may change by the time the program is ready to be implemented. If a major target species became overfished, it would not be intended that such a species would be allocated this alternative method (for example species such as Dover sole, sablefish, or Pacific whiting).

[o] The four areas are as follows: (1) north of 47°40 N Lat; (2) between 47°40 N Lat and 43°55 N Lat; (3) between 43°55 N Lat and 40°10 N Lat; and (4) south of 40°10 N Lat

[p] In order to determine an amount of aggregate target species to which bycatch rates will be applied, each vessel's QS will be multiplied by the trawl allocation at the time of implementation.

[q] State landings receipts (fish tickets) will be used to assess landings history for shoreside deliveries.

[r] Catch area data on fish tickets are not considered appropriate for this purpose. The catch area field is often filled out by fish receivers that do not know the area in which the vessel fished. Additionally catch area is often left unspecified. Therefore it will be assumed that all catch comes from ocean areas near the port of landing.

[s] Unless there is a change in the total OY or other factors affecting trawl allocation for the areas involved, in which case their change in QP would be proportional to the change in the trawl allocation.

[t] QP from a subsequent year may not be accessed until such QP have been issued by NMFS.

[u] Including QS that an entity received in excess of accumulation limits in place at the time of initial allocaiton (see Section A-2.2.3.e).

[v] Carryover of deficits provides some flexibility to use pounds from a year to cover a deficit from a previous year. Without a carryover provision, a vessel would still need to use pounds in a subsequent year to cover an overage but would incur a violation.

Table 1. Full description of the IFQ program (continued).

[w] The following is the text deleted from this section: "No QS use-or-lose provision has been specified.. The need for this provision will be evaluated as part of program review process, and the provision could be added later, if necessary. *Section A-2.2.3.b contains a provision mandating the transfer of QP to vessels each year. This is intended to encourage QP use."*

[x] QS may be transferred on a temporary basis through private contract (leased) but NMFS will not track lease transfers differently than any other transfer.

[y] The "vessel" accumulation limit was originally termed a "permit" limit. The term "permit" was changed to "vessel" to be consistent with Section A-2.1.3, which indicates that QP go into vessel accounts, not permit accounts. The term "own or control" was shortened to "control" for simplicity. "Control" includes ownership and therefore is inclusive of "ownership."

[z] It is the Council intent that control limits should not constrain the formation of risk pools to help the fishermen deal with overfished species constraints, so long as the pools do not undermine the effectiveness of the accumulation limits. A risk pool is one in which two or more people enter into an agreement whereby if one person does not have the QP it needs the others would agree to provide the QP, if they have them. Whether these kinds of agreements are informal or formal, as other considerations and conditions are added to the agreements they may begin to constitute control. It is the Council intent to allow for these pooling agreements, so long as they do not become control.

[aa] For example, if a person has a 50 percent ownership interest in that entity, then 50 percent of the QS owned by that entity will count against the individual's accumulation limit unless it is otherwise determined that the have effective control of a greater or lesser amount.

[bb]**Expanded data collection** would include:

mandatory submission of economic data for LE trawl industry (harvesters and processors),

voluntary submission of economic data for other sectors of the fishing industry,

transaction value information in a centralized registry of ownership, and

formal monitoring of government costs.

Mandatory Provisions: The Pacific Fishery Management Council and NMFS shall have the authority to implement a data collection program for cost, revenue, ownership, and employment data, compliance with which will be mandatory for members of the West Coast groundfish industry harvesting or processing fish under the Council's authority. Data collected under this authority will be treated as confidential in accordance with Section 402 of the MSA.

A mandatory data collection program shall be developed and implemented as part of the groundfish trawl rationalization program and continued through the life of the program. Cost, revenue, ownership, employment and other information will be collected on a periodic basis (based on scientific requirements) to provide the information necessary to study the impacts of the program, including achievement of goals and objectives associated with the rationalization program. These data may also be used to analyze the economic and social impacts of future FMP amendments on industry, regions, and localities. The program will include targeted and random audits as necessary to verify and validate data submissions. Additional funding (as compared to status quo) will be needed to support the collection of these data. The data collected would include data needed to meet MSA requirements (including antirust).

Table 1. Full description of the IFQ program (continued).

The development of the program shall include: a comprehensive discussion of the enforcement of such a program, including discussion of the type of enforcement actions that will be taken if inaccuracies are found in mandatory data submissions. The intent of this action will be to ensure that accurate data are collected without being overly burdensome on industry in the event of unintended errors.

Voluntary Provisions: A voluntary data collection program will be used to collect information needed to assess spillover impacts on non-trawl fisheries.

Central Registry: Information on transaction prices will be included in a central registry of QS owners. Such information will also be included for LE permit owners/lessees.

Government Costs: Data will be collected and maintained on the monitoring, administration, and enforcement costs related to governance of the trawl rationalization program.

[cc] The following are three options for the sequences of agency involvement in decision making for the distribution of adaptive management QP after year 2..

1. NMFS
2. State → Council →NMFS
3. Council →NMFS

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Table 2. Control and vessel limit options: Council preferred alternative.

Species Category	Vessel Limit (Applies to all QP in a Vessel Account, Used and Unused)	Vessel Unused QP Limit	QS Control Lim
Nonwhiting Groundfish Species	3.2%		2.7%
Lingcod - coastwide	3.2%		2.5%
Pacific Cod	20.0%		12.0%
Pacific whiting (shoreside)	15.0%		10.0%
Pacific whiting (mothership)	30.0%		20.0%
Sablefish			
N. of 36° (Monterey north)	4.5%		3.0%
S. of 36° (Conception area)	15.0%		10.0%
PACIFIC OCEAN PERCH	6.0%	4.0%	4.0%
WIDOW ROCKFISH *	8.5%	5.1%	5.1%
CANARY ROCKFISH	10.0%	4.4%	4.4%
Chilipepper Rockfish	15.0%		10.0%
BOCACCIO	15.4%	13.2%	13.2%
Splitnose Rockfish	15.0%		10.0%
Yellowtail Rockfish	7.5%		5.0%
Shortspine Thornyhead			
N. of 34°27'	9.0%		6.0%
S. of 34°27'	9.0%		6.0%
Longspine Thornyhead			
N. of 34°27'	9.0%		6.0%
COWCOD	17.7%	17.7%	17.7%
DARKBLOTCHED	6.8%	4.5%	4.5%
YELLOWEYE	11.4%	5.7%	5.7%
Minor Rockfish North			
Shelf Species	7.5%		5.0%
Slope Species	7.5%		5.0%
Minor Rockfish South			
Shelf Species	13.5%		9.0%
Slope Species	9.0%		6.0%
Dover sole	3.9%		2.6%
English Sole	7.5%		5.0%
Petrale Sole	4.5%		3.0%
Arrowtooth Flounder	20.0%		10.0%
Starry Flounder	20.0%		10.0%
Other Flatfish	15.0%		10.0%
Other Fish	7.5%		5.0%
Pacific Halibut	14.4%	5.4%	5.4%

* If widow rockfish is rebuilt before initial allocation of QS, the vessel limit will be set at limit will be 1.5 times the control limit.

3. Whiting At-sea Trawl Sector: Cooperative Program (Appendix B of the EIS)

The at-sea whiting sector co-op program is described generally below. Table 3 provides an outline of the sections of the program. A full description of the co-op programs follows Table 3, beginning with a section on management of the whiting fishery and followed by sections on the mothership and catcher-processor sectors of the whiting fishery (the "at-sea" sectors).

The Council considered but did not adopt a co-op program for the shoreside whiting fishery. Instead, the shoreside whiting sector was merged with the nonwhiting sector, both to be managed with IFQs. However, section place holders for the shoreside whiting co-op program are maintained in this document to maintain a numbering system that will correspond to the numbering of the alternatives and sections of the analysis as they are laid out in the EIS.

3.1. Overview of Co-op Program Elements

3.1.1. At-sea Whiting Sector Management under Co-ops

While co-ops will be used to control the harvest within the at-sea whiting sectors, a number of management measures will still be required to control competition between the whiting sectors. This section covers those measures along with other measures which will apply to all sectors managed under co-ops, such as observer requirements and mandatory submission of economic data. The description of the co-op management program for each at-sea whiting sector starts in Section 3.1.2.

The existing allocation of whiting between the shoreside, mothership, and catcher-processor (CP) sectors will not change under the rationalization program (42, 24, and 34 percent, respectively).

Provisions also address bycatch in the at-sea whiting fishery (particularly that of certain overfished species). The Council is recommending incidental groundfish species caps for each of the whiting sectors, for the co-op and non-co-op fisheries within the mothership sector, and for the co-ops within the mothership sector. Within sectors, bycatch allocations would be pro rata, based on the amount of whiting allocated to that sector.

Area closures may be used to control the pace of the fishery. For the mothership sector, the fishery will be divided into a co-op fishery and a non-co-op fishery (for those who do not desire to take part in a co-op). Participants in the non-co-op fishery will not have a claim to a particular amount of the fish allocated to that fishery; therefore the vessels will likely race to harvest the available allocation.

NMFS will close the whiting fishery, a particular sector, the co-op or non-co-op fishery within a sector, or individual co-ops, as appropriate, when it is projected that a whiting catch or bycatch limit will be reached. With respect to co-ops, inseason monitoring and closure will be needed only at the highest level of aggregation of the co-ops. For example, if individual co-ops join together to form an inter-co-op that covers the entirety of one of the whiting sectors, then NMFS will track and close at the sector level. Nevertheless, vessel level monitoring will still be required to ensure that catch is accurately recorded.

Given the high level of monitoring already in place in the whiting fishery, only moderate changes in monitoring are needed to implement this program for the at-sea whiting fishery. For the at-sea segment of the fishery, 100 percent coverage aboard mothership and catcher processors will continue. A program for the mandatory submission of economic data is also included, to facilitate monitoring program performance.

3.1.2. Co-ops for Catcher Vessels Delivering to Motherships

Under this program, those who hold whiting-endorsed permits for catcher vessels in the mothership sector will choose each year whether to be part of a co-op or to register to fish in the non-co-op portion of the fishery. The holders of catcher vessel permits with mothership whiting endorsements will form the co-ops. Based on its catch history, each permit that qualifies for a mothership whiting endorsement will be capped at a portion of the history (endorsement share) of the mothership sector allocation of whiting and bycatch species. Each year, NMFS will distribute a catch allocation to each catcher vessel co-op based on the sum of the endorsement shares for the permits registered to that co-op. NMFS will also distribute a catch allocation each year to the non-co-op portion of the fishery, based on the collective endorsement shares of the permits opting to participate in the non-co-op fishery.

The co-op organization will coordinate harvest by its members. Although co-op agreements will include a mandatory clause that the catch allocation made to a member must equal the amount that the member brings into the co-op, co-op members may transfer catch allocations among themselves. Similarly, if multiple co-ops join together in an inter-co-op, one co-op will be allowed to transfer catch allocation to another co-op within that inter-co-op. NMFS will not necessarily need to track transfers among co-op members or within an inter-co-op.

The class of motherships will be closed by creating a LE permit for mothership vessels. There will be restrictions limiting a vessels ability to both catch and operate as a mothership in the whiting fishery in the same year. This will limit the ability of processing vessels to move between the catcher processor and mothership sectors.

Prior to the start of each season, each catcher vessel permit desiring to participate in the co-op fishery will obligate itself to deliver its catch to a particular mothership. The obligation to a particular co-op or mothership will not carry-over from one year to the next, it may be changed at the catcher vessel permit owners discretion based on its preseason declaration. While catch may be transferred among participants in a co-op or inter-co-op, such transfers would not change the mothership to which the catch is obligated, unless a mutual agreement is reached.

As in the IFQ program, accumulation limits will be imposed to prevent excessive concentration of catch allocations. They will cap the proportion of whiting that an individual or entity can process, cap the proportion of whiting an individual or entity could accumulate via ownership of catcher vessel permit(s), and cap the amount that can be landed by any one catcher vessel.

3.1.3. Co-ops for Catcher-Processors

Under the catcher-processor (CP) co-op program, as under status quo, a voluntary CP co-op may continue to be formed by CP permit holders. This system will continue as long the existing co-op system continues to operate successfully or until the FMP is otherwise amended. If the voluntary co-op system fails, it will be replaced with an IFQ system. Currently the co-op operates under a private contract that includes division of the harvest among participants according to an agreed schedule. In the event the co-op system fails, IFQ will be allocated equally to each CP permit (equally divided among all CP endorsed permits).

Under the catcher-processor (CP) co-op program, the main Council recommendations are the creation of a CP endorsement to close the CP fishery to new entrants and the assignment of an allocation to the voluntary CP co-op. The endorsement will be granted to LE permits registered to CP vessels if the vessels meet specified qualification criteria. Only vessels with a CP LE permit will be allowed to harvest fish from the CP sector's allocation. LE permits with CP endorsements will continue to be transferable. NMFS will not establish an allocation of catch or catch history among CP permits unless the co-op fails. NMFS will specify in regulation the assignment of the CP sector allocation to the CP sector co-op. If necessary, a closure will be used to keep the CP sector from exceeding its allocation of whiting and bycatch species.

3.2. Detailed Specification of Co-op Program Elements

Table 3 Overview of the co-op program.

B.1	***Whiting Sector Management Under Co-ops***
B-1.1	Whiting Management
B-1.2	Annual Whiting Rollovers
B-1.3	Bycatch Species Management
B-1.4	At-sea Observers/Monitoring
B-1.5	Mandatory Data Collection
B-1.6	Adaptive Management—Not included in recommendation. *(This section header is being maintained as a place holder so that numbering will correspond to that of the alternatives and analysis in the EIS).*
B-1.7	Length Endorsement
B-2	***Whiting Mothership Sector Co-op Program***
B-2.1	Participation in the Mothership Sector
B-2.2	Permits/Endorsement Qualification and Characteristics
B-2.3	Co-op Formation and Operation Rules
B-2.4	Obligations to Processors
B-2.5	NMFS Role
B-3	***Whiting Shoreside Sector Co-op Program***
	Not included in recommendation. *(This section header is being maintained as a place holder)*.
B-4	***Co-ops for Catcher-Processors***
B-4.1	Participation in the Catcher-Processor Sector and Endorsement Qualification
B-4.2	Co-op Formation and Operation Rules
B-4.3	NMFS Role

B-1 Whiting Sector Management Under Co-ops

B-1.1 Whiting Management

Under the co-op program, catcher vessel permits for the mothership sector will be endorsed for deliveries to motherships and amounts of history assigned to each catcher vessel permit based on past harvest in the fishery. Catcher-processor permits will be endorsed for participation in the catcher-processor sector.

The whiting catch history calculation for each mothership-endorsed catcher vessel permit [CV(MS)] will be assigned to a pool for the co-op in which the permit will participate or a pool for the mothership non-co-op fishery. NMFS will make an allocation assignment to the catcher-processor sector co-op based on the allocation to the CP sector. Co-ops are responsible for monitoring and enforcing the catch limits of co-op members.

NMFS will monitor the catch in the mothership non-co-op fishery, the mothership co-op fishery, the CP fishery, and the overall whiting catch of all at-sea sectors. NMFS will close each segment of the fishery based on projected attainment of whiting catch. Additionally, all at-sea sectors will be subject to closure based on attainment of the overall trawl whiting allocation.

B-1.2 Annual Whiting Rollovers

There will not be a rollover of unused whiting from one sector to another.

B-1.3 Bycatch Species Management

For the foreseeable future, the whiting fishery will be managed under bycatch limits (hard caps) for widow, canary, darkblotched rockfish, and Pacific Ocean perch. The catch of all groundfish will be accounted for and tracked against the OY.

The ESA-listed salmon bycatch management measures—that is, the 11,000 Chinook threshold, 0.05 rate threshold, and triggered 100 fathom closure—will also continue to be in place.

The goal of bycatch management is to control the rate and amounts of rockfish and salmon bycatch to ensure each sector is provided an opportunity to harvest its whiting allocation.

There will be a set aside of Pacific halibut for the at-sea whiting fishery, as specified in the intersector allocation process (Amendment 21).

B-1.3.1 Bycatch Allocation Subdivision

Subdivide bycatch species managed with hard caps (widow, canary, darkblotched rockfish, and Pacific Ocean perch) among each of the whiting sectors; within the sectors subdivide between the co-op fishery and non-co-op fishery (subdivision for the non-co-op fishery does not apply to the catcher-processor co-op program); and subdivide among co-ops.

Only those species with hard caps will be subdivided for bycatch management and bycatch will be allocated to each permit and co-op pro rata in proportion to its whiting allocation. The mothership sector's bycatch allocation will be divided between its co-op and non-co-op fishery, based on the allocations made to the permits participating in each portion of the fishery.

B-1.3.2 Bycatch Management

All sectors and co-ops will close based on projected attainment of the at-sea whiting fishery bycatch cap for any one species. The mothership co-op fishery, non-co-op fishery, and catcher-processor fishery will each be closed based on projected attainment of their individual allocation. Additionally, each co-op will cease fishing when its bycatch allocation is reached.

The Council may also use area closures (seasonal or year-round) to manage overfished stocks in the co-op and non-co-op fisheries. The area closures may be the same or different for different species. Area closures may be year-round, seasonal, or triggered automatically by the attainment of certain levels of catch.

Unused bycatch may be rolled over from one sector to another if the sector's full allocation of whiting has been harvested or participants in the sector do not intend to harvest the remaining sector allocation.

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B-1.4 At-sea Observers/ Monitoring

At-sea Whiting Fishery: 100 percent observer coverage aboard mothership and catcher-processors will continue.

For some coverage, cameras may be used in place of observers (feasibility to be determined). It is the Council intent to provide NMFS flexibility sufficient to design and implementation a tracking and monitoring program that will achieve the goals and objectives of the trawl rationalization program.

B-1.5 Mandatory Data Collection

The following are the central elements of the data collection program that will be implemented as part of the co-op program.

- Mandatory submission of economic data for LE trawl industry (harvesters and processors).
- Voluntary submission of economic data for other sectors of the fishing industry.
- Include transaction value information in a centralized registry of ownership.
- Formal monitoring of government costs.

Mandatory Provisions. The Pacific Fishery Management Council and NMFS shall have the authority to implement a data collection program for cost, revenue, ownership, and employment data, compliance with which will be mandatory for members of the west coast groundfish industry harvesting or processing fish under the Council's authority. Data collected under this authority will be treated as confidential in accordance with Section 402 of the MSA.

A mandatory data collection program shall be developed and implemented as part of the groundfish trawl rationalization program and continued through the life of the program. Cost, revenue, ownership, employment and other information will be collected on a periodic basis (based on scientific requirements) to provide the information necessary to study the impacts of the program, including achievement of goals and objectives associated with the rationalization program. These data may also be used to analyze the economic and social impacts of future FMP amendments on industry, regions, and localities. The program will include targeted and random audits as necessary to verify and validate data submissions. *Data collected under this authority will be treated as confidential in accordance with Section 402 of the MSA.* Additional funding (as compared to status quo) will be needed to support the collection of these data. The data collected would include data needed to meet MSA requirements (including antirust).
The development of the program shall include a comprehensive discussion of the enforcement of such a program, including discussion of the type of enforcement actions that will be taken if inaccuracies are found in mandatory data submissions. The intent of this action will be to ensure that accurate data are collected without being overly burdensome to industry in the event of unintended errors. Annual reports will be provided to the Council.

Voluntary Provisions: A voluntary data collection program will be used to collect information needed to assess spillover impacts on non-trawl fisheries.

Central Registry: Information on transaction prices will be included in a central registry of whiting endorsed permit and mothership permit owners. Such information will also be included for sales and lessees.

Government Costs: Data will be collected and maintained on the monitoring, administration, and enforcement costs related to governance of the rationalization program.

B-1.6 Adaptive Management

There will not be an adaptive management set aside for the at-sea whiting fisheries. *(This section is being maintained as a place holder so that numbering will correspond to that in the alternatives and analysis of the EIS.)*

B-1.7 Length Endorsement

Length endorsement restrictions on LE permits endorsed for groundfish gear will be retained, however, the provision that requires that the size endorsements on trawl permits transferred to smaller vessels be reduced to the size of that smaller vessel will be eliminated (i.e. length endorsements will not change when a trawl endorsed permit is transferred to a smaller vessel).

B-2 Whiting Mothership Sector Co-Op Program

Overview. Qualified permits will be endorsed for mothership (MS) co-op participation. Each year the holders of those permits will choose whether their vessels will fish in the co-op fishery, in which individual co-ops will direct harvest, or fish in a non-co-op fishery that will be managed by NMFS as an Olympic style fishery. The co-op will be obligated to deliver its fish to specific mothership processors based on the obligations of each permit in the co-op determined based on preseason declarations. LE permits will be issued for motherships and required for a mothership to receive whiting from catcher vessels.

B-2.1 Participation in the Mothership Sector

a. Catcher Vessels

Vessels with CV(MS)-endorsed permits may participate in either the co-op or non-co-op portion of the mothership fishery. They will choose annually which fishery they will participate in for the coming year. Additionally, any groundfish LE trawl permitted vessels may participate in the co-op portion of the fishery if they join a co-op (as described in Section B-2.3.3).[6] No other catcher vessels may participate in the mothership fishery.

A vessel may not engage in the processing of whiting during any year in which a catcher vessel (mothership) (CV(MS)) endorsed permit is registered for use with the vessel.

b. Processors

Only motherships with a mothership LE permit may receive deliveries from catcher vessels participating in the co-op or non-co-op portions of the mothership sector whiting fishery. (Note: motherships may acquire such permits by transfer; see Section B-2.2.2.)

c. Vessels Excluded[7]

Motherships also operating as a catcher-processor may not operate as a mothership: during a year in which it also participates as a catcher-processor.

[6] When such permits participate in a co-op the co-op will not be allocated any additional fish based on participation by such a vessel.

[7] A vessel that has been under foreign registry after the date of the AFA and that has participated in fisheries in the territorial waters or exclusive economic zones of other countries will not be eligible to participate as a mothership in the mothership sector of the Pacific whiting fishery, as per Section 12102(c)(6) of the AFA.

B-2.2 Permits/Endorsement Qualification and Characteristics

B-2.2.1 Catcher Vessel Mothership Whiting Endorsement (CV(MS) Whiting Endorsement)

a. Endorsement Qualification and History Assignment

Permits with a qualifying history will be designated as CV(MS) permits through the addition of an endorsement to their LE groundfish permit. At the time of endorsement qualification, each permit will also be assigned a catch history that will determine the share of the mothership whiting allocation associated with that permit.

Qualifying for a CV(MS) Whiting Endorsement. A LE permit will qualify for a CV(MS) whiting endorsement if it has a total of more than 500 mt of whiting deliveries to motherships from 1994 through 2003

Catch History Assignment (Identification of Endorsement Related Catch History). The initial catch history calculation for CV(MS) whiting endorsements will be based on whiting history of the permit for 1994 through 2003, dropping 2 worst years. A permit's history for each year will be measured as a share of the fleet history for that year (i.e. "relative pounds" will be used This catch history will be used by NMFS to assign both whiting and bycatch species allocations to the co-ops and non-co-op fishery pools, as per section B.1.3.2.

