# Status of the U.S. petrale sole resource in 2010

Melissa A. Haltuch[1], Allan Hicks[1], and Kevin See[2]

[1] National Marine Fisheries Service
Northwest Fisheries Science Center
2725 Montlake Blvd. E.
Seattle WA, 98112
206-860-3480 (phone)
206-860-6792 (fax)
Melissa.Haltuch@noaa.gov
Allan.Hicks@noaa.gov

[2] School of Aquatic and Fisheries Sciences
University of Washington
Seattle, WA 98195

23 November, 2011

# 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 2010. 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 1981–2010 range between 701-3,056 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 2005 assessment, subsequent ACLs were reduced to 2499 mt. Following the 2009 assessment /ACLs were further reduced to 976 mt for 2011. 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). In 2009 catches of petrale sole began to be restricted due to declining stock size.

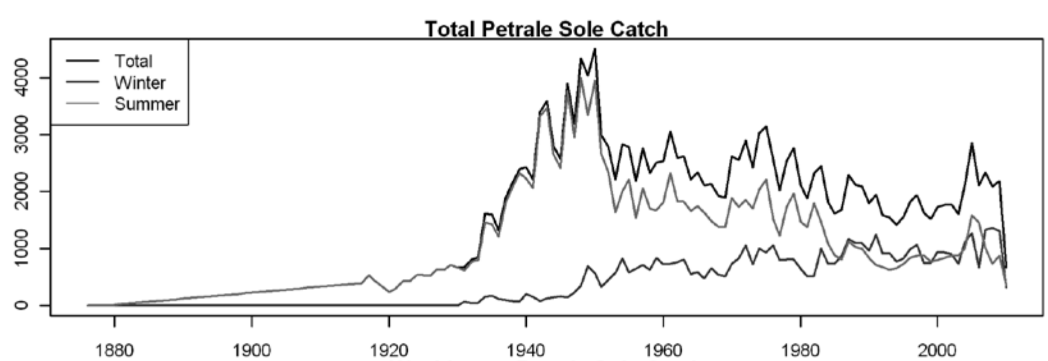



Figure a. Total and seasonal petrale sole catch history, 1876-2010.

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

| Fishing year | Washington trawl | Oregon trawl | California trawl | Total |
|---|---|---|---|---|
| 1999 | 434 | 481 | 582 | 1,496 |
| 2000 | 637 | 567 | 669 | 1,874 |
| 2001 | 614 | 615 | 583 | 1,813 |
| 2002 | 759 | 544 | 484 | 1,788 |
| 2003 | 858 | 653 | 413 | 1,924 |
| 2004 | 1,025 | 403 | 483 | 1,912 |
| 2005 | 1,298 | 646 | 767 | 2,711 |
| 2006 | 944 | 861 | 790 | 2,595 |
| 2007 | 601 | 621 | 1,013 | 2,235 |
| 2008 | 464 | 692 | 1,023 | 2,179 |
| 2009 | 497 | 681 | 557 | 1,736 |
| 2010 | 197 | 302 | 203 | 701 |

*Data and Assessment*

The previous stock assessment for petrale sole was developed during 2009 using Stock Synthesis 3, an integrated length-age structured model. The current assessment has been upgraded to the newest version of SS (3.21d, R. Methot) and is structured as an annual model with the start of the fishing year on November 1 and ending on October 31. The fisheries are structured seasonally based on winter (November to February) and summer (March to October) fishing seasons due to the development and growth of a wintertime fishery, beginning in the 1950s. In recent decades the wintertime catches often exceed the summertime catches. 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 a sensitivity model run with standardized fishery CPUE indices developed for the current assessment. While the impact of rapidly changing regulations in the trawl fishery after 2000 can make the fishery-based CPUE indices unreliable the standardized fishery CPUE indices attempt to account for the impact of some of the management changes. Biological data are derived from both port and on-board observer sampling programs. The National Marine Fisheries Service (NMFS) early (1980, 1983, 1986, 1989, 1992) and late (1995, 1998, 2001, and 2004) triennial bottom trawl survey and the Northwest Fisheries Science Center (NWFSC) trawl survey (2003–2010) 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 rate of natural mortality 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 reversed between 2005 and 2010 and the stock has been declining, most likely due to strong year classes having passed through the fishery (Table b). Since 2010 the total biomass of the stock has increased slightly as a large 2007 recruitment appears to be moving into the population. Note that these fish are not yet fully mature so this increase is not strongly reflected in the spawning biomass. The estimated relative depletion level in 2011 is 18% (~95% asymptotic interval: ±3.6%, ~ 75% interval based on the range of states of nature: 15.1-21.4%), corresponding to 4,720 mt (~95% asymptotic interval: ±493 mt, states of nature interval: 4,440-5,052 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 since 1956.

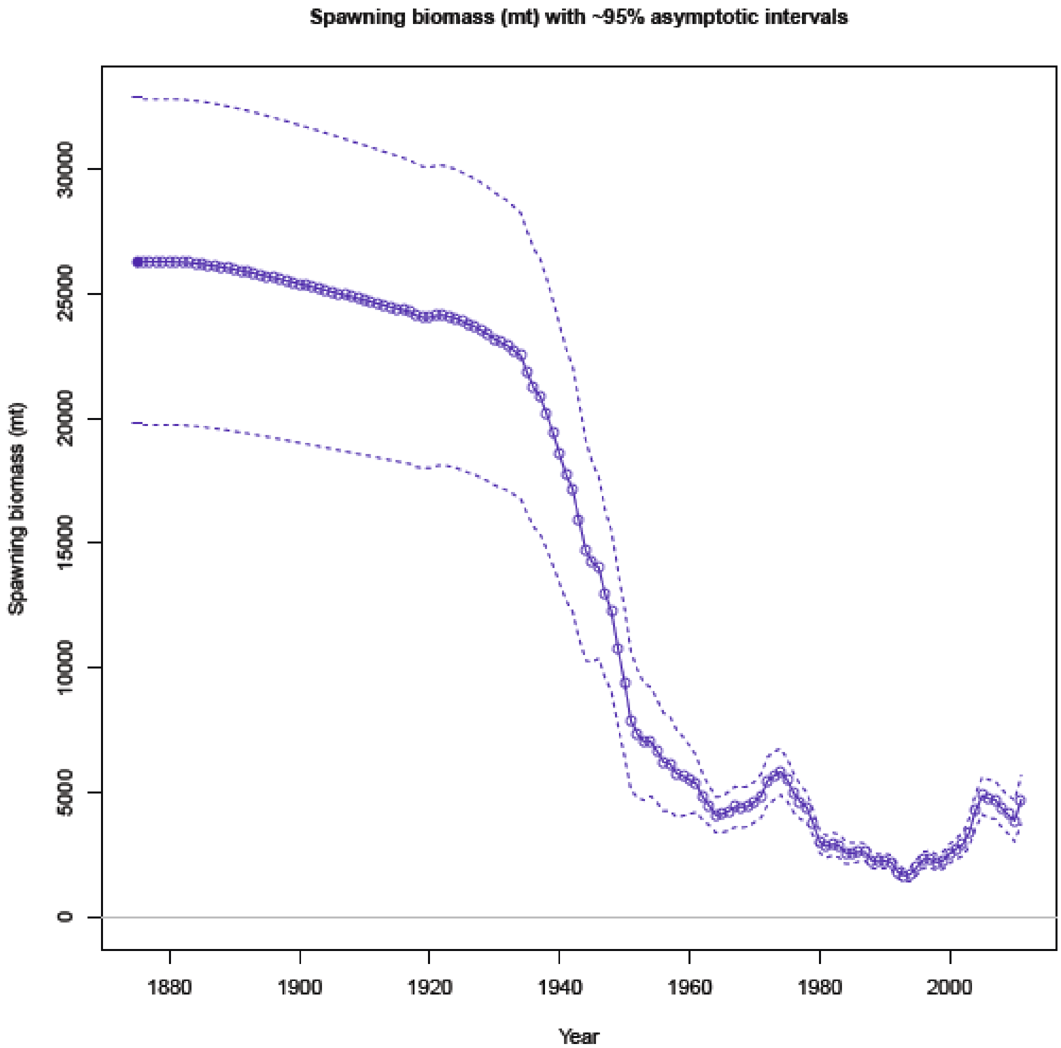



Figure b. Estimated spawning biomass time-series (1876-2011) for the base case model (solid line) with approximate asymptotic 95% confidence interval (dashed lines).

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 | 2,562 | 195 | 2,400-2,760 | 9.8% | 1.8% | 8.2%-11.7% |
| 2001 | 2,747 | 211 | 2,567-2,967 | 10.5% | 2.0% | 8.7%-12.6% |
| 2002 | 2,925 | 235 | 2,723-3,173 | 11.1% | 2.2% | 9.3%-13.5% |
| 2003 | 3,403 | 285 | 3,154-3,709 | 12.9% | 2.6% | 10.7%-15.7% |
| 2004 | 4,288 | 347 | 3,983-4,662 | 16.3% | 3.2% | 13.6%-19.8% |
| 2005 | 4,877 | 383 | 4,543-5,287 | 18.6% | 3.6% | 15.5%-22.4% |
| 2006 | 4,754 | 393 | 4,415-5,168 | 18.1% | 3.6% | 15.0%-21.9% |
| 2007 | 4,704 | 388 | 4,379-5,099 | 17.9% | 3.5% | 14.9%-21.6% |
| 2008 | 4,368 | 383 | 4,063-4,737 | 16.6% | 3.3% | 13.8%-20.1% |
| 2009 | 4,119 | 389 | 3,831-4,463 | 15.7% | 3.2% | 13.0%-18.9% |
| 2010 | 3,861 | 422 | 3,580-4,194 | 14.7% | 3.1% | 12.2%-17.8% |
| 2011 | 4,720 | 493 | 4,440-5,052 | 18.0% | 3.6% | 15.1%-21.4% |

*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 relationship with the decline in spawning biomass, punctuated by larger recruitments (Figure c). The four weakest recruitments since 1939 are estimated to be from 1962, 1986, 1987, and 1992, while the four strongest recruitments since 1939 are estimated to be from 1939, 1966, 1998, and 2007 (Figure c). Until 2007 the most recent large recruitment event, is estimated to be in 2006, and was smaller than of the 1998 recruitment event (Table c).

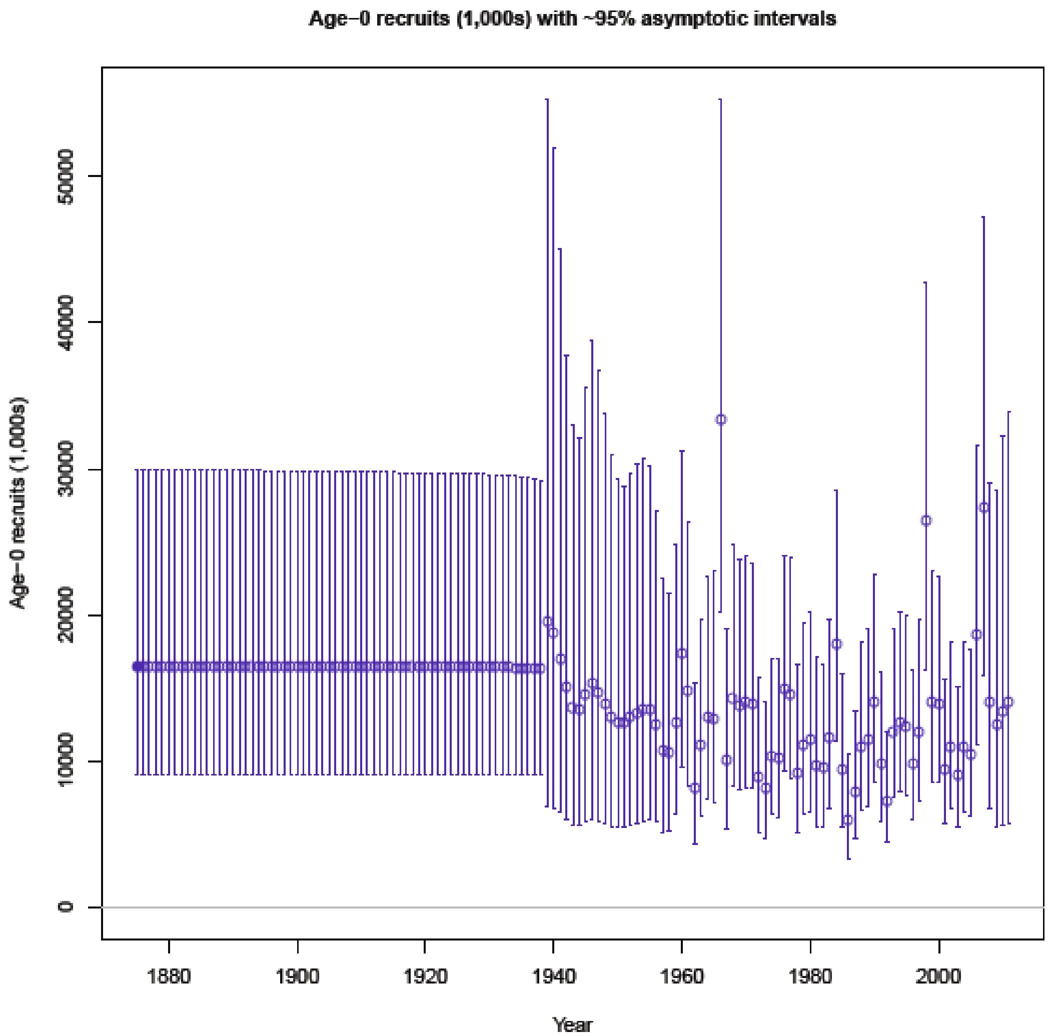



Figure c. Time series of estimated petrale sole recruitments for the base case model (round points) with approximate asymptotic 95% confidence interval (vertical bars).

Table c. Recent estimated trend in petrale sole recruitment.

| Fishing year | Estimated recruitment (1000s) | ± ~95% confidence interval | Range of states of nature |
|---|---|---|---|
| 2000 | 13,878 | 3515 | 10,824-18,231 |
| 2001 | 9,474 | 2448 | 7,385-12,453 |
| 2002 | 11,028 | 2837 | 8,590-14,498 |
| 2003 | 9,104 | 2398 | 7,094-11,959 |
| 2004 | 10,918 | 2879 | 8,511-14,324 |
| 2005 | 10,492 | 2846 | 8,180-13,756 |
| 2006 | 18,698 | 5087 | 14,589-24,492 |
| 2007 | 27,330 | 7783 | 21,378-35,682 |
| 2008 | 14,021 | 5400 | 10,924-18,301 |
| 2009 | 12,448 | 5510 | 9,678-16,283 |
| 2010 | 13,449 | 6305 | 10,476-17,586 |
| 2011 | 14,004 | 6639 | 10,749-18,457 |

*Reference Points*

Unfished spawning stock biomass was estimated to be 26,278 mt in the base case model (Figure b). The target stock size ($SB_{25\%}$) is therefore 6,570 mt which gives a catch of 2,578 mt (Table i, Figure b). Model estimates of spawning biomass at MSY and MSY yield are slightly lower than those specified under the current harvest control rule. Maximum sustained yield (MSY) applying recent fishery selectivity and allocations was estimated in the assessment model at 2,588 mt, occurring at a spawning stock biomass of 5,805 mt (SPR = 0.25) (Table i, Figures g, h). Pacific coast flatfish, including Petrale sole, are considered overfished when the stock falls below 12.5% of unfished spawning biomass and rebuilt when it reaches 25% of unfished spawning biomass.

*Exploitation status*

The abundance of petrale sole was estimated to have dropped and stayed below the $SB_{25\%}$ management target in 1956, subsequently declining below the $SB_{12.5\%}$ overfished threshold in the 1980s through the early 2000s. In 1988 the stock dropped below 10% of the unfished spawning biomass and did not rise above the 10% level until 2000 (Figure d). Since 2000 the stock has increased, reaching a peak of 19% of unfished biomass in 2005, followed by a decreasing trend through 2010. Fishing mortality rates in excess of the current F-target for flatfish of $SPR_{30\%}$ are estimated to have begun in the mid-1930s (Table d, Figures e, f). Current F (catch/biomass of age-3 and older fish) is estimated to have been 0.08 in 2010 (Table d, Figure e).

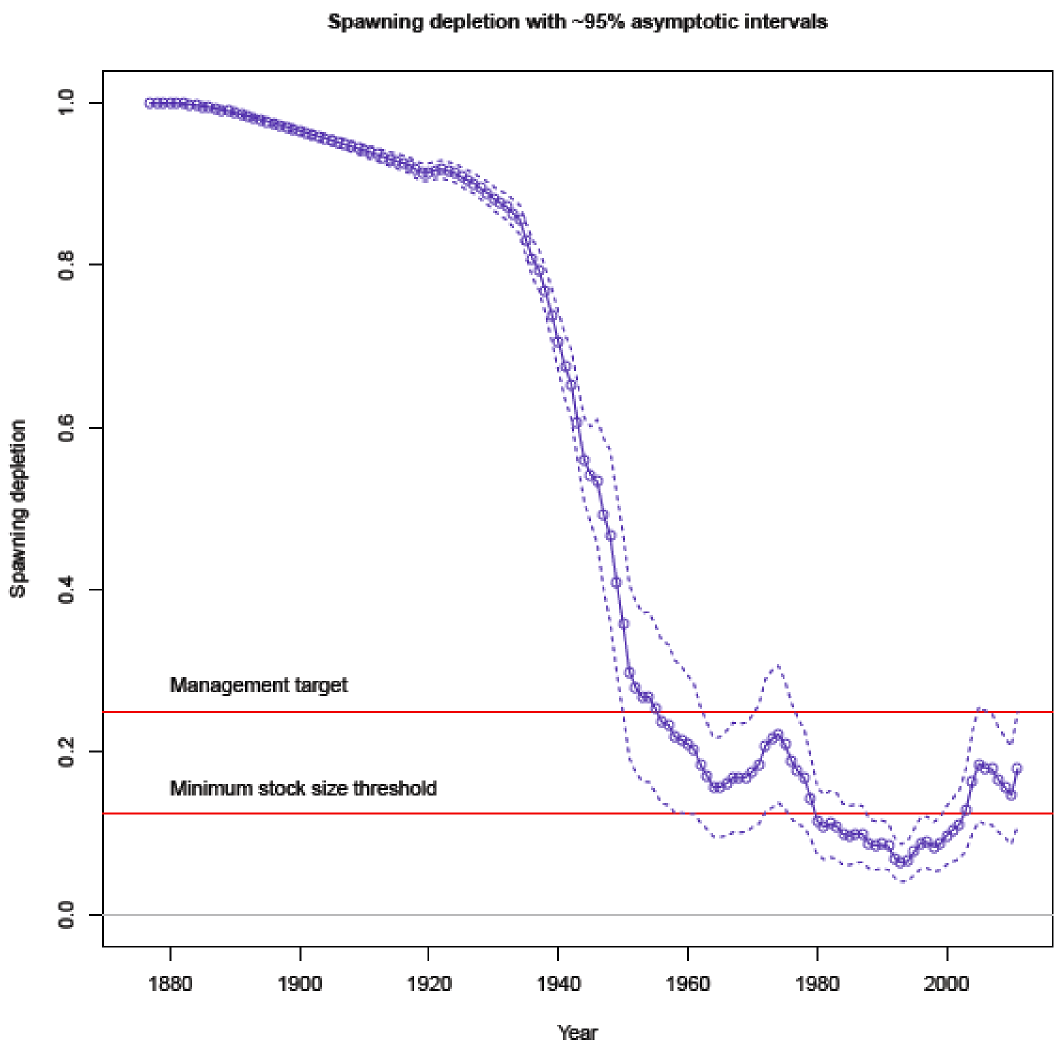



Figure d. Time series of depletion level as estimated in the base case model (round points) with approximate asymptotic 95% confidence interval (dashed lines) and alternate states of nature (light lines).

Table d. Recent trend in spawning potential ratio (1-SPR) and relative exploitation rate (catch/biomass of age-3 and older fish), assuming that the ACL is met in 2011.

| Fishing year | Estimated 1-SPR (%) | Range of states of nature | F | Range of states of nature |
|---|---|---|---|---|
| 2000 | 0.84 | 0.79-0.88 | 0.30 | 0.27-0.32 |
| 2001 | 0.83 | 0.78-0.87 | 0.27 | 0.24-0.29 |
| 2002 | 0.81 | 0.76-0.86 | 0.25 | 0.22-0.27 |
| 2003 | 0.76 | 0.69-0.81 | 0.20 | 0.18-0.21 |
| 2004 | 0.77 | 0.71-0.82 | 0.23 | 0.21-0.25 |
| 2005 | 0.81 | 0.76-0.86 | 0.30 | 0.27-0.32 |
| 2006 | 0.77 | 0.71-0.82 | 0.24 | 0.22-0.26 |
| 2007 | 0.79 | 0.73-0.84 | 0.27 | 0.24-0.29 |
| 2008 | 0.78 | 0.72-0.83 | 0.25 | 0.23-0.27 |
| 2009 | 0.80 | 0.74-0.85 | 0.26 | 0.24-0.29 |
| 2010 | 0.52 | 0.45-0.60 | 0.08 | 0.07-0.08 |
| 2011 | 0.54 | 0.47-0.61 | 0.08 | 0.08-0.09 |

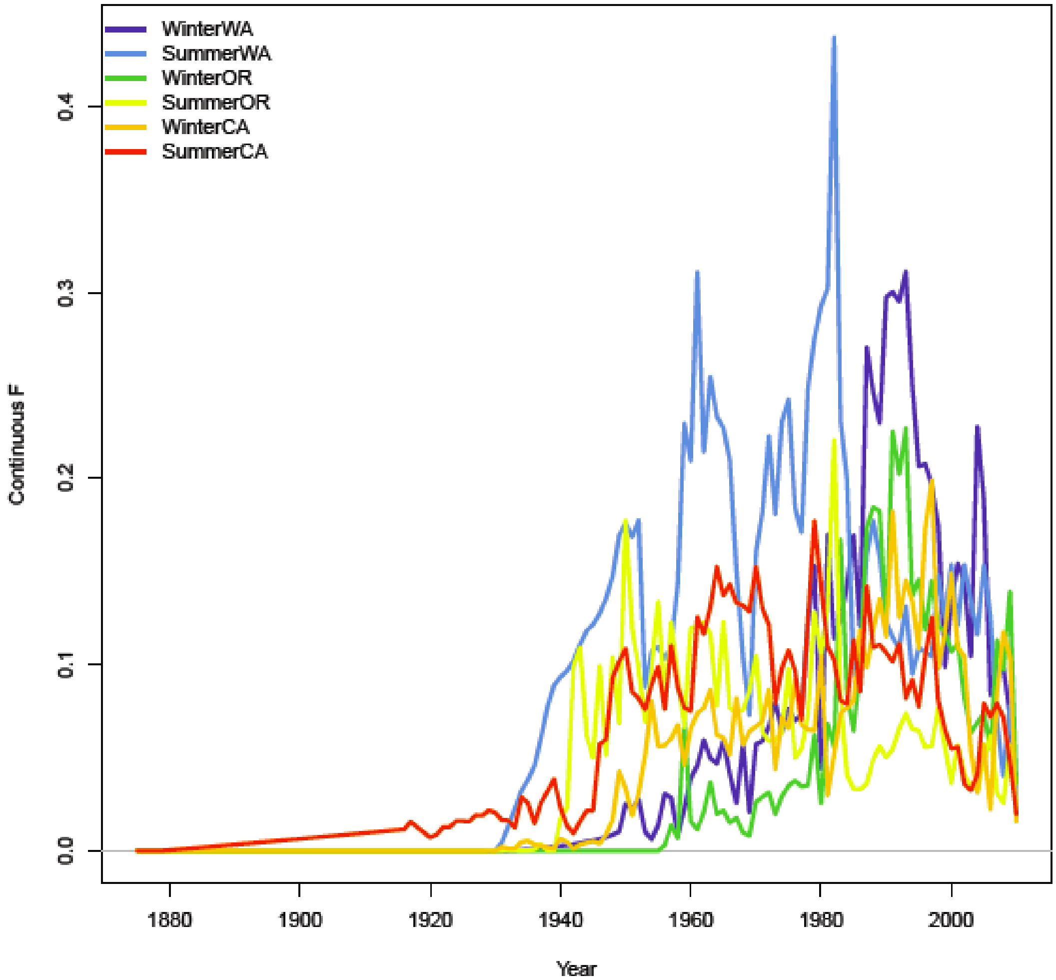



Figure e. Time series of estimated relative exploitation rate (catch/age 3 and older biomass) for each fleet in the base case model.

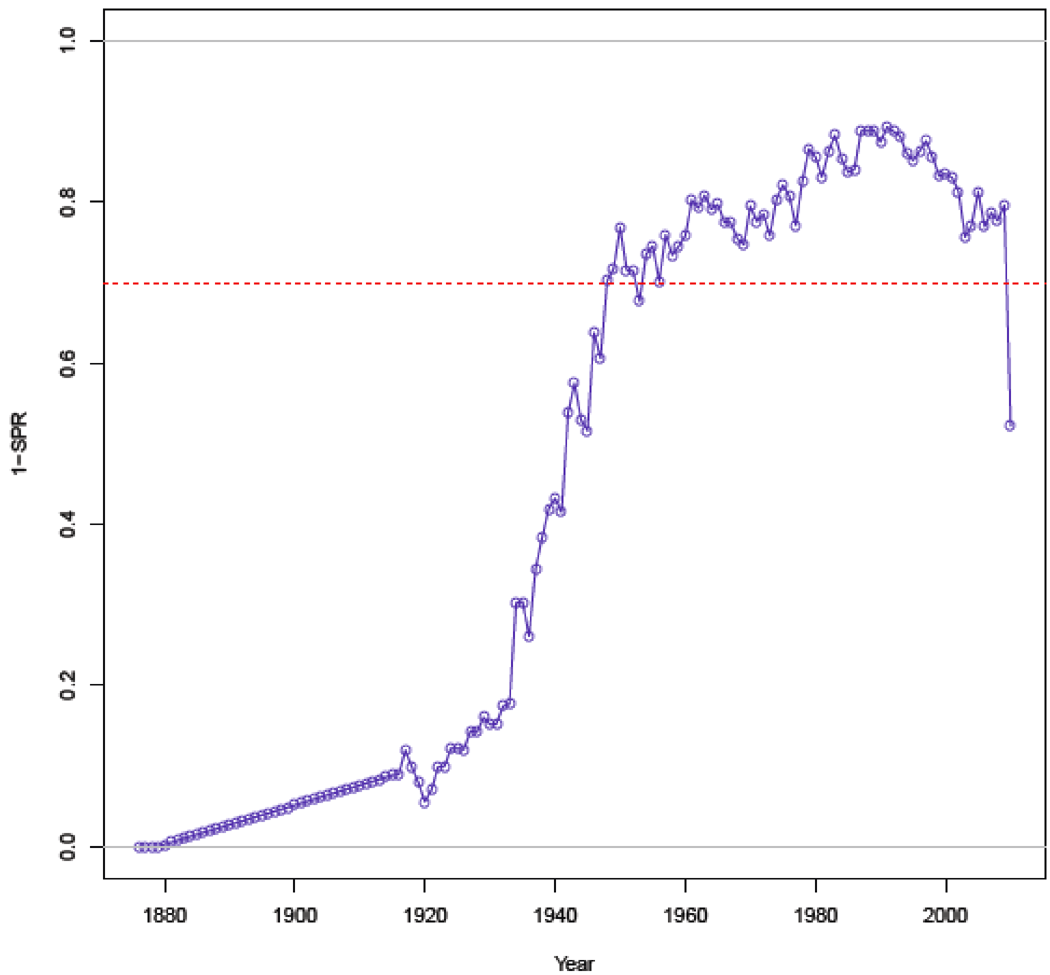



Figure f. Estimated spawning potential ratio from the base case model. One minus SPR is plotted so that higher exploitation rates occur on the upper portion of the y-axis. The management target is indicated by the dotted line.

*Management performance*

The 2009 stock assessment estimated petrale sole to be at 11.6% of unfished spawning stock biomass in 2010. Based on the 2009 stock assessment, the 2010 coast-wide OY was reduced to 1,200 mt to reflect the overfished status of the stock and the 2011 coast-wide OFL and ACL were set at 1,021 mt and 976 mt, respectively (Table e). Recent coast-wide annual landings have not exceeded the ACL except for 2005 when the ACL was exceeded by 92 mt, 3.3%. Both the 2005 and 2009 stock assessments estimated that petrale sole have been below 25 percent of unfished biomass from the mid-1950s until recently, with estimated harvest rates in excess of a fishing mortality rate of F30%. The length of time that the petrale sole stock had been below the 25 percent of unfished level while sustaining relatively stable annual landings lead the 2009 STAR panel and SSC to investigate new reference points for all flatfish managed by the PFMC. The end result is that new reference points were specified for flatfish. The new reference points are as follows: the target reference point is 25 percent of the unfished biomass, the overfished reference point is 12.5 percent of the unfished level, the limit reference point is 5% of the unfished level, and the F target is $F_{30\%}$. The current assessment estimates that petrale sole have been below the $SB_{25\%}$ management target since the mid-1950s and below the overfished threshold between the early 1980s and the early 2000s (Table b, Figures d) with fishing mortality rates in excess of the current F-target for flatfish of $SPR_{30\%}$ since the mid-1930s (Table d, Figure g). 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. Note that the 2010 OY was changed in season to reflect the overfished nature of the stock.

| Year | ABC/OFL (mt) for the Calendar Year | OY/ACL (mt) for the Calendar Year | Commercial Landings (mt) for the Calendar Year | Estimated Total Catch (mt) for the Calendar Year | Estimated Total Catch (mt) for the Fishing Year |
|---|---|---|---|---|---|
| 1999 | 2,700 | 2,700 | 1,520 | 1,818 | 1,654 |
| 2000 | 2,950 | 2,950 | 1,778 | 1,908 | 1,870 |
| 2001 | 2,762 | 2,762 | 1,838 | 1,843 | 1,915 |
| 2002 | 2,762 | 2,762 | 1,877 | 1,998 | 1,970 |
| 2003 | 2,762 | 2,762 | 1,686 | 1,836 | 1,748 |
| 2004 | 2,762 | 2,762 | 2,191 | 2,038 | 2,251 |
| 2005 | 2,762 | 2,762 | 2,854 | 3,252 | 3,002 |
| 2006 | 2,762 | 2,762 | 2,102 | 2,362 | 2,214 |
| 2007 | 3,025 | 2,499 | 2,329 | 1,917 | 2,415 |
| 2008 | 2,919 | 2,499 | 2,079 | 2,254 | 2,154 |
| 2009 | 2,811 | 2,433 | 1,736 | 2,180 | 2,275 |
| 2010 | 2,751 | 1,200 | 701 | 1,160 | 704 |

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

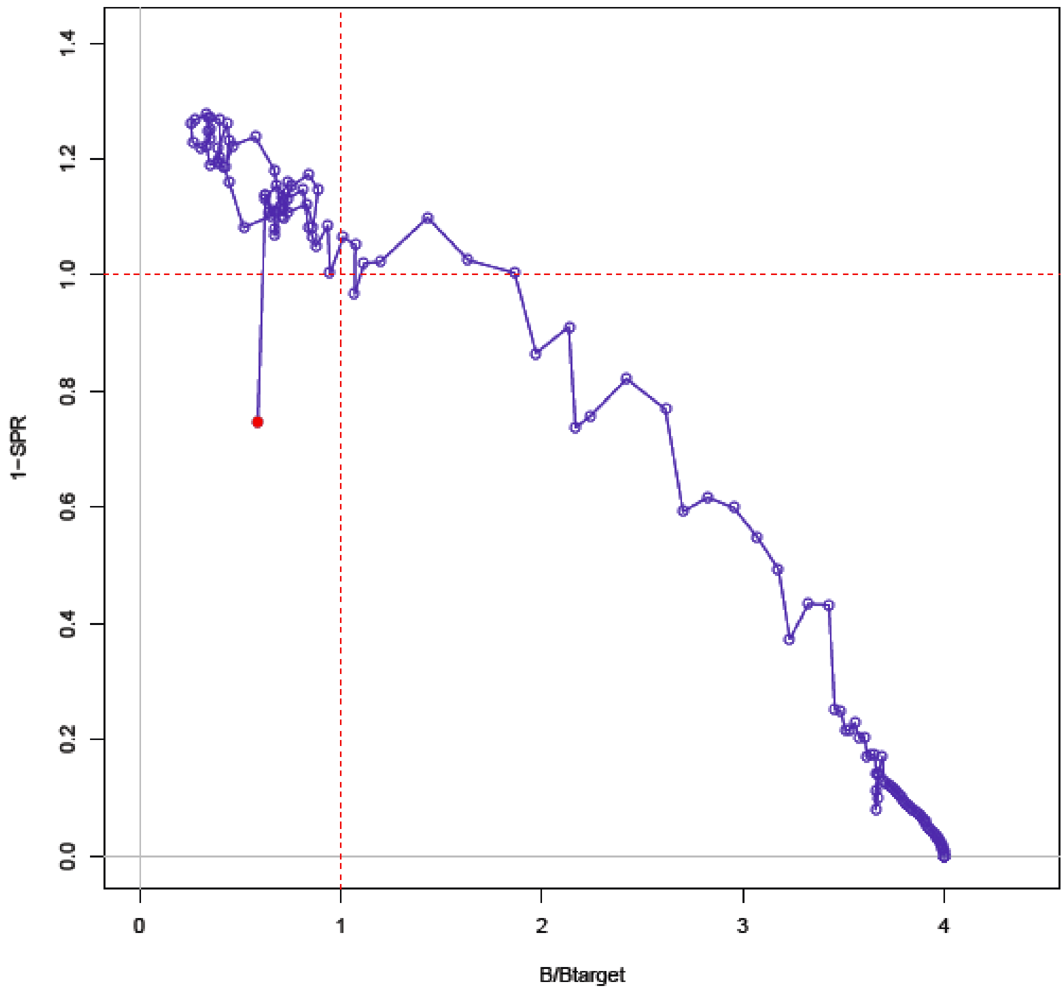



Figure g. Phase plot of estimated fishing intensity vs. relative spawning biomass for the base case model. Fishing intensity is the relative exploitation rate divided by the level corresponding to the overfishing proxy. Relative spawning biomass is annual spawning biomass relative to virgin spawning biomass divided by the 25% rebuilding target. The red point is 2010.

*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 that were evaluated during the STAR meeting. The most notable explorations involved the sensitivity of model estimates to the summer and winter commercial CPUE indices. Specifically the inclusion or exclusion of the winter commercial CPUE indices and, if included, the methods used to relate the winter commercial CPUE indices to the petrale sole stock.

Problems remain with the Oregon commercial age data from 1981–1997. Ages from this period were aged using a combination of methods and in a non-random manner (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 results in higher uncertainty regarding the ages from this period of the Oregon fishery. Historical samples that have been aged using a combination of aging methods should be re-aged using the break and burn method. Age reader information and the aging method for each age read also need to routinely be included in PacFIN.

*Forecasts*

The forecast of stock abundance and yield was developed using the base model. The total catch in 2011 and 2012 are set at 976 mt and 1160 mt, respectively, based on the adopted ACLs. The exploitation rate for 2013 and beyond is based upon an SPR of 30%. The 25:5 control rule reduces forecasted yields below those corresponding to $F_{30\%}$ because the stocks are estimated to be lower than the management target of $SB_{25\%}$ (Table f). The average 2009-2010 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 states of nature were based on the estimates of asymptotic standard deviation from the base model and are low (0.13) and high (0.19) values for female natural mortality. The quartiles of M used were based the 12.5% and 87.5% to correspond to the midpoints of the lower 25% probability and upper 25% probability regions. Each forecast scenario includes random variability in future recruitment deviations (Table g). Current medium-term forecasts predict an increasing trend in abundance and catch through 2014 followed by stable spawning biomass and catches in later years, with ACL values for 2013 set at 2,831 mt under the 25-5 harvest policy. The stock is expected to move above the target stock size of $SB_{25\%}$ in 2013. The following table shows the projection of expected petrale sole catch, spawning biomass and depletion from the base model using the 25-5 control rule (Table f).

Table f. Projection of potential petrale sole OFL, ACL , spawning biomass and depletion for the base case model based on the SPR= 30% fishing mortality target and assuming the adopted ACLs of 976 mt and 1,160 mt are attained in 2011 and 2012, respectively.

| Year | OFL (mt) | ACL (mt) | Age 3+ biomass (mt) | Spawning biomass (mt) | Depletion |
|---|---|---|---|---|---|
| 2011 | 1,831 | 976 | 11,550 | 4,720 | 0.18 |
| 2012 | 2,311 | 1,160 | 13,526 | 5,939 | 0.23 |
| 2013 | 2,766 | 2,766 | 15,150 | 7,361 | 0.28 |
| 2014 | 2,831 | 2,831 | 15,083 | 7,791 | 0.30 |
| 2015 | 2,799 | 2,799 | 14,784 | 7,803 | 0.30 |
| 2016 | 2,725 | 2,725 | 14,453 | 7,614 | 0.29 |
| 2017 | 2,653 | 2,653 | 14,196 | 7,403 | 0.28 |
| 2018 | 2,603 | 2,603 | 14,040 | 7,248 | 0.28 |
| 2019 | 2,575 | 2,575 | 13,966 | 7,165 | 0.27 |
| 2020 | 2,565 | 2,565 | 13,941 | 7,135 | 0.27 |
| 2021 | 2,563 | 2,563 | 13,939 | 7,133 | 0.27 |
| 2022 | 2,564 | 2,564 | 13,941 | 7,141 | 0.27 |

*Decision table*

Relative probabilities of each state of nature are based on the value for female natural mortality. Landings in 2011–2012 are 976 mt and 1160 mt for all cases. Selectivity and fleet allocations are projected based the average 2009-2010 values. The low female M state of nature projects the spawning stock depletion to increase beyond the target stock size of 25% of the unfished spawning biomass in 2014, one year later than the base case model. The high female M state of nature forecasts the petrale sole stock to be above the 25% of unfished spawning biomass target in 2013.

Table g. Decision table of 12-year projections for alternate states of nature (columns) and management options (rows) beginning in 2013.

| | | | State of nature | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Female M=0.13 | | Base case Female M estimated = 0.16 | | Female M=0.19 | |
| Relative probability | | | 0.25 | | 0.5 | | 0.25 | |
| **Management decision** | Year | Catch (mt) | Depletion | Spawning biomass (mt) | Depletion | Spawning biomass (mt) | Depletion | Spawning biomass (mt) |
| 25-5 catches from base case | 2013 | 2,766 | 24.1% | 7,085 | 28.0% | 7,361 | 32.6% | 7,689 |
| | 2014 | 2,831 | 25.7% | 7,547 | 29.6% | 7,791 | 34.1% | 8,039 |
| | 2015 | 2,799 | 25.9% | 7,614 | 29.7% | 7,803 | 33.7% | 7,942 |
| | 2016 | 2,725 | 25.5% | 7,481 | 29.0% | 7,614 | 32.4% | 7,653 |
| | 2017 | 2,603 | 24.9% | 7,304 | 28.2% | 7,403 | 31.3% | 7,372 |
| | 2018 | 2,653 | 24.4% | 7,184 | 27.6% | 7,248 | 30.6% | 7,212 |
| | 2019 | 2,575 | 24.0% | 7,048 | 27.3% | 7,165 | 30.1% | 7,095 |
| | 2020 | 2,565 | 23.7% | 6,975 | 27.2% | 7,135 | 30.0% | 7,073 |
| | 2021 | 2,563 | 23.6% | 6,922 | 27.1% | 7,133 | 30.0% | 7,083 |
| | 2022 | 2,564 | 23.4% | 6,878 | 27.2% | 7,141 | 30.1% | 7,099 |

*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. Two contributing factors likely contribute to the high estimate of NWFSC catchability: 1) the herding of flatfish by the trawl bridles toward the path of the net, and 2) the use of the total area within each strata during the expansion of the survey data rather than only the trawlable areas or petrale specific habitat. Currently, the survey biomass estimates are obtained using the area swept by the net, rather than by the area swept by the trawl doors (approximately 3 times the width of the net) or some value in between the net and door areas. Therefore the current biomass estimate does not correct for the herding of fish. However, a recent video study of the NWFSC survey trawl and flatfish behavior shows that flatfish are herded by the trawl (Bryan et al. In prep). If a correction for herding was made during the calculation of the NWFSC trawl survey index the trend in the index would not change but the scale of the index would be smaller, resulting in a lower estimate of $q$ in the stock assessment. At this time there are no area estimates for trawlable and untrawlable areas on the west coast. However the petrale sole population is most likely well surveyed by the trawl survey and expanding the survey index using areas that include untrawlable areas, and/or areas with different densities of petrale sole may not be appropriate.
2. In the past many assessments have derived historical catches independently. The states of California and Oregon have completed comprehensive historical catch reconstructions. The Oregon catch reconstruction is limited in that only annual catches based on the port of landing are available. In order to be relevant to the current petrale sole assessment the OR catch reconstruction needs to be expanded to include month or bimonthly period as well as the area of catch. At the time of this assessment, a comprehensive historical catch reconstruction is not available for Washington. Completion of a Washington catch reconstruction 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. While some recent age data were made available from California sample sized could be increased and this data collection needs to continue into the future. Without age data, the ability to estimate year-class strength and the extent of variation in recruitment is compromised.
5. Where possible, historical otolith samples aged using a combination of surface and break-and-burn ages should be re-aged using the break-and-burn method.
6. The effect of fishery regulations including the impacts of trip-limits and other management approaches, such as closed areas, on discards, fishery selectivity, and fishery behavior requires further study.
7. Studies on stock structure and movement of petrale sole, particularly with regard to the winter-summer spawning migration of petrale sole.

8. 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. Note that 2011 is the first forecast year in the stock assessment model.

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| Commercial landings (mt) | 1,876 | 1,686 | 2,191 | 2,854 | 2,102 | 2,329 | 2,079 | 1,736 | 701 | 976 |
| Estimated total annual catch (mt) | 1,998 | 1,836 | 2,038 | 3,252 | 2,362 | 1,917 | 2,254 | 2,180 | 1,160 | |
| ABC / (OFL) (mt) | 2,762 | 2,762 | 2,762 | 2,762 | 2,762 | 3,025 | 2,919 | 2,811 | 2,751 | 1,021 |
| OY / (ACL) (mt) | 2,762 | 2,762 | 2,762 | 2,762 | 2,762 | 2,499 | 2,499 | 2433 | 1200 | 976 |
| 1-SPR | 0.81 | 0.76 | 0.77 | 0.81 | 0.77 | 0.79 | 0.78 | 0.80 | 0.52 | 0.54 |
| Exploitation rate (catch/age 3+ biomass) | 0.25 | 0.20 | 0.23 | 0.30 | 0.24 | 0.27 | 0.25 | 0.26 | 0.08 | 0.08 |
| Age 3+ biomass (mt) | 8,024 | 8,960 | 9,844 | 10,071 | 9,295 | 9,053 | 8,554 | 8,619 | 9,293 | 11,550 |
| Spawning biomass (mt) | 2,925 | 3,403 | 4,288 | 4,877 | 4,754 | 4,704 | 4,368 | 4,119 | 3,861 | 4,720 |
| ± ~95% Confidence interval | 235 | 285 | 347 | 383 | 393 | 388 | 383 | 389 | 422 | 493 |
| Range of states of nature | 2,723-3,173 | 3,154-3,709 | 3,983-4,662 | 4,543-5,287 | 4,415-5,168 | 4,379-5,099 | 4,063-4,737 | 3,831-4,463 | 3,580-4,194 | 4,440-5,052 |
| Recruitment | 11,028 | 9,104 | 10,918 | 10,492 | 18,698 | 27,330 | 14,021 | 12,448 | 13,449 | 14,004 |
| ± ~95% Confidence interval | 2837 | 2398 | 2879 | 2846 | 5087 | 7783 | 5400 | 5510 | 6305 | 6639 |
| Range of states of nature | 8,590-14,498 | 7,094-11,959 | 8,511-14,324 | 8,180-13,756 | 14,589-24,492 | 21,378-35,682 | 10,924-18,301 | 9,678-16,283 | 10,476-17,586 | 10,749-18,457 |
| Depletion (%) | 11.1% | 12.9% | 16.3% | 18.6% | 18.1% | 17.9% | 16.6% | 15.7% | 14.7% | 18.0% |
| ± ~95% Confidence interval | 2.2% | 2.6% | 3.2% | 3.6% | 3.6% | 3.5% | 3.3% | 3.2% | 3.1% | 3.6% |
| Range of states of nature | 9.3%-13.5% | 10.7%-15.7% | 13.6%-19.8% | 15.5%-0.22.4% | 15.0%-21.9% | 14.9%-21.6% | 13.8%-20.1% | 13.0%-18.9% | 12.2%-17.8% | 15.1%-21.4% |

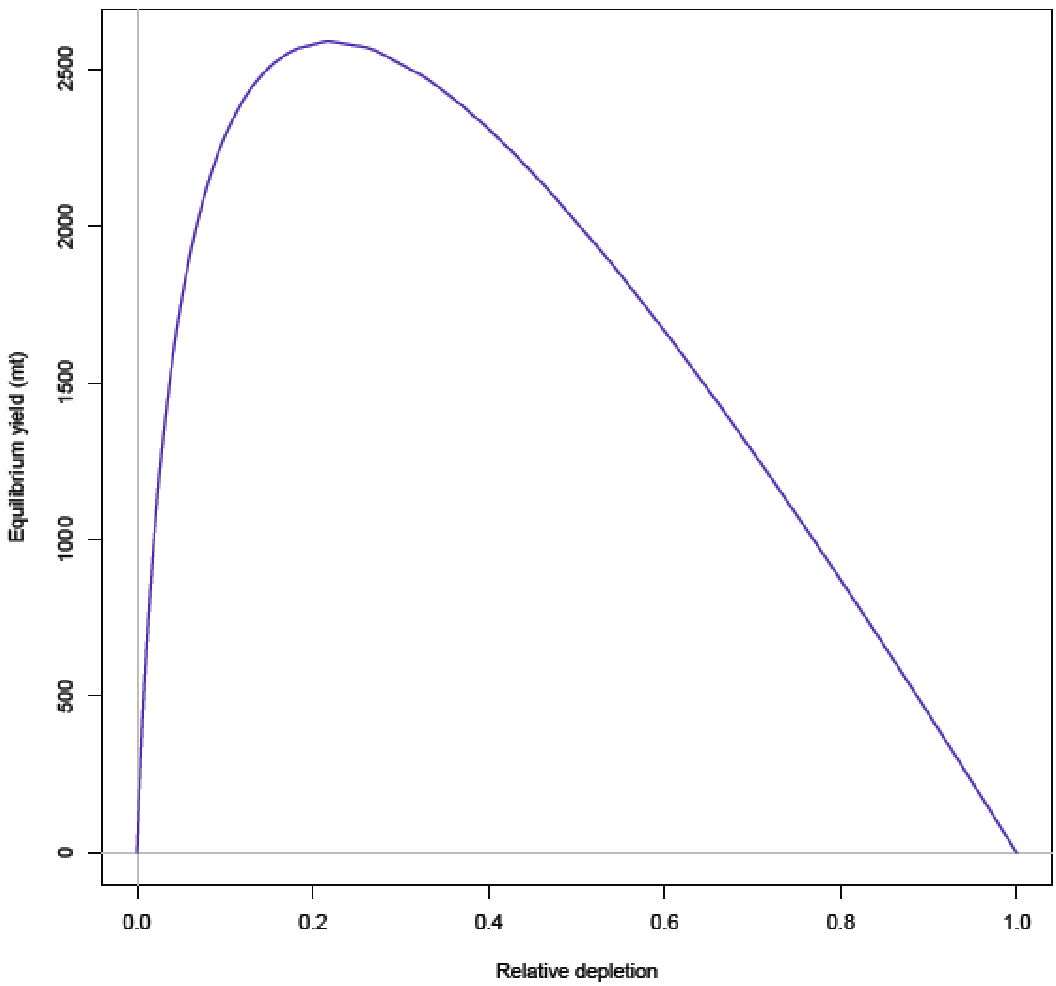



Figure j. Equilibrium yield curve (derived from reference point values reported in table i) for the base case model. Values are based on 2010 fishery selectivity and allocation. The depletion is relative to unfished spawning biomass.

Table i. Summary of petrale sole reference points from the base case model. Values are based on 2010 fishery selectivity and allocation.

| Quantity | Estimate | ± ~95% Confidence interval |
|---|---|---|
| Unfished spawning stock biomass ($SB_0$, mt) | 26,278 | 3,329 |
| Unfished 3+ biomass (mt) | 41,352 | 4,037 |
| Unfished recruitment ($R_0$, thousands) | 16,512 | 5,127 |
| ***Reference points based on $SB_{25\%}$*** | | |
| *MSY* Proxy Spawning Stock Biomass ($SB_{25\%}$) | 6,570 | 832 |
| SPR resulting in $SB_{25\%}$ ($SPR_{SB25\%}$) | 0.28 | 0.02 |
| Exploitation rate resulting in $SB_{25\%}$ | 0.20 | 0.01 |
| Yield with $SPR_{SB25\%}$ at $SB_{25\%}$ (mt) | 2,578 | 105 |
| ***Reference points based on SPR proxy for MSY*** | | |
| Spawning Stock Biomass at SPR ($SB_{SPR}$)(mt) | 7,133 | 1,233 |
| $SPR_{MSY\text{-}proxy}$ | 0.3 | |
| Exploitation rate corresponding to SPR | 0.18 | 0.02 |
| Yield with $SPR_{MSY\text{-}proxy}$ at $SB_{SPR}$ (mt) | 2,559 | 126 |
| ***Reference points based on estimated MSY values*** | | |
| Spawning Stock Biomass at *MSY* ($SB_{MSY}$) (mt) | 5,805 | 700 |
| $SPR_{MSY}$ | 0.25 | 0.04 |
| Exploitation Rate corresponding to $SPR_{MSY}$ | 0.22 | 0.02 |
| *MSY* (mt) | 2,588 | 94 |

# 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 soft substrates at depths ranging from 0-550 m (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 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 some 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 of 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). The 2009 assessment integrated the previously separate north-south assessments to provide a coast-wide 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. This 2011 assessment provides a coast-wide status evaluation for petrale sole using data through 2010.

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 is largely due to current management needs rather than the population dynamics. 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; Alderdice 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 2.2 cm 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 that 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 review).

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% from 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.

Historical catch reconstructions show peak catches from the summer fishery occurred during the 1940s and 1950s. After the period of peak catches during the 1940s and 1950s catches generally declined until the mid-2000s. (Table 1, Figure 1). Total reconstructed historical catches from 1876 to 2010 peaked during the late 1940s followed by a decline through the mid 1990s. In 2009 the fishery was declared overfished and 2010 management restrictions limited the catch to 701 mt (Table 1, Figure 1).

### *1.4 Management History and performance*

Beginning in 1983 the Pacific Fishery Management Council (PFMC) established coast-wide Annual Catch Limits (ACL) 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 coast-wide ACL of 2762 mt was specified and remained unchanged between 2001 and 2006 (Table 2).

The 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 support for a coast wide stock. Based on the 2005 stock assessment results, ACLs were set at 3025 mt and 2919 mt for 2007 and 2008, respectively, with an ACT of 2499 mt for both years (Table 2). The 2009 coast-wide stock assessment estimated that the petrale sole stock had declined from its 2005 high to 11.6% of the unfished spawning stock biomass, resulting in an overfished declaration for petrale sole and catch restrictions. Recent coast-wide annual landings have not exceeded the ACL except for 2005 when the ACL was exceeded by 3.3% (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 just prior to the completion of the assessment, with estimated harvest rates in excess of the target fishing mortality rate implemented for petrale sole at that time (F40%). However the 2005 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 ($SB_0$)). 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. Although the estimates of 1998 spawning-stock biomass were little changed between the 1999 and 2005 (Northern area) assessments, the estimated depletion in the 2005 assessment was much lower. The change in status between the 1999 and 2005 analyses was due to the introduction of a reconstructed catch history in 2005, which spanned the entire period of removals. 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's level of depletion. The stock's estimated decline in status between the 2005 and 2009 assessments was driven primarily by a significant decline in the trawl-survey index over that period.

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. Additionally, the skippers indicated that small petrale limits in 2010 have lead to large changes targeting strategy for petrale sole. 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. Effectively many of the more marginal petrale sole winter fishing grounds were closed while the main fishing areas have remained open.

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 exempted 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 'pineapple' trawl gear (this gear has a longer headrope than footrope, allowing some rockfish more chance to escape capture) from February–October during 2003 and 2004. This gear was found to reduce the catch-per-unit-effort of some overfished rockfish, relative to standard commercial flatfish gear, in pilot experiments (King et al. 2004). Beginning in 2005, this modified "selective flatfish" trawl gear has been required shoreward of the RCA, north of 40$^{o}$10'N latitude. The skippers present at the 2011 pre-assessment workshop (Newport, OR) indicated that, prior to the use of the pineapple trawl; fishing took place around the clock. However, now when using this gear they only fish during the day because the skippers are unable to catch fish at night. The ACLs for several species under Rebuilding Plans have resulted in limited harvests of other groundfishes in recent years.

Port sampling conducted by each state routinely samples 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*

The Canadian fishery developed rapidly during the late 1940s to mid-1950s following the discovery of spawning aggregations off the west coast of Vancouver Island (Anon. 2001). Annual landings of petrale sole in British Columbia peaked at 4,800 mt in 1948 but declined significantly after the mid-1960s (Anon. 2001). By the 1970s, analysis conducted by Pederson (1975) suggested that petrale abundance was low and abundance remained low into the 1990s. In the early 1990s vessel trip quotas were established to try to halt the decline in petrale sole abundance (Anon. 2001). 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. Biological data collected during 1980-1996 showed a prolonged decline in the proportion of young fish entering the population (Anon. 2001). Therefore, no directed fishing for petrale sole has been permitted in Canada since 1996 due to a continuing decline in long term abundance (Fargo, 1997, Anon. 2001). Current landings of petrale sole in Canada are very low due to the effect of the non-directed fishery. As of 2005 petrale sole off of British Columbia were treated as three “stocks” and were still considered to be at low levels. 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 2003-2010 (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 1876-2010
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 (Washington, Oregon, and California, 1987-2009).

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 NWFSC trawl survey*

Data from the NWFSC fishery-independent shelf and slope trawl survey were first available for inclusion in the 2009 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 (2003-2010) 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 550 meters. 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. This assessment uses a similar approach, developed during the 2009 assessment, implementing a 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).

The NWFSC index of abundance is based on a Generalized Linear Mixed Model (GLMM) approach that was endorsed by the trawl survey workshop for use in west coast stock assessments. 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 vessel 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 error structure. These factors result in the GLMM approach being robust to a few large tows, providing an index that is 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, these areas were combined with the Columbia deep area.

The coast-wide biomass index increases through 2005, followed by a steady decline through 2008, and increases during 2009 and 2010 (Table 5, Figure 7). The biomass by stratum, estimated from the GLMM, shows a decreasing trend, generally during 2005 to 2008, in the middle and shallow depths (Figure 8). Since 2008 the biomass by stratum generally shows increases in the north and at deeper 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 2003-2010 generally show a strong cohort growing through 2005 and smaller fish entering the population beginning in 2007 (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 6,033 fish were sampled for age compared to 30,465 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 the strong 97-98 cohort ageing from 2003 to 2007, with younger fish appearing in 2008-2010 (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.

### *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). While the AFSC conducted all of the previous Triennial surveys, the 2004 survey was conducted by the NWFSC FRAM division following the AFSC survey protocols. 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. Due to changes in survey timing the Triennial data have been split into independent early (1980-1992) and late (1995-2004) survey time series. The Conception area was also removed from the early Triennial survey analysis since it was not consistently surveyed.

As with 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 a depth stratification similar to the strata used for the NWFSC survey was used for the triennial survey (54.864–100 m, 100–182.88 m and 182.88–548.64 m).

Similarly to the NWFSC survey, the early and late Triennial trawl survey indices of abundance are based on a general linear model (GLM), however random vessel effects are not included in the modeling of this survey. To provide an adequate number of positive tows in the GLM analysis the late Triennial survey data are partitioned into two depth strata (55 m -100 m and 100 m – 500 m) and the Vancouver and Columbia INPFC areas are combined while the southern areas are not combined. The early Triennial data have two depth strata (55 m -100 m and 100 m – 400 m). The Vancouver and Columbia, and Monterey and Conception INPFC areas are combined for the early Triennial GLM. The Eureka shallow area is not combined with any of the above but the Eureka deep strata is combined with the Vancouver-Columbia deep strata. The estimated total biomass is given in Table 5 and Figure 17. The data 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 from the 1999, 2005, and 2009 assessments (Sampson and Lee 1999; Lai et al. 2005) have been re-estimated for the 2011 stock assessment using data from the NWFSC survey. The previous assessments used length and weight data from ODFW (1971–86), WDFW market samples, and the ODFW flatfish surveys (1971–72; Demory et al., 1976). New length and weight data from the NWFSC survey estimate the following length weight relationships for males, $W$=0.00000305$L^{3.360544}$, and females, $W$=0.00000208296$L^{3.473703}$.

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: $\beta_0$= -24.593, $\beta_1$=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 (1943–45) Washington trawl data from Swiftsure Bank, off the southwest corner of Vancouver Island. However petrale sole catches were relatively high during mid-1940s through the 1950s. 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. U.S. stock assessments prior to 2009 and current British Columbia stock assessments assumed a value of $M$ = 0.2 for both sexes. A recent meta-analysis (O. Hamel pers comm.) produced the following normal prior distributions for females (mean =

0.151, standard deviation = 0.16) and males (mean = 0.206, standard deviation = 0.218). The Hamel priors are used for M in this stock assessment.

### *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, 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 $L_\infty$ is the maximum length to data from the 2003 - 2008 NWFSC survey (Figure 6). The same starting values are used to estimate growth inside the 2011 stock assessment model.

### *2.2.5 Sex Ratios*

Both the Triennial and NWFSC sex ratios for petrale sole are generally about 50% each males and females (Figure 20). There is no indication of changes in sex ratio over time in the recent survey data. 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). 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.

### *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 (CAP) formed in Newport, Oregon during 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 CAP 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) continued to use the 'combination' ageing method for all commercial otolith samples through 2008.

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 were reanalyzed for the 2009 stock assessment.

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 2005 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 2009 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 very young fish (generally age 0-3 year olds that are very clear) (pers comm. P. MacDonald) for which they believe surface ages are reliable. 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 for the 2009 assessment using the surface read method to complete the age composition previously partially completed for the 2005 assessment. Since the 2009 stock assessment all of the NWFSC survey otoliths and the Oregon commercial otoliths have been aged using the break and burn method. Furthermore, in 2009 the WDFW began breaking and burning an increased number of petrale sole otoliths from commercial fishery samples.

In order to conduct a comprehensive estimation of ageing bias and imprecision the 2009 assessment 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). In the 2009 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 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 2009 aging error analysis compressed data sets with three or more reads down into double-read data for analyses, because this reduced the number of age compositions, improving model performance. However, since 2009 the aging error model has been improved to better deal with otoliths with more than two reads. Therefore, this 2011 analysis uses the triple read data available from the bomb radiocarbon study. The CAP lab completed new break-and-burn double reads for the 2009 and 2010 data that are included in this analysis. Furthermore, the WDFW aging lab was able to re-age most of the otoliths used for the bomb radiocarbon study, both break and burn and surface ages, so the estimation of aging error for the Washington commercial samples is much improved from that available during 2009. The distribution of ages from each aging method and agency show unimodal distributions, as expected, with the exception of ages from the CAP combination aging method (Figure 21).

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. Gender and age reader information is available for some, but not all, of the samples. In order to increase the power of the analysis and reduce the total number of data sets in the analysis samples are pooled over age reader and sex. Table 7 shows the number of samples collected by agency and ageing method. Tables 8a-f show the structure of the analysis as well as which estimates of ageing bias and imprecision are used in the stock assessment. A variety of models were explored for each dataset (Tables 9a-c) but only the models that the results were sensitive to are presented.

Each of the aging error analyses found that the best fit model included a non-linear bias (Table 9). The best fit models for the break and burn and surface ages fit the standard deviation of the aging bias as a non-linear function but the best fit models for both the CAP and WDFW combination age reads fit a linear function for the standard deviation (Table 9). Generally, all of the ageing methods applied to petrale sole are negatively biased (under ageing), particularly for older ages (Table 10, Figure 23). The break-and-burn and combination ages show a slight bias while the surface ages show greater negative bias toward older ages. The combination ages from CAP have a higher standard deviation than those for the break and burn ages at older ages (Table 10, Figure 23). The WDFW break and burn and combination ages show very little bias while the surface ages show stronger negative bias, particularly after approximately age 13 (Table 10, Figure 23). The WDFW standard deviations for the combination method are small in comparison to those from the other methods due to a relatively limited number of WDFW combination-method double reads (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). For the 2009 assessment, the CDFG and SWFSC provided a comprehensive catch reconstruction for the California commercial fishery that replaced catches previously reconstructed in 2005. In 2009, WDFW provided improved catch data for some years previously reconstructed by Lai et al. (2005). While Oregon recently completed a historical catch reconstruction it is limited to providing only annual catches based on the port of landing (Gertseva et al. 2010). In order to be relevant to the current petrale sole assessment the OR catch reconstruction needs to be expanded to include month or bimonthly period as well as the area of catch. At the time of this assessment, a comprehensive historical catch reconstruction is not available for Washington. Therefore, the best catch reconstructions used in the 2009 stock assessment remain the best available for the current stock assessment (Table 1, Figure 1). The catches used in this assessment begin in 1916 with the commercial landings data obtained from the following sources:

i) The PacFIN database (1981–2010 for CA and WA; 1987-2010 for OR);

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 exceptions to this are the comprehensive catch reconstructions for the state of California (Ralston et al. 2009) for this period.

iii) State of California catch reconstruction extending from 1931-1980 (Ralston et al. 2009). 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) and Haltuch et al. (2009) 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 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 – 2010 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. In years where 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 2010 (1987-2010 for OR) were extracted from the PacFIN database (Extraction: February, 2011). 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 less than 2% of the coast-wide landings. 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, landings in this assessment, as in previous assessments, are separated into two time periods: winter (November-February) and summer (March–October). Within each season, landings are partitioned by the state waters where the catch was taken (Table 3). Thus, the model includes six fleets: 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 creation 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 varied 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 (meaning 17% of the 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%. Independent analysis of the same discard data by D. Erickson (pers. comm. at STAR panel) produced an average discard rate of 0.2% for winter and 3.8% for summer from the Pikitch study. The values provided by D. Erickson were used in the base model. However, the model was not sensitive to the choice of discard rates from Sampson and Lee (1999) or from D. Erickson.

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 2002-2010 (2010 includes winter only, as summer data are not yet available) (Table 11, Figure 24). Recently the collection of length data for petrale sole has begun, providing length compositions of the discard for 2006-2010 (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 is 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 (Figure 28). These indices were also used in the 2005 northern area stock assessment (Lai et al. 2005) and in the 2009 coast-wide stock assessment. The logbook data for the years prior to 1987 were not included, because information on fishing location is not available for much of these data. Beginning in 1998, the west coast groundfish fishery has been subjected to a series of regulatory changes that would render extension of the Sampson and Lee index 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 with the CPUE indices were noted during the 2005 STAR panel review.

Due to multiple changes in management beginning in the early 2000s and resulting changes in fishing behavior, for which limited data are available, the 2009 stock assessment did include commercial CPUE indices. One example of a regulatory induced change in fishing behavior is the switch from fishing around the clock to fishing only during the day with the selective flatfish trawl (‘pineapple trawl’) that began to be used in 2003 and was used coast-wide by 2005. Many of these changes are not well documented or are not documented at all in the logbook data. Management and fishing behavior changes beginning around 2003 suggest that the changes in summer CPUE are likely not proportional to changes in stock abundance. In addition to the impact of changing management actions and resulting changes in fishing behavior on commercial CPUE the winter fleets were not analyzed due to concerns regarding the likelihood that changes in winter catch rates would not be proportional to changes in spawning stock biomass due to the spawning aggregations that are the target of the winter fishery (Hilborn and Walters 2001). However, in 2009 plots of raw CPUE (lbs/hour) for all fleets were calculated for comparison with the fishery independent NWFSC survey index. The downturn in the NWFSC survey index (from the summer season) between 2005 and 2008 is also apparent in the raw CPUE from the summer fisheries, although the magnitude of the changes in the CPUE was much larger than those from the survey (Figure 29). During the 2009 assessment review process there were concerns regarding the lack of a recent CPUE analysis for all fleets, regardless of the management impacts on the fishery. Therefore, this 2011 assessment has attempted to conduct a CPUE analysis that considers some of the management impacts on the petrale fleet. See Appendix B for the details of these analyses.

While this 2011 analysis has attempted to account for the impact of management measures on the fishery it is unable to account for changes in fishing behavior, or changes in spawning aggregation dynamics in the winter. Changes in the CPUE indices from approximately the years 2000-2003 forward could be due to management measures, fishing behavior, and spawning aggregation dynamics (winter only) that have not been captured in this analysis. For example, industry reports that the 2003 vessel buyback removed some of the more productive vessels in the fleet, but there is not information on the skippers that fished those vessels, many of which may have switched to fishing on different vessels. This CPUE analysis is also unable to capture changes in fishing behavior and targeting strategies for petrale sole and the dover-thornyhead-sablefish deep water fishery, which likely increased, as rockfish fishing opportunities became increasingly limited between the late 1990s and present. In the summer, the spatial management restrictions have changed on an annual basis and are captured only at a gross level in this analysis. In the winter, the spatial areas that have remained open to fishing since 2003 have been more stable, however, little is known about petrale sole spawning aggregation dynamics and how these spawning aggregation dynamics change as the stock increases from historical low levels in the 1990s to higher levels in the mid-2000s. There is some ancillary evidence that the timing of spawning (historically December - February) has shifted to be later in the winter season. This issue may have been captured by limiting the data used in the analysis to January-February. However little is known about how the timing of peak spawning, the duration of the spawning season, size of spawning aggregations, and density of spawning aggregations change with changes in the size of the spawning stock. It is not possible to capture these dynamics in the CPUE analysis competed for the 2011 stock assessment as there is a lack of understanding between how changes in catch rates and changes in the true population are related.

The pre-STAR draft of this stock assessment included the main effects commercial summer CPUE indices for each state as a sensitivity run and excluded the winter CPUE indices due to the issues discussed above. Discussions during the STAR panel lead to the removal of the summer CPUE as a viable index for the model due to the annual changes in spatial management. While the summer CPUE indices were removed from the assessment the general trends in the commercial summer CPUE are the same as the trend from the NWFSC fishery independent survey during the period of overlap. In the summer fishery, CPUE generally increased from 1987 through the middle of the past decade, but has decreased in the last few years for all three states. STAR panel discussions lead to the inclusion of the winter main effects CPUE indices due to the more consistent management during the winter, regardless of the possible issues with spawning aggregation dynamics. The winter fishery CPUE begins to increase about the year 2000, compared with the early part of the time series. While the California and Oregon CPUE indices continue to increase in the last few years, Washington (which has the largest data set of the three states) has declined since 2005. The winter commercial CPUE index from Washington shows a similar trend to the NWFSC summer fishery independent survey index.

*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 (1966–2010) and WDFW (1955–2010), but only 2001–2010 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 expanded length observations were then expanded by the catches in each state. 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 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). in both the northern- and southern-area models, the fishing year was specified as beginning on November 1 and continuing through October 31 of the following year, with a November–February winter fishery and a March–October summer fishery. Catches prior to 1957 were assumed to have been taken during the summer season in years where monthly data were not available to split the catches seasonally. The complete catch history was reconstructed for petrale sole for the 2005 stock assessment, with the northern area model starting in 1910 and the southern area model in 1876. In 2005, the STAR 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. The 2009 assessment treated petrale sole as a single coast-wide stock. This 2011 assessment continues with the coast-wide stock assessment.

**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 2009 petrale sole STAR panel has compiled a history of regulatory actions that impacted the petrale sole fishery, and more generally the groundfish fishery (Appendix C). 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 other fishery participants who were present at the STAR panel provided invaluable information regarding the history of the fishery and the timing of the impact of management regulations on fleet behavior. This information from the 2009 STAR panel GAP representative and fleet members was used to make decisions regarding the time blocking of fishery selectivity in the model. Information provided by the GAP and GMT representatives regarding the fishery for petrale sole helped guide the use of the commercial CPUE indices in this 2011 stock assessment.

*2.4.3 Response to the review panel recommendations in 2009*

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 the collection of age data needs to continue.

The STAR and "Follow-up" panel reports from 2009 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 STAR panel noted that plots of the unstandardized summer fishery CPUE and NWFSC survey biomass show similar trends, especially for the Washington portion of the catch. There was a slight time shift in the

peak values for Oregon and California fishery summer CPUE compared with the survey. The panel concluded that future exploration of the Summer CPUE series as an index of abundance may be warranted. Additionally there was general concern from the industry that commercial CPUE data had not been standardized and evaluated in the stock assessment, in spite of the likely impact of changes in regulations in the past decade or so. In fact, the 2005 STAR panel had strong concerns regarding the influence of management regulations on the fishery the CPUE analysis that extended through 2004 that was evaluated as part of the 2005 stock assessment. The 2005 STAR panel also suggested that any future GLM analysis of CPUE account for spatial considerations and consider a greater level of vessel standardization. This assessment completes a CPUE standardization that considers spatial management impacts on the fishery for both winter and summer fishing fleets that begins in 1987 and extends through 2009.

2. The petrale sole assessment used two indices of abundance, the Alaska Fisheries Science Center (AFSC) triennial survey from 1980 to 2004, and NWFSC survey from 2003 to 2008. The estimated catchability of the AFSC survey was 0.52 and 0.72 for early and late periods, while the estimated catchability of the NWFSC survey was 3.07. A catchability value of 1.0 would imply that the survey net captured all the fish in front of the net (and no others), and that fish density is the same in trawlable and untrawlable areas. A catchability greater than 1.0 could result from two general factors: herding of fish into the net by the trawl doors and mud gear, and the presence of lower fish densities in untrawlable areas. Higher catchability of the NWFSC survey compared to the AFSC triennial survey is to be expected, given differences in survey design, survey procedures, and net configuration. Although concerns were raised regarding the estimated *q* value for the NWFSC shelf/slope survey, the STAR panel regarded the *q* value as a scaling factor between the magnitude of the estimated population size and the magnitude of the survey index of abundance. However the STAR panel and PFMC SSC indicated a need to explore the herding of petrale sole by the NWFSC survey gear and the areas used to expand survey results to a biomass estimate. To investigate the first issue, potential herding of petrale sole, video of the NWFSC survey trawl and flatfish behaviour was collected during summer 2009 and data were analyzed in 2010 (Bryan et al. In prep). Results from this study indicate that flatfish are herded by the NWFSC survey trawl and video shows large mud clouds that likely contribute to this herding. It was also noted that the net width, which is used to calculate the swept area of the trawl, is on average three times smaller than the door width. If the door width were used in the swept area calculation then the NWFSC survey catchabilty would be around 1. However, the survey does not have door width measurement for all survey tows. The NWFSC does not currently have

reliable coast-wide estimates of trawlable and untrawlable habitat that can be used to address the second issue, the areas used to expand survey results to a biomass estimate. Therefore, the biomass expansion continues to use the total survey area even though the total survey area is unlikely the whole area represents petrale habitat. Regardless, neither issue will change the overall trends in the survey index of abundance, only the overall magnitude of the index would change.

3. The STAR panel noted that while the STAT addressed aging errors in the 2009 stock assessment, uncertainties in age-composition due to surface aging of petrale sole remain important. All petrale sole aging labs are now using the break-and-burn aging technique because it was estimated to be less biased than surface-read ages through a bomb radiocarbon age validation study (Haltuch et al. In review).

4. The PFMC SSC also noted that while flatfish are, in general, productive stocks, the model-derived estimate of steepness for petrale sole (0.95) in the 2009 stock assessment is at the 99th percentile of the distribution of steepness based on a meta-analysis of Pleuronectids stocks (the family of right-eyed flatfish), indicating that the estimate of steepness for petrale sole is high compared to other flatfish. Based on SSC recommendations the STAT has included a prior for steepness in the assessment model based on the meta-analysis of steepness for Pleuronectids.

5. The STAR panel noted that the comprehensive catch reconstructions currently underway in Washington and Oregon need to be completed and that the mixing of U.S. and Canadian catches is of particular concern for the Washington fleet. The Oregon catch reconstruction has been completed and is used in the 2011 assessment. The Washington catch reconstruction is not complete so the previously reconstructed catches from 2009 remain unchanged in the 2011 assessment.

6. The STAR panel noted that the current assessment platform (SS3) is structurally complex, making it difficult to understand how individual data elements are affecting outcomes. The STAR panel recommended investigating simpler, less structured models, including statistical catch/length models, to compare and contrast results as data and assumptions are changed. The SS3 model is the standard stock assessment tool used by PFMC stock assessments and is the platform for the current 2011 stock assessment. Resources were not available to develop and implement alternative assessment models.

7. The STAR panel recommended expanding the stock assessment area to include Canadian waters to cover the entire biological range of petrale sole. The 2011 stock assessment continues to cover only U.S. waters, as insufficient resources were available for the development of a trans-boundary assessment for this species.

8. The STAR panel noted that plots of petrale sole abundance vs. survey depth suggest that there may be high summer densities of petrale sole inshore of the survey area. The STAR panel recommended expanding the survey area inshore or implementing a new nearshore survey. The resources to start a new survey time series do not exist; the previous survey protocol remains unchanged.

9. The STAR panel noted that a winter shelf/slope survey would be particularly valuable for a stock like petrale with seasonal onshore-offshore migrations. However, the resources to start a new survey time series do not exist so there is not winter survey.

10. The STAR panel recommended a management strategy evaluation (MSE) be completed for petrale sole because the estimates of $B_0$ and $B_{current}$ are sensitive to the assumed stock-recruitment relationship (either Beverton-Holt or Ricker), making these reference points more uncertain, while $B_{MSY}$ estimates were consistent among all the model run results in the 2009 stock assessment. MSEs are a major undertaking and the resources did not exist to complete an MSE during the current stock assessment cycle.

## *2.5 Model Description*

### *2.5.1 Link from the 2009 to current assessment model*

As with the 2009 petrale sole stock assessment, the current model is implemented as a single-area model. The current assessment has been upgraded to the newest version of SS (3.21d). A thorough description of the 2011 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 2009 model was split into two seasons, winter (Nov.-Feb.) and summer (Mar.-Oct.) due to the timing of the fisheries and the shift over time toward fishing in the winter on spawning aggregations. Hence, the fishing year defined within the model is offset by two months from the calendar year. Early SS models did not allow the specification of catches from different fleets to take place at different times of the year so a seasonal model was implemented. More recent SS versions allow the timing of the catches from each fleet to be specified at the correct time. Therefore, the 2011 model is a 12-month model with removals from fishery catch assigned to appropriate the season, as defined above. In transitioning from the seasonal to the 12-month model, the STAT verified that the two model configurations give essentially the same results using the data available in 2009. The ageing-error analysis has been updated to reflect the inter-lab comparison between the CAP and the WDFW. This analysis was conducted using data from additional ageing of otoliths included in the bomb radiocarbon age-validation study, as well as new break-and-burn double-reads provided by the CAP aging lab. The aging analysis has also been improved through the incorporation of new triple-read age data.

*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-V3.21d) was used, since it included many improvements and corrections to older versions (Methot 2007).

*2.5.4 Sample Weighting*

Survey 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; iterative re-weighting was first completed for the fishery independent survey indices of abundance and then for the fishery CPUE indices of abundance. Initial input sample size for survey 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 produces input sample sizes that are 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 unacceptably long run times, this approach was not used for all of the commercial age samples. 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 $\sigma_R$ was determined using an iterative procedure to ensure that the value of $\sigma_R$ assumed by the assessment model and the empirical variance in recruitment were self-consistent. This involved setting $\sigma_R$ 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 (1959–2007), replacing the assumed value of $\sigma_R$ by the calculated value, and repeating the process until convergence occurred. Very little iterative reweighting was necessary for $\sigma_R$.

*2.5.5 Priors*

Priors were applied only to parameters for natural mortality and steepness in the base-case model. The steepness prior is based on the Myers (Myers et al. 1999) meta-analysis of flatfish steepness and the natural mortality prior is based on a meta-analysis completed by Hamel et al. (In prep.).

*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 the estimation of separate growth curves and natural mortality for males and females. The assessment therefore tracks only the spawning biomass of females for use in calculating stock status.

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.

### 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 (1939-2007) 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 and 2009 stock assessments.

## 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 coast-wide model with seasonal fleet structure for each state, splitting the triennial survey into an early and late time period, and estimates of 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.

Prior to the STAR panel, detailed exploration was made to evaluate:

1. estimation of natural mortality
2. estimation of the stock-recruitment steepness
3. tuning of composition sample sizes
4. the period over which recruitment deviations are estimated
5. time varying and asymptotic versus dome shaped selectivity curves for all fishing fleets and surveys

6. the tuning of recruitment variability
7. commercial age data and aging error estimates
8. Summer commercial CPUE

*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 signals 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 and/or activities for future assessments include:

1. Join the WA and OR fleets due to the difficulty of separating catches caught in one states waters but landed and samples in another states waters. This will allow the current version of the OR catch reconstruction to be used in the next assessment.
2. Investigate time varying growth

***2.8 Base-case model results***

The biological parameters estimated from the base-case model are reasonable (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 51 cm while males grow to 40 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, 0.16, compared to males, 0.18 (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 than in the early years (Figure 38). The catchability values for the NWFSC and the early and late triennial surveys are different, 2.97 and 0.59 and 0.84, respectively (Table 17). The catchability estimates are similar to the values estimated in the 2009 assessment. A power function was used to relate the winter commercial CPUE indices to the population size. The estimates of the Beta parameter for with WA, OR, and CA indices are 1.51, 1.68, and 0.80, respectively.

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 39-41). Time blocks were implemented to account for some of the 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). These time blocks were chosen based on changes in fishing practices and the timing of management measures implemented for the groundfish fishery and with the aide of the 2009 STAR panel GAP representative and the members of industry present at the panel.

The base-case model was able to fit the triennial and NWFSC fishery independent indices of abundance, as well as the winter commercial CPUE indices well (Figures 42 and 43). Fits to the fishery independent length and age distributions are good, with no strong trends in the Pearson residuals (Figures 44-49). The model fails to fit some of the fishery-dependent age and length compositions during periods of strong recruitments and early in the data when a higher proportion of large fish are observed in the population (Appendix C). The Pearson residuals reflect the noise in the data both within and between years. Slight residual patterns in the last few years of NWFSC survey compositions (Figure 46) suggest that there are proportionally more small/young fish in the population than expected. 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 D).

The discard rates for petrale sole are generally quite small, resulting in very small values for the standard deviations around the weights. The standard deviations on the discard ratios from the WCGOP are likely underestimates (pers. comm. J. Jannot), therefore an additional standard deviation is added to the estimates provided by the WCGOP. In the base model the discard rates fit well, with the exception of a few observations in the last year of the data for some fleets (Figure 52). The fits to the average weight of the discarded catch and the summer fleets discard length compositions are good (Figure 53-57).

The estimated recruitment deviations show relatively low variability. The value of $\sigma_R$ was estimated to be 0.32 (input value of 0.4), which is similar to the output values from the 2009 stock assessment. 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, punctuated by larger recruitments (Table 18, Figures 58-60). The four weakest recruitments since

1939 are estimated to be from 1962, 1986, 1987, and 1992, while the four strongest recruitments since 1939 are estimated to be from 1939, 1966, 1998, and 2007 (Table 18, Figure 58-59). Until 2007 the most recent large recruitment event, is estimated to be in 2006, and was smaller than of the 1998 recruitment event. The estimate of stock-recruitment steepness is 0.86 (Table17, Figure 60), which is lower than the 2009 assessment.

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 (Tables 18-19, Figures 61-62). This general pattern of stock decline is coincident with increasing catches and the movement of the fishery from summer fishing in shallow waters to winter fishing on spawning aggregations in deeper waters (Figure 1). From the mid-1990s through 2005 the stock increased slightly, then declined through 2010 (Table 18-19, 63). In 2011the stock has increased slightly, as the 2007 recruitment begins to mature.

### *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 female rate of natural mortality are presented in a decision table. 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. The model provided generally consistent behavior in the numerous sensitivity model runs that were explored before and during the STAR panel. Results from the base case and three sensitivity runs are shown in Table 20 and Figure 63. The first investigates the influence of assuming that the winter commercial CPUE indices are directly proportional to biomass. The second investigates the influence of excluding the winter CPUE data from the stock assessment. Both sensitivity model runs produce similar trajectories of stock decline and recovery, with the estimates of unfished biomass falling within the 95% confidence intervals from the base model run (Figure 63). In the first case, assuming that the winter commercial CPUE in directly proportion to the spawning stock suggests that the unfished biomass is much lower that the base model (20,190 mt v. 26,278 mt), this results in a higher 2011 depletion (39% v. 18%) and a lower spawning biomass at MSY proxy (5,048 mt v. 6,570 mt). However the model run that assumes the winter commercial CPUE is directly proportional to the spawning stock size produces estimates for biological parameters that are outside of those generally accepted for petrale sole and are at or outside of the significance levels from the M and h base model likelihood profiles (Figure 65). The estimates of female and male M are 0.24 and 0.26, respectively, much larger than any value that has been assumed or previously estimated for petrale sole in the California Current. The estimate of h, 0.74, is still a potentially reasonable value for petrale sole, but is the lowest estimate ever for west coast petrale sole. The second model sensitivity run, without the winter CPUE indices, suggests that the unfished biomass is slightly larger than the base model (27,576 mt v. 26,278 mt), resulting is a lower depletion (14% v. 18%) and a higher spawning biomass at the MSY proxy (6,894 mt v. 6,570 mt). The estimates of M and h, 0.146 for females and 0.89, are within the range of values previously estimated for petrale sole on the west coast.

### *2.9.2 Retrospective analysis*

A retrospective analysis was conducted by running the model using data only through 2005, 2006, 2007, 2008, 2009, and 2010 (Table 21, Figure 64). The retrospective model runs suggest that the unfished spawning biomass is between 26,000 mt and 30,000 mt. The unfished spawning biomass estimate is lower in the 2011-2009 model runs and higher in the 2006-2008 model runs. However, all of these values fall within the 95% confidence levels from the current base model. The stock depletion in a given year is similar across retrospective model runs, changing by <3% between the different retrospective runs.

### *2.9.3 Likelihood profiles*

Likelihood profiles for steepness and female natural mortality were completed to investigate the uncertainty in the estimates of h and female M (Figure 65). Plausible values for h range from approximately 0.75 to 1.0 while values for female M range from 0.12 to 0.22.

## 3. Rebuilding Parameters

The petrale sole stock has been declared overfished and is being managed under a rebuilding plan.

## 4. Reference points

The 2009 stock assessment estimated petrale sole to be at 11.6% of unfished spawning stock biomass. Based on the 2005 stock assessment the coast-wide ACLs and ACTs were set at 2,811 mt for 2009 and 2,393 mt for 2010. However the 2010 ACT was reduced to 1,200 mt following review and Council adoption of the 2009 petrale assessment. Based on the 2009 assessment and rebuilding analysis, the Council approved OFLs for 2011 and 2012 of 1,021 mt and 1,160 mt, respectively, along with ACLs of 976 mt and 1,160 mt, respectively. However, due to Secretarial review and disapproval of some elements of the package, the 2012 specifications have not yet been finalized (Table 22). Recent coast-wide annual landings have not exceeded the ACL except for 2005 when the ACL was exceeded by 92 mt, 3.3%. Both the 2005 and 2009 stock assessments estimated that petrale sole have been below 25% of unfished biomass from the mid-1950s until recently, with estimated harvest rates in excess of a fishing mortality rate of F30%. The length of time that the petrale sole stock had been below the 25% of unfished level while sustaining relatively stable annual landings led the STAR panel and SSC to investigate new reference points for all flatfish managed by the PFMC. The end result is that new reference points were specified for flatfish. The new reference points are as follows: the target reference point is 25% of the unfished biomass, the overfished reference point is 12.5 percent of the unfished level, the limit reference point is 5% of the unfished level, and the F target is $F_{30\%}$.

The current assessment estimates that petrale sole have been below the $SB_{25\%}$ management target since the mid-1950s and below the overfished threshold between the early 1980s and the early 2000s (Table 18, Figures 61-62) with fishing mortality rates in excess of the current F-target for flatfish of $SPR_{30\%}$ since the mid-1930s (Table 18, Figure 66). Since 2000 the stock has increased, reaching a peak in 2005, followed by a decreasing trend through 2010. Fishing mortality rates in excess of the current F-target for flatfish of $SPR_{30\%}$ are estimated to have begun in the late 1930s and persisted through 2009. Current F (catch/biomass of age-3 and older fish) is estimated to have been 0.08 in 2010. Unfished spawning stock biomass was estimated to be 26,278 mt in the base-case model (Figure 61). The target stock size ($SB_{25\%}$) is therefore 6,570 mt, which gives a catch of 2,578 mt. Model estimates of spawning biomass at MSY and MSY yield are slightly lower than those specified under the current control rule. Maximum sustained yield (MSY) applying recent fishery selectivity and allocations was estimated in the assessment model at 2,588 mt, occurring at a spawning stock biomass of 5,805 mt (SPR = 0.25) (Table i, Figures g,h). Pacific coast flatfish, including Petrale sole, are considered overfished when the stock falls below 12.5% of unfished spawning biomass and rebuilt when it reaches 25% of unfished spawning biomass.

## 5. Harvest projections and decision tables

The total ACLs in 2011 and 2012 are 976 mt and 1160 mt and the projections are based on the assumption that they will be reached. The exploitation rate for 2013 and beyond for the base model projection potential is based upon an SPR of 30% (Table 22). Selectivity and fleet allocations are projected at the average values for the most recent two years. The states of nature were based on the estimates of asymptotic standard deviation from the base model and are low (0.13) and high (0.19) values for female natural mortality (Table 23). The quartiles of M used were based the 12.5% and 87.5% to correspond to the midpoints of the lower 25% probability and upper 25% probability regions. The time series of catches are those from the 25-5 rule from the base case model. Further catch alternatives were not specified at the STAR panel as petrale sole will have a subsequent rebuilding analysis based on this stock assessment.

Current medium-term forecasts predict an increasing trend in abundance and catch through 2014 followed by stable spawning biomass and catches in later years, with ACL values for 2013 set at 2,831 mt under the 25-5 harvest policy. The stock is expected to move above the target stock size of $SB_{25\%}$ in 2013. The following table shows the projection of expected petrale sole catch, spawning biomass and depletion from the base model using the 25-5 control rule.

## 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. 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 comprehensive historical catch reconstructions have been completed for California and Oregon it would be best if a complete catch reconstruction is available from Washington 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.
2. While there are limited recent age data from the California fishery, this data collection needs to be continued.
3. Historical age data could be improved by obtaining new break and burn ages where structures are available.
4. Expand the assessment terms of reference, and set up an assessment and management framework that includes a joint U.S.-Canadian assessment, including the waters of British Columbia, since petrale sole are likely a single stock that moves across the U.S. Canadian boarder.
5. 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.
6. Studies of spawning aggregation dynamics across a range of stock sizes.

## 8. Acknowledgements

This assessment draws heavily on the text and analyses from previous petrale sole assessments as well as other groundfish assessments lead by I. Stewart and has benefited greatly from the efforts of all authors contributing to those analyses. Comments and suggestions from Jim Hastie and Stacey Miller improved the quality of this document.

Many people at various state and federal agencies assisted with assembling the data sources included in this assessment. Stacey Miller and John Devore assisted in identifying points of contact and acquiring Pacific council and other documentation. Beth Horness provided summary statistics from the NWFSC survey. John Wallace provided R code for generating GLMM-based indices of abundance from the triennial and NWFSC trawl surveys. Jason Jannot and Marlene Bellman provided discard data from the West Coast Groundfish Observer Program. Patrick McDonald and Teresa Tsou coordinated comparative ageing efforts and assisted in interpreting the results. Andre Punt provided software for the estimation of ageing imprecision and assistance in its use.

Finally, the members of the STAR panel and advisors to the panel provided a rigorous review of this work and provided insight into fishery. The members of the industry that attended the pre-assessment workshop in Newport, Oregon provided invaluable insights into the history of the fleet behavior as well as the historical context of the fishery.

## 9. Literature cited


Akaiki, H., 1974. A new look at the statistical model identification. IEEE Transaction on Automatic Control, AC-19, 716-723.

Anon. 2001. Fish stocks of the Pacific coast. Fisheries and Oceans Canada. ISBN 0-622-30042-4, Cat. No. Fs23-397/2001E.

Alderdice, D.F., and C.R. Forrester. 1971. Effects of salinity and temperature on embryonic development of the petrale sole (*Eopsetta jordani*). J. Fish. Res. Bd. Canada 28:727-744.

Allen, L.G., D.J. Pondella II, and M.H. Horn (eds). 2006. The ecology of marine fishes: California and adjacent waters. University of California Press, Los Angeles. 660 pp.

Alverson, D.L, and B.M. Chatwin. 1957. Results from tagging experiments on a spawning stock of petrale sole, *Eopsetta jordani* (Lockington). J. Fish. Res. Bd. Canada. 14:953-974.

Best, E.A. 1960. Petrale Sole. *In*: California ocean fisheries resources to the year 1960, p 58-60. California Department of Fish and Game. 79 p.

Best, E.A. 1963. Movements of petrale sole, *Eopsetta jordani*, tagged off of California. Pacific Marine Fisheries Commission Bulletin 6:24-38.

Birtwell, I.K., Wood, M., and D.K. Gordon. 1984. Fish diets and benthic invertebrates in the estuary of the Somass River, Port Alberni, British Columbia. Canadian Manuscript Report of Fisheries and Aquatic Sciences No. 1799. 49 p.

Bureau of Commercial Fisheries. 1949. The commercial fish catch of California for the year 1947 with an historical review 1916-1947. California Fish and Game Fish Bulletin 74:1-273.

Bryan, D., Bosley, K, Hicks, A.C., Haltuch, M.A., and W. Wakefield. 2011. In prep. Quantitative video analysis of flatfish herding behavior and the effective area swept of a survey trawl.

Burnham, K.P., and D.R. Anderson. 1998. Model selection and multimodel inference, a practical information-theoretic approach. 2nd ed. Springer, New York.

Carlin, B.P., A.E. Gelfand, and A.F.M. Smith. 1992. Hierarchical Bayesian analysis of change point problems. Appl. Statis. 41:389-405.

Casillas, E., L. Crockett, Y. deReynier, J. Glock, M. Helvey, B. Meyer, C. Schmitt, M. Yoklavich, A. Bailey, B. Chao, B. Johnson, and T. Pepperell. 1998. Essential Fish Habitat West Coast Groundfish Appendix, National Marine Fisheries Service, Seattle, Washington. Located at website http://www.nwr.noaa.gov/1sustfsh/efhappendix/page1.html

Castillo, G.C. 1995. Latitudinal patterns in reproductive life history traits of northeast Pacific flatfish. *In*: Proceedings of the International Symposium on North Pacific Flatfish, p 51-72. Alaska Sea Grant College Program, Fairbanks, Alaska.

Castillo, G.C., H.W. Li, and J.T. Golden. 1993. Environmental induced recruitment variation in petrale sole, *Eopsetta jordani*. Fisheries Bulletin 92:481-493.

Castillo, G.C. 1992. Fluctuations of year-class strength of petrale sole (*Eopsetta jordani*) and their relation to environmental factors. M.S.thesis, Oregon State University. 99 p.

Castillo, G.C., J.T. Golden, H.W. Li. 1995. Variations in relative abundance and year-class strength of petrale sole off Oregon and Washington. Proceedings of the International Symposium On North Pacific Flatfish, Alaska Sea Grant AK-SG-95-04.

Cleaver, F.C. (ed.) 1951. Fisheries statistics of Oregon. Oregon Fish Commission Contribution 16, Portland, Oregon.

Crone, P. R. 1995. Sampling design and statistical considerations for the commercial groundfish fishery of Oregon. Canadian Journal of Fisheries and Aquatic Sciences 52:716-732.

Dark, T. A., and M. E. Wilkins. 1994. Distribution, abundance and biological characteristics of groundfish off the coast of Washington, Oregon and California, 1977-1986. NOAA Technical Report NMFS 117:1-73.

Demory, R.L. 1984. Progress report on the status of petrale sole in the INPFC Columbia-Vancouver areas in 1984. Appendix 12. In: Status of the Pacific Coast groundfish fishery through 1984 and recommended biological catches for 1985: stock assessment and fishery evaluation. Pacific Fishery Management Council, Portland, OR.

Demory, R.L. and H.A. Bailey. 1967. Length-frequency and age-length-frequency distributions for dover sole, English sole, petrale sole, and Pacfic Ocean perch landed in Oregon 1948-65. Investigational Report 6. Fish Commission of Oregon.

Demory, R.L., M.J. Hosie, N. Ten Eyck, and B.O. Forsberg. 1976. Marine resource surveys on the continental shelf off Oregon, 1971-74. Oregon Department of Fisheries and Wildlife, Newport, OR. Project completion report to the National Marine Fisheries Service. Commercial Fisheries Research and Development Act, projects 1-78-D-1, 1-78-D-2, and 1-78-D-3. 49 p.

DiDonato, G. and N. Pasquale. 1970. Migration of petrale sole tagged in deep water off the Washington coast. Wash. Dept. Fish. Res. Pap. 3:53-61.

Eschmeyer, W.N. and E.S. Herald. 1983. A field guide to Pacific coast fishes North America. Houghton Mifflin CO., Boston, MA. 336 p.

Fargo, J. 1988. Flatfish. In Fargo, J., M.W. Saunder and A.V. Tyler (eds). Groundfish Stock Assessments for the West Coast of Canada in 1987 and Recommended Yield Options for 1988. Can. Tech. Rep. Fish. Aquat. Sci. 1617. 304 p.

Fargo, J.J. 1997. Flatfish stock assessments for the west coast of Canada for 1997 and recommended yield options for 1998. Can. Stock Assess. Sec. Res. Doc. 1997/36.

Fargo, J.J. 1999. Flatfish stock assessments for the west coast of Canada for 1998 and recommended yield options for 1999. Can. Stock Assess. Sec. Res. Doc. 99/17. 51 p.

Fargo, J.J. and A.R. Kronlund. 1997. Flatfish stock assessments for the west coast of Canada for 1996 and recommended yield options for 1997. Can. Tech. Rep. Fish. Aquat. Sci. 2149.

Fargo, J.J., A.R. Kronlund, J.T. Schnute and R. Haigh. 2000. Flatfish stock assessments for the west coast of Canada for 2000 and recommended yield options for 2001. Can. Stock Assess. Sec. Res. Doc. 2000/166.

Ford, R.F. 1965. Distribution, population dynamics and behavior of a Bothid flatfish, *Citharichthys stigmaeus*. Ph.D. Thesis, University of California San Diego. 243 p.

Gertseva, V., Karnowski, M., and A. Stephens. 2010. Historical Reconstruction of Oregon Commercial Groundfish Landings. NOAA NWFSC.

Garrison, K.J. and B.S. Miller. 1982. Review of the early life history of Puget Sound fishes. Fisheries Research Institute, School of Fisheries University of Washington, Contract No. 80-ABA-3680, Unpublished report FRI-UW-8216. 729 p.

Gates, D.E. and H.W. Frey. 1974. Designated common names of certain marine organisms of California. California Department of Fish and Game, Fish Bulletin 161:55-90.

Gregory, P.A. and T. Jow. 1976. The validity of otoliths as indicators of age of petrale sole from California. California Department of Fish and Game 62(2):132-140.

Haltuch, M.A., and A.C. Hicks. 2009. Status of the U.S. petrale sole resource in 2008. Pacific Fishery Management Council. Portland, Oregon.

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.

Harry, G. 1956. Analysis and History of the Oregon Otter-Trawl Fishery. PhD Thesis, University of Washington, Seattle. 328 p.

Harry, G. and A.R. Morgan. 1961. History of the trawl fishery, 1884-1961. Oregon Fish Commission Research Briefs. 19:5-26.

Harry, G.Y. 1959. Time of spawning, length at maturity, and fecundity of the English, petrale, and dover soles (*Parophrys vetulus*, *Eopsetta jordani*, and *Mircrostomus pacificus*, respectively). Fisheries Commission of Oregon, Research Briefs 7(1):5-13.

Hart, 1986

Hart, J.L. 1973. Pacific Fishes of Canada. Fisheries Research Board of Canada Bulletin 180, 740 p.

Heimann, R.F.G. and J.G. Carlisle. 1970. The California marine fish catch for 1968 and historical review 1916-68. CDFG Fish. Bull. 149. 70 p.

Hilborn, R., and C.J. Walters. 2001. Quantitative fisheries stock assessment, choice dynamics and uncertainty. Kluwer Academic Publishers, London.

Hoenig, J.M. 1983. Empirical use of longevity data to estimate mortality rate. U.S. Fish. Bull. 82:898-903.

Horton, H.F. 1989. Species profile: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Northwest). Dover and rock soles. U.S. Fish and Wildlife Service Biological Report 82(11.123), 27 p.

Keller, A.A., V.H. Simon, B.H. Horness, J.R. Wallace, V.J. Tuttle, E.L. Fruh, K.L. Bosley, D.J. Kamikawa, and J.C. Buchanan. 2007. The 2003 U.S. west coast bottom trawl survey of groundfish resources off Washington, Oregon, and California: Estimates of distribution, abundance, and length composition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-86, 130p.

Ketchen, K.S. and C.R. Forrester. 1966. Population dynamics of the petrale sole, *Eopsetta jordani*, in waters off western Canada. Fish. Res. Bd. Canada Bull. 153. 195 p.

Kimura, D.K. and J.V. Tagart, 1982. Stock reduction analysis, another solution to the catch equations. Can. J. Fish. Aquat. Sci. 39: 1467-1472.

King, S. E., R. W. Hannah, S. J. Parker, K. M. Matteson, and S. A. Berkeley. 2004. Protecting rockfish through gear design: development of a selective flatfish trawl for the U.S. west coast bottom trawl fishery. Canadian Journal of Fisheries and Aquatic Sciences 61:487-496.

Kramer, D.E., W.H. Barss, B.C. Paust, and B.E. Bracken. 1995. Guide to northeast Pacific flatfishes: families Bothidae, Cynoglossidae, and Pleuronectidae. Alaska Sea Grant College Program, Fairbanks, AK and Alaska Fisheries Development Foundation, Anchorage, AK. Marine Advisory Bull. 47. 104 p.

Kravitz, M.J., W.G. Pearcy, and M.P. Guin. 1977. Food of five species of co-occurring flatfishes on Oregon's continental shelf. Fishery Bulletin 74(4):984-990.

Lai, H.L., M.A. Haltuch, A.E., Punt, and J. Cope. 2005. Stock assessment of petrale sole: 2004. Pacific Fishery Management Council. Portland, Oregon.

Lee, Y.W. 2003. Oceanographic effects on the dynamics of food habits and growth condition of some groundfish species of the Pacific Northwest, PhD thesis, Oregon State University, 177p.

Love, M. 1996. Probably More Than You Want To Know About The Fishes Of The Pacific

Coast. Really Big Press, Santa Barbara, California, 381 p.
Love, M.S., C.W. Mecklenburg, T.A. Mecklenburg, and L. Thorsteinson. 2005. Resource inventory of marine and estuarine fishes of the west coast and Alaska: A checklist of north Pacific and arctic ocean species from Baja California to the Alaska-Yukon border. USGS, Seattle, WA. OCS study MMS 2005-030 and USGS/NBII 2005-001.
Lynde, M. 1986. The historical annotated landings (HAL) database: Documentation of annual harvest of groundfish from the northeast Pacific and eastern Bering Sea from 1956 to 1980. NOAA Tech. Memo. NMFS F/NWC-103.
Mantua, N. J., S. R. Hare, Y. Zhang, J. M. Wallace, and R. C. Francis. 1997. A Pacific interdecadal climate oscillation with impacts on salmon production. Bull. Am. Meteorol. Soc. 78:1069-1080.
Maunder, M.M and A.E. Punt. 2004. Standardizing catch and effort data: a review of recent approaches. Fish. Res. 70:141-159.
Methot, R. D. 2000. Technical description of the Stock Synthesis assessment program. National Marine Fisheries Service, Seattle.
Methot, R. D. 2007. User manual for the integrated analysis program Stock Synthesis 2 (SS2): Model version 2.00a.
Moser, H.G. (Editor). 1996a. The early stages of fishes in the California Current region. California Cooperative Oceanic Fisheries Investigations, Atlas No. 33. Allen Press, Inc., Lawrence, Kansas. 1505 p.
Myers, R.A, K.G. Bowen, and N.J. Barrowman. 1999. Maximum reproductive rate of fish at low population sizes. Can. J. Fish. Aquat. Sci. 56: 2404-2419.
MBC Applied Environmental Sciences. 1987. Ecology of important fisheries species offshore California. U.S. Department of the Interior, Minerals Management Service, Pacific OCS Region, Los Angeles, CA. MMS Contract No. 14-12-0001-30294.
Neter, J., W. Wasserman, and M.H. Kutner. 1985. Applied linear statistical models. 2$^{nd}$ ed. Irwin, Illinois.
NWFSC. 2004. Northwest Fisheries Science Center West Coast Groundfish Observer Program Data Report and Summary Analyses. Trawl Report 2004.
Otter Research Ltd. 2005. An introduction to AD Model Builder Version 7.1.1 for use in nonlinear modeling and statistics. in, Sidney, B.C., Canada.
Otter Research Ltd. 2005. An introduction to AD Model Builder Version 7.1.1 for use in nonlinear modeling and statistics. in, Sidney, B.C., Canada.
PFMC. 1998. Status of the Pacific Coast groundfish fishery through 1998 and recommended acceptable biological catches for 1999: stock assessment and fishery evaluation. Pacific Fishery Management Council. Portland, Oregon.
PMFC. 1979. Data series, Groundfish Section. Pacific Marine Fisheries Commission. Portland, Oregon.
PFMC (Pacific Fishery Management Council) and NMFS (National Marine Fisheries Service). 2006. 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.

Pearcy, W.G., M.J. Hosie, and S.L. Richardson. 1977. Distribution and duration of pelagic life of larvae of Dover sole, *Microstomus pacificus*; rex sole, *Glyptocephalus zachirus*; and petrale sole *Eopsetta jordani*, in waters off Oregon. Fish. Bull. 75:173-183.

Pedersen, M.G. 1975. Movements and growth of petrale sole (*Eopsetta jordani*) tagged off Washington and southwest Vancouver Island. Fishery Research Board of Canada Progress Report 32(1):2169-2177.

Perry, R.I., M. Stocker and J. Fargo. 1994. Environmental effects on the distribution of groundfish in Hecate Strait, British Columbia. Can. J. Fish. Aquat. Sci. 51:1401-1409.

Pikitch, E.K., D.L. Erikson, and J.R. Wallace. 1988. An evaluation of the effectiveness of trip limits as a management tool. NOAA, NMFS, NWAFC Processed Report 88-27. 33 p.

Porter, P. 1964. Notes on fecundity, spawning, and early life history of petrale sole (*Eopsetta jordani*), with descriptions of flatfish larvae collected in the Pacific Ocean off Humboldt Bay, California. M.S.thesis, Humboldt State College. 98 p.

Punt, A.E., D.C. Smith, K. KrusicGolub, and S. Robertson. 2008. Quantifying age-reading error for use in fisheries stock assessments, with application to species in Australia's southern and eastern scalefish and shark fishery. CJFAS, 65: 1991-2005.

Ralston, S., Pearson, D., Field, J., and M. Key. 2009. Documentation of the California catch reconstruction project. NOAA SWFSC.

Reilly, P.N. D. Wilson-Vandenberg, R.N. Lea, C. Wilson, and M. Sullivan. 1994. Recreational angler's guide to the common nearshore fishes of Northern and Central California. California Department of Fish and Game, Marine Resources Leaflet.

Sampson, D.B. and Y.W. Lee. 1999. An Assessment of the Stocks of Petrale Sole off Washington, Oregon and Northern California in 1998. In: Status of the Pacific Coast groundfish fishery through 1998 and recommended biological catches for 1994: stock assessment and fishery evaluation. Pacific Fishery Management Council, Portland, OR.

Sager, G. and R. Sammler. 1982. Approximations of the length growth of the petrale sole *Eopsetta jordani* (male & female) with a number of growth functions. Zool. JANRB., Abt. Anat. Ontog. Tiere. 108:27-46.

Sampson, D. B., and P. R. Crone. 1997. Commercial fisheries data collection procedures for U.S. Pacific coast groundfish. NOAA Technical Memorandum NMFS-MWFSC-31.

Scofield, W.L. 1948. Trawling gear in California. CDFG Fish Bull. 72:1-60.

Smith, H.S. 1956. Fisheries statistics of Oregon 1950-53. Oregon Fish Commission Contribution 22. Portland, Oregon.

Smith, R.T. 1937. Report on the Puget Sound otter trawl investigations. M.S. Thesis, University of Washington. 61 p.

Spiegelhalter, D.J., A. Thomas, N.G. Best, and D. Lunn 2003. WinBUGS user manual. Available from http://www.mrc-bsu.cam.ac.uk/bugs .

Starr, P.J. and J. Fargo. 2004. Petrale sole stock assessment for 2003 and recommendations for management in 2004. CSAS Res. Doc. 2004/036. 92 p.

TenEyck, N. and R. Demory 1975. Utilization of flatfish caught by Oregon trawlers in 1974. Oregon Dept. Fish and Wildlife Info. Rep. 75-3. 11 p.

Trumble, S.J. 1995. Abundance, movements, dive behavior, food habits, and mother – pup interactions of harbor seals (*Phoca vitulina richardsi*) near Monterey Bay, California. M.S. Thesis, California State University Fresno. 100 p.

Turnock, J., M. Wilkins, M. Saelens, and C. Wood. 1993. Status of West Coast petrale sole in 1993. Appendix G. In: Status of the Pacific Coast groundfish fishery through 1993 and recommended biological catches for 1994: stock assessment and fishery evaluation. Pacific Fishery Management Council, Portland, OR.

Tyler, A. V. and J. Fargo. 1990. Groundfish Stock Assessments for the West Coast of Canada in 1989 and Recommended Yield Options for 1990. Canadian Technical Report of Fisheries and Aquatic Sciences 1-343.

Wallace, J.R., E.K. Pikitch, and D.L. Erickson. 1996. Can changing cod end mesh size and mesh shape affect the nearshore trawl fishery off the west coast of the United States? N. Am. J. Fish. Management 16:530-539.

WDFW. 1956. 1955 Commercial Fishing Statistics. Washington Department of Fisheries. April 1956.

Weinberg, J. R., P. J. Rago, W. W. Wakefield, and C. Keith. 2002. Estimation of tow distance and spatial heterogeneity using data from inclinometer sensors: an example using a clam survey dredge. Fisheries Research 55:49-61.

Westrheim, S.J. and W.R. Harling. 1983. Principal prey species and periodicity of their incidence in stomachs of trawl-caught Pacific cod (*Gadus macrocephalus*), rock sole (*Lepidopsetta bilineata*), and petrale sole (*Eopsetta jordani*) landed in British Columbia, 1950-80. Can. Manusc. Rep. Fish. Aquat. Sci. 1681. 42 p.

Zimmermann, M., M. E. Wilkins, K. L. Weinberg, R. R. Lauth, and F. R. Shaw. 2001. Retrospective analysis of suspiciously small catches in the National Marine Fisheries Service west coast triennial bottom trawl survey. NOAA Proc. Rep. 2001-03.

Zimmermann, M., M.E. Wilkins, K.L. Weinberg, R.R. Lauth, F.R. Shaw. 2003. Influence of improved performance monitoring on the consistency of a bottom trawl survey. ICES J. Mar. Sci. 60:818-826.

## 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 | 0.00 | 1.00 |
| 1877 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| 1878 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| 1879 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| 1880 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11.55 | 0.00 | 11.55 |
| 1881 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 22.10 | 0.00 | 22.10 |
| 1882 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 32.65 | 0.00 | 32.65 |
| 1883 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 43.20 | 0.00 | 43.20 |
| 1884 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 53.75 | 0.00 | 53.75 |
| 1885 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 64.30 | 0.00 | 64.30 |
| 1886 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 74.85 | 0.00 | 74.85 |
| 1887 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 85.40 | 0.00 | 85.40 |
| 1888 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 95.95 | 0.00 | 95.95 |
| 1889 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 106.50 | 0.00 | 106.50 |
| 1890 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 117.05 | 0.00 | 117.05 |
| 1891 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 127.60 | 0.00 | 127.60 |
| 1892 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 138.15 | 0.00 | 138.15 |
| 1893 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 148.71 | 0.00 | 148.71 |
| 1894 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 159.26 | 0.00 | 159.26 |
| 1895 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 169.81 | 0.00 | 169.81 |
| 1896 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 180.36 | 0.00 | 180.36 |
| 1897 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 190.91 | 0.00 | 190.91 |
| 1898 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 201.46 | 0.00 | 201.46 |
| 1899 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 212.01 | 0.00 | 212.01 |
| 1900 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 222.56 | 0.00 | 222.56 |
| 1901 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 233.11 | 0.00 | 233.11 |
| 1902 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 243.66 | 0.00 | 243.66 |
| 1903 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 254.21 | 0.00 | 254.21 |
| 1904 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 264.76 | 0.00 | 264.76 |
| 1905 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 275.31 | 0.00 | 275.31 |
| 1906 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 285.86 | 0.00 | 285.86 |
| 1907 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 296.41 | 0.00 | 296.41 |
| 1908 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 306.96 | 0.00 | 306.96 |
| 1909 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 317.51 | 0.00 | 317.51 |
| 1910 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 328.06 | 0.00 | 329.06 |
| 1911 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 338.61 | 0.00 | 339.61 |
| 1912 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 349.16 | 0.00 | 350.16 |
| 1913 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 359.71 | 0.00 | 360.71 |
| 1914 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 370.26 | 0.00 | 371.26 |
| 1915 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 380.81 | 0.00 | 381.81 |
| 1916 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 386.42 | 0.00 | 387.42 |
| 1917 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 526.41 | 0.00 | 527.41 |
| 1918 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 423.85 | 0.00 | 424.85 |
| 1919 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 333.44 | 0.00 | 334.44 |
| 1920 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 230.49 | 0.00 | 231.49 |
| 1921 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 293.76 | 0.00 | 294.76 |
| 1922 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 424.78 | 0.00 | 425.78 |
| 1923 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 427.36 | 0.00 | 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 | 0.00 | 533.86 |
| 1925 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 528.47 | 0.00 | 529.47 |
| 1926 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 521.67 | 0.00 | 522.67 |
| 1927 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 632.04 | 0.00 | 633.04 |
| 1928 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 620.09 | 0.00 | 621.09 |
| 1929 | 0.00 | 0.00 | 0.00 | 3.08 | 0.00 | 706.04 | 0.00 | 709.12 |
| 1930 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 658.83 | 0.00 | 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 | 1463.39 |
| 1935 | 13.90 | 644.72 | 0.00 | 5.71 | 155.38 | 777.21 | 169.28 | 1427.64 |
| 1936 | 15.88 | 752.33 | 0.00 | 18.60 | 95.49 | 431.51 | 111.37 | 1202.44 |
| 1937 | 19.75 | 967.53 | 0.00 | 81.39 | 74.53 | 741.05 | 94.28 | 1789.97 |
| 1938 | 27.49 | 1182.73 | 0.00 | 4.10 | 47.86 | 890.00 | 75.35 | 2076.83 |
| 1939 | 35.22 | 1290.33 | 0.00 | 2.50 | 30.84 | 1028.96 | 66.06 | 2321.79 |
| 1940 | 39.09 | 1280.50 | 0.00 | 352.70 | 162.53 | 596.69 | 201.62 | 2229.89 |
| 1941 | 41.40 | 1260.83 | 0.00 | 464.20 | 110.81 | 331.32 | 152.21 | 2056.35 |
| 1942 | 46.00 | 1241.16 | 0.00 | 1868.70 | 24.37 | 215.56 | 70.37 | 3325.42 |
| 1943 | 50.61 | 1221.48 | 0.00 | 1898.56 | 71.66 | 344.72 | 122.27 | 3464.76 |
| 1944 | 55.21 | 1201.81 | 0.00 | 1007.50 | 85.53 | 446.58 | 140.74 | 2655.89 |
| 1945 | 59.82 | 1182.14 | 0.00 | 785.42 | 101.75 | 439.34 | 161.57 | 2406.90 |
| 1946 | 64.43 | 1162.46 | 0.00 | 1488.90 | 71.91 | 1115.57 | 136.34 | 3766.93 |
| 1947 | 69.03 | 1142.79 | 0.00 | 720.46 | 153.68 | 1092.65 | 222.71 | 2955.90 |
| 1948 | 73.64 | 1123.12 | 0.00 | 1326.50 | 272.66 | 1544.35 | 346.30 | 3993.97 |
| 1949 | 75.94 | 1113.27 | 0.00 | 755.79 | 615.70 | 1476.28 | 691.64 | 3345.34 |
| 1950 | 156.21 | 957.31 | 0.00 | 1643.80 | 410.94 | 1346.41 | 567.15 | 3947.52 |
| 1951 | 117.97 | 774.51 | 0.00 | 949.08 | 207.05 | 938.14 | 325.02 | 2661.73 |
| 1952 | 131.01 | 743.76 | 0.00 | 729.70 | 318.12 | 857.63 | 449.13 | 2331.09 |
| 1953 | 46.07 | 354.35 | 0.00 | 502.68 | 525.77 | 778.53 | 571.84 | 1635.56 |
| 1954 | 26.56 | 418.07 | 0.00 | 692.80 | 797.19 | 891.57 | 823.75 | 2002.44 |
| 1955 | 57.14 | 398.57 | 0.00 | 882.91 | 520.17 | 925.76 | 577.31 | 2207.24 |
| 1956 | 120.46 | 356.24 | 19.09 | 500.90 | 504.50 | 683.23 | 644.05 | 1540.37 |
| 1957 | 106.45 | 361.57 | 83.20 | 739.29 | 517.79 | 954.42 | 707.44 | 2055.28 |
| 1958 | 29.12 | 443.81 | 37.86 | 529.90 | 557.95 | 729.26 | 624.93 | 1702.97 |
| 1959 | 73.98 | 678.12 | 389.39 | 364.92 | 370.52 | 625.42 | 833.89 | 1668.46 |
| 1960 | 123.30 | 587.40 | 84.95 | 634.64 | 514.39 | 592.71 | 722.64 | 1814.75 |
| 1961 | 133.94 | 802.19 | 56.76 | 595.02 | 540.53 | 927.43 | 731.23 | 2324.64 |
| 1962 | 156.57 | 497.80 | 93.82 | 549.73 | 510.21 | 783.04 | 760.60 | 1830.57 |
| 1963 | 118.57 | 535.59 | 151.70 | 473.51 | 530.82 | 810.08 | 801.09 | 1819.18 |
| 1964 | 103.21 | 455.02 | 75.67 | 297.23 | 372.19 | 912.61 | 551.07 | 1664.86 |
| 1965 | 127.72 | 434.58 | 82.28 | 468.00 | 373.44 | 845.83 | 583.44 | 1748.41 |
| 1966 | 91.56 | 414.37 | 59.43 | 304.21 | 324.71 | 916.97 | 475.70 | 1635.55 |
| 1967 | 60.01 | 312.00 | 73.88 | 307.81 | 521.08 | 858.30 | 654.97 | 1478.11 |
| 1968 | 137.39 | 222.56 | 41.26 | 318.96 | 360.61 | 845.90 | 539.26 | 1387.42 |
| 1969 | 52.02 | 161.12 | 34.88 | 369.51 | 420.97 | 848.19 | 507.87 | 1378.82 |
| 1970 | 143.76 | 356.86 | 114.24 | 457.86 | 472.37 | 1070.97 | 730.37 | 1885.69 |
| 1971 | 152.49 | 418.93 | 133.52 | 296.50 | 539.72 | 1015.59 | 825.73 | 1731.02 |
| 1972 | 186.61 | 553.63 | 157.97 | 297.19 | 703.21 | 1000.27 | 1047.79 | 1851.09 |
| 1973 | 200.86 | 545.65 | 106.25 | 407.14 | 417.44 | 741.68 | 724.55 | 1694.47 |
| 1974 | 167.91 | 712.88 | 161.63 | 428.64 | 664.63 | 893.27 | 994.17 | 2034.79 |
| 1975 | 189.29 | 703.09 | 178.26 | 611.08 | 560.51 | 900.92 | 928.06 | 2215.09 |
| 1976 | 161.12 | 494.31 | 176.45 | 283.54 | 712.75 | 736.71 | 1050.32 | 1514.56 |

| 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 | 1226.20 |
| 1978 | 246.92 | 578.04 | 141.07 | 352.58 | 419.09 | 800.66 | 807.08 | 1731.28 |
| 1979 | 248.02 | 514.70 | 200.94 | 505.39 | 352.88 | 944.80 | 801.84 | 1964.89 |
| 1980 | 56.44 | 444.24 | 67.13 | 347.00 | 518.33 | 680.05 | 641.90 | 1471.29 |
| 1981 | 194.19 | 417.96 | 166.68 | 420.06 | 149.29 | 533.63 | 510.16 | 1371.65 |
| 1982 | 121.26 | 580.12 | 133.20 | 714.50 | 261.53 | 502.05 | 515.99 | 1796.67 |
| 1983 | 229.54 | 750.63 | 491.38 | 340.79 | 272.72 | 364.76 | 993.64 | 1456.18 |
| 1984 | 241.92 | 595.04 | 228.42 | 152.39 | 260.56 | 329.98 | 730.90 | 1077.41 |
| 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 | 1122.05 |
| 1988 | 333.64 | 449.18 | 409.10 | 160.73 | 349.17 | 411.28 | 1091.91 | 1021.19 |
| 1989 | 298.05 | 397.98 | 396.63 | 184.84 | 393.89 | 414.79 | 1088.57 | 997.61 |
| 1990 | 383.28 | 300.56 | 257.06 | 158.15 | 319.64 | 373.52 | 959.98 | 832.23 |
| 1991 | 352.01 | 246.91 | 440.45 | 149.91 | 447.94 | 310.28 | 1240.40 | 707.10 |
| 1992 | 298.02 | 204.76 | 339.67 | 159.65 | 273.54 | 307.39 | 911.23 | 671.80 |
| 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 | 246.18 | 303.57 | 763.57 | 652.92 |
| 1995 | 235.12 | 236.41 | 354.51 | 201.96 | 236.03 | 290.52 | 825.66 | 728.89 |
| 1996 | 264.64 | 247.52 | 310.87 | 182.23 | 406.09 | 401.93 | 981.60 | 831.68 |
| 1997 | 247.72 | 233.35 | 366.99 | 176.33 | 451.30 | 461.33 | 1066.01 | 871.01 |
| 1998 | 217.81 | 329.97 | 303.30 | 242.54 | 221.71 | 302.80 | 742.82 | 875.31 |
| 1999 | 134.65 | 307.13 | 323.37 | 193.18 | 292.03 | 268.38 | 750.05 | 768.69 |
| 2000 | 204.76 | 415.44 | 323.49 | 136.28 | 408.47 | 242.10 | 936.72 | 793.82 |
| 2001 | 252.78 | 347.07 | 358.42 | 225.93 | 317.31 | 261.34 | 928.51 | 834.34 |
| 2002 | 262.09 | 494.77 | 295.64 | 185.37 | 339.84 | 195.69 | 897.57 | 875.83 |
| 2003 | 224.44 | 527.35 | 241.76 | 166.43 | 260.70 | 180.19 | 726.90 | 873.97 |
| 2004 | 610.81 | 549.24 | 322.90 | 188.51 | 177.27 | 267.84 | 1110.98 | 1005.59 |
| 2005 | 555.84 | 763.41 | 374.93 | 286.19 | 339.46 | 534.42 | 1270.23 | 1584.02 |
| 2006 | 254.05 | 618.80 | 277.56 | 363.47 | 128.18 | 468.41 | 659.79 | 1450.68 |
| 2007 | 303.55 | 333.05 | 557.89 | 173.78 | 471.17 | 493.45 | 1332.61 | 1000.28 |
| 2008 | 286.74 | 179.78 | 448.62 | 136.28 | 617.55 | 416.16 | 1352.91 | 732.22 |
| 2009 | 198.24 | 328.79 | 599.01 | 280.70 | 512.81 | 259.67 | 1310.06 | 869.16 |
| 2010 | 58.99 | 115.62 | 164.71 | 125.20 | 84.21 | 117.60 | 307.91 | 358.42 |

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

| Year | ABC/OFL (mt) for the Calendar Year | OY/ACL (mt) for the Calendar Year | Commercial Landings (mt) for the Calendar Year | Estimated Total Catch (mt) for the Calendar Year | Estimated Total Catch (mt) for the Fishing Year |
|---|---|---|---|---|---|
| 1999 | 2,700 | 2,700 | 1,520 | 1,818 | 1,654 |
| 2000 | 2,950 | 2,950 | 1,778 | 1,908 | 1,870 |
| 2001 | 2,762 | 2,762 | 1,838 | 1,843 | 1,915 |
| 2002 | 2,762 | 2,762 | 1,877 | 1,998 | 1,970 |
| 2003 | 2,762 | 2,762 | 1,686 | 1,836 | 1,748 |
| 2004 | 2,762 | 2,762 | 2,191 | 2,038 | 2,251 |
| 2005 | 2,762 | 2,762 | 2,854 | 3,252 | 3,002 |
| 2006 | 2,762 | 2,762 | 2,102 | 2,362 | 2,214 |
| 2007 | 3,025 | 2,499 | 2,329 | 1,917 | 2,415 |
| 2008 | 2,919 | 2,499 | 2,079 | 2,254 | 2,154 |
| 2009 | 2,811 | 2,433 | 1,736 | 2,180 | 2,275 |
| 2010 | 2,751 | 1,200 | 701 | 1,160 | 704 |

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

Table 3. Summary of data sources available in 2011.

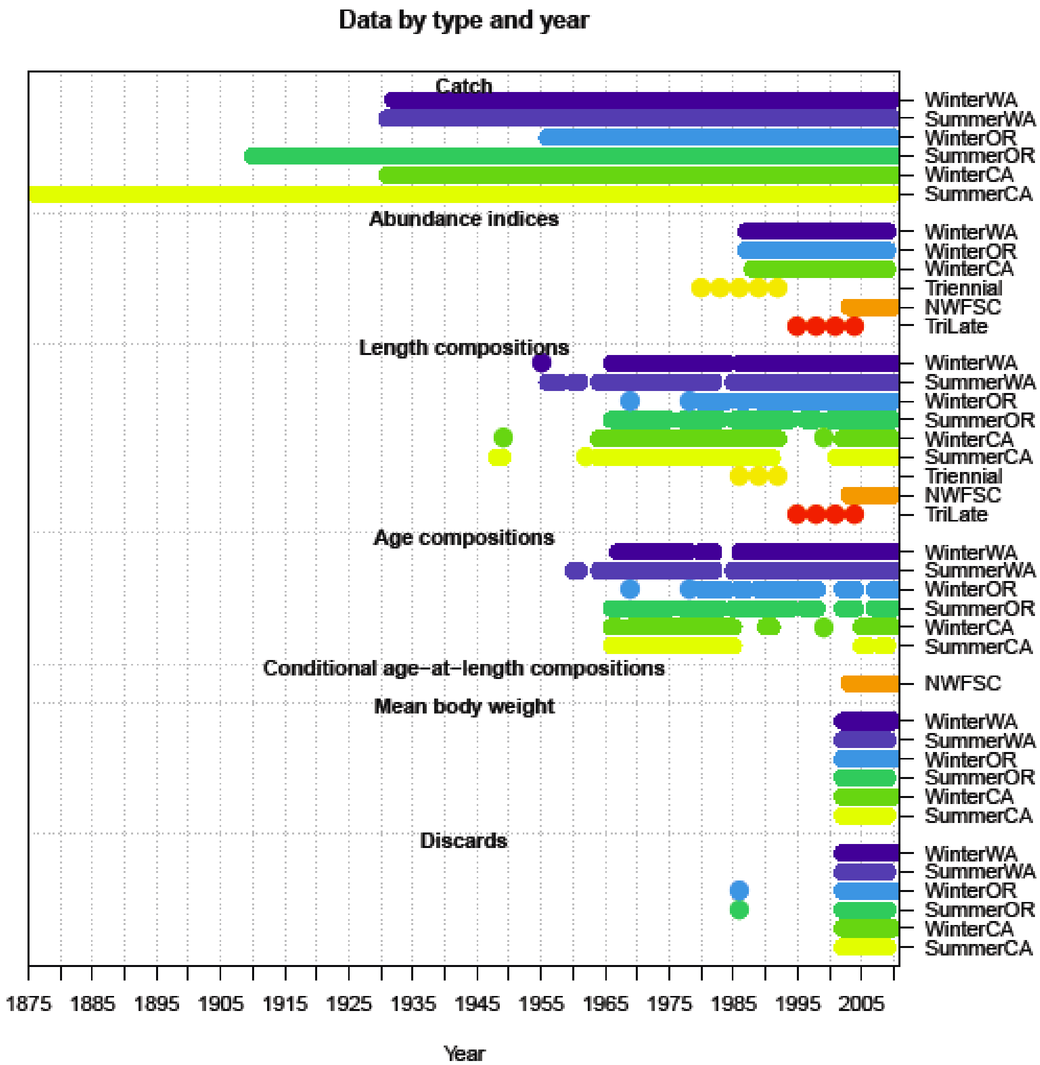


Table 4. Summary of the tow data from the NWFSC survey.

| Year | Number of tows | Number of Tows with Petrale | Percent of Tows with Petrale |
|---|---|---|---|
| 2003 | 540 | 198 | 36.7% |
| 2004 | 471 | 216 | 45.9% |
| 2005 | 635 | 278 | 43.8% |
| 2006 | 642 | 249 | 38.8% |
| 2007 | 686 | 258 | 37.6% |
| 2008 | 679 | 258 | 38.0% |
| 2009 | 682 | 278 | 40.8% |
| 2010 | 712 | 324 | 45.5% |

| Year | Number of tows with lengths taken | Percent Petrale tows with lengths taken | Number of female lengths | Number of male lengths | Number of unsexed lengths |
|---|---|---|---|---|---|
| 2003 | 197 | 99.5% | 1400 | 1433 | 4 |
| 2004 | 213 | 98.6% | 1795 | 1575 | 1 |
| 2005 | 276 | 99.3% | 2352 | 2176 | 16 |
| 2006 | 249 | 100.0% | 1988 | 1752 | 4 |
| 2007 | 258 | 100.0% | 1973 | 1456 | 6 |
| 2008 | 258 | 100.0% | 1612 | 1436 | 5 |
| 2009 | 277 | 99.6% | 1881 | 1549 | 2 |
| 2010 | 324 | 100.0% | 3014 | 3032 | 3 |

| Year | Number of tows with ages taken | Percent Petrale tows with ages taken | Number of female ages | Number of male ages | Number of unsexed ages |
|---|---|---|---|---|---|
| 2003 | 173 | 87.4% | 382 | 383 | 0 |
| 2004 | 168 | 77.8% | 432 | 293 | 0 |
| 2005 | 235 | 84.5% | 370 | 371 | 1 |
| 2006 | 238 | 95.6% | 424 | 358 | 2 |
| 2007 | 197 | 76.4% | 384 | 311 | 0 |
| 2008 | 226 | 87.6% | 399 | 349 | 1 |
| 2009 | 258 | 92.8% | 399 | 373 | 2 |
| 2010 | 296 | 91.4% | 395 | 404 | 0 |

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

| | Triennial | | NWFSC | |
|---|---|---|---|---|
| Year | Estimate (B) | SE(logB) | Estimate (B) | SE(logB) |
| 1980 | 1088 | 0.210 | | |
| 1981 | | | | |
| 1982 | | | | |
| 1983 | 1042 | 0.175 | | |
| 1984 | | | | |
| 1985 | | | | |
| 1986 | 1121 | 0.174 | | |
| 1987 | | | | |
| 1988 | | | | |
| 1989 | 1806 | 0.171 | | |
| 1990 | | | | |
| 1991 | | | | |
| 1992 | 998 | 0.168 | | |
| 1993 | | | | |
| 1994 | | | | |
| 1995 | 2436 | 0.083 | | |
| 1996 | | | | |
| 1997 | | | | |
| 1998 | 3471 | 0.071 | | |
| 1999 | | | | |
| 2000 | | | | |
| 2001 | 3767 | 0.079 | | |
| 2002 | | | | |
| 2003 | | | 19281 | 0.093 |
| 2004 | 9312 | 0.080 | 23195 | 0.123 |
| 2005 | | | 27690 | 0.087 |
| 2006 | | | 20515 | 0.081 |
| 2007 | | | 17263 | 0.083 |
| 2008 | | | 13779 | 0.075 |
| 2009 | | | 16971 | 0.076 |
| 2010 | | | 21866 | 0.065 |

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 | Number of 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 | WDFW-CAP Inter-lab Comparison; Bomb Radiocarbon Samples | Pre CAP; pre-1980 OR samples | Early CAP; 1981-1996 OR samples | Recent CAP; OR, CA, NWFSC samples 2000-present | CAP Bomb Radiocarbon Samples |
| BB v BB | 590 | 308 | | 7 | 924 | 333 |
| BB v. Combo | 590 | | | | | |
| BB v. S | | 308 | 216 | 3 | 314 | 333 |
| Combo v. Combo | 156 | | | | | |
| Combo v. S | | | | 142 | | |
| S v. S | | 308 | | 338 | 362 | 333 |

Tables 8a-d. The structure of the ageing bias and imprecision analysis for CAP and 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 unbiased. Therefore, these ages are used as the benchmark against which the other ageing methods are compared in the analysis.

a. WDFW break and burn ages

| | Radiocarbon v. BB1 v. BB2 | BB1 v BB2 |
|---|---|---|
| Radiocarbon v. BB1 v. BB2 | X | |
| BB1 v BB2 | | x |

b. CAP break and burn ages

| | Radiocarbon v. BB2 | BB1 v BB2 |
|---|---|---|
| Radiocarbon v. BB2 | X | |
| BB1 v BB2 | | x |

c. WDFW surface ages

| | Radiocarbon v. S1 v. S2 |
|---|---|
| Radiocarbon v. S1 v. S2 | x |

d. WDFW and CAP surface ages

| | Radiocarbon v. S1 v. S2 | S1 v. S2 |
|---|---|---|
| Radiocarbon v. S1 v. S2 | x | |
| S1 v. S2 | | x |

e. CAP combination ages

| | Radiocarbon v. S1 v. S2 | S1 v. S2 | S v. Combo |
|---|---|---|---|
| Radiocarbon v. S1 v. S2 | x | | |
| S1 v. S2 | | x | |
| S v. Combo | | | x |

f. WDFW combination ages

| | Radiocarbon v. S1 v. S2 | S1 v. S2 | S v. Combo |
|---|---|---|---|
| Radiocarbon v. S1 v. S2 | x | | |
| S1 v. S2 | | x | |
| S v. Combo | | | x |

Table 9a-f. A subset of the different models fit to each data set described in table 8 as well as the likelihoods, the model selected is highlighted. The bias options are 0 = unbiased, 1 = linear, 2 = type 2. The standard deviation options are 1=constant CV and 2=increase in CV with age.

a. WDFW break and burn ages

| Model Run | Likelihood | Bias Options For Each Aging Method | | Standard Deviation Options For Each Aging Method | |
|---|---|---|---|---|---|
| 1 | 3728.59 | 0 | 1 | 1 | 1 |
| 2 | 3724 | 0 | 2 | 1 | 1 |
| 3 | 3720.17 | 0 | 2 | 1 | 2 |

b. CAP break and burn ages

| Model Run | Likelihood | Bias Options For Each Aging Method | | Standard Deviation Options For Each Aging Method | |
|---|---|---|---|---|---|
| 1 | 4414.16 | 0 | 1 | 1 | 1 |
| 2 | 4405.5 | 0 | 2 | 1 | 1 |
| 3 | 4402.45 | 0 | 2 | 1 | 2 |
| 4 | na | 0 | 2 | 2 | 2 |

c. WDFW surface ages

| Model Run | Likelihood | Bias Options For Each Aging Method | | Standard Deviation Options For Each Aging Method | |
|---|---|---|---|---|---|
| 1 | 1498.4 | 0 | 1 | 1 | 1 |
| 2 | 1475.01 | 0 | 2 | 1 | 1 |
| 3 | 1469.7 | 0 | 2 | 1 | 2 |

d. CAP surface ages

| Model Run | Likelihood | Bias Options For Each Aging Method | | Standard Deviation Options For Each Aging Method | | |
|---|---|---|---|---|---|---|
| 1 | na | 0 | 1 | 1 | 1 | 1 |
| 2 | 3570.92 | 0 | 2 | 1 | 1 | 1 |
| 3 | 3546.58 | 0 | 2 | 1 | 2 | 2 |

e. WDFW combination ages

| Model Run | Likelihood | Bias Options For Each Aging Method | | | Standard Deviation Options For Each Aging Method | | |
|---|---|---|---|---|---|---|---|
| 1 | na | 0 | 1 | 1 | 1 | 1 | 1 |
| 2 | 3801.1 | 0 | 1 | 2 | 1 | 1 | 1 |
| 3 | 3795.41 | 0 | 2 | 2 | 1 | 1 | 1 |
| 4 | na | 0 | 2 | 2 | 1 | 1 | 2 |
| 5 | na | 0 | 2 | 2 | 1 | 2 | 2 |

f. CAP combination ages

| Model Run | Likelihood | Bias Options For Each Aging Method | | | Standard Deviation Options For Each Aging Method | | |
|---|---|---|---|---|---|---|---|
| 1 | 4343.09 | 0 | 1 | 1 | 1 | 1 | 1 |
| 2 | 4342.29 | 0 | 1 | 2 | 1 | 1 | 1 |
| 3 | 4332.75 | 0 | 2 | 2 | 1 | 1 | 1 |
| 4 | na | 0 | 2 | 2 | 1 | 1 | 2 |
| 5 | na | 0 | 2 | 2 | 1 | 2 | 2 |

Table 10. The estimates of bias 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.

| | CAP Break and Burn | | CAP Surface | | CAP Combo | | WDFW Break and Burn | | WDFW Surface | | WDFW Combo | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| True Age | Bias | Standard Deviation | Bias | Standard Deviation | Bias | Standard Deviation | Bias | Standard Deviation | Bias | Standard Deviation | Bias | Standard Deviation |
| 0.5 | 0.47 | 0.21 | 0.02 | 0.00 | 0.61 | 0.10 | 1.21 | 0.43 | 0.09 | 0.00 | 0.92 | 0.001 |
| 1.5 | 1.50 | 0.21 | 1.14 | 0.00 | 1.53 | 0.10 | 2.02 | 0.43 | 1.29 | 0.00 | 1.75 | 0.001 |
| 2.5 | 2.51 | 0.27 | 2.23 | 0.11 | 2.46 | 0.20 | 2.85 | 0.52 | 2.45 | 0.11 | 2.60 | 0.001 |
| 3.5 | 3.51 | 0.34 | 3.29 | 0.23 | 3.39 | 0.30 | 3.69 | 0.62 | 3.57 | 0.22 | 3.46 | 0.002 |
| 4.5 | 4.50 | 0.42 | 4.31 | 0.35 | 4.33 | 0.40 | 4.54 | 0.72 | 4.64 | 0.34 | 4.34 | 0.003 |
| 5.5 | 5.48 | 0.50 | 5.29 | 0.47 | 5.26 | 0.50 | 5.41 | 0.83 | 5.66 | 0.46 | 5.24 | 0.004 |
| 6.5 | 6.44 | 0.59 | 6.25 | 0.60 | 6.20 | 0.60 | 6.30 | 0.95 | 6.65 | 0.59 | 6.16 | 0.004 |
| 7.5 | 7.40 | 0.69 | 7.17 | 0.74 | 7.14 | 0.70 | 7.20 | 1.08 | 7.60 | 0.72 | 7.09 | 0.01 |
| 8.5 | 8.34 | 0.79 | 8.07 | 0.88 | 8.08 | 0.80 | 8.12 | 1.22 | 8.51 | 0.86 | 8.04 | 0.01 |
| 9.5 | 9.27 | 0.90 | 8.93 | 1.03 | 9.02 | 0.90 | 9.06 | 1.37 | 9.39 | 1.01 | 9.01 | 0.01 |
| 10.5 | 10.19 | 1.02 | 9.77 | 1.18 | 9.96 | 1.00 | 10.01 | 1.53 | 10.23 | 1.16 | 10.00 | 0.01 |
| 11.5 | 11.10 | 1.15 | 10.58 | 1.34 | 10.91 | 1.11 | 10.98 | 1.71 | 11.04 | 1.31 | 11.01 | 0.01 |
| 12.5 | 12.00 | 1.29 | 11.36 | 1.50 | 11.85 | 1.21 | 11.97 | 1.89 | 11.82 | 1.48 | 12.03 | 0.01 |
| 13.5 | 12.89 | 1.44 | 12.12 | 1.67 | 12.80 | 1.31 | 12.97 | 2.09 | 12.56 | 1.65 | 13.08 | 0.01 |
| 14.5 | 13.76 | 1.60 | 12.85 | 1.85 | 13.75 | 1.41 | 14.00 | 2.31 | 13.28 | 1.82 | 14.15 | 0.01 |
| 15.5 | 14.63 | 1.77 | 13.56 | 2.03 | 14.70 | 1.51 | 15.04 | 2.55 | 13.97 | 2.01 | 15.23 | 0.01 |
| 16.5 | 15.48 | 1.96 | 14.24 | 2.22 | 15.65 | 1.61 | 16.10 | 2.80 | 14.64 | 2.20 | 16.34 | 0.01 |
| 17.5 | 16.33 | 2.16 | 14.90 | 2.42 | 16.61 | 1.71 | 17.18 | 3.07 | 15.27 | 2.40 | 17.47 | 0.01 |
| 18.5 | 17.17 | 2.37 | 15.54 | 2.63 | 17.56 | 1.81 | 18.28 | 3.36 | 15.88 | 2.61 | 18.62 | 0.01 |
| 19.5 | 17.99 | 2.60 | 16.16 | 2.85 | 18.52 | 1.91 | 19.40 | 3.68 | 16.47 | 2.83 | 19.79 | 0.01 |
| 20.5 | 18.81 | 2.85 | 16.76 | 3.07 | 19.48 | 2.01 | 20.54 | 4.02 | 17.04 | 3.06 | 20.99 | 0.01 |
| 21.5 | 19.61 | 3.12 | 17.35 | 3.30 | 20.44 | 2.11 | 21.70 | 4.38 | 17.58 | 3.29 | 22.21 | 0.02 |
| 22.5 | 20.41 | 3.41 | 17.91 | 3.55 | 21.40 | 2.21 | 22.89 | 4.77 | 18.10 | 3.54 | 23.45 | 0.02 |
| 23.5 | 21.20 | 3.72 | 18.45 | 3.80 | 22.37 | 2.31 | 24.09 | 5.20 | 18.60 | 3.80 | 24.71 | 0.02 |
| 24.5 | 21.97 | 4.06 | 18.98 | 4.06 | 23.34 | 2.41 | 25.32 | 5.65 | 19.09 | 4.07 | 26.00 | 0.02 |
| 25.5 | 22.74 | 4.42 | 19.48 | 4.33 | 24.30 | 2.51 | 26.56 | 6.15 | 19.55 | 4.35 | 27.32 | 0.02 |
| 26.5 | 23.50 | 4.81 | 19.98 | 4.61 | 25.27 | 2.61 | 27.83 | 6.68 | 19.99 | 4.64 | 28.65 | 0.02 |
| 27.5 | 24.25 | 5.23 | 20.45 | 4.91 | 26.24 | 2.71 | 29.13 | 7.25 | 20.42 | 4.94 | 30.02 | 0.02 |
| 28.5 | 24.99 | 5.68 | 20.91 | 5.21 | 27.22 | 2.81 | 30.45 | 7.86 | 20.83 | 5.25 | 31.41 | 0.02 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29.5 | 25.72 | 6.16 | 21.36 | 5.53 | 28.19 | 2.91 | 31.79 | 8.52 | 21.23 | 5.58 | 32.83 | 0.02 |
| 30.5 | 26.45 | 6.68 | 21.79 | 5.86 | 29.17 | 3.01 | 33.15 | 9.23 | 21.61 | 5.93 | 34.28 | 0.02 |
| 31.5 | 27.16 | 7.24 | 22.20 | 6.20 | 30.15 | 3.11 | 34.54 | 10.00 | 21.97 | 6.28 | 35.75 | 0.02 |
| 32.5 | 27.79 | 8.07 | 22.37 | 6.45 | 30.98 | 3.22 | 35.86 | 11.19 | 22.28 | 6.58 | 37.12 | 0.02 |
| 33.5 | 28.47 | 8.72 | 22.68 | 6.78 | 31.93 | 3.32 | 37.26 | 12.11 | 22.49 | 6.93 | 38.61 | 0.02 |
| 34.5 | 29.14 | 9.40 | 22.97 | 7.12 | 32.89 | 3.42 | 38.68 | 13.11 | 22.67 | 7.28 | 40.11 | 0.02 |
| 35.5 | 29.80 | 10.13 | 23.23 | 7.46 | 33.84 | 3.52 | 40.12 | 14.17 | 22.83 | 7.64 | 41.63 | 0.03 |
| 36.5 | 30.45 | 10.89 | 23.47 | 7.82 | 34.79 | 3.62 | 41.58 | 15.30 | 22.96 | 8.01 | 43.18 | 0.03 |
| 37.5 | 31.09 | 11.69 | 23.69 | 8.18 | 35.75 | 3.72 | 43.05 | 16.51 | 23.06 | 8.39 | 44.74 | 0.03 |
| 38.5 | 31.72 | 12.54 | 23.89 | 8.55 | 36.70 | 3.82 | 44.55 | 17.81 | 23.14 | 8.78 | 46.33 | 0.03 |
| 39.5 | 32.34 | 13.43 | 24.06 | 8.93 | 37.65 | 3.92 | 46.07 | 19.19 | 23.19 | 9.17 | 47.94 | 0.03 |
| 40.5 | 32.94 | 14.36 | 24.20 | 9.31 | 38.61 | 4.02 | 47.60 | 20.66 | 23.21 | 9.58 | 49.57 | 0.03 |

Table 11. WCGOP petrale sole discard ratios (discard/discard+retained) and bootstrap estimated standard deviations for the commercial fisheries used in the model. Note that the values for summer 2010 do not represent the full time period and are not included in the assessment model.

| Fishing | WA winter | | OR winter | | CA winter | | WA summer | | OR summer | | CA summer | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| 2002 | 0.84% | 0.17% | 2.18% | 0.93% | 2.66% | 0.94% | 23.51% | 2.34% | 14.70% | 2.23% | 6.09% | 1.24% |
| 2003 | 1.40% | 1.41% | 0.28% | 0.11% | 4.53% | 2.98% | 16.78% | 4.11% | 6.81% | 2.05% | 3.96% | 0.82% |
| 2004 | 0.30% | 0.15% | 0.06% | 0.03% | 1.50% | 2.36% | 11.06% | 2.17% | 3.85% | 2.11% | 2.76% | 0.75% |
| 2005 | 0.31% | 0.14% | 0.95% | 0.67% | 0.62% | 0.24% | 6.83% | 0.95% | 3.53% | 1.30% | 1.01% | 0.22% |
| 2006 | 0.70% | 0.18% | 0.75% | 0.32% | 5.38% | 1.72% | 6.48% | 1.43% | 8.52% | 1.43% | 4.05% | 1.08% |
| 2007 | 0.59% | 0.32% | 0.30% | 0.19% | 1.20% | 0.21% | 8.90% | 2.45% | 13.28% | 3.86% | 6.97% | 1.81% |
| 2008 | 2.77% | 2.24% | 4.02% | 2.20% | 0.13% | 0.04% | 0.34% | 0.19% | 0.15% | 0.04% | 1.21% | 0.28% |
| 2009 | 2.26% | 1.27% | 3.81% | 1.91% | 0.05% | 0.02% | 2.72% | 0.40% | 12.99% | 2.77% | 25.03% | 7.62% |
| 2010 | 24.86% | 0.25% | 14.89% | 0.39% | 8.08% | 0.33% | 6.28% | 0.03% | 0.09% | 0.00% | 1.58% | 0.03% |

Table 12. Summary of number of trips generating length-frequency distributions used in the assessment model for the trawl fleets.

