# NATIONAL MARINE FISHERIES SERVICE REPORT

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

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

**Council Task:**

**Discussion.**

Reference Materials:

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

Agenda Order:

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

PFMC
05/16/11

Agenda Item E.1.a
Attachment 1
June 2011

# FEDERAL REGISTER NOTICES

**Groundfish and Halibut Notices**
**3/24/2011 through 5/19/2011**

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

76FR 18709. Proposed rule for 2011 Pacific whiting tribal fishery; request for comments – 4-5/11

76FR 27508. 2011-2012 harvest specifications and management measures for groundfish taken in the Pacific Coast Groundfish Fishery; request for comments - 5/11/11

76 FR 28897. Pacific Coast Groundfish Fishery; Biennial Specifications and Management Measures - 5/19/11

# Economic Data Collection (EDC)

Contact:
Dr. Todd Lee
Northwest Fisheries Science Center
NWFSC.EDC@noaa.gov
(866) 791-3726

June 9, 2011

West Coast Groundfish Catch Share Program

# Goals of the EDC

- Study impacts
  - Contribution of fishery to regional economies
  - Cost, earnings, and profitability
- Determine if goals and objectives are achieved
  - MSA requirement
  - Analyze future FMP amendments
- Developed with input from Council, advisory panels, regulatory deeming workgroup, industry, NGOs and other fishery participants

# Overview

- Annual data collection
- Baseline 2009 and 2010 data collected in 2011
- 2011 data collected in 2012, and so forth
- EDC Questionnaires
  - Catcher Vessels
  - Catcher processors
  - Motherships
  - First receivers and shore-based processors
- Due September 1st

# Types of questions

- Vessel/plant information and characteristics
- Owner/operator information, permits and licenses
- Annual expenses
- Capitalized investments
- Quota, permit and license expenses
- Annual earnings
- Vessel: fuel use, speed while fishing, crew size, days at sea
- Processor: employees, hours worked

# Update

- 2009 and 2010 questionnaires
  - –Packets mailed in early May 2011 (letter, FAQ, questionnaire)
  - –Sent to those we can identity
  - –Due September 1, 2011
- EDC website, email, and phone number for questions
- We have received  about 20 questionnaires
- NWC checks questionnaires to determine if they are complete.

# Update - continued

- Developing electronic database with the NWR to track:
  - Who is responsible for an EDC questionnaire
  - Whether a complete questionnaire has been received
- Analysis and reporting of results
  - EDC data is confidential
  - Annual report that summarizes data
  - In-depth research projects

# NOAA Fisheries Groundfish Science Report to PFMC

# June 2011

John Stein and Michelle McClure
NOAA Fisheries
Northwest Fisheries Science Center
Seattle, Washington



# 2011 Surveys

- Groundfish Pre-Recruit Survey: Southern portion complete. *F/V Excalibur.* Will complete June 18th.

- West Coast Bottom Trawl Survey. *F/V Noah's Ark* and *F/V Miss Julie*.

- Acoustic Hake Survey will be mobilizing June 13th on the *Bell M. Shimada :*


F/V Miss Julie


F/V Noah's Ark





F/V Excalibur

# Catch Shares Observer Training and Data

- Trainings
  - 5 completed, 2 more to go
  - Currently have 117 trained
- Debriefings -- using alternative technologies
- Met with mothership fleet
- Discard data transfer – transfer issues worked out

# Pre and Post Catch Share Stats

| Category | Pre-Catch Shares | Post-Catch Shares |
|---|---|---|
| WCGOP Observers | 24 year round, 18 7 – month | 97 as of 05/18/2011 |
| # of Trainings | 1 | 7 |
| # of observers trained | 13 to 20/year | 117 as of 05/25/2011 |
| # of hauls debriefed | ~4.5K | Est. 10.5K |
| Data availability | ~18 month delay | IFQ data sent weekly |
| # of post-first trip meetings | 13 to 20/year | 66 as of 05/18/2010 |

# Assessment-Related Activities

- Review of data-limited assessment methods
- Updated assessments
  - Boccaccio, canary, darkblotched, yelloweye
  - Cowcod status report
- Upcoming STAR Panels
  - Petrale sole, POP – June 20-24 (Seattle)
  - Widow rockfish, spiny dogfish – July 11-15 (Seattle)
  - Sablefish, dover sole – July 27-29 (Newport)
  - Blackgill, greenspotted rockfishes – August 8-12 (Santa Cruz)

# Economic Data Collection (EDC)

- EDC forms have been mailed

- Responses starting to come in
- Contact Todd Lee at 1-866-791-3726 or todd.lee@noaa.gov
- http://www.nwfsc.noaa.gov/research/divisions/fram/economic_data.cfm

Quileute Natural Resources
QUILEUTE INDIAN TRIBE

401 Main Street • Post Office Box 187
LaPush, Washington 98350
Phone: (360) 374-5695 • Fax: (360) 374-9250

May 11, 2011

Mr. Will Stelle, Regional Administrator
NMFS, NW Region
7600 Sand Point Way N.E
Seattle, WA 98115-0700

**Re: Treaty whiting fishery for 2011**

Dear Mr. Stelle:

This letter is to advise NMFS and other interested parties that the Quileute Tribe has determined that the Tribe is unlikely to conduct a commercial whiting fishery during the 2011 season. The Tribe is continuing its efforts to develop a viable whiting fishery, and hopes and expects to participate in the 2012 fishery.

As you know, the Tribe and NMFS staff has had disagreements in the past about reallocation and/or reapportionment of whiting from the allocated tribal share to the non-treaty fishery. The Quileute Tribe's position on this matter has not changed – NMFS does not have authority to reallocate or reapportion any part of the tribal share without consultation with and the affirmative consent of all tribal participants, including Quileute. We invite you to review our prior correspondence addressing such issues. The Tribe remains willing to discuss such matters with you and/or other interested parties at any time.

We look forward to further consultations with you about these matters. If you have any questions about the foregoing, please contact me at (360) 374-6693 or Mel Moon, Director of Quileute Natural Resources, at (360) 374-3133 or mel.moon@quileutenation.org.

Sincerely,

Lonnie Foster

Lonnie Foster
Policy Representative, Quileute National Resource Committee

cc: Barry Thom, NMFS
Stanley Speaks, BIA
Frank Lockhart, NMFS

Agenda Item E.2
Situation Summary
June 2011

# STOCK ASSESSMENTS FOR 2013-2014 GROUNDFISH FISHERIES

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

Members of the Groundfish Subcommittee of the SSC, the Groundfish Management Team (GMT), and Groundfish Advisory Subpanel (GAP) are scheduled to review four updated assessments and a cowcod status report immediately before the June Council meeting on Monday, June 6 (see SSC Groundfish Subcommittee Agenda). The Executive Summaries of these four updated assessments are provided as Agenda Item E.2.a, Attachments 1-5 and **all the assessments in their entirety under Council consideration at this meeting are available on the June 2011 briefing book CD and website (electronic only).**

In April, at the Council's request, a scientific review panel chaired by Dr. Martin Dorn was convened to evaluate the methods used to develop harvest specifications for data-limited groundfish stocks. The Council's request was to review the depletion-corrected average catch (DCAC) and the depletion-based stock reduction analysis (DB-SRA) methods used to inform 2011-2012 overfishing limits (OFLs), as well as any other methods that are recommended by the panel for informing harvest specifications for data-limited stocks. The Council was advised that new data-limited stock assessment methods would be reviewed by the panel and that these new assessment methods might be of sufficient maturity to be used to inform harvest specifications, and possibly stock status, for the upcoming cycle. The Council tasked the SSC with developing a Terms of Reference for conducting and reviewing new data-limited stock assessments for the June Council meeting in the event these new assessment methods were recommended by the Data-limited Methods Review Panel. The Panel did not recommend these new data-limited methods be used to inform 2013-2014 harvest specifications, so a Terms of Reference was not prepared for this meeting. All the recommendations of the Data-limited Methods Review Panel are provided in their report (Attachment 6).

The Council should consider the updated assessments and the cowcod status report, as well as the advice of the SSC, other advisory bodies, and the public before adopting the new updated stock assessments for use in 2013-2014 groundfish management.

**Council Action:**

**Consider results of the data-limited methodology review panel and approve updated stock assessments.**

Reference Materials:

1. Agenda Item E.2.a, Attachment 1: Status of Bocaccio, *Sebastes paucispinis*, in the Conception, Monterey and Eureka INPFC Areas as Updated for 2011.
2. Agenda Item E.2.a, Attachment 2: Status Update of the U.S. Canary Rockfish Resource in 2011.
3. Agenda Item E.2.a, Attachment 3: Cowcod Status Report.
4. Agenda Item E.2.a, Attachment 4: Status and Future Prospects for the Darkblotched Rockfish Resource in Waters off Washington, Oregon, and California as Updated in 2011.
5. Agenda Item E.2.a, Attachment 5: Status of the U.S. yelloweye rockfish resource in 2011 (Update of 2009 Assessment Model).
6. Agenda Item E.2.a, Attachment 6: Assessment Methods for Data-limited Stocks - Report of the Review Panel Meeting.

Agenda Order:

a. Agenda Item Overview John DeVore
b. Reports and Comments of Management Entities and Advisory Bodies
c. Public Comment
d. **Council Action:** Consider Results of Data-Limited Methodology Review Panel and Approve Updated Stock Assessments

PFMC
05/24/11

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# Status of bocaccio, *Sebastes paucispinis*, in the Conception, Monterey and Eureka INPFC areas as updated for 2011

Disclaimer: This information is distributed solely for the purpose of pre-dissemination peer review under applicable information quality guidelines. It has not been formally disseminated by NOAA Fisheries. It does not represent and should not be construed to represent any agency determination or policy.

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**John C. Field**
**Groundfish Analysis Team**
**Fisheries Ecology Division,**
**Southwest Fisheries Science Center**
**110 Shaffer Rd. Santa Cruz CA 95060**
**John.Field@noaa.gov**

## EXECUTIVE SUMMARY

### Stock

This update of the 2009 stock assessment of the bocaccio rockfish (*Sebastes paucispinis*) reports the best estimate of bocaccio abundance and productivity off of the west coast of the United States, from the U.S.-Mexico border to Cape Blanco, Oregon (representing the Conception, Monterey and Eureka INPFC areas).

### Catches

Bocaccio rockfish have long been one of the most important targets of both commercial and recreational fisheries in California waters, accounting for between 25 and 30% of the commercial rockfish (*Sebastes*) historical catch over the past century. However, this percentage has declined in recent years as a result of stock declines, management actions and the development of alternative fisheries (particularly the widow rockfish fishery in the early 1980s). Since 2002 catches have generally been less than 200 tons per year, with the largest fraction of catches coming from the southern California recreational fishery.

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

| | trawl south of 38° N | trawl north of 38° N | hook and line | setnet | rec south of 34.5° N | rec north of 34.5° N | total (S. of 43 ° N) |
|---|---|---|---|---|---|---|---|
| 1999 | 19.00 | 53.00 | 26.00 | 20.70 | 7.20 | 71.00 | 196.90 |
| 2000 | 13.50 | 60.00 | 6.60 | 7.00 | 0.70 | 52.00 | 139.80 |
| 2001 | 9.20 | 49.00 | 4.40 | 7.80 | 0.90 | 60.00 | 131.30 |
| 2002 | 28.04 | 20.67 | 0.13 | 0.01 | 35.88 | 4.93 | 89.66 |
| 2003 | 5.07 | 0.31 | 0.00 | 0.00 | 5.53 | 1.87 | 12.78 |
| 2004 | 13.86 | 3.52 | 1.84 | 0.21 | 63.43 | 2.27 | 85.13 |
| 2005 | 24.64 | 0.43 | 1.50 | 0.17 | 69.90 | 10.70 | 107.34 |
| 2006 | 16.09 | 0.31 | 2.25 | 0.25 | 29.00 | 11.80 | 59.70 |
| 2007 | 4.06 | 1.58 | 3.39 | 0.38 | 44.20 | 8.92 | 62.53 |
| 2008 | 0.42 | 1.98 | 2.02 | 0.08 | 31.50 | 3.33 | 39.33 |
| 2009 | 1.12 | 4.85 | 1.50 | 0.03 | 40.30 | 9.70 | 57.50 |
| 2010 | 2.90 | 10.97 | 1.45 | 0.05 | 52.60 | 7.40 | 75.36 |

### Data and Assessment

The last full assessment of bocaccio rockfish was done in 2009 using the SS3 assessment model. This update extends the time series included in that model for the CalCOFI larval abundance survey, the Southern California Bight hook and line survey, the NWFSC combined trawl survey, the SWFSC juvenile abundance survey, and the recreational pier fishery juvenile index. No new length frequency data are available for commercial fisheries, however new length frequency data are available and included for southern and central/northern California recreational fisheries.

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The length composition data from the 2010 NWFSC trawl survey is dominated by small (Young-of-the-Year, YOY) individuals and has an overly strong influence on the model results. Although several signs point to a strong 2010 year class, the STAT determined that rather than allow the length frequency data from the trawl survey to lead to the estimation of an unprecedented recruitment, a more reasoned approach would be to remove these length data from the model, but include the southern California power plant impingement survey for YOY bocaccio (which is updated from the index presented in the 2009 assessment but not included in the base model due to truncation of the time series). Several other scenarios related to the magnitude of the 2010 year class are developed and presented; additionally a second decision table explores the consequences of alternative model structure for dealing with this uncertainty. All other fixed parameters are unchanged from the 2009 model, and the general trends and results from this update are highly consistent with the 2009 assessment.

**Stock spawning output**

The spawning output exhibits a very moderate decline until about 1950, but is estimated to have declined steeply from the early 1950s through the early 1960s as catches rose from several hundred to several thousand tons. The biomass increased sharply in the early 1960s, exceeding the mean unfished biomass level through the early 70s, when high fishing mortality rates resulted in a rapid drop in spawning output. Fishing mortality remained high throughout the 1980s and 1990s, even as catches, biomass and spawning output declined rapidly. Fishing mortality declined towards the end of the 1990s, in response to management restrictions, and coincident with a series of several strong year classes (following a decade of very poor recruitment) that began in 1999. Since the early 2000s, spawning output has been increasing steadily, although the rate of increase has slowed in the later half of the 2000s. Indications of strong 2009 and 2010 year classes should lead to additional increases in abundance. The base model estimates a current (2011) depletion level of 24%, a 2011 SPR of 0.92, with the forecast under constant harvest rates indicating a continued increase in spawning output.

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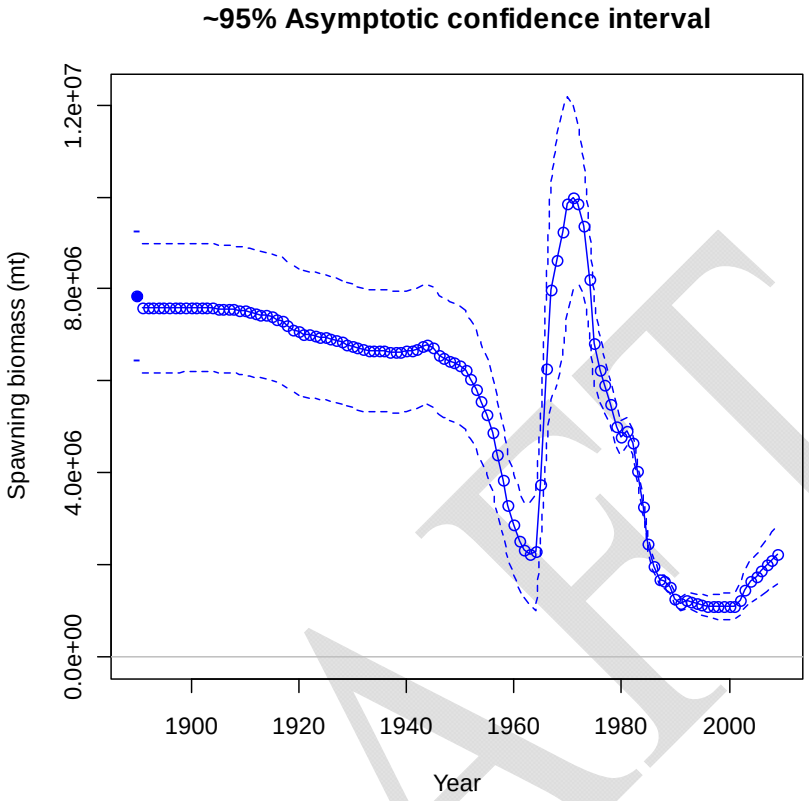



Figure E1. Estimated spawning output time series (1892-2011) for the base case model with approximate asymptotic 95% confidence interval.

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

| Year | Spawning Output (x$10^6$) | CV spawning | Depletion | Confidence interval depletion (~95%) |
|---|---|---|---|---|
| 1999 | 1177300 | 0.11 | 14.98% | (0.11 - 0.18) |
| 2000 | 1187100 | 0.11 | 15.10% | (0.11 - 0.18) |
| 2001 | 1177100 | 0.11 | 14.97% | (0.11 - 0.18) |
| 2002 | 1174700 | 0.12 | 14.94% | (0.11 - 0.18) |
| 2003 | 1275000 | 0.12 | 16.22% | (0.12 - 0.19) |
| 2004 | 1449000 | 0.12 | 18.43% | (0.14 - 0.22) |
| 2005 | 1573500 | 0.12 | 20.02% | (0.15 - 0.24) |
| 2006 | 1631400 | 0.12 | 20.75% | (0.15 - 0.3) |
| 2007 | 1685800 | 0.12 | 21.45% | (0.16 - 0.26) |
| 2008 | 1747600 | 0.12 | 22.23% | (0.16 - 0.27) |
| 2009 | 1803800 | 0.12 | 22.95% | (0.17 - 0.28) |
| 2010 | 1858900 | 0.12 | 23.65% | (0.17 - 0.29) |
| 2011 | 1890200 | 0.12 | 24.05% | (0.18 - 0.29) |

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**Recruitment**

Recruitment for bocaccio is highly variable, with a small number of year classes tending to dominate the catch in any given fishery or region. Recruitment appears to have been at very low levels throughout most of the 1990s, but several recent year classes (1999, 2003, 2005) have been relatively strong given the decline in spawner abundance, and have resulted in an increase in abundance and spawning output. Currently there is some evidence for a moderately strong 2009 year class and a very strong 2010 year class. The relative strength of both of these year classes is a major uncertainty in the model; all of the juvenile indices predict these moderately (2009) and very (2010) strong year classes, but most of these have respectable, but not outstanding, predictive power and only time will tell just how influential these year classes are. Estimated recruitments and confidence intervals for those values are shown in Table E3 and Figure E3.

Table E3. Estimated recruitment with 95% confidence interval, 1999-2010

| | Recruits (1000s) | Recruit CV | lower ~95% | upper ~95% |
|---|---|---|---|---|
| 1999 | 6528 | 0.12 | 4901 | 8155 |
| 2000 | 313 | 0.29 | 128 | 497 |
| 2001 | 199 | 0.32 | 70 | 328 |
| 2002 | 779 | 0.19 | 491 | 1068 |
| 2003 | 2851 | 0.13 | 2100 | 3601 |
| 2004 | 318 | 0.28 | 141 | 495 |
| 2005 | 2785 | 0.14 | 2025 | 3545 |
| 2006 | 630 | 0.26 | 304 | 956 |
| 2007 | 1376 | 0.17 | 899 | 1853 |
| 2008 | 1245 | 0.20 | 755 | 1734 |
| 2009 | 2987 | 0.20 | 1815 | 4159 |
| 2010 | 5637 | 0.32 | 1980 | 9293 |

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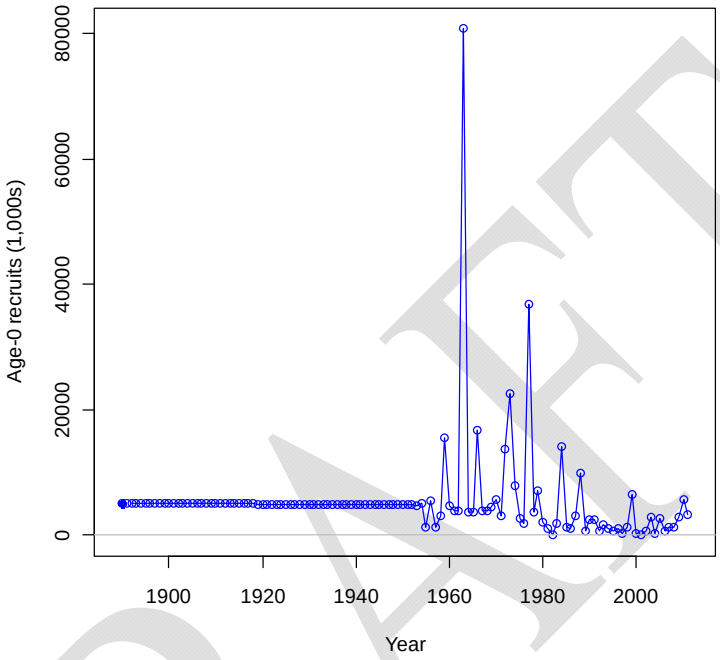



*Figure E3. Estimated recruitment of bocaccio rockfish from 1892-2009 (freely estimated only from 1954-2008).*

**Reference Points**

Reference points are presented in Table E4, which presents the unfished summary biomass, unfished spawning output, mean unfished recruitment and the proxy estimates for MSY based on the $SPR_{50\%}$ rate, the fishing mortality rate associated with a spawning stock output of 40% of the unfished level, and MSY estimated based on the spawner/recruit relationship. The corresponding yields for these three estimates vary by a relatively minor amount, ranging from 1179 tons based on the spawning output proxy and 1196 tons based on the MSY estimate (by contrast, the 2009 model estimated a range from 1250 to 1270 tons). Despite the minor difference in yield between the SPR proxy and the estimated MSY rate, there is a considerable range of spawning biomass levels associated with these alternatives.

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

| | | 95% Confidence Limits | |
|---|---|---|---|
| Unfished Stock | Estimate | Lower | Upper |
| Summary (1+) Biomass (tons) | 44412 | 36371 | 52452 |
| Spawning Output (x $10^6$) | 7861000 | 6373900 | 9348100 |
| Equilibrium recruitment (x $10^3$) | 5112 | 4140 | 6085 |

| | Yield reference Points | | |
|---|---|---|---|
| | $SSB_{40\%}$ | SPR proxy | MSY est. |
| SPR | 0.511 | 0.500 | 0.461 |
| MSY exploitation rate | 0.063 | 0.065 | 0.76 |
| Yield | 1179 | 1185 | 1196 |
| Spawning output (x $10^6$) | 3144390 | 3042520 | 2662320 |
| $SSB/SSB_0$ | 0.4 | 0.39 | 0.34 |

**Exploitation Status**

The 2009 spawning output is estimated to be at 24% of the unfished spawning output, significantly lower than the target levels, and moderately lower than the 2009 point estimate of depletion of 28% (Figure E5). The draft base model indicates that the exploitation rates for bocaccio rockfish has remained at low levels since the turn of the millennia, and the population has been increasing accordingly (Table E5, Figures E5-E6).

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

| Year | Exploitation rate | SPR |
|---|---|---|
| 1999 | 0.031 | 0.708 |
| 2000 | 0.024 | 0.770 |
| 2001 | 0.019 | 0.832 |
| 2002 | 0.011 | 0.906 |
| 2003 | 0.002 | 0.987 |
| 2004 | 0.009 | 0.908 |
| 2005 | 0.011 | 0.885 |
| 2006 | 0.006 | 0.936 |
| 2007 | 0.006 | 0.934 |
| 2008 | 0.004 | 0.939 |
| 2009 | 0.005 | 0.939 |
| 2010 | 0.007 | 0.920 |

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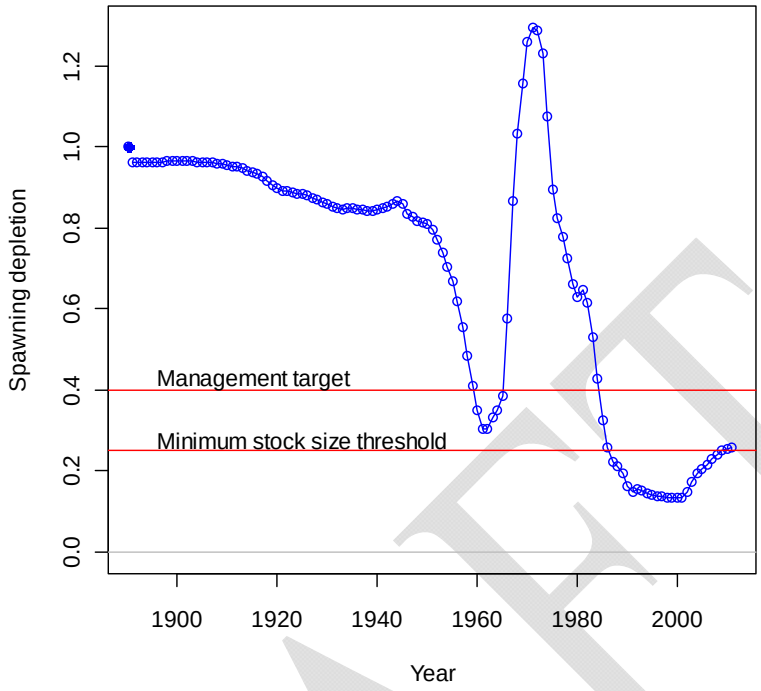



*Figure E4. Time series of estimated depletion level of bocaccio from the base model*

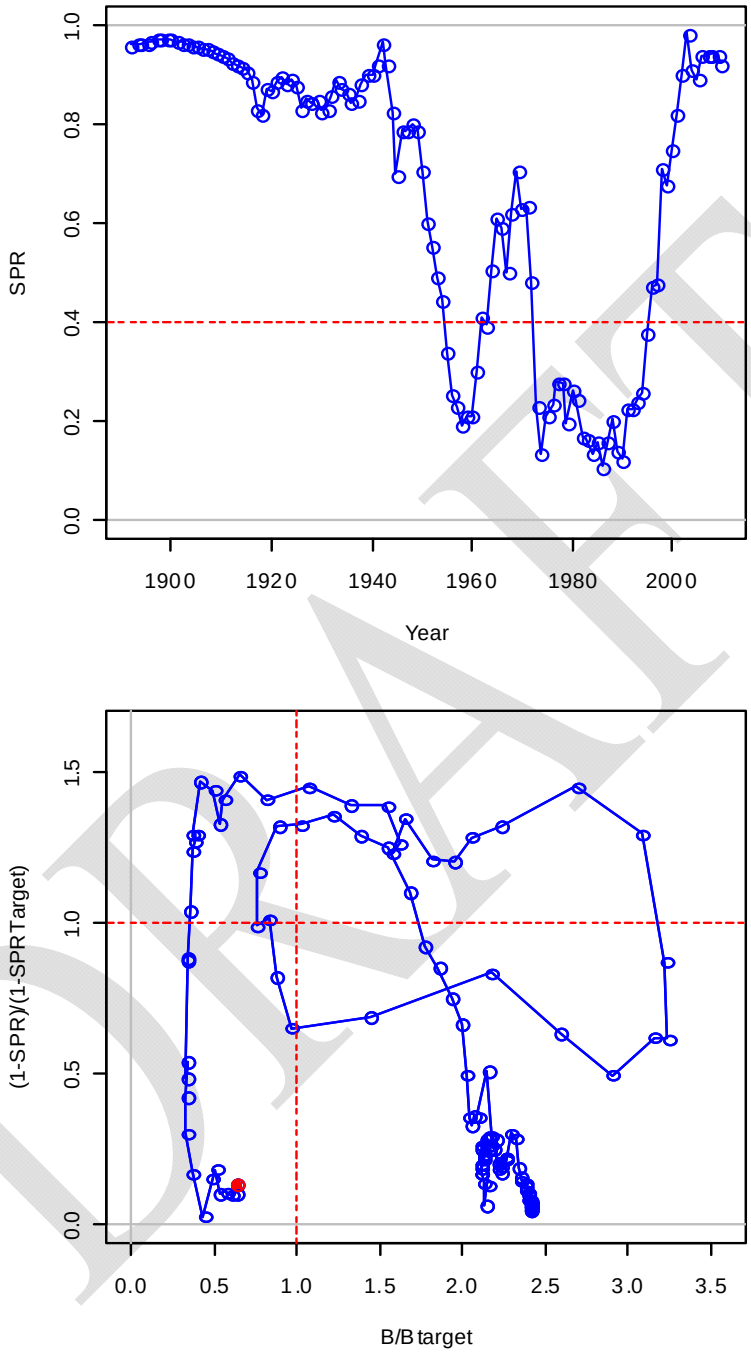
***Management Performance***

Bocaccio rockfish were formally designated as overfished in March of 1999, and the rebuilding OY was held constant at 100 MT for the years 2000-2002. Due to very pessimistic 2002 assessment, the 2003 OY was set to 20 tons, however an improved assessment in 2003 led to a 2004 OY of 199 tons. The OY has ranged from 218 and 307 tons since then (Table E6), with actual catches (including discards) estimated to be less than half of that amount in most years.

Table E6. Management performance

| | Catch | ABC | OY |
|---|---|---|---|
| 2001 | 131.30 | 122 | 100 |
| 2002 | 89.66 | 122 | 100 |
| 2003 | 12.78 | 244 | 20 |
| 2004 | 85.13 | 400 | 199 |
| 2005 | 107.34 | 566 | 307 |
| 2006 | 59.70 | 549 | 306 |
| 2007 | 62.53 | 602 | 218 |
| 2008 | 39.33 | 618 | 218 |
| 2009 | 57.50 | 793 | 288 |
| 2010 | 75.36 | 793 | 288 |
| 2011 | | 737 | 263 |
| 2012 | | 732 | 274 |

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

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**Unresolved problems and major uncertainties**

A major uncertainty for this update is the relative magnitude of the incoming 2010 year class. Virtually all sources of information that could be informative with respect to this recruitment year indicate a strong to very strong (to perhaps absurdly strong) recruitment. Thus, it is reasonable to expect that this year class will in fact result in increased abundance, as well as increased availability (or, inability for avoidance) for many fisheries, particularly in the Southern California Bight where most of the (recent) recruitment appears to have taken place.

Table E7. Forecast of bocaccio ABC, OY, spawning biomass and depletion, based on the SPR= 0.777 fishing mortality target (OY) and $F_{50\%}$ overfishing limit (ABC)

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

**Decision Table**

For the 2009 assessment, both the STAT and the STAR Panel identified the major sources of uncertainty in the model as relating to the tension between two generally pessimistic indices (both derived primarily from north of Point Conception, California) and two optimistic indices (both derived primarily from south of Point Conception). Consequently, the two alternative states of nature sequentially increased the emphasis on each of these groups to bracket uncertainty (Table E8). The low abundance scenario (State 1) was obtained by upweighting ($\lambda$ = 10) the triennial and southern trawl CPUE indices, while the high biomass scenario (State 2) was obtained by upweighting the southern recreational CPUE index and the CalCOFI indices. Thus, these scenarios also provided useful contrast between an apparent, but poorly understood, spatial dimension to relative abundance trends, as the data suggest that recovery may be taking place more rapidly in the south, and recovery in the central/northern California region may be dependent on an influx of fish from the southern area.

In addition, for the purposes of this update, the relative strength of the 2010 year class is highly uncertain and extremely important with respect to future biomass trends and productivity. Thus, the STAT has added two alternative states of nature (relative to the 2011 base model), where the

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Table E8: Decision Table for the bocaccio assessment update
(relative depletion against catch under base and alternative model scenarios)

| catch with 2010 F | | State 1 | Base | State 2 | Alt.State1 | Alt.State2 |
|---|---|---|---|---|---|---|
| 2011 | *263* | 0.15 | 0.24 | 0.31 | 0.24 | 0.24 |
| 2012 | *274* | 0.15 | 0.24 | 0.31 | 0.24 | 0.25 |
| 2013 | 100 | 0.17 | 0.25 | 0.33 | 0.24 | **0.41** |
| 2014 | 117 | 0.19 | 0.29 | 0.37 | 0.26 | **0.69** |
| 2015 | 131 | 0.21 | 0.32 | **0.42** | 0.27 | **0.93** |
| 2016 | 142 | 0.24 | 0.35 | **0.46** | 0.29 | **1.09** |
| 2017 | 153 | 0.26 | 0.38 | **0.50** | 0.32 | **1.20** |
| 2018 | 163 | 0.28 | **0.41** | **0.53** | 0.34 | **1.27** |
| 2019 | 170 | 0.31 | **0.44** | **0.57** | 0.36 | **1.30** |
| 2020 | 177 | 0.33 | **0.47** | **0.60** | 0.38 | **1.32** |
| 2021 | 183 | 0.35 | **0.49** | **0.63** | **0.41** | **1.31** |
| 2022 | 190 | 0.38 | **0.52** | **0.65** | **0.43** | **1.30** |
| | | | | | | |
| SPR of 0.77 (base) | | State 1 | Base | State 2 | Alt.State 1 | Alt.State2 |
| 2011 | *263* | 0.15 | 0.24 | 0.32 | 0.24 | 0.24 |
| 2012 | *274* | 0.15 | 0.25 | 0.33 | 0.24 | 0.25 |
| 2013 | 301 | 0.16 | 0.26 | 0.34 | 0.24 | **0.41** |
| 2014 | 347 | 0.18 | 0.28 | 0.37 | 0.25 | **0.69** |
| 2015 | 381 | 0.19 | 0.31 | **0.40** | 0.27 | **0.92** |
| 2016 | 408 | 0.21 | 0.33 | **0.43** | 0.28 | **1.08** |
| 2017 | 434 | 0.22 | 0.35 | **0.46** | 0.30 | **1.18** |
| 2018 | 459 | 0.24 | 0.37 | **0.49** | 0.31 | **1.24** |
| 2019 | 483 | 0.25 | **0.39** | **0.51** | 0.33 | **1.27** |
| 2020 | 499 | 0.27 | **0.41** | **0.54** | 0.34 | **1.28** |
| 2021 | 514 | 0.28 | **0.43** | **0.56** | 0.36 | **1.27** |
| 2022 | 529 | 0.29 | **0.45** | **0.58** | 0.37 | **1.25** |
| | | | | | | |
| State 2 SPR 0.77 | | State 1 | Base | State 2 | Alt.State 1 | Alt.State2 |
| 2011 | *263* | 0.15 | 0.24 | 0.32 | 0.24 | 0.24 |
| 2012 | *274* | 0.15 | 0.25 | 0.32 | 0.24 | 0.25 |
| 2013 | 392 | 0.16 | 0.26 | 0.34 | 0.24 | **0.41** |
| 2014 | 440 | 0.17 | 0.28 | 0.37 | 0.25 | **0.69** |
| 2015 | 475 | 0.19 | 0.30 | **0.40** | 0.26 | **0.91** |
| 2016 | 494 | 0.20 | 0.32 | **0.42** | 0.27 | **1.06** |
| 2017 | 509 | 0.21 | 0.34 | **0.45** | 0.29 | **1.16** |
| 2018 | 523 | 0.22 | 0.36 | **0.47** | 0.30 | **1.22** |
| 2019 | 537 | 0.24 | 0.38 | **0.50** | 0.31 | **1.25** |
| 2020 | 549 | 0.25 | **0.40** | **0.52** | 0.33 | **1.26** |
| 2021 | 561 | 0.26 | **0.42** | **0.54** | 0.34 | **1.25** |
| 2022 | 571 | 0.27 | **0.43** | **0.56** | 0.35 | **1.23** |

first model excludes any estimation of the magnitude of the 2010 year class (no recruitment deviation parameter estimated). The second alternative state of nature (Alt.State2) reflects the most optimistic estimation of the strength of this year class, based primarily on the length frequencies from the 2010 NWFSC West Coast combined trawl survey. Under the first (no strong 2010 year class) the model is slightly more pessimistic, and rebuilding is not anticipated to take place before 2021 (and only then with the lowest, e.g., status quo, catch scenario). By contrast, under the assumption of the extremely strong year class inferred by the trawl survey length frequency data, the stock will be expected to rebuilt by 2013 regardless of which harvest alternative (among those described) is selected.

DRAFT

**Research and Data Needs**

Since large scale area closures and other management actions were initiated in 2001, the spatial distribution of fishing mortality has changed over both large and small spatial scales. Not only has this effectively truncated several abundance indices (recreational CPUE indices), this confounds the interpretation of survey indices for surveys that do not sample in the Cowcod Conservation Areas (CCA's), as insights from larval surveys suggest that there has been a change in the distribution of bocaccio in recent years such that the greatest abundance of bocaccio is found in that area. This, in turn, infers that fishing mortality is relatively higher on the fraction of the stock currently outside of the CCAs, which may be undergoing localized depletion at a greater rate than the coastwide total stock due to the fact that the greatest catches of bocaccio are derived from these areas.