For the purpose of the endorsement and initial calculation, catch history associated with the permit includes that of permits that were combined to generate the current permit.

b. Whiting Permit and Endorsement Transferability and Endorsement Severability

The CV(MS) whiting endorsement (together with the associated catch history) *may not be* severed from the groundfish LE trawl permit. Catch history associated with the whiting endorsement may not be subdivided. CV (MS) permits may be transferred two times during the fishing year, provided that the second transfer is back to the original catcher vessel (i.e. only one transfer per year to a different catcher vessel

c. Accumulation Limit

CV(MS) Permit Ownership: No individual or entity may own CV(MS) permits for which the allocation total is greater than 20%.
Catcher Vessel Usage Limit: No vessel may catch more than 30% of the mothership sector's whiting allocation.

d. Combination

CV(MS) Permit Combination to Achieve a Larger Size Endorsement. When a CV(MS)-endorsed permit is combined with another permit (including unendorsed permits), the resulting permit will be CV(MS) endorsed[8]

B-2.2.2 Mothership Processor Permit

a. Qualifying Entities

The owners of qualifying motherships will be issued MS permits. In the case of bareboat charters, the charterer of the bareboat will be issued the permit.

b. Qualification Requirements

A qualifying mothership is one which processed at least 1,000 mt of whiting in each of any two years from 1997 through 2003.

c. Transferability

1. MS permits will be transferable
2. MS permits may be transferred to a vessel of any size (there will be no size endorsements associated with the permit) MS permits **may not** be transferred to a vessel engaged in the *harvest* of whiting in the year of the transfer.
3. Limit on the Frequency of Transfers: MS permits may be transferred two times during the fishing year provided that the second transfer is back to the original mothership (i.e. only one transfer per year to a different mothership).

d. Usage Limit

No individual or entity owning a MS permit(s) may process more than 45 percent of the total MS sector whiting allocation.

[8] Specifically, a CV(MS)-endorsed permit that is combined with a LE trawl permit that is not CV(MS) endorsed or one that is CV(Shoreside) [CV(SS)] endorsed will be reissued with the CV(MS) endorsement. If the other permit is CV(SS) endorsed, the CV(SS) endorsement will also be maintained on the resulting permit. However, CV(MS) and CV(SS) catch histories will be maintained separately on the resulting permit and be specific to participation in the sectors for which the catch histories were originally determined. If a CV(MS) permit is combined with a CP permit, the CV(MS) endorsement and history will not be reissued on the combined permit. The size endorsement resulting from permit combinations will be determined based on the existing permit combination formula.

B-2.3 Co-op Formation and Operation Rules.

B-2.3.1 Who and Number of Co-ops

Co-ops are not required but may be voluntarily formed among CV(MS) permit owners. The number of co-ops will be indirectly limited by the limit on the minimum number of vessels able to form a co-op (see Section 2.3.3-b).

B-2.3.2 When

Each year at a date certain prior to the start of the fishery, MS and CV(MS) permit holders planning to participate in the mothership sector must register with NMFS. At that time CV(MS) permit holders must identify which co-op they will participate in or if they plan to participate in the non-co-op fishery.

B-2.3.3 Co-op Agreement Standards

a. Submissions to NMFS and the Council

Co-op agreement. Co-op agreements will be submitted to NMFS for approval. Signed copies of the cooperative contracts must be filed with the Council and NMFS and available for public review before the co-op is authorized to engage in fishing activities.[9] Any material changes or amendments to the contract must be filed annually with the Council and NMFS by a date certain.

Letter to Department of Justice. Co-ops must also file with the Council and NMFS a copy of a letter from the co-op requesting a business review letter on the fishery cooperative from the Department of Justice and any response to such request.

b. Number of Participants in Each Co-op (Including Inter-co-ops)

CV permits may join together in separate harvester co-ops. A minimum of 20% of the CV(MS) permit holders are required to form a co-op.[10] Co-ops may form co-ops with other co-ops. Within one of the whiting sectors, these co-ops may be formed to manage directed catch and/or bycatch. Whiting and bycatch allocations may be transferred among co-ops through inter-co-op agreements.

c. Catch History Distributions Among Permits

Co-op agreements must stipulate that catch allocations to members of the co-op be based on their catch history calculation by NMFS used for distribution to the co-op.

[9] During council discussion this was flagged by NOAA GC as a potential legal problem.

[10] The minimum threshold number of participants required to form a co-op balances the potential advantages for multiple co-ops while limiting implementation and management costs and administrative requirements for managing this sector.

d. Participation by Non-CV (MS) Endorsed Permits

Through temporary arrangements a co-op allocation may be harvested by any catcher vessel holding a valid LE trawl permit which has joined the co-op (including one that does not have a CV(MS) endorsement).[11]

e. Other Required Co-op Agreement Provisions

The Council's intent is to have mothership sector participants work with NMFS to develop and describe a process and co-op agreement requirements to include in implementing regulations for this action.

A co-op agreement must include:

1. A list of all vessels, and which must match the amount distributed to individual permit holders by NMFS
2. Signature of all permit holders participating in the co-op
3. A plan to adequately monitor catch and bycatch
4. Adequate enforcement and penalty provisions to ensure that catch and bycatch overages do not occur
5. Measures designed to reduce bycatch of overfished species
6. An obligation to manage inseason transfers of catch history
7. A requirement that agreement by at least a majority of the members is required to dissolve a co-op (**During council discussion this was flagged by NOAA GC as a potential legal problem**)
8. An obligation to produce an annual report to the Council and NMFS by a date certain documenting the co-op's catch and bycatch data and inseason transfers (the report is to be available for review by the public)
9. Identification of a co-op manager who will:
   a. serve as the contact person with NMFS, the Council and other co-ops,
   b. be responsible for the annual distribution of catch and bycatch,
   c. oversee transfers,
   d. prepare annual reports, and
   e. be authorized to receive or respond to any legal process against the co-op.
10. Provisions that prohibit co-op membership by permit holders that have incurred legal sanctions that prevent them from fishing groundfish in the Council region
11. A provision that requires new owners to comply with membership restrictions in the co-op agreements

f. Additional Provisions for Inter-co-op Agreements

1. In the case of two or more cooperatives entering into an inter-cooperative agreement, the inter-co-op agreement must incorporate and honor the provisions of the individual co-op agreements unless all such agreements (or modifications thereof) are resubmitted for approval.
2. The requirements of Sections 2.3.3.a-2.3.3.e apply to the inter-co-op agreement, except that for the purpose of Section 2.3.3.e., subparagraph 7, the members of the inter-co-ops are the co-ops and not the participants in each co-op.

[11] As a member of the co-op, such a vessel would be subject to Section B-2.4 and the indicated processor obligations.

B-2.3.4 Annual Allocation Transferability

a. The annual allocations received by a co-op based on catch history of the whiting endorsements held by its members may be transferred among co-op members and from one co-op to another so long as obligations to processors are met (as per Section B-2.4). Additionally, in order to transfer annual allocation from one co-op to another there must be a NMFS approved inter-co-op agreement.
b. Allocations may not be transferred from the mothership sector to another sector.

B-2.4 Obligations to Processors (Processor TIes)

Each year, a permit will obligate to a processor all of its catch for a coming year.

B-2.4.1 Formation and Modification of Processor Tie Obligations

There will not be processor tie that caries from one year to the next. CV(MS) permits will be obligated to a single MS permit for an entire year but may change to a different MS permit through a preseason declaration of intent.

By September 1 of the year prior to implementation and every year thereafter, each CV(MS) permit is required to contact NMFS and indicate whether CV(MS) permit will be participating in the co-op or non-co-op fishery in the following year. If participating in the co-op fishery, then CV(MS) permit must also provide the name of the MS permit that CV(MS) permit will be linked to in the following year (i.e., annual catcher vessel, mothership linkage that may be changed each year without requirement to go into the "non-co-op" fishery). Once established, the catcher vessel, mothership linkage shall remain in place until changed by CV(MS) permit.

Mothership Permit Transfer. If a mothership transfers its MS permit to a different mothership or different owner, the CV(MS) permit obligation for that year remains in place and transfers with the MS permit to the replacement mothership unless the obligation is changed by mutual agreement. The obligation does not extend beyond the fishing year.

B-2.4.2 Flexibility in Meeting Obligations to Processors

a. Temporary Transfer of the Annual Allocation Within the Co-op or from One Co-op to Another

When CV(MS) permit owners transfer co-op allocations from one co-op member to another within the co-op or from one co-op to another within an inter-co-op such allocations must be delivered to the mothership to which the allocation is obligated through the preseason declaration, unless released by mutual agreement.

b. Mutual Agreement Exception

By mutual agreement of the CV(MS) permit owner and mothership to which the permit is obligated, a permit may deliver to a licensed mothership other than that to which it is obligated.

B-2.4.3 Mothership Processor Withdrawal

If a mothership withdraws subsequent to quota assignment, then the CV(MS) permit that it is obligated to it is free to participate in the co-op or non-co-op fishery. The MS permit shall notify NMFS and linked CV(MS) permits of its withdrawal, and CV(MS) permits shall notify NMFS of their intent to participate in the co-op or non-co-op fishery thereafter. If continuing in co-op fishery, then CV(MS) permit shall provide NMFS with the name of the new MS permit to which it will be obligated for that season.

B-2.5 NMFS Role

B-2.5.1 Permit and Endorsement Issuance

NMFS will issue all necessary permits and endorsements under the rules specified under this program. Appeals processes will be provided as appropriate and necessary.

B-2.5.2 Fishery Registration and Co-op Approval

NMFS will announce a deadline before which all co-op agreements must be received for the coming year. NMFS will review and approve or reject co-op agreements based on standards provided here and other standards that it deems necessary to achieve the policy intent of the Council's actions.

B-2.5.3 Annual Allocation to Co-ops and the Non-co-op Fishery

a. Co-op Allocation

Each year NMFS will determine the percent of the mothership sector's harvest allocation to be given to each co-op based on the catch history calculation of CV(MS) permits registered to participate in the co-op that year. NMFS does not allocate to the individual permit holder; rather, NMFS allocates an aggregate amount of harvest tonnage annually to the co-op based on the catch histories associated with the members of the co-ops.

b. Non-co-op Allocation

Each year NMFS will determine the distribution to be given to the non-co-op fishery based on the catch history calculation of permit holders registered to participate in that fishery.

B-2.5.4 Fishery Management and Co-op Monitoring

1. NMFS will track all permit transfers and the invocation of mutual agreement exceptions. Permit transfers will not be valid until registered and acknowledged by NMFS.

2. NMFS will monitor catch and close segments of the fishery as necessary to ensure catch limits are not exceeded for:
   a. the whiting mothership co-op fishery

   b. the whiting mothership non-co-op fishery
   c. the mothership whiting sector as a whole
3. NMFS will not necessarily monitor, but will investigate and enforce as it deems necessary, the permit and co-op obligations to motherships.
4. NMFS will not necessarily monitor or enforce (except as it deems necessary):
   a. an individual permit's progress towards its catch allocations (permit level catch control will be at the co-op level and enforced through execution of the private contract)
   b. a co-op's progress toward its catch allocation[12]
   c. actual performance of the co-op agreement (the parties to the contract will resolve through private contract and remedies any deviation from provisions such as that requiring that a vessel have the opportunity to harvest the catch allocated to the co-op based on that vessel's permit, Section B-2.3.3.c)
5. NMFS will monitor other program provisions as needed. In some situations, there may need to be a declaration procedure to determine where a permit is delivering its obligated catch, for example, if a mothership withdraws without transferring its permit or reaching a mutual agreement for the transfer of obligated deliveries to a different mothership.

B-3 Whiting Shoreside Sector Co-Op Program (placeholder, not recommended)

The shoreside whiting sector will be managed with an IFQ program. This section header is being maintained so that section numbering here will correspond to section numbering in the alternatives and analysis in the EIS.

[12] This assumes that there is an inter-co-op agreement in place that covers the entire co-op fishery. If such an agreement is not in place covering both catch and bycatch, NMFS may need to monitor catch by each individual co-op (but not by the individual vessels in the co-op).

B-4 Catcher-Processors Co-op Program

Catch by the catcher-processor sector will be controlled primarily by closing the fishery when a constraining allocation is reached.[13] As under status quo, vessels may form co-ops to achieve benefits that result from a slower-paced, more controlled harvest. The main recommendations are the creation of a limited number of catcher-processor endorsements and the specification in regulation of the amounts that will be available for harvest by the voluntary co-op. A new entrant will have to acquire a permit with a catcher-processor endorsement in order to enter the fishery. If the co-op system fails it will be replaced by an IFQ program and the initial issuance of IFQ will be allocated equally among the permits (equally divided among all CP endorsed permits).

B-4.1 Participation in the Catcher-Processor Sector , Endorsement Qualification and Permit Transferability.

Catcher-processor (CP) Endorsement. The class of CP endorsed permits (CP permits) will be limited by an endorsement placed on a LE permit. LE permits registered to qualified catcher-processor vessels will be endorsed as CP permits. A qualified permit is one that harvested and processed in the catcher-processor sector of the Pacific whiting fishery at any time from 1997 through 2003. Only vessels catcher-processor vessels with a CP endorsed LE permit will be allowed to process whiting at-sea as part of the CP sector. LE permits with CP endorsements will continue to be transferable.

Participation as Mothership. A catcher-processor cannot operate as a mothership during the same year it participates in the CP fishery.

CP Permit Combination to Achieve a Larger Size Endorsement. A CP permit that is combined with a LE trawl permit that is not CP endorsed will result in a single CP permit with a larger size endorsement. (A CV(MS) endorsement on one of the permits being combined will not be reissued on the resulting permit.) The resulting size endorsement will be determined based on the existing permit combination formula.

CP Permit Transfers to Smaller Vessels. Length endorsement restrictions on LE permits endorsed for groundfish gear will be retained, however, the provision that requires that the size endorsements on trawl permits transferred to smaller vessels be reduced to the size of that smaller vessel will be eliminated (i.e. length endorsements will not change when a trawl endorsed permit is transferred to a smaller vessel).

Number of Transfers Per Year. CP permits may be transferred two times during the fishing year, provided that the second transfer was back to the original CP (I.e., only one transfer per year to a different CP).

[13] All references to catcher-processors in this section references to vessels operating in the catcher-processor sector. Vessels under 75' which catch and process at-sea as part of the shoreside sector are not covered here.

B-4.2 Co-op Formation and Operation Rules

No annual registrations or declarations are required. As under status quo, co-op(s) will be formed among holders of permits for catcher-processors. Participation in the co-op will be at the discretion of those permit holders. If eligible participants choose to form a co-op, the catcher-processor sector will be managed as a private voluntary cooperative and governed by a private contract that specifies, among other things, allocation of whiting among CP permits, catch/bycatch management, and enforcement and compliance provisions. Under the co-op program, if more than one co-op is formed, a race for fish could ensue absent an inter co-op agreement. NMFS will not establish an allocation of catch or catch history among permits unless the co-op fails to form. If the co-op system fails it will be replaced by an IFQ program and the initial issuance of IFQ will be divided equally among all CP endorsed permits.

Annual Reporting Requirements. The CP cooperative will submit an annual report to the Pacific Fishery Management Council at their November meeting. The report will contain information about the current year's CP fishery, including the CP sector's annual allocation of Pacific whiting; the CP cooperative's actual retained and discarded catch of Pacific whiting, salmon, rockfish, groundfish, and other species on a vessel-by-vessel basis; a description of the method used by the CP cooperative to monitor performance of cooperative vessels that participated in the CP sector of the fishery; and a description of any actions taken by the CP cooperative in response to any vessels that exceed their allowed catch and bycatch. The report will also identify plans for the next year's CP fishery, including the companies participating in the cooperative, the harvest agreement, and catch monitoring and reporting requirements.

B-4.3 NMFS Role

B-4.3.1 Permit and Endorsement Issuance

NMFS will issue all necessary endorsements under the rules specified under this program. Appeals processes will be provided as appropriate and necessary.

B-4.3.2 Annual Allocation

Harvest amounts for the co-op will be specified in regulation. If the co-op breaks up, IFQ will issued and divided equally among the 10 permits.

The catcher-processor sector allocation may be divided among eligible catcher-processor vessels (i.e., those catcher-processor vessels for which a CP permit is held) according to an agreed catcher-processor cooperative harvest schedule as specified by private contract.

B-4.3.3 Fishery and Co-op Monitoring

1. NMFS will track all permit transfers. Permit transfers will not be valid until registered and acknowledged by NMFS.
2. NMFS will monitor catch and close the catcher-processor sector fishery as necessary to ensure catch limits are not exceeded.

Agenda Item E.6.b
NMFS Report
September 2009

AMENDMENT 20 & 21 (Trawl Rationalization and ISA) –DEEMING round 1

NMFS is developing regulations to implement the groundfish trawl rationalization program (program) based on our ongoing review of recommendations from the Council. The Council has developed the trawl rationalization program through two amendments to the Pacific Coast Groundfish Fishery Management Plan (FMP): (1) Amendment 20, the trawl rationalization program, and (2) Amendment 21, intersector allocation. Amendment 20 would create the structure and management details of the trawl rationalization program while Amendment 21 would allocate the groundfish stocks between trawl and non-trawl fisheries. The Council took initial action on Amendment 20 at its November 2008 meeting, with subsequent actions at its March and April 2009 meetings, culminating in a final recommendation to NMFS at the June 2009 meeting. The Council took final action on Amendment 21 at its April 2009 meeting but revised its recommendation on Pacific halibut at its June 2009 meeting. These amendments have not yet been formally transmitted from the Council to NMFS, but are scheduled for transmission in the spring of 2010.

To prepare for transmission of these amendments, NMFS is working on the following:

- A schedule of actions
- A rulemaking to collection ownership information for the program
- An outline of the regulatory structure for the program
- The initial issuance and appeals process

For the November Council meeting, NMFS plans to continue working on elements of the trawl rationalization program and bring further detail concerning the regulations forward for deeming by the Council. NMFS also plans to bring forward any issues which may need further clarification.

Draft Schedule

NMFS announced a draft schedule for implementation at the June PFMC meeting under Agenda item E.10. This schedule reiterates that announcement.

- NMFS intends to combine review and, pending approval, implementation of AM 20 & 21. NMFS and Council staff will work together to set a transmittal day for both FMP Amendments, likely spring 2010.

- Subject to review and approval, NMFS intends to implement the trawl rationalization program through three or more rulemakings beginning in the fall of 2009.
    1. Ownership data rule
    2. AM 20 & 21 FMP and “grand framework” rule
    3. Follow-up rule

- The ownership data rule is explained below and will allow NMFS to begin collecting ownership information for the trawl rationalization program. It will also announce the databases NMFS intends to use to determine initial QS (PacFIN & NorPac).
  - proposed rule to be published in September 2009
  - ownership information collected from industry beginning in early 2010

- If the AM 20 & 21 DEISs are published in November 2009, review of AM 20 & 21 and rulemaking for the main program components is scheduled for the summer/fall of 2010. The initial issuance and appeals process is scheduled to begin in late 2010.

- NMFS expects that there will be a need to do beta testing of tracking and monitoring components over the summer of 2010.

- NMFS believes there will be a need for a follow-up rule that will implement further program details possibly including additional tracking and monitoring requirements and cost recovery.

Ownership Data Proposed Rule

In September 2009, NMFS plans to publish a proposed rule to collect ownership interest information from potential participants in the trawl rationalization program (a draft of the proposed rule is provided under this agenda item). In order to prepare for implementation of the accumulation limits, this rule would allow NMFS to begin collecting ownership information from potential participants in the program, including the at-sea fleet (whiting motherships, whiting mothership catcher vessels, and whiting catcher/processors), the shore-based fleet (whiting and non-whiting permit owners and vessel owners) and the whiting shore-based processors. Similar to current requirements to collect ownership information from the limited entry fixed gear sablefish fleet, the primary purpose of collecting ownership interest information from the trawl fleet is to allow NMFS to monitor control of the groundfish resource in the trawl fishery to ensure participants remain within the accumulation limits recommended by the Council in Amendment 20 to the FMP. Initially, NMFS would use the ownership information collected as the first step in the application process to determine which potential quota share holders might be over their accumulation limits as an individual or as a member of a business entity. By collecting ownership information from potential participants in advance of the FMP amendment approval process, NMFS would expedite the quota share initial issuance process which is expected to take place in the fall of 2010. After ownership interest forms from this rulemaking are completed early in 2010, NMFS could provide partially pre-completed ownership interest forms with the initial issuance package in the fall of 2010, reducing the burden on potential participants and shortening the application process. If the ownership information requested as part of this rulemaking is not completed, it may delay implementation of the trawl rationalization program or issuance of an eligible participant’s quota share.

NMFS would collect ownership information through a Trawl Identification of Ownership Interest Form (a draft form is provided under this agenda item) mailed out to potential participants in the program. This rule would establish a onetime mailing requesting this information. Failure to return the completed form and any required supplemental documentation may result in the entity not receiving an initial allocation of QS, should the future trawl rationalization program be implemented. In the future and if the trawl program is implemented under Amendment 20, the form would likely be required during the permit or QS renewal process and during any permit or QS transfers.

This action would also announce that NMFS intends to use landings data from the Pacific States Marine Fisheries Commission's PacFIN and the NMFS, Northwest Fisheries Science Center's Pacific whiting observer (NORPAC) databases to determine initial allocations of quota share for the program. This action urges potential quota share owners to go directly to the source where fisheries data is entered in to these databases to get it corrected before NMFS extracts the data for initial issuance of quota share.

The public comment period is expected to be sometime between September and October 2009.

Draft Regulatory Structure

In reviewing the existing groundfish regulatory structure to plan for the trawl rationalization program, NMFS sees the opportunity to reorganize the entire groundfish regulations to make them easier to follow on a program by program basis. The trawl rationalization program will add regulatory complexity to the existing groundfish regulations. In an effort to make Federal regulations easier to follow and to prevent program-specific regulations, like the trawl rationalization program, from becoming too compartmentalized in the existing regulations, NMFS is reorganizing the groundfish regulations in to multiple subparts within the Code of Federal Regulation (CFR). Current groundfish regulations are found at 50 CFR part 660, subpart G. The reorganized groundfish regulations would be found at 50 CFR part 660, subparts C through G. An outline of the current and draft regulatory structure follows.

CURRENT

50 CFR CHAPTER VI
PART 660–FISHERIES OFF WEST COAST AND WESTERN PACIFIC STATES

Subpart A–General
660.1 Purpose and scope.
660.2 Relation to other laws.
660.3 Reporting and recordkeeping.