| Year | WA Winter | Year | WA Summer | Year | OR Winter | Year | OR Summer | Year | CA Winter | Year | CA Summer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1955 | 1 | 1956 | 2 | 1969 | 1 | 1966 | 9 | 1949 | 10 | 1948 | 4 |
| 1966 | 1 | 1957 | 4 | 1978 | 1 | 1967 | 11 | 1964 | 1 | 1949 | 4 |
| 1967 | 4 | 1958 | 3 | 1980 | 4 | 1968 | 19 | 1965 | 2 | 1962 | 3 |
| 1968 | 11 | 1960 | 1 | 1981 | 2 | 1969 | 18 | 1966 | 8 | 1964 | 22 |
| 1969 | 9 | 1961 | 1 | 1982 | 1 | 1970 | 21 | 1967 | 20 | 1965 | 14 |
| 1970 | 9 | 1964 | 1 | 1983 | 3 | 1971 | 5 | 1968 | 11 | 1966 | 33 |
| 1971 | 11 | 1965 | 1 | 1984 | 2 | 1972 | 7 | 1969 | 14 | 1967 | 44 |
| 1972 | 4 | 1966 | 28 | 1986 | 1 | 1973 | 5 | 1970 | 13 | 1968 | 87 |
| 1973 | 3 | 1967 | 31 | 1987 | 1 | 1974 | 7 | 1971 | 7 | 1969 | 49 |
| 1974 | 3 | 1968 | 38 | 1989 | 6 | 1975 | 5 | 1972 | 23 | 1970 | 29 |
| 1975 | 10 | 1969 | 37 | 1990 | 2 | 1977 | 11 | 1973 | 12 | 1971 | 37 |
| 1976 | 1 | 1970 | 40 | 1991 | 9 | 1978 | 12 | 1974 | 31 | 1972 | 39 |
| 1977 | 2 | 1971 | 10 | 1992 | 3 | 1979 | 6 | 1975 | 11 | 1973 | 41 |
| 1978 | 3 | 1972 | 24 | 1993 | 3 | 1980 | 16 | 1976 | 12 | 1974 | 35 |
| 1979 | 2 | 1973 | 14 | 1994 | 5 | 1981 | 29 | 1977 | 8 | 1975 | 19 |
| 1980 | 5 | 1974 | 35 | 1995 | 5 | 1982 | 16 | 1978 | 17 | 1976 | 26 |
| 1981 | 8 | 1975 | 20 | 1996 | 1 | 1983 | 1 | 1979 | 7 | 1977 | 38 |
| 1982 | 4 | 1976 | 6 | 1997 | 2 | 1985 | 2 | 1980 | 6 | 1978 | 33 |
| 1983 | 1 | 1977 | 10 | 1998 | 2 | 1986 | 4 | 1981 | 36 | 1979 | 12 |
| 1984 | 1 | 1978 | 9 | 1999 | 2 | 1987 | 7 | 1982 | 26 | 1980 | 81 |
| 1986 | 2 | 1979 | 17 | 2000 | 4 | 1988 | 2 | 1983 | 26 | 1981 | 65 |
| 1987 | 6 | 1980 | 28 | 2001 | 5 | 1989 | 6 | 1984 | 13 | 1982 | 34 |
| 1988 | 4 | 1981 | 8 | 2002 | 2 | 1990 | 5 | 1985 | 13 | 1983 | 33 |
| 1989 | 4 | 1982 | 1 | 2003 | 4 | 1991 | 2 | 1986 | 6 | 1984 | 19 |
| 1990 | 2 | 1985 | 3 | 2004 | 5 | 1992 | 6 | 1987 | 10 | 1985 | 17 |

| Year | WA Winter | Year | WA Summer | Year | OR Winter | Year | OR Summer | Year | CA Winter | Year | CA Summer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1991 | 2 | 1986 | 5 | 2005 | 6 | 1993 | 2 | 1988 | 6 | 1986 | 16 |
| 1992 | 1 | 1987 | 9 | 2006 | 6 | 1994 | 2 | 1989 | 9 | 1987 | 14 |
| 1993 | 4 | 1988 | 6 | 2007 | 18 | 1996 | 1 | 1990 | 2 | 1988 | 6 |
| 1994 | 4 | 1989 | 7 | 2008 | 28 | 1997 | 9 | 1991 | 12 | 1989 | 9 |
| 1995 | 3 | 1990 | 6 | 2009 | 16 | 1998 | 5 | 1992 | 6 | 1990 | 1 |
| 1996 | 2 | 1991 | 5 | 2010 | 11 | 2000 | 2 | 1999 | 1 | 1991 | 1 |
| 1997 | 1 | 1992 | 5 | 2011 | 12 | 2001 | 1 | 2002 | 12 | 2001 | 8 |
| 1998 | 2 | 1993 | 6 | | | 2002 | 3 | 2003 | 7 | 2002 | 9 |
| 1999 | 3 | 1994 | 7 | | | 2003 | 8 | 2004 | 12 | 2003 | 30 |
| 2000 | 10 | 1995 | 2 | | | 2004 | 6 | 2005 | 8 | 2004 | 13 |
| 2001 | 12 | 1996 | 3 | | | 2005 | 1 | 2006 | 25 | 2005 | 34 |
| 2002 | 7 | 1997 | 3 | | | 2006 | 12 | 2007 | 43 | 2006 | 43 |
| 2003 | 12 | 1998 | 16 | | | 2007 | 12 | 2008 | 69 | 2007 | 102 |
| 2004 | 12 | 1999 | 14 | | | 2008 | 6 | 2009 | 61 | 2008 | 82 |
| 2005 | 16 | 2000 | 20 | | | 2009 | 27 | 2010 | 31 | 2009 | 49 |
| 2006 | 8 | 2001 | 13 | | | 2010 | 25 | 2011 | 7 | 2010 | 36 |
| 2007 | 8 | 2002 | 20 | | | | | | | | |
| 2008 | 8 | 2003 | 24 | | | | | | | | |
| 2009 | 9 | 2004 | 22 | | | | | | | | |
| 2010 | 5 | 2005 | 26 | | | | | | | | |
| 2011 | 4 | 2006 | 27 | | | | | | | | |
| | | 2007 | 18 | | | | | | | | |
| | | 2008 | 23 | | | | | | | | |
| | | 2009 | 15 | | | | | | | | |
| | | 2010 | 15 | | | | | | | | |

Table 13. Summary of the number of trips and the aging agency and aging method applied to generate age-frequency distributions used in the assessment model for the trawl fleets.

| Year | Agency/Age Method | WA Winter | Year | Agency/Age Method | WA Summer | Year | Agency/Age Method | OR Winter | Year | Agency/Age Method | OR Summer | Year | Agency/Age Method | CA Winter | Year | Agency/Age Method | CA Summer |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1967 | CAP / Surface | 4 | 1960 | WDFW / Surface | 1 | 1969 | CAP / Surface | 1 | 1966 | CAP / Surface | 8 | 1966 | CAP / Surface | 8 | 1966 | CAP / Surface | 27 |
| 1968 | CAP / Surface | 11 | 1961 | WDFW / Surface | 1 | 1978 | CAP / Surface | 1 | 1967 | CAP / Surface | 11 | 1967 | CAP / Surface | 13 | 1967 | CAP / Surface | 11 |
| 1969 | CAP / Surface | 8 | 1964 | WDFW / Surface | 1 | 1980 | CAP / Surface | 4 | 1968 | CAP / Surface | 18 | 1969 | CAP / Surface | 8 | 1968 | CAP / Surface | 56 |
| 1969 | WDFW / Surface | 1 | 1965 | WDFW / Surface | 1 | 1981 | CAP/ Combo | 2 | 1969 | CAP / Surface | 18 | 1970 | CAP / Surface | 10 | 1969 | CAP / Surface | 31 |
| 1970 | CAP / Surface | 7 | 1966 | CAP / Surface | 24 | 1982 | CAP/ Combo | 1 | 1970 | CAP / Surface | 21 | 1971 | CAP / Surface | 6 | 1970 | CAP / Surface | 29 |
| 1970 | WDFW / Surface | 1 | 1966 | WDFW / Surface | 3 | 1983 | CAP/ Combo | 3 | 1971 | CAP / Surface | 5 | 1972 | CAP / Surface | 23 | 1971 | CAP / Surface | 37 |
| 1971 | CAP / Surface | 4 | 1967 | CAP / Surface | 28 | 1984 | CAP/ Combo | 2 | 1972 | CAP / Surface | 7 | 1973 | CAP / Surface | 12 | 1972 | CAP / Surface | 38 |
| 1971 | WDFW / Surface | 1 | 1967 | WDFW / Surface | 3 | 1986 | CAP/ Combo | 1 | 1973 | CAP / Surface | 5 | 1974 | CAP / Surface | 29 | 1973 | CAP / Surface | 38 |
| 1972 | WDFW / Surface | 4 | 1968 | CAP / Surface | 23 | 1987 | CAP/ Combo | 1 | 1974 | CAP / Surface | 6 | 1975 | CAP / Surface | 9 | 1974 | CAP / Surface | 34 |
| 1973 | WDFW / Surface | 3 | 1968 | WDFW / Surface | 11 | 1989 | CAP/ Combo | 6 | 1974 | WDFW / Surface | 1 | 1976 | CAP / Surface | 12 | 1975 | CAP / Surface | 18 |
| 1974 | WDFW / Surface | 3 | 1969 | CAP / Surface | 30 | 1990 | CAP/ Combo | 2 | 1975 | CAP / Surface | 5 | 1977 | CAP / Surface | 8 | 1976 | CAP / Surface | 23 |
| 1975 | WDFW / Surface | 9 | 1969 | WDFW / Surface | 5 | 1991 | CAP/ Combo | 8 | 1977 | CAP / Surface | 11 | 1978 | CAP / Surface | 9 | 1977 | CAP / Surface | 33 |
| 1976 | WDFW / Surface | 1 | 1970 | CAP / Surface | 27 | 1992 | CAP/ Combo | 3 | 1978 | CAP / Surface | 8 | 1979 | CAP / Surface | 5 | 1978 | CAP / Surface | 32 |
| 1977 | CAP / Surface | 1 | 1970 | WDFW / Surface | 12 | 1993 | CAP/ Combo | 3 | 1979 | CAP / Surface | 6 | 1980 | CAP / Surface | 6 | 1979 | CAP / Surface | 11 |
| 1977 | WDFW / Surface | 1 | 1971 | WDFW / Surface | 9 | 1994 | CAP/ Combo | 5 | 1980 | CAP/ Combo | 1 | 1981 | CAP / Surface | 18 | 1980 | CAP / Surface | 50 |
| 1978 | WDFW / Surface | 3 | 1972 | CAP / Surface | 9 | 1995 | CAP/ Combo | 5 | 1980 | CAP / Surface | 14 | 1982 | CAP / Surface | 1 | 1981 | CAP / Surface | 27 |
| 1980 | CAP / Surface | 2 | 1972 | WDFW / Surface | 14 | 1996 | CAP/ Combo | 1 | 1980 | WDFW / Surface | 2 | 1983 | CAP / Surface | 12 | 1982 | CAP / Surface | 18 |
| 1980 | WDFW / Surface | 1 | 1973 | CAP / Surface | 9 | 1997 | CAP/ Combo | 2 | 1981 | CAP/ Combo | 29 | 1984 | CAP / Surface | 6 | 1983 | CAP / Surface | 8 |
| 1981 | CAP/ Combo | 3 | 1973 | WDFW / Surface | 5 | 1998 | CAP / Surface | 2 | 1982 | CAP/ Combo | 15 | 1985 | CAP / Surface | 2 | 1984 | CAP / Surface | 3 |
| 1981 | WDFW / Combo | 3 | 1974 | CAP / Surface | 6 | 2002 | CAP / Surface | 1 | 1983 | CAP/ Combo | 1 | 1990 | CAP / Surface | 1 | 1985 | CAP / Surface | 4 |

| Year | Agency/Age Method | WA Winter | Year | Agency/Age Method | WA Summer | Year | Agency/Age Method | OR Winter | Year | Agency/Age Method | OR Summer | Year | Agency/Age Method | CA Winter | Year | Agency/Age Method | CA Summer |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1982 | CAP/ Combo | 4 | 1974 | WDFW / Surface | 22 | 2002 | WDFW / Combo | 1 | 1985 | CAP/ Combo | 2 | 1991 | CAP / Surface | 4 | 2005 | CAP / Break&Burn | 10 |
| 1986 | CAP/ Combo | 2 | 1975 | CAP / Surface | 5 | 2003 | CAP / Surface | 2 | 1986 | CAP/ Combo | 4 | 1999 | CAP / Break&Burn | 1 | 2006 | CAP / Break&Burn | 7 |
| 1987 | CAP/ Combo | 6 | 1975 | WDFW / Surface | 12 | 2004 | CAP / Surface | 2 | 1987 | CAP/ Combo | 7 | 2005 | CAP / Break&Burn | 3 | 2008 | CAP / Break&Burn | 18 |
| 1988 | CAP/ Combo | 4 | 1976 | WDFW / Surface | 5 | 2007 | CAP / Break&Burn | 1 | 1988 | CAP/ Combo | 2 | 2006 | CAP / Break&Burn | 2 | 2009 | CAP / Break&Burn | 3 |
| 1989 | CAP/ Combo | 4 | 1977 | CAP / Surface | 7 | 2008 | CAP / Break&Burn | 2 | 1989 | CAP/ Combo | 5 | 2007 | CAP / Break&Burn | 1 | 2009 | CAP / Break&Burn | 2 |
| 1990 | CAP/ Combo | 2 | 1977 | WDFW / Surface | 1 | 2009 | CAP / Break&Burn | 10 | 1990 | CAP/ Combo | 5 | 2008 | CAP / Break&Burn | 3 | | | |
| 1991 | CAP/ Combo | 2 | 1978 | CAP / Surface | 6 | 2010 | CAP / Break&Burn | 6 | 1991 | CAP/ Combo | 2 | 2009 | CAP / Break&Burn | 4 | | | |
| 1992 | CAP/ Combo | 1 | 1978 | WDFW / Surface | 2 | | | | 1992 | CAP/ Combo | 6 | 2009 | CAP / Break&Burn | 4 | | | |
| 1993 | CAP/ Combo | 4 | 1979 | CAP / Surface | 12 | | | | 1993 | CAP/ Combo | 2 | 2010 | CAP / Break&Burn | 2 | | | |
| 1994 | CAP/ Combo | 4 | 1979 | WDFW / Surface | 3 | | | | 1994 | CAP/ Combo | 2 | | | | | | |
| 1995 | CAP/ Combo | 3 | 1980 | CAP / Surface | 8 | | | | 1996 | CAP/ Combo | 1 | | | | | | |
| 1996 | CAP/ Combo | 2 | 1980 | WDFW / Surface | 14 | | | | 1997 | CAP/ Combo | 9 | | | | | | |
| 1997 | CAP/ Combo | 1 | 1981 | CAP/ Combo | 8 | | | | 1998 | CAP/ Combo | 2 | | | | | | |
| 1998 | CAP / Break&Burn | 1 | 1982 | CAP/ Combo | 1 | | | | 1998 | CAP/ Combo | 3 | | | | | | |
| 1998 | WDFW / Combo | 1 | 1985 | CAP/ Combo | 3 | | | | 2002 | CAP / Surface | 1 | | | | | | |
| 1999 | CAP / Break&Burn | 1 | 1986 | CAP/ Combo | 5 | | | | 2003 | CAP / Surface | 3 | | | | | | |
| 1999 | WDFW / Combo | 2 | 1987 | CAP/ Combo | 9 | | | | 2004 | CAP / Surface | 1 | | | | | | |
| 2000 | CAP / Break&Burn | 1 | 1988 | CAP/ Combo | 6 | | | | 2007 | CAP / Break&Burn | 3 | | | | | | |
| 2000 | WDFW / Combo | 5 | 1989 | CAP/ Combo | 7 | | | | 2008 | CAP / Break&Burn | 1 | | | | | | |
| 2001 | WDFW / Combo | 6 | 1990 | CAP/ Combo | 6 | | | | 2009 | CAP / Break&Burn | 19 | | | | | | |
| 2002 | CAP / Surface | 3 | 1991 | CAP/ Combo | 5 | | | | 2010 | CAP / Break&Burn | 13 | | | | | | |
| 2002 | WDFW / Combo | 4 | 1992 | CAP/ Combo | 5 | | | | | | | | | | | | |

| Year | Agency/Age Method | WA Winter | Year | Agency/Age Method | WA Summer | Year | Agency/Age Method | OR Winter | Year | Agency/Age Method | OR Summer | Year | Agency/Age Method | CA Winter | Year | Agency/Age Method | CA Summer |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2003 | CAP / Surface | 3 | 1993 | CAP/ Combo | 6 | | | | | | | | | | | | |
| 2003 | WDFW / Combo | 5 | 1994 | CAP/ Combo | 7 | | | | | | | | | | | | |
| 2004 | WDFW / Combo | 7 | 1995 | CAP/ Combo | 2 | | | | | | | | | | | | |
| 2005 | WDFW / Combo | 5 | 1996 | CAP/ Combo | 3 | | | | | | | | | | | | |
| 2006 | WDFW / Combo | 5 | 1997 | CAP/ Combo | 3 | | | | | | | | | | | | |
| 2007 | WDFW / Combo | 5 | 1998 | CAP / Break&Burn | 4 | | | | | | | | | | | | |
| 2008 | WDFW / Combo | 3 | 1998 | CAP/ Combo | 2 | | | | | | | | | | | | |
| 2009 | CAP / Break&Burn | 5 | 1998 | WDFW / Combo | 10 | | | | | | | | | | | | |
| 2009 | WDFW / Break&Burn | 3 | 1999 | CAP / Break&Burn | 4 | | | | | | | | | | | | |
| 2009 | WDFW / Combo | 3 | 1999 | WDFW / Combo | 9 | | | | | | | | | | | | |
| 2010 | CAP / Break&Burn | 1 | 2000 | WDFW / Combo | 12 | | | | | | | | | | | | |
| 2010 | WDFW / Break&Burn | 4 | 2001 | WDFW / Combo | 10 | | | | | | | | | | | | |
| | | | 2002 | CAP / Surface | 6 | | | | | | | | | | | | |
| | | | 2002 | WDFW / Combo | 10 | | | | | | | | | | | | |
| | | | 2003 | CAP / Surface | 3 | | | | | | | | | | | | |
| | | | 2003 | WDFW / Combo | 19 | | | | | | | | | | | | |
| | | | 2004 | CAP / Surface | 3 | | | | | | | | | | | | |
| | | | 2004 | WDFW / Combo | 18 | | | | | | | | | | | | |
| | | | 2005 | WDFW / Combo | 18 | | | | | | | | | | | | |
| | | | 2006 | WDFW / Combo | 14 | | | | | | | | | | | | |
| | | | 2007 | CAP / Break&Burn | 1 | | | | | | | | | | | | |
| | | | 2007 | WDFW / Combo | 16 | | | | | | | | | | | | |

| Year | Agency/Age Method | WA Winter | Year | Agency/Age Method | WA Summer | Year | Agency/Age Method | OR Winter | Year | Agency/Age Method | OR Summer | Year | Agency/Age Method | CA Winter | Year | Agency/Age Method | CA Summer |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2008 | CAP / Break&Burn | 3 | | | | | | | | | | | | |
| | | | 2008 | WDFW / Combo | 17 | | | | | | | | | | | | |
| | | | 2009 | CAP / Break&Burn | 6 | | | | | | | | | | | | |
| | | | 2009 | WDFW / Break&Burn | 8 | | | | | | | | | | | | |
| | | | 2009 | WDFW / Combo | 1 | | | | | | | | | | | | |
| | | | 2010 | CAP / Break&Burn | 8 | | | | | | | | | | | | |
| | | | 2010 | WDFW / Break&Burn | 3 | | | | | | | | | | | | |

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

| Parameter | Number estimated | Bounds (low, high) | Prior (Mean, SD) Type |
|---|---|---|---|
| Natural mortality (*M*, female) | 1 | (0.005,0.4) | (-1.888, 0.08) Lognormal |
| Natural mortality (*M*, male) (value estimated as offset from female) | 1 | (-0.5,0.7) | (-1.58, 0.05) Lognormal |
| Stock and recruitment | | | |
| Ln($R_0$) | 1 | (3,31) | - |
| Steepness (*h*) | 1 | (0.2,1) | - |
| $\sigma_r$ | - | - | - |
| Ln(Early Recruitment Deviations): 1939-1958 | 20 | (-3,3) | - |
| Ln(Main Recruitment Deviations): 1959-2007 | 49 | (-3,3) | - |
| Ln(Forecast Recruitment Deviations): 2008-2022 | 15 | (-3,3) | - |
| Indices | | | |
| Ln(*q*) – NWFSC survey | - | Analytic solution | |
| Ln(*q*) – Triennial survey (early and late) | - | Analytic solution | |
| *Beta* (power) – WA winter commercial CPUE | 1 | (-5,5) | - |
| *Beta* (power) – OR winter commercial CPUE | 1 | (-5,5) | - |
| *Beta* (power) – CA winter commercial CPUE | 1 | (-5,5) | - |
| Selectivity (asymptotic, sex specific, with retention curves) | | | |
| *Fisheries:* | | | |
| Length at peak selectivity | 6 | (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 | 23 | (-7,7) | |
| *Surveys:* | | | - |
| Length at peak selectivity | 3 | (15,61) | - |
| Width of top (as logistic) | - | | - |
| Ascending width (as exp(width)) | 3 | (-4,12) | - |
| Descending width (as exp(width)) | - | | - |
| Initial selectivity (as logistic) | 3 | (-15,5) | - |
| Final selectivity (as logistic) | - | | - |
| Male 1 | 3 | (-15,15) | - |
| Male 2 | 3 | (-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 | - | - | - |
| *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 | - | - | - |
| Total: 101 + 84 recruitment deviations =185 estimated parameters | | | |

Table 15. Time blocks

| Block Pattern | | | | |
|---|---|---|---|---|
| #1 (Winter-WA, Summer-WA, Summer-OR) | 1973-1982 | 1983-1992 | 1993-2002 | 2003-2008 |
| #2 (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.

| Parameter | Value |
|---|---|
| *Females:* | |
| Length at age min | 18.49 |
| Length at Linf | 51.37 |
| von Bertalanffy *K* | 0.17 |
| SD of length at age min | 3.72 |
| *Males:* | |
| Length at age min | 17.53 |
| Length at Linf | 40.21 |
| von Bertalanffy *K* | 0.33 |
| SD of length at age min | 3.00 |

Table 17. Petrale sole catchability, power, and productivity parameters.

| Parameter | Value |
|---|---|
| *Catchability/Power:* | |
| NWFSC survey catchability (*q*) | 2.97 |
| Triennial survey catchability (*q*) early, late | 0.59; 0.84 |
| WA winter commercial CPUE (*Beta*) | 1.51 |
| OR winter commercial CPUE (*Beta*) | 1.68 |
| CA winter commercial CPUE (*Beta*) | 0.80 |
| | |
| *Productivity:* | |
| $R_0$ | 9.71 |
| Steepness (*h*) | 0.86 |
| Female natural mortality (*M*) | 0.16 |
| Male natural mortality (*M*) | 0.18 |

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 | 41,781 | 26,278 | 1.00 | 16,512 | 1.0 | 0.000 | 0.000 |
| 1877 | 41,780 | 26,278 | 1.00 | 16,512 | 1.0 | 0.000 | 0.000 |
| 1878 | 41,779 | 26,277 | 1.00 | 16,512 | 1.0 | 0.000 | 0.000 |
| 1879 | 41,778 | 26,276 | 1.00 | 16,512 | 1.0 | 0.000 | 0.000 |
| 1880 | 41,778 | 26,276 | 1.00 | 16,512 | 11.6 | 0.003 | 0.000 |
| 1881 | 41,767 | 26,268 | 1.00 | 16,511 | 22.3 | 0.005 | 0.001 |
| 1882 | 41,747 | 26,255 | 1.00 | 16,511 | 32.9 | 0.008 | 0.001 |
| 1883 | 41,719 | 26,235 | 1.00 | 16,510 | 43.5 | 0.010 | 0.001 |
| 1884 | 41,683 | 26,209 | 1.00 | 16,510 | 54.1 | 0.012 | 0.001 |
| 1885 | 41,641 | 26,179 | 1.00 | 16,509 | 64.8 | 0.015 | 0.002 |
| 1886 | 41,592 | 26,144 | 0.99 | 16,508 | 75.4 | 0.017 | 0.002 |
| 1887 | 41,538 | 26,105 | 0.99 | 16,507 | 86.0 | 0.020 | 0.002 |
| 1888 | 41,480 | 26,063 | 0.99 | 16,506 | 96.7 | 0.022 | 0.002 |
| 1889 | 41,418 | 26,017 | 0.99 | 16,505 | 107.3 | 0.025 | 0.003 |
| 1890 | 41,352 | 25,969 | 0.99 | 16,504 | 117.9 | 0.027 | 0.003 |
| 1891 | 41,282 | 25,919 | 0.99 | 16,503 | 128.5 | 0.029 | 0.003 |
| 1892 | 41,210 | 25,866 | 0.98 | 16,501 | 139.2 | 0.032 | 0.003 |
| 1893 | 41,136 | 25,811 | 0.98 | 16,500 | 149.8 | 0.034 | 0.004 |
| 1894 | 41,059 | 25,755 | 0.98 | 16,498 | 160.4 | 0.037 | 0.004 |
| 1895 | 40,981 | 25,697 | 0.98 | 16,497 | 171.1 | 0.039 | 0.004 |
| 1896 | 40,901 | 25,638 | 0.98 | 16,495 | 181.7 | 0.042 | 0.004 |
| 1897 | 40,820 | 25,578 | 0.97 | 16,494 | 192.3 | 0.044 | 0.005 |
| 1898 | 40,737 | 25,517 | 0.97 | 16,492 | 203.0 | 0.047 | 0.005 |
| 1899 | 40,653 | 25,455 | 0.97 | 16,491 | 213.6 | 0.049 | 0.005 |
| 1900 | 40,569 | 25,393 | 0.97 | 16,489 | 224.2 | 0.051 | 0.006 |
| 1901 | 40,483 | 25,330 | 0.96 | 16,487 | 234.9 | 0.054 | 0.006 |
| 1902 | 40,397 | 25,266 | 0.96 | 16,486 | 245.5 | 0.056 | 0.006 |
| 1903 | 40,310 | 25,201 | 0.96 | 16,484 | 256.1 | 0.059 | 0.006 |
| 1904 | 40,222 | 25,137 | 0.96 | 16,482 | 266.8 | 0.061 | 0.007 |
| 1905 | 40,134 | 25,071 | 0.95 | 16,480 | 277.4 | 0.064 | 0.007 |
| 1906 | 40,046 | 25,006 | 0.95 | 16,479 | 288.0 | 0.066 | 0.007 |
| 1907 | 39,957 | 24,940 | 0.95 | 16,477 | 298.7 | 0.069 | 0.008 |
| 1908 | 39,867 | 24,874 | 0.95 | 16,475 | 309.3 | 0.071 | 0.008 |
| 1909 | 39,778 | 24,807 | 0.94 | 16,473 | 319.9 | 0.074 | 0.008 |
| 1910 | 39,688 | 24,740 | 0.94 | 16,471 | 331.6 | 0.076 | 0.008 |
| 1911 | 39,596 | 24,673 | 0.94 | 16,470 | 342.2 | 0.079 | 0.009 |
| 1912 | 39,505 | 24,605 | 0.94 | 16,468 | 352.9 | 0.081 | 0.009 |
| 1913 | 39,413 | 24,537 | 0.93 | 16,466 | 363.5 | 0.084 | 0.009 |
| 1914 | 39,322 | 24,469 | 0.93 | 16,464 | 374.1 | 0.086 | 0.010 |
| 1915 | 39,230 | 24,401 | 0.93 | 16,462 | 384.8 | 0.089 | 0.010 |
| 1916 | 39,138 | 24,333 | 0.93 | 16,460 | 390.4 | 0.090 | 0.010 |
| 1917 | 39,050 | 24,268 | 0.92 | 16,458 | 531.5 | 0.120 | 0.014 |
| 1918 | 38,840 | 24,119 | 0.92 | 16,454 | 428.2 | 0.099 | 0.011 |
| 1919 | 38,745 | 24,047 | 0.92 | 16,452 | 337.1 | 0.079 | 0.009 |
| 1920 | 38,747 | 24,043 | 0.91 | 16,452 | 233.3 | 0.056 | 0.006 |
| 1921 | 38,852 | 24,110 | 0.92 | 16,454 | 297.1 | 0.070 | 0.008 |
| 1922 | 38,891 | 24,135 | 0.92 | 16,454 | 429.1 | 0.099 | 0.011 |
| 1923 | 38,803 | 24,074 | 0.92 | 16,453 | 431.7 | 0.100 | 0.011 |
| 1924 | 38,719 | 24,015 | 0.91 | 16,451 | 538.0 | 0.122 | 0.014 |
| 1925 | 38,542 | 23,890 | 0.91 | 16,447 | 533.6 | 0.122 | 0.014 |

| Fishing year | Total biomass (mt) | Spawning biomass (mt) | Depletion | Age-0 recruits | Total catch (mt) | SPR | Relative exploitation rate |
|---|---|---|---|---|---|---|---|
| 1926 | 38,383 | 23,777 | 0.90 | 16,444 | 526.8 | 0.121 | 0.014 |
| 1927 | 38,245 | 23,677 | 0.90 | 16,441 | 638.1 | 0.144 | 0.017 |
| 1928 | 38,017 | 23,514 | 0.89 | 16,436 | 626.0 | 0.142 | 0.017 |
| 1929 | 37,821 | 23,372 | 0.89 | 16,431 | 714.8 | 0.161 | 0.019 |
| 1930 | 37,561 | 23,185 | 0.88 | 16,426 | 665.1 | 0.152 | 0.018 |
| 1931 | 37,373 | 23,046 | 0.88 | 16,421 | 682.0 | 0.153 | 0.018 |
| 1932 | 37,195 | 22,913 | 0.87 | 16,417 | 814.4 | 0.174 | 0.022 |
| 1933 | 36,927 | 22,713 | 0.86 | 16,411 | 852.2 | 0.177 | 0.023 |
| 1934 | 36,667 | 22,514 | 0.86 | 16,404 | 1628.8 | 0.302 | 0.045 |
| 1935 | 35,722 | 21,847 | 0.83 | 16,381 | 1613.5 | 0.304 | 0.046 |
| 1936 | 34,883 | 21,243 | 0.81 | 16,359 | 1328.0 | 0.261 | 0.039 |
| 1937 | 34,406 | 20,878 | 0.79 | 16,346 | 1903.9 | 0.345 | 0.056 |
| 1938 | 33,470 | 20,197 | 0.77 | 16,319 | 2175.2 | 0.383 | 0.066 |
| 1939 | 32,396 | 19,416 | 0.74 | 19,579 | 2413.8 | 0.420 | 0.076 |
| 1940 | 31,230 | 18,560 | 0.71 | 18,766 | 2459.0 | 0.432 | 0.080 |
| 1941 | 30,186 | 17,755 | 0.68 | 17,044 | 2233.8 | 0.415 | 0.075 |
| 1942 | 29,532 | 17,176 | 0.65 | 15,071 | 3429.9 | 0.539 | 0.118 |
| 1943 | 27,991 | 15,912 | 0.61 | 13,677 | 3626.5 | 0.575 | 0.132 |
| 1944 | 26,462 | 14,715 | 0.56 | 13,466 | 2832.0 | 0.530 | 0.109 |
| 1945 | 25,742 | 14,242 | 0.54 | 14,491 | 2602.5 | 0.516 | 0.103 |
| 1946 | 25,181 | 14,023 | 0.53 | 15,329 | 3950.6 | 0.638 | 0.159 |
| 1947 | 23,284 | 12,955 | 0.49 | 14,701 | 3219.9 | 0.606 | 0.141 |
| 1948 | 22,027 | 12,254 | 0.47 | 13,852 | 4395.7 | 0.703 | 0.203 |
| 1949 | 19,709 | 10,739 | 0.41 | 13,067 | 4099.6 | 0.718 | 0.212 |
| 1950 | 17,760 | 9,412 | 0.36 | 12,610 | 4585.5 | 0.769 | 0.263 |
| 1951 | 15,494 | 7,856 | 0.30 | 12,574 | 3039.0 | 0.716 | 0.200 |
| 1952 | 14,733 | 7,344 | 0.28 | 12,958 | 2834.1 | 0.714 | 0.197 |
| 1953 | 14,169 | 7,030 | 0.27 | 13,217 | 2254.5 | 0.677 | 0.163 |
| 1954 | 14,077 | 7,048 | 0.27 | 13,475 | 2887.2 | 0.736 | 0.210 |
| 1955 | 13,369 | 6,656 | 0.25 | 13,514 | 2840.2 | 0.746 | 0.218 |
| 1956 | 12,724 | 6,227 | 0.24 | 12,568 | 2232.7 | 0.702 | 0.180 |
| 1957 | 12,671 | 6,150 | 0.23 | 10,768 | 2823.1 | 0.759 | 0.229 |
| 1958 | 12,105 | 5,760 | 0.22 | 10,582 | 2385.1 | 0.735 | 0.202 |
| 1959 | 11,943 | 5,660 | 0.22 | 12,570 | 2561.7 | 0.745 | 0.220 |
| 1960 | 11,625 | 5,509 | 0.21 | 17,318 | 2599.5 | 0.758 | 0.229 |
| 1961 | 11,228 | 5,347 | 0.20 | 14,827 | 3129.5 | 0.803 | 0.288 |
| 1962 | 10,348 | 4,834 | 0.18 | 8,136 | 2655.1 | 0.793 | 0.267 |
| 1963 | 9,969 | 4,481 | 0.17 | 11,101 | 2693.7 | 0.809 | 0.280 |
| 1964 | 9,692 | 4,113 | 0.16 | 12,985 | 2287.5 | 0.792 | 0.242 |
| 1965 | 9,804 | 4,130 | 0.16 | 12,836 | 2405.8 | 0.797 | 0.253 |
| 1966 | 9,735 | 4,253 | 0.16 | 33,392 | 2169.7 | 0.776 | 0.232 |
| 1967 | 9,854 | 4,433 | 0.17 | 10,064 | 2190.9 | 0.775 | 0.233 |
| 1968 | 10,081 | 4,409 | 0.17 | 14,327 | 1978.2 | 0.755 | 0.211 |
| 1969 | 10,756 | 4,444 | 0.17 | 13,834 | 1946.6 | 0.748 | 0.186 |
| 1970 | 11,863 | 4,635 | 0.18 | 13,991 | 2715.3 | 0.795 | 0.236 |
| 1971 | 12,246 | 4,874 | 0.19 | 13,917 | 2646.5 | 0.776 | 0.223 |
| 1972 | 12,525 | 5,472 | 0.21 | 8,985 | 2985.7 | 0.785 | 0.245 |
| 1973 | 12,297 | 5,679 | 0.22 | 8,169 | 2523.9 | 0.759 | 0.211 |
| 1974 | 12,246 | 5,839 | 0.22 | 10,388 | 3166.1 | 0.804 | 0.264 |

| Fishing year | Total biomass (mt) | Spawning biomass (mt) | Depletion | Age-0 recruits | Total catch (mt) | SPR | Relative exploitation rate |
|---|---|---|---|---|---|---|---|
| 1975 | 11,377 | 5,507 | 0.21 | 10,191 | 3272.9 | 0.821 | 0.294 |
| 1976 | 10,161 | 4,990 | 0.19 | 14,946 | 2675.2 | 0.807 | 0.271 |
| 1977 | 9,304 | 4,638 | 0.18 | 14,542 | 2105.1 | 0.772 | 0.234 |
| 1978 | 8,966 | 4,404 | 0.17 | 9,213 | 2640.2 | 0.827 | 0.307 |
| 1979 | 8,233 | 3,775 | 0.14 | 11,087 | 2898.6 | 0.867 | 0.367 |
| 1980 | 7,431 | 3,039 | 0.12 | 11,492 | 2271.6 | 0.857 | 0.317 |
| 1981 | 7,269 | 2,830 | 0.11 | 9,683 | 1985.6 | 0.832 | 0.284 |
| 1982 | 7,370 | 2,934 | 0.11 | 9,565 | 2440.0 | 0.863 | 0.344 |
| 1983 | 7,030 | 2,860 | 0.11 | 11,556 | 2703.4 | 0.883 | 0.399 |
| 1984 | 6,333 | 2,591 | 0.10 | 17,996 | 2003.8 | 0.854 | 0.331 |
| 1985 | 6,212 | 2,563 | 0.10 | 9,421 | 1745.4 | 0.837 | 0.297 |
| 1986 | 6,357 | 2,623 | 0.10 | 5,940 | 1822.2 | 0.841 | 0.306 |
| 1987 | 6,525 | 2,609 | 0.10 | 7,919 | 2504.9 | 0.888 | 0.397 |
| 1988 | 6,184 | 2,291 | 0.09 | 10,962 | 2364.3 | 0.889 | 0.393 |
| 1989 | 5,842 | 2,235 | 0.09 | 11,484 | 2293.3 | 0.889 | 0.409 |
| 1990 | 5,354 | 2,265 | 0.09 | 13,995 | 1930.6 | 0.875 | 0.381 |
| 1991 | 5,107 | 2,204 | 0.08 | 9,757 | 2089.2 | 0.894 | 0.436 |
| 1992 | 4,802 | 1,828 | 0.07 | 7,289 | 1737.9 | 0.888 | 0.388 |
| 1993 | 4,932 | 1,673 | 0.06 | 11,955 | 1692.2 | 0.883 | 0.361 |
| 1994 | 5,233 | 1,730 | 0.07 | 12,611 | 1554.0 | 0.861 | 0.310 |
| 1995 | 5,640 | 2,033 | 0.08 | 12,369 | 1686.1 | 0.852 | 0.317 |
| 1996 | 5,873 | 2,317 | 0.09 | 9,872 | 1937.2 | 0.864 | 0.349 |
| 1997 | 5,911 | 2,337 | 0.09 | 11,987 | 2075.1 | 0.876 | 0.370 |
| 1998 | 5,910 | 2,189 | 0.08 | 26,405 | 1774.5 | 0.856 | 0.316 |
| 1999 | 6,269 | 2,291 | 0.09 | 14,070 | 1653.8 | 0.833 | 0.282 |
| 2000 | 6,853 | 2,562 | 0.10 | 13,878 | 1870.3 | 0.835 | 0.299 |
| 2001 | 7,461 | 2,747 | 0.10 | 9,474 | 1914.6 | 0.831 | 0.270 |
| 2002 | 8,353 | 2,925 | 0.11 | 11,028 | 1969.8 | 0.813 | 0.245 |
| 2003 | 9,215 | 3,403 | 0.13 | 9,104 | 1747.7 | 0.757 | 0.195 |
| 2004 | 10,119 | 4,288 | 0.16 | 10,918 | 2250.9 | 0.772 | 0.229 |
| 2005 | 10,321 | 4,877 | 0.19 | 10,492 | 3001.8 | 0.813 | 0.298 |
| 2006 | 9,588 | 4,754 | 0.18 | 18,698 | 2214.2 | 0.770 | 0.238 |
| 2007 | 9,403 | 4,704 | 0.18 | 27,330 | 2415.3 | 0.787 | 0.267 |
| 2008 | 9,087 | 4,368 | 0.17 | 14,021 | 2153.5 | 0.777 | 0.252 |
| 2009 | 9,223 | 4,119 | 0.16 | 12,448 | 2274.5 | 0.796 | 0.264 |
| 2010 | 9,647 | 3,861 | 0.15 | 13,449 | 704.3 | 0.523 | 0.076 |
| 2011 | 11,882 | 4,720 | 0.18 | 14,004 | 976.0 | 0.542 | 0.085 |

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 | 3,329 | 5,127 | 1921 | 3,070 | 5,078 | 1966 | 395 | 8,720 |
| 1877 | 3,329 | 5,127 | 1922 | 3,065 | 5,079 | 1967 | 413 | 3,380 |
| 1878 | 3,329 | 5,127 | 1923 | 3,058 | 5,078 | 1968 | 413 | 4,106 |
| 1879 | 3,329 | 5,127 | 1924 | 3,052 | 5,076 | 1969 | 410 | 3,916 |
| 1880 | 3,329 | 5,127 | 1925 | 3,045 | 5,073 | 1970 | 414 | 3,927 |
| 1881 | 3,329 | 5,127 | 1926 | 3,037 | 5,070 | 1971 | 445 | 3,807 |
| 1882 | 3,329 | 5,126 | 1927 | 3,028 | 5,067 | 1972 | 485 | 2,622 |
| 1883 | 3,328 | 5,126 | 1928 | 3,017 | 5,063 | 1973 | 494 | 2,309 |
| 1884 | 3,327 | 5,125 | 1929 | 3,005 | 5,059 | 1974 | 473 | 2,673 |
| 1885 | 3,325 | 5,125 | 1930 | 2,991 | 5,054 | 1975 | 435 | 2,696 |
| 1886 | 3,323 | 5,124 | 1931 | 2,977 | 5,050 | 1976 | 395 | 3,688 |
| 1887 | 3,321 | 5,123 | 1932 | 2,962 | 5,047 | 1977 | 352 | 3,741 |
| 1888 | 3,318 | 5,122 | 1933 | 2,943 | 5,041 | 1978 | 304 | 2,843 |
| 1889 | 3,314 | 5,121 | 1934 | 2,923 | 5,035 | 1979 | 257 | 3,225 |
| 1890 | 3,310 | 5,120 | 1935 | 2,890 | 5,015 | 1980 | 230 | 3,379 |
| 1891 | 3,306 | 5,119 | 1936 | 2,852 | 4,996 | 1981 | 226 | 2,889 |
| 1892 | 3,301 | 5,118 | 1937 | 2,814 | 4,984 | 1982 | 233 | 2,746 |
| 1893 | 3,295 | 5,117 | 1938 | 2,765 | 4,961 | 1983 | 237 | 3,185 |
| 1894 | 3,290 | 5,115 | 1939 | 2,708 | 11,137 | 1984 | 228 | 4,291 |
| 1895 | 3,284 | 5,114 | 1940 | 2,644 | 10,436 | 1985 | 214 | 2,595 |
| 1896 | 3,277 | 5,113 | 1941 | 2,576 | 9,002 | 1986 | 195 | 1,769 |
| 1897 | 3,271 | 5,111 | 1942 | 2,510 | 7,478 | 1987 | 175 | 2,188 |
| 1898 | 3,264 | 5,110 | 1943 | 2,415 | 6,463 | 1988 | 159 | 2,877 |
| 1899 | 3,257 | 5,109 | 1944 | 2,255 | 6,283 | 1989 | 154 | 3,034 |
| 1900 | 3,249 | 5,107 | 1945 | 2,048 | 7,005 | 1990 | 152 | 3,536 |
| 1901 | 3,242 | 5,106 | 1946 | 1,860 | 7,695 | 1991 | 143 | 2,548 |
| 1902 | 3,234 | 5,104 | 1947 | 1,715 | 7,250 | 1992 | 133 | 1,891 |
| 1903 | 3,226 | 5,103 | 1948 | 1,641 | 6,625 | 1993 | 134 | 2,876 |
| 1904 | 3,218 | 5,101 | 1949 | 1,583 | 6,035 | 1994 | 145 | 3,062 |
| 1905 | 3,210 | 5,100 | 1950 | 1,517 | 5,672 | 1995 | 160 | 3,054 |
| 1906 | 3,202 | 5,099 | 1951 | 1,413 | 5,562 | 1996 | 168 | 2,548 |
| 1907 | 3,193 | 5,097 | 1952 | 1,303 | 5,730 | 1997 | 167 | 3,072 |
| 1908 | 3,185 | 5,096 | 1953 | 1,196 | 5,862 | 1998 | 167 | 6,598 |
| 1909 | 3,176 | 5,094 | 1954 | 1,116 | 5,920 | 1999 | 178 | 3,597 |
| 1910 | 3,168 | 5,092 | 1955 | 1,051 | 5,771 | 2000 | 195 | 3,515 |
| 1911 | 3,159 | 5,091 | 1956 | 1,005 | 5,117 | 2001 | 211 | 2,448 |
| 1912 | 3,150 | 5,089 | 1957 | 960 | 4,200 | 2002 | 235 | 2,837 |
| 1913 | 3,141 | 5,088 | 1958 | 891 | 3,939 | 2003 | 285 | 2,398 |
| 1914 | 3,132 | 5,086 | 1959 | 806 | 4,490 | 2004 | 347 | 2,879 |
| 1915 | 3,124 | 5,085 | 1960 | 697 | 5,307 | 2005 | 383 | 2,846 |
| 1916 | 3,115 | 5,083 | 1961 | 577 | 4,462 | 2006 | 393 | 5,087 |
| 1917 | 3,106 | 5,081 | 1962 | 469 | 2,699 | 2007 | 388 | 7,783 |
| 1918 | 3,095 | 5,078 | 1963 | 398 | 3,306 | 2008 | 383 | 5,400 |
| 1919 | 3,085 | 5,076 | 1964 | 364 | 3,769 | 2009 | 389 | 5,510 |
| 1920 | 3,076 | 5,076 | 1965 | 369 | 3,925 | 2010 | 422 | 6,305 |
| | | | | | | 2011 | 493 | 6,639 |

Table 20. Results from the sensitivity model runs.

| Description | Base Case: Winter Commercial CPUE Beta Estimated | Winter Commercial CPUE Beta = 0 | No Winter Commercial CPUE |
|---|---|---|---|
| Negative log-likelihoods | | | |
| Total | 2921.09 | 2968.37 | 2955.91 |
| Indices | -60.03 | -39.40 | -18.21 |
| Length-frequency data | 1298.69 | 1318.90 | 1288.52 |
| Age-frequency data | 1913.49 | 1912.00 | 1917.42 |
| Discard biomass | -117.34 | -116.01 | -117.52 |
| Discard mean weight | -88.09 | -88.54 | -88.05 |
| Recruitment | -27.87 | -21.31 | -29.01 |
| Priors | 2.15 | 2.58 | 2.66 |
| Forecast recruitment | 0.03 | 0.08 | 0.04 |
| Select parameters | | | |
| Stock-recruit, productivity | | | |
| R0 | 16511.5 | 34883.5 | 14144.1 |
| Steepness (h) | 0.86 | 0.74 | 0.89 |
| Female M | 0.159 | 0.235 | 0.146 |
| Male M | 0.18 | 0.26 | 0.16 |
| Individual growth | | | |
| Female length at age min | 18.5 | 18.0 | 18.6 |
| Female length at Linf | 51.4 | 50.9 | 51.4 |
| Female von Bertalanffy K | 0.17 | 0.18 | 0.17 |
| Female SD of length-at-age min | 3.72 | 3.79 | 3.72 |
| Male length at age min | 17.53 | 17.08 | 17.62 |
| Male length at Linf | 40.21 | 39.98 | 40.26 |
| Male von Bertalanffy K | 0.33 | 0.35 | 0.33 |
| Male SD of length-at-age at age min | 3.00 | 3.05 | 2.99 |
| Management quantities | | | |
| SB0 | 26,278 | 20,190 | 27,576 |
| 2011 Depletion | 0.18 | 0.39 | 0.14 |
| 2011 F | 0.085 | 0.049 | 0.107 |
| SSB MSY proxy | 6,570 | 5048 | 6,894 |
| SPR MSY proxy | 0.28 | 0.32 | 0.27 |
| F MSY proxy | 0.2 | 0.23 | 0.2 |

Table 21. Results from the retrospective model runs. Note that the value for 2010 depletion for the 2007-2009 years assessed are forecasts from those retrospective runs.

| Assessment Year | 2011 | 2010 | 2009 | 2008 | 2007 | 2006 |
|---|---|---|---|---|---|---|
| SSB_Unfished | 26,278 | 27,336 | 26,763 | 28,221 | 29,585 | 29,909 |
| 2005 Depletion | 18.6% | 17.6% | 17.7% | 16.2% | 16.7% | 17.0% |
| 2006 Depletion | 18.1% | 17.4% | 17.4% | 16.2% | 17.5% | 18.7% |
| 2007 Depletion | 17.9% | 17.4% | 17.3% | 16.5% | 18.7% | |
| 2008 Depletion | 16.6% | 16.4% | 16.2% | 16.0% | | |
| 2009 Depletion | 15.7% | 15.6% | 15.5% | | | |
| 2010 Depletion | 14.7% | 14.8% | | | | |
| 2011 Depletion | 18.0% | | | | | |

Table 22. Projection of potential petrale sole OFL, ACL, spawning biomass and depletion for the base case model based on the SPR= 0.3 fishing mortality target and $F_{30\%}$ overfishing limit/target (OFL). Assuming the ACLs of 976 and 1160 mt are attained in 2011 and 2012.

| Year | OFL (mt) | ACL (mt) | Age 3+ biomass (mt) | Spawning biomass (mt) | Depletion |
|---|---|---|---|---|---|
| 2011 | 1,831 | 976 | 11,550 | 4,720 | 0.18 |
| 2012 | 2,311 | 1,160 | 13,526 | 5,939 | 0.23 |
| 2013 | 2,766 | 2,766 | 15,150 | 7,361 | 0.28 |
| 2014 | 2,831 | 2,831 | 15,083 | 7,791 | 0.30 |
| 2015 | 2,799 | 2,799 | 14,784 | 7,803 | 0.30 |
| 2016 | 2,725 | 2,725 | 14,453 | 7,614 | 0.29 |
| 2017 | 2,653 | 2,653 | 14,196 | 7,403 | 0.28 |
| 2018 | 2,603 | 2,603 | 14,040 | 7,248 | 0.28 |
| 2019 | 2,575 | 2,575 | 13,966 | 7,165 | 0.27 |
| 2020 | 2,565 | 2,565 | 13,941 | 7,135 | 0.27 |
| 2021 | 2,563 | 2,563 | 13,939 | 7,133 | 0.27 |
| 2022 | 2,564 | 2,564 | 13,941 | 7,141 | 0.27 |

Table 23. Decision table of 12-year projections for alternate states of nature (columns) and management options (rows) beginning in 2011. Relative probabilities of each state of nature are based on low and high values for the rate of female natural mortality.

| | | | **State of nature** | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Female M=0.13 | | Base case<br>Female M estimated = 0.16 | | Female M=0.19 | |
| Relative probability | | | 0.25 | | 0.5 | | 0.25 | |
| **Management decision** | Year | Catch (mt) | Depletion | Spawning biomass (mt) | Depletion | Spawning biomass (mt) | Depletion | Spawning biomass (mt) |
| 25-5 catches from base case | 2013 | 2,766 | 24.1% | 7,085 | 28.0% | 7,361 | 32.6% | 7,689 |
| | 2014 | 2,831 | 25.7% | 7,547 | 29.6% | 7,791 | 34.1% | 8,039 |
| | 2015 | 2,799 | 25.9% | 7,614 | 29.7% | 7,803 | 33.7% | 7,942 |
| | 2016 | 2,725 | 25.5% | 7,481 | 29.0% | 7,614 | 32.4% | 7,653 |
| | 2017 | 2,603 | 24.9% | 7,304 | 28.2% | 7,403 | 31.3% | 7,372 |
| | 2018 | 2,653 | 24.4% | 7,184 | 27.6% | 7,248 | 30.6% | 7,212 |
| | 2019 | 2,575 | 24.0% | 7,048 | 27.3% | 7,165 | 30.1% | 7,095 |
| | 2020 | 2,565 | 23.7% | 6,975 | 27.2% | 7,135 | 30.0% | 7,073 |
| | 2021 | 2,563 | 23.6% | 6,922 | 27.1% | 7,133 | 30.0% | 7,083 |
| | 2022 | 2,564 | 23.4% | 6,878 | 27.2% | 7,141 | 30.1% | 7,099 |

## 11. Figures

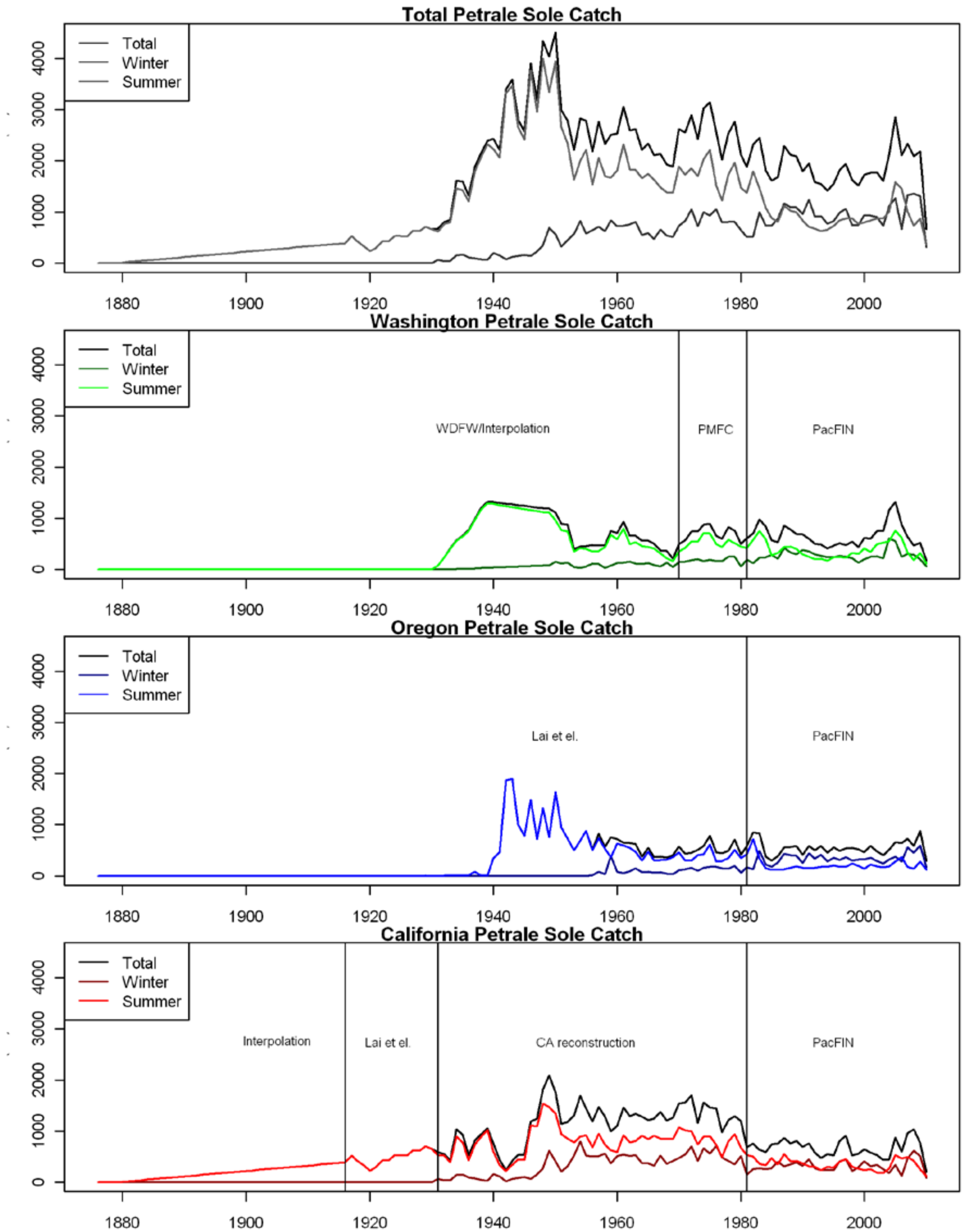



Figure 1. Distribution of total catch among each state for each of the summer and winter seasons 1876-2010 in comparison to the total catch in each year.

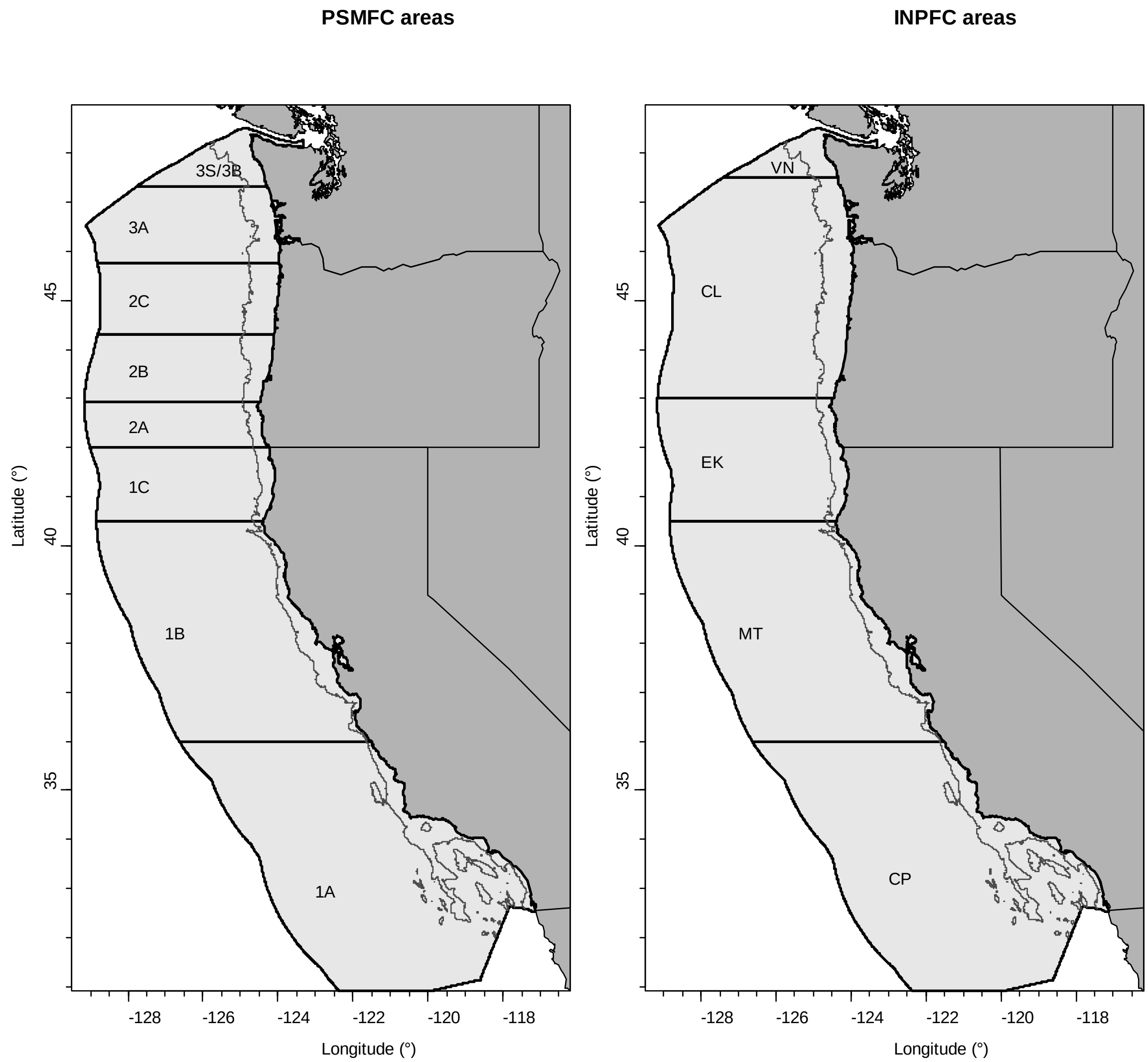



Figure 2. Map showing PSMFC and INPFC boundaries. The solid gray line off the coast is the 300 fathom depth contour.

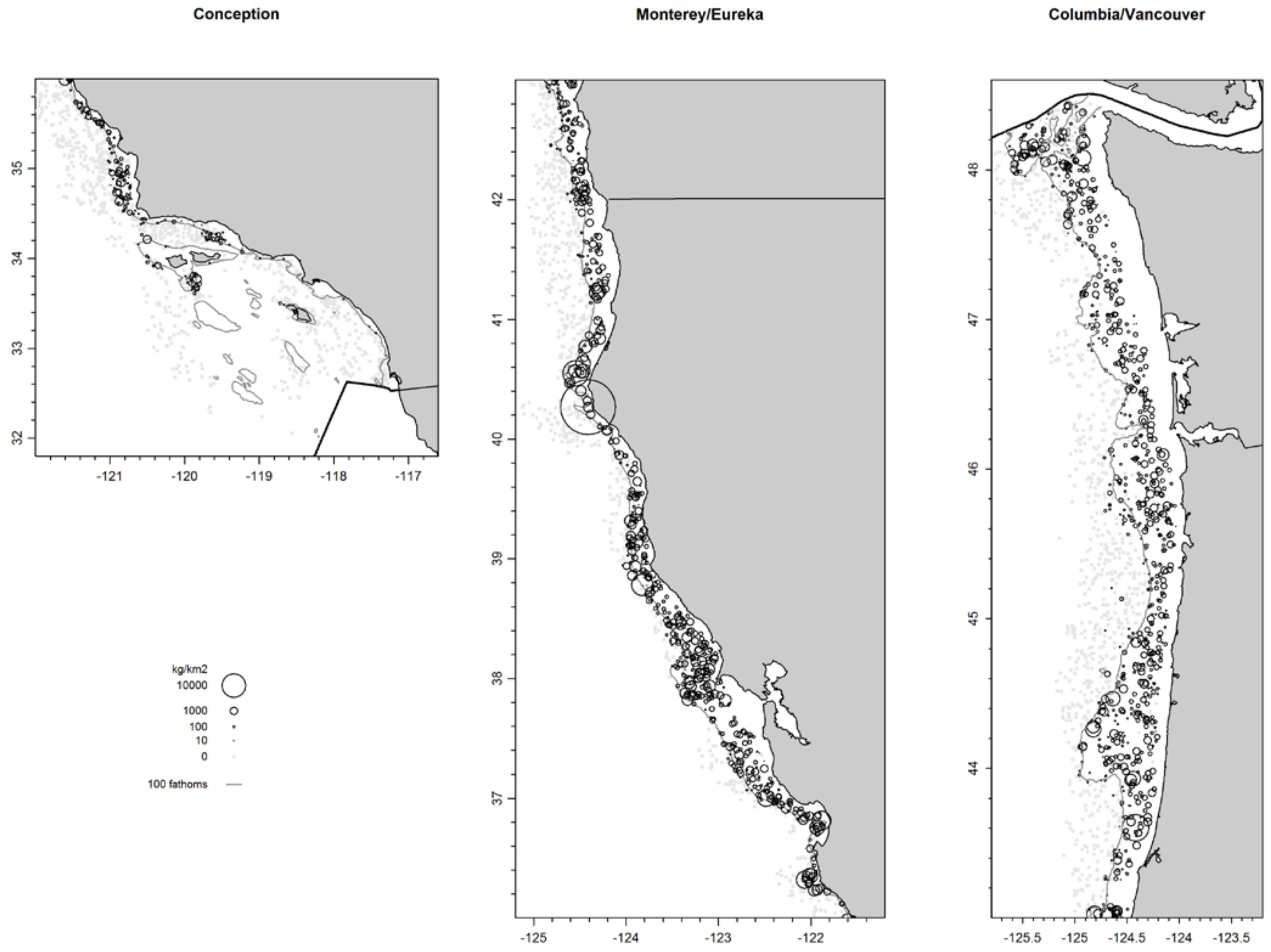



Figure 3. NWFSC survey catch rates.

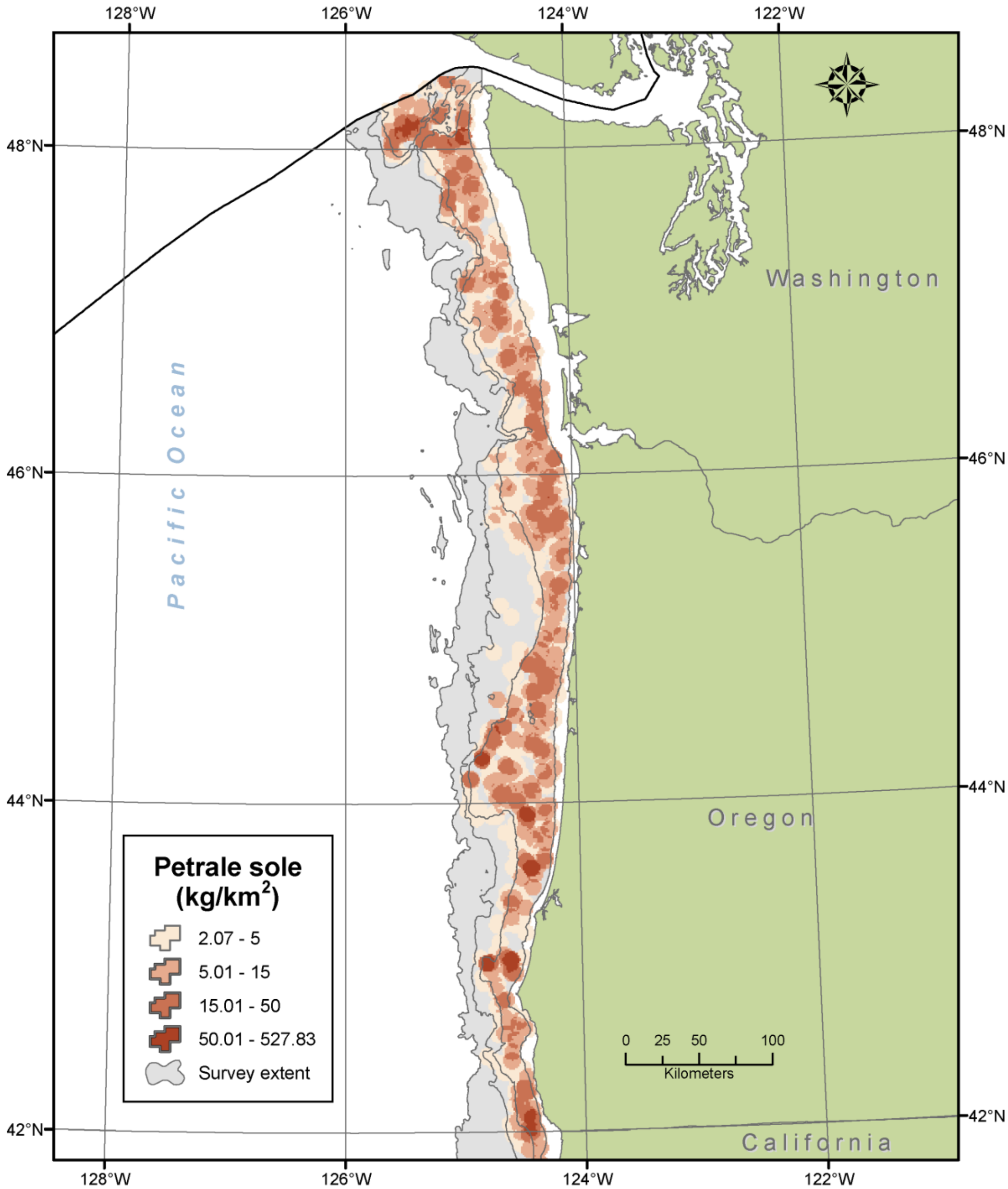



Figure 4a. Density of petrale sole (*Eopsetta jordani*) catch during NWFSC Groundfish Survey off of Washington and Oregon. Three main survey strata are defined by the 30-, 100-, 300- and 700-fathom isobaths.

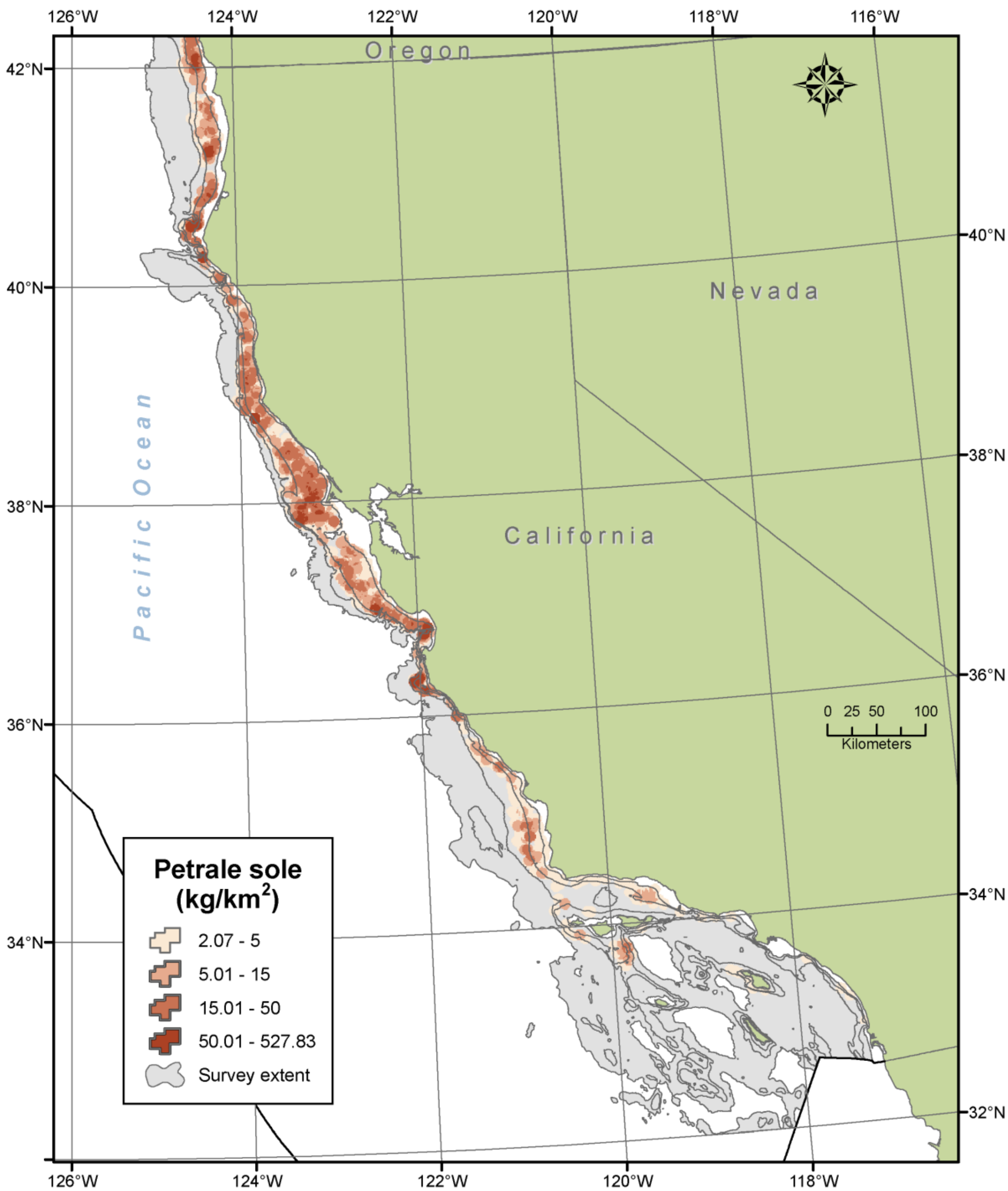



Figure 4b. Density of petrale sole (*Eopsetta jordani*) catch during NWFSC Groundfish Survey (2003-2010) off of California. Three main survey strata are defined by the 30-, 100-, 300- and 700-fathom isobaths.

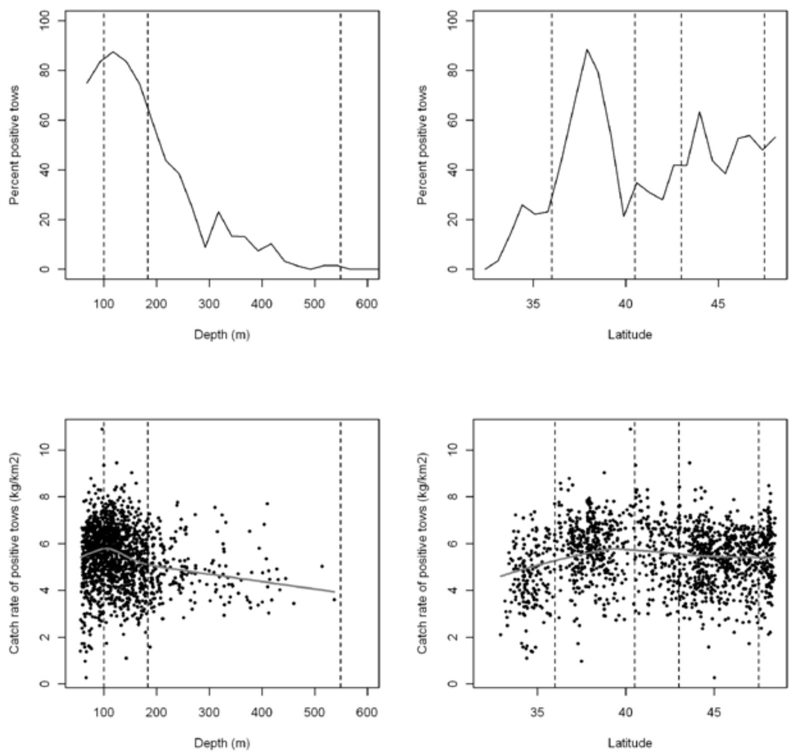



Figure 5. Plots of the percentage of positive tows and the catch rates for positive tows over depth and latitude.

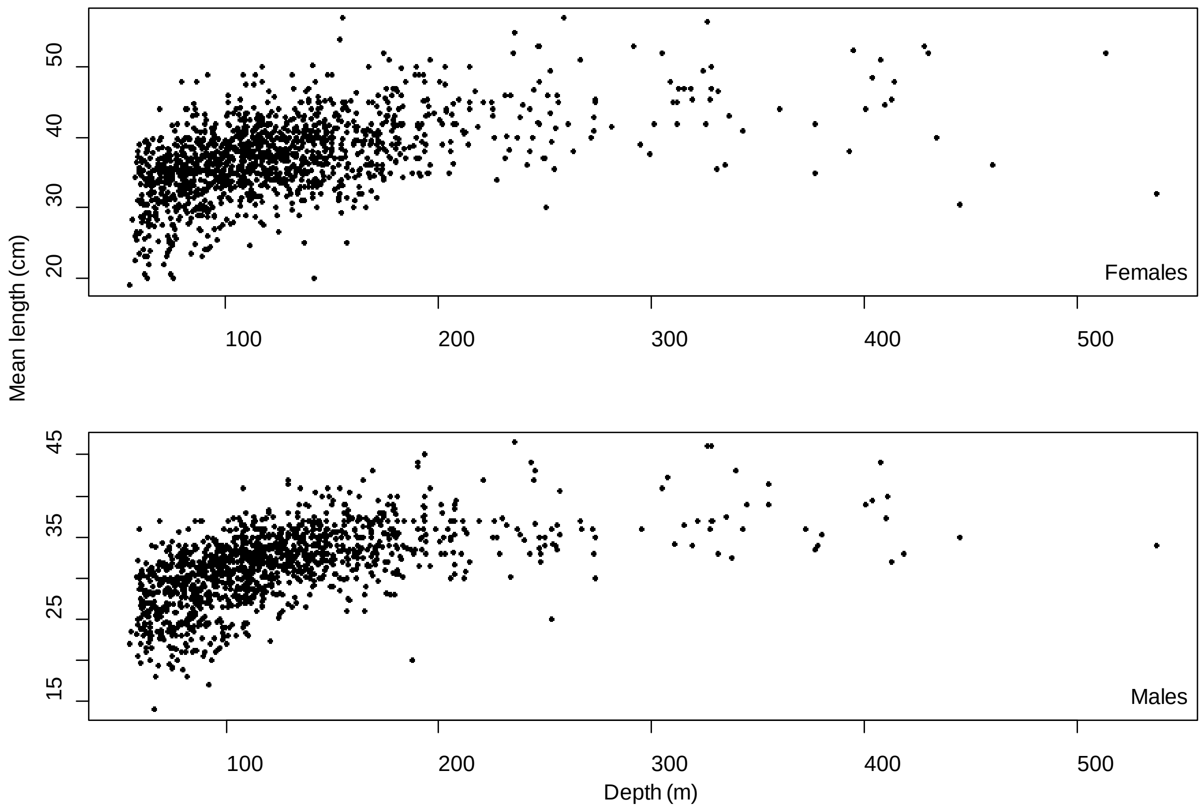



Figure 6. NWFSC survey mean length per tow by depth for females and males.

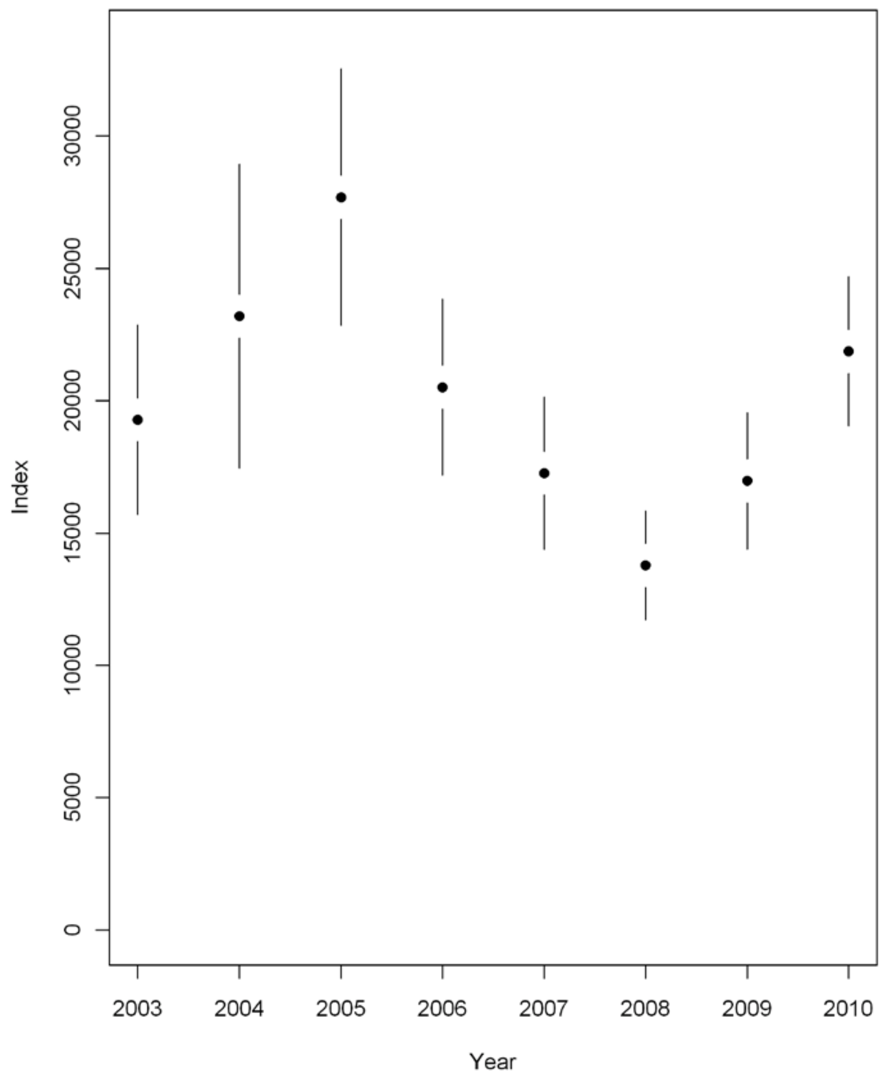



Figure 7. GLMM biomass estimates from the NWFSC survey.

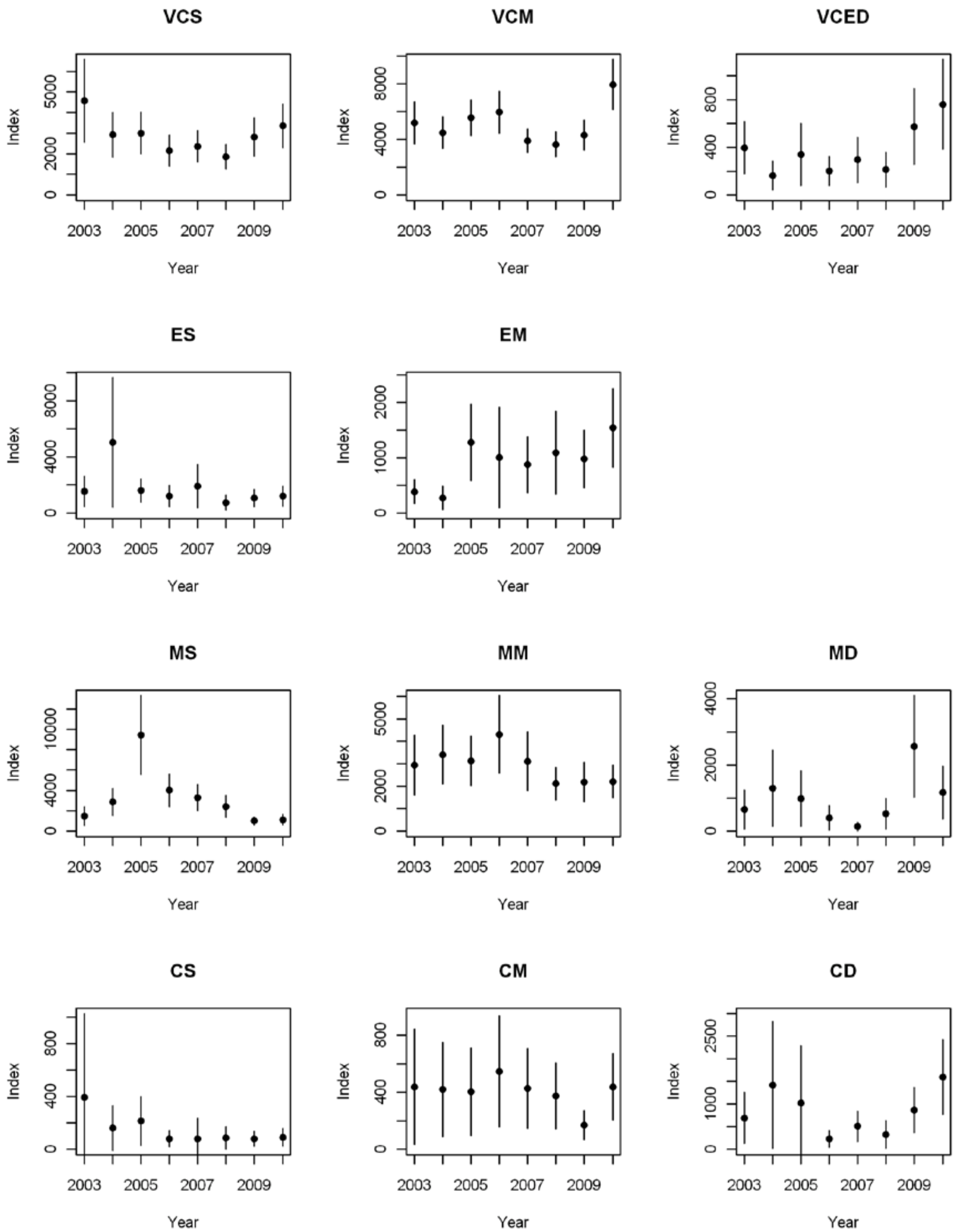



Figure 8. Plots of the estimated biomass for each strata chosen for the GLMM using the NWFSC survey.

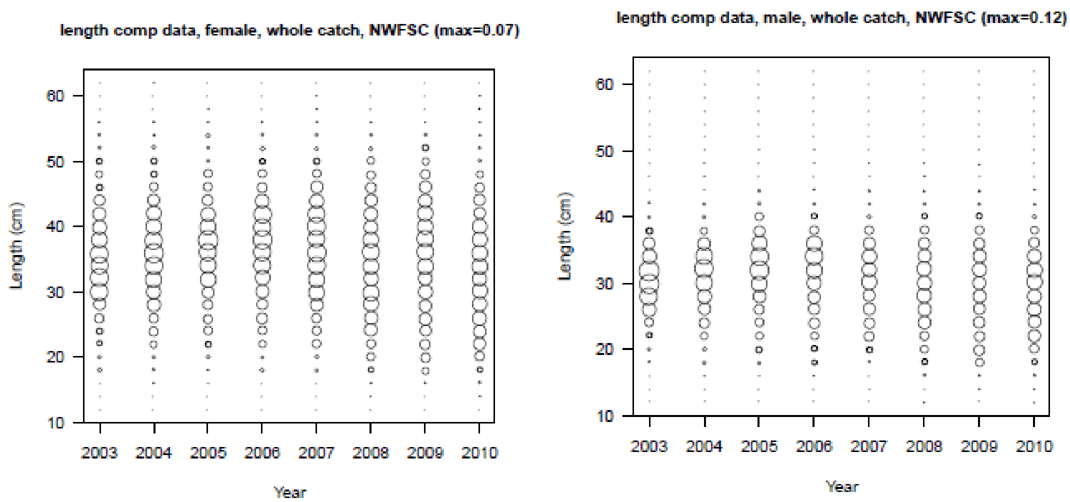



Figure 9. Female (left panel) and male (right panel) length frequencies for the NWFSC survey.

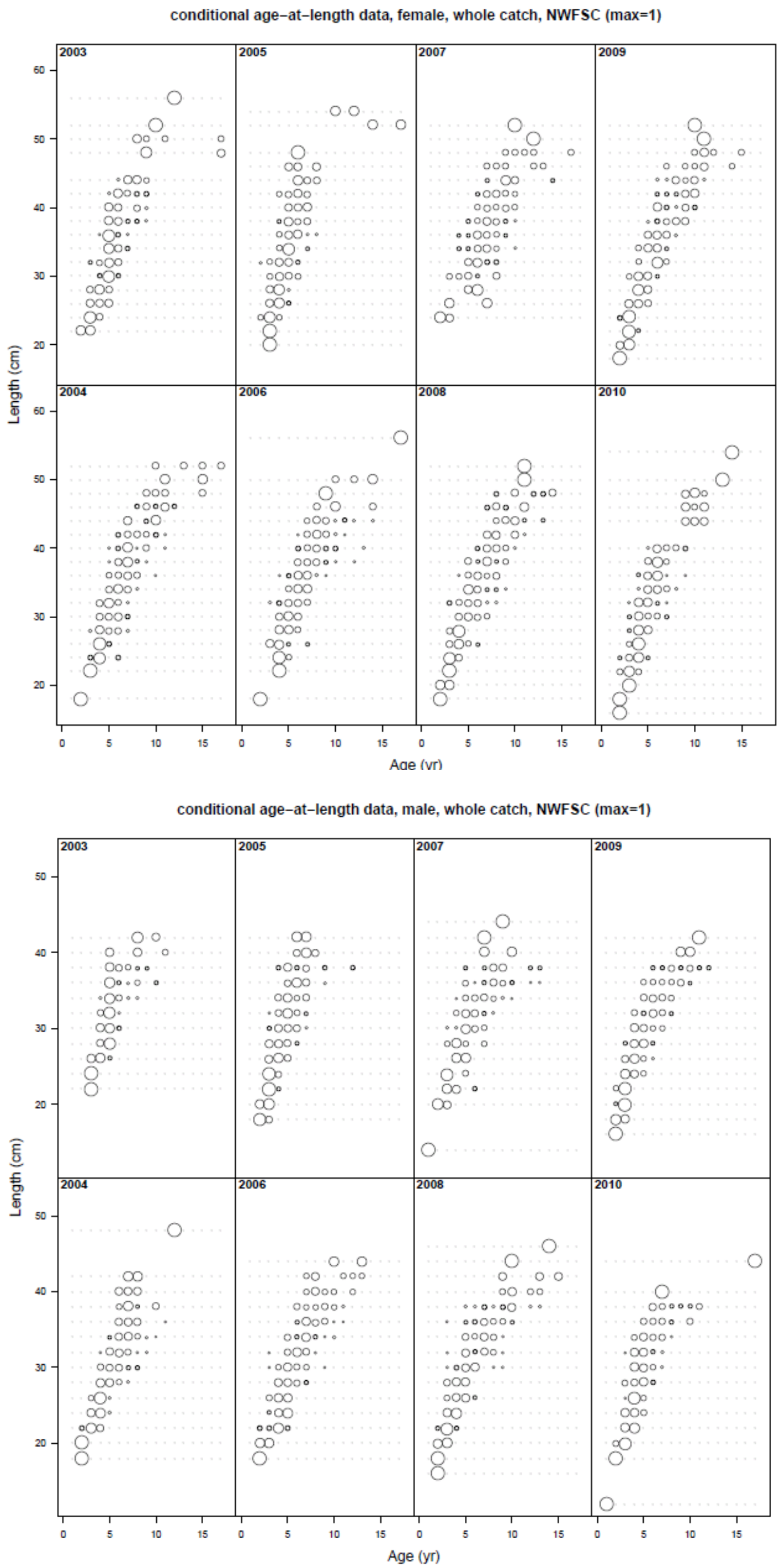



Figure 10. Female (top panel) and male (bottom panel) conditional age-at-length frequencies from the NWFSC survey.

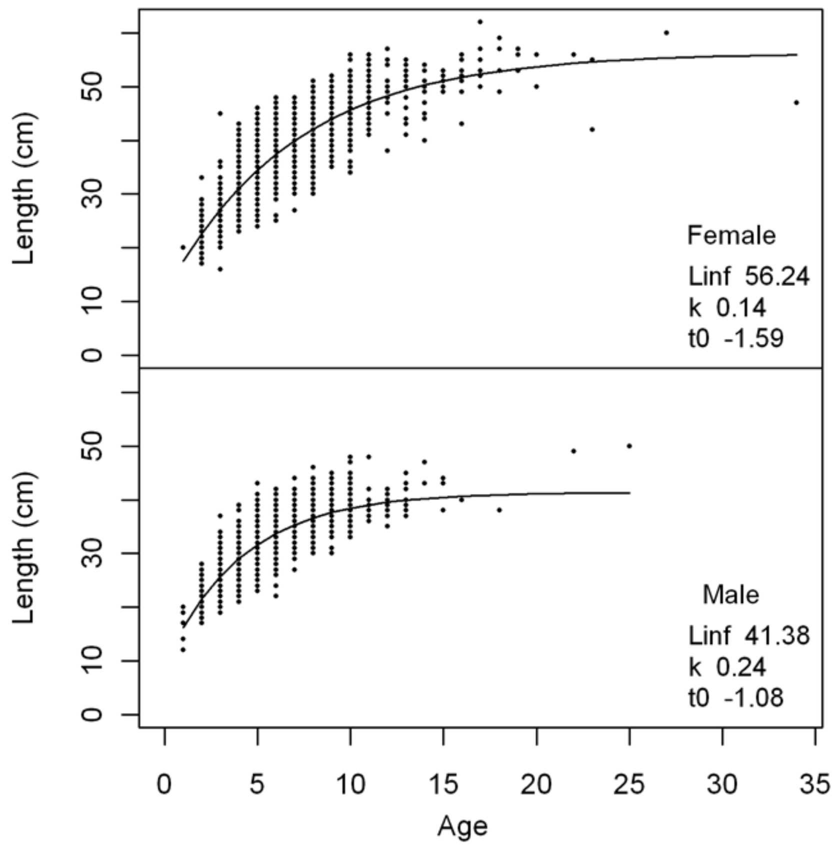



Figure 11. Length at age for males and females from the NWFSC survey with fits to the von Bertalanffy growth curve.

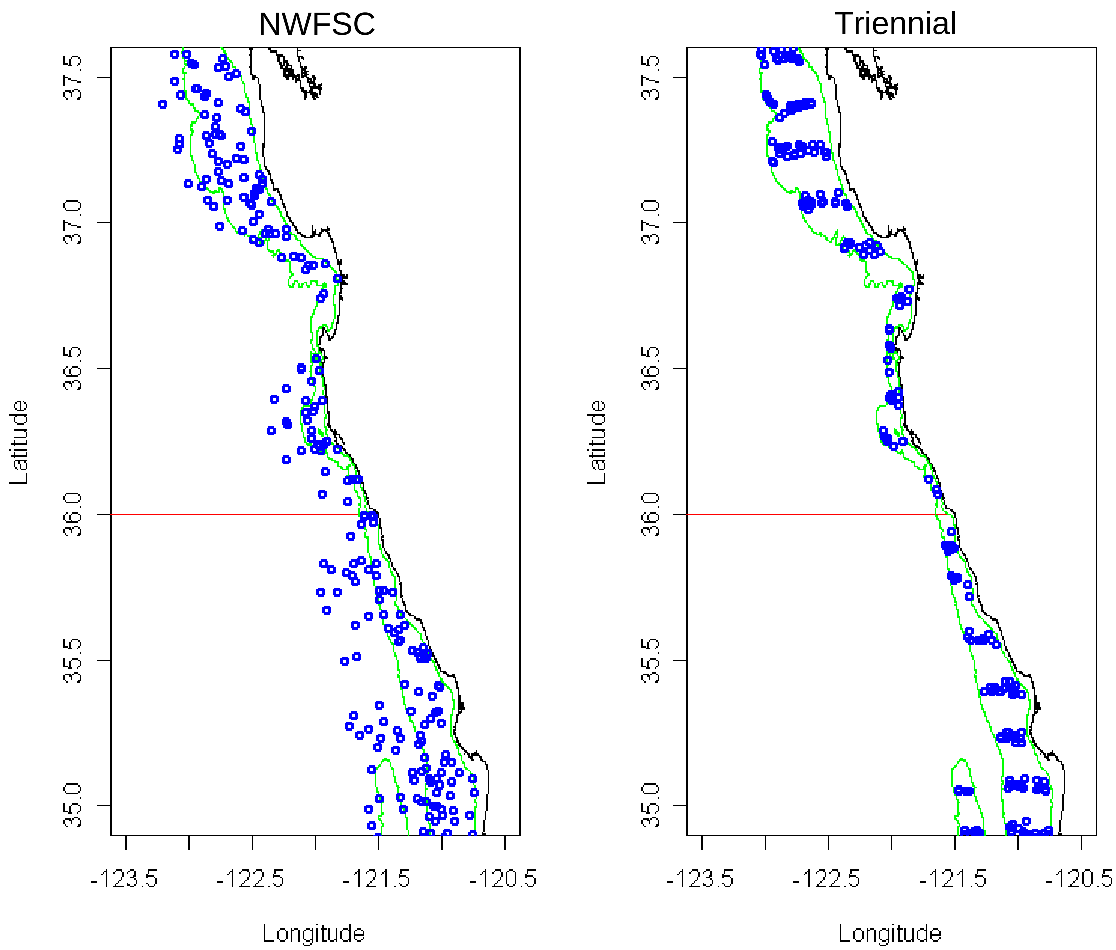



Figure 12. Survey tow locations in 2004, showing the difference in station design for the NWFSC trawl survey relative to the Triennial trawl survey.

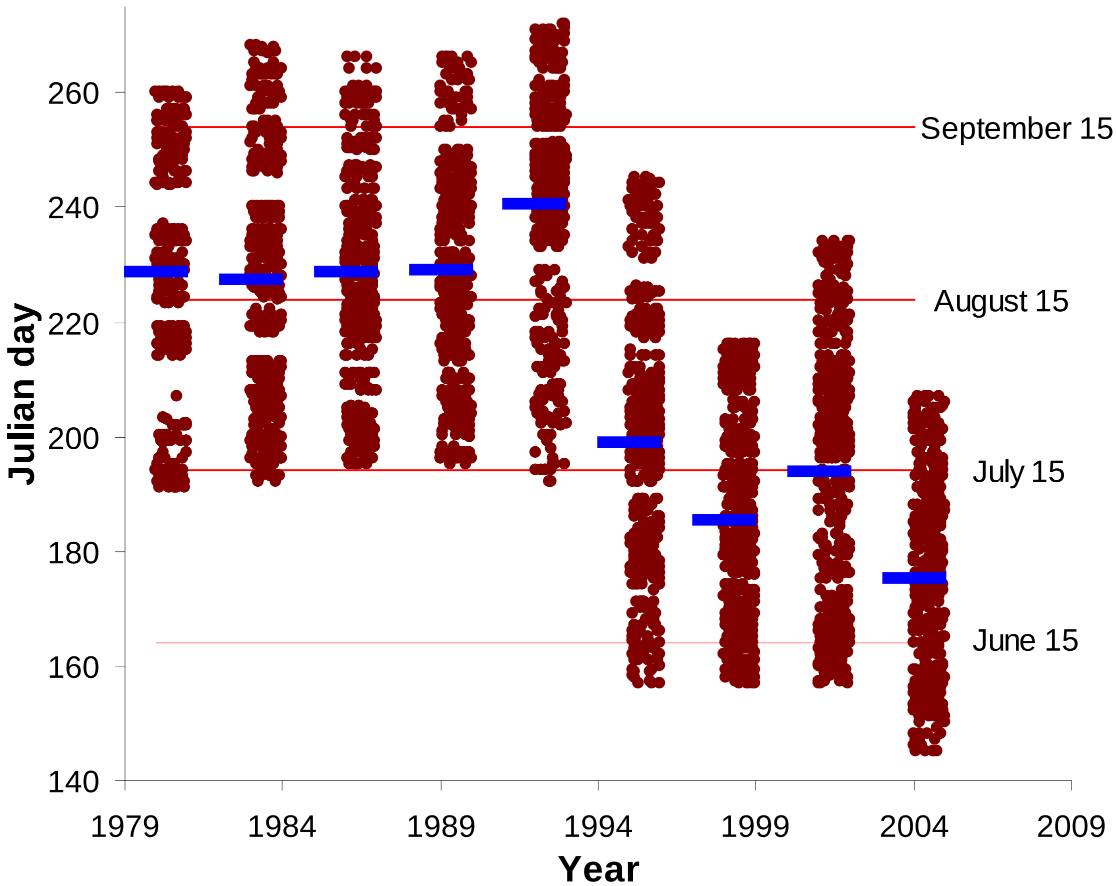



Figure 13. Distribution of dates of operation for the triennial survey (1980-2004). Solid bars show the mean date for each survey year, points represent individual hauls dates, but are jittered to allow better delineation of the distribution of individual points.

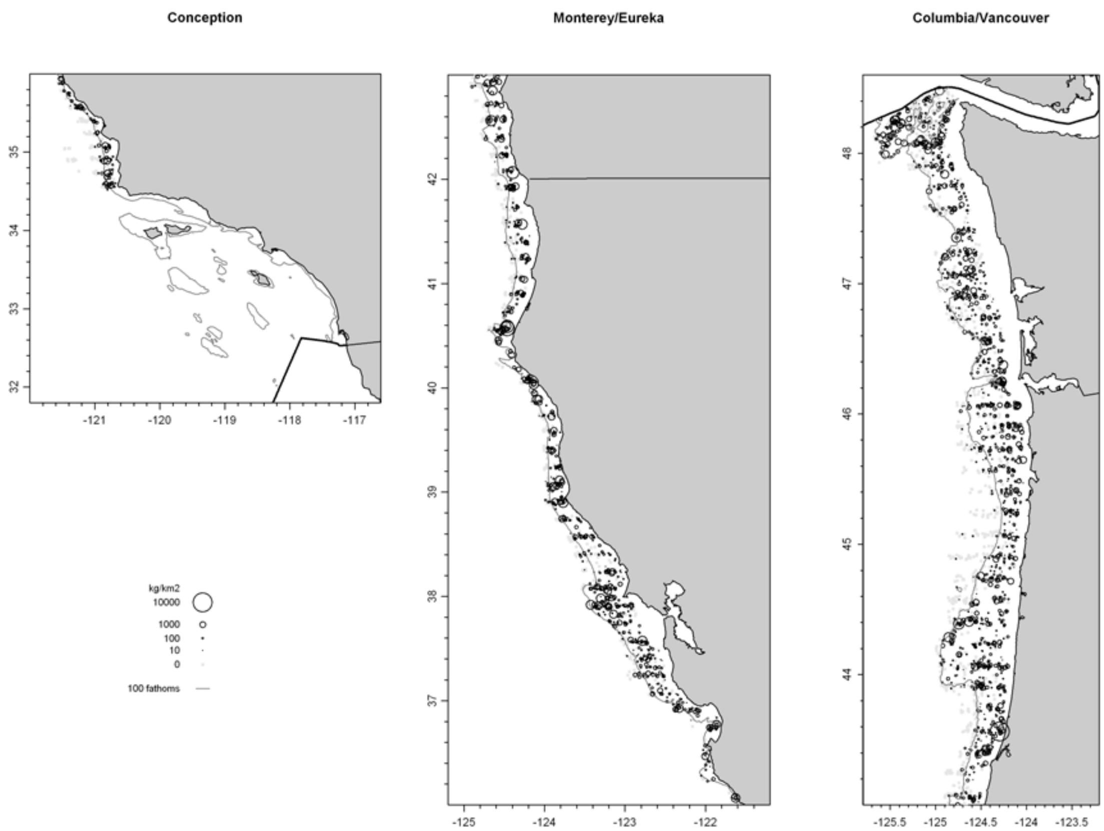



Figure 14. Catch rates over all years for the Triennial survey.

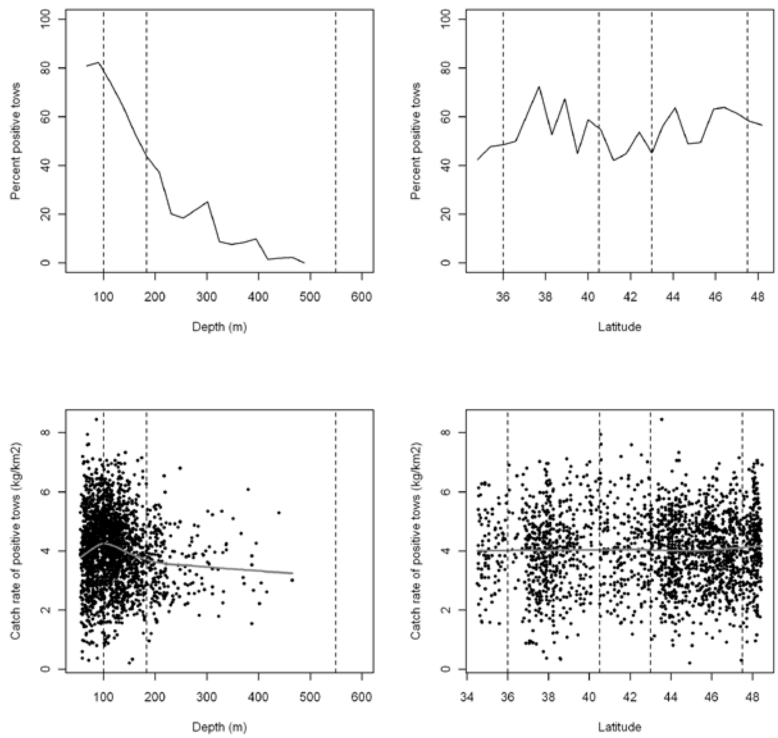



Figure 15. Plots of the percentage of positive tows and the catch rates for positive tows over depth and latitude.

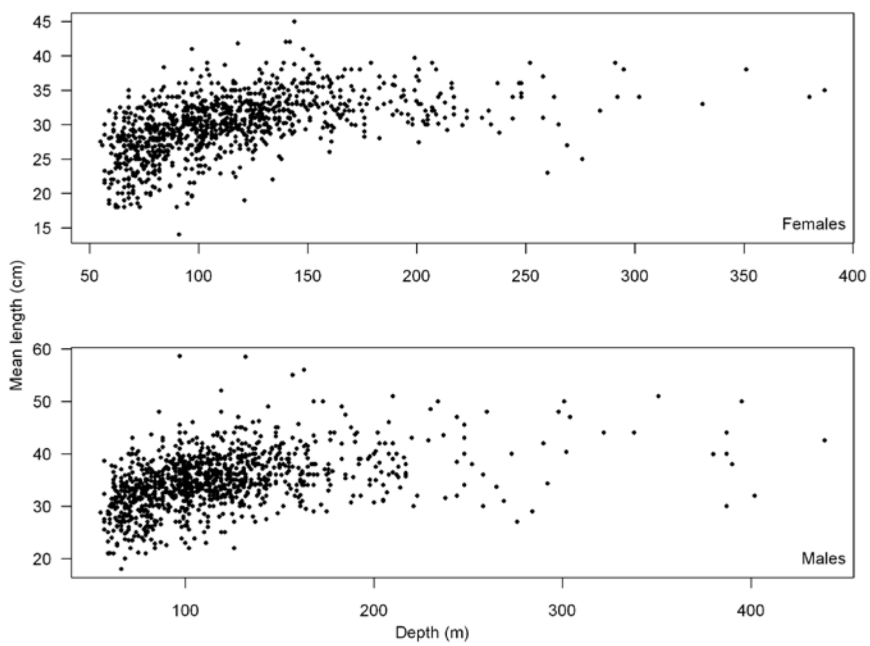



Figure 16. The mean length per tow from the Triennial trawl survey data plotted over depth for females and males.

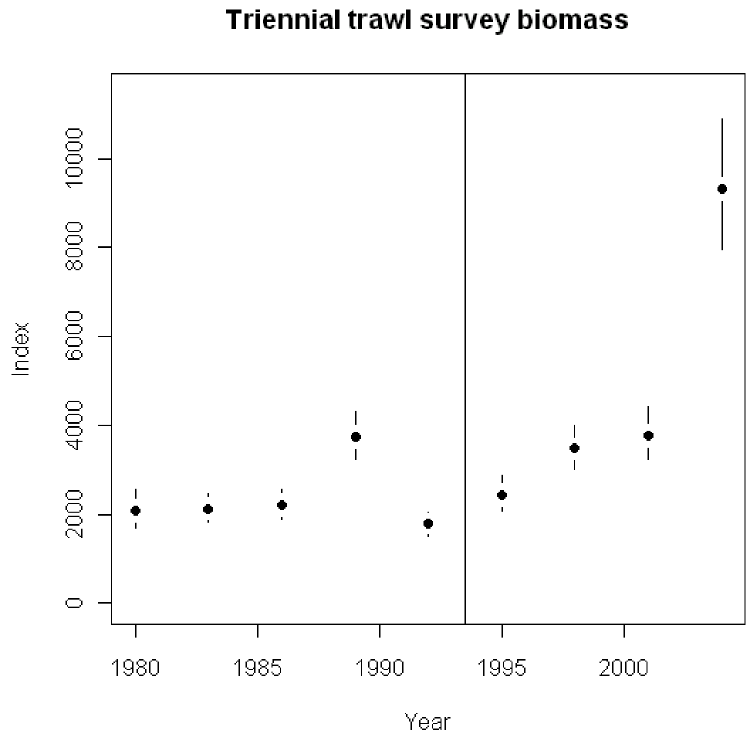



Table 17. GLMM biomass estimates from the early (points left of the vertical line) and late (points right of the vertical line) Triennial survey.

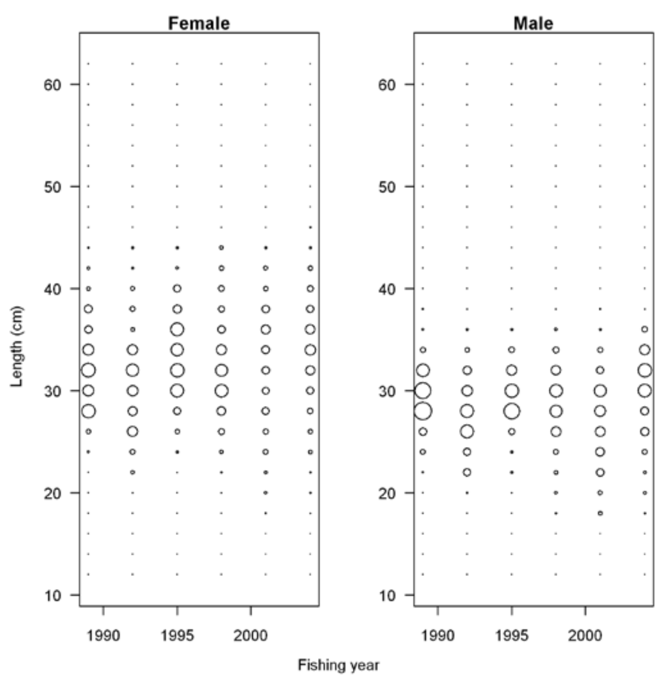



Figure 18. Plots of length frequencies from the triennial survey.

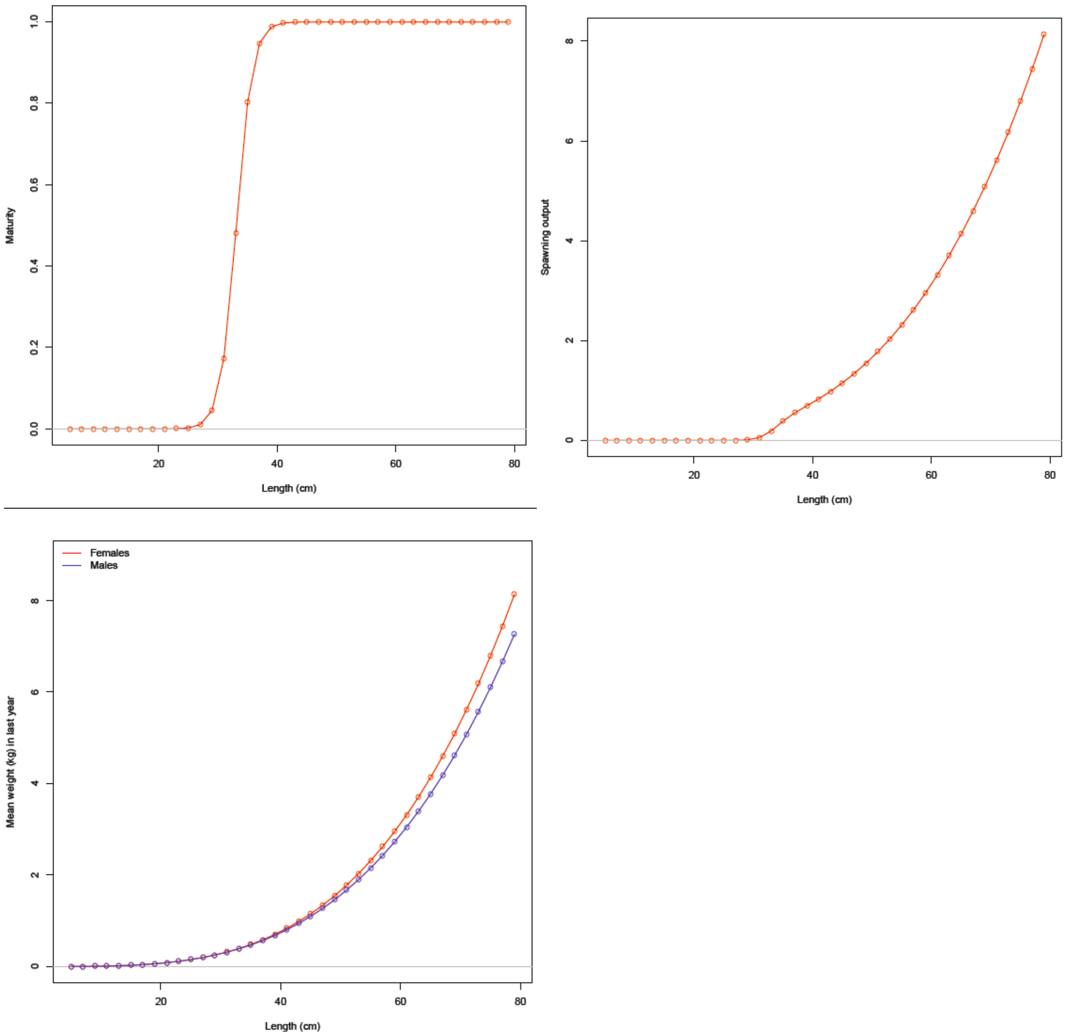



Figure 19. Biological relationships used for petrale sole weight-length relationship, maturity ogive (females only) and spawning output as a function of length.

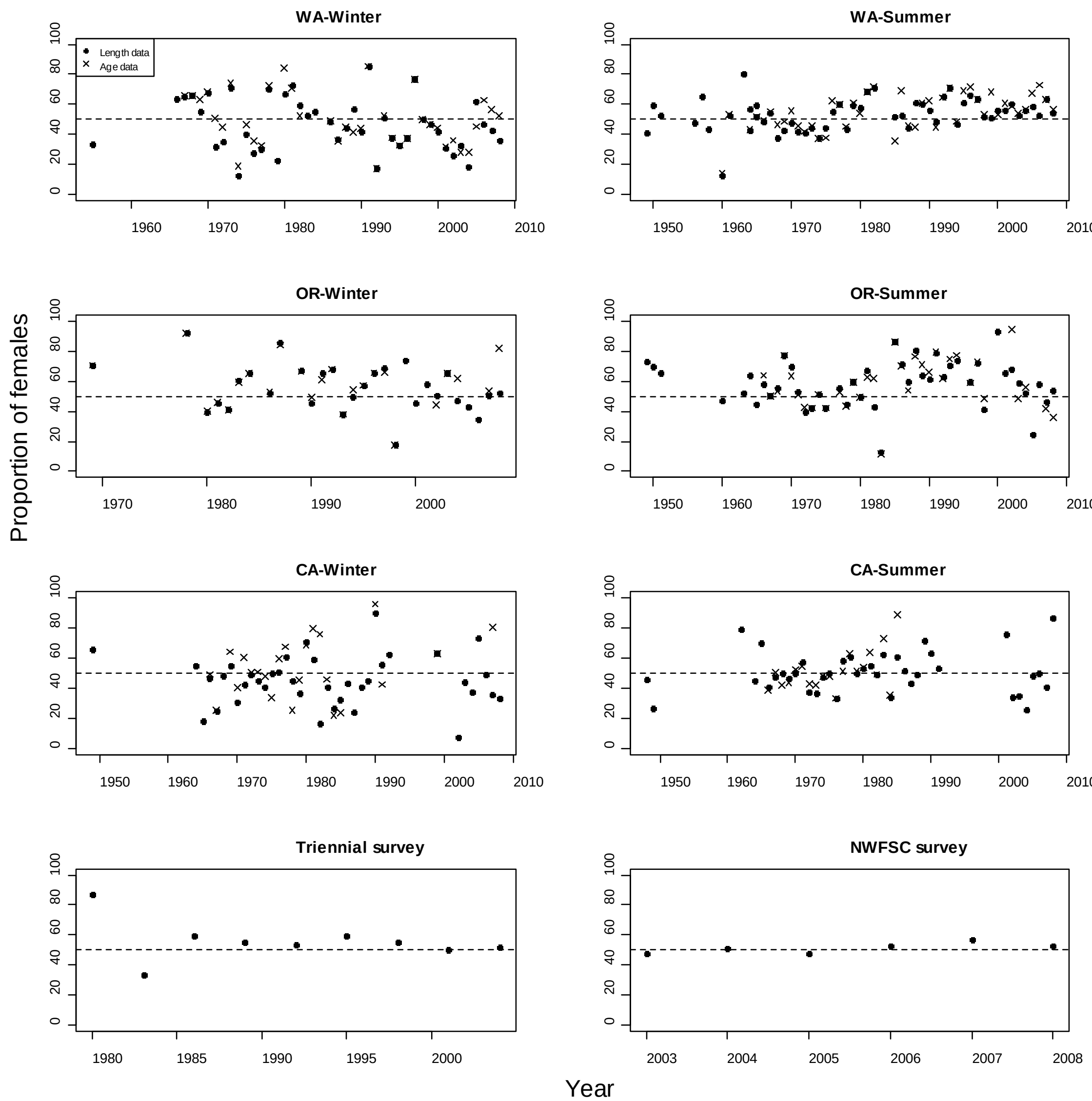



Figure 20. Proportion of females in length and age samples collected from the fisheries and surveys.

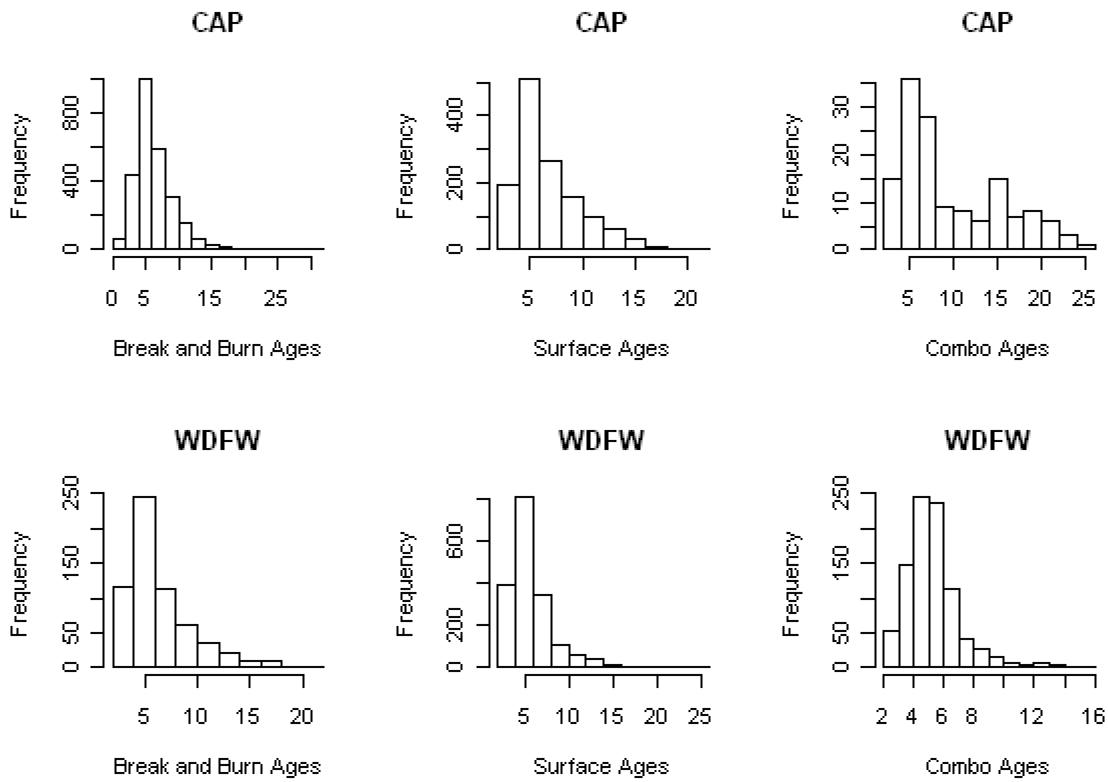



Figure 21. Distribution of double- and triple-reads used to calculate the ageing error keys.

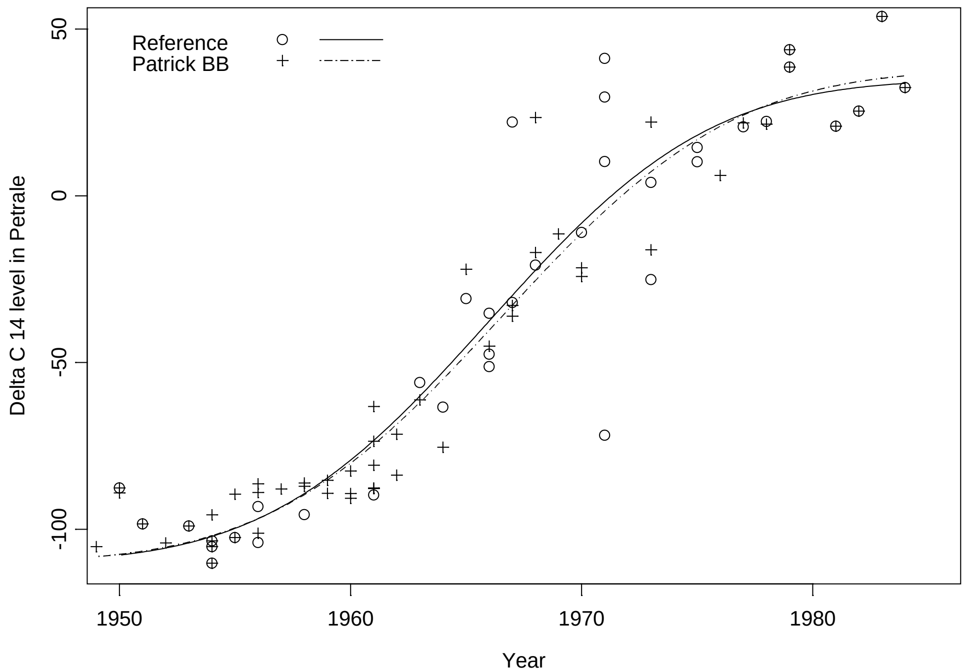



Figure 22. Fit of coupled-functions model (Hamel et al. 2008) to reference data and to age reader #1 break and burn ages of test samples (aged between 6 and 31) with early and late reference data (=1955, >=1979) added to ensure match at beginning and end of time series. No (or miniscule under ageing)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

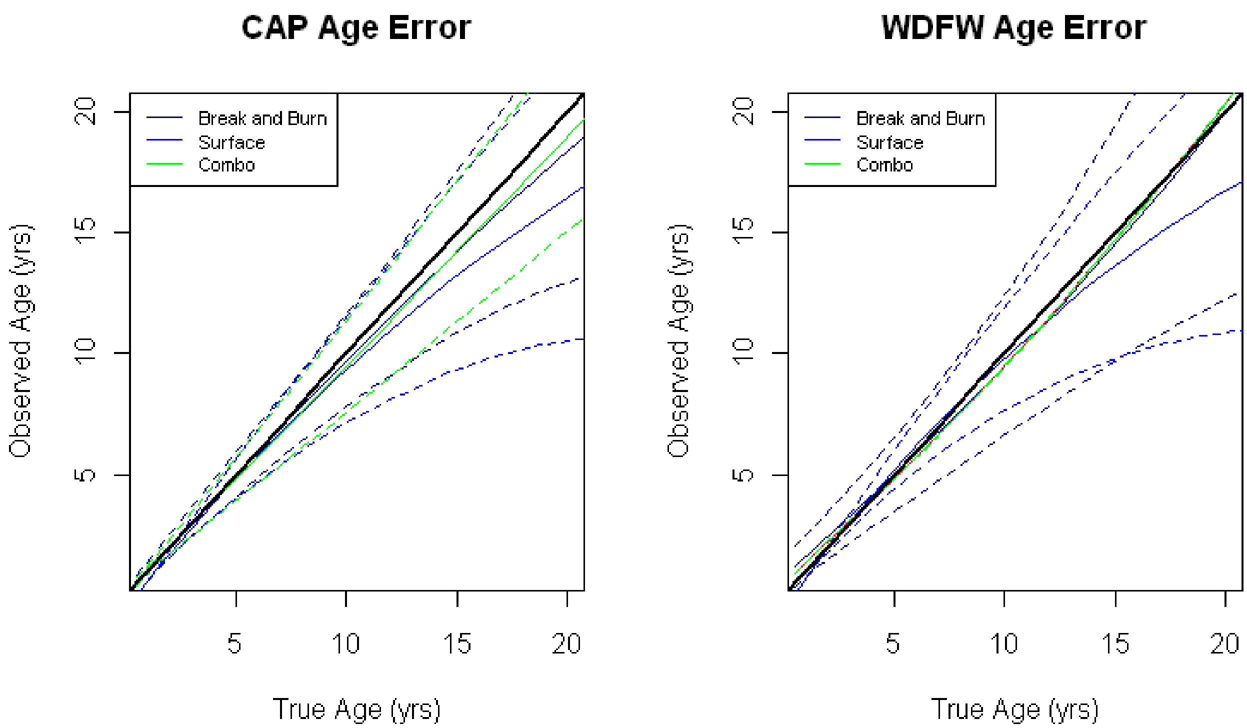
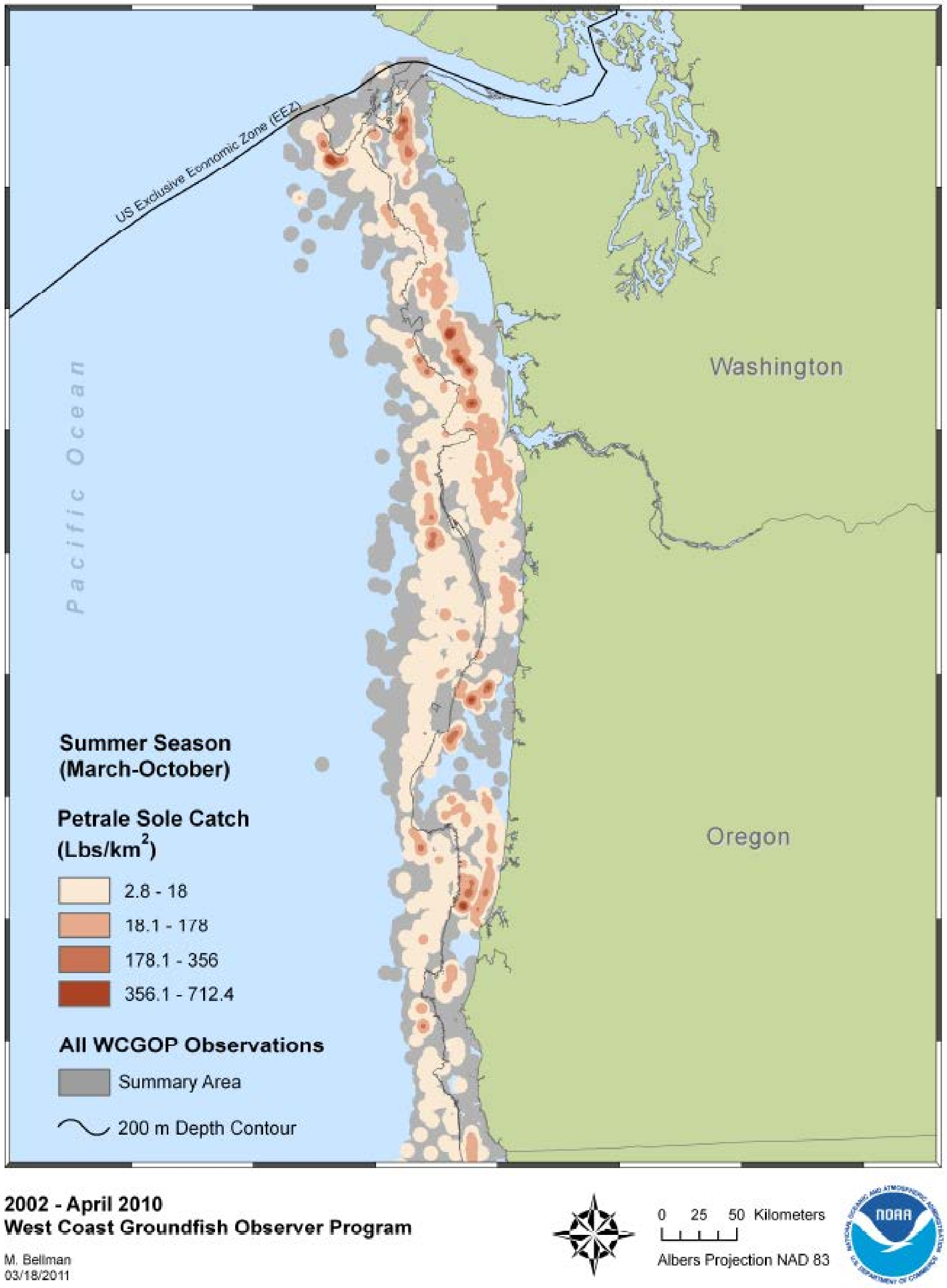
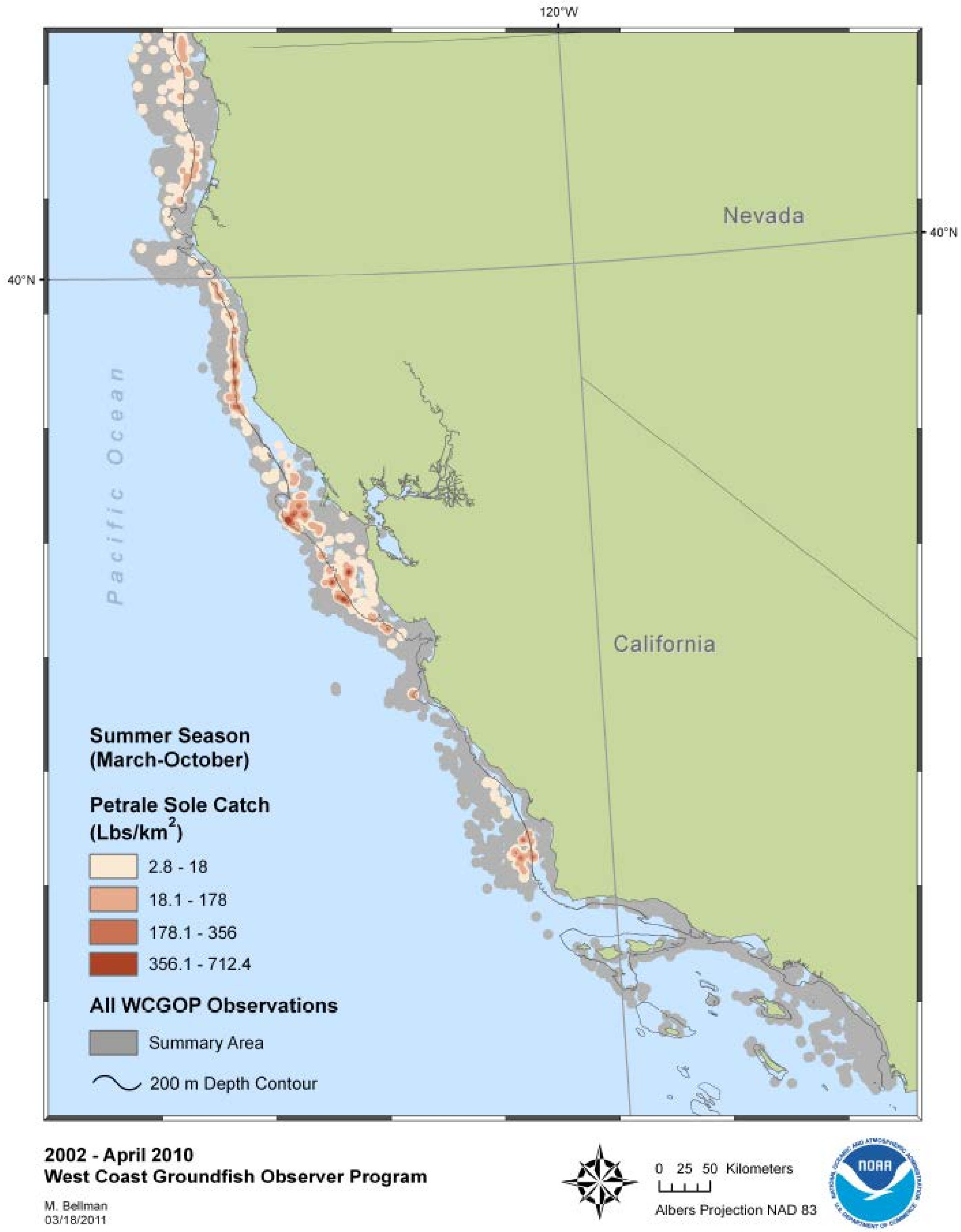



Figure 23. Plots of bias and imprecision for each data set. The 1:1 line is the dark bold line.

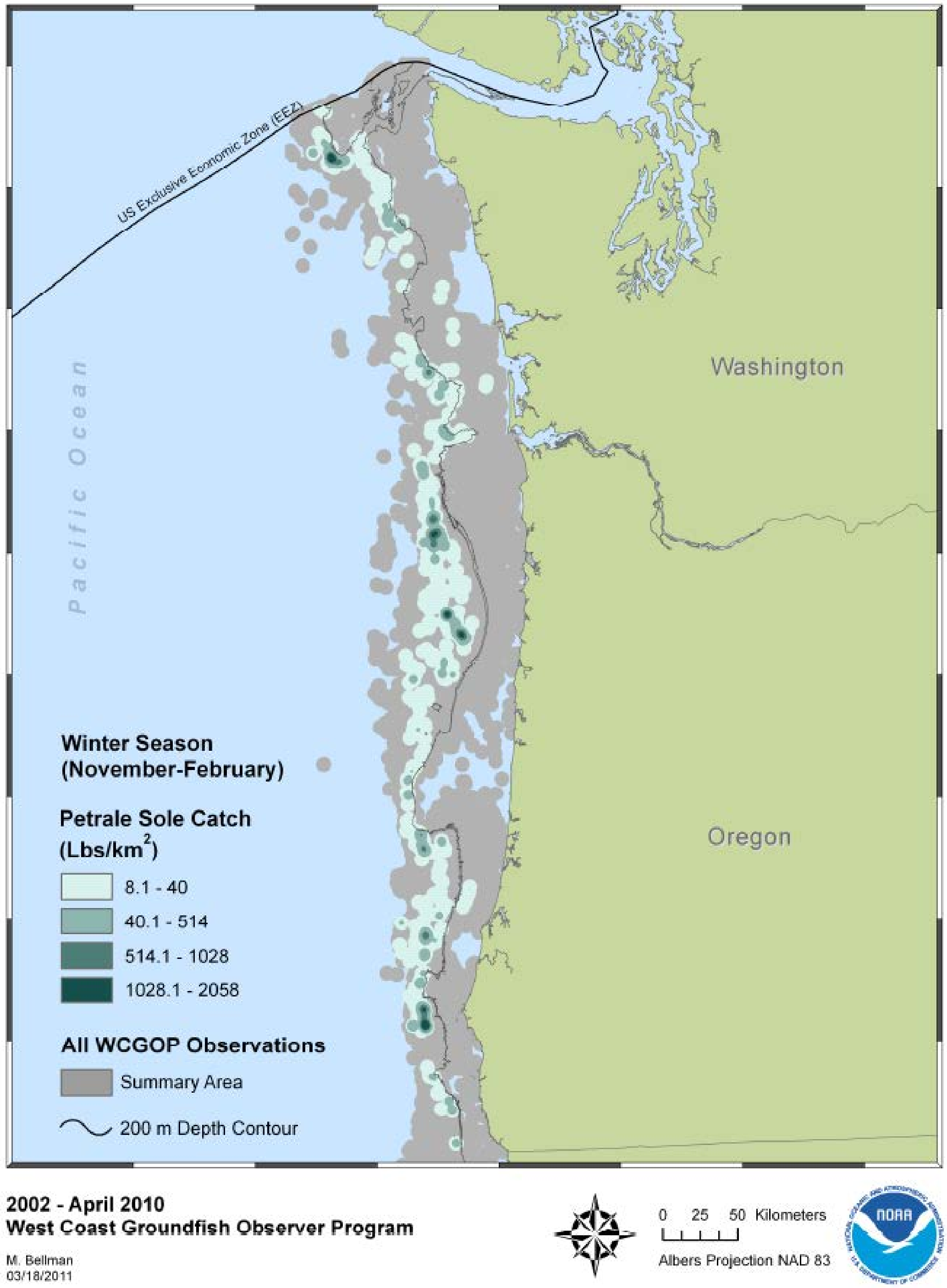


US Exclusive Eonnomic Zone (EEZ)
Pacific Ocean
Washington
Oregon
Summer Season
(March-October)
Petrale Sole Catch
(Lbs/km2)
2.8 - 18
18.1 - 178
178.1 - 356
356.1 - 712.4
All WCGOP Observations
Summary Area
200 m Depth Contour
2002 - April 2010
West Coast Groundfish Observer Program
M. Bellman
03/18/2011
0 25 50 Kilometers
Albers Projection NAD 83

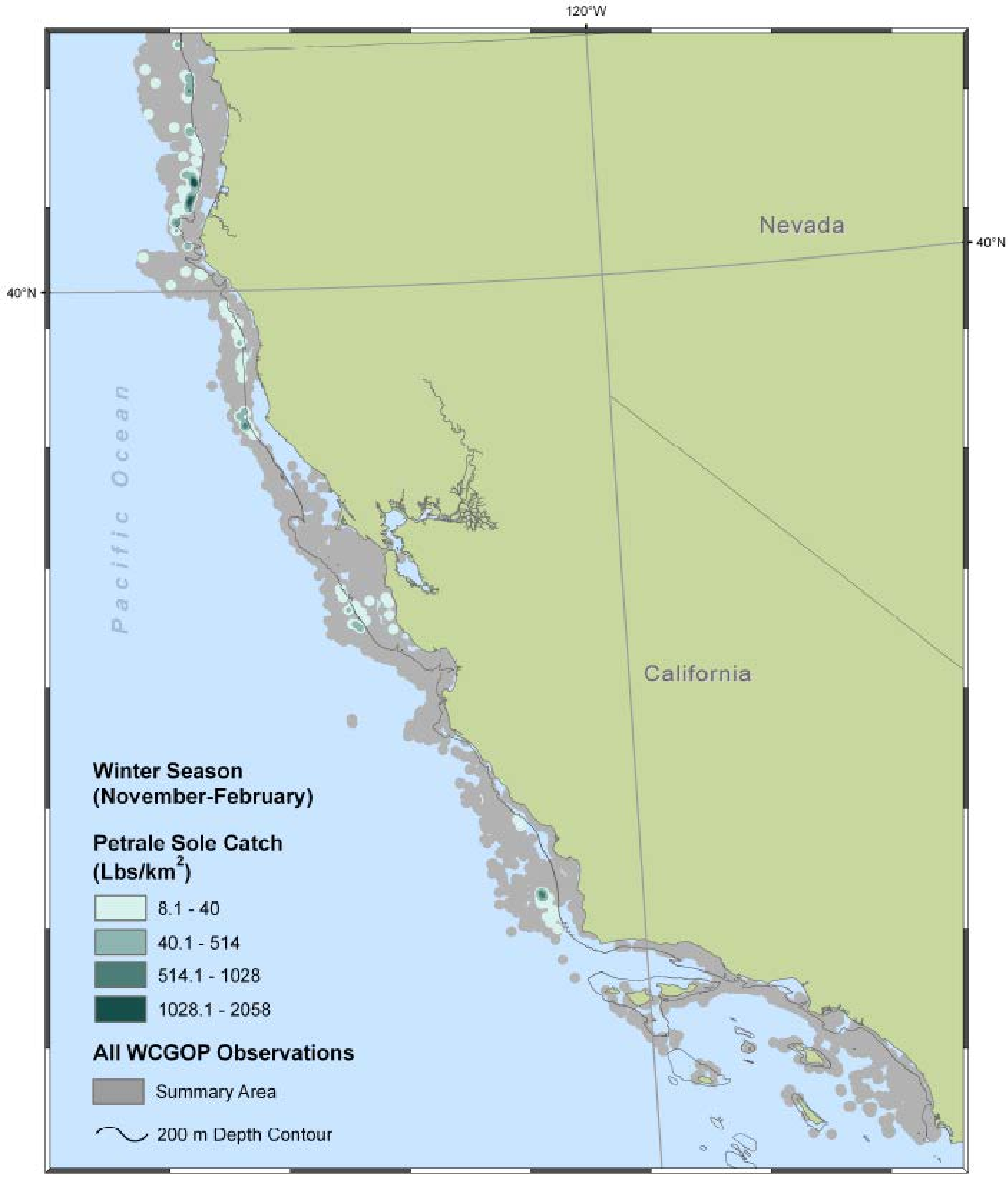

a.


120°W
40°N
40°N
Nevada
California
Pacific Ocean
Summer Season
(March-October)
Petrale Sole Catch
(Lbs/km2)
2.8 - 18
18.1 - 178
178.1 - 356
356.1 - 712.4
All WCGOP Observations
Summary Area
200 m Depth Contour
2002 - April 2010
West Coast Groundfish Observer Program
M. Bellman
03/18/2011
0 25 50 Kilometers
Albers Projection NAD 83

b.


US Exclusive Economic Zone (EEZ)
Pacific Ocean
Washington
Oregon
Winter Season
(November-February)
Petrale Sole Catch
(Lbs/km$^2$)
8.1 - 40
40.1 - 514
514.1 - 1028
1028.1 - 2058
All WCGOP Observations
Summary Area
200 m Depth Contour
2002 - April 2010
West Coast Groundfish Observer Program
M. Bellman
03/18/2011
0 25 50 Kilometers
Albers Projection NAD 83

c.




d.

Figure 24. Spatial distribution of petrale sole catch (lbs/km2), in the summer (panels a and b; March-October) and winter seasons (panels c and d; November-February), observed by the West Coast Groundfish Observer Program from 2002 – April 2010 and the summary area of all observed fishing events. The range of catch (minimum to maximum value) was mapped; the two highest classifications were defined by dividing the maximum value in half, and the resulting value in half, and the remaining observations were then allocated into equal proportions into the two lowest classifications. Panels a and c show Washington and Oregon, panels b and d show California.

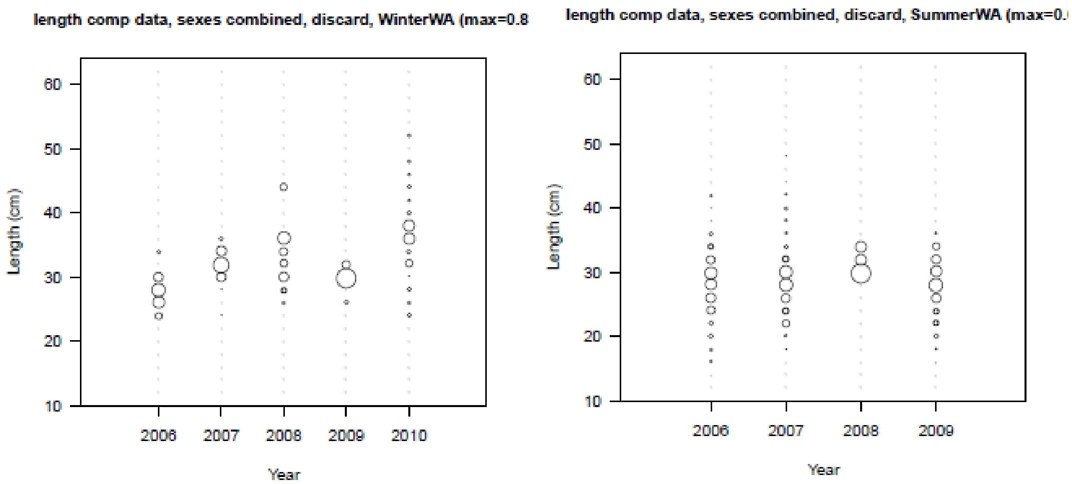



Figure 25. Discard length compositions by season for Washington.

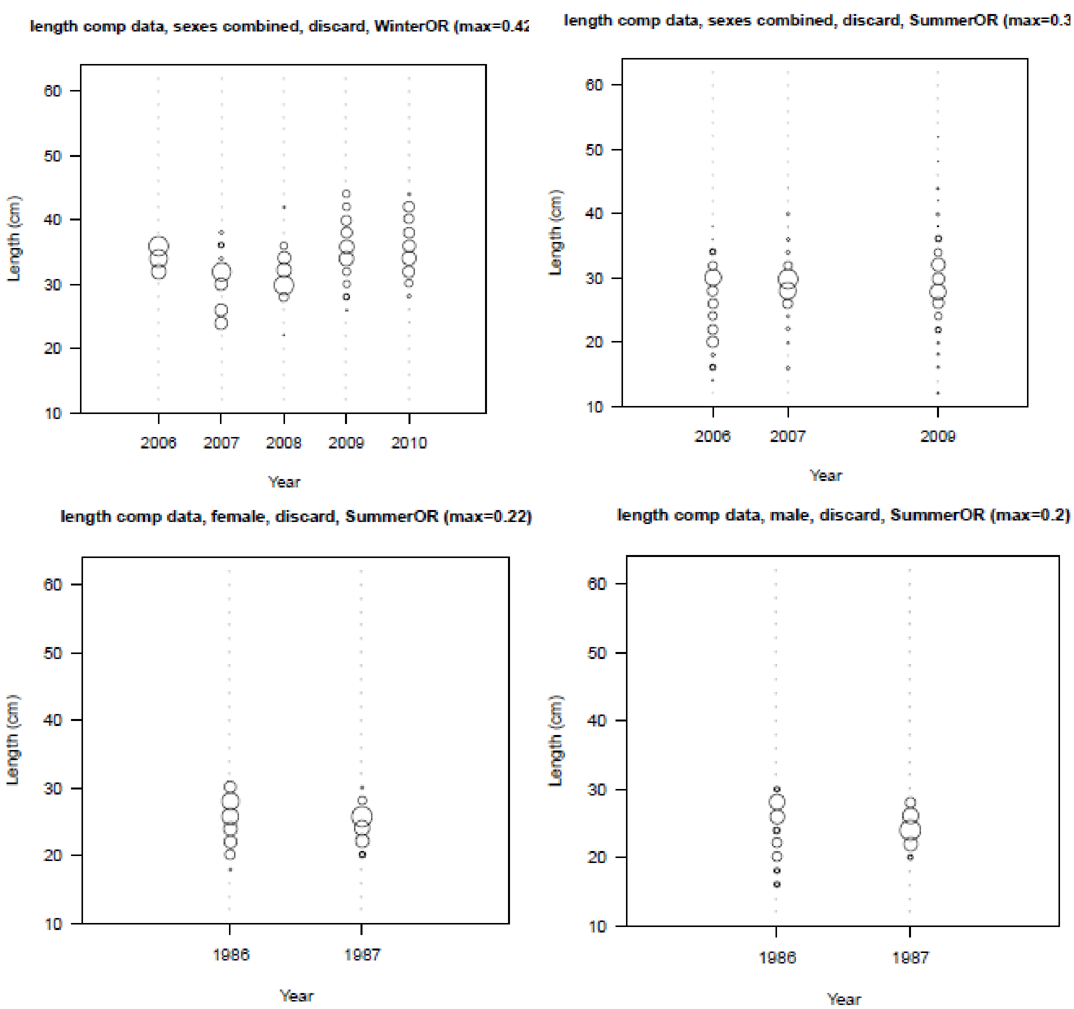



Figure 26. Discard length compositions by data source, season, and gender (where available) for Oregon.

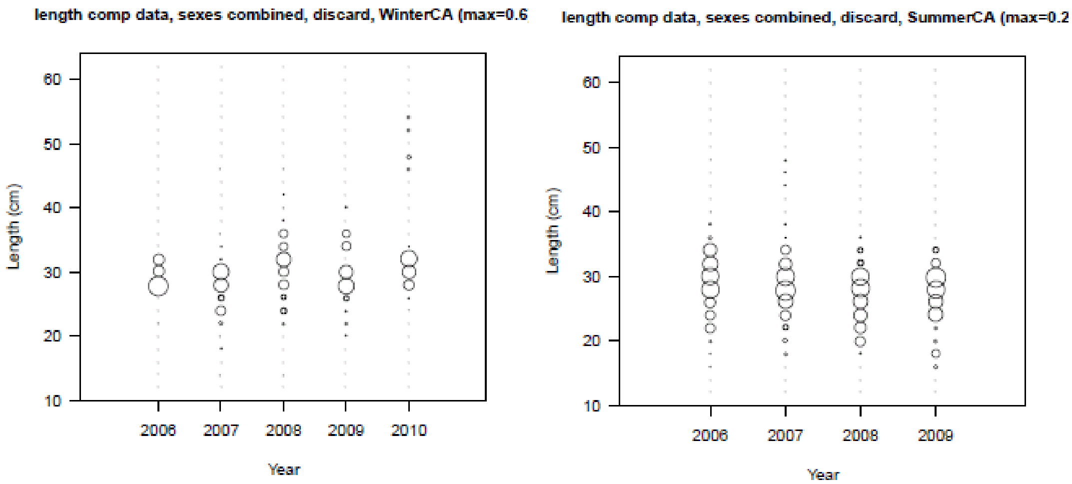


Figure 27. Discard length compositions by season for California.

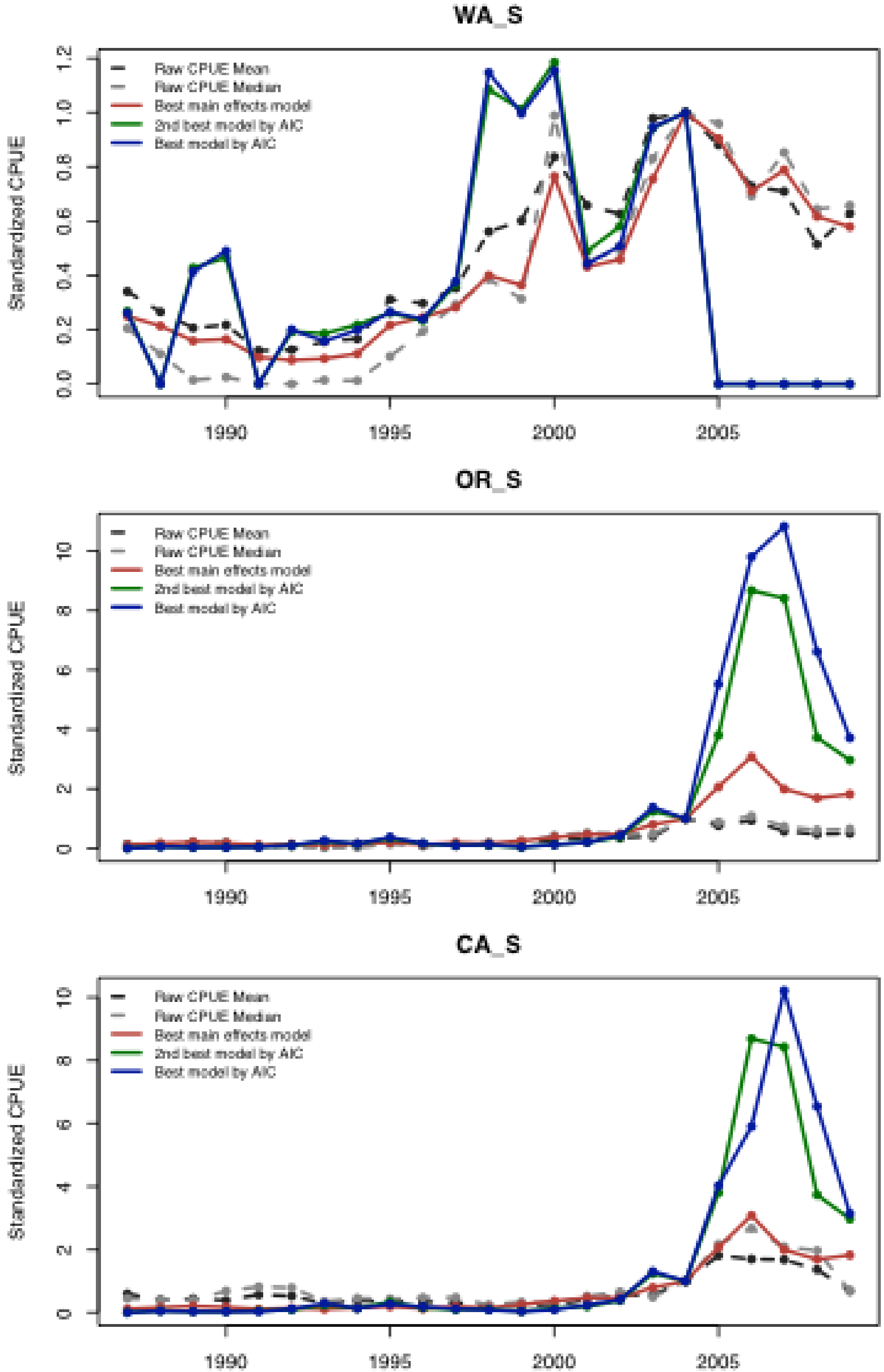



Figure 28. Plots of standardized summer CPUE indices.