Stock structure for bocaccio rockfish on the West Coast remains an important issue to explore and consider. Although a reanalysis of the genetic evidence done for this assessment suggests no significant differentiation among the major oceanographic provinces in the California Current, the apparent differences in growth, maturity, and longevity, are indicative of moderate demographic isolation.

The potential to develop defensible aging criteria for bocaccio in the southern area should be evaluated further, particularly if such criteria could be developed in a coordinated effort among workers along the west coast.

The application of juvenile indices to inform future recruitment remains an area in need of additional research and development, including more extensive evaluation of two indices not included in the 2009 assessment (power plant impingement data and submersible observation data). A greater appreciation of the strengths and weaknesses of these indices is an important research priority.

DRAFT

## INTRODUCTION

This updated assessment does not include the background information provided in the full 2009 assessment, for which the 2009 assessment should be referred to (Field et al. 2009). This update only includes a short summary of the time series for which new data were available and describes the resulting change in the perception of stock status and trends.

No changes to any of the life history parameters (maturity, fecundity) were made, no substantive changes in estimated life history parameters (growth) resulted from the extension of any of the time series included in this update.

## DATA

### Commercial and Recreational catches

Commercial bocaccio catch estimates were updated from 2008 through 2010 based on the NWFSC total mortality reports, consistent with the means by which catches were estimated in the 2009 assessment. As no estimate was available for 2010, catches in this year were estimated by applying the discard rates inferred from the West Coast Groundfish Observer Program to catch estimates from CalCOM. Discard rates were approximately 85% for the trawl fishery in 2008-2009 (those rates were applied to 2010 estimates as preliminary 2010 bycatch rates were 100%). No discards were observed in fixed gear fisheries for any of these years, thus fixed gear landing estimates were based on fixed gear catches. A more rigorous evaluation of bycatch data and rates by gear type and region should be undertaken in the next full assessment. Recreational catch estimates for 2008-2010 were provided by John Budrick (CDFG) based on the CRFSS sampling system. Although recent efforts have been undertaken to improve species-specific estimates of historical catches in Oregon (Gertseva et al. in prep), this effort currently does not provide region-specific catch estimates, which is key to bocaccio where only the catches south of Cape Blanco are included in the model. Consequently, historical catch data were not revisited, but should be in the next full assessment.

### Commercial Length Frequency Compositions

The number of length observations available from traditional (CalCOM) sources of length frequency data were inadequate (single digits each for 2009, 2010) to include as length composition information in this update. Consequently, no new commercial length frequency data are included in the update. Length frequency information is available from the bycatch monitoring program, but as this information was not incorporated in the 2009 assessment it is not included in this update. Revisiting an appropriate way to incorporate this data should be done in the next assessment.

### Recreational Length Frequency Data

New recreational length frequency data area available from the CRFSS monitoring program (accessed from the RecFIN website) for 2009-2010. The total number of clusters, fish sampled, and initial effective sample sizes are presented as Table 5.

DRAFT

## Fishery-Dependent Indices

None of the fishery-dependent indices (trawl or recreational CPUE) were updated for this assessment as all of the time series have been effectively truncated by management actions.

## Fishery-Independent Data

### CalCOFI larval abundance data

The CalCOFI larval abundance time series was updated with a small number of observations from (late) 2008, and new observations for all of 2009 and the January survey for 2010. The index was developed with the same approach adopted in the past assessment, a delta-GLM model with the main (fixed) effects of interest being year (adjusted to spawning season), month and line-station effects. These estimates and the associated standard errors estimated from a jackknife routine were used in the model as a relative index of population spawning output (Figures 2). The year effects through 2008 were virtually identical from the most recent GLM results, the new estimates for 2009 and 2010 estimates were suggestive of a decline from the increasing trend observed through most of the 2000s.

### Northwest Center Trawl Survey

The Northwest Fishery Science Center has conducted combined shelf and slope trawl surveys since 2003, based on a random-grid design from depths of 55 to 1280 meters. Additional details on this survey and design are available in the abundance and distribution reports by Keller et al. (2008). Bocaccio CPUE (kg/ha) and negative tows (in depths less than 350 m) pooled over all years are shown as Figure 3a and b; data for 2010 in the Southern California Bight only is shown in Figures 4a and b and discussed in greater detail momentarily. Additional data on the number of tows, number of positive tows, number of length measurements and mean CPUE rates by depth and INPFC area are provided in Tables 10.

The 2009 assessment used a GLMM approach for the development of a relative abundance index (using standard depth strata and area, as well as year, as factors), this index was updated with the latest catch data. The 2009 and the updated (2011) index are shown in Figure 5a. The 2011 index varies modestly from the 2009 index in the years 2005-2006, this is likely a result of changes to the definition of "standard" tows by the NWFSC between the 2009 data request and the 2011 data request, as tows that took place in recently closed (state MPA) areas were excluded from the 2011 data request (a document describing the rationale and results of this tuning is in preparation by the NWFSC). This resulted in a reduction of the number of acceptable hauls used to develop the index, particularly in 2005-2006 when 11 and 2 positive tows were removed respectively. Despite the modest difference between the 2009 and 2011 index, the general pattern is unchanged, with a peak in abundance in 2004 (likely reflecting a strong 2003 year class), a decline in 2005, and a smaller peak in 2006 with declining abundance since that time.

DRAFT

Length frequency data were based on the expanded length frequencies provided by Beth Horness (NWFSC), shown in Figure 5b through 2010. The length frequency data in most of the early years are dominated by the 1999 year class, with signs of the incoming 2003 and 2005 year classes in later survey years. Perhaps most importantly, the 2010 length frequency data are entirely dominated by small (16-20 cm) bocaccio, which represented over 85% of all of the fish encountered in the assessment region for that year (relative to just over 2% of all lengths encountered in the 2003-2009 time period). Although the majority of these fish came from a single haul, over 1 dozen hauls had age-0 fish in 2010, all of which were from hauls centered around the eastern half of the northern channel Islands (Figures 4a-b) and conducted during the second (fall) sweep of the survey. This has previously been described as a region that often has patchy, but highly abundant, numbers of YOY fish late in the year during years of successful recruitment (Love et al. 2005). As these length composition data have tremendous influence on the model results, they are discussed more extensively in that section.

As noted in the 2009 assessment, the fact that this survey does not sample in the Cowcod Conservation Areas is particularly problematic for bocaccio, as Ralston and MacFarlane (2010) have shown based on larval distribution that the greatest abundance of bocaccio in the Southern California Bight is in these closed areas. Thus, the index developed by the combined trawl survey (as well as other surveys) is not likely to be appropriate for indexing the total abundance of bocaccio in the assessment area.

**NWFSC Southern California Bight hook-and-line survey**

A hook and line survey CPUE index developed by the NWFSC was developed by Harms et al. (2008, 2009) was used in the last assessment and updated in this assessment (J. Harms and J. Wallace, pers. com). The extended index (Figure 6a) and associated length frequency data (Figure 6b) are used in the model. The index suggested a slight decline from 2004-2008 in the last assessment, the most recent data points suggest a steeper decline from the early period into 2009- 2010, with the 2010 data point being less than 1/3$^{rd}$ the value of the 2004 data point. As the selectivity of this survey is strongly dome-shaped, and the length frequency data are not indicative of a strong incoming year class, this likely represents the continued decline and reduced selectivity of recent dominant year classes (1999, 2003, 2005) with some sign of a moderately strong year class in 2009. As with the trawl survey index, the hook and line survey index does not include sampling in the Cowcod Conservation Areas where most of the spawning biomass of bocaccio is thought to reside.

**Recruitment Indices**

Two young-of-the-year (YOY) recruitment indices were used in the 2009 bocaccio assessment: the coastwide midwater trawl survey index (2001-2008) and a recreational pier fishery CPUE index that included historical data from the 1950s and 60s. The coastwide midwater trawl survey index was updated by Ralston (2010) and show in Figure 7a; the updated time series was included in the model. The 2010 estimated recruitment was the highest in the 10 year time series of this data set. The pier fishery index was also updated (Figure 7b), with several positive records of bocaccio in 2009, but only one positive record from currently available data for 2010.

DRAFT

This record was for several fish, which would have led to a high 2010 value for this index if a minimum number of positive values was reduced to 1 (included as a dashed line on the figure), but this precludes the ability to estimate error with a jackknife routine, and thus was not done for the model (consistent with the original approach adopted in the 2009 assessment). The estimated 2009 value is among the highest in recent decades (Figure 7b; note that to evaluate the most recent data, the scale is truncated to exclude the 1950s and 1960s estimates).

A third juvenile index, based in power plant impingement data, was revisited (the data had been used or proposed in past assessments) and discussed in the 2009 assessment but not used due to the fact that the time series at that time only extended to 2001. However a connection to the data sources subsequently became available and an index was developed and evaluated in Field et al. (2010; attached as an appendix). The power plant impingment index represents data collected from coastal cooling water intakes at five Southern California electrical generating stations from 1972 to 2010 (and ongoing). These data have been previously described and published by Love et al. (1998) and Miller et al (2009) with respect to trends in abundance of *Sebastes* species and queenfish (*Seriphus politus*), respectively (See either of these manuscripts for additional information, and the precise location of the facilities). The dataset includes observations on as many as 1.8 million fish encountered in three basic types of power plant impingement surveys (E. Miller unpublished data.). The three principle "types" of survey data include "normal operations" (fish sampled off of intake screens during normal operations, typically done every 24 hours although we aggregated these by month for any given plant to avoid excessive weighting of these data), "heat treatments" (periodic events in which a given volume of water is treated at high temperatures to kill off biofouling organisms, all fishes in that known volume of water are subsequently enumerated), and a third set ("fish chase") data that are unique to the San Onofre power plant but were not used in this analysis due to the low frequency of occurrence of bocaccio in those data. Although the frequency of all of these sampling methods is irregular over the 28 year time series, as a result of changes in operating schedules, regulatory requirements and changes in ownership over time, the time series is uninterrupted at the annual scale from 1972-2008.

As with the pier recruitment index, the impingement index was developed using a Delta-GLM (generalized linear model) approach to combine a binomial model for presence/absence information with a model of catch per unit effort for positive observations. Akaike's Information Criteria (AIC) was used to determine the appropriate error distributions and covariates. Year effects are independently estimated covariates which reflect a relative index of abundance for each year, error estimates for these parameters are developed with a jackknife routine. For the impingement data, the other covariates included month, the power plant (essentially "station" or spatial effects, five total), and survey type ("normal operations" or "heat treatments," described above). The resulting recruitment indices from 1972-2008 were compared to the estimated recruitments from the 2009 stock assessment (which did not include this index), and the natural log of both the predictor (indices) and response (assessment recruits) values were used for the regression to best mimic the behavior of stock assessment model optimization routines. The power plant index compared very well ($R^2$ of 0.58) with the assessment estimated recruitments for the 1972-2008 period (Figures 8a-b). Although the data and index were not extensively reviewed by the 2009 STAR Panel, due to the short duration of the time series, the extended time

DRAFT

series is included in this assessment due to the perceived or potential value of these data in assessing the relative strength of the 2010 year class.

A final juvenile index, based on a visual (Delta submersible) survey of Southern California Bight oil rigs and natural reefs was developed and presented in Field et al. (2010) and updated for informative purposes only in this assessment (see Love et al. 2005 for more details regarding this survey). Data from this survey begin in 1995 and were reported through 2008 in the manuscript, for which the index was developed in a manner consistent with the other juvenile indices. The index was updated to include data from 2010, and the results are consistent with the expectation that 2010 should be among the highest recruitment years in recent history for bocaccio (Figure 9a-b). However, as this index was neither discussed nor included in the 2009 assessment, nor is the time series as long as the impingement index, it is not included in the model but referenced solely for informational purposes.

## D.3 Model Description

### Modeling software

The 2009 assessment used the Stock Synthesis 3 (SS-V3.03A) modeling framework developed by Dr. Richard Methot (Methot 2009a; Methot 2009b), although more recent versions of Stock Synthesis 3 are currently available, we continued with the version used in the 2009 assessment. The 2009 model used uninformative priors on many of the selectivity parameters in early modeling efforts, as well as the Dorn (2002 and updated) beta prior distribution for steepness was used in the 2009 base model and is continued here.

### Base model results

The length frequency data from the NWFSC 2010 bottom trawl survey had a very strong influence on the model behavior with respect to the estimation of the 2010 year class. Specifically, due to the fact that over 85% of the individual fish encountered by the survey were YOY bocaccio (in contrast to just 2% for the preceding 7 years of the survey), the influence of the survey length frequency data were overwhelming, resulting in an estimated 2010 recruitment value far above any observed in the historical time series and a recruitment deviation estimate far greater than any estimated by the model. This resulted in some dilemmas regarding the most appropriate way to parameterize this assessment. It should be pointed out that several sources of information point to this year class as being quite strong, including the juvenile trawl survey, the impingement data, and to a somewhat inconclusive extent, the pier fishery index. Additionally, the index of YOY abundance based on visual observations (submersible surveys) is also suggestive of a very strong recruitment event, although that index is not included in the model. As the true strength of the 2010 year class will only be manifest in time, the length frequency data were not considered entirely reliable for the purposes of the update.

We explored several possible means of resolving this issue. The first was to run the model under the most straightforward interpretation of an update, and allow the trawl survey length data to drive the 2010 recruitment to a very high level. The second was to preclude the estimation of a 2010 recruitment deviation, essentially constraining the 2010 recruitment estimate to the (non-

DRAFT

bias adjusted) mean recruitment level. The third was to exclude the 2010 length frequency information from the combined trawl survey index, but include the recruitment index based on the power plant impingement survey for the period from 1972 through 2010. Although this index was not a part of the 2009 assessment model, the index was reported in that assessment through 2001 (the year to which data were then available) and would have been included had the more recent data been available at that time. Moreover, the methodology for the development of this index is entirely consistent with that of similar indices included in the 2009 assessment, as well as documented in a recent publication (Field et al. 2010) for which the impingement time series was demonstrated to be the best performing YOY abundance index for this species (out of four evaluated). Given the extenuating circumstances, the STAT recommends that this scenario be adopted as the base run for the updated model.

Point estimates of parameters for the 2011 update are reported in Table 7, along with the corresponding estimates from the 2009 model. The selectivity curves for the base model have changed very little, but are included as Figures 10a-j. The base model results for recruitment, recruitment deviations, summary biomass, spawning stock biomass (with approximate 95% confidence limits) and depletion are shown in Figures 11-13 and reported in Table 8. The initial unfished summary (age 1+) biomass is estimated to be 44,412 mt, with a spawning output ($SSB_0$) of 7,861 x $10^9$ larvae and mean age 0 recruitment ($R_0$) of 5,112,000 recruits. The estimated steepness (h) for the base model was 0.576, approximately one standard deviation lower than the prior point estimate of 0.73. The spawner-recruit curve is shown as Figure 14, total catches of bocaccio and instantaneous fishing mortality rates for bocaccio by fishery are shown in Figure 15a-b, and the SPR rate both over time and relative to biomass (phase plot) are shown in Figure 16. All of these results are very consistent with those from the 2009 base model, with steep biomass declines through the 1960s, a sharp increase in abundance from the mid-60s onwards, followed by persistent declines from the 1970s through the 1990s during which time the SPR rate was considerably greater than the target (0.5; note that 0.4 is inadvertently shown on Figures 16a-b). Since the early 2000s, fishing mortality rates have declined substantially and biomass has steadily increased, with the point estimate of relative spawning biomass estimated at 24% in 2011, slightly more pessimistic than the 2009 point estimate of 28% in the 2009 base model.

Fits to the updated relative abundance indices (CalCOFI, the NWFSC hook and line index, the NWFSC trawl survey index, the juvenile trawl survey index, the pier fishery CPUE index and the impingement index) are shown in Figures 17-22, in both arithmetic and log space, including plots of the observed vs. predicted values. Fits to the truncated time series (trawl CPUE, triennial survey and the recreational CPUE indices) are not included as they are essentially unchanged from the 2009 assessment. Note that the fits to both the hook and line and the trawl survey index are very poor; these indices estimate a declining trend in abundance while the model (based on CalCOFI and other indices) estimates an increasing trend, these inconsistencies relate directly to what the STAT considers to be the greatest uncertainties and data needs; reconciliation of trend data from the areas solely outside of closed areas with those for the entire S. California Bight (e.g., CalCOFI). Fits to the length composition data, along with plots of residual values and input relative to effective sample sizes, for the recreational fisheries and updated surveys are presented as Figures 23-27; note that fisheries for which no new data are available were not included as the fits have not changed significantly. Figure 28 shows the

DRAFT

equilibrium MSY relative to depletion and the estimated surplus production relative to total biomass for the base model.

**Uncertainty and sensitivity analysis**

For the 2009 assessment, both the STAT and the STAR Panel identified the major sources of uncertainty in the model as relating to the tension between two generally pessimistic indices (both derived primarily from north of Point Conception, California) and two optimistic indices (both derived primarily from south of Point Conception). Consequently, the two alternative states of nature sequentially increased the emphasis on each of these groups to bracket uncertainty (presented in Table E8). The low abundance scenario (State 1) was obtained by upweighting ($\lambda = 10$) the triennial and southern trawl CPUE indices, while the high biomass scenario (State 2) was obtained by upweighting the southern recreational CPUE index and the CalCOFI indices. Thus, these scenarios also provided useful contrast between an apparent, but poorly understood, spatial dimension to relative abundance trends, as the data suggest that recovery may be taking place more rapidly in the south, and recovery in the central/northern California region may be dependent on an influx of fish from the southern area. The basic time series for these runs relative to those from the base run are shown in Figures 29a-c, key model outputs and likelihood estimates are included in Table 9.

Given the high uncertainty regarding the magnitude of the 2010 year class, two additional scenarios were included for the purposes of greater sensitivity analysis. The alternative state 1 model is identical to the 2010 updated base model, except that the 2010 recruitment deviation value is not estimated. As a consequence, this alternative is considerably more pessimistic than the base model, albeit more optimistic than the State 1 scenario. The alternative State 2 model is essentially the model that would have resulted from the most stringent interpretation of the terms of reference for updated assessments, including both the 2010 survey length frequency data and an estimate of the 2010 recruitment deviation parameter. Under this scenario, the 2010 year class strength is the greatest in approximately 50 years (and thus the greatest observed with "contemporary" data as the early 60s recruitment event is primarily informed by the CalCOFI index), and the stock is rebuilt (virtually regardless of catch level) by 2013 (when the 2010 age class becomes mostly mature). The time series from these alternative scenarios are presented relative to the base case in Figures 30a-c. In the opinion of the STAT, these data are clearly informative of an impending strong year class, although they are not sufficiently informative to predict the actual magnitude of that year class. However, given that strong year classes are typically followed (often immediately followed!) by high catch rates, particularly in southern California recreational fisheries, it is critical to recognize that catch rates and catches may increase sharply in the near term (Figure 31).

In the opinion of the STAT, the Alt.State1 model is also not an optimal choice of model as it provides an even more pessimistic perception of stock status and productivity leading into the 2010 year. Specifically, without the estimation of a strong recruitment in 2010, the model estimate of steepness is reduced (from 0.573 in the 2009 base model to 0.576 in the 2011 base model update, relative to 0.521 in the Alt.State1) and the stock is unlikely to rebuild by the current (2022) target. This change is driven largely by the pessimistic indices from the combined trawl survey and the hook and line survey, neither of which survey the area that is currently the

DRAFT

greatest region of bocaccio abundance, within the cowcod conservation areas. These surveys may well capture the actual relative abundance trends in the coastal areas of the southern California Bight, where fishing mortality is equally focused on a fraction of the total available habitat (and biomass) for bocaccio (and thus relative declines may in fact be steep, although see discussion on ontogenetic changes in habitat preferences with size/age in the 2009 assessment as well). However, as pointed out in the 2009 assessment and as recently demonstrated by Ralston and MacFarlane (2010, see also Figure 32a-b), the CalCOFI data suggest that the greatest relative abundance of bocaccio in recent years is within the waters of the cowcod conservation area, where they are subject neither to fishing mortality nor to the other surveys with continuous time series in this region. Resolving how best to measure and assess the actual biomass trends of bocaccio throughout the survey area, remains a key uncertainty and research need for assessment of this species.

**Reference Points**

Reference points are presented in the Executive Summary (Table E4), which includes the unfished summary biomass, unfished spawning output, mean unfished recruitment and the proxy estimates for MSY based on the $SPR_{50\%}$ rate, the fishing mortality rate associated with a spawning stock output of 40% of the unfished level, and MSY estimated based on the spawner/recruit relationship. The corresponding yields for these three estimates vary by a relatively minor amount, ranging from 1179 tons based on the spawning output proxy and 1196 tons based on the MSY estimate (by contrast, the 2009 model estimated a range from 1250 to 1270 tons). Despite the minor difference in yield between the SPR proxy and the estimated MSY rate, there is a considerable range of spawning biomass levels associated with these alternatives.

**Future Research Needs**

Research needs are discussed comprehensively in the 2009 assessment and have changed little since that time. Particularly important is the observation that most of the fishing mortality on bocaccio rockfish takes place in the southern California recreational fishery, where a broad area of habitat is closed to fishing in the cowcod conservation areas (CCAs) and rockfish conservation areas (RCAs). As the NWFSC combined trawl survey and the NWFSC hook and line survey do not index abundance in the CCAs, where larval distribution data suggest the greatest abundance of bocaccio is currently found, the time series derived from these indices in this region are likely to be biased, and inconsistent with indices such as CalCOFI that index the entire region. Although this is not a problem limited to bocaccio, the problem is particularly acute to populations that have their greatest distribution in the Southern California Bight

**Acknowledgements**

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DRAFT

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DRAFT

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DRAFT

Table 1. Total catches (metric tons) and PFMC adopted ABC/OY values for bocaccio rockfish.

| | Catch | ABC | OY |
|---|---|---|---|
| 1999 | 196.90 | 230 | 230 |
| 2000 | 139.80 | 164 | 100 |
| 2001 | 131.30 | 122 | 100 |
| 2002 | 89.66 | 122 | 100 |
| 2003 | 12.78 | 244 | 20 |
| 2004 | 85.13 | 400 | 199 |
| 2005 | 107.34 | 566 | 307 |
| 2006 | 59.70 | 549 | 306 |
| 2007 | 62.53 | 602 | 218 |
| 2008 | 39.33 | 618 | 218 |
| 2009 | 57.50 | 793 | 288 |
| 2010 | 75.36 | 793 | 288 |
| 2011 | | 737 | 263 |
| 2012 | | 732 | 274 |

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Table 2. Estimated domestic commercial landings and discards of bocaccio rockfish south of Cape Blanco, by region and gear type, 1999-2010 (metric tons).

| | trawl south of 38° N | trawl north of 38° N | hook and line | setnet | rec south of 34.5° N | rec north of 34.5° N |
|---|---|---|---|---|---|---|
| 1999 | 19.00 | 53.00 | 26.00 | 20.70 | 7.20 | 71.00 |
| 2000 | 13.50 | 60.00 | 6.60 | 7.00 | 0.70 | 52.00 |
| 2001 | 9.20 | 49.00 | 4.40 | 7.80 | 0.90 | 60.00 |
| 2002 | 28.04 | 20.67 | 0.13 | 0.01 | 35.88 | 4.93 |
| 2003 | 5.07 | 0.31 | 0.00 | 0.00 | 5.53 | 1.87 |
| 2004 | 13.86 | 3.52 | 1.84 | 0.21 | 63.43 | 2.27 |
| 2005 | 24.64 | 0.43 | 1.50 | 0.17 | 69.90 | 10.70 |
| 2006 | 16.09 | 0.31 | 2.25 | 0.25 | 29.00 | 11.80 |
| 2007 | 4.06 | 1.58 | 3.39 | 0.38 | 44.20 | 8.92 |
| 2008 | 0.42 | 1.98 | 2.02 | 0.08 | 31.50 | 3.33 |
| 2009 | 1.12 | 4.85 | 1.50 | 0.03 | 40.30 | 9.70 |
| 2010 | 2.90 | 10.97 | 1.45 | 0.05 | 52.60 | 7.40 |

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Table 3. Total number of plankton tows, positive tows, and the mean cpue of positives for 2000-2010 (see 2009 assessment for complete table).

| | Northern area (lines<77) | | | Southern area (lines>=77) | | |
|---|---|---|---|---|---|---|
| | total tows | positive | ave cpue | total tows | positives | ave cpue |
| 2000 | | | | 96 | 8 | 0.8 |
| 2001 | | | | 93 | 6 | 0.5 |
| 2002 | | | | 118 | 10 | 1.0 |
| 2003 | 46 | 4 | 0.6 | 143 | 14 | 1.0 |
| 2004 | 46 | 3 | 1.3 | 99 | 11 | 4.9 |
| 2005 | | | | 146 | 16 | 1.6 |
| 2006 | 28 | 4 | 1.6 | 149 | 13 | 0.7 |
| 2007 | 10 | 4 | 5.6 | 108 | 11 | 1.2 |
| *2008* | ***20*** | ***1*** | ***0.3*** | 176 | 13 | 1.8 |
| ***2009*** | ***24*** | ***1*** | ***0.2*** | ***170*** | ***10*** | ***0.7*** |
| ***2010*** | ***15*** | ***3*** | ***3.0*** | ***129*** | ***10*** | ***0.9*** |

Table 4. Total number of length frequency observations, subsamples, and input effective sample size for recreational fisheries, 2008-2010 (see 2009 assessment for complete table).

| | Southern California | | | Central/Northern California | | |
|---|---|---|---|---|---|---|
| | obs | samples | Neff | obs | samples | Neff |
| 2008 | 1811 | 484 | 400 | 163 | 88 | 110 |
| 2009 | 2085 | 444 | 400 | 215 | 89 | 119 |
| 2010 | 1869 | 368 | 400 | 184 | 87 | 112 |

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Table 5. Summary of survey information for NWFSC survey, by latitude and inside of 350 meters depth, 2003-2010.

| lat | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2000 | 2010 |
|---|---|---|---|---|---|---|---|---|
| 32 | 37 | 39 | 48 | 49 | 57 | 50 | 64 | 60 |
| 34.5 | 20 | 18 | 17 | 16 | 23 | 24 | 29 | 24 |
| 36 | 23 | 24 | 32 | 31 | 29 | 41 | 42 | 38 |
| 38 | 34 | 39 | 50 | 45 | 33 | 42 | 33 | 45 |
| 40.5 | 56 | 28 | 50 | 34 | 41 | 36 | 44 | 49 |
| 43 | 129 | 136 | 167 | 172 | 196 | 164 | 171 | 180 |

Number of positive tows

| lat | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2000 | 2010 |
|---|---|---|---|---|---|---|---|---|
| 32 | 9 | 9 | 13 | 11 | 12 | 2 | 8 | 16 |
| 34.5 | 7 | 4 | 2 | 2 | 6 | 3 | 6 | 10 |
| 36 | 6 | 7 | 12 | 9 | 6 | 8 | 4 | 6 |
| 38 | 8 | 10 | 8 | 12 | 1 | 8 | 5 | 3 |
| 40.5 | 4 | 0 | 3 | 1 | 2 | 1 | 1 | 0 |
| 43 | 5 | 0 | 2 | 3 | 3 | 4 | 0 | 1 |

Percent positive

| lat | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2000 | 2010 |
|---|---|---|---|---|---|---|---|---|
| 32 | 0.24 | 0.23 | 0.27 | 0.22 | 0.21 | 0.04 | 0.13 | 0.27 |
| 34.5 | 0.35 | 0.22 | 0.12 | 0.13 | 0.26 | 0.13 | 0.21 | 0.42 |
| 36 | 0.26 | 0.29 | 0.38 | 0.29 | 0.21 | 0.20 | 0.10 | 0.16 |
| 38 | 0.24 | 0.26 | 0.16 | 0.27 | 0.03 | 0.19 | 0.15 | 0.07 |
| 40.5 | 0.07 | 0.00 | 0.06 | 0.03 | 0.05 | 0.03 | 0.02 | 0.00 |
| 43 | 0.04 | 0.00 | 0.01 | 0.02 | 0.02 | 0.02 | 0.00 | 0.01 |

Mean CPUE (kg/ha) of positives

| lat | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2000 | 2010 |
|---|---|---|---|---|---|---|---|---|
| 32 | 2.0 | 3.0 | 1.7 | 1.8 | 6.1 | 2.3 | 0.8 | 1.1 |
| 34.5 | 1.0 | 5.8 | 1.7 | 29.0 | 3.7 | 1.7 | 4.7 | 2.2 |
| 36 | 2.1 | 66.0 | 14.3 | 2.1 | 4.7 | 11.4 | 3.2 | 1.2 |
| 38 | 3.5 | 4.0 | 3.2 | 3.4 | 1.9 | 4.8 | 2.5 | 1.8 |
| 40.5 | 2.7 | 0.0 | 2.7 | 0.3 | 2.7 | 0.0 | 4.5 | 0.0 |
| 43 | 5.0 | 0.0 | 1.4 | 27.1 | 6.8 | 5.1 | 0.0 | 0.7 |

Number of length measurements

| lat | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2000 | 2010 |
|---|---|---|---|---|---|---|---|---|
| 32 | 37 | 54 | 111 | 92 | 98 | 7 | 26 | 207 |
| 34.5 | 15 | 29 | 4 | 81 | 25 | 10 | 44 | 48 |
| 36 | 11 | 378 | 165 | 16 | 21 | 63 | 19 | 8 |
| 38 | 25 | 32 | 22 | 22 | 1 | 21 | 8 | 3 |
| 40.5 | 9 | 0 | 15 | 1 | 4 | 1 | 3 | 0 |
| 43 | 16 | 0 | 2 | 50 | 8 | 9 | 0 | 1 |

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Table 6: Juvenile trawl survey young-of-the-year (YOY) index, 2001-2010

| | 09.Index | 09.CV | 11.Index | 11.CV |
|---|---|---|---|---|
| 2001 | 0.4 | 0.018 | 0.369 | 0.021 |
| 2002 | 0.59 | 0.018 | 0.583 | 0.021 |
| 2003 | 0.16 | 0.026 | 0.123 | 0.029 |
| 2004 | 0.39 | 0.017 | 0.353 | 0.021 |
| 2005 | 0.54 | 0.024 | 0.519 | 0.028 |
| 2006 | 0.09 | 0.017 | 0.115 | 0.017 |
| 2007 | 0.21 | 0.018 | 0.225 | 0.022 |
| 2008 | 0.23 | 0.018 | 0.243 | 0.021 |
| 2009 | | | 0.262 | 0.021 |
| 2010 | | | 0.625 | 0.033 |

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Table 7. Fixed and estimated parameter values with standard deviations for the base model.

| Parameter | est. | 09.value | 11.value | st. dev | Parameter | est. | 09.value | 11.value | st. dev |
|---|---|---|---|---|---|---|---|---|---|
| Natural mortality, both sexes | no | 0.15 | | | RecrDev_1954 | yes | 0.13 | 0.09 | 0.62 |
| Length@Amin, both sexes | no | 26 | | | RecrDev_1955 | yes | -1.03 | -1.28 | 0.67 |
| Length@Amax, females | yes | 67.75 | 67.25 | 0.33 | RecrDev_1956 | yes | 0.26 | 0.18 | 0.65 |
| VonBert K females | yes | 0.22 | 0.23 | 0.00 | RecrDev_1957 | yes | -0.96 | -1.23 | 0.68 |
| Length@Amax, males | yes | 58.89 | 58.70 | 0.31 | RecrDev_1958 | yes | -0.31 | -0.35 | 0.97 |
| VonBert K males | yes | 0.27 | 0.27 | 0.01 | RecrDev_1959 | yes | 0.36 | 1.34 | 1.10 |
| CV of size at Amin, both sexes | no | 0.1 | | | RecrDev_1960 | yes | 0.07 | 0.18 | 1.22 |
| CV of size at Amax, both sexes | no | 0.08 | | | RecrDev_1961 | yes | 0 | 0.08 | 1.11 |
| log R0 | yes | 8.53 | 8.54 | 0.10 | RecrDev_1962 | yes | 3.18 | 0.06 | 1.10 |
| Steepness (h) | yes | 0.57 | 0.58 | 0.08 | RecrDev_1963 | yes | 0.04 | 3.06 | 0.33 |
| Sigma-R | no | 1 | | | RecrDev_1964 | yes | 0.03 | -0.01 | 1.05 |
| Initial F, hook and line fleet | yes | 0.0060 | 0.0059 | 0.0007 | RecrDev_1965 | yes | 0 | -0.06 | 1.02 |
| length@peak_trawlsou | yes | 43.42 | 43.48 | 0.18 | RecrDev_1966 | yes | 1.42 | 1.36 | 0.59 |
| Width of top_trawlsou | no | -4.82 | | | RecrDev_1967 | yes | -0.14 | -0.15 | 0.97 |
| Ascending width_trawlsou | no | 4.3 | | | RecrDev_1968 | yes | -0.13 | -0.12 | 0.97 |
| Decending width_trawlsou | no | 4.76 | | | RecrDev_1969 | yes | 0.02 | 0.04 | 1.03 |
| Initial sel_trawlsou | no | -10.5 | | | RecrDev_1970 | yes | 0.42 | 0.33 | 0.91 |
| final sel_trawlsou | no | -0.77 | | | RecrDev_1971 | yes | 0.52 | -0.21 | 0.87 |
| length@peak_hook and line | yes | 50.24 | 50.05 | 0.77 | RecrDev_1972 | yes | 1.02 | 1.29 | 0.21 |
| Width of top_hook and line | yes | -4.09 | -4.20 | 2.56 | RecrDev_1973 | yes | 1.96 | 1.85 | 0.13 |
| Ascending width_hook and line | yes | 4.33 | 4.32 | 0.13 | RecrDev_1974 | yes | 0.95 | 0.87 | 0.16 |
| Decending width_hook and line | yes | 3.98 | 3.97 | 0.51 | RecrDev_1975 | yes | -0.87 | -0.11 | 0.18 |
| Initial sel_hook and line | yes | -9.41 | -9.37 | 4.09 | RecrDev_1976 | yes | -0.15 | -0.47 | 0.23 |
| final sel_hook and line | yes | -0.67 | -0.68 | 0.31 | RecrDev_1977 | yes | 2.57 | 2.53 | 0.08 |
| length@peak_setnet | yes | 48.57 | 48.45 | 0.36 | RecrDev_1978 | yes | -0.14 | 0.24 | 0.25 |
| Width of top_setnet | yes | -7.41 | -7.51 | 5.29 | RecrDev_1979 | yes | 1.01 | 0.92 | 0.11 |
| Ascending width_setnet | yes | 3.45 | 3.43 | 0.10 | RecrDev_1980 | yes | -0.32 | -0.33 | 0.18 |
| Decending width_setnet | yes | 4.15 | 4.12 | 0.18 | RecrDev_1981 | yes | -0.97 | -0.99 | 0.19 |
| Initial sel_setnet | yes | -6.07 | -6.05 | 0.32 | RecrDev_1982 | yes | -2.66 | -2.76 | 0.34 |
| final sel_setnet | yes | -1.59 | -1.60 | 0.21 | RecrDev_1983 | yes | -0.22 | -0.30 | 0.11 |
| length@peak_southern rec | yes | 38.37 | 38.24 | 0.48 | RecrDev_1984 | yes | 1.77 | 1.74 | 0.05 |
| Width of top_southern rec | yes | -7.64 | -7.83 | 5.06 | RecrDev_1985 | yes | -0.58 | -0.49 | 0.15 |
| Ascending width_southern rec | yes | 4.66 | 4.58 | 0.10 | RecrDev_1986 | yes | -0.65 | -0.69 | 0.15 |
| Decending width_southern rec | yes | 5.47 | 5.28 | 0.09 | RecrDev_1987 | yes | 0.6 | 0.51 | 0.12 |
| Initial sel_southern rec | yes | -4.47 | -4.72 | 0.28 | RecrDev_1988 | yes | 1.67 | 1.68 | 0.10 |
| final sel_southern rec | yes | -3.23 | -3.14 | 0.33 | RecrDev_1989 | yes | -1.31 | -1.07 | 0.27 |
| logistic, size infl_central rec | yes | 34.44 | 33.45 | 0.42 | RecrDev_1990 | yes | 0.56 | 0.47 | 0.16 |
| logistic, width 95%_central rec | yes | 11.7 | 10.79 | 0.53 | RecrDev_1991 | yes | 0.5 | 0.50 | 0.16 |
| logistic, size infl_northern trawl | yes | 40.34 | 40.10 | 0.38 | RecrDev_1992 | yes | -0.81 | -0.73 | 0.27 |
| logistic, width 95%_northern trawl | yes | 6.35 | 6.17 | 0.51 | RecrDev_1993 | yes | 0.04 | 0.01 | 0.17 |
| length@peak_triennial | no | 24 | | | RecrDev_1994 | yes | -0.25 | -0.29 | 0.18 |
| Width of top_triennial | no | -9.79 | | | RecrDev_1995 | yes | -0.86 | -0.82 | 0.22 |
| Ascending width_triennial | no | 6.11 | | | RecrDev_1996 | yes | -0.27 | -0.39 | 0.18 |
| Decending width_triennial | no | 5.56 | | | RecrDev_1997 | yes | -1.84 | -1.80 | 0.31 |
| Initial sel_triennial | no | -2.86 | | | RecrDev_1998 | yes | -0.13 | -0.19 | 0.21 |
| final sel_triennial | no | -1.25 | | | RecrDev_1999 | yes | 1.73 | 1.46 | 0.15 |
| length@peak_SCB hook line | yes | 55.07 | 46.56 | 3.08 | RecrDev_2000 | yes | -1.67 | -1.58 | 0.30 |
| Width of top_SCB hook line | yes | -5.73 | -1.40 | 0.45 | RecrDev_2001 | yes | -1.5 | -2.03 | 0.32 |
| Ascending width_SCB hook line | yes | 6 | 5.17 | 0.39 | RecrDev_2002 | yes | -0.2 | -0.71 | 0.19 |
| Decending width_SCB hook line | yes | 2.92 | 2.84 | 1.01 | RecrDev_2003 | yes | 0.85 | 0.51 | 0.13 |
| Initial sel_SCB hook line | yes | -7.76 | -5.82 | 1.40 | RecrDev_2004 | yes | -1.15 | -1.73 | 0.27 |
| final sel_SCB hook line | yes | -1.12 | -1.33 | 0.45 | RecrDev_2005 | yes | 0.68 | 0.43 | 0.12 |
| logistic, size inflection_NWFSC combo | yes | 22.56 | 17.45 | 0.72 | RecrDev_2006 | yes | -1.48 | -1.08 | 0.24 |
| logistic, width 95% inflect_NWFSC combo | yes | 15.19 | 1.40 | 1.85 | RecrDev_2007 | yes | -0.86 | -0.31 | 0.16 |
| | | | | | RecrDev_2008 | yes | -0.87 | -0.43 | 0.18 |
| | | | | | RecrDev_2009 | yes | | 0.43 | 0.18 |
| | | | | | RecrDev_2010 | yes | | 0.56 | 0.32 |