Subpart B-F [Reserved]

Subpart G–West Coast Groundfish Fisheries
660.301 Purpose and scope.
660.302 Definitions.
660.303 Reporting and recordkeeping.
660.305 Vessel identification.
660.306 Prohibitions.

monitoring
660.312 Vessel Monitoring Program (VMS) requirements.
660.314 Groundfish observer program.

allocations
660.320 Allocations.
660.321 Black rockfish harvest guideline.
660.322 Sablefish allocations.
660.323 Pacific whiting allocations, allocation attainment, and inseason allocation reapportionment.
660.324 Pacific Coast treaty Indian fisheries.

LE program
660.331 Limited entry and open access fisheries--general.
660.333 Limited entry fishery–eligibility and registration.
660.334 Limited entry permits–endorsements.
660.335 Limited entry permits–renewal, combination, stacking, change of permit ownership or permit holdership, and transfer.
660.336 Pacific whiting vessel licenses.
660.337 [Reserved]
660.338 Limited entry permits–small fleet.
660.339 Limited entry permit and Pacific whiting vessel license fees.
660.340 Limited entry permit appeals.
660.341 Limited entry permit sanctions.

660.350 Compensation with fish for collecting resource information–exempted fishing permits.
660.365 Overfished species rebuilding plans.

special programs
660.370 Specifications and management measures.
660.371 Black rockfish fishery management.
660.372 Fixed gear sablefish fishery management.
660.373 Pacific whiting (whiting) fishery management.

spex & mgmt measures
660.380 Groundfish harvest specifications.
660.381 Limited entry trawl fishery management measures.
660.382 Limited entry fixed gear fishery management measures.
660.383 Open access fishery management measures.
660.384 Recreational fishery management measures.
660.385 Washington coastal tribal fisheries management measures.

closed areas
660.390 Groundfish conservation areas.
660.391 Latitude/longitude coordinates defining the 27 fm (49 m) through 40 fm (73 m) depth contours.
660.392 Latitude/longitude coordinates defining the 50 fm (91 m) through 75 fm (137 m) depth contours.
660.393 Latitude/longitude coordinates defining the 100 fm (183 m) through 150 fm (274 m) depth contours.
660.394 Latitude/longitude coordinates defining the 180 fm (329 m) through 250 fm (457 m) depth contours.
660.395 Essential Fish Habitat (EFH).
660.396 EFH Conservation Areas.
660.397 EFH Conservation Areas off the Coast of Washington.
660.398 EFH Conservation Areas off the Coast of Oregon.
660.399 EFH Conservation Areas off the Coast of California.

TABLES: Tables (1a), OY tables (1b), Allocation tables (1c), Tables 2a, 2b, and 2c, Tables 3-5 North and South (Trip Limit Tables), and Figure 1, and Table 2 to Part 660 (Vessel Capacity Ratings)

REORGANIZED

Subpart A–General (stays same)

Subpart B [Reserved]

Subpart C – West Coast Groundfish Fisheries – General (660.10-660.99)
Purpose and Scope
Definitions
Prohibitions
Recordkeeping and reporting
Vessel Monitoring System (VMS) Program requirements.
Groundfish observer program.
Vessel and Gear Identification
Permits and Fees – limited entry permits
Compensation with fish for collecting resource information - EFPs
Overfished species rebuilding plans
Pacific Coast Treaty Indian fisheries
Allocations (include sablefish, whiting, black rockfish)
Specifications and management measures.
Groundfish harvest specifications.
Closed Area - GCA's and EFH
* ABC/OY Tables - Tables 1a-c & 2a-c
* Vessel Capacity Rating Table - Table 2 to Part 660

Subpart D – West Coast Groundfish – Trawl Fisheries (660.100-660.199)
IFQ Program – Shore-based Trawl Fishery
- IFQ Species and Allocations
- QS permits and accounts
- Vessel QP accounts
- Processor Permit
- Observers/Compliance monitors/cameras (?)
- Retention requirements (whiting and non-whiting vessels)
- Gear Switching (?)
- Adaptive Management Program

Mothership (MS) Co-op Program – Whiting At-sea Trawl Fishery
- MS Co-op Program Species and Allocations
- Co-op Permit (Agreement)
- Mothership Permit
- Catcher Vessel Mothership (CV/MS) endorsement
- Inter-Co-op Agreements
- Co-op accounts
- Non-Co-op Fishery
- Observers/cameras (?)
- Retention requirements

Catcher-Processor (C/P) Co-op Program - Whiting At-sea Trawl Fishery
- C/P Co-op Program Species and Allocations
- Co-op Permit (Agreement)
- C/P endorsement
- Observers
- Retention requirements

Crossover provisions – Areas, Gears (?), Trawl Fisheries
Limited entry trawl fishery management measures.
* Figure 1 & Trip Limit Tables - Table 3 North and South

Subpart E – West Coast Groundfish - Fixed Gear Fisheries (660.200-660.299)
Fixed gear sablefish fishery management.
Limited entry fixed gear fishery management measures.
* Trip Limit Tables - Table 4 North and South

Subpart F – West Coast Groundfish - Open Access Fisheries (660.300-.349)
Open access fishery management measures.
* Trip Limit Tables - Table 5 North and South

Subpart G – West Coast Groundfish – Recreational Fisheries (660.350-.399)

Initial Issuance and Appeals

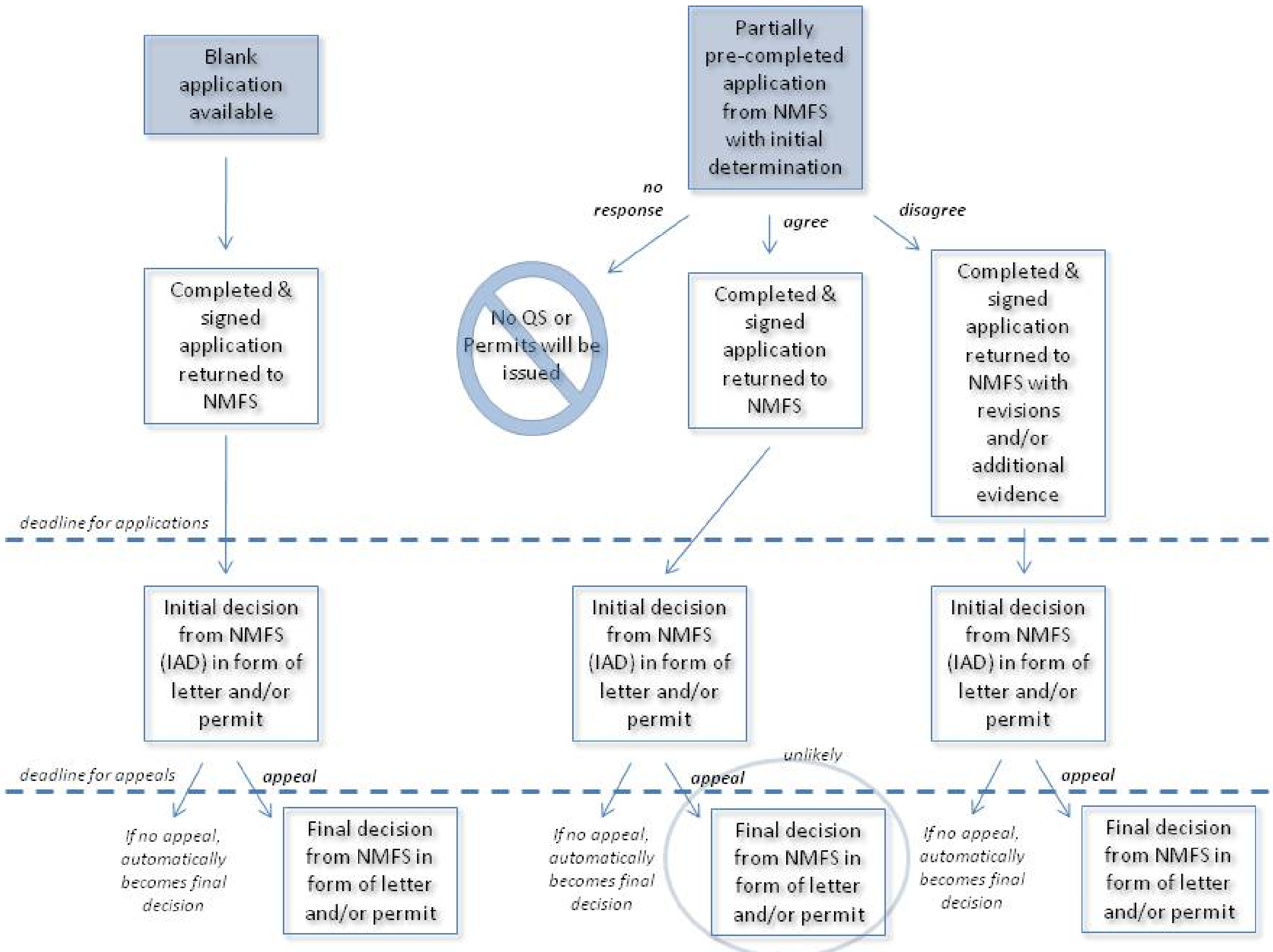
NMFS is still developing an initial issuance and appeals process. The draft implementation schedule provides NMFS only four months to go through the initial issuance and appeals process. Therefore, NMFS is making an effort to streamline that process via the ownership data rulemaking and providing partially pre-completed applications. Currently, NMFS intends to mail out partially pre-completed applications to participants NMFS determines are eligible to qualify for the following: IFQ QS, co-op mothership permits, co-op mothership/catcher vessel endorsements with catch history assignments, co-op catcher/processor endorsements. (Additional permits may be required for the IFQ and co-op fisheries, but would be handled on an ongoing basis, through a separate process (e.g., IFQ processor/first receiver permits, co-op permits)). NMFS would also provide blank applications on our website and by request for people that did not receive a pre-completed application and who can provide credible evidence that they should qualify. For the IFQ fishery, pre-completed applications would include NMFS determination of QS for each species and landings or data used to figure QS.

Potential QS, permit, or endorsement owners would return signed applications either agreeing with NMFS' initial determinations and requesting the QS, permit, or endorsement or disputing NMFS determination and providing additional credible evidence. This is a "pre-appeal" opportunity intended to speed up the initial issuance process, while still allowing fishermen an opportunity to correct their QS, mothership/catcher vessel catch history assignment, or initial determination. ALL applications would have a deadline by which they must be completed and returned to NMFS. QS, permits, or endorsements would not be issued to late applications.

NMFS would then make an initial administrative decision (IAD) that would be sent to the applicant in writing. If the applicant qualifies, the initial administrative decision would include QS, a permit, or an endorsement on a limited entry groundfish trawl permit, as appropriate. There would be one chance to appeal the initial administrative decision within a given deadline. Appeals would be reviewed by an appeals officer who makes a recommendation to the NMFS, Northwest Region, Regional Administrator. The final decision would be in writing from the Regional Administrator. If the applicant then qualifies, the final decision would include QS, a permit, or an endorsement on a limited entry groundfish trawl permit, as appropriate. Or, for QS or mothership/catch vessel catch history assignments, if the amount is different than the initial administrative decision, the final decision would include revised QS or catch history assignments, respectively.

The following is a diagram of the preliminary draft initial issuance and appeals process:

Preliminary draft initial issuance and appeals process -



BILLING CODE 3510-22-S

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 660

[Docket No.   ]

RIN 0648-AX98-X

Fisheries off West Coast States; Pacific Coast Groundfish Fishery; Data Collection for the Trawl Rationalization Program

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; request for comments.

SUMMARY: NMFS proposes to collect data to support implementation of a future trawl rationalization program under the Pacific Coast Groundfish Fishery Management Plan (FMP). NMFS proposes to collect ownership information from all potential participants in the trawl rationalization program. In addition, NMFS is notifying potential participants that the agency intends to use the Pacific States Marine Fisheries Commission's Pacific Fisheries Information Network (PacFIN) database and the NMFS, Northwest Fisheries Science Center's Pacific whiting observer data from NORPAC (a database of North Pacific fisheries and Pacific whiting information) to determine initial allocation of quota share (QS) for the trawl rationalization program, if approved and implemented.

DATES: Comments on this proposed rule must be received no later than 5 p.m., local time on [Insert date 30 days after date of publication in the FEDERAL REGISTER].

ADDRESSES: You may submit comments, identified by RIN 0648-AX98 by any one of the following methods:

Electronic Submissions: Submit all electronic public comments via the Federal eRulemaking Portal http://www.regulations.gov.

Fax: 206-526-6736, Attn: Jamie Goen.

Mail: Barry Thom, Acting Administrator, Northwest Region, NMFS, 7600 Sand Point Way NE, Seattle, WA 98115-0070, Attn: Jamie Goen.

Instructions: All comments received are a part of the public record and will generally be posted to http://www.regulations.gov without change. All Personal Identifying Information (for example, name, address, etc.) voluntarily submitted by the commenter may be publicly accessible. Do not submit Confidential Business Information or otherwise sensitive or protected information.

NMFS will accept anonymous comments (enter N/A in the required fields if you wish to remain anonymous). Attachments to electronic comments will be accepted in Microsoft Word, Excel, WordPerfect, or Adobe PDF file formats only. Written comments regarding the burden-hour estimates or other aspects of the collection-of-information requirements contained in this proposed rule may be submitted to NMFS, Northwest Region and by e-mail to David_Rostker@omb.eop.gov or fax to (202) 395-7285.

FOR FURTHER INFORMATION CONTACT: Jamie Goen, phone: 206-526-4656, fax: 206-526-6736, and e-mail jamie.goen@noaa.gov.

SUPPLEMENTARY INFORMATION:

Electronic Access

This proposed rule is accessible via the Internet at the Office of the Federal Register's Website at http://www.gpoaccess.gov/fr/index.html. Background information and documents are available at the Pacific Fishery Management Council's website at http://www.pcouncil.org/.

Background

Since 2003, the Pacific Fishery Management Council (Council) has been developing a trawl rationalization program for the Pacific Coast groundfish fishery, which would affect the limited entry trawl fishery. The trawl rationalization program is intended to increase net economic benefits, create individual economic stability, provide full utilization of the trawl sector allocation, consider environmental impacts, and achieve individual accountability of catch and bycatch.

The Council has developed the trawl rationalization program through two amendments to the Groundfish FMP: (1) Amendment 20, the trawl rationalization program, and (2) Amendment 21, intersector allocation. Amendment 20 would create the structure and management details of the trawl rationalization program while Amendment 21 would allocate the groundfish stocks between trawl and non-trawl fisheries. The Council took final action on Amendment 20 at their November 2008 meeting, with trailing actions at its March 2009, April 2009, and June 2009 meetings. The Council took final action on Amendment 21 at its April 2009 meeting. When the Council formally transmits those amendments to NMFS, the agency will publish a notice of availability (NOA) of an FMP amendment and a proposed rule in the Federal Register to announce a public comment period. Following the public comment period on the NOA and proposed rule, NMFS will announce its decision on whether or not to approve the amendments in a final rule published in the Federal Register. The FMP approval process and implementation, if appropriate, are expected to occur in 2010.

The trawl rationalization program would be a limited access privilege program (LAPP) under the Magnuson-Stevens Fishery Conservation and Management Act, as reauthorized in 2007 (MSA). A LAPP is considered a grant of permission to the holder of the limited access privilege or quota share to participate in the program and may be revoked, limited, or modified at any time. In other words, it is a conditional privilege, conveyed through quota shares or catch shares, to harvest a specified amount of fish. The MSA requires the Council or the Secretary of Commerce to ensure that limited access privilege holders do not acquire an excessive share of the total limited access privileges in the program and to establish a maximum share, expressed as a percentage that each limited access privilege holder may hold, acquire, or use. For the trawl rationalization program, the Council has adopted limits on the amount of pounds a vessel can hold, acquire, or use (i.e., vessel limits) and limits on the amount of quota share that can be held, acquired, or used (i.e., control limits).

Trawl Rationalization Program Structure

The trawl rationalization program would consist of: (1) an individual fishing quota (IFQ) program for the shore-based trawl fleet and (2) cooperative (co-op) programs for the at-sea trawl fleet. The shore-based trawl fleet would include IFQ participants who land groundfish to shore-based processors or first receivers. The at-sea trawl fleet would include fishery participants harvesting whiting with midwater trawl gear (i.e., whiting catcher/processor vessels, whiting motherships, and whiting catcher vessels associated with motherships). The co-op programs for the at-sea trawl fleet are further divided as follows: (1) the whiting catcher/processor co-op; and

(2) the whiting mothership co-ops. The mothership co-ops may consist of a single or multiple co-ops where vessels pool their harvest together or may consist of vessels not associated with a particular mothership (i.e., “non-co-op” segment of the mothership fishery).

The IFQ program for the shore-based fleet would require an initial allocation of harvest quota share to individual participants based on historic participation in the fishery, specifically to limited entry trawl permit owners and shore-based whiting processors who meet the eligibility requirements. In order to comply with the MSA, NMFS would be required to determine and track ownership interest in quota shares to determine if individuals are within set limits, both at the initial allocation stage and during the operation of the program. In Amendment 20, the Council has adopted limits (by species group and area) on the amount of quota share an individual can control (i.e. control limits).

The Council has adopted different whiting catcher/processor co-op and whiting mothership co-ops based on how the co-ops have operated in the past. The structure of the co-ops will be described in more detail in the proposed rule to implement Amendment 20, expected in 2010. The catcher/processor co-op would not require an initial allocation to individual vessels, provided a co-op is established, while the mothership co-op would. Quota shares for the at-sea fleet (called catch history assignments in Council documents) would initially be allocated to the individual whiting catcher vessels associated with the mothership fishery and would be non-transferable amounts associated with the vessel. They would show how much an individual vessel contributes to the total amount of fish their mothership co-op can harvest. However, the individual vessel in the co-op could harvest more than their at-sea quota, within the restrictions on individual vessel harvest and mothership co-op limits. Similar to the shore-based IFQ program, NMFS would be required to track ownership interest in quota shares to determine if individuals are within set limits. In addition, ownership interest in the co-op programs (catcher/processor and mothership) and IFQ program would be tracked to the individual level to monitor crossover of participants and ownership interest among the programs.

Collection of Ownership Information

Pursuant to section 402(a)(2) of the MSA, if the Secretary of Commerce determines that additional information is necessary for developing or implementing an FMP, the Secretary may, by regulation, implement an information collection program requiring submission of such additional information for the fishery. In this proposed rule, ownership information would be collected from the potential participants in the trawl rationalization program, including the at-sea fleet (whiting motherships, whiting mothership catcher vessels, and whiting catcher/processors), the shore-based fleet (whiting and non-whiting permit owners and holders) and the whiting shore-based processors. Ownership information would be collected to support and facilitate timely implementation of the potential future trawl rationalization program under the Groundfish FMP. Similar to current requirements to collect ownership information from the limited entry fixed gear sablefish fleet, the primary purpose of collecting ownership interest information from the trawl fleet is to allow NMFS to monitor control of the groundfish resource in the trawl fishery to ensure participants remain within the accumulation limits, or control limits on quota share, recommended by the Council in Amendment 20 to the FMP. Initially, NMFS would use the ownership information collected under this rule as the first step in the application process to determine which potential quota share holders might be over their accumulation limits as an individual or as a member of a business entity. By collecting ownership information from potential participants in advance of the FMP amendment approval process, NMFS would expedite the quota share initial issuance process which is expected to take place in the fall of 2010. After ownership interest forms from this rulemaking are completed early in 2010, NMFS intends to provide pre-filled out ownership interest forms with the initial issuance application package in the fall of 2010, reducing the burden on potential participants and shortening the application process. If the collection of the ownership information requested as part of this rulemaking is not completed at the time NMFS provides these forms, it may delay implementation of the trawl rationalization program or issuance of an eligible participant's quota share due to the additional time needed to gather the ownership information and to determine if an eligible participant is within the accumulation limits.

In addition, the ownership information collected would create a baseline of ownership information to evaluate the trawl rationalization program during periodic reviews of the program, as required by the MSA. It would allow NMFS to better understand the relationship between processors, permit owners, and the entities owning the vessel registered to the permit (i.e., permit holders). In other words, it would allow NMFS to better understand who will control QS and which individuals will potentially use QP. Further, it would allow NMFS to better understand potential vessel accounts for QP and to better understand the ownership of vessels that crossover between different sectors in the trawl fishery. For example, it would allow NMFS to better understand the ownership of vessels that participate in both the whiting shore-based and the mothership fisheries.

NMFS would send a Trawl Identification of Ownership Interest Form to potential participants in the trawl rationalization program requiring the following information to be filled out: type of entity; qualifying permit number; name of company or name of individuals owning the limited entry permit, vessel or processing plant; tax identification number (TIN) for each entity; date of birth (DOB) for each individual; state registered in for each business entity; business mailing address; physical address for processing plants, business phone number, fax number and email; authorized representative's name; name of each individual having ownership interest in the limited entry permit, vessel or processing plant; the individual's business addresses; percentage of ownership by each entity (if there are multiple entities given as an owner of the permit, vessel, or processing plant) and each individual shareholder in each entity; printed name of authorized representative, signature, and date. The percentage of ownership of all shareholders must equal 100 percent. The form would also allow owners to certify whether or not they are a small business according to Small Business Administration (SBA) and the Regulatory Flexibility Act standards.

For permits, the legal owner of the permit or authorized representative would be required to complete the form and provide all necessary information on the individual or entity owning each groundfish limited entry trawl permit. For vessels, the vessel owner would be required to complete the form and provide all necessary information on the individual or entity owning each vessel that is registered to a groundfish limited entry trawl permit (i.e., permit holder). For shore-based whiting processors or first receivers, the legal owner or authorized representative would be required to complete the form and provide all necessary information on the individual or entity owning each shore-based whiting processing or first receiver company. The individual signing the form would certify under penalty of perjury that the information provided is true and correct and the form would be required to be notarized by a notary public.

The form would be required even if the owner of the permit or potential participant in the trawl rationalization program is an individual person. This form does NOT prequalify these persons for quota share nor guarantee that they will qualify for quota share under the future trawl rationalization program.

In addition to filling out the mandatory ownership interest form, potential trawl rationalization program participants may be required to submit additional documentation. If the ownership interest in the permit, vessel, or potential quota share involves a business entity, then additional documentation will be required. If there is an authorized representative for a business entity, then a corporate resolution would be required authorizing the person signing to do so on behalf of the entity. Business entities established under the laws of the United States or any State would be required to provide proof that they had done so and to verify that they are an active corporation. If an entity was not established under the laws of the United States or any other State, they would not be required to do so by this proposed rule. However, this will be a requirement to qualify for an initial allocation of quota share, pursuant to section 304(c)(1)(D) of the MSA. Providing the information at this stage will expedite the initial issuance process.

Additional documentation that NMFS may request after review of the completed Trawl Identification of Ownership Interest Form include articles of incorporation, a contract, or any other credible documentation that substantiates those with ownership interest in the entity and the their percent ownership. NMFS may require a certified copy of the current vessel document (USCG or state) as evidence of vessel ownership. NMFS may also request or consider any other relevant, credible evidence.