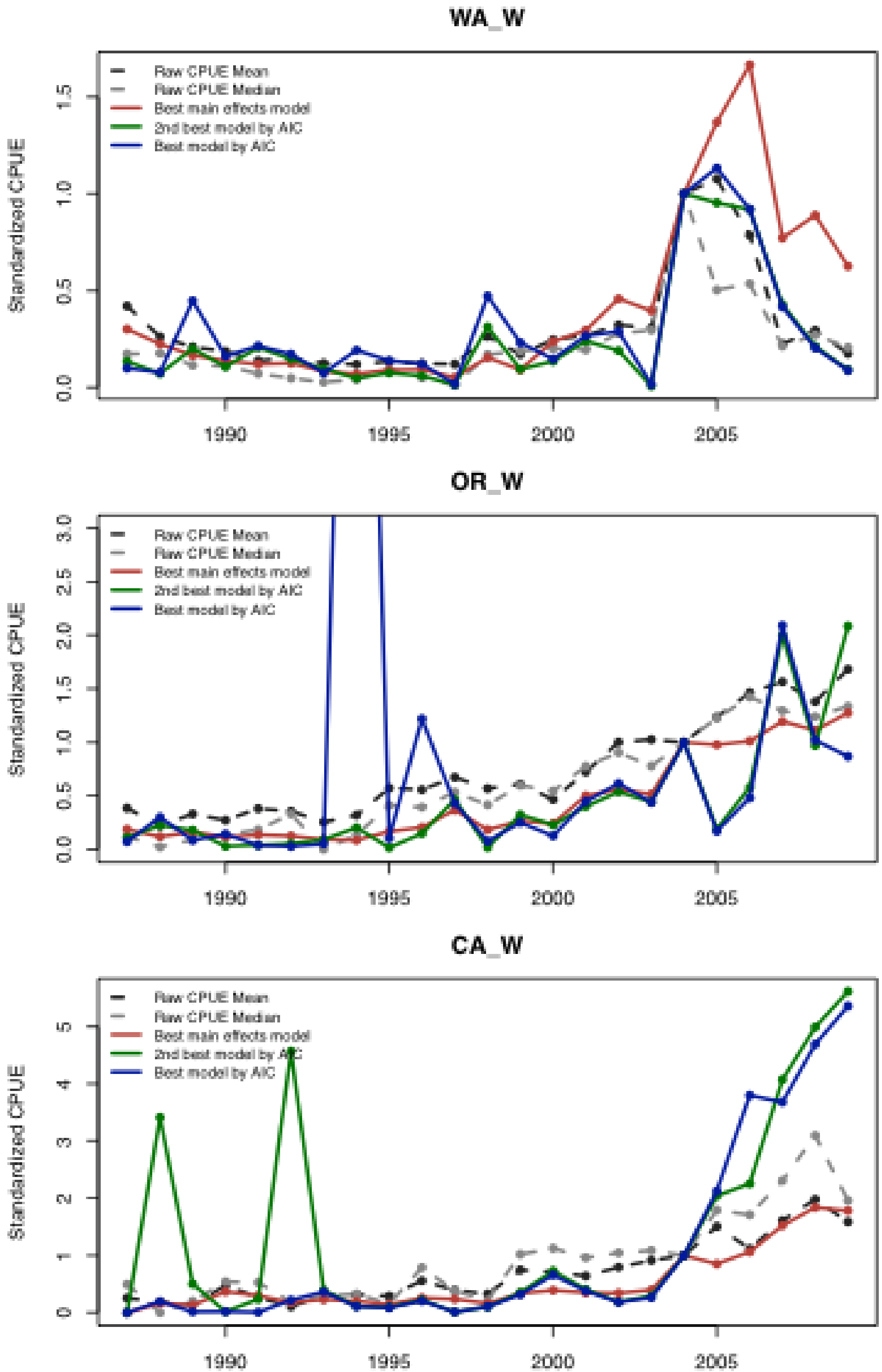



Figure 29. Plots of standardized winter CPUE indices.

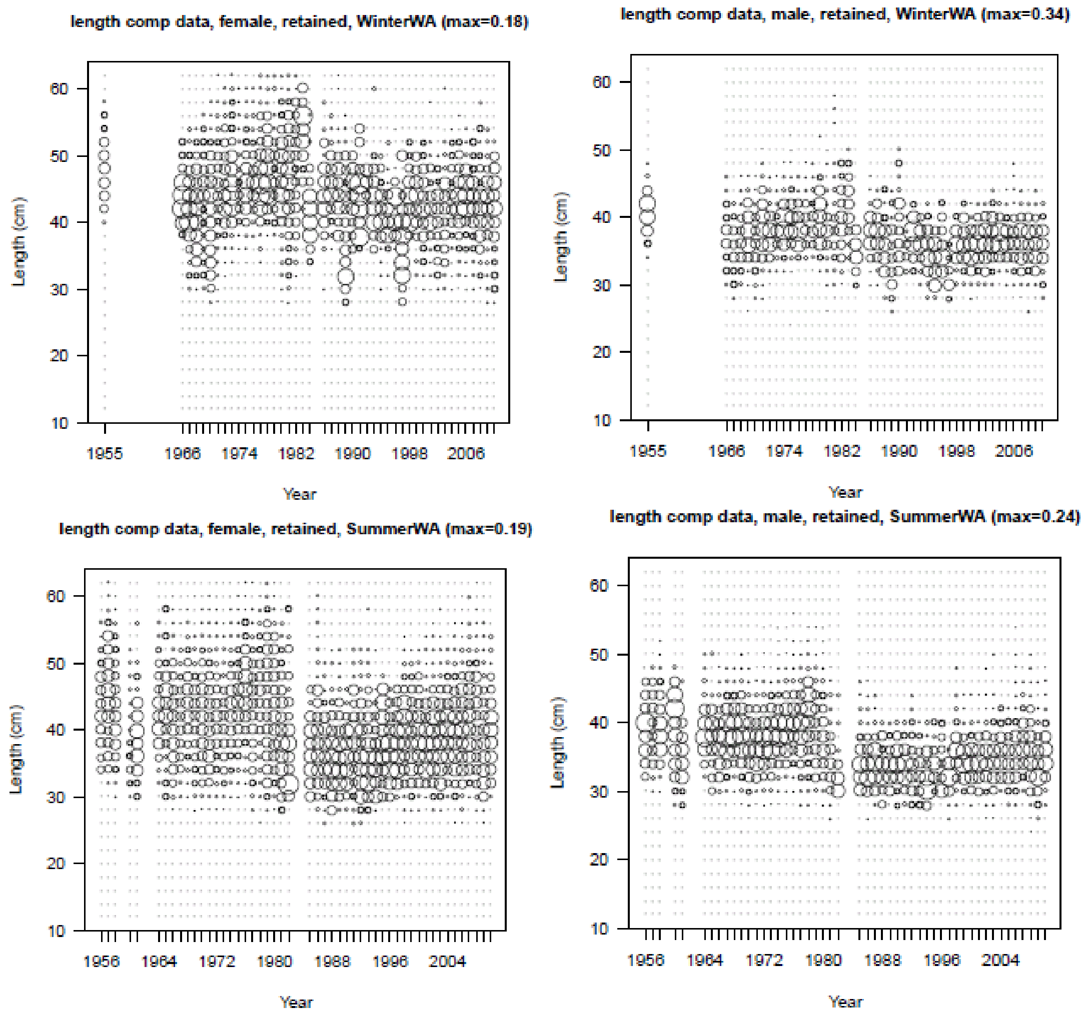



Figure 30. Length-frequency data by gender and season for the Washington fleets.

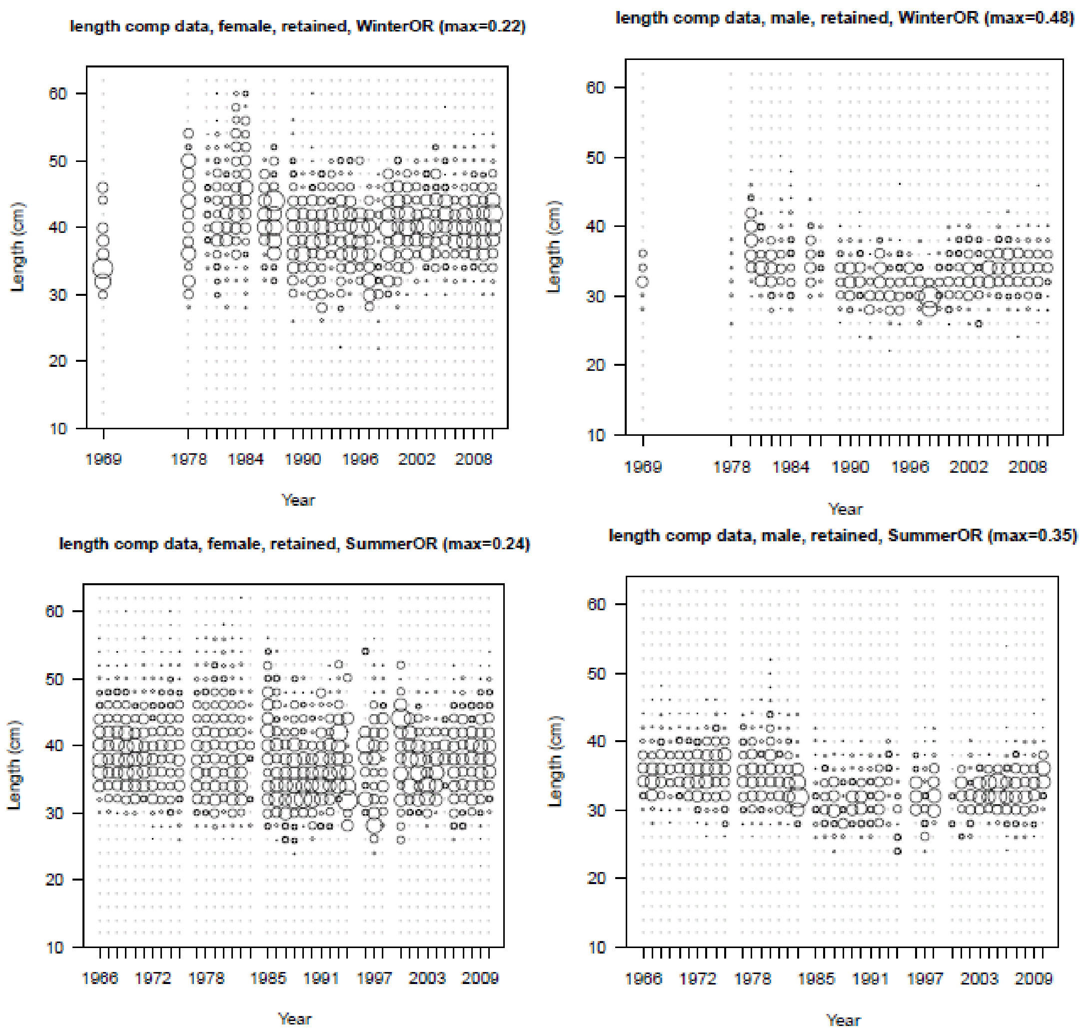



Figure 31. Length-frequency data by gender and season for the Oregon fleets.

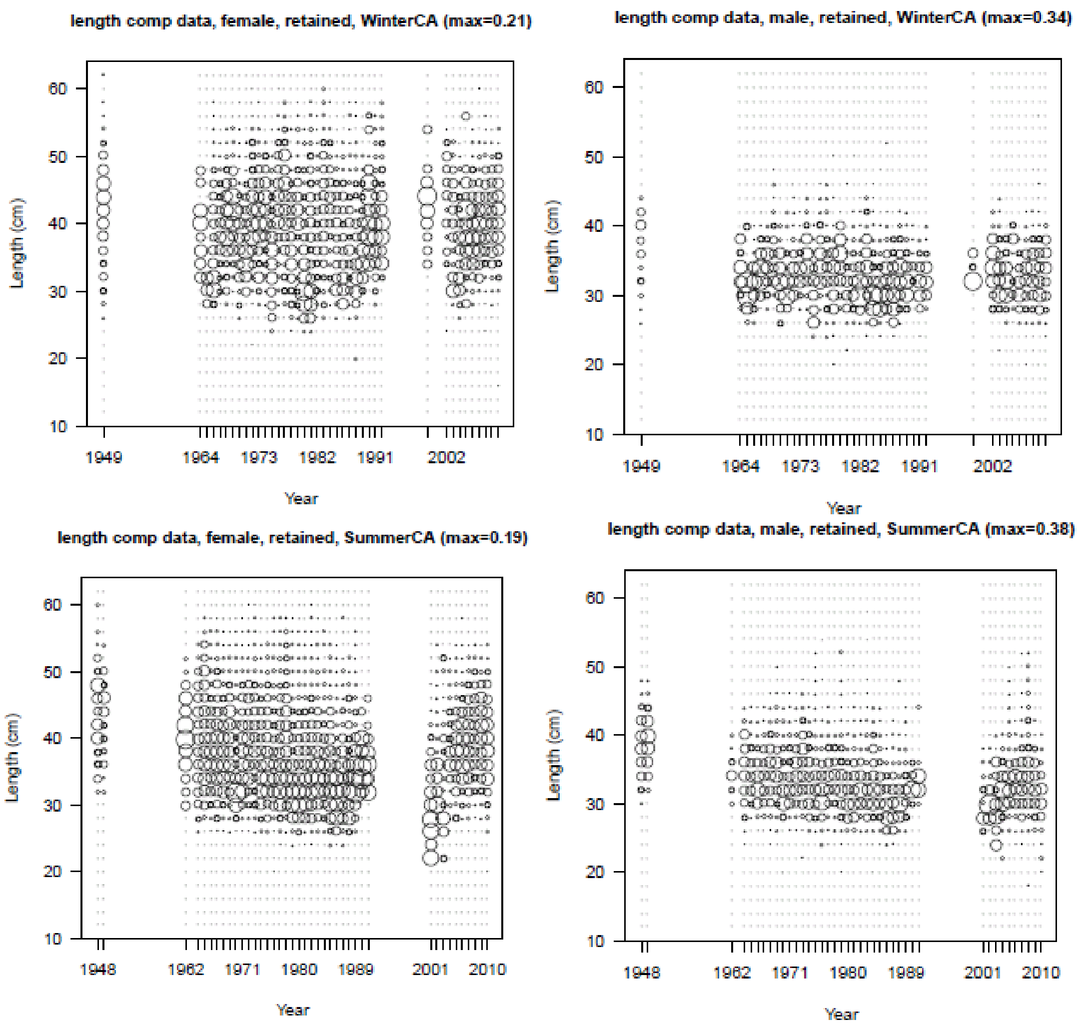



Figure 32. Length-frequency data by gender and season for the California fleets.

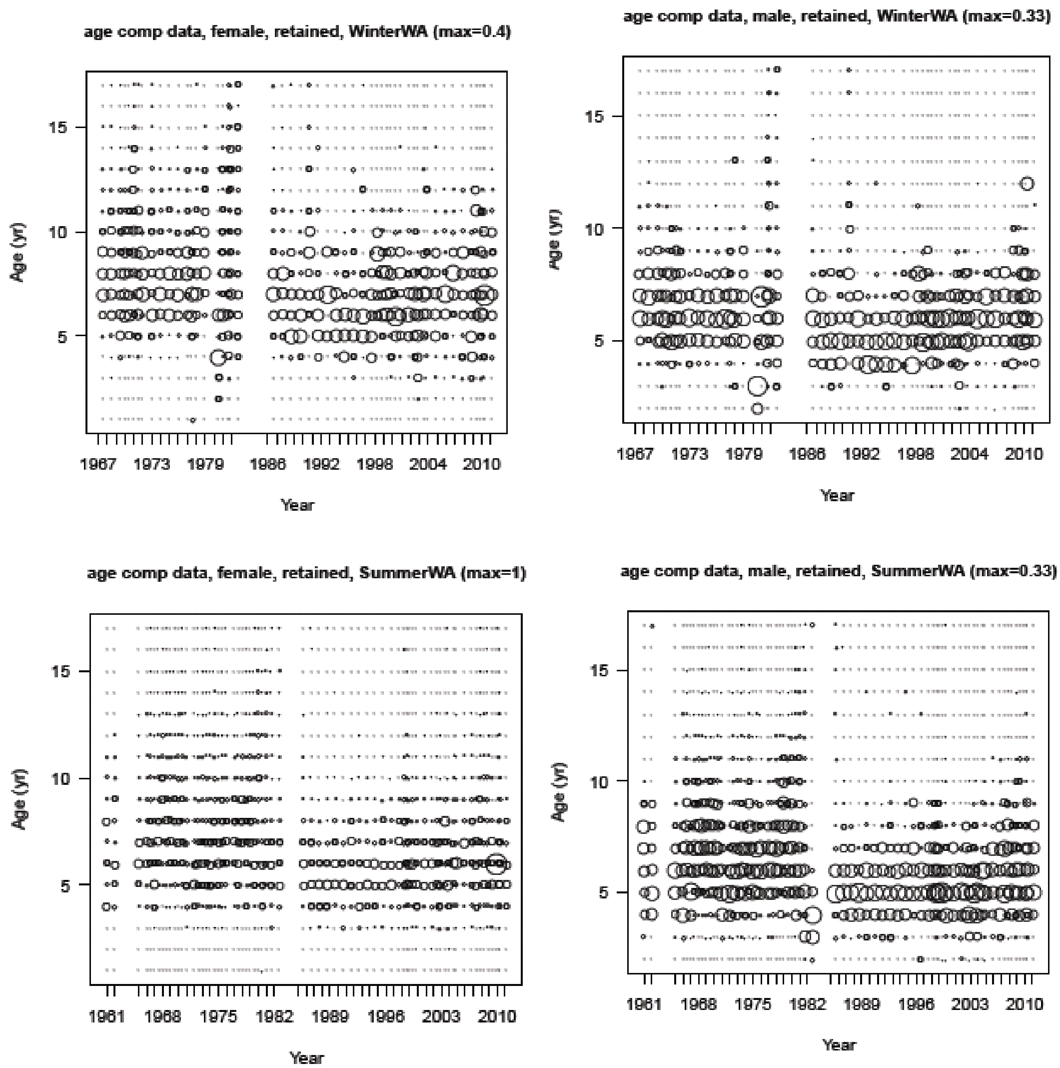



Figure 33. Age-frequency data by gender and season for the Washington fleets.

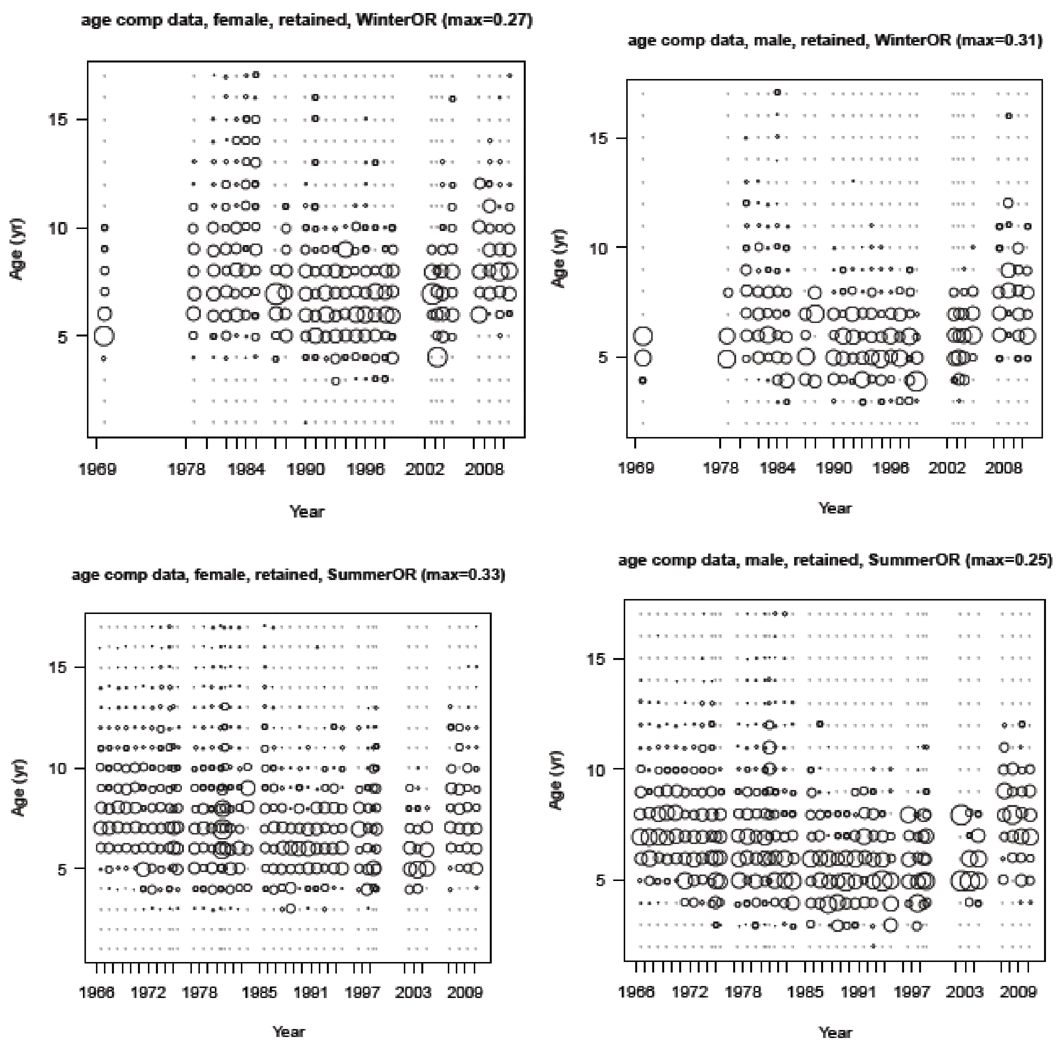



Figure 34. Age-frequency data by gender and season for the Oregon fleets.

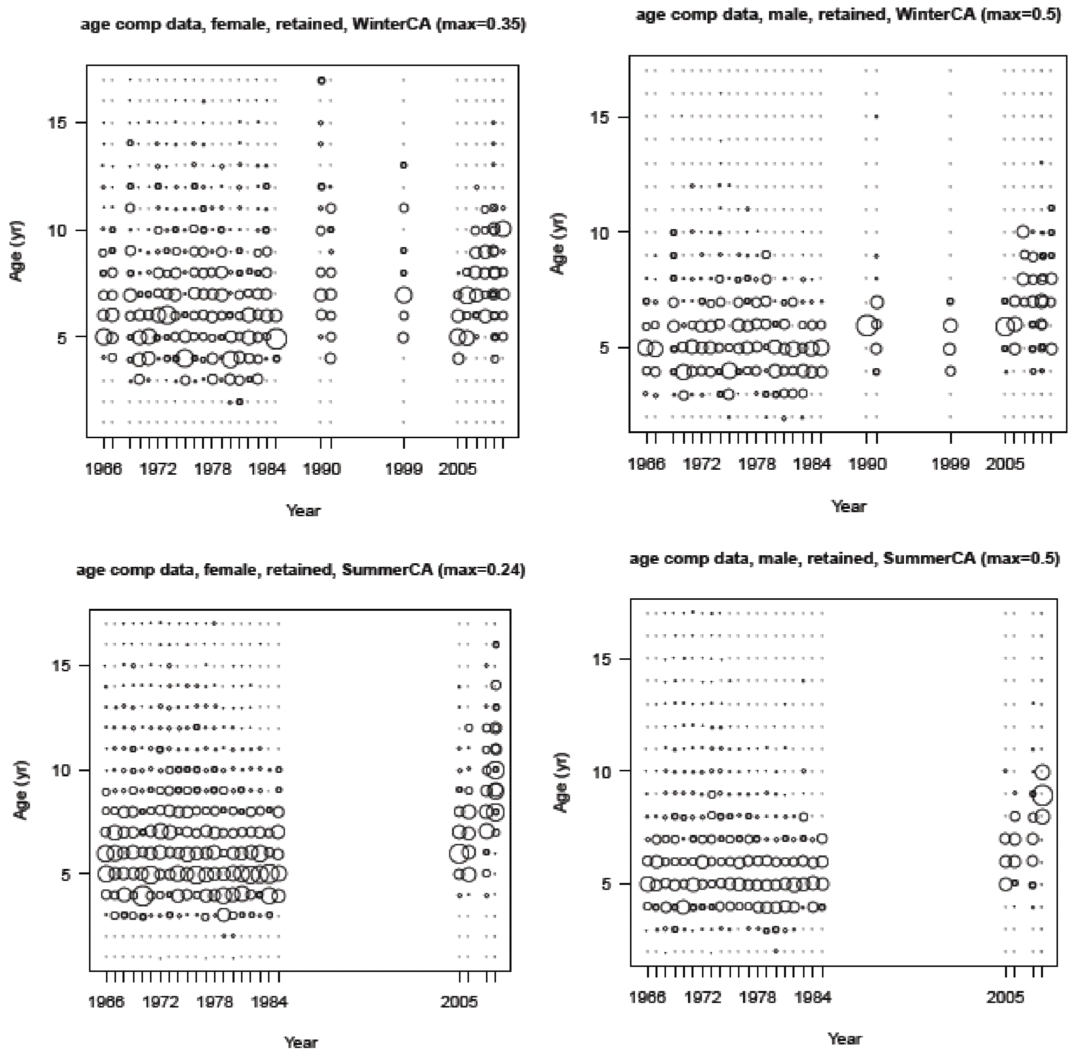



Figure 35. Age-frequency data by gender and season California fleets.

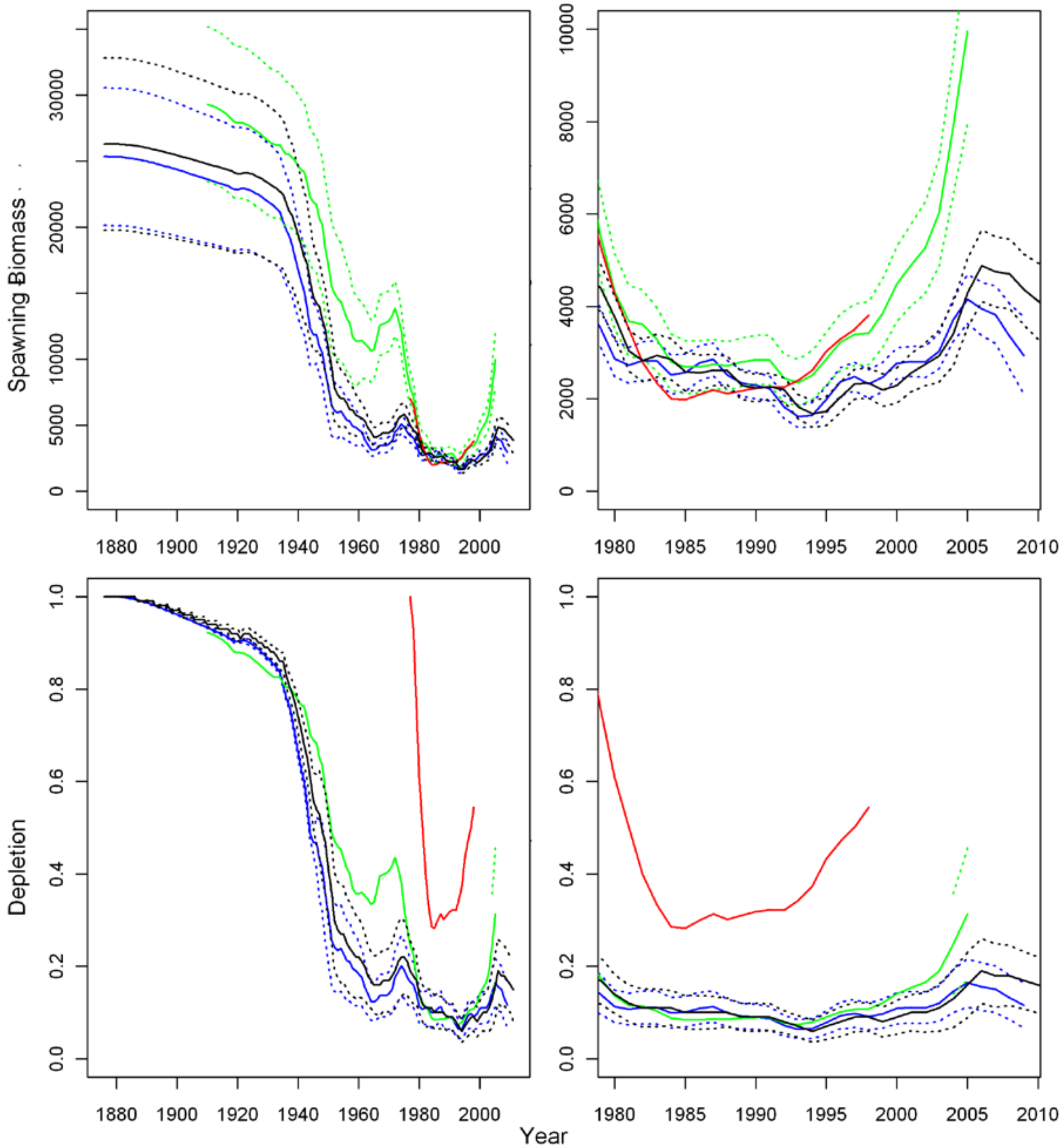



Figure 36. Comparisons of the model estimated spawning biomass and stock depletion for the 1999 (red), 2005 (green), 2009 (blue), and 2011 (black) assessment models. Where available the ~95% confidence intervals are shown as broken lines.

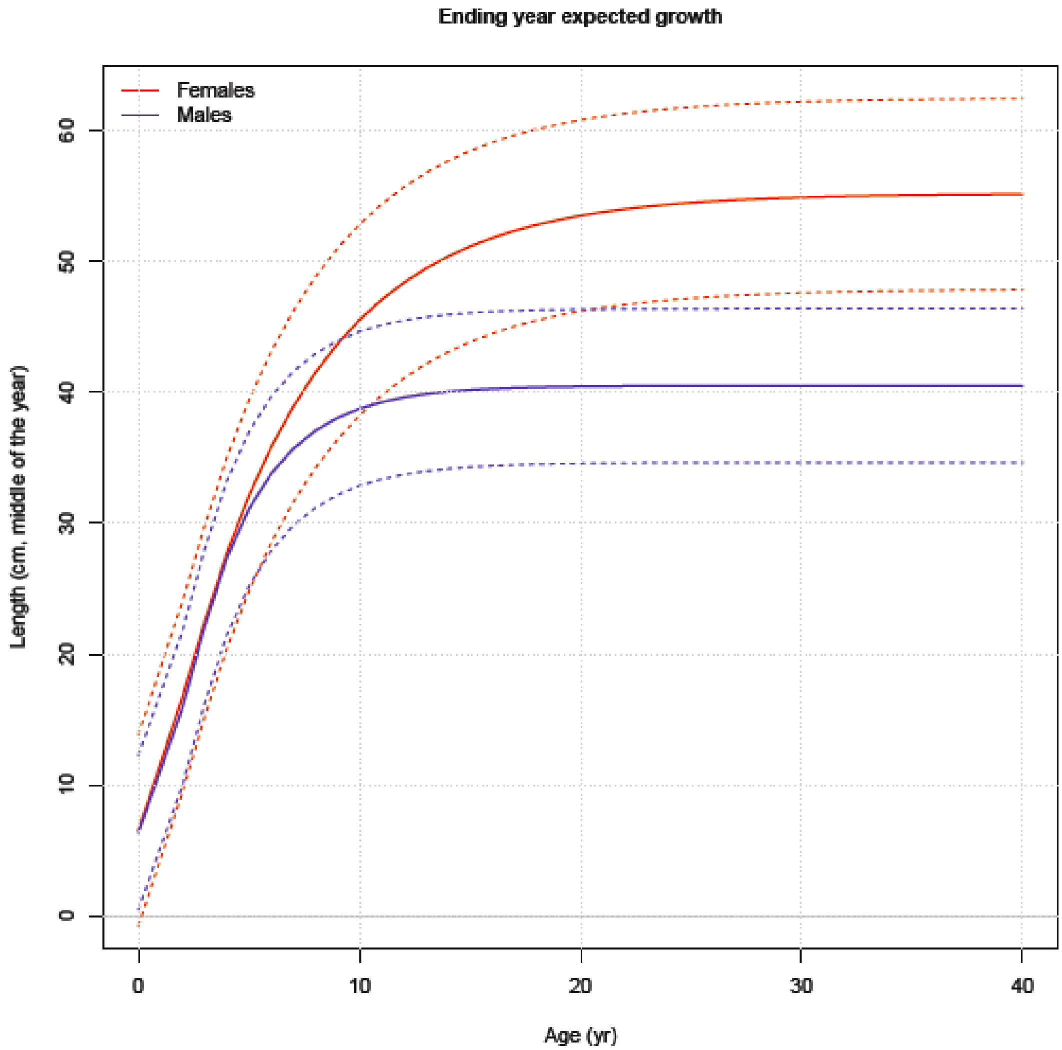



Figure 37. The growth curve for females (upper solid line) and males (lower solid line) with ~95% interval (dashed lines) indicating the estimated variability of length-at-age for the base case model.

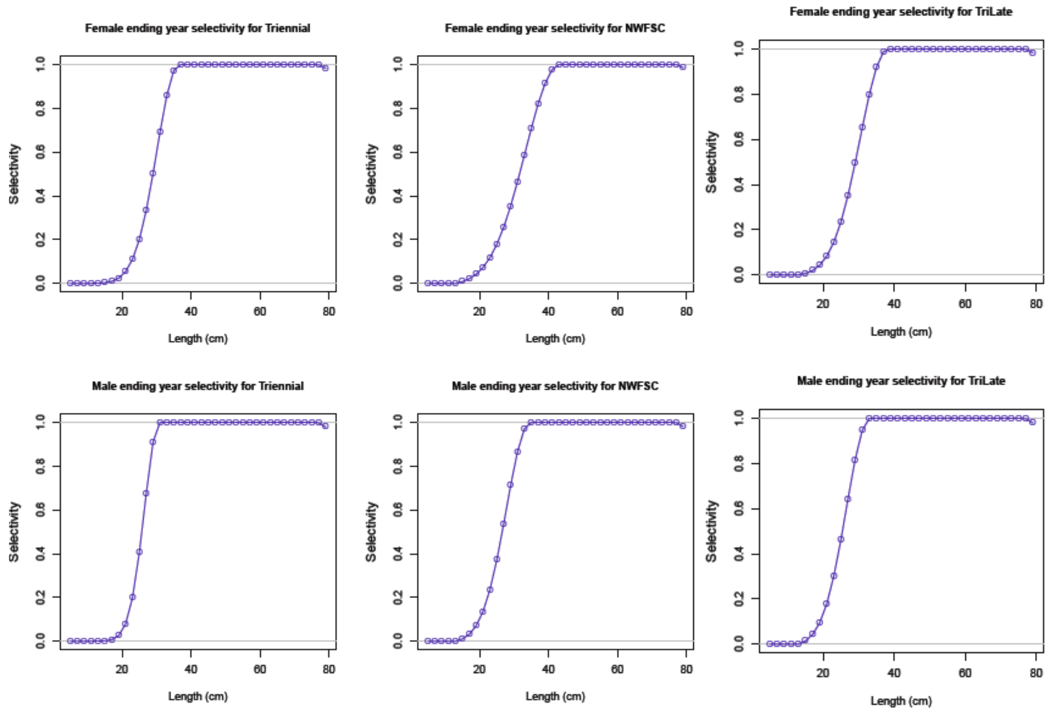



Figure 38. Estimated length-based selectivity curves for the NWFSC and triennial surveys.

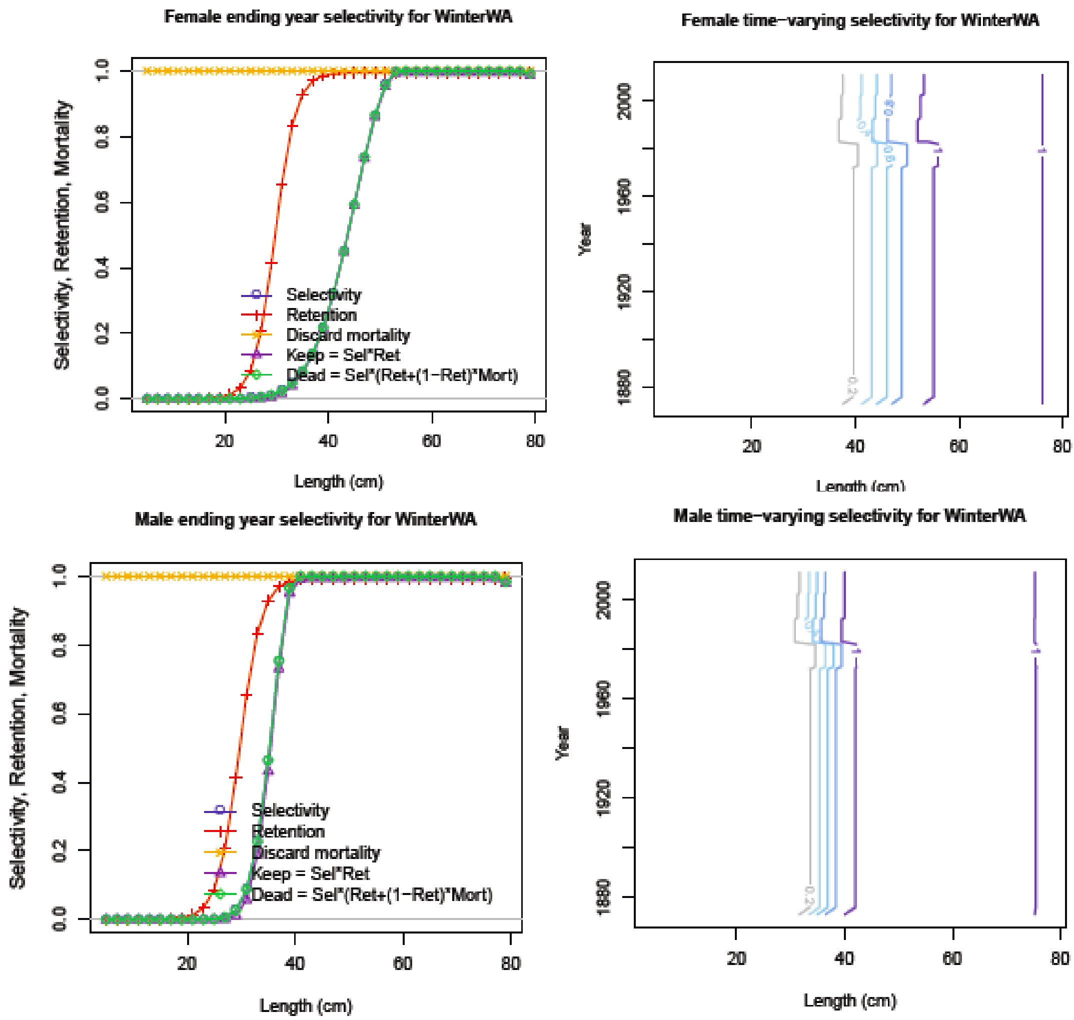
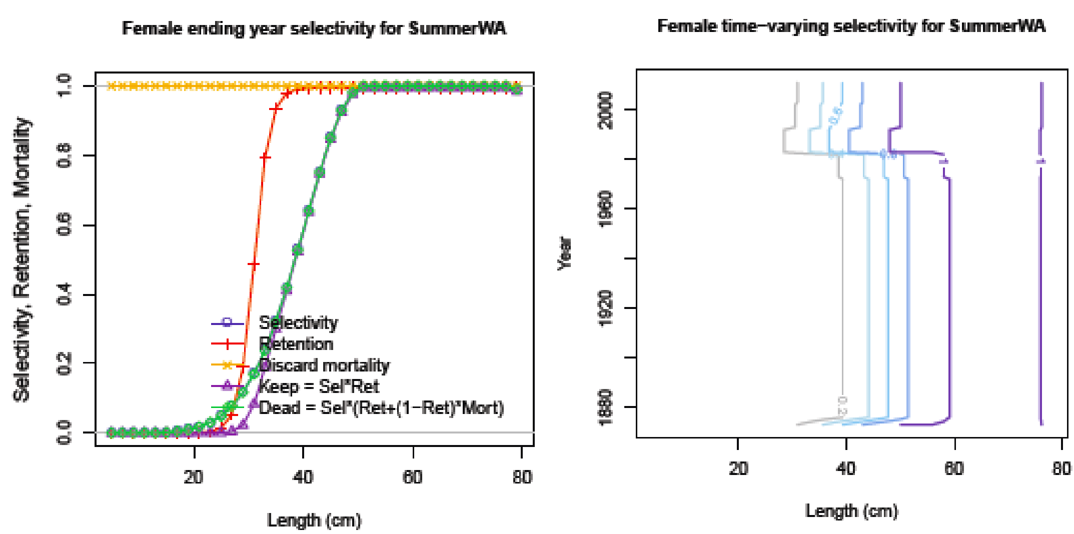



Figure 39. Estimated length-based female and male selectivity curves for the Washington fleets.



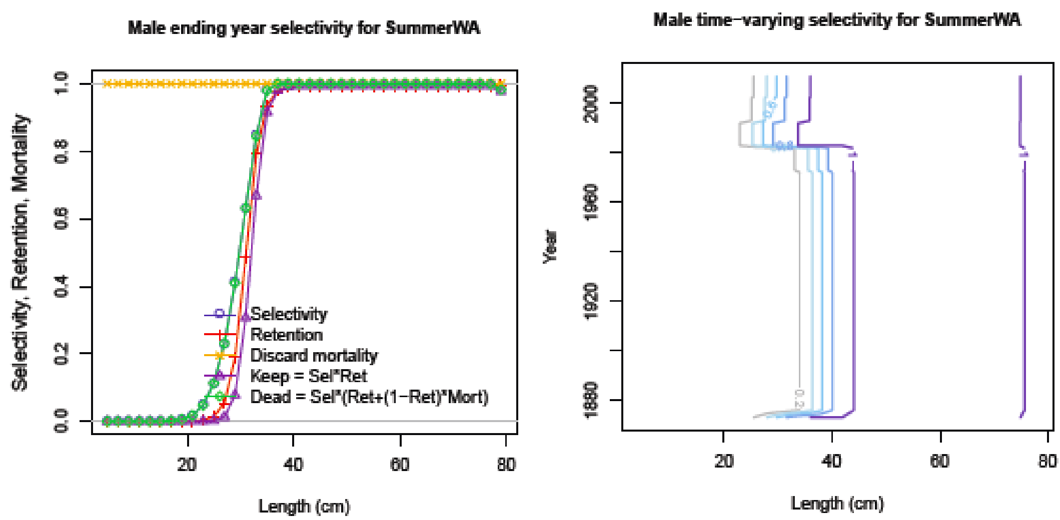



Figure 39 cont. Estimated length-based female and male selectivity curves for the Washington fleets.

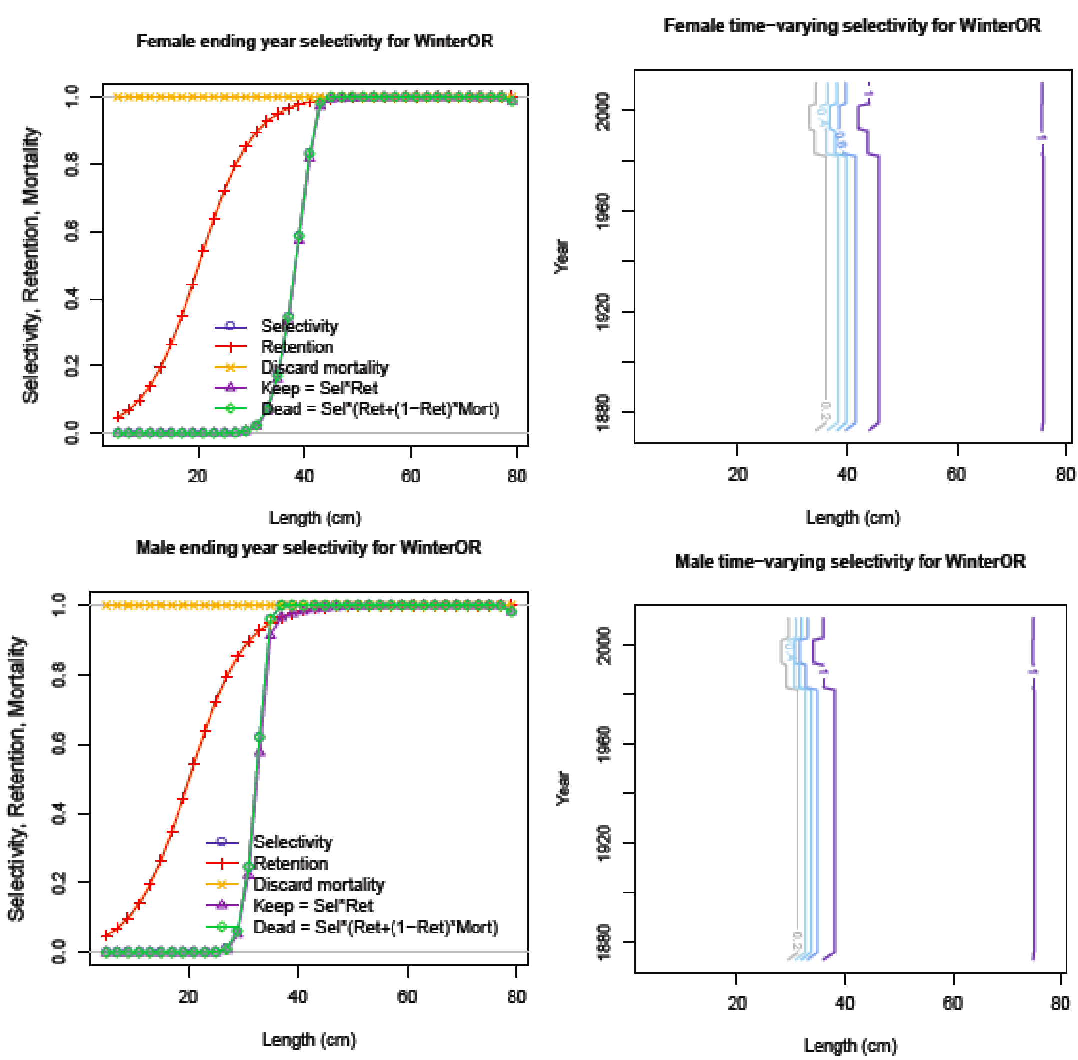


Figure 40. Estimated length-based female and male selectivity curves for the Oregon fleets.

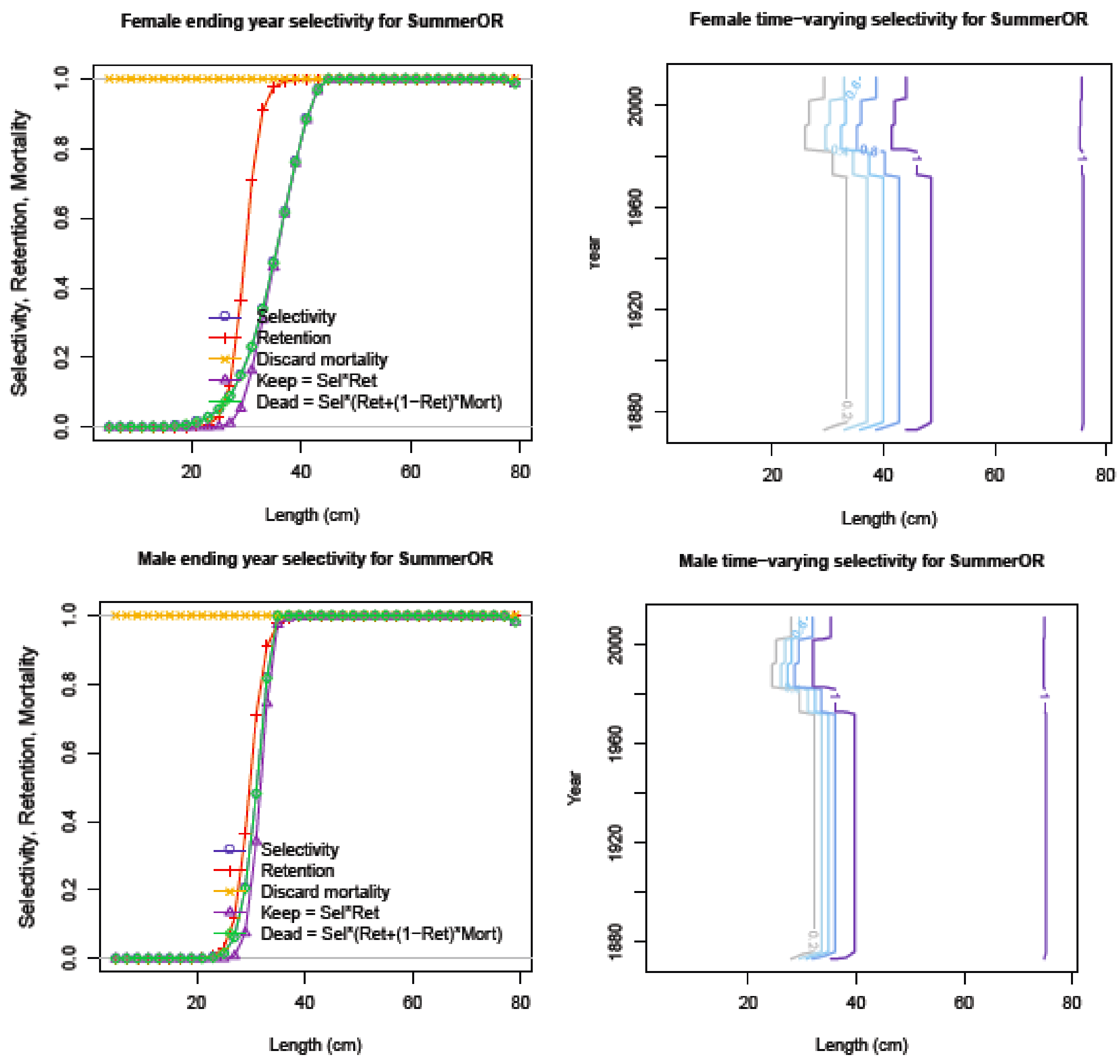



Figure 40 cont. Estimated length-based female and male selectivity curves for the Oregon fleets.

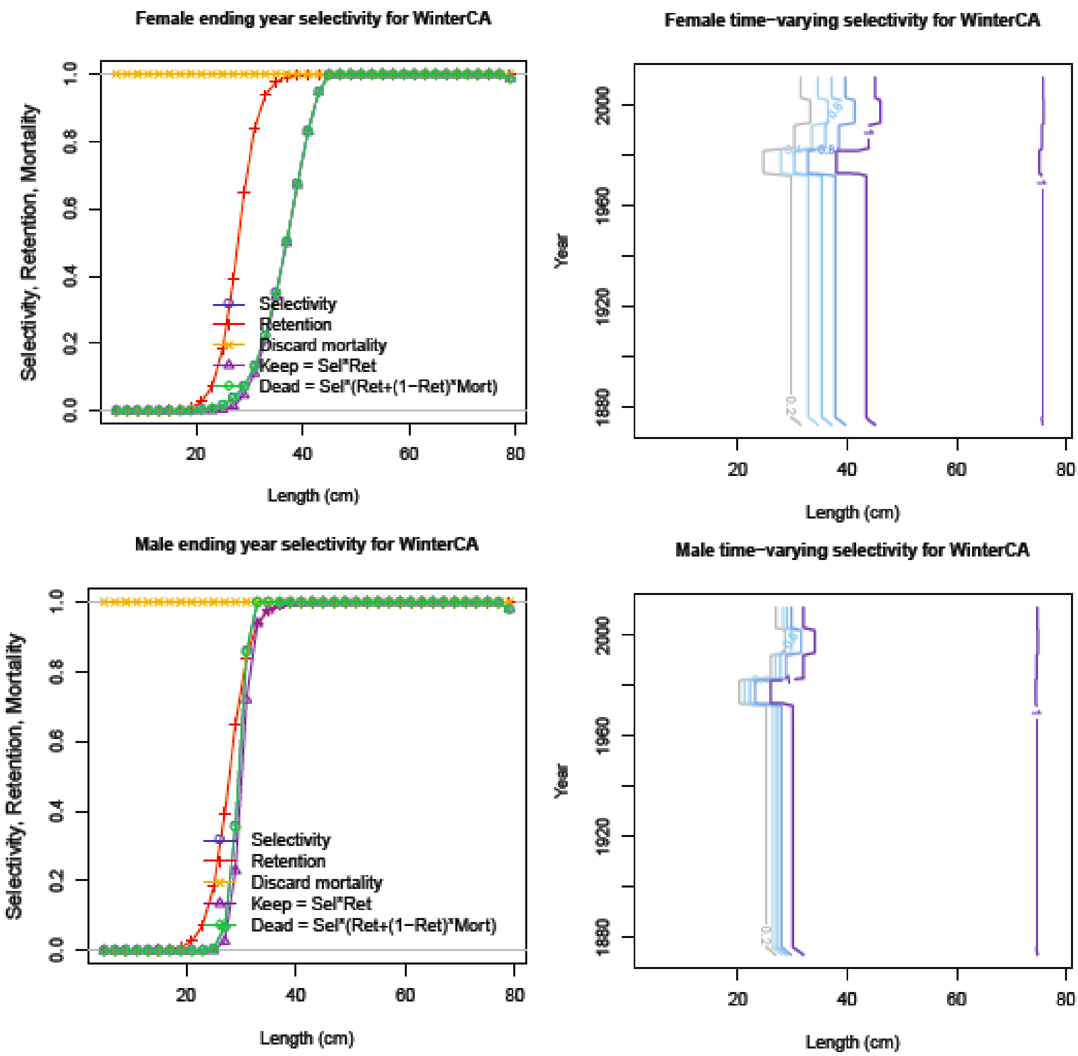



Figure 41. Estimated length-based female and male selectivity curves for the California fleets.

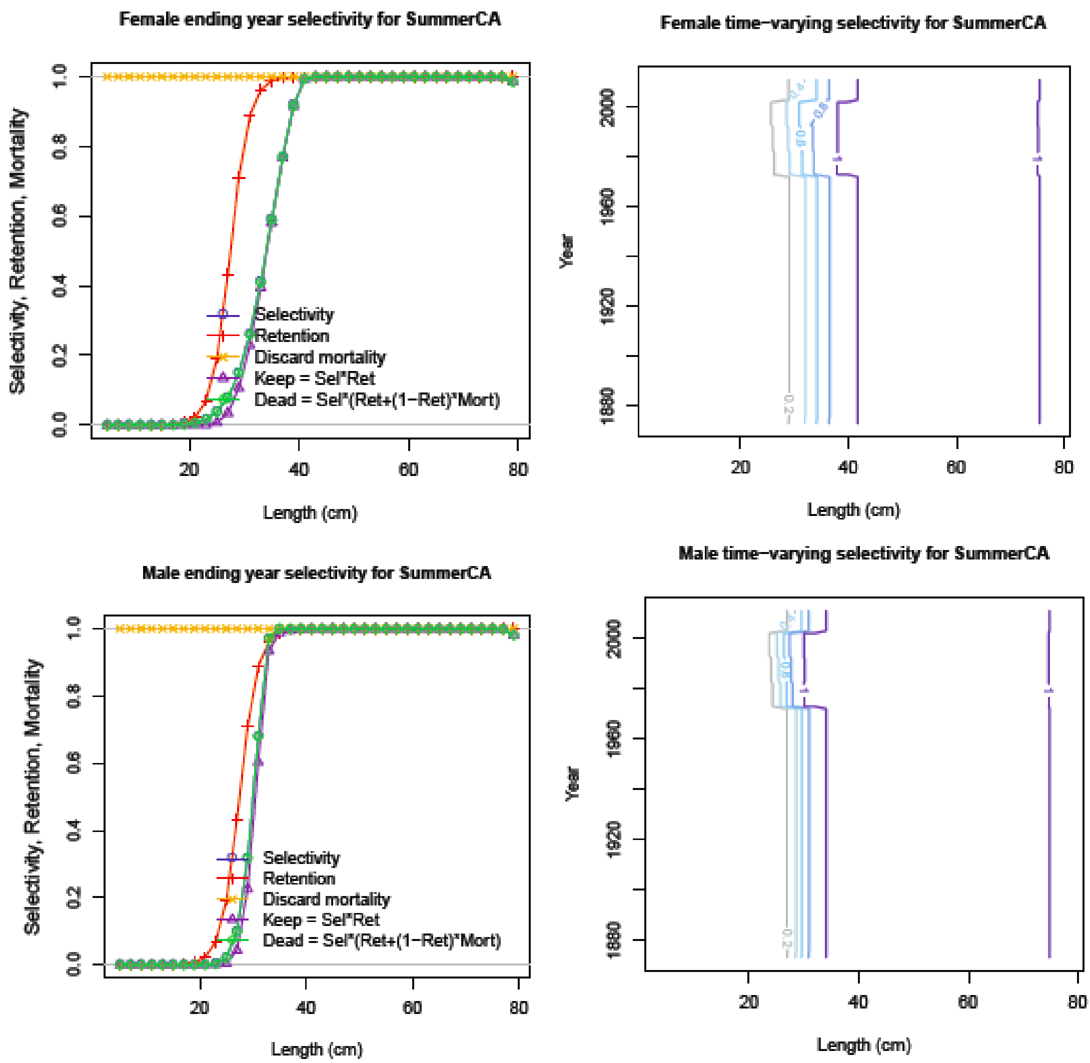



Figure 41 cont. Estimated length-based female and male selectivity curves for the California fleets.

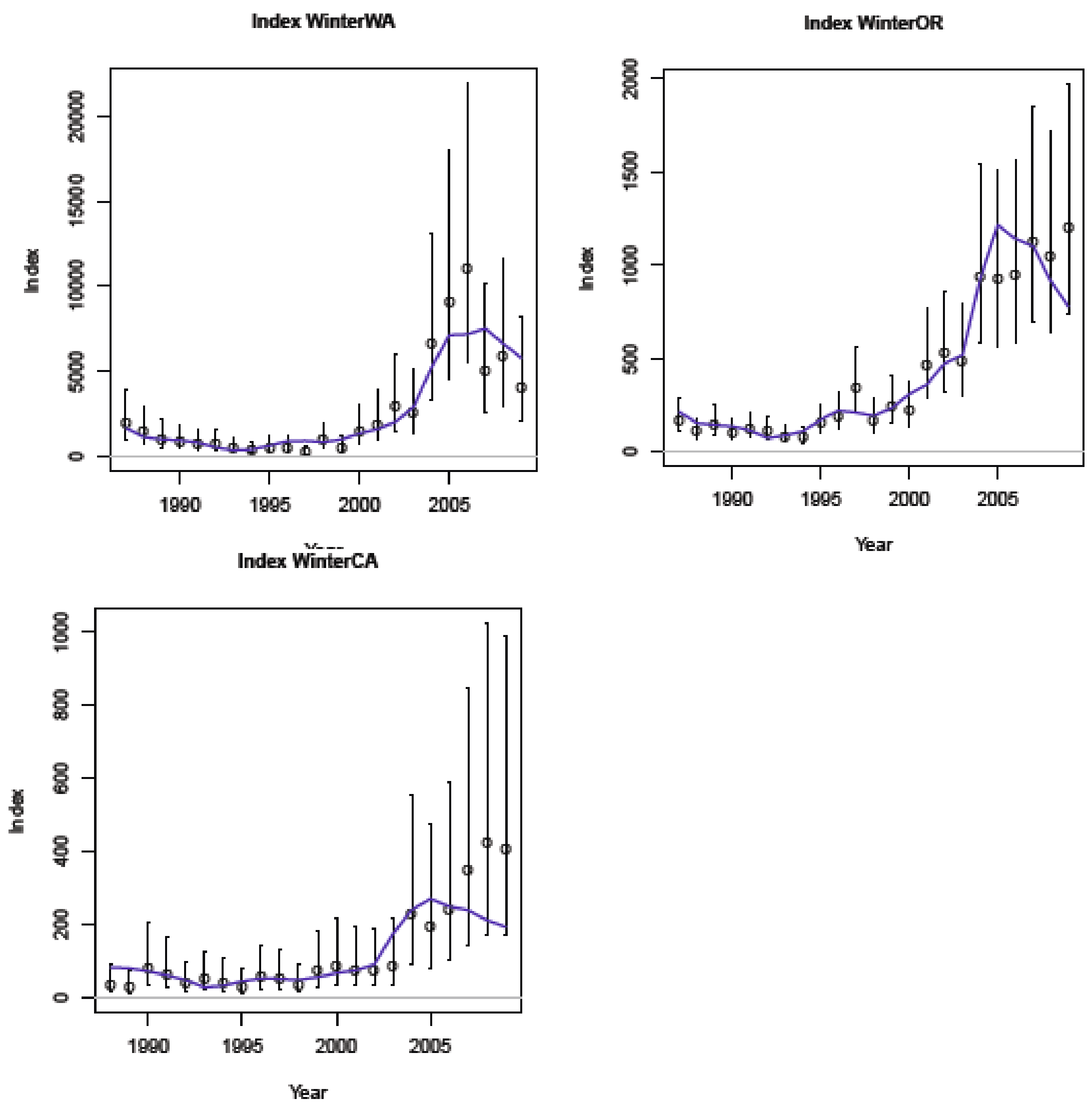



Figure 42. Fit to winter commercial CPUE.

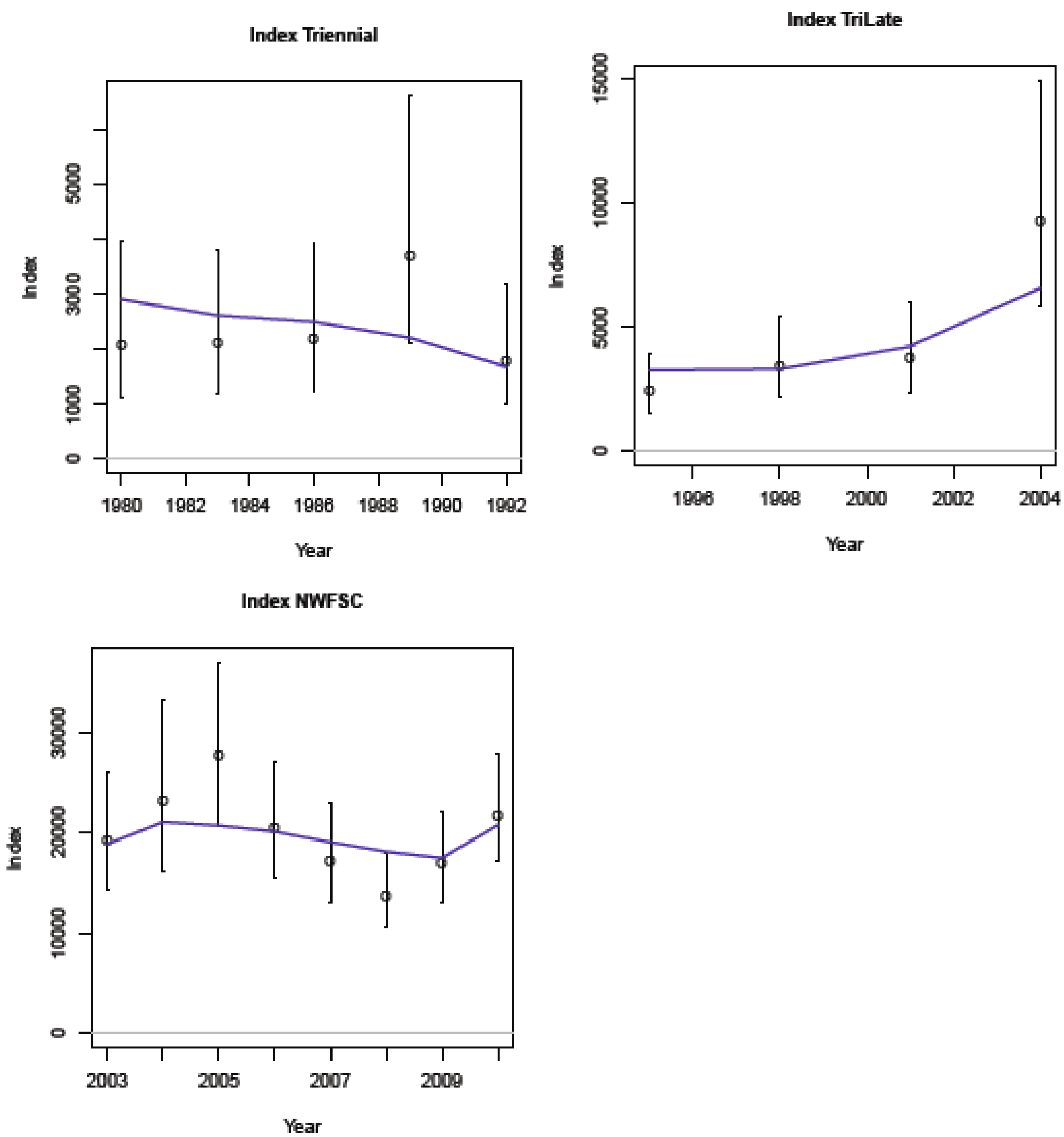



Figure 43. Fit to the early and late triennial (top and middle) and NWFSC survey (bottom) GLMM-based time series of relative biomass in the base case model.

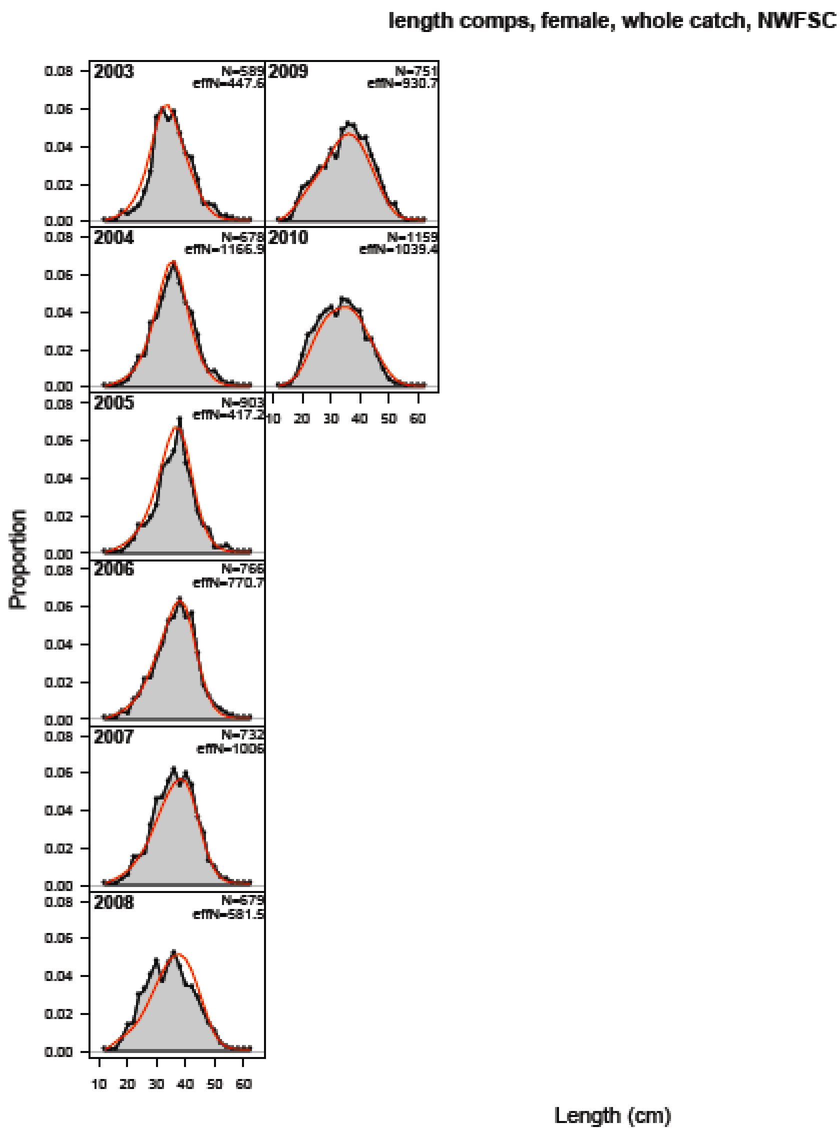



Figure 44. Fit to the NWFSC survey length-frequencies.

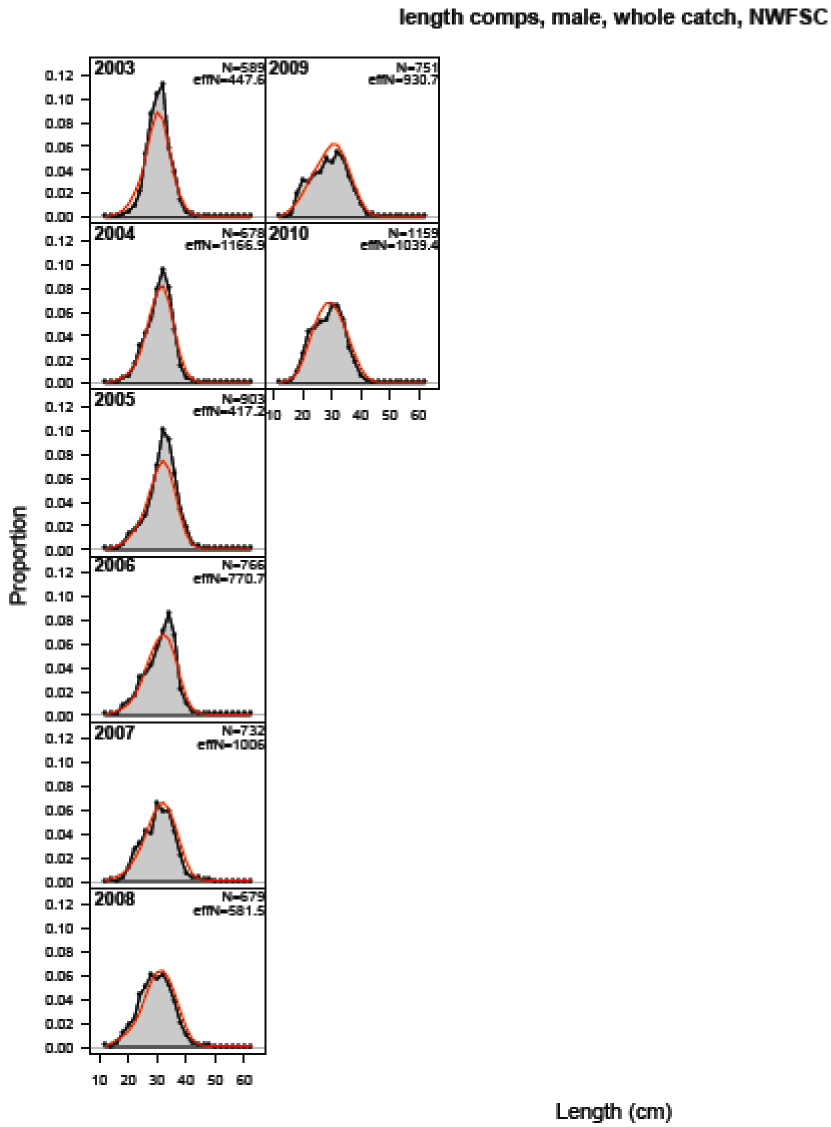



Figure 44 cont. Fit to the NWFSC survey length-frequencies.

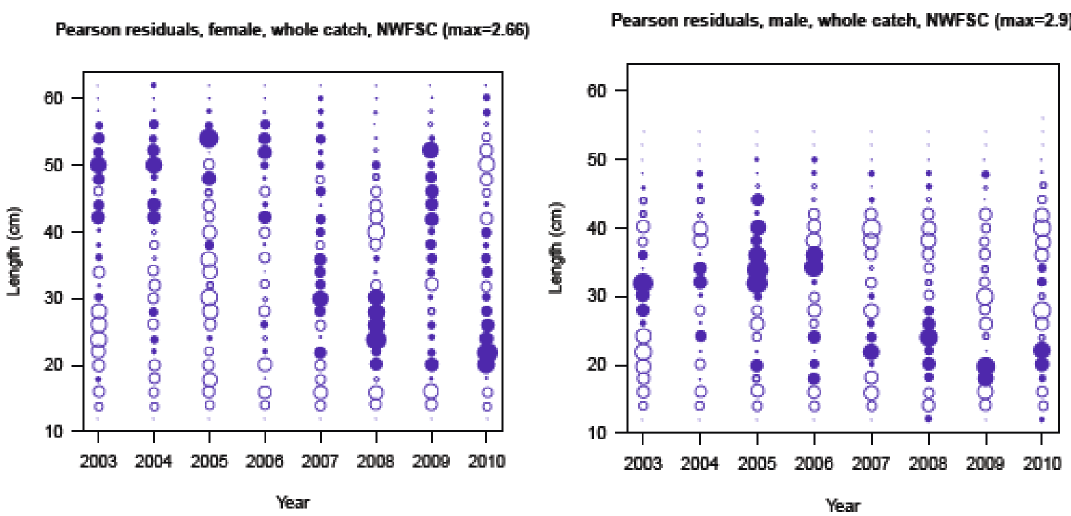



Figure 45. Observed and effective sample sizes for the NWFSC length-frequency observations.

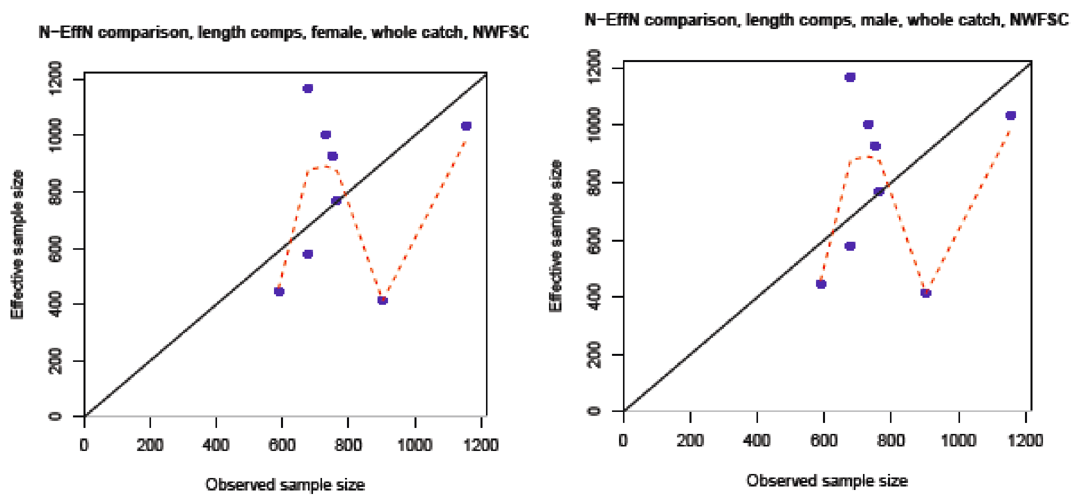



Figure 46. Pearson residuals for the fit to NWFSC survey length-frequencies.

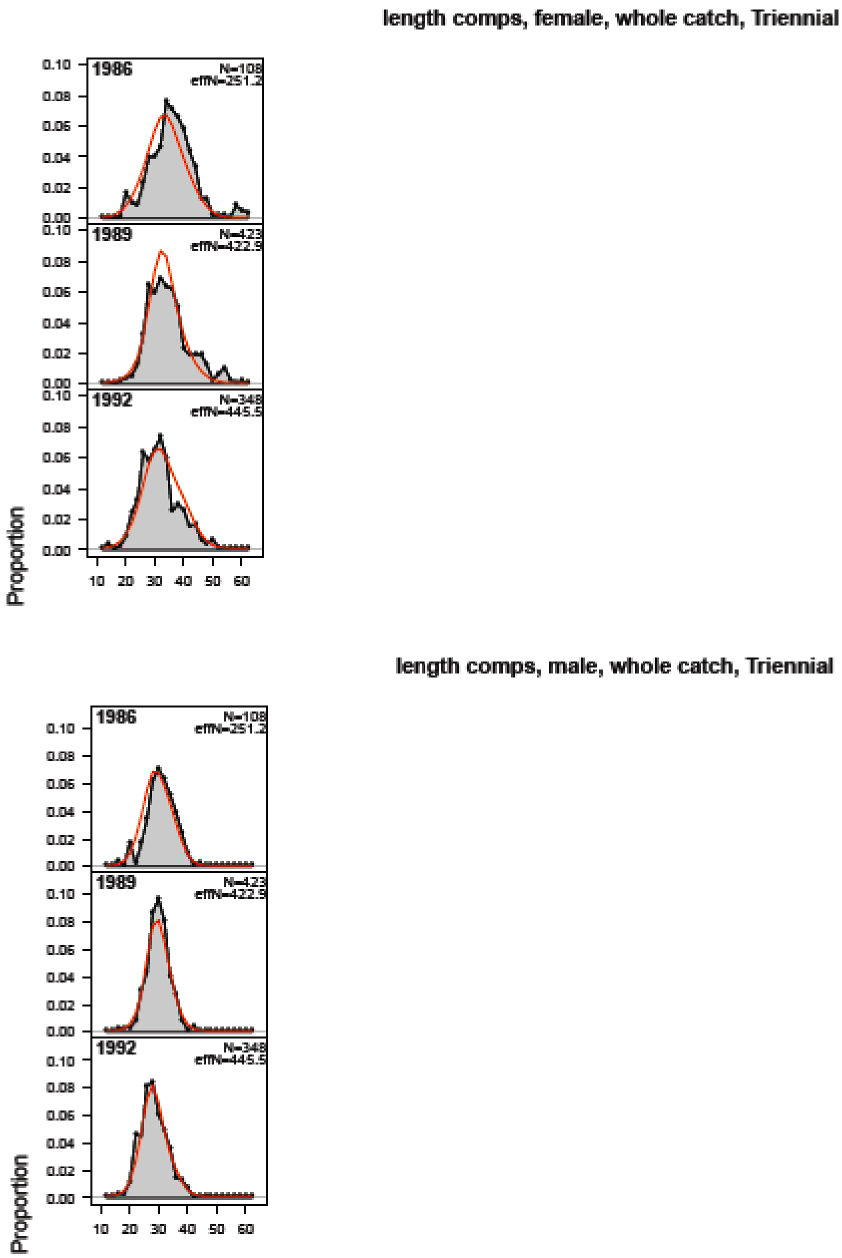
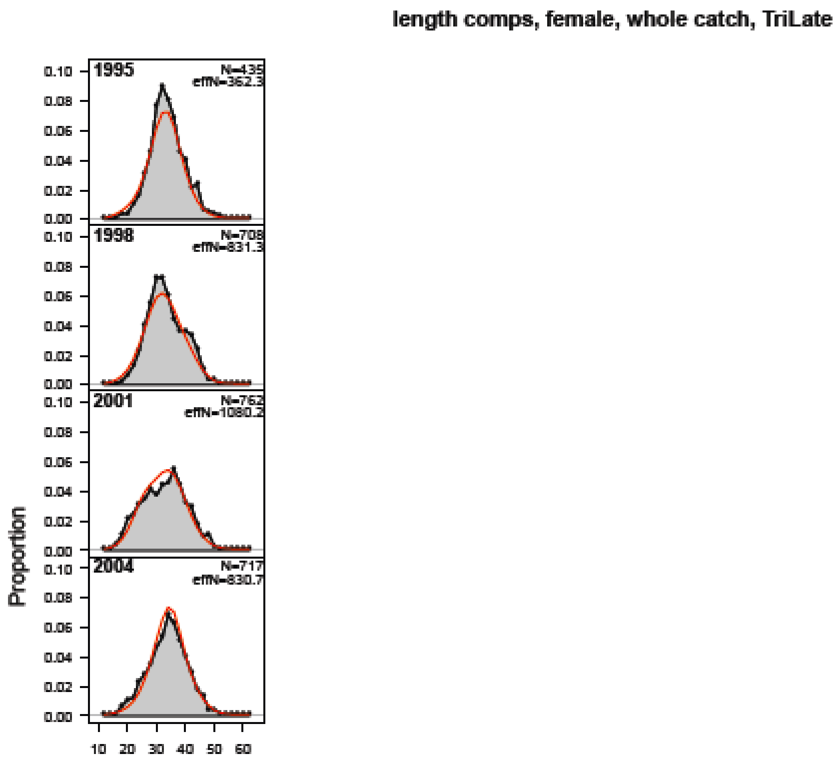



Figure 47. Fit to the early and late triennial survey length-frequencies.



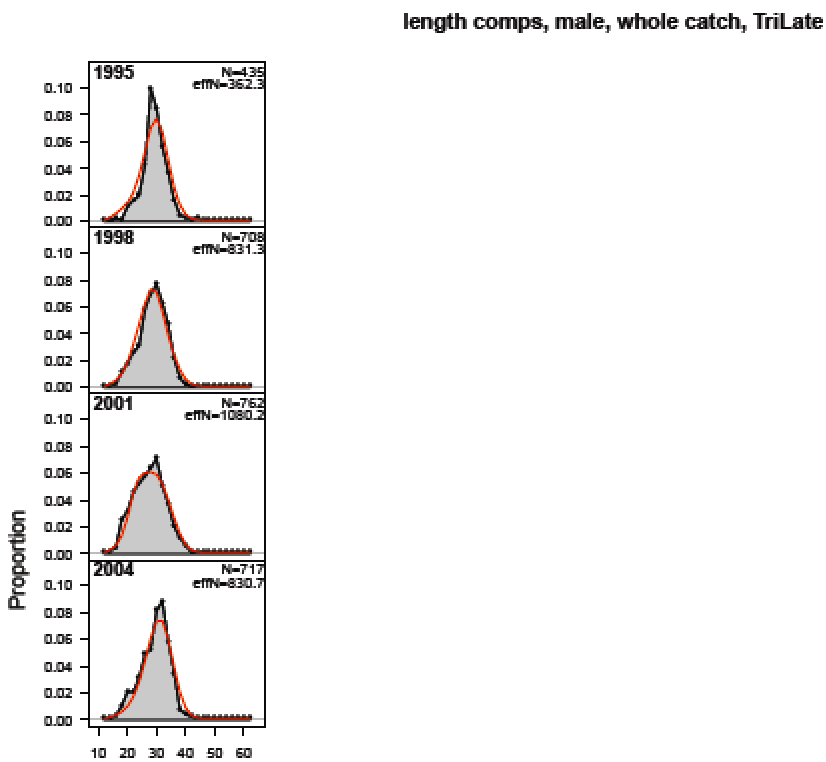




Figure 47 cont. Fit to the early and late triennial survey length-frequencies.

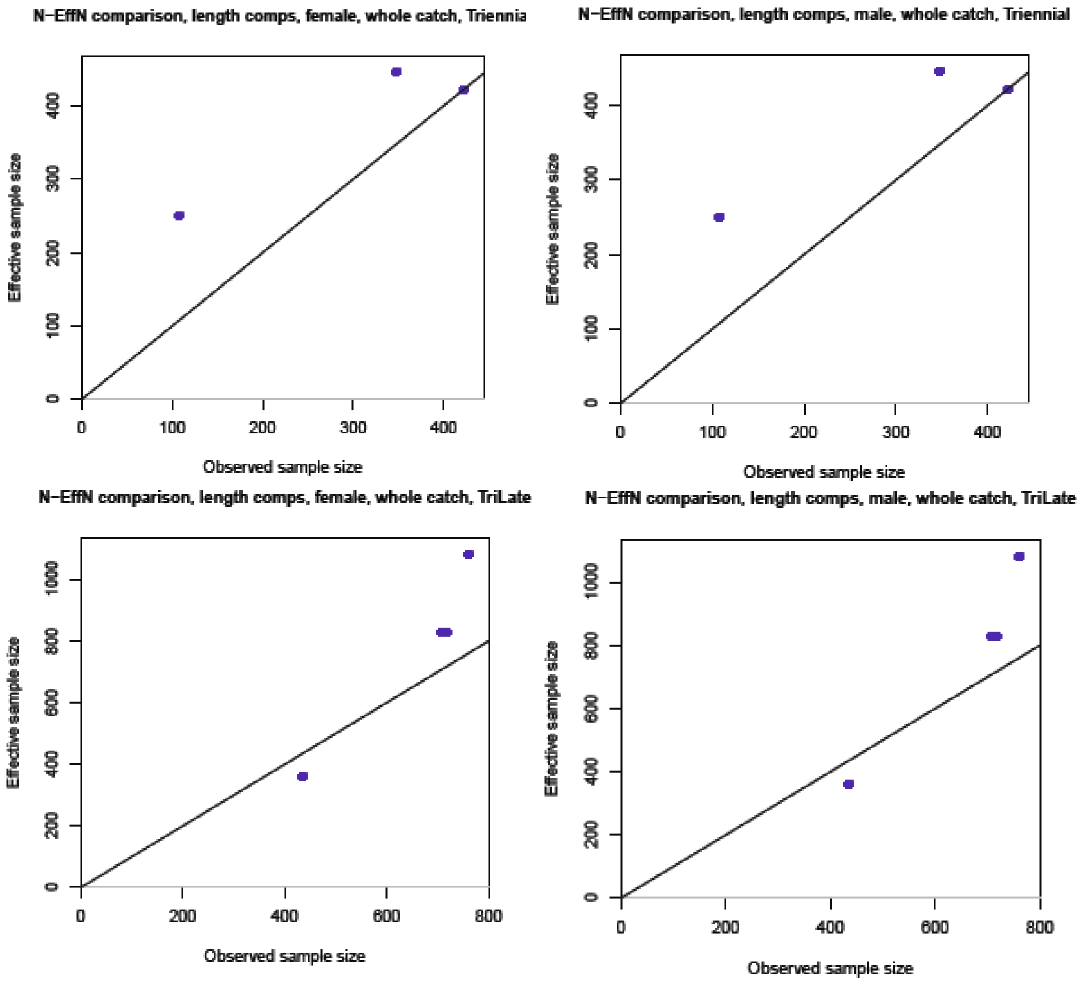



Figure 48. Observed and effective sample sizes for the early (top panels) and late (bottom panels) triennial length-frequency observations.

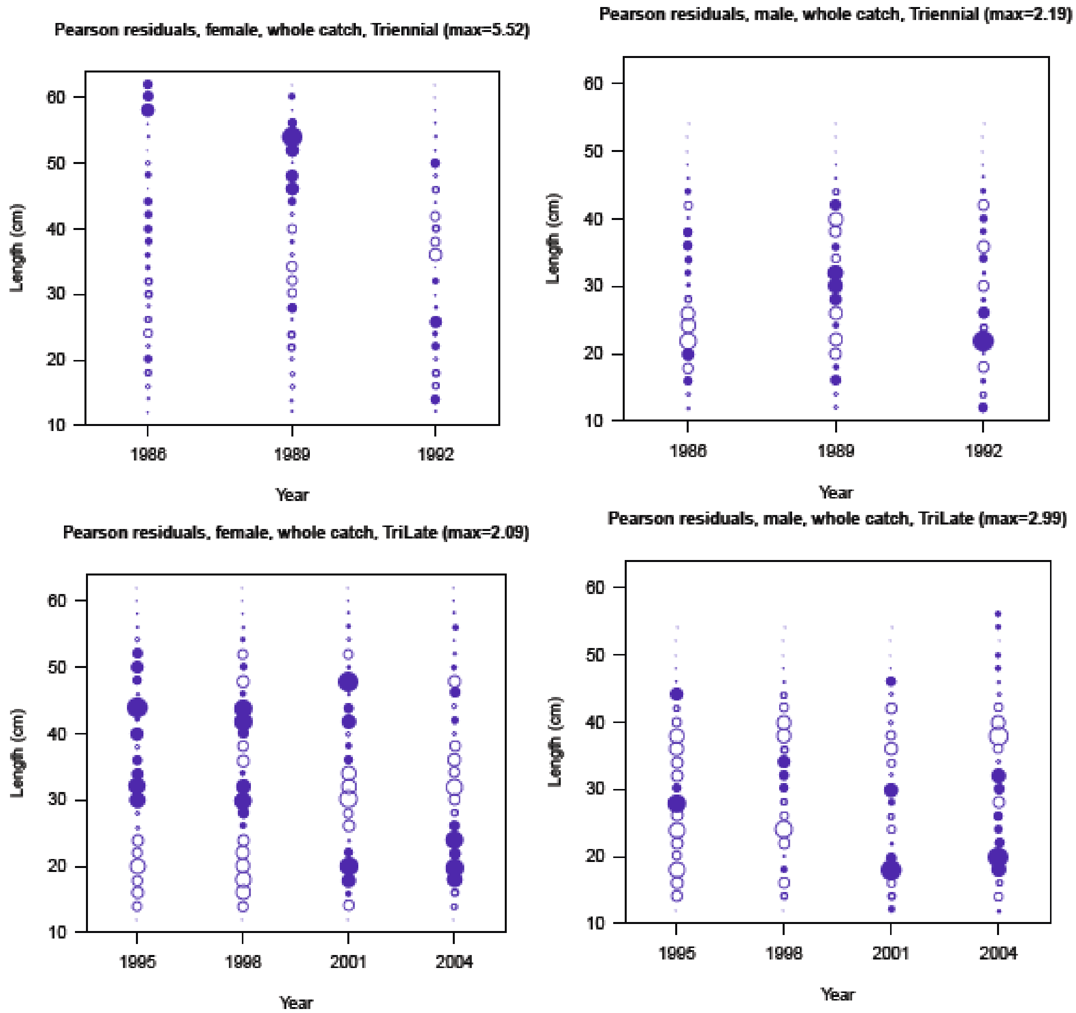



Figure 49. Pearson residuals for the fit to the early and late triennial survey length-frequencies.

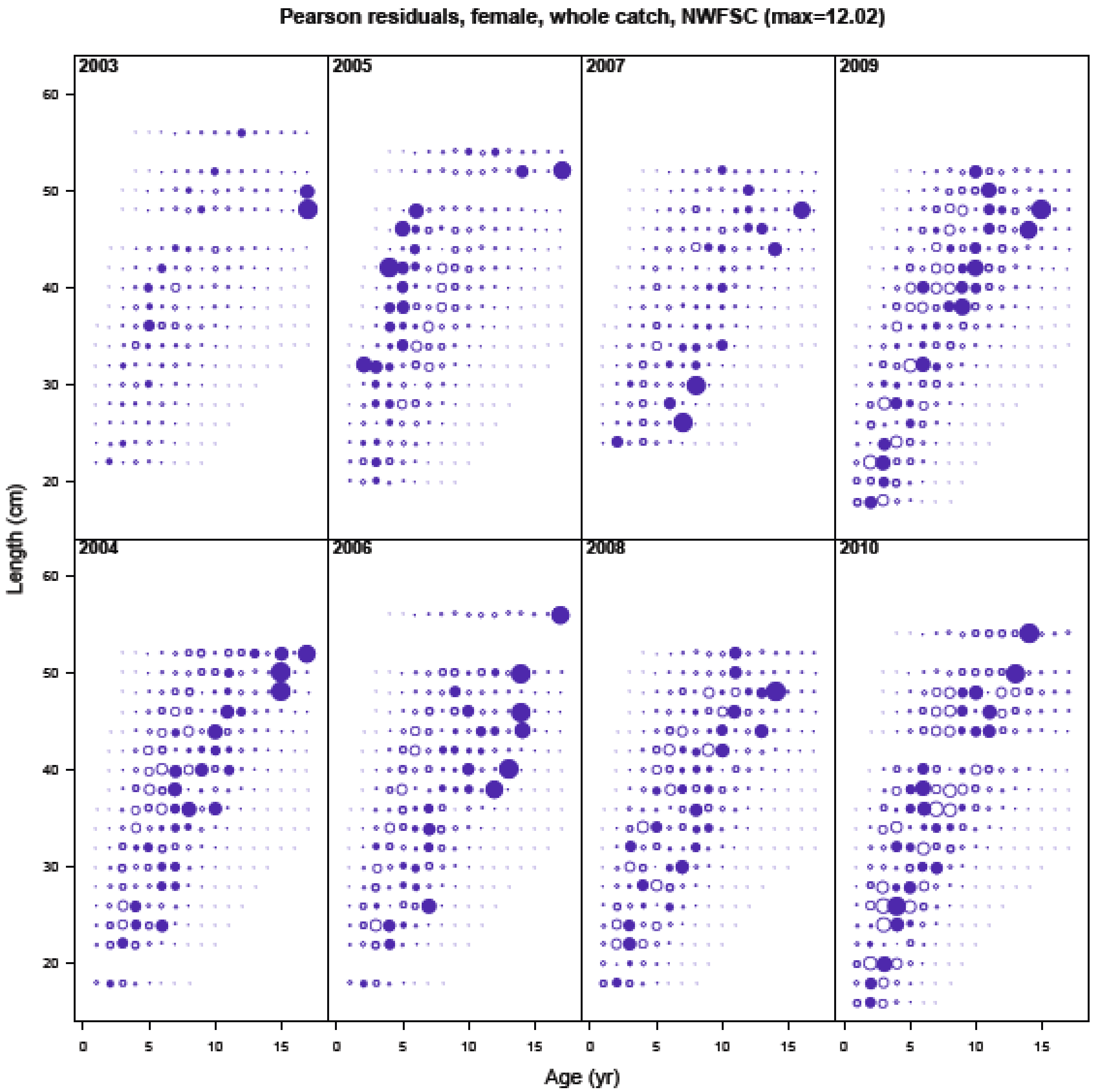



Figure 50. Pearson residuals for the fit to the NWFSC survey conditional age-at-length frequencies.

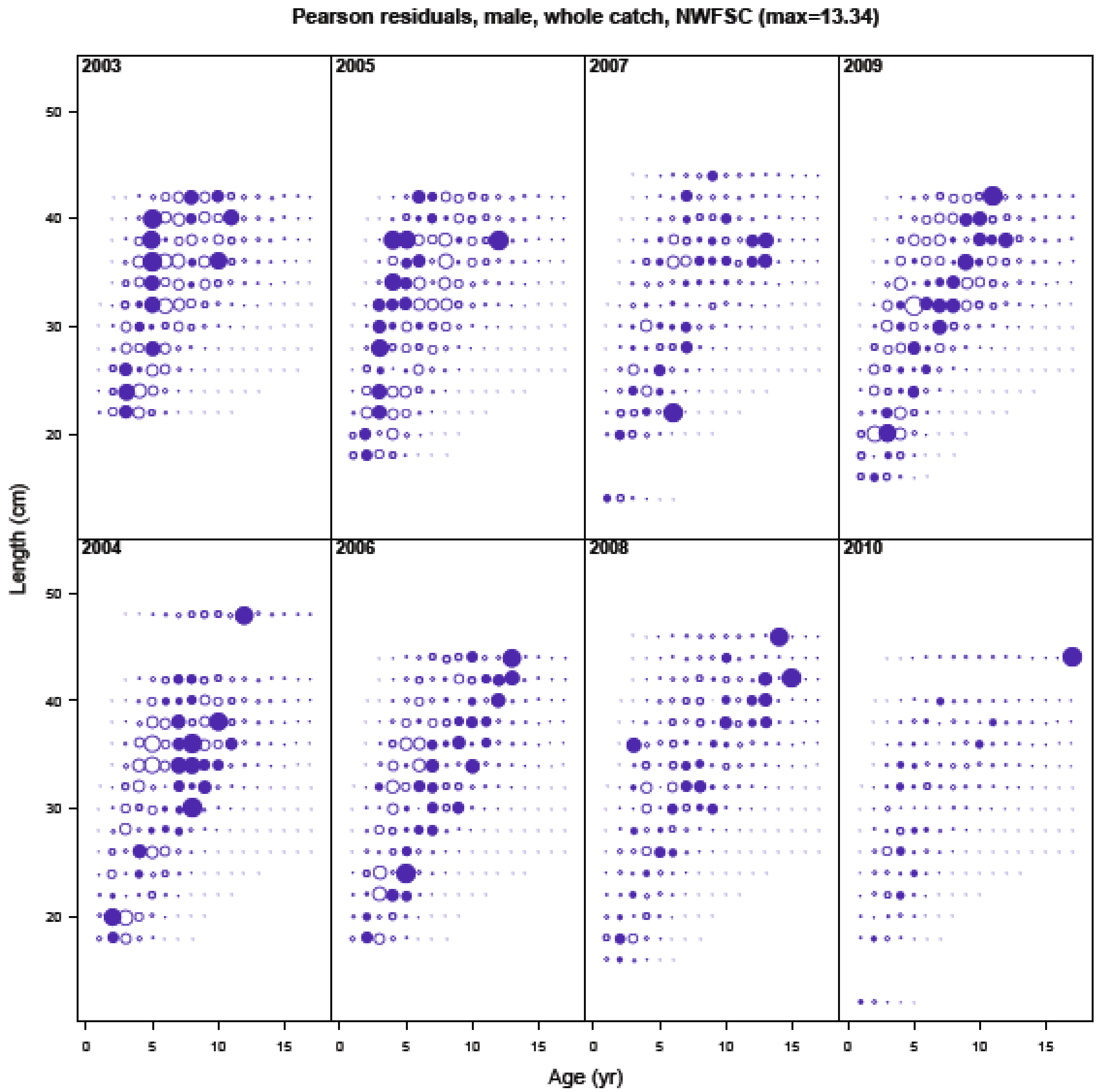



Figure 50 cont. Pearson residuals for the fit to the NWFSC survey conditional age-at-length frequencies.

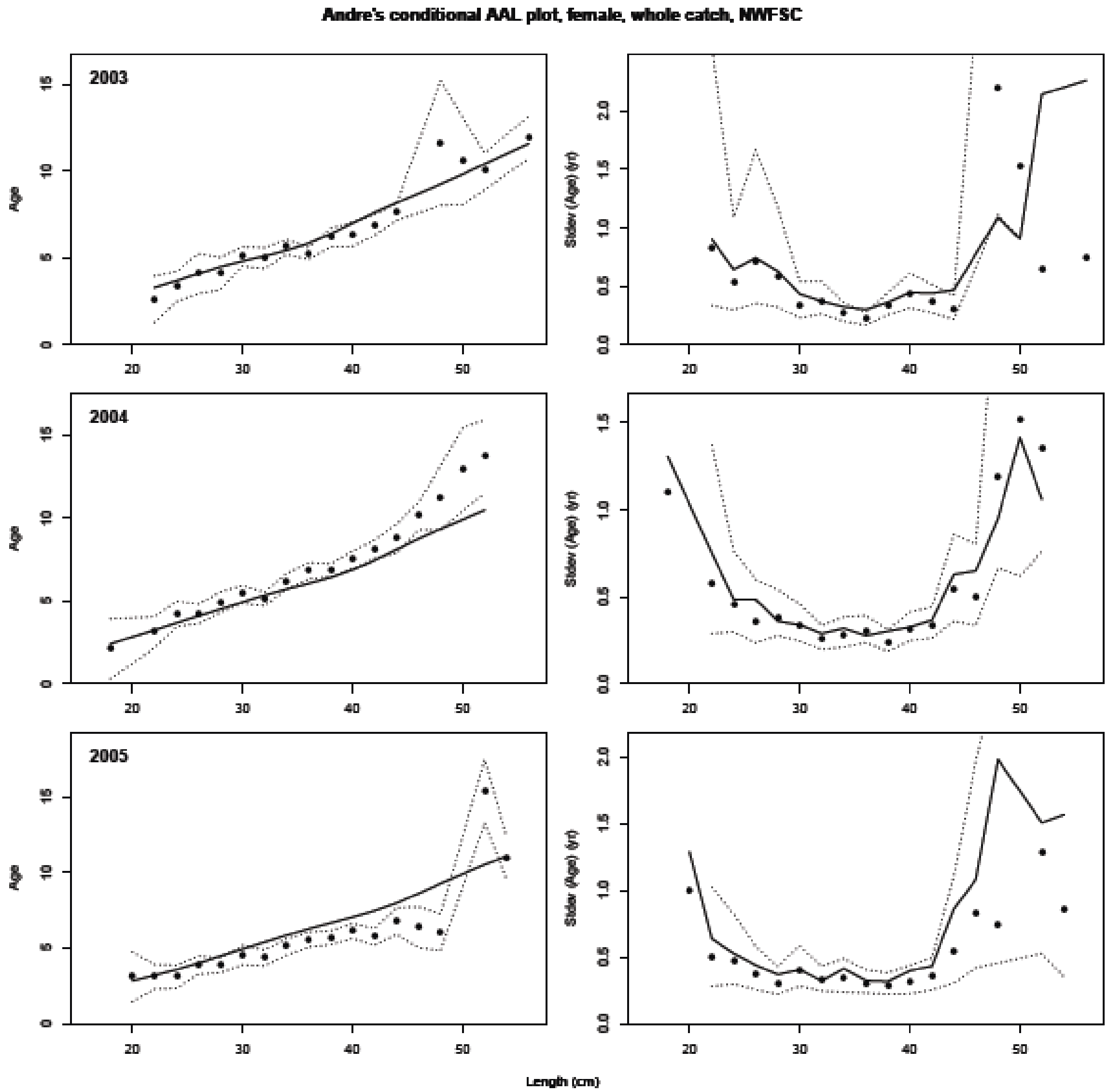



Figure 51. Conditional age-at-length and standard deviations of age-at-length plots for the NWFSC.

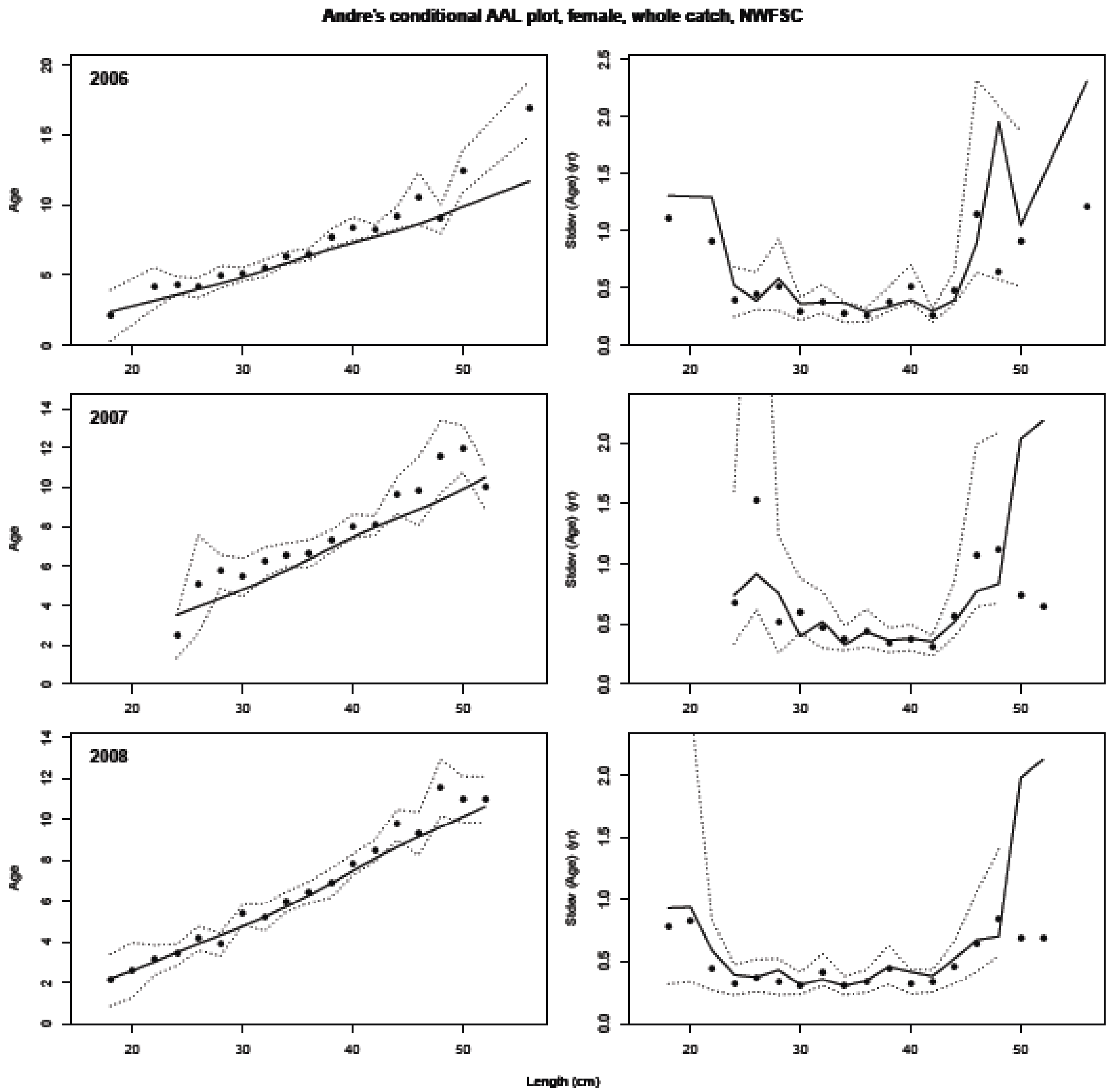


Figure 51cont. Conditional age-at-length and standard deviations of age-at-length plots for the NWFSC.

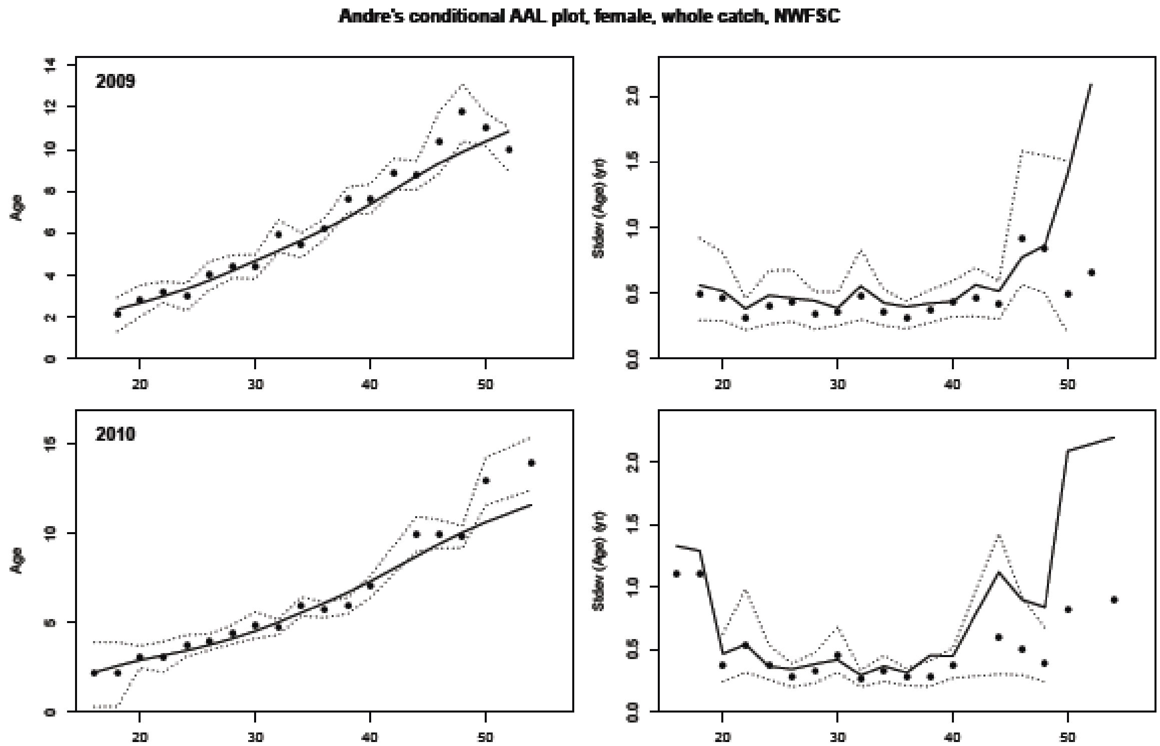



Figure 51cont. Conditional age-at-length and standard deviations of age-at-length plots for the NWFSC.

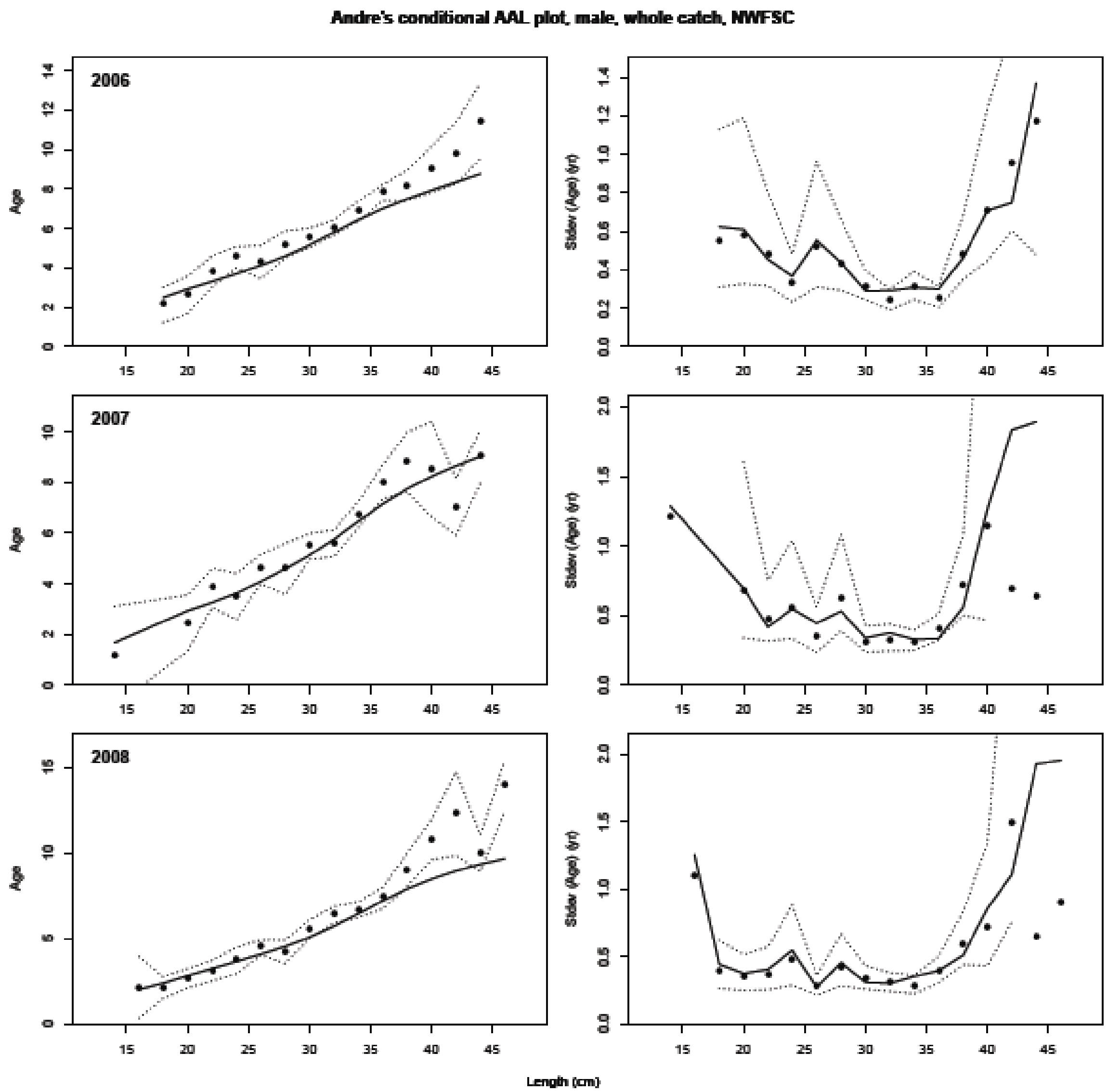



Figure 51cont. Conditional age-at-length and standard deviations of age-at-length plots for the NWFSC.

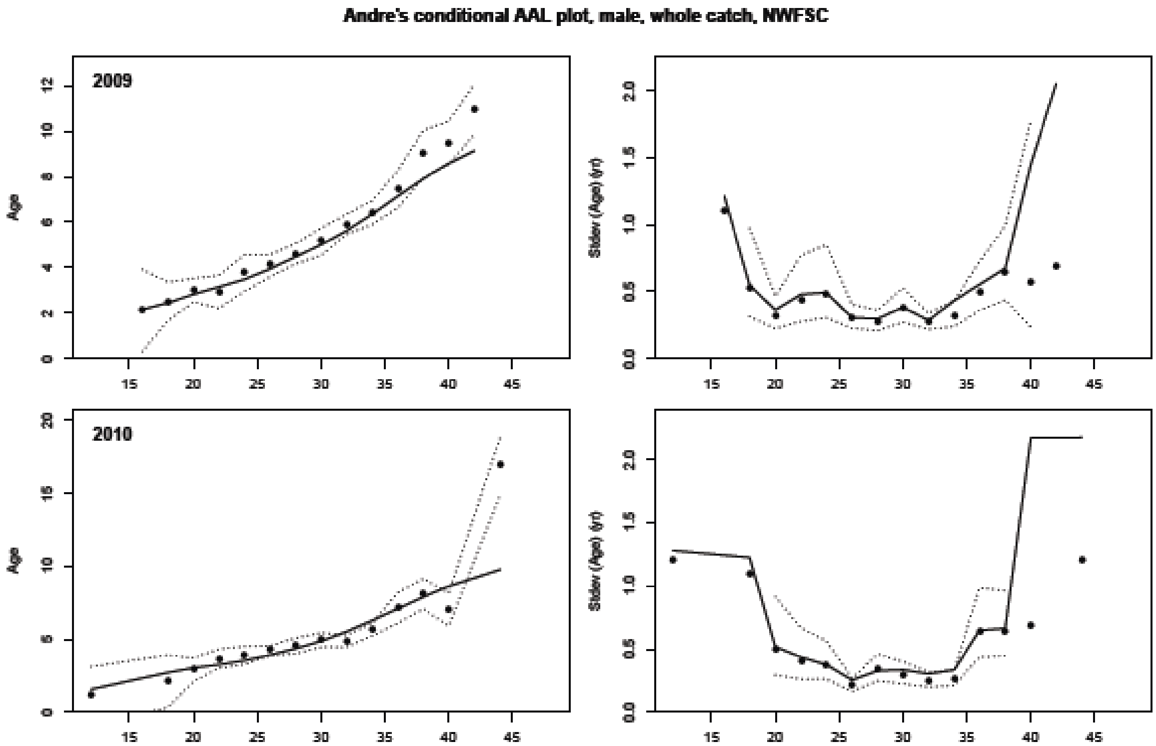



Figure 51. Conditional age-at-length and standard deviations of age-at-length plots for the NWFSC.

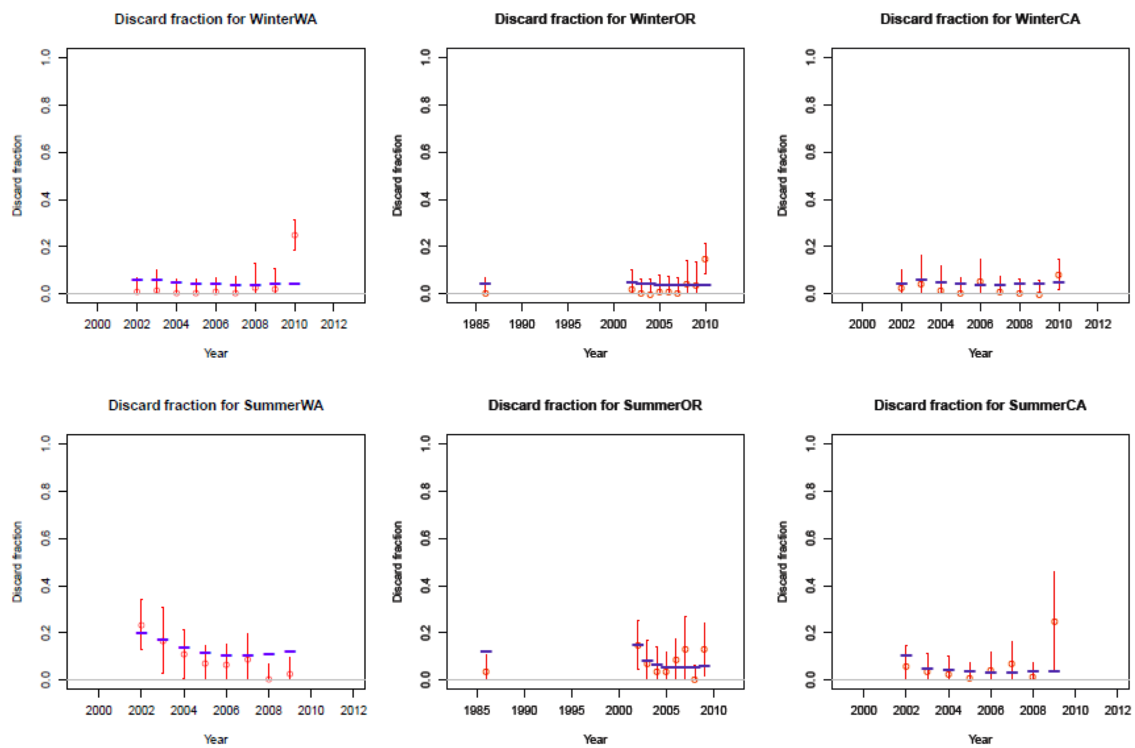



Figure 52: Fits to the discard ratios (discard/total catch) for each fleet and year for the base case model run.

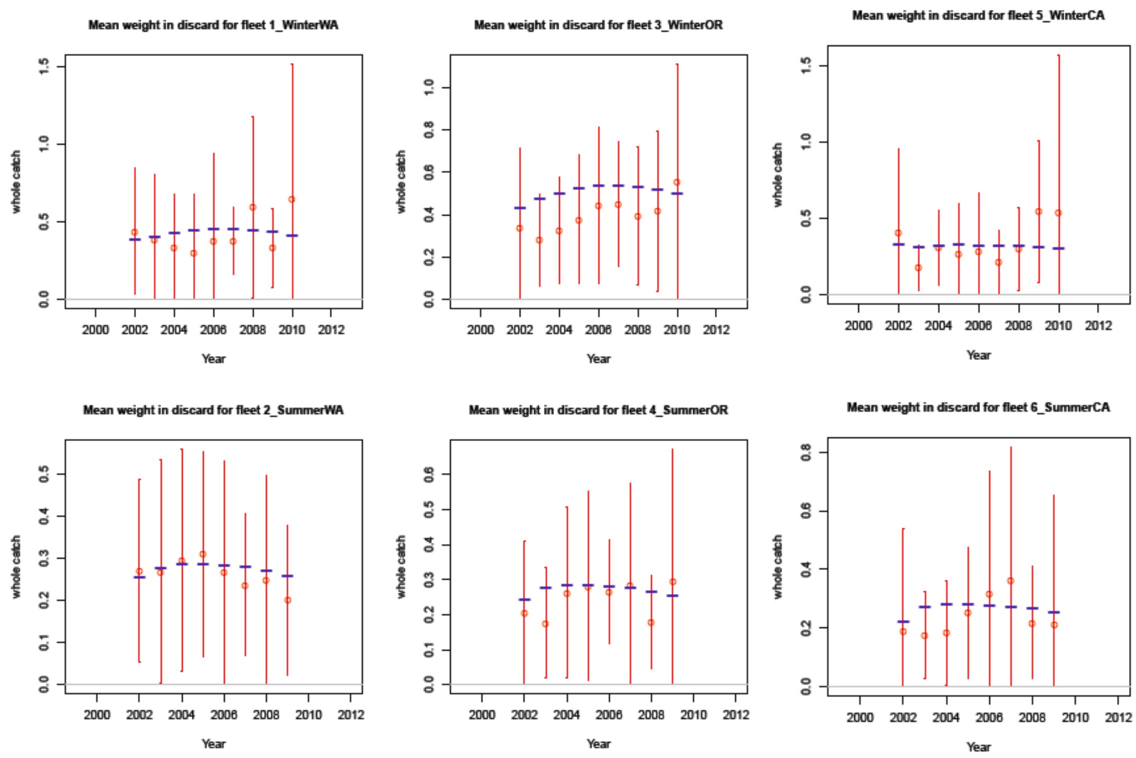



Figure 53. Fit to the mean weight of the discards recorded by the WCGOP.

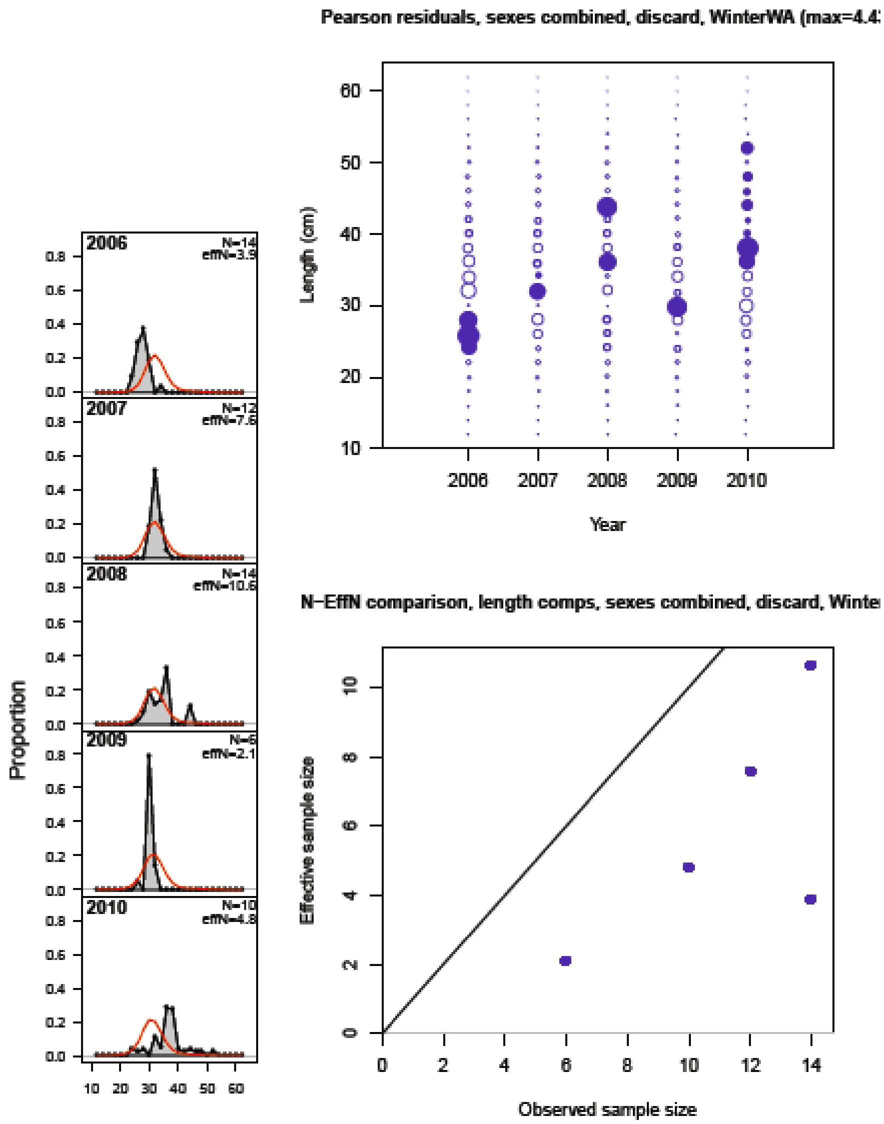


Figure 54. Fit to the Washington fleet discard length compositions.

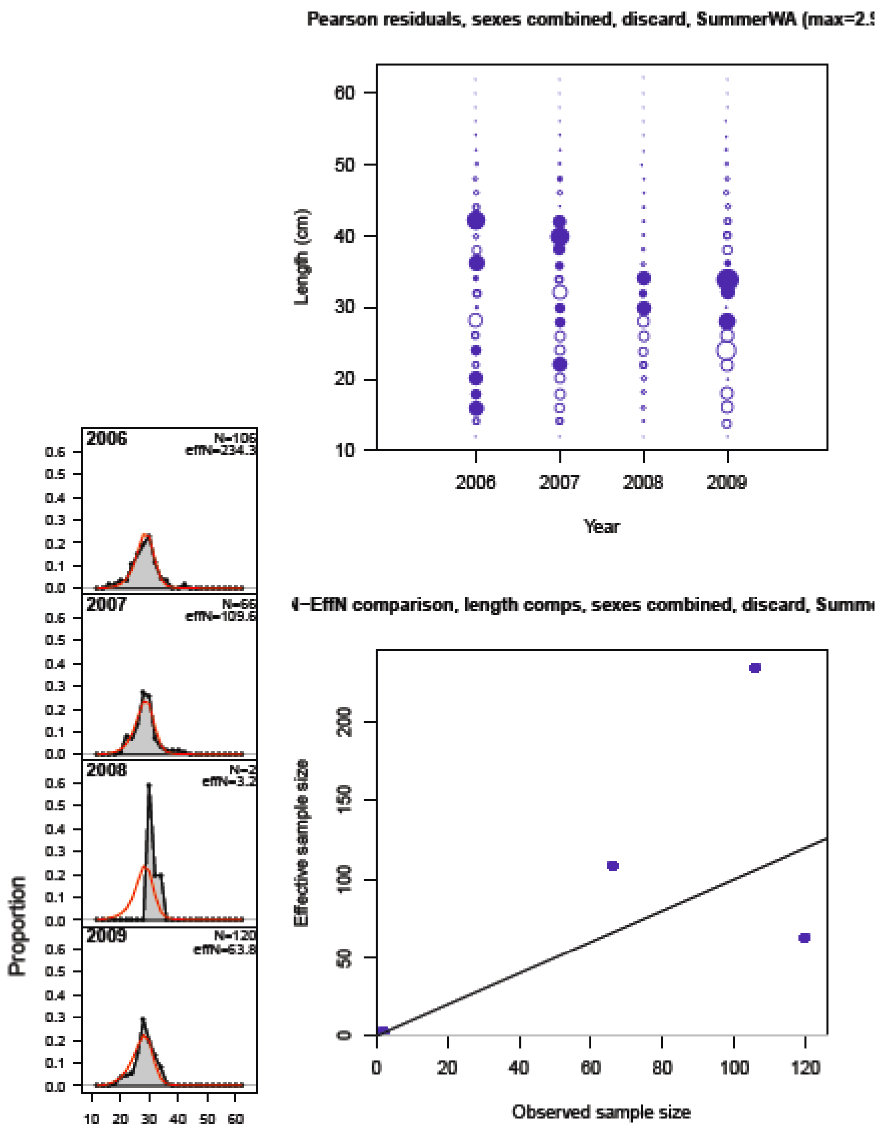



Figure 54 cont. Fit to the Washington fleet discard length compositions.

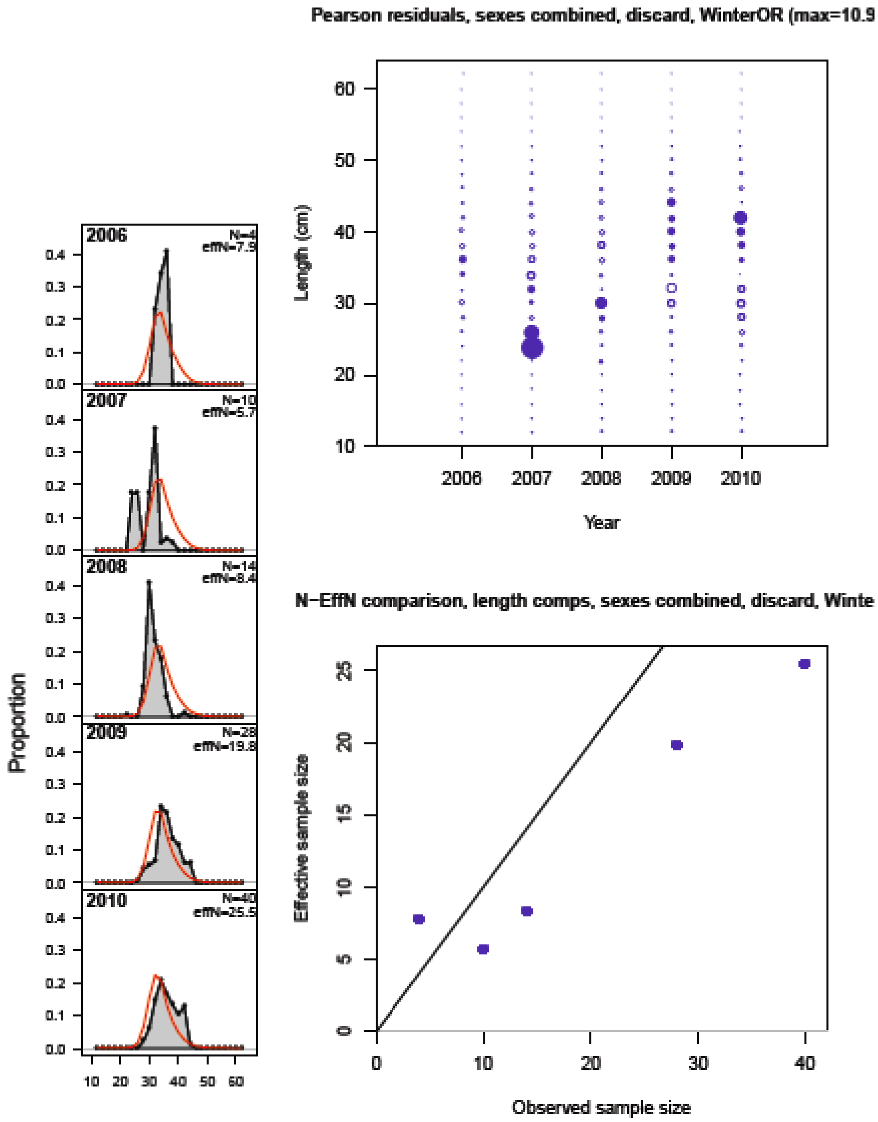



Figure 55. Fit to the Oregon fleet recent discard length compositions from the WCGOP.

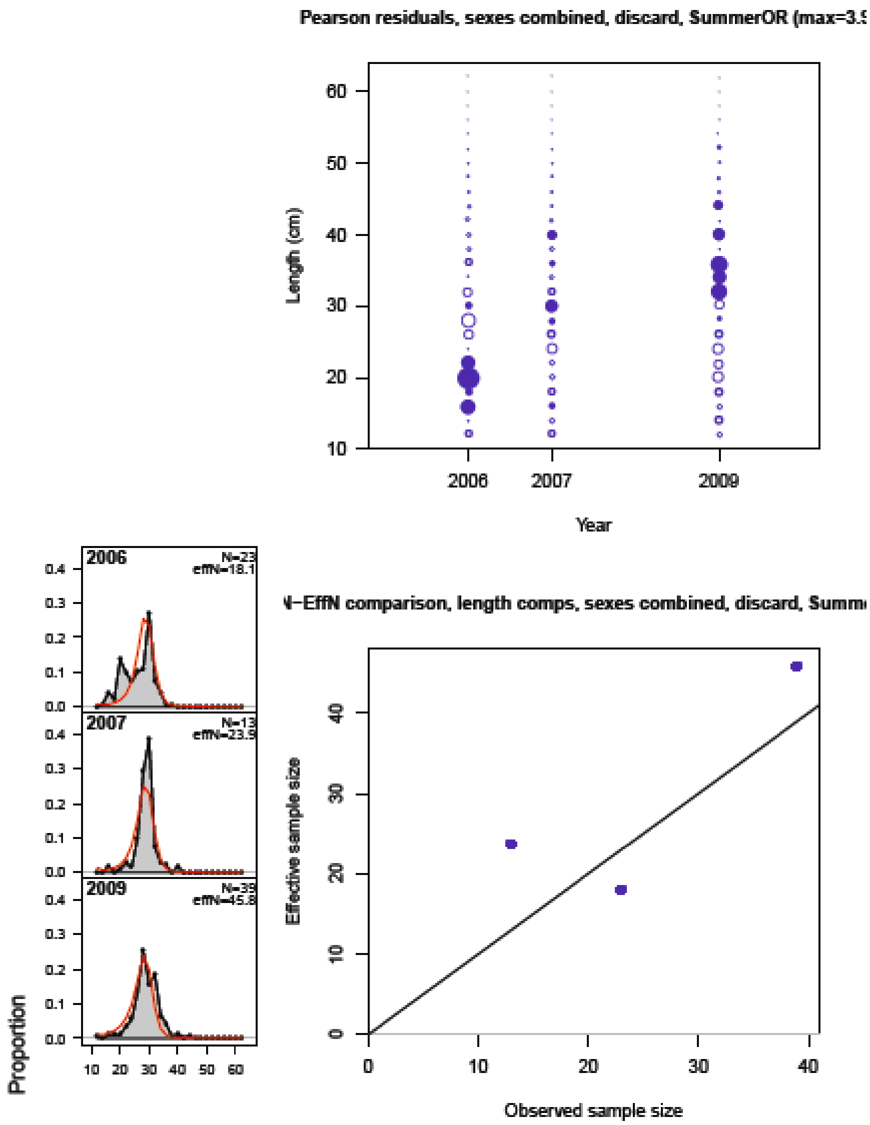
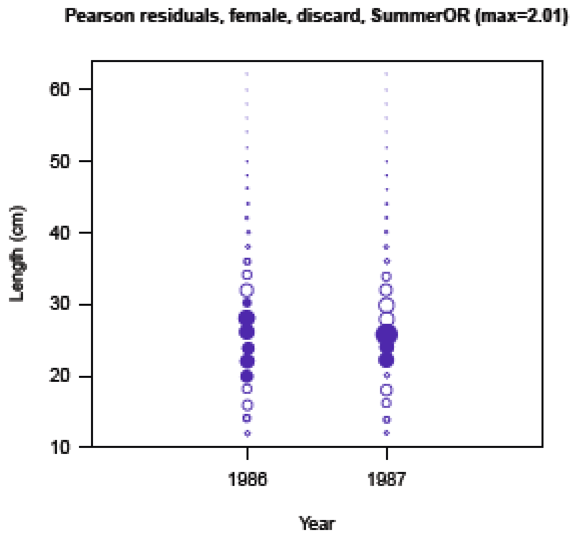



Figure 55 cont. Fit to the Oregon fleet recent discard length compositions from the WCGOP.



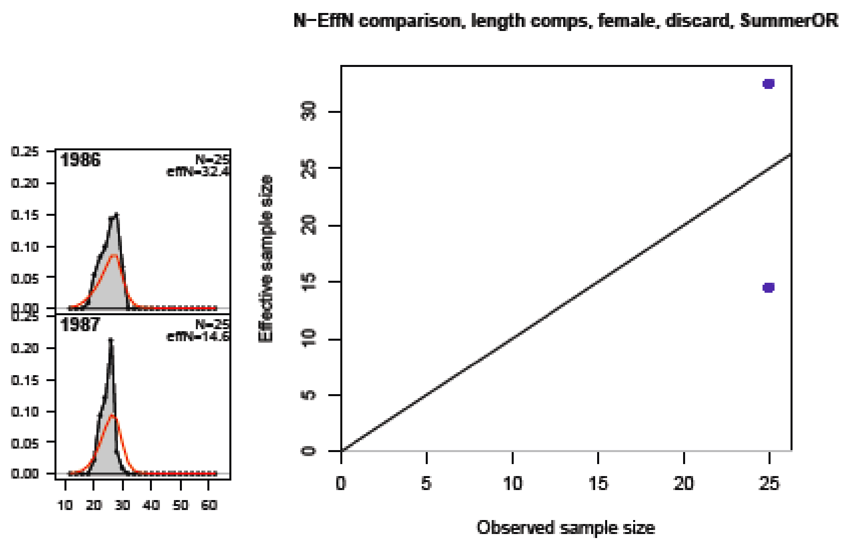




Figure 56. Fit to the Oregon fleet discard length compositions from Pikitch et al (1988).

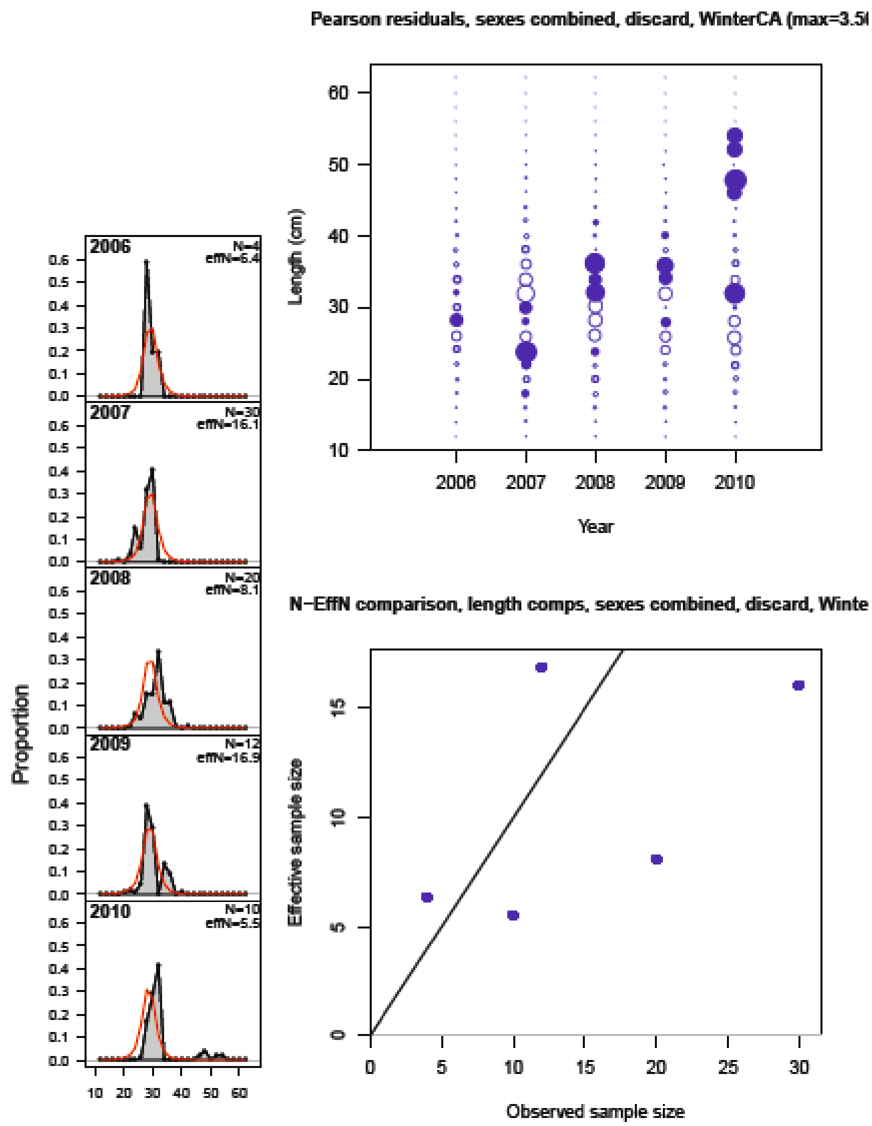



Figure 57. Fit to the California fleet discard length compositions.

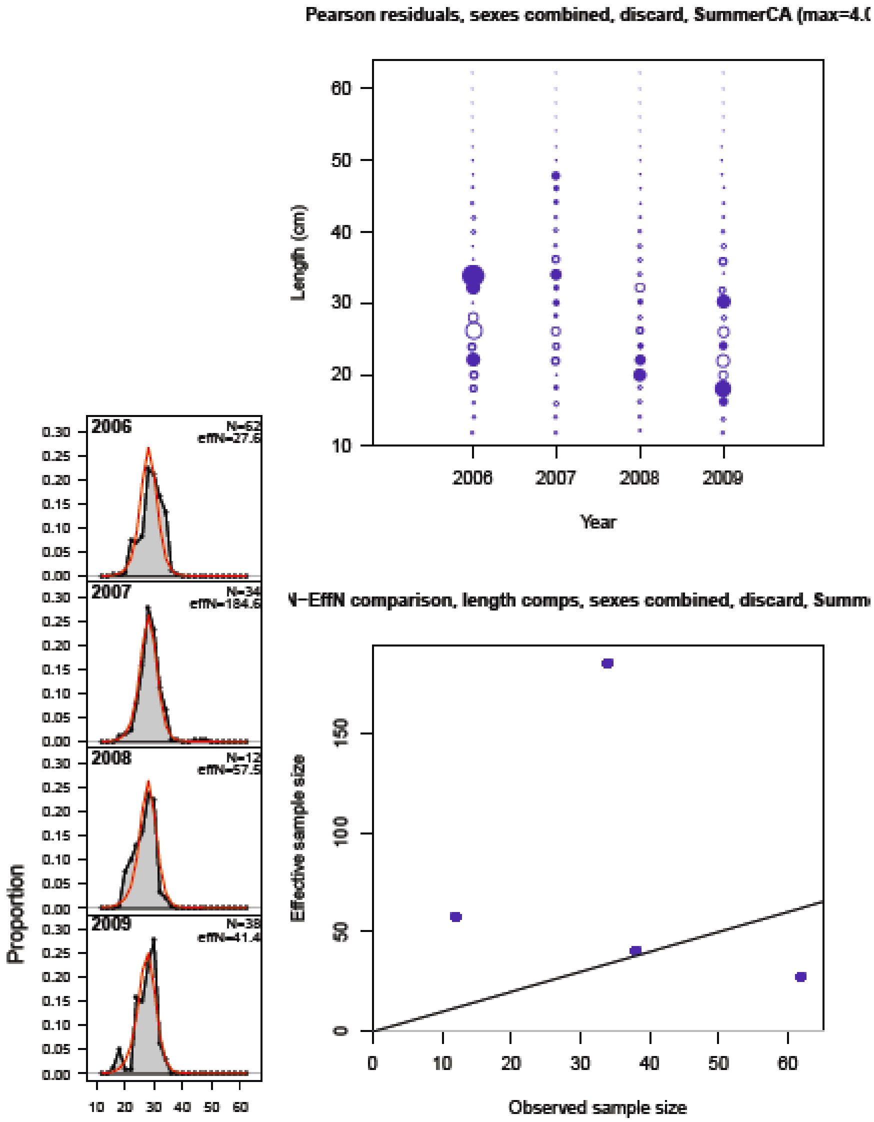



Figure 57 cont. Fit to the California fleet discard length compositions.

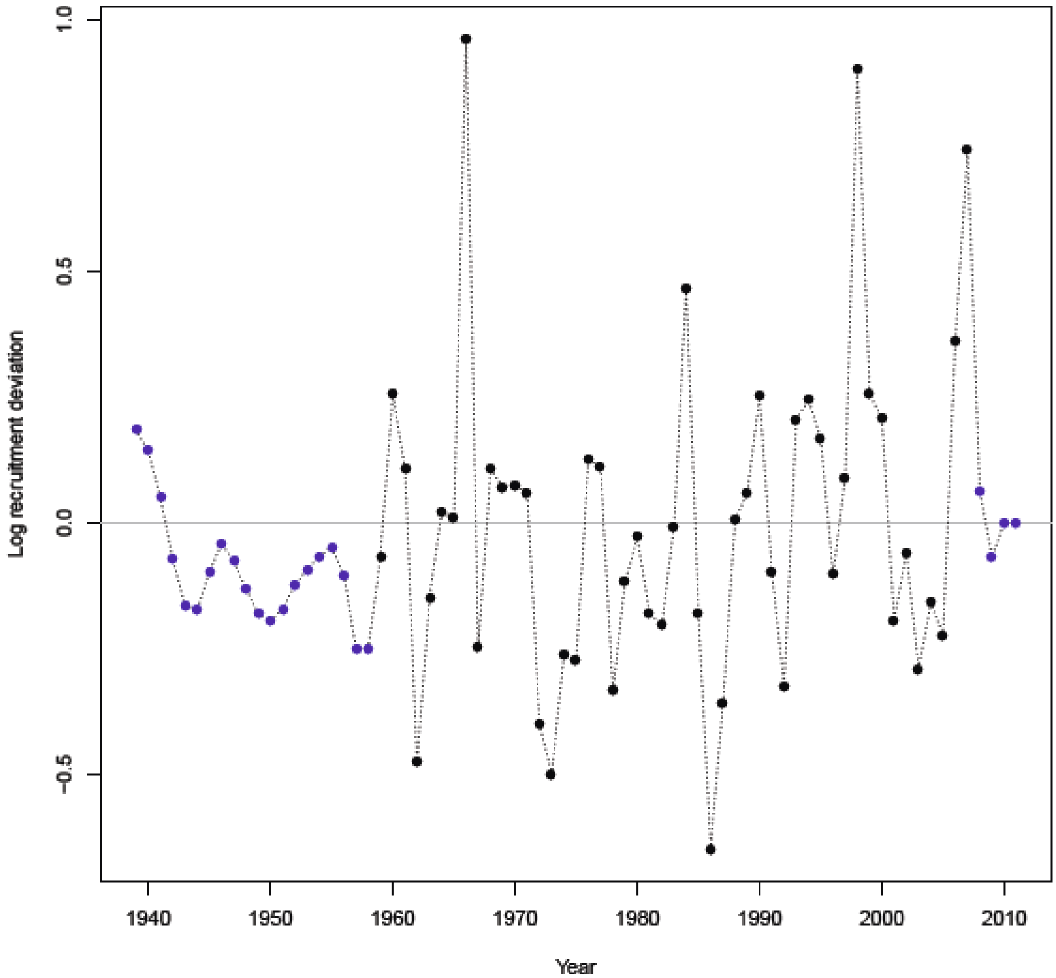


Figure 58 . Log recruitment deviations from the base case model run.