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Table 8. Time series of key model outputs for 2011.

| Year | Total biomass | Summary biomass | Spawning output | CV spawning | Depletion | Recruits (x 103) | CV recruits | Total catch | Exploit. rate | SPR rate |
|---|---|---|---|---|---|---|---|---|---|---|
| Unfished | 44478 | 44412 | 7861000 | 0.095 | 1.000 | 5112 | 0.095 | 0 | 0 | 0.96 |
| 1893 | 43050 | 42984 | 7582800 | 0.098 | 0.965 | 5078 | 0.094 | 157 | 0.004 | 0.96 |
| 1894 | 43039 | 42973 | 7582100 | 0.098 | 0.965 | 5078 | 0.094 | 148 | 0.003 | 0.97 |
| 1895 | 43033 | 42966 | 7582500 | 0.098 | 0.965 | 5078 | 0.094 | 139 | 0.003 | 0.97 |
| 1896 | 43031 | 42965 | 7583300 | 0.098 | 0.965 | 5078 | 0.094 | 131 | 0.003 | 0.97 |
| 1897 | 43034 | 42967 | 7584400 | 0.098 | 0.965 | 5078 | 0.094 | 123 | 0.003 | 0.97 |
| 1898 | 43041 | 42975 | 7586200 | 0.098 | 0.965 | 5078 | 0.094 | 115 | 0.003 | 0.97 |
| 1899 | 43054 | 42987 | 7588700 | 0.098 | 0.965 | 5079 | 0.094 | 108 | 0.003 | 0.98 |
| 1900 | 43072 | 43006 | 7592100 | 0.098 | 0.966 | 5079 | 0.094 | 119 | 0.003 | 0.97 |
| 1901 | 43076 | 43010 | 7593100 | 0.097 | 0.966 | 5079 | 0.094 | 131 | 0.003 | 0.97 |
| 1902 | 43069 | 43002 | 7592000 | 0.097 | 0.966 | 5079 | 0.094 | 142 | 0.003 | 0.97 |
| 1903 | 43049 | 42983 | 7588800 | 0.097 | 0.965 | 5079 | 0.094 | 154 | 0.004 | 0.96 |
| 1904 | 43019 | 42952 | 7583600 | 0.097 | 0.965 | 5078 | 0.094 | 165 | 0.004 | 0.96 |
| 1905 | 42979 | 42913 | 7576600 | 0.097 | 0.964 | 5077 | 0.094 | 176 | 0.004 | 0.96 |
| 1906 | 42930 | 42864 | 7567900 | 0.097 | 0.963 | 5076 | 0.094 | 188 | 0.004 | 0.96 |
| 1907 | 42874 | 42808 | 7557800 | 0.097 | 0.961 | 5075 | 0.094 | 199 | 0.005 | 0.95 |
| 1908 | 42811 | 42745 | 7546200 | 0.097 | 0.960 | 5073 | 0.094 | 210 | 0.005 | 0.95 |
| 1909 | 42741 | 42675 | 7533500 | 0.098 | 0.958 | 5072 | 0.094 | 237 | 0.006 | 0.95 |
| 1910 | 42650 | 42584 | 7517000 | 0.098 | 0.956 | 5069 | 0.094 | 263 | 0.006 | 0.94 |
| 1911 | 42540 | 42474 | 7497100 | 0.098 | 0.954 | 5067 | 0.094 | 289 | 0.007 | 0.93 |
| 1912 | 42412 | 42346 | 7473800 | 0.098 | 0.951 | 5064 | 0.094 | 316 | 0.007 | 0.93 |
| 1913 | 42267 | 42201 | 7447300 | 0.098 | 0.947 | 5060 | 0.094 | 342 | 0.008 | 0.92 |
| 1914 | 42108 | 42042 | 7418000 | 0.099 | 0.944 | 5057 | 0.094 | 368 | 0.009 | 0.92 |
| 1915 | 41934 | 41868 | 7386000 | 0.099 | 0.940 | 5052 | 0.093 | 395 | 0.009 | 0.91 |
| 1916 | 41748 | 41682 | 7351500 | 0.100 | 0.935 | 5048 | 0.093 | 474 | 0.011 | 0.89 |
| 1917 | 41496 | 41430 | 7306200 | 0.100 | 0.929 | 5042 | 0.093 | 747 | 0.018 | 0.83 |
| 1918 | 40986 | 40920 | 7217400 | 0.101 | 0.918 | 5030 | 0.093 | 799 | 0.020 | 0.82 |
| 1919 | 40456 | 40391 | 7122800 | 0.103 | 0.906 | 5016 | 0.093 | 529 | 0.013 | 0.88 |
| 1920 | 40236 | 40170 | 7077300 | 0.103 | 0.900 | 5010 | 0.093 | 550 | 0.014 | 0.87 |
| 1921 | 40018 | 39952 | 7033300 | 0.104 | 0.895 | 5004 | 0.092 | 463 | 0.012 | 0.89 |
| 1922 | 39909 | 39844 | 7008000 | 0.104 | 0.891 | 5000 | 0.092 | 417 | 0.010 | 0.90 |
| 1923 | 39861 | 39795 | 6993900 | 0.104 | 0.890 | 4998 | 0.092 | 489 | 0.012 | 0.88 |
| 1924 | 39748 | 39682 | 6970400 | 0.104 | 0.887 | 4995 | 0.092 | 442 | 0.011 | 0.89 |
| 1925 | 39692 | 39627 | 6956800 | 0.104 | 0.885 | 4993 | 0.092 | 505 | 0.013 | 0.88 |
| 1926 | 39579 | 39514 | 6934500 | 0.104 | 0.882 | 4989 | 0.092 | 711 | 0.018 | 0.84 |
| 1927 | 39268 | 39203 | 6879700 | 0.105 | 0.875 | 4981 | 0.092 | 610 | 0.016 | 0.86 |
| 1928 | 39075 | 39010 | 6843600 | 0.105 | 0.871 | 4976 | 0.092 | 639 | 0.016 | 0.85 |
| 1929 | 38866 | 38801 | 6804800 | 0.106 | 0.866 | 4970 | 0.091 | 597 | 0.015 | 0.86 |
| 1930 | 38714 | 38649 | 6774400 | 0.106 | 0.862 | 4965 | 0.091 | 715 | 0.018 | 0.83 |
| 1931 | 38455 | 38391 | 6726900 | 0.106 | 0.856 | 4958 | 0.091 | 689 | 0.018 | 0.84 |
| 1932 | 38244 | 38180 | 6685000 | 0.107 | 0.850 | 4952 | 0.091 | 556 | 0.015 | 0.86 |
| 1933 | 38183 | 38119 | 6668900 | 0.107 | 0.848 | 4949 | 0.091 | 429 | 0.011 | 0.89 |
| 1934 | 38259 | 38195 | 6676500 | 0.107 | 0.849 | 4950 | 0.091 | 494 | 0.013 | 0.88 |
| 1935 | 38267 | 38203 | 6675500 | 0.106 | 0.849 | 4950 | 0.091 | 534 | 0.014 | 0.87 |

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Table 8 (continued). Time series of key model outputs for 2011.

| Year | Total biomass | Summary biomass | Spawning output | CV spawning | Depletion | Recruits (x 103) | CV recruits | Total catch | Exploit. rate | SPR rate |
|---|---|---|---|---|---|---|---|---|---|---|
| 1936 | 38259 | 38195 | 6676500 | 0.106 | 0.849 | 4949 | 0.091 | 632 | 0.017 | 0.85 |
| 1937 | 38267 | 38203 | 6675500 | 0.106 | 0.849 | 4945 | 0.091 | 589 | 0.015 | 0.85 |
| 1938 | 38235 | 38170 | 6668200 | 0.106 | 0.848 | 4943 | 0.091 | 461 | 0.012 | 0.88 |
| 1939 | 38103 | 38039 | 6645400 | 0.106 | 0.845 | 4944 | 0.091 | 373 | 0.010 | 0.90 |
| 1940 | 38021 | 37956 | 6629900 | 0.106 | 0.843 | 4947 | 0.091 | 382 | 0.010 | 0.90 |
| 1941 | 38073 | 38008 | 6636100 | 0.106 | 0.844 | 4950 | 0.091 | 308 | 0.008 | 0.92 |
| 1942 | 38215 | 38150 | 6656900 | 0.105 | 0.847 | 4955 | 0.091 | 124 | 0.003 | 0.97 |
| 1943 | 38341 | 38277 | 6677000 | 0.105 | 0.849 | 4965 | 0.091 | 292 | 0.008 | 0.93 |
| 1944 | 38535 | 38470 | 6709400 | 0.104 | 0.854 | 4970 | 0.091 | 737 | 0.019 | 0.83 |
| 1945 | 38902 | 38837 | 6772100 | 0.103 | 0.861 | 4962 | 0.091 | 1413 | 0.036 | 0.70 |
| 1946 | 39087 | 39022 | 6802500 | 0.102 | 0.865 | 4934 | 0.090 | 880 | 0.023 | 0.79 |
| 1947 | 38832 | 38767 | 6749300 | 0.103 | 0.859 | 4923 | 0.090 | 890 | 0.023 | 0.79 |
| 1948 | 37936 | 37872 | 6574900 | 0.106 | 0.836 | 4913 | 0.090 | 766 | 0.020 | 0.81 |
| 1949 | 37601 | 37536 | 6506700 | 0.107 | 0.828 | 4907 | 0.090 | 828 | 0.022 | 0.79 |
| 1950 | 37281 | 37217 | 6441500 | 0.108 | 0.819 | 4900 | 0.090 | 1216 | 0.033 | 0.71 |
| 1951 | 37090 | 37026 | 6407900 | 0.108 | 0.815 | 4882 | 0.089 | 1759 | 0.048 | 0.61 |
| 1952 | 36839 | 36775 | 6366000 | 0.109 | 0.810 | 4847 | 0.089 | 1966 | 0.053 | 0.56 |
| 1953 | 36195 | 36131 | 6260900 | 0.110 | 0.796 | 4806 | 0.089 | 2271 | 0.063 | 0.50 |
| 1954 | 35025 | 34961 | 6063100 | 0.114 | 0.771 | 5186 | 0.602 | 2402 | 0.069 | 0.45 |
| 1955 | 33664 | 33601 | 5838900 | 0.118 | 0.743 | 1298 | 0.676 | 3053 | 0.091 | 0.35 |
| 1956 | 32044 | 31976 | 5564800 | 0.123 | 0.708 | 5507 | 0.646 | 3650 | 0.114 | 0.26 |
| 1957 | 30312 | 30295 | 5277800 | 0.128 | 0.671 | 1307 | 0.691 | 3566 | 0.118 | 0.24 |
| 1958 | 27807 | 27736 | 4891700 | 0.135 | 0.622 | 3012 | 0.980 | 3580 | 0.129 | 0.20 |
| 1959 | 24484 | 24467 | 4404300 | 0.148 | 0.560 | 15511 | 1.049 | 2847 | 0.116 | 0.22 |
| 1960 | 21244 | 21205 | 3854300 | 0.171 | 0.490 | 4622 | 1.260 | 2436 | 0.115 | 0.22 |
| 1961 | 18089 | 17887 | 3276800 | 0.200 | 0.417 | 3929 | 1.153 | 1924 | 0.108 | 0.31 |
| 1962 | 16487 | 16426 | 2828300 | 0.196 | 0.360 | 3843 | 1.126 | 1731 | 0.105 | 0.42 |
| 1963 | 16547 | 16496 | 2459700 | 0.282 | 0.313 | 80727 | 0.235 | 2008 | 0.122 | 0.40 |
| 1964 | 17508 | 17457 | 2450100 | 0.376 | 0.312 | 3805 | 1.081 | 1523 | 0.087 | 0.52 |
| 1965 | 19492 | 18438 | 2686300 | 0.394 | 0.342 | 3751 | 1.046 | 1746 | 0.095 | 0.62 |
| 1966 | 25060 | 25011 | 2824900 | 0.350 | 0.359 | 16742 | 0.576 | 3418 | 0.137 | 0.60 |
| 1967 | 36895 | 36846 | 3098300 | 0.320 | 0.394 | 3871 | 0.966 | 5331 | 0.145 | 0.51 |
| 1968 | 48582 | 48363 | 4622100 | 0.249 | 0.588 | 3938 | 0.972 | 3405 | 0.070 | 0.63 |
| 1969 | 56639 | 56588 | 6928800 | 0.171 | 0.881 | 4498 | 1.022 | 2347 | 0.041 | 0.71 |
| 1970 | 60017 | 59965 | 8242600 | 0.132 | 1.049 | 5751 | 0.903 | 2846 | 0.047 | 0.64 |
| 1971 | 62199 | 62141 | 9240400 | 0.106 | 1.175 | 3207 | 0.869 | 2497 | 0.040 | 0.64 |
| 1972 | 62934 | 62858 | 10061000 | 0.085 | 1.280 | 13687 | 0.184 | 3653 | 0.058 | 0.49 |
| 1973 | 61250 | 61208 | 10340000 | 0.069 | 1.315 | 22628 | 0.087 | 7201 | 0.118 | 0.23 |
| 1974 | 58786 | 58608 | 10293000 | 0.056 | 1.309 | 7940 | 0.132 | 9001 | 0.154 | 0.13 |
| 1975 | 54994 | 54699 | 9826600 | 0.047 | 1.250 | 2736 | 0.169 | 6404 | 0.117 | 0.21 |
| 1976 | 48988 | 48885 | 8592800 | 0.044 | 1.093 | 1875 | 0.225 | 6177 | 0.126 | 0.23 |
| 1977 | 42870 | 42835 | 7160300 | 0.043 | 0.911 | 36918 | 0.035 | 4861 | 0.113 | 0.28 |
| 1978 | 39554 | 39530 | 6574400 | 0.039 | 0.836 | 3684 | 0.244 | 4367 | 0.110 | 0.28 |
| 1979 | 35871 | 35389 | 6167800 | 0.036 | 0.785 | 7108 | 0.085 | 6116 | 0.173 | 0.19 |

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Table 8 (continued). Time series of key model outputs for 2011.

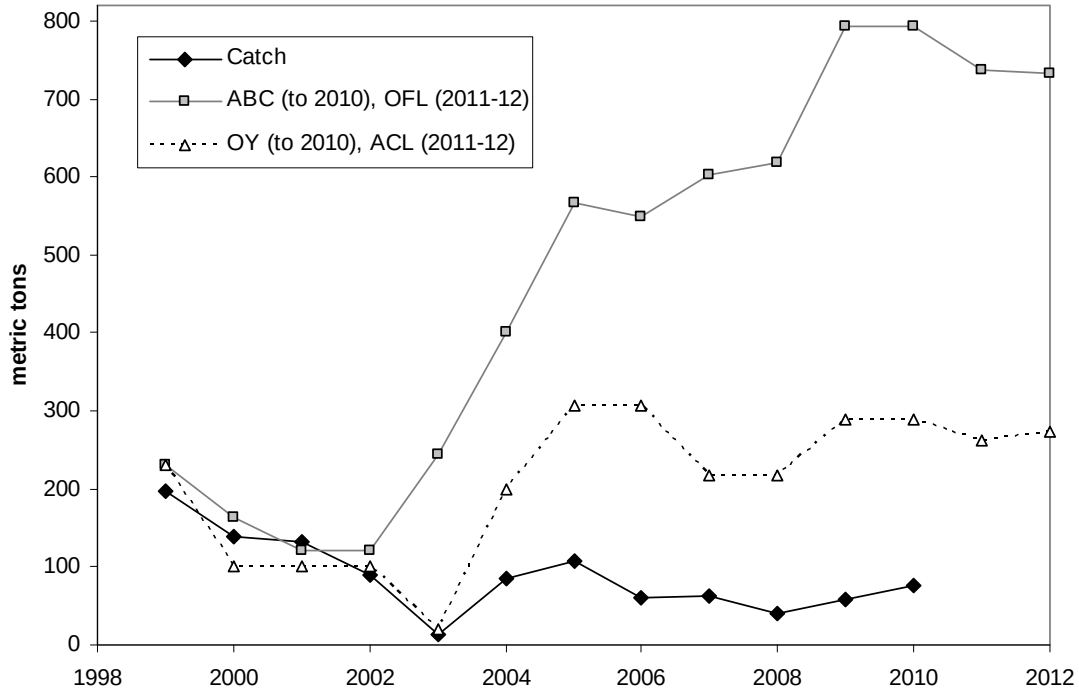
| Year | Total biomass | Summary biomass | Spawning output | CV spawning | Depletion | Recruits (x 103) | CV recruits | Total catch | Exploit. rate | SPR rate |
|---|---|---|---|---|---|---|---|---|---|---|
| 1980 | 35218 | 35125 | 5205700 | 0.036 | 0.662 | 2020 | 0.170 | 5384 | 0.153 | 0.27 |
| 1981 | 34267 | 34240 | 4956800 | 0.032 | 0.631 | 1045 | 0.178 | 5752 | 0.168 | 0.25 |
| 1982 | 32934 | 32920 | 5079300 | 0.026 | 0.646 | 176 | 0.336 | 6599 | 0.200 | 0.17 |
| 1983 | 29625 | 29622 | 4829100 | 0.023 | 0.614 | 1978 | 0.104 | 5598 | 0.189 | 0.17 |
| 1984 | 23937 | 23911 | 4179400 | 0.023 | 0.532 | 14206 | 0.029 | 4676 | 0.196 | 0.13 |
| 1985 | 18572 | 18386 | 3382000 | 0.025 | 0.430 | 1379 | 0.140 | 2864 | 0.156 | 0.16 |
| 1986 | 14550 | 14532 | 2566600 | 0.030 | 0.326 | 1026 | 0.134 | 3121 | 0.215 | 0.11 |
| 1987 | 13383 | 13369 | 2053000 | 0.035 | 0.261 | 3155 | 0.079 | 2649 | 0.198 | 0.16 |
| 1988 | 12087 | 12046 | 1760800 | 0.039 | 0.224 | 9953 | 0.048 | 2304 | 0.191 | 0.21 |
| 1989 | 11211 | 11081 | 1701300 | 0.039 | 0.216 | 613 | 0.261 | 2756 | 0.249 | 0.14 |
| 1990 | 10777 | 10769 | 1570800 | 0.043 | 0.200 | 2597 | 0.108 | 2624 | 0.244 | 0.13 |
| 1991 | 10178 | 10144 | 1312600 | 0.055 | 0.167 | 2536 | 0.115 | 1714 | 0.169 | 0.24 |
| 1992 | 9517 | 9484 | 1205600 | 0.068 | 0.153 | 775 | 0.256 | 1832 | 0.193 | 0.24 |
| 1993 | 9504 | 9493 | 1299800 | 0.070 | 0.165 | 1607 | 0.141 | 1593 | 0.168 | 0.26 |
| 1994 | 9004 | 8983 | 1281200 | 0.078 | 0.163 | 1174 | 0.159 | 1294 | 0.144 | 0.28 |
| 1995 | 8356 | 8340 | 1243300 | 0.088 | 0.158 | 675 | 0.203 | 818 | 0.098 | 0.41 |
| 1996 | 7738 | 7729 | 1205700 | 0.097 | 0.153 | 1032 | 0.159 | 547 | 0.071 | 0.51 |
| 1997 | 7412 | 7399 | 1186700 | 0.105 | 0.151 | 253 | 0.309 | 498 | 0.067 | 0.52 |
| 1998 | 7197 | 7194 | 1192500 | 0.109 | 0.152 | 1248 | 0.193 | 211 | 0.029 | 0.74 |
| 1999 | 6910 | 6893 | 1177300 | 0.113 | 0.150 | 6528 | 0.125 | 213 | 0.031 | 0.71 |
| 2000 | 6891 | 6806 | 1187100 | 0.114 | 0.151 | 313 | 0.295 | 160 | 0.024 | 0.77 |
| 2001 | 7158 | 7154 | 1177100 | 0.116 | 0.150 | 199 | 0.325 | 139 | 0.019 | 0.83 |
| 2002 | 7882 | 7879 | 1174700 | 0.126 | 0.149 | 779 | 0.185 | 90 | 0.011 | 0.91 |
| 2003 | 8552 | 8542 | 1275000 | 0.131 | 0.162 | 2851 | 0.132 | 13 | 0.002 | 0.99 |
| 2004 | 9071 | 9034 | 1449000 | 0.125 | 0.184 | 318 | 0.279 | 85 | 0.009 | 0.91 |
| 2005 | 9540 | 9536 | 1573500 | 0.121 | 0.200 | 2785 | 0.136 | 107 | 0.011 | 0.89 |
| 2006 | 9894 | 9857 | 1631400 | 0.122 | 0.208 | 630 | 0.259 | 60 | 0.006 | 0.94 |
| 2007 | 10151 | 10142 | 1685800 | 0.123 | 0.214 | 1376 | 0.173 | 63 | 0.006 | 0.93 |
| 2008 | 10461 | 10443 | 1747600 | 0.123 | 0.222 | 1245 | 0.197 | 39 | 0.004 | 0.94 |
| 2009 | 10670 | 10653 | 1803800 | 0.124 | 0.229 | 2987 | 0.196 | 58 | 0.005 | 0.94 |
| 2010 | 10833 | 10794 | 1858900 | 0.123 | 0.236 | 5637 | 0.324 | 75 | 0.007 | 0.92 |
| 2011 | 11085 | 11011 | 1890200 | 0.123 | 0.240 | 3247 | 0.122 | | | |

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Table 9. Sensitivity of model outputs and likelihood estimates under scenarios with alternative assumed values for the steepness of the spawner-recruit relationship (h).

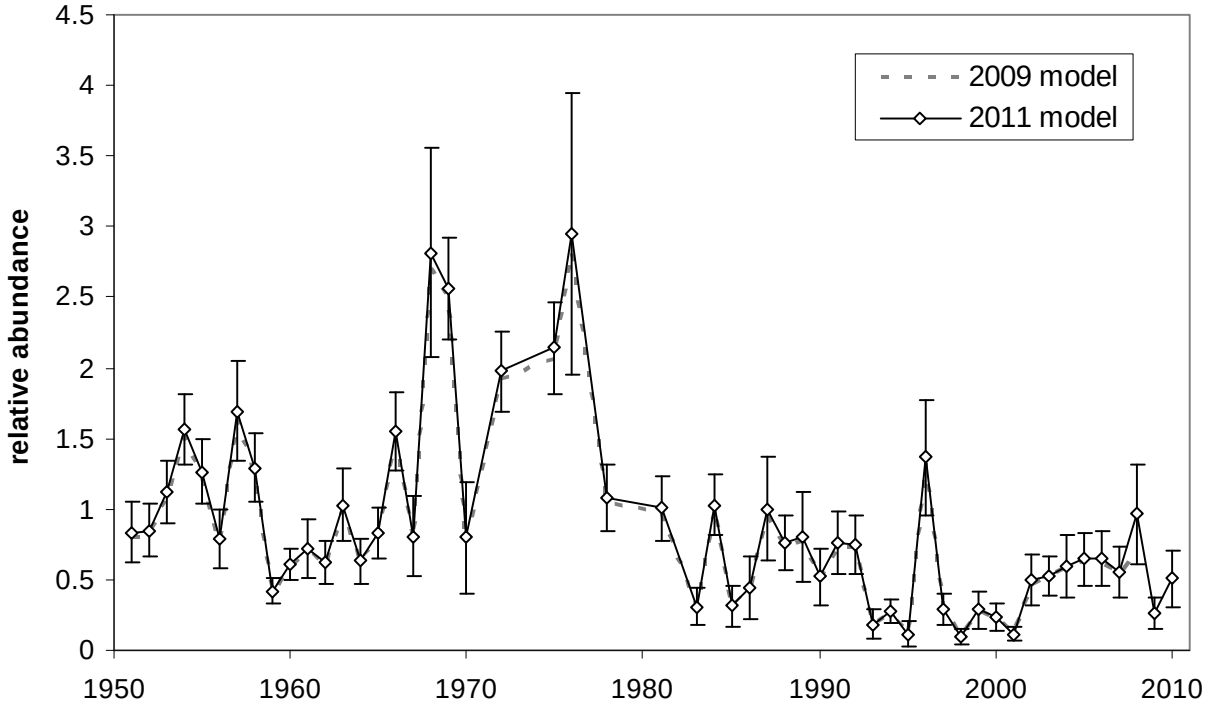
| | 2009 base | 2011 base | State 1 | State 2 | Alt. State 1 | Alt. State 2 |
|---|---|---|---|---|---|---|
| R0 | 5060 | 5112.15 | 4535.38 | 4611.53 | 5286 | 5147 |
| SSB0 | 7861300 | 7860970 | 7014720 | 7084780 | 8105600 | 7844870 |
| biomass0 | 44070 | 44411.5 | 39584 | 40008.3 | 45832 | 44420 |
| S2009/SSB0 | 0.281 | 0.236 | 0.144 | 0.314 | 0.229 | 0.252 |
| B2009/B0 | 0.291 | 0.243 | 0.149 | 0.322 | 0.236 | 0.264 |
| S2011/SSB0 | 0.243 | 0.243 | 0.149 | 0.322 | 0.235 | 0.264 |
| H. est | 0.573 | 0.576 | 0.557 | 0.711 | 0.521103 | 0.622 |
| | | | | | | |
| Likelihoods | 3102.1 | 3507.1 | 3583.1 | 3758.3 | 3438.4 | 3343.5 |
| Survey | 85.4 | 175.7 | 242.0 | 421.6 | 117.2 | 125.0 |
| Length_comp | 2982.4 | 3295.6 | 3303.3 | 3299.2 | 3285.5 | 3177.9 |
| Recruitment | 32.9 | 33.2 | 36.0 | 35.3 | 32.8 | 38.2 |
| Parm_priors | 1.4 | 2.5 | 1.9 | 2.2 | 2.8 | 2.5 |
| Survey | | | | | | |
| Trawl_south | 7.6 | 7.1 | 3.9 | 9.3 | 8.4 | 7.4 |
| RecSouth | 7.7 | 8.0 | 10.3 | 7.8 | 8.2 | 8.0 |
| RecCentral | 10.1 | 10.8 | 16.0 | 9.3 | 10.1 | 10.6 |
| CalCOFI | 21.3 | 21.7 | 26.8 | 19.4 | 22.2 | 21.7 |
| Triennial | 4.1 | 3.8 | 2.4 | 4.6 | 4.2 | 3.9 |
| CPFV_index | 6.0 | 5.7 | 4.6 | 6.5 | 6.2 | 5.7 |
| SCB_hook | 2.4 | 30.2 | 29.5 | 28.1 | 28.4 | 32.3 |
| Combo | 2.9 | 3.6 | 3.6 | 3.5 | 3.5 | 3.8 |
| Juv_trawl | 3.9 | 6.5 | 6.5 | 6.6 | 5.7 | 10.3 |
| Pier_index | 19.4 | 19.4 | 19.2 | 21.9 | 20.5 | 21.4 |
| Impingement | 0.0 | 55.1 | 62.3 | 59.7 | 0.0 | 89.0 |
| Length | | | | | | |
| Trawl_south | 468.1 | 469.9 | 472.3 | 475.5 | 469.5 | 467.1 |
| hook-line | 363.0 | 363.5 | 364.2 | 367.4 | 364.0 | 363.2 |
| setnet | 356.2 | 355.8 | 357.5 | 356.8 | 355.6 | 354.4 |
| RecSouth | 375.4 | 397.7 | 430.7 | 427.1 | 424.3 | 441.2 |
| RecCentral | 365.2 | 377.5 | 400.6 | 404.4 | 402.0 | 403.0 |
| Trawl_north | 365.4 | 369.4 | 367.8 | 368.5 | 368.2 | 369.1 |
| Triennial | 151.0 | 149.0 | 147.3 | 144.9 | 145.5 | 148.4 |
| CPFV_index | 213.1 | 214.1 | 215.9 | 213.7 | 217.5 | 216.4 |
| SCB_hook | 60.9 | 69.7 | 80.3 | 82.0 | 82.8 | 80.1 |
| Combo | 137.3 | 170.0 | 169.2 | 168.5 | 169.3 | 205.5 |
| CPFV S. Cal. LFs | 126.6 | 132.0 | 135.1 | 132.7 | 131.8 | 129.4 |

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Figure 1: Management performance with PFMC adopted ABC and OY values (to 2010, OFL and ACL values for 2011-2012) relative to estimated catches from 1999-2012.




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Figures 2. CalCOFI larval abundance indices for the coastwide bocaccio model updated through part of 2010 as compared to 2009 estimate.