NMFS would send out the Trawl Identification of Ownership Interest Form with instructions to the current address in NMFS records for potential participants in the trawl rationalization program. Completion of this form would be required only once in preparation for implementation of the trawl rationalization program. This form would be sent to the at-sea fleet (whiting motherships, whiting mothership catcher vessels, and whiting catcher/processors), the shore-based fleet (whiting and non-whiting permit owners and holders) and the whiting shore-based processors. Potential participants would have at least 60 days from the effective date of the Federal Register final rule for this action to return the completed form. The completed form must be returned to NMFS no later than May 1, 2010. If the completed form is not returned by the deadline date of May 1, 2010, NMFS will send a second written notice to delinquent applicants requesting the completed form by a revised deadline date of June 1, 2010. In the future and if the trawl program is implemented under Amendment 20, the ownership interest form would likely be required during the permit or QS renewal process and during any permit or QS transfers.

Databases to be Used for Initial Allocation of Quota Share

Potential participants of the trawl rationalization program should be aware that the agency intends to use landings data from the Pacific States Marine Fisheries Commission's PacFIN database and the NMFS, Northwest Fisheries Science Center's Pacific whiting observer data from NORPAC to determine initial allocations of QS for the trawl rationalization program. Landings data from state fish tickets, as provided by the states to the PacFIN database, would be used to determine initial allocation of IFQ QS for the shore-based whiting and nonwhiting harvesters and for the shore-based whiting processors. Landings data from the NORPAC database would be used to determine initial allocation of at-sea QS for the whiting mothership catcher vessels.

NMFS intends to "freeze" the databases for the purposes of initial allocation on the date the proposed rule proposing to implement Amendment 20 to the FMP is published in the Federal Register. This should allow time for NMFS to compile the dataset and cross check the data for any errors. "Freezing" the databases means that NMFS will extract a snapshot of the databases as of the proposed rule publication date and will use those for initial allocation of QS. "Freezing" the databases is necessary to hold them constant for use during qualification and initial issuance of the trawl rationalization program and to form an administrative record of the database at a given point in time. Following the "freezing" of the databases, any corrections to the "frozen" database would be made with NMFS through the processes set forth in future trawl rationalization rules. The PacFIN and NORPAC databases will continue to exist and be updated through their normal processes, but such updates may not be used for initial allocations of quota share.

If potential participants in the trawl rationalization program have concerns over the accuracy of their data that has been entered in the PacFIN database, they should contact the state in which they landed those fish to get it corrected. Any revisions to an entity's fish tickets would have to be approved by the state in order to be accepted. Contacts at the states are as follows: (1) Washington – Carol Turcotte (360-902-2253, Carole.Turcotte@dfw.wa.gov); (2) Oregon – Michelle Grooms (503-947-6247, Michelle.L.Grooms@state.or.us); and (3) California – Gerry Kobylinski (916-323-1456, Gkobylin@dfg.ca.gov). For concerns over the accuracy of NORPAC data, contact Janell Majewski (206-860-3293, janell.majewski@noaa.gov). NMFS urges potential QS owners to go directly to the source where fisheries data is entered in the database to get it corrected before NMFS extracts the data for initial issuance of QS.

Classification

Pursuant to section 402(a)(2) of the Magnuson-Stevens Act, the NMFS Assistant Administrator, acting on behalf of the Secretary of Commerce, has determined that information collected under this proposed rule is necessary for developing and implementing the trawl rationalization program. The NMFS Assistant Administrator has also determined that this proposed rule is consistent with other applicable law, subject to further consideration after public comment.

This proposed rule has been determined to be not significant for purposes of Executive Order 12866.

An initial regulatory flexibility analysis (IRFA) was prepared, as required by section 603 of the RFA (RFA). The IRFA describes the economic impact this proposed rule, if adopted, would have on small entities. A description of the action, why it is being considered, and the legal basis for this action are contained at the beginning of this section in the preamble and in the SUMMARY section of the preamble. A copy of this analysis is available from the NMFS (see ADDRESSES). A summary of the analysis follows:

The proposed rule would allow NMFS to collect data to support implementation of a future trawl rationalization program (program), Amendment 20, to the Groundfish FMP. A separate RIR/IRFA will be prepared for the full trawl rationalization program as part of the rulemaking for Amendment 20. This proposed rule would also announce that NMFS intends to use landings data from the Pacific States Marine Fisheries Commission's PacFIN and the NMFS, Northwest Fisheries Science Center's Pacific whiting observer (NORPAC) databases to determine initial allocations of quota share for the program. Section 402(a)(2) of the MSA gives the legal authority for the action. If the Secretary determines that additional information is necessary for developing or implementing an FMP, the Secretary may, by regulation, implement an information collection requiring submission of such additional information for the fishery.

The Council has recommended accumulation limits to comply with the MSA requirement to ensure that participants do not acquire an excessive share of the total limited access privileges in the program. Initially, NMFS would use the ownership information collected as the first step in the application process to determine which potential quota share holders might be over their accumulation limits as an individual or as a member of a business entity. By collecting ownership information from potential participants in advance of the FMP amendment approval process, NMFS would expedite the initial issuance of quota share which is expected to take place in the fall of 2010. NMFS could use the completed forms to troubleshoot any unforeseen data collection issues and to provide pre-filled ownership interest forms with the initial issuance package in the fall of 2010. Pre-filled forms would reduce the burden on potential participants and shorten the initial issuance and appeals process.

The IRFA considers three alternatives: (1) no action, (2) a blank form to collect ownership interest information, and (3) a partially pre-filled form to collect ownership information. The no action alternative would delay collecting any ownership interest information until the initial issuance and appeals process expected to take place in the fall of 2010. Under the second alternative, NMFS would mail a blank Trawl Identification of Ownership Interest Form to potential participants in the trawl rationalization program. Under the third and selected alternative, NMFS would mail out a partially pre-filled Trawl Identification of Ownership Interest Form to potential participants in the trawl rationalization program. NMFS would use its Permit's Office database to pre-fill the permit and/or vessel owner's name of record and address. NMFS would also use this information to begin to fill out the names of participants with ownership interest.

Compared to the no action alternative, both alternatives would facilitate a more timely implementation of the trawl rationalization program. And the preferred alternative, partially pre-filled forms, would expedite the process even more and would be the most helpful to the person completing the form. This should aid the person completing the form with what information is needed and how NMFS database currently views the permit and/or vessel owner or owner of the whiting processor. While a timely implementation of the program benefits program participants, NMFS must also be aware that doing so is not too burdensome and costly to the potential program participants. This proposed rule would establish a onetime mailing requesting this information. Filling out a Trawl Ownership Interest Form is expected to take approximately 30 minutes per response. There is an incentive to respond as this is the initial step by any business to gain ownership rights in the fishery that can, at a future time, be harvested, sold, leased, or combined with other businesses in fishing operations. The financial benefits of participating in the trawl rationalization program should far outweigh the minimal cost of time and effort to fill out a form. (Very preliminary Pacific Council estimates indicate that for the harvesting vessels, after taking into account the costs of having observer coverage, over time the fishery may increase annual profits (revenue minus costs) to $10 to $20 million.)

This proposed rule would collect ownership information from approximately 250 potential participants who may receive initial allocation of quota share, including the at-sea fleet (whiting motherships, whiting mothership catcher vessels, and whiting catcher/processors), the shore-based fleet (whiting and non-whiting permit owners and holders) and the whiting shore-based processors. Using Small Business Administration standards, most of the estimated 250 entities are considered small businesses, except for some catcher vessels who also fish off Alaska, some shoreside processors and all catcher-processors and motherships (less than 30) that are affiliated with larger processing companies or large international seafood companies. One of the purposes of this data collection is to have these entities certify that they are "small" or "large" entities based on SBA size and affiliation criteria.

This information collection would be requested of all potential participants in the program, regardless of size, and would not have a disproportionate effect on small versus large entities. Nor would this information collection have any effect on profitability for small entities.

These changes will not duplicate, overlap or conflict with other laws or regulations. This proposed action is not expected to meet any of the RFA tests of having a "significant" economic impact on a "substantial number" of small entities. Nonetheless, NMFS has prepared an IRFA for this action. NMFS is requesting comments on this conclusion.

This proposed rule contains a collection-of-information requirement subject to review and approval by OMB under the Paperwork Reduction Act (PRA). This requirement has been submitted to OMB for approval. The public reporting burden for the Trawl Identification of Ownership Interest Form is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection information.

Public comment is sought regarding: whether this proposed collection of information is necessary for the proper performance of the functions of the agency, including whether the information shall have practical utility; the accuracy of the burden estimate; ways to enhance the quality, utility, and clarity of the information to be collected; and ways to minimize the burden of the collection of information, including through the use of automated collection techniques or other forms of information technology. Send comments on these or any other aspects of the collection of information to NMFS, Northwest Region (see ADDRESSES section), and by e-mail to David_Rostker@omb.eop.gov or fax to (202) 395-7285.

Notwithstanding any other provision of the law, no person is required to respond to, and no person shall be subject to penalty for failure to comply with, a collection of information subject to the requirements of the PRA, unless that collection of information displays a currently valid OMB control number.

List of Subjects in 50 CFR Part 660

Fishing, Fisheries, and Indian Fisheries.

Dated:

____

For the reasons set out in the preamble, 50 CFR Part 660 is proposed to be amended as follows:

PART 660–-FISHERIES OFF WEST COAST STATES

1. The authority citation for part 660 continues to read as follows:

Authority: 16 U.S.C. 1801 et seq.

2. A new § 660.337 is added to read as follows:

§ 660.337 Trawl rationalization program - data collection requirements.

(a) Ownership reporting requirements — (1) In 2010, NMFS will send a Trawl Identification of Ownership Interest Form to the current address on record requesting information from participants in the trawl fishery. Receipt of this form does NOT prequalify these persons for quota share nor guarantee that they will qualify for quota share under a future trawl rationalization program. The following participants in the trawl fishery must complete and return the form to NMFS:

(i) Owners of each limited entry permit endorsed for trawl gear;

(ii) Owners of each vessel registered to a limited entry permit endorsed for trawl gear (i.e., permit holder) if not identical to the permit owner covered by paragraph (a)(1)(i) of this section;

(iii) Owners of each vessel registered to a Pacific whiting vessel license that are not covered by paragraphs (a)(1)(i) and (ii) above; and

(iv) First receivers issued current Pacific whiting first receiver exempted fishing permits.

(2) Supporting documentation.

(i) Business entities completing the Trawl Identification of Ownership Interest Form are required to submit the following:

(A) A corporate resolution or any other credible documentation as proof of the authorized representative selected to act on behalf of the entity; and

(B) Proof that the business entity was established and is currently recognized as active under the laws of the United States or any State, if indeed they were.

(ii) After review of the Trawl Identification of Ownership Interest Form, NMFS may require the following additional documentation:

(A) Articles of incorporation, a notarized contract, or any other credible documentation that identifies each person who owns an interest in the entity and their percentage of ownership;

(B) A certified copy of the current vessel document (USCG or state) as evidence of vessel ownership; or

(C) Such other relevant, credible evidence as the applicant may submit, or the SFD or the Regional Administrator request or acquire.

(3) Deadline. Applicants will be provided at least 60 calendar days to submit completed forms. If the persons listed in paragraph (a)(1) fail to return the completed form by the deadline date of May 1, 2010, NMFS will send a second written notice to delinquent applicants requesting the completed form by a revised deadline date of June 1, 2010.

(b) [Reserved]

TRAWL IDENTIFICATION OF OWNERSHIP INTEREST

PACIFIC COAST GROUNDFISH

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service, Northwest Region
Fisheries Permits Office
7600 Sand Point Way NE, Bldg. 1
Seattle, WA 98115-0070

Phone (206) 526-4353 *Fax* (206) 526-4461 www.nwr.noaa.gov

INSTRUCTIONS

The purpose of this form is to provide NOAA Fisheries with baseline information on participants in the trawl groundfish fishery to prepare for implementation of a future trawl rationalization program. Receipt of this form does not guarantee that you will qualify for an initial allocation of quota share.

IMPORTANT! This form should be submitted by the following:

1) Current owners of each limited entry permit endorsed for trawl gear;
2) Current owners of each vessel registered to a limited entry permit endorsed for trawl gear if not identical to the permit owner in number 1 above;
3) Current owners of Pacific whiting vessel licenses (if the vessel is not also associated with a permit listed in numbers 1 or 2 above); and
4) First receivers issued Pacific whiting first receiver exempted fishing permits (EFPs) during the 2009 Pacific whiting shoreside fishery.
   Pacific whiting shoreside first receivers means persons who receive, purchase, or take custody, control, or possession of Pacific whiting onshore directly from a Pacific whiting shoreside vessel.

A form should be filled out for each permit, vessel, EFP, or whiting license for which you have an ownership interest. Failure to complete this form may result in you not receiving an initial allocation of quota share. Please type or print legibly in ink. Attach additional sheets as necessary. Sign in ink, have your signature notarized, keep a copy for your records and mail the completed form to the address listed above.

SECTION A - PERMIT/VESSEL/PROCESSOR OWNER IDENTIFICATION
This section is pre-filled using information from NOAA Fisheries records. Please verify that the information included is correct and make any necessary corrections by crossing out and filling in correct data on the form.

- **Field 1. Check all boxes that apply**: If the permit owner and vessel owner are identical, check both boxes. If there are any differences among the permit or vessel owners, then a new form needs to be completed for each. If you are a Pacific whiting shoreside first receiver, check that box.

- **Fields 2-4. Permit Number/Vessel Name/Vessel Registration Number**: As applicable, list the Federal groundfish limited entry permit number, the name of the vessel registered to the permit and the U.S. Coast Guard documentation or state vessel registration number.

- **Fields 5-6. Name/TIN/DOB**: Enter the name of the business entity or individual that owns the permit, vessel, or first receiver. If a business entity, list their tax identification number (TIN). If an individual, list their date of birth (DOB) using the format of mm/dd/yyyy.

- **Field 7. State Registered**: If a business entity is listed in Field 5, list the state where that entity was established and is currently recognized as active.

- **Field 8. Business Mailing Address**: Enter the business mailing address, including street or PO Box number, state, and zip code, where the item(s) should be sent. Also list a physical address for first receivers, if different from mailing address.

- **Fields 9-11. Business Phone, Fax and Email**: List the business telephone and fax numbers including the area codes; the fax number and email are optional.

SECTION B - IDENTIFICATION OF SHAREHOLDERS AND PARTNERS

This section is partially pre-filled using the business entity name(s) from Section A. The intent of Section B (Parts 1 and 2) is to identify all of the individuals who control the business and their percent of ownership interest.

Part 1 – first level

Part 1 will be pre-filled with the business entities or individuals listed in Section A. List the TIN for business entities and the DOB for individuals. List the mailing address (if different than Section A), and the % ownership interest in the permit, vessel, or processor as listed in Section A. If there is only one individual listed, then the percent ownership interest held should equal 100%. If one business entity is listed, then the percent ownership interest held should equal 100%. If an individual and a business entity are listed, then list the percent of the individual and the percent of the business entity. (see examples below)

Part 2 – second level

If the information from Part 1 hasn't gotten down to the individual level and still includes business entities, then Part 2 should be completed. Part 2 will be pre-filled with any business entity names from Part 1. List the individual names of all shareholders/partners of the business entity. The DOB is required for each individual as an additional means of identification. List each individual's business mailing address and the percent ownership interest they hold in the business entity. The individual(s) listed under each business should equal 100%. Information should be provided down to the individual level. If necessary, attach an additional sheet of paper. (see examples below).

<u>Business entities established under the laws of the United States or any State must submit proof that they have done so and to verify that they are an active corporation.</u> NOAA Fisheries may request further documentation as proof of ownership, including percentage of ownership. Note the Privacy Act Statement at the end of the form.

Example A: jointly named owners on permit , two individuals

Part 1

NAME	TIN/DOB	BUSINESS MAILING ADDRESS	% HELD
Ahab, Captain R	05/15/1959	1234 Petrale St, Astoria, OR 54321	75
Starbuck, Jim T	10/23/1963	PO Box 555, Newport, OR 54123	25
		TOTAL OWNERSHIP =	**100%**

Part 2

NAME	DOB	BUSINESS MAILING ADDRESS	% HELD
business name from Part 1			
List individual names			
		TOTAL OWNERSHIP =	**100%**

Not Required

Example B: jointly named owners on permit , an individual and a business

Part 1

NAME	TIN/DOB	BUSINESS MAILING ADDRESS	% HELD
Dragger, Joe A	05/15/1959	3 Dover Lane Astoria, OR 54321	50%
Trawlers, Inc.	91-1234567	PO Box 70, Newport, OR 54123	50%
		TOTAL OWNERSHIP =	**100%**

Part 2

	NAME	DOB	BUSINESS MAILING ADDRESS	% HELD
business name from Part 1	Trawlers, Inc.			
List individual names	Ahab, Captain R	05/15/1959	1234 Petrale St, Astoria, OR 54321	55%
	Starbuck, Jim T	10/23/1963	PO Box 555, Newport, OR 54123	30%
	Ishmael, Mark S	03/07/1965	8 White Whale Dr. Newport, OR 54123	10%
	Queequeg, Warren G	07/23/1968	13 Wildside Blvd. Astoria, OR 54321	5%
			TOTAL OWNERSHIP of Business 1 =	**100%**

Example C: jointly named owners on permit , two businesses

Part 1

NAME	TIN/DOB	BUSINESS MAILING ADDRESS	% HELD
Trawlers, Inc.	91-1234567	PO Box 70, Newport, OR 54123	30%
Big Boat, LLC	71-7654321	4 Ever Whiting Astoria, OR 54321	70%
		TOTAL OWNERSHIP =	**100%**

Part 2

	NAME	DOB	BUSINESS MAILING ADDRESS	% HELD
business name from Part 1	Trawlers, Inc.			
List individual names	Ahab, Captain R	05/15/1959	1234 Petrale St, Astoria, OR 54321	55%
	Starbuck, Jim T	10/23/1963	PO Box 555, Newport, OR 54123	30%
	Ishmael, Mark S	03/07/1965	8 White Whale Dr. Newport, OR 54123	10%
	Queequeg, Warren G	07/23/1968	13 Wildside Blvd. Astoria, OR 54321	5%
			TOTAL OWNERSHIP of Business 1 =	**100%**
business name from Part 1	Big Boat, LLC			
List individual names	Hake, Fred C	06/03/1950	4 Ever Whiting Astoria, OR 54321	$33^{1/3}$%
	Hake, Brenda K	08/30/1954	4 Ever Whiting Astoria, OR 54321	$33^{1/3}$%
	Hake, Jr., Fred J	11/23/1975	12 Ever Whiting Astoria, OR 54321	$33^{1/3}$%
			TOTAL OWNERSHIP of Business 2 =	**100%**

SECTION C – SMALL BUSINESS CERTIFICATION

Read the criteria to determine if you are a small business according to the criteria listed. Check the appropriate box, yes or no.

SECTION D - CERTIFICATION OF APPLICANT AND NOTARY

The authorized agent must sign and date the form in the presence of a notary to certify that the individual(s) signing the form have satisfactorily identified themselves. By signing and dating the form, the authorized agent certifies that all information set forth in the form is true, correct, and complete to the best of the applicant's knowledge and belief. The form will not be considered without the authorized agent's signature. If a single individual is listed in Field 5 above, then that individual must sign. If two individuals are listed in Field 5 above with an "and" between their names, then both individuals must sign. If two individuals are listed in Field 5 above with an "or" between their names, then one of the individuals must sign. If an individual and a business entity are listed in Field 5 above, then the individual and the authorized agent for the business entity must both sign.

The notary must sign and date this section, and affix notary stamp or seal.

The authorized agent must include a copy of the corporate resolution or other authorizing document allowing the authorized agent to sign and certify on behalf of the business entity.

TRAWL IDENTIFICATION OF OWNERSHIP INTEREST

PACIFIC COAST GROUNDFISH

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service, Northwest Region
Fisheries Permits Office
7600 Sand Point Way NE, Bldg. 1
Seattle, WA 98115-0070

Phone (206) 526-4353 *Fax* (206) 526-4461 www.nwr.noaa.gov

SECTION A – PERMIT/VESSEL/FIRST RECEIVER OWNER IDENTIFICATION

1. Are you a: ❑ Permit Owner ❑ Vessel Owner ❑ Pacific Whiting First Receiver

2. Permit Number GF	3. Vessel Name		4. USCG Doc or State Registration Number
5. Name			6. TIN or DOB
			7. State Registered, if business entity
8. Business Mailing Address (also list physical address for first receiver, if different) *Street* ***or*** *PO Box*			9. Business Phone ( )
			10. Business Fax (*optional*) ( )
City	*State*	*Zip Code*	11. Business Email (*optional*)

SECTION B - IDENTIFICATION OF SHAREHOLDERS AND PARTNERS
PART 1 – first level

NAME ***(Last, First, Middle Initial)***	**TIN or DOB**	**BUSINESS MAILING ADDRESS (*Street or PO Box, City, State, Zip Code*)**	**% INTEREST HELD**
		TOTAL OWNERSHIP =	**100%**

SECTION B - IDENTIFICATION OF SHAREHOLDERS AND PARTNERS
PART 2 – second level

NOTE: Owners of a business entity from Part 1 above must be listed down to the level of individual persons that make up that business. If more than one business is listed, be clear which individuals belong to which business.

If necessary, attach an additional sheet of paper with the information required below.

	NAME *(Last, First, Middle Initial)*	**DOB** (*mm/dd/yyyy*)	**BUSINESS MAILING ADDRESS** (*Street or PO Box, City, State, Zip Code*)	**% INTEREST HELD (IN BUSINESS)**
business name from Part 1				
list individual names				
			TOTAL OWNERSHIP of Business 1 =	**100%**
business name from Part 1				
list individual names				
			TOTAL OWNERSHIP of Business 2 =	**100%**
business name from Part 1				
list individual names				
			TOTAL OWNERSHIP of Business 3 =	**100%**

SECTION C – SMALL BUSINESS CERTIFICATION

Are you a small business according to the standards outlined below? ❑ YES ❑ NO

Small businesses. The Small Business Administration has established size criteria for all major industry sectors in the US, including fish harvesting and fish processing businesses. A business involved in fish harvesting is a small business if it is independently owned and operated and not dominant in its field of operation (including its affiliates) and if it has combined annual receipts not in excess of $4.0 million for all its affiliated operations worldwide. A seafood processor is a small business if it is independently owned and operated, not dominant in its field of operation, and employs 500 or fewer persons on a full time, part time, temporary, or other basis, at all its affiliated operations worldwide. A business involved in both the harvesting and processing of seafood products is a small business if it meets the $4.0 million criterion for fish harvesting operations. A wholesale business servicing the fishing industry is a small business if it employs 100 or fewer persons on a full time, part time, temporary, or other basis, at all its affiliated operations worldwide. For marinas and charter/party boats, a small business is one with annual receipts not in excess of $7.0 million.