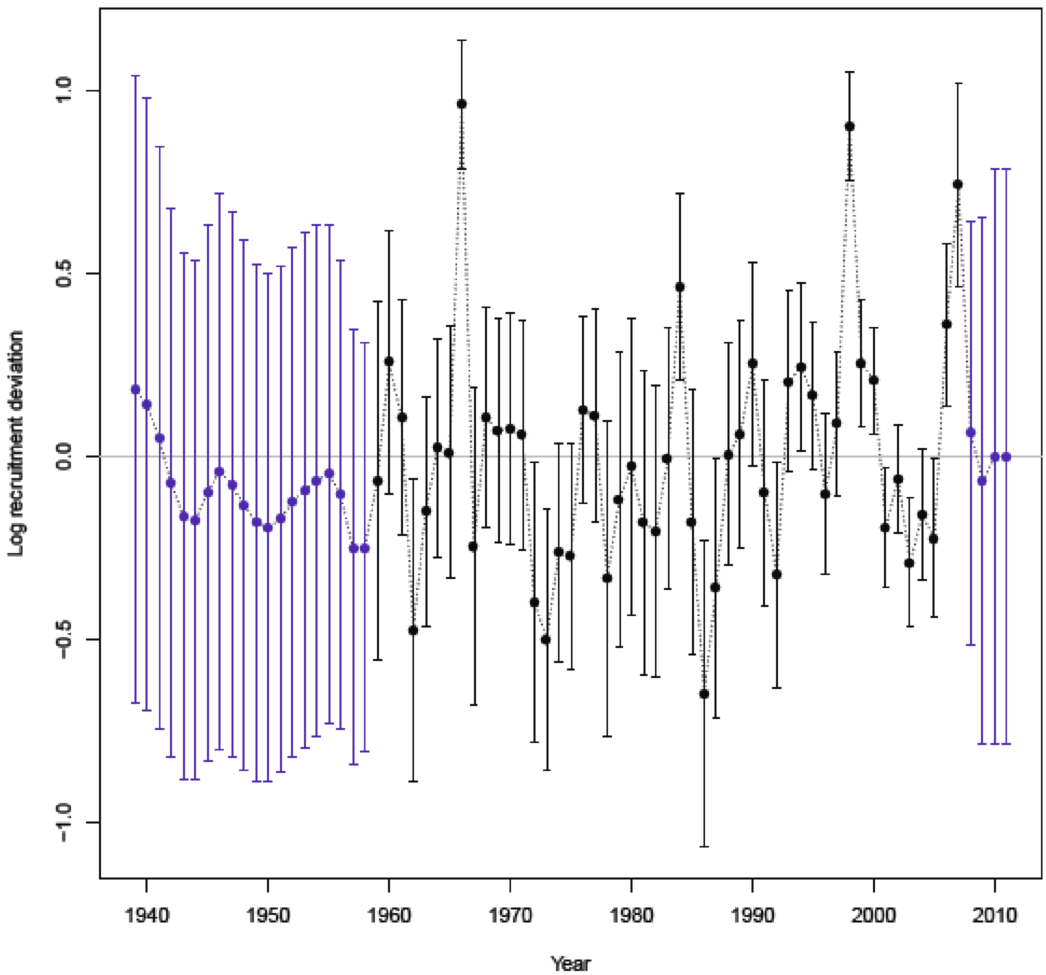



Figure 59. Time series of estimated petrale sole recruitments for the base case model (round points) with approximate asymptotic 95% confidence interval (horizontal lines).

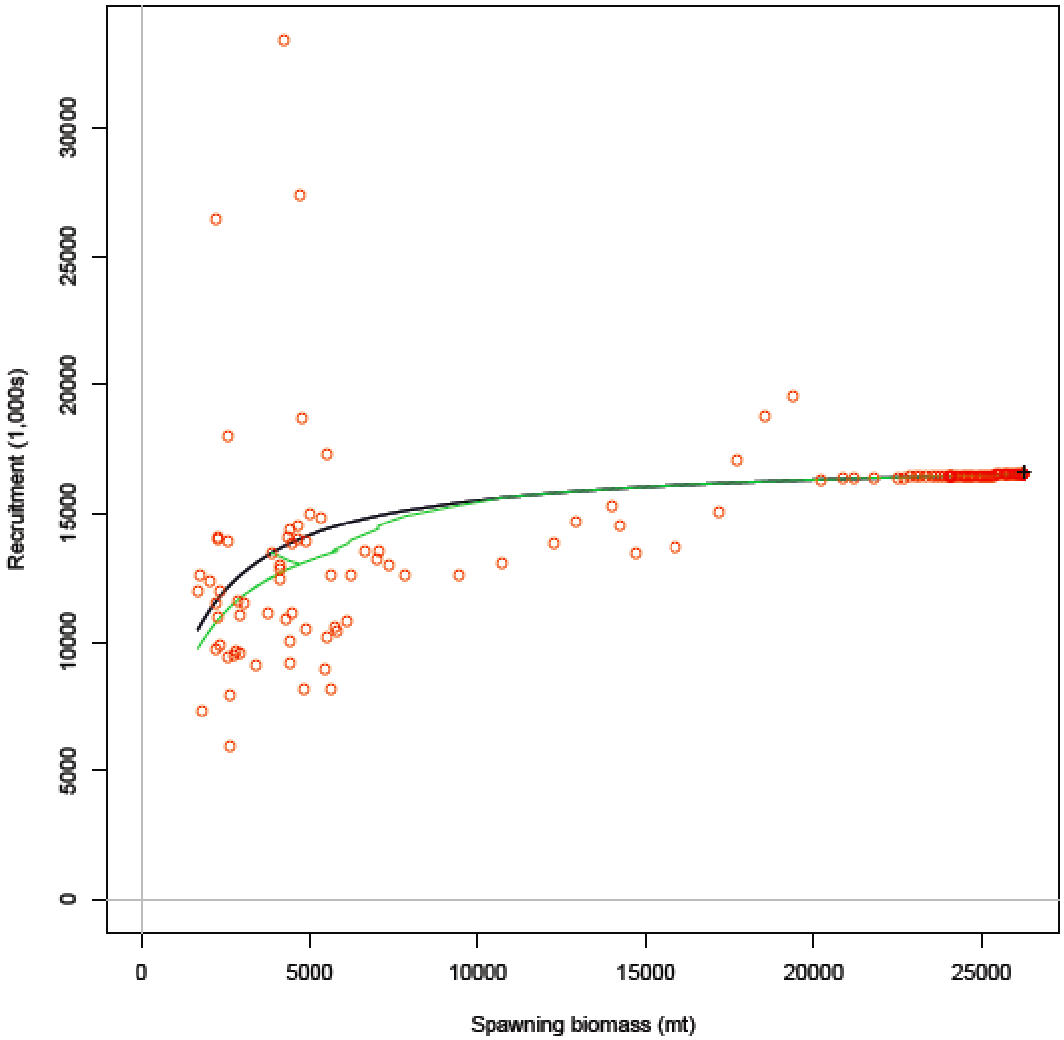



Figure 60. Stock-recruit function with predicted recruitments (points) and bias-corrected expectation (light line).

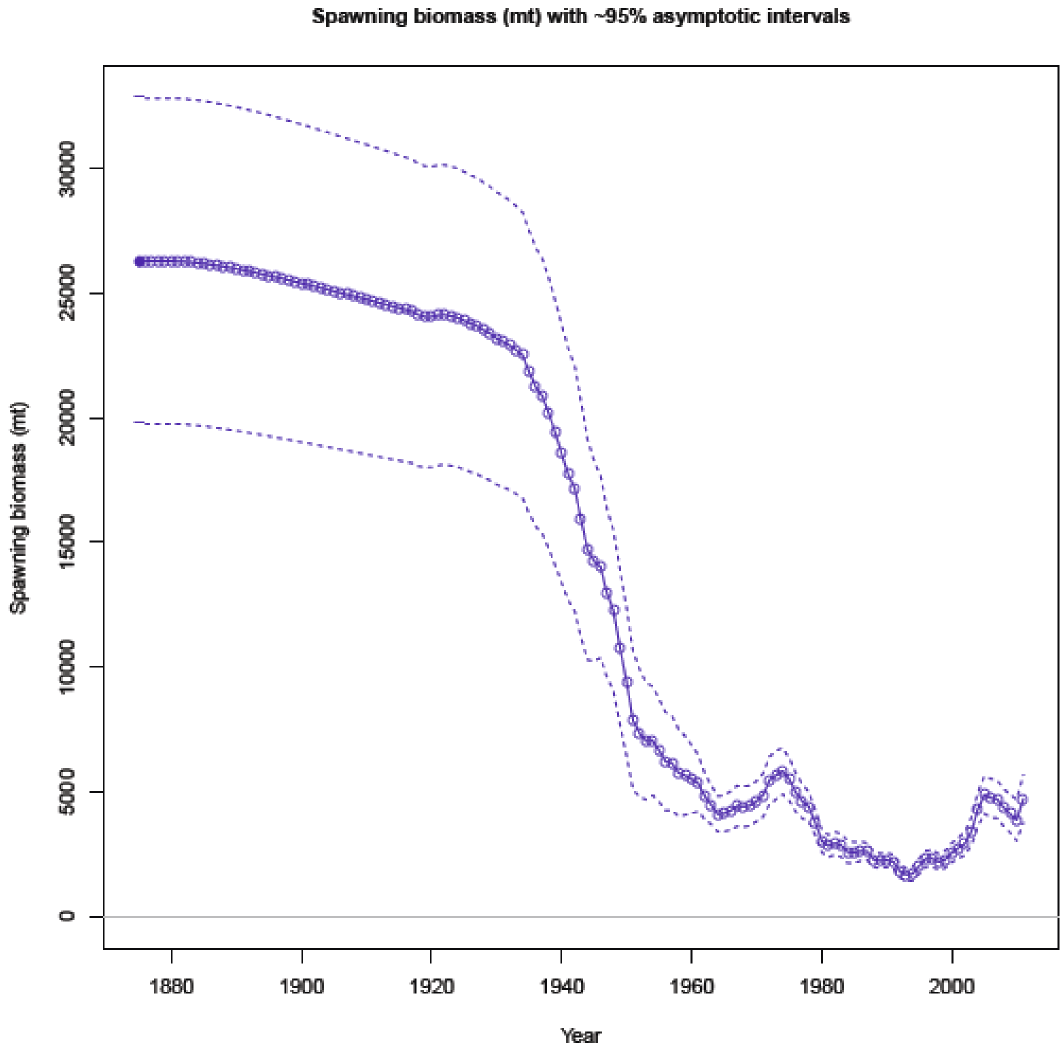


Figure 61. Estimated spawning biomass time-series for the base case model (solid line) with approximate asymptotic 95% confidence interval (dashed lines).

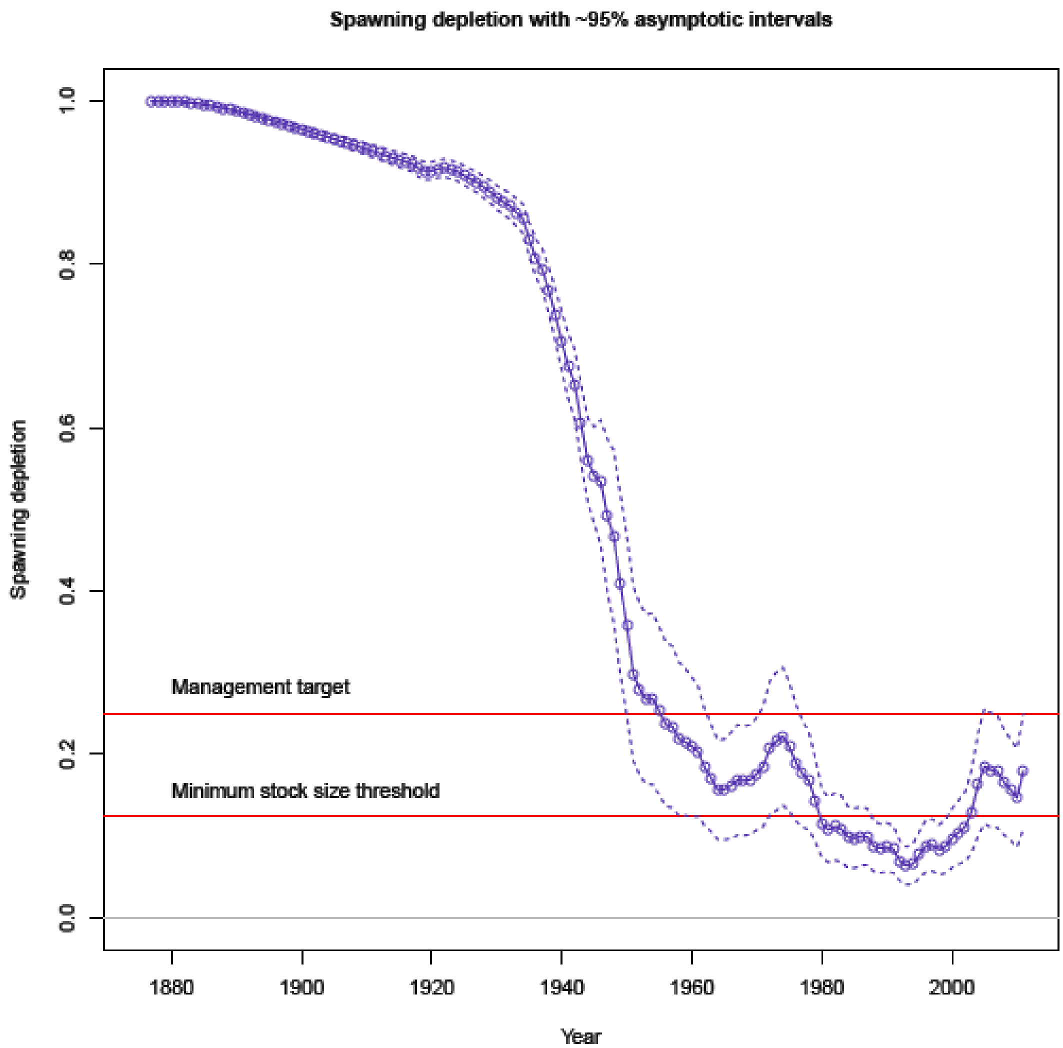



Figure 62. Time series of depletion level as estimated in the base case model (round points) with approximate asymptotic 95% confidence interval (dashed lines).

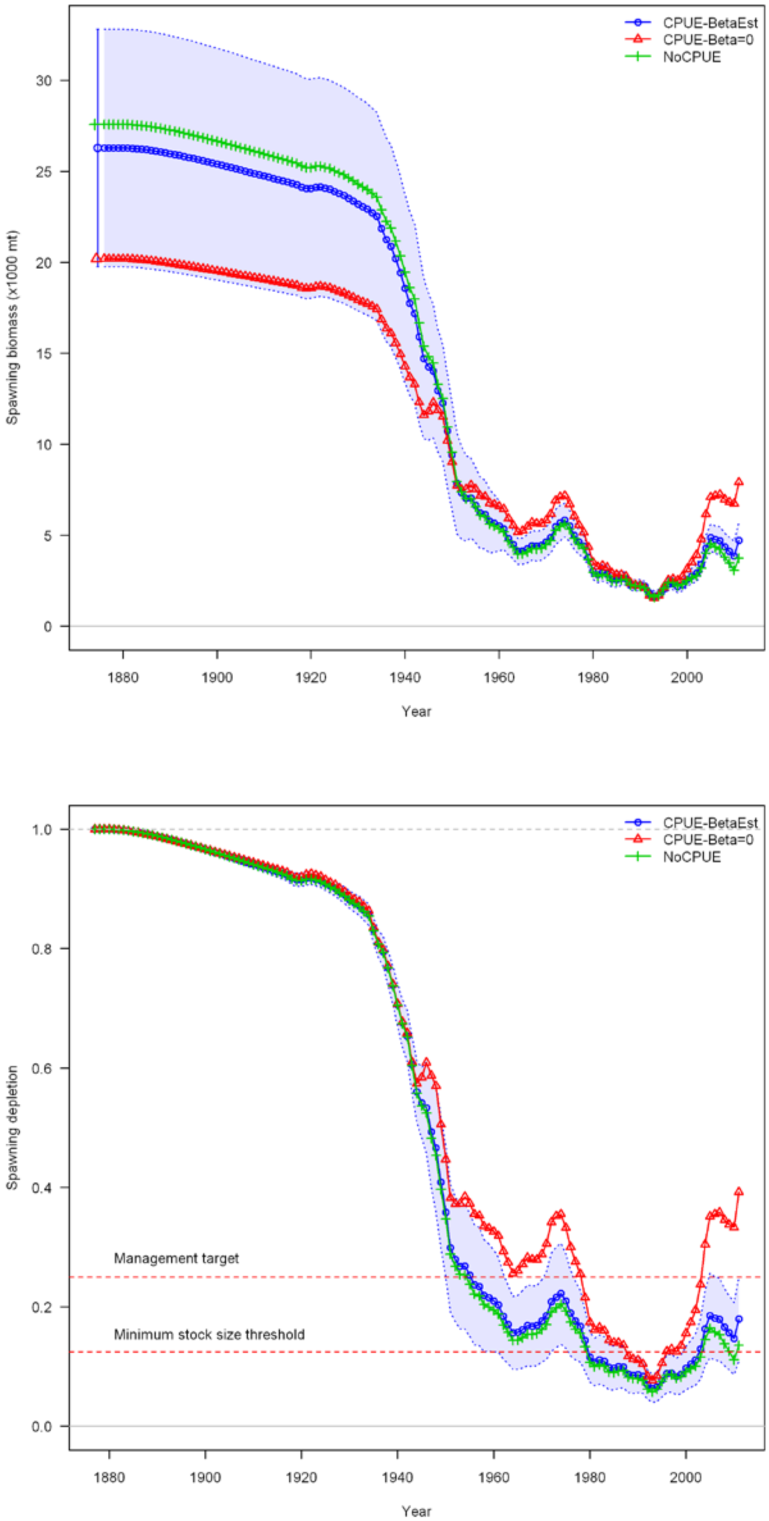



Figure 63. Plot showing sensitivity model runs.

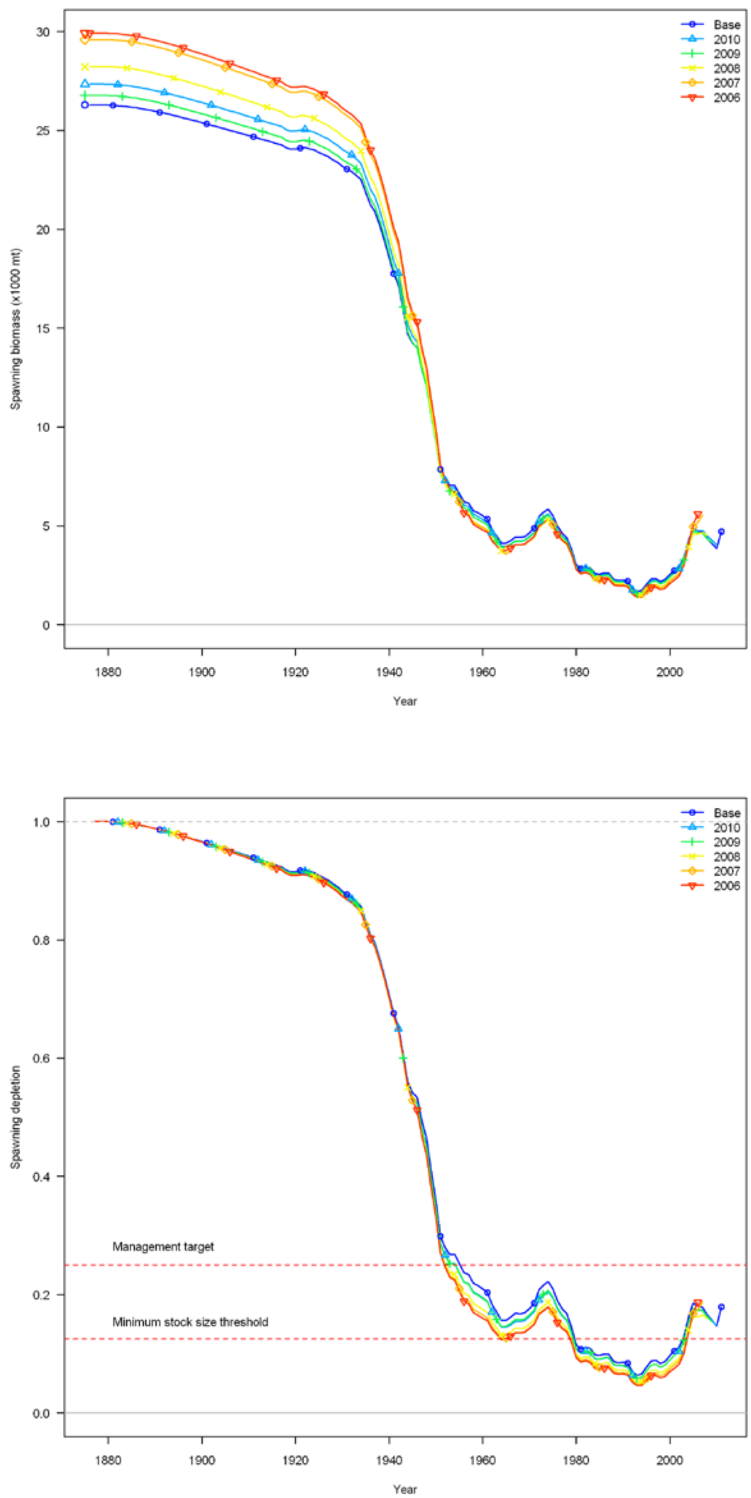



Figure 64. Results from a 5-year retrospective analysis. Each year of retrospective is performed as if the assessment were conducted in that year (i.e., retrospective in 2007 includes data through 2006).

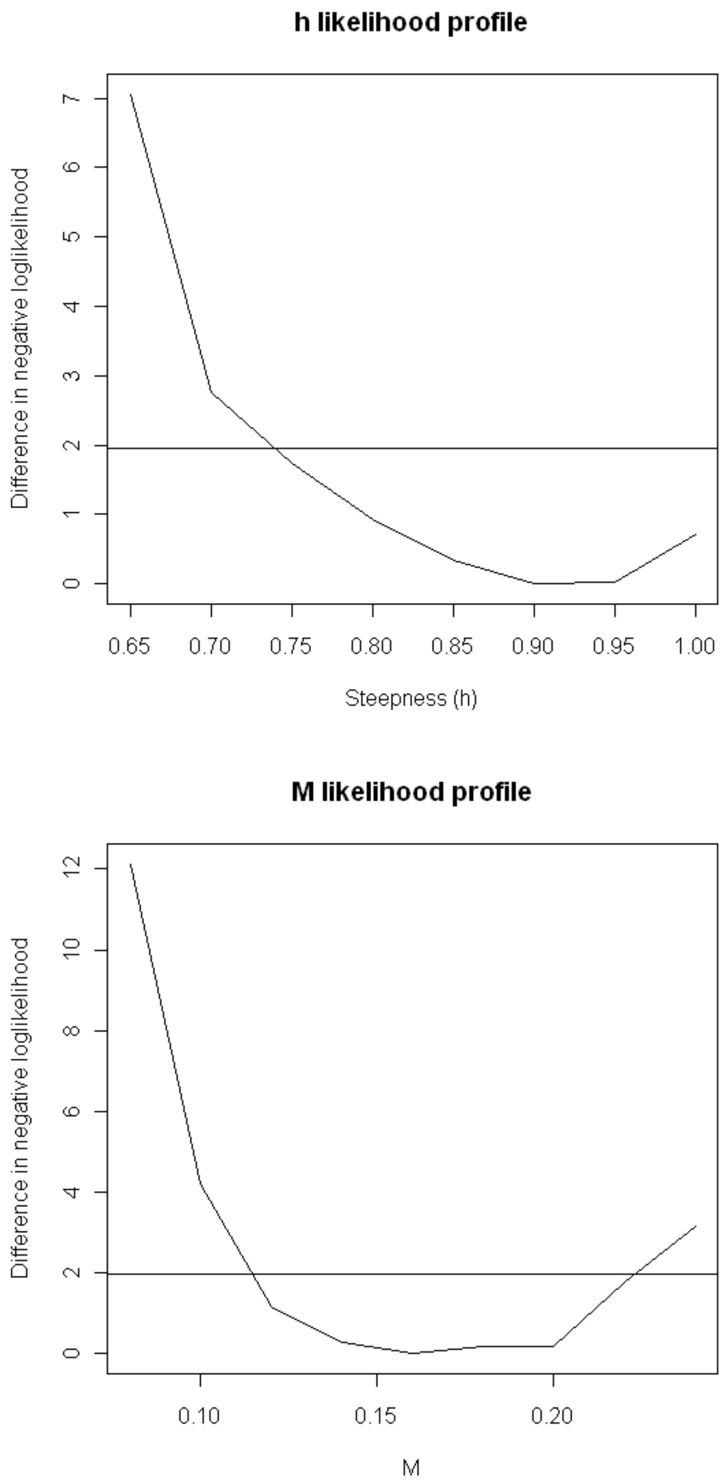



Figure 65. Likelihood profiles for the stock-recruitment steepness (h) parameter and female natural mortality (M).

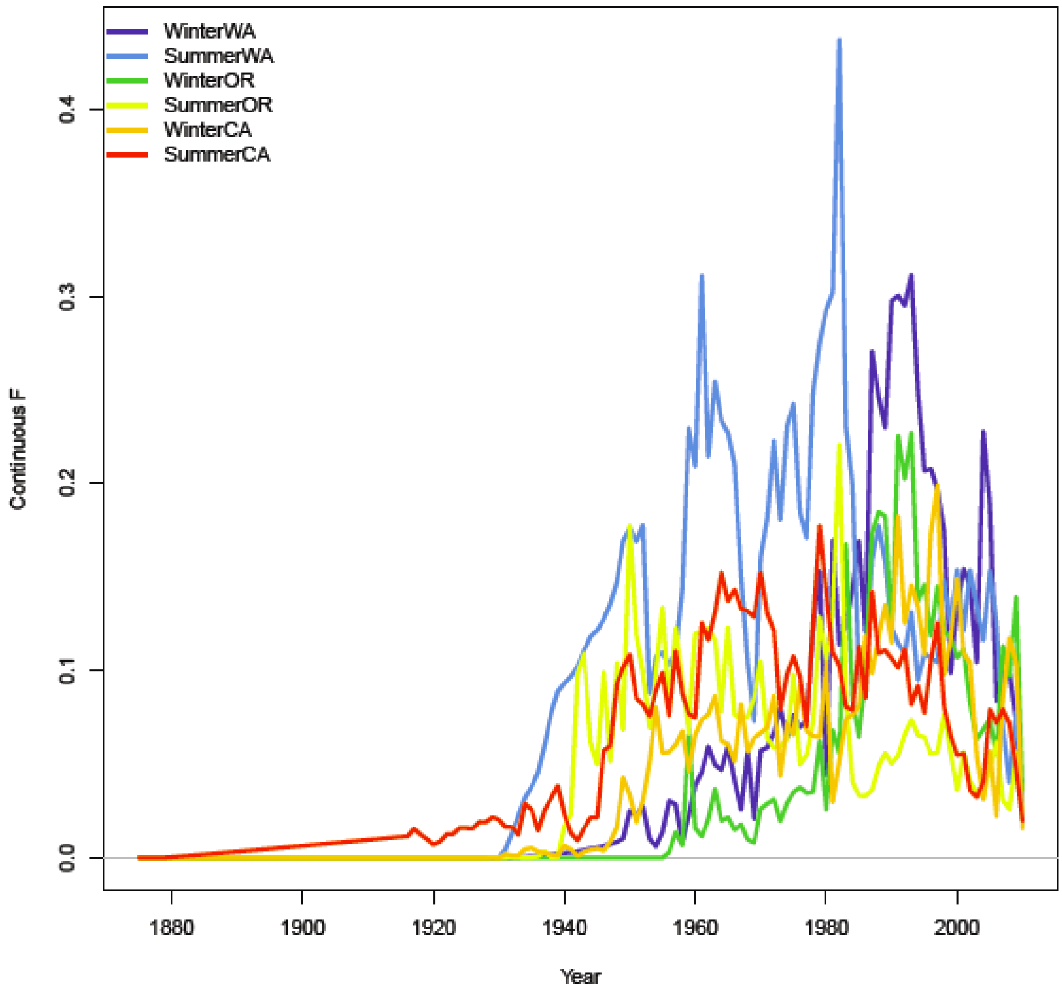



Figure 66. F time-series for each fleet.

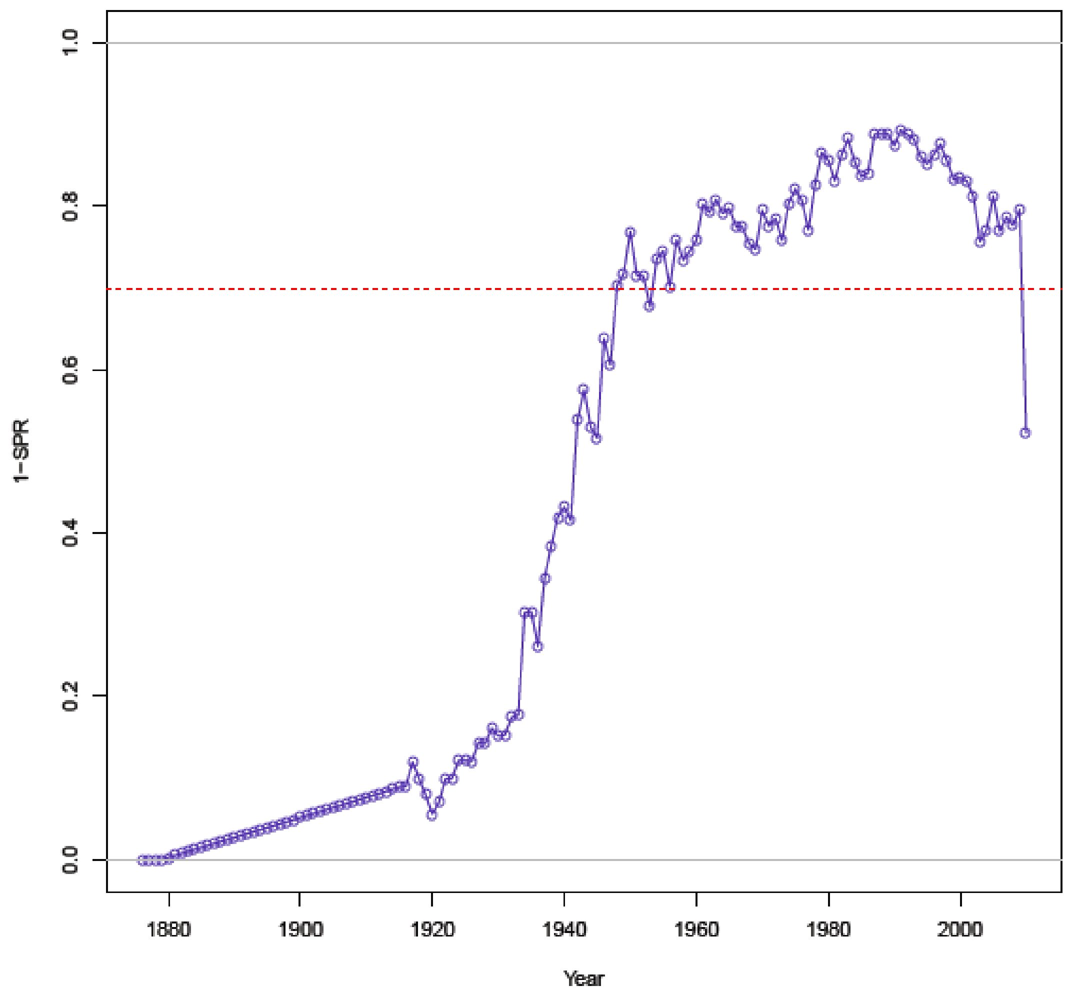


Figure 67. Time series of estimated spawning potential ratio (displayed as 1-SPR) for the base case model (round points). Values of SPR above 0.7 reflect harvests in excess of the current overfishing proxy.

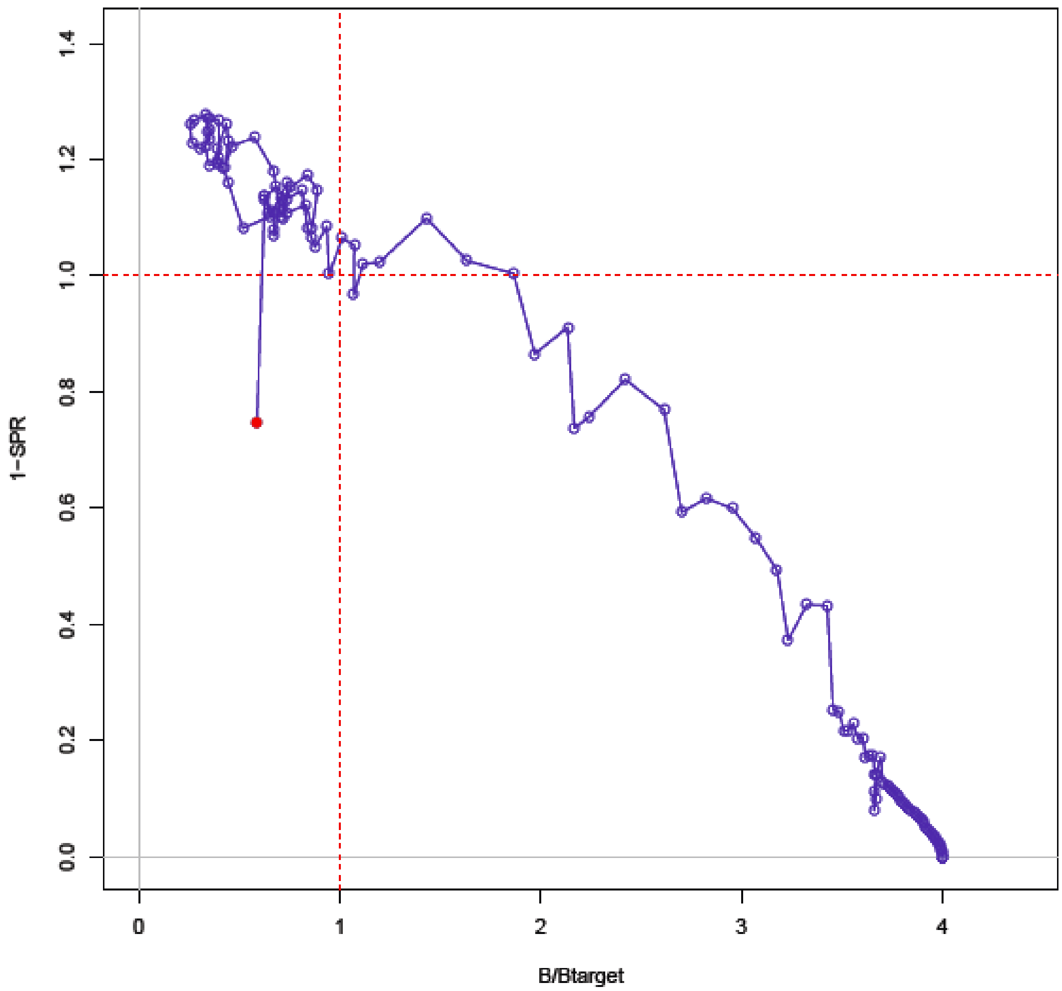


Figure 68. Phase plot of estimated fishing intensity vs. relative spawning biomass for the base case model. Fishing intensity is the relative exploitation rate divided by the level corresponding to the overfishing proxy (0.125). Relative spawning biomass is annual spawning biomass relative to virgin spawning biomass divided by the 25% rebuilding target.

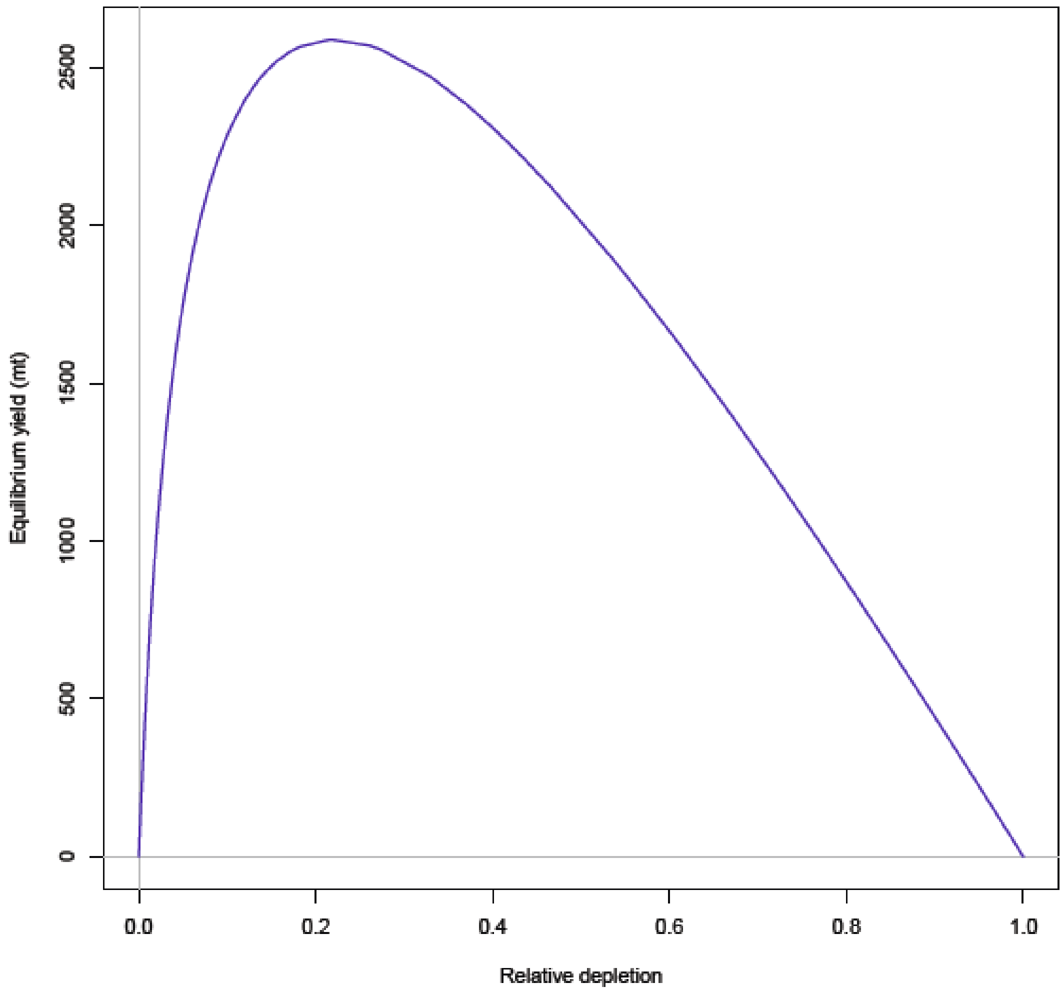



Figure 69. Equilibrium yield curve for the base case model. Values are based on 2010 fishery selectivity.

## 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 change point analysis of the length as a function of depth. The reasoning behind the change point 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 change points 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 ( $\delta$ ) 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.

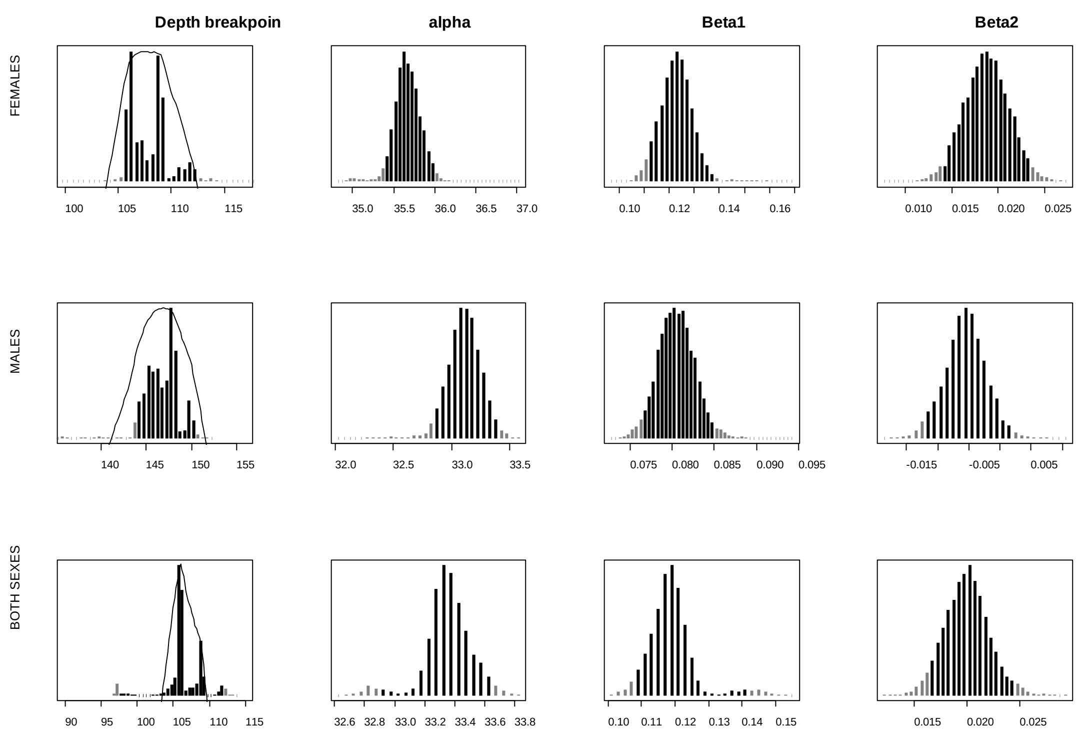
The parameters were estimated by minimizing the sum of the squared residuals and non-parametric bootstrapping was used to estimate the 95% confidence intervals.

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).**

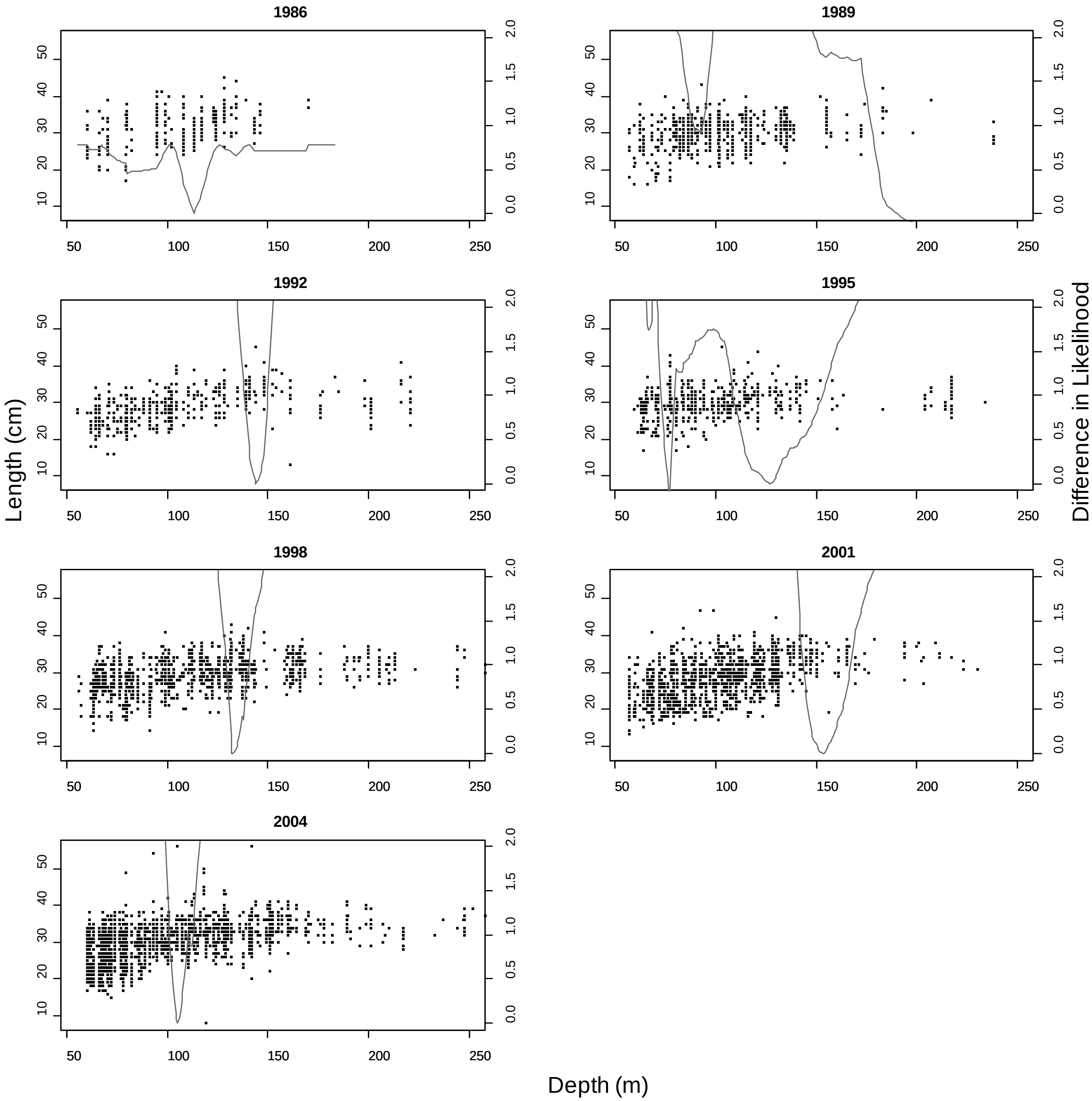



**Figure A2: Plots of length vs. depth from the Triennial survey for each year and males only with the likelihood profile of the breakpoint overlayed.**

## NWFSC Survey

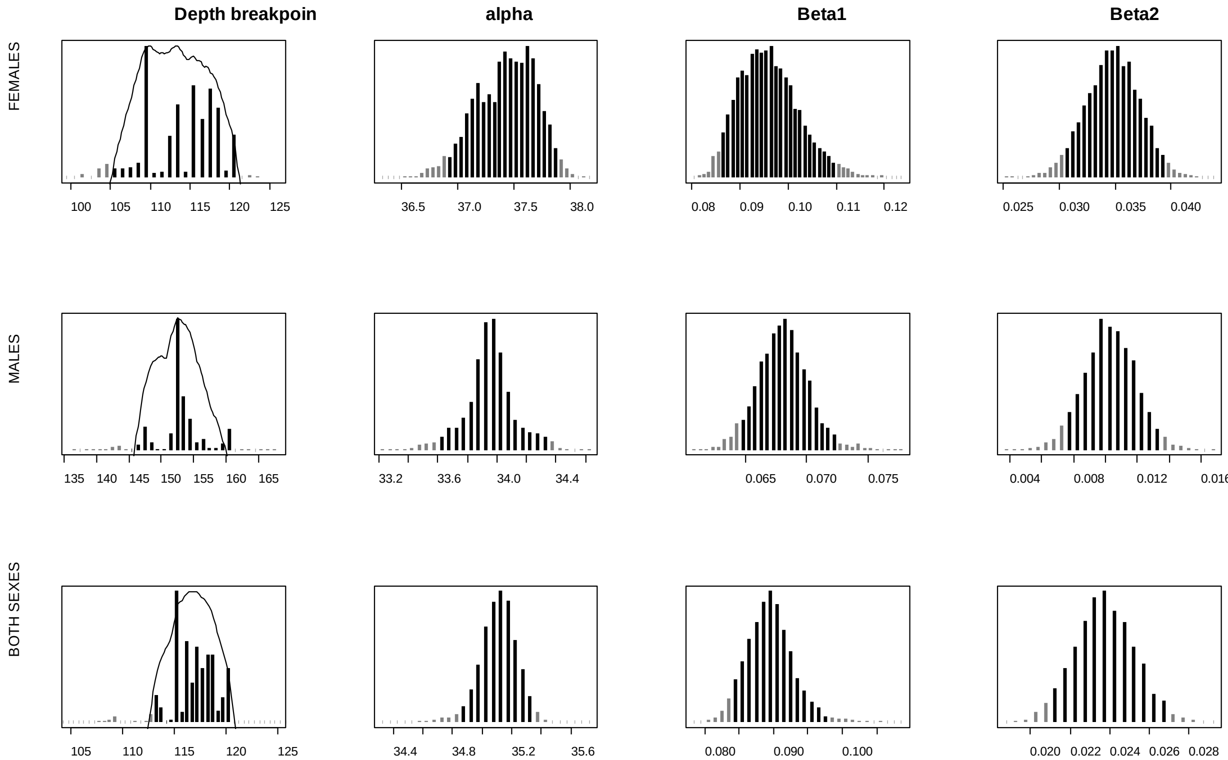



**Figure A3: Plot of NWFSC survey bootstrap results from piecewise regression for each sex. The line in the depth breakpoint plot is a likelihood profile (the 95% CI is where the profile crosses zero).**

## 14. Appendix B: Commercial logbook CPUE analysis.

Commercial logbook data for the west coast limited-entry groundfish fishery are archived in a regional Pacific Fisheries Information Network (PacFIN) database. These logbook data are used in a three step analysis to produce a CPUE index for each petrale sole fishing fleet from 1987-2009. Logbook data prior to 1987 were not considered because the spatial location of each tow was not available. The data for 2010 were incomplete at the time of this analysis. The summer season was defined as May-October, the same period that the NWFSC survey operates, while the winter was defined as November-February. The first step of the analysis is to define the spatial extent of recent petrale sole fishing grounds because spatial management measures began to impact the fleet during 2003 and have restricted the area open to fishing. The goal is to identify areas that have remained open to fishing for the duration period over which standardized CPUE indices are desired, 1987 – 2009. The second step was to filter the data for quality, and based on information from the industry present at 2011 pre-assessment workshop in Newport, OR. The final step was to conduct the CPUE standardization using a delta-GLM analysis.

**Spatial analysis**

Logbook records from PacFIN were queried for Washington, Oregon and California commercial fishing trips that caught petrale sole via bottom trawl gear from 2003 through 2008, a period of relatively stable management for petrale sole. Records include geographic positions where the vessel set and retrieved the trawl gear. Both set and up points were used to create line representations of each tow event. Any line intersecting the line representing the coastline or crossing seaward of the line representing the 700-fm isobath was flagged and removed from the data set. For each line, average vessel speed (knots) was calculated as a quotient of calculated linear distance between set and retrieval points versus recorded tow duration. Trawl events with calculated vessel speeds greater than 5 knots were removed, as were records with calculated straight-line distance greater than 20 nm.

Petrale fishing grounds that have remained open during 1987-2009 were identified using tows that caught petrale for both the summer and winter seasons. Only tows seaward of the 150-fathom line were retained in the winter and only tows shoreward of the 100-fathom line were retained in the summer to account for areas that have been closed in recent years. In order to investigate how sensitive the identification of fishing grounds are to the choice of positive catch rate data three criteria were investigated for each season: 1) using all tows with positive catch rates, 2) removing tows with the lowest 10% of the catch rates, and 3) removing tows with the lowest 20% of catch rates (Table 1). Each of the six sets of fishing grounds were identified using a type of minimum bounding geometry known as a convex hull. A common analogy used to conceptualize convex hulls is an elastic band being stretched over a set of points (Fig. B1). Convex hulls were computed for each set of selected lines within a regular network of contiguous 10x10 km cells.

Once fishing grounds were identified logbook data from 1987 – 2009 was overlaid on the maps of fishing grounds. Tows that fell within the fishing grounds were retained for CPUE standardization.

**Data**

The following data filters were applied for data quality:

1. Remove midwater trawl tows.
2. Remove records with large depth discrepancies (> 70 fathoms) between the logbook recorded catch and the GIS map depth.
3. Remove tows with a duration less than or equal to 0.2 hours as duration was incorrect for many of these records.

The following filters were applied based on knowledge of the petrale sole fishery. The tow duration and minimum number of years the vessel had been in the fishery were chosen based on discussions with industry members present at the 2011 pre-assessment workshop in Newport, OR.

1. Retain tows with depths less than or equal to 300 fathoms in summer and 400 fathoms in winter.
2. Retain tows with tow duration > 0 and <= 4 hours during the summer and <= 6 hours during the winter.
3. Retain vessels fishing five or more years. This rule was chosen in order to capture skippers that have fished petrale sole for most of the time series that likely switched vessels during the vessel buyback program.

Tows were assigned to states based on the state waters where the catch was taken such that the PSMFC areas 3A, 3B, 3S, 3C were assigned to Washington. PSMFC areas 2B,2C,2A,2E,2F are assigned to Oregon and PSMFC areas 1A,1B,1C were assigned to California. The states of Washington (> 47 degrees and >= 47 degrees) and Oregon (< 44 degrees and => 44 degrees) were split into two areas such that there were more than three positive data points in every year and area. There were not enough positive data points in every year and area to split California into areas.

After filtering, the winter data contained 13,777 tows, from 179 distinct vessels, which delivered to 47 different ports. The breakdown of tows by latitude bin is shown in Figure 2a. The tows are concentrated in Washington in Oregon compared to California. The winter fishery targets petrale on their spawning grounds, which is reflected in the fact that most of the tows that report targets are targeting petrale, with a minority of tows targeting dover sole, as seen in Figure 3a.

The summer data contained 123,375 tows, from 295 distinct vessels, which delivered to 47 different ports. The breakdown of tows by latitude bin is shown in Figure B2b. Compared to the winter fishery, the summer fishery catches a mixed species complex, as seen in Figure B3b. The reporting of target species, and the data in figures B2a and B2b, are biased towards more recent years in the time series because many of logbooks from the earlier period did not report a target species.

The fishery has undergone changes in gear type during the time period of interest, although these gear changes differ between the winter and summer fishery, and between states (Figure B4a and B4b). The Washington and Oregon winter fisheries have been using rolling trawls almost exclusively since 2000. The California winter fishery switched from primarily groundfish otter trawls to groundfish trawls with a footrope greater than 8 inches between 2002 and 2004. In the summer, both the Washington and Oregon fishery went from a variety of gear types to almost exclusive use of selective flatfish trawl in 2005. Meanwhile the California summer fishery diversified gear in 2002, moving from mostly groundfish otter trawls to a variety of gear types.

The winter fishery is clustered around distinct fishing grounds, which can be demarcated by latitude (Figure B5a), whereas the summer fishery is conducted much more uniformly across latitude (Figure B5b).

***Analytical methods***

CPUE is modeled as pounds per hour using the fishticket-adjusted catch and the skipper's logbook entry of tow duration. All covariates are factors and include year, bimonthly period, port of landing, vessel ID, gear type, and latitude bin (for WA and OR). Depth was not used a covariate because after spatial filtering the depth ranges of the remaining data sets were restricted.

The Delta-Lognormal approach (Maunder & Punt, 2004) was used to standardize the catch and effort data for each season (summer and winter) for each area (Washington, Oregon and California). First, the presence-absence data was analyzed using a logistic model assuming a logit link and binomial error distribution to estimate the probability that a tow caught (and retained) petrale sole. Then the catch and effort data for the positive tows was modeled using a linear model with a log link under the assumption of Gaussian errors to estimate the catch rate given the presence of petrale sole.

The factors considered in the GLMs included year, gear type, vessel ID, port of landing, bimonthly period (summer season only) number of years the vessel had fished and area fished (WA and OR only). For all three states, for both seasons (summer and winter) and for both portions of the model (binomial and lognormal), a base model was fit that included all the main effects. Subsequent models were then fit by removing one main effect at a time, based on the methods of Sampson 1999. Interactions of the covariates with year were explored by fitting models that included all the main effects as well as one year interaction. For the summer data, models with a year:vessel interaction were not fit due to computer memory constraints.

For each state and portion of the model, model selection of which factors to retain as covariates was carried out using the information theoretic approach (Burnham & Anderson, 1998) to determine which submodel was best supported by the data using the Akaiki Information Criterion (AIC, Akaiki, 1974). To determine the final model for each state, the main effects that AIC indicated were important were included and then year interactions were added sequentially in order of the difference in AIC magnitude from the base model with all main effects. At each step, the newest model's AIC was compared to the last model to determine whether that new interaction improved the model's AIC. If not, that interaction term was discarded and the next model was fit. The complete list of models, including which covariates were included and their AIC score is shown in Tables B1 and B2.

The CPUE index was calculated following the methods of Maunder & Punt, 2004 whereas a year effect was estimated from the coefficient for the main effect of year for the binomial and lognormal model fits. In addition, any year interactions were accounted for by a weighted average of the interaction term for each year. For example, year:area interactions were weighted by the area of each latitude bin. Other year interactions varied over time, such as year:vessel. The year:vessel effects were averaged over each year with weights corresponding to how many tows were in the dataset for each vessel that year. Other time-varying year interactions were weighted similarly.

***Main Effects Models CPUE Trends***

The main effects commercial summer CPUE indices show the same general trends in the as the trend from the NWFSC fishery independent survey during the period of overlap (Table B3). In the summer fishery, CPUE generally increased from 1987 through the middle of the past decade, but has decreased in the last few years for all three states. The main effects winter fishery CPUE begins to increase about the year 2000, compared with the early part of the time series (Table B3). While the California and Oregon main effects CPUE indices continue to increase in the last few years, Washington (which has the largest data set of the three states) has declined since 2005. The winter commercial CPUE index from Washington shows a similar trend to the NWFSC summer fishery independent survey index. While the winter fishery has been subject to more consistent spatial management measures than the summer fishery these analyses are unable to capture possible issues with the winter fishery targeting of spawning aggregations and any changes in petrale sole spawning dynamics as the stock size has increased during the late 1990s to mi-2000s.

**References**

Akaiki, H., 1974. A new look at the statistical model identification. IEEE Transaction on Automatic Control, AC-19, 716-723.

Burnham, K.P., and D.R. Anderson. 1998. Model selection and multimodel inference, a practical information-theoretic approach. 2nd ed. Springer, New York.

Maunder, M.M and A.E. Punt. 2004. Standardizing catch and effort data: a review of recent approaches. Fish. Res. 70:141-159.

Sampson, D.B. and Y.W. Lee. 1999. An Assessment of the Stocks of Petrale Sole off Washington, Oregon and Northern California in 1998. In: Status of the Pacific Coast groundfish fishery through 1998 and recommended biological catches for 1994: stock assessment and fishery evaluation. Pacific Fishery Management Council, Portland, OR.

**Tables**

Table B1a. Models fit to WA winter data. Covariates for each model are listed, along with each model's AIC score and the difference between the lowest AIC score.

| WA | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BINOMIAL | | | | | | | | | | | | | |
| Model | AIC | delta AIC | Covariates | | | | | | | | | | Notes |
| 1 | 5235.4 | 51.7 | year | pcid | drvid | grid | lat.b | -- | -- | -- | -- | Full main effects model |
| 2 | 5350.7 | 167.0 | -- | pcid | drvid | grid | lat.b | -- | -- | -- | -- | |
| 3 | 5228.1 | 44.4 | year | -- | drvid | grid | lat.b | -- | -- | -- | -- | |
| 4 | 5390.0 | 206.2 | year | pcid | -- | grid | lat.b | -- | -- | -- | -- | |
| 5 | 5268.1 | 84.4 | year | pcid | drvid | -- | lat.b | -- | -- | -- | -- | |
| 6 | 5242.8 | 59.1 | year | pcid | drvid | grid | -- | -- | -- | -- | -- | |
| 7 | 113330.7 | 108147.0 | year | pcid | drvid | grid | lat.b | year:pcid | -- | -- | -- | Model did not converge |
| 8 | 93754.0 | 88570.3 | year | pcid | drvid | grid | lat.b | -- | year:drvid | -- | -- | Model did not converge |
| 9 | 5218.6 | 34.9 | year | pcid | drvid | grid | lat.b | -- | -- | year:grid | -- | |
| 10 | 5197.9 | 14.2 | year | pcid | drvid | grid | lat.b | -- | -- | -- | year:lat.b | |
| 11 | 5228.1 | 44.4 | year | -- | drvid | grid | lat.b | -- | -- | -- | -- | Selected main effects model |
| 12 | 5191.6 | 7.9 | year | -- | drvid | grid | lat.b | -- | -- | -- | year:lat.b | |
| 13 | 5183.7 | 0.0 | year | -- | drvid | grid | lat.b | -- | -- | year:grid | year:lat.b | Selected final model |
| LOGNORMAL | | | | | | | | | | | | | |
| Model | AIC | delta AIC | Covariates | | | | | | | | | | Notes |
| 1 | 11758.5 | 694.5 | year | pcid | drvid | grid | lat.b | -- | -- | -- | -- | Full main effects model |
| 2 | 12204.1 | 1140.1 | -- | pcid | drvid | grid | lat.b | -- | -- | -- | -- | |
| 3 | 11784.4 | 720.4 | year | -- | drvid | grid | lat.b | -- | -- | -- | -- | |
| 4 | 12214.4 | 1150.4 | year | pcid | -- | grid | lat.b | -- | -- | -- | -- | |
| 5 | 11785.9 | 721.8 | year | pcid | drvid | -- | lat.b | -- | -- | -- | -- | |
| 6 | 11865.5 | 801.5 | year | pcid | drvid | grid | -- | -- | -- | -- | -- | |
| 7 | 11659.6 | 595.5 | year | pcid | drvid | grid | lat.b | year:pcid | -- | -- | -- | |
| 8 | 11135.1 | 71.1 | year | pcid | drvid | grid | lat.b | -- | year:drvid | -- | -- | |
| 9 | 11748.2 | 684.1 | year | pcid | drvid | grid | lat.b | -- | -- | year:grid | -- | |
| 10 | 11741.7 | 677.7 | year | pcid | drvid | grid | lat.b | -- | -- | -- | year:lat.b | |
| 11 | 11758.5 | 694.5 | year | pcid | drvid | grid | lat.b | -- | -- | -- | -- | Selected main effects model |
| 12 | 11135.1 | 71.1 | year | pcid | drvid | grid | lat.b | -- | year:drvid | -- | -- | |
| 13 | 11136.3 | 72.3 | year | pcid | drvid | grid | lat.b | year:pcid | year:drvid | -- | -- | |
| 14 | 11084.8 | 20.8 | year | pcid | drvid | grid | lat.b | -- | year:drvid | -- | year:lat.b | |
| 15 | 11064.0 | 0.0 | year | pcid | drvid | grid | lat.b | -- | year:drvid | year:grid | year:lat.b | Selected final model |

Table B1b. Models fit to OR winter data. Covariates for each model are listed, along with each model's AIC score and the difference between the lowest AIC score.

| OR | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BINOMIAL | | | | | | | | | | | | | |
| Model | AIC | delta AIC | Covariates | | | | | | | | | | Notes |
| 1 | 5707.0 | 20.3 | year | pcid | drvid | grid | lat.b | -- | -- | -- | -- | Full main effects model |
| 2 | 5935.3 | 248.6 | -- | pcid | drvid | grid | lat.b | -- | -- | -- | -- | |
| 3 | 5723.7 | 37.0 | year | -- | drvid | grid | lat.b | -- | -- | -- | -- | |
| 4 | 6031.2 | 344.5 | year | pcid | -- | grid | lat.b | -- | -- | -- | -- | |
| 5 | 5703.5 | 16.8 | year | pcid | drvid | -- | lat.b | -- | -- | -- | -- | |
| 6 | 5795.7 | 109.0 | year | pcid | drvid | grid | -- | -- | -- | -- | -- | |
| 7 | 122866.2 | 117179.6 | year | pcid | drvid | grid | lat.b | year:pcid | -- | -- | -- | Model did not converge |
| 8 | 95429.7 | 89743.0 | year | pcid | drvid | grid | lat.b | -- | year:drvid | -- | -- | Model did not converge |
| 9 | 5690.0 | 3.3 | year | pcid | drvid | grid | lat.b | -- | -- | year:grid | -- | |
| 10 | 5686.7 | 0.0 | year | pcid | drvid | grid | lat.b | -- | -- | -- | year:lat.b | |
| 11 | 5707.0 | 20.3 | year | pcid | drvid | grid | lat.b | -- | -- | -- | -- | Selected main effects model |
| 12 | 5686.7 | 0.0 | year | -- | drvid | grid | lat.b | -- | -- | -- | year:lat.b | Selected final model |
| 13 | 117331.6 | 111644.9 | year | -- | drvid | grid | lat.b | -- | -- | year:grid | year:lat.b | Model did not converge |
| LOGNORMAL | | | | | | | | | | | | | |
| Model | AIC | delta AIC | Covariates | | | | | | | | | | Notes |
| 1 | 15667.7 | 1166.3 | year | pcid | drvid | grid | lat.b | -- | -- | -- | -- | Full main effects model |
| 2 | 16388.6 | 1887.2 | -- | pcid | drvid | grid | lat.b | -- | -- | -- | -- | |
| 3 | 15674.6 | 1173.2 | year | -- | drvid | grid | lat.b | -- | -- | -- | -- | |
| 4 | 15960.7 | 1459.2 | year | pcid | -- | grid | lat.b | -- | -- | -- | -- | |
| 5 | 15704.0 | 1202.6 | year | pcid | drvid | -- | lat.b | -- | -- | -- | -- | |
| 6 | 15699.4 | 1198.0 | year | pcid | drvid | grid | -- | -- | -- | -- | -- | |
| 7 | 15242.5 | 741.1 | year | pcid | drvid | grid | lat.b | year:pcid | -- | -- | -- | |
| 8 | 14542.2 | 40.8 | year | pcid | drvid | grid | lat.b | -- | year:drvid | -- | -- | |
| 9 | 15565.2 | 1063.8 | year | pcid | drvid | grid | lat.b | -- | -- | year:grid | -- | |
| 10 | 15558.6 | 1057.2 | year | pcid | drvid | grid | lat.b | -- | -- | -- | year:lat.b | |
| 11 | 15667.7 | 1166.3 | year | pcid | drvid | grid | lat.b | -- | -- | -- | -- | Selected main effects model |
| 12 | 14542.2 | 40.8 | year | pcid | drvid | grid | lat.b | -- | year:drvid | -- | -- | |
| 13 | 14547.1 | 45.7 | year | pcid | drvid | grid | lat.b | year:pcid | year:drvid | -- | -- | |
| 14 | 14548.3 | 46.9 | year | pcid | drvid | grid | lat.b | -- | year:drvid | -- | year:lat.b | |
| 15 | 14501.4 | 0.0 | year | pcid | drvid | grid | lat.b | -- | year:drvid | year:grid | -- | Selected final model |

Table B1c. Models fit to CA winter data. Covariates for each model are listed, along with each model's AIC score and the difference between the lowest AIC score.

| CA | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BINOMIAL | | | | | | | | | | | | |
| Model | AIC | delta AIC | Covariates | | | | | | | | | Notes |
| 1 | 2482.3 | 5.0 | year | pcid | drvid | grid | NA | -- | -- | -- | NA | Full main effects model |
| 2 | 2508.3 | 31.1 | -- | pcid | drvid | grid | NA | -- | -- | -- | NA | |
| 3 | 2480.0 | 2.7 | year | -- | drvid | grid | NA | -- | -- | -- | NA | |
| 4 | 2585.4 | 108.1 | year | pcid | -- | grid | NA | -- | -- | -- | NA | |
| 5 | 2479.8 | 2.5 | year | pcid | drvid | -- | NA | -- | -- | -- | NA | |
| 6 | 42783.2 | 40306.0 | year | pcid | drvid | grid | NA | year:pcid | -- | -- | NA | |
| 7 | 31793.4 | 29316.1 | year | pcid | drvid | grid | NA | -- | year:drvid | -- | NA | |
| 8 | 42176.7 | 39699.5 | year | pcid | drvid | grid | NA | -- | -- | year:grid | NA | |
| 9 | 2479.8 | 2.5 | year | pcid | drvid | -- | NA | -- | -- | -- | NA | |
| 10 | 2477.3 | 0.0 | year | -- | drvid | -- | NA | -- | -- | -- | NA | Selected final model |
| LOGNORMAL | | | | | | | | | | | | |
| Model | AIC | delta AIC | Covariates | | | | | | | | | Notes |
| 1 | 6706.8 | 361.3 | year | pcid | drvid | grid | NA | -- | -- | -- | NA | Full main effects model |
| 2 | 6918.5 | 572.9 | -- | pcid | drvid | grid | NA | -- | -- | -- | NA | |
| 3 | 6728.0 | 382.4 | year | -- | drvid | grid | NA | -- | -- | -- | NA | |
| 4 | 6996.8 | 651.2 | year | pcid | -- | grid | NA | -- | -- | -- | NA | |
| 5 | 6711.4 | 365.9 | year | pcid | drvid | -- | NA | -- | -- | -- | NA | |
| 6 | 6566.1 | 220.6 | year | pcid | drvid | grid | NA | year:pcid | -- | -- | NA | |
| 7 | 6357.5 | 11.9 | year | pcid | drvid | grid | NA | -- | year:drvid | -- | NA | |
| 8 | 6715.2 | 369.7 | year | pcid | drvid | grid | NA | -- | -- | year:grid | NA | |
| 9 | 6706.8 | 361.3 | year | pcid | drvid | grid | NA | -- | -- | -- | NA | Selected main effects model |
| 10 | 6357.5 | 11.9 | year | pcid | drvid | grid | NA | -- | year:drvid | -- | NA | |
| 11 | 6345.5 | 0.0 | year | pcid | drvid | grid | NA | year:pcid | year:drvid | -- | NA | Selected final model |

Table B2a. Models fit to WA summer data. Covariates for each model are listed, along with each model's AIC score and the difference between the lowest AIC score.

| **WA** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BINOMIAL | | | | | | | | | | | | | |
| Model | AIC | delta AIC | Covariates | | | | | | | | | | Notes |
| 1 | 92933.4 | 1615.3 | year | bimonth | pcid | drvid | grid | lat.b | -- | -- | -- | -- | Full main effects model |
| 2 | 95122.6 | 3804.5 | -- | bimonth | pcid | drvid | grid | lat.b | -- | -- | -- | -- | |
| 3 | 92944.4 | 1626.3 | year | -- | pcid | drvid | grid | lat.b | -- | -- | -- | -- | |
| 4 | 93113.6 | 1795.5 | year | bimonth | -- | drvid | grid | lat.b | -- | -- | -- | -- | |
| 5 | 97143.8 | 5825.7 | year | bimonth | pcid | -- | grid | lat.b | -- | -- | -- | -- | |
| 6 | 93960.4 | 2642.3 | year | bimonth | pcid | drvid | -- | lat.b | -- | -- | -- | -- | |
| 7 | 92931.6 | 1613.6 | year | bimonth | pcid | drvid | grid | -- | -- | -- | -- | -- | |
| 8 | 92374.4 | 1056.4 | year | bimonth | pcid | drvid | grid | lat.b | year: bimonth | -- | -- | -- | |
| 9 | 91624.7 | 306.6 | year | bimonth | pcid | drvid | grid | lat.b | -- | year: pcid | -- | -- | |
| 10 | 92331.1 | 1013.0 | year | bimonth | pcid | drvid | grid | lat.b | -- | -- | year: grid | -- | |
| 11 | 92676.7 | 1358.6 | year | bimonth | pcid | drvid | grid | lat.b | -- | -- | -- | year: lat.b | |
| 12 | 2196058.8 | 2104740.7 | year | bimonth | pcid | drvid | grid | lat.b | -- | year: pcid | year: grid | -- | Model did not converge |
| 13 | 91318.1 | 0.0 | year | bimonth | pcid | drvid | grid | lat.b | -- | year: pcid | -- | year: lat.b | Selected final model |
| LOGNORMAL | | | | | | | | | | | | | |
| Model | AIC | delta AIC | Covariates | | | | | | | | | | Notes |
| 1 | 172037.1 | 3725.9 | year | bimonth | pcid | drvid | grid | lat.b | -- | -- | -- | -- | Full main effects model |
| 2 | 176148.6 | 7837.4 | -- | bimonth | pcid | drvid | grid | lat.b | -- | -- | -- | -- | |
| 3 | 172181.9 | 3870.7 | year | -- | pcid | drvid | grid | lat.b | -- | -- | -- | -- | |
| 4 | 172389.6 | 4078.4 | year | bimonth | -- | drvid | grid | lat.b | -- | -- | -- | -- | |
| 5 | 177896.0 | 9584.8 | year | bimonth | pcid | -- | grid | lat.b | -- | -- | -- | -- | |
| 6 | 173822.1 | 5510.9 | year | bimonth | pcid | drvid | -- | lat.b | -- | -- | -- | -- | |
| 7 | 172035.2 | 3724.0 | year | bimonth | pcid | drvid | grid | -- | -- | -- | -- | -- | |
| 8 | 171388.7 | 3077.5 | year | bimonth | pcid | drvid | grid | lat.b | year: bimonth | -- | -- | -- | |
| 9 | 169627.6 | 1316.4 | year | bimonth | pcid | drvid | grid | lat.b | -- | year: pcid | -- | -- | |
| 10 | 171223.2 | 2912.0 | year | bimonth | pcid | drvid | grid | lat.b | -- | -- | year: grid | -- | |
| 11 | 171601.6 | 3290.4 | year | bimonth | pcid | drvid | grid | lat.b | -- | -- | -- | year: lat.b | |
| 12 | 169214.8 | 903.6 | year | bimonth | pcid | drvid | grid | lat.b | -- | year: pcid | year: grid | -- | |
| 13 | 168563.5 | 252.3 | year | bimonth | pcid | drvid | grid | lat.b | year: bimonth | year: pcid | year: grid | -- | |
| 14 | 168311.2 | 0.0 | year | bimonth | pcid | drvid | grid | lat.b | year: bimonth | year: pcid | year: grid | year: lat.b | Selected final model |

Table B2b. Models fit to OR summer data. Covariates for each model are listed, along with each model's AIC score and the difference between the lowest AIC score.

| OR | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BINOMIAL | | | | | | | | | | | | | |
| Model | AIC | delta AIC | Covariates | | | | | | | | | | Notes |
| 1 | 15444.7 | 219.7 | year | bimonth | pcid | drvid | grid | lat.b | -- | -- | -- | -- | Full main effects model |
| 2 | 16098.7 | 873.7 | -- | bimonth | pcid | drvid | grid | lat.b | -- | -- | -- | -- | |
| 3 | 15493.4 | 268.4 | year | -- | pcid | drvid | grid | lat.b | -- | -- | -- | -- | |
| 4 | 15457.9 | 232.9 | year | bimonth | -- | drvid | grid | lat.b | -- | -- | -- | -- | |
| 5 | 16629.5 | 1404.5 | year | bimonth | pcid | -- | grid | lat.b | -- | -- | -- | -- | |
| 6 | 15470.1 | 245.1 | year | bimonth | pcid | drvid | -- | lat.b | -- | -- | -- | -- | |
| 7 | 15442.9 | 217.9 | year | bimonth | pcid | drvid | grid | -- | -- | -- | -- | -- | |
| 8 | 15342.9 | 117.9 | year | bimonth | pcid | drvid | grid | lat.b | year: bimonth | -- | -- | -- | |
| 9 | 309059.6 | 293834.6 | year | bimonth | pcid | drvid | grid | lat.b | -- | year: pcid | -- | -- | Model did not converge |
| 10 | 315265.3 | 300040.3 | year | bimonth | pcid | drvid | grid | lat.b | -- | -- | year: grid | -- | Model did not converge |
| 11 | 15303.3 | 78.3 | year | bimonth | pcid | drvid | grid | lat.b | -- | -- | -- | year: lat.b | |
| 12 | 15225.0 | 0.0 | year | bimonth | pcid | drvid | grid | lat.b | year: bimonth | -- | -- | year: lat.b | Selected final model |
| LOGNORMAL | | | | | | | | | | | | | |
| Model | AIC | delta AIC | Covariates | | | | | | | | | | Notes |
| 1 | 54412.0 | 1208.9 | year | bimonth | pcid | drvid | grid | lat.b | -- | -- | -- | -- | Full main effects model |
| 2 | 56549.5 | 3346.4 | -- | bimonth | pcid | drvid | grid | lat.b | -- | -- | -- | -- | |
| 3 | 54450.7 | 1247.6 | year | -- | pcid | drvid | grid | lat.b | -- | -- | -- | -- | |
| 4 | 54502.9 | 1299.7 | year | bimonth | -- | drvid | grid | lat.b | -- | -- | -- | -- | |
| 5 | 57411.8 | 4208.7 | year | bimonth | pcid | -- | grid | lat.b | -- | -- | -- | -- | |
| 6 | 54795.3 | 1592.1 | year | bimonth | pcid | drvid | -- | lat.b | -- | -- | -- | -- | |
| 7 | 54419.5 | 1216.4 | year | bimonth | pcid | drvid | grid | -- | -- | -- | -- | -- | |
| 8 | 54201.7 | 998.6 | year | bimonth | pcid | drvid | grid | lat.b | year: bimonth | -- | -- | -- | |
| 9 | 53756.1 | 553.0 | year | bimonth | pcid | drvid | grid | lat.b | -- | year: pcid | -- | -- | |
| 10 | 54067.8 | 864.7 | year | bimonth | pcid | drvid | grid | lat.b | -- | -- | year: grid | -- | |
| 11 | 54211.0 | 1007.9 | year | bimonth | pcid | drvid | grid | lat.b | -- | -- | -- | year: lat.b | |
| 12 | 53440.6 | 237.5 | year | bimonth | pcid | drvid | grid | lat.b | -- | year: pcid | year: grid | -- | |
| 13 | 53255.9 | 52.8 | year | bimonth | pcid | drvid | grid | lat.b | year: bimonth | year: pcid | year: grid | -- | |
| 14 | 53203.1 | 0.0 | year | bimonth | pcid | drvid | grid | lat.b | year: bimonth | year: pcid | year: grid | year: lat.b | Selected final model |

Table B2c. Models fit to CA summer data. Covariates for each model are listed, along with each model's AIC score and the difference between the lowest AIC score.

| **CA** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BINOMIAL | | | | | | | | | | | | | |
| Model | AIC | delta AIC | Covariates | | | | | | | | | | Notes |
| 1 | 12080.1 | 293.7 | year | bimonth | pcid | drvid | grid | NA | -- | -- | -- | NA | Full main effects model |
| 2 | 12293.7 | 507.3 | -- | bimonth | pcid | drvid | grid | NA | -- | -- | -- | NA | |
| 3 | 12078.4 | 292.0 | year | -- | pcid | drvid | grid | NA | -- | -- | -- | NA | |
| 4 | 12159.9 | 373.5 | year | bimonth | -- | drvid | grid | NA | -- | -- | -- | NA | |
| 5 | 13679.0 | 1892.6 | year | bimonth | pcid | -- | grid | NA | -- | -- | -- | NA | |
| 6 | 12088.6 | 302.2 | year | bimonth | pcid | drvid | -- | NA | -- | -- | -- | NA | |
| 7 | 12020.9 | 234.5 | year | bimonth | pcid | drvid | grid | NA | year: bimonth | -- | -- | NA | |
| 8 | 11849.0 | 62.6 | year | bimonth | pcid | drvid | grid | NA | -- | year: pcid | -- | NA | |
| 9 | 253730.8 | 241944.4 | year | bimonth | pcid | drvid | grid | NA | -- | -- | year: grid | NA | Model did not converge |
| 10 | 11786.4 | 0.0 | year | bimonth | pcid | drvid | -- | NA | year: bimonth | year: pcid | -- | NA | Selected final model |
| LOGNORMAL | | | | | | | | | | | | | |
| Model | AIC | delta AIC | Covariates | | | | | | | | | | Notes |
| 1 | 46698.5 | 887.3 | year | bimonth | pcid | drvid | grid | NA | -- | -- | -- | NA | Full main effects model |
| 2 | 49252.2 | 3441.0 | -- | bimonth | pcid | drvid | grid | NA | -- | -- | -- | NA | |
| 3 | 46747.3 | 936.1 | year | -- | pcid | drvid | grid | NA | -- | -- | -- | NA | |
| 4 | 46829.0 | 1017.8 | year | bimonth | -- | drvid | grid | NA | -- | -- | -- | NA | |
| 5 | 47899.7 | 2088.5 | year | bimonth | pcid | -- | grid | NA | -- | -- | -- | NA | |
| 6 | 46742.5 | 931.3 | year | bimonth | pcid | drvid | -- | NA | -- | -- | -- | NA | |
| 7 | 46450.5 | 639.3 | year | bimonth | pcid | drvid | grid | NA | year: bimonth | -- | -- | NA | |
| 8 | 46195.0 | 383.8 | year | bimonth | pcid | drvid | grid | NA | -- | year: pcid | -- | NA | |
| 9 | 46630.3 | 819.1 | year | bimonth | pcid | drvid | grid | NA | -- | -- | year: grid | NA | |
| 10 | 45913.5 | 102.3 | year | bimonth | pcid | drvid | grid | NA | year: bimonth | year: pcid | -- | NA | |
| 11 | 45811.2 | 0.0 | year | bimonth | pcid | drvid | grid | NA | year: bimonth | year: pcid | year: grid | NA | Selected final model |

Table B3. CPUE indices summer and winter for the main effects models for the data sets that remove tows with the lowest 10% of the catch rates.

| | Summer | | | Winter | | |
|---|---|---|---|---|---|---|
| Year | WA | OR | CA | WA | OR | CA |
| 1987 | 38.8 | 7.4 | 2.8 | 1,998.8 | 176.7 | |
| 1988 | 33.2 | 10.4 | 1.5 | 1,490.5 | 112.0 | 38.1 |
| 1989 | 24.6 | 13.1 | 2.7 | 1,101.4 | 153.8 | 30.4 |
| 1990 | 25.6 | 11.0 | 2.2 | 912.3 | 107.1 | 84.8 |
| 1991 | 15.2 | 7.2 | 2.5 | 798.4 | 128.8 | 68.9 |
| 1992 | 13.6 | 9.0 | 2.4 | 836.1 | 118.4 | 41.3 |
| 1993 | 14.5 | 7.1 | 1.6 | 556.2 | 88.5 | 52.9 |
| 1994 | 17.3 | 9.3 | 1.3 | 464.4 | 80.5 | 46.2 |
| 1995 | 33.6 | 12.2 | 1.7 | 603.4 | 157.8 | 33.7 |
| 1996 | 38.1 | 7.9 | 1.8 | 618.0 | 194.3 | 59.6 |
| 1997 | 43.8 | 11.9 | 2.1 | 346.9 | 347.4 | 54.6 |
| 1998 | 62.0 | 9.7 | 1.1 | 1,023.8 | 173.2 | 37.6 |
| 1999 | 56.5 | 15.9 | 1.8 | 613.5 | 252.0 | 77.2 |
| 2000 | 118.5 | 23.3 | 1.7 | 1,575.8 | 227.4 | 90.2 |
| 2001 | 66.9 | 29.2 | 3.0 | 1,958.0 | 474.2 | 80.5 |
| 2002 | 71.2 | 29.0 | 3.4 | 3,039.9 | 529.6 | 78.9 |
| 2003 | 117.1 | 49.7 | 3.0 | 2,626.8 | 487.6 | 91.4 |
| 2004 | 154.9 | 62.0 | 16.8 | 6,626.1 | 946.2 | 230.5 |
| 2005 | 140.2 | 128.4 | 46.7 | 9,072.6 | 925.2 | 196.6 |
| 2006 | 110.0 | 191.2 | 23.2 | 11,036.0 | 956.5 | 245.1 |
| 2007 | 122.2 | 123.8 | 29.3 | 5,117.6 | 1,130.9 | 351.0 |
| 2008 | 95.8 | 104.8 | 43.3 | 5,891.9 | 1,052.2 | 424.1 |
| 2009 | 89.8 | 113.2 | 8.9 | 4,151.1 | 1,206.6 | 411.0 |

**Figures**

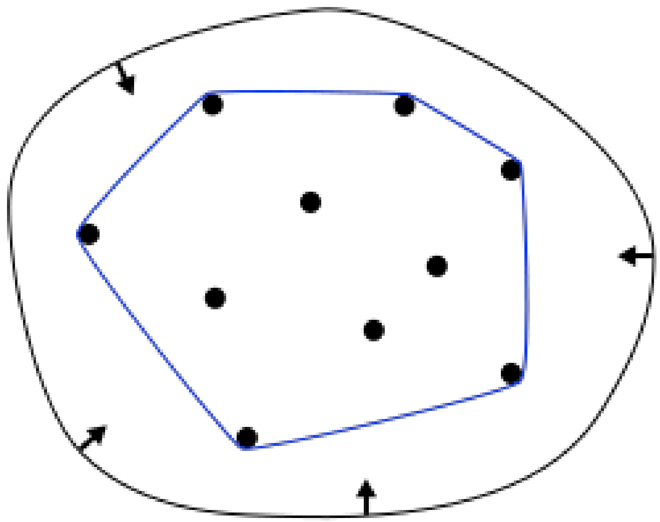


Figure B1. Example of a convex hull for a set of points. The curved outer line shows a conceptual elastic band contracting around a set of points. Image source: Wikipedia, “Convex hull”.

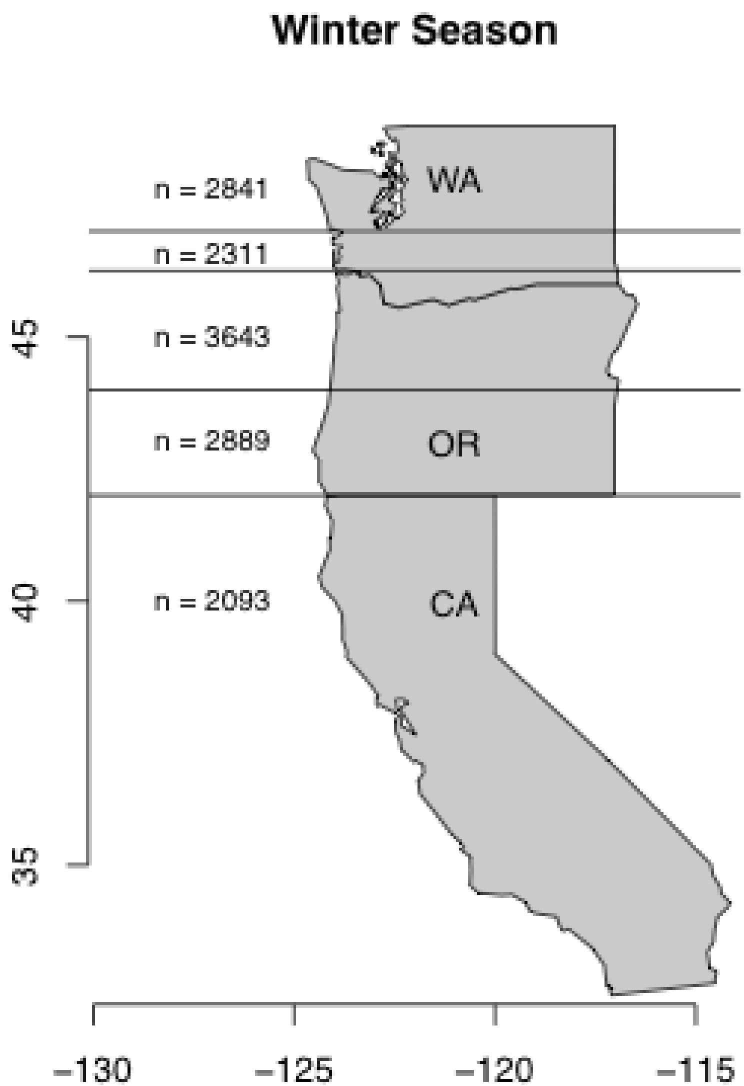



Figure B2a. Map showing how latitude bins were defined and the number of tows that were in each latitude bin for the winter data.

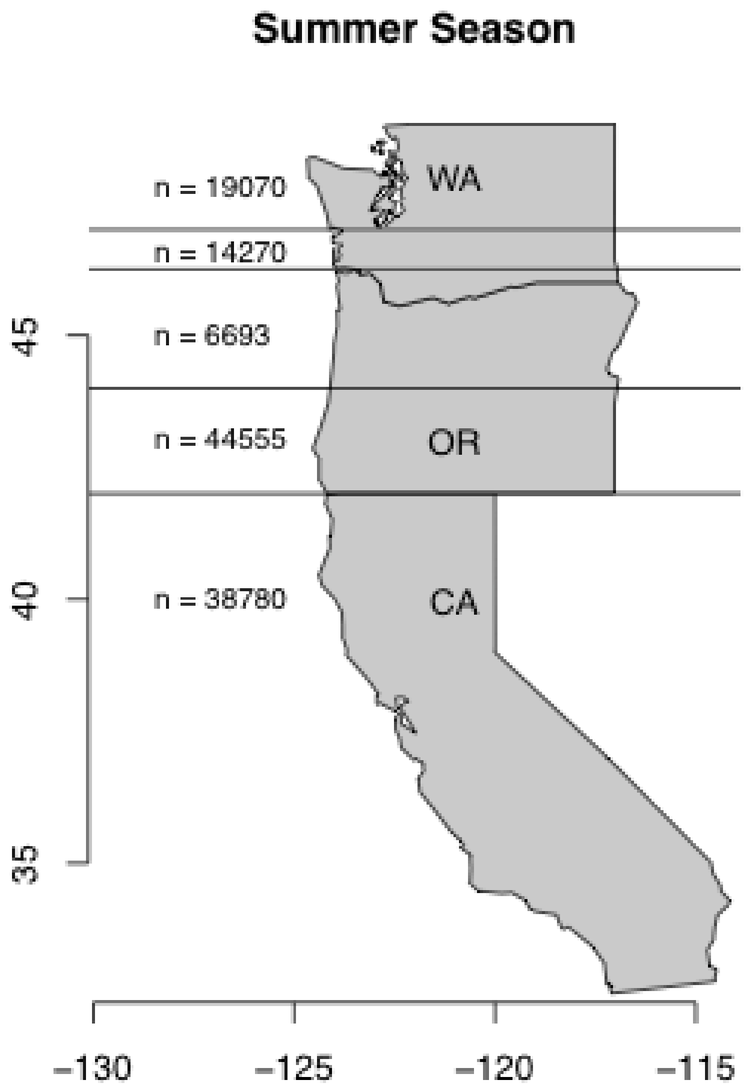



Figure B2b. Map showing how latitude bins were defined and the number of tows that were in each latitude bin for the summer data.

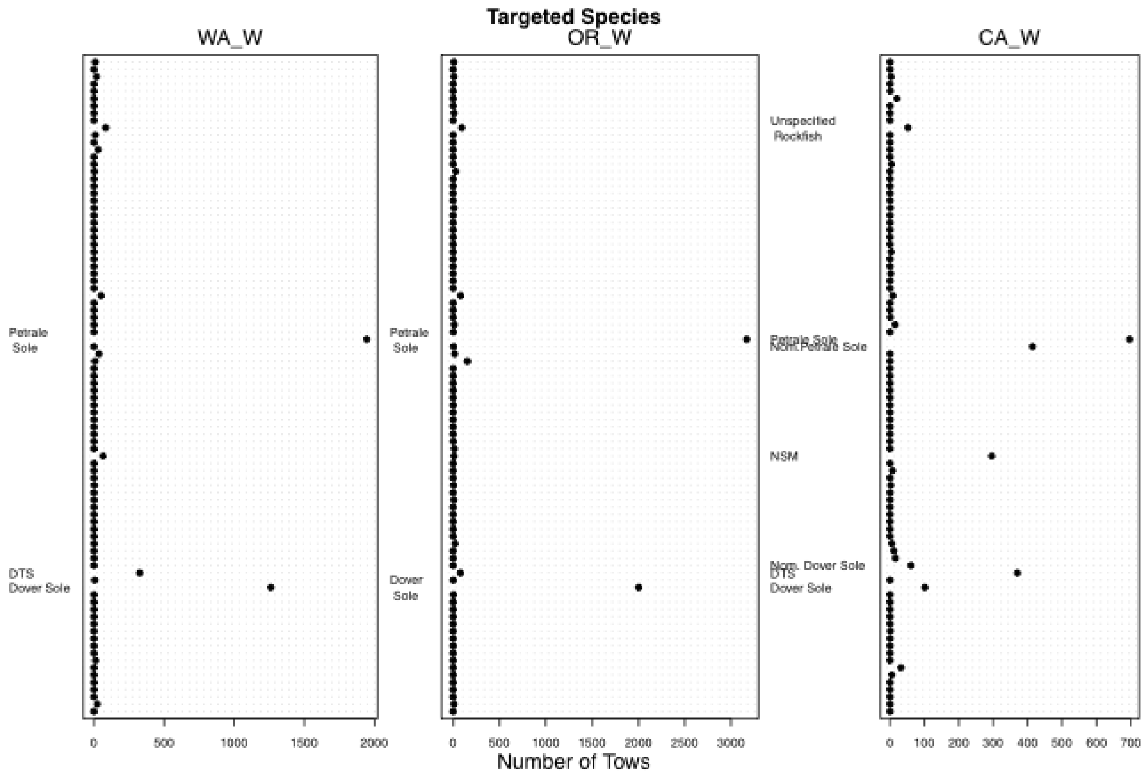



Figure B3a. Targeted species for tows where logbook reported targeted species for winter season.

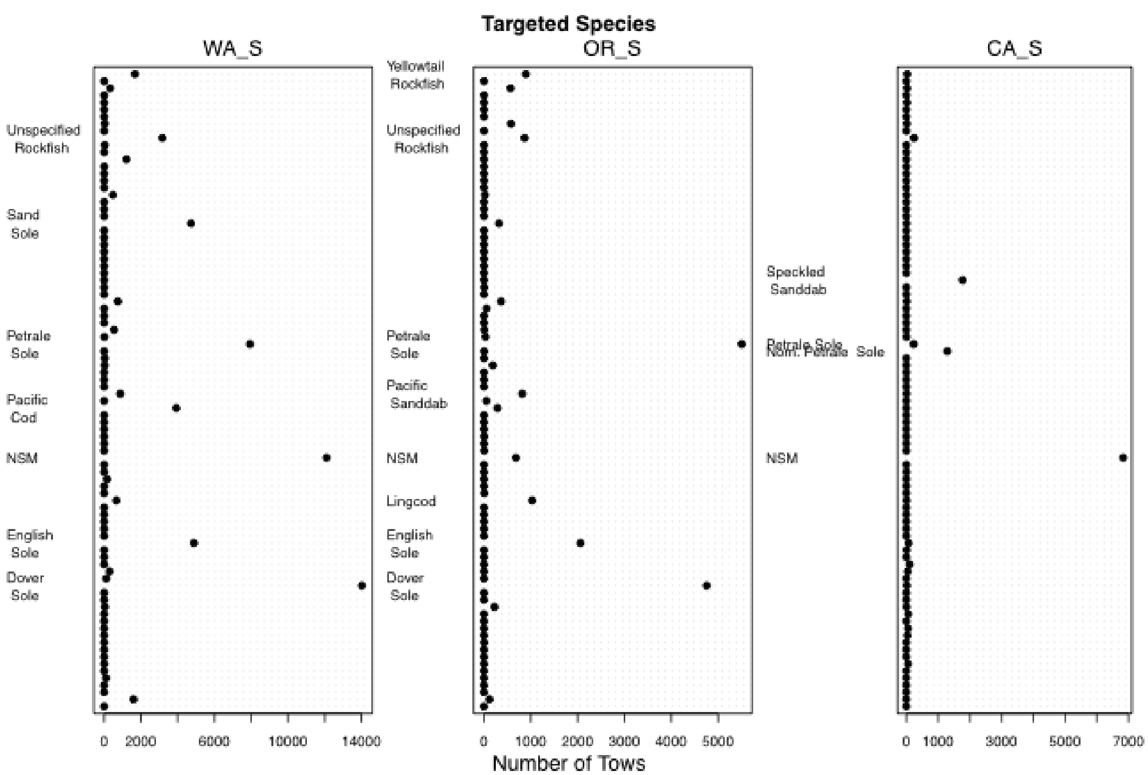


Figure B3b. Targeted species for tows where logbook reported targeted species for summer season.

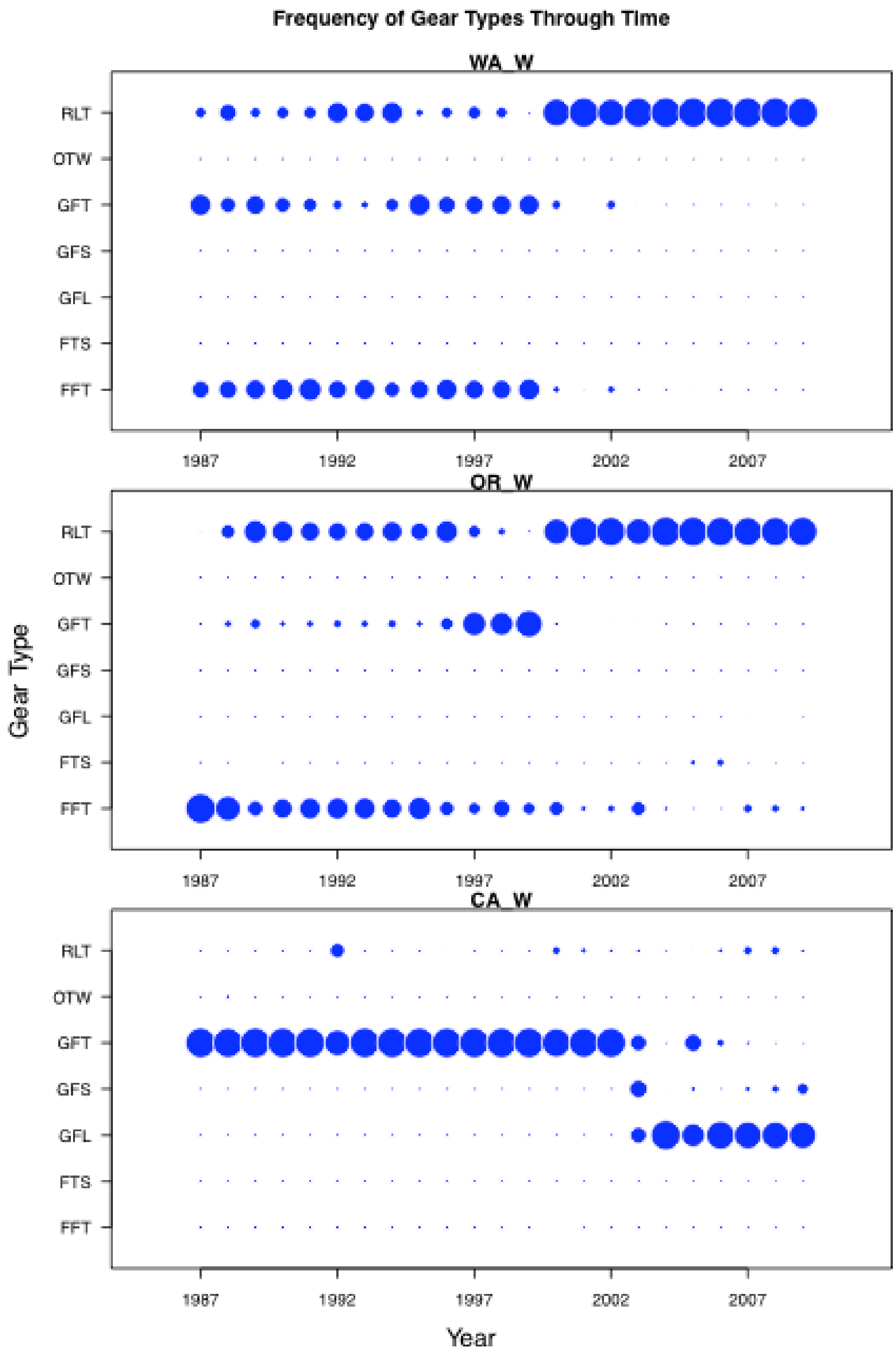


Figure B4a. Frequency of gear used over time for winter season, by state. The size of the circles corresponds to the percentage of tows in each year that used each gear type. RLT – roller trawl, OTW – other trawl gear, GFT – groundfish trawl (otter), GFS – groundfish trawl (footrope < 8in), GFL – groundfish trawl (footrope > 8in), FTS – selective flatfish trawl (small footrope), FFT – flatfish trawl.

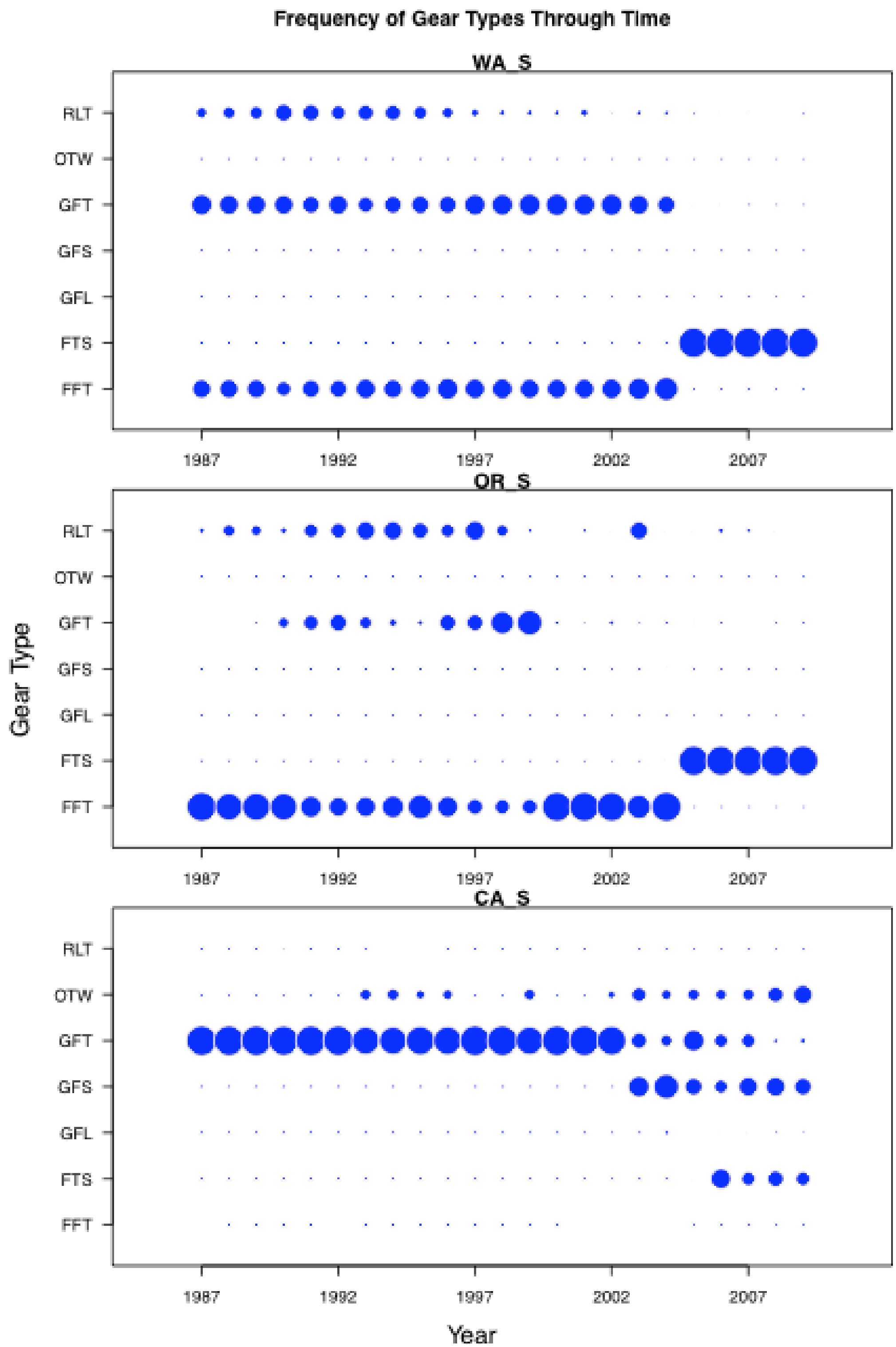


Figure B4b. Frequency of gear used over time for summer season, by state. The size of the circles corresponds to the percentage of tows in each year that used each gear type. RLT – roller trawl, OTW – other trawl gear, GFT – groundfish trawl (otter), GFS – groundfish trawl (footrope < 8in), GFL – groundfish trawl (footrope > 8in), FTS – selective flatfish trawl (small footrope), FFT – flatfish trawl.

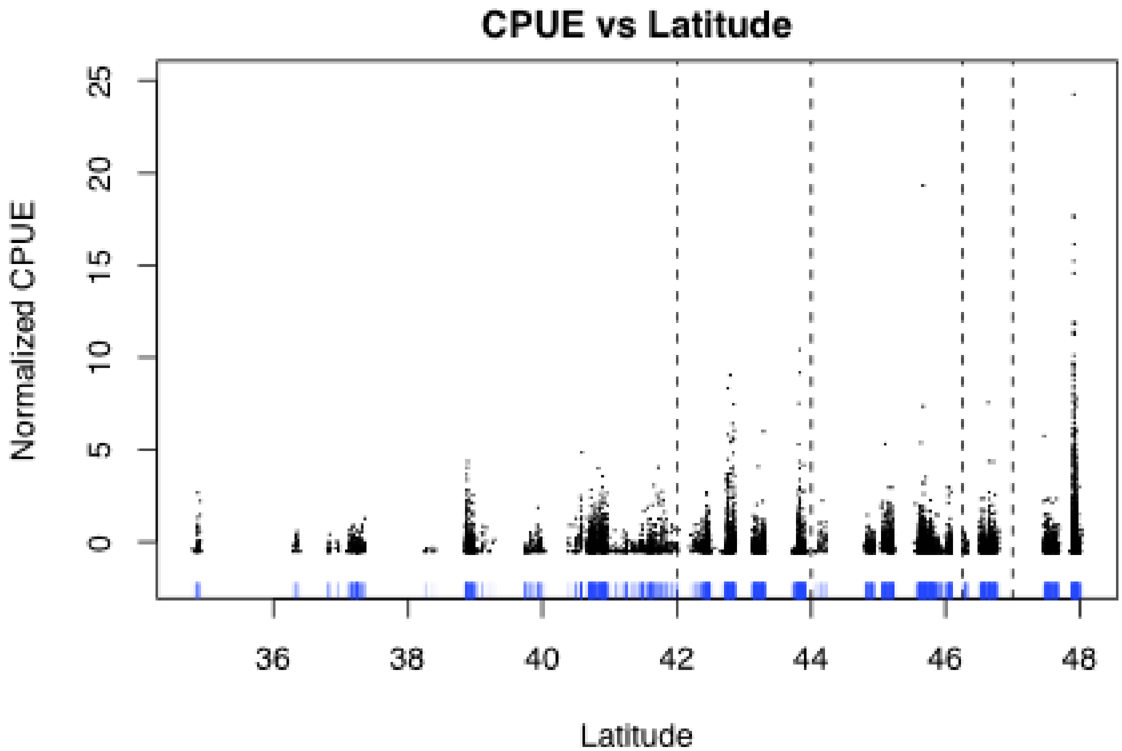


Figure B5a. Plot of winter season CPUE normalized to have a mean of 0 and a standard deviation of 1 against latitude of tows. Dashed lines show boundaries of latitude bins. The blue rug histogram provides additional information about the frequency of tows across latitude.

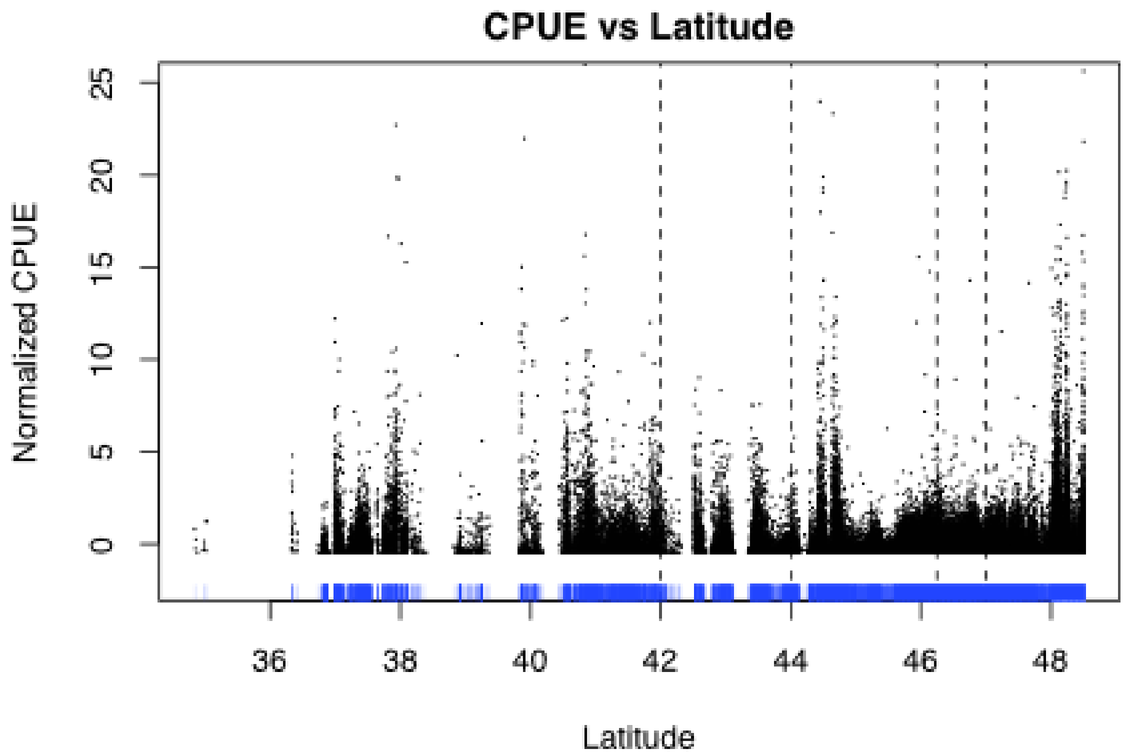



Figure B5b. Plot of summer season CPUE normalized to have a mean of 0 and a standard deviation of 1 against latitude of tows. Dashed lines show boundaries of latitude bins. The blue rug histogram provides additional information about the frequency of tows across latitude.

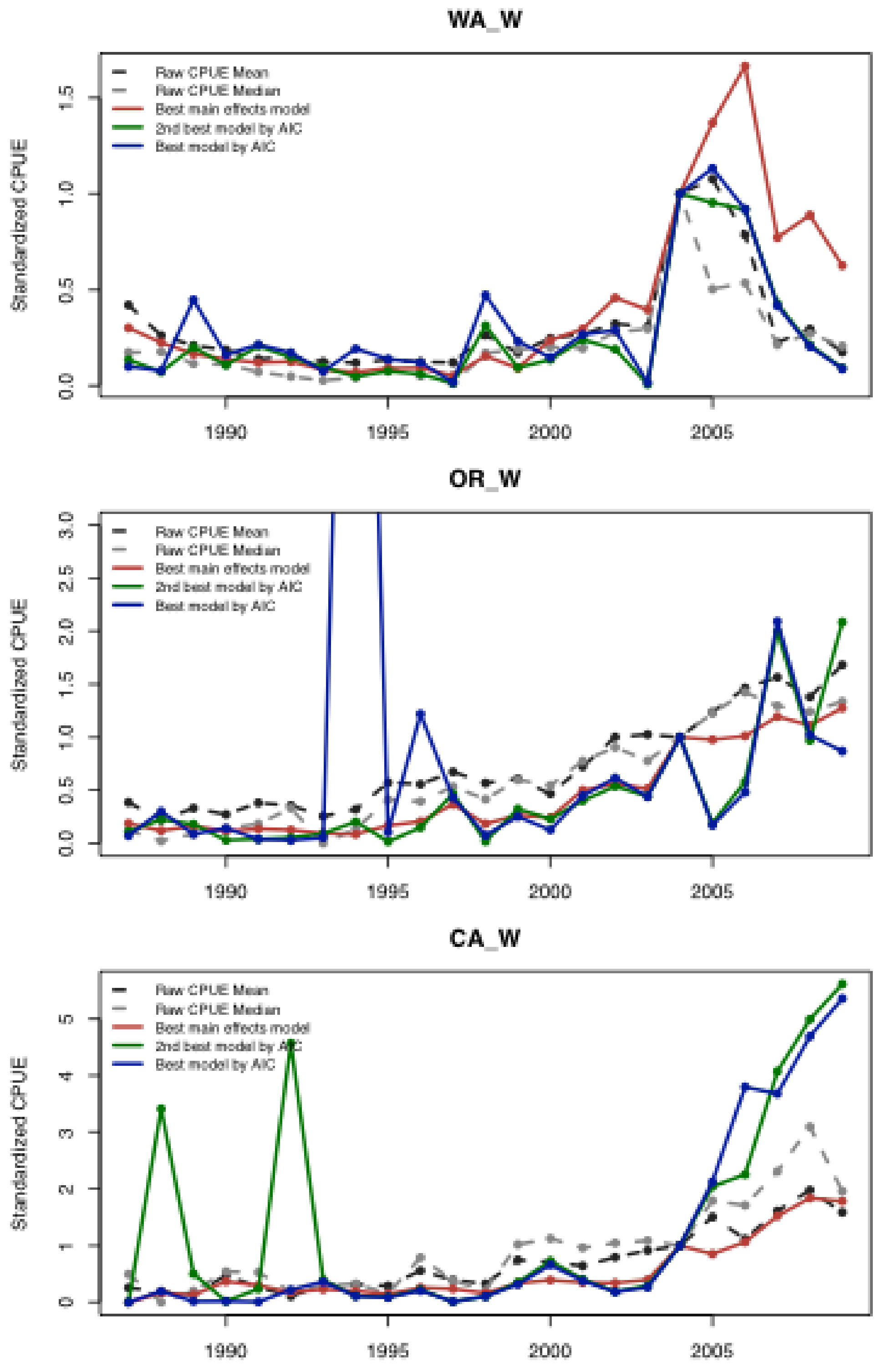



Figure B6a. Winter  CPUE indices, standardized to 2004. The mean and median of the CPUE data for each year is plotted in two shades of gray with dashed lines.

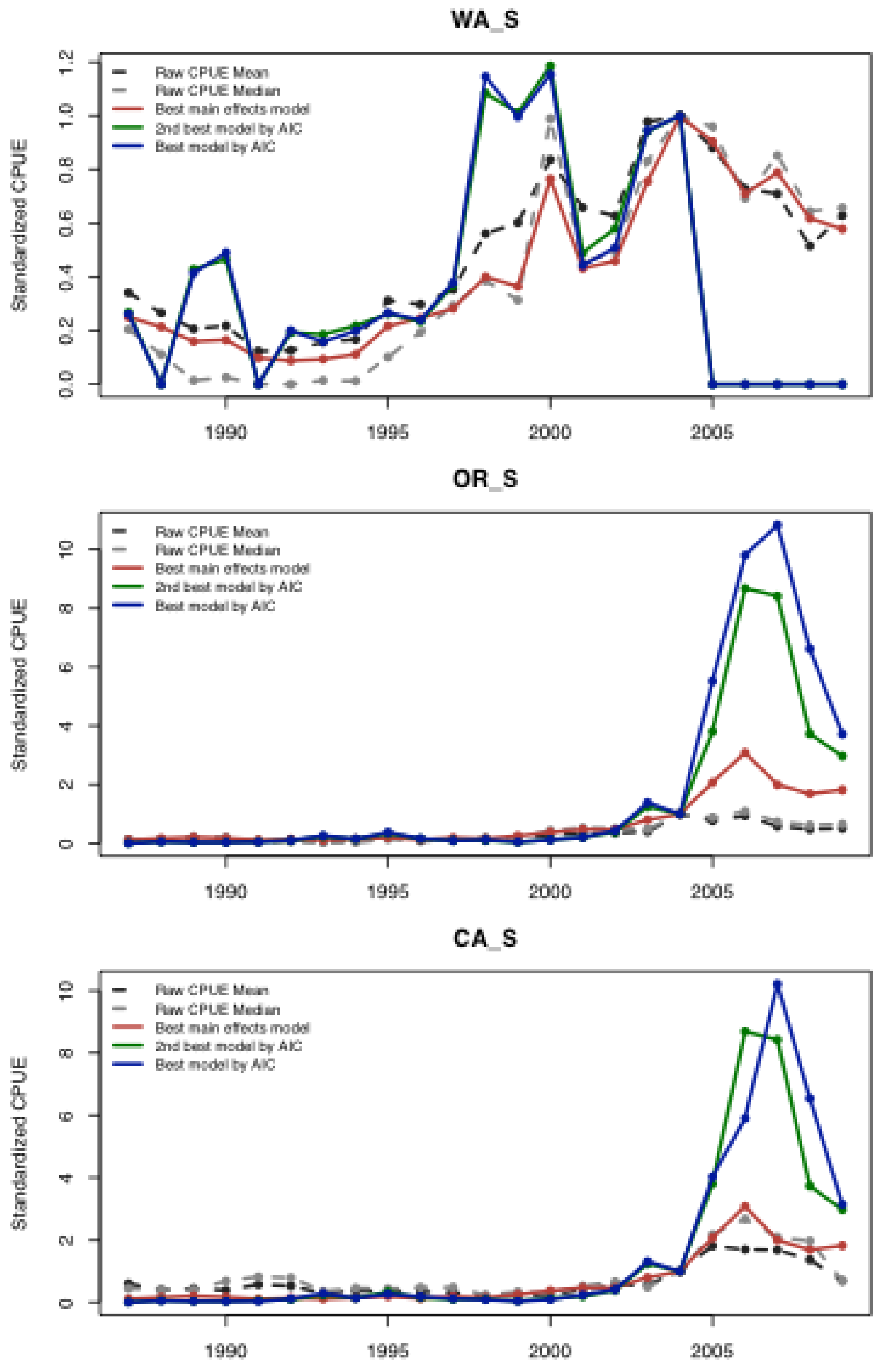



Figure B6b. Summer CPUE indices, standardized to 2004. The mean and median of the CPUE data for each year is plotted in two shades of gray with dashed lines.

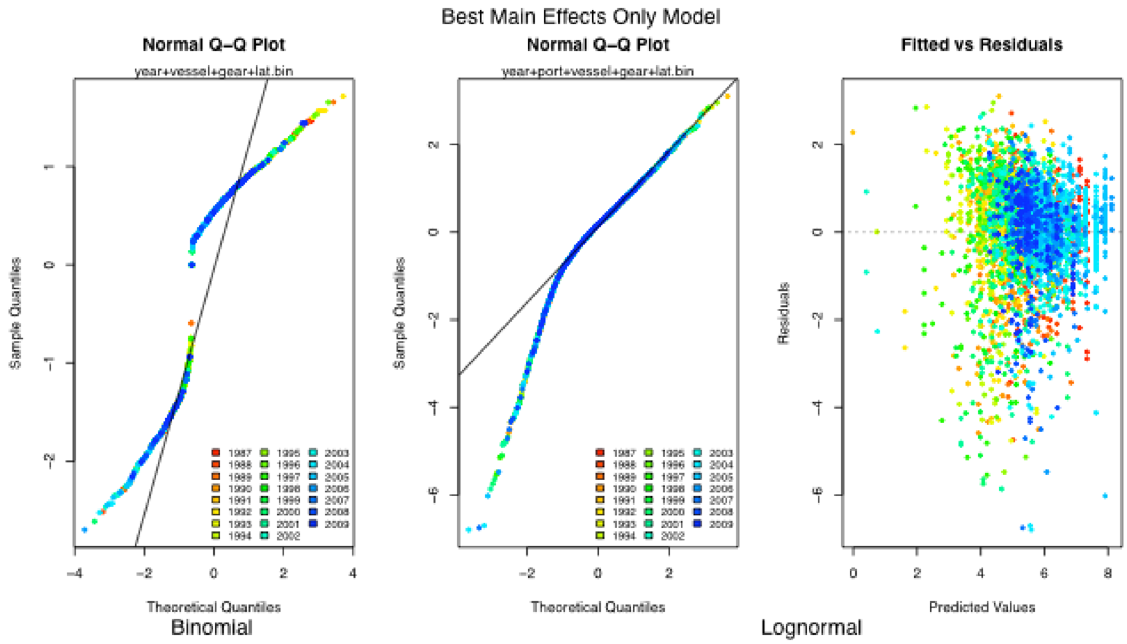



Figure B7a. Residual plots for model components in “Best main effects models” in Figure B6a for WA. From left to right: the Q-Q plot of the binomial model, the Q-Q plot of the lognormal model and the fitted vs. residual plot of the lognormal model. All plots are color coded by year. The terms included in each model are listed above the Q-Q plots.

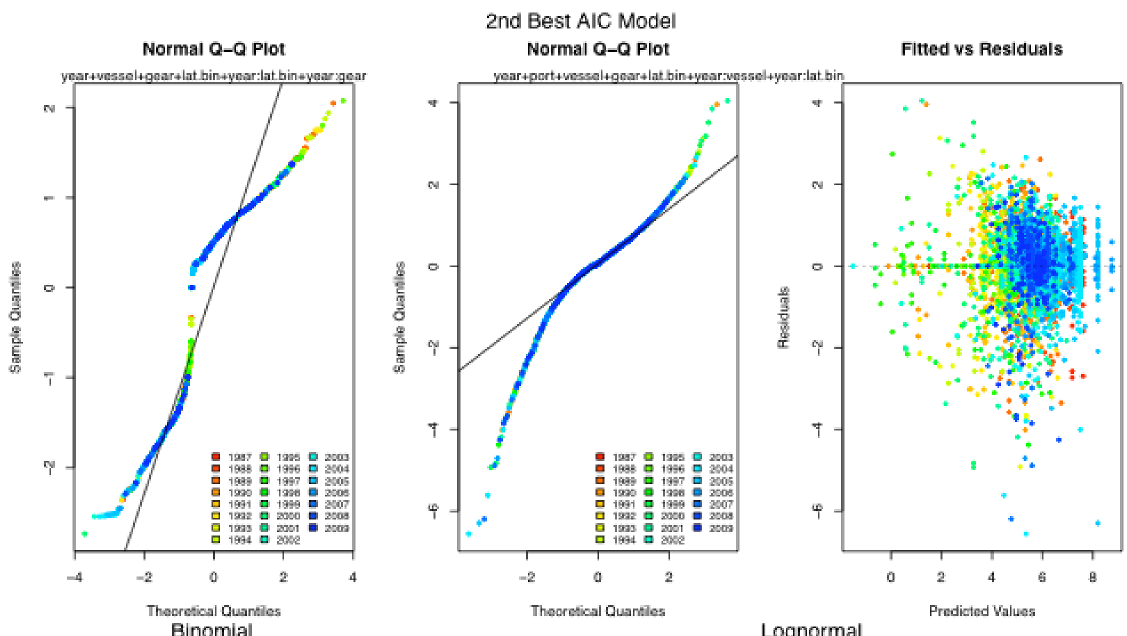



Figure B7b. Residual plots for model components in “2$^{nd}$ best model by AIC” in Figure B6a for WA. From left to right: the Q-Q plot of the binomial model, the Q-Q plot of the lognormal model and the fitted vs. residual plot of the lognormal model. All plots are color coded by year. The terms included in each model are listed above the Q-Q plots.

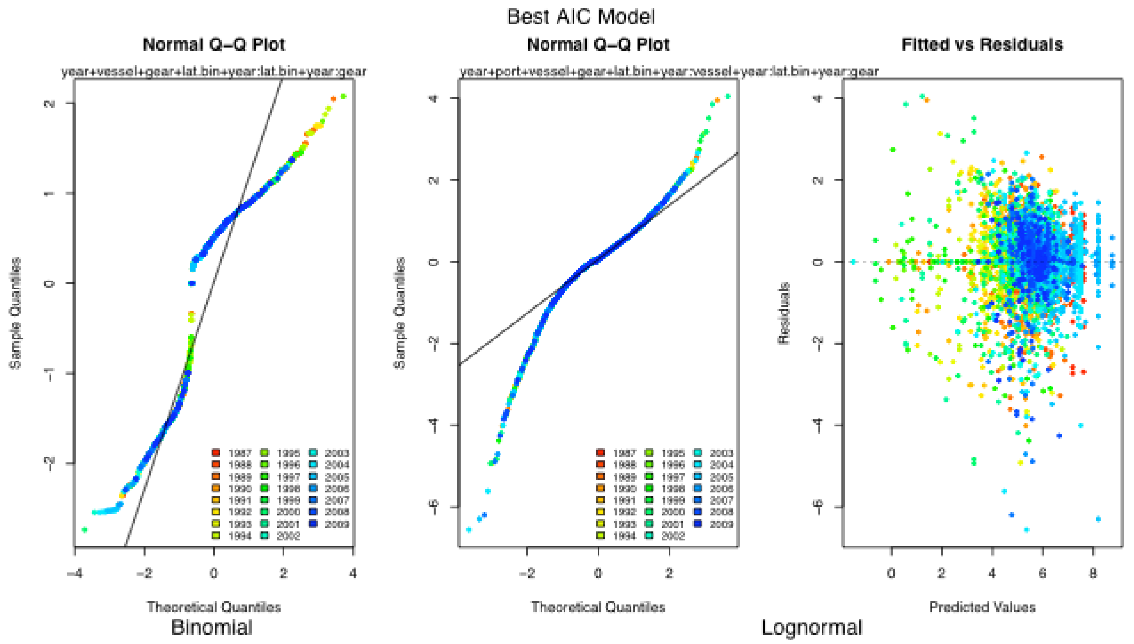



Figure B7c. Residual plots for model components in "Best model by AIC" in Figure B6a for WA. From left to right: the Q-Q plot of the binomial model, the Q-Q plot of the lognormal model and the fitted vs. residual plot of the lognormal model. All plots are color coded by year. The terms included in each model are listed above the Q-Q plots.

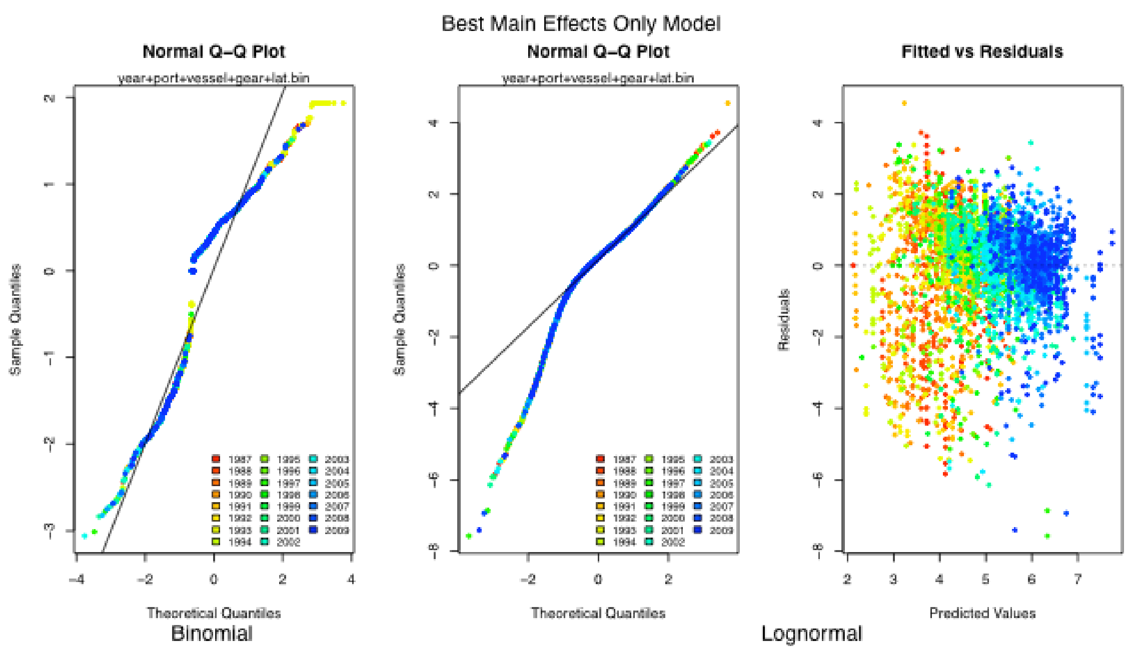



Figure B8a. Residual plots for model components in "Best main effects models" in Figure B6a for OR. From left to right: the Q-Q plot of the binomial model, the Q-Q plot of the lognormal model and the fitted vs. residual plot of the lognormal model. All plots are color coded by year. The terms included in each model are listed above the Q-Q plots.

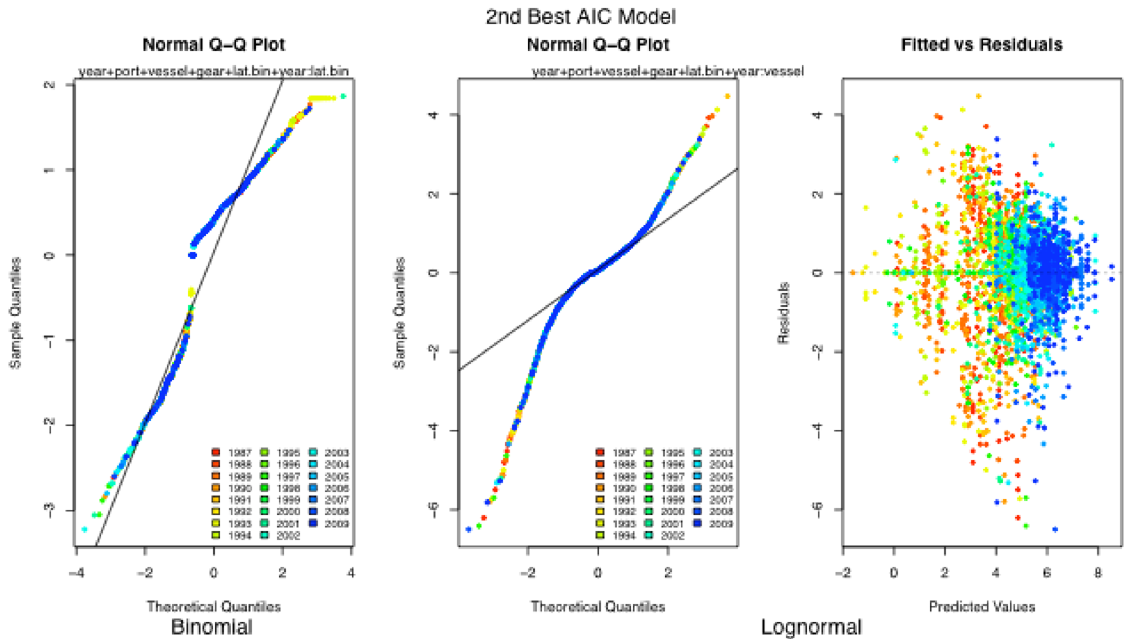



Figure B8b. Residual plots for model components in "2nd best model by AIC" in Figure B6a for OR. From left to right: the Q-Q plot of the binomial model, the Q-Q plot of the lognormal model and the fitted vs. residual plot of the lognormal model. All plots are color coded by year. The terms included in each model are listed above the Q-Q plots.

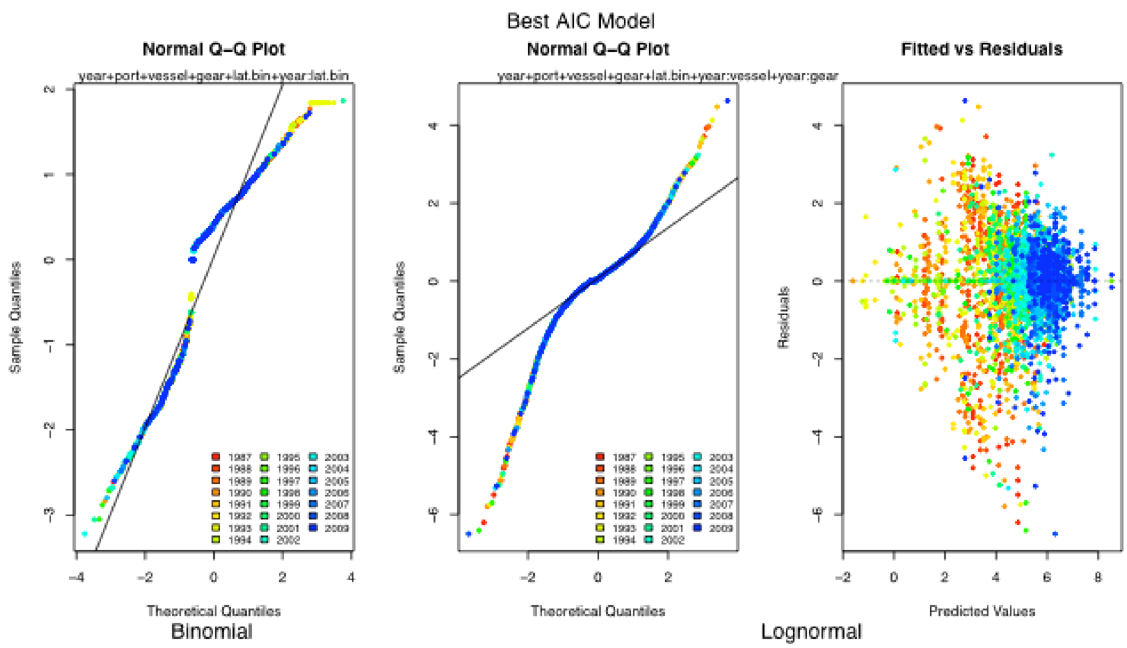



Figure B8c. Residual plots for model components in "Best model by AIC" in Figure B6a for OR. From left to right: the Q-Q plot of the binomial model, the Q-Q plot of the lognormal model and the fitted vs. residual plot of the lognormal model. All plots are color coded by year. The terms included in each model are listed above the Q-Q plots.

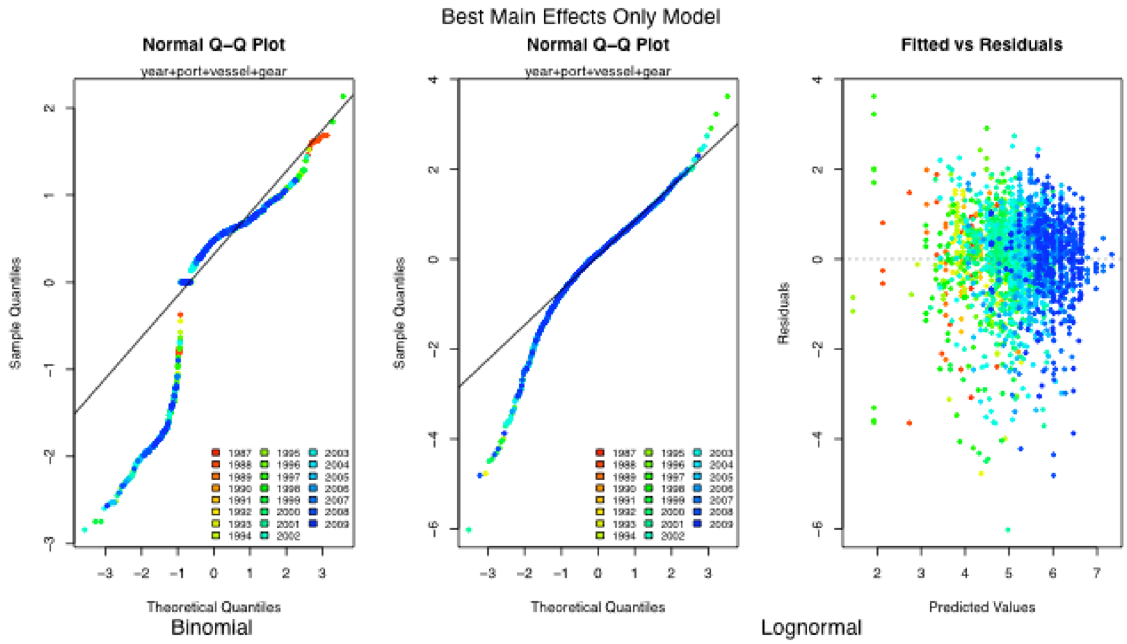



Figure B9a. Residual plots for model components in “Best main effects models” in Figure B6a for CA. From left to right: the Q-Q plot of the binomial model, the Q-Q plot of the lognormal model and the fitted vs. residual plot of the lognormal model. All plots are color coded by year. The terms included in each model are listed above the Q-Q plots.

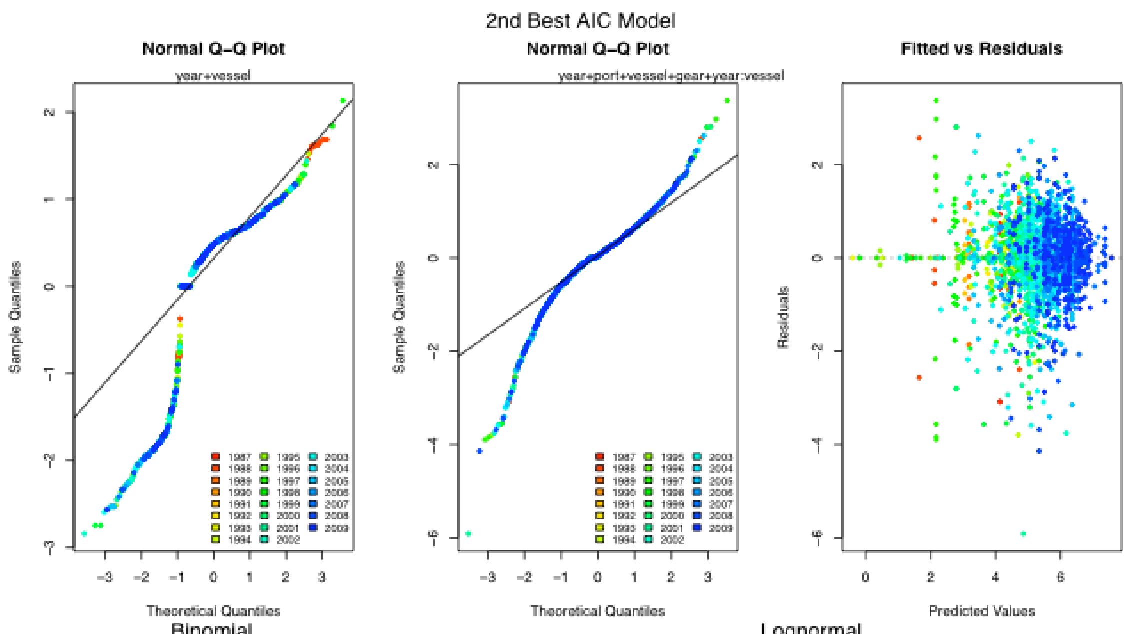



Figure B9b. Residual plots for model components in “2nd best model by AIC” in Figure B6a for CA. From left to right: the Q-Q plot of the binomial model, the Q-Q plot of the lognormal model and the fitted vs. residual plot of the lognormal model. All plots are color coded by year. The terms included in each model are listed above the Q-Q plots.

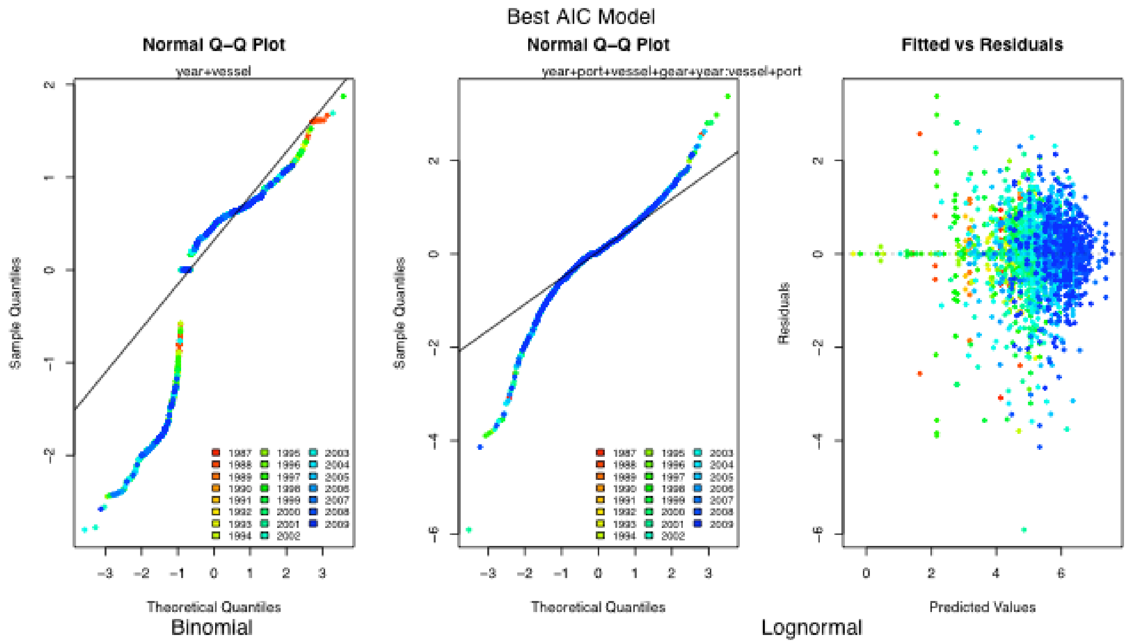



Figure B9c. Residual plots for model components in “Best model by AIC” in Figure B6a for CA. From left to right: the Q-Q plot of the binomial model, the Q-Q plot of the lognormal model and the fitted vs. residual plot of the lognormal model. All plots are color coded by year. The terms included in each model are listed above the Q-Q plots.

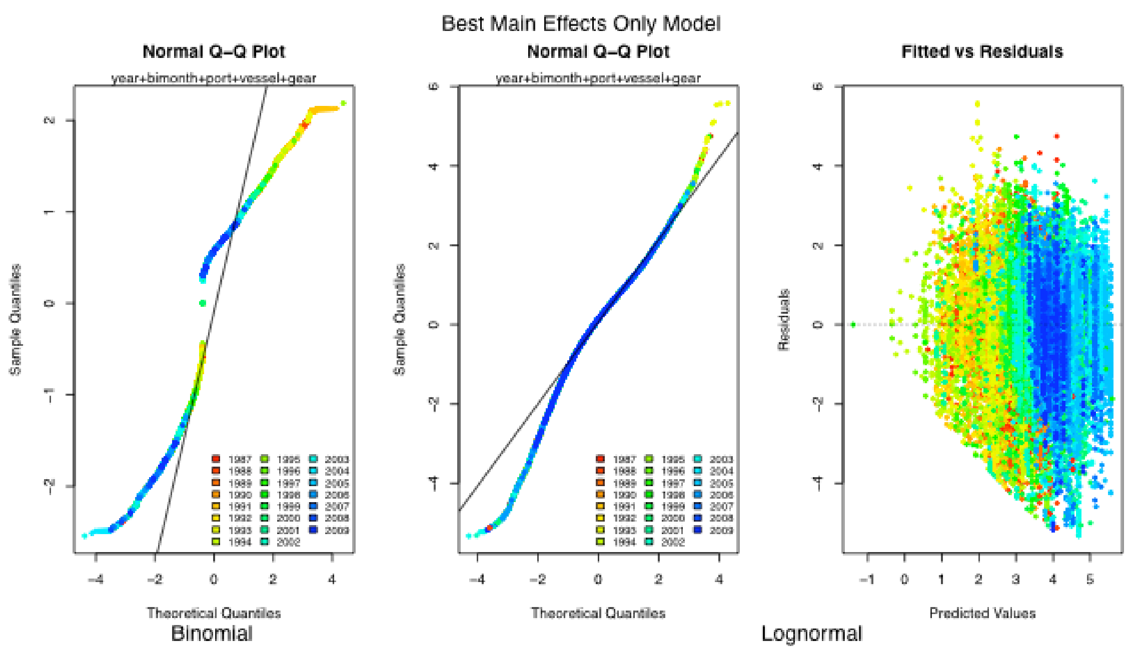



Figure B10a. Residual plots for model components in “Best main effects models” in Figure B6b for WA. From left to right: the Q-Q plot of the binomial model, the Q-Q plot of the lognormal model and the fitted vs. residual plot of the lognormal model. All plots are color coded by year. The terms included in each model are listed above the Q-Q plots.

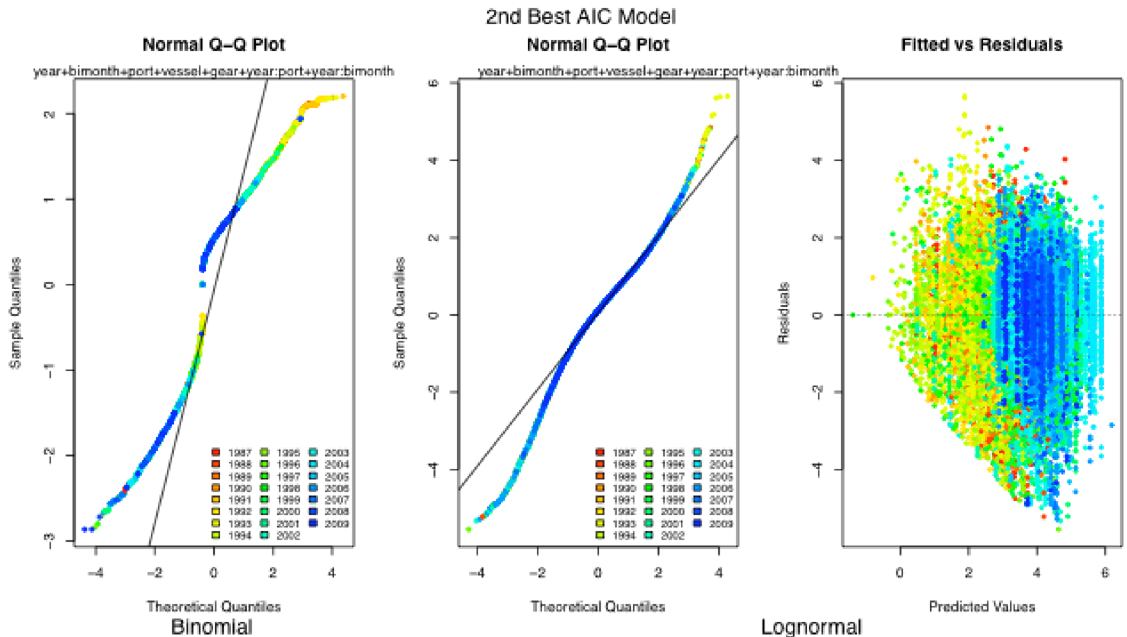



Figure B10b. Residual plots for model components in "2nd best model by AIC" in Figure B6b for WA. From left to right: the Q-Q plot of the binomial model, the Q-Q plot of the lognormal model and the fitted vs. residual plot of the lognormal model. All plots are color coded by year. The terms included in each model are listed above the Q-Q plots.

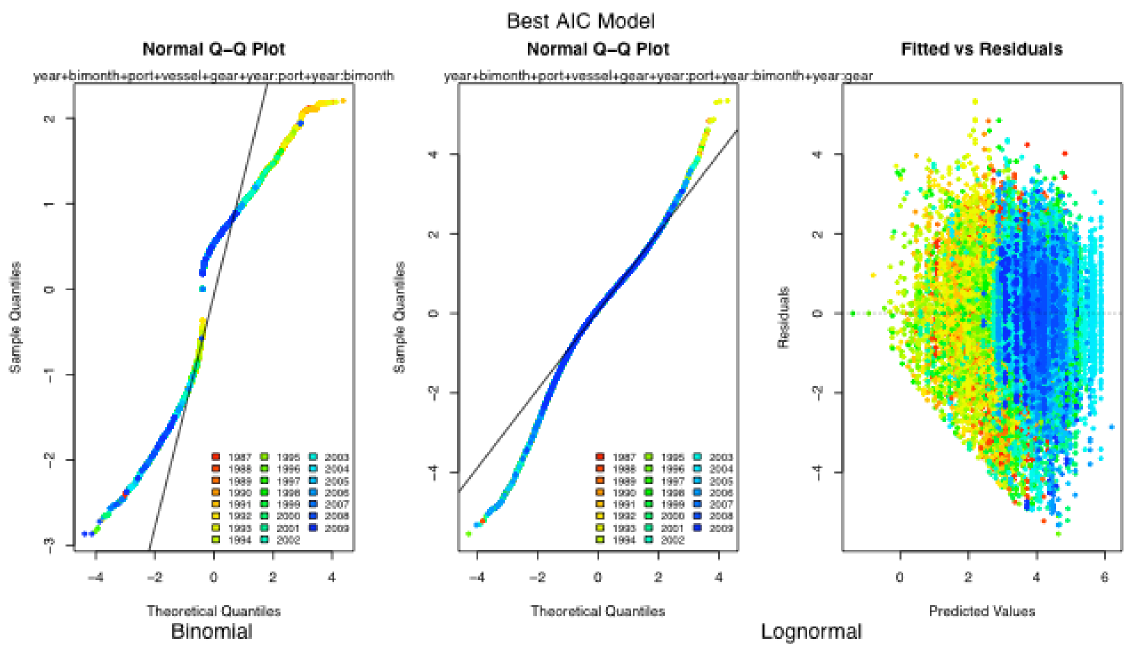



Figure B10c. Residual plots for model components in "Best model by AIC" in Figure B6b for WA. From left to right: the Q-Q plot of the binomial model, the Q-Q plot of the lognormal model and the fitted vs. residual plot of the lognormal model. All plots are color coded by year. The terms included in each model are listed above the Q-Q plots.