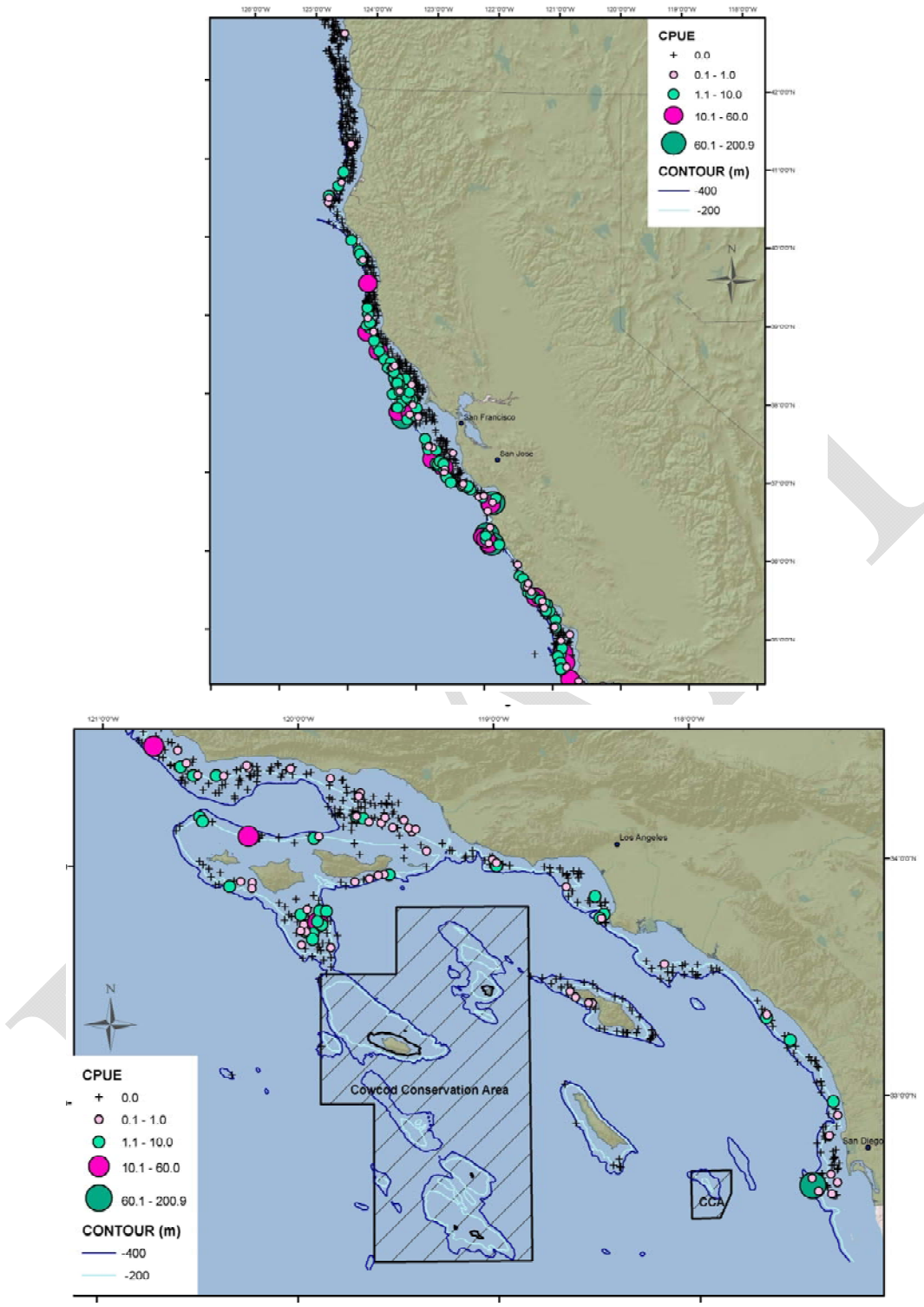
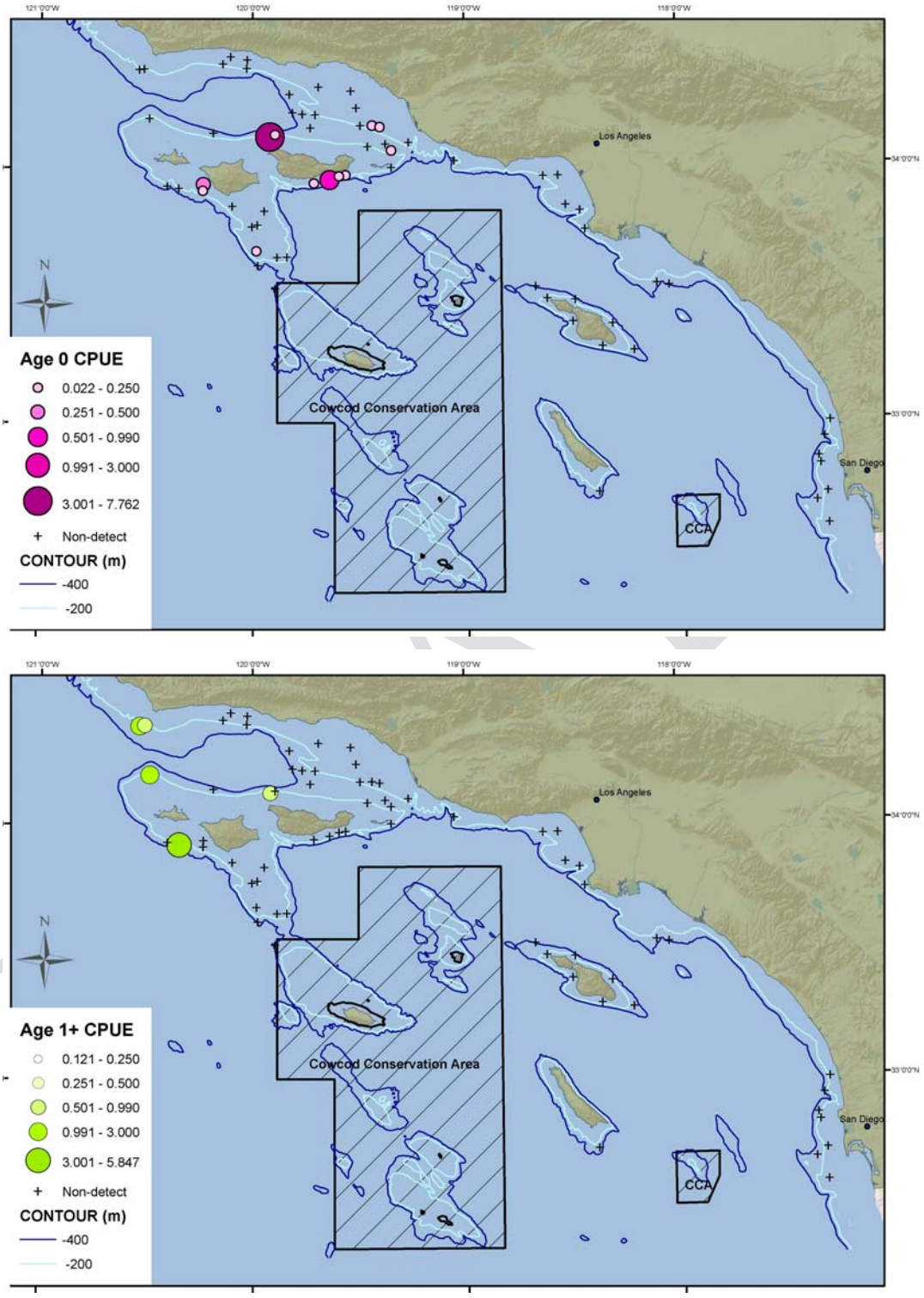
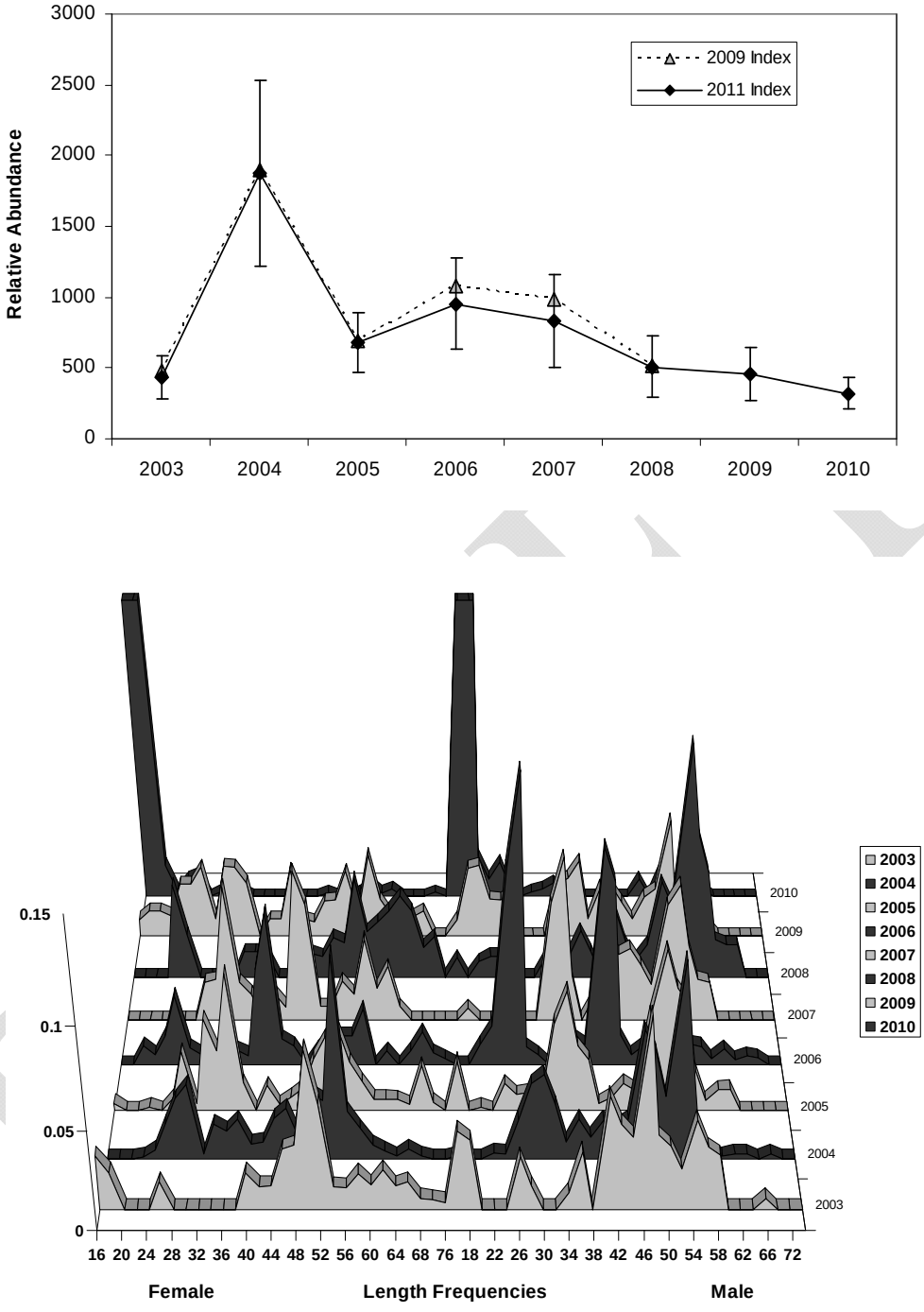



Figure 3a-b: NWFSC Combined shelf-slope survey CPUE for bocaccio rockfish, all years (2003-2010) combined.




Figures 4a-b. Northwest Fisheries Science Center combined trawl survey catches of likely age-0 (<22 cm) bocaccio (top) and likely age 1+ (=>22 cm) bocaccio (bottom) in the Southern California Bight during 2010.




Figures 5a-b. 5a (top), Comparison 2009 and updated 2011 GLMM relative abundance estimates for bocaccio rockfish from the NWFSC Combined survey. Error bars shown for 2011 only (comparable to 2009 error estimates); 5b (bottom) associated length frequency information for the 2003-2010 combined trawl survey.

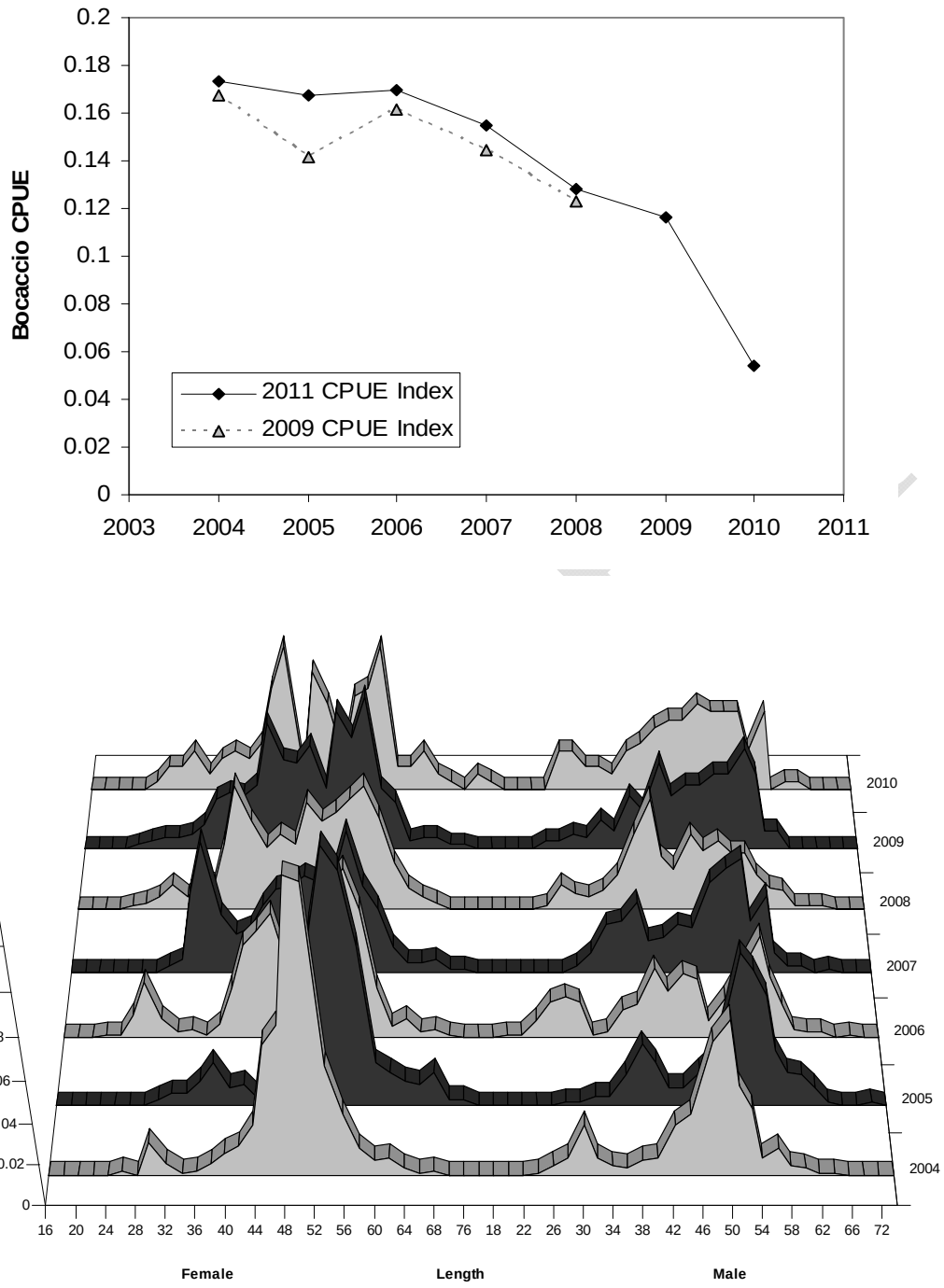
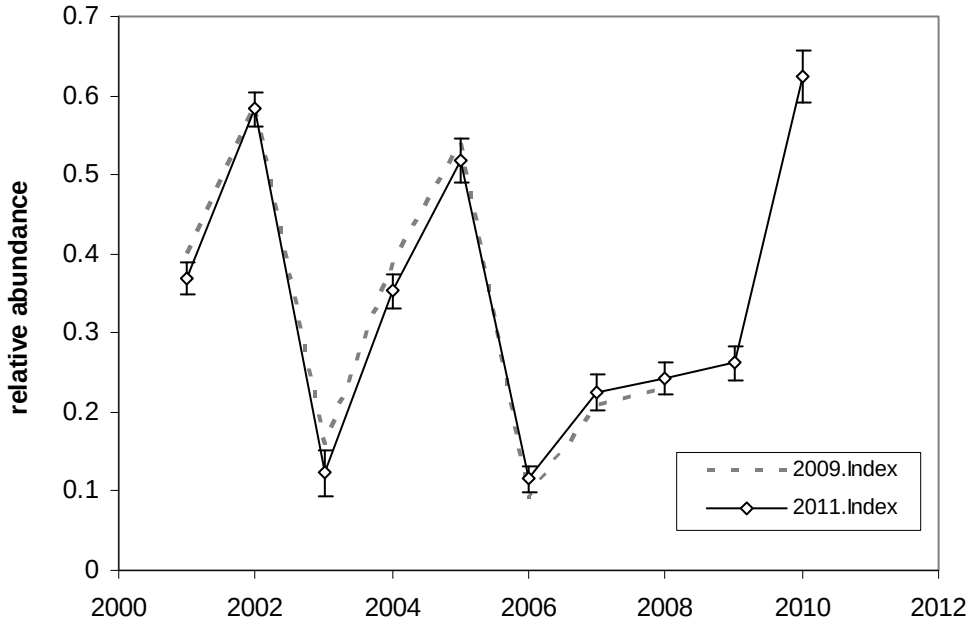
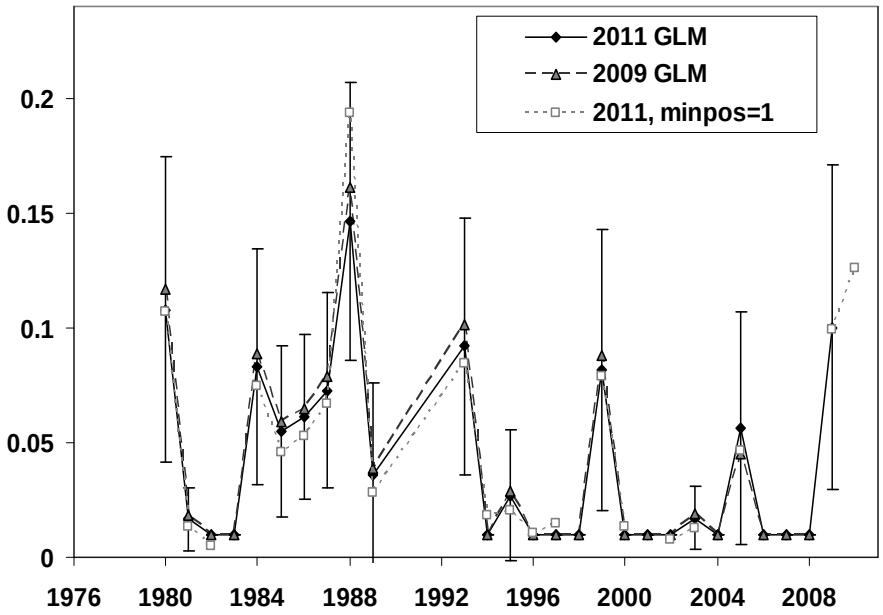



Figure 6a-b. Figure 6a (top) Catch rate indices of bocaccio abundance for the NWFSC hook-and-line survey in the Southern California Bight, 2004-2010 and Figure 6b (bottom), length frequency distribution for all bocaccio rockfish measured in the same survey.




Figures 7a-b. Figure 7a (top), 2009 and current index for the coastwide pelagic juvenile trawl survey index of bocaccio YOY abundance; 7b (bottom), 2009 and current index for the 1980-2010 pier fishery index.

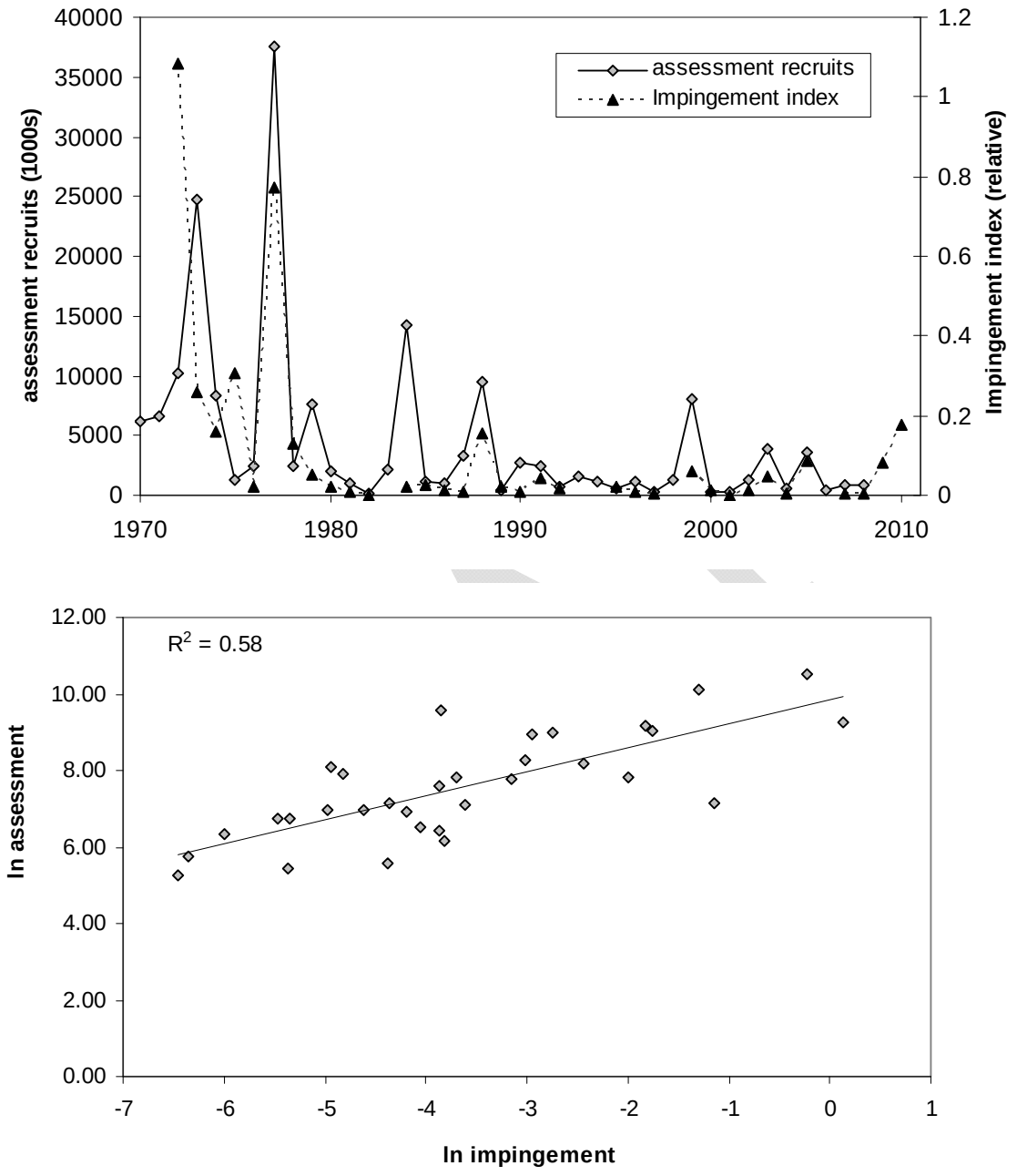



Figure 8a-b. Recruitment estimates from the 2009 model (run with zero emphasis on the recruitment indices) compared to an index of age-0 abundance developed from the Power plant impingement dataset provided by Eric Miller (MBC Applied Environmental Sciences)

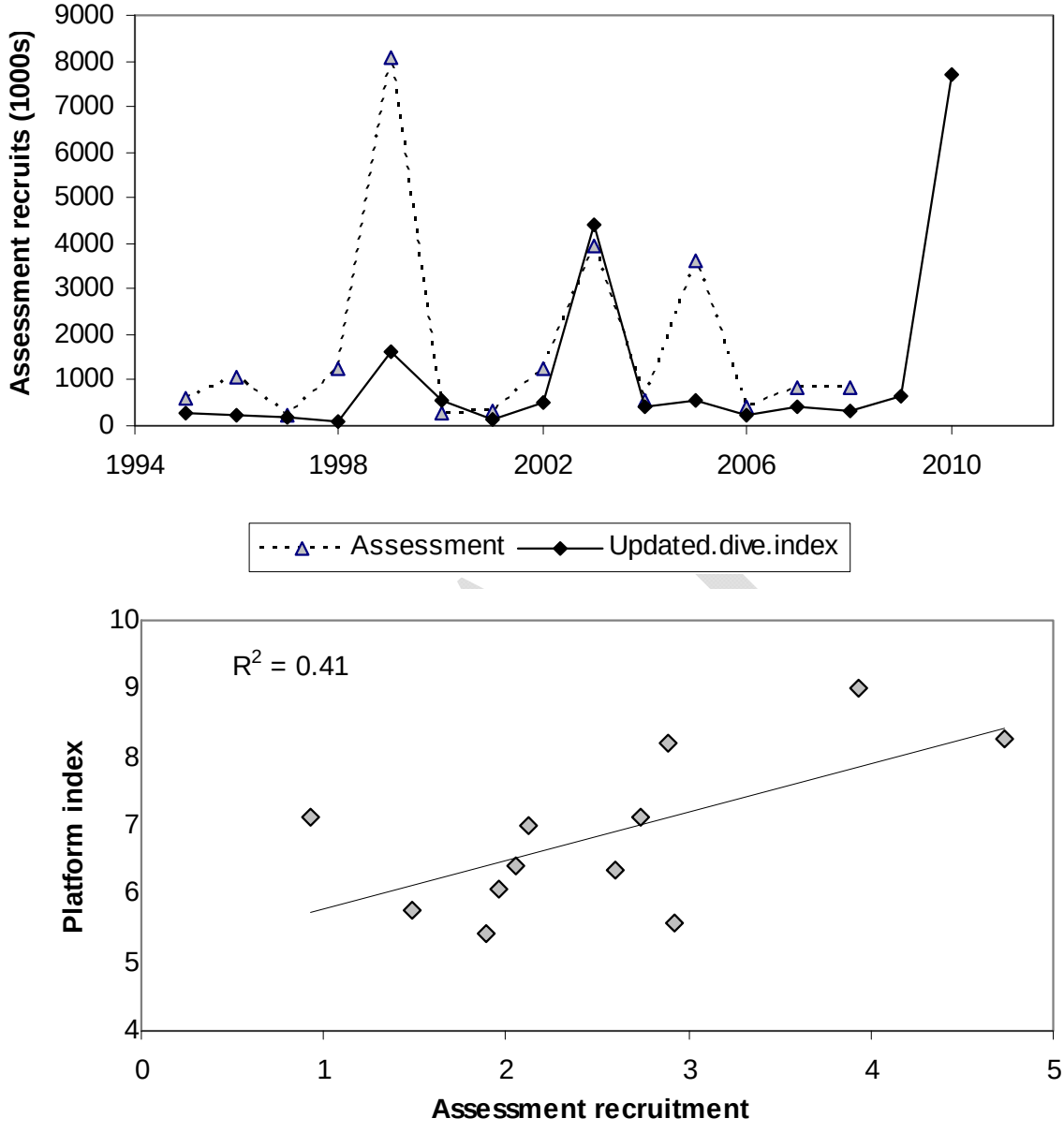
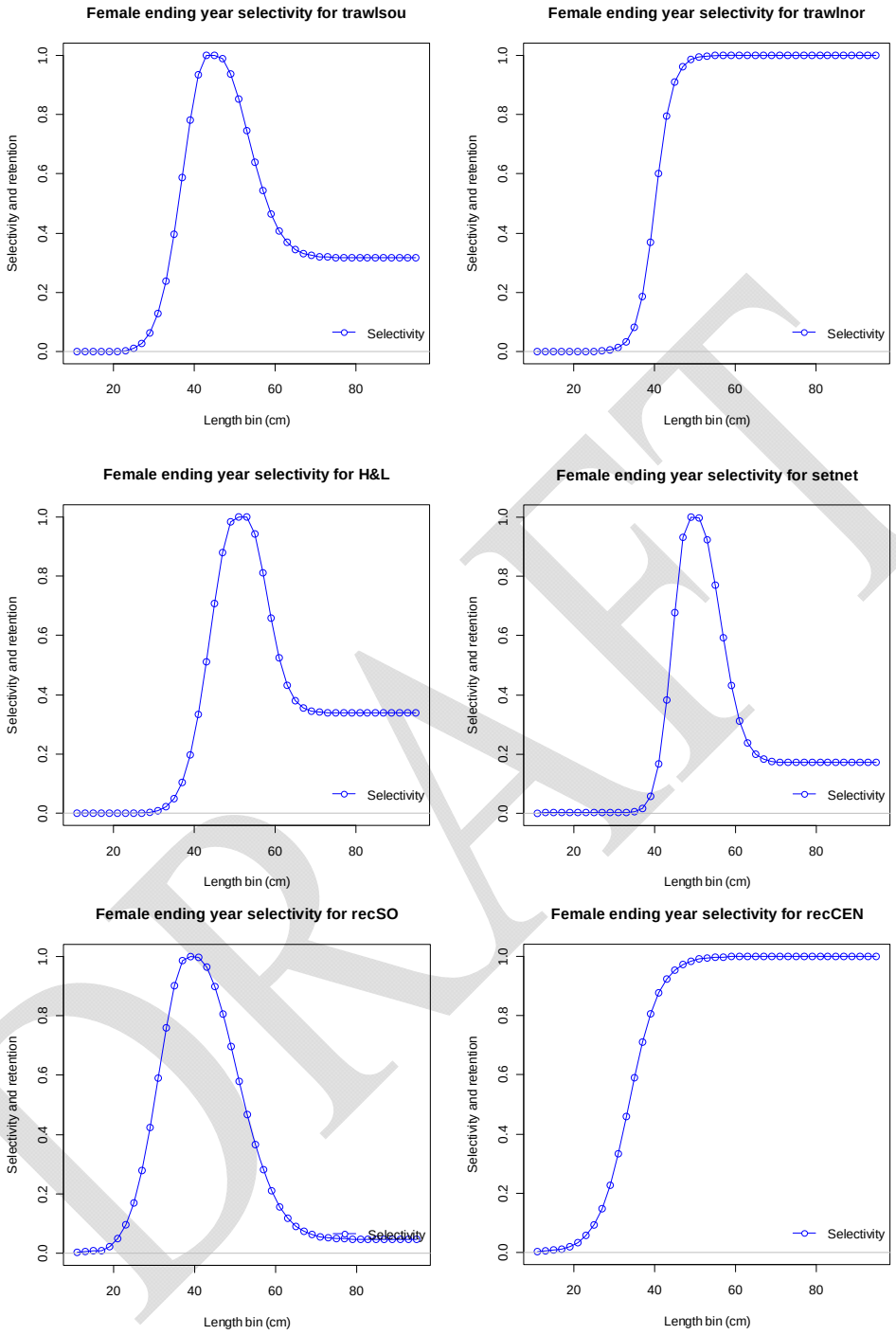
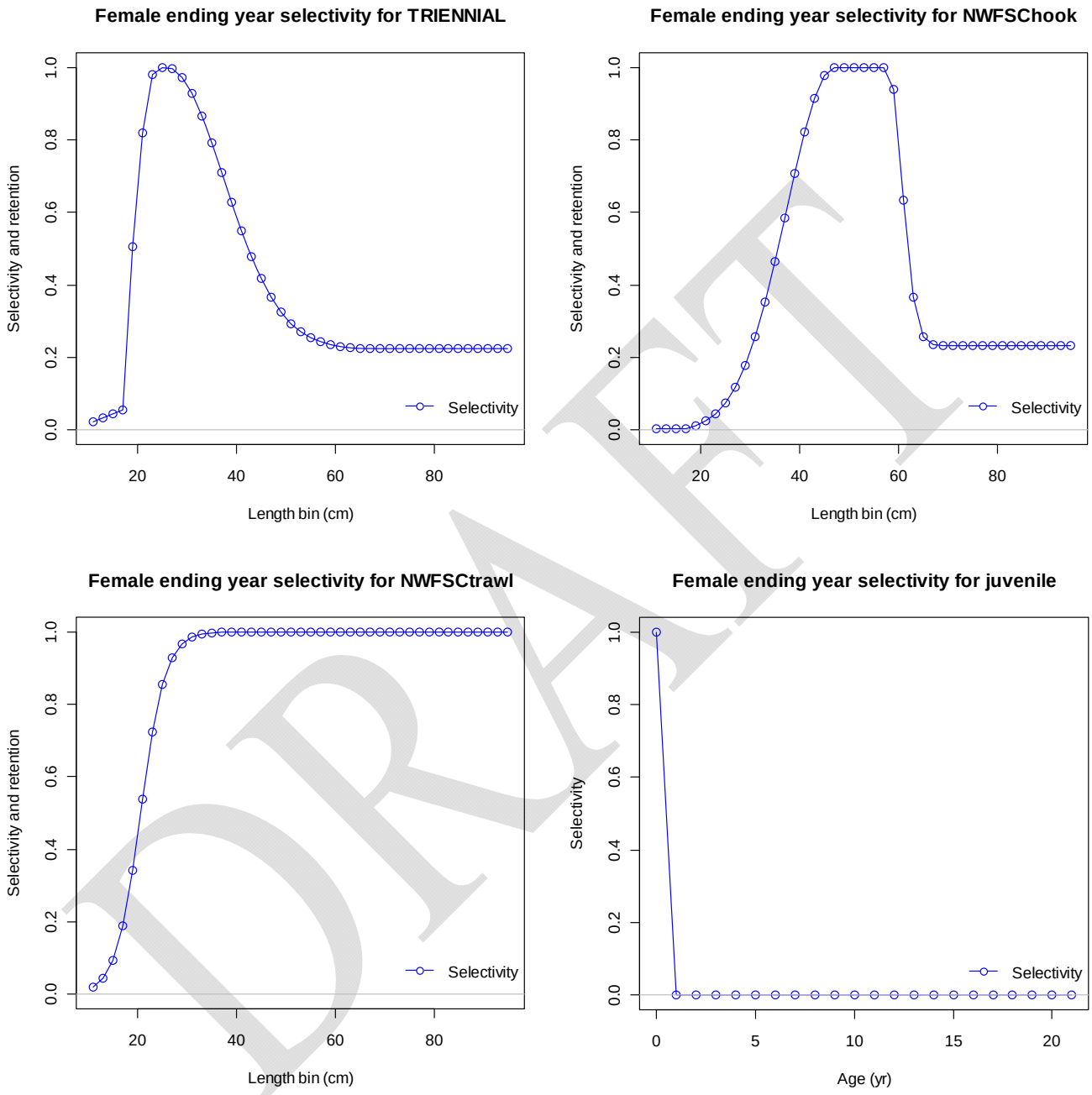



Figure 9a-b: Recruitment estimates from the 2009 model (run with zero emphasis on the recruitment indices) compared to an index of age-0 abundance developed from the delta submersible dive survey conducted by M. Love (USCB, Pers. Com)



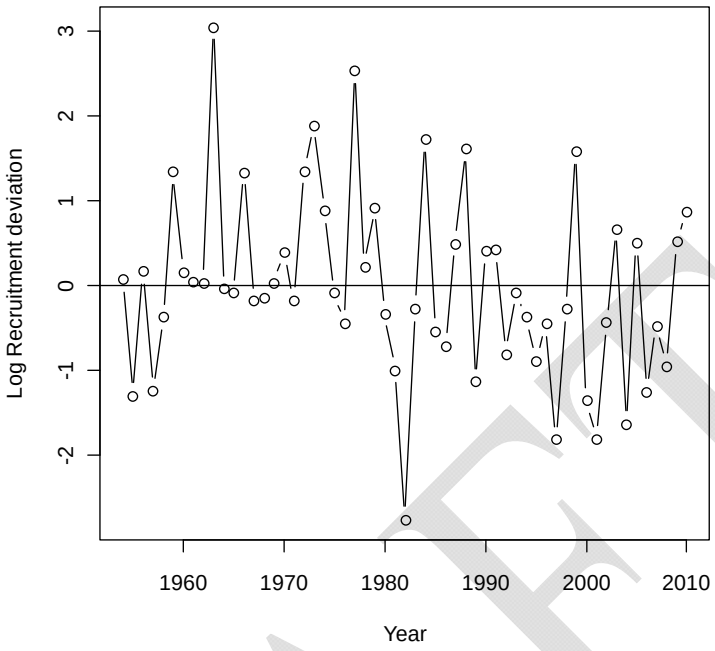

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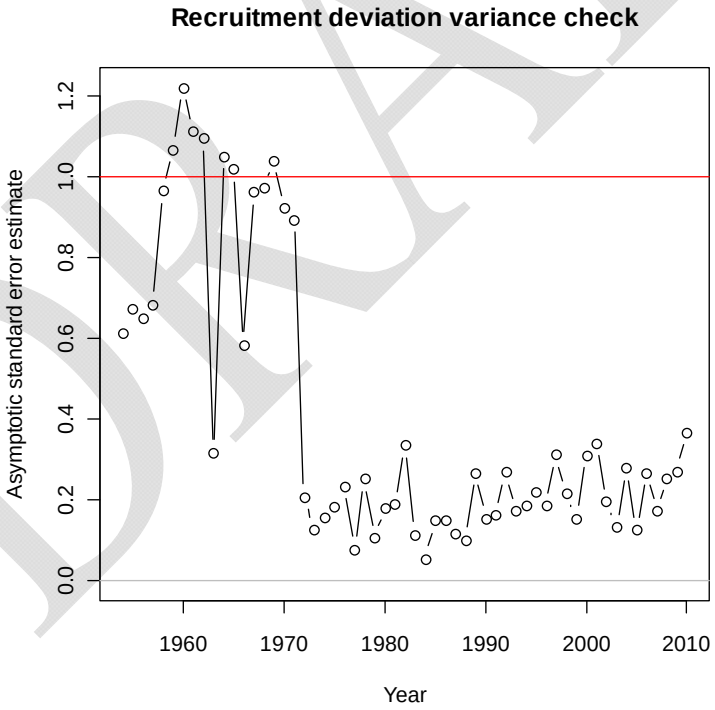
Figures 10a-f. Estimated selectivity curves for the bocaccio base model for commercial fisheries, trawl (north and south of 38˚ N latitude), hook-and-line, set net, and southern and central California recreational fisheries.




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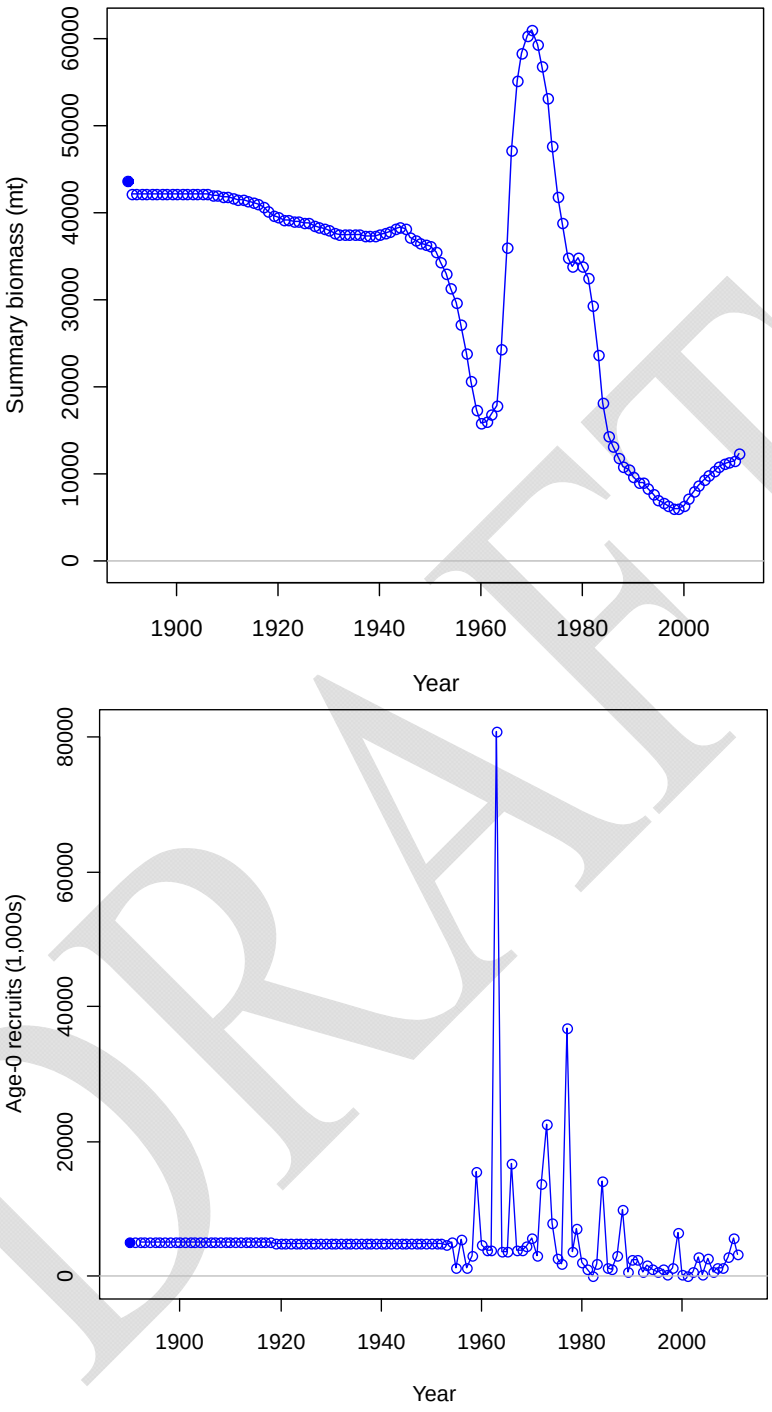
Figures 10g-j. Selectivity curves for bocaccio in the triennial survey (fixed), the NWFSC Southern California Bight hook-and-line survey, the NWFSC combined shelf and slope survey, and age selectivity for the pelagic juvenile age-0 survey.