Small organizations. The Regulatory Flexibility Act defines “small organizations” as any nonprofit enterprise that is independently owned and operated and is not dominant in its field.

Small governmental jurisdictions. The Regulatory Flexibility Act defines small governmental jurisdictions as governments of cities, counties, towns, townships, villages, school districts, or special districts with populations of less than 50,000.

SECTION D - CERTIFICATION OF APPLICANT AND NOTARY

This section must be completed by a notary to certify that the individual(s) have satisfactorily identified themselves.

Under penalties of perjury, I hereby declare that I, the undersigned, completed this form, and the information contained herein is true, correct, and complete to the best of my knowledge and belief.

Signature of Authorized Representative	Date
Printed Name of Authorized Representative (*NOTE: attach authorization, if needed*)	
Notary Public Signature ❑ ATTEST	Affix Notary Stamp or Seal Here
Date Commission Expires	

WARNING STATEMENT: A false statement on this form is punishable by permit sanctions (revocation, suspension, or modification) under 15 CFR 904, a civil penalty of up to $140,000 under 16 USC 1858, and as a federal crime under 18 USC 1001.

PRIVACY ACT STATEMENT: Your DOB and/or TIN are confidential and protected under the Privacy Act. Provision of your DOB or TIN is mandatory as part of this collection. The primary purpose for requiring the DOB and/or TIN is to verify the identity of individuals/entities doing business with the government to provide a unique identification for assistance to comply with the Debt Collection Improvement Act of 1996 (Public Law 104-134) and for enforcement activities. The information collected is part of a Privacy Act System of Records, COMMERCE/NOAA #19, Permits and Registration for United States Federally Regulated Fisheries. A notice was published in the Federal Register on April 17, 2008 (73 FR 20914) and became effective on June 11, 2008 (73 FR 33065).

PRA STATEMENT: Public reporting burden for this collection of information is estimated to average 0.5 hours per response, including the time for reviewing the instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to NOAA/National Marine Fisheries Service, Northwest Region, Attn: Assistant Regional Administrator, Sustainable Fisheries Division, 7600 Sand Point Way NE, Seattle, WA 98115. Some of the information collection described above is confidential under section 402(b) of the Magnuson-Stevens Act and under NOAA Administrative Order 216-100, Protection of Confidential Fisheries Statistics. Phone number, fax, email, TIN, and DOB are not released to the public. The names of individuals who have an ownership interest in an entity that owns a permit, vessel or processing plant and the actual percentage of ownership are considered business confidential and are not released to the public.

Agenda Item E.6.b
Supplemental NMFS PowerPoint
September 2009

Amendment 20 & 21 (TIQ & ISA)

Deeming - Round 1
NMFS Report

Overview

- Draft Schedule & Rulemaking Plans
- Ownership Data Proposed Rule
- Draft Regulatory Structure
- Initial Issuance of Quota Share & Appeals Process
- Thoughts on Tracking & Monitoring

Draft Schedule & Rulemaking plans

- Combined Review of Amendments 20 & 21
- NEPA: DEIS in November 2009
- If Approved, 3 Rulemakings to Implement
  - Ownership Data Rule (now)
  - "Grand Framework" Rule (summer 2010)
  - Follow-Up Rule (Fall 2010)

Ownership Data Rule

- Published Today -- Comments until Oct 16
- Primary Purpose: Collect Ownership Interest Information
  - Accumulation Limits
  - Expedite Initial Issuance of Quota Shares
- Secondary Purposes:
  - Use of NORPAC & PacFIN; Freeze Date

Draft Regulatory Structure

- Completely Reorganized
  - Make Our Jobs Easier
  - Make it Easier on Fishermen & Public

Initial Issuance & Appeals process

- Scheduled: September 2010
- Facilitated by Ownership Data Rule
- “Pre-Appeal” Process
- Initial Administrative Decision
- Deadline for Appeal

Tracking & Monitoring

- State Fish Ticket System as the Foundation

  → Electronic Submission

- NOAA
  - QS/QP Tracking
  - Onshore Compliance Monitors
  - 100% Observers (NWC)
- Discussions with States
- Cameras on Whiting Catcher Vessels??

Federal Register / Vol. 74, No. 178 / Wednesday, September 16, 2009 / Proposed Rules **47545**

value of the portion and how frequently the portion is used by the species. In addition, the portion may contribute to resiliency for other reasons—for instance, it may contain an important concentration of certain types of habitat that are necessary for the species to carry out its life history functions, such as breeding, feeding, migration, dispersal, or wintering.

Redundancy of populations may be needed to provide a margin of safety for the species to withstand catastrophic events. This does not mean that any portion that provides redundancy is a significant portion of the range of a species. The idea is to conserve enough areas of the range such that random perturbations in the system act on only a few populations. Therefore, each area must be examined based on whether that area provides an increment of redundancy that is important to the conservation of the species.

Adequate representation insures that the species' adaptive capabilities are conserved. Specifically, the portion should be evaluated to see how it contributes to the genetic diversity of the species. The loss of genetic diversity may substantially reduce the ability of the species to respond and adapt to future environmental changes. A peripheral population may contribute meaningfully to representation if there is evidence that it provides genetic diversity due to its location on the margin of the species' habitat requirements.

Based upon factors that contribute to our analysis of whether a species or subspecies is in danger of extinction throughout all or a significant portion of its range, and in consideration of the status of, and threats to, the Bliss Rapids snail discussed previously, we find that the primary threats to the continued existence of the Bliss Rapids snail occur throughout all of its range. Therefore, it is not necessary to conduct further analysis with respect to the significance of any portion of its range.

Finding

On the basis of the best available scientific and commercial information, as discussed above, we find that the Bliss Rapids snail is likely to become endangered within the foreseeable future (*i.e.,* it is threatened, as defined by the Act). Therefore, removing the Bliss Rapids snail from the List is not warranted.

References Cited

A complete list of all references cited herein is available upon request from the Idaho Fish and Wildlife Office (*see* **ADDRESSES**).

Author

The primary authors of this document are the Idaho Fish and Wildlife Office (*see* **ADDRESSES**).

Authority

The authority for this action is the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Dated: August 26, 2009.

Daniel M. Ashe,

Acting Director, Fish and Wildlife Service.

[FR Doc. E9–21949 Filed 9–15–09; 8:45 am]

BILLING CODE 4310–55–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 660

[Docket No. 0907281183–91184–01]

RIN 0648–AX98

Fisheries off West Coast States; Pacific Coast Groundfish Fishery; Data Collection for the Trawl Rationalization Program

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; request for comments.

SUMMARY: NMFS proposes to collect data to support implementation of a future trawl rationalization program under the Pacific Coast Groundfish Fishery Management Plan (FMP). NMFS proposes to collect ownership information from all potential participants in the trawl rationalization program. In addition, NMFS is notifying potential participants that the agency intends to use the Pacific States Marine Fisheries Commission's Pacific Fisheries Information Network (PacFIN) database and NMFS' Northwest Fisheries Science Center's Pacific whiting observer data from NORPAC (a database of North Pacific fisheries and Pacific whiting information) to determine initial allocation of quota share (QS) for the trawl rationalization program, if it is approved and implemented.

DATES: Comments on this proposed rule must be received no later than 5 p.m., local time on October 16, 2009.

ADDRESSES: You may submit comments, identified by RIN 0648–AX98 by any one of the following methods:

Electronic Submissions: Submit all electronic public comments via the Federal eRulemaking Portal *http://www.regulations.gov*.

Fax: 206–526–6736, Attn: Jamie Goen.

Mail: Barry Thom, Acting Administrator, Northwest Region, NMFS, 7600 Sand Point Way NE, Seattle, WA 98115–0070, Attn: Jamie Goen.

Instructions: All comments received are a part of the public record and will generally be posted to *http://www.regulations.gov* without change. All Personal Identifying Information (for example, name, address, etc.) voluntarily submitted by the commenter may be publicly accessible. Do not submit Confidential Business Information or otherwise sensitive or protected information.

NMFS will accept anonymous comments (enter N/A in the required fields if you wish to remain anonymous). Attachments to electronic comments will be accepted in Microsoft Word, Excel, WordPerfect, or Adobe PDF file formats only. Written comments regarding the burden-hour estimates or other aspects of the collection-of-information requirements contained in this proposed rule may be submitted to NMFS, Northwest Region and by e-mail to David__Rostker@omb.eop.gov or fax to (202) 395–7285.

FOR FURTHER INFORMATION CONTACT: Jamie Goen, phone: 206–526–4656, fax: 206–526–6736, and e-mail *jamie.goen@noaa.gov*.

SUPPLEMENTARY INFORMATION:

Electronic Access

This proposed rule is accessible via the Internet at the Office of the **Federal Register's** Web site at *http://www.gpoaccess.gov/fr/index.html*. Background information and documents are available at the Pacific Fishery Management Council's website at *http://www.pcouncil.org/*.

Background

Since 2003, the Pacific Fishery Management Council (Council) has been developing a trawl rationalization program, which would affect the limited entry trawl fishery of the Pacific Coast groundfish fishery. The trawl rationalization program is intended to increase net economic benefits, create individual economic stability, provide full utilization of the trawl sector allocation, consider environmental impacts, and achieve individual accountability of catch and bycatch.

The Council has developed the trawl rationalization program through two amendments to the Groundfish FMP: (1) Amendment 20, the trawl rationalization program; and (2) Amendment 21, intersector allocation. Amendment 20 would create the structure and management details of the trawl rationalization program, while Amendment 21 would allocate the groundfish stocks between trawl and non-trawl fisheries. The Council took final action on Amendment 20 at their November 2008 meeting, with trailing actions at its March 2009, April 2009, and June 2009 meetings. The Council took final action on Amendment 21 at its April 2009 meeting. When the Council formally transmits those amendments to NMFS, the agency will publish a notice of availability (NOA) of an FMP amendment and a proposed rule in the **Federal Register** to announce a public comment period. Following the public comment period on the NOA and proposed rule, NMFS will announce its decision on whether or not to approve the amendments in a final rule published in the **Federal Register**. The FMP approval process and implementation, if appropriate, are expected to occur in 2010.

The trawl rationalization program would be a limited access privilege program (LAPP) under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), 16 U.S.C.1851–1891d, as reauthorized in 2007. A LAPP is considered a grant of permission to the holder of the limited access privilege or QS to participate in the program and may be revoked, limited, or modified at any time. In other words, it is a conditional privilege, conveyed through QS or catch shares, to harvest a specified amount of fish. The MSA requires the Council or the Secretary of Commerce to ensure that limited access privilege holders do not acquire an excessive share of the total limited access privileges in the program and to establish a maximum share, expressed as a percentage that each limited access privilege holder may hold, acquire, or use. For the trawl rationalization program, the Council has adopted limits on the amount of pounds a vessel can hold, acquire, or use (i.e., vessel limits) and limits on the amount of QS that can be held, acquired, or used (i.e., control limits).

Trawl Rationalization Program Structure

The trawl rationalization program would consist of: (1) An individual fishing quota (IFQ) program for the shore-based trawl fleet; and (2) cooperative (co-op) programs for the at-sea trawl fleet. Under trawl rationalization, the shore-based trawl fleet would consist of IFQ participants who land groundfish to shore-based processors or first receivers. The at-sea trawl fleet would consist of fishery participants harvesting whiting with midwater trawl gear (i.e., whiting catcher/processor vessels, whiting motherships, and whiting catcher vessels associated with motherships). The co-op programs for the at-sea trawl fleet would be further divided as follows: (1) The whiting catcher/processor co-op; and (2) the whiting mothership co-ops. The mothership co-ops may consist of a single co-op or multiple co-ops where vessels pool their harvest together, or it may consist of vessels not associated with a particular mothership (i.e., ‘‘non-co-op’’ segment of the mothership fishery).

The IFQ program for the shore-based fleet would require an initial allocation of harvest QS to individual participants based on historic participation in the fishery, specifically to limited entry trawl permit owners and shore-based whiting processors who meet the eligibility requirements. In order to comply with the MSA, NMFS would be required to determine and track ownership interest in QS to determine if individuals are within set limits, both at the initial allocation stage and during the operation of the program. In Amendment 20, the Council has adopted limits (by species group and area) on the amount of QS an individual can control (control limits).

The Council has adopted different program structures for the whiting catcher/processor co-ops and whiting mothership co-ops, based on how these co-ops have operated in the past. The structure of the co-ops will be described in more detail in the proposed rule to implement Amendment 20, which is expected in 2010. The catcher/processor co-op would not require an initial allocation of QS to individual vessels, provided a co-op is established.

QS for the at-sea mothership fleet (called ‘‘catch history assignments’’ in Council documents) would initially be allocated to the individual whiting catcher vessels associated with the mothership fishery, and would be non-transferable amounts associated with the vessel. The QS allocated to individual vessels would reflect that individual vessel's contribution to the total amount of fish its mothership co-op can harvest. However, an individual vessel in the co-op could harvest more than its at-sea quota, within the restrictions on individual vessel harvest and mothership co-op limits. Similar to the shore-based IFQ program, NMFS would be required to track ownership interest in QSs to determine if individuals are within set limits. In addition, ownership interest in the co-op programs (both the catcher/processor and mothership) and IFQ program would be tracked at the individual level to monitor crossover of participants and ownership interest among the programs.

Collection of Ownership Information

Pursuant to section 402(a)(2) of the MSA, if the Secretary of Commerce determines that additional information is necessary for developing or implementing an FMP, the Secretary may, by regulation, implement an information collection program requiring submission of additional information for the fishery. In this proposed rule, ownership information would be collected from the potential participants in the trawl rationalization program, including the at-sea fleet (whiting motherships, whiting mothership catcher vessels, and whiting catcher/processors), the shore-based fleet (whiting and non-whiting permit owners and holders) and the shore-based whiting processors. Ownership information would be collected to support and facilitate the timely implementation of the potential future trawl rationalization program under the Groundfish FMP.

Similar to current NMFS requirements to collect ownership information from the limited entry fixed gear sablefish fleet, the primary purpose of collecting ownership interest information from the trawl fleet is to allow NMFS to monitor control of the groundfish resource in the trawl fishery to ensure participants remain within the accumulation limits, or control limits on QS, recommended by the Council in Amendment 20 to the FMP. Initially, NMFS would use the ownership information collected under this rule as the first step in the application process to determine which potential QS holders might be over their accumulation limits as individuals or as members of a business entity. By collecting ownership information from potential participants in advance of the FMP amendment approval process, NMFS would expedite the QS initial issuance process, which is expected to take place in the fall of 2010. After ownership interest forms from this rulemaking are completed early in 2010, NMFS intends to provide pre-filled ownership interest forms with the initial issuance application package in the fall of 2010, thereby reducing the burden on potential participants and shortening the application process. If the collection of the ownership information requested as part of this rulemaking is not completed at the time NMFS provides these forms, NMFS may delay implementation of the trawl rationalization program or the issuance of an eligible participant's QS due to the additional time needed to gather the ownership information and determine if an eligible participant is within the accumulation limits.

In addition, the ownership information collected would create a baseline of ownership information to evaluate the trawl rationalization program during periodic reviews of the program, as required by the MSA. It would allow NMFS to better understand the relationship between processors, permit owners, and the entities owning the vessel registered to the permit (i.e., permit holders). In other words, it would allow NMFS to better understand who will control QS and which individuals will potentially use quota pounds (QP). Moreover, the ownership information would allow NMFS to better understand potential vessel accounts for QP and to better understand the ownership of vessels that crossover between different sectors in the trawl fishery. For example, it would allow NMFS to better understand the ownership of vessels that participate in both the whiting shore-based and the mothership fisheries.

NMFS would send a Trawl Identification of Ownership Interest Form to potential participants in the trawl rationalization program requiring the following information to be filled out: Type of entity; qualifying permit number; name of company or name of individuals owning the limited entry permit, vessel or processing plant; tax identification number (TIN) for each entity; date of birth (DOB) for each individual; state in which each business entity is registered; business mailing address; physical address for processing plants; business phone number, fax number and email; authorized representative's name; name of each individual having ownership interest in the limited entry permit, vessel or processing plant; the individual's business addresses; percentage of ownership by each entity (if there are multiple entities given as an owner of the permit, vessel, or processing plant) and each individual shareholder in each entity; printed name of authorized representative, their signature, and the date. The percentage of ownership of all shareholders must equal 100 percent. The form would also allow owners to certify whether or not they are a small business according to Small Business Administration (SBA) and the Regulatory Flexibility Act (RFA) standards.

For permits, the legal owner of the permit or authorized representative would be required to complete the form and provide all necessary information on the individual or entity owning each groundfish limited entry trawl permit. For vessels, the vessel owner would be required to complete the form and provide all necessary information on the individual or entity owning each vessel that is registered to a groundfish limited entry trawl permit (i.e., permit holder). For shore-based whiting processors or first receivers, the legal owner or authorized representative would be required to complete the form and provide all necessary information on the individual or entity owning each shore-based whiting processing or first receiver company. The individual signing the form would certify under penalty of perjury that the information provided is true and correct and the form would be required to be notarized by a notary public.

The form would be required even if the owner of the permit or potential participant in the trawl rationalization program is a person and not an entity. This form does NOT prequalify these persons for QS nor guarantee that they will qualify for QS under the future trawl rationalization program.

In addition to filling out the mandatory ownership interest form, potential trawl rationalization program participants may be required to submit additional documentation to NMFS. If the ownership interest in the permit, vessel, or potential QS includes a business entity, then additional documentation will be required. If there is an authorized representative for a business entity, then a corporate resolution would be required authorizing the person signing to do so on behalf of the entity. Business entities established under the laws of the United States or of any State would be required to provide proof of the establishment of their business and to verify that they are an active corporation. If an entity was not established under the laws of the United States or of any other State, this rule would not require the entity to become so established. However, an entity must be established under the laws of the United States or of any State in order to qualify for an initial allocation of QS, pursuant to section 303A(c)(1)(D) of the MSA. Providing the information at this stage will expedite the initial issuance process.

Additional documentation that NMFS may request after review of the completed Trawl Identification of Ownership Interest Form includes articles of incorporation, a contract, or any other credible documentation that substantiates those with ownership interests in the entity and their percent ownership. NMFS may require a certified copy of the current vessel document (United States Coast Guard or state) as evidence of vessel ownership. NMFS may also request or consider any other relevant, credible evidence.

NMFS would send out the Trawl Identification of Ownership Interest Form with instructions to the current address in NMFS records for potential participants in the trawl rationalization program. Completion of this form would be required only once in preparation for implementation of the trawl rationalization program. This form would be sent to the at-sea fleet (whiting motherships, whiting mothership catcher vessels, and whiting catcher/processors), the shore-based fleet (whiting and non-whiting permit owners and holders) and the shore-based whiting processors. Potential participants would have at least 60 days from the effective date of the **Federal Register** final rule for this action to return the completed form. The completed form must be returned to NMFS no later than May 1, 2010. In the future and if the trawl program is implemented under Amendment 20, the ownership interest form would likely be required during the permit or QS renewal process and during any permit or QS transfers.

Databases to be Used for Initial Allocation of Quota Share

Potential participants of the trawl rationalization program should be aware that the agency intends to use landings data from the Pacific States Marine Fisheries Commission's PacFIN database and NMFS' Northwest Fisheries Science Center's Pacific whiting observer data from NORPAC to determine initial allocations of QS for the trawl rationalization program. Landings data from state fish tickets, as provided by the states to the PacFIN database, would be used to determine initial allocation of IFQ QS for the shore-based whiting and nonwhiting harvesters and for the shore-based whiting processors. Landings data from the NORPAC database would be used to determine initial allocation of at-sea QS for the whiting mothership catcher vessels.

NMFS intends to ''freeze'' the databases for the purposes of initial allocation on the date the proposed rule proposing to implement Amendment 20 to the FMP is published in the **Federal Register**. This should allow time for NMFS to compile the dataset and cross check the data for any errors. ''Freezing'' the databases means that NMFS will extract a snapshot of the databases as of the proposed rule publication date and will use those for initial allocation of

QS. ''Freezing'' the databases is necessary to hold them constant for use during qualification and initial issuance of the trawl rationalization program and to form an administrative record of the database at a given point in time. Following the ''freezing'' of the databases, any corrections to the ''frozen'' database would be made with NMFS through the processes set forth in future trawl rationalization rules. After NMFS extracts a copy of the databases, the PacFIN and NORPAC databases will continue to exist and be updated through their normal processes, but such updates may not be used for initial allocations of QS.

If potential participants in the trawl rationalization program have concerns over the accuracy of their data in the PacFIN database, they should contact the state in which they landed those fish to correct any errors. Any revisions to an entity's fish tickets would have to be approved by the state in order to be accepted. State contacts are as follows: (1) Washington - Carol Turcotte (360–902–2253, *Carol.Turcotte@dfw.wa.gov*); (2) Oregon - Michelle Grooms (503–947–6247, *Michelle.L.Grooms@state.or.us*); and (3) California - Gerry Kobylinski (916–323–1456, *Gkobylin@dfg.ca.gov*). For concerns over the accuracy of NORPAC data, contact Janell Majewski (206–860–3293, *janell.majewski@noaa.gov*). NMFS urges potential QS owners to go directly to the source where fisheries data is entered in the database to get it corrected before NMFS extracts the data for initial issuance of QS.

Classification

Pursuant to section 402(a)(2) of the MSA, the NMFS Assistant Administrator, acting on behalf of the Secretary of Commerce, has determined that information collected under this proposed rule is necessary for developing and implementing the trawl rationalization program. The NMFS Assistant Administrator has also determined that this proposed rule is consistent with other applicable law, subject to further consideration after public comment.

This proposed rule has been determined to be not significant for purposes of Executive Order 12866.

An initial regulatory flexibility analysis (IRFA) was prepared, as required by section 603 of the RFA. The IRFA describes the economic impact this proposed rule, if adopted, would have on small entities. A description of the action, why it is being considered, and the legal basis for this action are contained at the beginning of this section in the preamble and in the SUMMARY section of the preamble. A copy of the IRFA is available from the NMFS (see ADDRESSES). A summary of the analysis follows:

The proposed rule would allow NMFS to collect data to support implementation of a future trawl rationalization program, Amendment 20, to the Groundfish FMP. A separate Regulatory Impact Review/IRFA will be prepared for the full trawl rationalization program as part of the rulemaking for Amendment 20. This proposed rule would also announce that NMFS intends to use landings data from the PacFIN and NORPAC databases to determine initial allocations of QS for the trawl rationalization program. Section 402(a)(2) of the MSA gives the legal authority for the action. If the Secretary determines that additional information is necessary for developing or implementing an FMP, the Secretary may, by regulation, implement an information collection requiring submission of such additional information for the fishery.