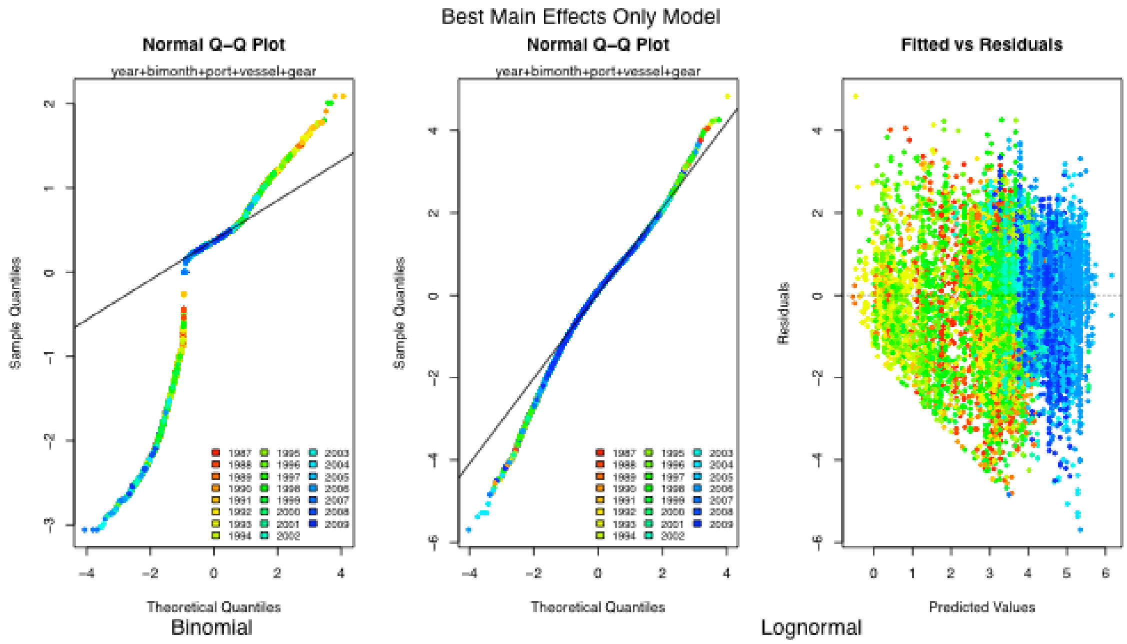



Figure B11a. Residual plots for model components in “Best main effects models” in Figure B6b for OR. From left to right: the Q-Q plot of the binomial model, the Q-Q plot of the lognormal model and the fitted vs. residual plot of the lognormal model. All plots are color coded by year. The terms included in each model are listed above the Q-Q plots.

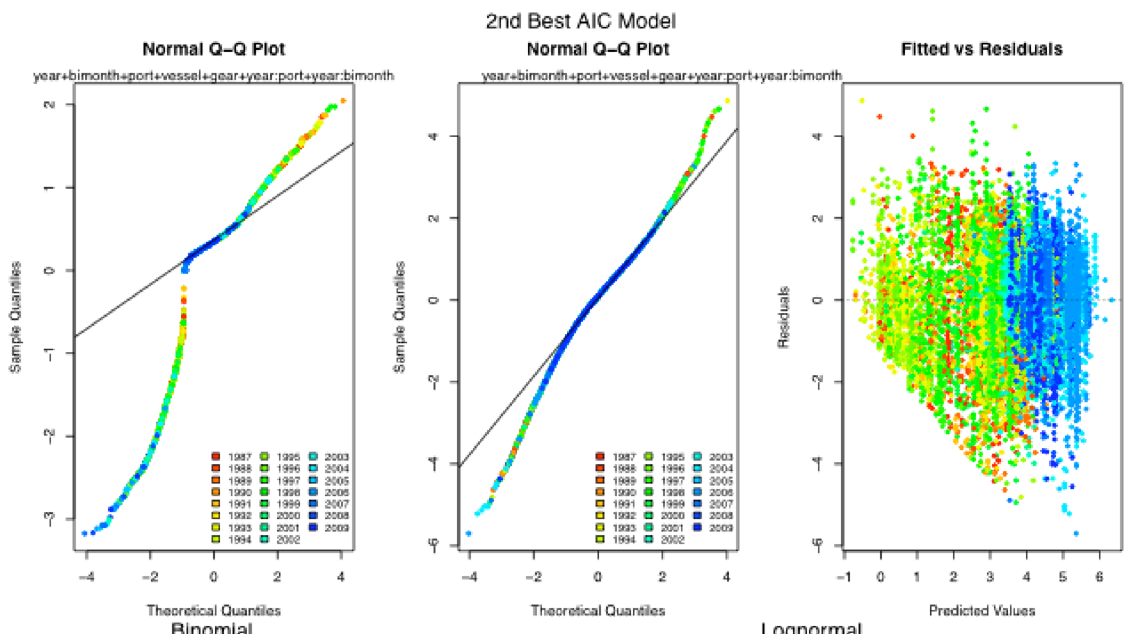



Figure B11b. Residual plots for model components in “2nd best model by AIC” in Figure B6b for OR. From left to right: the Q-Q plot of the binomial model, the Q-Q plot of the lognormal model and the fitted vs. residual plot of the lognormal model. All plots are color coded by year. The terms included in each model are listed above the Q-Q plots.

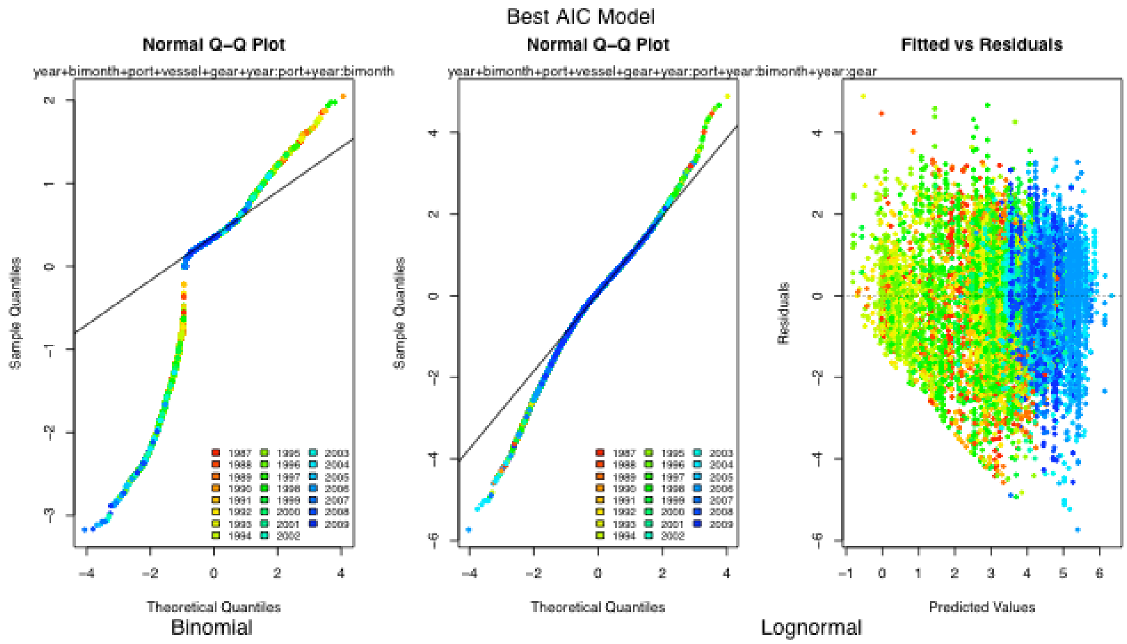



Figure B11c. Residual plots for model components in “Best model by AIC” in Figure B6b for OR. From left to right: the Q-Q plot of the binomial model, the Q-Q plot of the lognormal model and the fitted vs. residual plot of the lognormal model. All plots are color coded by year. The terms included in each model are listed above the Q-Q plots.

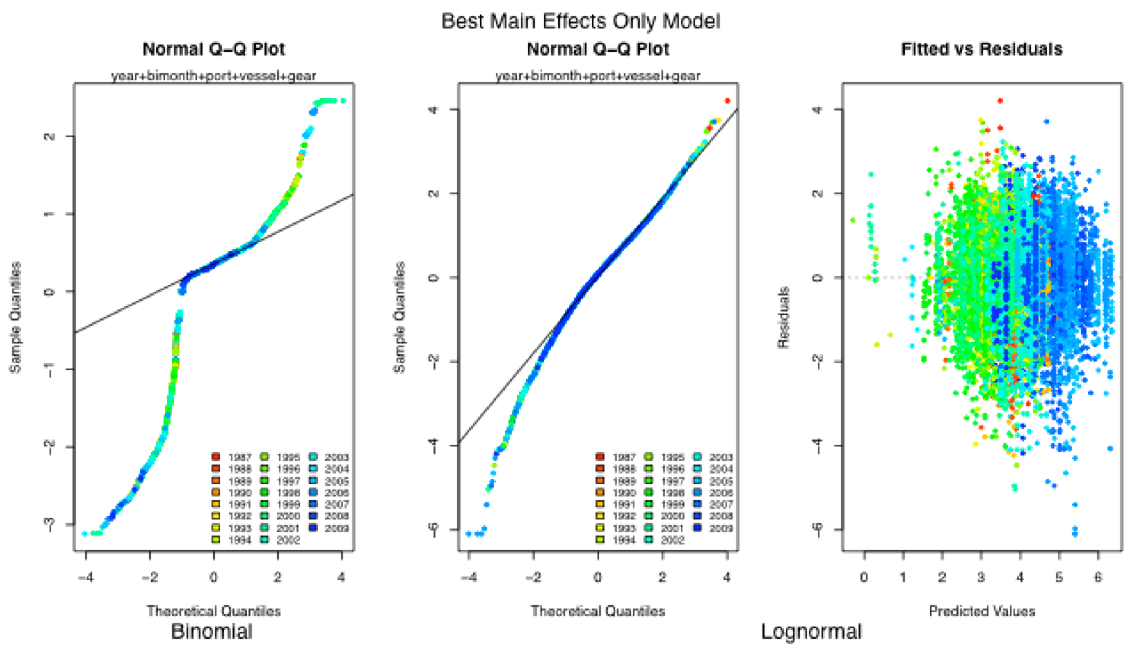



Figure B12a. Residual plots for model components in “Best main effects models” in Figure B6b for CA. From left to right: the Q-Q plot of the binomial model, the Q-Q plot of the lognormal model and the fitted vs. residual plot of the lognormal model. All plots are color coded by year. The terms included in each model are listed above the Q-Q plots.

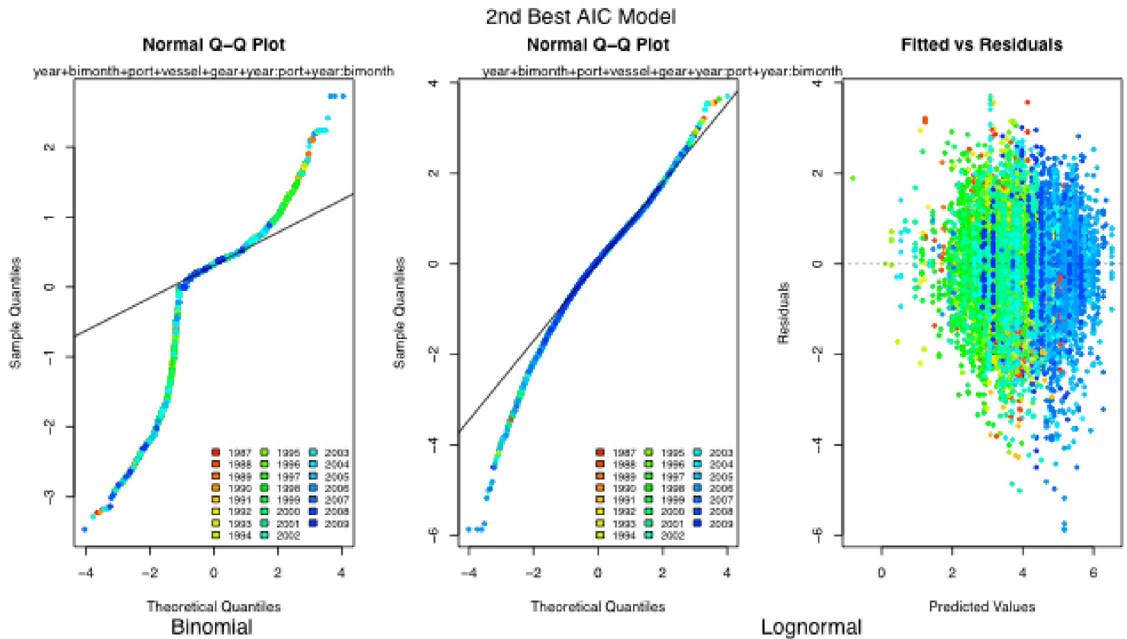



Figure B12b. Residual plots for model components in "2nd best model by AIC" in Figure B6b for CA. From left to right: the Q-Q plot of the binomial model, the Q-Q plot of the lognormal model and the fitted vs. residual plot of the lognormal model. All plots are color coded by year. The terms included in each model are listed above the Q-Q plots.

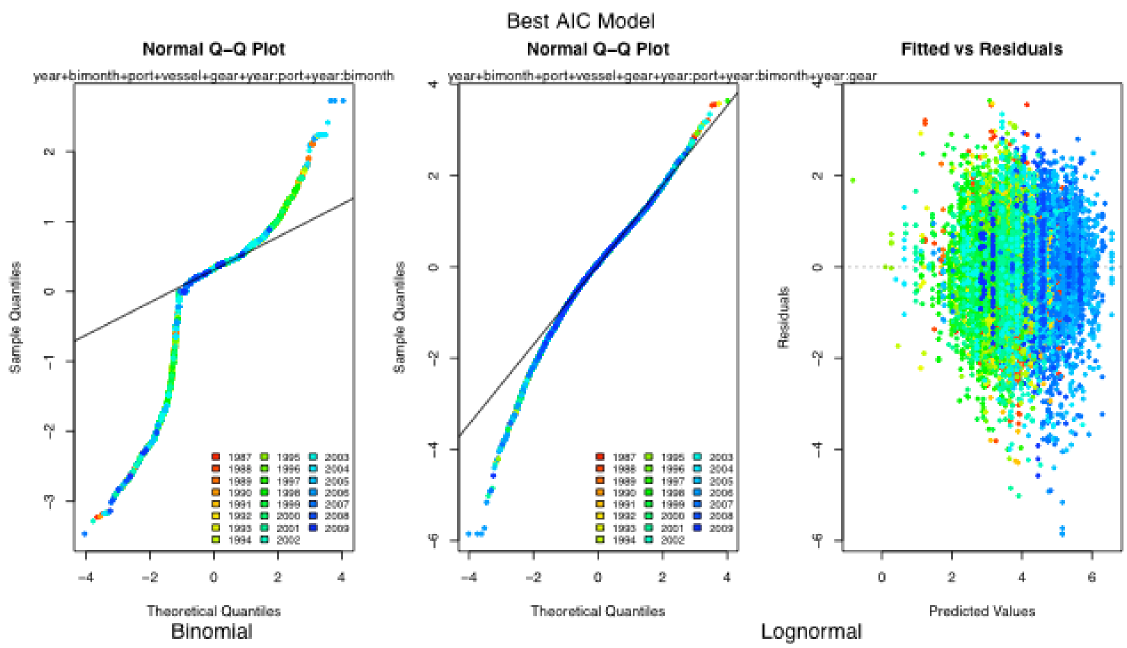



Figure B12c. Residual plots for model components in "Best model by AIC" in Figure B6b for CA. From left to right: the Q-Q plot of the binomial model, the Q-Q plot of the lognormal model and the fitted vs. residual plot of the lognormal model. All plots are color coded by year. The terms included in each model are listed above the Q-Q plots.

**15. Appendix C: 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.

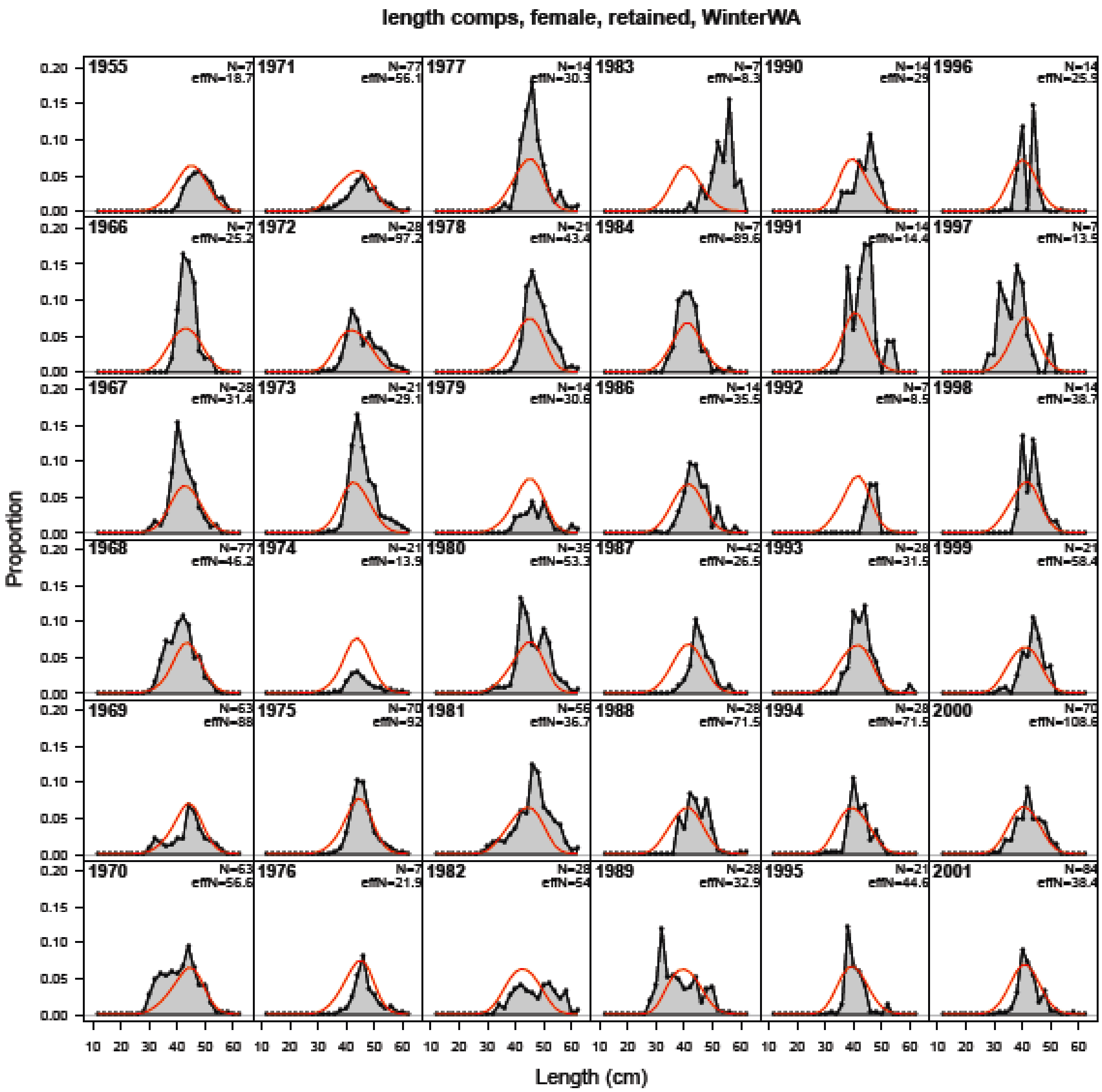
Table C1. Annual RCA depth boundaries 2002 – 2009 (does not include in-season changes).

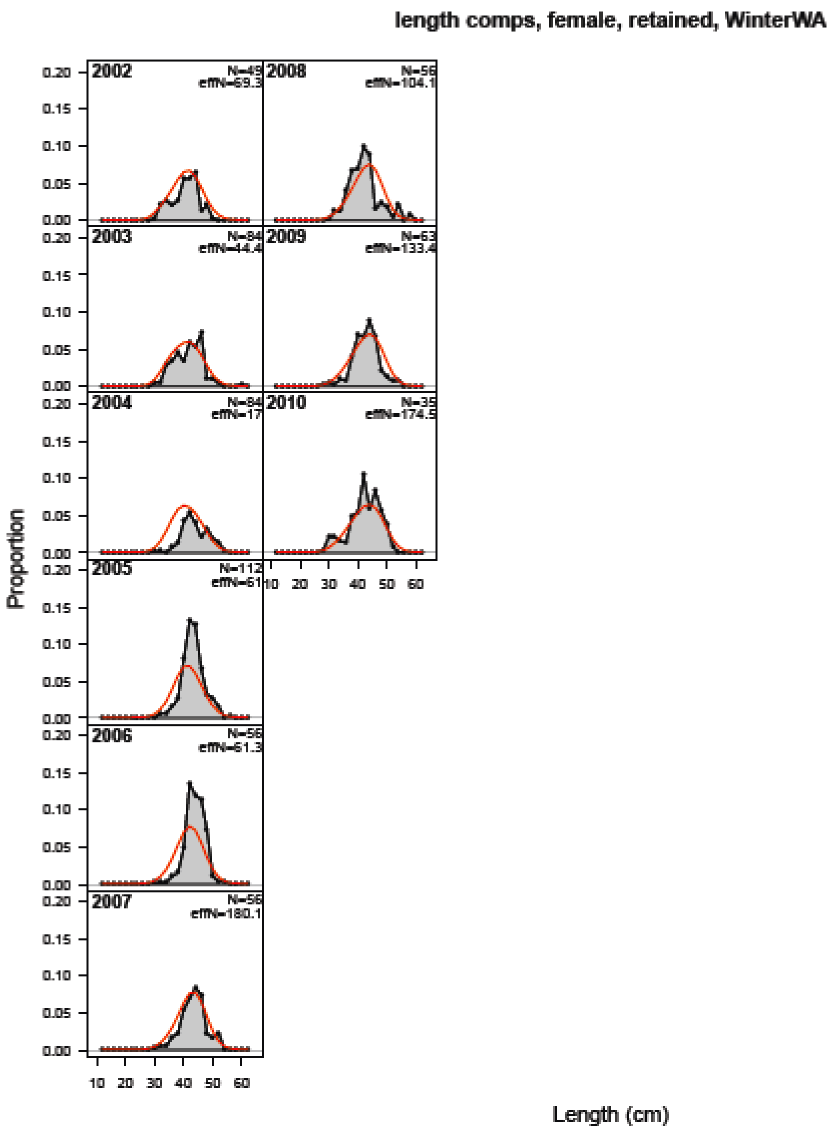
| Year | Location | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2008 | North 48 10 | 0 - [m]200 | | 0 - 200 | | 0 - 150 | | | | | | 0 - [m]200 | |
| | 48 10 - 46 38.17 | | | 60 - 200 | | 60 - 150 | | | | | 75 - 150 | | |
| | 46 38.17 - 46 16 | 75 - [m]200 | | 60 - 200 | | | | 60 - 150 | | | | 75 - [m]200 | |
| | 46 16 - 45 46 | | | 75 - 200 | | 75 - 150 | | | | 75 - 200 | | | |
| | 45 46 - 43 20.83 | | | 75 - 200 | | | | | | | | | |
| | 43 20.83 - 42 40.50 | 0 - [m]200 | | 0 - 200 | | | | | | | | 0 - [m]200 | |
| | 42 40.5 - 40 10 | 75 - [m]200 | | 75 - 200 | | 60 - 200 | | | | | 75 - 200 | 75 - [m]200 | |
| | 40 10 - 34 27 | 100 - 150 | | | | | | | | | | | |
| | South 34 27 (mainland) | | | | | | | | | | | | |
| | South 34 27 (islands) | 0 - 150 | | | | | | | | | | | |
| 2007 | North 48 10 | 0 - [m]200 | | 0 - 200 | | 0 - 150 | | | | | | 0 - [m]200 | |
| | 48 10 - 46 16 | 75 - [m]200 | | 60 - 200 | | 60 - 150 | | | | 75 - 150 | | 75 - [m]200 | |
| | 46 16 - 43 20.83 | | | 75 - 200 | | | | | | | | | |
| | 43 20.83 - 42 40.50 | 0 - [m]200 | | 0 - 200 | | | | | | | | 0 - [m]200 | |
| | 42 40.50 - 40 10 | 75 - [m]200 | | 75 - 200 | | | | | | | | 75 - [m]200 | |
| | 40 10 - 34 27 | 100 - 150 | | | | | | | | | | | |
| | South 34 27 (mainland) | | | | | | | | | | | | |
| | South 34 27 (islands) | 0 - 150 | | | | | | | | | | | |
| 2006 | North 40 10 | 75 - [m]200 | | 75 - 200 | | | | 100 - 250 | | 75 - 250 | | 75 - [m]200 | |
| | 40 10 – 38 | 75 - 150 | | 100 - 150 | | | | 100 - 200 | | 100 - 250 | | 75 - [m]250 | |
| | 38 - 34 27 | | | | | | | 100 - 150 | | | | 75 - 150 | |
| | South 34 27 (mainland) | | | | | | | | | | | | |
| | South 34 27 (islands) | 0 - 150 | | | | | | | | | | | |
| 2005 | North 40 10 | 75 - [m]200 | | 100 - 200 | | | | | | | 0 - 250 | | |
| | 40 10 – 38 | 75 - 150 | | 100 - 200 | | 100 - 150 | | | | | | | |
| | 38 – 36 | | | 100 - 150 | | | | | | | 0 - 200 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 36 - 34 27 | | | | | | 50 - 200 | |
| | South 34 27 (mainland) | | | | | | | |
| | South 34 27 (islands) | 0 - 150 | | | | | 0 - 200 | |
| 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 requirements outside DBCA | | | | | | |

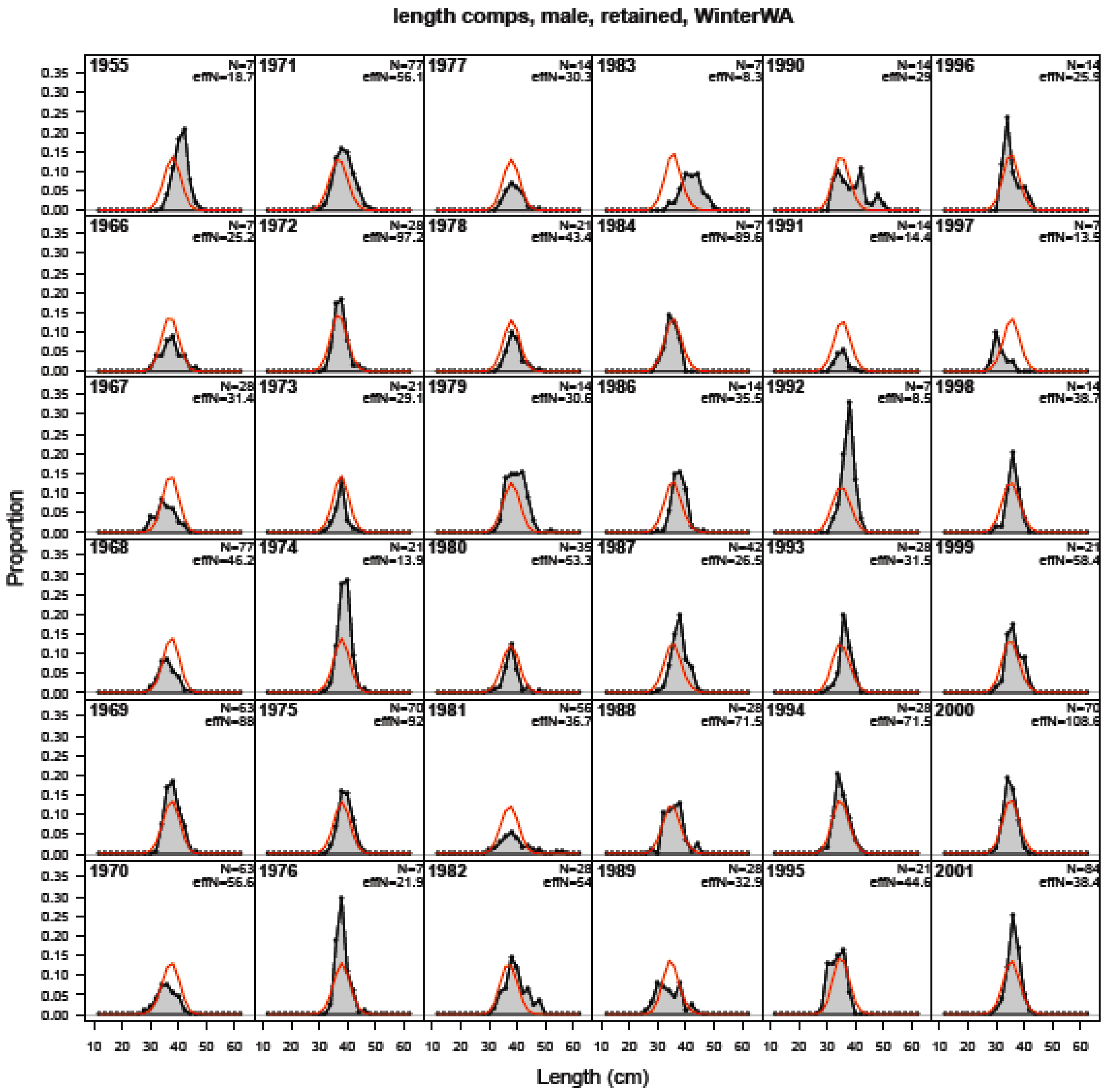
[m]The "modified" depth" line is modified to exclude certain petrale sole areas from the RCA.

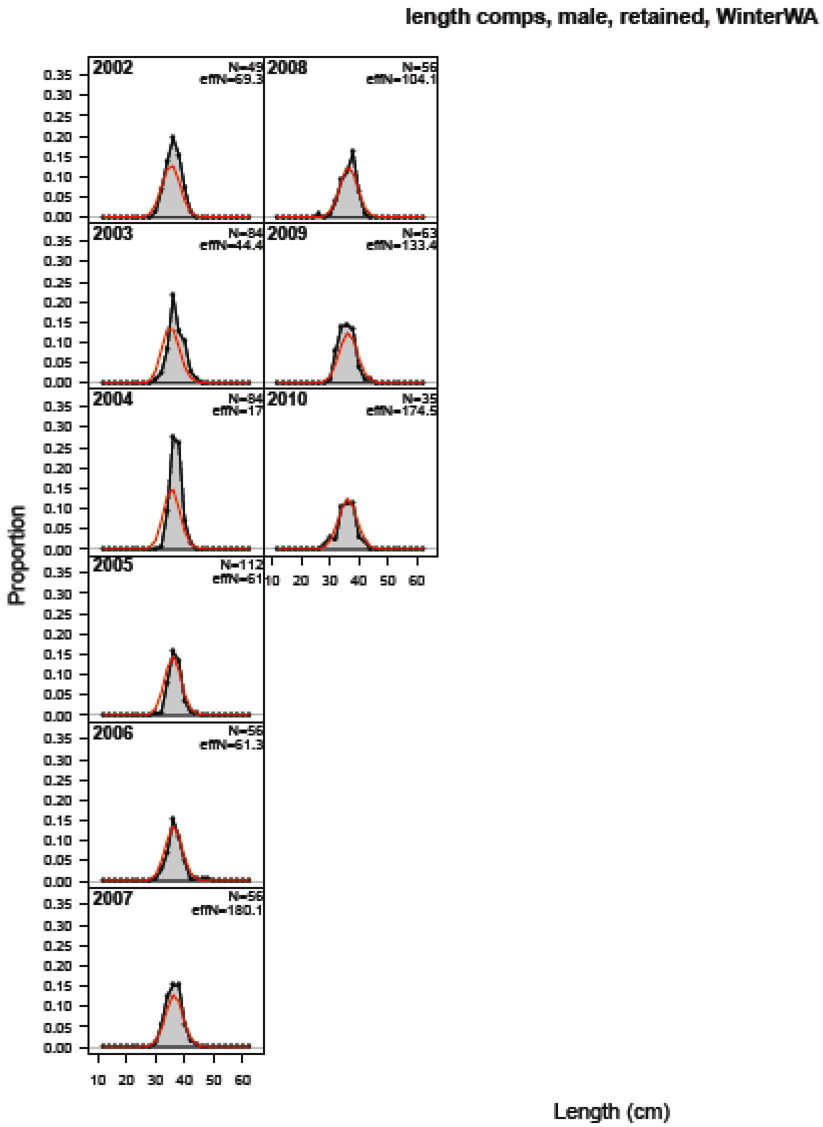
## 16. Appendix D: Model fits and diagnostics for fishery age and length composition data.

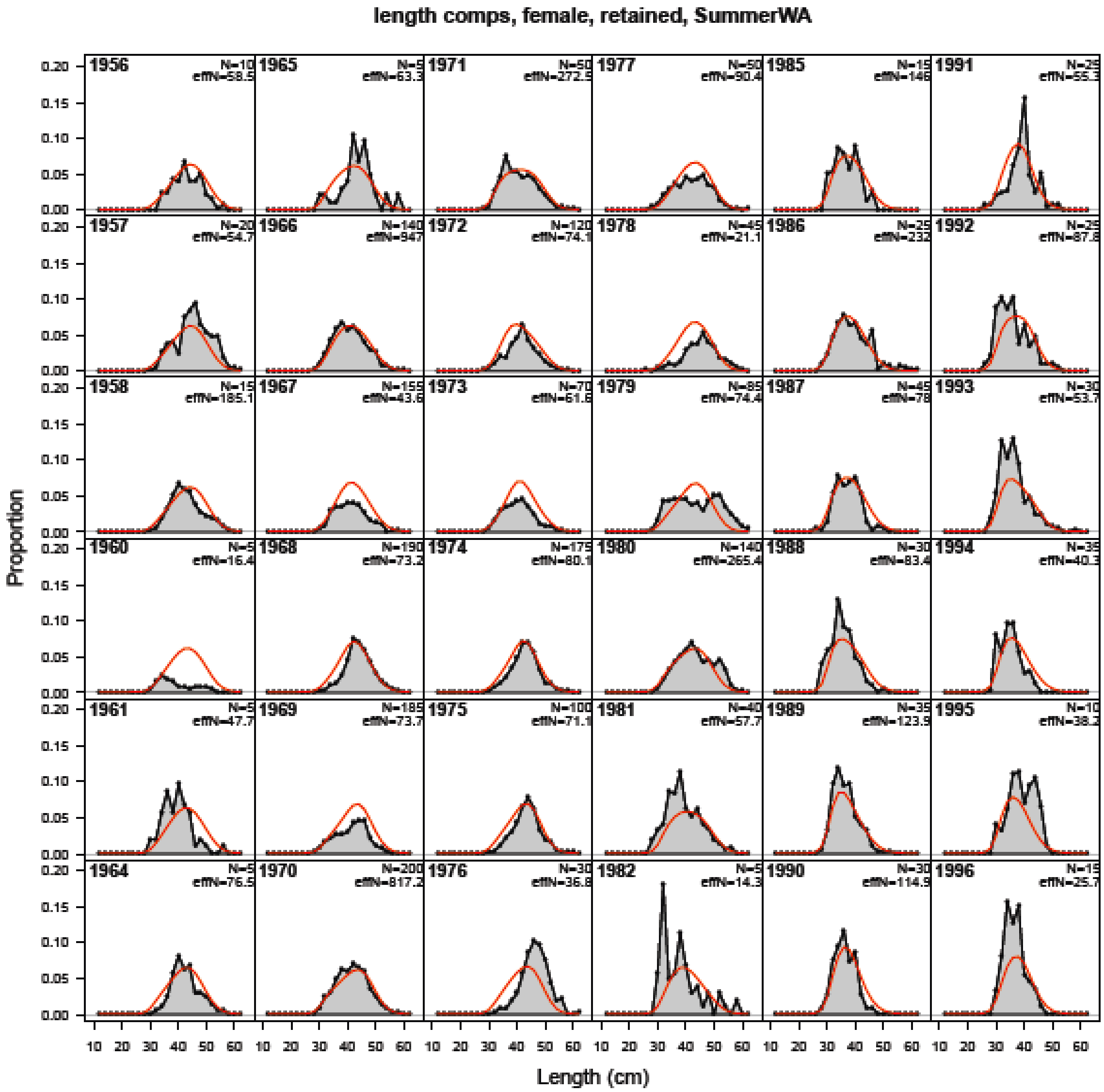


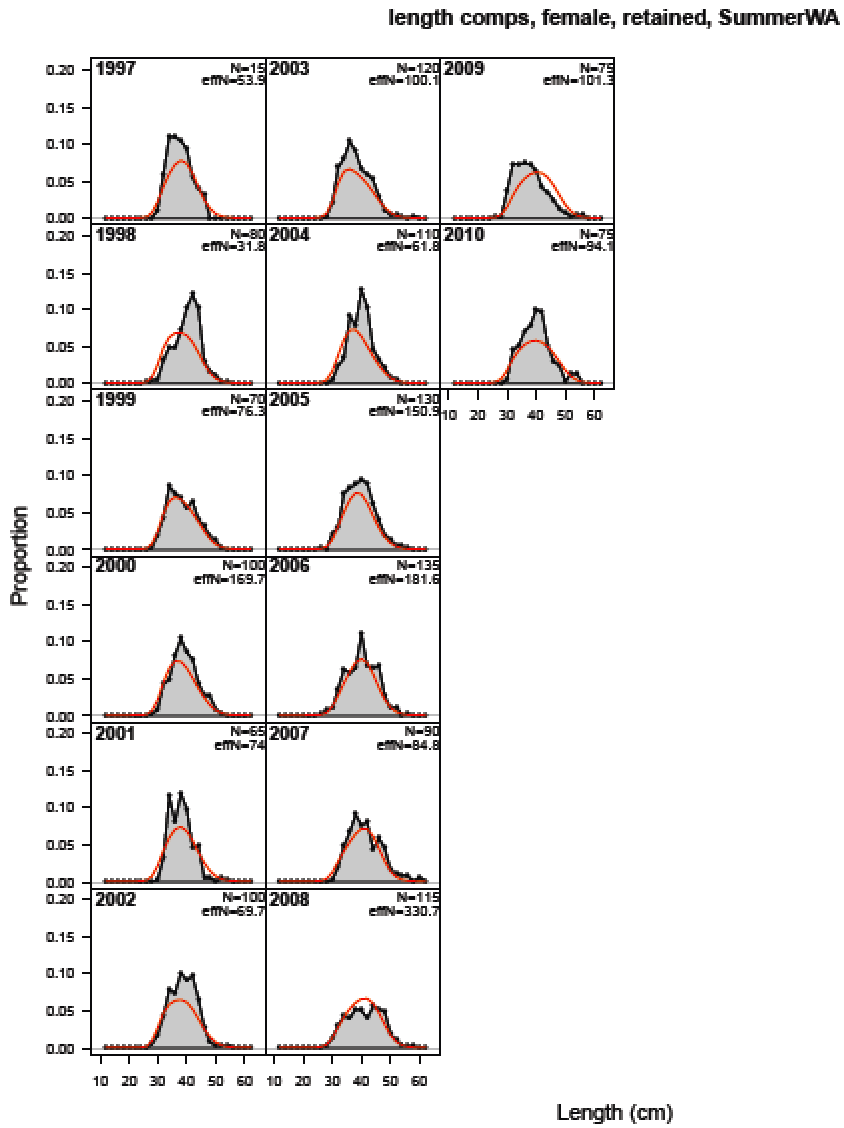


length comps, female, retained, WinterWA
2002
N=49
effN=69.3
2003
N=84
effN=44.4
2004
N=84
effN=17
2005
N=112
effN=61
2006
N=56
effN=61.3
2007
N=56
effN=180.1
2008
N=56
effN=104.1
2009
N=63
effN=133.4
2010
N=35
effN=174.5
Proportion
0.00
0.05
0.10
0.15
0.20
10 20 30 40 50 60
Length (cm)

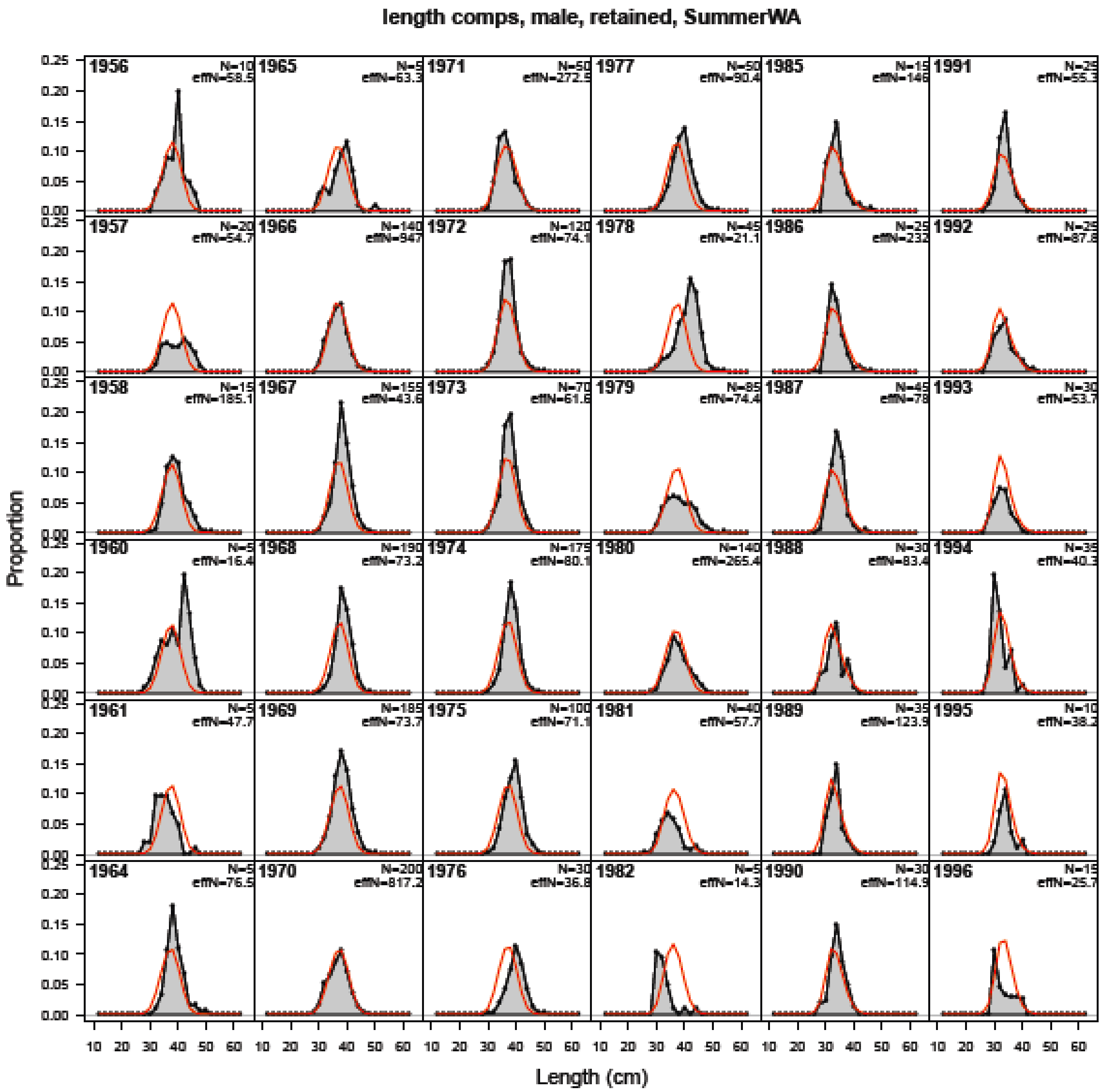

length comps, male, retained, WinterWA
Proportion
Length (cm)


length comps, male, retained, WinterWA
2002
N=49
effN=69.3
2008
N=56
effN=104.1
2003
N=84
effN=44.4
2009
N=63
effN=133.4
2004
N=84
effN=17
2010
N=35
effN=174.5
2005
N=112
effN=61
2006
N=56
effN=61.3
2007
N=56
effN=180.1
Proportion
Length (cm)


length comps, female, retained, SummerWA
Proportion
Length (cm)
1956
1965
1971
1977
1985
1991
1957
1966
1972
1978
1986
1992
1958
1967
1973
1979
1987
1993
1960
1968
1974
1980
1988
1994
1961
1969
1975
1981
1989
1995
1964
1970
1976
1982
1990
1996



length comps, female, retained, SummerWA
1997
N=15
effN=53.9
2003
N=120
effN=100.1
2009
N=79
effN=101.3
1998
N=80
effN=31.8
2004
N=110
effN=61.8
2010
N=79
effN=94.1
1999
N=70
effN=76.3
2005
N=130
effN=150.9
2000
N=100
effN=169.7
2006
N=135
effN=181.6
2001
N=65
effN=74
2007
N=90
effN=84.8
2002
N=100
effN=69.7
2008
N=115
effN=330.7
Proportion
Length (cm)



length comps, male, retained, SummerWA
Proportion
Length (cm)
1956
1957
1958
1960
1961
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996

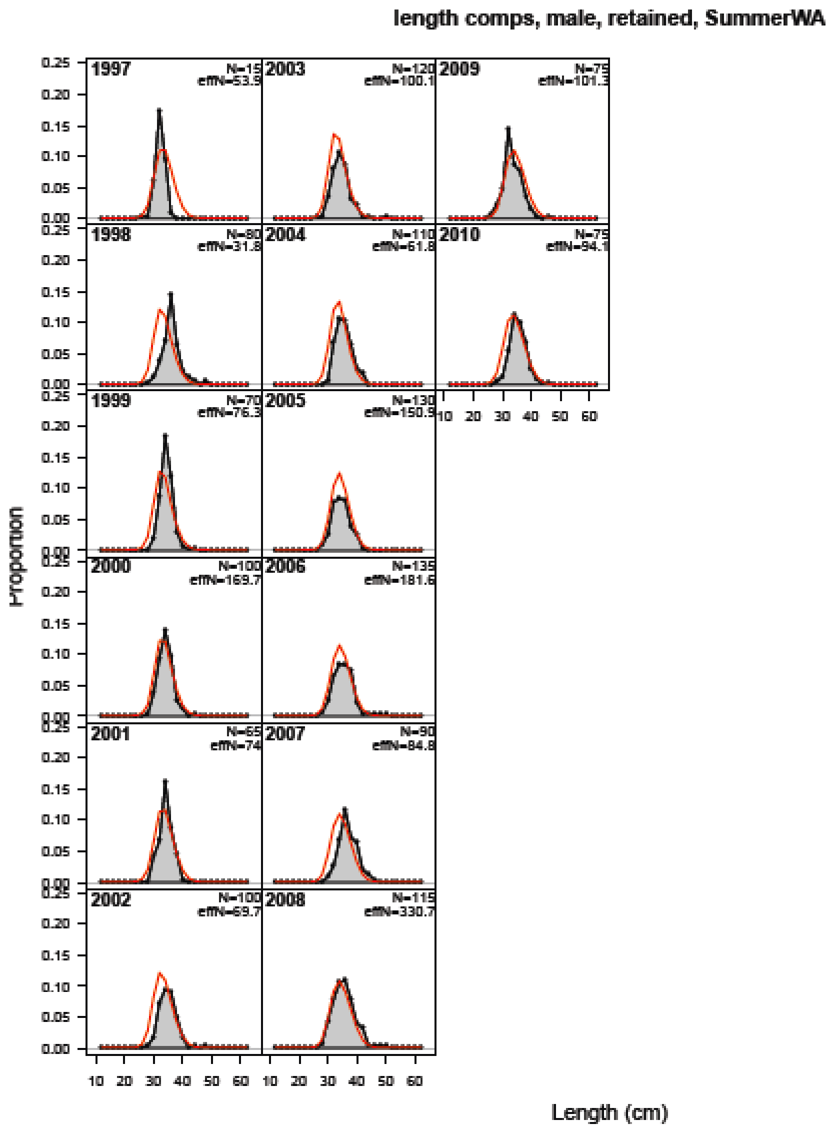
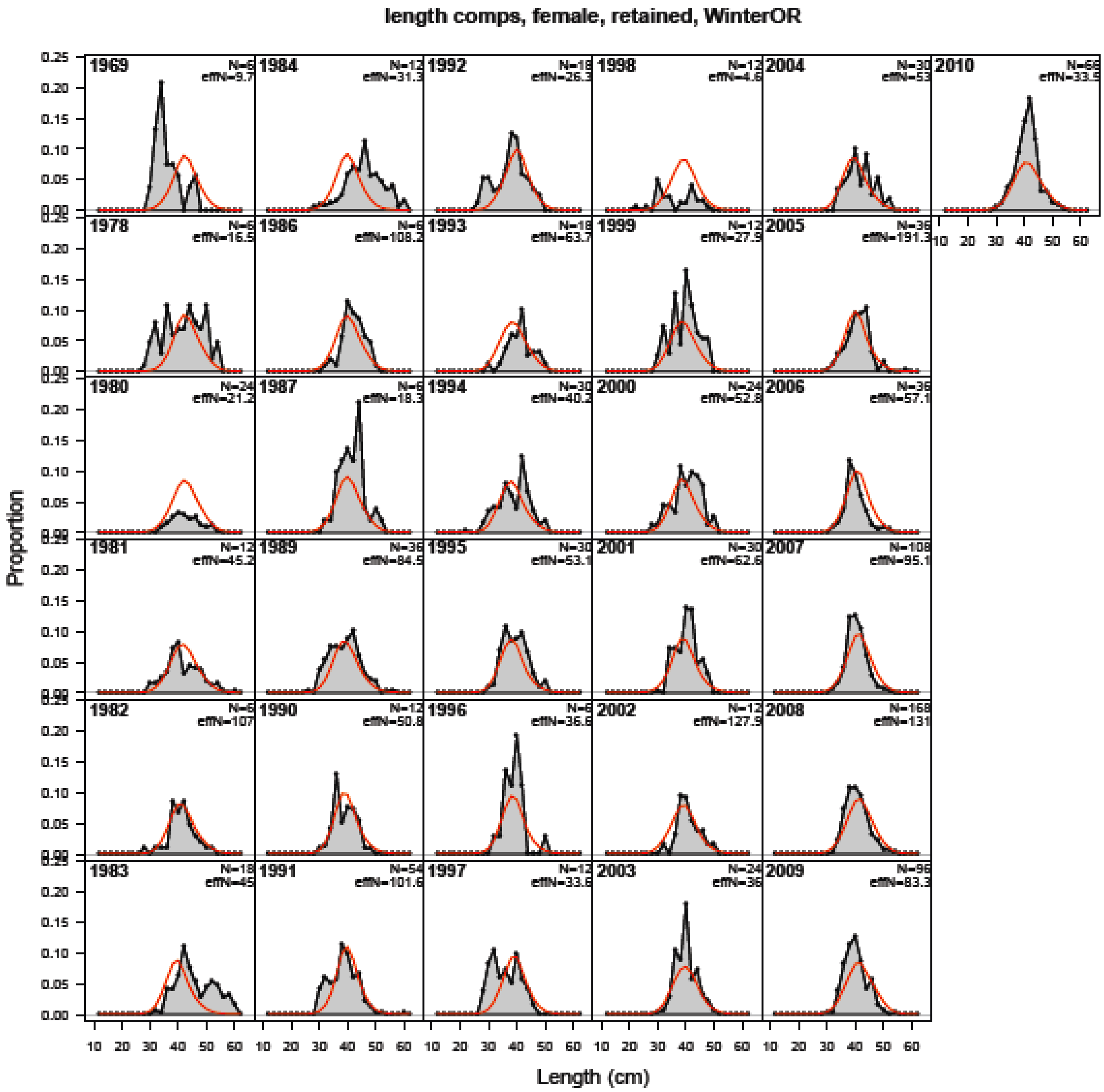
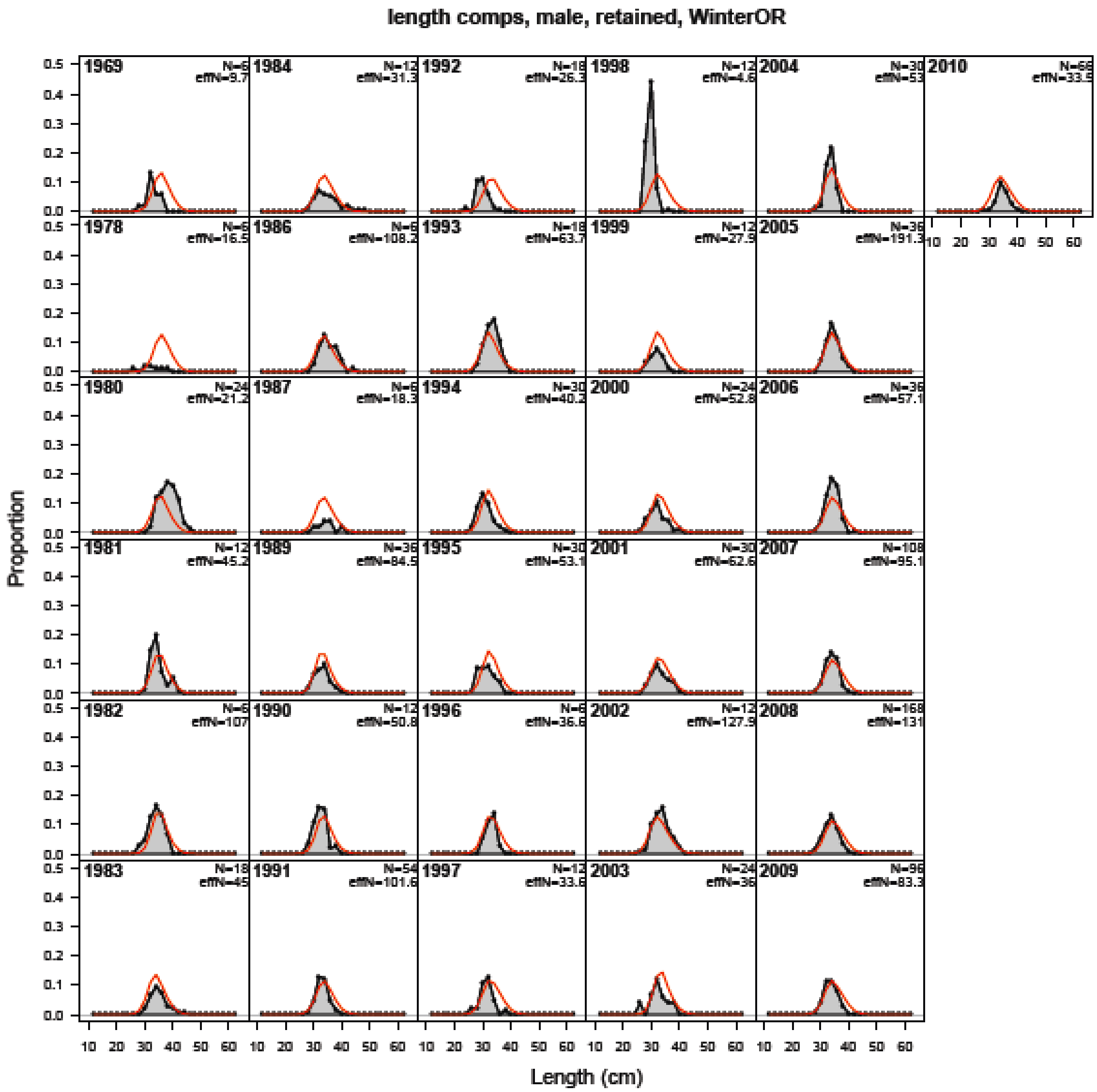
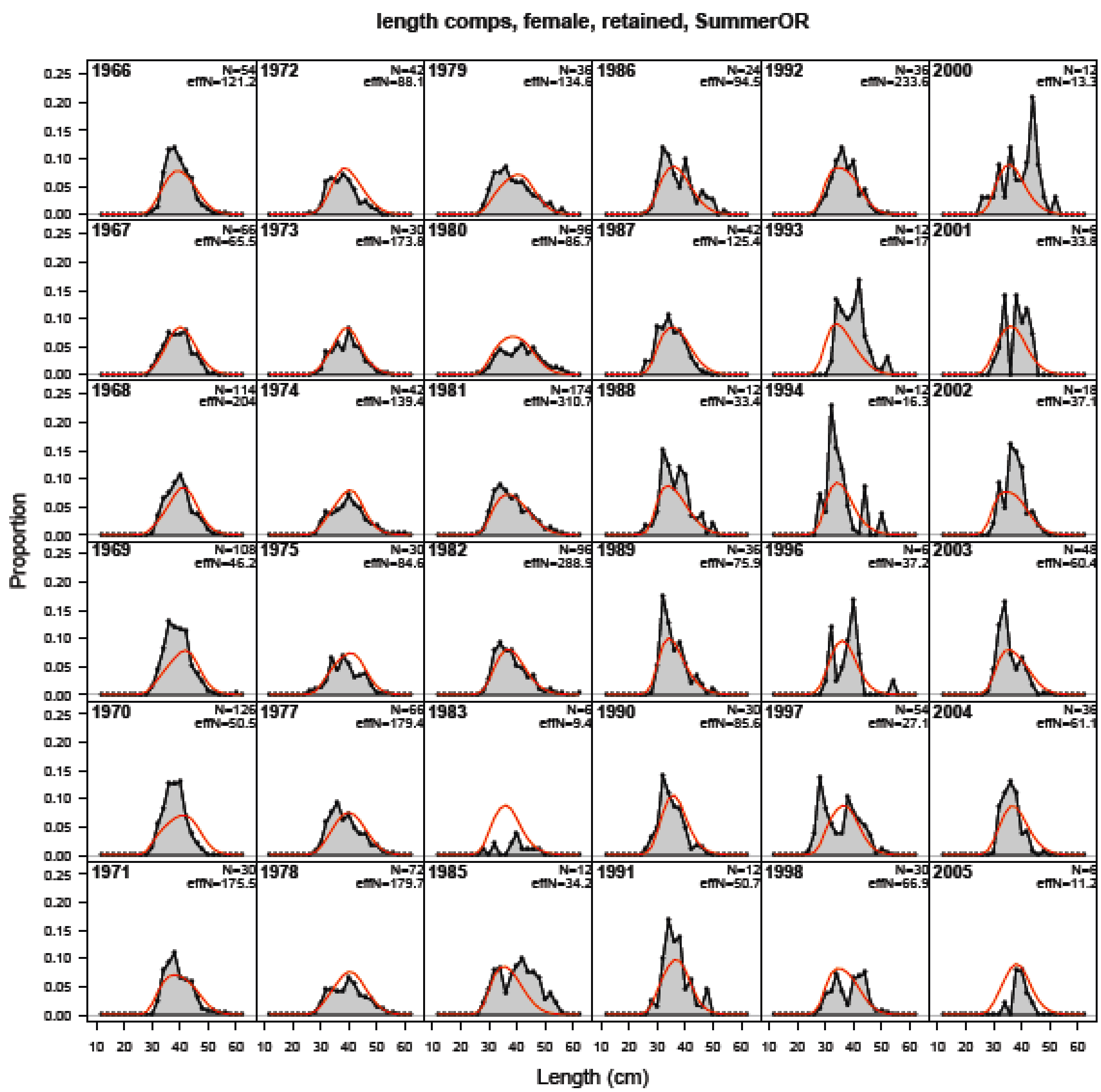


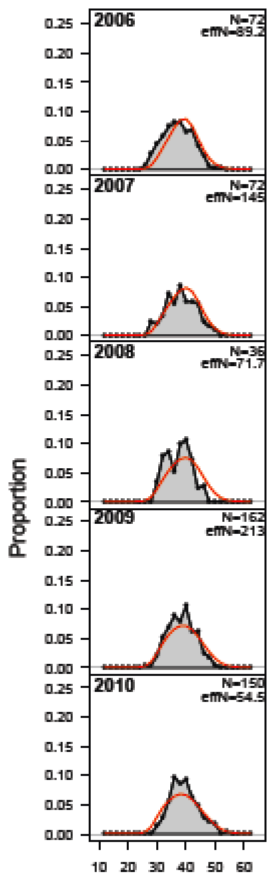

Figure D1. Fit to the Washington fishery length compositions.


length comps, female, retained, WinterOR
Proportion
Length (cm)
1969
N=6
effN=9.7
1984
N=12
effN=31.3
1992
N=18
effN=26.3
1998
N=12
effN=4.6
2004
N=30
effN=53
2010
N=66
effN=33.9
1978
N=6
effN=16.5
1986
N=6
effN=108.2
1993
N=18
effN=63.7
1999
N=12
effN=27.9
2005
N=36
effN=191.3
1980
N=24
effN=21.2
1987
N=6
effN=18.3
1994
N=30
effN=40.2
2000
N=24
effN=52.8
2006
N=36
effN=57.1
1981
N=12
effN=45.2
1989
N=36
effN=84.9
1995
N=30
effN=53.1
2001
N=30
effN=62.6
2007
N=108
effN=95.1
1982
N=6
effN=107
1990
N=12
effN=50.8
1996
N=6
effN=36.6
2002
N=12
effN=127.9
2008
N=168
effN=131
1983
N=18
effN=45
1991
N=54
effN=101.6
1997
N=12
effN=33.6
2003
N=24
effN=36
2009
N=96
effN=83.3

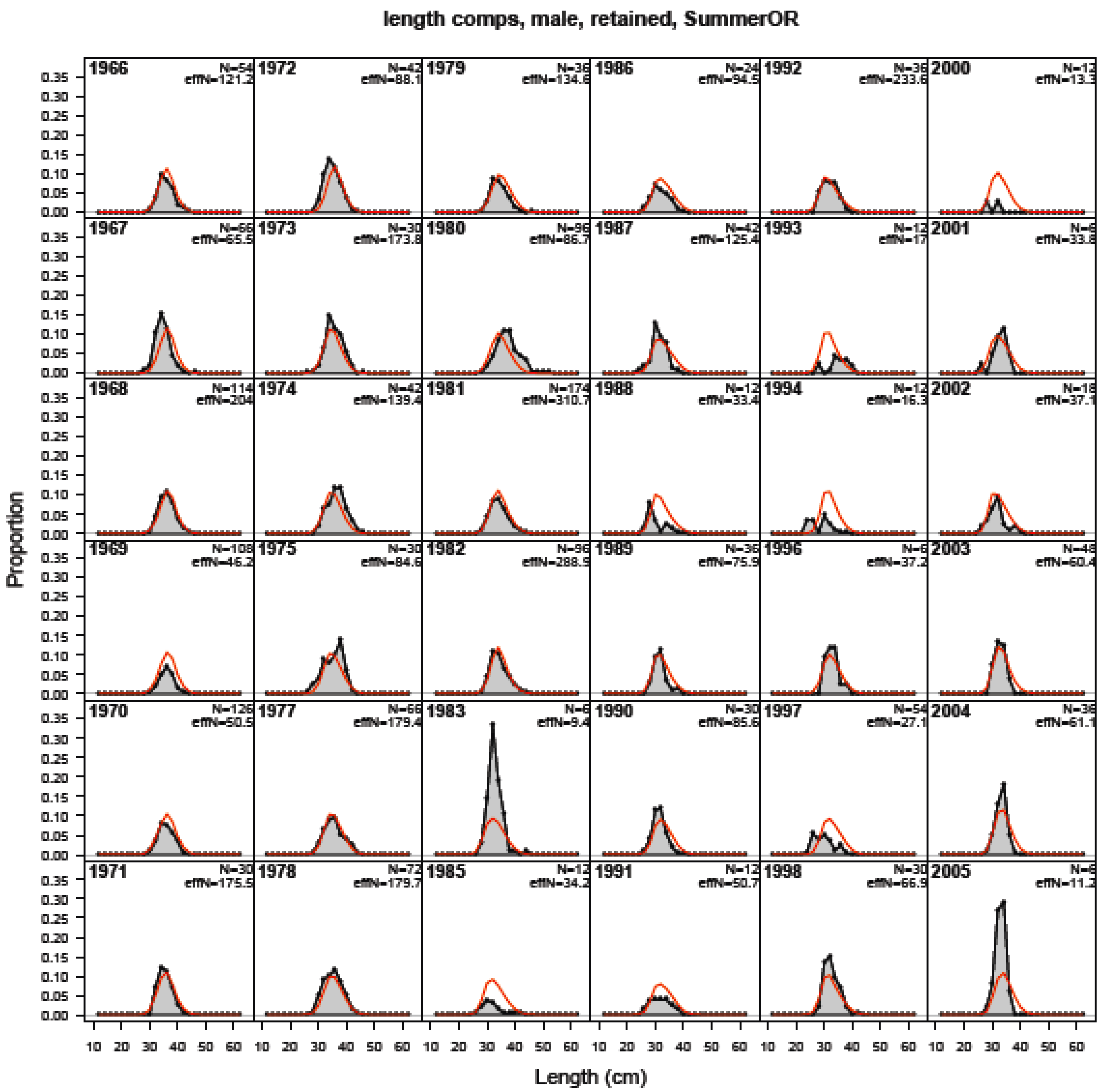

length comps, male, retained, WinterOR
Proportion
Length (cm)


length comps, female, retained, SummerOR
Proportion
Length (cm)
1966 N=54 effN=121.2
1967 N=66 effN=65.5
1968 N=114 effN=204
1969 N=108 effN=46.2
1970 N=126 effN=50.5
1971 N=30 effN=175.5
1972 N=42 effN=88.1
1973 N=30 effN=173.8
1974 N=42 effN=139.4
1975 N=30 effN=84.6
1977 N=66 effN=179.4
1978 N=72 effN=179.7
1979 N=36 effN=134.6
1980 N=96 effN=86.7
1981 N=174 effN=310.7
1982 N=96 effN=288.9
1983 N=6 effN=9.4
1985 N=12 effN=34.2
1986 N=24 effN=94.5
1987 N=42 effN=125.4
1988 N=12 effN=33.4
1989 N=36 effN=75.9
1990 N=30 effN=85.6
1991 N=12 effN=50.7
1992 N=36 effN=233.6
1993 N=12 effN=17
1994 N=12 effN=16.3
1996 N=6 effN=37.2
1997 N=54 effN=27.1
1998 N=30 effN=66.9
2000 N=12 effN=13.3
2001 N=6 effN=33.8
2002 N=18 effN=37.1
2003 N=48 effN=60.4
2004 N=36 effN=61.1
2005 N=6 effN=11.2

length comps, female, retained, SummerOR




Length (cm)



length comps, male, retained, SummerOR
Proportion
Length (cm)
1966 N=54 effN=121.2
1972 N=42 effN=88.1
1979 N=36 effN=134.8
1986 N=24 effN=94.5
1992 N=36 effN=233.6
2000 N=12 effN=13.3
1967 N=66 effN=65.5
1973 N=30 effN=173.8
1980 N=96 effN=86.7
1987 N=42 effN=125.4
1993 N=12 effN=17
2001 N=6 effN=33.8
1968 N=114 effN=204
1974 N=42 effN=139.4
1981 N=174 effN=310.7
1988 N=12 effN=33.4
1994 N=12 effN=16.3
2002 N=18 effN=37.1
1969 N=108 effN=46.2
1975 N=30 effN=84.6
1982 N=96 effN=288.9
1989 N=36 effN=75.9
1996 N=6 effN=37.2
2003 N=48 effN=60.4
1970 N=126 effN=50.5
1977 N=66 effN=179.4
1983 N=6 effN=9.4
1990 N=30 effN=85.6
1997 N=54 effN=27.1
2004 N=36 effN=61.1
1971 N=30 effN=175.5
1978 N=72 effN=179.7
1985 N=12 effN=34.2
1991 N=12 effN=50.7
1998 N=30 effN=66.9
2005 N=6 effN=11.2

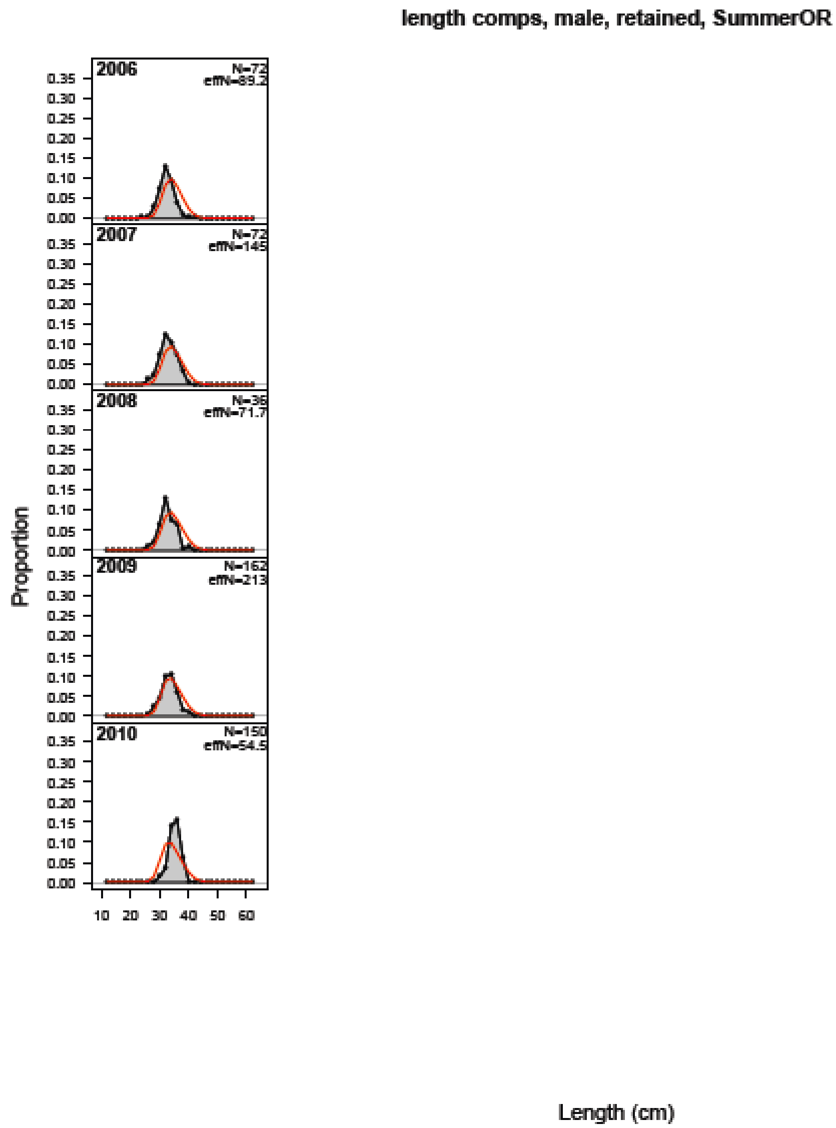
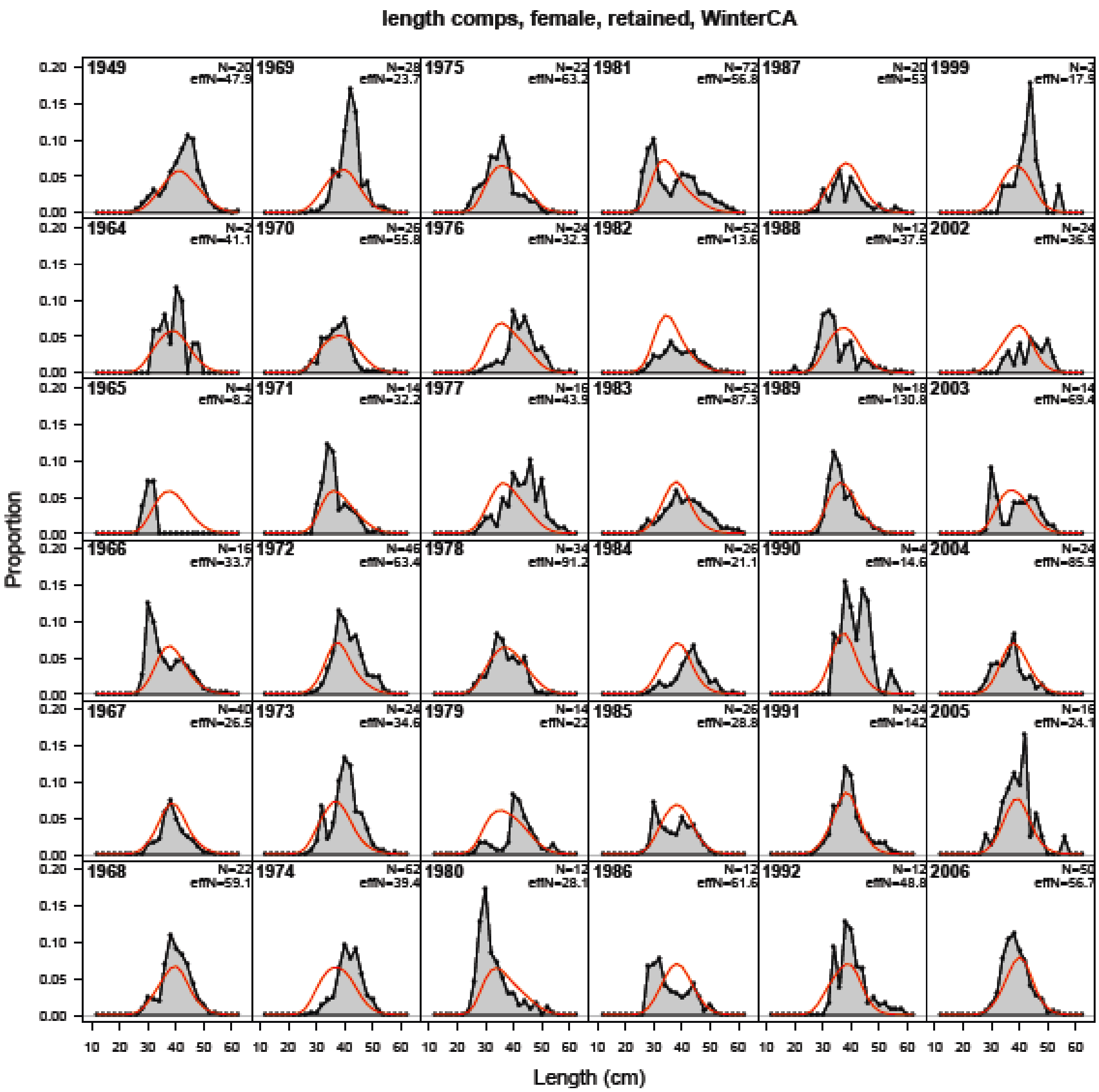
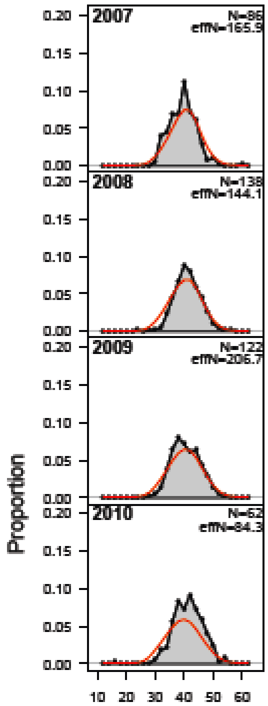


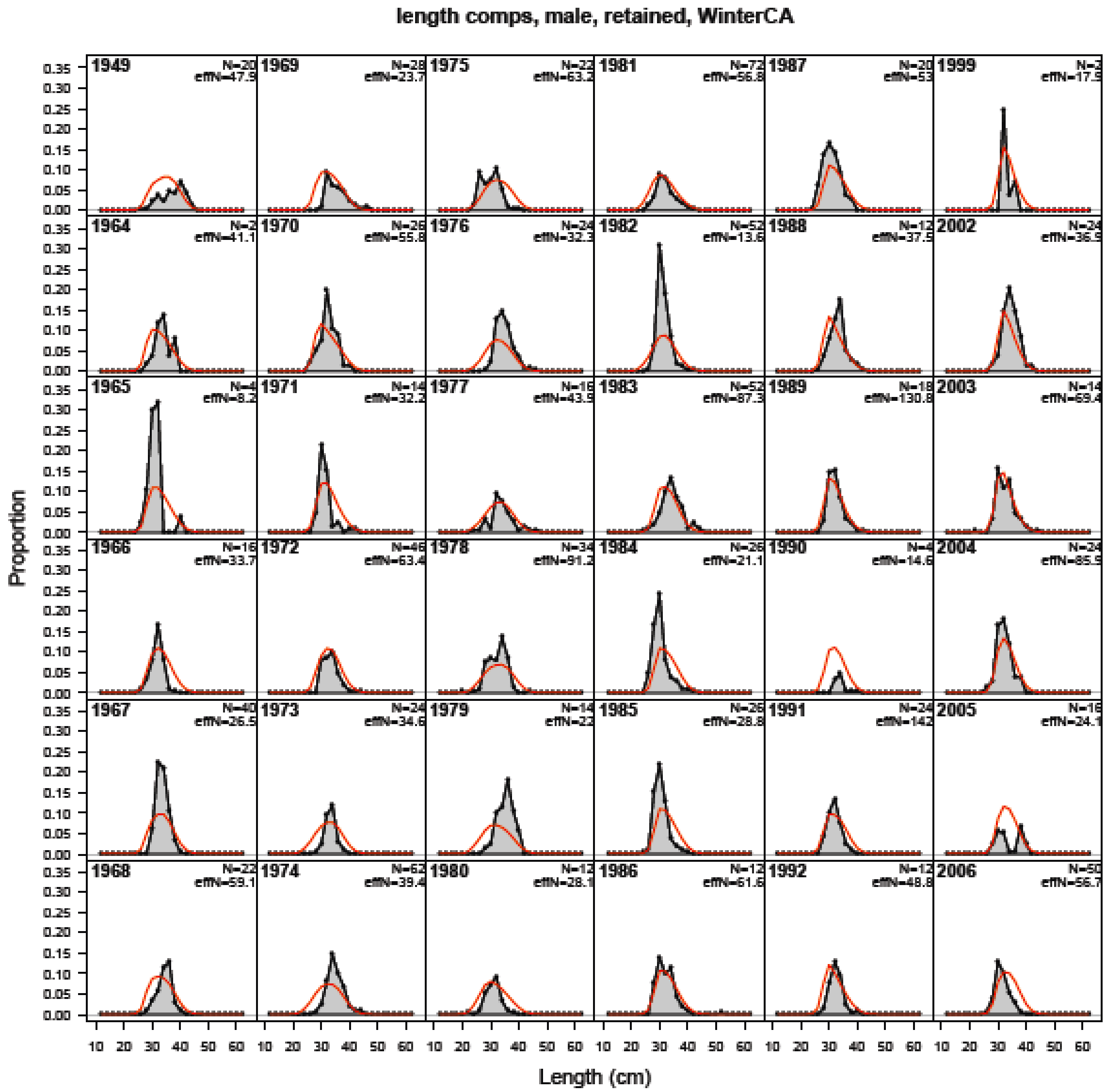
Figure D2. Fit to the Oregon fishery length compositions.


length comps, female, retained, WinterCA
Proportion
Length (cm)

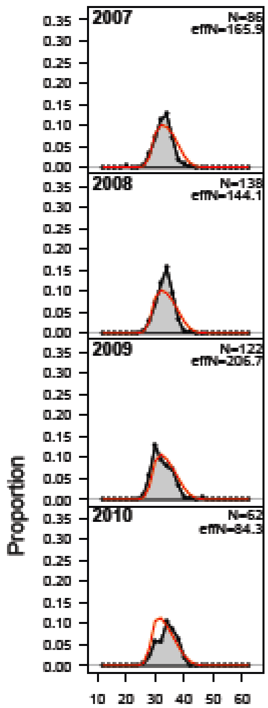
length comps, female, retained, WinterCA




Length (cm)

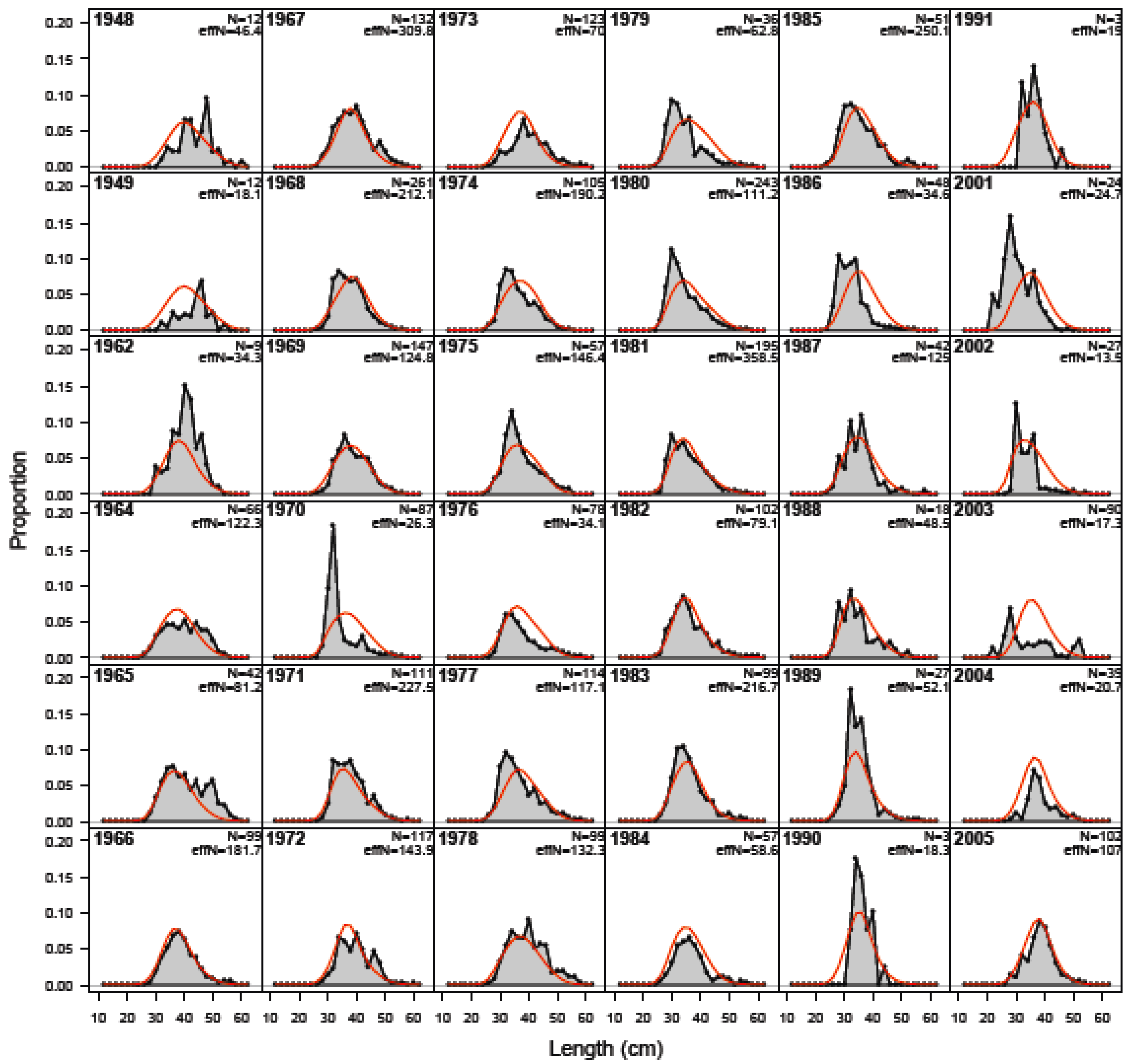

length comps, male, retained, WinterCA
Proportion
Length (cm)

length comps, male, retained, WinterCA

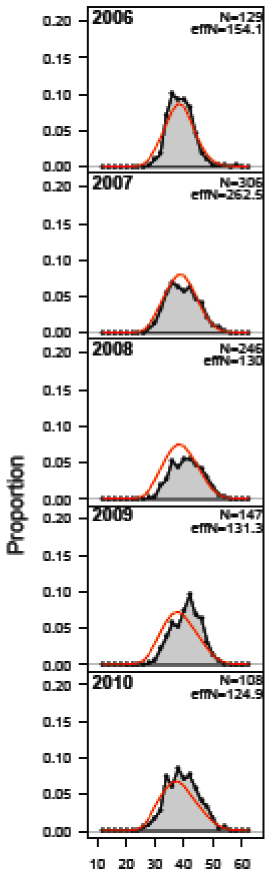



Length (cm)

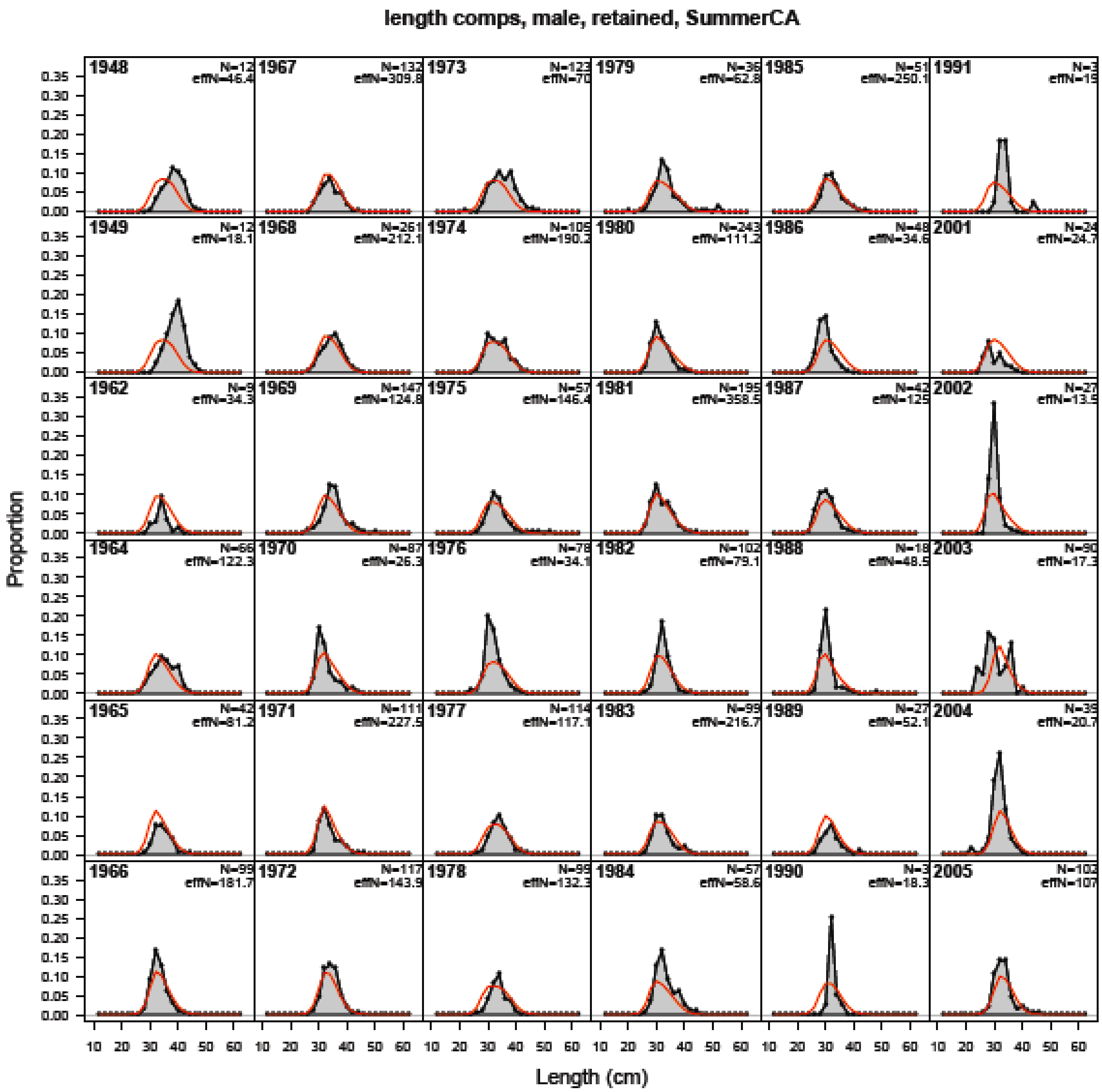
length comps, female, retained, SummerCA



length comps, female, retained, SummerCA




Length (cm)


length comps, male, retained, SummerCA
Proportion
Length (cm)

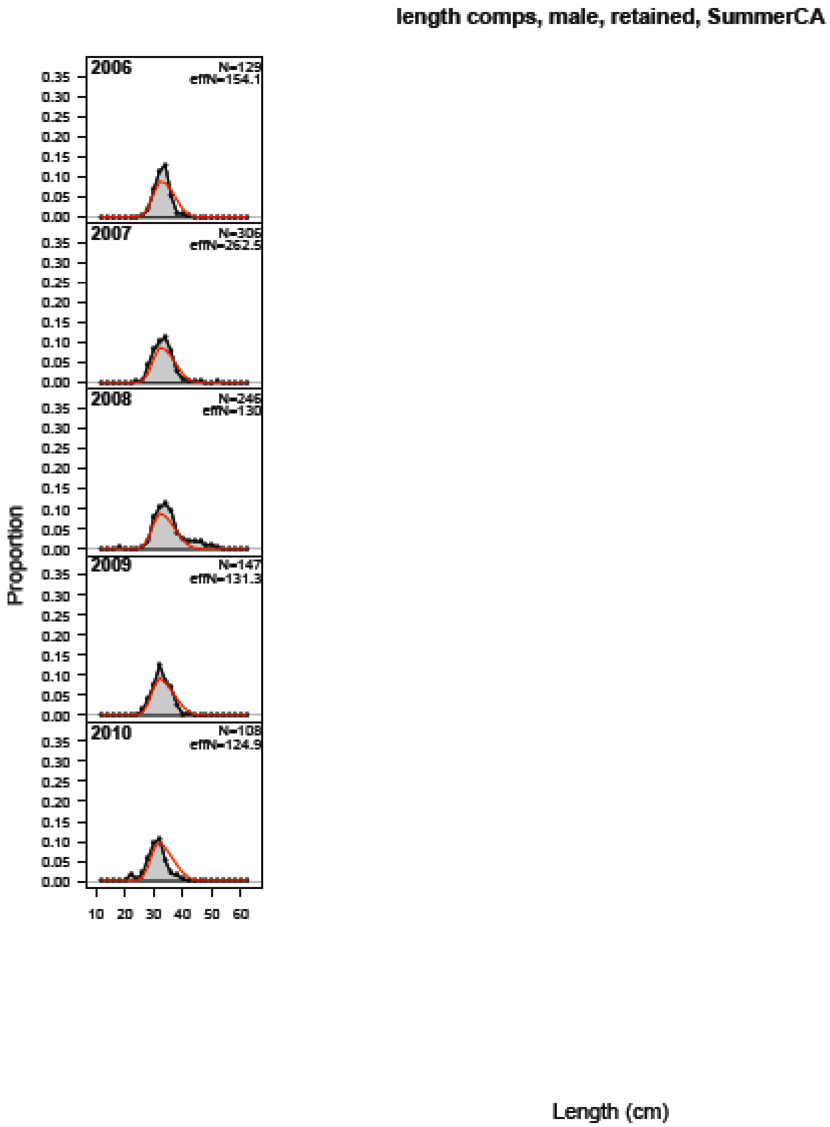
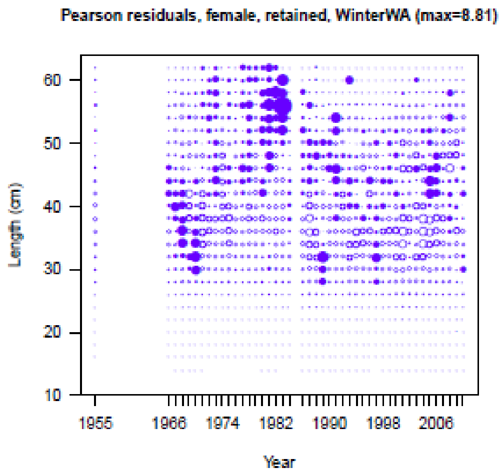
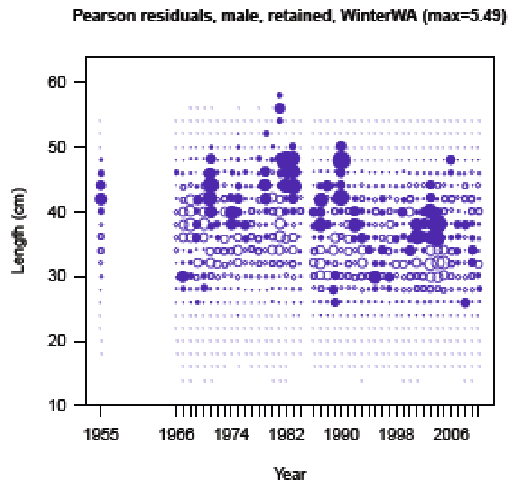
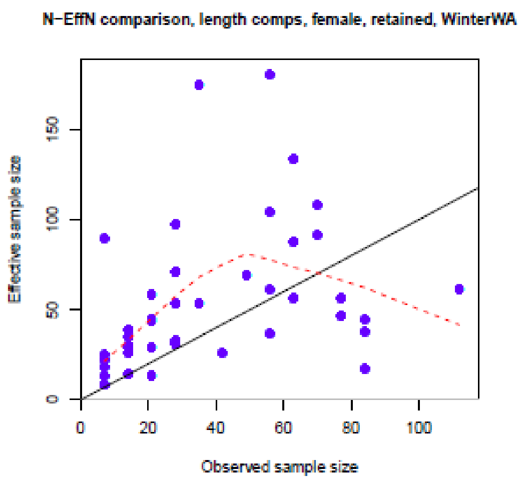
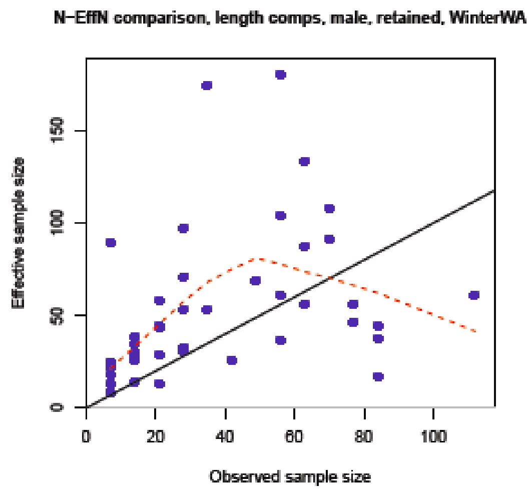



Figure D3. Fit to the California fishery length compositions.


Pearson residuals, female, retained, WinterWA (max=8.81)
Length (cm)
Year
1955
1966
1974
1982
1990
1998
2006
10
20
30
40
50
60


Pearson residuals, male, retained, WinterWA (max=5.49)
Length (cm)
Year
1955
1966
1974
1982
1990
1998
2006
10
20
30
40
50
60


N−EffN comparison, length comps, female, retained, WinterWA
Effective sample size
Observed sample size
0
50
100
150
0
20
40
60
80
100


N−EffN comparison, length comps, male, retained, WinterWA
Effective sample size
Observed sample size
0
50
100
150
0
20
40
60
80
100

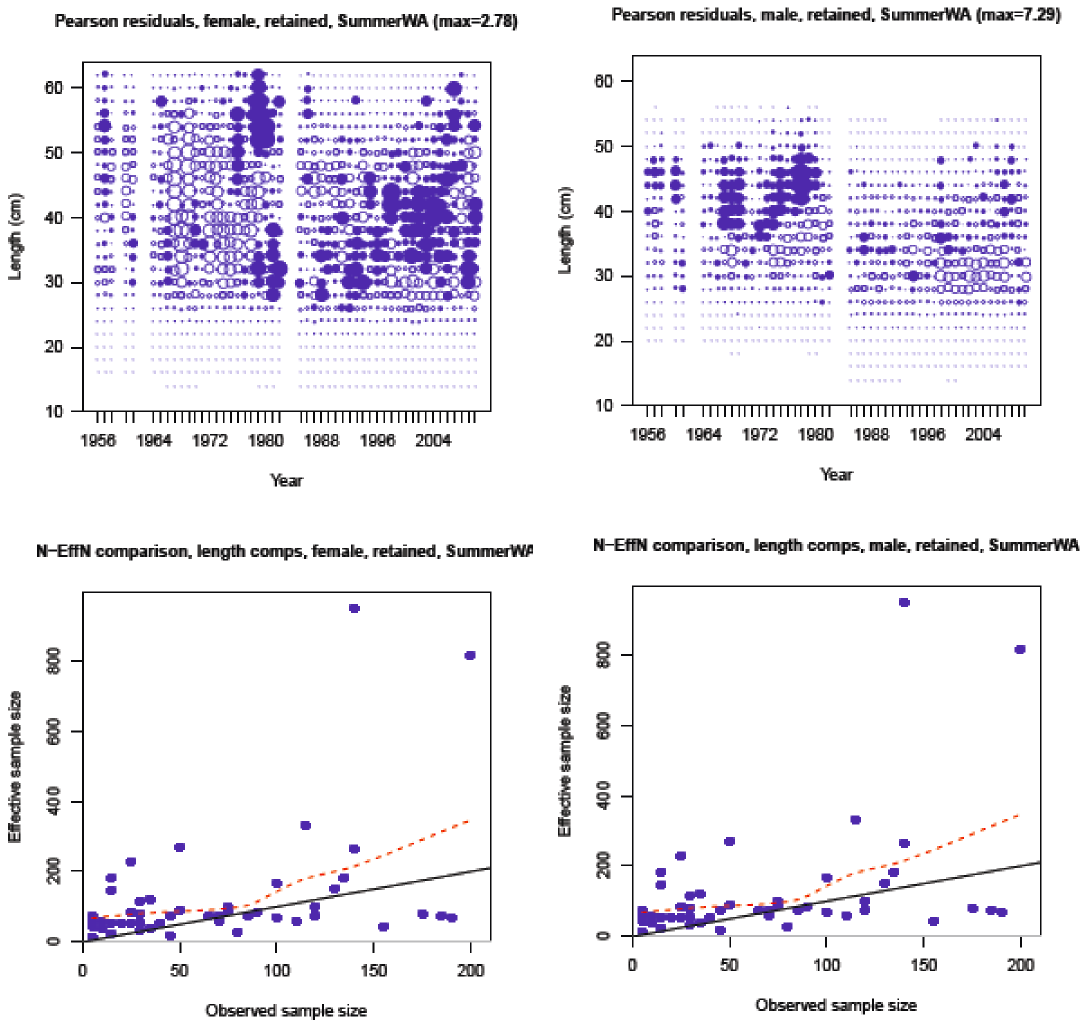
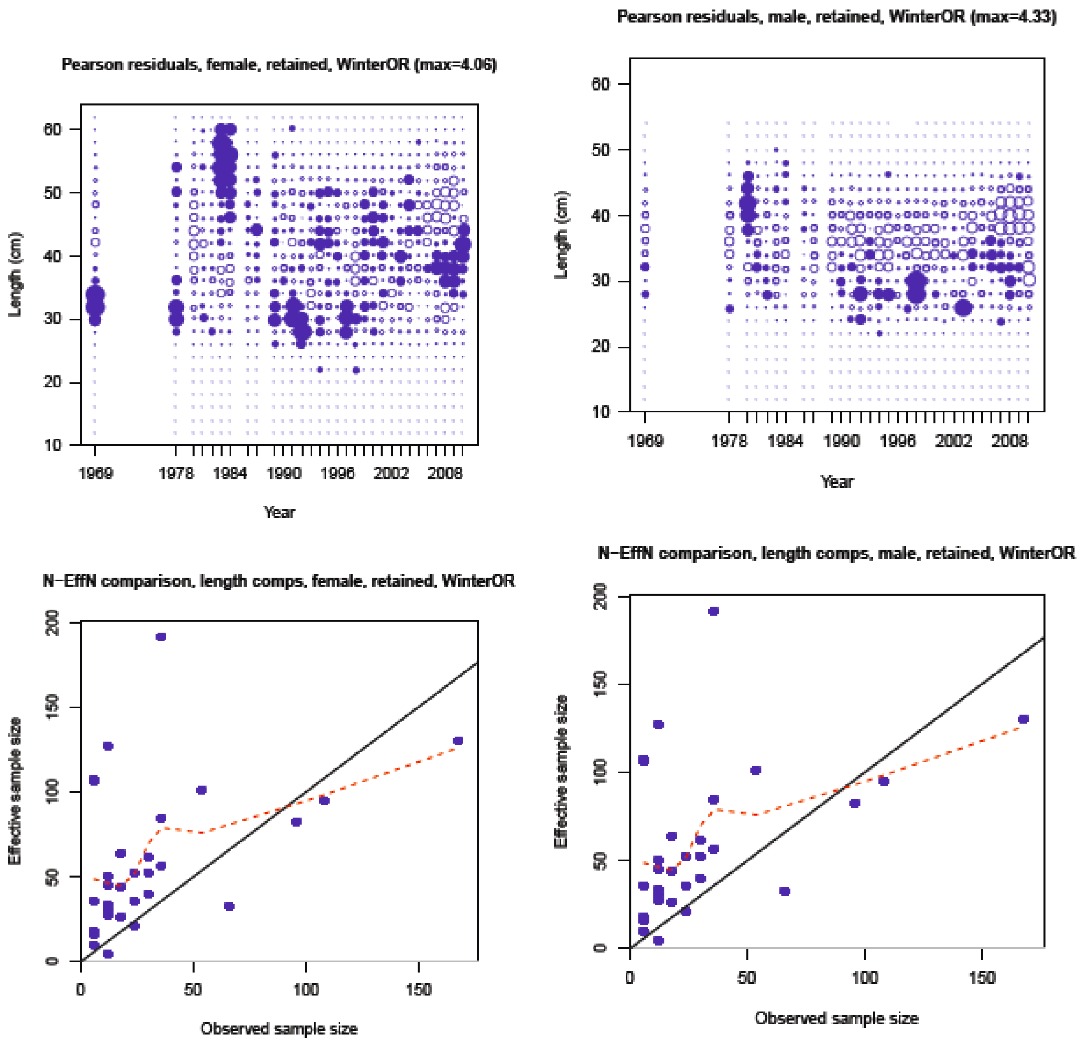



Figure D4. Pearson residuals and Effective N for the Washington fishery length compositions.


Pearson residuals, female, retained, WinterOR (max=4.06)
Length (cm)
Year
Pearson residuals, male, retained, WinterOR (max=4.33)
Length (cm)
Year
N−EffN comparison, length comps, female, retained, WinterOR
Effective sample size
Observed sample size
N−EffN comparison, length comps, male, retained, WinterOR
Effective sample size
Observed sample size

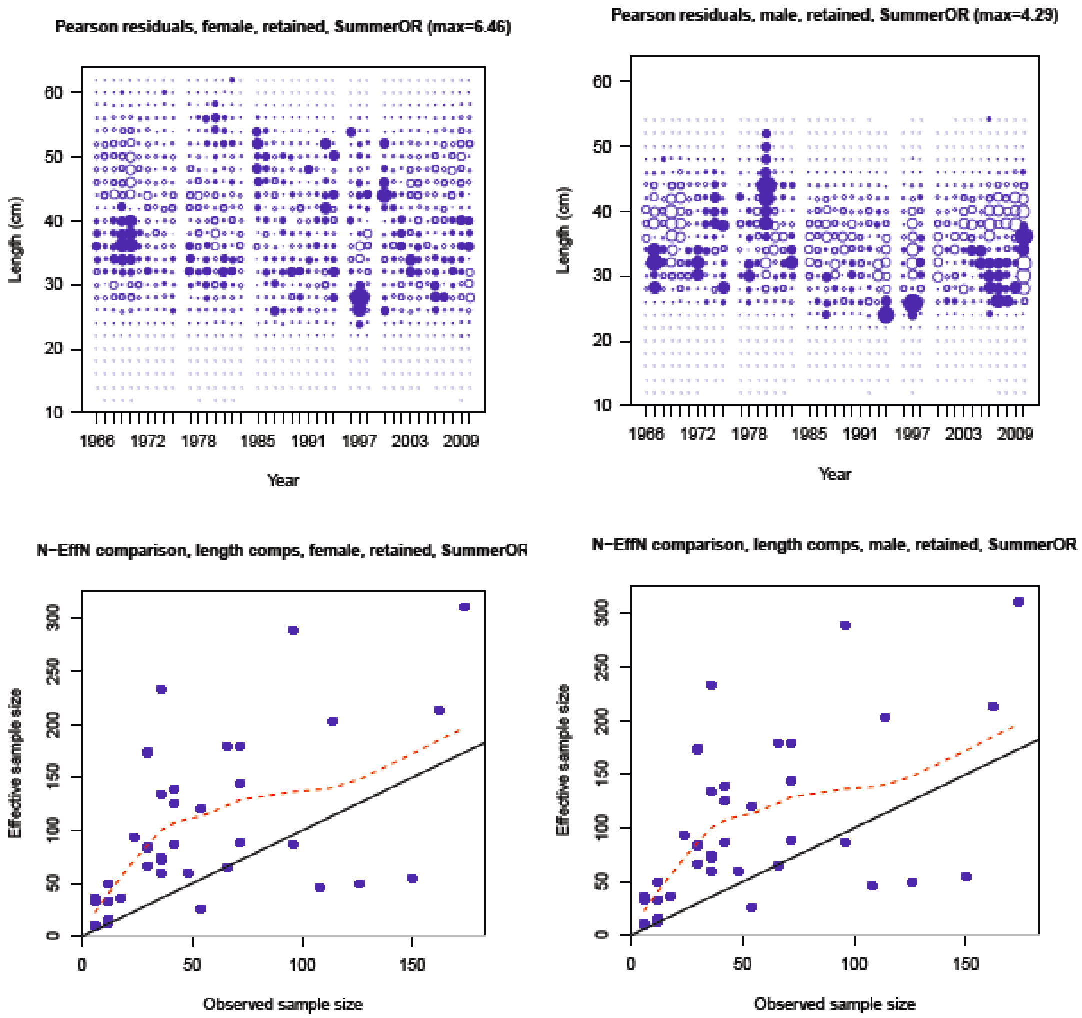
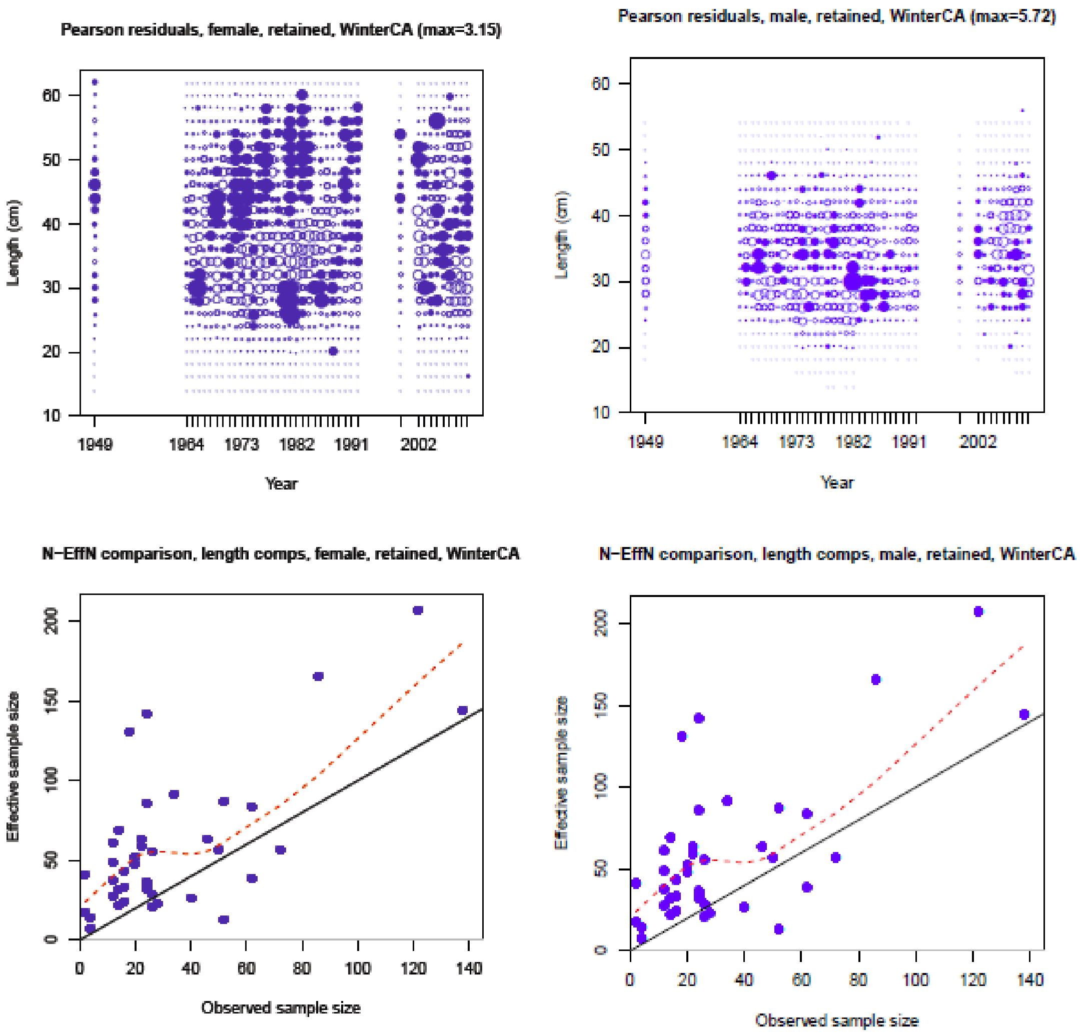



Figure D5. Pearson residuals and Effective N for the Oregon fishery length compositions.



Pearson residuals, female, retained, WinterCA (max=3.15)
Length (cm)
Year
Pearson residuals, male, retained, WinterCA (max=5.72)
Length (cm)
Year
N-EffN comparison, length comps, female, retained, WinterCA
Effective sample size
Observed sample size
N-EffN comparison, length comps, male, retained, WinterCA
Effective sample size
Observed sample size

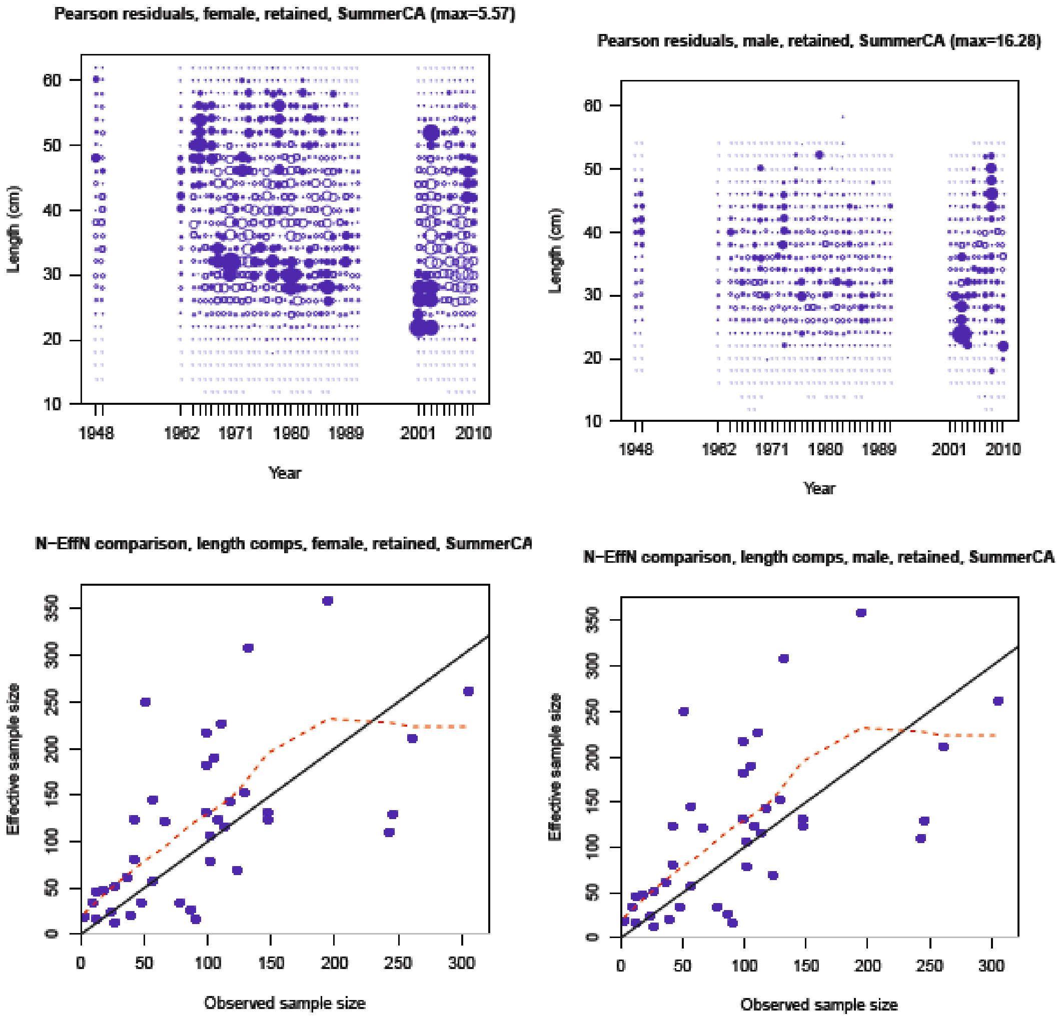
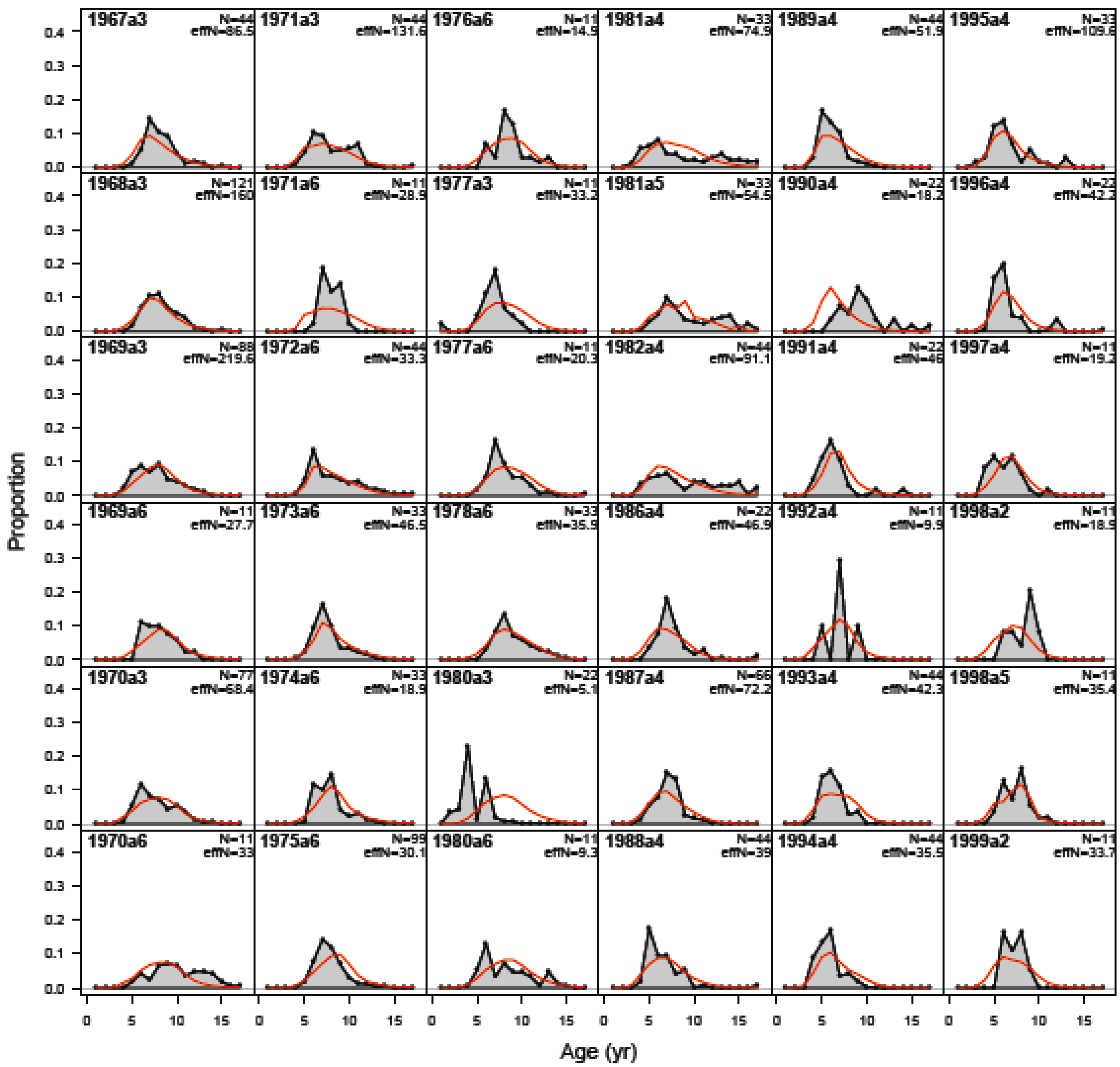
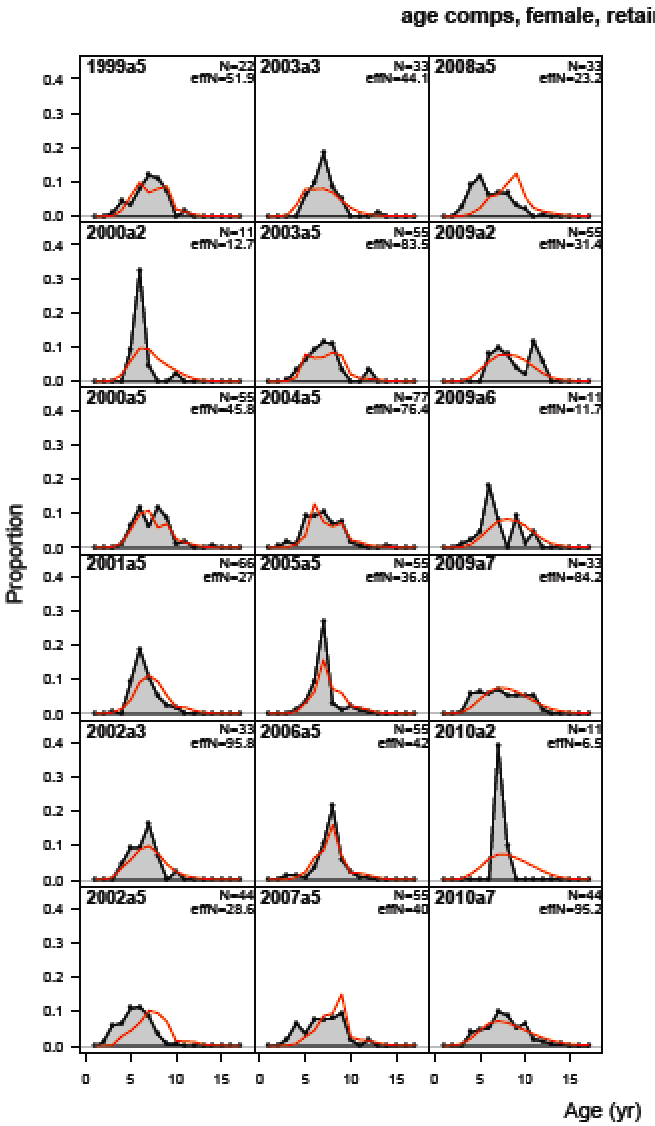


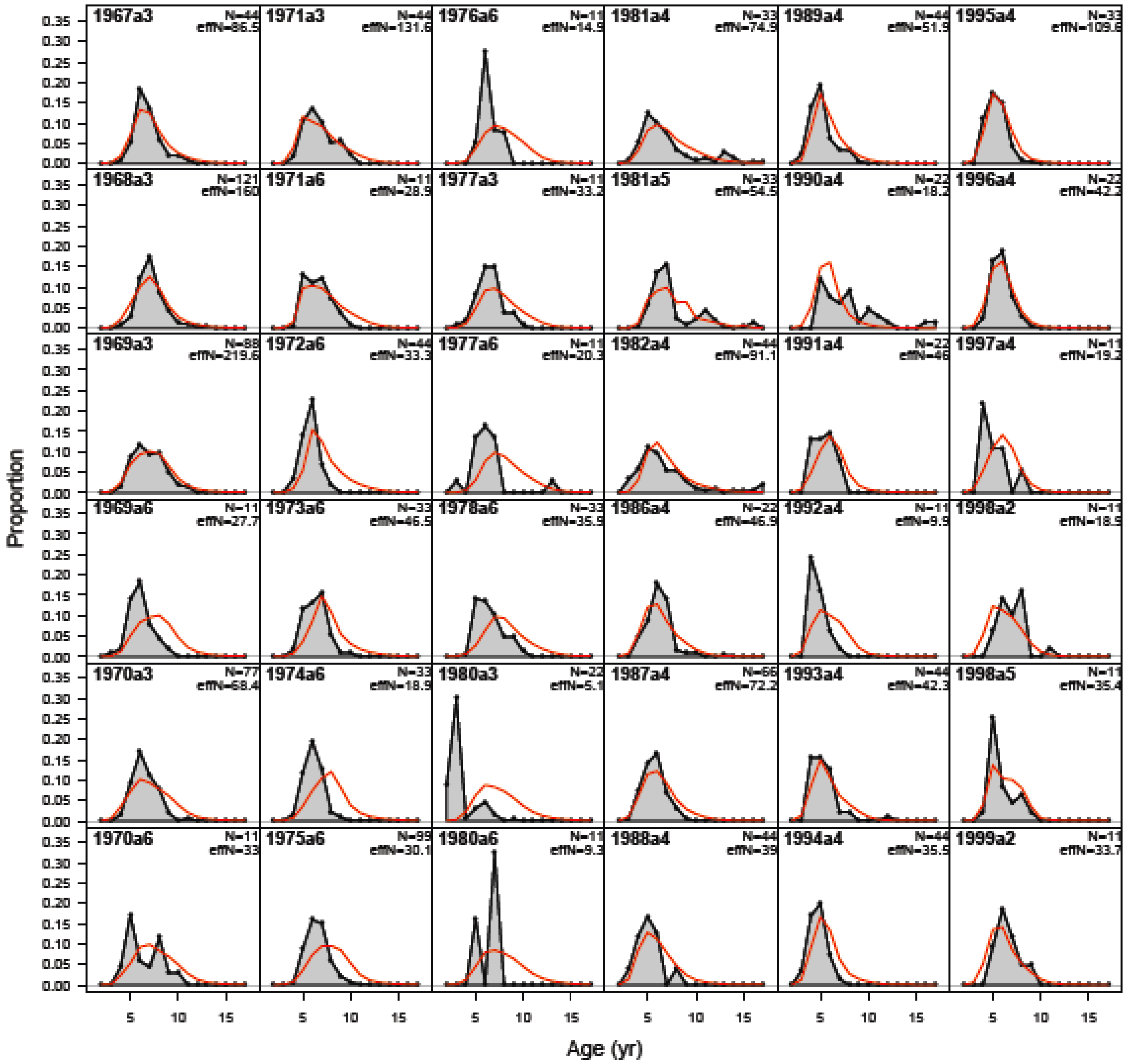

Figure D6. Pearson residuals and Effective N for the California fishery length compositions.

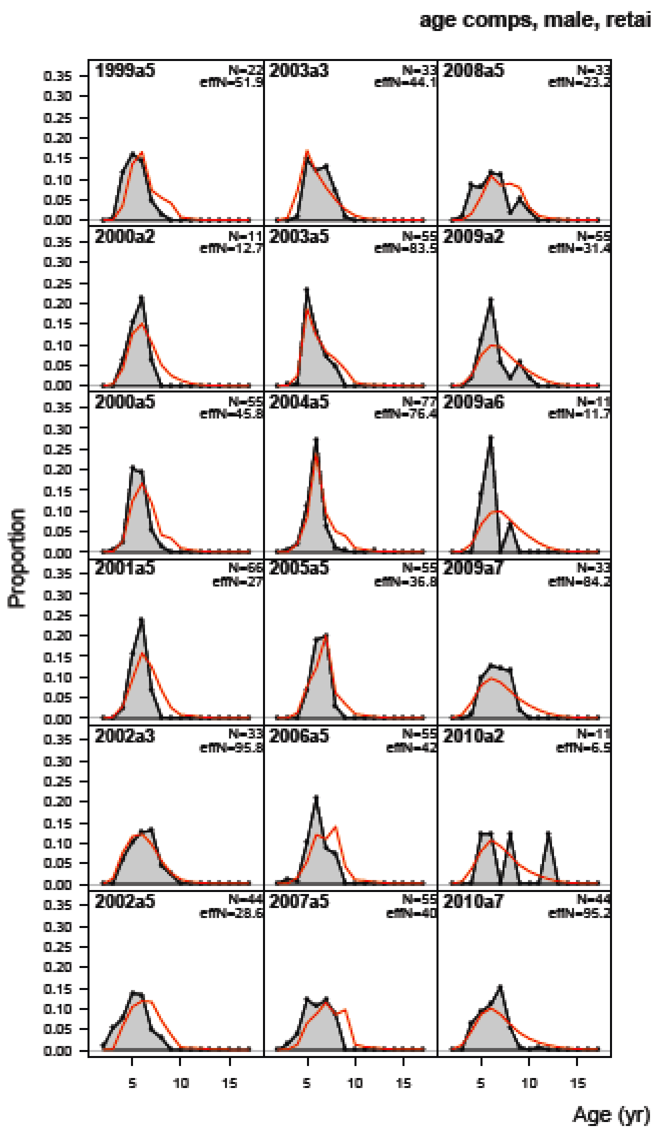
age comps, female, retained, WinterWA

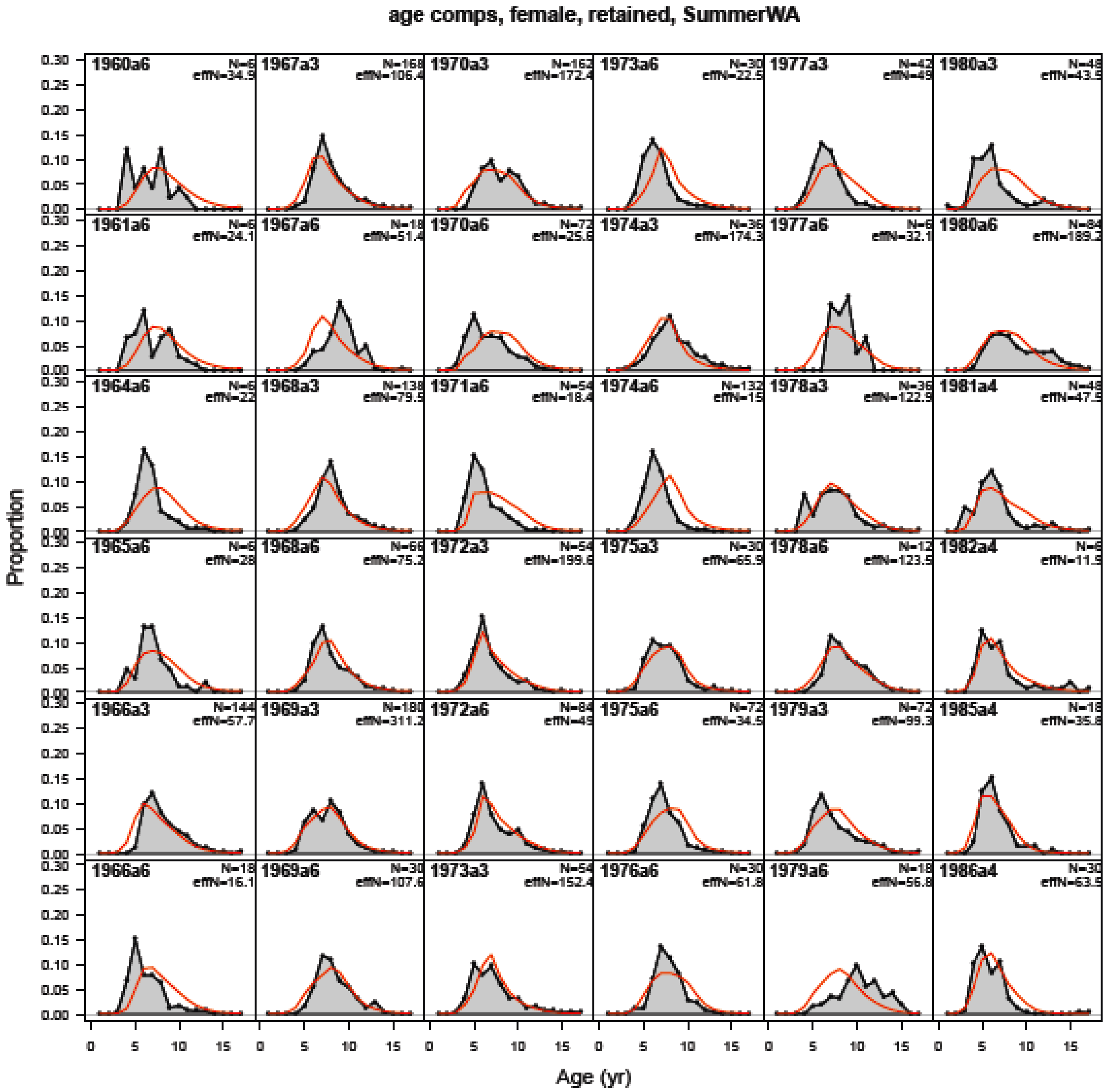


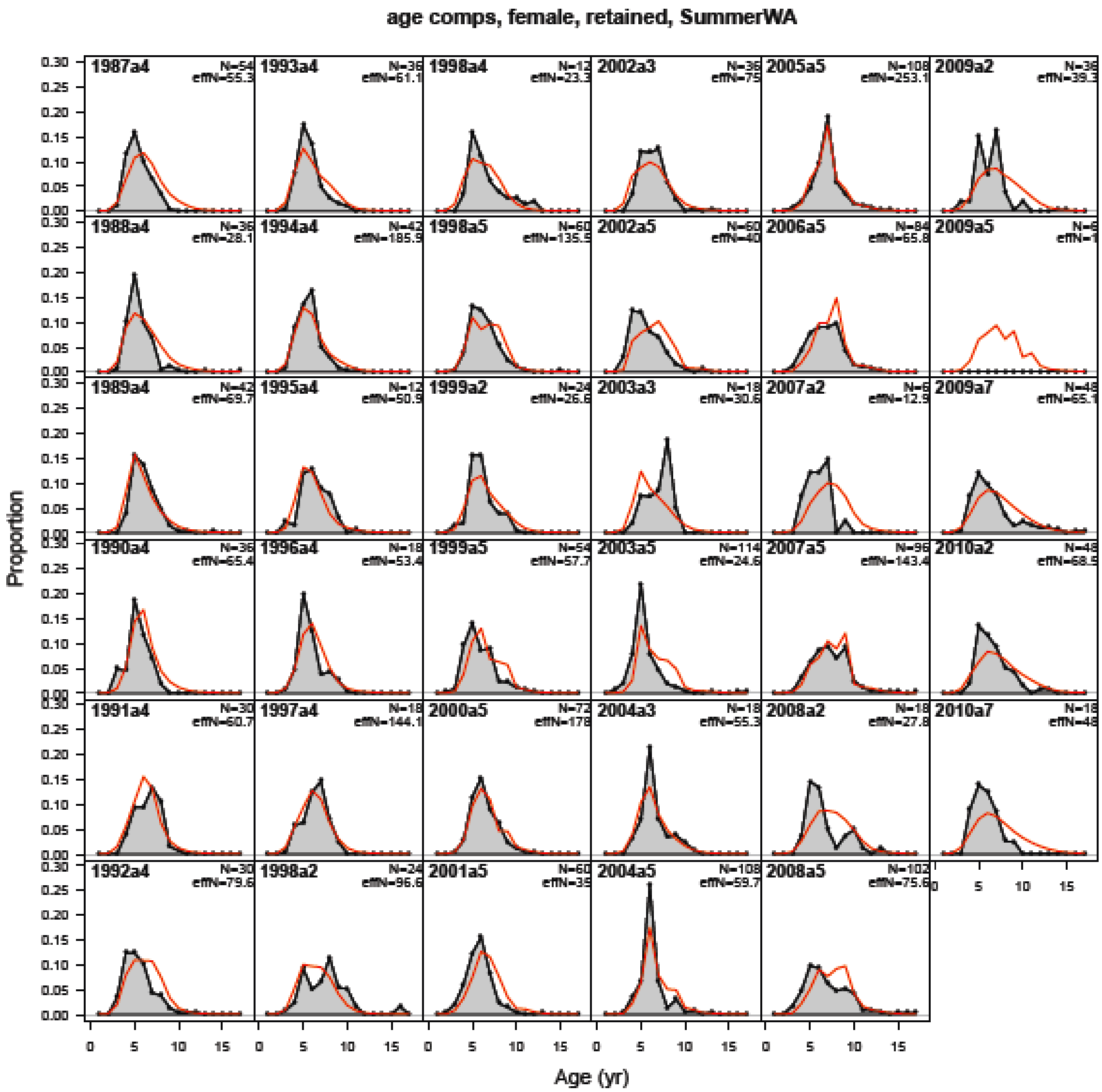

age comps, female, retained, WinterWA
1999a5
N=22
effN=51.9
2003a3
N=33
effN=44.1
2008a5
N=33
effN=23.2
2000a2
N=11
effN=12.7
2003a5
N=55
effN=83.5
2009a2
N=55
effN=31.4
2000a5
N=55
effN=45.8
2004a5
N=77
effN=76.4
2009a6
N=11
effN=11.7
2001a5
N=66
effN=27
2005a5
N=55
effN=36.8
2009a7
N=33
effN=84.2
2002a3
N=33
effN=95.8
2006a5
N=55
effN=42
2010a2
N=11
effN=6.9
2002a5
N=44
effN=28.6
2007a5
N=55
effN=40
2010a7
N=44
effN=95.2
Proportion
Age (yr)

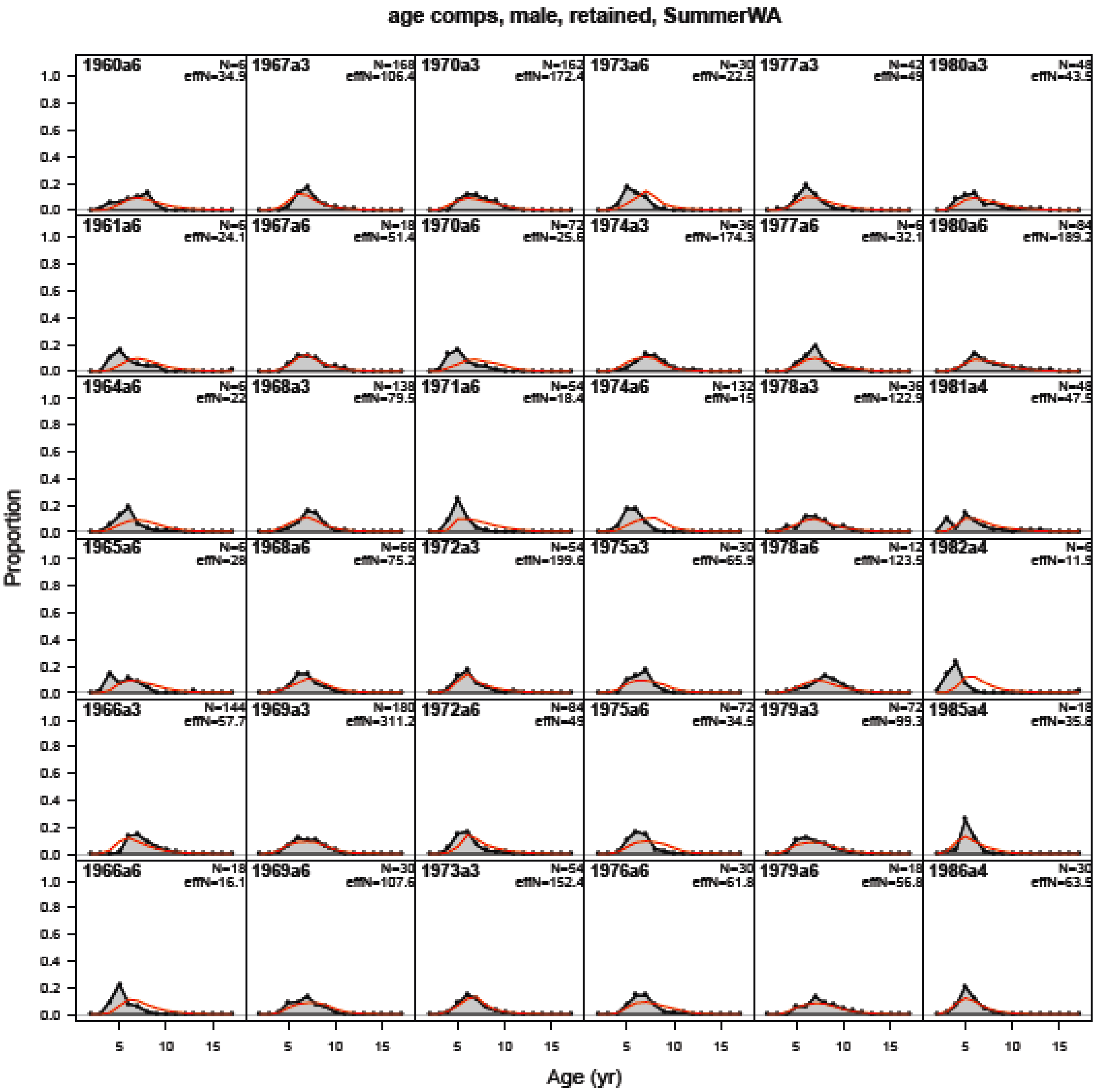
age comps, male, retained, WinterWA




age comps, male, retained, WinterWA
Proportion
Age (yr)
1999a5 N=22 effN=51.9
2003a3 N=33 effN=44.1
2008a5 N=33 effN=23.2
2000a2 N=11 effN=12.7
2003a5 N=55 effN=83.5
2009a2 N=55 effN=31.4
2000a5 N=55 effN=45.8
2004a5 N=77 effN=76.4
2009a6 N=11 effN=11.7
2001a5 N=66 effN=27
2005a5 N=55 effN=36.8
2009a7 N=33 effN=84.2
2002a3 N=33 effN=95.8
2006a5 N=55 effN=42
2010a2 N=11 effN=6.9
2002a5 N=44 effN=28.6
2007a5 N=55 effN=40
2010a7 N=44 effN=95.2


age comps, female, retained, SummerWA
1960a6
1967a3
1970a3
1973a6
1977a3
1980a3
1961a6
1967a6
1970a6
1974a3
1977a6
1980a6
1964a6
1968a3
1971a6
1974a6
1978a3
1981a4
1965a6
1968a6
1972a3
1975a3
1978a6
1982a4
1966a3
1969a3
1972a6
1975a6
1979a3
1985a4
1966a6
1969a6
1973a3
1976a6
1979a6
1986a4
Proportion
Age (yr)


age comps, female, retained, SummerWA
Proportion
Age (yr)
1987a4
1993a4
1998a4
2002a3
2005a5
2009a2
1988a4
1994a4
1998a5
2002a5
2006a5
2009a5
1989a4
1995a4
1999a2
2003a3
2007a2
2009a7
1990a4
1996a4
1999a5
2003a5
2007a5
2010a2
1991a4
1997a4
2000a5
2004a3
2008a2
2010a7
1992a4
1998a2
2001a5
2004a5
2008a5


age comps, male, retained, SummerWA
Proportion
Age (yr)
1960a6
1967a3
1970a3
1973a6
1977a3
1980a3
1961a6
1967a6
1970a6
1974a3
1977a6
1980a6
1964a6
1968a3
1971a6
1974a6
1978a3
1981a4
1965a6
1968a6
1972a3
1975a3
1978a6
1982a4
1966a3
1969a3
1972a6
1975a6
1979a3
1985a4
1966a6
1969a6
1973a3
1976a6
1979a6
1986a4

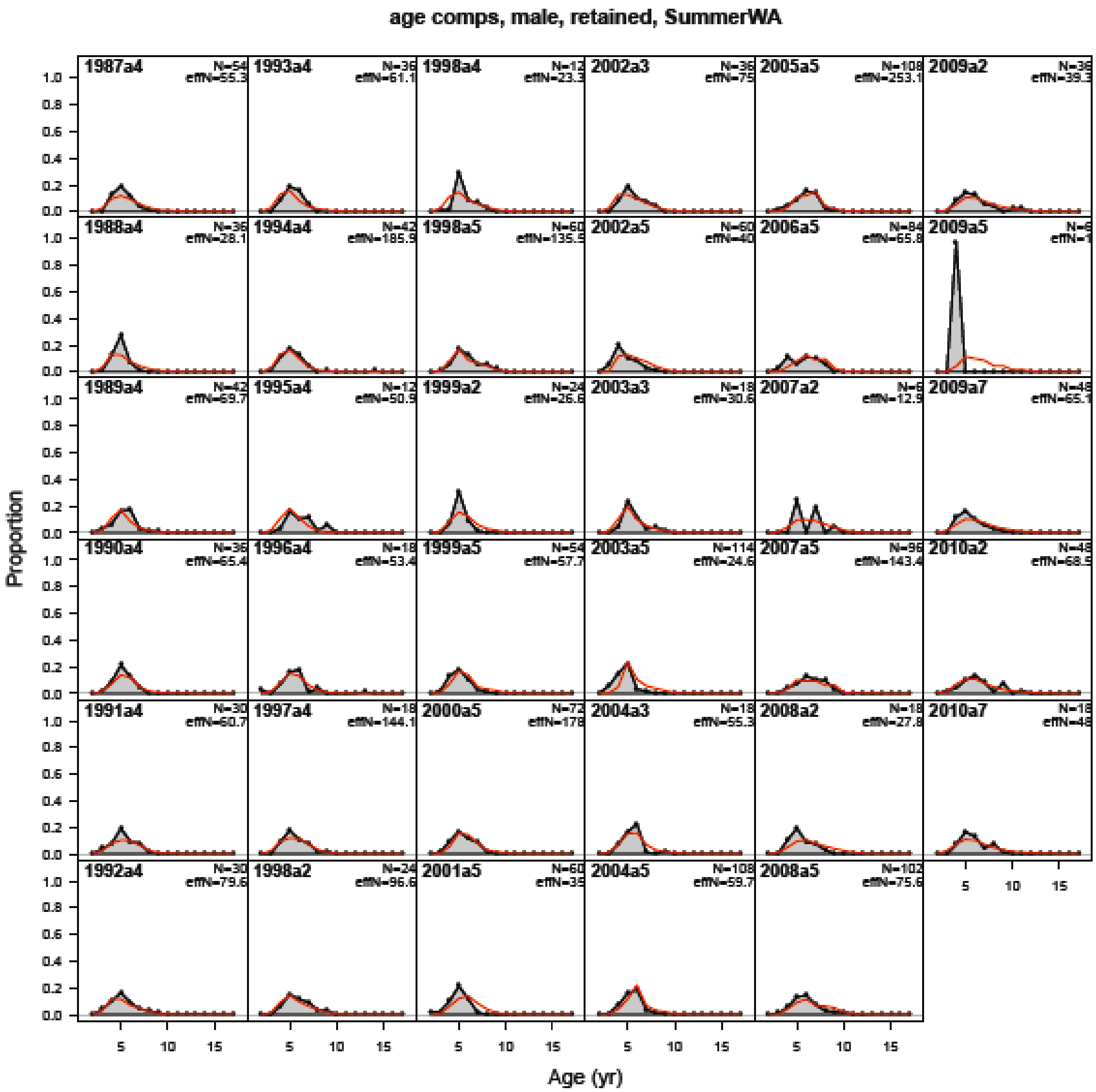
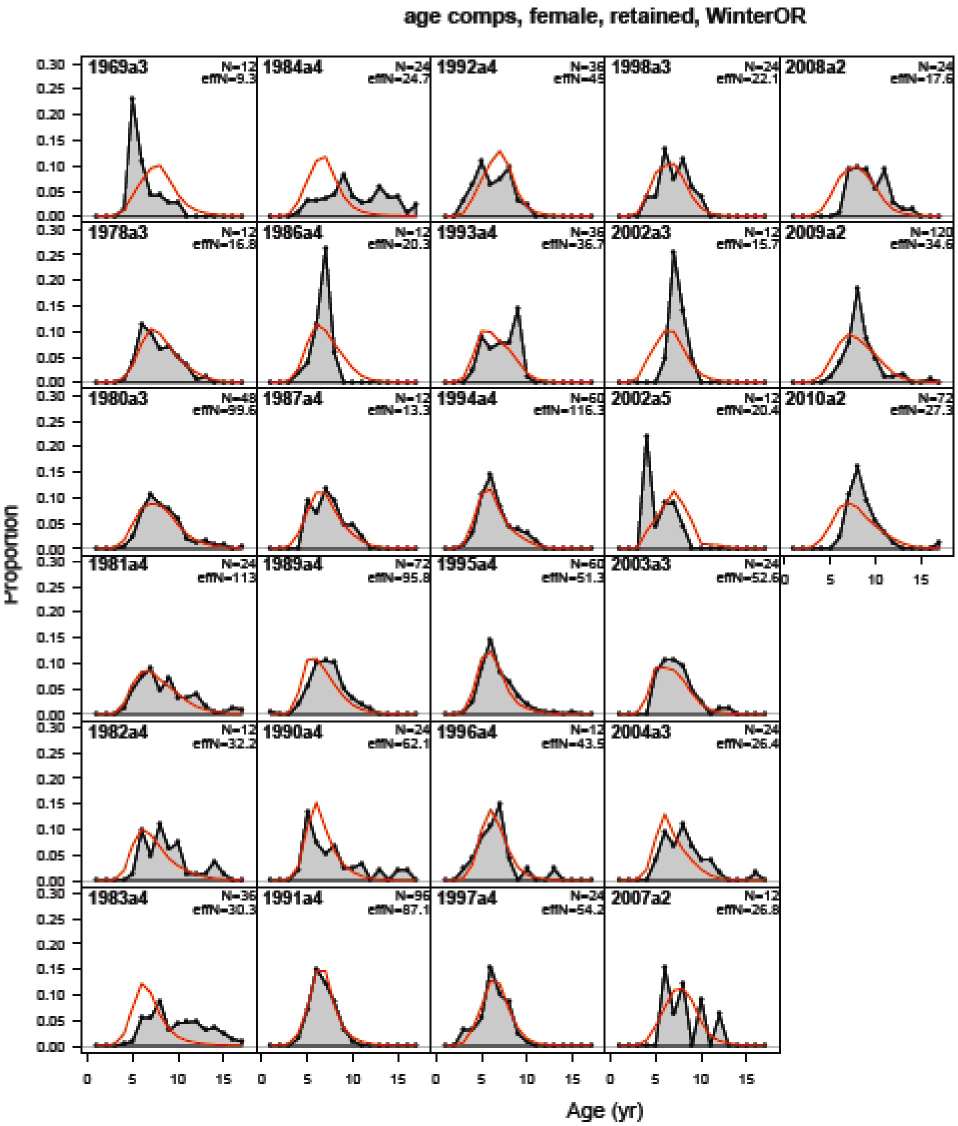
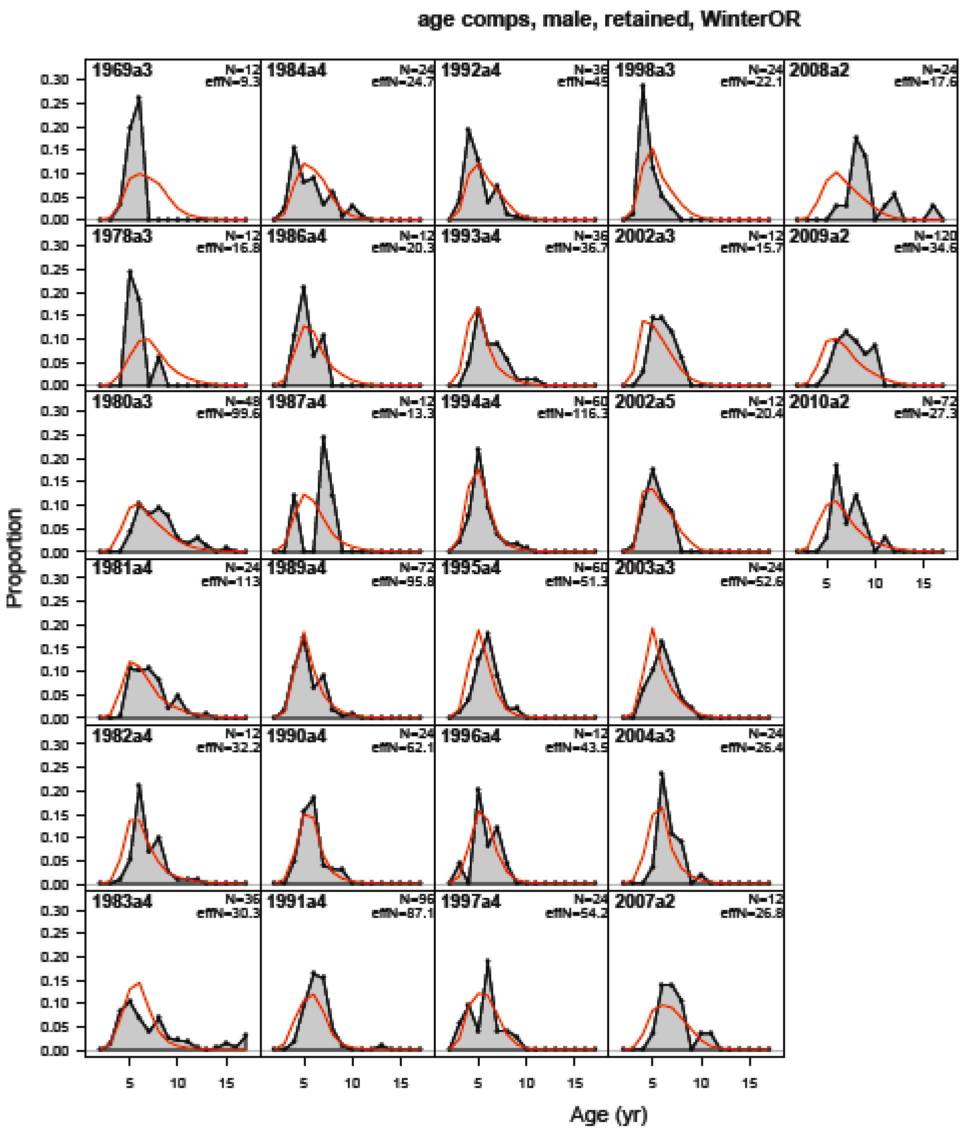


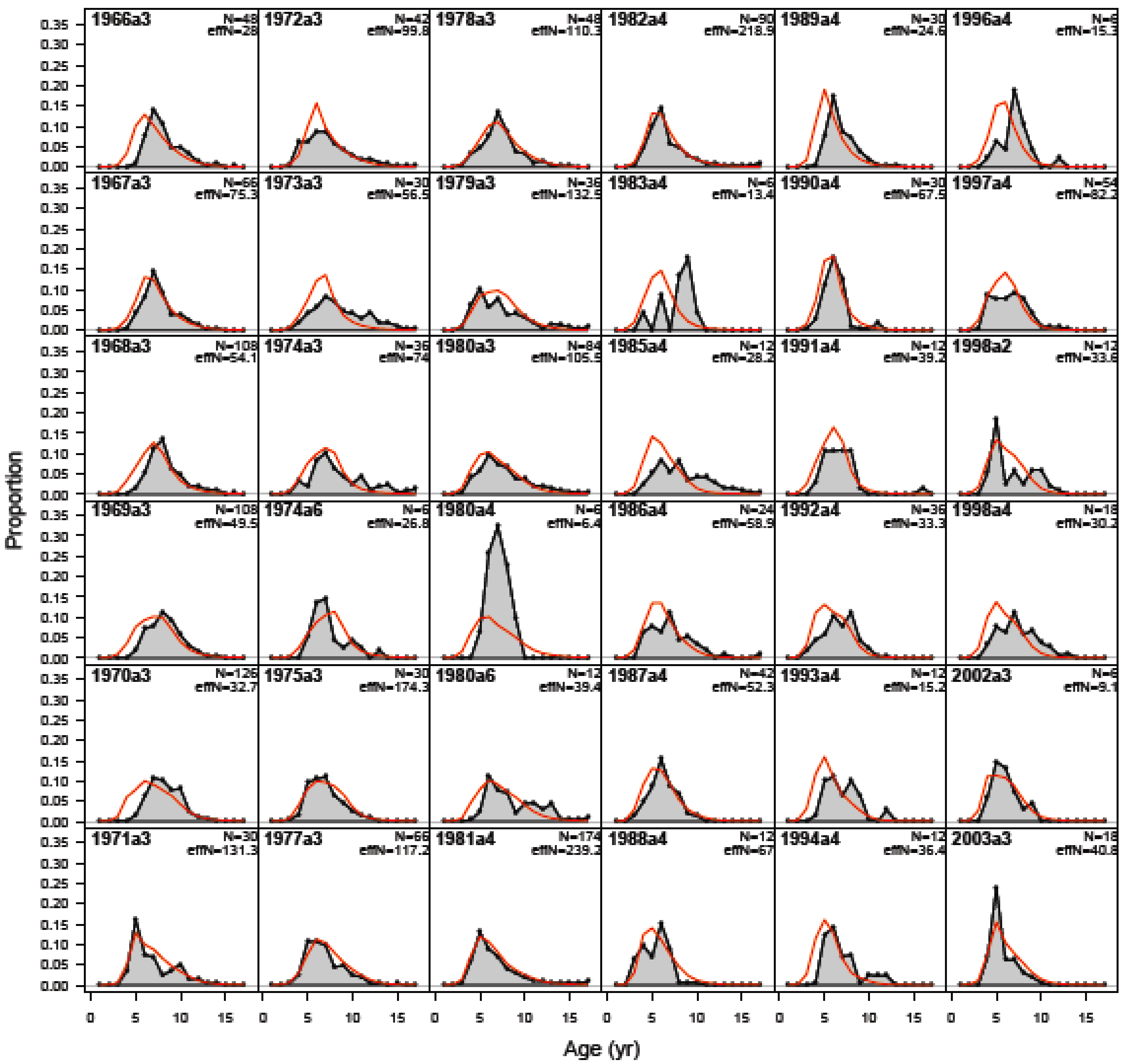

Figure D7. Fit to the Washington fishery age compositions.