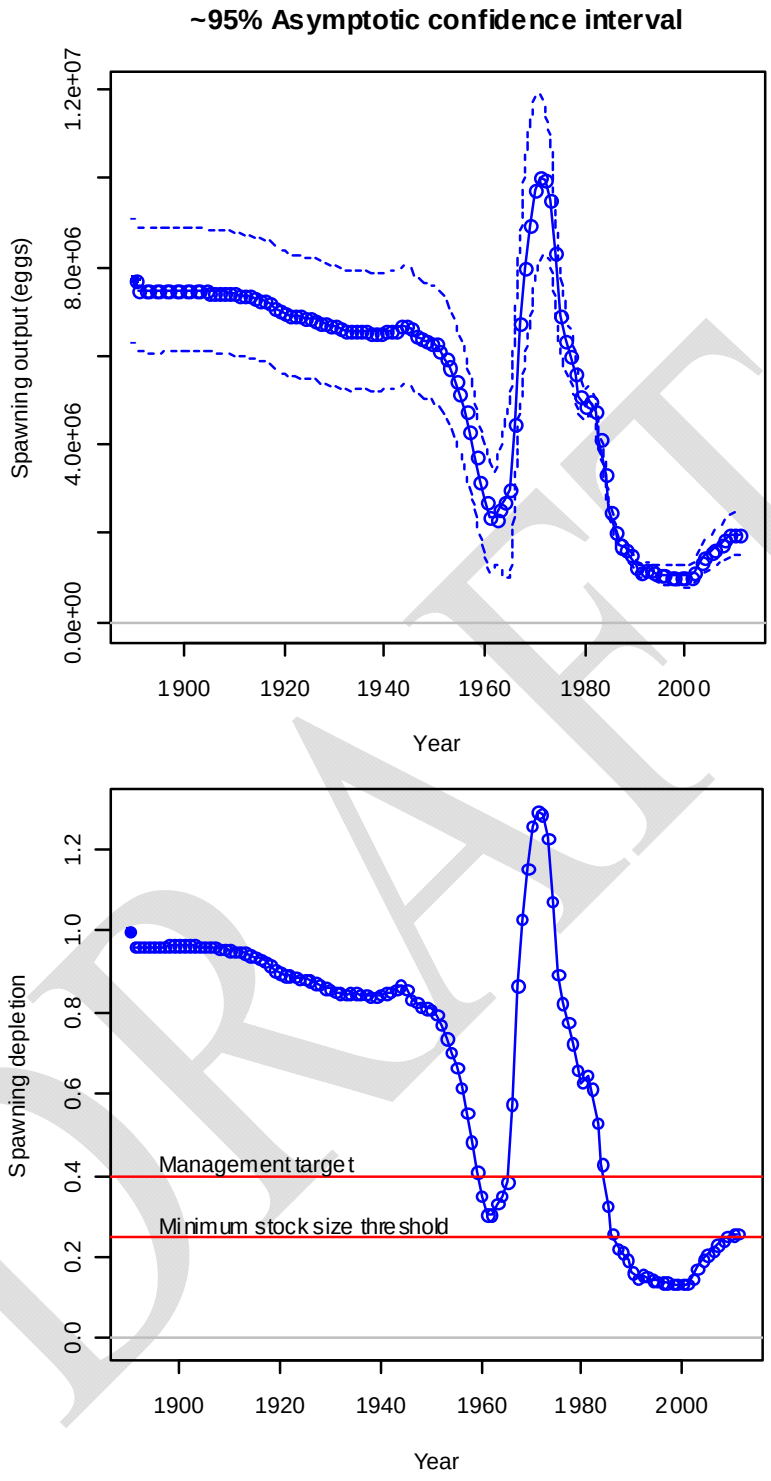

Figures 11a-b. Recruitment deviation parameter estimates for bocaccio (top) and asymptotic standard error estimates (bottom).

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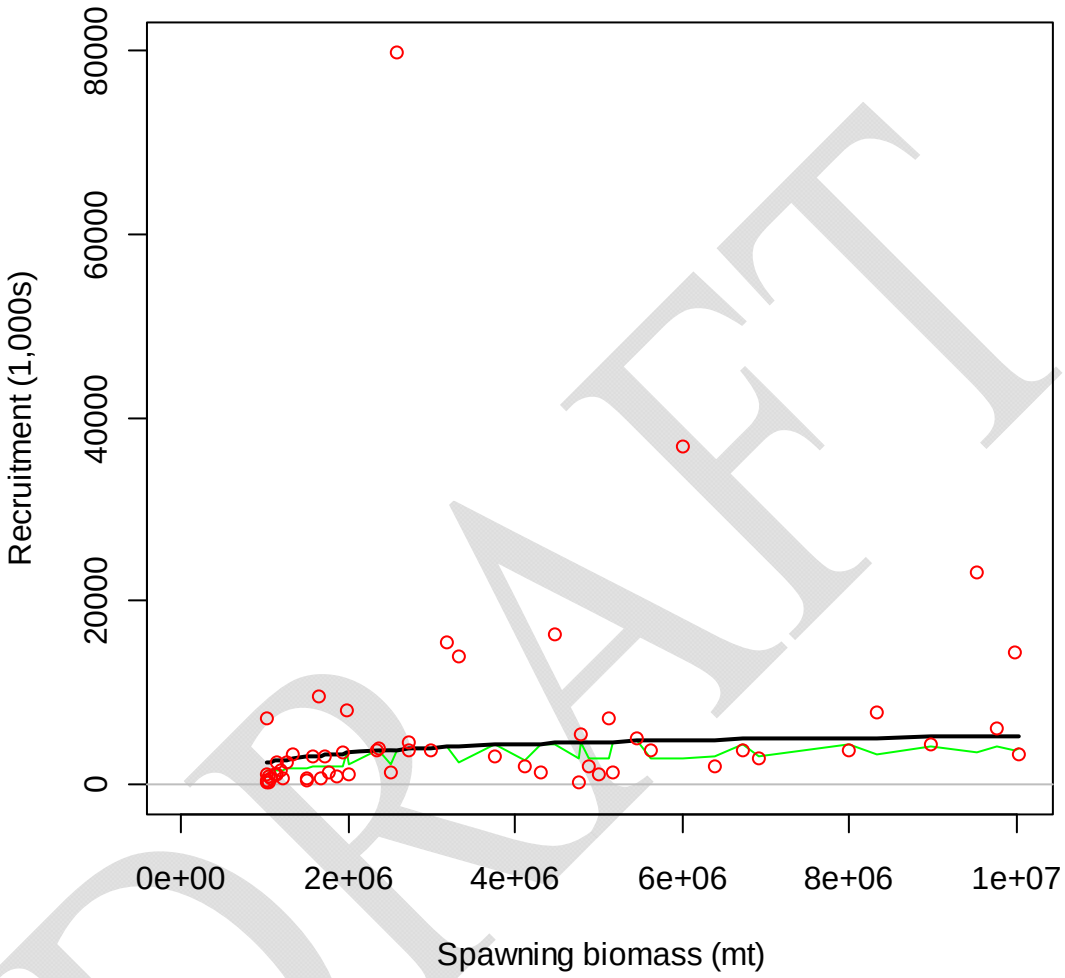

Figures 12a-b. Summary (age 1+) biomass and recruitment (age 0) of bocaccio for the base model.

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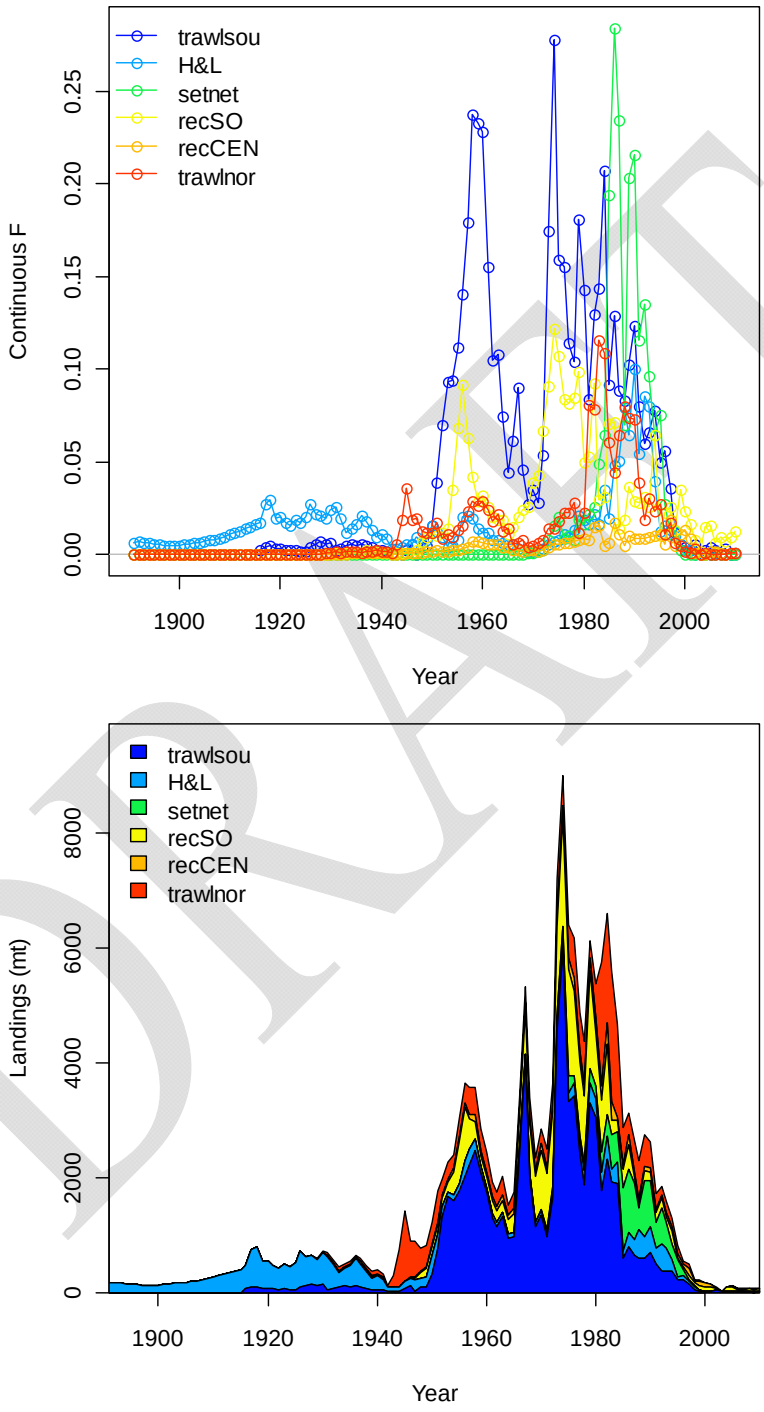

Figures 13a-b. Spawning output ($x10^6$) estimated for bocaccio, with asymptotic confidence intervals (top) and relative depletion for the base model.

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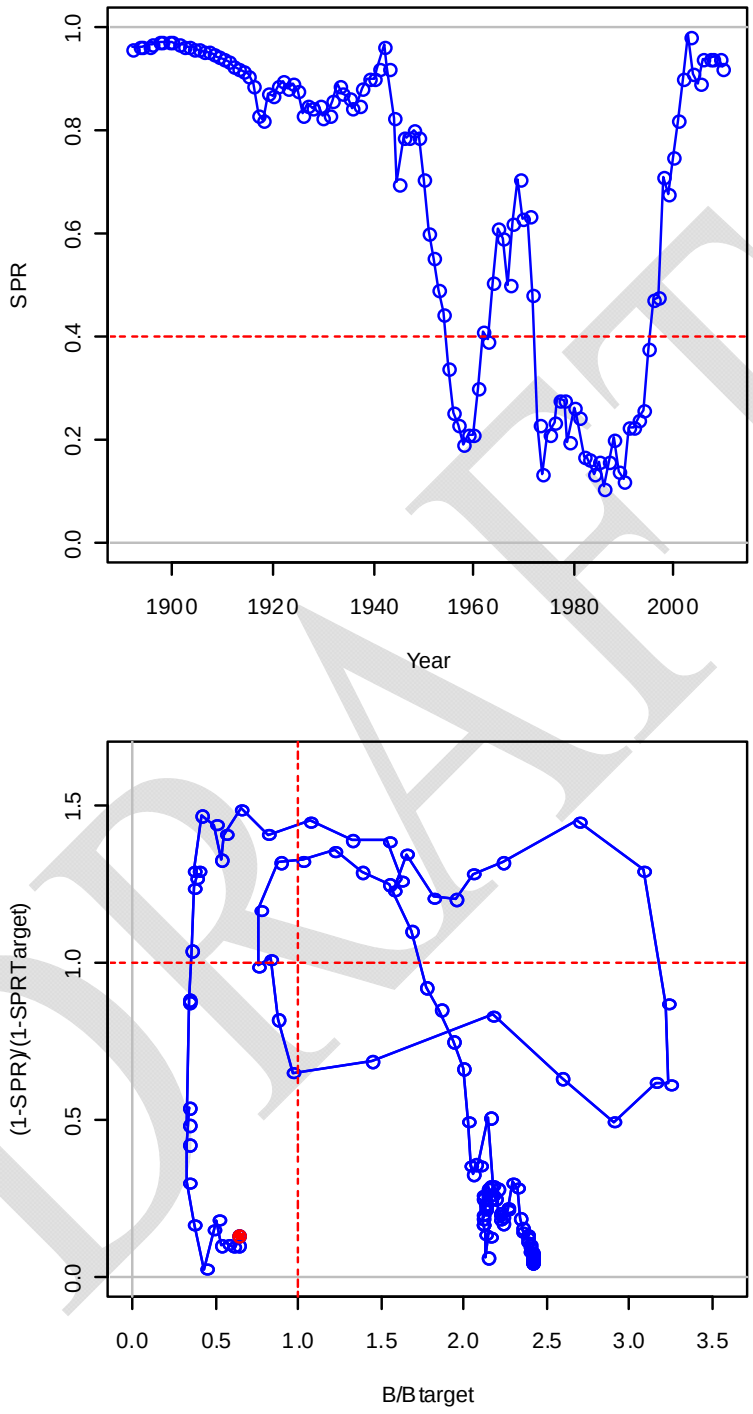

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Figure 14. Spawner-recruit curve for bocaccio, as updated in 2011



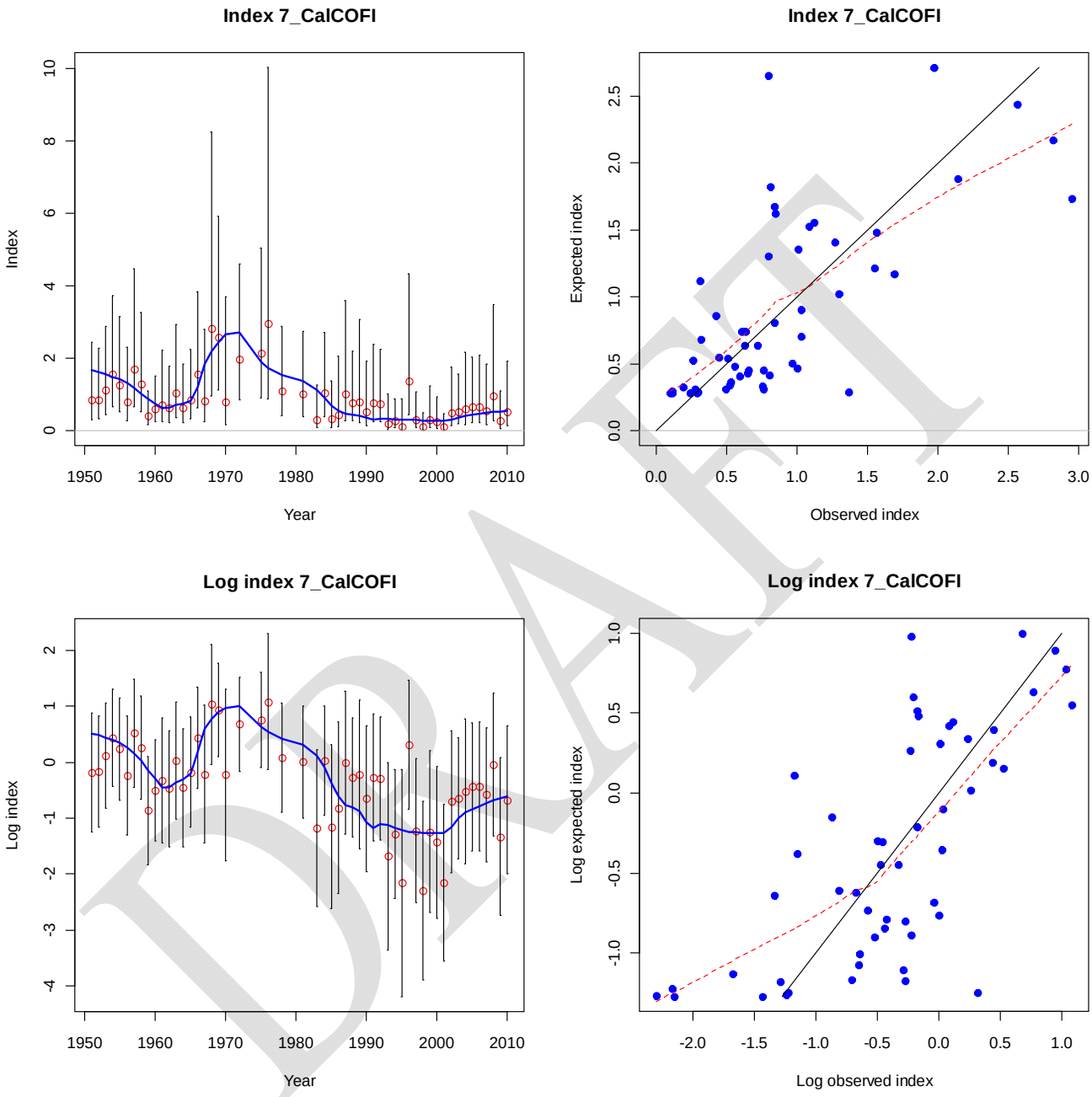

Figures 15a-b. Total catches of bocaccio and instantaneous fishing mortality rates for bocaccio by fishery.

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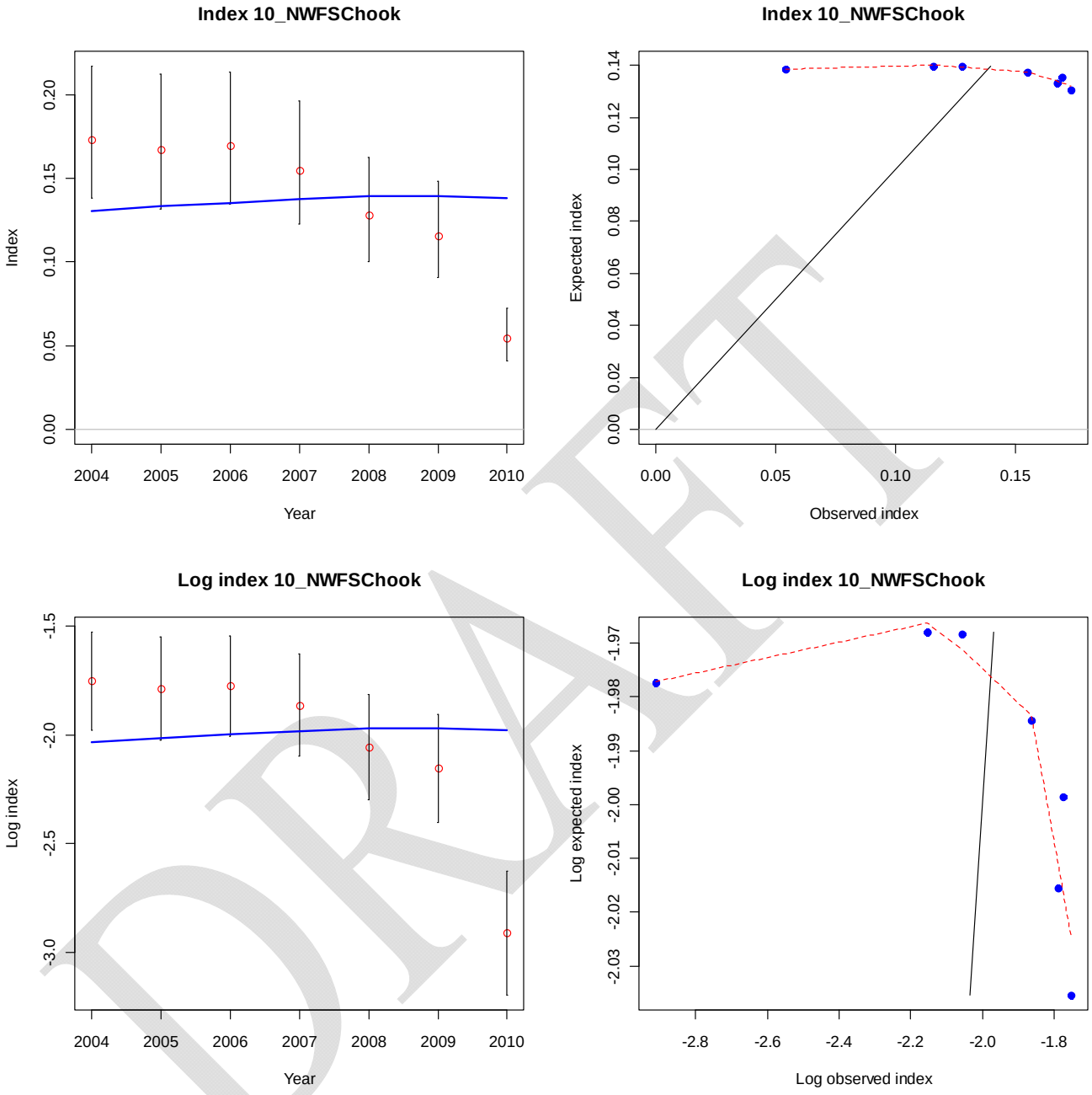

Figures 16a-b. SPR (top) over time, with reference proxy for *Sebastes* and phase plot of SPR rate plotted against SSB target levels (bottom).

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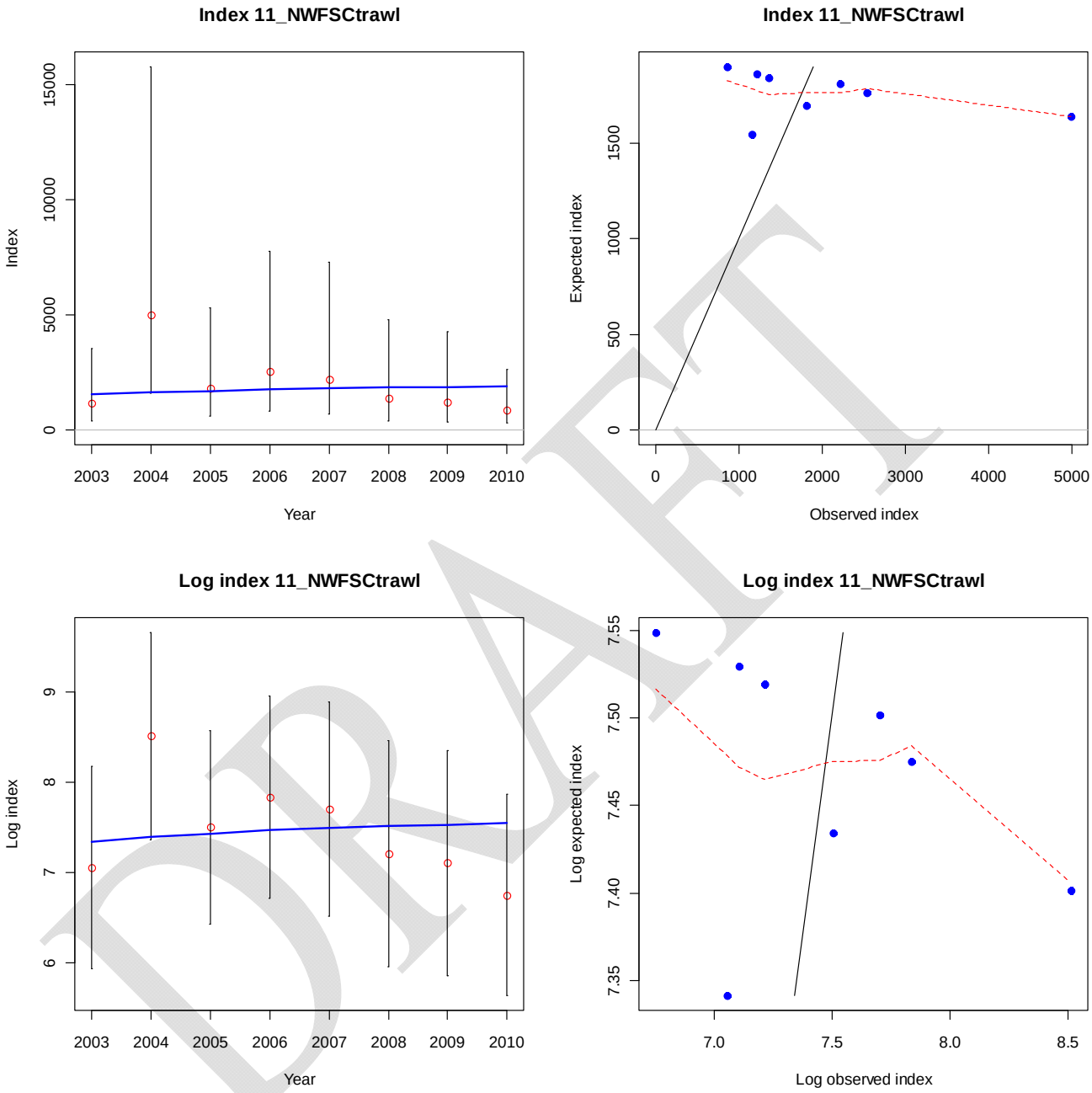

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Figures 17a-d. Arithmetic and log fits, with corresponding observed and predicted values, to the CalCOFI larval abundance time series of bocaccio abundance.



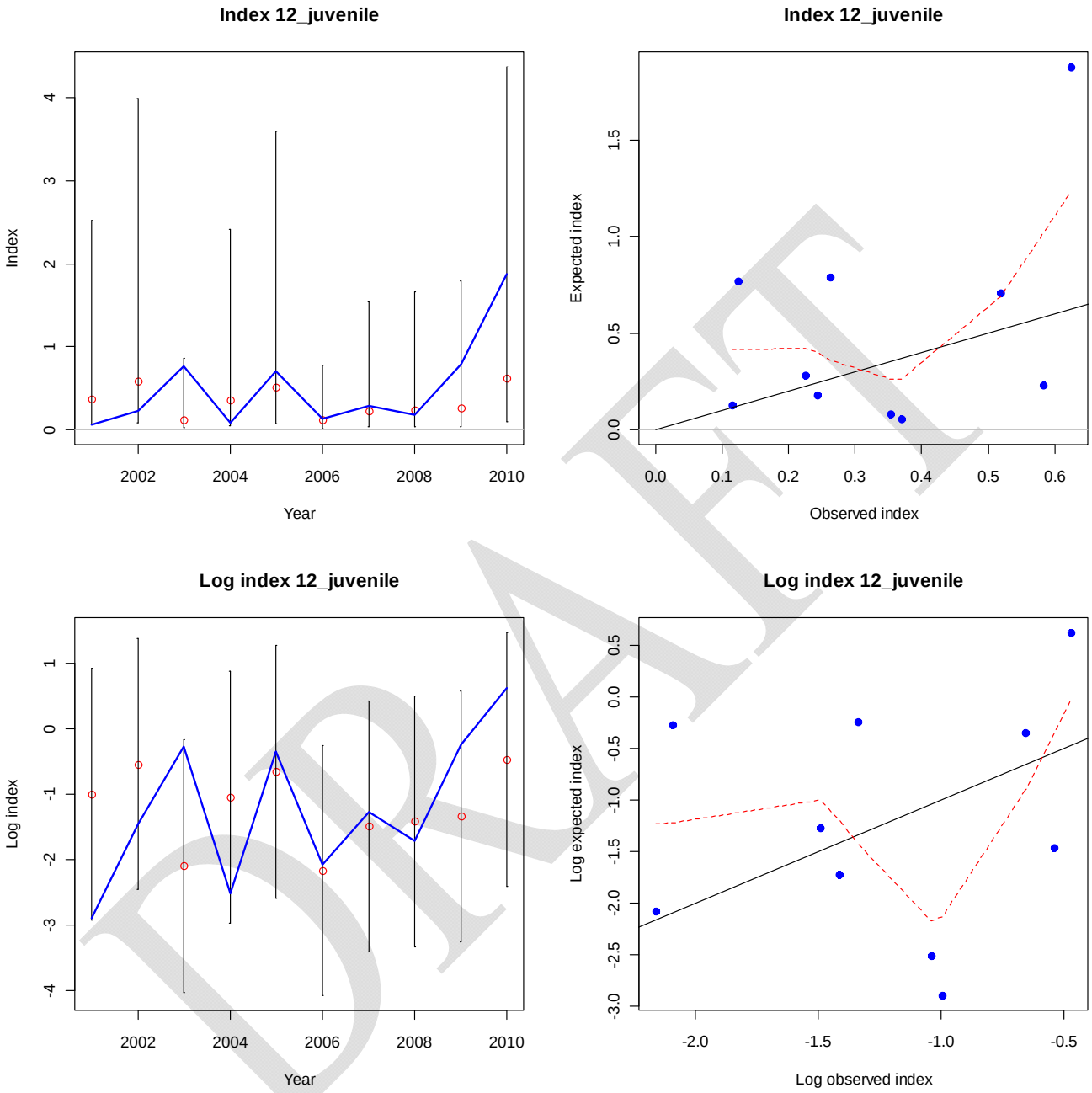

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Figures 18a-d. Arithmetic and log fits, with corresponding observed and predicted values, to the NWFSC hook and line survey GLMM index of bocaccio abundance.



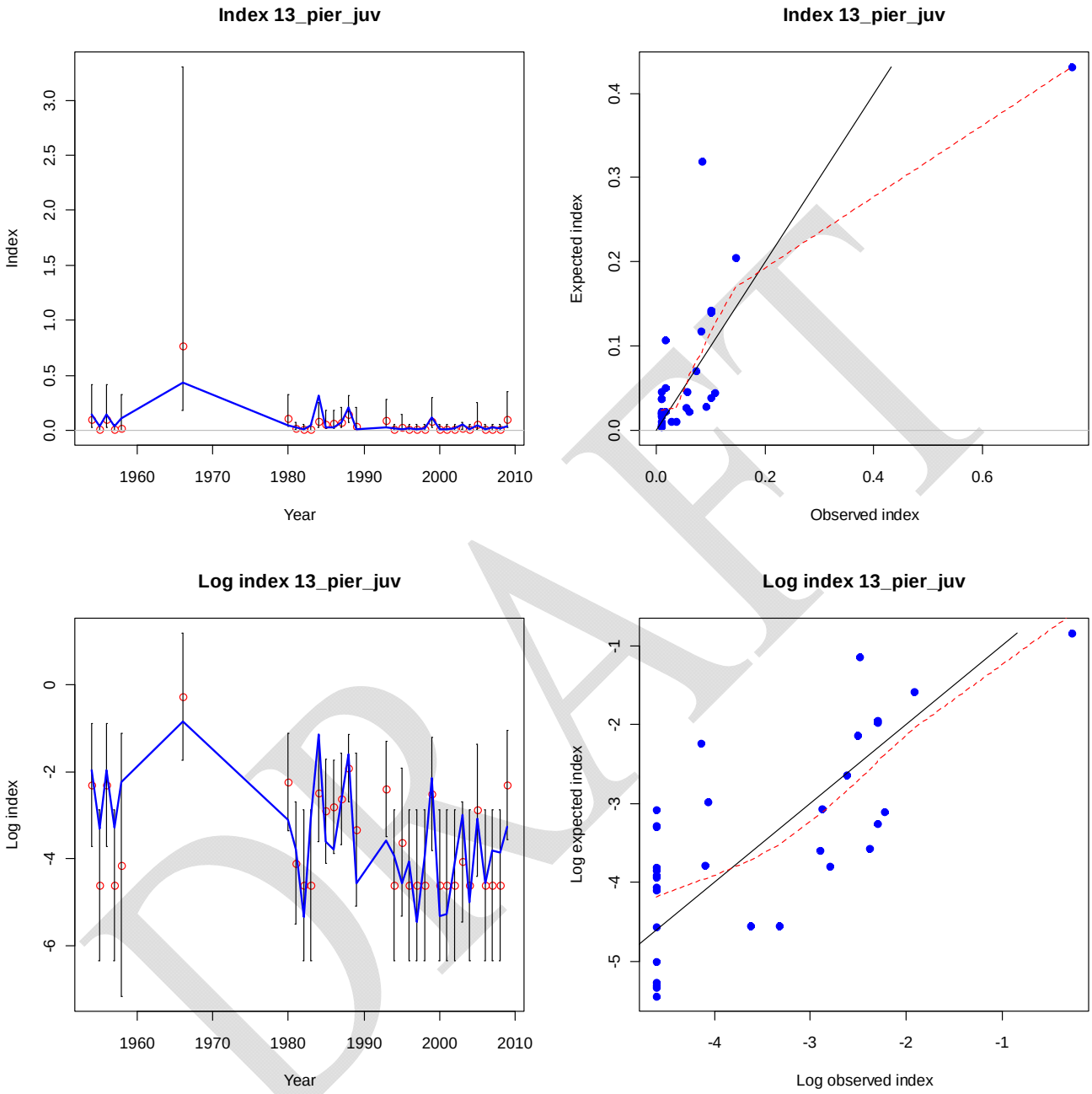

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Figures 19a-d. Arithmetic and log fits, with corresponding observed and predicted values, to the NWFSC combined trawl survey GLMM index of bocaccio abundance.



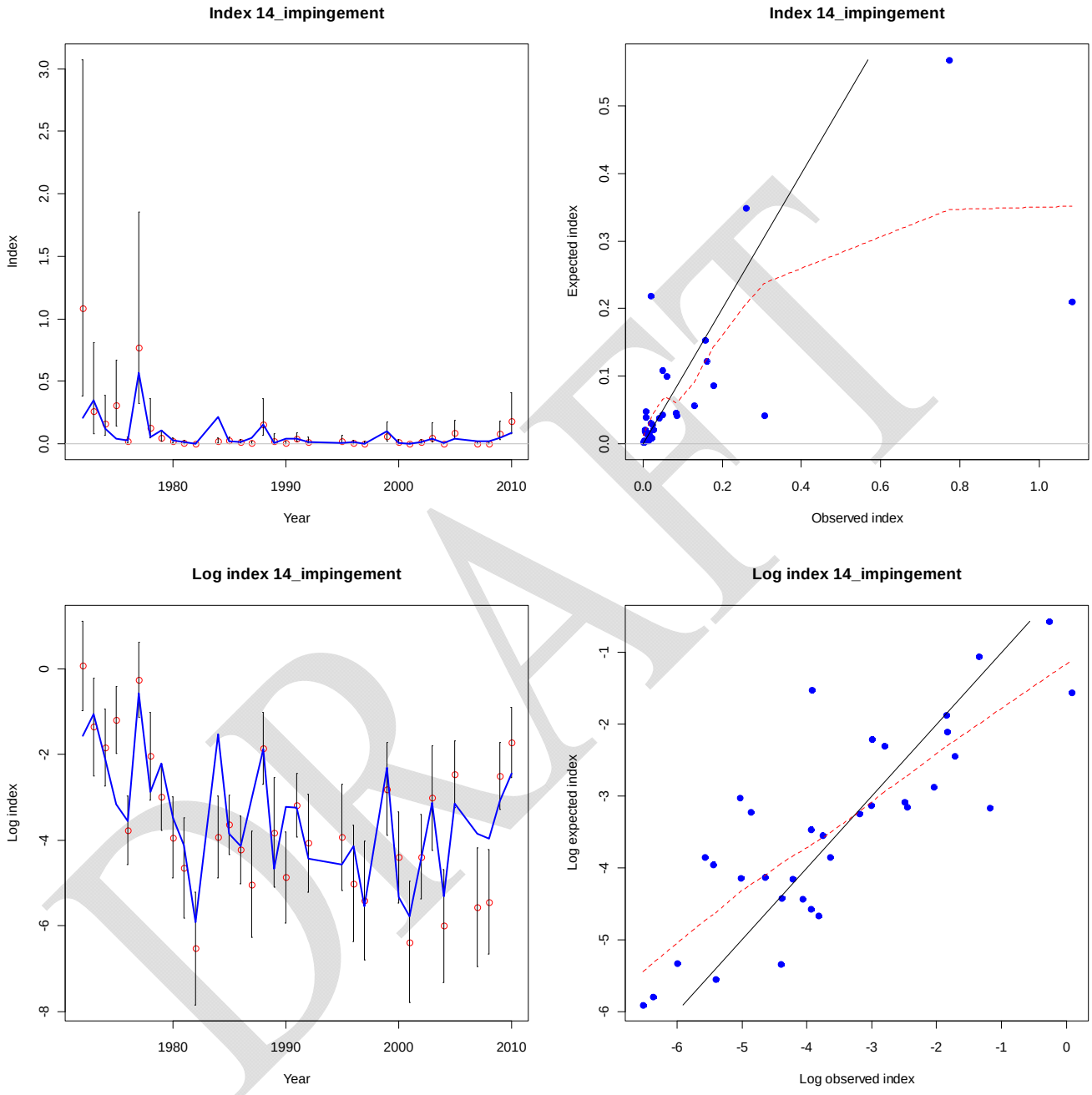

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Figures 20a-d. Arithmetic and log fits, with corresponding observed and predicted values, to the midwater trawl survey index of juvenile (YOY) bocaccio abundance.