The Council has recommended accumulation limits to comply with the MSA requirement to ensure that participants do not acquire an excessive share of the total limited access privileges in the trawl rationalization program. Initially, NMFS would use the ownership information collected as the first step in the application process to determine which potential QS holders might be over their accumulation limits as individuals or as members of a business entity. By collecting ownership information from potential participants in advance of the FMP amendment approval process, NMFS would expedite the initial issuance of QS, which is expected to take place in the fall of 2010. Also, NMFS could use the completed forms to troubleshoot any unforeseen data collection issues and to provide pre-filled ownership interest forms with the initial issuance package in the fall of 2010. Pre-filled forms would reduce the burden on potential participants and shorten the initial issuance and appeals process.

The IRFA considers three alternatives: (1) No action; (2) a blank form to collect ownership interest information; and (3) a partially pre-filled form to collect ownership information. The no action alternative would delay collecting any ownership interest information until the initial issuance and appeals process for the trawl rationalization program, which is expected to take place in the fall of 2010. Under the second alternative, NMFS would mail a blank Trawl Identification of Ownership Interest Form to potential participants in the trawl rationalization program. Under the third and selected alternative, NMFS would mail out a partially pre-filled Trawl Identification of Ownership Interest Form to potential participants in the trawl rationalization program. NMFS would use its Permit Office's database to pre-fill the permit and/or vessel owner's name of record and address. NMFS would also use this information to begin to fill out the names of participants with ownership interest.

Compared to the no action alternative, both alternatives would facilitate a timelier implementation of the trawl rationalization program. Additionally, the preferred alternative, partially pre-filled forms, would further expedite the trawl rationalization program implementation process and would be the most helpful to the person completing the form. This should aid the person completing the form by providing details on what information is needed and how NMFS database currently views the permit and/or vessel owner or owner of the whiting processor. While timely implementation of the trawl rationalization program benefits its participants, NMFS must also be aware that doing so is not too burdensome and costly to the potential trawl rationalization program participants. This proposed rule would establish a onetime mailing requesting ownership information. Filling out a Trawl Ownership Interest Form is expected to take approximately 30 minutes per response and cost approximately $19.15 per response (which includes the respondent's time ($8.51), mailing, photocopying, and notary fee). There is no fee for this form. There is an incentive to respond because this is the initial step by any business to gain ownership rights in the fishery that can, at a future time, be harvested, sold, leased, or combined with other businesses in fishing operations. The financial benefits of participating in the trawl rationalization program should far outweigh the minimal cost of time and effort to fill out a form. (Very preliminary Pacific Council estimates indicate that for the harvesting vessels, after taking into account the costs of having observer coverage, over time the fishery may increase annual profits (revenue minus costs) by $10 to $20 million.)

This proposed rule would collect ownership information from approximately 250 potential participants who may receive initial allocation of QS, including the at-sea fleet (whiting motherships, whiting mothership catcher vessels, and whiting catcher/processors), the shore-based fleet (whiting and non-whiting permit owners and holders) and the shore-based whiting processors. Using SBA standards, most of the estimated 250 entities are considered small businesses, except for some catcher vessels that also fish off Alaska, some shoreside processors and all catcher-processors and motherships (fewer than 30) that are affiliated with larger processing companies or large international seafood companies. One of the purposes of this data collection is to have these entities certify that they are ''small'' or ''large'' entities based on SBA size and affiliation criteria.

This information collection would be requested of all potential participants in the trawl rationalization program, regardless of size, and would not have a disproportionate effect on small versus large entities. Nor would this information collection have any effect on profitability for small entities.

These changes will not duplicate, overlap or conflict with other laws or regulations. This proposed action is not expected to meet any of the RFA tests of having a ''significant'' economic impact on a ''substantial number'' of small entities. Nonetheless, NMFS has prepared an IRFA for this action. NMFS is requesting comments on this conclusion.

This proposed rule contains a collection-of-information requirement subject to review and approval by OMB under the Paperwork Reduction Act (PRA). This requirement has been submitted to OMB for approval. The public reporting burden for the Trawl Identification of Ownership Interest Form is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection information. This form is estimated to cost approximately $19.15 per response (which includes the respondent's time ($8.51), mailing, photocopying, and notary fee). There is no fee for this form.

Public comment is sought regarding: Whether this proposed collection of information is necessary for the proper performance of the functions of the agency, including whether the information shall have practical utility; the accuracy of the burden estimate; ways to enhance the quality, utility, and clarity of the information to be collected; and ways to minimize the burden of the collection of information, including through the use of automated collection techniques or other forms of information technology. Send comments on these or any other aspects of the collection of information to NMFS, Northwest Region (see **ADDRESSES** section), and by e-mail to *David__Rostker@omb.eop.gov* or fax to (202) 395–7285.

Notwithstanding any other provision of the law, no person is required to respond to, and no person shall be subject to penalty for failure to comply with, a collection of information subject to the requirements of the PRA, unless that collection of information displays a currently valid OMB control number.

List of Subjects in 50 CFR Part 660

Fishing, Fisheries, and Indian Fisheries.

Dated: September 11, 2009.

Samuel D. Rauch III,

Deputy Assistant Administrator For Regulatory Programs, National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR Part 660 is proposed to be amended as follows:

PART 660—FISHERIES OFF WEST COAST STATES

1. The authority citation for part 660 continues to read as follows:

Authority: 16 U.S.C. 1801 *et seq.*

2. A new § 660.337 is added to read as follows:

§ 660.337 Trawl rationalization program - data collection requirements.

(a) Ownership reporting requirements - (1) In 2010, NMFS will send a Trawl Identification of Ownership Interest Form to the current address on record requesting information from participants in the trawl fishery. Receipt of this form does NOT prequalify these persons for quota share nor does it guarantee that they will qualify for quota share under a future trawl rationalization program. The following participants in the trawl fishery must complete and return the form to NMFS:

(i) Owners of each limited entry permit endorsed for trawl gear;

(ii) Owners of each vessel registered to a limited entry permit endorsed for trawl gear (i.e., permit holder) if not identical to the permit owner covered by paragraph (a)(1)(i) of this section;

(iii) Owners of each vessel registered to a Pacific whiting vessel license that are not covered by paragraphs (a)(1)(i) and (ii) above; and

(iv) First receivers issued current Pacific whiting first receiver exempted fishing permits.

(2) Supporting documentation.

(i) Business entities completing the Trawl Identification of Ownership Interest Form are required to submit the following:

(A) A corporate resolution or any other credible documentation as proof of the authorized representative selected to act on behalf of the entity; and

(B) Proof that the business entity was established and is currently recognized as active under the laws of the United States or any State, if indeed they were.

(ii) After review of the Trawl Identification of Ownership Interest Form, NMFS may require the following additional documentation:

(A) Articles of incorporation, a notarized contract, or any other credible documentation that identifies each person who owns an interest in the entity and their percentage of ownership;

(B) A certified copy of the current vessel document (United States Coast Guard or state) as evidence of vessel ownership; or

(C) Such other relevant, credible evidence as the applicant may submit, or as the SFD or the Regional Administrator request or acquire.

(3) Deadline. Persons listed in paragraph (a)(1) will be provided at least 60 calendar days to submit completed forms. All forms must be completed and returned to NMFS with a postmark no later than the deadline date of May 1, 2010.

(b) [Reserved]

[FR Doc. E9–22325 Filed 9–15–09; 8:45 am]

BILLING CODE 3510–22–S

Thoughts on Costs

- Costs will be dependent on industry decisions

Sea Days vs. Monthly Stipend

Observer Paid by Sea Day

Sea Days/ Month	Approximate Daily Rate	Vessel Monthly Cost	Vessel cost/year
5	$500 per day	$2,500	$30,000
10	$500 per day	$5,000	$60,000
15	$500 per day	$7,500	$90,000
20	$500 per day	$10,000	$120,000
25	$500 per day	$12,500	$150,000

Observer Paid by Monthly Stipend

Month Stipend	Daily cost if observers available 30 days	Daily cost if observers available 20 days	Vessel Monthly Cost	Vessel cost/year (100% observer availability)
$5000	$167.00	$250	$5000	$60,000

Formation of Observer Groups

Monthly Cost for observer*	Number of Vessels	Vessel cost per 3 months	Vessel cost per year
$5,000.00	1	$15,000.00	$60,000.00
	2	$7,500.00	$30,000.00
	3	$5,000.00	$20,000.00
	4	$3,750.00	$15,000.00
	5	$3,000.00	$12,000.00
	6	$2,500.00	$10,000.00
	7	$2,142.86	$8,571.43
	8	$1,875.00	$7,500.00
	9	$1,666.67	$6,666.67
	10	$1,500.00	$6,000.00
	11	$1,363.64	$5,454.55
	12	$1,250.00	$5,000.00
	13	$1,153.85	$4,615.38
	14	$1,071.43	$4,285.71
	15	$1,000.00	$4,000.00
	16	$937.50	$3,750.00
	17	$882.35	$3,529.41
	18	$833.33	$3,333.33
	19	$789.47	$3,157.89
	20	$750.00	$3,000.00
	21	$714.29	$2,857.14
	22	$681.82	$2,727.27
	23	$652.17	$2,608.70
	24	$625.00	$2,500.00
	25	$600.00	$2,400.00
	26	$576.92	$2,307.69
	27	$555.56	$2,222.22
	28	$535.71	$2,142.86
	29	$517.24	$2,068.97
	30	$500.00	$2,000.00

*Monthly cost was estimated at $5000 which is equal to the monthly stipend or 10 days if observers are paid by sea day.

Timeline for TIQ Observer Planning

ID	Task Name	Start	Finish	Duration
1	Vessels notify observer provider	10/1/2010	11/1/2010	4.4w
2	Observer provider recruits observers	10/1/2010	11/30/2010	8.6w
3	Observer Training	12/6/2010	12/22/2010	2.6w
4	Observer deployment	1/3/2011	3/31/2011	12.8w

Knowns:

1. Observer program plans quarterly TIQ trainings: Dec 2010
2. Observer providers will need at minimum one-month to recruit and hire observers.

   Therefore, fleet will need to plan observer coverage in 3 -month blocks.

INSEASON ADJUSTMENTS TO 2009 AND 2010 GROUNDFISH FISHERIES – PART II

Consideration of inseason adjustments to 2009 and 2010 groundfish fisheries may be a two-step process at this meeting. The Council will meet on Tuesday, September 15, 2009, and consider advisory body advice and public comment on inseason adjustments under Agenda Item E.4. If the Council elects to make final inseason adjustments under Agenda Item E.4, then this agenda item may be cancelled. If finalization is not canceled under Agenda Item E.4, it will be completed at this time.

Council Action:

Consider information on the status of ongoing 2009 fisheries and adopt inseason adjustments as necessary for 2009 and 2010.

Reference Materials: None.

Agenda Order:

a. Agenda Item Overview — Merrick Burden
b. Reports and Comments of Management Entities and Advisory Bodies
c. Public Comment
d. **Council Action:** Adopt or Confirm Final Adjustments to 2009 and 2010 Groundfish Fisheries

PFMC
08/24/09

Projected mortality impacts (mt) of overfished groundfish species updated with most recent research estimates and fishery projections through September 2009.

Fishery	Bocaccio b/	Canary	Cowcod	Dkbl	POP	Widow	Yelloweye
Limited Entry Trawl- Non-whiting	**14.8**	**21.8**	1.3	**203.1**	**95.5**	**19.3**	0.6
Limited Entry Trawl- Whiting							
At-sea whiting motherships a/		4.3		6.0	0.5	60.0	0.0
At-sea whiting cat-proc a/		6.1		8.5	0.5	85.0	0.0
Shoreside whiting a/		7.6		10.5	0.1	105.0	0.0
Tribal whiting		1.4		0.0	0.7	3.7	0.0
Tribal							
Midwater Trawl		3.6		0.0	0.0	40.0	0.0
Bottom Trawl		0.8		0.0	3.7	0.0	0.0
Troll		0.5		0.0	0.0		0.0
Fixed gear		0.3		0.0	0.0	0.0	2.3
Fixed Gear Sablefish	0.2	2.8	0.0	4.2	0.5	0.1	0.9
Fixed Gear Nearshore	0.3	**3.6**	0.0	0.0	0.0	0.3	1.2
Fixed Gear Other	5.0	0.0	0.0	9.0	0.0	0.7	0.0
Open Access: Incidental Groundfish	2.0	0.9	0.0	0.0	0.0	4.0	0.3
Recreational Groundfish e/							
WA		**10.3**					5.2
OR						1.0	
CA	67.3	**15.0**	**0.3**			**6.0**	2.8
EFPs	13.7	2.7	0.3	1.3	0.0	5.5	0.3
Research: Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs.							
	2.0	**4.5**	0.2	2.0	2.0	5.7	**0.7**
TOTAL	105.3	86.2	2.1	244.6	103.5	336.3	14.3
2009 OY f/	288	105	4.0	285	189	522	17
Difference	182.7	18.8	1.9	40.4	85.5	185.7	2.7
Percent of OY	36.6%	82.1%	52.5%	85.8%	54.8%	64.4%	84.1%
Key		= either not applicable; trace amount (<0.01 mt); or not reported in available data					

a/ Non-tribal whiting values for canary, darkblotched, and widow reflect bycatch limits for the non-tribal whiting sectors. The widow bycatch limit is the difference between the OY and the projected impacts in all non-whiting fisheries. All other species' impacts are projected from the GMT's whiting impact projection model. The Council may elect to change these bycatch limits when setting final whiting management measures in March of 2009 or 2010 or under any inseason action at any of their future meetings.

b/ South of 40°10' N. lat.

c/ Mortality estimates are not hard numbers; based on the GMT's best professional judgment.

d/ Bycatch amounts by species unavailable, but bocaccio occurred in 0.1% of all port samples and other rockfish in another 0.1% of all port samples (and squid fisheries usually land their whole catch).

e/ Values in scorecard represent projected impacts for all species except canary and yelloweye rockfish, which are the prescribed harvest guidelines.

f/ 2009 and 2010 OYs are the same except for darkblotched (291 mt in 2010), POP (200 mt in 2010), and widow (509 mt in 2010).

PFMC
09/16/09

Agenda Item E.8
Situation Summary
September 2009

REPORT ON CATCH OF UNDENTIFIED ROCKFISH SPECIES
IN THE RECREATIONAL FISHERY

In October of 2008, Recreational Fishery Information Network (RecFIN) staff reported occurrences of unidentified rockfish in the recreational fishery that have not been accounted for in historical estimates of recreational impacts. This catch appears to be comprised of recreational discards or retained catch that cannot be identified by a sampler. The Council considered this matter at the March 2009 Council meeting. During this meeting, the Council directed RecFIN committees, appropriate state staff, and National Marine Fisheries Service (NMFS) and Council staff to meet and discuss the risks associated with the unidentified rockfish issue. The Council requested that a report be brought back at the September meeting where the Council would provide further guidance on working to resolve the issue.

In June of 2009, state, NMFS, PSMFC, and Council staff held a teleconference to discuss the unidentified rockfish issue and how to respond to the Council guidance received in June. Participants concluded that staff at each of the state agencies should provide a report to the Council for the September meeting. These reports would address the Council's request by identifying the magnitude of the issue in each state, the conservation risks posed by having unidentified rockfish, the reasons for the presence of unidentified rockfish, potential ways of resolving the issue, and a stated preference on how to move forward. These reports are included under Agenda Item E.8.b.

The Council task under this agenda item is to consider the information provided by each of the three west coast states and to provide direction on how to continue moving forward. Such direction may include a time line for resolution and implementation, an identification of resources to be devoted toward that task, and guidance on alternative means for identifying any unidentified rockfish.

Council Action:

1. Consider recommendations for resolving this issue.

Reference Materials:

1. Agenda Item E.8.b, ODFW Report: Oregon Department of Fish and Wildlife Report on Unidentified Rockfish from the Recreational Fishery

Agenda Order:

a. Agenda Item Overview — Merrick Burden
b. Reports and Comments of Management Entities and Advisory Bodies
c. Public Comment
d. **Council Action:** Provide Guidance on Further Process

PFMC
08/27/09

Agenda Item E.8.b
ODFW Report
September 2009

OREGON DEPARTMENT OF FISH AND WILDLIFE REPORT ON UNIDENTIFIED ROCKFISH FROM THE RECREATIONAL FISHERY

The Recreational Fisheries Information Network (RecFIN) provides estimates of recreational catches separately for three 'types' of recreational catch. Type A catch estimates are based on "sampler examined catch" and represent landed fish. Type B1 catch estimates are based on "angler reported harvested dead catch" and may represent fish that were landed but not observed by the sampler, fish that were released dead at sea, or a combination of these depending on the year and region. For Oregon, type B1 estimates currently represent only fish that were released dead at sea. Type B2 catch estimates are based on "angler reported released alive catch". Catch is estimated in units of numbers of fish, which may be converted to weight of catch via multiplication by stratified estimates of average weight. All three RecFIN catch types contain estimates of unidentified rockfish in at least some years for Oregon, but because the primary interest here is accounting for fishery mortality by species, this report focuses on addressing type A and B1 estimates.

1. Magnitude of the Issue

ODFW examined recreational catch data from 1980 through 2008 to determine the magnitude of unidentified rockfish ("rockfish genus" in RecFIN) catch (Figure 1). In the early 1980s, there were large numbers (415,000 in 1982) of unidentified rockfish, primarily released fish and likely artificially high due to a small sample size and high expansion factors. Since the early 90's, with the exception of 2000, the number of unidentified rockfish has been much lower. Similar to the early 1980s, 2000 may be due to a change in sample design, as this was the beginning of the transition from Marine Recreational Fishery Statistical Survey (MRFSS) to the Ocean Recreational Boat Survey (ORBS) in Oregon.

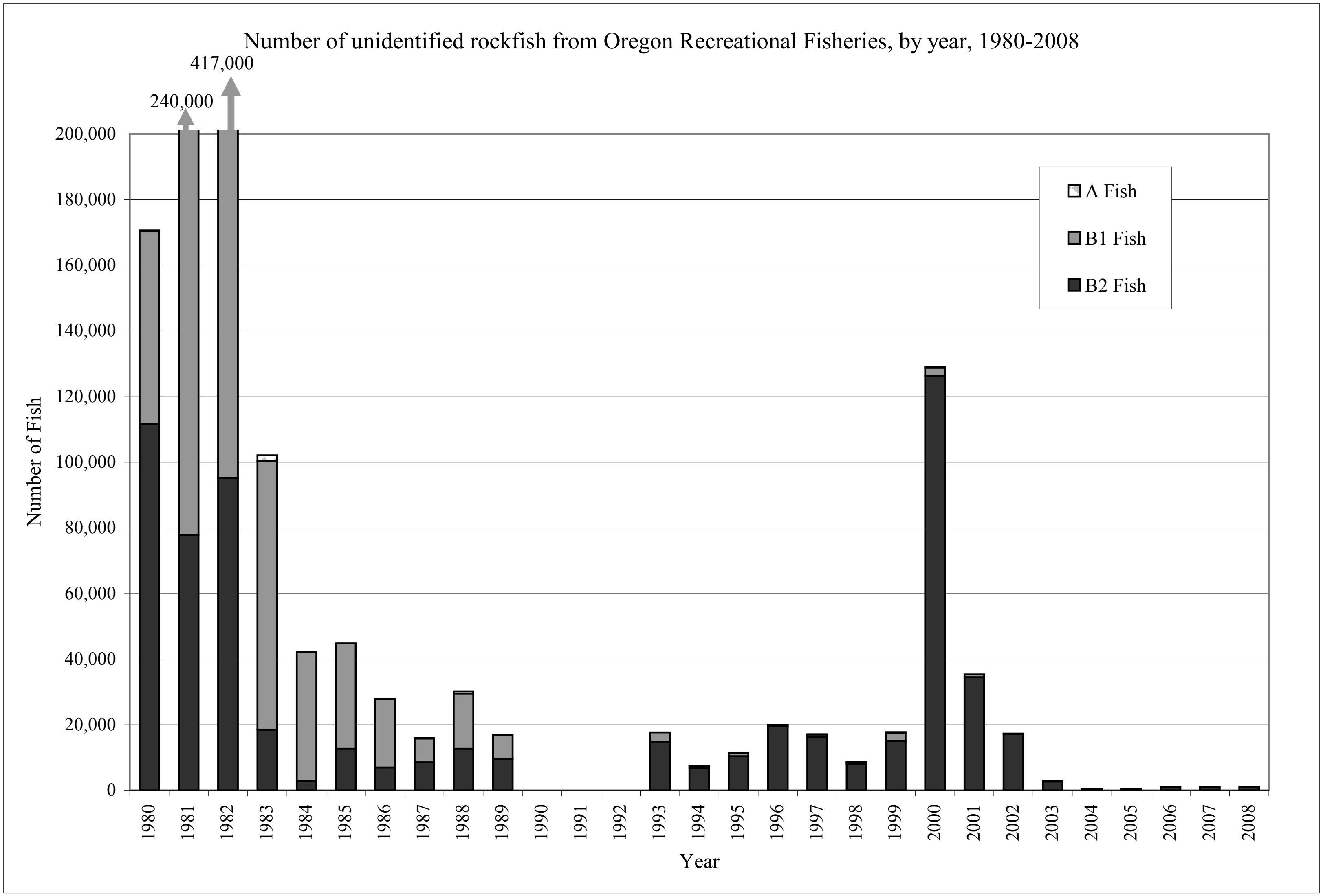


Figure 1. Total number of unidentified rockfish (A, B1 and B2) from Oregon recreational fisheries 1980-2008 from the RecFIN database.

Looking more closely at recent (2004-2008) data, there has been an average of seven unidentified A fish, zero B1 fish and 872 B2 fish per year (Table 1).

Table 1. Total number of unidentified rockfish (A, B1 and B2) from Oregon recreational fisheries, 2004-2008, from the RecFIN database.

Year	A	B1	B2	Total
2004	9	0	793	802
2005	8	0	393	401
2006	7	0	982	989
2007	8	0	1,075	1,083
2008	4	0	1,117	1,121
Average	7	0	872	879

Between 2004 and 2008, 52% of unidentified rockfish came from anglers targeting halibut (Figure 2). Anglers on bottomfish trips reported 36%, 11% on combination trips, and salmon and tuna trips combined account for less than 1% of the unidentified rockfish.