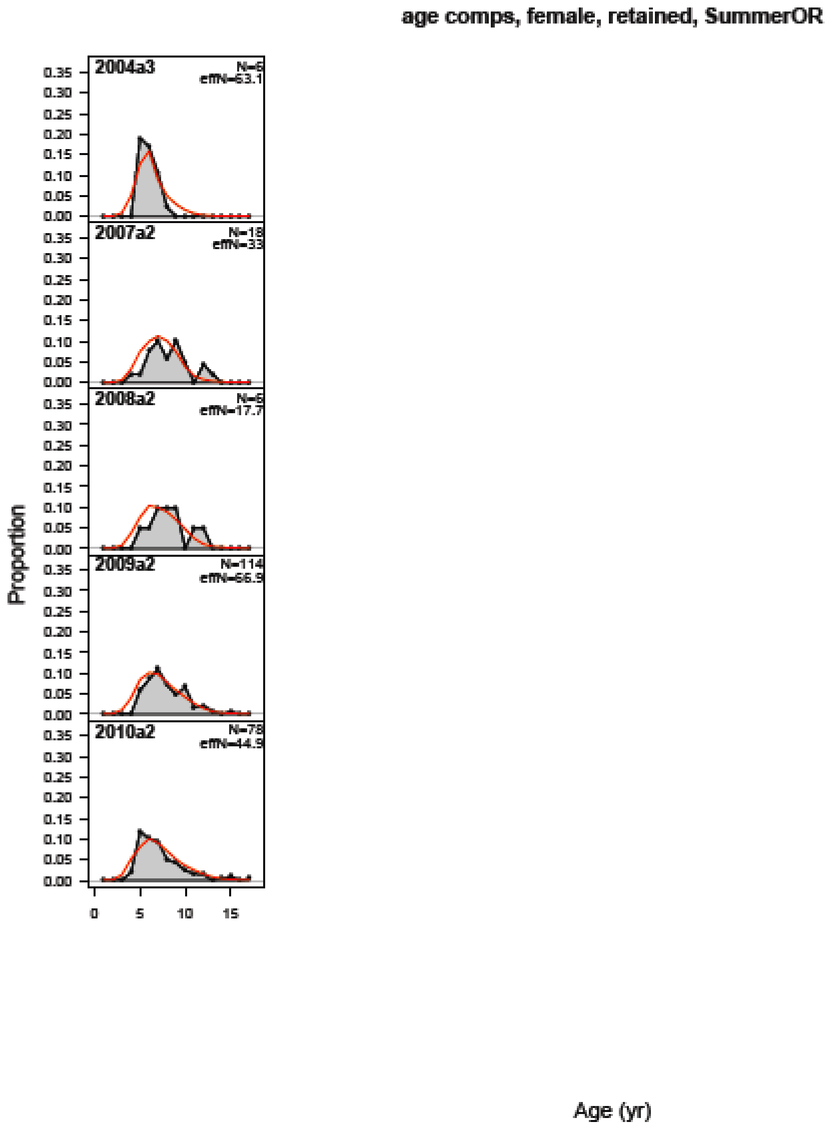


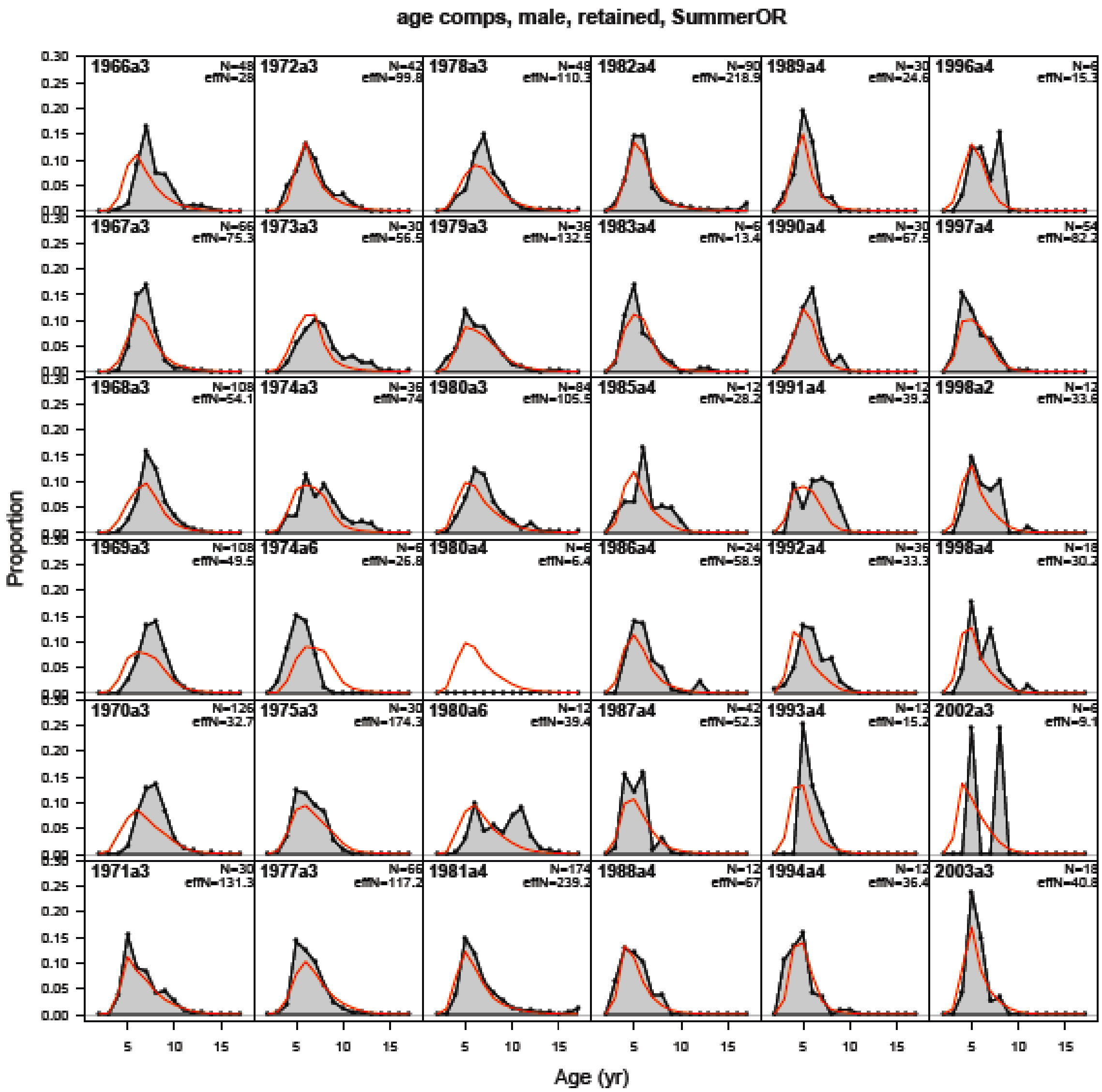
age comps, female, retained, WinterOR
1969a3
1978a3
1980a3
1981a4
1982a4
1983a4
1984a4
1986a4
1987a4
1989a4
1990a4
1991a4
1992a4
1993a4
1994a4
1995a4
1996a4
1997a4
1998a3
2002a3
2002a5
2003a3
2004a3
2007a2
2008a2
2009a2
2010a2
Proportion
Age (yr)


age comps, male, retained, WinterOR
1969a3 N=12 effN=9.3
1984a4 N=24 effN=24.7
1992a4 N=36 effN=45
1998a3 N=24 effN=22.1
2008a2 N=24 effN=17.6
1978a3 N=12 effN=16.8
1986a4 N=12 effN=20.3
1993a4 N=36 effN=36.7
2002a3 N=12 effN=15.7
2009a2 N=120 effN=34.6
1980a3 N=48 effN=99.6
1987a4 N=12 effN=13.3
1994a4 N=60 effN=116.3
2002a5 N=12 effN=20.4
2010a2 N=72 effN=27.3
1981a4 N=24 effN=113
1989a4 N=72 effN=95.8
1995a4 N=60 effN=51.3
2003a3 N=24 effN=52.6
1982a4 N=12 effN=32.2
1990a4 N=24 effN=62.1
1996a4 N=12 effN=43.5
2004a3 N=24 effN=26.4
1983a4 N=36 effN=30.3
1991a4 N=96 effN=87.1
1997a4 N=24 effN=54.2
2007a2 N=12 effN=26.8
Proportion
Age (yr)

age comps, female, retained, SummerOR




age comps, female, retained, SummerOR
2004a3
N=6
effN=63.1
2007a2
N=18
effN=33
2008a2
N=6
effN=17.7
2009a2
N=114
effN=66.9
2010a2
N=78
effN=44.9
Proportion
Age (yr)


age comps, male, retained, SummerOR
Proportion
Age (yr)
1966a3 N=48 effN=28
1972a3 N=42 effN=99.8
1978a3 N=48 effN=110.3
1982a4 N=90 effN=218.9
1989a4 N=30 effN=24.6
1996a4 N=6 effN=15.3
1967a3 N=66 effN=75.3
1973a3 N=30 effN=56.5
1979a3 N=36 effN=132.5
1983a4 N=6 effN=13.4
1990a4 N=30 effN=67.9
1997a4 N=54 effN=82.2
1968a3 N=108 effN=54.1
1974a3 N=36 effN=74
1980a3 N=84 effN=105.9
1985a4 N=12 effN=28.2
1991a4 N=12 effN=39.2
1998a2 N=12 effN=33.6
1969a3 N=108 effN=49.5
1974a6 N=6 effN=26.8
1980a4 N=6 effN=6.4
1986a4 N=24 effN=58.9
1992a4 N=36 effN=33.3
1998a4 N=18 effN=30.2
1970a3 N=126 effN=32.7
1975a3 N=30 effN=174.3
1980a6 N=12 effN=39.4
1987a4 N=42 effN=52.3
1993a4 N=12 effN=15.2
2002a3 N=6 effN=9.1
1971a3 N=30 effN=131.3
1977a3 N=66 effN=117.2
1981a4 N=174 effN=239.2
1988a4 N=12 effN=67
1994a4 N=12 effN=36.4
2003a3 N=18 effN=40.8

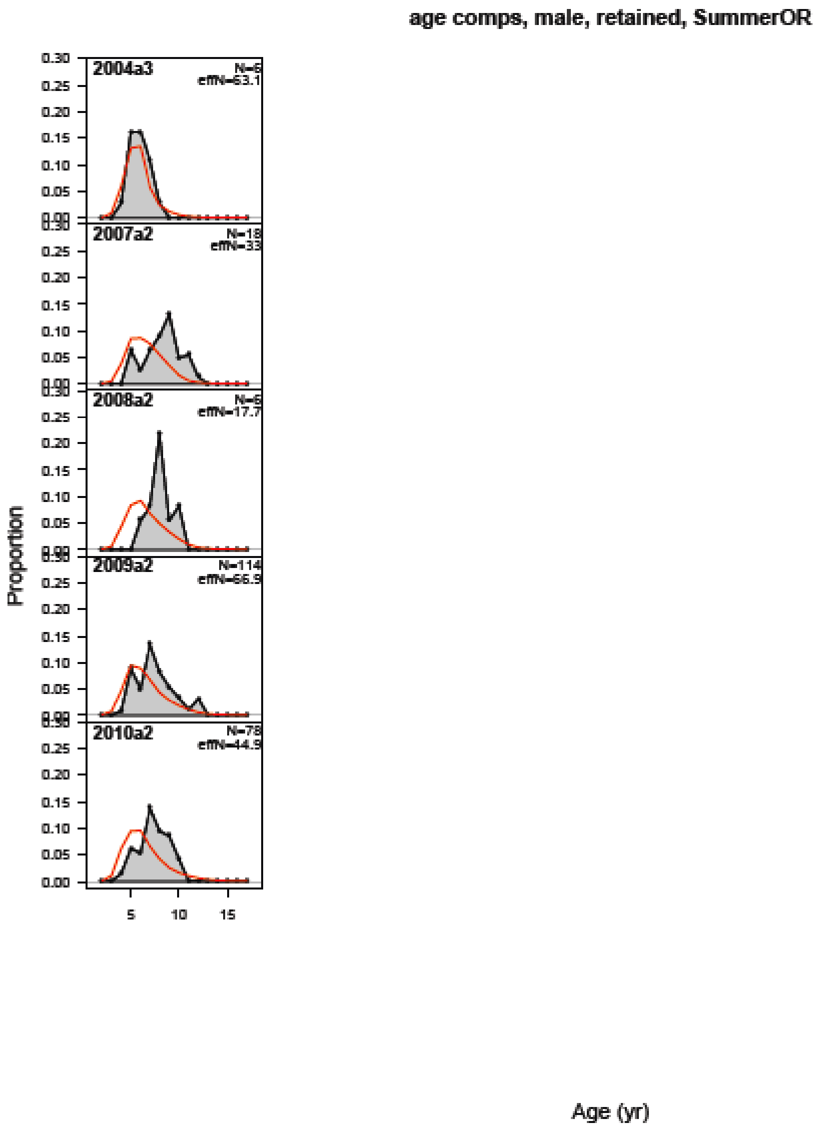
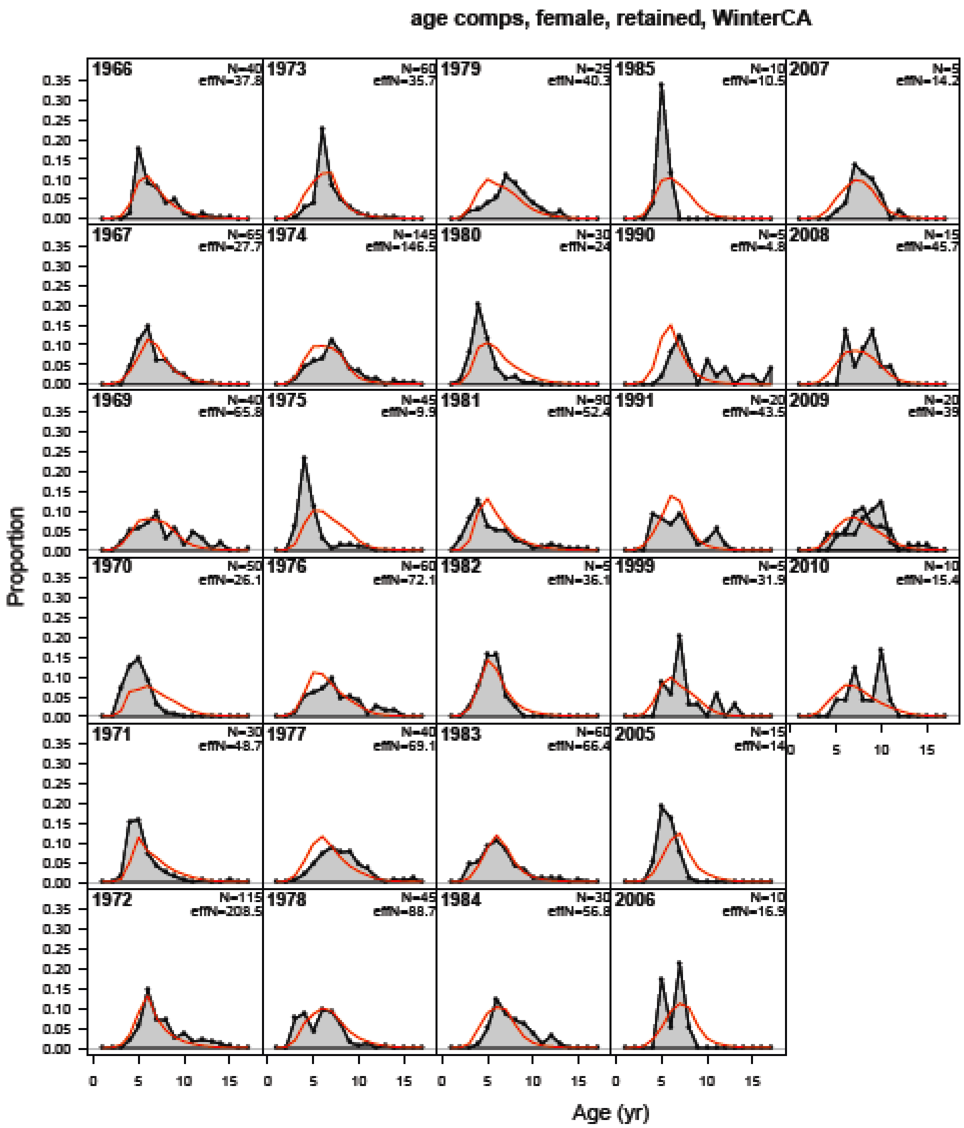
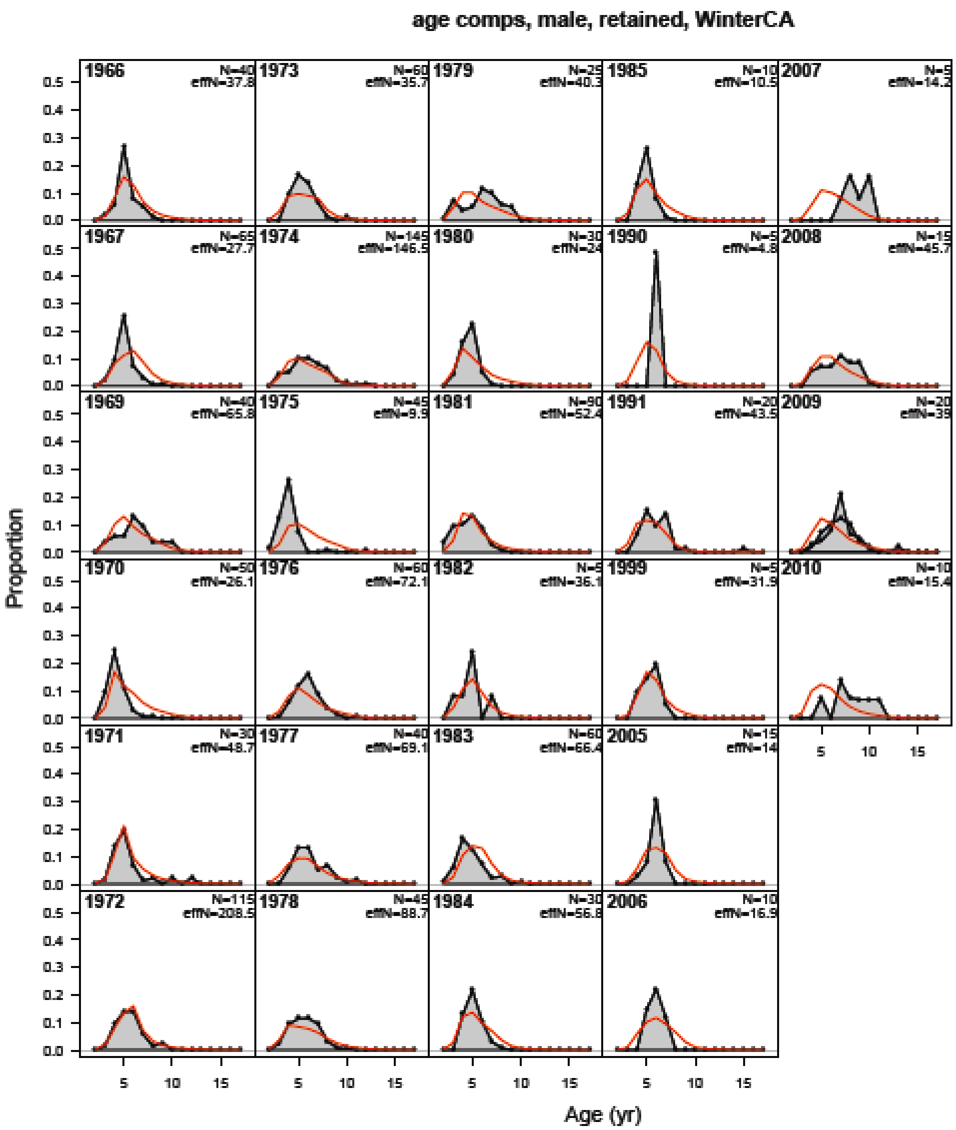
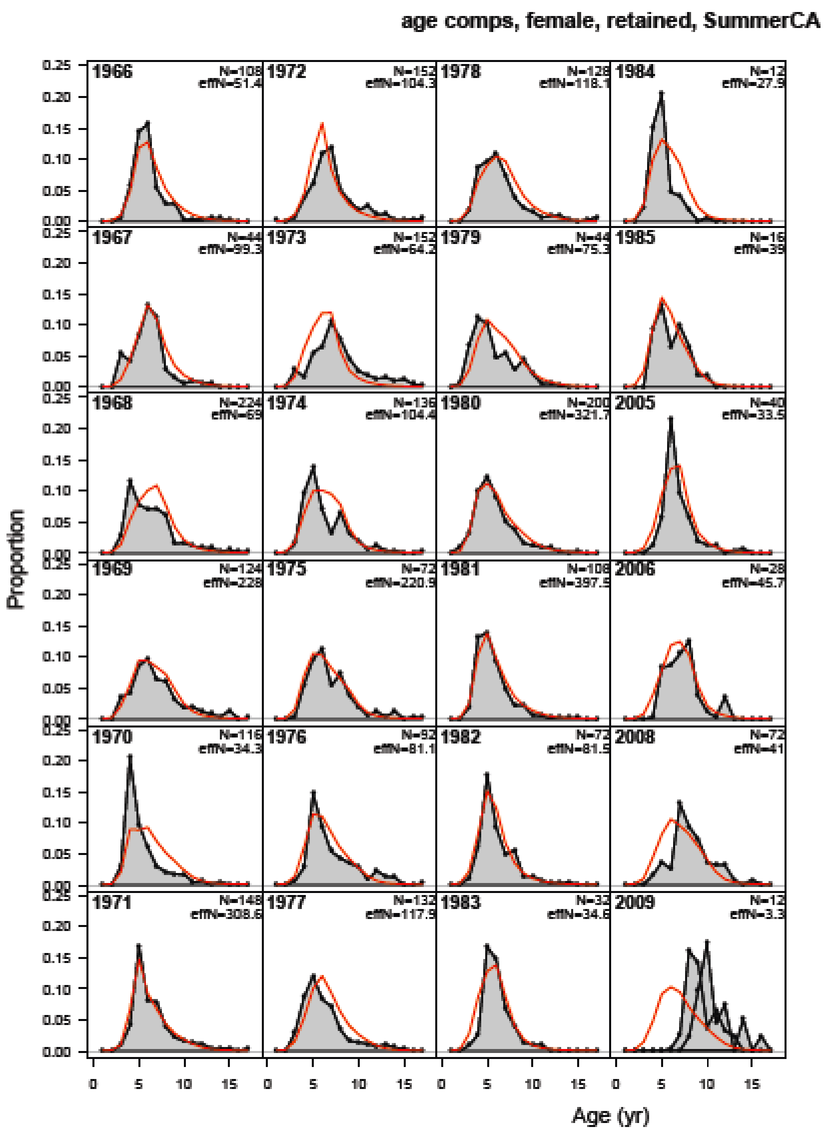



Figure D8. Fit to the Oregon fishery age compositions.


age comps, female, retained, WinterCA
Proportion
Age (yr)
1966
1973
1979
1985
2007
1967
1974
1980
1990
2008
1969
1975
1981
1991
2009
1970
1976
1982
1999
2010
1971
1977
1983
2005
1972
1978
1984
2006



age comps, male, retained, WinterCA
Proportion
Age (yr)
1966
N=40
effN=37.8
1973
N=60
effN=35.7
1979
1985
2007
1967
1974
1980
1990
2008
1969
1975
1981
1991
2009
1970
1976
1982
1999
2010
1971
1977
1983
2005
1972
1978
1984
2006



age comps, female, retained, SummerCA
Proportion
Age (yr)
1966 N=108 effN=51.4
1972 N=152 effN=104.3
1978 N=128 effN=118.1
1984 N=12 effN=27.9
1967 N=44 effN=99.3
1973 N=152 effN=64.2
1979 N=44 effN=75.3
1985 N=16 effN=39
1968 N=224 effN=69
1974 N=136 effN=104.4
1980 N=200 effN=321.7
2005 N=40 effN=33.5
1969 N=124 effN=228
1975 N=72 effN=220.9
1981 N=108 effN=397.9
2006 N=28 effN=45.7
1970 N=116 effN=34.3
1976 N=92 effN=81.1
1982 N=72 effN=81.9
2008 N=72 effN=41
1971 N=148 effN=308.6
1977 N=132 effN=117.9
1983 N=32 effN=34.6
2009 N=12 effN=3.3

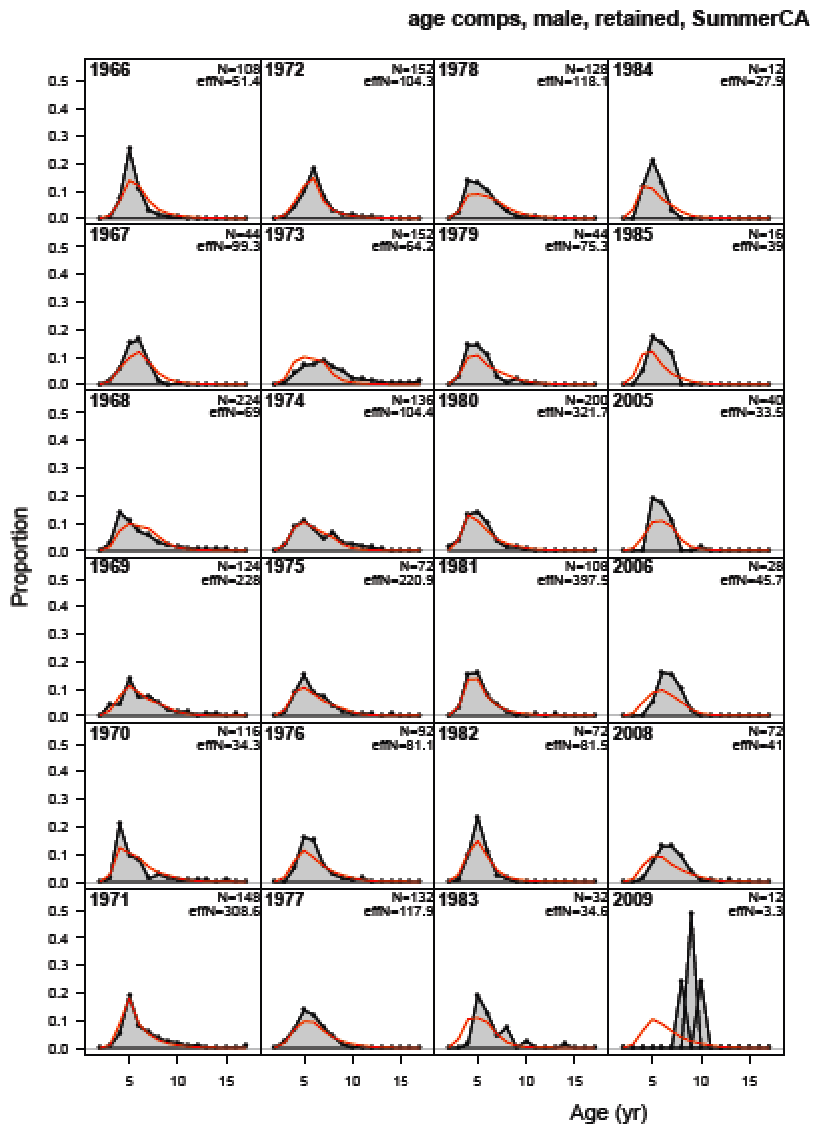
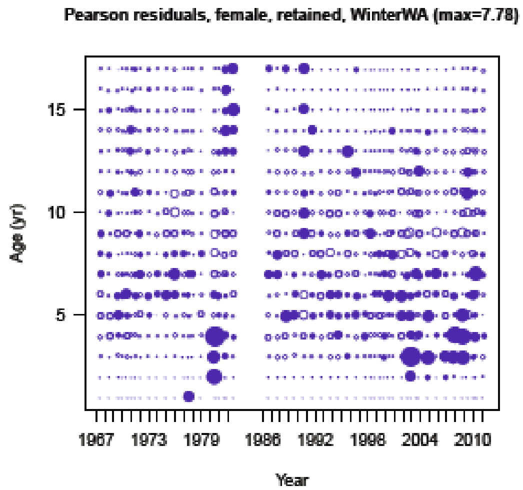
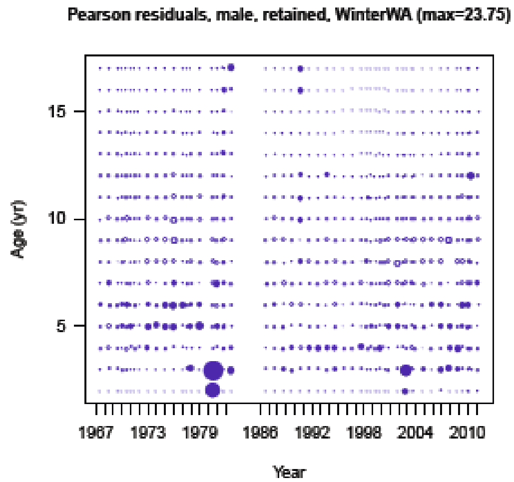
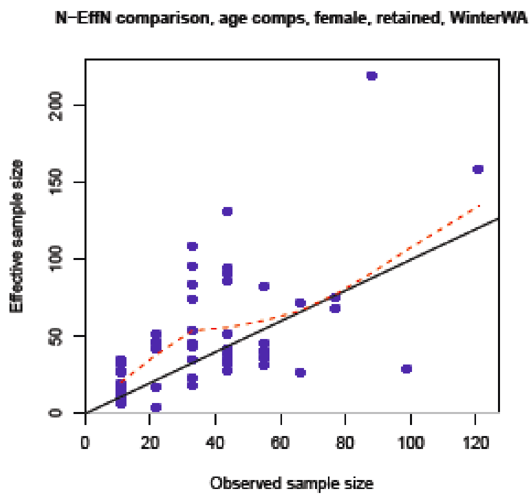
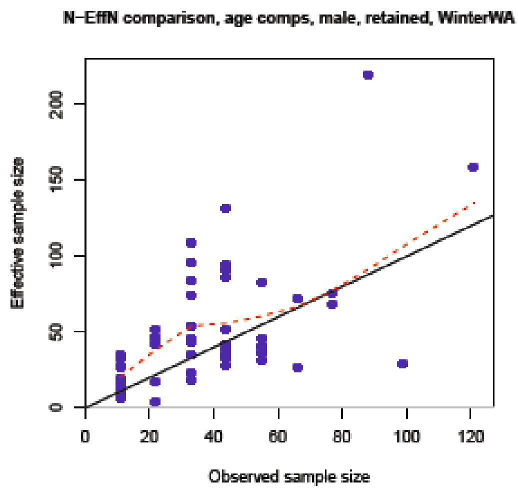



Figure D9. Fit to the California fishery age compositions.


Pearson residuals, female, retained, WinterWA (max=7.78)
Age (yr)
15
10
5
1967
1973
1979
1986
1992
1998
2004
2010
Year


Pearson residuals, male, retained, WinterWA (max=23.75)
Age (yr)
15
10
5
1967
1973
1979
1986
1992
1998
2004
2010
Year


N−EffN comparison, age comps, female, retained, WinterWA
Effective sample size
0
50
100
150
200
0
20
40
60
80
100
120
Observed sample size


N−EffN comparison, age comps, male, retained, WinterWA
Effective sample size
0
50
100
150
200
0
20
40
60
80
100
120
Observed sample size

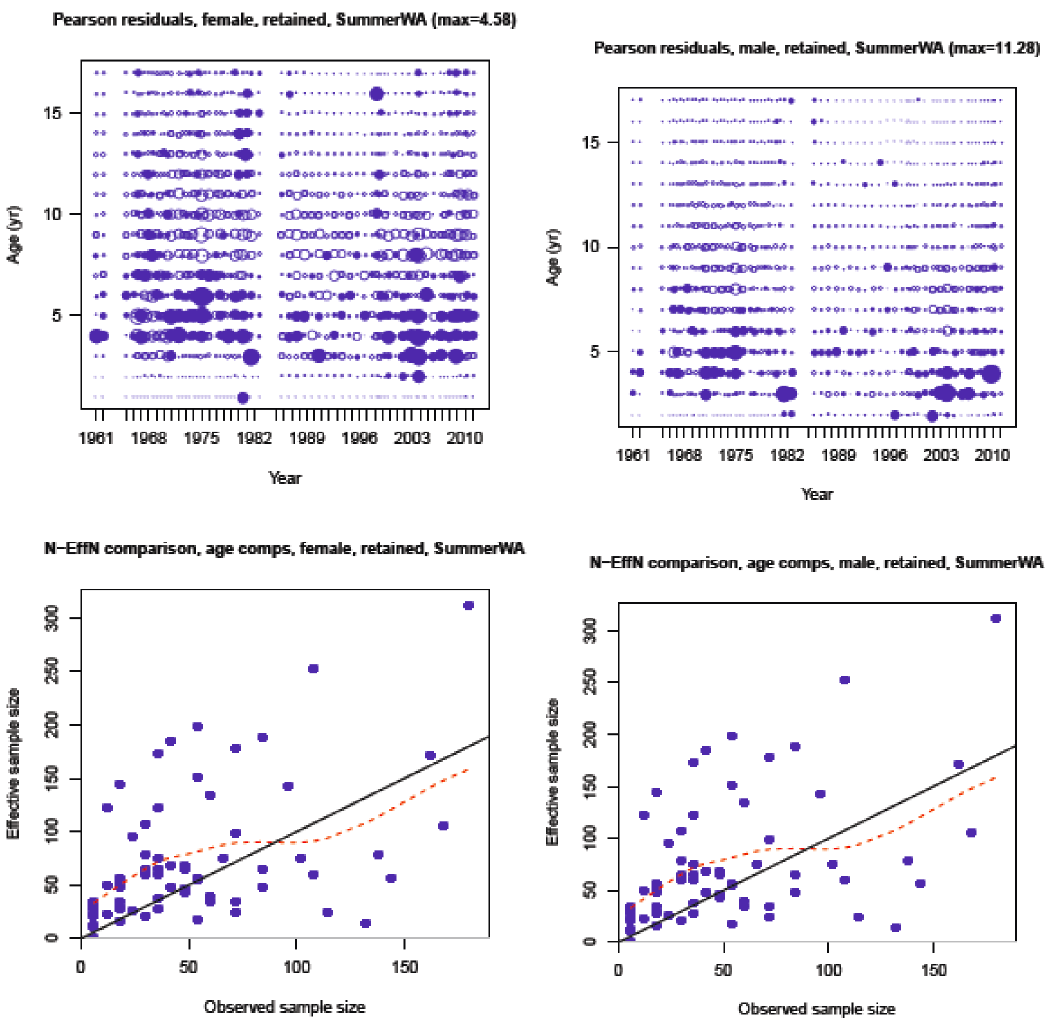
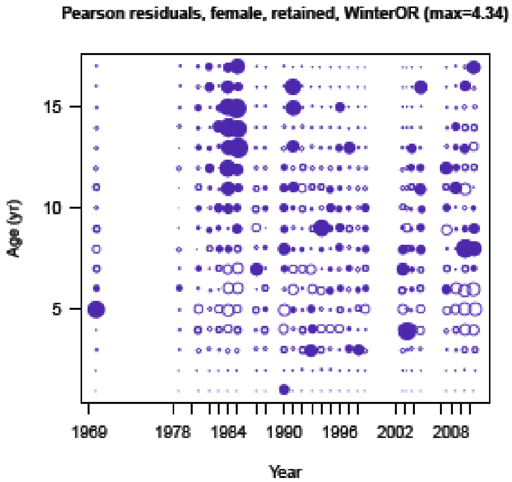
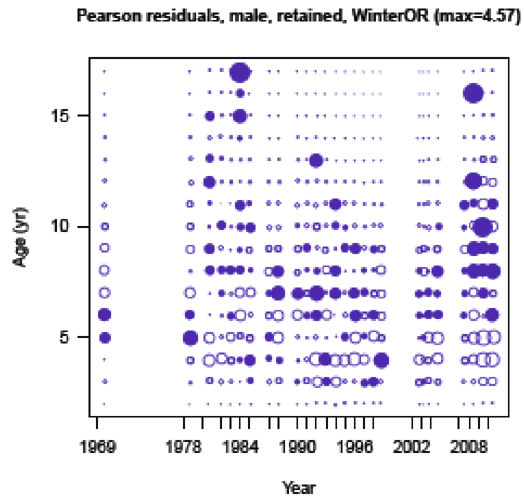
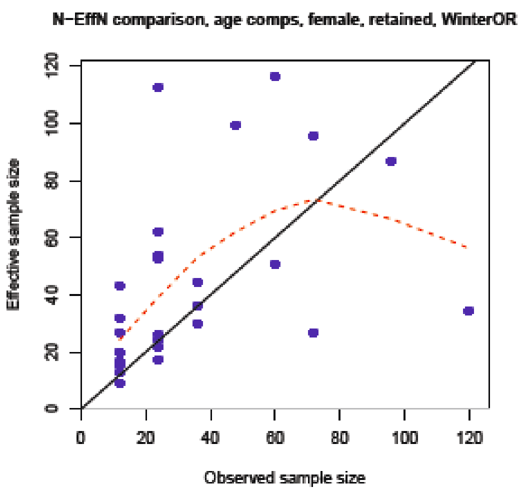
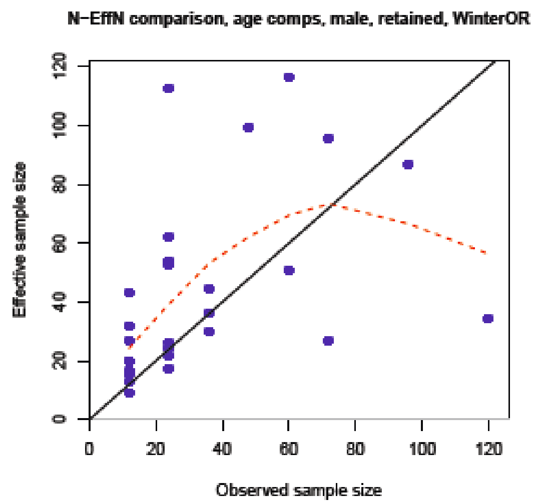



Figure D10. Pearson residuals and effective N for the Washington age compositions.


Pearson residuals, female, retained, WinterOR (max=4.34)
Age (yr)
Year
1969
1978
1984
1990
1996
2002
2008


Pearson residuals, male, retained, WinterOR (max=4.57)
Age (yr)
Year
1969
1978
1984
1990
1996
2002
2008


N−EffN comparison, age comps, female, retained, WinterOR
Effective sample size
Observed sample size


N−EffN comparison, age comps, male, retained, WinterOR
Effective sample size
Observed sample size

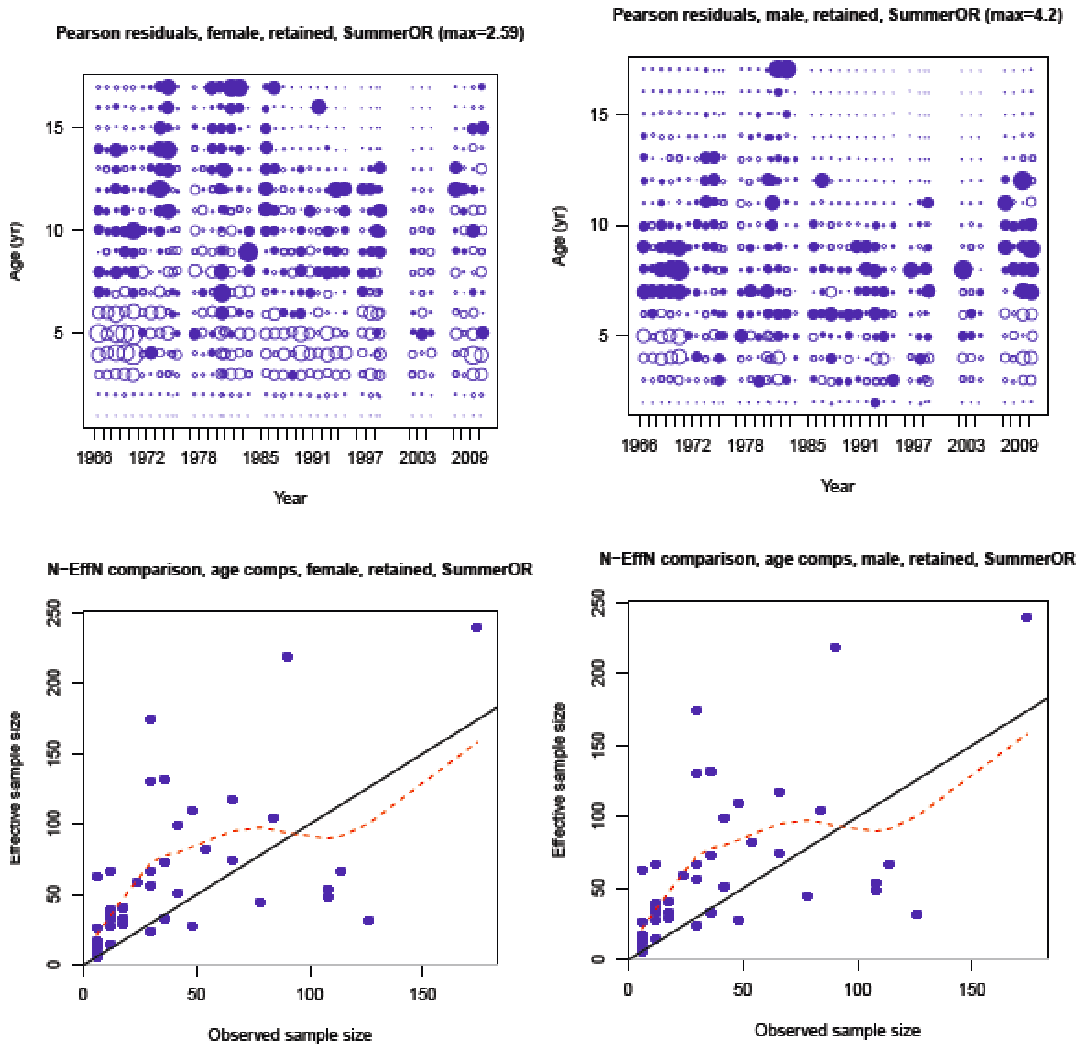
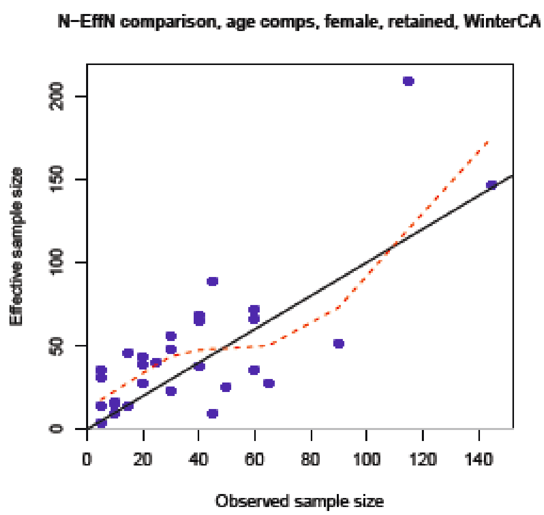
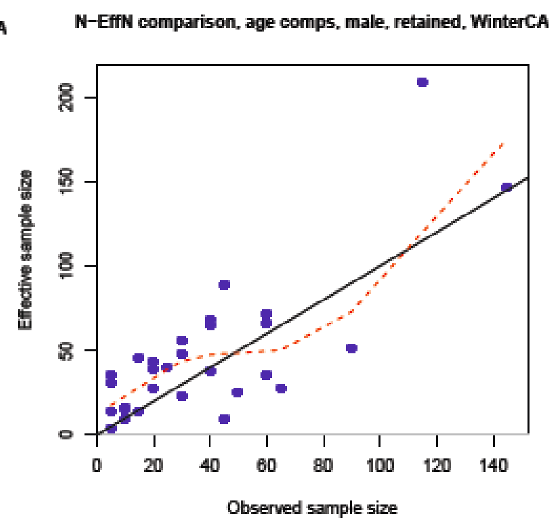


Figure D11. Pearson residuals and effective N for the Oregon age compositions.


Pearson residuals, female, retained, WinterCA (max=5.13)
Age (yr)
Year
1966
1972
1978
1984
1990
1999
2005
5
10
15


Pearson residuals, male, retained, WinterCA (max=5.15)
Age (yr)
Year
1966
1972
1978
1984
1990
1999
2005
5
10
15


N−EffN comparison, age comps, female, retained, WinterCA
Effective sample size
Observed sample size


N−EffN comparison, age comps, male, retained, WinterCA
Effective sample size
Observed sample size

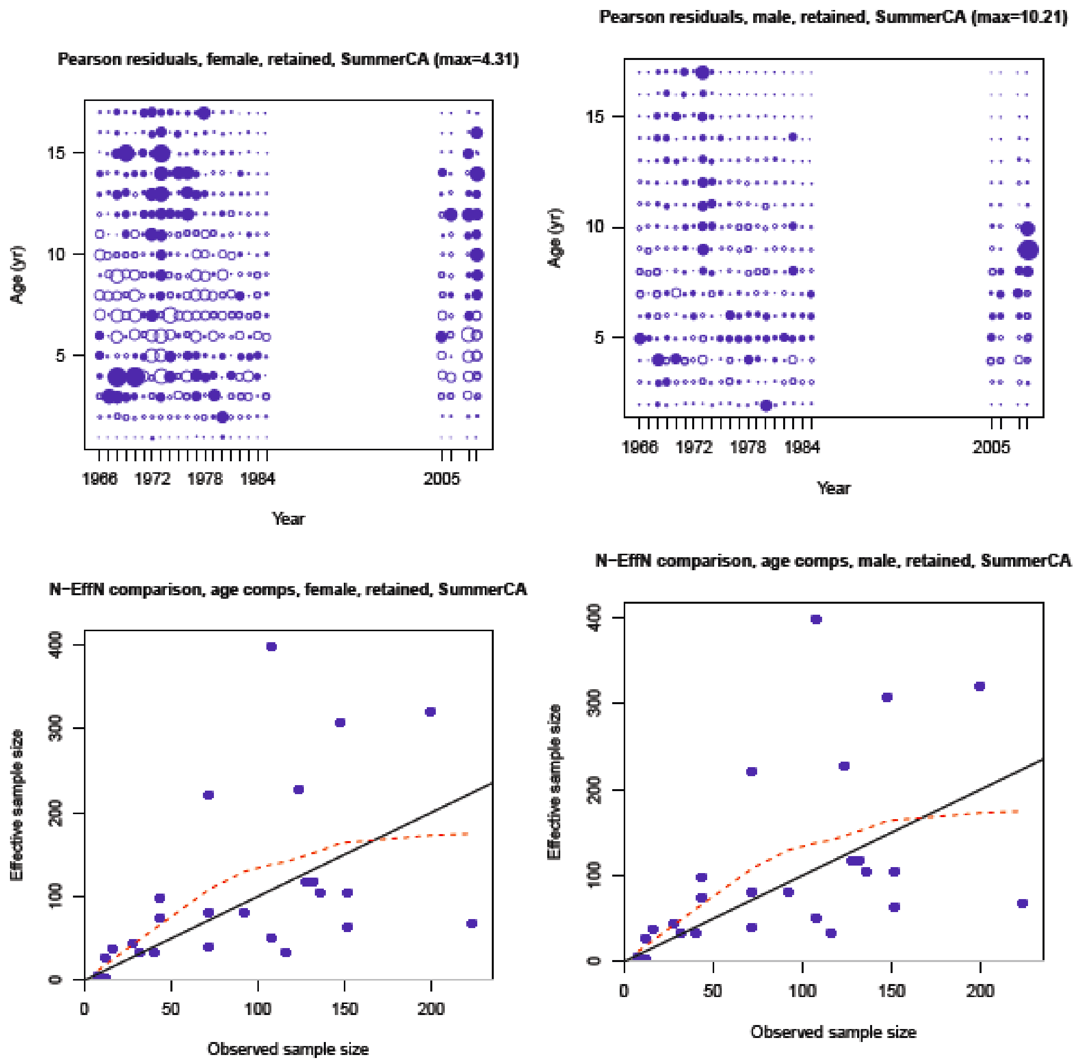


Figure D12. Pearson residuals and effective N for the California age compositions.

## 17. Appendix E: Numbers at age matrix

| Gender | Yr | Seas | Time | Beg/Mid | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1874 | 1 | 1874 | B | 8255.8 | 7042.4 | 6007.4 | 5124.5 | 4371.3 | 3728.9 | 3180.8 | 2713.4 | 2314.6 | 1974.4 | 1684.2 | 1436.7 | 1225.5 | 1045.4 | 891.8 | 760.7 | 648.9 | 553.5 | 472.2 | 402.8 | 343.6 |
| 1 | 1875 | 1 | 1875 | B | 8255.8 | 7042.4 | 6007.4 | 5124.5 | 4371.3 | 3728.9 | 3180.8 | 2713.4 | 2314.6 | 1974.4 | 1684.2 | 1436.7 | 1225.5 | 1045.4 | 891.8 | 760.7 | 648.9 | 553.5 | 472.2 | 402.8 | 343.6 |
| 1 | 1876 | 1 | 1876 | B | 8255.8 | 7042.4 | 6007.4 | 5124.5 | 4371.3 | 3728.9 | 3180.8 | 2713.4 | 2314.6 | 1974.4 | 1684.2 | 1436.7 | 1225.5 | 1045.4 | 891.8 | 760.7 | 648.9 | 553.5 | 472.2 | 402.8 | 343.6 |
| 1 | 1877 | 1 | 1877 | B | 8255.8 | 7042.4 | 6007.4 | 5124.5 | 4371.3 | 3728.9 | 3180.8 | 2713.3 | 2314.5 | 1974.4 | 1684.2 | 1436.7 | 1225.5 | 1045.4 | 891.8 | 760.7 | 648.9 | 553.5 | 472.2 | 402.8 | 343.6 |
| 1 | 1878 | 1 | 1878 | B | 8255.7 | 7042.4 | 6007.4 | 5124.5 | 4371.3 | 3728.9 | 3180.8 | 2713.3 | 2314.5 | 1974.3 | 1684.1 | 1436.6 | 1225.5 | 1045.4 | 891.7 | 760.7 | 648.9 | 553.5 | 472.2 | 402.8 | 343.6 |
| 1 | 1879 | 1 | 1879 | B | 8255.7 | 7042.4 | 6007.4 | 5124.5 | 4371.3 | 3728.9 | 3180.8 | 2713.3 | 2314.5 | 1974.3 | 1684.1 | 1436.6 | 1225.4 | 1045.3 | 891.7 | 760.6 | 648.9 | 553.5 | 472.1 | 402.8 | 343.6 |
| 1 | 1880 | 1 | 1880 | B | 8255.7 | 7042.4 | 6007.4 | 5124.5 | 4371.3 | 3728.9 | 3180.8 | 2713.3 | 2314.5 | 1974.3 | 1684.1 | 1436.5 | 1225.4 | 1045.3 | 891.7 | 760.6 | 648.8 | 553.5 | 472.1 | 402.7 | 343.6 |
| 1 | 1881 | 1 | 1881 | B | 8255.6 | 7042.4 | 6007.4 | 5124.5 | 4371.3 | 3728.7 | 3180.5 | 2712.8 | 2313.9 | 1973.7 | 1683.6 | 1436.1 | 1225.0 | 1045.0 | 891.4 | 760.4 | 648.6 | 553.3 | 472.0 | 402.6 | 343.4 |
| 1 | 1882 | 1 | 1882 | B | 8255.5 | 7042.3 | 6007.4 | 5124.5 | 4371.2 | 3728.5 | 3180.0 | 2712.0 | 2312.9 | 1972.7 | 1682.7 | 1435.3 | 1224.3 | 1044.4 | 890.9 | 759.9 | 648.2 | 553.0 | 471.7 | 402.4 | 343.2 |
| 1 | 1883 | 1 | 1883 | B | 8255.2 | 7042.2 | 6007.3 | 5124.4 | 4371.2 | 3728.3 | 3179.4 | 2711.1 | 2311.7 | 1971.4 | 1681.3 | 1434.1 | 1223.3 | 1043.5 | 890.1 | 759.3 | 647.7 | 552.5 | 471.3 | 402.0 | 342.9 |
| 1 | 1884 | 1 | 1884 | B | 8254.9 | 7042.0 | 6007.2 | 5124.4 | 4371.1 | 3728.1 | 3178.9 | 2710.1 | 2310.4 | 1969.8 | 1679.7 | 1432.6 | 1221.9 | 1042.3 | 889.0 | 758.4 | 646.9 | 551.8 | 470.7 | 401.5 | 342.5 |
| 1 | 1885 | 1 | 1885 | B | 8254.5 | 7041.7 | 6007.0 | 5124.3 | 4371.0 | 3727.9 | 3178.4 | 2709.2 | 2309.0 | 1968.2 | 1677.9 | 1430.8 | 1220.2 | 1040.8 | 887.8 | 757.3 | 646.0 | 551.0 | 470.0 | 401.0 | 342.0 |
| 1 | 1886 | 1 | 1886 | B | 8254.1 | 7041.4 | 6006.8 | 5124.1 | 4370.9 | 3727.6 | 3177.9 | 2708.3 | 2307.7 | 1966.5 | 1676.0 | 1428.8 | 1218.4 | 1039.1 | 886.3 | 756.0 | 644.8 | 550.1 | 469.2 | 400.2 | 341.4 |
| 1 | 1887 | 1 | 1887 | B | 8253.6 | 7041.0 | 6006.5 | 5123.9 | 4370.7 | 3727.4 | 3177.3 | 2707.3 | 2306.3 | 1964.8 | 1674.1 | 1426.8 | 1216.3 | 1037.2 | 884.5 | 754.5 | 643.5 | 548.9 | 468.3 | 399.4 | 340.7 |
| 1 | 1888 | 1 | 1888 | B | 8253.1 | 7040.6 | 6006.2 | 5123.7 | 4370.5 | 3727.0 | 3176.7 | 2706.3 | 2305.0 | 1963.1 | 1672.2 | 1424.8 | 1214.3 | 1035.2 | 882.7 | 752.8 | 642.1 | 547.7 | 467.2 | 398.5 | 339.9 |
| 1 | 1889 | 1 | 1889 | B | 8252.5 | 7040.1 | 6005.8 | 5123.4 | 4370.3 | 3726.7 | 3176.1 | 2705.3 | 2303.6 | 1961.4 | 1670.3 | 1422.7 | 1212.2 | 1033.1 | 880.7 | 751.0 | 640.4 | 546.3 | 465.9 | 397.5 | 339.0 |
| 1 | 1890 | 1 | 1890 | B | 8251.9 | 7039.6 | 6005.4 | 5123.1 | 4370.0 | 3726.3 | 3175.5 | 2704.3 | 2302.2 | 1959.7 | 1668.4 | 1420.7 | 1210.1 | 1031.0 | 878.7 | 749.1 | 638.7 | 544.7 | 464.6 | 396.3 | 338.0 |
| 1 | 1891 | 1 | 1891 | B | 8251.3 | 7039.1 | 6005.0 | 5122.8 | 4369.7 | 3725.9 | 3174.8 | 2703.2 | 2300.7 | 1958.0 | 1666.5 | 1418.7 | 1208.0 | 1028.9 | 876.6 | 747.1 | 636.9 | 543.1 | 463.2 | 395.0 | 337.0 |
| 1 | 1892 | 1 | 1892 | B | 8250.6 | 7038.6 | 6004.6 | 5122.4 | 4369.4 | 3725.5 | 3174.1 | 2702.1 | 2299.3 | 1956.2 | 1664.5 | 1416.6 | 1205.9 | 1026.8 | 874.6 | 745.2 | 635.1 | 541.4 | 461.6 | 393.7 | 335.8 |
| 1 | 1893 | 1 | 1893 | B | 8249.9 | 7038.0 | 6004.1 | 5122.0 | 4369.0 | 3725.1 | 3173.4 | 2701.0 | 2297.8 | 1954.4 | 1662.5 | 1414.5 | 1203.8 | 1024.8 | 872.6 | 743.2 | 633.2 | 539.7 | 460.1 | 392.3 | 334.6 |
| 1 | 1894 | 1 | 1894 | B | 8249.2 | 7037.4 | 6003.6 | 5121.6 | 4368.7 | 3724.6 | 3172.6 | 2699.9 | 2296.3 | 1952.6 | 1660.5 | 1412.4 | 1201.7 | 1022.7 | 870.5 | 741.3 | 631.4 | 537.9 | 458.5 | 390.8 | 333.3 |
| 1 | 1895 | 1 | 1895 | B | 8248.5 | 7036.8 | 6003.1 | 5121.2 | 4368.3 | 3724.1 | 3171.9 | 2698.8 | 2294.7 | 1950.8 | 1658.5 | 1410.3 | 1199.5 | 1020.5 | 868.5 | 739.3 | 629.5 | 536.2 | 456.8 | 389.3 | 331.9 |
| 1 | 1896 | 1 | 1896 | B | 8247.7 | 7036.2 | 6002.6 | 5120.8 | 4367.9 | 3723.6 | 3171.1 | 2697.6 | 2293.2 | 1948.9 | 1656.4 | 1408.1 | 1197.3 | 1018.4 | 866.4 | 737.4 | 627.7 | 534.5 | 455.2 | 387.9 | 330.6 |
| 1 | 1897 | 1 | 1897 | B | 8246.9 | 7035.5 | 6002.1 | 5120.3 | 4367.4 | 3723.1 | 3170.3 | 2696.4 | 2291.6 | 1947.1 | 1654.4 | 1406.0 | 1195.2 | 1016.2 | 864.4 | 735.4 | 625.8 | 532.7 | 453.6 | 386.4 | 329.2 |
| 1 | 1898 | 1 | 1898 | B | 8246.1 | 7034.9 | 6001.5 | 5119.8 | 4367.0 | 3722.6 | 3169.5 | 2695.2 | 2290.0 | 1945.2 | 1652.3 | 1403.8 | 1193.0 | 1014.1 | 862.3 | 733.4 | 624.0 | 531.0 | 452.0 | 384.9 | 327.8 |
| 1 | 1899 | 1 | 1899 | B | 8245.3 | 7034.2 | 6000.9 | 5119.4 | 4366.6 | 3722.0 | 3168.7 | 2694.0 | 2288.4 | 1943.3 | 1650.2 | 1401.6 | 1190.8 | 1011.9 | 860.2 | 731.4 | 622.1 | 529.3 | 450.4 | 383.4 | 326.5 |
| 1 | 1900 | 1 | 1900 | B | 8244.5 | 7033.5 | 6000.4 | 5118.9 | 4366.1 | 3721.5 | 3167.8 | 2692.8 | 2286.8 | 1941.4 | 1648.1 | 1399.4 | 1188.5 | 1009.7 | 858.1 | 729.4 | 620.2 | 527.5 | 448.8 | 381.9 | 325.1 |
| 1 | 1901 | 1 | 1901 | B | 8243.7 | 7032.8 | 5999.8 | 5118.4 | 4365.7 | 3720.9 | 3167.0 | 2691.5 | 2285.2 | 1939.5 | 1646.0 | 1397.2 | 1186.3 | 1007.5 | 855.9 | 727.4 | 618.3 | 525.7 | 447.2 | 380.4 | 323.8 |
| 1 | 1902 | 1 | 1902 | B | 8242.8 | 7032.1 | 5999.2 | 5117.9 | 4365.2 | 3720.3 | 3166.1 | 2690.3 | 2283.6 | 1937.5 | 1643.9 | 1395.0 | 1184.1 | 1005.3 | 853.8 | 725.3 | 616.4 | 524.0 | 445.5 | 378.9 | 322.4 |
| 1 | 1903 | 1 | 1903 | B | 8242.0 | 7031.4 | 5998.6 | 5117.4 | 4364.7 | 3719.8 | 3165.3 | 2689.0 | 2281.9 | 1935.6 | 1641.7 | 1392.7 | 1181.8 | 1003.1 | 851.7 | 723.3 | 614.5 | 522.2 | 443.9 | 377.4 | 321.0 |
| 1 | 1904 | 1 | 1904 | B | 8241.1 | 7030.6 | 5997.9 | 5116.8 | 4364.2 | 3719.2 | 3164.4 | 2687.8 | 2280.3 | 1933.6 | 1639.6 | 1390.5 | 1179.5 | 1000.9 | 849.5 | 721.3 | 612.6 | 520.4 | 442.2 | 375.9 | 319.6 |
| 1 | 1905 | 1 | 1905 | B | 8240.2 | 7029.9 | 5997.3 | 5116.3 | 4363.7 | 3718.6 | 3163.5 | 2686.5 | 2278.6 | 1931.6 | 1637.4 | 1388.2 | 1177.2 | 998.6 | 847.4 | 719.2 | 610.6 | 518.6 | 440.6 | 374.4 | 318.3 |
| 1 | 1906 | 1 | 1906 | B | 8239.3 | 7029.1 | 5996.7 | 5115.8 | 4363.2 | 3718.0 | 3162.7 | 2685.2 | 2276.9 | 1929.6 | 1635.2 | 1385.9 | 1175.0 | 996.4 | 845.2 | 717.2 | 608.7 | 516.8 | 438.9 | 372.9 | 316.9 |
| 1 | 1907 | 1 | 1907 | B | 8238.4 | 7028.4 | 5996.1 | 5115.2 | 4362.7 | 3717.4 | 3161.8 | 2683.9 | 2275.2 | 1927.6 | 1633.0 | 1383.6 | 1172.7 | 994.1 | 843.0 | 715.1 | 606.8 | 515.0 | 437.3 | 371.4 | 315.5 |
| 1 | 1908 | 1 | 1908 | B | 8237.5 | 7027.6 | 5995.4 | 5114.7 | 4362.2 | 3716.8 | 3160.9 | 2682.6 | 2273.5 | 1925.6 | 1630.8 | 1381.3 | 1170.3 | 991.8 | 840.8 | 713.0 | 604.8 | 513.2 | 435.6 | 369.8 | 314.1 |
| 1 | 1909 | 1 | 1909 | B | 8236.6 | 7026.9 | 5994.8 | 5114.1 | 4361.7 | 3716.2 | 3159.9 | 2681.3 | 2271.8 | 1923.6 | 1628.6 | 1379.0 | 1168.0 | 989.6 | 838.6 | 711.0 | 602.9 | 511.4 | 433.9 | 368.3 | 312.7 |
| 1 | 1910 | 1 | 1910 | B | 8235.7 | 7026.1 | 5994.1 | 5113.5 | 4361.2 | 3715.5 | 3159.0 | 2680.0 | 2270.1 | 1921.6 | 1626.4 | 1376.7 | 1165.7 | 987.3 | 836.4 | 708.9 | 600.9 | 509.6 | 432.3 | 366.8 | 311.3 |
| 1 | 1911 | 1 | 1911 | B | 8234.8 | 7025.3 | 5993.4 | 5113.0 | 4360.7 | 3714.9 | 3158.1 | 2678.6 | 2268.3 | 1919.5 | 1624.1 | 1374.4 | 1163.3 | 985.0 | 834.2 | 706.8 | 599.0 | 507.8 | 430.6 | 365.2 | 309.9 |
| 1 | 1912 | 1 | 1912 | B | 8233.8 | 7024.5 | 5992.8 | 5112.4 | 4360.1 | 3714.3 | 3157.2 | 2677.2 | 2266.5 | 1917.4 | 1621.8 | 1372.0 | 1160.9 | 982.6 | 832.0 | 704.6 | 597.0 | 505.9 | 428.9 | 363.7 | 308.5 |
| 1 | 1913 | 1 | 1913 | B | 8232.9 | 7023.7 | 5992.1 | 5111.8 | 4359.6 | 3713.6 | 3156.2 | 2675.9 | 2264.8 | 1915.3 | 1619.5 | 1369.6 | 1158.5 | 980.3 | 829.7 | 702.5 | 595.0 | 504.1 | 427.2 | 362.2 | 307.1 |
| 1 | 1914 | 1 | 1914 | B | 8231.9 | 7022.9 | 5991.4 | 5111.2 | 4359.1 | 3713.0 | 3155.3 | 2674.5 | 2263.0 | 1913.2 | 1617.2 | 1367.2 | 1156.2 | 977.9 | 827.5 | 700.4 | 593.0 | 502.2 | 425.5 | 360.6 | 305.7 |
| 1 | 1915 | 1 | 1915 | B | 8230.9 | 7022.1 | 5990.7 | 5110.6 | 4358.5 | 3712.3 | 3154.3 | 2673.2 | 2261.2 | 1911.2 | 1615.0 | 1364.8 | 1153.8 | 975.6 | 825.2 | 698.2 | 591.0 | 500.4 | 423.8 | 359.0 | 304.3 |
| 1 | 1916 | 1 | 1916 | B | 8230.0 | 7021.2 | 5990.0 | 5110.1 | 4358.0 | 3711.7 | 3153.4 | 2671.8 | 2259.4 | 1909.1 | 1612.7 | 1362.5 | 1151.4 | 973.3 | 823.0 | 696.1 | 589.0 | 498.5 | 422.1 | 357.5 | 302.9 |
| 1 | 1917 | 1 | 1917 | B | 8229.0 | 7020.4 | 5989.3 | 5109.5 | 4357.4 | 3711.1 | 3152.6 | 2670.6 | 2257.9 | 1907.2 | 1610.6 | 1360.3 | 1149.1 | 971.0 | 820.8 | 694.1 | 587.1 | 496.7 | 420.4 | 356.0 | 301.5 |
| 1 | 1918 | 1 | 1918 | B | 8226.9 | 7019.6 | 5988.6 | 5108.8 | 4356.3 | 3708.3 | 3147.1 | 2662.9 | 2249.2 | 1898.6 | 1602.5 | 1352.9 | 1142.5 | 965.1 | 815.5 | 689.4 | 582.9 | 493.1 | 417.2 | 353.1 | 299.0 |
| 1 | 1919 | 1 | 1919 | B | 8225.8 | 7017.8 | 5987.9 | 5108.2 | 4356.2 | 3709.0 | 3148.3 | 2663.3 | 2248.2 | 1896.5 | 1599.9 | 1350.1 | 1139.7 | 962.4 | 813.0 | 687.0 | 580.7 | 491.0 | 415.3 | 351.4 | 297.5 |
| 1 | 1920 | 1 | 1920 | B | 8225.8 | 7016.9 | 5986.4 | 5107.7 | 4356.1 | 3710.4 | 3152.1 | 2668.8 | 2253.5 | 1900.3 | 1602.2 | 1351.4 | 1140.4 | 962.6 | 812.9 | 686.7 | 580.2 | 490.5 | 414.7 | 350.8 | 296.8 |
| 1 | 1921 | 1 | 1921 | B | 8226.7 | 7016.8 | 5985.6 | 5106.4 | 4356.1 | 3712.0 | 3156.9 | 2677.2 | 2263.8 | 1910.1 | 1610.2 | 1357.5 | 1145.0 | 966.1 | 815.5 | 688.7 | 581.7 | 491.6 | 415.5 | 351.4 | 297.2 |
| 1 | 1922 | 1 | 1922 | B | 8227.1 | 7017.7 | 5985.5 | 5105.7 | 4354.7 | 3711.0 | 3156.1 | 2678.1 | 2267.5 | 1915.6 | 1615.7 | 1361.8 | 1148.0 | 968.2 | 817.0 | 689.6 | 582.4 | 491.9 | 415.7 | 351.4 | 297.1 |
| 1 | 1923 | 1 | 1923 | B | 8226.2 | 7018.0 | 5986.3 | 5105.6 | 4353.6 | 3707.7 | 3150.5 | 2670.9 | 2261.0 | 1911.8 | 1614.2 | 1361.2 | 1147.2 | 967.0 | 815.6 | 688.2 | 580.9 | 490.5 | 414.4 | 350.2 | 296.0 |
| 1 | 1924 | 1 | 1924 | B | 8225.4 | 7017.2 | 5986.5 | 5106.2 | 4353.5 | 3706.6 | 3147.6 | 2666.0 | 2254.7 | 1906.2 | 1610.9 | 1359.8 | 1146.5 | 966.2 | 814.5 | 686.9 | 579.6 | 489.3 | 413.2 | 349.0 | 294.9 |
| 1 | 1925 | 1 | 1925 | B | 8223.5 | 7016.5 | 5985.9 | 5106.4 | 4353.5 | 3704.8 | 3142.9 | 2658.1 | 2244.7 | 1895.3 | 1601.2 | 1352.7 | 1141.7 | 962.6 | 811.2 | 683.8 | 576.7 | 486.6 | 410.8 | 346.9 | 293.0 |
| 1 | 1926 | 1 | 1926 | B | 8221.8 | 7014.9 | 5985.2 | 5105.8 | 4353.7 | 3704.8 | 3141.4 | 2654.3 | 2238.2 | 1887.0 | 1592.1 | 1344.6 | 1135.8 | 958.6 | 808.2 | 681.1 | 574.2 | 484.2 | 408.6 | 344.9 | 291.2 |
| 1 | 1927 | 1 | 1927 | B | 8220.3 | 7013.5 | 5983.9 | 5105.3 | 4353.2 | 3705.0 | 3141.6 | 2653.2 | 2235.2 | 1881.7 | 1585.3 | 1337.2 | 1129.2 | 953.8 | 805.0 | 678.7 | 572.0 | 482.2 | 406.6 | 343.1 | 289.6 |
| 1 | 1928 | 1 | 1928 | B | 8217.9 | 7012.2 | 5982.7 | 5104.1 | 4352.3 | 3702.8 | 3137.7 | 2647.7 | 2228.0 | 1873.3 | 1575.6 | 1327.0 | 1119.1 | 945.0 | 798.2 | 673.7 | 568.0 | 478.7 | 403.5 | 340.3 | 287.1 |
| 1 | 1929 | 1 | 1929 | B | 8215.7 | 7010.1 | 5981.6 | 5103.1 | 4351.3 | 3702.1 | 3136.1 | 2644.8 | 2223.8 | 1867.7 | 1568.9 | 1319.2 | 1110.9 | 936.8 | 791.1 | 668.2 | 563.9 | 475.4 | 400.7 | 337.8 | 284.9 |
| 1 | 1930 | 1 | 1930 | B | 8212.8 | 7008.2 | 5979.8 | 5102.1 | 4350.0 | 3699.7 | 3132.2 | 2638.7 | 2216.3 | 1859.3 | 1560.0 | 1309.9 | 1101.3 | 927.3 | 782.0 | 660.3 | 557.7 | 470.7 | 396.9 | 334.4 | 281.9 |
| 1 | 1931 | 1 | 1931 | B | 8210.6 | 7005.8 | 5978.2 | 5100.6 | 4349.4 | 3699.3 | 3131.8 | 2637.7 | 2213.7 | 1855.4 | 1555.1 | 1304.2 | 1095.0 | 920.5 | 775.1 | 653.6 | 551.9 | 466.2 | 393.4 | 331.7 | 279.6 |
| 1 | 1932 | 1 | 1932 | B | 8208.5 | 7003.9 | 5976.1 | 5099.2 | 4348.3 | 3699.7 | 3133.4 | 2639.7 | 2214.8 | 1854.4 | 1552.2 | 1300.1 | 1089.8 | 914.7 | 768.7 | 647.1 | 545.6 | 460.7 | 389.1 | 328.3 | 276.8 |
| 1 | 1933 | 1 | 1933 | B | 8205.3 | 7002.1 | 5974.5 | 5097.4 | 4347.1 | 3698.7 | 3133.3 | 2640.0 | 2214.4 | 1852.4 | 1547.8 | 1293.7 | 1082.3 | 906.4 | 760.2 | 638.5 | 537.2 | 452.8 | 382.2 | 322.7 | 272.2 |
| 1 | 1934 | 1 | 1934 | B | 8202.0 | 6999.3 | 5973.0 | 5096.1 | 4345.9 | 3699.2 | 3135.5 | 2643.8 | 2218.0 | 1854.2 | 1546.9 | 1289.7 | 1076.0 | 898.8 | 751.8 | 629.8 | 528.6 | 444.4 | 374.4 | 315.8 | 266.6 |
| 1 | 1935 | 1 | 1935 | B | 8190.6 | 6996.5 | 5970.6 | 5094.4 | 4341.9 | 3686.9 | 3111.8 | 2611.0 | 2182.3 | 1819.3 | 1514.0 | 1258.7 | 1046.6 | 871.2 | 726.4 | 606.7 | 507.6 | 425.6 | 357.6 | 301.0 | 253.8 |
| 1 | 1936 | 1 | 1936 | B | 8179.7 | 6986.8 | 5968.2 | 5092.4 | 4340.7 | 3684.4 | 3103.4 | 2593.6 | 2157.2 | 1791.1 | 1485.7 | 1231.5 | 1020.6 | 846.3 | 703.0 | 585.1 | 488.0 | 407.9 | 341.6 | 286.8 | 241.3 |
| 1 | 1937 | 1 | 1937 | B | 8172.9 | 6977.5 | 5959.9 | 5090.6 | 4340.6 | 3689.9 | 3114.9 | 2605.1 | 2162.0 | 1787.4 | 1476.5 | 1219.4 | 1007.0 | 832.0 | 688.1 | 570.4 | 473.9 | 394.7 | 329.5 | 275.8 | 231.3 |
| 1 | 1938 | 1 | 1938 | B | 8159.4 | 6971.7 | 5952.0 | 5083.2 | 4337.1 | 3682.4 | 3103.5 | 2591.3 | 2144.6 | 1764.2 | 1448.0 | 1188.9 | 976.9 | 803.3 | 661.4 | 545.5 | 451.1 | 374.1 | 311.1 | 259.4 | 216.9 |
| 1 | 1939 | 1 | 1939 | B | 9789.6 | 6960.2 | 5947.0 | 5076.3 | 4330.0 | 3675.9 | 3089.7 | 2570.7 | 2120.3 | 1736.7 | 1416.4 | 1154.1 | 941.6 | 769.7 | 630.2 | 517.0 | 425.1 | 350.7 | 290.3 | 241.0 | 200.8 |
| 1 | 1940 | 1 | 1940 | B | 9383.0 | 8350.8 | 5937.2 | 5071.9 | 4323.0 | 3665.8 | 3075.4 | 2546.4 | 2088.8 | 1702.3 | 1380.5 | 1116.4 | 903.0 | 732.4 | 595.6 | 485.6 | 397.0 | 325.6 | 268.1 | 221.5 | 183.6 |
| 1 | 1941 | 1 | 1941 | B | 8521.9 | 8004.0 | 7123.2 | 5063.5 | 4319.8 | 3662.2 | 3070.8 | 2537.6 | 2068.5 | 1673.0 | 1347.0 | 1081.2 | 867.0 | 696.4 | 561.6 | 454.6 | 369.3 | 301.1 | 246.3 | 202.4 | 167.0 |
| 1 | 1942 | 1 | 1942 | B | 7535.4 | 7269.5 | 6827.4 | 6075.2 | 4313.8 | 3664.2 | 3077.7 | 2546.6 | 2073.5 | 1666.4 | 1330.8 | 1059.9 | 843.1 | 671.1 | 535.8 | 430.0 | 346.8 | 280.8 | 228.4 | 186.5 | 153.0 |
| 1 | 1943 | 1 | 1943 | B | 6838.4 | 6427.9 | 6200.4 | 5821.9 | 5171.9 | 3647.8 | 3051.7 | 2504.7 | 2017.9 | 1601.3 | 1258.7 | 987.4 | 775.7 | 610.6 | 482.1 | 382.6 | 305.6 | 245.5 | 198.3 | 160.9 | 131.1 |
| 1 | 1944 | 1 | 1944 | B | 6732.9 | 5833.4 | 5482.5 | 5286.9 | 4954.0 | 4364.5 | 3021.9 | 2459.8 | 1957.5 | 1531.6 | 1185.6 | 913.7 | 706.0 | 548.3 | 427.8 | 335.5 | 264.9 | 210.8 | 168.8 | 136.0 | 110.1 |
| 1 | 1945 | 1 | 1945 | B | 7245.5 | 5743.4 | 4975.6 | 4675.2 | 4500.4 | 4186.8 | 3631.5 | 2458.8 | 1952.8 | 1518.4 | 1164.6 | 886.8 | 674.5 | 515.8 | 397.3 | 308.0 | 240.4 | 189.0 | 149.9 | 119.8 | 96.3 |
| 1 | 1946 | 1 | 1946 | B | 7664.3 | 6180.6 | 4898.9 | 4243.1 | 3980.1 | 3805.2 | 3488.4 | 2962.9 | 1960.4 | 1523.5 | 1162.4 | 877.6 | 659.8 | 496.8 | 376.8 | 288.4 | 222.4 | 172.9 | 135.5 | 107.2 | 85.4 |
| 1 | 1947 | 1 | 1947 | B | 7350.4 | 6537.8 | 5271.6 | 4176.6 | 3605.9 | 3338.5 | 3104.9 | 2741.6 | 2240.7 | 1433.5 | 1084.2 | 809.8 | 601.5 | 446.6 | 333.0 | 250.7 | 190.8 | 146.5 | 113.4 | 88.7 | 70.0 |

| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 293.1 | 250.0 | 213.3 | 181.9 | 155.2 | 132.4 | 112.9 | 96.3 | 82.2 | 70.1 | 59.8 | 51.0 | 43.5 | 37.1 | 31.7 | 27.0 | 23.0 | 19.7 | 16.8 | 97.3 |
| 293.1 | 250.0 | 213.3 | 181.9 | 155.2 | 132.4 | 112.9 | 96.3 | 82.2 | 70.1 | 59.8 | 51.0 | 43.5 | 37.1 | 31.7 | 27.0 | 23.0 | 19.7 | 16.8 | 97.3 |
| 293.1 | 250.0 | 213.3 | 181.9 | 155.2 | 132.4 | 112.9 | 96.3 | 82.2 | 70.1 | 59.8 | 51.0 | 43.5 | 37.1 | 31.7 | 27.0 | 23.0 | 19.7 | 16.8 | 97.3 |
| 293.1 | 250.0 | 213.3 | 181.9 | 155.2 | 132.4 | 112.9 | 96.3 | 82.2 | 70.1 | 59.8 | 51.0 | 43.5 | 37.1 | 31.7 | 27.0 | 23.0 | 19.7 | 16.8 | 97.3 |
| 293.1 | 250.0 | 213.3 | 181.9 | 155.2 | 132.4 | 112.9 | 96.3 | 82.2 | 70.1 | 59.8 | 51.0 | 43.5 | 37.1 | 31.7 | 27.0 | 23.0 | 19.7 | 16.8 | 97.3 |
| 293.1 | 250.0 | 213.3 | 181.9 | 155.2 | 132.4 | 112.9 | 96.3 | 82.2 | 70.1 | 59.8 | 51.0 | 43.5 | 37.1 | 31.7 | 27.0 | 23.0 | 19.6 | 16.8 | 97.3 |
| 293.1 | 250.0 | 213.2 | 181.9 | 155.2 | 132.4 | 112.9 | 96.3 | 82.2 | 70.1 | 59.8 | 51.0 | 43.5 | 37.1 | 31.7 | 27.0 | 23.0 | 19.6 | 16.8 | 97.3 |
| 293.0 | 249.9 | 213.2 | 181.9 | 155.1 | 132.3 | 112.9 | 96.3 | 82.1 | 70.1 | 59.8 | 51.0 | 43.5 | 37.1 | 31.6 | 27.0 | 23.0 | 19.6 | 16.8 | 97.3 |
| 292.8 | 249.8 | 213.1 | 181.7 | 155.0 | 132.2 | 112.8 | 96.2 | 82.1 | 70.0 | 59.7 | 51.0 | 43.5 | 37.1 | 31.6 | 27.0 | 23.0 | 19.6 | 16.7 | 97.2 |
| 292.5 | 249.5 | 212.9 | 181.6 | 154.9 | 132.1 | 112.7 | 96.1 | 82.0 | 70.0 | 59.7 | 50.9 | 43.4 | 37.0 | 31.6 | 27.0 | 23.0 | 19.6 | 16.7 | 97.1 |
| 292.2 | 249.2 | 212.6 | 181.4 | 154.7 | 132.0 | 112.6 | 96.0 | 81.9 | 69.9 | 59.6 | 50.8 | 43.4 | 37.0 | 31.6 | 26.9 | 23.0 | 19.6 | 16.7 | 97.0 |
| 291.8 | 248.9 | 212.3 | 181.1 | 154.5 | 131.8 | 112.4 | 95.9 | 81.8 | 69.8 | 59.5 | 50.8 | 43.3 | 36.9 | 31.5 | 26.9 | 22.9 | 19.6 | 16.7 | 96.9 |
| 291.2 | 248.4 | 211.9 | 180.8 | 154.2 | 131.5 | 112.2 | 95.7 | 81.7 | 69.7 | 59.4 | 50.7 | 43.2 | 36.9 | 31.5 | 26.8 | 22.9 | 19.5 | 16.7 | 96.7 |
| 290.6 | 247.9 | 211.5 | 180.4 | 153.9 | 131.3 | 112.0 | 95.5 | 81.5 | 69.5 | 59.3 | 50.6 | 43.1 | 36.8 | 31.4 | 26.8 | 22.8 | 19.5 | 16.6 | 96.5 |
| 290.0 | 247.4 | 211.0 | 180.0 | 153.5 | 131.0 | 111.7 | 95.3 | 81.3 | 69.3 | 59.2 | 50.5 | 43.0 | 36.7 | 31.3 | 26.7 | 22.8 | 19.4 | 16.6 | 96.3 |
| 289.2 | 246.7 | 210.4 | 179.5 | 153.1 | 130.6 | 111.4 | 95.0 | 81.1 | 69.2 | 59.0 | 50.3 | 42.9 | 36.6 | 31.2 | 26.6 | 22.7 | 19.4 | 16.5 | 96.0 |
| 288.4 | 246.0 | 209.8 | 179.0 | 152.7 | 130.2 | 111.1 | 94.8 | 80.8 | 69.0 | 58.8 | 50.2 | 42.8 | 36.5 | 31.1 | 26.6 | 22.7 | 19.3 | 16.5 | 95.7 |
| 287.4 | 245.2 | 209.1 | 178.4 | 152.2 | 129.8 | 110.7 | 94.5 | 80.6 | 68.7 | 58.6 | 50.0 | 42.7 | 36.4 | 31.0 | 26.5 | 22.6 | 19.3 | 16.4 | 95.4 |
| 286.4 | 244.3 | 208.4 | 177.8 | 151.7 | 129.4 | 110.4 | 94.1 | 80.3 | 68.5 | 58.4 | 49.8 | 42.5 | 36.3 | 30.9 | 26.4 | 22.5 | 19.2 | 16.4 | 95.1 |
| 285.4 | 243.4 | 207.6 | 177.1 | 151.1 | 128.9 | 109.9 | 93.8 | 80.0 | 68.2 | 58.2 | 49.7 | 42.4 | 36.1 | 30.8 | 26.3 | 22.4 | 19.1 | 16.3 | 94.7 |
| 284.2 | 242.4 | 206.8 | 176.4 | 150.5 | 128.3 | 109.5 | 93.4 | 79.7 | 68.0 | 58.0 | 49.4 | 42.2 | 36.0 | 30.7 | 26.2 | 22.3 | 19.1 | 16.3 | 94.3 |
| 283.0 | 241.4 | 205.9 | 175.6 | 149.8 | 127.8 | 109.0 | 93.0 | 79.3 | 67.7 | 57.7 | 49.2 | 42.0 | 35.8 | 30.6 | 26.1 | 22.2 | 19.0 | 16.2 | 93.9 |
| 281.8 | 240.3 | 204.9 | 174.8 | 149.1 | 127.2 | 108.5 | 92.5 | 78.9 | 67.3 | 57.4 | 49.0 | 41.8 | 35.7 | 30.4 | 25.9 | 22.1 | 18.9 | 16.1 | 93.5 |
| 280.6 | 239.2 | 203.9 | 173.9 | 148.3 | 126.5 | 107.9 | 92.1 | 78.5 | 67.0 | 57.1 | 48.8 | 41.6 | 35.5 | 30.3 | 25.8 | 22.0 | 18.8 | 16.0 | 93.0 |
| 279.3 | 238.0 | 202.9 | 173.0 | 147.6 | 125.9 | 107.4 | 91.6 | 78.1 | 66.6 | 56.8 | 48.5 | 41.4 | 35.3 | 30.1 | 25.7 | 21.9 | 18.7 | 15.9 | 92.5 |
| 278.1 | 236.9 | 201.9 | 172.1 | 146.8 | 125.2 | 106.8 | 91.1 | 77.7 | 66.3 | 56.5 | 48.2 | 41.1 | 35.1 | 29.9 | 25.5 | 21.8 | 18.6 | 15.8 | 92.0 |
| 276.8 | 235.8 | 200.9 | 171.2 | 146.0 | 124.5 | 106.1 | 90.5 | 77.2 | 65.9 | 56.2 | 47.9 | 40.9 | 34.9 | 29.8 | 25.4 | 21.6 | 18.5 | 15.8 | 91.4 |
| 275.6 | 234.7 | 199.9 | 170.3 | 145.1 | 123.7 | 105.5 | 90.0 | 76.7 | 65.5 | 55.8 | 47.6 | 40.6 | 34.7 | 29.6 | 25.2 | 21.5 | 18.4 | 15.7 | 90.9 |
| 274.4 | 233.6 | 198.9 | 169.4 | 144.3 | 123.0 | 104.9 | 89.4 | 76.2 | 65.0 | 55.5 | 47.3 | 40.4 | 34.4 | 29.4 | 25.1 | 21.4 | 18.2 | 15.6 | 90.3 |
| 273.1 | 232.4 | 197.9 | 168.5 | 143.5 | 122.3 | 104.2 | 88.8 | 75.7 | 64.6 | 55.1 | 47.0 | 40.1 | 34.2 | 29.2 | 24.9 | 21.2 | 18.1 | 15.4 | 89.6 |
| 271.9 | 231.3 | 196.8 | 167.6 | 142.7 | 121.5 | 103.5 | 88.2 | 75.2 | 64.1 | 54.7 | 46.7 | 39.8 | 33.9 | 29.0 | 24.7 | 21.1 | 18.0 | 15.3 | 89.0 |
| 270.6 | 230.2 | 195.8 | 166.6 | 141.9 | 120.8 | 102.9 | 87.7 | 74.7 | 63.7 | 54.3 | 46.3 | 39.5 | 33.7 | 28.7 | 24.5 | 20.9 | 17.8 | 15.2 | 88.3 |
| 269.4 | 229.0 | 194.8 | 165.7 | 141.0 | 120.1 | 102.2 | 87.1 | 74.2 | 63.2 | 53.9 | 46.0 | 39.2 | 33.4 | 28.5 | 24.3 | 20.8 | 17.7 | 15.1 | 87.6 |
| 268.1 | 227.9 | 193.8 | 164.8 | 140.2 | 119.3 | 101.6 | 86.5 | 73.7 | 62.8 | 53.5 | 45.6 | 38.9 | 33.2 | 28.3 | 24.1 | 20.6 | 17.6 | 15.0 | 86.9 |
| 266.8 | 226.8 | 192.8 | 163.9 | 139.4 | 118.6 | 100.9 | 85.9 | 73.2 | 62.3 | 53.1 | 45.2 | 38.6 | 32.9 | 28.1 | 23.9 | 20.4 | 17.4 | 14.8 | 86.2 |
| 265.6 | 225.6 | 191.7 | 163.0 | 138.6 | 117.9 | 100.3 | 85.3 | 72.6 | 61.9 | 52.7 | 44.9 | 38.3 | 32.6 | 27.8 | 23.7 | 20.2 | 17.3 | 14.7 | 85.4 |
| 264.3 | 224.5 | 190.7 | 162.1 | 137.8 | 117.1 | 99.6 | 84.8 | 72.1 | 61.4 | 52.3 | 44.5 | 37.9 | 32.3 | 27.6 | 23.5 | 20.0 | 17.1 | 14.6 | 84.6 |
| 263.1 | 223.3 | 189.7 | 161.1 | 136.9 | 116.4 | 99.0 | 84.2 | 71.6 | 61.0 | 51.9 | 44.2 | 37.6 | 32.1 | 27.3 | 23.3 | 19.9 | 16.9 | 14.4 | 83.8 |
| 261.8 | 222.2 | 188.6 | 160.2 | 136.1 | 115.7 | 98.3 | 83.6 | 71.1 | 60.5 | 51.5 | 43.8 | 37.3 | 31.8 | 27.1 | 23.1 | 19.7 | 16.8 | 14.3 | 83.0 |
| 260.5 | 221.0 | 187.6 | 159.3 | 135.3 | 114.9 | 97.7 | 83.0 | 70.6 | 60.0 | 51.1 | 43.5 | 37.0 | 31.5 | 26.8 | 22.9 | 19.5 | 16.6 | 14.2 | 82.2 |
| 259.2 | 219.9 | 186.6 | 158.4 | 134.5 | 114.2 | 97.0 | 82.4 | 70.1 | 59.6 | 50.7 | 43.1 | 36.7 | 31.2 | 26.6 | 22.7 | 19.3 | 16.5 | 14.0 | 81.3 |
| 258.0 | 218.7 | 185.6 | 157.4 | 133.6 | 113.5 | 96.4 | 81.9 | 69.6 | 59.1 | 50.3 | 42.8 | 36.4 | 31.0 | 26.4 | 22.4 | 19.1 | 16.3 | 13.9 | 80.5 |
| 256.7 | 217.6 | 184.5 | 156.5 | 132.8 | 112.7 | 95.7 | 81.3 | 69.1 | 58.7 | 49.9 | 42.4 | 36.1 | 30.7 | 26.1 | 22.2 | 18.9 | 16.1 | 13.7 | 79.6 |
| 255.4 | 216.5 | 183.5 | 155.6 | 132.0 | 112.0 | 95.1 | 80.7 | 68.6 | 58.2 | 49.5 | 42.1 | 35.8 | 30.4 | 25.9 | 22.0 | 18.8 | 16.0 | 13.6 | 78.7 |
| 253.2 | 214.5 | 181.8 | 154.1 | 130.7 | 110.9 | 94.1 | 79.8 | 67.8 | 57.6 | 48.9 | 41.6 | 35.3 | 30.0 | 25.6 | 21.7 | 18.5 | 15.7 | 13.4 | 77.5 |
| 251.8 | 213.3 | 180.7 | 153.1 | 129.8 | 110.1 | 93.4 | 79.2 | 67.3 | 57.1 | 48.5 | 41.2 | 35.0 | 29.8 | 25.3 | 21.5 | 18.3 | 15.6 | 13.3 | 76.6 |
| 251.2 | 212.7 | 180.2 | 152.6 | 129.3 | 109.7 | 93.0 | 78.9 | 66.9 | 56.8 | 48.2 | 41.0 | 34.8 | 29.6 | 25.1 | 21.4 | 18.2 | 15.5 | 13.2 | 75.9 |
| 251.5 | 212.8 | 180.2 | 152.6 | 129.3 | 109.6 | 92.9 | 78.8 | 66.8 | 56.7 | 48.1 | 40.9 | 34.7 | 29.5 | 25.1 | 21.3 | 18.1 | 15.4 | 13.1 | 75.5 |
| 251.3 | 212.6 | 180.0 | 152.4 | 129.1 | 109.3 | 92.7 | 78.6 | 66.6 | 56.5 | 47.9 | 40.7 | 34.6 | 29.3 | 24.9 | 21.2 | 18.0 | 15.3 | 13.0 | 74.9 |
| 250.3 | 211.7 | 179.1 | 151.6 | 128.4 | 108.7 | 92.1 | 78.1 | 66.2 | 56.1 | 47.6 | 40.4 | 34.3 | 29.1 | 24.7 | 21.0 | 17.8 | 15.2 | 12.9 | 74.1 |
| 249.3 | 210.8 | 178.3 | 150.9 | 127.7 | 108.1 | 91.6 | 77.6 | 65.7 | 55.7 | 47.3 | 40.1 | 34.0 | 28.9 | 24.5 | 20.8 | 17.7 | 15.0 | 12.8 | 73.2 |
| 247.6 | 209.3 | 177.0 | 149.7 | 126.7 | 107.2 | 90.8 | 76.9 | 65.1 | 55.2 | 46.8 | 39.7 | 33.7 | 28.6 | 24.2 | 20.6 | 17.5 | 14.8 | 12.6 | 72.2 |
| 246.0 | 207.9 | 175.7 | 148.6 | 125.7 | 106.3 | 90.0 | 76.2 | 64.5 | 54.7 | 46.3 | 39.3 | 33.3 | 28.3 | 24.0 | 20.4 | 17.3 | 14.7 | 12.5 | 71.2 |
| 244.6 | 206.6 | 174.6 | 147.6 | 124.8 | 105.5 | 89.3 | 75.6 | 64.0 | 54.2 | 45.9 | 38.9 | 33.0 | 28.0 | 23.7 | 20.1 | 17.1 | 14.5 | 12.3 | 70.3 |
| 242.4 | 204.7 | 172.9 | 146.1 | 123.5 | 104.4 | 88.3 | 74.7 | 63.3 | 53.6 | 45.4 | 38.4 | 32.6 | 27.6 | 23.4 | 19.9 | 16.9 | 14.3 | 12.1 | 69.1 |
| 240.4 | 202.9 | 171.3 | 144.7 | 122.3 | 103.4 | 87.4 | 73.9 | 62.6 | 52.9 | 44.8 | 38.0 | 32.2 | 27.3 | 23.1 | 19.6 | 16.6 | 14.1 | 12.0 | 68.0 |
| 237.8 | 200.6 | 169.4 | 143.0 | 120.8 | 102.1 | 86.3 | 73.0 | 61.7 | 52.2 | 44.2 | 37.4 | 31.7 | 26.9 | 22.8 | 19.3 | 16.4 | 13.9 | 11.8 | 66.8 |
| 235.6 | 198.7 | 167.7 | 141.6 | 119.5 | 101.0 | 85.3 | 72.1 | 61.0 | 51.6 | 43.6 | 36.9 | 31.3 | 26.5 | 22.4 | 19.0 | 16.1 | 13.7 | 11.6 | 65.7 |
| 233.3 | 196.6 | 165.8 | 139.9 | 118.1 | 99.7 | 84.2 | 71.2 | 60.2 | 50.9 | 43.0 | 36.4 | 30.8 | 26.1 | 22.1 | 18.7 | 15.9 | 13.5 | 11.4 | 64.4 |
| 229.5 | 193.3 | 163.0 | 137.4 | 115.9 | 97.9 | 82.6 | 69.8 | 59.0 | 49.8 | 42.1 | 35.6 | 30.2 | 25.5 | 21.6 | 18.3 | 15.5 | 13.1 | 11.1 | 62.8 |
| 224.8 | 189.5 | 159.6 | 134.5 | 113.4 | 95.7 | 80.7 | 68.2 | 57.6 | 48.7 | 41.1 | 34.8 | 29.4 | 24.9 | 21.1 | 17.8 | 15.1 | 12.8 | 10.8 | 61.0 |
| 214.1 | 180.6 | 152.1 | 128.1 | 107.9 | 91.0 | 76.8 | 64.8 | 54.7 | 46.2 | 39.0 | 33.0 | 27.9 | 23.6 | 20.0 | 16.9 | 14.3 | 12.1 | 10.3 | 57.6 |
| 203.4 | 171.5 | 144.6 | 121.7 | 102.5 | 86.4 | 72.8 | 61.4 | 51.8 | 43.7 | 36.9 | 31.2 | 26.4 | 22.3 | 18.9 | 15.9 | 13.5 | 11.4 | 9.7 | 54.3 |
| 194.5 | 163.8 | 138.1 | 116.4 | 98.0 | 82.5 | 69.5 | 58.6 | 49.4 | 41.7 | 35.2 | 29.7 | 25.1 | 21.2 | 17.9 | 15.2 | 12.8 | 10.9 | 9.2 | 51.4 |
| 181.8 | 152.8 | 128.6 | 108.4 | 91.3 | 76.8 | 64.7 | 54.5 | 45.9 | 38.7 | 32.6 | 27.5 | 23.3 | 19.6 | 16.6 | 14.0 | 11.9 | 10.0 | 8.5 | 47.4 |
| 167.7 | 140.4 | 117.9 | 99.2 | 83.6 | 70.4 | 59.2 | 49.8 | 41.9 | 35.3 | 29.8 | 25.1 | 21.2 | 17.9 | 15.1 | 12.8 | 10.8 | 9.1 | 7.7 | 43.0 |
| 152.8 | 127.5 | 106.7 | 89.5 | 75.3 | 63.4 | 53.3 | 44.9 | 37.8 | 31.8 | 26.8 | 22.6 | 19.0 | 16.1 | 13.6 | 11.4 | 9.7 | 8.2 | 6.9 | 38.4 |
| 138.3 | 114.9 | 95.8 | 80.1 | 67.2 | 56.5 | 47.5 | 40.0 | 33.6 | 28.3 | 23.8 | 20.1 | 16.9 | 14.3 | 12.0 | 10.2 | 8.6 | 7.2 | 6.1 | 33.9 |
| 126.0 | 104.3 | 86.6 | 72.1 | 60.3 | 50.5 | 42.5 | 35.7 | 30.0 | 25.3 | 21.2 | 17.9 | 15.1 | 12.7 | 10.7 | 9.0 | 7.6 | 6.4 | 5.4 | 30.1 |
| 107.4 | 88.4 | 73.0 | 60.6 | 50.5 | 42.2 | 35.3 | 29.7 | 25.0 | 21.0 | 17.6 | 14.8 | 12.5 | 10.5 | 8.9 | 7.5 | 6.3 | 5.3 | 4.5 | 24.8 |
| 89.6 | 73.3 | 60.3 | 49.8 | 41.2 | 34.3 | 28.7 | 24.0 | 20.2 | 16.9 | 14.3 | 12.0 | 10.1 | 8.5 | 7.1 | 6.0 | 5.1 | 4.3 | 3.6 | 19.8 |
| 77.8 | 63.2 | 51.7 | 42.4 | 35.0 | 29.0 | 24.1 | 20.1 | 16.9 | 14.2 | 11.9 | 10.0 | 8.4 | 7.1 | 5.9 | 5.0 | 4.2 | 3.6 | 3.0 | 16.5 |
| 68.6 | 55.4 | 44.9 | 36.7 | 30.1 | 24.8 | 20.6 | 17.1 | 14.3 | 11.9 | 10.0 | 8.4 | 7.1 | 5.9 | 5.0 | 4.2 | 3.5 | 3.0 | 2.5 | 13.8 |
| 55.7 | 44.6 | 36.0 | 29.2 | 23.8 | 19.5 | 16.1 | 13.3 | 11.1 | 9.2 | 7.7 | 6.5 | 5.4 | 4.6 | 3.8 | 3.2 | 2.7 | 2.3 | 1.9 | 10.5 |

## 18. Appendix F: SS2 Data file

#C
#_bootstrap file: 1
#year is from Nov-Oct
#Winter in yr 1 includes Nov-Dec from yr-1
#Last data is from Summer (March-October) 2010
1876 #_styr
2010 #_endyr
1 #_nseas
12 #_months/season
1 #_spawn_seas
6 #_Nfleet
3 #_Nsurveys
1 #_N_areas
WinterWA%SummerWA%WinterOR%SummerOR%WinterCA%SummerCA%Triennial%NWFSC%TriLate
0.16 0.67 0.16 0.67 0.16 0.67 0.73 0.67 0.67 #_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
135 #_N_lines_of_catch_to_read

| #WA-Winter | WA-Summer | OR-Winter | OR-Summer | CA-Winter | CA-Summer | Year | Season |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 0.00 | 0.00 | 0 | 1 | 1876 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 1 | 1877 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 1 | 1878 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 1 | 1879 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 11.55 | 1880 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 22.1 | 1881 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 32.65 | 1882 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 43.2 | 1883 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 53.75 | 1884 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 64.3 | 1885 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 74.85 | 1886 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 85.4 | 1887 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 95.95 | 1888 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 106.5 | 1889 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 117.05 | 1890 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 127.6 | 1891 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 138.15 | 1892 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 148.71 | 1893 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 159.26 | 1894 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 169.81 | 1895 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 180.36 | 1896 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 190.91 | 1897 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 201.46 | 1898 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 212.01 | 1899 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 222.56 | 1900 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 233.11 | 1901 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 243.66 | 1902 | 1 |
| 0 | 0 | 0.00 | 0.00 | 0 | 254.21 | 1903 | 1 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0.00 | 0.00 | 0 | 264.76 | 1904 | 1 | | |
| 0 | 0 | 0.00 | 0.00 | 0 | 275.31 | 1905 | 1 | | |
| 0 | 0 | 0.00 | 0.00 | 0 | 285.86 | 1906 | 1 | | |
| 0 | 0 | 0.00 | 0.00 | 0 | 296.41 | 1907 | 1 | | |
| 0 | 0 | 0.00 | 0.00 | 0 | 306.96 | 1908 | 1 | | |
| 0 | 0 | 0.00 | 0.00 | 0 | 317.51 | 1909 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 328.06 | 1910 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 338.61 | 1911 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 349.16 | 1912 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 359.71 | 1913 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 370.26 | 1914 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 380.81 | 1915 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 386.42 | 1916 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 526.41 | 1917 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 423.85 | 1918 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 333.44 | 1919 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 230.49 | 1920 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 293.76 | 1921 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 424.78 | 1922 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 427.36 | 1923 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 532.86 | 1924 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 528.47 | 1925 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 521.67 | 1926 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 632.04 | 1927 | 1 | | |
| 0 | 0 | 0.00 | 1 | 0 | 620.09 | 1928 | 1 | | |
| 0 | 0 | 0.00 | 3.08 | 0 | 706.04 | 1929 | 1 | | |
| 0 | 0 | 0.00 | 1.00 | 0 | 658.83 | 1930 | 1 | | |
| 0 | 80.59 | 0.00 | 0.98 | 63.39 | 530.88 | 1931 | 1 | | |
| 1.99 | 241.77 | 0.00 | 6.80 | 36.4 | 519.91 | 1932 | 1 | | |
| 5.96 | 402.95 | 0.00 | 4.31 | 38.57 | 392.08 | 1933 | 1 | | |
| 9.93 | 564.13 | 0.00 | 2.90 | 139.41 | 896.36 | 1934 | 1 | | |
| 13.9 | 644.72 | 0.00 | 5.71 | 155.38 | 777.21 | 1935 | 1 | | |
| 15.88 | 752.33 | 0.00 | 18.60 | 95.49 | 431.51 | 1936 | 1 | | |
| 19.75 | 967.53 | 0.00 | 81.39 | 74.53 | 741.05 | 1937 | 1 | | |
| 27.49 | 1182.73 | 0.00 | 4.10 | 47.86 | 890 | 1938 | 1 | | |
| 35.22 | 1290.33 | 0.00 | 2.50 | 30.84 | 1028.96 | 1939 | 1 | | |
| 39.09 | 1280.5 | 0.00 | 352.70 | 162.53 | 596.69 | 1940 | 1 | | |
| 41.4 | 1260.83 | 0.00 | 464.20 | 110.81 | 331.32 | 1941 | 1 | | |
| 46 | 1241.16 | 0.00 | 1868.70 | 24.37 | 215.56 | 1942 | 1 | | |
| 50.61 | 1221.48 | 0.00 | 1898.56 | 71.66 | 344.72 | 1943 | 1 | | |
| 55.21 | 1201.81 | 0.00 | 1007.50 | 85.53 | 446.58 | 1944 | 1 | | |
| 59.82 | 1182.14 | 0.00 | 785.42 | 101.75 | 439.34 | 1945 | 1 | | |
| 64.43 | 1162.46 | 0.00 | 1488.90 | 71.91 | 1115.57 | 1946 | 1 | | |
| 69.03 | 1142.79 | 0.00 | 720.46 | 153.68 | 1092.65 | 1947 | 1 | | |
| 73.64 | 1123.12 | 0.00 | 1326.50 | 272.66 | 1544.35 | 1948 | 1 | | |
| 75.94 | 1113.27 | 0.00 | 755.79 | 615.7 | 1476.28 | 1949 | 1 | | |
| 156.21 | 957.31 | 0.00 | 1643.80 | 410.94 | 1346.41 | 1950 | 1 | | |
| 117.97 | 774.51 | 0.00 | 949.08 | 207.05 | 938.14 | 1951 | 1 | | |
| 131.01 | 743.76 | 0.00 | 729.70 | 318.12 | 857.63 | 1952 | 1 | | |
| 46.07 | 354.35 | 0.00 | 502.68 | 525.77 | 778.53 | 1953 | 1 | | |
| 26.56 | 418.07 | 0.00 | 692.80 | 797.19 | 891.57 | 1954 | 1 | | |
| 57.14 | 398.57 | 0.00 | 882.91 | 520.17 | 925.76 | 1955 | 1 | | |
| 120.46 | 356.24 | 19.08538266 | | 500.9048004 | | 504.5 | 683.23 | 1956 | 1 |
| 106.45 | 361.57 | 83.19653508 | | 739.2912438 | | 517.79 | 954.42 | 1957 | 1 |
| 29.12 | 443.81 | 37.86344228 | | 529.9001669 | | 557.95 | 729.26 | 1958 | 1 |
| 73.98 | 678.12 | 389.3859451 | | 364.915062 | | 370.52 | 625.42 | 1959 | 1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 123.3 | 587.4 | 84.95229238 | 634.6428419 | 514.39 | 592.71 | 1960 | 1 |
| 133.94 | 802.19 | 56.76342579 | 595.0223934 | 540.53 | 927.43 | 1961 | 1 |
| 156.57 | 497.8 | 93.82471134 | 549.7313855 | 510.21 | 783.04 | 1962 | 1 |
| 118.57 | 535.59 | 151.7034318 | 473.5144639 | 530.82 | 810.08 | 1963 | 1 |
| 103.21 | 455.02 | 75.67095126 | 297.2254084 | 372.19 | 912.61 | 1964 | 1 |
| 127.72 | 434.58 | 82.27623287 | 468.0040234 | 373.44 | 845.83 | 1965 | 1 |
| 91.56 | 414.37 | 59.43053608 | 304.2129827 | 324.71 | 916.97 | 1966 | 1 |
| 60.01 | 312 | 73.88134629 | 307.8110962 | 521.08 | 858.3 | 1967 | 1 |
| 137.39 | 222.56 | 41.2624545 | 318.9622835 | 360.61 | 845.9 | 1968 | 1 |
| 52.02 | 161.12 | 34.8814166 | 369.5093387 | 420.97 | 848.19 | 1969 | 1 |
| 143.76 | 356.86 | 114.2374653 | 457.8560562 | 472.37 | 1070.97 | 1970 | 1 |
| 152.49 | 418.93 | 133.5236858 | 296.4982753 | 539.72 | 1015.59 | 1971 | 1 |
| 186.61 | 553.63 | 157.9714353 | 297.1896405 | 703.21 | 1000.27 | 1972 | 1 |
| 200.86 | 545.65 | 106.2533495 | 407.1357719 | 417.44 | 741.68 | 1973 | 1 |
| 167.91 | 712.88 | 161.6296984 | 428.64479 | 664.63 | 893.27 | 1974 | 1 |
| 189.29 | 703.09 | 178.2618016 | 611.0796414 | 560.51 | 900.92 | 1975 | 1 |
| 161.12 | 494.31 | 176.4474321 | 283.5405907 | 712.75 | 736.71 | 1976 | 1 |
| 161.77 | 437.19 | 152.8606288 | 294.2000114 | 484.15 | 494.81 | 1977 | 1 |
| 246.92 | 578.04 | 141.0672272 | 352.5773495 | 419.09 | 800.66 | 1978 | 1 |
| 248.02 | 514.7 | 200.9414201 | 505.3926191 | 352.88 | 944.8 | 1979 | 1 |
| 56.44 | 444.24 | 67.13167082 | 346.9981633 | 518.33 | 680.05 | 1980 | 1 |
| 194.19 | 417.96 | 166.6786302 | 420.0563 | 149.29 | 533.63 | 1981 | 1 |
| 121.26 | 580.12 | 133.1994 | 714.4955 | 261.53 | 502.05 | 1982 | 1 |
| 229.54 | 750.63 | 491.384 | 340.7898 | 272.72 | 364.76 | 1983 | 1 |
| 241.92 | 595.04 | 228.4194 | 152.3882 | 260.56 | 329.98 | 1984 | 1 |
| 286.38 | 282.35 | 173.5963 | 124.3823 | 273.29 | 471.93 | 1985 | 1 |
| 206.97 | 327.23 | 264.5211 | 123.8339 | 402.99 | 355.49 | 1986 | 1 |
| 422.2 | 439.51 | 431.9859 | 126.1704 | 310.94 | 556.37 | 1987 | 1 |
| 333.64 | 449.18 | 409.0995 | 160.7302 | 349.17 | 411.28 | 1988 | 1 |
| 298.05 | 397.98 | 396.6297 | 184.8398 | 393.89 | 414.79 | 1989 | 1 |
| 383.28 | 300.56 | 257.0614 | 158.1468 | 319.64 | 373.52 | 1990 | 1 |
| 352.01 | 246.91 | 440.4501 | 149.9066 | 447.94 | 310.28 | 1991 | 1 |
| 298.02 | 204.76 | 339.6681 | 159.6469 | 273.54 | 307.39 | 1992 | 1 |
| 271.41 | 213.33 | 413.0767 | 173.9348 | 237.99 | 235.66 | 1993 | 1 |
| 237.33 | 173.72 | 280.055 | 175.634 | 246.18 | 303.57 | 1994 | 1 |
| 235.12 | 236.41 | 354.5096 | 201.9551 | 236.03 | 290.52 | 1995 | 1 |
| 264.64 | 247.52 | 310.874 | 182.2337 | 406.09 | 401.93 | 1996 | 1 |
| 247.72 | 233.35 | 366.9922 | 176.3271 | 451.3 | 461.33 | 1997 | 1 |
| 217.81 | 329.97 | 303.295 | 242.5376 | 221.71 | 302.8 | 1998 | 1 |
| 134.65 | 307.13 | 323.3691 | 193.1765 | 292.03 | 268.38 | 1999 | 1 |
| 204.76 | 415.44 | 323.4859 | 136.2776 | 408.47 | 242.1 | 2000 | 1 |
| 252.78 | 347.07 | 358.4171 | 225.9309 | 317.31 | 261.34 | 2001 | 1 |
| 262.09 | 494.77 | 295.6402 | 185.3728 | 339.84 | 195.69 | 2002 | 1 |
| 224.44 | 527.35 | 241.7632 | 166.4343 | 260.7 | 180.19 | 2003 | 1 |
| 610.81 | 549.24 | 322.8969 | 188.5097 | 177.27 | 267.84 | 2004 | 1 |
| 555.84 | 763.41 | 374.9271 | 286.1923 | 339.46 | 534.42 | 2005 | 1 |
| 254.05 | 618.8 | 277.558 | 363.4669 | 128.18 | 468.41 | 2006 | 1 |
| 303.55 | 333.05 | 557.8857 | 173.7824 | 471.17 | 493.45 | 2007 | 1 |
| 286.74 | 179.78 | 448.6156 | 136.2821 | 617.55 | 416.16 | 2008 | 1 |
| 198.24 | 328.79 | 599.01 | 280.7 | 512.81 | 259.67 | 2009 | 1 |
| 58.99 | 115.62 | 164.71 | 125.2 | 84.21 | 117.6 | 2010 | 1 |

#Abundance indices
85 #86 #nobs
#_Fleet/Survey (explicitly entered for future capability), Units (0=num; 1=bio; 2=F), Error distribution (-1=normal; 0=lognorm; >0=df_T)

1 1 0
2 1 0
3 1 0
4 1 0
5 1 0
6 1 0
7 1 0
8 1 0
9 1 0

| #Year | Seas | Fleet | Value | SE(log(B)) | | | |
|---|---|---|---|---|---|---|---|
| # | 1987 | 1 | 2 | 49.28 | 0.5 | # | WA-Summer |
| # | 1988 | 1 | 2 | 42.09 | 0.5 | # | WA-Summer |
| # | 1989 | 1 | 2 | 31.91 | 0.5 | # | WA-Summer |
| # | 1990 | 1 | 2 | 32.34 | 0.5 | # | WA-Summer |
| # | 1991 | 1 | 2 | 19.72 | 0.5 | # | WA-Summer |
| # | 1992 | 1 | 2 | 17.26 | 0.5 | # | WA-Summer |
| # | 1993 | 1 | 2 | 17.61 | 0.5 | # | WA-Summer |
| # | 1994 | 1 | 2 | 20.83 | 0.5 | # | WA-Summer |
| # | 1995 | 1 | 2 | 41.04 | 0.5 | # | WA-Summer |
| # | 1996 | 1 | 2 | 45.31 | 0.5 | # | WA-Summer |
| # | 1997 | 1 | 2 | 51.59 | 0.5 | # | WA-Summer |
| # | 1998 | 1 | 2 | 76.23 | 0.5 | # | WA-Summer |
| # | 1999 | 1 | 2 | 64.99 | 0.5 | # | WA-Summer |
| # | 2000 | 1 | 2 | 139.22 | 0.5 | # | WA-Summer |
| # | 2001 | 1 | 2 | 77.37 | 0.5 | # | WA-Summer |
| # | 2002 | 1 | 2 | 87.27 | 0.5 | # | WA-Summer |
| # | 2003 | 1 | 2 | 130.07 | 0.5 | # | WA-Summer |
| # | 2004 | 1 | 2 | 179.86 | 0.5 | # | WA-Summer |
| # | 2005 | 1 | 2 | 201.48 | 0.5 | # | WA-Summer |
| # | 2006 | 1 | 2 | 153.82 | 0.5 | # | WA-Summer |
| # | 2007 | 1 | 2 | 176.54 | 0.5 | # | WA-Summer |
| # | 2008 | 1 | 2 | 140.05 | 0.5 | # | WA-Summer |
| # | 2009 | 1 | 2 | 148.72 | 0.5 | # | WA-Summer |
| # | 1987 | 1 | 4 | 7.24 | 0.5 | # | OR-Summer |
| # | 1988 | 1 | 4 | 8.78 | 0.5 | # | OR-Summer |
| # | 1989 | 1 | 4 | 11.59 | 0.5 | # | OR-Summer |
| # | 1990 | 1 | 4 | 10.24 | 0.5 | # | OR-Summer |
| # | 1991 | 1 | 4 | 7.95 | 0.5 | # | OR-Summer |
| # | 1992 | 1 | 4 | 10.5 | 0.5 | # | OR-Summer |
| # | 1993 | 1 | 4 | 7.01 | 0.5 | # | OR-Summer |
| # | 1994 | 1 | 4 | 11.24 | 0.5 | # | OR-Summer |
| # | 1995 | 1 | 4 | 15.13 | 0.5 | # | OR-Summer |
| # | 1996 | 1 | 4 | 11.5 | 0.5 | # | OR-Summer |
| # | 1997 | 1 | 4 | 13.21 | 0.5 | # | OR-Summer |
| # | 1998 | 1 | 4 | 9.24 | 0.5 | # | OR-Summer |
| # | 1999 | 1 | 4 | 14.24 | 0.5 | # | OR-Summer |
| # | 2000 | 1 | 4 | 17.99 | 0.5 | # | OR-Summer |
| # | 2001 | 1 | 4 | 27.21 | 0.5 | # | OR-Summer |
| # | 2002 | 1 | 4 | 27.58 | 0.5 | # | OR-Summer |
| # | 2003 | 1 | 4 | 47.43 | 0.5 | # | OR-Summer |
| # | 2004 | 1 | 4 | 62.32 | 0.5 | # | OR-Summer |
| # | 2005 | 1 | 4 | 120.96 | 0.5 | # | OR-Summer |
| # | 2006 | 1 | 4 | 198.41 | 0.5 | # | OR-Summer |
| # | 2007 | 1 | 4 | 126.91 | 0.5 | # | OR-Summer |
| # | 2008 | 1 | 4 | 110.17 | 0.5 | # | OR-Summer |
| # | 2009 | 1 | 4 | 115.12 | 0.5 | # | OR-Summer |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| # | 1987 | 1 | 6 | 2.63 | 0.5 | # | CA-Summer |
| # | 1988 | 1 | 6 | 1.46 | 0.5 | # | CA-Summer |
| # | 1989 | 1 | 6 | 2.5 | 0.5 | # | CA-Summer |
| # | 1990 | 1 | 6 | 1.99 | 0.5 | # | CA-Summer |
| # | 1991 | 1 | 6 | 2.36 | 0.5 | # | CA-Summer |
| # | 1992 | 1 | 6 | 2.24 | 0.5 | # | CA-Summer |
| # | 1993 | 1 | 6 | 1.5 | 0.5 | # | CA-Summer |
| # | 1994 | 1 | 6 | 1.25 | 0.5 | # | CA-Summer |
| # | 1995 | 1 | 6 | 1.55 | 0.5 | # | CA-Summer |
| # | 1996 | 1 | 6 | 1.73 | 0.5 | # | CA-Summer |
| # | 1997 | 1 | 6 | 1.98 | 0.5 | # | CA-Summer |
| # | 1998 | 1 | 6 | 1.03 | 0.5 | # | CA-Summer |
| # | 1999 | 1 | 6 | 1.7 | 0.5 | # | CA-Summer |
| # | 2000 | 1 | 6 | 1.58 | 0.5 | # | CA-Summer |
| # | 2001 | 1 | 6 | 2.83 | 0.5 | # | CA-Summer |
| # | 2002 | 1 | 6 | 3.22 | 0.5 | # | CA-Summer |
| # | 2003 | 1 | 6 | 2.85 | 0.5 | # | CA-Summer |
| # | 2004 | 1 | 6 | 16 | 0.5 | # | CA-Summer |
| # | 2005 | 1 | 6 | 44.28 | 0.5 | # | CA-Summer |
| # | 2006 | 1 | 6 | 21.77 | 0.5 | # | CA-Summer |
| # | 2007 | 1 | 6 | 27.82 | 0.5 | # | CA-Summer |
| # | 2008 | 1 | 6 | 40.95 | 0.5 | # | CA-Summer |
| # | 2009 | 1 | 6 | 8.45 | 0.5 | # | CA-Summer |
| 1987 | 1 | 1 | 1998.82 | 0.35 | # | WA-Winter | |
| 1988 | 1 | 1 | 1490.51 | 0.35 | # | WA-Winter | |
| 1989 | 1 | 1 | 1101.39 | 0.35 | # | WA-Winter | |
| 1990 | 1 | 1 | 912.34 | 0.35 | # | WA-Winter | |
| 1991 | 1 | 1 | 798.35 | 0.35 | # | WA-Winter | |
| 1992 | 1 | 1 | 836.12 | 0.35 | # | WA-Winter | |
| 1993 | 1 | 1 | 556.24 | 0.35 | # | WA-Winter | |
| 1994 | 1 | 1 | 464.43 | 0.35 | # | WA-Winter | |
| 1995 | 1 | 1 | 603.43 | 0.35 | # | WA-Winter | |
| 1996 | 1 | 1 | 618.03 | 0.35 | # | WA-Winter | |
| 1997 | 1 | 1 | 346.9 | 0.35 | # | WA-Winter | |
| 1998 | 1 | 1 | 1023.8 | 0.35 | # | WA-Winter | |
| 1999 | 1 | 1 | 613.52 | 0.35 | # | WA-Winter | |
| 2000 | 1 | 1 | 1575.83 | 0.35 | # | WA-Winter | |
| 2001 | 1 | 1 | 1957.96 | 0.35 | # | WA-Winter | |
| 2002 | 1 | 1 | 3039.93 | 0.35 | # | WA-Winter | |
| 2003 | 1 | 1 | 2626.77 | 0.35 | # | WA-Winter | |
| 2004 | 1 | 1 | 6626.14 | 0.35 | # | WA-Winter | |
| 2005 | 1 | 1 | 9072.64 | 0.35 | # | WA-Winter | |
| 2006 | 1 | 1 | 11035.96 | | 0.35 | # | WA-Winter |
| 2007 | 1 | 1 | 5117.64 | 0.35 | # | WA-Winter | |
| 2008 | 1 | 1 | 5891.87 | 0.35 | # | WA-Winter | |
| 2009 | 1 | 1 | 4151.1 | 0.35 | # | WA-Winter | |
| 1987 | 1 | 3 | 176.65 | 0.25 | # | OR-Winter | |
| 1988 | 1 | 3 | 111.99 | 0.25 | # | OR-Winter | |
| 1989 | 1 | 3 | 153.82 | 0.25 | # | OR-Winter | |
| 1990 | 1 | 3 | 107.11 | 0.25 | # | OR-Winter | |
| 1991 | 1 | 3 | 128.8 | 0.25 | # | OR-Winter | |
| 1992 | 1 | 3 | 118.36 | 0.25 | # | OR-Winter | |
| 1993 | 1 | 3 | 88.49 | 0.25 | # | OR-Winter | |
| 1994 | 1 | 3 | 80.47 | 0.25 | # | OR-Winter | |
| 1995 | 1 | 3 | 157.82 | 0.25 | # | OR-Winter | |
| 1996 | 1 | 3 | 194.27 | 0.25 | # | OR-Winter | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1997 | 1 | 3 | 347.44 | 0.25 | # | OR-Winter |
| 1998 | 1 | 3 | 173.22 | 0.25 | # | OR-Winter |
| 1999 | 1 | 3 | 252.03 | 0.25 | # | OR-Winter |
| 2000 | 1 | 3 | 227.43 | 0.25 | # | OR-Winter |
| 2001 | 1 | 3 | 474.2 | 0.25 | # | OR-Winter |
| 2002 | 1 | 3 | 529.59 | 0.25 | # | OR-Winter |
| 2003 | 1 | 3 | 487.6 | 0.25 | # | OR-Winter |
| 2004 | 1 | 3 | 946.21 | 0.25 | # | OR-Winter |
| 2005 | 1 | 3 | 925.15 | 0.25 | # | OR-Winter |
| 2006 | 1 | 3 | 956.51 | 0.25 | # | OR-Winter |
| 2007 | 1 | 3 | 1130.85 | 0.25 | # | OR-Winter |
| 2008 | 1 | 3 | 1052.22 | 0.25 | # | OR-Winter |
| 2009 | 1 | 3 | 1206.6 | 0.25 | # | OR-Winter |
| 1988 | 1 | 5 | 38.12 | 0.45 | # | CA-Winter |
| 1989 | 1 | 5 | 30.43 | 0.45 | # | CA-Winter |
| 1990 | 1 | 5 | 84.77 | 0.45 | # | CA-Winter |
| 1991 | 1 | 5 | 68.93 | 0.45 | # | CA-Winter |
| 1992 | 1 | 5 | 41.26 | 0.45 | # | CA-Winter |
| 1993 | 1 | 5 | 52.89 | 0.45 | # | CA-Winter |
| 1994 | 1 | 5 | 46.19 | 0.45 | # | CA-Winter |
| 1995 | 1 | 5 | 33.67 | 0.45 | # | CA-Winter |
| 1996 | 1 | 5 | 59.64 | 0.45 | # | CA-Winter |
| 1997 | 1 | 5 | 54.56 | 0.45 | # | CA-Winter |
| 1998 | 1 | 5 | 37.56 | 0.45 | # | CA-Winter |
| 1999 | 1 | 5 | 77.19 | 0.45 | # | CA-Winter |
| 2000 | 1 | 5 | 90.18 | 0.45 | # | CA-Winter |
| 2001 | 1 | 5 | 80.48 | 0.45 | # | CA-Winter |
| 2002 | 1 | 5 | 78.87 | 0.45 | # | CA-Winter |
| 2003 | 1 | 5 | 91.4 | 0.45 | # | CA-Winter |
| 2004 | 1 | 5 | 230.48 | 0.45 | # | CA-Winter |
| 2005 | 1 | 5 | 196.57 | 0.45 | # | CA-Winter |
| 2006 | 1 | 5 | 245.05 | 0.45 | # | CA-Winter |
| 2007 | 1 | 5 | 350.95 | 0.45 | # | CA-Winter |
| 2008 | 1 | 5 | 424.13 | 0.45 | # | CA-Winter |
| 2009 | 1 | 5 | 410.98 | 0.45 | # | CA-Winter |

| #Year | Season | Fleet | Value | seLogB |
|---|---|---|---|---|
| 1980 | 1 | 7 | 2085.319 | 0.10691644 |
| 1983 | 1 | 7 | 2124.238 | 0.0778331 |
| 1986 | 1 | 7 | 2208.127 | 0.07559119 |
| 1989 | 1 | 7 | 3731.683 | 0.07258284 |
| 1992 | 1 | 7 | 1784.602 | 0.0734451 |
| 1995 | 1 | 9 | 2435.568 | 0.08343566 |
| 1998 | 1 | 9 | 3471.031 | 0.07092453 |
| 2001 | 1 | 9 | 3768.803 | 0.07854848 |
| 2004 | 1 | 9 | 9312.097 | 0.08006019 |

| #Year | Season | Fleet | Value | seLogB |
|---|---|---|---|---|
| 2003 | 1 | 8 | 19280.81 | 0.09266469 |
| 2004 | 1 | 8 | 23195.46 | 0.12332577 |
| 2005 | 1 | 8 | 27689.71 | 0.08743881 |
| 2006 | 1 | 8 | 20515.22 | 0.08097218 |
| 2007 | 1 | 8 | 17263.41 | 0.08295536 |
| 2008 | 1 | 8 | 13779.21 | 0.07456213 |
| 2009 | 1 | 8 | 16971.39 | 0.07595605 |
| 2010 | 1 | 8 | 21865.82 | 0.06460339 |

#_Discards

```
6 # N fleets with discard
#Fleet, Units#(1=biomass,2=fraction), Error
1 2 -1
2 2 -1
3 2 -1
4 2 -1
5 2 -1
6 2 -1

53	#nobs_disc
#Year	Seas	Fleet	Biomass	stdev
1986	1	3	0.002056637	0.0026 #Pikitch
1986	1	4	0.03828968	0.0048 #Pikitch
#	YEAR	SEASON	Fleet	mean	stdev
	2002	1	1	0.0084	0.0017
	2003	1	1	0.0140	0.0141
	2004	1	1	0.0030	0.0015
	2005	1	1	0.0031	0.0014
	2006	1	1	0.0070	0.0018
	2007	1	1	0.0059	0.0032
	2008	1	1	0.0277	0.0224
	2009	1	1	0.0226	0.0127
	2010	1	1	0.2486	0.0025
	2002	1	2	0.2351	0.0234
	2003	1	2	0.1678	0.0411
	2004	1	2	0.1106	0.0217
	2005	1	2	0.0683	0.0095
	2006	1	2	0.0648	0.0143
	2007	1	2	0.0890	0.0245
	2008	1	2	0.0034	0.0019
	2009	1	2	0.0272	0.0040
#	2010	1	2	0.0628	0.0003
	2002	1	3	0.0218	0.0093
	2003	1	3	0.0028	0.0011
	2004	1	3	0.0006	0.0003
	2005	1	3	0.0095	0.0067
	2006	1	3	0.0075	0.0032
	2007	1	3	0.0030	0.0019
	2008	1	3	0.0402	0.0220
	2009	1	3	0.0381	0.0191
	2010	1	3	0.1489	0.0039
	2002	1	4	0.1470	0.0223
	2003	1	4	0.0681	0.0205
	2004	1	4	0.0385	0.0211
	2005	1	4	0.0353	0.0130
	2006	1	4	0.0852	0.0143
	2007	1	4	0.1328	0.0386
	2008	1	4	0.0015	0.0004
	2009	1	4	0.1299	0.0277
#	2010	1	4	0.0009	0.0000
	2002	1	5	0.0266	0.0094
	2003	1	5	0.0453	0.0298
	2004	1	5	0.0150	0.0236
	2005	1	5	0.0062	0.0024
	2006	1	5	0.0538	0.0172
	2007	1	5	0.0120	0.0021
```

| | | | | | |
|---|---|---|---|---|---|
| | 2008 | 1 | 5 | 0.0013 | 0.0004 |
| | 2009 | 1 | 5 | 0.0005 | 0.0002 |
| | 2010 | 1 | 5 | 0.0808 | 0.0033 |
| | 2002 | 1 | 6 | 0.0609 | 0.0124 |
| | 2003 | 1 | 6 | 0.0396 | 0.0082 |
| | 2004 | 1 | 6 | 0.0276 | 0.0075 |
| | 2005 | 1 | 6 | 0.0101 | 0.0022 |
| | 2006 | 1 | 6 | 0.0405 | 0.0108 |
| | 2007 | 1 | 6 | 0.0697 | 0.0181 |
| | 2008 | 1 | 6 | 0.0121 | 0.0028 |
| | 2009 | 1 | 6 | 0.2503 | 0.0762 |
| # | 2010 | 1 | 6 | 0.0158 | 0.0003 |