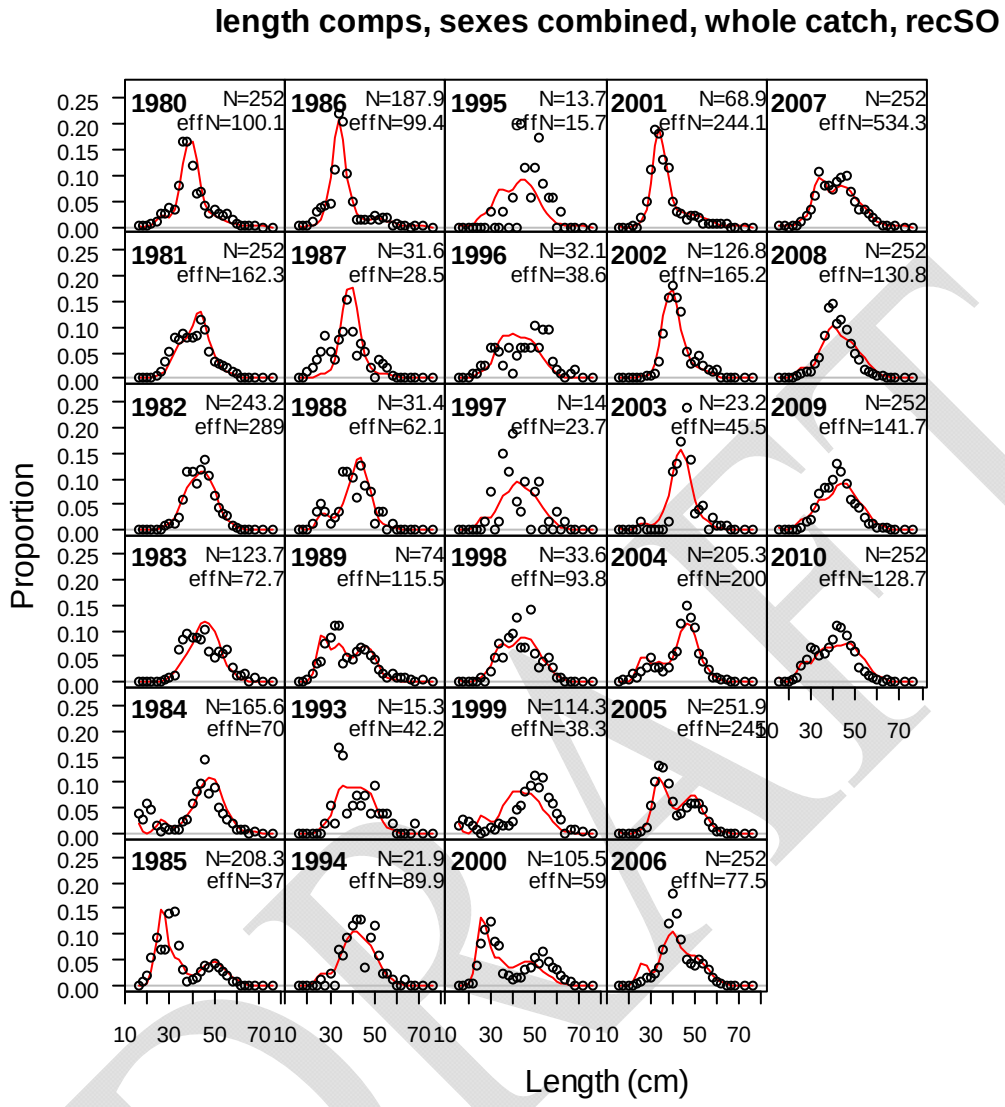

Figures 21a-d. Arithmetic and log fits, with corresponding observed and predicted values, to the pier fishery index of YOY.

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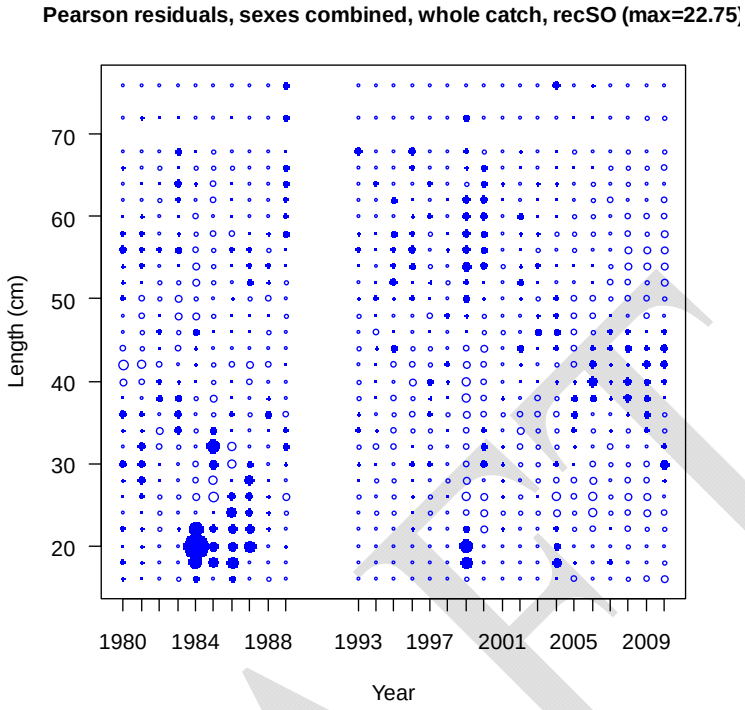

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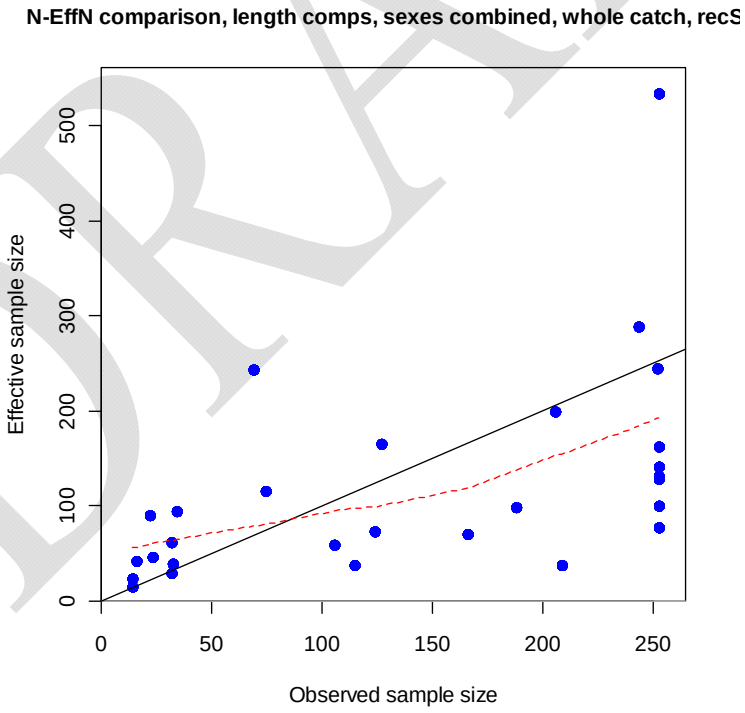
Figures 22a-d. Arithmetic and log fits, with corresponding observed and predicted values, to the power plant impingement survey index of YOY.




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Figure 23a. Fits to combined sex length frequency data for the southern recreational fishery.




Figures 23b-c. Residuals and input versus effective sample sizes for the southern California recreational fishery.

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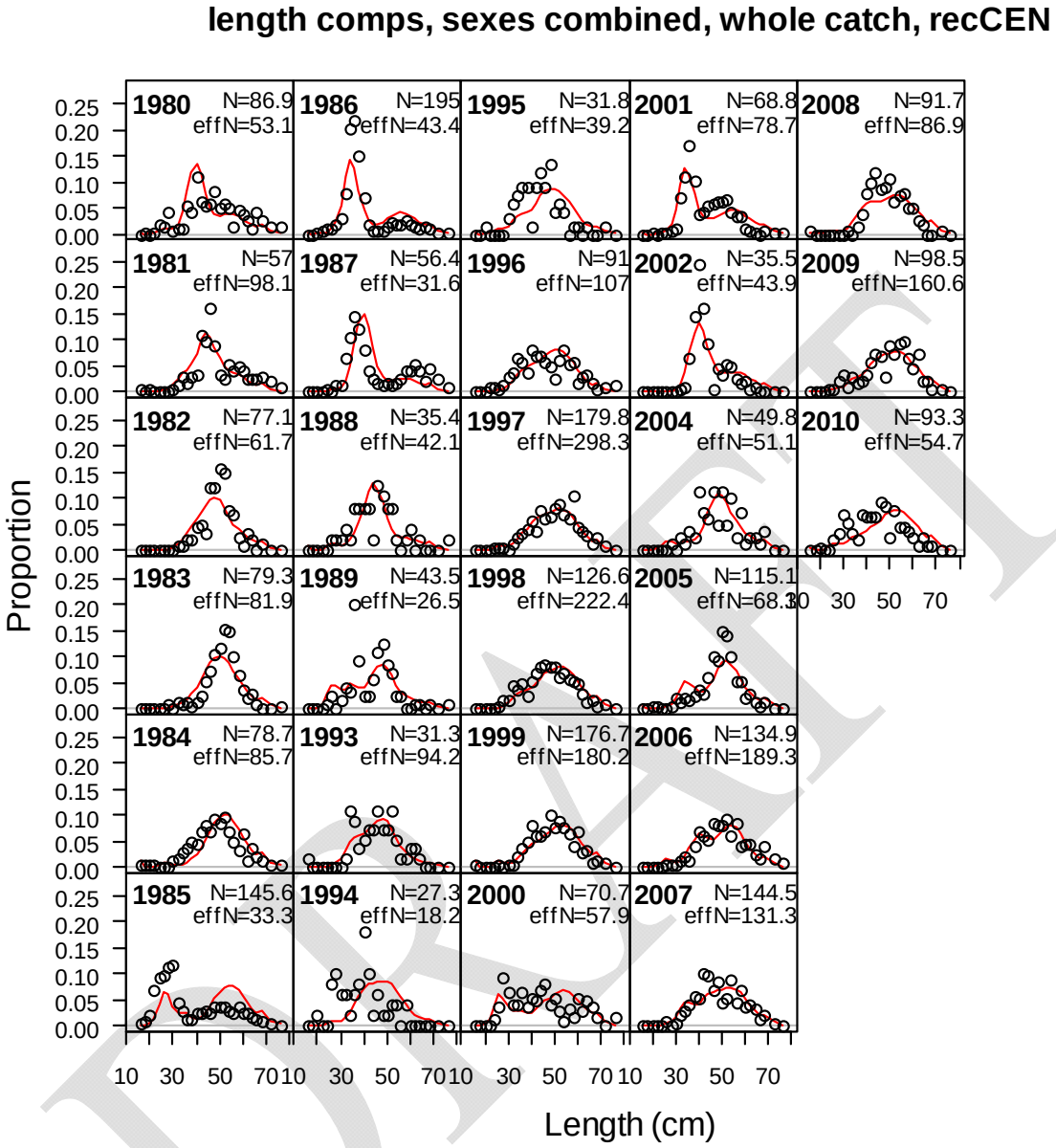
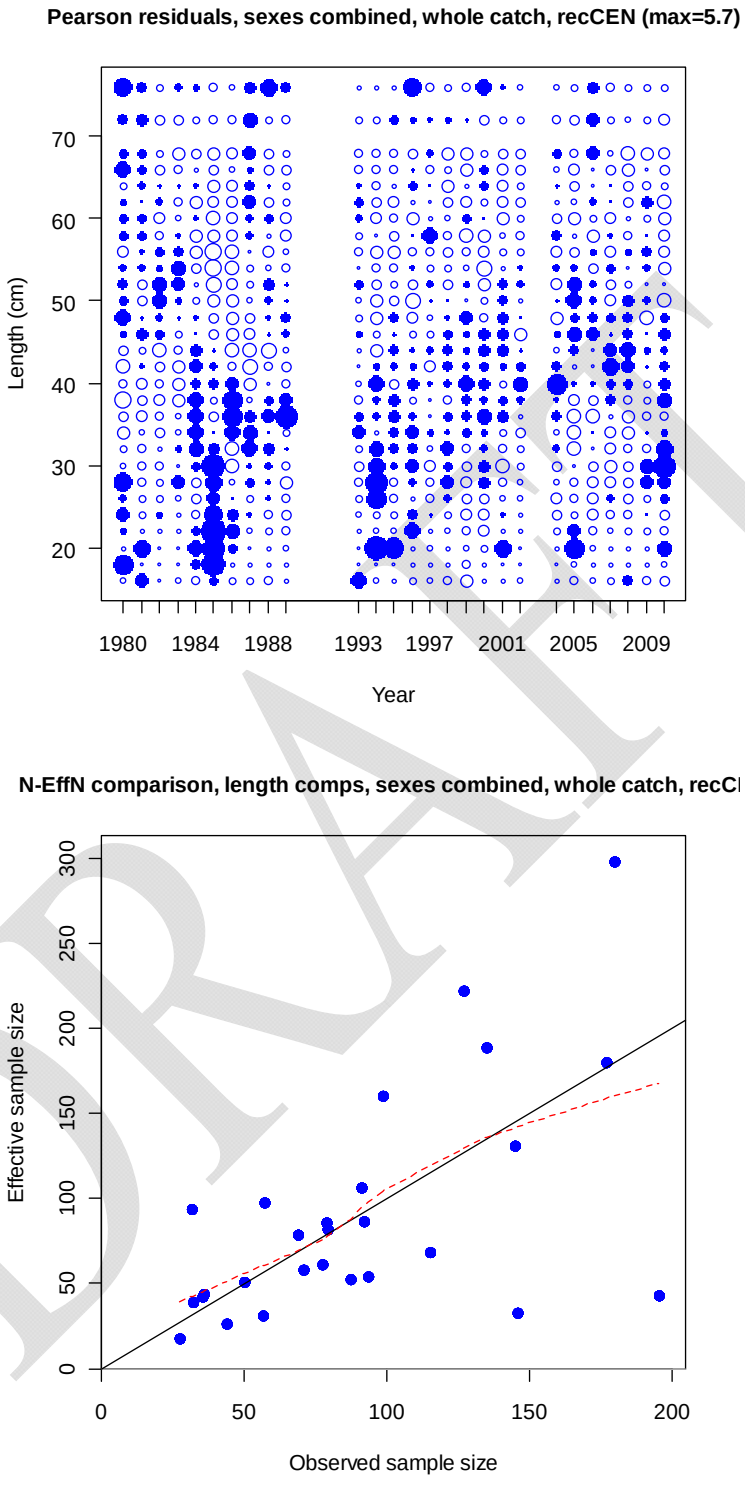


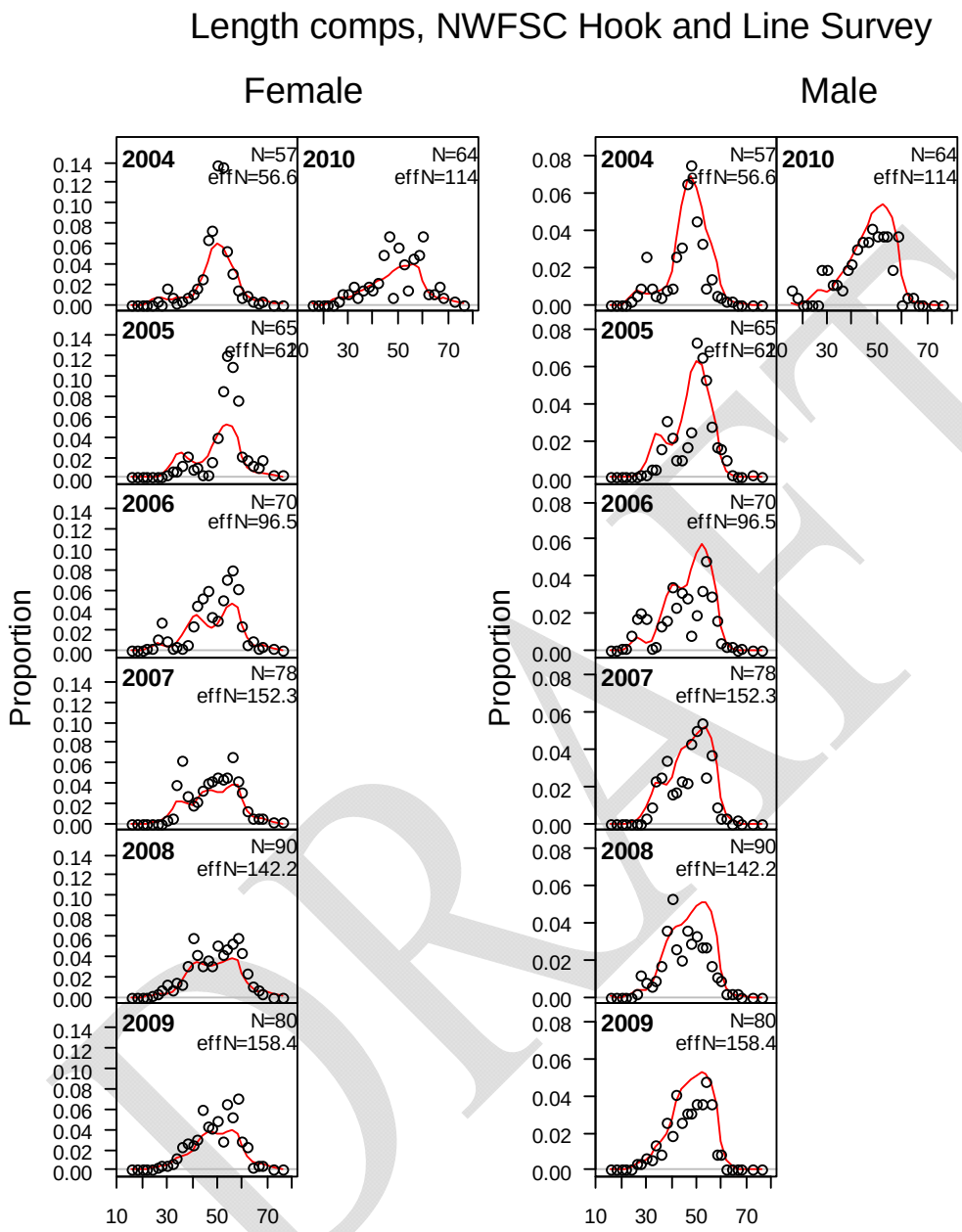

Figure 24a. Fits to combined sex length frequency data for the central California recreational fishery.

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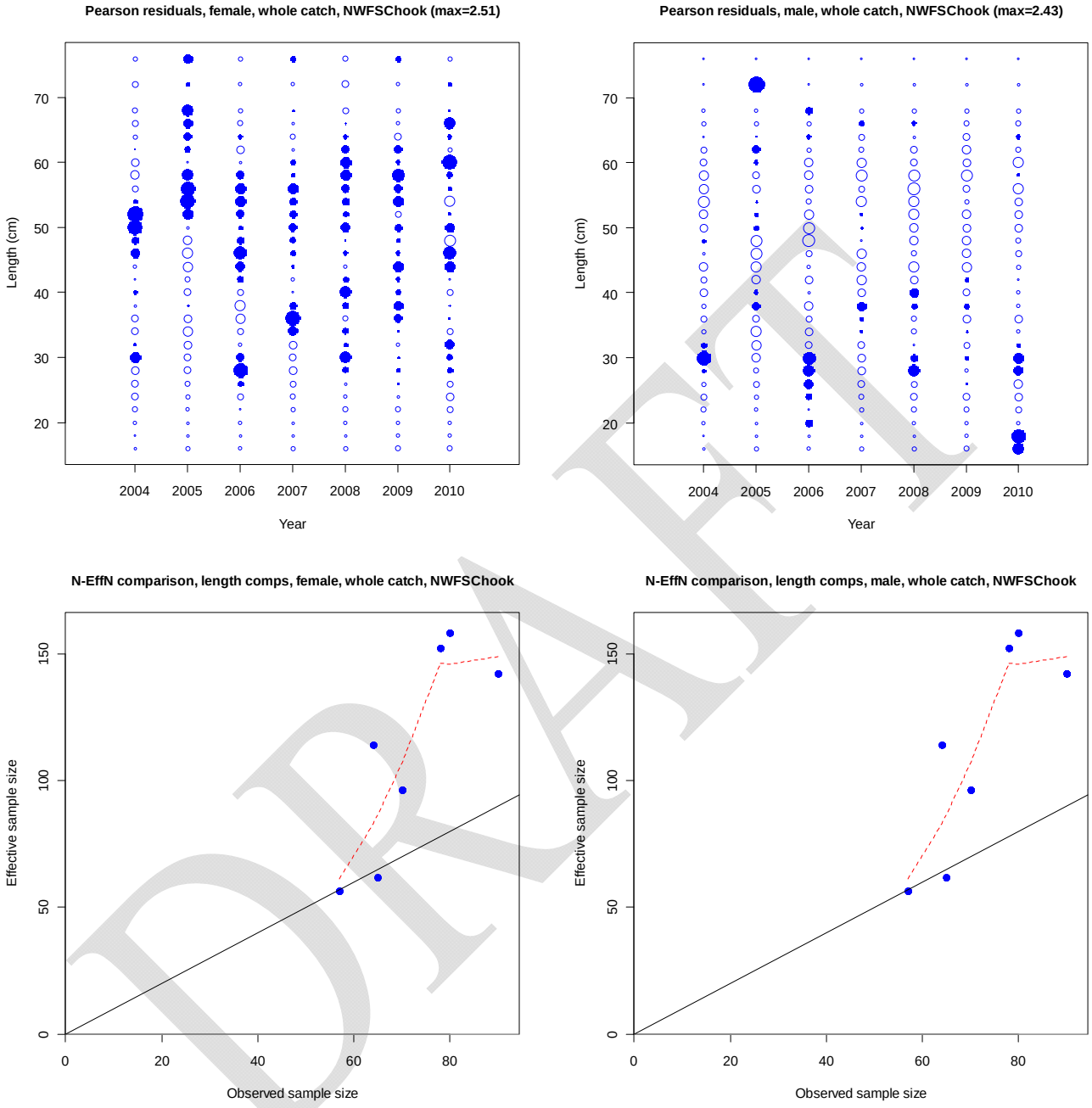

Figures 24b-c. Residuals and input versus effective sample sizes for the central California recreational fishery.

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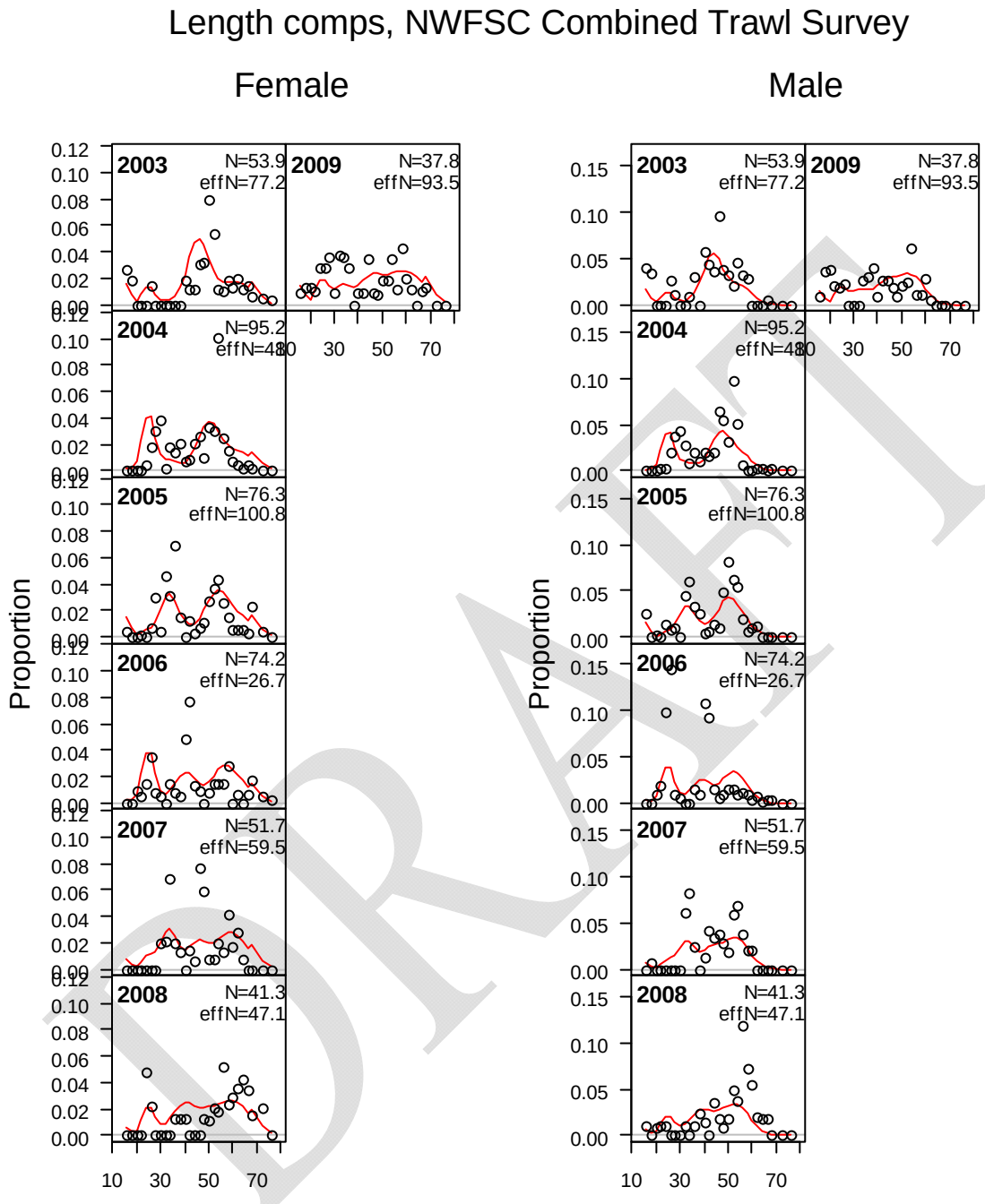

Figures 25a. Fits to sex-specific length frequency data for the NWFSC SCB Hook and Line survey.

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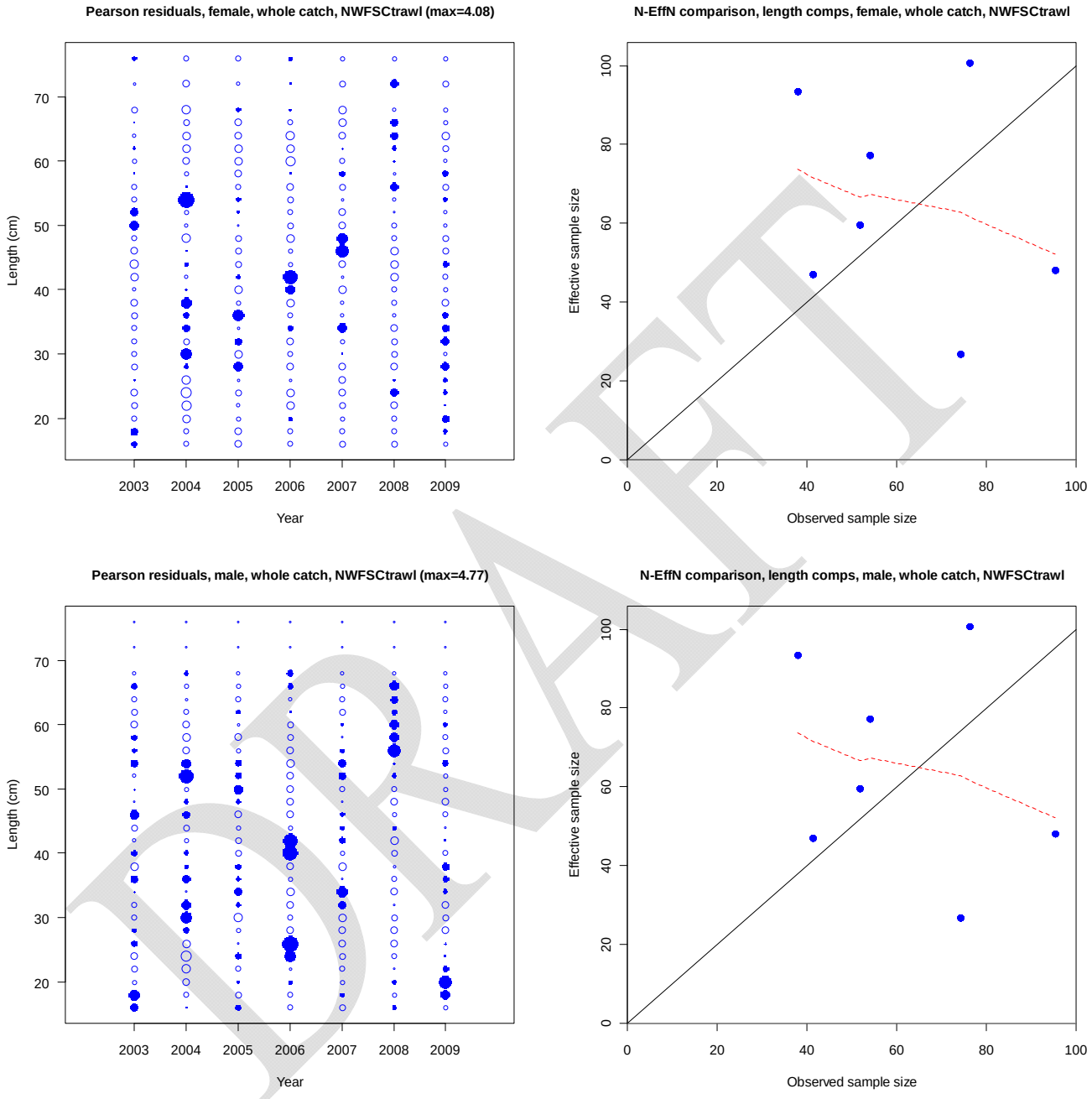

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Figures 25b-C. Residuals and input versus effective sample sizes for the NWFSC SCB Hook and Line survey.



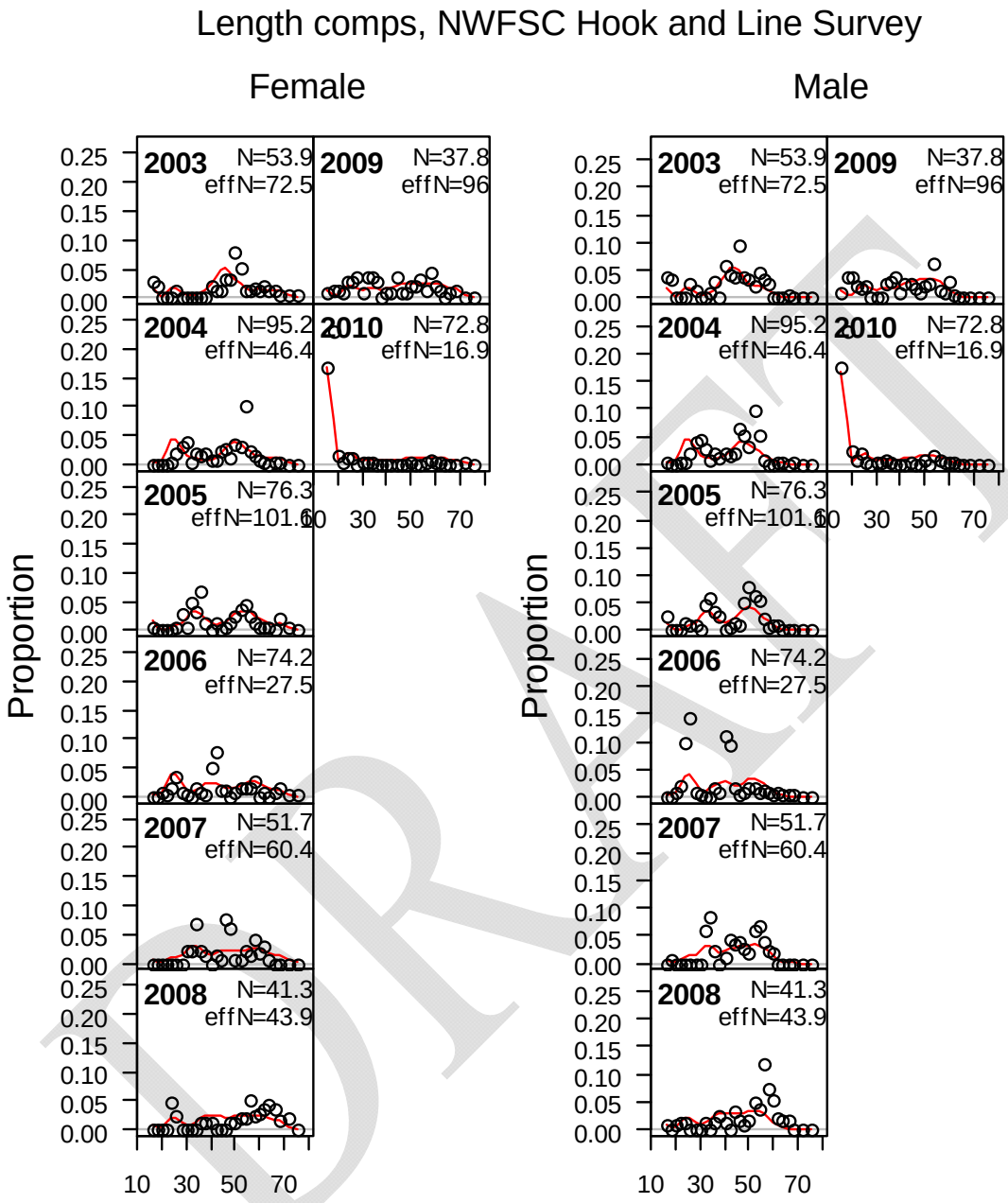

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Figures 26a. Fits to sex-specific length frequency data for the NWFSC combined trawl survey for the base model (excluding the 2010 length frequency data).