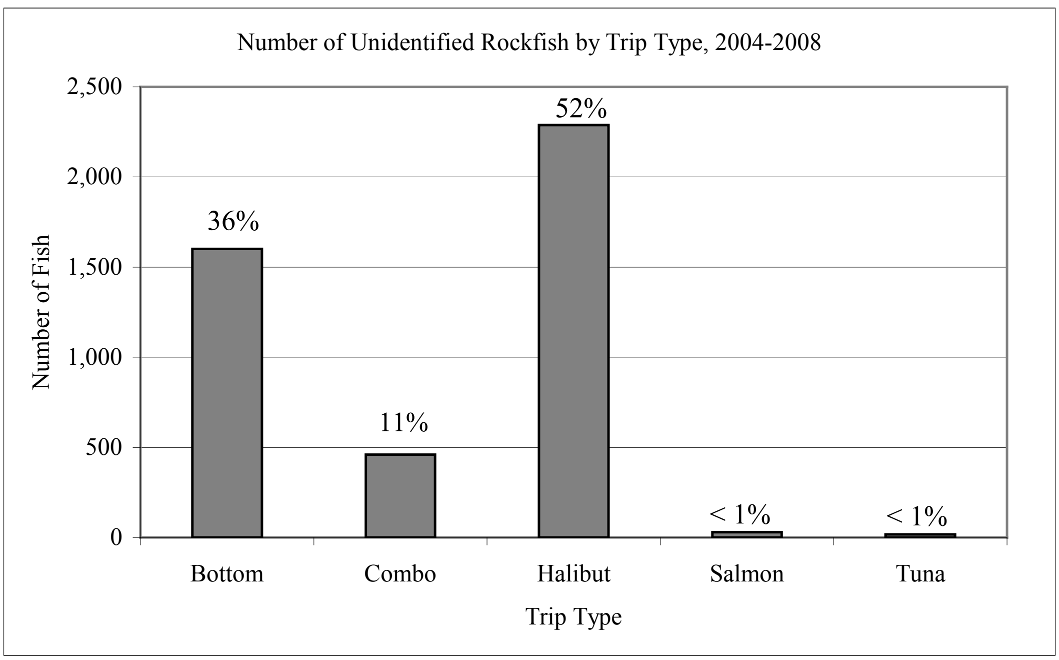


Figure 2. Total number of unidentified rockfish (A, B1 and B2) from Oregon recreational fisheries by trip type, 2004-2008.

The methodology used to produce historical estimates of unidentified fish, whether landed or discarded, has changed through time. There are three periods of estimates based on differing methodologies. The earliest spans the period from the early 1980's through 1989 and is based on MRFSS. In this survey anglers were asked if they discarded any fish and about the disposition of the fish (live or dead). Unless the sampler was confident the angler knew the rockfish species discarded, the fish were recorded as unidentified rockfish. During the period from 1990 through 2001 the landed statistics reported to RecFIN were from ODFW's ORBS. During that period discards, except for salmon and lingcod in the later years, were not recorded. The MRFSS program was also conducted during that period, but the landed estimates from the ORBS program were considered more accurate, and thus used in RecFIN. The sources of discards reported during that period on RecFIN are unknown and may be a product of the MRFSS sampling. The third period started in 2001 when ORBS began recording all fish landed by species and inquiring about all discards at the species level. Anglers were not asked about the disposition of fish discarded (i.e., dead or alive) yet they are reported on RecFIN as B1 and B2. This distinction could not be due to MRFSS sampling starting in July 2003 as the program was discontinued in Oregon. How RecFIN assigns discarded fish to B1 versus B2 will be examined and taken into account when the partitioning methodology is finalized. The estimates are not available by trip type in many years. Since 1999 they have been available by trip type and boat type.

The sampling programs described above represent sampling of ocean, shore and estuary fisheries. From July 2003 through June 2005 MRFSS was replaced by the Shore and Estuary Boat Sampling (SEBS) program. Shore and estuary sampling was discontinued in July 2005 due to lack of funding.

Several factors influence the accuracy of the catch estimates including regulations. Prior to the late 1990s with the advent of a sub-bag limit for canary rockfish there was little reason not to report releases. Most fish were either sub-legal (lingcod) or smaller fish. This changed with the adoption of a canary rockfish sub-limit in 1999 and intensified when retention of both canary rockfish and yelloweye rockfish were prohibited. Anglers did not always report releases of these species as they would count toward an annual limit on impacts, which included release mortality. In fact, these restrictions resulted in an increase in the release of “red” rockfish due to uncertainty in identification. Other examples of the influence of regulations are offshore closures and non-retention of groundfish in the directed halibut fishery. The advent of these regulations either promoted discards (prohibition) or influenced species composition (offshore closures), therefore careful attention must be given to the effects of regulation when developing methodologies for partitioning unidentified rockfish.

2. Conservation Risks

The conservation risks associated with the unidentified rockfish are that the actual impacts in a year may have exceeded a species’ Optimum Yield (OY or Acceptable Biological Catch (ABC). Based on preliminary calculations, none of the additional impacts from Oregon recreational fisheries caused the total species’ OY or ABC to be exceeded. However, this may not be the case when all three states include their additional impacts. Preliminary calculations (based on RecFIN data 2004-2008) of additional impact from partitioning all unidentified catch (A, B1 and B2) into species (the worst case scenario), shows that the additional impacts from Oregon recreational fisheries would have caused the Oregon portion of the yelloweye harvest guideline, but not the ABC or OY, to be exceeded by less than 0.1 mt in 2008 and 0.2 mt in 2005. The black rockfish recreational harvest guideline, but not the ABC or OY, was exceeded in 2004 by approximately 5 mt; however, partitioning of unidentified rockfish contributed less than 0.1 mt to that exceedence. No other rockfish species federal harvest guideline, OY, or ABC’s would have been approached in the time period 2004-2008, even with the additional impacts. Just examining A and B1 fish, there are currently less than ten A and B1 unidentified rockfish per year (Table1). Even if all ten unidentified rockfish were yelloweye rockfish, there would be less than 0.03 mt of additional impacts per year, not enough to cause an exceedence of the ABC or OY in any given year. However, it is unknown (to ODFW) how released fish are currently partitioned into B1 and B2 estimates, but it is assumed that some type of mortality rate calculation is used. If species specific mortality rates are greater than that applied to unidentified rockfish, the conservation risks may increase substantially.

3. Reasons for Unidentified Rockfish

ORBS relies on a combination of sampler examination of landed catch and angler reported discards to estimate total catch data. Over the last five years, 99% of the unidentified rockfish were reported by anglers as discarded, and are estimated as B2 (released alive) fish in RecFIN. The reasons for the angler reports of unidentified rockfish could be due to anglers' inexperience with rockfish identification. A second possibility is that the anglers can identify rockfish by species but don't want to report their discarded catch for fear that the information may close an area or the entire fishery. A more likely scenario is that anglers correctly identify and report the common rockfish species, and the species of concern (yelloweye and canary rockfish), but are unfamiliar with rare or unusual rockfish. Finally, ORBS protocol does not request that the samplers investigate/ask further questions about species ID. They simply ask "what did you discard" and are not instructed to try to dig in and investigate if unknown.

ODFW has been working to educate anglers on rockfish identification. ODFW produced a Red Rockfish Guide to assist with rockfish identification for common species such as vermillion, canary, and yelloweye rockfish. In the ports of Brookings and Newport, traditionally the two highest angler effort ports for marine recreational fishing in Oregon, ODFW built informational kiosks. These kiosks include regulations, the Red Rockfish Guides, and other information related to fish identification. During the summer of 2009, ODFW held two open house angler education events, in Brookings and Newport that focused on fish identification, collaborative research projects, navigating the management process, and regulations. The two events were attended by approximately 300 people. Most participants were interested in how to identify fish that they were allowed to retain from those they could not. Future angler education events will be scheduled in other ports in future years, dependent upon funding.

4. Methodology for Partitioning Unidentified Catch into Species

Since there are no direct data on the species composition of unidentified rockfish, partitioning to species will require the application of species composition estimates derived from other data sources. Development of alternative methodologies for partitioning will consist of at least three steps. First, appropriate datasets for deriving species composition estimates must be identified for each type of RecFIN catch estimate. Second, a method for deriving estimates of species composition and applying these to estimates of unidentified rockfish must be chosen. Third, a method for converting estimated numbers of fish (by species) to weight must be chosen because weight is the quantity of interest to managers. This report does not seek to develop or recommend a particular methodology, but rather to outline the data and methods available.

Species composition data for Oregon recreational fisheries is available from three independent sources; ORBS, MRFSS/SEBS, and ODFW's charter vessel observer program (Observer) (Table 2). ORBS has collected rockfish species composition samples for fish landed by boat-based anglers fishing in ocean waters from a subset of dockside interviews since 1979. Through 1998 samples were recorded as weekly tallies, with the consequence that the number of fishing trips sampled for rockfish species composition is unknown. Starting May 1999, species composition samples were linked to individual fishing trips, and in 2000 rockfish species composition samples became mandatory for all dockside interviews. ORBS began collecting data on the species composition of rockfish discarded at sea (as reported by anglers) in May 2001. MRFSS has collected data on landed and discarded rockfish species composition from both boat-based and shore-based anglers fishing in ocean and estuary waters for 1980-1988 and 1993-2003. ODFW's observer program has collected species composition data for both landed and discarded fish for 2001 and 2003-present. These samples are restricted to charter vessels targeting bottomfish, with the majority of the samples from fishing activity taking place shallower than 40 fathoms. In addition, observers did not begin recording the condition (live or dead) of released fish until 2005. All three data sources are applicable to the partitioning of type A unidentified rockfish and to the partitioning of type B1 unidentified rockfish for those years that type B1 estimates represent released dead fish only. For those years that include angler reported landings in the estimates, only MRFSS data is applicable to partitioning type B1 unidentified rockfish. For all three catch types, only MRFSS/SEBS data is applicable to partitioning shore and estuary catch prior to 2001. After 2001, ORBS data may be applicable to partitioning catches made by boat-based anglers fishing in estuary waters. However, estuaries are not the focus of ORBS, and it does not sample all estuaries or estuary fisheries.

Table 2. Summary of data sources available for partitioning unidentified rockfish to species.

Survey	Years	Modes	Waters	Available data from species composition sampling: Number landed	Number discarded	Disposition (alive or dead)	Trip type or target species	Boat type
MRFSS	1980-1989	Shore and Boat	Ocean and Estuary	Y	Y	Y	N	Y
	1993-2003	Shore and Boat	Ocean and Estuary	Y	Y	Y	Y	Y
SEBS	2003-2005	Shore and Boat	Estuary	Y	Y	Y	Y	Y
ORBS	1979-1987	Boat	Ocean	Y	N	N	N	Y
	1987-2000	Boat	Ocean	Y	N	N	Y	N
	2001-present	Boat	Ocean and Estuary	Y	Y	N	Y	Y
Observer	2001, 2003-2004	Charter boat	Ocean	Y	Y	N	Y	Y
	2005-present	Charter boat	Ocean	Y	Y	Y	Y	Y

Given an appropriate source of species composition data, the method of partitioning that is the simplest, most straightforward, and consistent with current methods is to stratify the data by factors thought to affect species composition, calculate the average proportion of each species within each unique strata combination, then multiply the average proportion by the estimated number of unidentified rockfish in the corresponding strata combination. The stratification used will be a major decision point when applying this methodology and to a degree will be dictated by the available data. For 1979-May 1999, ORBS data may be stratified by year, month, port, and boat type (1979-1987 only) or trip type (1988-May 1999 only). For May 1999 to present, ORBS data may be stratified by both trip type and boat type, and at higher temporal (calendar date) and spatial (reef area) resolutions. MRFSS data may be stratified by time period (e.g. week, month, year), interview site (finer spatial resolution than port), primary target species (1993-2003), and waters fished (inland, state, or federal). Observer data may be stratified by time period, port, and location. For all data sources this method will likely require some aggregation of strata levels due to small sample sizes for some unique strata combinations. Alternatively, a statistical model similar to that developed by Sampson and Lee (2008) may be used to describe the relationship of species composition to factors such as year, port, boat type, etc. These relationships may then be used to predict the expected proportion of each species for any combination of factor levels. However, such an approach will likely be difficult to incorporate into the estimation and reporting process currently used by RecFIN. A hybrid approach may be to use a statistical model to inform decisions regarding stratification and aggregation of strata levels used in calculating average proportions.

Average weight for each species may be estimated for each combination of strata where estimates of unidentified rockfish occur. However, it is likely that a simplified stratification (compared to that used for calculating average species proportions) will be necessary due to the very small sample sizes for fish weights (e.g. one fish) that occur in some individual strata.

5. Resources Necessary to Partition Catch

Key in determining how much staff time to dedicate for the multiple agencies involved will be the level of priority given this item by the Council, along with the budget and staffing status of the respective agencies. ODFW would need to commit staff time to (1) finalize the methodology for portioning catch, (2) back calculate estimates by species both in numbers of fish and in weight, and (3) make the appropriate updates to databases, reports, calculations, etc. For the Council processes, time will be needed for both the SSC and GMT to review the proposed methodologies, as well as Council staff time working on this issue. The RecFIN Technical Team and/or Statistical Team will need to spend some time determining how unidentified rockfish should be dealt with in RecFIN. Finally, staff time for Pacific States Marine Fisheries Commission staff will also be necessary to make updates and/or corrections to the RecFIN database.

6. Pros and Cons of Partitioning

Will the species specific estimates be accurate? If so, they could provide better information for stock assessments. If not, they could detract from stock assessments and possibly overestimate or underestimate impacts for depleted species. Either way the revised estimates may result in increasing or decreasing previous estimates of depleted species and either put the estimate over or under the state harvest guidelines.

It is important to note that all of the methods of partitioning discussed will likely result in catch estimates that are biased high for common species and biased low for rare species because both samplers and anglers are more likely to be able to identify common species than rare species. The extent of this bias is unknown and it is likely not resolvable given our current knowledge. Research on the ability of anglers to identify rockfish to species may help resolve this issue, but to the best of our knowledge no such research is currently being undertaken.

7. Implementation Preference

ODFW believes that the most logical time to implement accounting for unidentified rockfish would be at the beginning of a biennial specification (SPEX) cycle. However, if there are conservation concerns for any species, action should be taken as soon as possible to mitigate those effects. All three states should begin accounting for the unidentified rockfish at the same time to prevent any one state from being held to a higher or lesser standard than the others.

ODFW will also continue with its angler education activities to promote accurate identification of rockfish, proper release techniques including use of recompression devices, and fishing strategies to avoid overfished species.

References

Sampson, D.B. and Y-W. Lee. 2008. Evaluation of Estimators for Rockfish Species Compositions. Project Progress Report to the Oregon Department of Fish and Wildlife Marine Resources Program. 23 pp.

California Department of Fish and Game Report on Unidentified Rockfish in the California Recreational Fishery

At its March 2009 meeting, the Pacific Fishery Management Council (Council) requested that the Groundfish Management Team (GMT), RecFIN committees, and others identify the conservation risks associated with the unidentified rockfish category and recommend a process to apportion the catch[1] by species. The California Department of Fish and Game (CDFG) offers these comments after reviewing the unidentified rockfish category in California Recreational Fisheries Survey (CRFS), considering issues of data quality, and evaluating possible conservation risks and workload priorities.

Amount and Source of Unidentified Rockfish Catch

Less than 10 percent of the total estimated recreational rockfish catch in California was classified as unidentified rockfish in 2008 (Table 1). The two primary sources of unidentified rockfish are fish reported by anglers and fillets that could not be identified to species. About 69 percent of the unidentified rockfish were angler-reported released fish, and 31 percent were angler-reported landed fish or fillets.

Table 1. 2008 CRFS estimates (mt) of total rockfish catch and unidentified rockfish catch, and percent of unidentified rockfish catch by CRFS District.

CRFS District	Management Area	CRFS Estimated Total Rockfish Catch (mt)	CRFS Estimated Unidentified Rockfish Catch (mt)	Percent Unidentified Rockfish Catch by District
Redwood (6)	Northern	110	0.2	0.2%
Wine (5)	North-Central North of Point Arena	45.7	0.6	1.3%
Bay (4)	North-Central South of Point Arena	158.7	17.6	11.1%
Central (3)	South -Central	245.3	15.2	6.2%
Channel (2)	Southern	119.7	16.5	13.7%
Southern (1)	Southern	109.7	24.7	22.5%
Total	*Statewide*	*789.1*	*74.7*	*9.5%*

A number of factors make it difficult for anglers to report catch to the species level:

- The sheer number of rockfish species encountered by California's anglers. In 2008, CRFS samplers observed 37 of the 60 or more rockfish species found off California.
- Many species of rockfish are very similar in appearance and difficult to identify.

[1] In this report, "Catch" is defined as total fishing mortality: landed fish plus mortality due to discards (all angler-reported released fish, alive or dead, with a mortality rate applied).

- Anglers are being asked to recall fish at the end of their trip when they may be rushed for time or fatigued. Either situation may adversely affect their ability to recall their released catch by species.

CDFG believes that some species are less likely to comprise the unidentified rockfish category than others. This is because anglers are better able to identify and more likely to recall easily recognizable species, prohibited species, and/or species with individual bag limits. Since 2000, the CDFG increased outreach and education efforts promoting protection of overfished rockfishes and improving groundfish identification materials. CDFG believes that these ongoing efforts help reduce illegal take, and increase the ability of anglers to identify prohibited or managed species, and contributed to the decline in unidentified rockfish catch in the California recreational fishery.

Management Issues

Beginning to account for unidentified rockfish in species specific catches would be a step toward full catch accounting. Accomplishing this task in a meaningful manner would require a commitment of staff resources that would be diverted from other Council priorities. **The potential error that can be introduced into catch estimates as a result of accounting for unidentified rockfish must be weighed against the potential for conservation risks when deciding when or whether the Council should account for this additional catch.**

If the Council decides to go forward with decomposing the unidentified rockfish catch, this catch needs to be accounted for in all processes in the management cycle before incorporating unidentified rockfish catch into inseason catch tracking. Five processes requiring action or analysis by the Council or GMT are typically undertaken in a management cycle, each of which would be affected by accounting for unidentified rockfish: 1) stock assessments, 2) allocation between sectors, 3) interstate catch sharing agreements, 4) regulatory development, and 5) inseason catch tracking relative to management targets (e.g. harvest guideline, HGs). The potential implications of accounting for unidentified rockfish catch in each process are described in the March 2009 Final Inseason Supplemental GMT report (Agenda Item G.7.b) http://www.pcouncil.org/bb/2009/0309/G7b_SUP_GMT_0309.pdf. To date, with few exceptions, unidentified rockfish have not been accounted for in any of these steps. To forego accounting in any one process in the management cycle while accounting for the catch in another, results in potential inequities. For example, accounting for unidentified rockfish catch inseason before accounting for them in the historical catch previously used for stock assessments and allocation, could unduly constrain the recreational fishery.

Potential Conservation Risks

Conservation risks could ensue if the total magnitude of the additional apportioned catch of any species caused its annual optimum yield (OY) or allowable biological catch (ABC) to be exceeded. Conservation risks were evaluated for black, blue, bocaccio, canary, cowcod, widow and yelloweye rockfish and Minor Nearshore Rockfish South using CRFS catch data from the 2008 season. **The addition of apportioned**

unidentified rockfish catch did not result in exceeding any annual HG, OY or ABC of the species or management groups evaluated.

A simple approach was used to estimate species composition of the unidentified rockfish category for the risk evaluation: the estimated number of unidentified rockfish was partitioned into individual species based on the proportion of each species in the "identified catch". Estimates were made for each CRFS district and catch type (sampler-observed landed fish, angler-reported landed fish, and angler-reported released fish). Mortality rates were applied to released fish. The total weight of the catch was then estimated by multiplying the number of fish by that species average weight. Data from 2008 were used, because the magnitude of the 2008 unidentified rockfish catch is assumed to be the most representative of the 2009 catch given the recent changes in the economy, current groundfish depth restrictions, ongoing outreach efforts, and salmon restrictions.

For angler-reported released fish, this methodology is expected to overestimate species that anglers are better able to identify or more likely to recall (i.e., easily recognizable species, prohibited species, and species with size or bag limits). Thus, the method most likely overestimated the catch of black, blue, bocaccio, canary, cowcod, widow and yelloweye rockfishes as well as most members of Minor Nearshore Rockfish South. More refined methods would be desirable if the Council decides to decompose the unidentified rockfish category in catch histories and in inseason estimates.

The estimated 2008 unidentified rockfish catch apportioned by species and CRFS district is presented in Table 2, and the estimated total catch in Table 3. **The HGs for Minor Nearshore Rockfish South and black, blue, bocaccio, canary and widow rockfishes would not have been exceeded as a result of accounting for unidentified rockfish in 2008 (Table 3). Cowcod would have exceeded its projected recreational impact by 0.7 mt. However, the overage would not have resulted in exceeding the OY or ABC.**

Table 2. Results of the apportionment of the 2008 unidentified rockfish catch by CRFS District for overfished and managed species groups.

Species/Group	Estimated Unidentified Rockfish Catch by CRFS District (mt)						
	South (1)	Channel (2)	Central (3)	Bay (4)	Wine (5)	Redwood (6)	*Statewide**
Black Rockfish	0.00	0.00	0.69	0.80	0.10	0.14	*1.7*
Blue Rockfish	0.01	0.35	2.44	2.65	0.17	0.01	5.6
Bocaccio	8.00	1.22	0.17	0.00	0.00	0.00	*9.4*
Canary Rockfish	0.06	0.72	0.19	0.96	0.04	0.02	*2.0*
Cowcod	0.05	0.66	0.00	0.00	0.00	0.00	*0.7*
Minor Nearshore Rockfish South**	4.18	3.49	6.59	8.96	0.31	NA	*23.5*
Widow Rockfish	0.00	0.02	0.21	0.00	0.00	0.00	*0.2*
Yelloweye Rockfish	0.00	0.00	0.01	0.16	0.04	0.01	*0.2*

***** Rounded to the nearest tenth.

** Includes blue rockfish

Table 3. Comparison of 2008 harvest guidelines with total estimated catch (unidentified rockfish estimated catch apportioned to species plus CRFS estimates by species).

Species/Group	Estimate of Unidentified Rockfish Catch (mt)	2008 CRFS Estimates (mt)	Total Estimated Catch (mt)	2008 Harvest Guideline* (mt)	Total Estimated Catch as a Percent of 2008 Harvest Guideline
Black Rockfish	1.7	154.3	156.0	168.0	**92.9%**
Blue Rockfish	5.6	85.0	90.6	NA	**NA**
Bocaccio	9.4	34.8	44.2	66.3	**66.7%**
Canary Rockfish	2.0	5.6	7.6	9.0	**84.3%**
Cowcod	0.7	0.3	1.0	0.3*	**320.0%**
Minor Nearshore Rockfish South**	23.5	303.0	326.5	426.0	**76.7%**
Widow Rockfish	0.2	4.7	4.9	8.0	**61.6%**
Yelloweye Rockfish	0.2	1.7	1.9	2.1	**91.0%**

*****Not a harvest guideline for cowcod; this is a projected impact and an overage does not require mandatory action if exceeded.
** Includes blue rockfish

Potential Apportionment Methods

Decomposing the unidentified rockfish category to its component species will produce results of questionable reliability in the absence of a deliberative and methodical approach. Should the Council decide to use decomposed unidentified rockfish catch estimates in management processes, considerable resources may be needed to undertake a coordinated effort among the three states to develop plausible methods for the west coast recreational fishery. Moreover, the reconstruction of historic catch will likely require different methods than for estimating inseason catch, because less data are available for decomposing historic catch than for current catch.