#_Mean_BodyWt
51 #nobs_mnwt #N_observations
30 #Degrees of freedom for Student's T distribution
#must be in kilograms

| #YEAR | SEASON | | Fleet | Partition | Value | CV |
|---|---|---|---|---|---|---|
| # | YEAR | Season | Fleet | Partition | Wghtd.Ave_W_kg | CV |
| | 2002 | 1 | 1 | 1 | 0.440379037 | 0.450094176 |
| | 2003 | 1 | 1 | 1 | 0.388033409 | 0.527295899 |
| | 2004 | 1 | 1 | 1 | 0.336294807 | 0.500064846 |
| | 2005 | 1 | 1 | 1 | 0.304282942 | 0.608578161 |
| | 2006 | 1 | 1 | 1 | 0.37423087 | 0.74778404 |
| | 2007 | 1 | 1 | 1 | 0.380655848 | 0.278309281 |
| | 2008 | 1 | 1 | 1 | 0.59492934 | 0.478065859 |
| | 2009 | 1 | 1 | 1 | 0.334002074 | 0.374700296 |
| | 2010 | 1 | 1 | 1 | 0.649645631 | 0.65474324 |
| | 2002 | 1 | 2 | 1 | 0.269888208 | 0.391852929 |
| | 2003 | 1 | 2 | 1 | 0.267846567 | 0.485256248 |
| | 2004 | 1 | 2 | 1 | 0.295780118 | 0.43597612 |
| | 2005 | 1 | 2 | 1 | 0.309580384 | 0.386269476 |
| | 2006 | 1 | 2 | 1 | 0.26797146 | 0.480658427 |
| | 2007 | 1 | 2 | 1 | 0.236528007 | 0.349096152 |
| | 2008 | 1 | 2 | 1 | 0.249128633 | 0.485746205 |
| | 2009 | 1 | 2 | 1 | 0.200203885 | 0.435169364 |
| # | 2010 | 1 | 2 | 1 | 0.372934116 | 0.179631766 |
| | 2002 | 1 | 3 | 1 | 0.340817491 | 0.536126025 |
| | 2003 | 1 | 3 | 1 | 0.280719613 | 0.382745202 |
| | 2004 | 1 | 3 | 1 | 0.326095345 | 0.377502619 |
| | 2005 | 1 | 3 | 1 | 0.378378781 | 0.391726503 |
| | 2006 | 1 | 3 | 1 | 0.442844435 | 0.408942969 |
| | 2007 | 1 | 3 | 1 | 0.451858101 | 0.317272602 |
| | 2008 | 1 | 3 | 1 | 0.396380027 | 0.402940346 |
| | 2009 | 1 | 3 | 1 | 0.418933195 | 0.44180881 |
| | 2010 | 1 | 3 | 1 | 0.557085976 | 0.487195696 |
| | 2002 | 1 | 4 | 1 | 0.206745809 | 0.484416392 |
| | 2003 | 1 | 4 | 1 | 0.176421713 | 0.438372797 |
| | 2004 | 1 | 4 | 1 | 0.262462298 | 0.455029267 |
| | 2005 | 1 | 4 | 1 | 0.281369608 | 0.471241102 |
| | 2006 | 1 | 4 | 1 | 0.265795639 | 0.272187554 |
| | 2007 | 1 | 4 | 1 | 0.284921288 | 0.497038596 |
| | 2008 | 1 | 4 | 1 | 0.179913506 | 0.362848119 |
| | 2009 | 1 | 4 | 1 | 0.296813512 | 0.620201005 |
| | 2002 | 1 | 5 | 1 | 0.409963409 | 0.658202015 |
| | 2003 | 1 | 5 | 1 | 0.17819576 | 0.40686274 |

```
        2004    1       5       1       0.308563264     0.393827606
        2005    1       5       1       0.270739059     0.584397573
        2006    1       5       1       0.283956712     0.668245725
        2007    1       5       1       0.218025226     0.465842432
        2008    1       5       1       0.300154419     0.44548394
        2009    1       5       1       0.545545719     0.414879906
        2010    1       5       1       0.541186171     0.931643163
        2002    1       6       1       0.190468703     0.900302405
        2003    1       6       1       0.176556597     0.416823891
        2004    1       6       1       0.183464381     0.471727126
        2005    1       6       1       0.251940986     0.437513829
        2006    1       6       1       0.318455215     0.642855376
        2007    1       6       1       0.364290824     0.608735944
        2008    1       6       1       0.218920051     0.430724879
        2009    1       6       1       0.212998174     1.007597288
#       2010    1       6       1       0.15787722      0.355828981

#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
0.001   #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

294     #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
#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
        1955    1       1       3       2       7       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
1966 1 1 3 2 7 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
1967 1 1 3 2 28 0 0 0 0 0
0 0 0 0 0.60063256 1.674317067 1.073684507
2.748001574 8.516011923 16.08819919 11.68038528 8.801481927
7.043118342 3.661260067 2.049691377 0.862525187 0.97600687 0
0 0 0 0 0 0 0 0 0 0 0
0.536842254 3.949266694 3.771994704 8.53181597 6.71686129
6.243809343 2.749043503 1.725050373 0 0 0 0 0
0 0 0 0 0
1968 1 1 3 2 77 0 0 0 0 0
0 0 0 0 0.151919708 1.471120671 4.738959295
7.445321478 7.332655474 10.01934408 11.12698513 9.899336241
5.112053117 5.417329359 2.30298233 1.561826377 0.280378131 0
0 0 0 0 0 0 0 0 0 0 0
0 1.322302376 3.376532413 7.977558729 8.843996916 5.834061355
4.318868733 0.651845927 0.674433095 0.140189065 0 0 0
0 0 0 0 0
1969 1 1 3 2 63 0 0 0 0 0
0 0 0 0 0.787666354 2.199450016 1.517931766
1.116962863 1.222404662 2.228288761 2.170870456 6.932140488
6.266486002 3.722232861 2.186456918 1.816022199 1.393264773
0.464421591 0 0 0 0 0 0 0 0 0
0 0.13254089 0 0.196755619 0.640798707 7.633342142
17.62985585 18.98757322 11.78848625 7.287402075 1.446434742
0.232210795 0 0 0 0 0 0 0 0
1970 1 1 3 2 63 0 0 0 0 0
0 0 0 0.322575053 2.786615065 5.028992619 5.893096632
5.545686414 6.145128456 5.862773265 6.986519299 9.927857082
6.608953093 4.144711305 4.300159118 1.536176454 0.323131996
0.214451312 0.249577469 0.020823116 0 0 0 0 0
0 0 0 0 0.84495221 1.857591048 4.205811071
7.526233031 7.914627757 5.483565292 4.808104304 1.102538896
0.228754353 0.130594289 0 0 0 0 0 0 0
0
1971 1 1 3 2 77 0 0 0 0 0
0 0 0 0.082602415 0.079197921 0.386409738 0.32019618
0.613600821 1.395005462 1.782150385 3.137060439 4.343576296
5.317904253 3.085029591 3.22379871 1.583248646 1.201856547
0.888644987 0.28275601 0 0.164842706 0 0 0 0
0 0 0 0 0.244402752 0.369942756 1.4817648
6.789636566 13.94307801 16.41418319 15.50457236 9.800918632
5.3647736 1.480612296 0.618392742 0.09984118 0 0 0
0 0 0
1972 1 1 3 2 28 0 0 0 0 0
0 0 0 0 0.002019781 0.054808279 0.081579065
0.34366573 1.75462221 5.169055023 8.973043067 7.432264191
3.914441187 5.411777394 3.672993555 3.329247384 2.612439737
0.944116815 0.719496987 0.387785988 0 0 0 0 0

0 0 0 0 0.009345831 0.021464515 0.600610078
6.191780789 17.94274411 18.97271241 8.150419395 1.63210366
1.254260653 0.421202162 0 0 0 0 0 0 0
0
1973 1 1 3 2 21 0 0 0 0 0
0 0 0 0 0 0 0.180790001 0.301316669
0.957258386 5.707490525 12.64357429 17.24737009 12.20189925
7.656408799 6.762248713 2.493246262 2.079438881 1.839262529
1.364110813 0.888959097 0.296319699 0 0 0 0 0
0 0 0 0 0 0.537373034 2.233911174 6.140408802
13.70431477 2.936158479 1.136090403 0.571522678 0.120526667 0
0 0 0 0 0 0 0
1974 1 1 3 2 21 0 0 0 0 0
0 0 0 0 0 0 0 0.106099995 0.21219999
1.646363636 2.800996944 3.14730666 2.108270519 1.281878344
0.898417613 0.688387223 0.265249988 0.36014609 0.161319593
0.161319593 0 0 0 0 0 0 0 0 0
0 0 0.428739182 2.415454699 12.44899827 29.06965283
29.79419613 9.655152725 1.413018605 0.783283326 0.153548046 0
0 0 0 0 0 0
1975 1 1 3 2 70 0 0 0 0 0
0 0 0 0 0 0 0.054553101 0.292975444
0.735853738 3.023382575 6.910372927 10.66048644 10.33899048
6.121824379 3.04635212 2.006478528 1.393630929 0.865147228
0.27555303 0.248801294 0.025981457 0 0 0 0 0
0 0.019016174 0 0 0 0.164381842 1.804158902
7.289965484 16.64014379 15.83509527 8.911877724 2.610429031
0.428538018 0.167571973 0.10245667 0.025981457 0 0 0
0 0
1976 1 1 3 2 7 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
1977 1 1 3 2 14 0 0 0 0 0
0 0 0 0 0 0 0.14739982 0.976474816
0.29479964 3.924079295 10.35356361 14.51711862 18.77274953
10.20616379 6.576884134 2.855528581 1.160626612 2.708128761
0.773751075 0.386875537 0.773751075 0 0 0 0 0
0 0 0 0 0 0 1.750225891 4.900554111
7.185055359 5.914172821 4.495498545 0.884398919 0.29479964
0.14739982 0 0 0 0 0 0 0
1978 1 1 3 2 21 0 0 0 0 0
0 0 0 0 0 0 0 0 0.12649582
1.35964499 4.337770136 12.2191986 14.49608465 11.51829347
9.347484324 5.833268665 4.39565527 3.355763182 0.518188947
0.828399477 0.415956835 0 0 0 0 0 0 0
0 0 0.014055091 0.028110182 1.254564929 5.21987431
10.07431793 8.794826414 2.640138396 2.079784176 0.623935253
0.518188947 0 0 0 0 0 0 0
1979 1 1 3 2 14 0 0 0 0 0
0 0 0 0 0 0 0 0 0.428005903
2.140029514 2.568035416 2.628292217 4.340315828 2.200286315

4.46082943 2.260543116 0.428005903 0.428005903 0 0.976525407
0.488262704 0 0 0 0 0 0 0 0 0
0 0.488262704 2.996041319 14.2925486 15.20881721 15.32933081
15.87785031 9.162686064 2.80906262 0 0 0.488262704 0
0 0 0 0
1980 1 1 3 2 35 0 0 0 0 0
0 0 0 0.041342493 0.165369972 0.650243765 0.833939129
0.720545361 1.086712506 4.235922306 13.6156552 11.50159182
7.051497243 6.451172517 9.321318604 7.126036521 2.842428547
1.779604339 1.4066638 0.185964587 0.3592205 0 0 0
0 0 0 0 0.077347413 0 0.289397451 0.779608817
1.448202228 6.797430509 13.0192324 5.912460233 0.576999083
1.282187171 0.041342493 0.281873086 0.118689906 0 0 0
0 0 0
1981 1 1 3 2 56 0 0 0 0 0
0 0 0 0.177000329 0.926079939 1.610462362 2.04649962
1.694496365 2.853151749 3.718401261 6.267219465 5.793901943
13.0509547 11.74559015 6.742114328 5.883194242 4.697648134
4.167076611 1.598436302 0.522477839 0.751102597 0 0 0
0 0 0 0 0 0.035851479 0.824146277 1.274087306
2.863413999 4.483944953 5.584291567 4.233735044 1.688683793
1.940594617 0.881619657 0.854755409 0 0 0.259274719
0.622344938 0.207448313 0 0
1982 1 1 3 2 28 0 0 0 0 0
0 0 0 0 0 0.08348193 1.258634498 0.918301235
2.717590994 3.724449272 4.252718405 3.419682266 3.010922988
2.239944034 4.252718405 4.399171925 3.212575414 2.294237468
3.312964644 0.097623442 0.437956706 0 0 0 0 0
0 0 0 0 0.08348193 1.660119473 5.889140519
6.92155647 14.86821788 12.51147049 5.523751686 6.728594855
2.352202161 3.828490911 0 0 0 0 0 0 0
1983 1 1 3 2 7 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
1984 1 1 3 2 7 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
1986 1 1 3 2 14 0 0 0 0 0
0 0 0 0 0.165898991 0 0 1.161292939
2.985080108 5.804261225 9.951001516 9.784368036 6.633756181
6.633388937 0.663595965 3.648308828 0.829127711 0 0.829127711
0 0 0 0 0 0 0 0 0 0 0
0.165898991 0.165898991 5.472463243 15.42236302 16.08559175
11.44225621 1.658622668 0.331797982 0.165898991 0 0 0
0 0 0 0 0
1987 1 1 3 2 42 0 0 0 0 0
0 0 0 0 0 0 0 0.077125826 0.963599268

1.857544661 3.892419573 10.67534035 8.145273838 5.310035054
4.50354662 1.270529555 0.413735946 0.990035197 0.015068968
0.030137936 0 0 0 0 0 0 0 0 0
0 0.327467282 1.386994954 7.425474001 15.38709949 20.62083579
8.686884814 6.818182567 1.187599339 0.015068968 0 0 0
0 0 0 0 0
1988 1 1 3 2 28 0 0 0 0 0
0 0 0 0 0 0 0 0 5.3956035
3.616563698 8.81747474 7.735597505 5.345882954 7.951986728
3.687842435 0.505023121 0.252511561 0 0 0.097691644
0.097691644 0 0 0 0 0 0 0 0
1.245854327 0 10.72922401 11.50576387 12.5612282 13.50282383
3.794829827 0.664697753 2.491708653 0 0 0 0 0
0 0 0 0
1989 1 1 3 2 28 0 0 0 0 0
0 0 0 2.050884351 4.101768702 12.3053061 5.377359219
5.558761217 5.091438666 3.626096183 3.782649374 5.448454358
1.613545707 3.576410342 4.035371153 0.544205994 0.362803996
0.181401998 0 0 0 0 0 0 0 0 0
0 1.025442175 3.076326526 8.261360343 7.004830328 6.29034966
4.431790712 8.321948866 0.7917809 2.59808057 0.541632558 0
0 0 0 0 0 0 0 0
1990 1 1 3 2 14 0 0 0 0 0
0 0 0 0 0 0 0 2.615889806 2.570029238
2.615889806 7.251022676 5.966008057 11.2895088 5.966008057
3.99262556 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 7.939390553 10.50941979
7.847669417 5.782565785 5.828426353 11.19778767 1.973382496
1.330875187 3.99262556 1.330875187 0 0 0 0 0
0
1991 1 1 3 2 14 0 0 0 0 0
0 0 0 0 0 0 0 1.645944015 15.21194947
5.985063165 13.56600545 18.45377261 18.45377261 4.339119149 0
4.339119149 4.339119149 0 0 0 0 0 0 0
0 0 0 0 0 0 0 2.194592021 4.389184041
5.43641516 1.09729601 0.548648005 0 0 0 0 0
0 0 0 0 0 0
1992 1 1 3 2 7 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
1993 1 1 3 2 28 0 0 0 0 0
0 0 0 0 0 0 0 2.608554883 3.586332451
11.8591262 10.29697243 12.52199109 6.194887334 4.504543975
1.562153767 0 0 0 0 1.092075178 0 0 0
0 0 0 0 0 0 0 0.758239853 1.982531458
5.258756992 20.7849197 11.83640163 5.152513053 0 0 0
0 0 0 0 0 0 0 0
1994 1 1 3 2 28 0 0 0 0 0
0 0 0 0 0.165497447 0.248246171 0.248246171
0.248246171 5.324777389 10.93659823 6.32999837 7.08565246
1.937342318 3.19080947 1.253467152 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1.253467152

1.584462047 9.747114411 21.23771344 15.35113966 9.066413451
3.53734133 1.253467152 0 0 0 0 0 0 0
0 0 0
1995 1 1 3 2 21 0 0 0 0 0
0 0 0 0 0 0.269527331 0 1.418109754
12.70792399 6.893016654 6.240121144 4.056797146 0.269527331
0.269527331 0 1.262423272 0 0 0 0 0 0
0 0 0 0 0 0 0 1.687637085 13.37251555
13.33066991 15.28935644 17.0760941 5.856752965 0 0 0
0 0 0 0 0 0 0 0 0
1996 1 1 3 2 14 0 0 0 0 0
0 0 0 0 0 0 0.094887228 0.189774457
6.137321416 12.36953006 0.284661685 15.29585993 3.021217094
0.094887228 0 0 0.094887228 0 0 0 0 0
0 0 0 0 0 0 0 0 0.094887228
12.36953006 24.54928567 10.01252357 6.137321416 6.232208645
3.021217094 0 0 0 0 0 0 0 0 0
0
1997 1 1 3 2 7 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
1998 1 1 3 2 14 0 0 0 0 0
0 0 0 0 0 0 0 0 3.277913071
13.97994203 5.919768119 13.47849277 7.057275399 3.277913071
1.638956536 1.638956536 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1.504347768 1.504347768
11.06886945 21.03721743 11.33808698 3.277913071 0 0 0
0 0 0 0 0 0 0 0
1999 1 1 3 2 21 0 0 0 0 0
0 0 0 0 0 0.545103843 0.726805123 0
2.407661474 5.905530633 5.184677052 10.96595431 7.955741088
3.705318623 3.737018347 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1.473406887
3.134466598 15.32872707 17.79383645 9.636597438 9.091493596
2.407661474 0 0 0 0 0 0 0 0 0
0
2000 1 1 3 2 70 0 0 0 0 0
0 0 0 0 0.101411731 0.303086161 1.982166837
1.886106486 5.103079275 5.137433898 9.435610805 5.019740505
4.925353858 4.519600107 1.81638514 1.272489244 0 0 0
0 0 0 0 0 0 0 0 0 0.017337683
0.223861231 1.301591722 8.95541659 20.12306081 17.27093614
8.977750157 1.405955141 0.221626478 0 0 0 0 0
0 0 0 0 0
2001 1 1 3 2 84 0 0 0 0 0
0 0 0 0 0.048468492 0.242342458 0.145405475
0.697135085 2.94920899 9.367588989 7.450993794 5.661617064
1.66529191 3.235859365 0.376948215 0.416930012 0 0
0.12714782 0 0 0 0 0 0 0 0 0
0 0.048468492 1.557242056 3.892633932 12.48217882 26.17432529
17.32225308 5.041694918 1.096265745 0 0 0 0 0
0 0 0 0 0

2002 1 1 3 2 49 0 0 0 0 0
0 0 0 0 0.228273828 2.194294564 2.742157494
2.010575285 2.746397982 5.734561816 5.865303975 6.76821621
1.301060088 2.016352402 0.228273828 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
1.365960648 7.127895582 14.29860874 20.42510923 16.12738136
7.539842975 1.279733996 0 0 0 0 0 0 0
0 0 0
2003 1 1 3 2 84 0 0 0 0 0
0 0 0 0 0.447630275 0.510978869 2.979348866
3.508816667 4.718718896 3.444165221 6.143399683 5.49739447
7.406493897 1.124834541 0.954299924 0.4847161 0.003359506 0
0 0.247495049 0 0 0 0 0 0 0 0
0 0 0.80331575 2.674417484 8.608167853 22.48434343
13.11327752 10.75363436 2.939431081 1.151760554 0 0 0
0 0 0 0 0 0
2004 1 1 3 2 84 0 0 0 0 0
0 0 0 0.008715598 0.087155982 0.061009187 0.034862393
0.610726387 1.259356032 4.277802558 5.517139605 4.057332744
2.058124413 3.367239833 1.904835635 1.409872717 0.133617999 0
0 0 0 0 0 0 0 0 0 0 0
0 0.069724785 0.596234807 9.715057347 28.93417141 27.19223029
7.026743641 1.678046642 0 0 0 0 0 0 0
0 0 0
2005 1 1 3 2 112 0 0 0 0 0
0 0 0 0.009459217 0.009459217 0.532658238 0.621157364
1.52600671 2.792597036 8.272707226 13.76636507 13.04514348
6.98532585 3.378119969 2.845404101 1.559167308 0.028454689
0.120567408 0 0 0 0 0 0 0 0 0
0 0 0.003153072 0.320116684 0.693111443 8.420880017
16.38212706 13.92108462 3.705497809 0.855200997 0.206235409 0
0 0 0 0 0 0 0 0
2006 1 1 3 2 56 0 0 0 0 0
0 0 0 0.010446941 0.078530177 0.139292658 0.212795832
1.03753932 1.489263297 5.042374887 14.07683768 12.4609873
11.84379948 7.561006195 0.99342604 0.322720763 0.322720763 0
0 0 0 0 0 0 0 0 0 0 0
0.020893882 0.569730026 2.825972287 7.248726686 15.90823702
11.19321189 4.918011541 0.443535791 0.408382627 0.322720763
0.548836144 0 0 0 0 0 0 0
2007 1 1 3 2 56 0 0 0 0 0
0 0 0 0.005713521 0.200030011 0.464061071 0.474879259
1.740725318 2.265523037 5.631639406 7.182618122 8.743029221
7.705664098 2.278579244 1.574220153 2.320496451 0.034794322 0
0 0 0 0 0 0 0 0 0 0 0
0.098589139 0.788306686 5.670478541 13.05212492 15.86441453
15.80300477 5.813874476 1.644055912 0.643177791 0 0 0
0 0 0 0 0 0
2008 1 1 3 2 56 0 0 0 0 0
0 0 0 0 0.042362688 1.261742195 1.14922445
4.098961969 7.016633431 7.236647859 10.22553751 9.193817761
1.535651325 2.362853518 1.773226845 0.373434413 2.182991043 0
0.678607227 0 0 0 0 0 0 0 0 0
0.678607227 0 0.763332603 3.973882785 9.581554051 11.76104855
16.67238289 6.367548424 1.038758652 0.031192585 0 0 0
0 0 0 0 0 0

2009 1 1 3 2 63 0 0 0 0
0.01595194 0 0 0.01595194 0.239279098 0.430702377
0.298589423 0.899614367 0.79233159 4.213637857 7.166659859
6.934735392 9.171721197 6.878623274 2.283216415 1.179505738
0.704849666 0.854086368 0 0 0 0 0 0 0
0 0 0 0 0 0.04785582 0.708191088 8.125692406
14.59147243 14.95846585 13.6495594 4.140796501 0.940624598
0.757885407 0 0 0 0 0 0 0 0 0
2010 1 1 3 2 35 0 0 0 0 0
0 0 0 0.234705471 2.112349235 2.112349235 1.471734771
1.437916804 5.076704175 5.619518025 10.81067264 6.069262083
8.667101667 5.826912574 3.81533704 0.736503401 0 0 0
0 0 0 0 0 0 0 0 0 0
1.173527353 2.983114354 2.324954892 11.01084698 11.83010474
11.77280014 3.008108481 1.905475939 0 0 0 0 0
0 0 0 0 0
2011 1 1 3 2 28 0 0 0 0 0
0 0 0 0 0.213686726 0.997550522 2.636161223
2.244694279 3.990202086 7.233376795 2.266636533 7.632424556
1.61203734 1.080334667 0.071813019 0.035906509 0 0 0
0 0 0 0 0 0 0 0 0 0 0
4.379208629 22.31476081 25.36526114 14.03038539 2.985027329
0.83871943 0 0.071813019 0 0 0 0 0 0
0 0 0
1956 1 2 3 2 10 0 0 0 0 0
0 0 0 0 0 0 2.45842653 2.492437101
4.390107069 4.022077072 7.041260166 4.169456211 4.192129925
5.268295623 2.192428246 1.42760826 0.102031712 0.628777704
0.011336857 0 0 0 0 0 0 0 0 0
0 0 0.011336857 3.325278228 5.483695903 9.279035838
9.097646129 20.89095708 5.522957051 4.916853061 3.053193664
0.022673714 0 0 0 0 0 0 0
1957 1 2 3 2 20 0 0 0 0 0
0 0 0 0 0.030687322 0.463982489 2.604114657
3.982579546 4.217910109 2.480891218 7.697181533 8.777603537
9.922849143 6.74315462 5.610600115 4.898229238 5.099110511
1.990005917 0.581828975 0.314889535 0.279858557 0 0 0
0 0 0 0 0 0 0.279858557 1.216510847
4.659503322 4.936610775 4.327713423 4.291617868 5.61483192
4.753649819 3.174742323 1.014453146 0.035030978 0 0 0
0 0 0
1958 1 2 3 2 15 0 0 0 0 0
0 0 0 0 0.23364351 0.495671956 1.886768428
3.407360972 5.285193581 6.927588842 5.999708639 5.768566744
3.829185737 2.840878128 2.302650404 2.017601851 1.555050085
0.716308897 0.182195194 0.038441747 0 0 0 0 0
0 0 0 0 0 0.132489102 0.646489183 4.876005442
11.3541007 13.15724019 11.9603543 6.062334757 4.923253192
2.496558088 0.622218269 0.188094711 0.094047356 0 0 0
0 0
1960 1 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
1961 1 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
1964 1 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
1965 1 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
1966 1 2 3 2 140 0 0 0 0 0
0 0 0 0.045236223 1.111772822 2.470394139 4.459566406
5.994630903 7.083919501 5.964382024 6.333129924 5.585281364
4.030041608 3.060959523 2.72452805 0.725927904 0.659283895
0.170851056 0.094220268 0.031192551 0 0 0 0 0
0 0 0 0 0.034758752 1.51869514 5.401767543
8.472407779 11.11608749 11.71099486 6.512418673 3.07900665
1.050125271 0.42247678 0.104750351 0.031192551 0 0 0
0 0 0
1967 1 2 3 2 155 0 0 0 0 0
0 0 0 0.035542639 0.377144993 0.83526078 2.929809008
3.585413018 3.569415722 4.232918481 4.041661542 3.7815764
2.589051734 1.580162547 1.239161248 1.134097552 0 0.090057217
0.070329581 0 0 0 0 0 0 0 0 0
0 0.029729314 0.595412101 2.639506902 4.934607353 12.06986438
22.46097481 15.27291444 7.844779918 2.885085818 0.85247649
0.323046017 0 0 0 0 0 0 0
1968 1 2 3 2 190 0 0 0 0 0
0 0 0 0.011215903 0.17638229 0.338677347 1.053865102
1.371854751 2.569191351 4.726976598 7.837275155 7.350890783
6.173295698 4.392376486 2.876596921 1.552535877 0.924155035
0.487350844 0.120506728 0.029588402 0 0 0 0 0
0 0 0 0.002436282 0.04935647 0.241583458 1.017799887
2.987104299 9.101053673 18.30626487 14.45771349 8.254107971
2.775455361 0.568938998 0.245449972 0 0 0 0 0
0 0
1969 1 2 3 2 185 0 0 0 0 0
0 0 0 0.121188215 0.86888852 1.685987492 2.197892597
2.751328775 2.688208348 3.154683775 4.320354974 4.738186447
4.703668692 2.075173946 1.108164046 0.669224999 0.319262089
0.006439136 0.001073189 0.034948558 0.001073189 0 0 0
0 0 0 0.02976984 0 0.089438135 1.106784077
2.754117238 6.234897732 13.27949377 17.77883011 14.61635443
7.617811997 3.645916843 0.996101842 0.203510797 0.200153014 0
0 0.001073189 0 0 0

1970 1 2 3 2 200 0 0 0 0 0
0 0 0 0.078710394 0.897997798 2.387618657 3.101545338
5.078158376 6.458602503 6.215685531 7.191199897 6.692961592
6.208072575 3.687426426 2.553113021 1.355865003 0.729509803
0.272517314 0.165075507 0.031854536 0 0 0 0 0
0 0 0 0.039193185 0.198782876 1.78273732 5.48630513
6.63101082 9.156689904 11.03670799 7.284564711 3.566121014
1.253501108 0.31296926 0.126473333 0.019029083 0 0 0
0 0 0
1971 1 2 3 2 50 0 0 0 0 0
0 0 0 0.068992586 0.408848754 2.677276866 4.69900323
7.869065761 5.526789019 5.550416923 4.590476588 5.005657296
4.412440325 3.088328235 2.076137262 1.234536253 0.386441857
0.297449173 0.14366194 0.143790386 0.002206285 0 0 0
0 0 0 0 0 0.071832861 0.455094919 4.832812724
12.70016382 13.85418036 9.998641805 4.958741401 3.524127986
1.214339819 0.175704667 0.032840903 0 0 0 0 0
0 0
1972 1 2 3 2 120 0 0 0 0 0
0 0 0.01400936 0.043424237 0.473876789 1.093588006
2.045722623 1.88931693 3.978139071 4.699241966 6.726734655
4.496404982 3.140143433 2.329310328 1.303543777 0.741708648
0.389625762 0.246838424 0.082156832 0.019689181 0.006726961 0
0 0 0 0 0.01400936 0 0 0.139878331
1.083690669 3.377361296 8.882271636 18.9704319 19.54655648
8.696374086 3.289434388 1.577354147 0.548089116 0.076099664
0.06194738 0 0.016299587 0 0 0 0
1973 1 2 3 2 70 0 0 0 0 0
0 0 0 0.040890947 0.477836467 1.667321671 2.999204885
3.496849129 3.831791413 4.381183358 4.602214851 3.543741865
2.520490923 1.168831114 0.738507324 0.816479159 0.325649881
0.057783778 0.012825864 0 0.015716013 0 0 0 0
0 0 0 0 0.070609642 0.933269886 3.673533991
6.190670309 18.60141249 20.49036274 11.39536386 5.350258815
2.372557236 0.208698173 0.015944213 0 0 0 0 0
0 0
1974 1 2 3 2 175 0 0 0 0 0
0 0 0 0.003260656 0.157691124 0.723992119 1.362066758
2.245611507 3.513826322 4.914455827 7.193973645 7.208132214
5.719710248 3.278014716 1.365705689 1.252256496 0.524500087
0.273896717 0.194588778 0.021611715 0.010656965 0 0 0
0 0 0 0 0 0.055371832 0.403785731 1.463165517
4.062521958 11.66950877 19.10639249 14.78888337 5.788066001
1.755312192 0.522713961 0.244929354 0.07480636 0.075824864
0.024766018 0 0 0 0
1975 1 2 3 2 100 0 0 0 0 0
0 0 0 0 0.125852802 0.350481127 1.093619816
2.243794818 3.109533343 4.386355228 6.820491657 8.04742015
6.507514973 3.440931406 1.970171167 1.655874384 0.423210998
0.243061481 0.13589861 0.103106954 0.012165112 0 0 0
0 0 0 0 0 0.034943128 0.256584214 0.916891932
4.256585173 9.620190328 13.15795711 16.08479011 9.593133039
3.328260667 1.64852125 0.335425363 0.069229358 0.015839195
0.012165112 0 0 0 0
1976 1 2 3 2 30 0 0 0 0 0
0 0 0 0 0.005470019 0.167141169 0.837369328

0.672619722 1.930237304 2.931635505 5.810402905 8.880059016
10.666935 10.06102219 8.00468347 4.594392646 1.852146995
2.17851991 0.0880372 0.0880372 0.161929598 0 0 0
0 0 0 0 0 0 0.146257471 0.308760621
1.872861735 4.287040613 7.824744813 11.89808074 8.828849841
4.194153902 1.178803693 0.205948198 0.161929598 0.117910998 0
0.0440186 0 0 0
1977 1 2 3 2 50 0 0 0 0 0
0 0 0 0.378969686 0.831063605 2.114320867 2.869902479
3.707924736 3.266245535 4.744030242 4.154901563 4.429403667
5.009747271 3.544851594 3.292585342 1.391155284 0.800361715
0.228640973 0.213315828 0 0.079524495 0 0 0 0
0 0 0 0 0.290944935 0.488481364 2.034120873
4.306309519 9.237523636 12.65865062 14.43904655 8.551036883
4.472370543 1.599338441 0.660183672 0.168483688 0.036564397 0
0 0 0 0
1978 1 2 3 2 45 0 0 0 0 0
0 0 0.093873756 0 0.322181867 0.562115868 1.003232704
0.821843384 1.207162507 2.987313605 3.835123122 3.897503185
5.495930567 4.029579035 3.597562859 1.834988869 1.681795928
1.123925794 0.522363618 0.093873756 0 0 0 0 0
0 0 0 0 0.323037363 0.751121901 2.124254757
2.434020834 3.9661093 8.465486421 10.0698585 16.20410026
13.58551191 6.491849862 1.595111391 0.563242537 0.222050775
0.093873756 0 0 0 0
1979 1 2 3 2 85 0 0 0 0 0
0 0 0 0.278554056 1.696204916 4.528739048 4.458809615
4.768654341 4.836374953 4.57677181 3.805463398 4.171608793
3.017862748 4.400058872 5.166532378 5.314358557 3.515108734
2.585453568 1.56936786 0.66935195 0.424299565 0 0 0
0 0 0 0 0 0.03994348 1.266686461 4.342903752
5.80801475 6.260102123 5.979692592 4.798401407 5.025778411
3.981186045 1.544580413 0.935308323 0.120385102 0 0.113441978
0 0 0 0
1980 1 2 3 2 140 0 0 0 0 0
0 0 0 0.044468727 0.623609221 1.845084121 3.224061596
4.53651551 5.394339393 6.263748966 7.231109289 6.082686087
4.317726787 4.761887935 3.970472547 4.853540377 3.38532483
0.9386496 0.30634971 0.09750135 0.028544114 0 0 0
0 0 0 0 0 0.187082022 0.646191198 3.486445149
5.630113732 9.780774126 8.335578305 5.692108114 3.966448498
2.688732473 1.322092506 0.225867553 0.062519857 0.0445021
0.025924209 0 0 0 0
1981 1 2 3 2 40 0 0 0 0 0
0 0 0 1.787762009 3.40919703 4.248838678 8.931314351
8.680001369 11.84529331 6.545049885 5.33699021 6.44652114
4.187886435 3.557499035 1.976986729 1.455083553 0.567909116
0.865869451 0.023410047 0 0.013501379 0 0 0 0
0 0 0 0.297960335 0.311461714 3.242642561 5.711243541
7.050611129 5.885421438 4.205400315 1.090480469 0.783963881
1.343024192 0.151856601 0.046820094 0 0 0 0 0
0 0
1982 1 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
1985 1 2 3 2 15 0 0 0 0 0
0 0 0 0 5.13843733 5.547081438 8.970863384
8.190159424 5.912929168 9.081997772 5.706533514 1.146551689
2.569218665 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 8.466274711
11.09416288 15.48364249 6.746781316 2.914355262 1.215580511
1.114797934 0.254713342 0.445919174 0 0 0 0 0
0 0 0
1986 1 2 3 2 25 0 0 0 0 0
0 0 0 0.90250029 2.368217953 5.070127987 6.831286646
8.185144906 6.540335468 6.866406216 4.649128089 3.949281445
5.834714581 0.250348223 0.919198886 0.67645808 0.069354516
0.641780822 0.355567669 0.286213153 0.034677258 0 0 0
0 0 0 0 0.227882849 0 6.733416585 14.91317196
12.28864827 6.362739646 2.927225793 0.648200567 0.973695445
0.320890411 0.104031774 0.034677258 0.034677258 0 0 0
0 0 0
1987 1 2 3 2 45 0 0 0 0 0
0 0 0.461745953 0.236898403 1.430250171 5.461902371
8.016832916 6.550888226 7.143194186 7.944374422 5.479405723
1.421892859 0.171975853 0.859334179 0.530913016 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0.715442009 6.204086225 11.56029103 17.59612944 13.15949665
3.090906523 1.2130725 0.22005433 0.530913016 0 0 0
0 0 0 0 0 0
1988 1 2 3 2 30 0 0 0 0 0
0 0 0 4.094218425 6.036534476 6.905124212 13.53794926
9.63790007 8.844940936 5.10131318 4.260948732 1.589320866
0.941370569 0 0.600877569 0.047072729 0 0 0 0
0 0 0 0 0 0 0 0 0 3.32538221
3.817485742 9.814094223 11.9300283 2.917677718 5.587253575
1.010507207 0 0 0 0 0 0 0 0 0
0 0
1989 1 2 3 2 35 0 0 0 0 0
0 0 0 0.553586594 3.239554446 9.995527923 12.40944408
9.847038571 10.05207925 5.270344718 4.076048794 3.29653653
0.974905676 0.269629179 0.258466048 0.269629179 0 0 0
0 0 0 0 0 0 0 0 0 0
0.028656473 6.335212827 10.31348452 15.3554269 4.291309841
2.376557181 0.786561275 0 0 0 0 0 0 0
0 0 0 0
1990 1 2 3 2 30 0 0 0 0 0
0 0 0 0.825325426 2.815084147 7.946703921 9.919773541
12.16549981 7.588674441 9.017236798 2.89945314 0.830600151
0.905167008 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1.868853681 2.17241498
10.11974744 15.6427732 9.035511379 4.889430424 1.357750512 0
0 0 0 0 0 0 0 0 0 0
1991 1 2 3 2 25 0 0 0 0 0
0 0 0.620198156 0.620198156 2.012297198 2.531266494
2.693848397 6.398312072 8.95719148 16.1678291 5.002018387
2.483282513 5.202508407 0.384254776 0.620198156 0.620198156 0

0 0 0 0 0 0 0 0 0 0 0
0 1.316247677 3.752421001 12.72239757 17.19962723 6.721709337
2.58528803 1.388707709 0 0 0 0 0 0 0
0 0 0 0
1992 1 2 3 2 25 0 0 0 0 0
0 0 0.877231344 2.069503528 9.146870987 10.50947782
9.034870413 10.72319066 3.97146152 6.575636102 3.50432036
4.99619681 1.015915806 1.015915806 1.015915806 0.507957903 0
0 0 0 0 0 0 0 0 0 0 0
0 2.631694031 6.143076499 7.486379362 8.992984029 3.905591061
2.855899996 1.822353864 0.68959839 0.507957903 0 0 0
0 0 0 0 0 0
1993 1 2 3 2 30 0 0 0 0 0
0 0 0 1.961594472 5.500389208 13.32871396 10.61196655
13.5654959 9.802354876 4.226680802 5.005194026 2.395615585
2.378195385 1.123987404 0.645091406 0.478895998 0 0
0.322545703 0 0 0 0 0 0 0 0 0
0 2.949544344 5.171349101 7.713244678 7.272542613 3.175588855
2.048463439 0.322545703 0 0 0 0 0 0 0
0 0 0 0
1994 1 2 3 2 35 0 0 0 0 0
0 0 0 0.198219731 8.319934832 5.88969401 9.961393949
9.979612779 5.846643206 2.857621908 3.141482143 1.194692347
0.040430112 0.027244063 0 0.046494577 0 0 0 0
0 0 0 0 0 0 0 0 0 4.531055033
20.57535561 13.94753488 4.37947873 7.277415849 0.410230997
1.375465246 0 0 0 0 0 0 0 0 0
0 0
1995 1 2 3 2 10 0 0 0 0 0
0 0 0 0 4.128764218 3.189042203 6.378084405
11.44657064 11.8164468 7.317806421 9.937002765 10.87672478
6.747960562 0.939722015 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1.879444031
7.317806421 11.07669448 3.758888061 0.939722015 2.249320187 0
0 0 0 0 0 0 0 0 0 0
1996 1 2 3 2 15 0 0 0 0 0
0 0 0 0 3.44377388 8.409442464 16.35524723
13.34311423 15.69552931 5.709384207 4.67674537 3.644106534
1.119103179 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 11.13477847
4.67674537 3.184380852 3.041322773 3.041322773 2.525003355 0
0 0 0 0 0 0 0 0 0 0
1997 1 2 3 2 15 0 0 0 0 0
0 0 0 0 1.112002651 6.174630468 11.50452986
11.40113388 10.90662777 9.754588083 5.680124356 4.074463727
3.169253031 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0.37066755 0.37066755
6.421459457 18.23329792 10.0852186 0.741335101 0 0 0
0 0 0 0 0 0 0 0 0 0
1998 1 2 3 2 80 0 0 0 0 0
0 0 0.038264476 0.35913306 0.477683333 3.216542827
5.091916453 4.994727111 7.40301218 10.58342488 12.47630094
10.53325013 2.975150824 1.707833906 1.065912203 0.209528865
0.130736479 0 0 0 0 0 0 0 0 0
0 0 0 0.340650275 1.143696632 3.799528692 7.283760779

14.96549664 6.793708251 2.143225484 1.142289071 0.694015564 0
0.430210938 0 0 0 0 0 0 0
1999 1 2 3 2 70 0 0 0 0 0
0 0 0 0.250268937 1.974834738 4.520534969 8.831220358
7.91254949 7.121514056 5.76062731 6.822295753 4.139128344
3.245020844 1.747971914 1.195891538 0.099307585 0 0.01687 0
0 0 0 0 0 0 0 0 0 0
0.015793359 1.992620094 9.00603159 19.07350592 12.26741885
3.06684068 0.614559718 0.190747473 0.134446481 0 0 0
0 0 0 0 0 0
2000 1 2 3 2 100 0 0 0 0 0
0 0 0 0.202877609 0.75148213 4.392039439 5.09816041
8.511549475 10.81396459 8.859063486 7.964518195 4.517546215
2.848862822 2.65923411 0.852679312 0.224675843 0 0 0
0 0 0 0 0 0 0 0 0 0
0.275696726 3.895655269 9.801159574 14.36619227 10.04183929
2.59605937 1.123299123 0 0.203444741 0 0 0 0
0 0 0 0 0
2001 1 2 3 2 65 0 0 0 0 0
0 0 0 0.011110963 0.13601094 3.402622972 11.97244842
8.37086021 12.40517567 10.22681102 4.788417231 5.02485067
0.482425251 0.468777752 0.07236588 0.430497211 0.174810354 0
0 0 0 0 0 0 0 0 0 0 0
0.010609326 4.329621693 6.86656077 16.81755991 8.930631359
4.586737683 0.403689537 0.015039297 0.07236588 0 0 0
0 0 0 0 0 0
2002 1 2 3 2 100 0 0 0 0 0
0 0 0 0.440178992 1.753651393 4.462498978 8.183493105
7.71361878 10.55180419 9.457089598 10.08408235 6.872800472
2.810197296 0.729575893 0.262957523 0.334979316 0.355190552
0.043709714 0 0 0 0 0 0 0 0 0
0 0.053382542 0.31925345 1.756361571 7.514730032 9.843733034
9.342409991 5.081588481 1.663509077 0.048744858 0.152969159 0
0.167489658 0 0 0 0 0 0 0
2003 1 2 3 2 120 0 0 0 0 0
0 0.002687707 0.002687707 0.196703434 2.145955359 7.123095891
8.388916968 10.8268248 9.398605369 6.805393085 6.170729057
5.389421988 2.984648246 1.114397485 0.441807723 0.357776481
0.075876936 0 0.251048893 0 0 0 0 0 0
0 0 0 0.0717692 0.352583088 3.704547986 8.342488602
10.94998726 9.07694957 3.164614724 2.07420516 0.11478184
0.262450757 0 0 0.209044687 0 0 0 0 0
0
2004 1 2 3 2 110 0 0 0 0 0
0 0 0 0.007887002 0.472072788 2.449036282 3.446376108
9.461951973 8.108074233 13.16209265 10.74263531 4.813491492
3.331206012 2.075661333 0.846679994 0.560809082 0 0 0
0 0 0 0 0 0 0 0 0 0
0.021832929 0.696380564 7.002407747 11.15781904 10.51222409
6.664844741 2.633393663 1.81084516 0.003960918 0.010334551
0.007982345 0 0 0 0 0 0 0
2005 1 2 3 2 130 0 0 0 0 0
0 0 0.131981288 0.015508062 2.250277974 2.973381116
7.93942743 8.641801232 9.154850204 9.774301982 9.331368796
6.317326789 4.046867314 2.000074751 1.293454477 0.45178447
0.403652373 0.131981288 0.00813111 0 0 0 0 0

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0.790174152 | | 2.585204107 | | 8.044127724 | |
| 8.623955727 | | 8.425179703 | | 3.786817298 | | 2.549930335 | | 0.320309186 | | |
| 0.00813111 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2006 | 1 | 2 | 3 | 2 | 135 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0.066923087 | | 0.714576927 | | 0.977209753 | | 3.717210063 | | |
| 6.516862908 | | 5.989382562 | | 6.62095313 | | 11.54929923 | | 6.911804914 | | |
| 6.644867863 | | 6.931204425 | | 2.766222896 | | 0.917135931 | | 1.131103715 | | |
| 0.05481895 | | 0.11686135 | | 0.031270971 | | 0.034764718 | | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0.007889211 | | 0.518191517 | | 2.490448855 | |
| 6.810071883 | | 8.754604991 | | 8.615925854 | | 7.695484372 | | 2.245652239 | | |
| 0.350973558 | | 0.366698557 | | 0.228307627 | | 0.093812912 | | 0.096003485 | | 0 |
| 0.033461543 | | 0 | 0 | 0 | 0 | | | | | |
| 2007 | 1 | 2 | 3 | 2 | 90 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0.17815598 | | 2.030000473 | | 5.040504938 | | |
| 6.934436864 | | 9.418617869 | | 7.973990709 | | 8.288202121 | | 4.512427499 | | |
| 6.093174666 | | 4.665114134 | | 1.592285515 | | 1.009895459 | | 0.887795767 | | |
| 0.684400886 | | 0.006298362 | | 0.590315939 | | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0.026466585 | | 0.84041941 | | 2.68225331 | | |
| 6.96640506 | | 12.07386174 | | 7.451376392 | | 6.550911144 | | 1.907476412 | | |
| 1.286123821 | | 0.292008788 | | 0.017080153 | | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | | | | | | | | | |
| 2008 | 1 | 2 | 3 | 2 | 115 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0.035048111 | | 0.268220994 | | 1.297515 | | 3.156916532 | | |
| 4.369666288 | | 4.098143382 | | 5.449764544 | | 5.196516476 | | 4.141726306 | | |
| 5.755544453 | | 5.449702605 | | 5.04723071 | | 1.912409896 | | 0.98775222 | | |
| 0.357656431 | | 0.182354995 | | 0.136433953 | | 0.016805471 | | 0.045355656 | | 0 |
| 0 | 0 | 0 | 0 | 0 | 0.056400791 | | 0.086010956 | | 0.580086076 | |
| 4.466302047 | | 8.032559469 | | 11.03532652 | | 11.46268388 | | 7.945873608 | | |
| 3.931450244 | | 3.361912001 | | 0.342591511 | | 0.247839906 | | 0.364132641 | | |
| 0.182066321 | | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 2009 | 1 | 2 | 3 | 2 | 75 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0.107549326 | | 0.215098653 | | 3.820915862 | | 7.635594746 | | |
| 7.575921736 | | 7.686491444 | | 7.62159504 | | 6.668549318 | | 4.259096355 | | |
| 3.578440083 | | 2.551513877 | | 1.171828112 | | 0.742732597 | | 0.238943342 | | |
| 0.407098455 | | 0.302607353 | | 0 | 0.009033591 | | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0.660441561 | | 2.302079649 | | 4.813119217 | | |
| 15.00219259 | | 9.040524446 | | 7.860875241 | | 3.647802639 | | 1.569505295 | | |
| 0.232584183 | | 0.018067183 | | 0.259798106 | | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | | | | | | | | |
| 2010 | 1 | 2 | 3 | 2 | 75 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0.464750301 | | 4.680346344 | | 5.201043008 | | |
| 7.345060425 | | 8.071901131 | | 10.42343597 | | 9.978379849 | | 5.291295076 | | |
| 3.014896472 | | 2.537905932 | | 0.247360938 | | 1.300970712 | | 1.315929427 | | |
| 0.013771436 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0.432351849 | | 1.262302871 | | 5.611778794 | | 11.83120943 | | |
| 10.288591 | | 6.97348678 | | 2.664622087 | | 0.747610317 | | 0.131883886 | | |
| 0.131883886 | | 0.037232075 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 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 | | | | | |
| 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
1980 1 3 3 2 24 0 0 0 0 0
0 0 0 0 0 0 0.987665413 1.458588517
2.503080183 3.229092146 3.023557572 2.113539547 2.423576187
1.123288284 0.853921014 1.140567962 0.103352835 0 0 0
0 0 0 0 0 0 0 0 0 0
0.217690852 2.146932379 12.53346366 14.32497748 18.13909393
16.7600094 11.6680127 3.659653821 1.432342881 0.157593237 0
0 0 0 0 0 0
1981 1 3 3 2 12 0 0 0 0 0
0 0 0 0 1.619963393 1.619963393 2.429945089
3.420044099 7.469952581 8.640168904 3.060901901 4.50074798
4.231118225 4.051000911 1.890685578 1.260821195 1.530450951
0.180117314 0 0.180117314 0 0 0 0 0 0
0 0 0 0 1.530450951 15.21062735 20.52026459
7.47104501 2.700667274 5.580359432 0.900586568 0 0 0
0 0 0 0 0 0 0
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
1983 1 3 3 2 18 0 0 0 0 0
0 0 0 0 0 0.652509872 0.217503291 4.385780609
4.149045601 6.564397803 11.55132606 8.054790328 5.424450538
2.869590501 4.548104448 5.525494936 4.940830369 2.772363327
3.285365365 1.509624243 0 0 0 0 0 0 0
0 0 0.217503291 2.175032907 6.668190841 10.03788459
7.563535711 2.895155146 2.43458392 0.486135871 0.876346089 0
0.048613587 0.145840761 0 0 0 0 0 0
1984 1 3 3 2 12 0 0 0 0 0
0 0 0 0.380033192 0.760066384 0.760066384 1.140099576
1.520132767 2.637190079 6.212942007 7.306957055 6.926923863
11.75214404 5.965319752 6.166857479 4.84826244 3.351171936
4.11123832 0.558528656 1.675585968 0 0 0 0 0
0 0 0 0 1.520132767 4.940431494 7.376083846
5.832908815 5.631371087 4.134280583 0.938561848 2.234114624
0.380033192 0.558528656 0.380033192 0 0 0 0 0
0 0
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
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

1989 1 3 3 2 36 0 0 0 0 0
0 0 0.410438661 0 3.764872442 5.433202778 7.74281316
7.982055999 7.44591798 9.087821954 10.35504471 6.070454112
3.164848665 2.388914842 1.813490175 0 0.303758665 0.410438661
0 0 0 0 0 0 0 0 0 0
0.214601997 1.743261867 6.719879077 8.42253519 10.03324367
3.938653881 2.073035671 0.480715847 0 0 0 0 0
0 0 0 0 0 0
1990 1 3 3 2 12 0 0 0 0 0
0 0 0 0 0.823066122 1.176933878 4.353867755
13.41547102 5.176933878 7.884669388 7.530801633 5.530801633
0.823066122 0.823066122 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 3.646132245
11.17693388 16.93839673 16.23066122 2 2.469198367 0 0
0 0 0 0 0 0 0 0 0 0
1991 1 3 3 2 54 0 0 0 0 0
0 0 0 0 4.24188071 6.268742107 5.24504515
5.836590414 11.82615589 10.24540383 6.296917303 6.836952266
2.242284928 1.429477677 0.178686967 0.265805196 0 0 0
0.186429955 0 0 0 0 0 0 0 0.255827574
0 0.844688238 4.879607945 13.51614 12.71139969 4.564748341
1.711267225 0.207974298 0.207974298 0 0 0 0 0
0 0 0 0 0
1992 1 3 3 2 18 0 0 0 0 0
0 0 1.099413543 5.497067714 5.497067714 3.298240628
3.724498098 6.879296319 13.04556207 12.40821074 6.134419042
5.528914419 3.58105569 2.481642148 0 0 0 0 0
0 0 0 0 0 0 0 0 1.099413543
0.071721204 10.60786417 11.36099267 5.867994709 1.458019563
0.286884816 0.071721204 0 0 0 0 0 0 0
0 0 0 0 0
1993 1 3 3 2 18 0 0 0 0 0
0 0 0 0 1.160800584 0 1.14162301 3.776095848
6.122400152 5.804002919 10.43907881 2.609769702 3.180581207
3.205284343 1.160800584 0 0 0 0 0 0
0 0 0 0 0 0 0 2.892412673 9.555395631
16.16084587 18.8255474 10.76560249 3.19975878 0 0 0
0 0 0 0 0 0 0 0 0
1994 1 3 3 2 30 0 0 0 0 0
0.218113796 0 0 1.52679657 3.377332819 4.202857123
4.212907733 8.139861971 6.344786742 3.927976786 12.68219644
6.892485403 3.551461041 1.250333264 2.042137531 0 0 0
0 0 0 0 0 0 0 0 0.218113796 0
1.744910366 9.022124488 14.06143411 9.972676199 3.756573236
2.021979517 0.832941069 0 0 0 0 0 0 0
0 0 0 0 0
1995 1 3 3 2 30 0 0 0 0 0
0 0 0 0 0.834745346 1.397268658 7.082158035
11.16829457 8.911444635 9.120978029 10.14885175 6.74732246
3.201305075 0.924044383 2.036957853 0 0 0 0 0
0 0 0 0 0 0 0 0 0.562523312
9.185682113 8.939882564 9.390943645 5.883722871 3.901351393
0.278168124 0 0 0 0.284355188 0 0 0 0
0 0 0 0
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
1997 1 3 3 2 12 0 0 0 0 0
0 0 0 3.897552793 8.574616144 10.91314782 6.148345264
7.531887974 5.193356298 10.29897339 5.885127653 4.41384574
1.471281913 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 2.338531676 2.338531676
11.34170156 12.98846188 5.193356298 0 1.471281913 0 0
0 0 0 0 0 0 0 0 0 0
1998 1 3 3 2 12 0 0 0 0 0
0.525717657 0 0.525717657 0 5.041803092 2.258042717
2.258042717 0 1.051435314 1.051435314 4.205741257 1.577152971
1.577152971 0.525717657 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 24.83846989
46.21228966 7.825563466 0 0.525717657 0 0 0 0
0 0 0 0 0 0 0 0 0
1999 1 3 3 2 12 0 0 0 0 0
0 0 0 0 2.540135983 7.620407949 2.994648536
13.15519247 4.358186194 17.05886611 11.25650837 6.443809624
5.534784519 5.534784519 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 2.994648536
5.534784519 8.074920501 5.534784519 1.363537658 0 0 0
0 0 0 0 0 0 0 0 0 0
2000 1 3 3 2 24 0 0 0 0 0
0 0 0 1.067014176 1.198788217 4.488511579 4.570098882
3.339910101 10.986371 7.924196045 10.08713054 9.640297222
7.917102514 1.15569501 2.627034279 0 0 0 0 0
0 0 0 0 0 0 0 0 0.397231562
4.995704569 7.338495152 11.00632714 5.027105132 4.275735216
0.801556655 1.15569501 0 0 0 0 0 0 0
0 0 0 0
2001 1 3 3 2 30 0 0 0 0 0
0 0 0 0 0.264160971 0 7.482793199 7.522730536
6.705840888 14.58936234 13.98264121 4.86314088 5.63244173
3.248579064 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 2.761888299 7.05846374
10.21291223 6.530621238 4.546201855 4.013207264 0.585014553 0
0 0 0 0 0 0 0 0 0 0
2002 1 3 3 2 12 0 0 0 0 0
0 0 0 0 0 1.451884491 0 3.245020065
9.949125814 9.60787473 5.593472343 3.800336768 3.800336768
1.451884491 1.451884491 0 0 0 0 0 0 0
0 0 0 0 0 0 0.896567787 1.451884491
10.2903769 14.43196475 16.35228579 8.283175704 5.593472343
2.348452278 0 0 0 0 0 0 0 0 0
0 0
2003 1 3 3 2 24 0 0 0 0 0
0 0 0 0 0.434847261 0.579796348 2.947074269
10.78500168 9.07468618 18.76787817 6.063698386 7.626961817
3.160059211 2.311500634 0.692459916 0 0 0 0 0
0 0 0 0 0 0 0 0 3.901214958 0
6.68923144 12.5733394 6.028200895 4.046164045 4.3178854 0
0 0 0 0 0 0 0 0 0 0 0

2004 1 3 3 2 30 0 0 0 0 0
0 0 0 0 0 0 3.419087333 4.754429068
6.333731171 10.3881707 4.088868582 9.438695878 2.566164542
5.51590367 0.989477733 1.903833825 0 0 0 0 0
0 0 0 0 0 0 0 0 1.053895639
1.952196388 16.56707164 22.92761084 7.816801605 0.142030695 0
0.142030695 0 0 0 0 0 0 0 0 0
0
2005 1 3 3 2 36 0 0 0 0 0
0 0 0 0 0.328157329 1.054929938 2.763600761
3.890417392 6.421672475 9.88041841 9.790132044 10.65150877
3.157667803 0.198451413 1.483151829 0 0 0 0.198451413
0 0 0 0 0 0 0 0 0 0 0
3.677318045 10.83846649 17.10268563 11.73567385 4.569215223
2.258081191 0 0 0 0 0 0 0 0 0
0 0
2006 1 3 3 2 36 0 0 0 0 0
0 0 0 0 0 0.863411424 1.487785343 3.800625437
11.99643951 9.874655226 6.151822204 3.444426557 1.268198403
0.458624445 0.863411424 0.458624445 0 0 0 0 0
0 0 0 0 0 0 0 0 0.917248889
3.761862884 13.05575023 19.46578335 16.70071904 4.971986742 0
0.458624445 0 0 0 0 0 0 0 0 0
0
2007 1 3 3 2 108 0 0 0 0 0
0 0 0 0 0 0.726543562 1.636588003 4.151408324
12.89997831 13.07860863 10.76837571 6.353334159 2.835077182
1.075429844 0.672107289 0.381762867 0 0 0 0 0
0 0 0 0 0 0 0.221267449 0 0.677746378
3.546755951 11.70163586 14.15956342 12.11765034 2.570284208
0.425882506 0 0 0 0 0 0 0 0 0
0 0
2008 1 3 3 2 168 0 0 0 0 0
0 0 0 0 0 0.140865452 2.334221758 7.428151648
11.10254613 11.26360307 9.908378514 6.805539034 3.348255935
2.092396787 0.668791317 0.649780235 0.112141476 0 0 0
0 0 0 0 0 0 0 0 0 1.615385532
5.569303196 10.45439911 13.57672909 8.739435989 3.512307064
0.659210805 0.01855785 0 0 0 0 0 0 0
0 0 0
2009 1 3 3 2 96 0 0 0 0 0
0 0 0 0 0.410942606 0.327570787 3.775927993
8.546343057 11.82889186 13.32854817 9.004272669 4.279454601
5.837252142 1.608578124 0.669676303 0 0.191724767 0 0
0 0 0 0 0 0 0 0 0 0.230007057
0.455586176 4.277337746 11.99082318 11.76088077 7.987989664
2.833050759 0.327570787 0 0 0.327570787 0 0 0
0 0 0 0 0
2010 1 3 3 2 66 0 0 0 0 0
0 0 0 0 0.453189528 1.13297382 3.799860045
5.306995764 9.93802379 14.93489289 18.94419503 11.95658951
3.128800393 3.304991137 1.299435616 0.872469686 0.346576755 0
0 0 0 0 0 0 0 0 0 0 0
0.427146591 0.24646324 3.532140729 10.26002758 7.032038534
2.362063473 0.721125887 0 0 0 0 0 0 0
0 0 0 0

2011 1 3 3 2 72 0 0 0 0 0
0 0 0 0 0 0 0.783763433 0.969415235
5.908513417 6.487993553 6.700878911 5.514386431 4.693645219
1.880872549 1.507466547 0.315526681 0.20432141 0 0 0
0 0 0 0 0 0 0 0 0 0
1.361296951 12.89282291 23.28552484 16.41342321 9.174330566
1.693505012 0.00813704 0 0.20417609 0 0 0 0
0 0 0 0
1966 1 4 3 2 54 0 0 0 0 0
0 0 0 0 0.655579453 1.459094842 7.901539675
12.05493781 12.35474769 10.22937664 8.098880472 6.522528369
2.849003022 1.714433556 0.922428858 0.200345138 0.235433542
0.219484693 0 0 0 0 0 0 0 0 0
0 0 0 0.77675778 3.89543305 10.50241655 8.896133162
6.776751186 2.150726647 1.383622722 0.200345138 0 0 0
0 0 0 0 0 0
1967 1 4 3 2 66 0 0 0 0 0
0 0 0 0 1.237775554 3.495012002 5.165298846
7.680601258 7.358017678 7.593395739 7.993734213 3.949802082
3.673023898 2.10395647 0.157015123 0.168904659 0 0 0
0 0 0 0 0 0 0 0 0 0
1.007575742 1.75861828 10.9075388 15.98350615 12.20902445
4.807779421 2.024711817 0.548068953 0 0.176638864 0 0
0 0 0 0 0 0
1968 1 4 3 2 114 0 0 0 0 0
0 0 0 0 0.199115806 3.352680493 6.714502743
7.646252467 9.565441077 11.19950207 8.52722636 4.09127219
3.810432001 2.668264734 0.909014387 0.115767065 0.165852445 0
0 0 0 0 0 0 0 0 0 0 0
0 0.49254814 4.753277969 10.08431585 11.21836943 8.447333851
3.848688007 1.472844665 0.551445798 0.057883533 0.107968913 0
0 0 0 0 0 0
1969 1 4 3 2 108 0 0 0 0 0
0 0 0 0 1.419255258 4.578721145 8.451920665
13.4621829 12.57868366 12.20759084 11.87130449 5.43792 3.748892905
2.357723633 0.721232233 0.36419454 0 0 0 0.113283881
0 0 0 0 0 0 0 0 0 0.142445466
0.36250949 2.008589213 5.382689277 7.252458346 5.40599722
1.265148896 0.654721844 0.113283881 0.099250216 0 0 0
0 0 0 0 0
1970 1 4 3 2 126 0 0 0 0 0
0 0 0 0 1.359073028 5.565606611 8.484908454
13.3622589 13.08503024 13.52757312 7.156584546 3.741078145
2.028708613 0.888759768 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0.803881169
3.463754572 8.507870248 8.0037977 5.956964653 3.449798416
0.437246062 0.177105764 0 0 0 0 0 0 0
0 0
1971 1 4 3 2 30 0 0 0 0 0
0 0 0 0 0 2.635976863 8.191312396 9.71192449
11.39254832 6.933671446 6.406119664 6.146063079 3.192337151
1.085526519 0.727205883 0.542989428 0.175005484 0.354616453 0
0 0 0 0 0 0 0 0 0 0 0
0 7.317605776 12.80800252 11.57100954 7.102933393 2.753359237
0.776786874 0.175005484 0 0 0 0 0 0 0
0 0

1972 1 4 3 2 42 0 0 0 0 0
0 0 0.145190369 0.290380737 1.488135175 6.098434343
6.850181434 6.067492861 7.53183336 6.405095519 4.360164053
1.962074878 2.350761755 1.259784232 0.825075389 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0.141302909 3.555888822 10.54809177 14.70399062 12.28507155
8.31884144 3.980193884 0.670093993 0.161920907 0 0 0
0 0 0 0 0 0
1973 1 4 3 2 30 0 0 0 0 0
0 0 0 0.254020884 1.005073296 4.187611518 4.244213047
5.846785699 4.48179522 8.399730357 5.441888023 4.929586765
2.480647603 1.85067301 0.572083034 0.358326767 0.173508069 0
0 0 0 0 0 0 0 0 0 0
0.178969377 0.508041769 2.06142145 6.749246988 15.81107287
12.18184371 10.61703518 5.620327845 1.831953239 0 0.214144279
0 0 0 0 0 0 0 0
1974 1 4 3 2 42 0 0 0 0 0
0 0 0 0.192524261 2.429751952 4.097656507 3.995093711
4.444766567 5.43588019 7.355696249 5.564854195 4.918065646
2.833573627 1.974679771 1.754782867 0.684045073 0.121701734
0.184909539 0.092454769 0.184909539 0 0 0 0 0
0 0 0 0 0 2.17144285 6.880870498 8.009844615
12.41665294 12.28795223 6.737992395 3.823257513 1.163237285
0.243403467 0 0 0 0 0 0 0 0
1975 1 4 3 2 30 0 0 0 0 0
0 0 0.508337264 1.016674529 1.241509632 2.48805769
6.802525132 4.444078955 7.132951921 5.593621389 3.246667247
3.568647205 3.937739027 1.746081765 0.288910174 0.433365261
0.325375504 0 0 0 0 0 0 0 0 0
0 0 0.254168632 2.69327321 4.076826999 9.278254236
8.360145924 10.58849314 14.49479014 6.236233321 1.098816614
0.144455087 0 0 0 0 0 0 0 0 0
1977 1 4 3 2 66 0 0 0 0 0
0 0 0 0.523621498 2.174008312 6.038174152 7.989997711
9.814121887 6.534995679 7.469805024 4.986803031 3.731109331
3.902658878 1.792692798 1.605529946 0.672793001 0.382383344
0.172400734 0 0 0 0 0 0 0 0 0
0 0 0.354421603 3.069387966 6.696968427 9.421621374
10.19638598 5.239909992 4.00207952 2.747587408 0.465856446
0.014685956 0 0 0 0 0 0 0 0
1978 1 4 3 2 72 0 0 0 0 0
0 0 0 0.50208994 2.15010598 4.660850573 4.57127851
4.26432312 4.367356615 6.829622672 5.584465475 3.628986318
3.135006209 2.840717157 1.405539999 1.094765016 0.334856363
0.357686791 0.056681127 0 0 0 0 0 0 0
0 0 0.175667741 0.747660688 5.091535746 9.65646684
10.31820954 12.24916481 8.829100973 5.083758986 1.562752789
0.404938078 0.096411941 0 0 0 0 0 0 0
0
1979 1 4 3 2 36 0 0 0 0 0
0 0 0 1.636596713 4.392168089 7.928051041 7.905640693
8.908345327 6.38388433 5.847281051 5.964750174 4.557596575
3.309097559 3.072176138 1.825601554 2.052041594 0.226440041
0.936654362 0 0 0 0 0 0 0 0 0
0 0 0.512294762 3.222519712 9.292347005 8.798907795

6.903378789 3.981481164 1.571990132 0.554587331 0 0.21616807
0 0 0 0 0 0 0 0
1980 1 4 3 2 96 0 0 0 0 0
0 0 0.093919518 0.468054045 1.352815653 3.42251978
4.73728623 3.923030976 3.562292862 4.633188141 5.766005874
3.925665052 4.790462752 3.096795828 2.157409067 1.233003064
1.195411097 0.85240045 0.32216282 0 0 0 0 0
0 0 0 0 0 0.189777752 2.125675669 4.564017974
9.032349146 11.53391479 11.38058555 5.927549607 4.58301501
3.468388751 0.637556641 0.380420257 0.351291538 0.293034102 0
0 0 0 0
1981 1 4 3 2 174 0 0 0 0 0
0 0 0.099411091 0.867114792 4.274445675 8.189325243
9.202767931 8.237605878 6.650263731 7.07750202 4.113926322
4.725760792 3.306148277 2.247233634 1.112102849 1.221300221
0.597557952 0.288282606 0.048166631 0.028380982 0 0 0
0 0 0 0 0 0.028457078 1.032657063 4.665747038
8.962856064 9.436296727 6.766369561 4.002200601 1.784986232
0.863783049 0.169349958 0 0 0 0 0 0 0
0 0
1982 1 4 3 2 96 0 0 0 0 0
0 0 0 0.474531782 2.961136723 8.11513735 9.510841964
8.034205051 8.045238014 5.261235842 4.914036006 3.174223095
3.382345434 0.944300309 0.498143633 1.009719485 0.236234735
0.142724772 0 0 0.137916143 0 0 0 0 0
0 0 0 0.254563067 4.730196912 11.59561364 11.02858876
6.988727304 4.573032334 2.366595143 1.074652627 0.498748969
0.047310904 0 0 0 0 0 0 0 0
1983 1 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
1985 1 4 3 2 12 0 0 0 0 0
0 0 0 2.267551989 4.802655967 8.267551989 8.633775995
4 7.464896022 9.098672016 10.36622401 7.901327984 7.831120027
6.732448011 2.732448011 3.901327984 2 0.366224005 0 0
0 0 0 0 0 0 0 0 0.732448011
2.267551989 3.732448011 3.267551989 1.633775995 0.366224005
0.366224005 0.633775995 0.633775995 0 0 0 0 0
0 0 0 0 0
1986 1 4 3 2 24 0 0 0 0 0
0 0 0.22572058 1.218119424 6.013792492 12.45673154
11.03068422 7.405220795 5.065455911 10.24072592 5.063323363
2.053760741 4.239494663 3.048765773 2.806136644 0 0.69222786
0 0 0 0 0 0 0 0 0 0 0
1.421680923 3.889793142 7.467211265 5.918397197 5.166649532
3.323388651 1.009698812 0.243020548 0 0 0 0 0
0 0 0 0 0 0
1987 1 4 3 2 42 0 0 0 0 0
0 0 2.542175982 2.559532832 8.928819885 8.637955299
10.87185803 7.650774702 7.992777877 6.03948139 3.242781057
1.545118093 0.453154961 0.22064233 0 0 0 0 0
0 0 0 0 0 0 0 0 0.688525048
1.94776224 3.197486196 13.6488928 9.63756166 8.120102289

1.300304983 0.774292348 0 0 0 0 0 0 0
0 0 0 0 0
1988 1 4 3 2 12 0 0 0 0 0
0 0.309296875 1.690703125 1.690703125 4.309296875 15.83492187
12.7628125 8.618593751 12.45351562 11.07210937 3.546484377
2.927890626 3.690703125 0.309296875 2 0 0 0 0
0 0 0 0 0 0 0 0 0 1.690703125
8.453515623 3.381406249 0.618593751 2.783671878 1.237187501
0.309296875 0.309296875 0 0 0 0 0 0 0
0 0 0 0
1989 1 4 3 2 36 0 0 0 0 0
0 0 0 0.349649494 5.405165586 18.28692997 13.25588025
8.033204145 9.775451034 5.523020186 2.009026886 3.588814072
1.732163974 0.168668393 1.064542978 0 0 0 0 0
0 0 0 0 0 0 0 0 0 3.160228941
9.907853183 11.76533784 3.560209759 0.930196892 1.483656421 0
0 0 0 0 0 0 0 0 0 0 0
1990 1 4 3 2 30 0 0 0 0 0
0 0 1.139339381 3.344554479 5.026451887 14.65037082
11.42786117 9.029830642 8.476262162 4.944018913 1.070574374
1.709009071 1.348361235 0.33130666 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0.90097635
4.130978241 11.90024691 12.34089199 5.732759692 1.931234993
0.282485517 0.282485517 0 0 0 0 0 0 0
0 0 0 0
1991 1 4 3 2 12 0 0 0 0 0
0 0 0 2.381862944 1.562412877 10.30865821 17.49249067
13.50997122 14.36766492 4.72548226 6.364382392 1.600656505
1.562412877 4.763725887 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1.600656505 3.906032193
3.982519448 3.944275821 3.944275821 2.381862944 1.600656505 0
0 0 0 0 0 0 0 0 0 0 0
1992 1 4 3 2 36 0 0 0 0 0
0 0 0 2.051701108 3.58788677 6.821726633 9.876759773
12.50638158 8.353007978 9.929796074 3.635400226 4.444948186
1.519908151 0.462528291 0.125038303 0.176281124 0 0 0
0 0 0 0 0 0 0 0 0 0
5.650823635 9.010397601 8.40883327 8.13785379 4.290244516
1.010482994 0 0 0 0 0 0 0 0 0
0 0 0
1993 1 4 3 2 12 0 0 0 0 0
0 0 0 0 0 2.321534352 13.92920611 11.60767176
10.17272019 11.94588576 17.47553725 6.964603055 4.094699921
0.886582785 0.886582785 3.208117136 0 0 0 0 0
0 0 0 0 0 0 0 0 2.321534352 0
0.886582785 4.432913923 3.546331138 3.546331138 1.773165569 0
0 0 0 0 0 0 0 0 0 0
1994 1 4 3 2 12 0 0 0 0 0
0 0 0 7.604941583 4.087542878 23.95511309 16.06509943
12.26262863 5.227831223 0.855216259 0.285072086 8.745229928 0
0 3.802470792 0 0 0 0 0 0 0 0
0 0 0 0 3.802470792 3.802470792 0.285072086
4.942759136 2.565648776 1.140288345 0.285072086 0.285072086 0
0 0 0 0 0 0 0 0 0 0 0
1996 1 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
1997 1 4 3 2 54 0 0 0 0 0
0 0.645430882 3.920852968 14.32689704 8.706838353 5.557204617
3.926555993 4.064054202 10.72581437 7.936800149 6.308059212
5.488573386 3.564255887 0.245259744 0.982232515 0.451881415 0
0.078469686 0 0 0 0 0 0 0 0 0
0.645430882 5.634204839 3.917790934 5.211552077 3.602633326
1.260273116 2.355882539 0.24105305 0.092646849 0.078469686 0
0 0.030882283 0 0 0 0 0 0 0
1998 1 4 3 2 30 0 0 0 0 0
0 0 0 1.187830595 3.884409678 4.148852239 7.564645911
4.256689503 1.582575676 6.641764785 7.04464944 7.715567352
2.273605602 0.700181298 0.700181298 0.425794549 0 0 0
0 0 0 0 0 0 0 0 0 0
2.101823068 13.94797128 15.93227561 9.853042848 7.148123741
1.935822211 0.254012015 0.700181298 0 0 0 0 0
0 0 0 0 0
2000 1 4 3 2 12 0 0 0 0 0
0 0 3.090626815 3.090626815 3.090626815 9.271880446
3.090626815 12.36250726 6.29703699 6.29703699 9.445555485
21.86595443 9.387663805 3.206410175 0.115783359 3.090626815 0
0 0 0 0 0 0 0 0 0 0 0
0 3.090626815 0 3.090626815 0 0.05789168 0.05789168
0 0 0 0 0 0 0 0 0 0 0
0
2001 1 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
0 0 0 0 0 0 0 0 0 0 0
0 0 2.43902439 0 4.87804878 9.756097561 12.19512195
4.87804878 0 0 0 0 0 0 0 0 0
0 0 0 0
2002 1 4 3 2 18 0 0 0 0 0
0 0 0 0 2.053047713 9.490562251 4.892639415
16.64332855 15.45947807 12.33015395 4.013473847 4.303206258
1.859378635 0.584448989 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1.758331135 3.806394681
6.75854463 10.07655365 2.352748458 0.879165567 2.154095213
0.584448989 0 0 0 0 0 0 0 0 0
0 0
2003 1 4 3 2 48 0 0 0 0 0
0 0 0 0.500639766 4.477510323 12.9742402 17.11094809
7.626190283 4.779339297 6.767279787 4.455433566 1.605032602
0.011148536 0.257969853 0.117836391 0.007475101 0 0 0
0 0 0 0 0 0 0 0 0 0 0
8.052683303 14.01242794 13.16140475 3.91633625 0.155083665
0.011020304 0 0 0 0 0 0 0 0 0
0 0
2004 1 4 3 2 36 0 0 0 0 0
0 0 0 0 0.4621631 9.100774243 11.48321054
13.46025171 11.60614036 3.821656035 4.24994145 0.604432055 0
0.604432055 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0.81946406 5.324545273

13.74462338 18.94720461 5.279345571 0.491815565 0 0 0
0 0 0 0 0 0 0 0 0
2005 1 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
2006 1 4 3 2 72 0 0 0 0 0
0 0 0.676315094 2.734862115 4.564076608 6.035988214
7.618434701 8.399560217 8.53873867 6.843944129 7.19179066
4.346857895 2.452697025 0.475297974 0.09444927 0.28541282 0
0 0 0 0 0 0 0 0 0 0
0.210842716 0.210842716 2.85006797 7.759031368 13.67489479
9.671275079 4.05943224 0.916523221 0.120823865 0.17339137 0
0 0 0 0 0.09444927 0 0 0 0
2007 1 4 3 2 72 0 0 0 0 0
0 0 0 2.460214512 2.035708045 3.605445122 7.553319656
5.674315679 9.004795094 6.140387893 6.028124615 5.773468302
2.24582934 1.660813144 1.080274006 0 0 0 0 0
0 0 0 0 0 0 0 0 1.22323297
2.500169745 7.516109627 13.20770163 10.93175364 7.697286585
3.369780166 0.29127023 0 0 0 0 0 0 0
0 0 0 0
2008 1 4 3 2 36 0 0 0 0 0
0 0 0 0 3.397447821 8.106634086 8.989110977
5.416121105 10.34600818 11.01346902 7.46476713 2.378652217
2.851447069 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 1.182840934 2.115350252
6.921687983 13.79158392 7.912527876 6.916540151 0.295685363
0.90012592 0 0 0 0 0 0 0 0 0
0 0
2009 1 4 3 2 162 0 0 0 0 0
0.041221962 0 0.110540174 0.423608749 2.025885784 5.416617845
7.184799612 9.219358488 8.236914938 11.02271654 6.463300206
6.36464747 2.5994668 1.81833207 0.349353649 0.095761975
0.001904682 0 0 0 0 0 0 0 0 0
0 0 0.201477866 2.597010052 4.788916319 10.42670919
11.11223526 6.425217313 1.746035415 1.193212348 0.009563846
0.12519145 0 0 0 0 0 0 0 0 0
2010 1 4 3 2 150 0 0 0 0 0
0 0 0 0 1.271622679 2.830742135 5.784317313
10.14026974 8.921350194 9.666856539 6.462866188 5.089952945
2.869744709 2.247670037 1.605178302 0.078661001 0.193749536
0.005482115 0 0 0 0 0 0 0 0 0
0 0 0.019826307 1.414254144 3.695941355 14.89041995
16.13487574 6.195196248 0.199548826 0.107800651 0 0.173673348
0 0 0 0 0 0 0 0
1949 1 5 3 2 20 0 0 0 0 0
0 0 0.340099433 1.200876898 2.150546221 3.121273309
2.373240348 3.626913766 5.744049134 7.205032737 9.007433656
10.94847592 10.45272204 6.035181839 3.727242811 1.558664948
0.750181651 0.169181871 0.171059905 0 0.284923439 0 0
0 0 0 0 0 0.340099433 0.340099433 2.094306076
3.737582493 2.191583978 4.779072996 4.27080287 7.373410587

4.501822835 1.504119371 0 0 0 0 0 0 0
0 0
1964 1 5 3 2 2 0 0 0 0 0
0 0 0 0 0 6.12244898 6.12244898 8.163265306
4.081632653 12.24489796 10.20408163 0 4.081632653 4.081632653
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 2.040816327 4.081632653 12.24489796
14.28571429 4.081632653 8.163265306 0 0 0 0 0
0 0 0 0 0 0 0
1965 1 5 3 2 4 0 0 0 0 0
0 0 0 3.693880751 7.387761501 7.387761501 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 2.269372397
10.95587242 31.36654392 33.24492676 0 0 0 3.693880751
0 0 0 0 0 0 0 0 0 0 0
1966 1 5 3 2 16 0 0 0 0 0
0 0 0 2.643065953 12.91422497 10.33772088 5.936799269
4.715796359 3.42347543 4.5966589 4.802025114 3.804808403
3.050860575 1.951245805 0.673087718 0.413292065 0.275528043
0.137764022 0.200869633 0 0 0 0 0 0 0
0 0 0.893542052 3.549128073 8.461241008 17.54623334
8.404463359 0.89220616 0.238198838 0.137764022 0 0 0
0 0 0 0 0 0 0 0
1967 1 5 3 2 40 0 0 0 0 0
0 0.005400078 0.010800157 0.041791107 1.439234238 1.670935887
2.039799279 5.94251136 7.754560282 5.050742488 3.156032035
2.419441727 2.007376818 0.967428419 0.316652568 0.189616949
0.041791107 0.022653954 0 0 0 0 0 0 0
0 0 0 0 0.125373322 6.551198217 23.47764409
22.04064498 11.09091796 3.323082408 0.271325202 0.043045357 0
0 0 0 0 0 0 0 0 0
1968 1 5 3 2 22 0 0 0 0 0
0 0 0 0.745764816 2.571866465 2.155901939 1.905587654
7.250384306 11.4997716 9.520862564 8.626435283 7.061153418
4.517037179 2.28278949 1.413572657 0.259786452 0.259786452 0
0 0 0 0 0 0 0 0 0 0 0
0.803130376 3.717535938 6.0354008 12.17646445 13.3428608
2.850110537 1.003796814 0 0 0 0 0 0 0
0 0 0 0
1969 1 5 3 2 28 0 0 0 0 0
0 0 0 0.016262064 0.068323624 0.600898749 1.671096028
5.981487777 5.187453767 11.60119023 17.72246994 14.39486536
3.639388248 4.220556381 0.937474383 0.747520154 0.792060423
0.01824273 0.003318003 0 0 0 0 0 0 0
0 0 0 0.013009651 0.922652057 9.705606099 6.337943201
5.728876626 4.630813974 2.472100441 1.295570147 0.149973271
1.065860025 0.074986636 0 0 0 0 0 0 0
1970 1 5 3 2 26 0 0 0 0 0
0 0 0.321151724 1.451904836 1.342782956 4.956133293
4.847720754 6.026626522 6.505420463 7.690472702 4.120440298
1.571460513 0.425451801 0.041838681 0.287034827 0.16589454
0.155699576 0.020389928 0.040779856 0 0 0 0 0
0 0 0 0 2.569213795 5.309052717 8.051191922
20.64032075 11.07077192 9.395919238 1.419475349 1.562656064 0
0.010194964 0 0 0 0 0 0 0 0 0

1971 1 5 3 2 14 0 0 0 0 0
0 0 0 0 4.033396222 7.007514344 12.66488612
11.61527174 3.357695803 4.066724134 3.385677359 2.846913199
1.709794986 0.126075347 0.118862852 0.322715456 0 0 0
0 0 0 0 0 0 0 0 0 0
4.970297175 22.195527 15.87139095 1.386249846 2.546501839
0.076837736 0.848833946 0.848833946 0 0 0 0 0
0 0 0 0 0
1972 1 5 3 2 46 0 0 0 0 0
0.046476944 0 0 0.104733621 0.447964282 1.305456552
3.50850223 6.053509507 11.79768191 10.62656937 7.795622539
8.403053769 5.423924072 2.66744688 2.552652187 2.363067511
0.714227571 0.085162158 0.0212328 0.032072344 0 0 0
0 0 0 0 0 0 0.0625923 8.484706532
8.860027234 10.63091782 4.771888592 2.103617389 0.307634811
0.597434476 0.185297849 0.046526753 0 0 0 0 0
0 0 0
1973 1 5 3 2 24 0 0 0 0 0
0 0 0 0.524517234 1.832496354 6.812932997 2.102019128
4.265664964 10.37957142 13.82757491 12.73076112 6.175586201
5.903467025 3.483182261 1.262055561 0.591704539 0.407455208
0.020041779 0.092303006 0 0 0 0 0 0 0
0 0 0 0.32553832 2.547763428 9.91365331 12.41247284
3.148720317 1.04015726 0.118976236 0.08138458 0 0 0
0 0 0 0 0 0 0
1974 1 5 3 2 62 0 0 0 0 0
0 0.024040186 0.005039658 0.23590145 0.310662657 1.38167785
2.050031417 2.502288738 6.502257857 10.1055842 8.101073433
9.41291664 5.773572204 2.708431673 2.049908788 0.469098469
0.010593787 0.035467914 0 0 0 0 0 0 0
0 0 0 0.077160217 0.704117698 2.619901614 8.331686447
15.29841079 10.31065657 7.056289477 2.118979912 0.950163468
0.804948346 0.049138546 0 0 0 0 0 0 0
0
1975 1 5 3 2 22 0 0 0 0 0
0 0.886923018 3.120164365 3.904646722 4.302028011 8.060488194
7.680197471 10.8141639 7.603196429 2.789774465 2.476420437
2.324899248 1.448860347 1.508103627 0.33173222 0 0.052089097
0 0 0 0 0 0 0 0 0 0
1.182564024 9.670857121 6.589655985 7.726271027 10.70964529
5.19213079 0.825193203 0.305693199 0.494301811 0 0 0
0 0 0 0 0 0 0 0
1976 1 5 3 2 24 0 0 0 0 0
0 0 0 0.178246157 0.788937591 0.983491611 1.487782765
1.357226047 3.092132121 8.675256367 6.334470468 7.831218551
5.695598135 3.146475401 3.386585479 2.044131533 0.202703371
0.272796864 0 0.028930517 0 0 0 0 0 0
0 0 0.089123079 0.189927602 2.390614411 13.50663116
15.1279586 12.05404933 5.752513955 3.700281205 0.745855109
0.745855109 0.19120747 0 0 0 0 0 0 0
0
1977 1 5 3 2 16 0 0 0 0 0
0 0 0.007736342 1.006014763 1.994228222 2.32210602
0.880340049 4.946377279 3.782772259 8.575020212 6.886702933
7.113621175 10.44358487 4.694447216 7.666033841 2.288132094
1.558392421 0.754288703 0.859962437 0 0 0 0 0

0 0 0 0.646441116 0.646441116 3.245349642 1.032098897
9.763536737 7.937318853 5.072009013 2.722914442 0.338040361
1.502533701 0.642571264 0.65290947 0.007736342 0 0.010338206
0 0 0 0 0
1978 1 5 3 2 34 0 0 0 0 0
0 0.084926698 1.179358688 2.489695226 2.317977533 4.706345416
8.470250053 7.766886559 4.97681653 5.13425584 4.362036893
5.075419732 1.689992293 0.311296742 0.10955535 0 0.268445109
0 0 0 0 0 0 0 0 0.269637806 0
0.339706792 0.783540019 7.765143397 8.766028486 8.225346091
14.18796338 9.115929586 1.245477421 0.122569905 0 0.182354324
0 0 0.05304413 0 0 0 0 0 0
1979 1 5 3 2 14 0 0 0 0 0
0 0 0.291377068 1.601173048 1.645533417 1.134132382
0.506227126 0.505436373 1.571786774 8.538976741 7.730811566
5.258791094 3.670889465 2.15696187 0.705762419 0.507180633
1.373737552 0.267769684 0.070932158 0 0 0 0 0
0 0 0 0 0 1.350143002 2.538068363 10.65297058
12.01232415 18.93235437 10.94819908 5.957528917 0.070932158 0
0 0 0 0 0 0 0 0 0
1980 1 5 3 2 12 0 0 0 0 0
0 0.477709278 4.788057359 13.27826711 18.10501917 8.831456197
7.479345301 5.292433111 2.984180287 3.117515238 1.28233783
1.787419114 0.854891887 1.709783773 0 1.071010609 0.172298534
0 0 0 0 0 0 0 0 0 0.344597069
0 0.819801306 5.476876079 7.570446607 9.652538284 3.375682255
0.932527228 0.427445943 0 0 0 0.168360428 0 0
0 0 0 0 0 0
1981 1 5 3 2 72 0 0 0 0 0
0 0.440196497 5.599575241 8.968191656 10.4379495 4.475625821
3.49209558 2.342485955 4.415630743 5.420528496 5.286528698
4.897167817 2.651798438 2.743087961 2.347554039 1.452394475
1.336459467 0.610929446 0.299246214 0.005954725 0.004282811 0
0 0 0 0 0 0.053727894 1.24708666 3.570677666
9.154404449 8.557097702 4.536658817 2.804185269 1.756636237
0.823825789 0.245754124 0 0 0 0.022261811 0 0
0 0 0 0
1982 1 5 3 2 52 0 0 0 0 0
0 0 0.100007145 1.048595763 2.308890637 2.193735505
2.820184136 4.293270154 3.278446882 2.696170797 3.015618252
2.988380284 1.45356351 1.415776046 0.719213379 0.195218993
0.075144767 0.110047642 0 0 0 0 0 0 0
0 0 0 0.507089458 6.474300793 32.20251244 19.57895589
8.631398703 2.073092778 1.158258608 0.308723077 0.292671107
0.060733251 0 0 0 0 0 0 0 0 0
1983 1 5 3 2 52 0 0 0 0 0
0 0 0.801787911 1.821950391 1.35893792 2.026764913
3.253902593 3.99956511 6.144402543 4.384189463 4.891571282
4.668801382 4.169636176 3.120609672 2.824067488 1.734686543
0.650337267 0.655554344 0.56216369 0.455312194 0 0 0
0 0 0 0 0.400893956 1.029126223 2.002240812
5.001003973 10.56449077 13.97700991 8.793691332 6.51660435
1.063347496 2.230057263 0.876791351 0.020501687 0 0 0
0 0 0 0 0
1984 1 5 3 2 26 0 0 0 0 0
0 0 0 0.13759883 0.887987509 1.548537581 0.93360843

1.301010615 2.126915334 4.072589962 5.634555787 6.796922179
4.283941025 3.303590404 1.608248523 1.860746117 0.551132452 0
0.196884486 0 0 0 0 0 0 0 0 0
4.687075568 17.20180366 25.13573092 8.415190414 3.766840718
3.042773862 1.092007886 0.772313275 0.379728004 0.131133231
0.131133231 0 0 0 0 0 0 0 0
1985 1 5 3 2 26 0 0 0 0 0
0 0 0.281822217 1.041884887 7.341392333 4.317337009
3.420380708 2.92113225 2.832222782 5.156941848 3.852096352
3.991922195 2.495949517 1.338937765 0.491613761 0.027488742
0.030531157 0.030531157 0 0 0 0 0 0 0
0 0 0.245650806 0.949960403 16.07752306 22.81552265
13.19527617 3.776900481 1.826367223 1.149408918 0.290517545
0.030531157 0 0 0.07015691 0 0 0 0 0
0 0
1986 1 5 3 2 12 0 0 0 0 0
0 0 0 6.809593931 7.312062062 7.942424612 4.223206562
3.335037437 3.146082305 2.396053002 3.084731394 4.298799829
2.494847874 0.56770939 1.384311048 0.355166354 0 0 0
0 0 0 0 0 0 0 0 0.138139821
7.957068693 14.53097386 10.39166485 11.79988547 4.528840948
1.993135944 0.832715484 0.177583177 0 0 0 0
0.299965954 0 0 0 0 0
1987 1 5 3 2 20 0 0 0 0 0
0 0 0.228638571 0.228638571 3.254300817 1.602767833
3.836677068 5.936131919 1.665748697 4.820927315 3.411081628
1.905855149 1.079831321 0.421145213 0.894041349 0.181637429
0.106029766 0.674133865 0.106029766 0 0 0 0 0
0 0 0 0.228638571 6.315442195 14.38015569 17.08815038
15.03339706 10.02747347 3.703624436 2.833896901 0.010653174
0.024951843 0 0 0 0 0 0 0 0 0
0
1988 1 5 3 2 12 0 0 0 0
0.605958402 0 0 0.958664767 3.481952703 8.307812278
8.791050291 7.833117791 1.502127034 3.788153159 4.251583534
0.479876966 1.774107338 1.637102279 0.833304759 0.695341127
0.420372437 0 0.137963632 0.101974851 0 0 0 0
0 0 0 0 0 0.352706365 3.621494507 8.370336131
13.35865515 18.33041425 5.199336176 3.071213428 1.675008206
0.420372437 0 0 0 0 0 0 0 0 0
0
1989 1 5 3 2 18 0 0 0 0 0
0 0 0 0.065757356 2.335622137 7.641833448 11.6232825
9.59486559 4.942832123 5.705281249 2.651039093 2.072144554
1.963366088 0.683690923 0.591808793 0 0 0 0 0
0 0 0 0 0 0 0 0 0 3.115567643
15.30473538 15.93196018 8.985689173 3.533806753 2.177083409
0.511049119 0.568584488 0 0 0 0 0 0 0
0 0 0
1990 1 5 3 2 4 0 0 0 0 0
0 0 0 0 0 0 8.628834335 7.314417167
15.9432515 12.34279142 7.713957081 14.97162575 13.31441717
5.314417167 0.342791416 0 3.314417167 1.657208584 0 0
0 0 0 0 0 0 0 0 0 0 0
3.371165665 4.74233133 0.342791416 0.342791416 0.342791416 0
0 0 0 0 0 0 0 0 0 0

1991 1 5 3 2 24 0 0 0 0 0
0 0 0 0.639834 1.61508553 2.773129862 6.879815834
7.073397387 12.59919927 11.35707253 5.275626371 3.397884459
2.608435264 1.519418679 1.533447441 1.48933106 0.407699261
0.300665186 0 0 0 0 0 0 0 0 0
0.093221292 0 4.330782699 10.62860419 14.14076714 7.703820439
2.684806979 0.94795513 0 0 0 0 0 0 0
0 0 0 0 0
1992 1 5 3 2 12 0 0 0 0 0
0 0 0 0 0 1.735589194 9.712010766 3.962532583
13.28005305 12.28557465 6.894421268 6.558898735 1.659813994
2.361879724 1.411399702 1.570218342 0.785109171 0.785109171
0.785109171 0 0 0 0 0 0 0 0 0
0 1.377656544 7.954798605 13.37836532 10.03692877 2.397994478
0.264920944 0.801615823 0 0 0 0 0 0 0
0 0 0 0
1999 1 5 3 2 2 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
2002 1 5 3 2 24 0 0 0 0 0
0 0.130936988 0 0 0 0 1.807935984 2.933742754
1.129882257 3.995896001 1.242655993 4.898944986 3.813991586
3.073992222 4.755901429 2.105151904 0.17233399 0 0 0
0 0 0 0 0 0 0 0 0 2.085201309
4.052832552 15.30318603 21.25914098 15.44479454 9.06498986
1.422070902 1.306417732 0 0 0 0 0 0 0
0 0 0
2003 1 5 3 2 14 0 0 0 0 0
0 0 0 0.35720091 9.403663394 5.305357205 1.156858487
1.238628489 4.268331721 4.301914822 4.287177383 5.144607203
4.776306399 2.697892609 1.23025412 0.978383753 0 0 0
0 0 0 0 0 0 0 0.178600455 0 0
3.612713626 16.20902987 11.14713339 13.32045212 4.648737956
3.429206569 1.329165758 0.489129016 0.489254736 0 0 0
0 0 0 0 0 0
2004 1 5 3 2 24 0 0 0 0 0
0 0 0.563817619 1.853018213 4.098370869 4.330167596
4.010526671 5.45402552 8.644345645 3.3291965 2.061606651
2.521301776 0.790350272 1.357216402 0.150373241 0.040241049 0
0 0 0 0 0 0 0 0 0 0 0
1.289200594 2.955298009 17.23707045 18.64772744 12.52120771
4.167203799 3.977733974 0 0 0 0 0 0 0
0 0 0 0 0
2005 1 5 3 2 16 0 0 0 0 0
0 0 0 2.65587377 1.278086668 3.440945479 7.549304698
9.444259047 11.5237422 10.0044874 17.26299688 2.330097998
5.779101441 2.352007346 0 0 0 2.330097998 0 0
0 0 0 0 0 0 0 0 0.096498635
2.526118844 5.735659228 5.208911062 0.43650047 0.692054827
7.023158016 2.330097998 0 0 0 0 0 0 0
0 0 0 0

2006 1 5 3 2 50 0 0 0 0 0
0 0 0 0.543688257 1.438629111 2.953189985 8.129073416
10.80268292 11.60291659 9.059994593 7.787893521 4.190329782
2.645743631 2.256903997 0.326048316 0.435758001 0.094368225 0
0 0 0 0 0 0 0 0 0 0
0.70984936 4.072249569 13.49451173 10.57702917 5.422842928
2.82209251 0.634204386 0 0 0 0 0 0 0
0 0 0 0 0
2007 1 5 3 2 86 0 0 0 0 0
0 0 0 0.001148328 0.525071925 4.154633858 4.590895599
7.07255132 7.087593453 11.65945359 7.43174181 6.348850588
2.907624623 0.68368018 1.07727256 0.197400648 0 0 0
0.169272467 0 0 0 0 0 0.129848068 0
0.026723993 0.487908651 3.264030757 7.275684238 11.91077182
13.12989184 7.183046806 1.703332038 0.784170187 0.197400648 0
0 0 0 0 0 0 0 0 0
2008 1 5 3 2 138 0 0 0 0 0
0 0.055831663 0 0.071506421 0.201505801 0.442902314
2.322373039 4.649007777 6.859816152 9.16917189 8.303787513
6.143763253 4.646491022 2.753999218 1.082590301 0.305988647
0.065346041 0.139213443 0 0 0 0 0 0 0
0 0.023770961 0.02106197 0.541146111 2.822971362 7.119867951
12.24051719 16.14803674 9.885711336 3.32642846 0.314542995
0.280752133 0 0 0.061898304 0 0 0 0 0
0 0
2009 1 5 3 2 122 0 0 0 0 0
0 0 0.037119441 0.18004494 0.32237933 1.355500314
3.827805148 6.65530066 8.250635175 7.367659193 6.224208655
6.530826546 4.404353492 3.064762158 1.431282083 0.367574706
0.045378856 0.020336298 0 0 0 0 0 0 0
0.008387685 0 0 0.946525334 5.936734855 13.34036477
9.887634122 8.136572976 7.348682178 3.350401839 0.442807162
0.215559053 0.020336298 0.225272434 0.015646006 0 0 0
0.039908294 0 0 0
2010 1 5 3 2 62 0 0 0.061765807 0
0 0 0 0 0.024242373 0.460681469 1.770134319
2.21929683 5.800033213 8.603281016 7.568292487 9.522479333
7.46071417 6.052905247 4.073398166 2.557286955 0.094483628
0.665217404 0 0 0 0 0 0 0 0 0
0 0.088004724 0.403231807 2.277733164 6.110410943 5.873467417
10.80227191 8.961070879 6.641570157 1.908026579 0 0 0
0 0 0 0 0 0 0 0
2011 1 5 3 2 14 0 0 0 0 0
0 0 0 0 1.037199873 0 1.948313803 1.770180507
6.815134021 4.090595949 8.388157455 13.24724914 8.331533999
8.090025811 5.249571474 3.02153633 1.615330899 0 0 0
0 0 0 0 0 0 0 0 0 0.295270103
3.50148674 8.686809892 9.243529498 10.0239863 4.370082068
0.274006142 0 0 0 0 0 0 0 0 0
0 0
1948 1 6 3 2 12 0 0 0 0 0
0 0 0 0 0 1.140737185 2.740662369 2.28147437
2.28147437 6.759457953 6.717889657 2.959420512 5.170395345
9.800240579 2.125479384 2.542449948 0.459187998 0.833410838 0
0.876158562 0 0 0 0 0 0 0 0 0
0 0.459187998 3.422211556 6.370769492 7.995373734 11.93900616

10.72829972 8.38098944 2.917733369 0.681549187 0.416440274 0
0 0 0 0 0 0
1949 1 6 3 2 12 0 0 0 0 0
0 0 0 0 0 1.012400938 0.473810554 2.433832599
1.550991321 2.293351864 1.985714033 4.958137016 7.197514775
1.856154373 2.613285827 0 0.869445423 0 0 0 0
0 0 0 0 0 0 0 0 0 0
2.282430788 6.191553803 10.22132173 15.62895237 19.55135589
12.36476219 4.302283104 1.777978688 0.434722711 0 0 0
0 0 0 0
1962 1 6 3 2 9 0 0 0 0 0
0 0 0 0 3.817436159 3.211289578 3.719098253
9.098839699 8.620258554 15.7039827 13.7589811 6.463465588
8.646029429 4.084225934 1.197177606 0.985386235 0 0 0
0 0 0 0 0 0 0 0 0 0 0
2.408467183 3.014613765 9.649987876 3.620760346 0.492693118
1.507306882 0 0 0 0 0 0 0 0 0
0 0
1964 1 6 3 2 66 0 0 0 0 0
0 0 0.359166429 1.345909335 3.043706713 4.044949477
4.857449721 4.752401957 4.098701761 5.505790571 3.668685822
5.203014149 4.004065686 4.085132345 2.629883671 0.849212331
0.573492996 0 0 0 0 0 0 0 0 0
0 0.119722143 0.460993011 2.703834683 5.352561325 7.182355657
9.966428168 8.628772015 6.742784413 7.368499717 1.911621638
0.540864264 0 0 0 0 0 0 0 0 0
1965 1 6 3 2 42 0 0 0 0 0
0 0 0 1.057064586 3.287467611 5.639455802 7.673362079
8.132935347 6.42928179 6.762559715 4.45583535 5.906894612
3.719309104 5.187458474 5.933059495 2.473943222 2.362077736
0.770426799 0.272678299 0 0 0 0 0 0 0
0 0 0 0.257458982 2.633844039 7.584266157 7.698036865
6.085411957 3.950980182 0.657891698 0.745436249 0.322863851 0
0 0 0 0 0 0 0 0
1966 1 6 3 2 99 0 0 0 0 0
0 0 0.085519101 0.377910743 1.831797461 4.058626833
5.361996178 7.213153645 7.764058278 6.62767364 4.324688774
3.893031517 2.171436691 1.175035736 0.937538501 0.309237474
0.483671798 0.426205436 0.040748601 0 0 0 0 0
0 0 0 0 0.029445124 1.613491044 9.603554828
17.3416495 13.339702 6.249478653 3.125077372 0.888916678
0.638544912 0.087809481 0 0 0 0 0 0 0
0 0
1967 1 6 3 2 132 0 0 0 0 0
0 0 0.123405112 1.681772094 2.784442787 5.688812026
6.812694764 7.937549094 7.576085595 8.805559504 6.538447655
4.53185881 2.404388122 3.618522629 2.086917274 1.078340495
0.678186319 0.426885347 0.04204258 0 0 0 0 0
0 0 0 0 0.053195153 2.230913696 5.326147558
7.31426098 9.195991573 5.1654716 5.061635187 2.169929049
0.387592174 0.278952823 0 0 0 0 0 0 0
0 0
1968 1 6 3 2 261 0 0 0 0 0
0 0 0.077392588 0.473476436 1.832836221 7.300879831
8.515815141 7.778246127 7.045434756 7.287275011 5.514044908
2.956195825 1.995026927 1.179659362 0.806945979 0.412125654

0.104576434 0.114402047 0.017057748 0 0 0 0 0
0 0 0 0.077392588 0.219164616 1.981989752 5.373639377
6.730188916 9.530419662 10.32347785 7.08123822 3.396757297
1.193310012 0.574389928 0.104164833 0 0.002475953 0 0
0 0 0 0
1969 1 6 3 2 147 0 0 0 0 0
0 0 0.182885089 0.413542294 1.285868386 4.66731558
6.242045119 8.42684797 6.46972877 5.342064019 5.436830573
5.099621991 3.163973078 1.495405173 1.020639873 0.884260544
0.17566647 0.054275658 0.020300297 0 0 0 0 0
0 0 0 0.040088436 0.862700558 1.311422422 3.229809401
6.701125903 13.13773506 12.33432364 5.114819487 2.562020469
2.287044077 1.186240537 0.345088165 0.0480838 0.458227164 0
0 0 0 0 0
1970 1 6 3 2 87 0 0 0 0 0
0 0 0.051807259 1.764729909 9.872632788 19.14261905
5.697720105 2.376422164 2.05302482 1.566778479 3.117661137
1.088897419 0.807730398 0.394277255 0.435721947 0.567578063
0.173338994 0.08541514 0.025147393 0 0 0 0 0
0 0.051807259 0 0 0 4.171585099 17.7903671
13.52597165 5.759037375 3.366802882 2.959199746 1.030923334
1.541617519 0.488374883 0.088369323 0.004441512 0 0 0
0 0 0 0
1971 1 6 3 2 111 0 0 0 0 0
0 0 0.034804132 0.409275945 2.433480539 8.913037836
8.392360501 8.41679902 8.752977459 6.730881053 5.649204015
2.518054167 3.552382252 1.859689923 0.86730039 0.438793339
0.146410018 0.073822587 0.109631483 0 0 0 0 0
0 0 0 0 0.16285281 0.822084406 9.102834649
12.30251121 7.612204705 3.813489674 3.523291308 2.054006933
0.642001968 0.399579637 0.266238043 0 0 0 0 0
0 0 0
1972 1 6 3 2 117 0 0 0 0 0
0 0 0.040892838 0.450183205 1.533394632 2.387329759
6.91406628 6.384718068 4.979466613 7.480821874 5.143646607
2.48506548 4.897567126 3.059430719 0.741386942 0.37492126
0.112340578 0.319989781 0.005269451 0.123771042 0 0 0
0 0 0 0 0 0.148786436 1.271382029 4.617025335
12.41078653 13.46061381 12.44275726 5.365463218 1.982230281
0.28720177 0.523193353 0.056297725 0 0 0 0 0
0 0 0
1973 1 6 3 2 123 0 0 0 0 0
0 0 0.143250558 0.645910436 2.24215604 1.960352119
2.54440002 4.159227837 6.724711479 4.477075921 4.895476065
3.27031138 3.444820475 2.004100895 0.872412415 1.15110377
0.45773442 0.267860643 0.312827549 0.054616567 0 0 0
0 0 0 0.395888251 0 0.100144732 2.305134053
7.096632769 8.509067196 11.14319336 8.556712342 11.10937466
5.933978055 3.131377627 1.111475922 0.816624677 0.162047772 0
0 0 0 0 0 0
1974 1 6 3 2 105 0 0 0 0 0
0 0 0.678911202 1.335843615 6.394454817 8.878012288
8.505050468 5.957414303 5.059833832 3.538352246 3.838203131
3.06261623 1.498447521 1.277239511 0.45280443 0.309913654
0.18275917 0 0.024330728 0 0 0 0 0 0
0 0 0 1.028112056 4.462736636 10.15737687 9.000472001

7.570811442 8.669476593 3.80219538 3.18041065 0.880831005
0.209345245 0.044044978 0 0 0 0 0 0 0
0
1975 1 6 3 2 57 0 0 0 0 0
0 0 0.563302483 2.283872485 3.080309601 8.428943459
11.94908392 8.559979576 6.008026192 4.520617294 3.8711833
3.131614109 2.675983285 1.968170073 1.107659891 0.857283349
0.744106705 0 0 0 0 0 0 0 0 0
0 0 0.336861155 2.648816334 6.762463287 10.81678637
9.362518694 4.59957333 2.316818185 1.141482233 0.529414745
0.462528594 0.456069671 0.326612672 0.163306336 0.326612672 0
0 0 0 0
1976 1 6 3 2 78 0 0 0 0
0.046782498 0.027040339 0 0.039383845 0.740285034 3.590877193
6.343481993 6.249177543 4.978143788 3.77605706 2.436983122
2.07865199 1.400533415 1.117153926 1.333750906 0.958692558
0.74904451 0.398048826 0.227719248 0.235748549 0 0 0
0 0 0 0 0 1.111042953 1.202143743 4.568453097
20.94718728 17.35250873 9.109629727 5.076579041 2.110614124
1.15638067 0.448131655 0.071437357 0 0.088363251 0 0
0.029972028 0 0 0 0
1977 1 6 3 2 114 0 0 0 0.007344167
0 0 0.073902538 0.727666574 2.058594383 8.034209907
10.01714007 9.020344 7.434017436 5.708139505 3.799539083
4.709548857 2.482433234 2.692650146 1.40549433 0.948693346
1.174279592 0.44875847 0.202959019 0.275740388 0 0.01728227
0 0 0 0 0 0 0.053618061 0.259381207
1.236603101 4.765567731 8.324966377 10.68892632 6.891480385
4.152179253 1.251552236 0.815457417 0.304275153 0.017255452 0
0 0 0 0 0 0 0
1978 1 6 3 2 99 0 0 0 0 0
0 0 0.171333815 0.758413705 3.365275499 5.579869968
7.850439378 6.974384659 6.741824727 9.462784777 5.377720985
5.858337262 5.71492633 1.812580606 1.934034809 1.861518512
1.235991658 1.058770247 0.227249144 0 0 0 0 0
0 0 0 0.018381426 0.388309871 1.029284712 4.119993403
8.518514506 10.81953663 4.393351255 3.75040835 0.879106341
0.097657421 0 0 0 0 0 0 0 0 0
0
1979 1 6 3 2 36 0 0 0 0 0
0 0.256582538 0.933673648 5.954484161 9.767500912 9.085769501
6.107370502 6.98459003 1.690615268 2.87339396 2.089793956
1.476605192 0.655153481 0.407163883 0.58758028 0.436998935
0.451744036 0.183088652 0.150581345 0 0 0 0 0
0 0.190507414 0 0.16539163 0.717442722 3.877015096
7.097352472 14.25265365 11.2365374 4.301778537 3.268484626
1.686126034 0.422416689 0.230986906 0.422416689 0.422416689
0.073779732 1.542003426 0 0 0 0 0
1980 1 6 3 2 243 0 0 0 0 0
0.019136061 0 1.462406071 6.210545865 11.6231 9.56518253
7.086365754 4.666486806 4.540622131 3.037341449 2.831214656
1.70865075 1.182600575 0.762719467 0.503825539 0.31826499
0.28351165 0.199284837 0.011280526 0.007277262 0.002229767 0
0 0 0 0 0 0.065657921 1.574283941 7.792961104
13.41174338 9.094346615 6.790344607 3.115683756 1.146465343

0.708836725 0.191980208 0.054695495 0 0.020427948 0.010526275
0 0 0 0 0 0
1981 1 6 3 2 195 0 0 0 0 0
0 0.065061889 0.259189487 4.770701234 8.524705196 6.664565288
7.512874946 5.66070097 4.854245172 4.139818593 3.110364935
2.171215237 1.08936938 0.559774581 0.608770499 0.505630026
0.226651636 0.201143826 0 0.006889686 0 0 0 0
0 0 0 0.002050347 2.103072404 8.395744857 13.23492833
7.823345698 8.173695124 5.283972941 2.188013834 1.124091715
0.341463088 0.246509959 0.109207975 0 0.042231146 0 0
0 0 0 0
1982 1 6 3 2 102 0 0 0 0 0
0 0.145165659 0.496827143 4.074947012 5.370353437 7.447023033
8.981514934 7.125919003 4.092275253 4.420604063 3.405220487
1.611069288 2.152312396 0.661507635 0.768223919 0.442407202
0.137645496 0.107705396 0.3506858 0.088061076 0.007075426 0
0 0 0 0 0 0.018121882 0.435385249 1.890689038
10.15423135 19.15979523 9.94617825 4.672066153 1.002662101
0.455566531 0.332317728 0.046442839 0 0 0 0 0
0 0 0 0
1983 1 6 3 2 99 0 0 0 0 0
0.019616439 0 0.732278768 2.548019203 6.203395962 10.71707454
10.80548748 9.229050629 7.014783167 4.322788079 3.04378165
2.82198279 0.93704944 0.684488904 1.089707366 0.216629099
0.617255599 0.097407212 0.058044823 0 0 0 0 0
0 0 0 0.031931865 0.693589793 4.650218767 10.32683987
10.43970648 5.849320286 2.387188243 1.287524878 1.973835239
0.59820204 0.171436903 0.171436903 0.090470575 0.009504247
0.009504247 0.07522426 0 0.07522426 0 0
1984 1 6 3 2 57 0 0 0 0 0
0 0 0.511191028 1.481991486 3.018158505 5.738046856
6.156478706 6.745506617 5.69672493 3.960801561 1.696934883
0.563864769 1.014409129 0.984981864 0.911851554 0 0.427328352
0.378454432 0 0 0 0 0 0 0 0.033219335
0 0.033146866 0.73134833 3.429504705 13.38400158 17.15720759
9.427482144 5.647269247 6.21269667 2.676200741 1.068708485
0.912489634 0 0 0 0 0 0 0 0 0
1985 1 6 3 2 51 0 0 0 0 0
0 0.58804793 1.264804347 5.304174117 8.71386563 8.990161941
8.439583199 6.812745365 5.207143224 5.199104588 2.923788241
2.903397401 1.220551691 0.307565657 0.500693103 0.90338096
0.456364944 0 0.016118408 0 0 0 0 0 0
0 0 0.05958534 1.273849934 4.06489156 9.966481343
10.13912298 7.025372272 3.442502263 2.28489362 1.247305858
0.248168029 0.496336058 0 0 0 0 0 0 0
0 0
1986 1 6 3 2 48 0 0 0 0 0
0 0.041810443 3.3711222 10.73670006 9.088443101 9.668208493
10.3313608 3.956115601 3.30820669 1.039762794 0.670631374
0.499351031 0.423777709 0.297227743 0.210796807 0.208327201
0.085948652 0 0 0 0 0 0 0 0 0
0 0.723789802 5.184379614 14.01458014 15.23474407 5.796805145
3.433623763 1.419662763 0.152465819 0.102158189 0 0 0
0 0 0 0 0 0 0 0
1987 1 6 3 2 42 0 0 0 0 0
0 0.327222312 0.944102191 5.312587262 3.652606649 10.54807011

6.268319731 11.32185693 6.801269951 3.730067968 1.197191978
1.574248693 0.197408784 0.397046259 0.889549637 0.070727995 0
0.017511837 0.368461231 0 0 0 0 0 0 0
0 0.327222312 6.287132481 10.73978621 11.5161187 9.444304398
4.715089756 1.545636963 0.863069524 0.543121919 0.400268224 0
0 0 0 0 0 0 0 0 0
1988 1 6 3 2 18 0 0 0 0 0
0 0 1.641780904 8.071356493 5.500035966 9.700644914
6.000904405 7.120993007 2.186419715 2.261443003 2.926348104
1.383591356 2.268524237 1.000920721 0.197655908 0.796314095 0
0 0 0 0 0 0 0 0 0 0 0
0.820890452 11.32165955 22.39392769 9.117538399 1.713480058
1.671385769 1.088279253 0.407952997 0 0 0 0.407952997
0 0 0 0 0 0 0
1989 1 6 3 2 27 0 0 0 0 0
0 0 0.74255794 2.22767382 5.033883387 19.13824089
13.66511641 14.94628163 8.133597259 4.271414472 0.934898872
1.634858777 1.008962532 0.557047007 0.204580128 0.102290064
0.204580128 0.204580128 0 0 0 0 0 0 0
0 0 0 0.59229582 3.845546497 5.774391065 8.089111321
4.413144108 2.057982152 1.250758331 0.102290064 0.761627135
0.102290064 0 0 0 0 0 0 0 0 0
1990 1 6 3 2 3 0 0 0 0 0
0 0 0 0 0 7.894736842 18.42105263 15.78947368
7.894736842 10.52631579 0 2.631578947 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 2.631578947 26.31578947 5.263157895 2.631578947
0 0 0 0 0 0 0 0 0 0 0
0 0
1991 1 6 3 2 3 0 0 0 0 0
0 0 0 0 0 12.19512195 7.317073171 14.63414634
9.756097561 4.87804878 2.43902439 0 2.43902439 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 2.43902439 19.51219512 19.51219512
2.43902439 0 0 0 2.43902439 0 0 0 0
0 0 0 0 0
2001 1 6 3 2 24 0 0 0 0 0
4.944352272 3.350030754 10.22335369 16.45771424 10.77027571
9.043079865 4.946694136 8.438454313 3.86090774 2.378558343
1.333995851 0.242952909 0.021844527 0.121476455 0.021844527
0.021844527 0 0 0 0 0 0 0 0 0
0 0 0 4.226730625 8.168438707 2.569652878 4.955092188
2.119181486 1.488670313 0.294853938 0 0 0 0 0
0 0 0 0 0 0 0
2002 1 6 3 2 27 0 0 0 0 0
0 0 0.027753173 0.389623337 13.15846981 5.833223242
5.883048117 8.610879811 0.697871393 0.722230246 0.607449076
0.398536318 0.320240404 0.139395771 0.358588709 0 0.219192938
0 0 0 0 0 0 0 0 0 0 0
0.013876587 14.66937238 35.03717572 9.11473785 2.12290662
1.022902502 0.504713085 0.147812901 0 0 0 0 0
0 0 0 0 0 0
2003 1 6 3 2 90 0 0 0 0 0
1.312114008 0 3.215679099 6.971062974 2.716992343 1.286871334
1.983403532 1.63324945 2.093762167 2.323810468 1.833469415
0.227085947 0.131781329 0.049939204 1.337843272 2.642404572 0

0 0 0 0 0 0 0 0 0 0
6.995434279 5.1278798 16.47730631 14.57934496 5.082253889
7.171840545 13.37140934 0.122947751 1.312114008 0 0 0
0 0 0 0 0 0 0 0
2004 1 6 3 2 39 0 0 0 0 0
0 0 0.046155366 0.124134442 1.21336527 0.357620109
3.221314366 7.45046303 6.125821499 2.502827719 1.795151369
2.012175157 0.832202098 0.595788709 0.829952854 0.091971351 0
0 0 0 0 0 0 0 0 0 1.641431093
0.044343505 0.875616941 4.07802891 19.79620616 27.48883155
11.87597518 4.182971189 2.220797712 0.596854427 0 0 0
0 0 0 0 0 0 0 0
2005 1 6 3 2 102 0 0 0 0 0
0 0.035174556 0 1.358396181 0.979074477 4.23297142
3.465916365 6.73262603 9.255009219 8.438243442 5.685002308
2.982014701 1.420390788 1.15288798 0.587566112 0.464031683
0.121625612 0 0 0 0 0 0 0 0 0
0 0 0.68833653 1.87212078 11.17043827 14.47135815
14.55939683 4.81167815 1.353731943 2.029798726 0.783587609
0.619785457 0.331803826 0.231130937 0.165901913 0 0 0
0 0 0
2006 1 6 3 2 129 0 0 0 0 0
0 0 0.005844039 0.140432769 0.958025385 1.760901853
7.467812229 10.40603541 9.746599895 9.78444157 8.516733934
4.799461518 1.947923984 1.120601094 0.149508979 0.100871531
0.081974962 0 0.100871531 0 0 0 0 0 0
0 0 0.07557916 0.340304522 1.996477298 7.07314411
12.1117949 13.68098098 5.544967291 1.148382172 0.775968214
0.164360666 0 0 0 0 0 0 0 0 0
0
2007 1 6 3 2 306 0 0 0 0 0
0.003822562 0 0.028955979 0.616861776 1.270727068 3.312329603
5.652254054 7.179577909 6.634892287 5.915468357 6.478351227
4.875005863 4.152777273 2.177649449 0.918395665 0.856436915
0.062246485 0.011214498 0 0 0 0 0.013859987 0
0 0 0.034331106 0.224047108 0.635318293 4.368690465
8.650575813 10.67330332 11.91364096 8.175004158 2.861268608
1.059389736 0.61026114 0.165376284 0.290320596 0 0.013517064
0.164128392 0 0 0 0 0
2008 1 6 3 2 246 0 0 0 0 0
0 0 0.003325962 0.068560515 0.245275686 1.840574316
2.690714312 5.389149375 4.513262817 5.670822832 5.788148496
4.932798448 4.354876953 2.92512486 1.645436002 0.583697274
0.284529393 0 0 0 0 0 0 0 0.308189963
0 0.001362696 0.002725393 0.496441569 1.820036641 8.312978997
10.86225985 11.80650582 10.08467126 4.345870932 2.64571167
2.108364149 2.063104567 1.813918779 0.958705202 1.011527912
0.42132736 0 0 0 0 0
2009 1 6 3 2 147 0 0 0 0 0
0 0 0 0.14532143 0.527437708 2.177777554 3.832259625
5.823918541 5.418932399 7.624568917 9.973215801 7.058743127
6.551159376 3.213213996 1.312157636 0.53581139 0.054104745 0
0 0 0 0 0 0 0 0 0 0.042497539
1.335098121 4.105928015 7.727649951 13.02618123 8.933495796
7.147670951 2.707570234 0.174579317 0.550706601 0 0 0
0 0 0 0 0 0 0

```
	2010	1	6	3	2	108	0	0	0	0
	0.034923503	0	0	0.472790783	0.821533379	1.772803269
	2.886620828	7.799169164	6.343800834	8.892978876	7.361453814
	7.892977985	6.032241531	4.179862841	3.396046354	1.670892832
	0.263185043	0.426107026	0	0	0	0	0	0	0
	0	0.205449491	1.643778892	0.251007397	2.000066244	5.786680955
	9.713254956	11.25413021	5.174999412	1.827146037	1.364351516
	0.531746825	0	0	0	0	0	0	0	0	0
	0	0
#	#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	1	4	3	1	25	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	1	4	3	1	25	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	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

	2006	1	1	0	1	14	0	0	0	0	0
	0	24.73333333	75.50126659	95.13685516	46.8	0	8.6	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	24.73333333
	75.50126659	95.13685516	46.8	0	8.6	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	2007	1	1	0	1	12	0	0	0	0	0
	0	1	0	1	48.4	136.4	57.495	12.4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	1	48.4	136.4	57.495
	12.4	0	0	0	0	0	0	0	0	0	0
	0	0	0
	2008	1	1	0	1	14	0	0	0	0	0
	0	0	17.18758466	49.72738103	147.6073467	92.07860658
	110.9910035	256	0	0	0	84	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	0	17.18758466	49.72738103	147.6073467	92.07860658	110.9910035
	256	0	0	0	84	0	0	0	0	0	0
	0	0	0
	2009	1	1	0	1	6	0	0	0	0	0
	0	0	1	0	16.61333333	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	16.61333333
```

3 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2010 1 1 0 1 10 0 0 0 0 0
0 21.6 10.8 21.6 1 58.8 22.2 145.8 143.2 19.6 10.2
20.4 10.2 12.8 0 12.8 0 0 0 0 0 0
0 0 0 0 0 21.6 10.8 21.6 1 58.8 22.2
145.8 143.2 19.6 10.2 20.4 10.2 12.8 0 12.8 0 0
0 0 0
2006 1 2 0 1 106 0 1 96.24533333
108.7953333 252.4906667 256.2126576 727.9670024 1035.784464
1353.813061 1622.175646 770.3785688 326.0921704 212.6777778 9
9.2 88.8 0 0 0 0 0 0 0 0 0
0 0 1 96.24533333 108.7953333 252.4906667 256.2126576
727.9670024 1035.784464 1353.813061 1622.175646 770.3785688
326.0921704 212.6777778 9 9.2 88.8 0 0 0 0
0 0 0 0 0 0
2007 1 2 0 1 66 0 0 0 10.49655172
47.89655172 361.5529534 307.229963 575.2321515 1183.647431
1131.949108 307.2105723 130.2448875 79.02266569 55.63355442 81.55
38.4 5.627102804 0 6.65620915 0 0 0 0 0
0 0 0 0 0 10.49655172 47.89655172 361.5529534
307.229963 575.2321515 1183.647431 1131.949108 307.2105723
130.2448875 79.02266569 55.63355442 81.55 38.4 5.627102804 0
6.65620915 0 0 0 0 0 0 0
2008 1 2 0 1 2 0 0 0 0 0
0 0 0 0 18 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 18 6 6
0 0 0 0 0 0 0 0 0 0 0
0 0 0
2009 1 2 0 1 120 0 4.6 30 268.6630769
1473.423077 1890.166127 2014.380823 5535.657312 11639.41811
7955.465397 5151.172477 3125.335638 444.3619048 3.4 0 0
0 0 0 0 0 0 0 0 0 0 0
4.6 30 268.6630769 1473.423077 1890.166127 2014.380823
5535.657312 11639.41811 7955.465397 5151.172477 3125.335638
444.3619048 3.4 0 0 0 0 0 0 0 0
0 0 0 0
# 2010 1 2 0 1 8 0 0 0 0 0
0 0 0 13.8 102.8 146 108.4 8 0 0 0
0 0 0 0 0 3 0 0 0 0 0
0 0 0 0 0 0 0 13.8 102.8 146 108.4
8 0 0 0 0 0 0 0 0 3 0
0 0 0
2006 1 3 0 1 4 0 0 0 0 0
0 0 0 0 0 17.72857143 26.12857143 31.25714286
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 17.72857143 26.12857143 31.25714286 0 0 0 0
0 0 0 0 0 0 0 0 0
2007 1 3 0 1 10 0 0 0 0 0
0 19.8 19.8 0 19.8 42.8 2.6 4.2 3 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 19.8 19.8 0 19.8 42.8 2.6
4.2 3 0 0 0 0 0 0 0 0 0
0 0 0

2008 1 3 0 1 14 0 0 0 0 0
1 0 0 22.32871795 98.98615385 56 42.92871795 14.4
0 0 3 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 0 0
22.32871795 98.98615385 56 42.92871795 14.4 0 0 3
0 0 0 0 0 0 0 0 0 0
2009 1 3 0 1 28 0 0 0 0 0
0 0 4 36.00504202 46.4 58.40504202 201.2 186.8621849
118.4 99.21008403 53.4 51 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 4
36.00504202 46.4 58.40504202 201.2 186.8621849 118.4 99.21008403
53.4 51 0 0 0 0 0 0 0 0 0

2010 1 3 0 1 40 0 0 0 0 0
0 5.633333333 1.6 206.8 590.0250836 1392.19741 1957.696115
1569.958391 1251.663569 978.4985105 1212.353192 110.8 1 1
0 0 0 0 0 0 0 0 0 0 0
0 0 5.633333333 1.6 206.8 590.0250836 1392.19741
1957.696115 1569.958391 1251.663569 978.4985105 1212.353192 110.8
1 1 0 0 0 0 0 0 0
2006 1 4 0 1 23 0 20.23559055 150.4721663
80.30619403 495.9443325 360.3483088 261.6317218 366.0854396
396.8308706 987.8564873 274.1236723 144.1504493 6.6 6.6 0
0 0 0 0 0 0 0 0 0 0 0
0 20.23559055 150.4721663 80.30619403 495.9443325 360.3483088
261.6317218 366.0854396 396.8308706 987.8564873 274.1236723
144.1504493 6.6 6.6 0 0 0 0 0 0 0
0 0 0 0 0
2007 1 4 0 1 13 0 0 86.5290566 0
43.764 118.5290566 72 452.5951274 1344.164482 1770.052866
330.9802872 118.7347991 88.89664119 2 73.10930233 0 2
0 0 0 0 0 0 0 0 0 0 0
86.5290566 0 43.764 118.5290566 72 452.5951274 1344.164482
1770.052866 330.9802872 118.7347991 88.89664119 2 73.10930233
0 2 0 0 0 0 0 0 0 0 0

2009 1 4 0 1 39 72.09459459 0 89.09188034
86.35873016 83.87346398 356.4714895 549.6326817 1342.830614
2558.506753 1570.007085 1869.380793 658.3377791 426.7121166 28.5
126.430303 11.4 62.4 0 11.4 0 11.4 0 0 0
0 0 72.09459459 0 89.09188034 86.35873016 83.87346398
356.4714895 549.6326817 1342.830614 2558.506753 1570.007085
1869.380793 658.3377791 426.7121166 28.5 126.430303 11.4 62.4
0 11.4 0 11.4 0 0 0 0 0
2006 1 5 0 1 4 0 0 0 0 0
1 0 0 749.4 249.8 249.8 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 749.4 249.8 249.8 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0
2007 1 5 0 1 30 0 1 0 10.25 1
39.13 187.842197 78.86666667 389.3955303 504.5151623 6.464285714
3 1 0 0 0 0 1 0 0 0 0
0 0 0 0 0 1 0 10.25 1 39.13
187.842197 78.86666667 389.3955303 504.5151623 6.464285714 3

1 0 0 0 0 1 0 0 0 0 0
0 0 0
2008 1 5 0 1 20 0 1 0 0 0
15.25 77.1 51.05 189.35 184.4 418.2 137.6 137.6 6.8 1 5.4
0 1 0 0 0 0 0 0 0 0 0
1 0 0 0 15.25 77.1 51.05 189.35 184.4 418.2 137.6
137.6 6.8 1 5.4 0 1 0 0 0 0 0
0 0 0
2009 1 5 0 1 12 0 0 0 0 1
2 1 6.2 50.8476362 37.69842413 0 16.8 12 0
1.2 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 1 2 1 6.2 50.8476362
37.69842413 0 16.8 12 0 1.2 0 0 0 0
0 0 0 0 0 0 0
2010 1 5 0 1 10 0 0 0 0 0
0 2 11.82723404 343.8939007 583.9469504 849.1 4.8 0
0 0 0 0 38.99501179 77.99002358 0 38.99501179
38.99501179 0 0 0 0 0 0 0 0 0
0 2 11.82723404 343.8939007 583.9469504 849.1 4.8 0
0 0 0 0 38.99501179 77.99002358 0 38.99501179
38.99501179 0 0 0 0
2006 1 6 0 1 62 0 0 4.8 5 20.2
256.2465989 250.2929991 293.581196 785.3311403 745.8430092
576.8440722 473.0572188 45.95830508 14.4 1 0 0 0
1 0 0 0 0 0 0 0 0 0 4.8
5 20.2 256.2465989 250.2929991 293.581196 785.3311403
745.8430092 576.8440722 473.0572188 45.95830508 14.4 1 0
0 0 1 0 0 0 0 0 0 0
2007 1 6 0 1 34 0 0 0 27 48.8
62.4 228.4 452.9057637 795.4662114 659.8769086 319.8523969
187.8012052 4.8 7 0 0 5.4 5.4 10.8 0 0
0 0 0 0 0 0 0 0 27 48.8 62.4
228.4 452.9057637 795.4662114 659.8769086 319.8523969 187.8012052
4.8 7 0 0 5.4 5.4 10.8 0 0 0 0
0 0 0
2008 1 6 0 1 12 0 0 0 1 24
31.8 41 49.475 74.75 70.75 10 6.6 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 1 24 31.8 41 49.475 74.75 70.75 10 6.6
1 0 0 0 0 0 0 0 0 0 0
0 0 0
2009 1 6 0 1 38 0 0 18 76.1 13.2
11.76 244.3528544 232.6411877 351.0423279 425.4596419 96.98416268
41.81507177 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 18 76.1 13.2 11.76
244.3528544 232.6411877 351.0423279 425.4596419 96.98416268
41.81507177 0 0 0 0 0 0 0 0 0
0 0 0 0 0
# 2010 1 6 0 1 8 0 0 0 0
104.3541999 167.04908 262.4138063 159.0824133 68.78435374
59.51887755 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
104.3541999 167.04908 262.4138063 159.0824133 68.78435374
59.51887755 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0

```
#	#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	1	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	1	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	1	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	1	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	1	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	1	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 1 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 1 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 1 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 1 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 1 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 1 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
#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 1 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 1 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 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 1 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 1 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 1 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 1 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 1 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 1 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 1 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
#NWFSCyear 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 1 8 3 0 589 0 0 0 0.423663719
0.31920027 0.56301549 0.812651101 1.614012109 2.709716341
5.770087662 6.227346864 5.57380127 6.057600302 4.815881208
3.720006865 3.44232922 2.223467721 0.86774853 0.918789482
0.770246519 0.245477067 0.186351948 0.068195925 0 0 0
0 0 0 0.208207201 0.447814153 0.97574504 2.186731739
5.50637215 8.965005791 10.78530416 11.67929679 6.008993236
3.981398409 1.394486028 0.332861439 0.171044635 0 0.02714961
0 0 0 0 0 0 0 0
2004 1 8 3 0 678 0 0 0.055130709
0.136661214 0.291529494 0.933206849 1.583599969 1.713252048
3.481283109 3.810090196 4.980987638 6.076002013 6.892704828
5.762153307 4.587747916 4.071962191 2.760165139 1.365076844
0.813377478 0.840706113 0.346716564 0.118539817 0.091727454 0
0 0.021935953 0 0 0.04168282 0.45846593 0.595580291
1.567097279 3.232617775 4.28673163 5.693489039 8.163504418
9.997038984 8.34833004 4.607501546 1.49309669 0.43621886
0.248611226 0.021219033 0.03995139 0.034306208 0 0 0
0 0 0 0
2005 1 8 3 0 903 0 0 0.017413546
0.045637031 0.344715702 0.741894012 1.428535993 1.513959295
1.902991306 2.645821292 4.746201266 5.094568374 5.622013475
7.404419582 4.994628234 3.951372959 2.231432908 1.441476843
1.282814541 0.254527443 0.188134368 0.403768969 0.069478458
0.022145206 0 0 0 0 0.026575358 0.389178141
1.318690441 1.712315382 2.269210352 2.925579325 4.844471082
7.372637178 10.42968748 9.602840002 6.671798366 3.444608063
1.919479978 0.450900598 0.26031901 0 0 0.01375844 0
0 0 0 0 0
2006 1 8 3 0 766 0 0 0 0.386584461
0.246913454 0.987004871 1.307450411 2.192114795 2.250892731
3.406489638 4.122612936 5.43988872 5.649466292 6.694066515
5.631161708 5.893368313 3.649986737 1.812073432 1.205509482

0.692214175 0.50316155 0.242142892 0.106140311 0 0 0
0 0 0.051486672 0.815951129 1.159348462 1.644945548
3.293680193 3.638469275 4.374672376 5.873344824 7.270376682
8.88017185 6.891743157 2.213589028 1.011876688 0.298569067
0.11085456 0 0.023230679 0.028446386 0 0 0 0
0 0
2007 1 8 3 0 732 0 0 0 0.275232721
0.469623117 1.435664683 1.528993577 1.722449434 3.27119023
4.766768563 4.874284324 5.727334167 6.470099013 5.528961822
6.201633106 5.478681115 3.779504519 2.885569368 1.274476995
0.881061014 0.361447866 0.221138844 0.07981402 0.038766185
0.023913576 0 0 0.031999371 0 0.259414318 1.199054371
2.826787168 3.268267842 4.289506604 4.176849315 6.736089486
6.1096607 6.141972626 4.250524756 2.217348866 0.606972243
0.313486316 0.209896245 0.029536438 0.036025078 0 0 0
0 0 0 0
2008 1 8 3 0 679 0 0.017133873 0.07028532
0.603549613 1.344256154 1.511620816 3.042816325 3.36017113
4.216964473 4.970741437 3.792478271 4.82698398 5.468355999
4.584043263 3.573014123 3.545298777 2.907206396 2.132087722
1.436835448 1.029675634 0.35408056 0.157388237 0.049411147 0
0 0 0.043790384 0.017130435 0.333092941 1.101267308
1.864023742 2.388913614 4.574603131 5.269099094 6.294539389
5.922819603 6.351737098 5.372180792 3.902129558 2.031237141
0.963374696 0.342949043 0.134540781 0.0692643 0.028908254 0
0 0 0 0 0 0
2009 1 8 3 0 751 0 0 0.078659048
0.897514765 1.839023819 1.991542861 2.390664262 2.963879792
2.970836356 3.878067289 3.487782524 5.00491549 5.357787696
5.262373276 4.560064349 4.547476422 3.588370833 2.801629825
1.799297325 0.945962789 0.852369412 0.208773646 0.027371731 0
0 0 0 0.050894774 0.173571723 1.973550832 3.277580377
3.09391175 3.825714499 3.960090988 5.080540449 4.791682205
5.745286294 5.130573401 3.523220564 2.280197455 1.137145804
0.264066079 0.162793033 0.016569431 0.058246832 0 0 0
0 0 0 0
2010 1 8 3 0 1159 0 0.038357369 0.1539255
0.583520636 1.697802291 2.85862671 3.137437842 3.838835561
4.193207927 4.359493218 3.900696762 4.86867615 4.760134076
4.310697915 4.115831822 2.635728363 2.534284318 1.6601024
0.912982791 0.325552306 0.170994617 0.093809141 0.039073202
0.054971309 0.037419783 0 0.018269304 0.03989213 0.202314257
0.969288506 2.4797215 4.556244208 4.8209935 5.353594676
5.471004911 6.78248106 6.779183949 5.514871081 3.103818977
1.754012692 0.609512378 0.195183159 0.067451702 0 0 0
0 0 0 0 0 0

#_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

7 #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
#2011 CAP BB    use     this    for     survey  ages    (except 2004)   and     OR
        commerical      ages    8-Jul


0.472   1.497   2.510   3.511   4.500   5.477   6.443   7.397   8.339   9.270   10.190  11.099
        11.998  12.885  13.762  14.628  15.484  16.330  17.166  17.992  18.807  19.613  20.410
        21.197  21.974  22.742  23.501  24.251  24.992  25.724  26.448  27.162  27.787  28.468
        29.139  29.799  30.449  31.088  31.718  32.336  32.945
0.206   0.206   0.272   0.344   0.420   0.503   0.592   0.688   0.791   0.902   1.022   1.150
        1.289   1.438   1.598   1.771   1.957   2.157   2.372   2.604   2.854   3.123   3.412
        3.723   4.058   4.419   4.808   5.226   5.676   6.160   6.682   7.243   8.073   8.720
        9.404   10.126  10.889  11.693  12.540  13.430  14.364
#2009 bias and stdev from CAP bomb v. bb; bb1 v. bb2 for survey bb ages
#BB 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
#2011 CAP Surface use   this    for     all     CA      ages,   and     OR      commerical
        ages    from    2000-

0.015   1.143   2.233   3.288   4.308   5.295   6.250   7.173   8.067   8.931   9.767   10.576
        11.358  12.115  12.847  13.556  14.241  14.904  15.545  16.165  16.765  17.345  17.907
        18.450  18.975  19.483  19.975  20.451  20.911  21.356  21.786  22.203  22.372  22.683
        22.969  23.233  23.474  23.691  23.885  24.056  24.204
0.001   0.001   0.111   0.227   0.348   0.473   0.603   0.738   0.879   1.025   1.177   1.335
        1.500   1.670   1.848   2.032   2.224   2.424   2.631   2.846   3.070   3.303   3.545
        3.797   4.059   4.331   4.614   4.907   5.213   5.531   5.861   6.204   6.449   6.779
        7.118   7.464   7.819   8.181   8.550   8.928   9.313
#2009 bias and stdev from CAP bomb v. bb v. surface reads
#SURFACE 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
#2011 CAP combo use	this	for	OR	commercial	ages	from	1981-1996
	where	a	combination	of	methods were	used
0.605	1.534	2.463	3.395	4.328	5.263	6.199	7.137	8.076	9.018	9.961	10.905
	11.851	12.799	13.749	14.700	15.653	16.607	17.563	18.521	19.481	20.442	21.405
	22.369	23.335	24.303	25.273	26.244	27.217	28.192	29.168	30.146	31.455	32.409
	33.362	34.316	35.270	36.223	37.177	38.131	39.085
0.100	0.100	0.201	0.301	0.402	0.502	0.603	0.703	0.804	0.904	1.005	1.105
	1.206	1.306	1.407	1.507	1.608	1.708	1.809	1.909	2.010	2.110	2.211
	2.311	2.412	2.512	2.612	2.713	2.813	2.914	3.014	3.115	3.266	3.367
	3.467	3.568	3.668	3.769	3.869	3.970	4.070
#2009 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
#2011 WDFW combo biasand	stdev	from	WDFW	combo	method,	post	1982,
	improved for 2011 assessment using WDFW reads of radiocarbon data
0.916	1.749	2.597	3.462	4.344	5.242	6.158	7.091	8.043	9.012	10.000	11.007
	12.034	13.080	14.146	15.233	16.340	17.469	18.619	19.792	20.987	22.205	23.446
	24.712	26.001	27.315	28.655	30.020	31.412	32.830	34.275	35.748	37.125	38.606
	40.108	41.632	43.177	44.744	46.332	47.941	49.572
0.001	0.001	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.007	0.007	0.008
	0.009	0.009	0.010	0.011	0.012	0.012	0.013	0.014	0.015	0.015	0.016
	0.017	0.017	0.018	0.019	0.020	0.020	0.021	0.022	0.022	0.023	0.024
	0.024	0.025	0.026	0.027	0.027	0.028	0.029
#2009 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
#2011 WDFW Surface bias	and	stdev	from	WDFW	surface age	method,
	pre	1982	, new for 2011 assessment, estimated using WDFS reads of radiocarbon oties