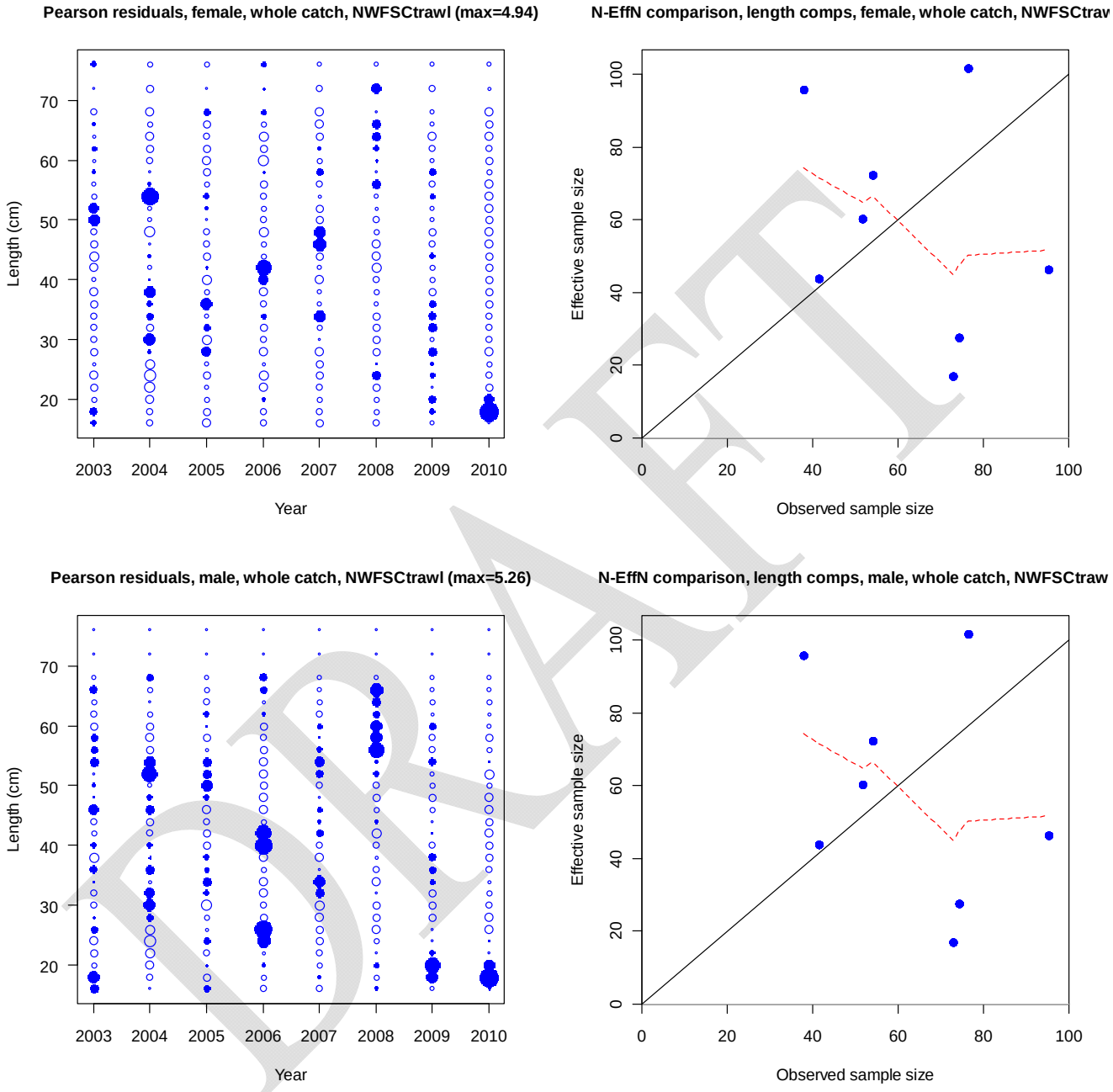

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Figures 26b-c. Residuals and input versus effective sample sizes for the NWFSC combined trawl survey.



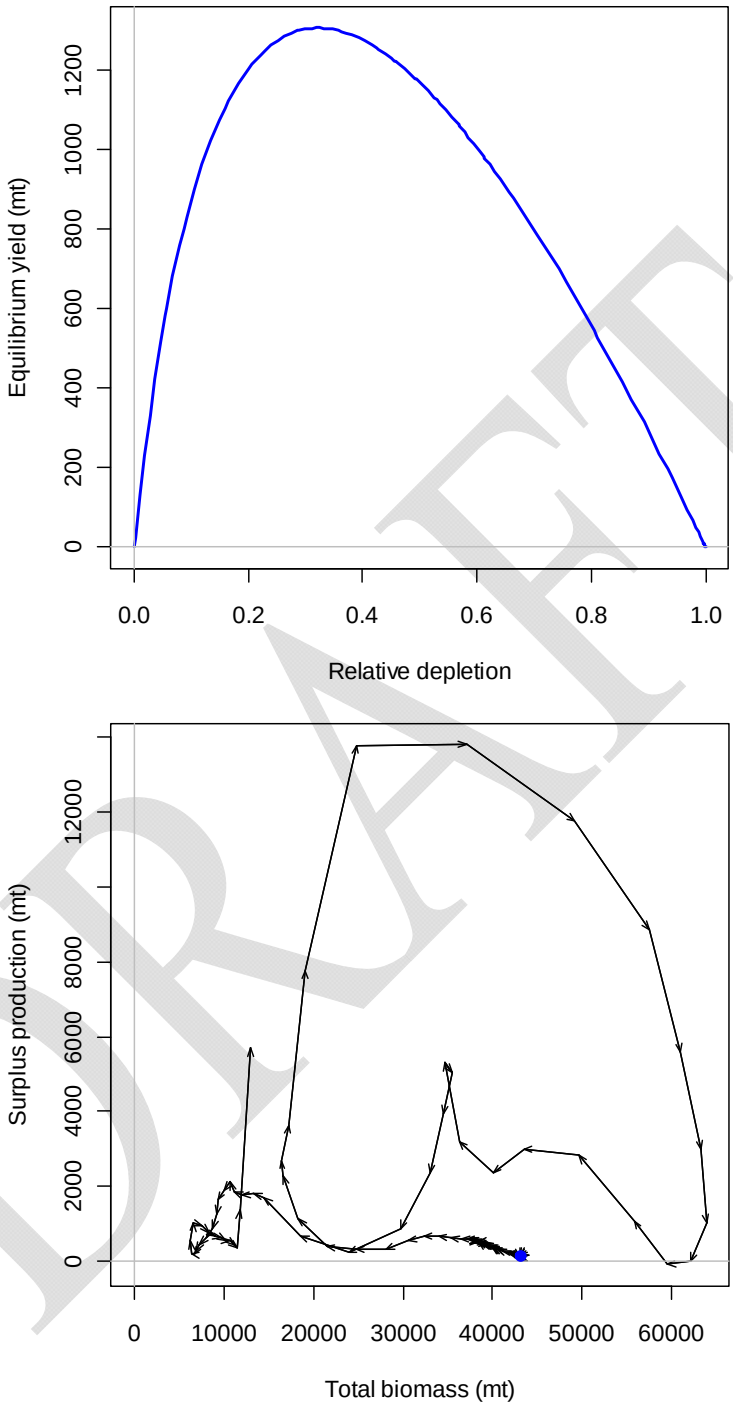

Figures 27a. Fits to sex-specific length frequency data for the NWFSC combined trawl survey for the alternative model which includes the 2010 length frequency data.

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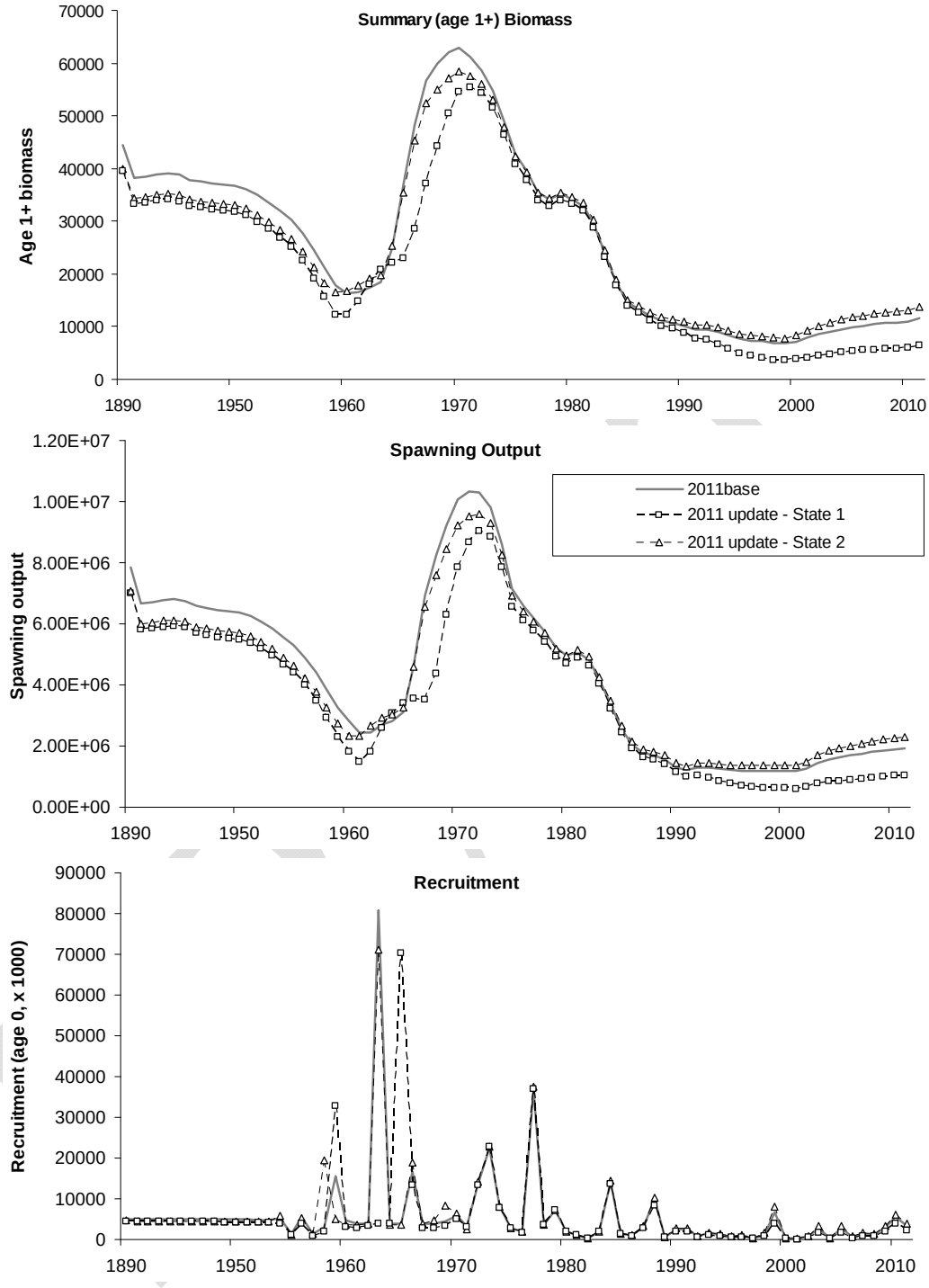

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Figures 27b-c. Residuals and input versus effective sample sizes for the NWFSC combined trawl survey for the alternative model which includes the 2010 length frequency data.

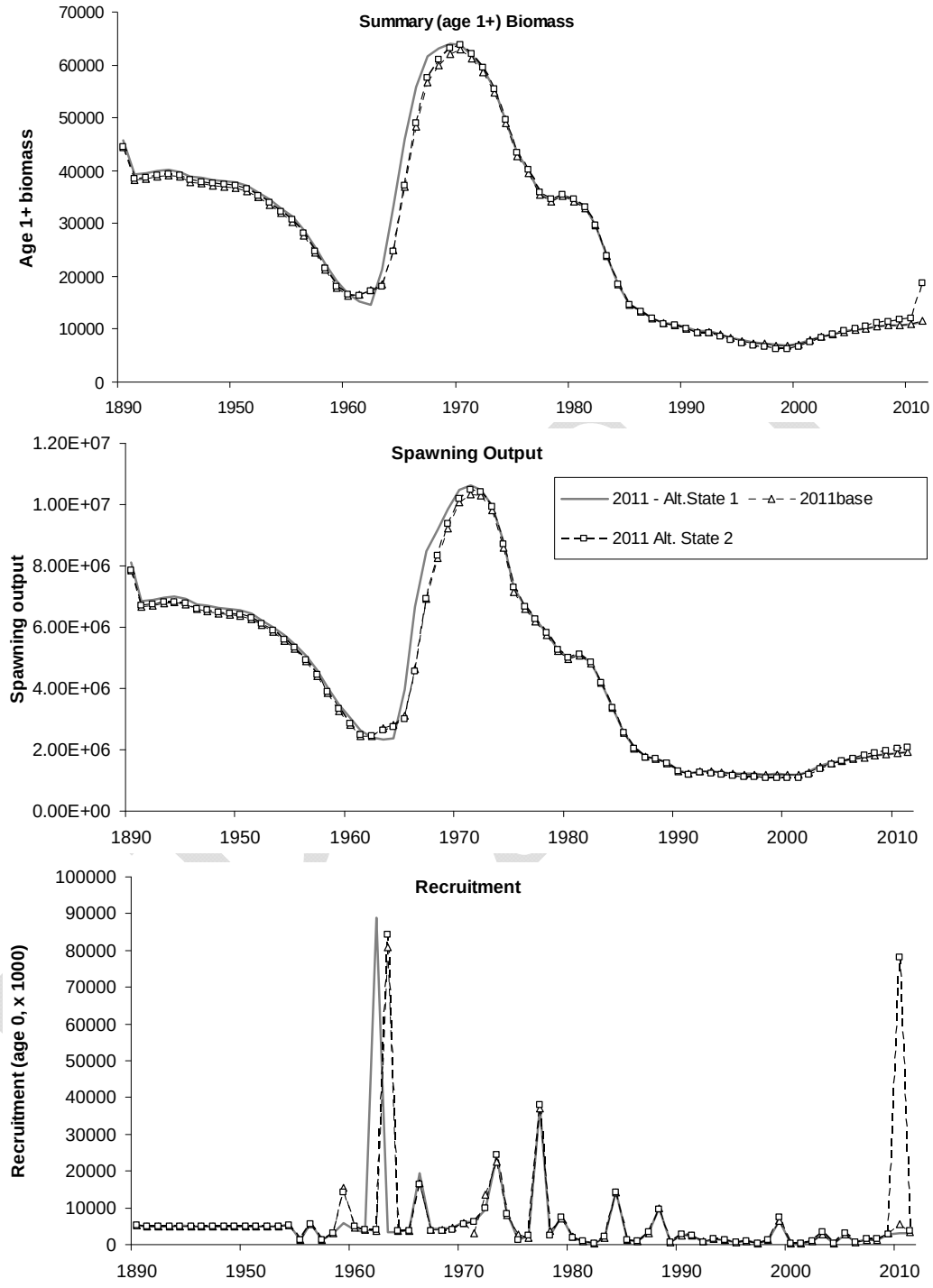



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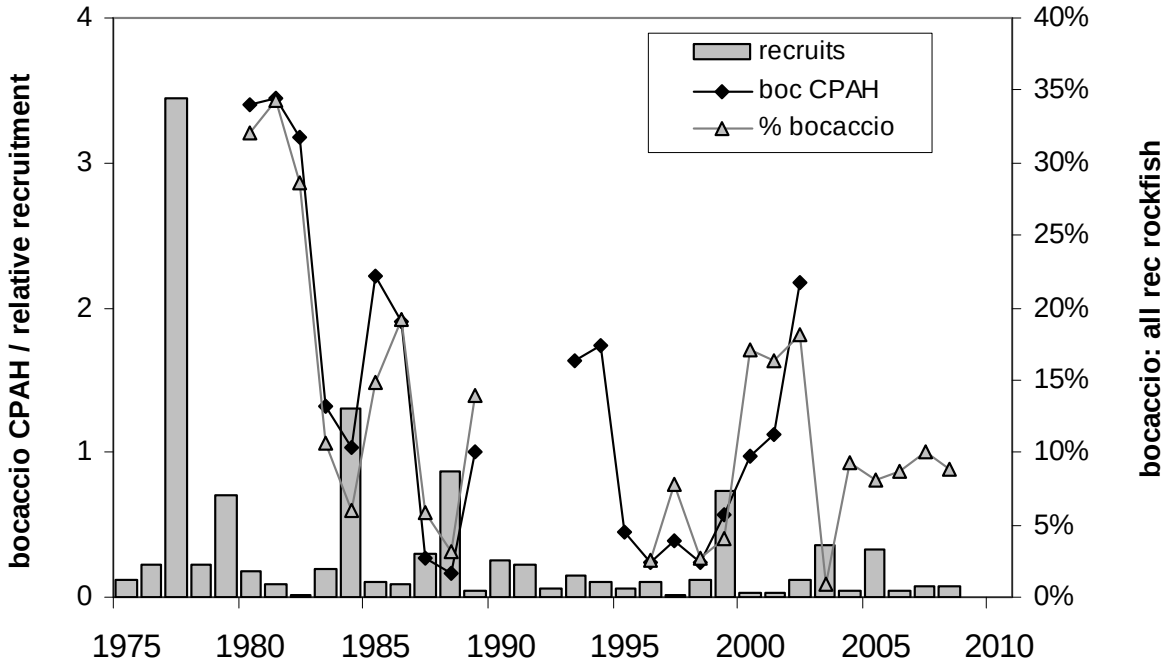
Figures 28a-b. Equilibrium yield relative to depletion, and surplus production relative to total biomass for the updated base model.




Figures 29a-c. The 2011 base model update with the two alternative states of nature as specified in the 2009 model; where State 1 is increased emphasis on the trawl CPUE index and triennial survey, State 2 is increased emphasis on the CalCOFI time series and the southern recreational CPUE index.

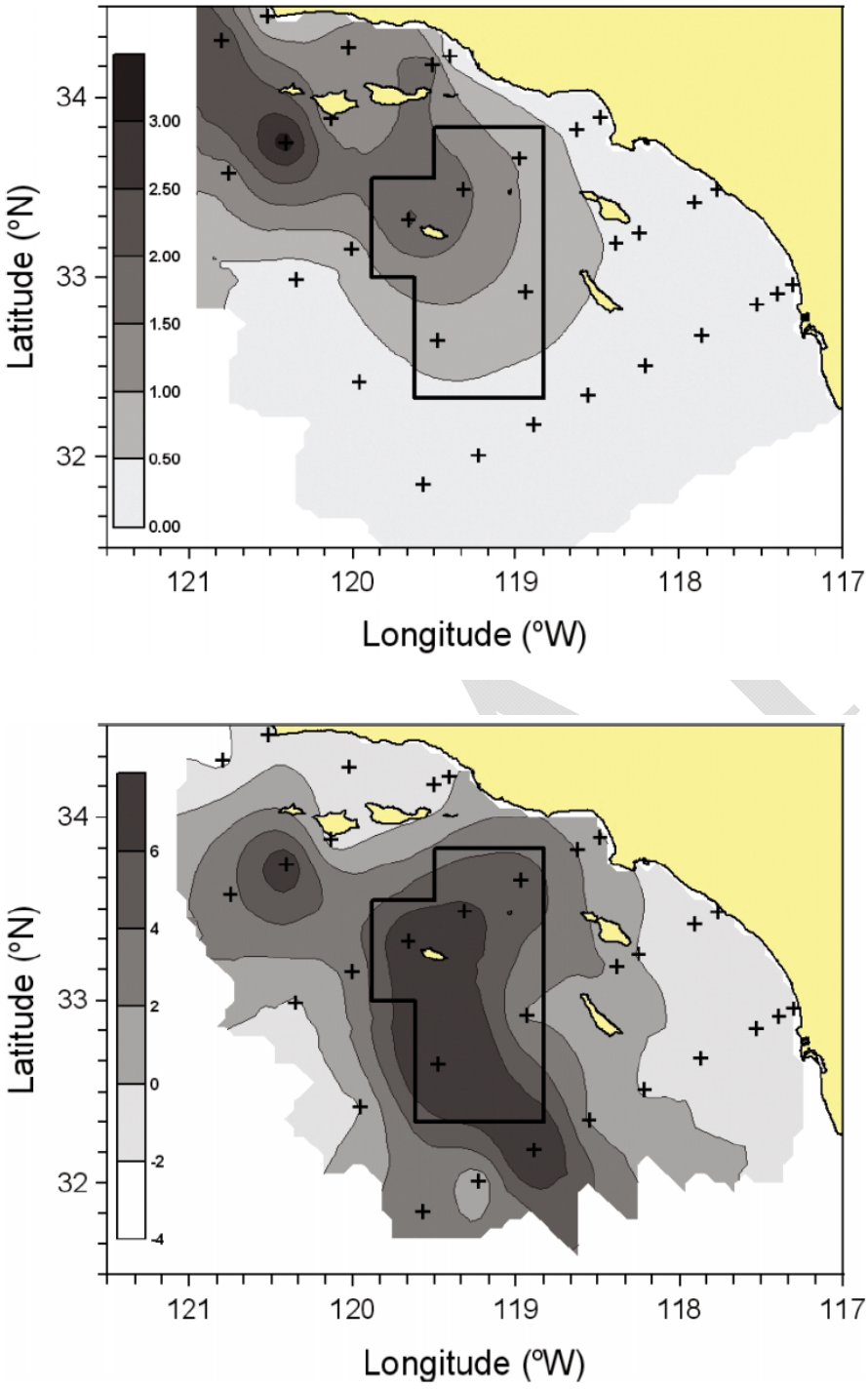



Figures 30a-c. The 2011 base model update, compared with alternative "states of nature" models, Alt.State 1 does not estimate a 2010 recruitment dev, while Alt.State2 excludes the impingement data but includes the NWFSC combined trawl survey length frequency data.




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Figure 31: Estimated annual recruitment (grey bars) relative to Southern California recreational fishery catch rates (catch per angler hour, black line) and to the percentage of the total southern California recreational catch represented by bocaccio (grey line).




Figures 32a-b. Spatial distribution of bocaccio larvae (number per 10 m2) based on long-term mean of station effects (top) and as 2002-2003 anomalies from the long-term mean distribution (bottom).

# Appendix A. SS3 files for the base model (all files in SS3 version 3.03 format).

.CTL file

```
#C growth parameters are estimated
#_SS-V3.01-O-opt;_12/16/08;_Stock_Synthesis_by_Richard_Methot_(NOAA);_using_Otter_Research_ADMB_7.0.1
1  #_N_Growth_Patterns
1 #_N_Morphs_Within_GrowthPattern
#_Cond 1 #_Morph_between/within_stdev_ratio (no read if N_morphs=1)
#_Cond  1 #vector_Morphdist_(-1_in_first_val_gives_normal_approx)
#_Cond 0  #  N recruitment designs goes here if N_GP*nseas*area>1
#_Cond 0  #  placeholder for recruitment interaction request
#_Cond 1 1 1  # example recruitment design element for GP=1, seas=1, area=1
#_Cond 0 # N_movement_definitions goes here if N_areas > 1
#_Cond 1.0 # first age that moves (real age at begin of season, not integer) also cond on do_migration>0
#_Cond 1 1 1 2 4 10 # example move definition for seas=1, morph=1, source=1 dest=2, age1=4, age2=10

3 #_Nblock_Patterns
11 6 18 #_blocks_per_pattern
# begin and end years of blocks
1975 1977
1978 1980
1981 1983
1984 1986
1987 1989
1990 1992
1993 1995
1996 1998
1999 2001
2002 2004
2005 2008

1970 1979
1980 1988
1989 1991
1992 1998
1999 2003
2004 2008

1973 1974
1975 1976
1977 1978
1979 1980
1981 1982
1983 1984
1985 1986
1987 1988
1989 1990
1991 1992
1993 1994
1995 1996
1997 1998
1999 2000
2001 2002
2003 2004
2005 2006
2007 2008


0.5 #_fracfemale
1 #_natM_type:_0=1Parm; 1=N_breakpoints;_2=Lorenzen;_3=agespecific;_4=agespec_withseasinterpolate
2 #_N_breakpoints
1 5 # age(real) at M breakpoints
1 # GrowthModel: 1=vonBert with L1&L2; 2=Richards with L1&L2; 3=not implemented; 4=not implemented
1.5 #_Growth_Age_for_L1
25 #_Growth_Age_for_L2 (999 to use as Linf)
0 #_SD_add_to_LAA (set to 0.1 for SS2 V1.x compatibility)
0 #_CV_Growth_Pattern:  0 CV=f(LAA); 1 CV=F(A); 2 SD=F(LAA); 3 SD=F(A)
1 #_maturity_option:  1=length logistic; 2=age logistic; 3=read age-maturity matrix by growth_pattern; 4=read age-fecundity
```

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

#_growth_parms

| #_LO | HI | INIT | PRIOR | PR_type | SD | PHASE | env-var | use_dev | dev_min | dev_max | dev_std | Block | Blk_Fxn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.05 | 0.25 | 0.15 | 0.16 | 0 | 0.8 | -3 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | NatM_p_1_Fem_GP:1 | | | | | | | | | | | |
| 0.05 | 0.25 | 0.15 | 0.16 | 0 | 0.8 | -3 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | NatM_p_2_Fem_GP:1 | | | | | | | | | | | |
| 1 | 45 | 26 | 27 | 0 | 10 | -4 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | L_at_Amin_Fem_GP_1 | | | | | | | | | | | |
| 60 | 80 | 67.738 | 69 | 0 | 10 | 3 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | L_at_Amax_Fem_GP_1 | | | | | | | | | | | |
| 0.15 | 0.25 | 0.21958 | 0.21 | 0 | 0.8 | 3 | 0 | 0 | 1970 | 2008 | 0.5 | 3 | 0 |
| | # | VonBert_K_Fem_GP_1 | | | | | | | | | | | |
| 0.05 | 0.25 | 0.1 | 0.1 | 0 | 0.8 | -6 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | CV_young_Fem_GP_1 | | | | | | | | | | | |
| 0.05 | 0.25 | 0.08 | 0.1 | 0 | 0.8 | -3 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | CV_old_Fem_GP_1 | | | | | | | | | | | |
| 0.05 | 0.25 | 0.15 | 0.16 | 0 | 0.8 | -3 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | NatM_p_1_Mal_GP:1 | | | | | | | | | | | |
| 0.05 | 0.25 | 0.15 | 0.16 | 0 | 0.8 | -3 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | NatM_p_2_Mal_GP:1 | | | | | | | | | | | |
| 1 | 45 | 26 | 27 | 0 | 10 | -4 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | L_at_Amin_Mal_GP_1 | | | | | | | | | | | |
| 50 | 70 | 58.9149 | 61 | 0 | 10 | 3 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | L_at_Amax_Mal_GP_1 | | | | | | | | | | | |
| 0.2 | 0.3 | 0.26418 | 0.2 | 0 | 0.8 | 3 | 0 | 0 | 1970 | 2008 | 0.5 | 3 | 0 |
| | # | VonBert_K_Mal_GP_1 | | | | | | | | | | | |
| 0.05 | 0.25 | 0.1 | 0.1 | 0 | 0.8 | -6 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | CV_young_Mal_GP_1 | | | | | | | | | | | |
| 0.05 | 0.25 | 0.08 | 0.1 | 0 | 0.8 | -3 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | CV_old_Mal_GP_1 | | | | | | | | | | | |
| -3 | 3 | 7.355E-06 | 2.44E-06 | 0 | 0.8 | -3 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | Wtlen_1_Mal | | | | | | | | | | | |
| -3 | 4 | 3.11359 | 3.34694 | 0 | 0.8 | -3 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | Wtlen_2_Mal | | | | | | | | | | | |
| 30 | 60 | 39.9 | 37.7 | 0 | 0.8 | -3 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | Mat50%_Fem | | | | | | | | | | | |
| -3 | 3 | -0.359 | -0.2876 | 0 | 0.8 | -3 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | Mat_slope_Fem | | | | | | | | | | | |
| #-3 | 3 | 0.22475 | 0.25 | 0 | 0.8 | -3 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | Eg/gm_inter_Fem | | | | | | | | | | | |
| #-3 | 3 | 0.03657 | 0 | 0 | 0.8 | -3 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | Eg/gm_slope_wt_Fem | | | | | | | | | | | |
| -3 | 3 | 192.5 | 190 | 0 | 0.8 | -3 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | Eg/gm_inter_Fem | | | | | | | | | | | |
| -3 | 3 | 49.3 | 36.57 | 0 | 0.8 | -3 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | Eg/gm_slope_wt_Fem | | | | | | | | | | | |
| -3 | 3 | 7.355E-06 | 2.44E-06 | 0 | 0.8 | -3 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | Wtlen_1_Mal | | | | | | | | | | | |
| -3 | 4 | 3.11359 | 3.34694 | 0 | 0.8 | -3 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 |
| | # | Wtlen_2_Mal | | | | | | | | | | | |
| 0 | 0 | 0 | 0 | -1 | 0 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | # | RecrDist_GP_1 | | | | | | | | | | | |
| 0 | 0 | 0 | 0 | -1 | 0 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | # | RecrDist_Area_1 | | | | | | | | | | | |
| 0 | 0 | 0 | 0 | -1 | 0 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | # | RecrDist_Seas_1 | | | | | | | | | | | |
| 0 | 0 | 0 | 0 | -1 | 0 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | # | CohortGrowDev | | | | | | | | | | | |

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

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

| #_LO | HI | INIT | PRIOR | PR_type | SD | PHASE |
|---|---|---|---|---|---|---|
| -5 | 5 | 0 | 0 | 0 | -5 | -4 |

1965 #_last_early_yr_nobias_adj_in_MPD
1975 #_first_yr_fullbias_adj_in_MPD
2009 #_last_yr_fullbias_adj_in_MPD
2010 #_first_recent_yr_nobias_adj_in_MPD
1.
0
-5 #min rec_dev
5 #max rec_dev
0 #_read_recdevs
#_end of advanced SR options
# read specified recr devs
#_Yr Input_value


#Fishing Mortality info
0.26 # F ballpark for tuning early phases
1980 # F ballpark year (neg value to disable)
3 # F_Method:  1=Pope; 2=instan. F; 3=hybrid (hybrid is recommended)
2.9 # max F or harvest rate, depends on F_Method

#need these three lines when doing option 2
#0.1  # start F
#1    # overall phase
#0    # N detailed inputs
#5  # need this for Fmethod 3, number if tuning iterations in hybrid F, 4 or 5 usually good
5

# no additional F input needed for Fmethod 1
# read overall start F value; overall phase; N detailed inputs to read for Fmethod 2
# read N iterations for tuning for Fmethod 3 (recommend 3 to 7)
#Fleet Year Seas F_value se phase (for detailed setup of F_Method=2)

#_initial_F_parms
#_LO HI INIT PRIOR PR_type SD PHASE
0 0.1 0 0.01 1 99 -2 # InitF_1FISHERY1
0.0001 0.05 0.007 0.007 0 99 2 # InitF_1FISHERY2
0 0.1 0 0.01 1 99 -2 # InitF_1FISHERY3
0 0.1 0 0.01 1 99 -2 # InitF_1FISHERY4
0 0.1 0 0.01 1 99 -2 # InitF_1FISHERY5
0 0.1 0 0.01 1 99 -2 # InitF_1FISHERY6


#_Q_setup
# A=do power, B=env-var, C=extra SD, D=devtype(<0=mirror, 0/1=none, 2=cons, 3=rand, 4=randwalk); E=0=num/1=bio, F=err_type
#_A  B  C  D  E  F
0 0 0 0 1 0 # 1 FISHERY1
0 0 0 0 1 0 # 1 FISHERY2
0 0 0 0 1 0 # 1 FISHERY3
0 0 0 0 1 0 # 1 FISHERY4
0 0 0 0 1 0 # 1 FISHERY5
0 0 0 0 1 0 # 1 FISHERY6
0 0 0 0 1 0 # 2 SURVEY1
0 0 0 0 1 0 # 3 SURVEY2
0 0 0 0 1 0 # 1 SURVEY3
0 0 0 0 1 0 # 1 SURVEY4
0 0 0 0 1 0 # 1 SURVEY5
0 0 0 0 1 0 # 1 SURVEY6
0 0 0 0 1 0 # 1 SURVEY7
0 0 0 0 1 0 # 1 SURVEY8
0 0 0 0 1 0 # 1 SURVEY9
0 0 0 0 1 0 # 1 SURVEY10

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

#_size_selex_types
#_Pattern Discard Male Special
24 0 0 0 #  FISHERY1 trawl
24 0 0 0 #  FISHERY2 hookline

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24 0 0 0 # FISHERY3 gillnet
24 0 0 0 # FISHERY4 southrec
1 0 0 0 # FISHERY5 cenrec
1 0 0 0 # Fishery6 trawlnorth
30 0 0 0 # SURVEY1 calcofi
24 0 0 0 # SURVEY2 triennial
5 0 0 5 # SURVEY3 deb w-v
24 0 0 0 # SURVE4 hookline
1 0 0 0 # SURVEY5 nwc combo
33 0 0 0 # SURVEY6 juvenile survey
0 0 0 0 # SURVEY7 pier index
33 0 0 0 # SURVEY8 60s MBay rec LFs
5 0 0 1 # SURVEY9 mirror southern trawl to look at LFs from observer fleet
5 0 0 4 # SURVEY10 - mirror southern rec (for CPFV obs. LFs)

#_age_selex_types
#_Pattern ___ Male Special
11 0 0 0 # 1 FISHERY1
11 0 0 0 # 1 FISHERY2
11 0 0 0 # 1 FISHERY3
11 0 0 0 # 1 FISHERY4
11 0 0 0 # 1 FISHERY5
11 0 0 0 # 1 FISHERY6
11 0 0 0 # 2 SURVEY1
11 0 0 0 # 3 SURVEY2
11 0 0 0 # 3 SURVEY3
11 0 0 0 # 3 SURVEY4
11 0 0 0 # 3 SURVEY5
11 0 0 0 # 3 SURVEY6
11 0 0 0 # 3 SURVEY7
11 0 0 0 # 3 SURVEY8
11 0 0 0 # 3 SURVEY9
11 0 0 0 # 3 SURVEY10

#_LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
#_size_sel: trawl - try logistic-

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 60 | 45.5 | 46 | 0 | 20 | 3 | 0 | 0 | 0 | 0 | 0.5 | 0 |
| | 0 | # | PEAK | value | | | | | | | | |
| -10 | 10 | -4.822 | 5 | 0 | 10 | -4 | 0 | 0 | 0 | 0 | 0.5 | 0 |
| | 0 | # | TOP | logistic | | | | | | | | |
| 1 | 15 | 4.296 | 3.5 | 0 | 10 | -4 | 0 | 0 | 0 | 0 | 0.5 | 0 |
| | 0 | # | WIDTH | exp | | | | | | | | |
| -1 | 9 | 4.76 | 2 | 0 | 10 | -4 | 0 | 0 | 0 | 0 | 0.5 | 0 |
| | 0 | # | WIDTH | exp | | | | | | | | |
| -15 | 9 | -10.5 | -4.5 | 0 | 10 | -4 | 0 | 0 | 0 | 0 | 0.5 | 0 |
| | 0 | # | INIT | logistic | | | | | | | | |
| -5 | 9 | -0.766 | 2 | 0 | 10 | -4 | 0 | 0 | 0 | 0 | 0.5 | 0 |
| | 0 | # | FINAL | logistic | | | | | | | | |

# size_se1: 1- male offsets- 4 lines

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| #1 | 60 | 16 | 20 | 0 | 100 | -5 | 0 | 0 | 0 | 0 | 0.5 | 0 |
| | 0 | # | size@dogleg | | | | | | | | | |
| #-10 | 0 | 0 | 0 | 0 | 10 | -5 | 0 | 0 | 0 | 0 | 0.5 | 0 |
| | 0 | # | log(relmalesel)at minL | | | | | | | | | |
| #-10 | 0 | 0 | 0 | 0 | 10 | -5 | 0 | 0 | 0 | 0 | 0.5 | 0 |
| | 0 | # | log(relmalesel)at dogleg | | | | | | | | | |
| #-10 | 0 | 0 | 0 | 0 | 10 | -5 | 0 | 0 | 0 | 0 | 0.5 | 0 |
| | 0 | # | log(relmalesel) at maxL | | | | | | | | | |

# size_se1: 1- male offsets- 4 lines
# fishery 2

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 60 | 52.459 | 55 | 0 | 20 | 3 | 0 | 0 | 0 | 0 | 0.5 | 0 |
| | 0 | # | PEAK | value | | | | | | | | |
| -10 | 10 | -10 | 5 | 0 | 10 | 3 | 0 | 0 | 0 | 0 | 0.5 | 0 |
| | 0 | # | TOP | logistic | | | | | | | | |
| 1 | 15 | 4.096 | 3.5 | 0 | 10 | 3 | 0 | 0 | 0 | 0 | 0.5 | 0 |
| | 0 | # | WIDTH | exp | | | | | | | | |
| -1 | 9 | 4.744 | 2 | 0 | 10 | 3 | 0 | 0 | 0 | 0 | 0.5 | 0 |
| | 0 | # | WIDTH | exp | | | | | | | | |