Adding species estimates from the unidentified rockfish category to the individual species catch estimates will increase uncertainty. Any approach that is chosen should be thoroughly evaluated and potential biases identified. Species composition of the unidentified rockfish category and average weight of individual species are typically influenced by:

- Catch category (i.e., landed or released)
- Fishing mode
- Geographic area
- Fishing depth
- Regulations
- Time period (seasons or years)
- Long-term trends in relative abundance of species

The Council's ongoing California catch reconstruction project (Ralston et al, 2009) has not yet attempted to estimate species composition of released fish. However, many of the factors that lead to uncertainties in that project's estimates of species composition of landed fish would apply to estimates of the species composition of the unidentified rockfish category.

A major limitation is the availability of suitable data sets and the potential biases introduced by their use, including:

- Most of the data sets are relatively recent and may not reflect historic trends in species composition.
- The data available will vary depending on the time period and location.
- It may be necessary to average across time periods due to uncertainty resulting from a lack of data prior to the Marine Recreational Fisheries Statistical Survey sampling or gaps in the sampling program.
- Most sampler-observed data is for retained catch. Species composition of retained catch is not representative of released catch.
- All sampler-observed data on released fish is from Commercial Passenger Fishing Vessels (CPFVs). Species composition in the private/rental boat mode and shore mode tend to differ from the CPFV mode. By weight, 46 percent of the unidentified released rockfish in 2008 was from the private/rental and shore modes. The lack of direct observations of released fish in the private/rental and shore modes will increase the uncertainty in any estimates of species composition.
- Angler-reported catch data are dependent on the angler's ability to identify and recall their catch. Species that are easily identified tend to be more prevalent in the reported catch.

Recommendations

Given that no conservation risks were apparent from unidentified rockfish catch, the biases resulting from estimation methods that rely on limited data, and the resources that would be diverted from other Council duties to fully address the issue, CDFG does not believe accounting for unidentified rockfish catch in the Council process is imperative. **Therefore, CDFG recommends no further action.**

If the Council decides to proceed:

CDFG recommends that species specific accounting should begin with the adoption of a stock assessment that includes SSC and RECFIN approved apportionment methodologies and that the process should begin during the same management cycle for all three states. As much as possible, consistent methodologies should be applied among the states.

CDFG recommends that any apportionment of historic catches proceed as part of the currently ongoing historic catch reconstruction efforts.

The following are considerations that contribute to these recommendations:

- State agency staff indicated that addition of an entire catch stream is a time and labor-intensive undertaking that would divert many hours of time from existing duties and assignments. With current furloughs and overtime restrictions on many state staff due to budget issues, the time devoted to this item will need to be taken from other Council priorities.

- The CRFS staff indicated that current work priorities, including integrating depth dependent mortality rates, revising catch type categories, and updating average weight estimates, are expected to have a more substantial impact on CRFS catch estimates and believes these improvements need to be completed before any work on apportioning unidentified rockfish begins.
- Given the implications of incorporating estimates of unidentified rockfish into the historical and inseason catch estimates, the GMT noted at the March 2009 Council meeting that the Council may wish to have any new methodology reviewed by the RecFIN Technical Committee. The CDFG agrees with this suggestion, however, the time commitments of the RecFIN Technical Committee are unknown and may present delays.

Reference

Ralston, S., Pearson, D., Field, J., and Key, M. 2009. Draft documentation of the California reconstruction project. 130 p.

GROUNDFISH MANAGEMENT TEAM REPORT ON CATCH OF UNIDENTIFIED ROCKFISH SPECIES IN THE RECREATIONAL FISHERY

Introduction

The Groundfish Management Team (GMT) reviewed the reports provided by California, Oregon, and Washington regarding accounting for unidentified rockfish catch in Recreational Fishery Information Network (RecFIN). Each report included the magnitude of unidentified rockfish catch, assessment of the conservation risks presented by unidentified rockfish catch, and the associated management implications.

Catch accounting is central to the GMT's role in the Council's management of the Pacific Coast groundfish fisheries. As reflected in the revised National Standard 1 guidelines, an accounting of total fishing removals, including uncertainty in our ability to account for catch, is essential to sustainable fisheries management. For recreational fisheries, the challenges and complexities involved with surveying catch are well known. These challenges and complexities have been an issue of national focus, stemming from a 2006 National Research Council report and new mandates and programs included in the Magnuson-Stevens Reauthorization Act of 2006.[1] NMFS has begun implementation of new projects and regulatory programs through the Marine Recreational Information Program (MRIP). The recreational survey programs in the three west coast states are currently on par or ahead of those in other regions of the country. Although the GMT would always prefer better catch information, we fully recognized that recreational monitoring involves prioritization amidst limited resources.

The magnitude of the 2008 unidentified rockfish catch varies between regions within states. Estimates of unidentified rockfish catch in 2008 varied from less than 1 percent of total rockfish catch in Washington, Oregon, and Northern California to 13.8 percent in Southern California (CRFS District 1) (Table 1). The statewide unidentified rockfish catch represented less than 7 percent of the total rockfish catch in each state.

[1] National Research Council, Review of Recreational Fisheries Survey Methods (2006).

Table 1. Total rockfish catch, unidentified rockfish catch, and unidentified rockfish catch as a percentage of total rockfish catch, by region in 2008 reported numbers of fish.

State/Region	Total Rockfish Catch (# of Fish)	Unidentified Rockfish Catch (# of Fish)	Unidentified Rockfish as a % of Total Rockfish Catch
Washington	225,139	454	0.2%
Oregon	304,319	1,121	0.4%
CA, District 1	189,201	26,199	13.8%
CA, District 2	201,988	17,168	8.5%
CA, District 3	381,194	16,773	4.4%
CA, District 4	253,978	17,937	7.1%
CA, District 5	52,233	591	1.1%
CA, District 6	99,260	213	0.2%
CA Total	1,177,854	78,880	6.7%

None of the states reported an overage in any species optimum yield (OY) in 2008 based on their preliminary estimates of unidentified rockfish impacts. However, we do not have information to inform ongoing conservation risk inseason at this time. As mentioned in our report under Agenda Item E.5.b, the GMT will evaluate the management uncertainty associated with all fisheries in analyzing control rules under Amendment 23.

The GMT could not reach consensus on whether the Council should move forward with accounting for unidentified rockfish catch. Concerns expressed include the results of the quantification of conservation risk, work load associated with accounting for unidentified rockfish catch, the amount of unidentified rockfish catch, the magnitude of error in existing catch estimates, other priorities of the state programs in improving the existing catch estimates, and the potential biases to be introduced in the apportionment of unidentified rockfish catch given limited data.

Methodology Review Steps

The states' evaluation of conservation risks involved use of preliminary estimation methods, which need refinement and review prior to final implementation. The following sequence represents an outline for developing and implementing catch apportionment methods:

- State and Science Center personnel develop and submit proposed methodology for historical apportionment of unidentified rockfish to species-specific catch estimates to the RecFIN Technical Committee.
- State representatives develop and submit proposed methodology for inseason apportionments to the RecFIN Technical Committee.
- RecFIN Technical Committee provides comments and refinement.
- SSC review and approval of inseason apportionment methodology.

The GMT recommends implementation of the apportionment of the historical unidentified rockfish catch be conducted as part of each state's historical catch reconstruction effort. Assessments informing the 2013-2014 management cycle will be conducted in early 2011. The proposed historical apportionment methodology should be provided to the RecFIN Technical Committee early enough to allow for review during their October 2010 meeting.

In addition to historical catch reconstruction, each state needs to develop inseason unidentified rockfish catch apportionment methods. The GMT, the RecFIN Technical Committee and the SSC should review this methodology prior to approval by the Council for final implementation. Partitioning unidentified rockfish into species would also inform catch projection models preseason and may affect catch sharing agreements or allocations.

Considerations for the Timing of Implementation

The time needed for methodology development and review would preclude implementation in the 2010 season for all three states. Stock assessments have been adopted for the 2011 and 2012 biennial specification process. Likewise, there is not sufficient time for development and review of methods before the estimates are needed for implementation in other aspects of the management process for 2011-2012. In other words, historical catch estimates cannot be used in assessments until 2011 at the earliest. Likewise, development of methodologies by state personnel for inseason accounting and review of those methodologies cannot happen prior to development of preliminary management alternatives for the 2011-2012 cycle.

The unidentified rockfish catch could be accounted for in the 2013-2014 biennial specification process with sufficient time for methodological review and would be the first opportunity to incorporate it in all aspects of the management cycle. Development and review of the unidentified rockfish catch apportionment methodology may proceed in the interim in 2010 and the results integrated into the management processes for the 2013-2014 regulatory specification development.

Lastly, as mentioned above, the NMFS MRIP is focused on improving recreational survey methodologies. The Highly Migratory Species Management Team was able to initiate and coordinate with RecFIN and the states on two recreation survey project proposals that were funded by the NMFS Marine Recreational Information Program in Fiscal Year 2009. The GMT recommends that this unidentified rockfish issue be submitted for MRIP funding in Fiscal Year 2010. Funding from MRIP could help address some of the budgetary and staffing concerns of the states and bring in outside experts to help examine the issue. If the Council concurs, members of the GMT have expressed their willingness to assist the RecFIN Technical Committee in developing the proposal.

PFMC
09/17/09

Agenda Item E.8.b
Supplemental SSC Report
September 2009

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON UNIDENTIFIED ROCKFISH SPECIES IN THE RECREATIONAL FISHERY

Mr. Russell Porter of the Pacific States Marine Fisheries Commission briefed the Scientific and Statistical Committee (SSC) on the treatment of unidentified rockfish within the Recreational Fisheries Information Network (RecFIN), including a historical perspective and differences among States in the way that this catch category is tracked and recorded. Mr. John Budrick (California Department of Fish and Game [CDFG]) and Ms. Lynn Mattes (Oregon Department of Fish and Wildlife [ODFW]) of the Groundfish Management Team (GMT) were present to answer questions regarding written materials that were provided by ODFW and CDFG. The SSC also received a written report from Washington Department of Fish and Wildlife on this subject.

Unidentified rockfish catches from recreational fisheries are currently not taken into account in stock assessments, the setting of optimum yields (OY), or the tracking of catches against limits. The amount of unidentified rockfish in each state is small, but not insignificant, compared to identified catches, and the proportion of unidentified catch has been trending down in recent years, apparently due to angler education efforts and public awareness that overfished species may not be retained. Preliminary analyses presented in the State reports indicate that this unaccounted catch is probably not of sufficient magnitude to have caused the OY for any overfished rockfish to have been exceeded in recent years.

It is consistent with the goal of total catch accounting for this source of additional impacts to be included in rockfish management. However, there does not appear to be an immediate conservation concern related to this issue, and development of a solution represents a significant additional workload. There is a range of possible ways to apportion this catch by species, and differences exist in the data collected among States that complicate potential solutions. Therefore, the SSC recommends that the RecFIN staff be asked to work with state representatives to partition the unidentified rockfish catch to species so that the results can be incorporated into management as soon as is practical. The SSC suggests that any proposed analytical protocols should be reviewed by the RecFIN Statistical Committee before they are considered for use in stock assessments or management decisions.

PFMC
09/16/09

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE REPORT ON UNIDENTIFIED ROCKFISH IN THE RECREATIONAL FISHERY

In March, it was brought to the Council's attention that unidentified rockfish catches in the recreational fishery have not been accounted for in historical annual catch estimates. This could be a concern to the extent that a portion of the unidentified rockfish could be overfished species. In response, the Council requested that each state provide a report at the September meeting that describes the magnitude of the unidentified catch, the reasons why all fish are not identified, the potential amount of unidentified rockfish that could be overfished species, and a recommendation for how to move forward. This is the Washington Department of Fish and Wildlife's (WDFW's) initial response to that request.

Magnitude of Unidentified Catch

Unidentified rockfish in Washington is comprised of both retained and released catches. When interviewing anglers, WDFW samplers will attempt to collect complete species information for all fish caught, at times using rockfish identification cards to assist anglers in accurately determining the species. For a rockfish to be recorded in the "unidentified" category, it means that the fish were not available to the sampler (for retained catch) or were released by the angler who could not identify the species.

In RecFIN, estimates of recreational catches are reported as landed or retained catch (A), and released catch (B). Released catch is further separated into catch that is reported by the angler to be released dead (B1) or released alive (B2). WDFW's Ocean Sampling Program records all released rockfish in the B1 category, and does not ask anglers whether or not a fish was released live (B2). The mortality of released fish is then estimated using the Groundfish Management Team's discard mortality by depth matrix.

The number of identified rockfish caught by Washington anglers, on average, is about 281,500 per year. Of that amount, about 10% are released (Table 1).

Table 1. Number of identified rockfish caught in Washington recreational fishery, 2005-2008.

Identified Rockfish	2005	2006	2007	2008
Total Rockfish Landed (A)	288,072	268,293	248,716	205,597
Total Rockfish Released (B1)	43,479	29,332	24,021	19,088

The number of unidentified rockfish recorded by WDFW samplers, on average, is about 355 per year, or about 0.4 mt using an average weight across all rockfish species. Of that amount, approximately 58% are retained catch. In general, unidentified rockfish represents less than 0.1% of the total rockfish landed and 0.5% of the total rockfish released (Table 2).

Table 2. Estimated catch of unidentified rockfish in Washington recreational fishery, 2005-2008.

Unidentified Rockfish		2005	2006	2007	2008
Numbers of Fish	Landed (A)	295	122	145	278
	Released (B1)	165	127	113	175
	Total	***460***	***249***	***259***	***454***
Weight (mt)	Landed (A)	0.4	0.1	0.2	0.3
	Released (B1)	0.2	0.2	0.1	0.2
	Total	***0.6***	***0.3***	***0.3***	***0.5***
Percent Total Rockfish Landed		0.1%	0.05%	0.06%	0.14%
Percent Total Rockfish Released		0.4%	0.4%	0.5%	0.9%

Unidentified Rockfish by Washington Subarea

Higher amounts of unidentified rockfish are encountered off Washington's north coast (WDFW Marine Catch Areas 3 and 4) with decreasing amounts as you move further south. On average, about 66% of the unidentified rockfish were from the north coast and less than 10% from the Columbia area (Marine Catch Area 1) (Figure 1).

The diversity of rockfish species encountered in the north coast is also considerably greater than what occurs in the south coast (Marine Catch Area 2) and Columbia areas, which may contribute to the higher amounts of unidentified rockfish in the area. Black rockfish make up 92% of the rockfish landed in the south coast and 97% in the Columbia area with yellowtail rockfish comprising most of the balance in both areas. In the north, about 85% are black rockfish, with the balance being blue, china, copper, quillback, and yellowtail rockfish.

Another factor that may contribute to the higher amount of unidentified rockfish in the north could be the larger number of private boats that fish the area. In general, having more boats to sample means that a sampler is not always present when the boat reaches the dock, giving anglers time to fillet their catch before the sampler arrives.

Unidentified Rockfish by Trip Type

On average, most of the unidentified rockfish are encountered on fishing trips targeting bottomfish (47%), followed by salmon (26%) trips and halibut trips (22%) (Figure 2). Salmon and halibut trips are defined by species on board even though combination trips could occur (e.g., halibut and bottomfish). Although rare, we have seen a few salmon/halibut combination trips in recent years (noted as sal/hal in the figure).

The amount of unidentified rockfish attributed to the different types of fishing trips varied between years, which could be the result of changes in regulations, such as depth restrictions, or fluctuations in salmon and halibut seasons.

Figure 1. Distribution of unidentified rockfish by Washington recreational subarea.

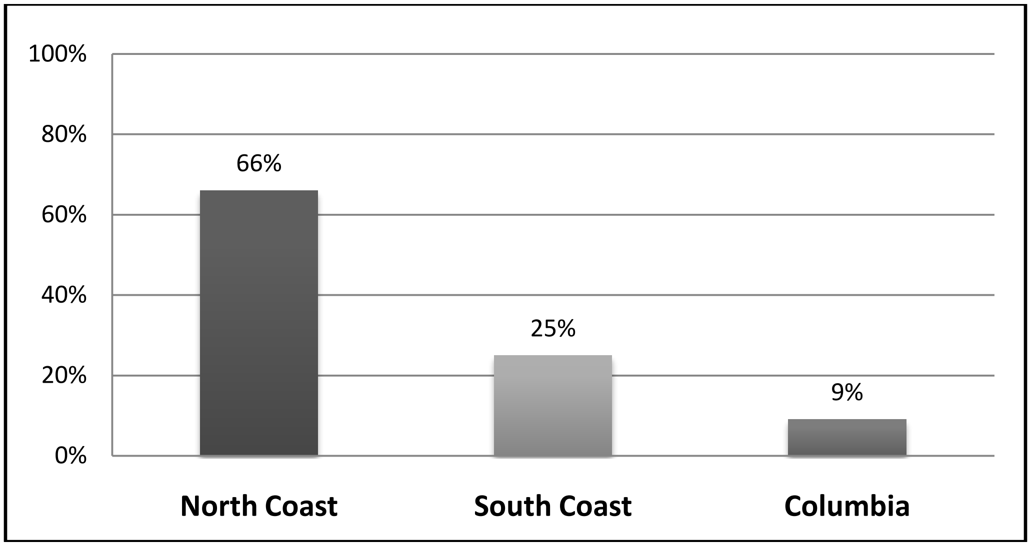
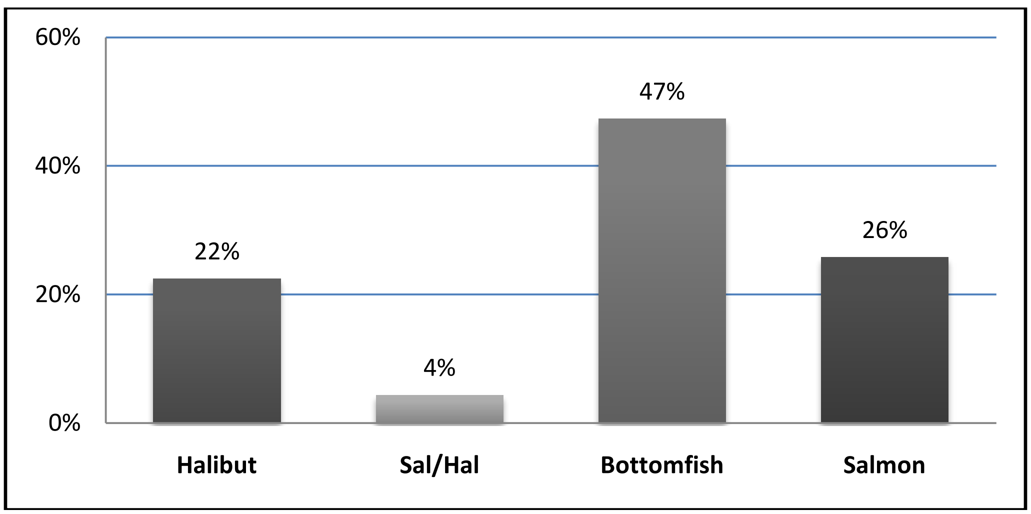


Figure 2. Distribution of unidentifed rockfish by trip type.



<u>Estimating Proportion of Overfished Species</u>

From a conservation perspective, it is essential that we have as accurate catch reporting as possible in all groundfish fisheries, including recreational. Incorporating unidentified rockfish catches into historical and future catch estimates could affect achievement of optimum yields for overfished species, such as canary and yelloweye rockfish. Given that these species are managed under rebuilding plans with recreational-specific harvest guidelines, we want to be certain that our estimates are based on sound data collection and expansion methods.

Apportioning the unidentified rockfish to the species level requires a process for estimating the species composition of both the landed (A) and released (B1) unidentified rockfish. It is also important to take into consideration the variability in landed and released catch by coastal area, month, trip type and boat type when deciding on the best apportionment method.

WDFW examined summarized data, which were provided by the Oregon Department of Fish and Wildlife (ODFW), from observations on Oregon charter vessel trips. After careful consideration, we determined that the ODFW data would not be representative of the Washington unidentified rockfish catches. There are considerable differences in the fishing regulations between the two states, including depth restrictions by area and bag limits, and target species, all of which affect where boats fish and the composition of their retained and discarded catch In addition, as noted above, there is quite a bit of difference among Washington subareas relative to rockfish catch composition, so applying one species composition across all Washington subareas does not seem appropriate.

Ideally, WDFW would have at-sea observations for Washington trips across trip types and subareas. However, absent this data the best source of information we have is the Ocean Sampling Program data. Apportioning the unidentified rockfish to the species level using these data statified by port, month, trip type and boat type will provide our best estimate of overfished rockfish species catches, and will ensure that consideration for the variablity in management measures by Washington subarea are accounted for in the estimates.

Results

By applying the WDFW Ocean Sampling Program annual expanded estimates to the unidentified rockfish catch data, we calculated preliminary estimates of yelloweye and canary rockfish (Table 3). These catches have not been stratified by depth; therefore, we have not yet applied the depth-based mortality rates to estimate the mortality of canary and yelloweye rockfish in the unidentified rockfish category.

Table 3. Preliminary WDFW catch estimates of yelloweye and canary rockfish in the unidentified rockfish category.

Yelloweye Rockfish		**2005**	**2006**	**2007**	**2008**
Numbers of Fish	Landed (A)	0.12	0.04	0.06	0.08
	Discarded (B1)	11	6	8	13
	Total	***11.07***	***6.54***	***8.34***	***12.95***
Weight (mt)	Landed (A)	0.0003	0.0001	0.0001	0.0002
	Discarded (B1)	0.03	0.02	0.02	0.03
	Total	***0.03***	***0.02***	***0.02***	***0.03***
Canary Rockfish		**2005**	**2006**	**2007**	**2008**
Numbers of Fish	Landed (A)	0.26	0.08	0.09	0.10
	Discarded (B1)	12	9	10	17
	Total	***12.09***	***9.13***	***10.37***	***17.56***
Weight (mt)	Landed (A)	0.0002	0.0001	0.0001	0.0001
	Discarded (B1)	0.01	0.01	0.01	0.02
	Total	***0.01***	***0.01***	***0.01***	***0.02***

Recommendation

In general, WDFW recommends that the unidentified rockfish catch be accounted for through the annual catch reporting by state and the biennial management and specifications process, beginning with the 2011-12 process. Given the variability among the three states relative to the magnitude and catch composition of unidentified rockfish, we believe that a coordinated approach by the Groundfish Management Team and RecFIN staff would be appropriate. Provided that potential unidentified rockfish catches can be accounted for preseason, and management measures adopted accordingly through the biennial management process, we would not see a need to address unidentified rockfish catches through inseason management.

Specific to Washington, WDFW plans to stratify our preliminary estimates of unidentified rockfish by depth and apply the depth-based mortality rates to estimate the mortality of rockfish, by species, within the unidentified rockfish category. We will then provide that information to the GMT and Scientific and Statistical Committee in November for consideration.