0.089	1.294	2.453	3.566	4.636	5.664	6.651	7.600	8.512	9.389	10.231	11.040
	11.818	12.565	13.283	13.973	14.636	15.273	15.885	16.473	17.038	17.581	18.103
	18.604	19.086	19.549	19.994	20.422	20.833	21.227	21.607	21.971	22.281	22.491
	22.674	22.830	22.960	23.064	23.140	23.190	23.214
0.001	0.001	0.108	0.221	0.339	0.462	0.590	0.723	0.861	1.006	1.157	1.314
	1.477	1.647	1.825	2.010	2.203	2.403	2.613	2.831	3.058	3.295	3.541
```

3.798 4.066 4.345 4.636 4.939 5.254 5.583 5.926 6.283 6.583 6.928
7.281 7.643 8.012 8.391 8.777 9.173 9.576
#2011 WDFW BB bias and stdev from WDFW break and burn age method, post 2008 , new for 2011 assessment, estimated using WDFS reads of radiocarbon oties
1.211 2.021 2.847 3.687 4.542 5.413 6.299 7.202 8.121 9.057 10.010 10.980
11.967 12.973 13.997 15.039 16.101 17.181 18.282 19.402 20.542 21.704 22.886
24.090 25.316 26.564 27.834 29.128 30.445 31.786 33.152 34.542 35.861 37.261
38.680 40.119 41.577 43.054 44.551 46.067 47.603
0.431 0.431 0.520 0.616 0.720 0.831 0.951 1.081 1.220 1.370 1.532 1.706
1.893 2.095 2.312 2.546 2.798 3.070 3.362 3.677 4.016 4.381 4.775
5.198 5.655 6.146 6.676 7.246 7.860 8.521 9.233 10.000 11.191 12.115
13.105 14.166 15.301 16.514 17.809 19.191 20.663
#_AGE_COMPOSITIONS(duplicates_must_be_contigent_within_Year-Seas-Fleet-Sex_because_of_ageerr_and_states)

493 #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
1 #_combine males into females at or below this bin number
# 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
# 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
1967 1 1 3 2 3 -1 -1 44 0 0
0 0 1.246994995 5.350101276 14.60473194 10.6958982
9.397383409 4.019870432 1.198503895 1.879924027 1.19850388 0
0.408087933 0 0 0 0 0 0.641590457 5.295338477
18.97768542 13.99332794 6.079629413 2.067471936 2.067471936
0.877484441 0 0 0 0 0 0
1968 1 1 3 2 3 -1 -1 121 0 0
0.150422335 0.15042235 1.569952504 7.230813619 10.62604103
11.06591858 6.926547968 5.505405565 3.91882051 1.351005564
0.689777897 0.104882615 0.605106847 0 0.104882615 0 0
0 0.734233217 2.800977007 12.60651953 17.91839805 8.811621363
4.283817271 1.175672178 1.096502093 0.326037836 0.246221456 0
0 0 0
1969 1 1 3 2 3 -1 -1 88 0 0
0 2.041198052 7.068946005 8.752233907 7.086143005 9.318485357
4.846327904 4.321549953 2.880826952 1.970117961 1.220194541
0.15345698 0.187062495 0 0.15345698 0 0 0
1.492998131 8.822027507 11.90230551 9.652813007 9.795658532
5.059999794 1.847775516 1.426421911 0 0 0 0 0
0
1969 1 1 3 2 6 -1 -1 11 0 0
0 0 0 11.36363633 10.22727248 10.22727273 7.954545434
5.681818188 2.272727245 2.27272727 0 0 0 0 0
0 0 0.892857143 1.785714281 14.28571447 18.74999996
8.035714484 4.464285706 1.785714281 0 0 0 0 0
0 0 0

1970 1 1 3 2 3 -1 -1 77 0 0
0 0.672685148 5.550458985 12.17095482 8.270184478 7.322309331
4.437105238 5.566351435 3.539954141 1.423321621 0.513548579
0.437028254 0 0.096097875 0 0 0 0 1.425029976
9.550535975 17.34437145 11.42514797 7.720674115 1.87935131 0
0.654889298 0 0 0 0 0 0
1970 1 1 3 2 6 -1 -1 11 0 0
0 0 1.829268494 4.268292687 2.439024492 6.707317029
7.317073127 6.707317029 3.658536588 4.878048765 4.878048765
4.268292672 1.829268289 0.609756098 0.609756098 0 0 0
4.411764691 17.64705894 5.882352981 4.411764486 11.76470584
2.941176461 2.941176461 0 0 0 0 0 0 0
1971 1 1 3 2 3 -1 -1 44 0 0
0 1.021256801 4.390159505 10.33664726 9.72317401 4.860764955
5.247060106 5.725455606 6.804742057 1.021256796 0.43474123 0
0 0 0.43474123 0 0 0 1.620822442 10.68395601
14.09358551 10.48218351 5.219578885 5.760727691 2.139146387 0
0 0 0 0 0 0
1971 1 1 3 2 6 -1 -1 11 0 0
0 0 0 2.3809524 19.047619 11.9047619 14.2857143
2.3809524 0 0 0 0 0 0 0 0 0
0 0.420168065 13.445378 11.344538 12.605042 7.563025209
3.781512604 0.840336135 0 0 0 0 0 0 0
1972 1 1 3 2 6 -1 -1 44 0 0
0 0.354952849 4.460646491 13.79636457 5.851703988 5.890421238
4.79213584 3.787019842 4.347424591 2.178778366 1.995782976
1.160432268 0.488718439 0.447809219 0.447809219 0 0
0.074729265 3.448541178 14.54028197 23.23293745 6.779538486
1.813523191 0.110448555 0 0 0 0 0 0 0
0
1973 1 1 3 2 6 -1 -1 33 0 0
0 0.27472525 2.197801998 9.615384592 16.89560449 10.02747254
3.434065947 3.296703297 2.197802198 1.510989009 0.54945055 0
0 0 0 0 0 0 1.685393259 11.79775299
13.48314599 16.01123599 5.337078646 0.842696629 0.842696629 0
0 0 0 0 0 0
1974 1 1 3 2 6 -1 -1 33 0 0
0 0.258350102 0.516700004 12.0791505 10.37568859 15.21434828
4.098605484 2.178477818 3.211878277 1.291750581 0.775050347 0
0 0 0 0 0 0 1.643215939 12.1873871
20.11969417 12.98125461 2.208791579 0.783559322 0.076097301 0
0 0 0 0 0 0
1975 1 1 3 2 6 -1 -1 99 0 0
0 0.1059322 1.800847501 7.838983054 14.61864401 12.28813561
6.991525403 3.072033902 1.271186451 1.165254236 0.423728815
0.423728815 0 0 0 0 0 0 0.51020408
8.928571504 16.32653051 15.43367351 5.867346943 2.168367346
0.6377551 0.12755102 0 0 0 0 0 0
1976 1 1 3 2 6 -1 -1 11 0 0
0 0 0 7.14285714 2.857142996 17.14285713 12.85714283
2.857142846 2.857142846 1.428571428 2.857142851 0 0 0
0 0 0 0 0 5.468749993 28.12499996 8.593749988
7.812499989 0 0 0 0 0 0 0 0 0
1977 1 1 3 2 3 -1 -1 11 2.272727272
0 0 0 4.545454495 11.36363634 18.18181798 6.818181792
4.545454545 2.272727247 0 0 0 0 0 0 0

0 0 0.641025639 1.923076923 8.33333349 15.38461548
15.38461548 3.84615384 3.84615384 0.641025639 0 0 0
0 0 0 0
1977 1 1 3 2 6 -1 -1 11 0 0
0 0 1.851852 5.555555549 16.6666665 9.259259249
5.555555549 5.555555549 3.08641975 0.61728395 1.2345679 0
0 0 0.61728395 0 0 2.77777778 0 13.888889
16.6666665 13.888889 0 0 0 0 0 2.77777778
0 0 0 0
1978 1 1 3 2 6 -1 -1 33 0 0
0 0 0 3.20743971 8.453670527 13.96519434 7.234274323
6.018797469 4.210228863 2.951843054 2.265094472 1.190102909
0.503354327 0 0 0 0 0 0.440325701 14.56343855
13.84673304 10.27261553 4.83417208 4.83417208 1.208543019 0
0 0 0 0 0 0
1980 1 1 3 2 3 -1 -1 22 0
3.352706119 4.470274826 23.66043001 1.244666503 13.63366603
1.819128005 0.765948752 0.765948752 0 0 0.19148718
0.09574359 0 0 0 0 0 9.040183038 30.73662232
0.619587562 3.097938008 4.646906512 1.548969004 0 0.309793781
0 0 0 0 0 0 0 0
1980 1 1 3 2 6 -1 -1 11 0 0
0 0.666666648 5.333333482 13.33333331 3.333333489 7.333333326
4.666666635 4.666666635 3.333333339 0.666666663 4.66666665
1.333333331 0.666666663 0 0 0 0 0 0
16.66666645 0 33.33333339 0 0 0 0 0 0
0 0 0 0
1981 1 1 3 2 4 -1 -1 33 0 0
1.201774405 5.608280552 6.525908003 8.343559453 4.030803002
3.781086602 2.033713351 2.192649551 1.587731851 2.868621811
3.913653127 2.098900026 2.186781716 1.766393556 1.860143096 0
0 0.74487126 5.214098832 12.80439951 10.3464325 7.614756503
3.596313441 1.858761721 0.69176068 1.425721091 0.475240365
2.851442176 1.425721091 0 0.475240365 0.475240365
1981 1 1 3 2 5 -1 -1 33 0 0
0 0.307420551 2.848188009 5.005399466 10.01236153 6.848605722
3.594474562 2.865307709 2.422490758 3.335534041 4.341832389
4.62184355 0.849831348 2.259685012 0.687025582 0 0 0
0.213857766 5.811340019 13.96386004 16.09335005 2.446494053
0.855431063 2.232636287 4.55933121 2.018778521 0.213857766 0
0.213857766 1.377205224 0
1982 1 1 3 2 4 -1 -1 44 0 0
0 3.387643336 5.276379479 5.781403227 6.605359474 3.923821834
1.794180493 3.821407285 4.341785333 2.330358966 3.127272347
2.768234389 3.978999804 0.287778014 2.5753758 0 0
3.178700492 5.839703497 11.17035796 10.00414696 5.531856978
5.531856823 2.681737274 1.059566831 0.529783413 1.059566831 0
0.562603618 0.201202474 0.529783413 2.119133662
1986 1 1 3 2 4 -1 -1 22 0 0
0 0.171514899 3.734399979 7.957392304 18.63307089 9.659565344
3.734399829 1.530658141 2.876825283 0.171514909 0.343029818
0.171514909 0 0 1.016113399 0 0 0 4.741224183
8.832375949 18.30229189 14.19860792 1.631447671 0.815723835
0.981375084 0 0 0.331302503 0.165651254 0 0 0
1987 1 1 3 2 4 -1 -1 66 0 0
0 1.428889996 5.548322483 8.034305425 15.59497395 13.47278726

2.648502492 1.537829745 1.198291846 0.245698514 0.049139705 0
0.241258489 0 0 0 0 0.392555609 7.458556602
14.65631146 17.02409045 6.808858479 3.18607167 0.473555829 0
0 0 0 0 0 0 0
1988 1 1 3 2 4 -1 -1 44 0 0
0 1.779080598 18.01824548 9.681332441 9.453892991 4.116651096
5.337241845 0 0.889540299 0 0 0 0 0
0.724015099 0 0 3.769456201 12.14940844 17.16520148
12.89721049 0 4.018723536 0 0 0 0 0 0
0 0 0
1989 1 1 3 2 4 -1 -1 44 0 0
0 2.944824405 16.97186103 13.89478742 10.39765452 2.610913854
1.740609203 1.154827252 0.28452265 0 0 0 0 0
0 0 0 2.240391353 14.13797427 20.02167653 6.21570201
3.503202505 3.297185895 0.583867111 0 0 0 0 0
0 0 0
1990 1 1 3 2 4 -1 -1 22 0 0
0 0 0 3.706825159 7.418086019 5.553584114 12.95836298
9.255973573 3.702389409 0 3.702389424 0 1.851194715 0
1.851194715 0 0 0 12.50373953 7.81436952
6.250000016 9.382479003 1.564369749 4.681890777 3.121260518
1.560630259 0 0 0 1.560630259 1.560630259
1991 1 1 3 2 4 -1 -1 22 0 0
0 4.790594113 11.40276403 16.46584125 10.72863053 2.969018158
0 0 1.821575955 0 0 1.82157598 0 0 0
0 0 0 13.44989189 13.44989204 15.03028104 8.069935022
0 0 0 0 0 0 0 0 0 0
1992 1 1 3 2 4 -1 -1 11 0 0
0 0 10 0 30 0 10 0 0 0 0
0 0 0 0 0 0 0 25 16.6666665 6.25
2.0833335 0 0 0 0 0 0 0 0 0
0
1993 1 1 3 2 4 -1 -1 44 0 0
0 1.785714291 14.28571443 16.07142847 11.60714294 2.678571436
3.571428531 0 0 0 0 0 0 0 0 0
0 0 15.95744673 15.95744692 12.76595743 2.127659489
2.127659564 0 0 0 1.063829779 0 0 0 0
0
1994 1 1 3 2 4 -1 -1 44 0 0
0 9.053979569 13.58662103 17.24160149 3.489734008 4.318029859
2.007995654 0.302038551 0 0 0 0 0 0 0
0 0 3.495957318 17.31327346 20.48333904 7.317806016
1.389624003 0 0 0 0 0 0 0 0 0
0
1995 1 1 3 2 4 -1 -1 33 0 0
1.418885873 2.837771737 12.57362894 13.99251478 6.898085468
1.418885893 5.381027575 1.418885893 1.320713894 0 2.739599777
0 0 0 0 0 0 0 11.29162908 17.96520192
15.29494843 4.22286848 0.634631022 0.590721237 0 0 0
0 0 0 0 0
1996 1 1 3 2 4 -1 -1 22 0 0
0 0.41998745 15.96668751 20.48334381 4.516656002 4.096668752
0 0 0.41998745 3.676681287 0 0 0 0
0.41998747 0 0 0 2.487250446 16.90077101 19.13303051
7.971733504 2.997232622 0.509982175 0 0 0 0 0
0 0 0

1997 1 1 3 2 4 -1 -1 11 0 0
0 8.333333398 11.66666657 8.333333398 11.66666657 6.666666688
1.66666666 0 1.66666666 0 0 0 0 0 0
0 0 0 22.22222235 11.11111106 11.11111106 0
5.555555587 0 0 0 0 0 0 0 0 0
1998 1 1 3 2 2 -1 -1 11 0 0
0 0 0 8.333333333 8.333333483 4.166666642 20.83333331
8.333333333 0 0 0 0 0 0 0 0 0
0 0 6.249999988 14.58333347 10.41666648 16.66666663 0
0 2.083333331 0 0 0 0 0 0
1998 1 1 3 2 5 -1 -1 11 0 0
0 0 3.703703516 12.96296301 7.407407532 16.66666672
5.555555574 1.851851858 1.851851858 0 0 0 0 0
0 0 0 0 2.173913054 26.08695661 8.695652037
4.347826019 6.521739158 2.173913054 0 0 0 0 0
0 0 0
1999 1 1 3 2 2 -1 -1 11 0 0
0 0 0 16.66666667 11.11111101 16.66666667 5.555555557
0 0 0 0 0 0 0 0 0 0 0
0 9.523809512 19.04761902 11.90476202 4.761904766 4.761904766
0 0 0 0 0 0 0 0
1999 1 1 3 2 5 -1 -1 22 0 0
0.862421762 4.382272086 3.449686989 8.333333323 12.28439446
11.42197276 7.721598625 0 1.544319745 0 0 0 0
0 0 0 0 0.442027014 12.07857571 16.45764045
14.68953245 4.749168485 1.58305614 0 0 0 0 0
0 0 0 0
2000 1 1 3 2 2 -1 -1 11 0 0
0 0 9.523809476 33.33333327 4.761904988 0 0
2.380952394 0 0 0 0 0 0 0 0 0
0 6.249999984 15.62499996 21.87499995 6.249999984 0 0
0 0 0 0 0 0 0 0
2000 1 1 3 2 5 -1 -1 55 0 0
0.078649205 0.913048349 6.45641049 12.02027508 6.290980991
12.10193563 8.750185487 0.994708849 1.795354547 0 0
0.598451514 0 0 0 0 0 0.533040589 2.317909692
20.66380247 19.83398497 5.397062992 1.254199143 0 0 0
0 0 0 0 0 0
2001 1 1 3 2 5 -1 -1 66 0 0
0.51367304 0 9.318227498 19.35916595 11.0189605 5.097945399
2.568365199 1.922021 0.20164145 0 0 0 0 0
0 0 0 0 2.403225164 15.944038 24.63258899
6.862917498 0.15723032 0 0 0 0 0 0 0
0 0
2002 1 1 3 2 3 -1 -1 33 0 0
0 4.761904745 9.52380949 9.52380949 16.66666648 7.142857142
0 2.380952397 0 0 0 0 0 0 0 0
0 0 6.179775273 10.67415749 12.92134849 13.48314599
4.494382015 2.247191008 0 0 0 0 0 0 0
0
2002 1 1 3 2 5 -1 -1 44 0
1.113951572 6.126733656 6.683709435 11.11554947 11.67252512
8.86367998 3.317888292 0.548986999 0.556975799 0 0 0
0 0 0 0 0 0.984823688 5.416530283 7.843275722
14.17400197 13.73102947 4.909992989 2.940345553 0 0 0
0 0 0 0 0 0

2003 1 1 3 2 3 -1 -1 33 0 0
0 0 6.250000004 10.00000001 18.75000001 8.750000006
5.000000003 0 0 0 1.250000001 0 0 0 0
0 0 0 0.892857146 15.17857151 12.50000001 13.39285701
7.14285715 0.892857146 0 0 0 0 0 0 0
0
2003 1 1 3 2 5 -1 -1 55 0 0
0.223158714 3.333434186 6.551348972 9.575333709 11.73321495
11.1532897 3.659320134 0 0 3.659320134 0 0
0.111579355 0 0 0 0.036994665 0.163818584 0.525228923
23.6282209 13.51308794 7.279589469 4.853059664 0 0 0
0 0 0 0 0 0
2004 1 1 3 2 5 -1 -1 77 0
0.23139281 1.851142466 0.809874851 9.220089506 9.467796556
10.65738901 7.104925955 7.815418555 1.420985201 0.7104926 0
0 0.710492595 0 0 0 0 0 0.58944484
2.003756441 11.50671901 28.08653302 6.335308004 1.055884706
0.21117694 0 0 0.21117694 0 0 0 0 0
2005 1 1 3 2 5 -1 -1 55 0 0
0.133670835 1.278163947 3.567149992 9.739020377 27.27308094
3.192871792 1.064290597 2.155315345 1.064290597 0.532145299 0
0 0 0 0 0 0 0.024493995 0.07348199
6.948233984 19.52667695 20.50178595 2.925327408 0 0 0
0 0 0 0 0 0
2006 1 1 3 2 5 -1 -1 55 0
0.23482372 1.439210283 1.401035648 0.624533499 3.729489194
10.82416748 21.96266091 5.99826634 2.249349896 0.786679749
0.749783294 0 0 0 0 0 0 0.119215485
1.146423848 0.692375069 10.40201348 21.29438796 8.768277485
7.515666292 0.06164036 0 0 0 0 0 0 0
0
2007 1 1 3 2 5 -1 -1 55 0
0.09690523 1.931419319 6.760821683 3.656920018 8.035210589
7.932837039 8.15311599 9.883700298 1.706496658 0.136076751
1.706496673 0 0 0 0 0 0 0 1.377738772
4.02929953 12.55906006 10.90620705 12.33774056 8.789953773 0
0 0 0 0 0 0 0 0
2008 1 1 3 2 5 -1 -1 33 0 0
2.87060786 9.226719435 12.10242398 6.20196304 7.057199488
6.781181389 3.167013095 2.162724896 0 0.430166604 0 0
0 0 0 0 0 0.983916263 8.634743941 8.112215987
11.82446798 11.31358498 1.729860587 5.189581766 2.211628706 0
0 0 0 0 0 0
2009 1 1 3 2 2 -1 -1 55 0 0
0 0 0 7.999999996 9.999999996 7.999999996 3.999999998
1.999999999 11.99999999 5.999999997 0 0 0 0 0
0 0 0 1.923076924 11.53846149 21.15384599 5.769230997
1.923076924 5.769230767 1.923076924 0 0 0 0 0
0 0
2009 1 1 3 2 7 -1 -1 33 0 0
0.743143373 6.19286143 6.33915348 6.091439281 7.344968477
5.479631483 5.479631483 5.479631483 5.479631483 1.369907871 0
0 0 0 0 0 0 0 0.689251348 10.02342197
13.09577546 12.40652446 11.71727288 2.067754038 0 0 0
0 0 0 0 0

2009 1 1 3 2 6 -1 -1 11 0 0
1.162790694 2.325581388 4.651162977 18.60465106 8.13953496 0
9.302325554 1.162790694 4.651162777 0 0 0 0 0
0 0 0 0 0 14.28571443 28.57142836 0
7.14285711 0 0 0 0 0 0 0 0 0
2010 1 1 3 2 2 -1 -1 11 0 0
0 0 0 0 40 10 0 0 0 0 0
0 0 0 0 0 0 0 0 12.5 12.5 0
12.5 0 0 0 12.5 0 0 0 0 0
2010 1 1 3 2 7 -1 -1 44 0 0
0 3.989742948 4.805517498 5.363500947 10.16913599 9.203324295
5.327582797 6.779424147 1.944117699 1.451841319 0.47978247
0.486029425 0 0 0 0 0 0 6.637988737
9.474191495 11.35990349 15.69566549 5.469327197 0.68586978 0
0.677054265 0 0 0 0 0 0
1960 1 2 3 2 6 -1 -1 6 0 0
0 12.5 4.166666501 8.333333352 4.166666501 12.5 2.083333351
4.166666651 2.083333351 0 0 0 0 0 0 0
0 1.73611111 5.902777781 6.250000002 9.027778002 10.0694445
12.84722222 3.819444446 0.34722222 0 0 0 0 0
0 0
1961 1 2 3 2 6 -1 -1 6 0 0
0 6.603773565 7.54716996 12.26415089 2.830188485 6.603773565
8.490566005 2.830188685 1.88679244 0.94339622 0 0 0
0 0 0 0 0 10.63829781 15.95744692 8.510638455
5.319148972 4.255319127 4.255319127 0 0 0 0 0
0 0 1.063829779
1964 1 2 3 2 6 -1 -1 6 0 0
0 1.744186055 7.558139522 16.86046515 13.37209304 4.069767462
2.906976758 1.744186055 0.581395352 0.581395352 0.581395352 0
0 0 0 0 0 0.438596491 5.26315791 12.71929804
19.29824556 6.578947519 2.631578953 0.877192983 0.877192983
1.315789479 0 0 0 0 0 0
1965 1 2 3 2 6 -1 -1 6 0 0
0 4.807692286 2.884615492 13.46153841 13.46153846 6.73076923
4.807692286 0.961538447 0.961538447 0 1.923076919 0 0
0 0 0 0 2.083333329 15.62499995 7.291666479
11.45833347 8.333333476 4.166666653 0 0 0 0
1.041666662 0 0 0 0
1966 1 2 3 2 3 -1 -1 144 0 0
0 0 1.307588498 10.01539943 12.35954598 8.422445085
5.903781289 4.451743792 3.376926594 1.433961907 1.323266053
0.485186564 0.444406429 0.06397125 0.411777169 0 0 0
0 1.257540498 13.70639098 14.68710197 9.148559654 5.297420645
3.191461394 1.265997028 0.616593339 0.323498304 0.254264465
0.251171685 0 0
1966 1 2 3 2 6 -1 -1 18 0 0
0.307521909 6.666896539 15.66252097 8.040196936 7.902866987
6.359374639 1.265890848 1.743604597 0.752373849 0.615043819
0.615043819 0.06866502 0 0 0 0 0 0.321424644
9.665718349 22.91762396 8.293230486 6.01799999 2.143907071
0.575810634 0.06428493 0 0 0 0 0 0 0
1967 1 2 3 2 3 -1 -1 168 0 0
0 0.53965345 1.611931999 8.337741093 15.01140249 9.406135142
5.913216695 3.677879047 1.946916748 1.803371094 0.816503119
0.561572875 0.15403358 0.118994345 0.100648385 0 0

0.077644 0.3481226 2.935032498 13.24008949 17.07326349
8.218693583 3.966430702 2.415150418 1.028539109 0.5384818
0.158552255 0 0 0 0
1967 1 2 3 2 6 -1 -1 18 0 0
0 0 1.013195997 3.84615384 4.249436989 7.485677681
13.96813641 10.12198257 3.442870841 5.065979802 0.403282979 0
0 0.403282979 0 0 0 0 0.452460924 5.485106486
11.51197847 11.69207197 10.27762815 4.00766177 3.82905363
2.140757274 0.452460924 0.15082031 0 0 0 0
1968 1 2 3 2 3 -1 -1 138 0 0
0 0.275313601 2.402678007 4.583209813 10.69535153 14.29401764
7.793539122 3.51749071 2.775536308 1.80033897 0.973967068
0.576306237 0.160462035 0.074738175 0.077050705 0 0 0
0.827384107 2.845260008 7.484786021 16.44536855 14.63715128
5.155759655 0.890246123 0.911460578 0.423771611 0.06316119
0.215656441 0.09999452 0 0
1968 1 2 3 2 6 -1 -1 66 0 0
0.0843063 0.333288399 2.513781995 10.11500203 13.61753198
7.916070036 5.029044191 4.561559192 2.952487395 1.173032313
0.866488443 0.586910734 0.21890416 0.02103234 0.010560405 0
0 0.308238904 1.174480063 4.867839491 14.87255647 14.94322397
7.004370402 4.659898852 1.511035492 0.480849849 0.17750659 0
0 0 0 0
1969 1 2 3 2 3 -1 -1 180 0 0
0 0.707352848 6.432922982 8.907831726 6.870415981 10.65992792
8.458809077 3.851599689 1.755517995 1.084758832 0.435179539
0.423123074 0.227257884 0.124598165 0.0607045 0 0
0.15882628 1.624271831 6.454595982 12.12334897 10.13955747
10.41991466 5.39191565 2.719718038 0.518830169 0.211054859
0.07932196 0.07932196 0 0.07932196 0
1969 1 2 3 2 6 -1 -1 30 0 0
0 0 1.588370002 5.647706807 12.19124702 11.12480321
6.680583209 5.438844657 3.070852054 1.261917432 2.561097818
0.434577856 0 0 0 0 0 0 1.539162292
8.919005012 9.657498513 14.07390402 7.690465275 5.868707498
1.847251052 0.398162861 0 0.005843415 0 0 0 0
1970 1 2 3 2 3 -1 -1 162 0 0
0 0.14546215 4.638725504 8.380824608 9.770150009 5.785756755
7.793604307 6.780484706 3.380521403 1.193207771 1.109669936
0.40029576 0.302424595 0.116814475 0.202058295 0 0 0
0.43625728 7.795692507 12.33027201 11.09902451 8.010997342
6.612985351 2.024674147 1.215067841 0.313970025 0.16105871 0
0 0 0
1970 1 2 3 2 6 -1 -1 72 0 0
0.970986783 6.709267988 11.35960648 6.820430388 6.934607488
6.753216338 3.931280043 2.845540395 2.410790646 0.776962419
0.296354284 0.11147787 0.07947886 0 0 0 0
2.064616021 12.71057662 16.38095747 7.865286986 4.526227492
3.628777128 1.699817192 0.416092104 0.383592659 0.162028175 0
0.162028175 0 0 0
1971 1 2 3 2 6 -1 -1 54 0 0
0.101942876 6.800558634 15.60005408 12.58841666 5.310138526
4.357673122 2.763126414 1.683547258 0.341912202 0.244261866
0.106425621 0.101942876 0 0 0 0 0 0.358236452
9.189047855 25.03394112 10.61088305 3.439862517 0.961927905

0.391104707 0.005070475 0.00992578 0 0 0 0 0
0
1972 1 2 3 2 3 -1 -1 54 0 0
0.396674369 3.412648644 8.895973485 15.40557267 7.772704987
5.056447791 3.059289145 2.084389346 2.450212096 0.547187594
0.461822329 0.091974905 0.18301744 0.09104254 0.09104254 0
0 0.11713711 3.002924295 12.85333598 17.55721747 7.256399488
4.462193992 1.838708172 0.681101139 1.457240968 0.423517619
0.234274215 0.11594967 0 0 0
1972 1 2 3 2 6 -1 -1 84 0 0
0.079426165 1.579203602 8.03229701 14.34656712 8.00484601
4.814492356 3.766664405 4.906439006 2.074855853 1.020469216
0.659903906 0.2382785 0.476556996 0 0 0 0
0.06442578 4.04470248 15.35476852 17.14904352 6.818518509
2.618023838 1.974985283 1.523057477 0.317576115 0.13489833 0
0 0 0 0
1973 1 2 3 2 3 -1 -1 54 0 0
0.38786897 3.323829952 10.28349951 8.164019105 9.823355006
6.137096904 3.337873152 3.298342402 1.260399051 1.545524301
0.764952095 0.65260154 0.23788502 0.435941985 0.346810915 0
0 0.518853435 1.853943616 8.612254005 15.30976401 12.23424951
5.449149453 2.996070477 1.241910991 0.581309795 0.60754212 0
0.18967886 0.133596455 0.133596455 0.138080915
1973 1 2 3 2 6 -1 -1 30 0 0
0 3.22929341 10.89637103 14.12353594 11.57572553 5.052968015
1.932454106 1.213471004 0.712583952 0.757020162 0.16157111
0.206007316 0.13899821 0 0 0 0 0.320812576
4.796521734 17.52197905 13.62301354 9.937142029 2.935974324
0.612510232 0.12602336 0 0.12602336 0 0 0 0
0
1974 1 2 3 2 3 -1 -1 36 0 0
0.423328834 1.023692447 2.558913993 6.258364682 8.319680477
11.18734762 6.116776383 5.496110385 2.919796342 2.572001718
1.020122732 1.026935527 0.219926654 0.426860659 0.430141634 0
0 0 0.936716642 2.853077992 7.729240478 12.59198546
11.91105043 7.02874486 2.484400723 1.731106825 1.575537296
0.575299018 0.142900565 0.297039059 0 0.142900565
1974 1 2 3 2 6 -1 -1 132 0 0
0 2.7688874 8.935357001 16.3890748 12.5357205 5.779816801
1.97358805 0.88611605 0.2833639 0.38096403 0 0.067111645
0 0 0 0 0 0.276064445 4.96911868 18.0677175
17.272008 7.692607001 1.313415735 0.316974105 0.026556095
0.01327805 0.052260205 0 0 0 0 0
1975 1 2 3 2 3 -1 -1 30 0 0
0.41995758 0.5635925 6.687877502 10.6411641 9.543207503
9.593391103 7.171556003 2.381941701 1.2007341 0.484336315
0.98935076 0.16144544 0.16144544 0 0 0 0 0
0.384658215 10.355194 13.229311 17.48498701 6.198307437
1.723795031 0 0 0.170505415 0.453241835 0 0 0
0
1975 1 2 3 2 6 -1 -1 72 0 0
0 0.3602507 5.450261996 10.99297059 14.20445049 8.284666643
6.194792195 1.752122449 1.128956099 0.603884725 0.518642455
0.3288763 0.08524227 0 0.094883075 0 0 0.161507525
0.960839979 10.13746649 17.23285399 14.60418549 3.794775657

2.074982313 0.476317405 0.395563645 0 0.161507525 0 0
0 0
1976 1 2 3 2 6 -1 -1 30 0 0
0 1.101840243 1.142635493 7.271119207 14.07412892 11.52941328
8.214977251 2.924773383 2.428210236 0.78774121 0.525160807 0
0 0 0 0 0 0.428672242 0.842315485 7.606819955
14.43504391 14.86531591 7.080612643 2.207080032 1.364764542
1.169375248 0 0 0 0 0 0
1977 1 2 3 2 3 -1 -1 42 0 0
0.169975585 3.242640745 8.428051987 13.58752423 11.80522648
6.948079689 3.128355695 1.196900048 1.050587998 0.08957384
0.315540984 0.03754286 0 0 0 0 0 0.702955724
1.948894567 9.515163485 18.64197747 11.48281348 5.389590191
1.655093842 0.540064029 0.12344707 0 0 0 0 0
0
1977 1 2 3 2 6 -1 -1 6 0 0
0 0 0 0 13.33333346 11.66666662 14.99999996
3.33333334 6.66666663 0 0 0 0 0 0 0
0 0 0 6.428571481 11.42857147 19.99999994 7.857142832
1.428571426 1.428571426 0.714285713 0.714285713 0 0 0
0 0
1978 1 2 3 2 3 -1 -1 36 0 0
0 7.700067183 3.097248493 7.668408333 8.490779981 8.344288332
7.123316284 3.006212243 1.688819046 0.839344798 1.287136827
0.249114139 0.271736449 0.083038045 0.150490175 0 0 0
4.44133259 2.659282994 12.60326897 11.60105447 8.631049981
3.421185832 4.278197906 1.528204627 0.557614864 0.18587162
0.09293581 0 0 0
1978 1 2 3 2 6 -1 -1 12 0 0
0 0 1.438953498 3.691864294 11.68604298 9.796507084
7.281974988 5.755814291 5.305232142 2.790700016 1.351746443
0.450582149 0.450582149 0 0 0 0 0 0.896884494
3.190116995 4.022556494 8.517728486 13.53383716 10.76798876
6.07948098 2.491943016 0.499463574 0 0 0 0 0
1979 1 2 3 2 3 -1 -1 72 0 0
0.15998949 1.769116104 8.624238518 12.08393803 7.952273017
5.311720511 4.268019759 2.857344856 2.409898855 2.056972009
1.415290743 0.270793546 0.256159501 0.149137205 0.415107971 0
0 0 1.269728318 10.45649852 12.75528753 9.56637002
8.060461882 3.833847303 2.455503305 0.940565727 0.258449776
0.273286091 0.13000142 0 0 0
1979 1 2 3 2 6 -1 -1 18 0 0
0 0 1.730660993 1.894687843 3.615970486 3.350374437
6.949383223 10.15269246 5.730656928 6.735769019 3.474691621
4.300611673 1.912746528 0 0.151754619 0 0 0 0
5.622904478 6.418150475 13.70403445 8.96871445 6.962433643
4.470887598 2.50501568 1.078287521 0.269571879 0 0 0
0
1980 1 2 3 2 3 -1 -1 48 0.711057473
0 0.689010178 10.32905202 10.32984247 13.04467266 4.892853987
3.141153342 1.544838396 0.730572798 0.885046248 1.71652543
1.089882342 0.421621014 0.421621014 0.026125265 0.026125265 0
0 0.08111392 8.692692652 11.08649047 12.81663497 4.510433988
5.231571491 2.179624599 1.055796232 1.573345331 0.930660952
0.507074499 0.444853664 0.444853664 0.444853664 0

1980 1 2 3 2 6 -1 -1 84 0 0
0 0.528190849 4.112061995 7.257285442 7.575582991 6.929953542
4.725836145 3.661308996 3.842071146 3.688103311 3.839313366
1.762564013 1.123893584 0.830443269 0.123391285 0 0 0
1.499934963 6.356744993 13.97757648 8.063305491 6.078989593
4.287147535 3.412179571 3.048826346 1.439402253 0.601599304
0.837602624 0.387137435 0 0.009553475
1981 1 2 3 2 4 -1 -1 48 0 0
4.888700269 3.483322606 9.837155018 12.34257417 9.083563017
3.692898907 1.343794952 0.553629151 1.274472152 0.730491691
1.545882473 0.371103891 0.341028221 0.09838005 0.413003506 0
0.503284511 10.31425874 3.007395456 14.32878903 8.566582516
3.974626007 2.008537979 2.066888519 0.471855961 1.464014503
0.904351692 1.132035932 0.573176171 0.300767726 0.1125147
0.270920481
1982 1 2 3 2 4 -1 -1 6 0 0
0 4.929577429 12.67605645 9.154929561 10.56338046 3.521126735
2.112676041 0.704225347 1.408450694 0.704225347 0.704225347
0.704225347 2.112676046 0 0.704225347 0 1.785714277
14.28571422 23.21428562 7.14285697 1.785714492 0 0 0
0 0 0 0 0 0 0 1.785714277
1985 1 2 3 2 4 -1 -1 18 0 0
0 2.356331644 12.82759797 15.51152766 8.706984978 5.790175786
1.373537647 1.373537647 1.373537647 0 0.686768823 0 0
0 0 0 0 2.173182285 3.257324087 26.39452793
12.19606997 2.255752994 0.446965459 0.382871114 0 0.765742228
0 0.596079674 0 0.382871114 0.765742228 0.382871114
1986 1 2 3 2 4 -1 -1 30 0 0
0.590958353 10.52602755 14.00548057 8.52323434 10.76264405
3.373725016 1.175826955 0.264920351 0.08160505 0 0.04959157
0 0 0.430657522 0.215328761 0 0 1.1751823
7.140605758 21.4262361 12.04038006 4.774011522 2.388180681
0.627311003 0.234858061 0 0 0 0 0 0.193234436
0
1987 1 2 3 2 4 -1 -1 54 0 0
1.174558953 11.81385703 16.38445547 10.17220878 6.670723486
3.484395343 0.299801149 0 0 0 0 0 0 0
0 0 0 0.308750409 13.08071441 19.50795796 12.16317148
3.552738993 1.386666552 0 0 0 0 0 0 0
0 0
1988 1 2 3 2 4 -1 -1 36 0 0
0.552816533 10.15185856 20.07134543 10.14360157 6.927282976
0.473440748 1.206213546 0.248573499 0 0 0.12428675 0
0 0 0.1005805 0 0 0.993057262 12.59205825
28.0242154 7.215329475 1.175339496 0 0 0 0 0
0 0 0 0 0
1989 1 2 3 2 4 -1 -1 42 0 0
0 4.091702689 15.95491146 14.13500201 8.914706975 4.844628537
1.375848996 0.231832599 0.225683399 0 0 0.225683419 0
0 0 0 0 3.074690547 6.635066722 16.98879695
17.78020145 3.150918491 1.318604836 0.704302633 0 0 0
0 0.347418284 0 0 0
1990 1 2 3 2 4 -1 -1 36 0 0
4.985552897 4.565161242 19.22659847 12.09459653 7.340417988
1.787672697 0 0 0 0 0 0 0 0 0
0 0 1.343406613 9.11622413 21.81134196 12.88264398

4.846383492 0 0 0 0 0 0 0 0 0
0
1991 1 2 3 2 4 -1 -1 30 0 0
0 4.112495941 9.599632479 9.621098879 13.76082547 10.77382253
1.493501597 0.638622899 0 0 0 0 0 0
0 0 3.830331987 7.676726028 19.51164196 9.547423979
8.077458482 1.117496428 0.238921349 0 0 0 0 0
0 0 0
1992 1 2 3 2 4 -1 -1 30 0 0
3.42177416 12.74665427 12.62311202 10.57270472 4.446115007
3.809126056 1.345679302 0.2449479 0.394943151 0.394943166 0
0 0 0 0 0 0 3.930481541 10.3377952
16.84598153 9.409381015 4.226439507 3.02333483 1.254572042
0.444061786 0 0 0.527952806 0 0 0 0
1993 1 2 3 2 4 -1 -1 36 0 0
0.335611776 7.785278012 17.93414803 13.82540767 5.017270508
2.590354504 1.582420602 0.929508851 0 0 0 0 0
0 0 0 0 0 9.262998489 19.14324003 16.23360152
5.360160008 0 0 0 0 0 0 0 0 0
0
1994 1 2 3 2 4 -1 -1 42 0 0
0.847752826 8.927323164 14.07409002 16.84564483 5.147211508
2.963691955 0.848233151 0.21434605 0.1317065 0 0 0
0 0 0 0 0 1.259772002 11.22079137 18.04729653
13.08767502 4.746564507 0.245751545 0.685708001 0.07066348 0
0 0 0.635777546 0 0 0
1995 1 2 3 2 4 -1 -1 12 0 0
2.190934583 1.545327102 12.24588802 13.14560747 9.017850514
8.118130862 3.090654205 0 0.645607451 0 0 0 0
0 0 0 0 0 3.45208407 16.21375152 11.03562502
11.71499802 1.726042033 5.857499134 0 0 0 0 0
0 0 0
1996 1 2 3 2 4 -1 -1 18 0 0
0.700434193 4.862601574 20.4861931 12.86229266 3.774357518
4.416143171 2.547760962 0.350217102 0 0 0 0 0
0 0 0 2.473022662 0 6.978418154 16.30326008
18.61925709 0.937673505 3.750694583 0 0 0 0
0.937673645 0 0 0 0
1997 1 2 3 2 4 -1 -1 18 0 0
0.291747521 5.790094513 6.545575015 12.76013908 15.00479053
7.089806716 2.517846556 0 0 0 0 0 0 0
0 0 0 0 9.215525936 17.86644904 11.18708653
8.019628018 1.916521214 1.794789334 0 0 0 0 0
0 0 0
1998 1 2 3 2 2 -1 -1 24 0 0
0.765971352 2.422415905 9.418934021 5.142358211 6.633679015
11.71254978 5.478271162 5.284287362 1.570766603 0 0 0
0 1.570766598 0 0 0 0 6.515919304 15.53332053
11.89188853 9.504537521 3.549220373 3.005113737 0 0 0
0 0 0 0 0
1998 1 2 3 2 4 -1 -1 12 0 0
0 3.473134051 16.395575 11.48310235 6.101386002 3.942377701
2.628251801 2.628251801 1.3141259 2.033795291 0 0 0
0 0 0 0 0.97873892 0.97873892 30.12763301
8.468075003 6.680885002 2.765929241 0 0 0 0 0
0 0 0 0

1998 1 2 3 2 5 -1 -1 60 0 0
0.372153943 3.828530484 13.56588044 12.81784675 9.973805459
5.341091928 2.44974399 1.005133946 0.406947548 0.025261565 0
0 0.213603964 0 0 0 0 0.651564592 5.572973262
17.43762343 13.03499945 5.672749977 5.501984862 2.084810286 0
0.043294125 0 0 0 0 0 0
1999 1 2 3 2 2 -1 -1 24 0 0
1.620405878 1.938541954 16.01356303 15.97895678 6.271078012
3.938011557 3.854826457 0.384616201 0 0 0 0 0
0 0 0 0.15333699 0 6.744216492 31.71833006
9.631975018 1.270319002 0.302042466 0 0.179780105 0 0
0 0 0 0 0
1999 1 2 3 2 5 -1 -1 54 0
0.211967991 0.835241978 9.76987904 14.37853606 8.882352436
9.172195037 2.304309309 2.224435609 1.112711655 0.742155403
0.211967991 0.077123795 0 0.077123795 0 0 0
0.05862904 1.887405733 13.3614458 18.59324608 10.98534754
3.412206514 0.829061263 0.139378506 0.391896602 0.139378506
0.06262581 0 0 0 0 0.139378506
2000 1 2 3 2 5 -1 -1 72 0 0
0.33020944 2.750932899 11.76872549 15.77356759 9.114589495
6.231976447 2.299923349 1.093991749 0.4649172 0.171166175 0
0 0 0 0 0 0 1.347550259 9.5421187
17.11488549 11.62636849 8.819745496 1.549331719 0 0 0
0 0 0 0 0 0
2001 1 2 3 2 5 -1 -1 60 0
0.374937441 2.055575814 6.183888311 12.59944352 15.98837653
8.420974515 2.234888954 1.426756603 0.400441851 0.072577 0
0.20991781 0.032221805 0 0 0 0 1.688666438
2.328997194 10.24082668 22.00104004 11.96453402 1.693885503
0.02213667 0.059913295 0 0 0 0 0 0 0
0
2002 1 2 3 2 3 -1 -1 36 0 0
0 3.50145641 12.48398904 12.12256444 12.96336654 5.758110717
2.446461357 0 0.412791851 0 0.311259741 0 0 0
0 0 0 0 8.149085894 19.47819856 10.36514003
7.736951522 4.270623912 0 0 0 0 0 0 0
0 0
2002 1 2 3 2 5 -1 -1 60 0
0.029499025 3.087590395 12.57719558 12.31896298 8.217440187
7.252803489 3.719282594 1.588360648 0.648122699 0 0.526679074
0.0340636 0 0 0 0 0 0.05992565 5.440177422
20.55810786 10.84256898 8.311579987 3.157586995 1.293791798 0
0.336261034 0 0 0 0 0 0 0
2003 1 2 3 2 3 -1 -1 18 0 0
0 1.984113294 7.722858976 7.417478277 8.669022474 19.20035034
5.006176485 0 0 0 0 0 0 0 0 0
0 0 4.508838581 24.56013843 12.28006946 3.005892491
3.885615323 1.75944587 0 0 0 0 0 0 0
0
2003 1 2 3 2 5 -1 -1 114 0
0.572318973 2.121446908 8.051815672 22.47790292 8.055004672
4.715487483 1.748791994 1.321555845 0.445466298 0 0
0.174714789 0 0 0.140779525 0.174714789 0 0.288718724
5.765100435 15.43571126 23.18290842 3.346146488 1.550838495

0.217029009 0.005579125 0.207968174 0 0 0 0 0
0 0
2004 1 2 3 2 3 -1 -1 18 0 0
0 3.302661204 7.099040008 21.94419752 7.260809508 3.464430704
3.796378604 2.306817503 0.825665301 0 0 0 0 0
0 0 0 0 7.341286673 17.13560852 22.72727253
1.046209501 0 1.749622427 0 0 0 0 0 0
0 0
2004 1 2 3 2 5 -1 -1 108 0
0.015206375 0.320330452 3.506825418 6.735444035 26.74908559
6.650338035 1.298338707 3.037382866 0.516219153 0.707900154
0.110559336 0.352369852 0 0 0 0 0 0.098448066
0.801541984 7.338849069 16.38023459 19.1065726 3.90469902
1.137223841 0.87219118 0.360239682 0 0 0 0 0
0 0
2005 1 2 3 2 5 -1 -1 108 0
0.00703041 0.702152986 1.991406202 4.732608506 10.04990926
19.45778952 6.004818407 3.461434604 1.461172252 1.159991801
0.709084346 0.131301055 0.131301055 0 0 0 0 0
1.912475792 4.859582886 9.475802011 15.82885802 14.23823752
2.284877593 0.808122416 0.254000225 0.33804313 0 0 0
0 0 0
2006 1 2 3 2 5 -1 -1 84 0 0
1.127845006 4.489409005 8.059273008 9.28737781 9.27369651
10.04796836 4.347150155 1.323167901 0.974952951 0.817685431
0.25147406 0 0 0 0 0 0 2.786701298
11.39871273 6.279083507 11.10981651 11.02235901 6.131828871
0.21486872 0.564126031 0.492503126 0 0 0 0 0
0
2007 1 2 3 2 2 -1 -1 6 0 0
0 7.5 12.5 12.5 15 0 2.5 0 0 0 0
0 0 0 0 0 0 0 0 25 0 20
0 5 0 0 0 0 0 0 0 0
2007 1 2 3 2 5 -1 -1 96 0 0
0.353594101 3.206826955 6.259908009 8.945203763 9.697409014
7.21981151 9.369079164 2.518737054 1.022282801 0.469915481
0.32938909 0.20454782 0.2006569 0 0.202638385 0 0
0.377396141 4.342143571 7.306008511 13.31559552 10.73019752
9.919996819 3.67858477 0.110426635 0.146433645 0.03680888 0
0.036407945 0 0 0
2008 1 2 3 2 2 -1 -1 18 0 0
0 3.750000014 15.00000005 13.75000005 5.000000018 1.250000005
3.750000014 5.000000018 1.250000005 0 1.250000005 0 0
0 0 0 0 0 10.60606064 19.69696957 9.090909033
7.575757528 3.030303041 0 0 0 0 0 0 0
0 0
2008 1 2 3 2 5 -1 -1 102 0 0
1.760355143 4.759675796 10.06634049 9.527121391 6.296775994
4.866350446 5.311843295 4.287155146 0.890860499 0.837015194
0.526378585 0.06872575 0.302314145 0.196001825 0.303086205 0
0 1.062230964 5.42588805 13.64925399 14.84552799 7.438895493
3.030064047 2.010564038 1.868991223 0.41997515 0 0
0.248609155 0 0 0
2009 1 2 3 2 2 -1 -1 36 0 0
1.955990289 2.043437249 15.41785099 7.681336547 16.77107349
3.911980598 0.08744695 1.955990299 0 0 0 0.087446965

0.087446965 0 0 0 0 0 8.451790286 14.63656349
12.77214949 5.841775497 4.071825733 0 2.112947574 2.112947574
0 0 0 0 0 0
2009 1 2 3 2 7 -1 -1 48 0 0
0.435652391 7.524820509 12.21790051 9.821812362 7.900953009
3.564372354 1.386110402 2.217838603 1.603936602 0.910881406
0.950458031 0.732631836 0.039576625 0.217826195 0.475229016 0
0 0 12.02039689 16.61842602 10.02905751 5.792833007
3.258503824 1.411886272 0.398267865 0.07236089 0 0
0.398267865 0 0 0
2009 1 2 3 2 5 -1 -1 6 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
2010 1 2 3 2 2 -1 -1 48 0 0
0 2.058362255 13.85041053 11.93038323 9.481196522 5.227846712
4.44790751 1.501946503 0 0.750973242 0.750973242 0 0
0 0 0 0 1.99089546 4.061663024 10.35383802
13.95889153 8.283070019 1.534285969 7.746588663 0 2.070767565
0 0 0 0 0 0
2010 1 2 3 2 7 -1 -1 18 0 0
0 9.209911155 14.21640451 12.85079301 8.602623504 2.581814201
2.538453401 0 0 0 0 0 0 0 0 0
0 0 7.179718119 17.01118051 13.08086501 4.151215002
7.624019189 0.9530024 0 0 0 0 0 0 0
0
1969 1 3 3 2 3 -1 -1 12 0 0
0 1.388888906 23.6111111 11.11111115 4.166666517 4.166666667
2.777777812 2.777777812 0 0 0 0 0 0 0
0 0 0 3.333333349 20.00000008 26.66666661 0 0
0 0 0 0 0 0 0 0 0
1978 1 3 3 2 3 -1 -1 12 0 0
0 0.55555555 3.888888997 11.66666664 9.999999994 6.666666646
7.222222195 4.999999997 3.333333348 0.555555555 1.111111109 0
0 0 0 0 0 0 0 24.99999998 18.74999999
0 6.249999996 0 0 0 0 0 0 0 0
0
1980 1 3 3 2 3 -1 -1 48 0 0
0 0.43697645 2.250934498 7.681957395 10.81661649 8.883256594
7.838884995 5.882536896 1.799694849 1.239597139 1.526777579
0.70012214 0.724156889 0 0.218488225 0 0 0.04694253
0.04694253 4.149565997 10.49600699 8.217826994 9.641932058
7.66665488 2.830145713 1.787507059 2.991962008 1.304006719 0
0.820506379 0 0
1981 1 3 3 2 4 -1 -1 24 0 0
0 1.2775099 4.985193001 7.615703001 9.093549501 4.709366351
7.339876251 3.356366351 3.356366351 4.032866336 1.47784653
0.400673265 0.20033663 1.2775099 0.876836635 0 0 0
0.17153922 10.789579 10.488762 10.789579 8.365652721
2.01620899 4.847852411 1.265413325 0.514617665 0.75079566 0
0 0 0
1982 1 3 3 2 4 -1 -1 12 0 0
0 0 1.250000002 10.00000002 5.000000008 11.25000002
6.25000001 7.500000012 1.250000002 1.250000002 1.250000002
3.750000006 1.250000002 0 0 0 0 0 0.862068966

5.172414008 21.55172403 6.896551511 10.3448276 2.586206899
0.862068966 0.862068966 0.862068966 0 0 0 0 0
1983 1 3 3 2 4 -1 -1 36 0 0
0 0.36158685 0.834840001 5.535468907 5.647135007 9.013082862
3.089438604 4.535786006 4.674040606 4.870784391 3.116027079
3.674357705 2.504519498 1.308092812 0.834839831 0 0
1.130695756 8.480218191 10.65846651 6.917195009 3.957435005
6.917195064 2.569004123 2.003656248 1.829064147 0.349184195 0
0.349184195 1.438308367 0.523776291 2.876616734
1984 1 3 3 2 4 -1 -1 24 0 0
0 0.8686552 3.1794875 3.1739055 3.611023999 4.468515649
8.494330999 4.036978899 2.736787 3.02075697 5.905110734
3.741845414 3.883830389 0.72108844 2.15768355 0 0
2.50107372 15.8580289 8.322595999 9.174182499 3.331186
6.105384604 0.83011217 3.0473237 0.83011217 0 0 0
0 0 0
1986 1 3 3 2 4 -1 -1 12 0 0
0 1.923076902 3.846154003 11.53846156 26.92307702 5.769230755
0 0 0 0 0 0 0 0 0 0 0
0 10.86956522 21.73913052 6.521739006 10.86956501 0 0
0 0 0 0 0 0 0 0
1987 1 3 3 2 4 -1 -1 12 0 0
0 0 9.523809495 7.142857146 11.90476199 9.523809495
4.761904748 4.761904748 2.380952399 0 0 0 0 0
0 0 0 0 12.49999999 0 0 24.99999999
12.49999999 0 0 0 0 0 0 0 0 0
1989 1 3 3 2 4 -1 -1 72 0 0
0 1.886792446 5.660377489 10.37735848 10.69182398 10.37735848
5.03144654 3.144654094 1.886792446 0.943396223 0 0 0
0 0 0.442477874 0 1.769911502 11.06194688 17.69911497
6.637167987 9.292035482 1.769911502 0.442477874 0.884955748 0
0 0 0 0 0 0
1990 1 3 3 2 4 -1 -1 24 0 0
0 2.072222405 13.66435253 7.447685469 5.375463014 6.996295518
2.462036556 2.462036556 3.303240658 0 2.072222395 0
2.072222395 2.072222395 0 0 0 0 5.005345948
16.03133404 18.95262805 3.93659051 3.206266818 2.867834737 0
0 0 0 0 0 0 0
1991 1 3 3 2 4 -1 -1 96 0 0
0 1.464048102 7.305482008 15.52796262 12.62938301 8.710496609
3.401353804 0.961273651 0 0 0 0 0 0 0
0 0 0 1.757182812 9.61136551 16.66666652 15.81464552
4.39295703 0.878591406 0 0 0 0.878591406 0 0
0 0
1992 1 3 3 2 4 -1 -1 36 0 0
3.234029008 6.468058016 10.98587453 6.468058016 7.648956518
9.804975874 3.234029008 2.156019355 0 0 0 0 0
0 0 0 0 4.197792815 19.69137029 13.00307553
3.701501509 7.403003018 1.201953913 0.600976956 0.20032565 0
0 0 0 0 0 0
1993 1 3 3 2 4 -1 -1 36 0 0
0 2.272727255 9.090909019 6.818181814 7.954545516 7.954545466
14.77272728 1.136363652 0 0 0 0 0 0 0
0 0 0 4.929577475 16.90140853 9.154929519 9.154929519
5.633802827 1.408450708 1.408450708 1.408450708 0 0 0
0 0 0

1994 1 3 3 2 4 -1 -1 60 0 0
0.579316954 3.045469996 10.70520599 14.72845513 8.498046988
4.162326144 3.754751245 3.056626496 1.469800748 0 0 0
0 0 0 0 0 2.277045217 7.908852364 22.42630647
9.640968987 3.710390995 1.601392933 1.758174198 0.676869154 0
0 0 0 0 0 0
1995 1 3 3 2 4 -1 -1 60 0 0
0.46728972 2.3364486 9.345794499 14.95327105 8.411214999
6.542056049 3.738317749 1.8691589 0.93457945 0.46728972
0.46728972 0 0.46728972 0 0 0 0 1.333333335
3.999999999 12.6666665 18.6666665 9.333333499 2 2 0
0 0 0 0 0 0 0
1996 1 3 3 2 4 -1 -1 12 0 0
2.173913037 4.347826084 8.695651968 10.86956516 15.21739144
4.347826084 0 2.173913042 0 0 2.173913037 0 0
0 0 0 0 4.16666665 0 20.83333342 8.333333469
12.49999995 4.16666665 0 0 0 0 0 0 0
0 0
1997 1 3 3 2 4 -1 -1 24 0 0
3.17460318 3.174603155 5.555555509 15.87301587 10.31746052
8.730158764 2.380952404 0.793650801 0 0 0 0 0
0 0 0 0 5.555555564 9.722222235 4.166666506
19.44444453 4.166666506 4.166666671 2.777777784 0 0 0
0 0 0 0 0
1998 1 3 3 2 3 -1 -1 24 0 0
0 3.846153861 3.846154011 13.46153849 7.692307522 11.53846158
5.769230766 3.846153861 0 0 0 0 0 0 0
0 0 1.282051284 29.48717957 11.53846153 5.128205015
2.564102507 0 0 0 0 0 0 0 0 0
0
2002 1 3 3 2 3 -1 -1 12 0 0
0 0 0 4.76190474 26.19047595 14.28571427 4.76190474
0 0 0 0 0 0 0 0 0 0 0
2.941176464 14.70588247 14.70588247 11.76470598 5.882352928 0
0 0 0 0 0 0 0 0
2002 1 3 3 2 5 -1 -1 12 0 0
0 22.72727276 4.545454503 9.090909106 9.090909006 4.545454553
0 0 0 0 0 0 0 0 0 0 0
1.282051281 10.25641026 17.94871801 11.53846151 8.974359006 0
0 0 0 0 0 0 0 0 0
2003 1 3 3 2 3 -1 -1 24 0 0
0 0 8.536585509 10.97560976 10.97561001 9.756097561
4.878048805 2.439024403 0 1.219512196 1.219512196 0 0
0 0 0 0 0 6.250000007 10.41666651 16.66666652
10.41666651 4.16666667 2.083333337 0 0 0 0 0
0 0 0
2004 1 3 3 2 3 -1 -1 24 0 0
0 0 4.166666523 9.722222254 6.944444539 11.11111116
6.944444489 4.166666673 4.166666673 1.388888898 0 0 0
1.388888898 0 0 0 0 0 3.703703521 24.07407413
11.11111106 9.259259312 0 1.85185186 0 0 0 0
0 0 0
2007 1 3 3 2 2 -1 -1 12 0 0
0 0 0 15.62499994 6.249999978 12.49999996 0
9.374999967 0 6.249999978 0 0 0 0 0 0

0	0	0	3.571428487	14.28571445	14.28571445	10.71428568
0	3.571428557	3.571428557	0	0	0	0	0	0
2008	1	3	3	2	2	-1	-1	24	0	0
0	0	0	0.754667698	9.586358975	9.782156625	9.390561226
5.645745985	9.390561226	2.822872988	1.313537642	1.313537642	0
0	0	0	0	0	0	0	3.132399492	3.132399492
17.98169897	14.03660193	0	3.132399432	5.452101251	0	0
0	3.132399432	0
2009	1	3	3	2	2	-1	-1	120	0	0
0	0	1.181708001	3.886583802	8.022562004	18.83313151
8.613416205	4.902028903	1.098576601	1.181708096	1.689430636	0
0	0.590854045	0	0	0	0	0	2.990680002
9.828673505	11.68220001	9.828673355	6.837993319	8.83178001	0
0	0	0	0	0	0
2010	1	3	3	2	2	-1	-1	72	0	0
0	0	0	2.173913055	10.86956502	16.30434788	9.782608721
5.434782611	3.260869557	1.086956522	0	0	0	0
1.086956522	0	0	0	0	3.125000007	18.75000004
6.250000013	12.50000003	6.250000013	0	3.125000007	0	0
0	0	0	0
1966	1	4	3	2	3	-1	-1	48	0	0
0	0	0.893698496	8.006198168	14.48966244	10.82104726
4.93563133	5.04539918	3.147709437	1.22663673	0.359162349
0.901182631	0	0.173671819	0	0	0	0	0.399336438
1.349420495	9.237000463	17.02506843	7.733312274	7.296626746
3.716033035	0.759028857	1.18610186	0.868245542	0.429826018	0
0	0
1967	1	4	3	2	3	-1	-1	66	0	0
0	0.517933099	4.31799999	8.564867531	14.84477947	9.317480179
4.014194541	4.022348441	2.474748094	1.293746792	0.16710462
0.464797194	0	0	0	0	0	0	0.335783249
5.081946989	15.20300647	17.21413196	7.933985767	2.11261288
0.702808578	0.809144363	0.303289899	0.303289899	0	0	0
0
1968	1	4	3	2	3	-1	-1	108	0	0
0	0.1142221	1.629105496	5.347984436	11.58282947	13.72069621
6.593172683	4.696239388	2.087007894	1.833323015	0.988258272
1.078017267	0.130470715	0.198673309	0	0	0	0
0.14163149	2.474875493	6.675722982	16.04986896	12.71783852
6.119142754	3.276569756	1.455742966	0.739455888	0.274586704	0
0	0.07456423	0
1969	1	4	3	2	3	-1	-1	108	0	0
0	0	1.901373992	7.34359507	8.149353967	11.59351895
9.557589061	5.719482477	3.038792538	1.655980553	0.347013279
0.568600138	0.06477279	0.059927365	0	0	0	0	0
2.710415489	6.836793972	13.45779345	14.2649276	8.361043686
3.028712363	1.067468811	0.272844454	0	0	0	0	0
1970	1	4	3	2	3	-1	-1	126	0	0
0	0.07114815	1.502566997	6.287302887	11.06807498	10.47532753
8.041547034	8.229148533	2.226203495	1.032579963	0.677798374
0.196711775	0.19159034	0	0	0	0	0	0
1.487181497	8.162784483	13.03548197	13.98320061	8.582141462
2.911317379	0.967203898	0.715084259	0	0.155604385	0	0
0
1971	1	4	3	2	3	-1	-1	30	0	0
0.18509781	3.566685352	16.60074301	7.673850003	6.986199503

2.376740051 3.695968802 5.230699902 1.433586001 1.449473701
0.322326865 0.47862884 0 0 0 0 0 0
3.661510702 15.79986751 9.264761504 8.583284504 4.309246117
4.610244837 2.522068591 0.836298 0.2063592 0.2063592 0
0 0 0
1972 1 4 3 2 3 -1 -1 42 0 0
0.468135503 6.198743838 6.319948539 8.999545005 8.976931555
5.938993637 4.210374826 3.046546619 1.66839056 2.014257912
1.094205602 0.608458219 0.146656426 0.154405831 0.154405831 0
0 0 4.803577235 8.09620905 13.60665408 10.26533756
5.093050936 3.126578814 3.17717153 1.327691743 0.503729143 0
0 0 0 0
1973 1 4 3 2 3 -1 -1 30 0 0
0.243714364 1.921470846 4.316741491 5.725232988 8.605239482
7.202273735 4.67771444 4.198886641 3.055043844 4.450404771
1.854526801 1.841406821 1.095545023 0.20696704 0.604831594 0
0 0 1.717425146 5.640569988 8.449251982 10.41323398
9.31285749 4.706868915 2.527009705 3.140809293 1.768861731
1.774014101 0.15974787 0.22960205 0 0.15974787
1974 1 4 3 2 3 -1 -1 36 0 0
0.27073538 3.276406344 1.917543497 8.572962785 10.36638448
6.519863089 4.359498542 2.608298445 4.453663692 1.088767078
1.963657022 2.174637806 0.473784514 0.793991499 1.159805628 0
0 0 3.324023619 3.285069494 11.52277548 7.102659988
9.460086048 6.275528404 3.172415964 1.906322307 2.143018806
1.685705052 0.122395035 0 0 0
1974 1 4 3 2 6 -1 -1 6 0 0
0 0 5.263157996 14.03508769 14.91228049 4.385964896
2.631578948 4.385964896 2.631578948 0 1.754385964 0 0
0 0 0 0 2.222222218 8.888888882 15.55555549
14.44444449 7.777777993 1.111111109 0 0 0 0 0
0 0 0 0
1975 1 4 3 2 3 -1 -1 30 0 0
0.303582781 1.677620457 9.817236042 10.80592225 11.26530355
6.457272927 4.61739897 2.664563561 1.305293206 0.914549924 0
0.171256571 0 0 0 0 0 0.224080731 3.450683475
12.67122905 12.08438855 9.626555541 8.378633176 2.663038391
0.901390849 0 0 0 0 0 0 0
1977 1 4 3 2 3 -1 -1 66 0 0
0.383229806 2.602650756 11.00650902 10.90479682 10.03046902
4.48310871 4.963608461 2.441263655 2.039270555 0.447538311
0.401673721 0.0220073 0.273873751 0 0 0 0
0.18047498 1.863567154 14.51687703 12.75639103 10.46812952
5.918023143 2.3953914 1.132946473 0.346932326 0.421267041 0
0 0 0 0
1978 1 4 3 2 3 -1 -1 48 0 0
0.549383938 3.310888217 4.794267025 7.819752041 13.80514107
8.966028547 3.76544822 3.419509068 1.054637906 1.560056463
0.307242132 0.306073597 0.177772526 0.081899525 0.081899525 0
0 0.075209875 2.818647055 4.152555522 11.48982956 15.18473558
7.599608825 5.317986313 1.826504575 0.665061103 0.199063226
0.101424121 0.374331282 0.124777096 0 0.070266065
1979 1 4 3 2 3 -1 -1 36 0 0
0.903177414 6.380961445 10.50492149 5.729933845 8.034414993
3.945469147 4.138899396 3.164207647 1.850135048 0.448831445
1.625719349 1.264448384 0.903177414 0.180635485 0.925067534 0

0 2.744318288 4.377092531 12.21437049 9.147854992 8.955314492
5.8094244 3.534262257 1.252393019 0.982484749 0.327494915 0
0.327494915 0.327494915 0 0
1980 1 4 3 2 4 -1 -1 6 0 0
0 0 6.666667 26.6666667 33.333333 23.3333333 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
1980 1 4 3 2 3 -1 -1 84 0 0
0.4290202 4.197930705 5.860114506 10.02189686 7.537235008
6.697236607 3.769514854 3.802441104 2.120959352 1.998734927
1.441263557 0.860830791 0.591984881 0.21617338 0.454663366 0
0 0.13327886 3.119654128 6.790356007 12.52249151 11.60537801
6.200122922 3.712975674 2.327850918 0.825311941 1.910350637
0.279717445 0.345325085 0.11769882 0 0.109487935
1980 1 4 3 2 6 -1 -1 12 0 0
0 0.258440401 2.373540507 11.63628039 7.827808024 7.263350773
2.162676507 4.372929614 4.631370014 2.985574344 4.372929599
0.516880842 0.516880842 0.258440421 0.822897838 0 0 0
0.226493561 2.986111509 10.15617753 4.470159514 5.644322712
4.243665893 7.664748434 9.107100693 3.605880656 0.947669693
0.721176132 0.226493561 0 0
1981 1 4 3 2 4 -1 -1 174 0 0
0.562801656 5.987325664 13.35113003 9.077948321 7.233032017
4.115858959 3.078350757 1.798214454 1.188325153 0.826638737
0.624745711 0.435532366 0.497032731 0.404062961 0.819000292 0
0 0.105449065 4.010145694 15.17770553 12.10506203 6.517826515
4.26514007 2.733845771 1.276588963 0.884403212 0.742509542
0.453696021 0.263230176 0.114879305 0.272978101 1.076540192
1982 1 4 3 2 4 -1 -1 90 0 0
0.14587517 4.672519388 10.40638047 15.06762211 5.770464985
5.056680987 2.851176243 1.921705595 0.799130948 0.918921718
0.301606839 0.577079634 0.1708453 0.341690604 0.998300297 0
0 1.444900301 6.218911379 15.10747246 15.06034246 4.641488488
2.11659268 1.436406516 0.916361193 0.695188113 0.177251505
0.370134234 0 0.334413429 0 1.480536946
1983 1 4 3 2 4 -1 -1 6 0 0
0 4.545454546 0 9.090909091 0 13.63636364 18.18181818
4.545454546 0 0 0 0 0 0 0 0 0
1.785714283 11.3095238 17.26190498 7.738094993 5.952380994
2.976190472 1.785714283 0 0 0.595238094 0.595238094 0
0 0 0
1985 1 4 3 2 4 -1 -1 12 0 0
0 2.535921343 5.192812986 8.638950876 5.629481985 8.323252427
3.62759339 4.222111438 4.161626239 2.814740947 1.565219686
1.504734486 0.970701652 0.436668819 0.376183624 0 0
3.769173435 6.154132748 6.154132983 16.84437695 4.769918487
5.153387561 4.769918622 2.384959313 0 0 0 0 0
0 0
1986 1 4 3 2 4 -1 -1 24 0 0
0.028872405 6.557557886 7.910093544 6.661123687 11.20706956
4.677347926 5.295258979 3.474274469 2.079764711 0.122909986
0.94584477 0.094037581 0 0 0.94584477 0 0 0
7.21552601 14.31574658 13.89259408 6.419942035 4.922587337
0.731351254 0.226281136 0 2.275971298 0 0 0 0
0

1987 1 4 3 2 4 -1 -1 42 0 0
1.320029503 4.826854912 8.775253022 15.78834284 9.102243523
6.941839368 1.807868905 1.279968753 0.07879955 0.078799565 0
0 0 0 0 0 0 1.158969198 15.81164554
12.43030503 16.32494554 0.736925002 3.115417883 0.289605561 0
0.132186305 0 0 0 0 0 0
1988 1 4 3 2 4 -1 -1 12 0 0
6.493999871 9.925999929 7.127666485 15.52266662 9.028666981
0.633666699 0.633666699 0.633666699 0 0 0 0 0
0 0 0 0 6.549143551 13.0982871 12.30057097
10.38342848 3.834284992 3.834284922 0 0 0 0 0
0 0 0 0
1989 1 4 3 2 4 -1 -1 30 0 0
0 0.541323149 7.982436983 17.80735406 8.941474981 7.361156085
3.947011842 1.933834896 0.504107799 0.505952084 0.475348084 0
0 0 0 0 0 3.345448548 7.259232225 20.13677446
13.86436197 2.792991494 2.60119134 0 0 0 0 0
0 0 0 0
1990 1 4 3 2 4 -1 -1 30 0 0
0.483073185 2.779007499 11.6106415 18.54497544 12.93047099
0.9999916 0.4424724 0.4999958 1.709371599 0 0 0
0 0 0 0 0 2.482337944 7.083992982 12.78141149
16.44652849 6.490798497 1.563671464 3.151259109 0 0 0
0 0 0 0 0
1991 1 4 3 2 4 -1 -1 12 0 0
0 3.116137912 10.83558554 10.97737954 11.11917354 10.97737954
1.487172056 0 0 0 0 0 0 1.487172046 0
0 0 0 9.721920291 4.860960018 10.18538654 10.64885254
9.721920291 4.860960148 0 0 0 0 0 0 0
0
1992 1 4 3 2 4 -1 -1 36 0 0
1.763948721 4.628143228 5.799751972 10.66957155 7.969968461
11.62291169 4.373138579 2.437371688 0.247655399 0.344496723 0
0.143042009 0 0 0 0 0.820826651 1.492786288
4.985253151 13.43013493 12.84104044 6.519745468 6.850096632
2.239289764 0.820826651 0 0 0 0 0 0 0
1993 1 4 3 2 4 -1 -1 12 0 0
0 1.390254552 10.26271301 11.32457626 6.622881009 10.46525321
6.622881159 0.530931501 0 2.780509064 0 0 0 0
0 0 0 0 0 25.83051653 13.42749102 8.05649451
2.685498163 0 0 0 0 0 0 0 0 0
1994 1 4 3 2 4 -1 -1 12 0 0
0 0.544614752 12.68153805 14.6006159 7.209539027 7.572615328
0.363076501 2.463692359 2.282154108 2.282154113 0 0 0
0 0 0 0 10.89102138 13.49006178 16.08910206
4.331734016 3.465387013 0 0.866346803 0.866346803 0 0
0 0 0 0 0
1996 1 4 3 2 4 -1 -1 6 0 0
0 2.17391305 6.521739 4.3478261 19.5652175 10.8695652
4.3478261 0 0 2.173913045 0 0 0 0 0
0 0 0 3.125 12.5 12.5 6.25 15.625 0 0 0
0 0 0 0 0 0
1997 1 4 3 2 4 -1 -1 54 0 0
0.346785476 8.808438765 8.026844514 8.083753464 9.554173516
8.107080914 4.191098207 1.093448702 0.689598401 0.793295651
0.236896465 0.06858588 0 0 0 0 0 3.437740166

15.69437672 12.46584752 7.413445013 6.437425011 3.432952736
0.432361181 0.459217411 0.22663429 0 0 0 0 0
0
1998 1 4 3 2 2 -1 -1 12 0 0
0 5.158378501 18.947973 2.579189251 5.754144001 2.579189251
6.052026901 6.052026901 2.0173423 0.85972975 0 0 0
0 0 0 0 0 5.295149936 15.098117 9.660179002
8.568921502 10.28637548 0 0 1.091257215 0 0 0
0 0 0
1998 1 4 3 2 4 -1 -1 18 0 0
0 3.315574111 7.829830525 6.432709271 11.60290954 5.808497119
6.858119422 3.726899612 2.737541309 0.638296747 1.049622278 0
0 0 0 0 0 0 4.420244359 18.02791456
6.794026022 12.70221204 4.420244359 2.210122182 0 1.425236545
0 0 0 0 0 0
2002 1 4 3 2 3 -1 -1 6 0 0
0 6.060606062 15.15151503 13.63636368 7.575757515 3.030303056
4.545454559 0 0 0 0 0 0 0 0 0
0 0 0 25.00000005 0 0 25.00000005 0 0
0 0 0 0 0 0 0
2003 1 4 3 2 3 -1 -1 18 0 0
0 6.962025273 24.6835444 6.329113875 6.329113975 3.164556938
1.898734193 0.632911398 0 0 0 0 0 0 0
0 0 0 4.237288118 24.5762709 15.25423744 2.54237299
3.389830497 0 0 0 0 0 0 0 0 0
2004 1 4 3 2 3 -1 -1 6 0 0
0 0 19.56521761 17.39130444 10.86956506 2.173913062 0
0 0 0 0 0 0 0 0 0 0 0
2.777777795 16.66666659 16.66666659 11.11111106 2.777777795 0
0 0 0 0 0 0 0 0
2007 1 4 3 2 2 -1 -1 18 0 0
0 2.069888782 2.069888982 7.757301683 10.34944391 5.867872349
10.51077841 4.823365508 0 4.481571521 2.069888772 0 0
0 0 0 0 0 0 6.431967444 2.684938977
6.431967444 9.284016245 13.3850747 4.996038047 5.536987707
1.249009514 0 0 0 0 0
2008 1 4 3 2 2 -1 -1 6 0 0
0 0 4.999999995 4.999999995 9.999999989 9.999999989
9.999999989 0 4.999999995 4.999999995 0 0 0 0
0 0 0 0 0 0 5.555555494 8.333333491
22.2222222 5.555555549 8.333333326 0 0 0 0 0
0 0
2009 1 4 3 2 2 -1 -1 114 0 0
0 0 6.143537004 8.703344206 11.26315151 7.308016555
4.888399303 6.796055105 1.676440851 2.047845701 0.652518025 0
0.52069175 0 0 0 0 0 0.783242526 9.044617006
5.128965004 13.74407201 8.337712951 5.482697684 3.347444627
0.998278076 3.132970107 0 0 0 0 0
2010 1 4 3 2 2 -1 -1 78 0 0
0 1.902597196 12.07100198 10.28333193 9.694178481 5.15064569
4.261037942 2.420083795 1.546269897 1.358540607 0 0.25558077
0.838009623 0 0.218722265 0 0 0 1.415819132
6.315658488 5.390463489 14.15819147 9.688660281 8.710069058
4.247457397 0 0.07368051 0 0 0 0 0
1966 1 5 3 2 3 -1 -1 40 0 0
0 1.319690502 18.27110603 9.236499264 8.131155013 4.176837256

4.835499657 1.482944102 0.322839451 1.313338367 0.493625011
0.24356963 0.17289552 0 0 0 0 1.991368563
5.974105694 27.40256854 8.086299513 5.177570008 1.368087877 0
0 0 0 0 0 0 0 0
1967 1 5 3 2 3 -1 -1 65 0 0
0 4.555644275 11.40582794 14.77873942 6.268645466 6.325654316
3.330793482 2.454449537 0.419756948 0.209878469 0.250609999 0
0 0 0 0 0 2.317724827 9.696366042 26.26370686
7.38322246 3.239029482 0.354197618 0.745752866 0 0 0
0 0 0 0 0
1969 1 5 3 2 3 -1 -1 40 0 0
1.90364011 5.021753076 5.829386531 7.070538637 9.52964755
3.137511416 5.71500908 1.364925807 4.814957625 2.94588382
0.482764793 1.828595285 0.0539397 0.105345691 0.196101121 0
0 3.921766791 5.798941195 6.130260032 13.30055307 9.623960551
3.711602189 3.711602189 3.80131374 0 0 0 0 0
0 0
1970 1 5 3 2 3 -1 -1 50 0 0
7.449319561 13.07856038 14.92626148 9.397598188 3.161852996
0.916159899 0.659525749 0.05473095 0 0.09325287 0.038521935
0.07704387 0.147172265 0 0 0 0 9.608091648
25.24761481 11.28044249 2.712690997 0.552552999 0.552552769 0
0 0 0 0 0 0.04605414 0 0
1971 1 5 3 2 3 -1 -1 30 0 0
1.46456408 15.74293125 16.197616 7.472630699 4.037807999
2.3699517 1.30102685 0.579585 0 0.36674562 0 0
0.467140605 0 0 0 0 1.686847205 13.96196276
20.138673 6.892499999 1.1270625 2.06431825 0 2.06431825
0 2.06431825 0 0 0 0 0

1972 1 5 3 2 3 -1 -1 115 0 0
0.028070195 1.916822555 5.513826513 14.91314974 7.352054017
7.074007167 2.574525906 3.760881409 1.685107654 2.003675315
1.653425734 1.087170063 0.305354606 0.01048713 0.121441855 0
0 1.384504438 9.622497003 14.18925703 14.51772803 5.888531514
1.338706018 2.572216681 0.171848055 0.171848055 0.142863315 0
0 0 0 0
1973 1 5 3 2 3 -1 -1 60 0 0
0.141647055 2.789419857 4.23207551 23.06749806 8.700089521
5.064090612 2.945748507 1.514196204 0.774104152 0.141647055
0.294907786 0.334575741 0 0 0 0 0 0
9.905315329 17.03505554 13.97761853 6.653911516 1.396593238 0
1.031505783 0 0 0 0 0 0 0
1974 1 5 3 2 3 -1 -1 145 0
0.125859065 1.353944649 4.535033662 5.896999016 6.727725718
11.51359803 8.158368722 4.157470561 3.345049459 1.198675303
1.560142424 0.01029406 0.731369902 0.332252336 0.284116816
0.06910029 0 0 4.626994042 5.170310649 10.11582653
10.48711403 8.415065523 6.266015932 1.77977329 1.102581848
0.463777546 0.867602472 0.234979376 0.234979376 0 0.234979376
0
1975 1 5 3 2 3 -1 -1 45 0 0
6.335620081 23.994958 11.3890165 3.13312745 0.5479695
1.2432831 1.30338 1.09638295 0.7605509 0.065237205 0 0
0 0.065237205 0.065237205 0 1.091556115 12.7757543

27.15576538 7.719304001 0 0 0.786947965 0 0 0
0.470672135 0 0 0 0 0
1976 1 5 3 2 3 -1 -1 60 0 0
0.967745694 5.332772095 6.245633494 7.187129444 9.658900991
4.838728446 5.050101095 4.152184846 0.631629849 2.672807553
1.451618539 1.705061858 0 0 0.105686305 0 0
0.35500748 6.01783364 12.19070599 16.58886299 8.833489492
3.839469892 1.599923704 0 0.574706609 0 0 0 0
0 0
1977 1 5 3 2 3 -1 -1 40 0 0
0.576210589 1.940375097 4.760154992 7.381416287 8.972695485
7.603114737 7.942489886 4.449207492 3.395066744 1.152421173 0
0.576210589 0.337213114 0.913423703 0 0 0 0
5.80694033 13.69130798 13.79866298 5.097717491 6.945257813
2.358786086 0.849592354 1.451735083 0 0 0 0 0
0
1978 1 5 3 2 3 -1 -1 45 0 0
7.532555062 8.972259509 4.404547004 9.847488759 9.318287509
6.324739156 1.328605001 0.630848401 1.245549501 0.07969594
0.3154242 0 0 0 0 0 0 2.457915812
9.686928084 11.68043101 11.83464001 9.877276509 3.219279938
0.812022041 0.43150655 0 0 0 0 0 0 0
1979 1 5 3 2 3 -1 -1 25 0 0
2.181368781 2.218694306 4.230183011 5.340164814 11.08573153
9.115089925 6.343657017 4.097628761 2.574219007 1.045322163
1.76794066 0 0 0 0 0 0.817253972 7.397237965
3.900395161 4.921243013 11.88563253 9.980241027 5.955093771
5.142902584 0 0 0 0 0 0 0 0
1980 1 5 3 2 3 -1 -1 30 0
1.09468365 8.210127368 20.4853029 11.58055805 4.27072617
1.514882007 1.895813309 0.400564852 0.547341803 0 0 0
0 0 0 0 0 0 4.291689905 16.38057785
23.38963861 5.152889524 0.785204004 0 0 0 0 0
0 0 0 0 0
1981 1 5 3 2 3 -1 -1 90 0
3.080908324 8.1119691 12.63584562 6.273539008 5.207905756
5.094274506 2.419887853 2.133812153 0.603934701 1.043161301
1.459408872 0.875901351 0.405285645 0.405285645 0.18900645
0.05987347 0 3.608091954 9.765180937 10.44383504 13.72467452
8.952340511 2.543120003 0.884901916 0 0 0.07785537 0
0 0 0 0 0
1982 1 5 3 2 3 -1 -1 5 0 0
2.631578942 7.894736841 15.78947348 15.78947368 5.263157994
2.631578947 0 0 0 0 0 0 0 0 0
0 0 8.333333325 8.333333325 24.99999997 0 8.33333349
0 0 0 0 0 0 0 0 0 0
1983 1 5 3 2 3 -1 -1 60 0 0
4.657584386 5.057029357 9.190882512 10.91535216 8.366657511
4.131056955 3.298200654 0.970422601 0.867113551 0.821409696
0.875728726 0 0.550535916 0.149012925 0.149012925 0
1.000818801 6.276353348 17.11056408 12.85429202 7.175004009
2.183197503 2.717801219 0.181559745 0.500409401 0 0 0
0 0 0 0
1984 1 5 3 2 3 -1 -1 30 0 0
0 1.049261693 4.985016467 12.60177082 8.812030942 7.144031453
6.279347459 3.869573474 1.040341343 3.121024024 1.040341343 0

0 0.057260805 0 0 0 0 13.25486624 22.41090535
10.56667693 3.00412648 0.76342518 0 0 0 0 0
0 0 0 0
1985 1 5 3 2 3 -1 -1 10 0 0
0 3.846153853 34.61538453 11.53846156 0 0 0 0
0 0 0 0 0 0 0 0 0 0
13.51351353 27.02702702 8.108108007 1.351351501 0 0 0
0 0 0 0 0 0 0
1990 1 5 3 2 3 -1 -1 5 0 0
0 0 2.083333496 8.333333333 12.49999998 6.249999988 0
6.249999988 2.083333346 4.166666657 0 2.083333331 2.083333331
0 4.166666657 0 0 0 0 0 49.9999999 0
0 0 0 0 0 0 0 0 0 0
1991 1 5 3 2 3 -1 -1 20 0 0
0 9.45945946 8.108108009 6.756756757 9.45945951 5.405405406
1.351351351 2.702702703 5.405405406 1.351351351 0 0 0
0 0 0 0 0 6.666666672 15.55555552 10.00000001
14.44444452 1.111111111 1.111111111 0 0 0 0 0
1.111111111 0 0
1999 1 5 3 2 2 -1 -1 5 0 0
0 0 8.823529476 5.882352934 20.58823544 2.941176442
2.941176442 0 5.882352934 0 2.941176462 0 0 0
0 0 0 0 9.999999973 14.99999996 19.99999995
4.999999987 0 0 0 0 0 0 0 0 0
0
2005 1 5 3 2 2 -1 -1 15 0 0
0 5.008664557 19.44685153 16.65944622 7.77440801 1.110629751
0 0 0 0 0 0 0 0 0 0
0 2.628880373 7.88664101 31.59783754 7.88664101 0 0
0 0 0 0 0 0 0 0
2006 1 5 3 2 2 -1 -1 10 0 0
0 0 17.77487248 5.274872545 21.67538248 5.274872545 0
0 0 0 0 0 0 0 0 0 0 0
0 15.24235698 22.78607148 11.97157149 0 0 0 0
0 0 0 0 0 0
2007 1 5 3 2 2 -1 -1 5 0 0
0 0 1.999999997 3.999999993 13.99999998 11.99999998
9.999999984 5.99999999 0 1.999999997 0 0 0 0
0 0 0 0 0 0 0 8.333333486 16.66666664
8.333333321 16.66666664 0 0 0 0 0 0 0
2008 1 5 3 2 2 -1 -1 15 0 0
0 0 0 13.63636368 4.54545451 9.09090912 13.63636368
4.54545456 4.54545456 0 0 0 0 0 0 0
0 0 5.714285727 7.142857015 7.142857015 11.42857152
8.571428588 8.571428588 1.428571433 0 0 0 0 0
0 0
2009 1 5 3 2 2 -1 -1 20 0 0
0 4.16666668 4.16666653 4.16666668 4.16666653 8.333333409
10.41666672 12.50000009 2.083333365 0 0 0 0 0
0 0 0 0 1.785714298 7.142857051 10.71428558
12.50000009 10.71428579 3.571428595 1.785714298 0 0
1.785714298 0 0 0 0
2009 1 5 3 2 2 -1 -1 20 0 0
0 0 3.658536513 4.878048817 9.756097534 10.97560979
6.097561021 6.097561021 4.878048817 0 1.219512199 1.219512199
1.219512199 0 0 0 0 0 2.702702714 4.054054014

8.108108028 21.62162158 6.756756779 5.405405424 1.351351355 0
0 0 0 0 0 0
2010 1 5 3 2 2 -1 -1 10 0 0
0 0 4.316295995 4.316295895 12.23066749 4.316295895
3.957185696 16.90607343 3.957185696 0 0 0 0 0
0 0 0 0 0 7.594159992 0 13.92467199
7.594160172 6.962335918 6.962335918 6.962335918 0 0 0
0 0 0
1966 1 6 3 2 3 -1 -1 108 0 0
0.536159521 5.755562406 14.84263902 16.08619017 5.377056506
2.838233453 2.879237703 0.2021686 0.2276383 0.308581625
0.450383485 0.402365345 0.09378372 0 0 0 0
0.38811237 7.027441943 25.69745003 11.20179351 3.146924503
1.401856007 0.825184551 0.21185841 0.099378825 0 0 0
0 0 0
1967 1 6 3 2 3 -1 -1 44 0 0
5.43498755 4.28143098 8.521133961 13.35865684 11.54523845
2.756329337 1.422524943 0.508966898 1.017933745 0.643830607
0.508966878 0 0 0 0 0 0 1.702474802
6.019095922 15.23800393 16.80987792 8.375282461 1.428141653 0
0.314344619 0 0 0.112778504 0 0 0 0
1968 1 6 3 2 3 -1 -1 224 0 0
2.809125772 11.83559798 7.92290852 7.162207668 7.338573519
6.236919016 1.495425754 1.630499654 1.089437553 0.789936082
0.752720352 0.236010991 0.417012511 0.114587065 0.16903746 0
0.209106081 2.531303226 14.28376161 10.94908303 7.125383518
5.667046014 3.160959948 1.91170094 1.474959044 0.940108457
0.455083821 0.286280216 0.456274011 0.342338531 0.0617763
0.14483536
1969 1 6 3 2 3 -1 -1 124 0 0
3.502243184 4.365172605 8.81612101 9.935703111 6.534028508
6.208982057 3.153660304 1.780708402 1.981931902 1.155238481
0.763457341 0.329079355 1.328279422 0.055479905 0.089914585 0
0 4.26730238 4.50280109 14.14071802 7.287146008 7.805773509
4.960529881 2.228489083 1.276141936 1.340929412 0.248963225
0.678765961 0.557740746 0.190279755 0.374433115 0.13998571
1970 1 6 3 2 3 -1 -1 116 0 0
2.909683322 20.97952747 9.985180008 6.137990155 2.998121002
2.066191002 1.701333551 1.676634451 0.42079685 0.489106675
0.077222565 0.396405235 0.02818196 0.04651807 0.087107935 0
0 1.320006231 21.58442485 9.740746008 8.515856007 1.143386001
2.677232932 1.717262886 0.894924606 0.49314781 0.466569335
0.52284973 0.04281238 0.721913696 0.015811085 0.143056195
1971 1 6 3 2 3 -1 -1 148 0 0
0.825169158 4.108856339 17.23976495 8.345744027 8.069507978
3.932921889 2.155412294 1.608258146 1.251559247 1.118045737
0.375590249 0.338199969 0.331114834 0 0.299855229 0 0
0.535362629 5.402002325 19.52716845 8.075695478 5.848197484
3.518051511 2.326101284 1.90676926 0.809894668 0.834586178
0.335156139 0 0.105212925 0.256929734 0.518871889
1972 1 6 3 2 3 -1 -1 152 0 0
0.68088288 3.752702249 6.294528998 11.2260627 12.2048785
5.138266198 3.266352949 1.776499199 2.530319999 1.04092124
1.15855518 0.127229355 0.20920683 0.22928268 0.36431082
0.03914912 0 0.695667755 4.396762098 9.955907997 18.88646849

8.298000997	3.118868329	1.632264089	1.247996795	0.710642385
0.405493505	0.195162815	0.1560137	0.16813605	0	0.093466105
1973	1	6	3	2	3	-1	-1	152	0	0
2.762680421	1.615877412	5.642107043	6.670417801	10.79177608
7.83219911	4.567536385	2.61768542	1.860281614	1.31306852
1.498446236	0.984363033	1.230537264	0.391366038	0.221657787	0
0.143772761	0.924113342	4.083791981	6.989250053	7.729130059
9.16504857	6.515746565	5.039245739	2.351146748	1.903626295
1.548056737	0.800005201	0.412790878	0.67183948	0.375520823
1.3469146
1974	1	6	3	2	3	-1	-1	136	0	0
1.461829244	9.86603623	14.00281104	7.135616721	3.19069351
6.67706247	3.086931659	1.954032206	0.568280152	1.145425498
0.297107351	0.314042211	0.047670735	0.047670735	0.204790331	0
0	1.809695435	8.819564586	11.19483453	8.130254524	4.467217013
6.62259587	2.738089523	2.518855063	1.714990055	1.052629858
0.445706581	0	0.240328211	0.078986615	0.166252035
1975	1	6	3	2	3	-1	-1	72	0	0
0.416508481	5.66350556	9.977577018	11.55383507	5.50953051
7.411493564	3.739410057	2.051026154	0.525630151	1.157244327
0.393391711	1.181392317	0	0.301368291	0.11808691	0	0
1.177598822	8.674611891	15.57461703	8.700758016	7.696091514
3.938237057	1.705221068	0.826371972	0.775003836	0.419919311	0
0.511569361	0	0	0
1976	1	6	3	2	3	-1	-1	92	0	0
0.590058398	2.800102439	15.05245394	9.68016676	5.418217978
4.396360582	3.496792736	2.917957788	0.806386997	2.228318721
1.334463985	1.10343556	0	0	0.175284089	0	0	0
5.225143829	16.74929093	15.40279794	6.318313474	2.836691243
1.304417725	0.866852391	1.19987132	0.02329127	0.05003864
0.02329127	0	0	0
1977	1	6	3	2	3	-1	-1	132	0.015370895
0	2.916106762	8.796645497	12.36610543	8.480088249	7.327991956
3.446151579	1.558189141	1.388964992	1.118260593	0.701861271
1.004769554	0.457805997	0.225433929	0.083057514	0.113196769	0
0	2.529446135	7.143851922	14.02799892	12.37857043	7.660441454
4.256760159	1.195440388	0.390946178	0.249708628	0.146333734
0.02050194	0	0	0	0
1978	1	6	3	2	3	-1	-1	128	0	0
1.703688588	8.912092341	9.89748899	11.08878994	7.600049492
3.852572246	2.184461598	1.504415998	0.641487449	0.797959819
0.858554139	0.185724345	0	0.11509993	0.657615264	0	0
2.266569488	14.10318175	13.18776799	10.51187699	5.878446494
2.526929292	0.901688564	0.25149067	0.372048625	0	0	0
0	0	0
1979	1	6	3	2	3	-1	-1	44	0
0.479443499	6.879702305	11.33630002	10.41394298	4.691842539
5.615513987	2.752397744	4.51884689	2.104930695	0.468359249
0.507226419	0.231493694	0	0	0	0	0	0
3.002501368	14.62666145	14.50807947	10.89936698	2.885190494
0.795138263	2.20308581	0.265933564	0.814042588	0	0	0
0	0	0
1980	1	6	3	2	3	-1	-1	200	0.049528485
0.88691316	3.250491713	10.13617445	12.60325494	9.258247053
5.137947974	3.772130881	1.596631842	1.172181244	0.913826845
0.804425491	0.196926179	0.06208656	0.159232989	0	0	0

1.438457808 3.831713485 13.50783087 14.43819043 10.19571395
3.476739482 1.262336419 1.308102383 0.369378563 0 0.171536814
0 0 0 0 0
1981 1 6 3 2 3 -1 -1 108 0 0
1.887998449 13.50854562 14.25950592 9.398493746 4.985576471
2.167016788 2.180706737 0.588636897 0.458360747 0.131066599
0.140272074 0.126067089 0.140272074 0.027480895 0 0 0
2.936826348 16.02754534 16.27824691 7.880772455 4.073818477
1.648228596 0.253466264 0.04873359 0.463629482 0.030817155
0.357915278 0 0 0 0
1982 1 6 3 2 3 -1 -1 72 0 0
1.077357853 6.302839636 18.13747996 9.529311829 5.008432989
5.670638238 1.345001547 1.364810097 0.639691649 0.246714634
0.248849059 0.307832814 0.06063387 0.038149615 0.022256395 0
0 0.964787143 9.930570678 24.06445745 11.26937848 2.493049495
1.277756577 0 0 0 0 0 0 0 0 0
1983 1 6 3 2 3 -1 -1 32 0 0
0.83924938 2.6424119 17.1845945 15.0561943 6.949068999
4.028879499 1.3652938 0.97251165 0.8825279 0 0 0
0 0.079268035 0 0 0 0 1.410269635 19.615345
12.9637355 4.489573499 7.624331444 0.15801366 2.552942175 0
0 0 1.185789135 0 0 0
1984 1 6 3 2 3 -1 -1 12 0 0
2.341210814 15.47667036 20.92068345 4.741657038 4.148949989
1.778121395 0 0.592707148 0 0 0 0 0 0
0 0 0 0 11.9456854 21.77122394 13.17368047
3.109409992 0 0 0 0 0 0 0 0 0
0
1985 1 6 3 2 3 -1 -1 16 0 0
0 9.654629309 13.34496951 6.643656356 10.00081451 6.623160056
1.892852352 1.839917502 0 0 0 0 0 0 0
0 0 0 5.400910865 17.57077802 15.54246701 11.48584451
0 0 0 0 0 0 0 0 0 0
2005 1 6 3 2 2 -1 -1 40 0 0
0 1.228392149 5.893819495 22.05128908 9.735609491 5.734494845
1.925500798 1.316343299 1.127293299 0 0.329085825 0.658171649
0 0 0 0 0 0 0 19.64361398 17.79612448
11.21785049 0 0 1.342411114 0 0 0 0 0
0 0
2006 1 6 3 2 2 -1 -1 28 0 0
0 0.244720351 8.387609041 8.945623094 10.71725405 12.89990136
3.767734118 1.153747456 0.312394252 3.571016222 0 0 0
0 0 0 0 0 0.241373706 5.460770027 16.52273008
15.84173858 10.10643918 1.826948474 0 0 0 0 0
0 0 0
2008 1 6 3 2 2 -1 -1 72 0 0
0 1.524795999 3.684786997 2.529857598 13.42229849 9.649633093
7.552068094 3.695893547 3.211699748 3.204170653 0.762397994 0
0.762397994 0 0 0 0 0 1.219570469 7.385622994
13.19106599 13.23564749 9.359614763 3.772686792 0.627490775
0.809384994 0 0.398915525 0 0 0 0
2009 1 6 3 2 2 -1 -1 12 0 0
0 0 0 0.30436255 2.663424497 16.50806128 14.45336198
3.753337145 6.605031192 3.272149476 2.440271942 0 0 0
0 0 0 0 0 0 0 0 0 49.99999994
0 0 0 0 0 0 0 0

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2009 | 1 | 6 | 3 | 2 | 2 | -1 | -1 | 8 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 2.3491417 | | 9.899427799 | | 17.95257495 | |
| | 4.69828335 | | 7.550286104 | | 0 | 5.201144424 | | 0 | 2.34914168 | | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 0 | 25 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| # | #NWFSC | | age2-at-length | | | | | | | | |
| | | | | | | | | | | | |
| #female | year2 | 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 | F1.1 | F2.1 | F3.1 | F4.1 | F5.1 | F6.1 | F7.1 |
| | F8.1 | F9.1 | F10.1 | F11.1 | F12.1 | F13.1 | F14.1 | F15.1 | F16.1 | | |
| #females | 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 | F1.1 | F2.1 | F3.1 | F4.1 | F5.1 | F6.1 | F7.1 |
| | F8.1 | F9.1 | F10.1 | F11.1 | F12.1 | F13.1 | F14.1 | F15.1 | F16.1 | F17.1 | |
| | 2003 | 1 | 8 | 1 | 0 | 2 | 22 | 22 | 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 | |
| | 2003 | 1 | 8 | 1 | 0 | 2 | 24 | 24 | 4 | 0 | 0 |
| | 75 | 25 | 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 | |
| | 2003 | 1 | 8 | 1 | 0 | 2 | 26 | 26 | 3 | 0 | 0 |
| | 33.33333333 | | 33.33333333 | | 33.33333333 | | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 33.33333333 | |
| | 33.33333333 | | 33.33333333 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | | | | | | |
| | 2003 | 1 | 8 | 1 | 0 | 2 | 28 | 28 | 4 | 0 | 0 |
| | 25 | 50 | 25 | 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 | |
| | 2003 | 1 | 8 | 1 | 0 | 2 | 30 | 30 | 8 | 0 | 0 |
| | 0 | 12.5 | 75 | 12.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12.5 | 75 | 12.5 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 2003 | 1 | 8 | 1 | 0 | 2 | 32 | 32 | 11 | 0 | 0 |
| | 9.090909091 | | 18.18181818 | | 45.45454545 | | 27.27272727 | | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 9.090909091 | | 18.18181818 | | 45.45454545 | | 27.27272727 | | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| | 2003 | 1 | 8 | 1 | 0 | 2 | 34 | 34 | 16 | 0 | 0 |
| | 0 | 0 | 56.25 | 31.25 | 12.5 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 56.25 | 31.25 | 12.5 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 2003 | 1 | 8 | 1 | 0 | 2 | 36 | 36 | 22 | 0 | 0 |
| | 0 | 4.545454545 | | 77.27272727 | | 13.63636364 | | 4.545454545 | | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 4.545454545 | | 77.27272727 | | 13.63636364 | | 4.545454545 | | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| | 2003 | 1 | 8 | 1 | 0 | 2 | 38 | 38 | 18 | 0 | 0 |
| | 0 | 0 | 38.88888889 | | 33.33333333 | | 11.11111111 | | 11.11111111 | | |
| | 5.555555556 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

0 0 0 38.88888889 33.33333333 11.11111111 11.11111111
5.555555556 0 0 0 0 0 0 0 0
2003 1 8 1 0 2 40 40 13 0 0
0 0 38.46153846 30.76923077 0 23.07692308 7.692307692
0 0 0 0 0 0 0 0 0 0 0
0 38.46153846 30.76923077 0 23.07692308 7.692307692 0
0 0 0 0 0 0 0
2003 1 8 1 0 2 42 42 14 0 0
0 0 7.142857143 42.85714286 21.42857143 14.28571429
14.28571429 0 0 0 0 0 0 0 0 0
0 0 0 7.142857143 42.85714286 21.42857143 14.28571429
14.28571429 0 0 0 0 0 0 0 0
2003 1 8 1 0 2 44 44 13 0 0
0 0 0 7.692307692 38.46153846 38.46153846 15.38461538
0 0 0 0 0 0 0 0 0 0 0
0 0 7.692307692 38.46153846 38.46153846 15.38461538 0
0 0 0 0 0 0 0
2003 1 8 1 0 2 48 48 3 0 0
0 0 0 0 0 0 66.66666667 0 0 0
0 0 0 0 33.33333333 0 0 0 0 0
0 0 0 66.66666667 0 0 0 0 0 0
0 33.33333333
2003 1 8 1 0 2 50 50 5 0 0
0 0 0 0 0 40 20 0 20 0 0
0 0 0 20 0 0 0 0 0 0 0
40 20 0 20 0 0 0 0 0 20
2003 1 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 1 8 1 0 2 56 56 1 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 0
2004 1 8 1 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
2004 1 8 1 0 2 22 22 3 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 1 8 1 0 2 24 24 7 0 0
14.28571429 71.42857143 0 14.28571429 0 0 0 0
0 0 0 0 0 0 0 0 0 14.28571429
71.42857143 0 14.28571429 0 0 0 0 0 0
0 0 0 0 0
2004 1 8 1 0 2 26 26 7 0 0
0 85.71428571 14.28571429 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 85.71428571
14.28571429 0 0 0 0 0 0 0 0 0
0 0 0
2004 1 8 1 0 2 28 28 13 0 0
7.692307692 38.46153846 23.07692308 23.07692308 7.692307692 0
0 0 0 0 0 0 0 0 0 0 0

7.692307692 38.46153846 23.07692308 23.07692308 7.692307692 0
0 0 0 0 0 0 0 0 0
2004 1 8 1 0 2 30 30 15 0 0
0 26.66666667 26.66666667 33.33333333 13.33333333 0 0
0 0 0 0 0 0 0 0 0 0 0
26.66666667 26.66666667 33.33333333 13.33333333 0 0 0
0 0 0 0 0 0 0
2004 1 8 1 0 2 32 32 20 0 0
0 25 50 20 5 0 0 0 0 0 0
0 0 0 0 0 0 0 25 50 20 5
0 0 0 0 0 0 0 0 0 0
2004 1 8 1 0 2 34 34 16 0 0
0 0 25 43.75 25 6.25 0 0 0 0 0
0 0 0 0 0 0 0 0 25 43.75 25
6.25 0 0 0 0 0 0 0 0 0
2004 1 8 1 0 2 36 36 22 0 0
0 0 18.18181818 22.72727273 31.81818182 22.72727273 0
4.545454545 0 0 0 0 0 0 0 0 0
0 0 18.18181818 22.72727273 31.81818182 22.72727273 0
4.545454545 0 0 0 0 0 0 0
2004 1 8 1 0 2 38 38 21 0 0
0 0 4.761904762 28.57142857 52.38095238 9.523809524
4.761904762 0 0 0 0 0 0 0 0 0
0 0 0 4.761904762 28.57142857 52.38095238 9.523809524
4.761904762 0 0 0 0 0 0 0 0
2004 1 8 1 0 2 40 40 22 0 0
0 0 4.545454545 13.63636364 50 4.545454545 22.72727273
0 4.545454545 0 0 0 0 0 0 0 0
0 0 4.545454545 13.63636364 50 4.545454545 22.72727273
0 4.545454545 0 0 0 0 0 0
2004 1 8 1 0 2 42 42 21 0 0
0 0 0 14.28571429 23.80952381 23.80952381 19.04761905
14.28571429 4.761904762 0 0 0 0 0 0 0
0 0 0 0 14.28571429 23.80952381 23.80952381
19.04761905 14.28571429 4.761904762 0 0 0 0 0
0
2004 1 8 1 0 2 44 44 8 0 0
0 0 0 0 37.5 0 12.5 50 0 0 0
0 0 0 0 0 0 0 0 0 0 37.5
0 12.5 50 0 0 0 0 0 0 0
2004 1 8 1 0 2 46 46 8 0 0
0 0 0 0 0 12.5 25 12.5 37.5 12.5 0
0 0 0 0 0 0 0 0 0 0 0
12.5 25 12.5 37.5 12.5 0 0 0 0 0
2004 1 8 1 0 2 48 48 4 0 0
0 0 0 0 0 0 25 25 25 0 0
0 25 0 0 0 0 0 0 0 0 0
0 25 25 25 0 0 0 25 0 0
2004 1 8 1 0 2 50 50 2 0 0
0 0 0 0 0 0 0 0 50 0 0
0 50 0 0 0 0 0 0 0 0 0
0 0 0 50 0 0 0 50 0 0
2004 1 8 1 0 2 52 52 4 0 0
0 0 0 0 0 0 0 25 0 0 25
0 25 0 25 0 0 0 0 0 0 0
0 0 25 0 0 25 0 25 0 25

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2005 | 1 | 8 | 1 | 0 | 2 | 20 | 20 | 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 | |
| 2005 | 1 | 8 | 1 | 0 | 2 | 22 | 22 | 4 | 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 | 1 | 8 | 1 | 0 | 2 | 24 | 24 | 6 | 0 | |
| 16.66666667 | 66.66666667 | 16.66666667 | 0 | 0 | 0 | 0 | 0 | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16.66666667 | |
| 66.66666667 | 16.66666667 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2005 | 1 | 8 | 1 | 0 | 2 | 26 | 26 | 9 | 0 | 0 |
| 33.33333333 | 55.55555556 | 11.11111111 | 0 | 0 | 0 | 0 | 0 | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 33.33333333 | |
| 55.55555556 | 11.11111111 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 0 | 0 | 0 | 0 | 0 | | | | | | |
| 2005 | 1 | 8 | 1 | 0 | 2 | 28 | 28 | 13 | 0 | 0 |
| 30.76923077 | 61.53846154 | 7.692307692 | 0 | 0 | 0 | 0 | 0 | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30.76923077 | |
| 61.53846154 | 7.692307692 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 0 | 0 | 0 | 0 | 0 | | | | | | |
| 2005 | 1 | 8 | 1 | 0 | 2 | 30 | 30 | 11 | 0 | 0 |
| 18.18181818 | 36.36363636 | 27.27272727 | 18.18181818 | 0 | 0 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 18.18181818 | 36.36363636 | 27.27272727 | 18.18181818 | 0 | 0 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 2005 | 1 | 8 | 1 | 0 | 2 | 32 | 32 | 18 | 0 | |
| 5.555555556 | 16.66666667 | 33.33333333 | 33.33333333 | 11.11111111 | 0 | | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5.555555556 | 16.66666667 | 33.33333333 | 33.33333333 | 11.11111111 | 0 | | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 2005 | 1 | 8 | 1 | 0 | 2 | 34 | 34 | 11 | 0 | 0 |
| 0 | 18.18181818 | 72.72727273 | 0 | 9.090909091 | 0 | 0 | 0 | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 18.18181818 | 72.72727273 | 0 | 9.090909091 | 0 | 0 | 0 | 0 | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2005 | 1 | 8 | 1 | 0 | 2 | 36 | 36 | 18 | 0 | 0 |
| 0 | 16.66666667 | 33.33333333 | 38.88888889 | 5.555555556 | 5.555555556 | | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 16.66666667 | 33.33333333 | 38.88888889 | 5.555555556 | 5.555555556 | | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 2005 | 1 | 8 | 1 | 0 | 2 | 38 | 38 | 19 | 0 | 0 |
| 0 | 10.52631579 | 42.10526316 | 21.05263158 | 26.31578947 | 0 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10.52631579 | 42.10526316 | 21.05263158 | 26.31578947 | 0 | 0 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 2005 | 1 | 8 | 1 | 0 | 2 | 40 | 40 | 13 | 0 | 0 |
| 0 | 0 | 30.76923077 | 30.76923077 | 38.46153846 | 0 | 0 | 0 | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30.76923077 | 30.76923077 | 38.46153846 | 0 | 0 | 0 | 0 | 0 | | | |
| 0 | 0 | 0 | 0 | 0 | | | | | | |
| 2005 | 1 | 8 | 1 | 0 | 2 | 42 | 42 | 13 | 0 | 0 |
| 0 | 15.38461538 | 23.07692308 | 38.46153846 | 23.07692308 | 0 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 15.38461538 | 23.07692308 | 38.46153846 | 23.07692308 | 0 | 0 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 2005 | 1 | 8 | 1 | 0 | 2 | 44 | 44 | 4 | 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 | 0 | 0 | 0 | |
| 2005 | 1 | 8 | 1 | 0 | 2 | 46 | 46 | 3 | 0 | 0 |
| 0 | 0 | 33.33333333 | 33.33333333 | 0 | 33.33333333 | 0 | 0 | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 33.33333333 | 33.33333333 | 0 | 33.33333333 | 0 | 0 | 0 | 0 | | | |
| 0 | 0 | 0 | 0 | 0 | | | | | | |
| 2005 | 1 | 8 | 1 | 0 | 2 | 48 | 48 | 1 | 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 | 0 | 0 | 0 | 0 | |
| 2005 | 1 | 8 | 1 | 0 | 2 | 52 | 52 | 2 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 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 | |
| 2005 | 1 | 8 | 1 | 0 | 2 | 54 | 54 | 2 | 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 | 50 | 0 | 50 | 0 | 0 | 0 | 0 | 0 | |
| 2006 | 1 | 8 | 1 | 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 | |
| 2006 | 1 | 8 | 1 | 0 | 2 | 22 | 22 | 1 | 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 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 2006 | 1 | 8 | 1 | 0 | 2 | 24 | 24 | 6 | 0 | 0 |
| 0 | 83.33333333 | 16.66666667 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 83.33333333 | |
| 16.66666667 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 0 | 0 | 0 | | | | | | | | |
| 2006 | 1 | 8 | 1 | 0 | 2 | 26 | 26 | 11 | 0 | 0 |
| 36.36363636 | 45.45454545 | 9.090909091 | 0 | 9.090909091 | 0 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 36.36363636 | 45.45454545 | 9.090909091 | 0 | 9.090909091 | 0 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 2006 | 1 | 8 | 1 | 0 | 2 | 28 | 28 | 5 | 0 | 0 |
| 0 | 40 | 40 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 40 | 40 | 20 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 2006 | 1 | 8 | 1 | 0 | 2 | 30 | 30 | 14 | 0 | 0 |
| 0 | 28.57142857 | 42.85714286 | 28.57142857 | 0 | 0 | 0 | 0 | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 28.57142857 | 42.85714286 | 28.57142857 | 0 | 0 | 0 | 0 | 0 | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2006 | 1 | 8 | 1 | 0 | 2 | 32 | 32 | 14 | 0 | 0 |
| 7.142857143 | 14.28571429 | 28.57142857 | 28.57142857 | 21.42857143 | 0 | | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7.142857143 | 14.28571429 | 28.57142857 | 28.57142857 | 21.42857143 | 0 | | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |

2006 1 8 1 0 2 34 34 15 0 0
0 0 20 40 40 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
2006 1 8 1 0 2 36 36 25 0 0
0 4 12 36 36 8 4 0 0 0 0
0 0 0 0 0 0 0 4 12 36 36
8 4 0 0 0 0 0 0 0 0
2006 1 8 1 0 2 38 38 19 0 0
0 0 0 26.31578947 26.31578947 26.31578947 10.52631579
5.263157895 0 5.263157895 0 0 0 0 0 0
0 0 0 0 26.31578947 26.31578947 26.31578947
10.52631579 5.263157895 0 5.263157895 0 0 0 0
0
2006 1 8 1 0 2 40 40 14 0 0
0 0 0 14.28571429 21.42857143 28.57142857 14.28571429
14.28571429 0 0 7.142857143 0 0 0 0 0
0 0 0 0 14.28571429 21.42857143 28.57142857
14.28571429 14.28571429 0 0 7.142857143 0 0 0
0
2006 1 8 1 0 2 42 42 26 0 0
0 0 0 3.846153846 23.07692308 38.46153846 23.07692308
7.692307692 3.846153846 0 0 0 0 0 0 0
0 0 0 0 3.846153846 23.07692308 38.46153846
23.07692308 7.692307692 3.846153846 0 0 0 0 0
0
2006 1 8 1 0 2 44 44 17 0 0
0 0 0 0 17.64705882 29.41176471 23.52941176
5.882352941 11.76470588 5.882352941 0 5.882352941 0 0
0 0 0 0 0 0 0 17.64705882 29.41176471
23.52941176 5.882352941 11.76470588 5.882352941 0 5.882352941
0 0 0
2006 1 8 1 0 2 46 46 4 0 0
0 0 0 0 0 25 0 50 0 0 0
25 0 0 0 0 0 0 0 0 0 0
25 0 50 0 0 0 25 0 0 0
2006 1 8 1 0 2 48 48 1 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 0
2006 1 8 1 0 2 50 50 4 0 0
0 0 0 0 0 0 0 25 0 25 0
50 0 0 0 0 0 0 0 0 0 0
0 0 25 0 25 0 50 0 0 0
2006 1 8 1 0 2 56 56 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 1 8 1 0 2 24 24 3 0
66.66666667 33.33333333 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 66.66666667
33.33333333 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2007 1 8 1 0 2 26 26 2 0 0
50 0 0 0 50 0 0 0 0 0 0

0 0 0 0 0 0 50 0 0 0 50
0 0 0 0 0 0 0 0 0 0
2007 1 8 1 0 2 28 28 3 0 0
0 0 33.33333333 66.66666667 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
33.33333333 66.66666667 0 0 0 0 0 0 0
0 0 0 0
2007 1 8 1 0 2 30 30 11 0 0
18.18181818 18.18181818 27.27272727 9.090909091 0 27.27272727
0 0 0 0 0 0 0 0 0 0 0
18.18181818 18.18181818 27.27272727 9.090909091 0 27.27272727
0 0 0 0 0 0 0 0 0
2007 1 8 1 0 2 32 32 7 0 0
0 0 28.57142857 42.85714286 14.28571429 14.28571429 0
0 0 0 0 0 0 0 0 0 0 0
0 28.57142857 42.85714286 14.28571429 14.28571429 0 0
0 0 0 0 0 0 0
2007 1 8 1 0 2 34 34 19 0 0
0 10.52631579 10.52631579 26.31578947 31.57894737 15.78947368
0 5.263157895 0 0 0 0 0 0 0 0
0 0 10.52631579 10.52631579 26.31578947 31.57894737
15.78947368 0 5.263157895 0 0 0 0 0 0
0
2007 1 8 1 0 2 36 36 12 0 0
0 8.333333333 8.333333333 33.33333333 25 16.66666667
8.333333333 0 0 0 0 0 0 0 0 0
0 0 8.333333333 8.333333333 33.33333333 25 16.66666667
8.333333333 0 0 0 0 0 0 0 0
2007 1 8 1 0 2 38 38 18 0 0
0 0 11.11111111 16.66666667 33.33333333 22.22222222
11.11111111 5.555555556 0 0 0 0 0 0 0
0 0 0 0 11.11111111 16.66666667 33.33333333
22.22222222 11.11111111 5.555555556 0 0 0 0 0
0 0
2007 1 8 1 0 2 40 40 17 0 0
0 0 0 17.64705882 23.52941176 17.64705882 23.52941176
17.64705882 0 0 0 0 0 0 0 0 0
0 0 0 17.64705882 23.52941176 17.64705882 23.52941176
17.64705882 0 0 0 0 0 0 0
2007 1 8 1 0 2 42 42 20 0 0
0 0 0 10 25 30 20 15 0 0 0
0 0 0 0 0 0 0 0 0 10 25
30 20 15 0 0 0 0 0 0 0
2007 1 8 1 0 2 44 44 10 0 0
0 0 0 0 10 0 50 30 0 0 0
10 0 0 0 0 0 0 0 0 0 10
0 50 30 0 0 0 10 0 0 0
2007 1 8 1 0 2 46 46 5 0 0
0 0 0 0 20 20 20 0 0 20 20
0 0 0 0 0 0 0 0 0 0 20
20 20 0 0 20 20 0 0 0 0
2007 1 8 1 0 2 48 48 5 0 0
0 0 0 0 0 0 20 20 20 20 0
0 0 20 0 0 0 0 0 0 0 0
0 20 20 20 20 0 0 0 20 0

2007 1 8 1 0 2 50 50 1 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 0
2007 1 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
2008 1 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
2008 1 8 1 0 2 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
2008 1 8 1 0 2 22 22 5 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
2008 1 8 1 0 2 24 24 11 0 0
72.72727273 27.27272727 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 72.72727273
27.27272727 0 0 0 0 0 0 0 0 0
0 0 0 0
2008 1 8 1 0 2 26 26 12 0 0
25 50 16.66666667 8.333333333 0 0 0 0 0
0 0 0 0 0 0 0 0 25 50
16.66666667 8.333333333 0 0 0 0 0 0 0
0 0 0 0
2008 1 8 1 0 2 28 28 9 0 0
22.22222222 77.77777778 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 22.22222222
77.77777778 0 0 0 0 0 0 0 0 0
0 0 0 0
2008 1 8 1 0 2 30 30 18 0 0
0 27.77777778 33.33333333 22.22222222 16.66666667 0 0
0 0 0 0 0 0 0 0 0 0 0
27.77777778 33.33333333 22.22222222 16.66666667 0 0 0
0 0 0 0 0 0 0
2008 1 8 1 0 2 32 32 15 0 0
13.33333333 20 26.66666667 26.66666667 6.666666667 6.666666667
0 0 0 0 0 0 0 0 0 0 0
13.33333333 20 26.66666667 26.66666667 6.666666667 6.666666667
0 0 0 0 0 0 0 0 0
2008 1 8 1 0 2 34 34 22 0 0
0 0 50 27.27272727 9.090909091 9.090909091 4.545454545
0 0 0 0 0 0 0 0 0 0 0
0 50 27.27272727 9.090909091 9.090909091 4.545454545 0
0 0 0 0 0 0 0
2008 1 8 1 0 2 36 36 19 0 0
0 5.263157895 21.05263158 31.57894737 15.78947368 26.31578947
0 0 0 0 0 0 0 0 0 0 0
0 5.263157895 21.05263158 31.57894737 15.78947368 26.31578947
0 0 0 0 0 0 0 0 0

2008 1 8 1 0 2 38 38 12 0 0
0 0 25 8.333333333 41.66666667 8.333333333 16.66666667
0 0 0 0 0 0 0 0 0 0 0
0 25 8.333333333 41.66666667 8.333333333 16.66666667 0
0 0 0 0 0 0 0
2008 1 8 1 0 2 40 40 16 0 0
0 0 0 12.5 31.25 31.25 18.75 6.25 0 0 0
0 0 0 0 0 0 0 0 0 12.5 31.25
31.25 18.75 6.25 0 0 0 0 0 0 0
2008 1 8 1 0 2 42 42 20 0 0
0 0 0 0 30 35 0 30 5 0 0
0 0 0 0 0 0 0 0 0 0 30
35 0 30 5 0 0 0 0 0 0
2008 1 8 1 0 2 44 44 11 0 0
0 0 0 0 0 18.18181818 27.27272727 36.36363636
9.090909091 0 9.090909091 0 0 0 0 0 0
0 0 0 0 0 18.18181818 27.27272727 36.36363636
9.090909091 0 9.090909091 0 0 0 0
2008 1 8 1 0 2 46 46 7 0 0
0 0 0 0 14.28571429 28.57142857 14.28571429 0
42.85714286 0 0 0 0 0 0 0 0 0
0 0 0 14.28571429 28.57142857 14.28571429 0
42.85714286 0 0 0 0 0 0
2008 1 8 1 0 2 48 48 7 0 0
0 0 0 0 0 14.28571429 0 28.57142857 0
14.28571429 14.28571429 28.57142857 0 0 0 0 0
0 0 0 0 0 14.28571429 0 28.57142857 0
14.28571429 14.28571429 28.57142857 0 0 0
2008 1 8 1 0 2 50 50 1 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 0 0
2008 1 8 1 0 2 52 52 1 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 0 0
2009 1 8 1 0 2 18 18 5 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
2009 1 8 1 0 2 20 20 6 0
33.33333333 66.66666667 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 33.33333333
66.66666667 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2009 1 8 1 0 2 22 22 11 0 0
90.90909091 9.090909091 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 90.90909091
9.090909091 0 0 0 0 0 0 0 0 0
0 0 0 0
2009 1 8 1 0 2 24 24 7 0
14.28571429 85.71428571 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 14.28571429
85.71428571 0 0 0 0 0 0 0 0 0
0 0 0 0 0

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | 1 | 8 | 1 | 0 | 2 | 26 | 26 | 8 | 0 | 0 |
| 37.5 | 37.5 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 37.5 | 37.5 | 25 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 2009 | 1 | 8 | 1 | 0 | 2 | 28 | 28 | 9 | 0 | 0 |
| 0 | 66.66666667 | 33.33333333 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 66.66666667 | |
| 33.33333333 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 0 | 0 | 0 | | | | | | | | |
| 2009 | 1 | 8 | 1 | 0 | 2 | 30 | 30 | 12 | 0 | 0 |
| 16.66666667 | 41.66666667 | 33.33333333 | 8.333333333 | 0 | 0 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 16.66666667 | 41.66666667 | 33.33333333 | 8.333333333 | 0 | 0 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 2009 | 1 | 8 | 1 | 0 | 2 | 32 | 32 | 6 | 0 | 0 |
| 0 | 16.66666667 | 0 | 66.66666667 | 16.66666667 | 0 | 0 | 0 | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 16.66666667 | 0 | 66.66666667 | 16.66666667 | 0 | 0 | 0 | 0 | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2009 | 1 | 8 | 1 | 0 | 2 | 34 | 34 | 11 | 0 | 0 |
| 0 | 18.18181818 | 36.36363636 | 36.36363636 | 9.090909091 | 0 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18.18181818 | 36.36363636 | 36.36363636 | 9.090909091 | 0 | 0 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 2009 | 1 | 8 | 1 | 0 | 2 | 36 | 36 | 14 | 0 | 0 |
| 0 | 0 | 28.57142857 | 35.71428571 | 28.57142857 | 7.142857143 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 28.57142857 | 35.71428571 | 28.57142857 | 7.142857143 | 0 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 2009 | 1 | 8 | 1 | 0 | 2 | 38 | 38 | 14 | 0 | 0 |
| 0 | 0 | 7.142857143 | 14.28571429 | 21.42857143 | 28.57142857 | | | | | |
| 28.57142857 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 0 | 0 | 0 | 7.142857143 | 14.28571429 | 21.42857143 | 28.57142857 | | | | |
| 28.57142857 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 2009 | 1 | 8 | 1 | 0 | 2 | 40 | 40 | 15 | 0 | 0 |
| 0 | 0 | 0 | 40 | 13.33333333 | 6.666666667 | 26.66666667 | | | | |
| 13.33333333 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 0 | 0 | 0 | 40 | 13.33333333 | 6.666666667 | 26.66666667 | | | | |
| 13.33333333 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 2009 | 1 | 8 | 1 | 0 | 2 | 42 | 42 | 10 | 0 | 0 |
| 0 | 0 | 0 | 10 | 10 | 10 | 30 | 40 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 10 |
| 10 | 30 | 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 2009 | 1 | 8 | 1 | 0 | 2 | 44 | 44 | 13 | 0 | 0 |
| 0 | 0 | 0 | 7.692307692 | 7.692307692 | 30.76923077 | 15.38461538 | | | | |
| 30.76923077 | 7.692307692 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 0 | 0 | 0 | 0 | 7.692307692 | 7.692307692 | 30.76923077 | | | | |
| 15.38461538 | 30.76923077 | 7.692307692 | 0 | 0 | 0 | 0 | 0 | | | |
| 0 | | | | | | | | | | |
| 2009 | 1 | 8 | 1 | 0 | 2 | 46 | 46 | 6 | 0 | 0 |
| 0 | 0 | 0 | 0 | 16.66666667 | 0 | 16.66666667 | 16.66666667 | | | |
| 33.33333333 | 0 | 0 | 16.66666667 | 0 | 0 | 0 | 0 | 0 | | |
| 0 | 0 | 0 | 0 | 16.66666667 | 0 | 16.66666667 | 16.66666667 | | | |
| 33.33333333 | 0 | 0 | 16.66666667 | 0 | 0 | 0 | | | | |
| 2009 | 1 | 8 | 1 | 0 | 2 | 48 | 48 | 5 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 40 | 20 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 20 | 40 | 20 | 0 | 0 | 20 | 0 | 0 | |
| 2009 | 1 | 8 | 1 | 0 | 2 | 50 | 50 | 2 | 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 | 0 | 0 | |
| 2009 | 1 | 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 | |
| 2010 | 1 | 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 | |
| 2010 | 1 | 8 | 1 | 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 | |
| 2010 | 1 | 8 | 1 | 0 | 2 | 20 | 20 | 7 | 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 | |
| 2010 | 1 | 8 | 1 | 0 | 2 | 22 | 22 | 5 | 0 | 20 |
| 60 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 20 | 60 | 20 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 2010 | 1 | 8 | 1 | 0 | 2 | 24 | 24 | 11 | 0 | |
| 9.090909091 | 27.27272727 | 54.54545455 | 9.090909091 | 0 | 0 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 9.090909091 | 27.27272727 | 54.54545455 | 9.090909091 | 0 | 0 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 2010 | 1 | 8 | 1 | 0 | 2 | 26 | 26 | 13 | 0 | 0 |
| 15.38461538 | 84.61538462 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15.38461538 | | |
| 84.61538462 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 0 | 0 | 0 | 0 | | | | | | | |
| 2010 | 1 | 8 | 1 | 0 | 2 | 28 | 28 | 11 | 0 | 0 |
| 9.090909091 | 54.54545455 | 36.36363636 | 0 | 0 | 0 | 0 | 0 | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9.090909091 | |
| 54.54545455 | 36.36363636 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 0 | 0 | 0 | 0 | 0 | | | | | | |
| 2010 | 1 | 8 | 1 | 0 | 2 | 30 | 30 | 10 | 0 | 0 |
| 10 | 40 | 20 | 20 | 10 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 10 | 40 | 20 | 20 | 10 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 2010 | 1 | 8 | 1 | 0 | 2 | 32 | 32 | 22 | 0 | 0 |
| 4.545454545 | 40.90909091 | 40.90909091 | 9.090909091 | 4.545454545 | 0 | | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4.545454545 | 40.90909091 | 40.90909091 | 9.090909091 | 4.545454545 | 0 | | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 2010 | 1 | 8 | 1 | 0 | 2 | 34 | 34 | 15 | 0 | 0 |
| 0 | 6.666666667 | 33.33333333 | 33.33333333 | 20 | 6.666666667 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6.666666667 | 33.33333333 | 33.33333333 | 20 | 6.666666667 | 0 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |

2010 1 8 1 0 2 36 36 22 0 0
0 9.090909091 31.81818182 50 4.545454545 0 4.545454545
0 0 0 0 0 0 0 0 0 0 0
9.090909091 31.81818182 50 4.545454545 0 4.545454545 0
0 0 0 0 0 0 0
2010 1 8 1 0 2 38 38 12 0 0
0 0 25 58.33333333 16.66666667 0 0 0 0
0 0 0 0 0 0 0 0 0 0 25
58.33333333 16.66666667 0 0 0 0 0 0 0
0 0 0
2010 1 8 1 0 2 40 40 14 0 0
0 0 7.142857143 35.71428571 21.42857143 21.42857143
14.28571429 0 0 0 0 0 0 0 0 0
0 0 0 7.142857143 35.71428571 21.42857143 21.42857143
14.28571429 0 0 0 0 0 0 0 0
2010 1 8 1 0 2 44 44 3 0 0
0 0 0 0 0 0 33.33333333 33.33333333
33.33333333 0 0 0 0 0 0 0 0 0
0 0 0 0 0 33.33333333 33.33333333 33.33333333
0 0 0 0 0 0
2010 1 8 1 0 2 46 46 5 0 0
0 0 0 0 0 0 40 20 40 0 0
0 0 0 0 0 0 0 0 0 0 0
0 40 20 40 0 0 0 0 0 0
2010 1 8 1 0 2 48 48 6 0 0
0 0 0 0 0 0 33.33333333 50 16.66666667
0 0 0 0 0 0 0 0 0 0 0
0 0 0 33.33333333 50 16.66666667 0 0 0
0 0 0
2010 1 8 1 0 2 50 50 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
2010 1 8 1 0 2 54 54 1 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 0 0
#males 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 M1.1 M2.1 M3.1 M4.1 M5.1 M6.1 M7.1
M8.1 M9.1 M10.1 M11.1 M12.1 M13.1 M14.1 M15.1 M16.1 M17.1
2003 1 8 2 0 2 22 22 4 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
2003 1 8 2 0 2 24 24 4 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
2003 1 8 2 0 2 26 26 10 0 0
40 50 10 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
2003 1 8 2 0 2 28 28 7 0 0
0 28.57142857 71.42857143 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 28.57142857

71.42857143 0 0 0 0 0 0 0 0 0
0 0 0
2003 1 8 2 0 2 30 30 16 0 0
0 37.5 50 12.5 0 0 0 0 0 0 0
0 0 0 0 0 0 0 37.5 50 12.5 0
0 0 0 0 0 0 0 0 0 0
2003 1 8 2 0 2 32 32 18 0 0
0 22.22222222 72.22222222 5.555555556 0 0 0 0
0 0 0 0 0 0 0 0 0 0
22.22222222 72.22222222 5.555555556 0 0 0 0 0
0 0 0 0 0 0
2003 1 8 2 0 2 34 34 28 0 0
0 7.142857143 57.14285714 21.42857143 7.142857143 7.142857143
0 0 0 0 0 0 0 0 0 0 0
0 7.142857143 57.14285714 21.42857143 7.142857143 7.142857143
0 0 0 0 0 0 0 0 0
2003 1 8 2 0 2 36 36 19 0 0
0 0 57.89473684 10.52631579 5.263157895 15.78947368 0
10.52631579 0 0 0 0 0 0 0 0 0
0 0 57.89473684 10.52631579 5.263157895 15.78947368 0
10.52631579 0 0 0 0 0 0 0
2003 1 8 2 0 2 38 38 12 0 0
0 0 41.66666667 25 16.66666667 8.333333333 8.333333333
0 0 0 0 0 0 0 0 0 0 0
0 41.66666667 25 16.66666667 8.333333333 8.333333333 0
0 0 0 0 0 0 0
2003 1 8 2 0 2 40 40 5 0 0
0 0 40 0 0 40 0 0 20 0 0
0 0 0 0 0 0 0 0 40 0 0
40 0 0 20 0 0 0 0 0 0
2003 1 8 2 0 2 42 42 3 0 0
0 0 0 0 0 66.66666667 0 33.33333333 0
0 0 0 0 0 0 0 0 0 0 0
0 0 66.66666667 0 33.33333333 0 0 0 0
0 0 0
2004 1 8 2 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
2004 1 8 2 0 2 20 20 4 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 1 8 2 0 2 22 22 7 0
14.28571429 57.14285714 28.57142857 0 0 0 0 0
0 0 0 0 0 0 0 0 0 14.28571429
57.14285714 28.57142857 0 0 0 0 0 0 0
0 0 0 0 0 0
2004 1 8 2 0 2 24 24 13 0 0
38.46153846 53.84615385 7.692307692 0 0 0 0 0
0 0 0 0 0 0 0 0 0 38.46153846
53.84615385 7.692307692 0 0 0 0 0 0 0
0 0 0 0 0
2004 1 8 2 0 2 26 26 17 0 0
17.64705882 76.47058824 5.882352941 0 0 0 0 0
0 0 0 0 0 0 0 0 0 17.64705882

76.47058824 5.882352941 0 0 0 0 0 0 0
0 0 0 0 0
2004 1 8 2 0 2 28 28 17 0 0
0 41.17647059 35.29411765 17.64705882 5.882352941 0 0
0 0 0 0 0 0 0 0 0 0
41.17647059 35.29411765 17.64705882 5.882352941 0 0 0
0 0 0 0 0 0 0
2004 1 8 2 0 2 30 30 18 0 0
0 22.22222222 27.77777778 27.77777778 11.11111111 11.11111111
0 0 0 0 0 0 0 0 0 0 0
0 22.22222222 27.77777778 27.77777778 11.11111111 11.11111111
0 0 0 0 0 0 0 0 0
2004 1 8 2 0 2 32 32 23 0 0
0 4.347826087 30.43478261 34.7826087 21.73913043 4.347826087
4.347826087 0 0 0 0 0 0 0 0 0
0 0 4.347826087 30.43478261 34.7826087 21.73913043
4.347826087 4.347826087 0 0 0 0 0 0 0
0
2004 1 8 2 0 2 34 34 36 0 0
0 0 8.333333333 30.55555556 36.11111111 16.66666667
5.555555556 2.777777778 0 0 0 0 0 0 0
0 0 0 0 8.333333333 30.55555556 36.11111111
16.66666667 5.555555556 2.777777778 0 0 0 0 0
0 0
2004 1 8 2 0 2 36 36 29 0 0
0 0 0 31.03448276 34.48275862 31.03448276 0 0
3.448275862 0 0 0 0 0 0 0 0 0
0 0 31.03448276 34.48275862 31.03448276 0 0
3.448275862 0 0 0 0 0 0
2004 1 8 2 0 2 38 38 12 0 0
0 0 0 16.66666667 50 8.333333333 0 25 0
0 0 0 0 0 0 0 0 0 0 0
16.66666667 50 8.333333333 0 25 0 0 0 0
0 0 0
2004 1 8 2 0 2 40 40 6 0 0
0 0 0 33.33333333 33.33333333 33.33333333 0 0
0 0 0 0 0 0 0 0 0 0 0
0 33.33333333 33.33333333 33.33333333 0 0 0 0
0 0 0 0 0
2004 1 8 2 0 2 42 42 2 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 0 0
2004 1 8 2 0 2 48 48 1 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 0
2005 1 8 2 0 2 18 18 4 0 75
25 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
2005 1 8 2 0 2 20 20 10 0 40
60 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

2005 1 8 2 0 2 22 22 11 0 0
90.90909091 9.090909091 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 90.90909091
9.090909091 0 0 0 0 0 0 0 0 0
0 0 0 0
2005 1 8 2 0 2 24 24 10 0 0
80 20 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
2005 1 8 2 0 2 26 26 13 0 0
30.76923077 46.15384615 23.07692308 0 0 0 0 0
0 0 0 0 0 0 0 0 0 30.76923077
46.15384615 23.07692308 0 0 0 0 0 0 0
0 0 0 0 0
2005 1 8 2 0 2 28 28 12 0 0
33.33333333 33.33333333 25 8.333333333 0 0 0 0
0 0 0 0 0 0 0 0 0 33.33333333
33.33333333 25 8.333333333 0 0 0 0 0 0
0 0 0 0 0
2005 1 8 2 0 2 30 30 20 0 0
10 30 30 25 5 0 0 0 0 0 0
0 0 0 0 0 0 10 30 30 25 5
0 0 0 0 0 0 0 0 0 0
2005 1 8 2 0 2 32 32 23 0 0
4.347826087 21.73913043 47.82608696 17.39130435 8.695652174 0
0 0 0 0 0 0 0 0 0 0 0
4.347826087 21.73913043 47.82608696 17.39130435 8.695652174 0
0 0 0 0 0 0 0 0 0
2005 1 8 2 0 2 34 34 13 0 0
0 23.07692308 38.46153846 15.38461538 23.07692308 0 0
0 0 0 0 0 0 0 0 0 0 0
23.07692308 38.46153846 15.38461538 23.07692308 0 0 0
0 0 0 0 0 0 0
2005 1 8 2 0 2 36 36 18 0 0
0 0 22.22222222 44.44444444 27.77777778 0 5.555555556
0 0 0 0 0 0 0 0 0 0 0
0 22.22222222 44.44444444 27.77777778 0 5.555555556 0
0 0 0 0 0 0 0
2005 1 8 2 0 2 38 38 9 0 0
0 11.11111111 33.33333333 11.11111111 22.22222222 0
11.11111111 0 0 11.11111111 0 0 0 0 0
0 0 0 11.11111111 33.33333333 11.11111111 22.22222222
0 11.11111111 0 0 11.11111111 0 0 0 0
0
2005 1 8 2 0 2 40 40 4 0 0
0 0 0 25 50 25 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
2005 1 8 2 0 2 42 42 2 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 0 0 0
2006 1 8 2 0 2 18 18 4 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

2006 1 8 2 0 2 20 20 4 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
2006 1 8 2 0 2 22 22 7 0
14.28571429 14.28571429 57.14285714 14.28571429 0 0 0
0 0 0 0 0 0 0 0 0 0
14.28571429 14.28571429 57.14285714 14.28571429 0 0 0
0 0 0 0 0 0 0 0 0
2006 1 8 2 0 2 24 24 11 0 0
9.090909091 36.36363636 54.54545455 0 0 0 0 0
0 0 0 0 0 0 0 0 0 9.090909091
36.36363636 54.54545455 0 0 0 0 0 0 0
0 0 0 0 0
2006 1 8 2 0 2 26 26 5 0 0
20 40 40 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
2006 1 8 2 0 2 28 28 9 0 0
0 33.33333333 33.33333333 22.22222222 11.11111111 0 0
0 0 0 0 0 0 0 0 0 0 0
33.33333333 33.33333333 22.22222222 11.11111111 0 0 0
0 0 0 0 0 0 0
2006 1 8 2 0 2 30 30 24 0 0
4.166666667 16.66666667 37.5 20.83333333 16.66666667 0
4.166666667 0 0 0 0 0 0 0 0 0
0 4.166666667 16.66666667 37.5 20.83333333 16.66666667 0
4.166666667 0 0 0 0 0 0 0 0
2006 1 8 2 0 2 32 32 27 0 0
3.703703704 0 22.22222222 44.44444444 25.92592593 3.703703704
0 0 0 0 0 0 0 0 0 0 0
3.703703704 0 22.22222222 44.44444444 25.92592593 3.703703704
0 0 0 0 0 0 0 0 0
2006 1 8 2 0 2 34 34 26 0 0
0 0 23.07692308 11.53846154 42.30769231 11.53846154
3.846153846 7.692307692 0 0 0 0 0 0 0
0 0 0 0 23.07692308 11.53846154 42.30769231
11.53846154 3.846153846 7.692307692 0 0 0 0 0
0 0
2006 1 8 2 0 2 36 36 29 0 0
0 0 0 10.34482759 37.93103448 24.13793103 20.68965517
3.448275862 3.448275862 0 0 0 0 0 0 0
0 0 0 0 10.34482759 37.93103448 24.13793103
20.68965517 3.448275862 3.448275862 0 0 0 0 0
0
2006 1 8 2 0 2 38 38 13 0 0
0 0 0 23.07692308 15.38461538 15.38461538 23.07692308
15.38461538 7.692307692 0 0 0 0 0 0 0
0 0 0 0 23.07692308 15.38461538 15.38461538
23.07692308 15.38461538 7.692307692 0 0 0 0 0
0
2006 1 8 2 0 2 40 40 6 0 0
0 0 0 0 16.66666667 33.33333333 16.66666667
16.66666667 0 16.66666667 0 0 0 0 0 0
0 0 0 0 0 16.66666667 33.33333333 16.66666667
16.66666667 0 16.66666667 0 0 0 0 0

2006 1 8 2 0 2 42 42 6 0 0
0 0 0 0 16.66666667 33.33333333 0 0
16.66666667 16.66666667 16.66666667 0 0 0 0 0
0 0 0 0 0 16.66666667 33.33333333 0 0
16.66666667 16.66666667 16.66666667 0 0 0 0
2006 1 8 2 0 2 44 44 2 0 0
0 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
2007 1 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 1 8 2 0 2 20 20 3 0
66.66666667 33.33333333 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 66.66666667
33.33333333 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2007 1 8 2 0 2 22 22 8 0 0
50 37.5 0 12.5 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
2007 1 8 2 0 2 24 24 5 0 0
80 0 20 0 0 0 0 0 0 0 0
0 0 0 0 0 0 80 0 20 0 0
0 0 0 0 0 0 0 0 0 0
2007 1 8 2 0 2 26 26 8 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 0 0 0 0 0
2007 1 8 2 0 2 28 28 6 0 0
16.66666667 50 16.66666667 0 16.66666667 0 0 0
0 0 0 0 0 0 0 0 0 16.66666667
50 16.66666667 0 16.66666667 0 0 0 0 0
0 0 0 0 0
2007 1 8 2 0 2 30 30 17 0 0
5.882352941 5.882352941 47.05882353 23.52941176 17.64705882 0
0 0 0 0 0 0 0 0 0 0 0
5.882352941 5.882352941 47.05882353 23.52941176 17.64705882 0
0 0 0 0 0 0 0 0 0
2007 1 8 2 0 2 32 32 17 0 0
0 17.64705882 35.29411765 29.41176471 11.76470588 5.882352941
0 0 0 0 0 0 0 0 0 0
0 17.64705882 35.29411765 29.41176471 11.76470588 5.882352941
0 0 0 0 0 0 0 0 0
2007 1 8 2 0 2 34 34 26 0 0
0 3.846153846 19.23076923 23.07692308 26.92307692 15.38461538
7.692307692 3.846153846 0 0 0 0 0 0 0
0 0 0 3.846153846 19.23076923 23.07692308 26.92307692
15.38461538 7.692307692 3.846153846 0 0 0 0 0
0 0
2007 1 8 2 0 2 36 36 27 0 0
0 0 18.51851852 3.703703704 11.11111111 29.62962963
18.51851852 11.11111111 0 3.703703704 3.703703704 0 0
0 0 0 0 0 0 18.51851852 3.703703704

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 11.11111111 | 29.62962963 | 18.51851852 | 11.11111111 | 0 | 3.703703704 | | | | | |
| 3.703703704 | 0 | 0 | 0 | 0 | | | | | | |
| 2007 | 1 | 8 | 2 | 0 | 2 | 38 | 38 | 10 | 0 | 0 |
| 0 | 0 | 10 | 0 | 10 | 30 | 30 | 0 | 0 | 10 | 10 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 10 |
| 30 | 30 | 0 | 0 | 10 | 10 | 0 | 0 | 0 | 0 | |
| 2007 | 1 | 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 | 1 | 8 | 2 | 0 | 2 | 42 | 42 | 1 | 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 | 0 | 0 | 0 | |
| 2007 | 1 | 8 | 2 | 0 | 2 | 44 | 44 | 1 | 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 | 0 | |
| 2008 | 1 | 8 | 2 | 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 | |
| 2008 | 1 | 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 | 1 | 8 | 2 | 0 | 2 | 20 | 20 | 11 | 0 | |
| 45.45454545 | 54.54545455 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 45.45454545 | | |
| 54.54545455 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 0 | 0 | 0 | 0 | 0 | | | | | | |
| 2008 | 1 | 8 | 2 | 0 | 2 | 22 | 22 | 9 | 0 | |
| 11.11111111 | 77.77777778 | 11.11111111 | 0 | 0 | 0 | 0 | 0 | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11.11111111 | |
| 77.77777778 | 11.11111111 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2008 | 1 | 8 | 2 | 0 | 2 | 24 | 24 | 5 | 0 | 0 |
| 40 | 60 | 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 | |
| 2008 | 1 | 8 | 2 | 0 | 2 | 26 | 26 | 21 | 0 | 0 |
| 19.04761905 | 33.33333333 | 38.0952381 | 9.523809524 | 0 | 0 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 19.04761905 | 33.33333333 | 38.0952381 | 9.523809524 | 0 | 0 | 0 | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 2008 | 1 | 8 | 2 | 0 | 2 | 28 | 28 | 8 | 0 | 0 |
| 25 | 37.5 | 37.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 25 | 37.5 | 37.5 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 2008 | 1 | 8 | 2 | 0 | 2 | 30 | 30 | 21 | 0 | 0 |
| 4.761904762 | 14.28571429 | 33.33333333 | 38.0952381 | 0 | 4.761904762 | | | | | |
| 4.761904762 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 0 | 4.761904762 | 14.28571429 | 33.33333333 | 38.0952381 | 0 | | | | | |
| 4.761904762 | 4.761904762 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 0 | | | | | | | | | | |

2008 1 8 2 0 2 32 32 27 0 0
3.703703704 0 33.33333333 11.11111111 29.62962963 18.51851852
3.703703704 0 0 0 0 0 0 0 0 0
0 3.703703704 0 33.33333333 11.11111111 29.62962963
18.51851852 3.703703704 0 0 0 0 0 0 0
0
2008 1 8 2 0 2 34 34 24 0 0
0 0 25 16.66666667 33.33333333 20.83333333 4.166666667
0 0 0 0 0 0 0 0 0 0 0
0 25 16.66666667 33.33333333 20.83333333 4.166666667 0
0 0 0 0 0 0 0
2008 1 8 2 0 2 36 36 22 0 0
4.545454545 0 9.090909091 13.63636364 27.27272727 18.18181818
18.18181818 9.090909091 0 0 0 0 0 0 0
0 0 4.545454545 0 9.090909091 13.63636364 27.27272727
18.18181818 18.18181818 9.090909091 0 0 0 0 0
0 0
2008 1 8 2 0 2 38 38 14 0 0
0 0 7.142857143 7.142857143 14.28571429 7.142857143
14.28571429 35.71428571 0 7.142857143 7.142857143 0 0
0 0 0 0 0 0 7.142857143 7.142857143
14.28571429 7.142857143 14.28571429 35.71428571 0 7.142857143
7.142857143 0 0 0 0
2008 1 8 2 0 2 40 40 5 0 0
0 0 0 0 0 0 20 40 0 20 20
0 0 0 0 0 0 0 0 0 0 0
0 20 40 0 20 20 0 0 0 0
2008 1 8 2 0 2 42 42 3 0 0
0 0 0 0 0 0 33.33333333 0 0 0
33.33333333 0 33.33333333 0 0 0 0 0 0
0 0 0 0 33.33333333 0 0 0 33.33333333
0 33.33333333 0 0
2008 1 8 2 0 2 44 44 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
2008 1 8 2 0 2 46 46 1 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 0 0
2009 1 8 2 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
2009 1 8 2 0 2 18 18 5 0 60
40 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
2009 1 8 2 0 2 20 20 11 0
9.090909091 90.90909091 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 9.090909091
90.90909091 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2009 1 8 2 0 2 22 22 6 0
16.66666667 83.33333333 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 16.66666667

83.33333333 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2009 1 8 2 0 2 24 24 6 0 0
50 33.33333333 16.66666667 0 0 0 0 0 0
0 0 0 0 0 0 0 0 50 33.33333333
16.66666667 0 0 0 0 0 0 0 0 0
0 0 0
2009 1 8 2 0 2 26 26 17 0 0
29.41176471 47.05882353 17.64705882 5.882352941 0 0 0
0 0 0 0 0 0 0 0 0 0
29.41176471 47.05882353 17.64705882 5.882352941 0 0 0
0 0 0 0 0 0 0 0
2009 1 8 2 0 2 28 28 19 0 0
10.52631579 36.84210526 42.10526316 10.52631579 0 0 0
0 0 0 0 0 0 0 0 0 0
10.52631579 36.84210526 42.10526316 10.52631579 0 0 0
0 0 0 0 0 0 0 0
2009 1 8 2 0 2 30 30 13 0 0
0 38.46153846 30.76923077 15.38461538 15.38461538 0 0
0 0 0 0 0 0 0 0 0 0 0
38.46153846 30.76923077 15.38461538 15.38461538 0 0 0
0 0 0 0 0 0 0
2009 1 8 2 0 2 32 32 29 0 0
0 20.68965517 13.79310345 34.48275862 20.68965517 10.34482759
0 0 0 0 0 0 0 0 0 0 0
0 20.68965517 13.79310345 34.48275862 20.68965517 10.34482759
0 0 0 0 0 0 0 0 0
2009 1 8 2 0 2 34 34 16 0 0
0 0 25 31.25 25 18.75 0 0 0 0 0
0 0 0 0 0 0 0 0 25 31.25 25
18.75 0 0 0 0 0 0 0 0 0
2009 1 8 2 0 2 36 36 12 0 0
0 0 16.66666667 16.66666667 16.66666667 16.66666667 25
8.333333333 0 0 0 0 0 0 0 0 0
0 0 16.66666667 16.66666667 16.66666667 16.66666667 25
8.333333333 0 0 0 0 0 0 0
2009 1 8 2 0 2 38 38 9 0 0
0 0 0 11.11111111 11.11111111 22.22222222 11.11111111
22.22222222 11.11111111 11.11111111 0 0 0 0 0
0 0 0 0 0 11.11111111 11.11111111 22.22222222
11.11111111 22.22222222 11.11111111 11.11111111 0 0 0
0 0
2009 1 8 2 0 2 40 40 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
2009 1 8 2 0 2 42 42 1 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 0 0
2010 1 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
2010 1 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
2010 1 8 2 0 2 20 20 5 0 20
80 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 20 80 0 0 0 0
0 0 0 0 0 0 0 0 0 0
2010 1 8 2 0 2 22 22 7 0 0
42.85714286 57.14285714 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 42.85714286
57.14285714 0 0 0 0 0 0 0 0 0
0 0 0 0
2010 1 8 2 0 2 24 24 10 0 0
40 40 20 0 0 0 0 0 0 0 0
0 0 0 0 0 0 40 40 20 0 0
0 0 0 0 0 0 0 0 0 0
2010 1 8 2 0 2 26 26 23 0 0
4.347826087 78.26086957 17.39130435 0 0 0 0 0
0 0 0 0 0 0 0 0 0 4.347826087
78.26086957 17.39130435 0 0 0 0 0 0 0
0 0 0 0 0
2010 1 8 2 0 2 28 28 15 0 0
20 26.66666667 40 13.33333333 0 0 0 0 0
0 0 0 0 0 0 0 0 20 26.66666667
40 13.33333333 0 0 0 0 0 0 0 0
0 0 0
2010 1 8 2 0 2 30 30 17 0 0
0 41.17647059 35.29411765 17.64705882 5.882352941 0 0
0 0 0 0 0 0 0 0 0 0 0
41.17647059 35.29411765 17.64705882 5.882352941 0 0 0
0 0 0 0 0 0 0
2010 1 8 2 0 2 32 32 26 0 0
3.846153846 38.46153846 38.46153846 11.53846154 7.692307692 0
0 0 0 0 0 0 0 0 0 0 0
3.846153846 38.46153846 38.46153846 11.53846154 7.692307692 0
0 0 0 0 0 0 0 0 0
2010 1 8 2 0 2 34 34 27 0 0
0 18.51851852 33.33333333 22.22222222 22.22222222 3.703703704
0 0 0 0 0 0 0 0 0 0 0
0 18.51851852 33.33333333 22.22222222 22.22222222 3.703703704
0 0 0 0 0 0 0 0 0
2010 1 8 2 0 2 36 36 9 0 0
0 0 22.22222222 22.22222222 22.22222222 11.11111111 0
22.22222222 0 0 0 0 0 0 0 0 0
0 0 22.22222222 22.22222222 22.22222222 11.11111111 0
22.22222222 0 0 0 0 0 0 0
2010 1 8 2 0 2 38 38 10 0 0
0 0 0 30 20 10 10 10 20 0 0
0 0 0 0 0 0 0 0 0 30 20
10 10 10 20 0 0 0 0 0 0
2010 1 8 2 0 2 40 40 1 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 0 0 0
2010 1 8 2 0 2 44 44 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 #N mean size-at-age obs
0 #N_envvar
0 #N_envdata
0 #N sizefreq methods to read
0 #Do_TagData(0/1)
0 #no morphcomp data

999

ENDDATA

## 19. Appendix G: SS2 Control file

#C
#_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

3 #_Nblock_Patterns
4 3 2 #_blocks_per_pattern
# begin and end years of blocks
1973 1982 1983 1992 1993 2002 2003 2010
1983 1992 1993 2002 2003 2010
1973 2002 2003 2010

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

0.005 0.40 0.1549 -1.888 3 0.33 6 0 0 0 0 0.5 0 0 #1 F_M_young
10 45 16.27 17.18 -1 10 2 0 0 0 0 0.5 0 0 #2 F_L@Amin (Amin is age entered above)
40 80 47.86 58.7 -1 10 3 0 0 0 0 0.5 0 0 #3 F_L@Amax
0.04 0.5 0.27 0.13 -1 0.8 2 0 0 0 0 0.5 0 0 #4 F_VBK
0.02 8.00 2.61 3.0 -1 0.8 2 0 0 0 0 0.5 0 0 #5 F_SD@AFIX
-1 1.5 0.0 0.0 -1 0.8 -5 0 0 0 0 0.5 0 0 #6 F_SD@AFIX2=ln(SD@AFIX2/SD@AFIX)
#GP_1:::Male
0.005 0.70 0.1036 -1.58 3 0.33 6 0 0 0 0 0.5 0 0 #7 M_young
-1 2 0.008 0.05 -1 10 2 0 0 0 0 0.5 0 0 #8 LN(F_L@Amin/M_L@Amin)
-1 2 -0.211 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 0.47 0.24 -1 0.8 2 0 0 0 0 0.5 0 0 #10 M_VBK
-1.0 1.00 -0.09 0.0 -1 0.8 2 0 0 0 0 0.5 0 0 #11 M2_SD@AFIX
-1 1.5 0.0 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 2.08296E-06 2.08296E-06 0 0.8 -3 0 0 0 0 0.5 0 0 #WL_intercept_female
1 5 3.473703 3.473703 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 3.05E-06 3.05E-06 0 0.8 -3 0 0 0 0 0.5 0 0 #WL_intercept_male
-3 5 3.360544 3.360544 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 - winter(in log space)

#-4 4 4 0 0 9.8 -3 0 0 0 0 0.5 0 0 #frac R in season 2 - summer(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
3 31 10 9 -1 10 1 #Ln(R0)
0.2 1 0.85 0.8 0 0.09 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
-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
2007 # last year of main recr_devs; forecast devs start in following year
1 #_recdev phase
1 # (0/1) to read 13 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
2007 #_last_yr_fullbias_adj_in_MPD
2010 #_first_recent_yr_nobias_adj_in_MPDadj_in_MPD (-1 to override ramp and set biasadj=1.0 for all estimated recdevs)
0.9 #max bias
0 #period of cycles in recruitment
-4 #min rec_dev
4 #max rec_dev
0 #67 #_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  #Fleet3_(WinterOR)
0   1   0   0.0001  0       99  -1  #Fleet4_(SummerOR)
0   1   0   0.0001  0       99  -1  #Fleet5_(WinterCA)
0   1   0   0.0001  0       99  -1  #Fleet6_(SummerCA)

#_Q_setup
#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)
#do power, env-var, extra SD, dev type
1   0   0   0     #Fleet1_(WinterWA)
0   0   0   0     #Fleet2_(SummerWA)
1   0   0   0     #Fleet3_(WinterOR)
0   0   0   0     #Fleet4_(SummerOR)
1   0   0   0     #Fleet5_(WinterCA)
0   0   0   0     #Fleet6_(SummerCA)
0   0   0   0     #7 Triennial
0   0   0   0     #8 NWFSC
0   0   0   0     #9 Triennial

# LO HI INIT PRIOR PR_type SD PHASE
#       WA Winter
        -5      5       0.0     0.5     -1      99      7       #               (log)   base
        parameter       1987
#       OR Winter
        -5      5       0.0     0.5     -1      99      7       #               (log)   base
        parameter       1987
#       CA Winter
        -5      5       0.0     0.5     -1      99      7       #               (log)   base
        parameter       1987

#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  54.59    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  4.78     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   -7.58    -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  30.39     15      -1  9   1   0   0   0   0   0   0   0   # Retain_1 Inflection
0.1     10  0.75      3       -1  9   2   0   0   0   0   0   0   0   # Retain_2 Slope
0.001   1   0.995     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     -12.55    0   -1     5   3   0   0   0   0   0.5 0   0   #PEAK (see Selex24.xls)
-15     15     -1.32     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)
-15     15     1         0   -1    5   -4  0   0   0   0   0.5 0   0   #APICAL SEL (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  59.51   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  5.32    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   -11.35  -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  29.67  15      -1     9   1   0   0   0   0   0   0   0   # Retain_1 Inflection
0.1     10  1.05   3       -1     9   2   0   0   0   0   0   0   0   # Retain_2 Slope
0.001   1   0.999  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     -13.97  0  -1     -5    3   0   0   0   0   0.5 0   0   #PEAK (see Selex24.xls)
```

-15 15 -1.33 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)
-15 15 1 0 -1 5 -4 0 0 0 0 0.5 0 0 #APICAL SEL (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 43.3917 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 3.4998 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 -13.7804 -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 1. 3 -1 9 2 0 0 0 0 0 0 0 # Retain_2 Slope
0.001 1 0.995 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 -6.4278 0 -1 5 3 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-15 15 -0.9482 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)
-15 15 1 0 -1 5 -4 0 0 0 0 0.5 0 0 #APICAL SEL (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 45.6814 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 4.2597 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 -6.7181 -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 29.4653 15 -1 9 1 0 0 0 0 0 0 0 # Retain_1 Inflection
0.1 10 1.1882 3 -1 9 2 0 0 0 0 0 0 0 # Retain_2 Slope
0.001 1 0.9974 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 -5.0972 0 -1 5 3 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-15 15 -0.9401 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)
-15 15 1 0 -1 5 -4 0 0 0 0 0.5 0 0 #APICAL SEL (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 44.5116 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 4.5070 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 -14.6384 -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 22.8648 15 -1 9 1 0 0 0 0 0 0 0 # Retain_1 Inflection
0.1 10 1.8325 3 -1 9 2 0 0 0 0 0 0 0 # Retain_2 Slope
0.001 1 0.99 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 -11.5284 0 -1 5 3 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-15 15 -2.5591 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)
-15 15 1 0 -1 5 -4 0 0 0 0 0.5 0 0 #APICAL SEL (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 39.7903 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 3.9017 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 -13.0482 -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 26.2448 15 -1 9 1 0 0 0 0 0 0 0 # Retain_1 Inflection
0.1 10 1.8336 3 -1 9 2 0 0 0 0 0 0 0 # Retain_2 Slope
0.001 1 0.9997 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 -5.6710 0 -1 5 3 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-15 15 -1.5100 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)
-15 15 1 0 -1 5 -4 0 0 0 0 0.5 0 0 #APICAL SEL (see Selex24.xls)
#Size_selectivity for TRIENNIAL SURVEY early
#FEMALE
#LO HI INIT PRIOR PR_TYPE SD PHASE env-var use_dev dev_yr1 dev_yr2 dev_sd nblks blk_pat #
15 61 35.4319 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 4.2436 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 -7.3791 -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 -4.1823 0 -1 5 2 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-15 15 -0.5322 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)
-15 15 1 0 -1 5 -4 0 0 0 0 0.5 0 0 #APICAL SEL (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 42.7077 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 5.1017 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 -10.6927 -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 -7.3384 0 -1 5 2 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-15 15 -0.5892 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)
-15 15 1 0 -1 5 -4 0 0 0 0 0.5 0 0 #APICAL SEL (see Selex24.xls)
#Size_selectivity for TRIENNIAL SURVEY late
#FEMALE
#LO HI INIT PRIOR PR_TYPE SD PHASE env-var use_dev dev_yr1 dev_yr2 dev_sd nblks blk_pat #
15 61 38.3545 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 4.8335 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 -9.4754 -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 -4.0542 0 -1 5 2 0 0 0 0 0.5 0 0 #PEAK (see Selex24.xls)
-15 15 -0.1367 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)
-15 15 1 0 -1 5 -4 0 0 0 0 0.5 0 0 #APICAL SEL (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

1 #_Variance_adjustments_to_input_values
#_fleet: 1 2 3 4 5 6 7 8 9
0 0 0 0 0 0 0.22 0.06 0.16 #_add_to_survey_CV
0.03 0.03 0.03 0.03 0.03 0.03 0 0 0#_add_to_discard_stddev
0 0 0 0 0 0 0 0 0 #_add_to_bodywt_CV
1 1 1 1 1 1 1 1 1 #_mult_by_lencomp_N
1 1 1 1 1 1 1 1 1 #_mult_by_agecomp_N
1 1 1 1 1 1 1 1 1 #_mult_by_size-at-age_N

15 #_maxlambdaphase
1 #_sd_offset

15 # 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 1.0 1 #Winter WA CPUE
1 3 1 1.0 1 #Winter OR CPUE
1 5 1 1.0 1 #Winter CA CPUE
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 0 1 #WA winter disc
#2 3 1 0 1 #OR winter disc
#2 5 1 0 1 #CA winter disc
#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

## 20. Appendix H: SS2 Starter file

#C
petrale11.dat
petrale11.ctl
1 # changed from 1 to 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 # write to cumreport.sso (0=no,1=like&timeseries; 2=add survey fits)
0 # 1 is example file; 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: 1st is input, 2nd is estimates, 3rd and higher are bootstrap
10 # Turn off estimation for parameters entering after this phase
10 # MCMC eval burn interval
2 # MCMC thin interval
0.000 # 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 # 0.25 in example; Fraction (X) for Depletion denominator (e.g. 0.4)
4 # 3 in example; SPR_report_basis: 0=skip; 1=(1-SPR)/(1-SPR_tgt); 2=(1-SPR)/(1-SPR_MSY); 3=(1-SPR)/(1-SPR_Btarget); 4=rawSPR
1 # 4 in example; F_report_units: 0=skip; 1=exploitation(Bio); 2=exploitation(Num); 3=sum(Frates); 4=true F for range of ages
# 4 20 #_min and max age over which average F will be calculated
0 # F_report_basis: 0=raw; 1=F/Fspr; 2=F/Fmsy ; 3=F/Fbtgt
999 # check value for end of file

## 21. Appendix I: SS2 Forecast file

#C
# for all year entries except rebuilder; enter either: actual year, -999 for styr, 0 for endyr, neg number for rel. endyr
1 # Benchmarks: 0=skip; 1=calc F_spr,F_btgt,F_msy
2 # Forecast method, MSY: 1= set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt); 4=set to F(endyr)
0.3 # SPR target (e.g. 0.40)
0.25 # Biomass target (e.g. 0.40)
#_Bmark_years: beg_bio, end_bio, beg_selex, end_selex, beg_relF, end_relF (enter actual year, or values of 0 or -integer to be rel. endyr)
0 0 0 0 0 0
2 #Bmark_relF_Basis: 1 = use year range; 2 = set relF same as forecast below
#
1 # Forecast: 0=none; 1=F(SPR); 2=F(MSY) 3=F(Btgt); 4=Ave F (uses first-last relF yrs); 5=input annual F scalar
12 # N forecast years
1 # F scalar (only used for Do_Forecast==5)
#_Fcast_years: beg_selex, end_selex, beg_relF, end_relF (enter actual year, or values of 0 or -integer to be rel. endyr)
0 0 -10 0
1 # Control rule method (1=catch=f(SSB) west coast; 2=F=f(SSB) )
0.25 # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40)
0.05 # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)
1 # Control rule target as fraction of Flimit (e.g. 0.75)
3 #_N forecast loops (1-3) (fixed at 3 for now)
3 #_First forecast loop with stochastic recruitment
0 #_Forecast loop control #3 (reserved for future bells&whistles)
0 #_Forecast loop control #4 (reserved for future bells&whistles)
0 #_Forecast loop control #5 (reserved for future bells&whistles)
2013 #FirstYear for caps and allocations (should be after years with fixed inputs)
0.0 # stddev of log(realized catch/target catch) in forecast (set value>0.0 to cause active impl_error)
1 # Do West Coast gfish rebuilder output (0/1)
2011 # Rebuilder: first year catch could have been set to zero (Ydecl)(-1 to set to 1999)
-1 # Rebuilder: year for current age structure (Yinit) (-1 to set to endyear+1)
1 # fleet relative F: 1=use first-last alloc year; 2=read seas(row) x fleet(col) below
# Note that fleet allocation is used directly as average F if Do_Forecast=4
2 # basis for fcast catch tuning and for fcast catch caps and allocation (2=deadbio; 3=retainbio; 5=deadnum; 6=retainnum)
# Conditional input if relative F choice = 2
# Fleet relative F: rows are seasons, columns are fleets
#_Fleet: FISHERY1 FISHERY2 FISHERY3
# max totalcatch by fleet (-1 to have no max) must enter value for each fleet
-1 -1 -1 -1 -1 -1
# max totalcatch by area (-1 to have no max)

-1
# fleet assignment to allocation group (enter group ID# for each fleet, 0 for not included in an alloc group)
0 0 0 0 0 0
#_Conditional on >1 allocation group
# allocation fraction for each of: 0 allocation groups
# no allocation groups
12 # Number of forecast catch levels to input (else calc catch from forecast F)
2 # basis for input Fcast catch: 2=dead catch; 3=retained catch; 99=input Hrate(F) (units are from fleetunits; note new codes in SSV3.20)
# Input fixed catch values
#Year Seas Fleet Catch(or_F)

| | | | |
|---|---|---|---|
| 2011 | 1 | 1 | 88.22667681 |
| 2011 | 1 | 2 | 152.4294488 |
| 2011 | 1 | 3 | 261.9487901 |
| 2011 | 1 | 4 | 139.2189302 |
| 2011 | 1 | 5 | 204.7739114 |
| 2011 | 1 | 6 | 129.4022426 |
| 2012 | 1 | 1 | 104.8595749 |
| 2012 | 1 | 2 | 181.1661482 |
| 2012 | 1 | 3 | 311.3325784 |
| 2012 | 1 | 4 | 165.465122 |
| 2012 | 1 | 5 | 243.3788291 |
| 2012 | 1 | 6 | 153.7977474 |

999 # verify end of input