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-15 9 -11.22 -4.5 0 10 3 0 0 0 0 0.5 0
0 # INIT logistic
-5 9 -1 2 0 10 3 0 0 0 0 0.5 0
0 # FINAL logistic
# fishery 3
15 60 50.713 55 0 20 3 0 0 0 0 0.5 0
0 # PEAK value
-10 10 -9.8 -5 0 10 3 0 0 0 0 0.5 0
0 # TOP logistic
1 15 3.008 3.5 0 10 3 0 0 0 0 0.5 0
0 # WIDTH exp
-1 9 4.408 2 0 10 3 0 0 0 0 0.5 0
0 # WIDTH exp
-15 9 -11.22 -6 0 10 3 0 0 0 0 0.5 0
0 # INIT logistic
-5 9 -1.76 2 0 10 3 0 0 0 0 0.5 0
0 # FINAL logistic
#_size_sel: 4 double logistic-
15 60 36 40 0 20 3 0 0 0 0 0.5 0
0 # PEAK value
-10 10 -7 -5 0 10 3 0 0 0 0 0.5 0
0 # TOP logistic
1 15 4 3.5 0 10 3 0 0 0 0 0.5 0
0 # WIDTH exp
-1 9 5.2 5 0 10 3 0 0 0 0 0.5 0
0 # WIDTH exp
-15 9 -4 -4.5 0 10 3 0 0 0 0 0.5 0
0 # INIT logistic
-5 9 -3.28 -4 0 10 3 0 0 0 0 0.5 0
0 # FINAL logistic
# size_sel fishery 5 cenrec double logistic
#15 80 54.68 55 0 20 3 0 0 0 0 0.5 0
0 # PEAK value
#-10 10 5.1 5 0 10 3 0 0 0 0 0.5 0
0 # TOP logistic
#1 15 6.1 3.5 0 10 3 0 0 0 0 0.5 0
0 # WIDTH exp
#-1 9 2.5 2 0 10 3 0 0 0 0 0.5 0
0 # WIDTH exp
#-15 9 -2.86 -4.5 0 10 3 0 0 0 0 0.5 0
0 # INIT logistic
#-5 9 1.25 2 0 10 3 0 0 0 0 0.5 0
0 # FINAL logistic
#_size_sel: cenRec - try logistic-
5 50 40 35 0 50 3 0 0 0 0 0 0
0 #
0.0001 35 10 15 0 10 3 0 0 0 0 0 0
0 #

# size_sel fishery 6 trawlnorth double logistic
#13 80 54.68 55 0 20 3 0 0 0 0 0.5 0
0 # PEAK value
#-10 10 -9.792 5 0 10 3 0 0 0 0 0.5 0
0 # TOP logistic
#1 15 6.112 3.5 0 10 3 0 0 0 0 0.5 0
0 # WIDTH exp
#-1 9 5.56 2 0 10 3 0 0 0 0 0.5 0
0 # WIDTH exp
#-15 9 -2.86 -4.5 0 10 3 0 0 0 0 0.5 0
0 # INIT logistic
#-5 9 -1.25 2 0 10 3 0 0 0 0 0.5 0
0 # FINAL logistic

# size sel for fishery 6- northern trawl
5 50 40 35 0 50 3 0 0 0 0 0 0
0 #
0.0001 35 10 5 0 10 3 0 0 0 0 0 0
0 #
#-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_1_SURVEY3 - min and max bins
#-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_2_SURVEY3 - min and max bins# sel survey 8 triennial

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```
# size selectivity survey 8 - triennial
#5      50      40      20      0       50      3       0       0       0       0       0       0
        0 #
#0.0001 35      10      5       0       10      3       0       0       0       0       0       0
        0 #

# sel survey 8 - triennial double logistic
15      80      24      25      0       20      -3      0       0       0       0       0.5     0
        0       #       PEAK    value
-10     10      -9.792  5       0       10      -3      0       0       0       0       0.5     0
        0       #       TOP     logistic3
1       15      6.112   3.5     0       10      -3      0       0       0       0       0.5     0
        0       #       WIDTH   exp
-1      9       5.56    2       0       10      -3      0       0       0       0       0.5     0
        0       #       WIDTH   exp
-15     9       -2.86   -4.5    0       10      -3      0       0       0       0       0.5     0
        0       #       INIT    logistic
-5      9       -1.25   2       0       10      -3      0       0       0       0       0.5     0
        0       #       FINAL   logistic
# size sel 9 cpfv, set to mirror northrec
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_1_SURVEY3 - min and max bins
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_2_SURVEY3 - min and max bins# sel survey 8 triennial


#_size_sel: 10 SCB hook line double logistic-
15      60      54      55      0       20      3       0       0       0       0       0.5     0
        0       #       PEAK    value
-10     10      -3.9    -5      0       10      3       0       0       0       0       0.5     0
        0       #       TOP     logistic
1       15      12.2    3.5     0       10      3       0       0       0       0       0.5     0
        0       #       WIDTH   exp
-1      9       5.2     2       0       10      3       0       0       0       0       0.5     0
        0       #       WIDTH   exp
-15     9       -1.7    -4.5    0       10      3       0       0       0       0       0.5     0
        0       #       INIT    logistic
-5      9       -3.3    2       0       10      3       0       0       0       0       0.5     0
        0       #       FINAL   logistic

# size sel. 11 - combo survey - mirror triennial
#-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_1_SURVEY3 - min and max bins
#-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_2_SURVEY3 - min and max bins# sel survey 8 triennial
5       50      30      25      0       50      3       0       0       0       0       0       0
        0 #
0.0001  35      10      15      0       10      3       0       0       0       0       0       0
        0 #
# size selectivity survey 11 - NWFSC combo survey
#13     60      28.52   55      0       20      3       0       0       0       0       0.5     0
        0       #       PEAK    value
#-10    10      -1.23   5       0       10      3       0       0       0       0       0.5     0
        0       #       TOP     logistic
#1      15      4.43    3.5     0       10      3       0       0       0       0       0.5     0
        0       #       WIDTH   exp
#-2     9       -1.5    2       0       10      3       0       0       0       0       0.5     0
        0       #       WIDTH   exp
#-15    9       -0.58   -4.5    0       10      3       0       0       0       0       0.5     0
        0       #       INIT    logistic
#-5     9       -0.03   2       0       10      3       0       0       0       0       0.5     0
        0       #       FINAL   logistic

# size selectivity survey 14 - 60s LFs from CenCal Rec fishery- mirror cen/north rec
#-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_1_SURVEY
#-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_2_SURVEY
# size sel. 15 bycatch LF data from observer program, link to southern trawl fishery
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_1_SURVEY
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_2_SURVEY
# size sel. 16 mirror southern rec for LF data from CPFV observer program
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_1_SURVEY
-1 20 -1 -1 -1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_1P_2_SURVEY
```

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```
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_1_FISHERY1
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_2_FISHERY1
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_1_FISHERY2
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_2_FISHERY2
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_1_FISHERY3
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_2_FISHERY3
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_1_FISHERY4
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_2_FISHERY4
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_1_FISHERY5
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_2_FISHERY5
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_1_FISHERY6
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_1P_2_FISHERY6
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_1_SURVEY1
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY1
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_1_SURVEY2
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY2
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY3
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY3
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY4
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY4
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY5
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY5
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY6
0 21 0 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_2_SURVEY6
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY7
0 21 0 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_2_SURVEY7
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY8
0 21 0 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_2_SURVEY8
#0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY8
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY9
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY9
0 21 0 5 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_3P_1_SURVEY10
0 21 40 6 0 99 -1 0 0 0 0 0.5 0 0 # AgeSel_2P_2_SURVEY10

#_Cond 0 #_custom_sel-env_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no enviro fxns

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

1 #_Variance_adjustments_to_input_values
#_1 2 3
  0.06 0 0 0.59 0.6 0 0.285 0.5 0.22 -0.06 0.25 0.96 0 0 0 0 #_add_to_survey_CV
  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 #_add_to_discard_stddev
  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 #_add_to_bodywt_CV
  0.76 1 0.81 0.63 0.83 0.485 1 0.32 1 1 1 1 1 1 1 0.63 #_mult_by_lencomp_N
  1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 #_mult_by_agecomp_N
  1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 #_mult_by_size-at-age_N
30 #_DF_for_discard_like
30 #_DF_for_meanbodywt_like

4 #_maxlambdaphase
0 #_sd_offset

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

1 1 1 1 1
1 8 1 1 1
4 15 1 1 1
#10 11 4 1 1
# for state 1, put lambdas of 1.8 to 10- for state 2, put lambdas of 4, 7 to 10
# lambdas (for info only; columns are phases)
0 # (0/1) read specs for more stddev reporting
#
999
```

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# .DAT File

#_bootstrap file: 1
1892 #_styr
2010 #_endyr
1 #_nseas
12 #_months/season
1 #_spawn_seas
6 #_Nfleet
10 #_Nsurveys
1 #_N_areas
trawlsou%H&L%setnet%recSO%recCEN%trawlnor%CalCOFI%TRIENNIAL%CFGCPUE%NWFSChook%NWFSCtrawl%juvenile%pier_juv%impingement%free1%mirror_recSO
0.5 0.5 0.5 0.5 0.5 0.5 0.1 0.5 0.5 0.78 0.66 0.5 0.75 0.5 0.5 0.5 #_surveytiming_in_season
# SCB hook and line, and NWFSC combo based on Julian days
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 #_area_assignments_for_each_fishery_and_survey
1 1 1 1 1 1 #_units of catch: 1=bio; 2=num
0.01 0.01 0.01 0.01 0.01 0.01 #_se of log(catch) only used for init_eq_catch and for Fmethod 2 and 3
2 #_Ngenders
21 #_Nages
0 152.72 0 0 0 0 #_init_equil_catch_for_each_fishery
119 #_N_lines_of_catch_to_read
#_catch_biomass(mtons):_columns_are_fisheries,year,season

| #TWL | HKL | NET | RecSou | RecNor | ORWA_all | year | season |
|---|---|---|---|---|---|---|---|
| 0 | 166.77 | 0 | 0 | 0 | 0 | 1892 | 1 |
| 0 | 157.4 | 0 | 0 | 0 | 0 | 1893 | 1 |
| 0 | 148.03 | 0 | 0 | 0 | 0 | 1894 | 1 |
| 0 | 138.66 | 0 | 0 | 0 | 0 | 1895 | 1 |
| 0 | 130.93 | 0 | 0 | 0 | 0 | 1896 | 1 |
| 0 | 123.2 | 0 | 0 | 0 | 0 | 1897 | 1 |
| 0 | 115.47 | 0 | 0 | 0 | 0 | 1898 | 1 |
| 0 | 107.73 | 0 | 0 | 0 | 0 | 1899 | 1 |
| 0 | 119.2 | 0 | 0 | 0 | 0 | 1900 | 1 |
| 0 | 130.66 | 0 | 0 | 0 | 0 | 1901 | 1 |
| 0 | 142.12 | 0 | 0 | 0 | 0 | 1902 | 1 |
| 0 | 153.59 | 0 | 0 | 0 | 0 | 1903 | 1 |
| 0 | 165.05 | 0 | 0 | 0 | 0 | 1904 | 1 |
| 0 | 176.36 | 0 | 0 | 0 | 0 | 1905 | 1 |
| 0 | 187.68 | 0 | 0 | 0 | 0 | 1906 | 1 |
| 0 | 198.99 | 0 | 0 | 0 | 0 | 1907 | 1 |
| 0 | 210.3 | 0 | 0 | 0 | 0 | 1908 | 1 |
| 0 | 236.64 | 0 | 0 | 0 | 0 | 1909 | 1 |
| 0 | 262.98 | 0 | 0 | 0 | 0 | 1910 | 1 |
| 0 | 289.32 | 0 | 0 | 0 | 0 | 1911 | 1 |
| 0 | 315.66 | 0 | 0 | 0 | 0 | 1912 | 1 |
| 0 | 342 | 0 | 0 | 0 | 0 | 1913 | 1 |
| 0 | 368.34 | 0 | 0 | 0 | 0 | 1914 | 1 |
| 0 | 394.68 | 0 | 0 | 0 | 0 | 1915 | 1 |
| 54.77 | 418.96 | 0 | 0 | 0 | 0.160 | 1916 | 1 |
| 85.57 | 661.43 | 0 | 0 | 0 | 0.320 | 1917 | 1 |
| 96.66 | 701.13 | 0 | 0 | 0 | 0.720 | 1918 | 1 |
| 66 | 463.1 | 0 | 0 | 0 | 0.160 | 1919 | 1 |
| 67.82 | 482.28 | 0 | 0 | 0 | 0.220 | 1920 | 1 |
| 56.38 | 406.03 | 0 | 0 | 0 | 0.330 | 1921 | 1 |
| 49.37 | 367.12 | 0 | 0 | 0 | 0.250 | 1922 | 1 |
| 55.07 | 434.14 | 0 | 0 | 0 | 0.080 | 1923 | 1 |
| 36.97 | 405.15 | 0 | 0 | 0 | 0.270 | 1924 | 1 |
| 29.85 | 474.63 | 0 | 0 | 0 | 0.870 | 1925 | 1 |
| 83.2 | 627.09 | 0 | 0 | 0 | 0.810 | 1926 | 1 |
| 111.29 | 497.26 | 0 | 0 | 0 | 1.500 | 1927 | 1 |
| 150.62 | 482.9 | 0 | 1.99 | 2.39 | 1.210 | 1928 | 1 |
| 119.43 | 441.16 | 0 | 3.99 | 4.79 | 28.040 | 1929 | 1 |
| 135.62 | 551 | 0 | 5.99 | 5.51 | 16.700 | 1930 | 1 |
| 45.59 | 578.08 | 0 | 7.99 | 7.34 | 49.580 | 1931 | 1 |
| 68.87 | 430.61 | 0 | 9.99 | 9.18 | 37.280 | 1932 | 1 |
| 89.53 | 257.34 | 0 | 11.98 | 11.02 | 59.260 | 1933 | 1 |
| 108.88 | 316.57 | 0 | 13.98 | 12.85 | 41.380 | 1934 | 1 |
| 90.51 | 369.17 | 0 | 15.98 | 14.69 | 43.190 | 1935 | 1 |
| 107.86 | 473.58 | 0 | 15.98 | 16.53 | 17.690 | 1936 | 1 |

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|---|---|---|---|---|---|---|---|
| 91.98 | 408.44 | 0 | 27.51 | 19.59 | 41.130 | 1937 | 1 |
| 76.46 | 295.45 | 0 | 22.18 | 19.27 | 47.540 | 1938 | 1 |
| 49.95 | 200.11 | 0 | 19.63 | 16.85 | 86.170 | 1939 | 1 |
| 45.57 | 238.49 | 0 | 14.07 | 24.27 | 59.720 | 1940 | 1 |
| 32.44 | 187.35 | 0 | 13 | 22.43 | 53.070 | 1941 | 1 |
| 7.9 | 72.1 | 0 | 6.91 | 11.91 | 25.550 | 1942 | 1 |
| 7.56 | 70.44 | 0 | 6.6 | 11.39 | 196.130 | 1943 | 1 |
| 2.94 | 83.63 | 0 | 5.42 | 9.35 | 635.220 | 1944 | 1 |
| 55.17 | 127.08 | 0 | 7.23 | 12.47 | 1211.050 | 1945 | 1 |
| 111.53 | 122.33 | 0 | 12.45 | 21.47 | 611.940 | 1946 | 1 |
| 5.57 | 198.21 | 0 | 37.32 | 16.99 | 631.600 | 1947 | 1 |
| 81.94 | 150.23 | 0 | 102.08 | 33.9 | 397.440 | 1948 | 1 |
| 94 | 176.56 | 0 | 132.83 | 43.94 | 380.480 | 1949 | 1 |
| 303.66 | 327.61 | 0 | 156.82 | 53.55 | 374.730 | 1950 | 1 |
| 765.29 | 262.44 | 0 | 135.78 | 63.17 | 532.060 | 1951 | 1 |
| 1310.96 | 180.88 | 0 | 151.62 | 54.97 | 268.000 | 1952 | 1 |
| 1678.25 | 70.2 | 0 | 171.23 | 46.81 | 304.510 | 1953 | 1 |
| 1597.98 | 89.11 | 0 | 410.71 | 58.19 | 245.780 | 1954 | 1 |
| 1764.99 | 122.87 | 0 | 760.57 | 69.38 | 334.950 | 1955 | 1 |
| 2006.22 | 299.57 | 0 | 917.14 | 77.46 | 349.930 | 1956 | 1 |
| 2219.46 | 271.26 | 0 | 529.88 | 76.8 | 468.870 | 1957 | 1 |
| 2459.84 | 213.5 | 0 | 301.14 | 123.49 | 482.050 | 1958 | 1 |
| 2062.66 | 125.38 | 0 | 177.61 | 102.75 | 378.690 | 1959 | 1 |
| 1731.86 | 92.91 | 0 | 185.13 | 81.26 | 344.610 | 1960 | 1 |
| 1297.35 | 80.89 | 0 | 211.89 | 68.5 | 265.670 | 1961 | 1 |
| 1147.09 | 68.25 | 0 | 204.46 | 80.38 | 230.360 | 1962 | 1 |
| 1314.09 | 85.06 | 0 | 194.38 | 88.71 | 326.220 | 1963 | 1 |
| 942.79 | 70.17 | 0 | 244.36 | 74.98 | 190.470 | 1964 | 1 |
| 965.94 | 81.03 | 0 | 319.14 | 106.55 | 273.070 | 1965 | 1 |
| 2410.23 | 129.52 | 0 | 564.3 | 118.21 | 196.070 | 1966 | 1 |
| 4036.28 | 117.9 | 0 | 770.19 | 111.44 | 294.710 | 1967 | 1 |
| 1996.47 | 80.71 | 0 | 832.18 | 103.9 | 391.890 | 1968 | 1 |
| 1132.64 | 78.02 | 17.41 | 785 | 110.52 | 223.000 | 1969 | 1 |
| 1341.14 | 82.39 | 15.06 | 1039.41 | 117.87 | 250.090 | 1970 | 1 |
| 961.36 | 81.56 | 58.73 | 966.96 | 104.45 | 323.740 | 1971 | 1 |
| 1648.11 | 122.56 | 70.95 | 1308.7 | 123.08 | 379.600 | 1972 | 1 |
| 4537.05 | 151.53 | 167.3 | 1510.62 | 186.09 | 648.420 | 1973 | 1 |
| 5956.32 | 164.1 | 261.65 | 1892.59 | 200.89 | 525.550 | 1974 | 1 |
| 3316.02 | 158.13 | 285.36 | 1865.23 | 200.29 | 578.560 | 1975 | 1 |
| 3424.73 | 218.88 | 123.1 | 1489.03 | 215.7 | 705.480 | 1976 | 1 |
| 2381.4 | 188.75 | 158.08 | 1265.09 | 193.57 | 673.610 | 1977 | 1 |
| 1878.87 | 247.93 | 124.75 | 1174.03 | 195.63 | 745.440 | 1978 | 1 |
| 3299.31 | 351.15 | 235.32 | 1713.94 | 230.22 | 286.170 | 1979 | 1 |
| 3054.87 | 320.49 | 215.88 | 942.92 | 264.04 | 586.080 | 1980 | 1 |
| 1779.75 | 312.34 | 353.03 | 908.12 | 234.52 | 2164.520 | 1981 | 1 |
| 2323.84 | 392.92 | 387.01 | 1225.49 | 371.85 | 1897.440 | 1982 | 1 |
| 1914.02 | 238.56 | 588.49 | 265.96 | 310.65 | 2280.140 | 1983 | 1 |
| 1891.75 | 367.29 | 547.07 | 181.6 | 67.14 | 1621.380 | 1984 | 1 |
| 582.41 | 143.01 | 1091.66 | 324.48 | 67.93 | 654.150 | 1985 | 1 |
| 789.66 | 258.99 | 1085.78 | 433.75 | 175.84 | 376.540 | 1986 | 1 |
| 650.4 | 277.14 | 967.86 | 91.7 | 106.14 | 555.370 | 1987 | 1 |
| 590 | 496.55 | 371.48 | 106.54 | 44.32 | 695.430 | 1988 | 1 |
| 594.21 | 362.92 | 981.88 | 182.16 | 81.71 | 553.310 | 1989 | 1 |
| 681.56 | 458.67 | 793.27 | 160.27 | 68.02 | 462.620 | 1990 | 1 |
| 498.36 | 266.28 | 457.6 | 160.27 | 68.02 | 263.310 | 1991 | 1 |
| 362.09 | 468.03 | 640.31 | 160.27 | 68.02 | 133.250 | 1992 | 1 |
| 358.87 | 417.33 | 430.18 | 115.71 | 68.02 | 202.860 | 1993 | 1 |
| 377.01 | 193.06 | 262.64 | 243.9 | 68.02 | 149.530 | 1994 | 1 |
| 215.41 | 56.74 | 281.15 | 34.24 | 68.02 | 162.450 | 1995 | 1 |
| 225.84 | 66.23 | 91.83 | 68.36 | 32.22 | 62.910 | 1996 | 1 |
| 136.26 | 53.37 | 34.94 | 68.71 | 111.26 | 93.850 | 1997 | 1 |
| 41.16 | 39.38 | 39.21 | 33.53 | 25.87 | 31.970 | 1998 | 1 |
| 19.01 | 20.68 | 7.18 | 80.06 | 60.21 | 25.980 | 1999 | 1 |
| 13.48 | 7.01 | 0.73 | 58.24 | 74.42 | 6.570 | 2000 | 1 |
| 9.21 | 7.82 | 0.88 | 62.68 | 53.84 | 4.440 | 2001 | 1 |
| 28.04 | 0.13 | 0.01 | 35.88 | 4.93 | 20.67 | 2002 | 1 |
| 5.07 | 0 | 0 | 5.53 | 1.87 | 0.31 | 2003 | 1 |
| 13.86 | 1.84 | 0.21 | 63.43 | 2.27 | 3.52 | 2004 | 1 |
| 24.64 | 1.5 | 0.17 | 69.9 | 10.7 | 0.43 | 2005 | 1 |
| 16.09 | 2.25 | 0.25 | 29 | 11.8 | 0.31 | 2006 | 1 |

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|---|---|---|---|---|---|---|---|
| 4.06 | 3.39 | 0.38 | 44.2 | 8.92 | 1.58 | 2007 | 1 |
| 20.42 | 2.02 | 0.08 | 31.50 | 3.33 | 1.98 | 2008 | 1 |
| 1.12 | 1.50 | 0.03 | 40.30 | 9.70 | 4.85 | 2009 | 1 |
| 2.90 | 1.45 | 0.05 | 52.60 | 7.40 | 10.97 | 2010 | 1 |

221 #_N_cpue_and_surveyabundance_observations

#_year seas index obs se(log)

| | | | | | |
|---|---|---|---|---|---|
| 1982 | 1 | 1 | 166.4 | 0.32 | #areaweightedCPUEfromRalston |
| 1983 | 1 | 1 | 73.1 | 0.32 | #areaweightedCPUEfromRalston |
| 1984 | 1 | 1 | 72.3 | 0.32 | #areaweightedCPUEfromRalston |
| 1985 | 1 | 1 | 30.7 | 0.32 | #areaweightedCPUEfromRalston |
| 1986 | 1 | 1 | 31.2 | 0.32 | #areaweightedCPUEfromRalston |
| 1987 | 1 | 1 | 44.4 | 0.32 | #areaweightedCPUEfromRalston |
| 1988 | 1 | 1 | 51.6 | 0.32 | #areaweightedCPUEfromRalston |
| 1989 | 1 | 1 | 35.8 | 0.32 | #areaweightedCPUEfromRalston |
| 1990 | 1 | 1 | 37.1 | 0.32 | #areaweightedCPUEfromRalston |
| 1991 | 1 | 1 | 26.9 | 0.32 | #areaweightedCPUEfromRalston |
| 1992 | 1 | 1 | 20.4 | 0.32 | #areaweightedCPUEfromRalston |
| 1993 | 1 | 1 | 19.7 | 0.32 | #areaweightedCPUEfromRalston |
| 1994 | 1 | 1 | 23.9 | 0.32 | #areaweightedCPUEfromRalston |
| 1995 | 1 | 1 | 15.2 | 0.32 | #areaweightedCPUEfromRalston |
| 1996 | 1 | 1 | 8.7 | 0.32 | #areaweightedCPUEfromRalston |

| | | | | | |
|---|---|---|---|---|---|
| 1980 | 1 | 4 | 3.401 | 0.071906949 | #MRFsoCAL |
| 1981 | 1 | 4 | 3.447 | 0.059646908 | #MRFsoCAL |
| 1982 | 1 | 4 | 3.173 | 0.073301426 | #MRFsoCAL |
| 1983 | 1 | 4 | 1.318 | 0.081365149 | #MRFsoCAL |
| 1984 | 1 | 4 | 1.034 | 0.084548676 | #MRFsoCAL |
| 1985 | 1 | 4 | 2.224 | 0.091706845 | #MRFsoCAL |
| 1986 | 1 | 4 | 1.91 | 0.105307369 | #MRFsoCAL |
| 1987 | 1 | 4 | 0.275 | 0.448819689 | #MRFsoCAL |
| 1988 | 1 | 4 | 0.169 | 0.387042386 | #MRFsoCAL |
| 1989 | 1 | 4 | 0.997 | 0.137842628 | #MRFsoCAL |
| 1993 | 1 | 4 | 1.631 | 0.255474245 | #MRFsoCAL |
| 1994 | 1 | 4 | 1.732 | 0.142670896 | #MRFsoCAL |
| 1995 | 1 | 4 | 0.448 | 0.358378941 | #MRFsoCAL |
| 1996 | 1 | 4 | 0.246 | 0.203184778 | #MRFsoCAL |
| 1997 | 1 | 4 | 0.395 | 0.38023361 | #MRFsoCAL |
| 1998 | 1 | 4 | 0.234 | 0.202021118 | #MRFsoCAL |
| 1999 | 1 | 4 | 0.566 | 0.091309348 | #MRFsoCAL |
| 2000 | 1 | 4 | 1.098 | 0.086438291 | #MRFsoCAL |
| 2001 | 1 | 4 | 1.28 | 0.113037949 | #MRFsoCAL |
| 2002 | 1 | 4 | 2.01 | 0.08355396 | #MRFsoCAL |

| | | | | | |
|---|---|---|---|---|---|
| 1980 | 1 | 5 | 0.917 | 0.118186092 | #MRFnorth |
| 1981 | 1 | 5 | 1.28 | 0.170552193 | #MRFnorth |
| 1982 | 1 | 5 | 1.326 | 0.131232941 | #MRFnorth |
| 1983 | 1 | 5 | 1.377 | 0.143163299 | #MRFnorth |
| 1984 | 1 | 5 | 0.388 | 0.126294711 | #MRFnorth |
| 1985 | 1 | 5 | 0.75 | 0.081166137 | #MRFnorth |
| 1986 | 1 | 5 | 1.39 | 0.07061189 | #MRFnorth |
| 1987 | 1 | 5 | 0.914 | 0.154768554 | #MRFnorth |
| 1988 | 1 | 5 | 0.294 | 0.1734864 | #MRFnorth |
| 1989 | 1 | 5 | 0.457 | 0.157321533 | #MRFnorth |
| 1993 | 1 | 5 | 0.202 | 0.345617372 | #MRFnorth |
| 1994 | 1 | 5 | 0.351 | 0.236456026 | #MRFnorth |
| 1995 | 1 | 5 | 0.482 | 0.197847986 | #MRFnorth |
| 1996 | 1 | 5 | 0.535 | 0.099354307 | #MRFnorth |
| 1997 | 1 | 5 | 0.42 | 0.125405334 | #MRFnorth |
| 1998 | 1 | 5 | 0.432 | 0.14513239 | #MRFnorth |
| 1999 | 1 | 5 | 0.802 | 0.066825326 | #MRFnorth |
| 2000 | 1 | 5 | 1.961 | 0.089420947 | #MRFnorth |
| 2001 | 1 | 5 | 2.022 | 0.115414586 | #MRFnorth |
| 2002 | 1 | 5 | 2.618 | 0.162618942 | #MRFnorth |

| | | | | | |
|---|---|---|---|---|---|
| 1951 | 1 | 7 | 0.8356082 | 0.2600304 | #CalCOFIindex |
| 1952 | 1 | 7 | 0.8477566 | 0.2198659 | #CalCOFIindex |
| 1953 | 1 | 7 | 1.1203115 | 0.1946184 | #CalCOFIindex |

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|---|---|---|---|---|---|
| 1954 | 1 | 7 | 1.5595068 | 0.1593167 | #CalCOFIindex |
| 1955 | 1 | 7 | 1.2647899 | 0.1813438 | #CalCOFIindex |
| 1956 | 1 | 7 | 0.7930313 | 0.2586213 | #CalCOFIindex |
| 1957 | 1 | 7 | 1.6910182 | 0.209057 | #CalCOFIindex |
| 1958 | 1 | 7 | 1.2934664 | 0.187288 | #CalCOFIindex |
| 1959 | 1 | 7 | 0.4205862 | 0.2053309 | #CalCOFIindex |
| 1960 | 1 | 7 | 0.6059711 | 0.1798713 | #CalCOFIindex |
| 1961 | 1 | 7 | 0.7215946 | 0.2842966 | #CalCOFIindex |
| 1962 | 1 | 7 | 0.6241535 | 0.2465393 | #CalCOFIindex |
| 1963 | 1 | 7 | 1.0273862 | 0.2474056 | #CalCOFIindex |
| 1964 | 1 | 7 | 0.6319091 | 0.2547808 | #CalCOFIindex |
| 1965 | 1 | 7 | 0.8358392 | 0.2157732 | #CalCOFIindex |
| 1966 | 1 | 7 | 1.550326 | 0.1764235 | #CalCOFIindex |
| 1967 | 1 | 7 | 0.808292 | 0.347014 | #CalCOFIindex |
| 1968 | 1 | 7 | 2.8134619 | 0.26283 | #CalCOFIindex |
| 1969 | 1 | 7 | 2.5614508 | 0.1417053 | #CalCOFIindex |
| 1970 | 1 | 7 | 0.7970022 | 0.4980813 | #CalCOFIindex |
| 1972 | 1 | 7 | 1.9745682 | 0.1459947 | #CalCOFIindex |
| 1975 | 1 | 7 | 2.1435162 | 0.1515554 | #CalCOFIindex |
| 1976 | 1 | 7 | 2.9527088 | 0.3385088 | #CalCOFIindex |
| 1978 | 1 | 7 | 1.0812648 | 0.2139001 | #CalCOFIindex |
| 1981 | 1 | 7 | 1.0067293 | 0.2256607 | #CalCOFIindex |
| 1983 | 1 | 7 | 0.3079739 | 0.4329301 | #CalCOFIindex |
| 1984 | 1 | 7 | 1.0295769 | 0.2097524 | #CalCOFIindex |
| 1985 | 1 | 7 | 0.3150882 | 0.4627654 | #CalCOFIindex |
| 1986 | 1 | 7 | 0.4419074 | 0.4968653 | #CalCOFIindex |
| 1987 | 1 | 7 | 0.9991566 | 0.3677525 | #CalCOFIindex |
| 1988 | 1 | 7 | 0.758646 | 0.2576719 | #CalCOFIindex |
| 1989 | 1 | 7 | 0.8016189 | 0.3971494 | #CalCOFIindex |
| 1990 | 1 | 7 | 0.5212969 | 0.3795327 | #CalCOFIindex |
| 1991 | 1 | 7 | 0.762163 | 0.2951539 | #CalCOFIindex |
| 1992 | 1 | 7 | 0.7505338 | 0.2754136 | #CalCOFIindex |
| 1993 | 1 | 7 | 0.1866505 | 0.5711888 | #CalCOFIindex |
| 1994 | 1 | 7 | 0.2767606 | 0.3024538 | #CalCOFIindex |
| 1995 | 1 | 7 | 0.1149556 | 0.7522513 | #CalCOFIindex |
| 1996 | 1 | 7 | 1.3652737 | 0.3017633 | #CalCOFIindex |
| 1997 | 1 | 7 | 0.2939504 | 0.3710218 | #CalCOFIindex |
| 1998 | 1 | 7 | 0.1007829 | 0.5326119 | #CalCOFIindex |
| 1999 | 1 | 7 | 0.2891032 | 0.4504429 | #CalCOFIindex |
| 2000 | 1 | 7 | 0.2381801 | 0.4086741 | #CalCOFIindex |
| 2001 | 1 | 7 | 0.1161277 | 0.4280781 | #CalCOFIindex |
| 2002 | 1 | 7 | 0.4933842 | 0.3644697 | #CalCOFIindex |
| 2003 | 1 | 7 | 0.5258488 | 0.26999 | #CalCOFIindex |
| 2004 | 1 | 7 | 0.5947927 | 0.3758298 | #CalCOFIindex |
| 2005 | 1 | 7 | 0.6444137 | 0.2998567 | #CalCOFIindex |
| 2006 | 1 | 7 | 0.6522035 | 0.3031658 | #CalCOFIindex |
| 2007 | 1 | 7 | 0.5582143 | 0.3251469 | #CalCOFIindex |
| 2008 | 1 | 7 | 0.9627358 | 0.3697702 | #CalCOFIindex |
| 2009 | 1 | 7 | 0.2627943 | 0.4361989 | #CalCOFIindex |
| 2010 | 1 | 7 | 0.5093906 | 0.3887055 | #CalCOFIindex |

| | | | | | |
|---|---|---|---|---|---|
| 1980 | 1 | 8 | 2227.932433 | 0.149683111 | #TRIENNIAL |
| 1983 | 1 | 8 | 1849.416128 | 0.176692006 | #TRIENNIAL |
| 1986 | 1 | 8 | 723.6568073 | 0.159390796 | #TRIENNIAL |
| 1989 | 1 | 8 | 529.7149835 | 0.143672021 | #TRIENNIAL |
| 1992 | 1 | 8 | 319.1654707 | 0.228586262 | #TRIENNIAL |
| 1995 | 1 | 8 | 192.9998349 | 0.194757645 | #TRIENNIAL |
| 1998 | 1 | 8 | 56.92735471 | 0.301249017 | #TRIENNIAL |
| 2001 | 1 | 8 | 121.4857726 | 0.261983439 | #TRIENNIAL |
| 2004 | 1 | 8 | 439.3928644 | 0.214285691 | #TRIENNIAL |

| | | | | | |
|---|---|---|---|---|---|
| 1987 | 1 | 9 | 3.545 | 0.161148115 | #VandenbergCPUE |
| 1988 | 1 | 9 | 2.349 | 0.140405176 | #VandenbergCPUE |
| 1989 | 1 | 9 | 3.001 | 0.121154053 | #VandenbergCPUE |
| 1990 | 1 | 9 | 6.009 | 0.14611662 | #VandenbergCPUE |
| 1991 | 1 | 9 | 4.637 | 0.172508578 | #VandenbergCPUE |
| 1992 | 1 | 9 | 3.543 | 0.12570181 | #VandenbergCPUE |
| 1993 | 1 | 9 | 2.319 | 0.131726504 | #VandenbergCPUE |

DRAFT

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|---|---|---|---|---|---|
| 1994 | 1 | 9 | 1.46 | 0.168399042 | #VandenbergCPUE |
| 1995 | 1 | 9 | 1.721 | 0.15083795 | #VandenbergCPUE |
| 1996 | 1 | 9 | 1.457 | 0.169280019 | #VandenbergCPUE |
| 1997 | 1 | 9 | 1.823 | 0.157419694 | #VandenbergCPUE |
| 1998 | 1 | 9 | 1.646 | 0.215088204 | #VandenbergCPUE |

| | | | | | |
|---|---|---|---|---|---|
| 2004 | 1 | 10 | 0.1735 | 0.1749 | #S_Cal_Hook_line |
| 2005 | 1 | 10 | 0.1674 | 0.1821 | #S_Cal_Hook_line |
| 2006 | 1 | 10 | 0.1697 | 0.1775 | #S_Cal_Hook_line |
| 2007 | 1 | 10 | 0.1551 | 0.1801 | #S_Cal_Hook_line |
| 2008 | 1 | 10 | 0.1279 | 0.1832 | #S_Cal_Hook_line |
| 2009 | 1 | 10 | 0.116 | 0.1865 | #S_Cal_Hook_line |
| 2010 | 1 | 10 | 0.0544 | 0.2057 | #S_Cal_Hook_line |

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|---|---|---|---|---|---|---|
| 2003 | 1 | 11 | 1158.72 | 0.320567 | # | NWFSC |
| 2004 | 1 | 11 | 4995.34 | 0.3364637 | # | NWFSC |
| 2005 | 1 | 11 | 1814.90 | 0.2983181 | # | NWFSC |
| 2006 | 1 | 11 | 2533.64 | 0.3218136 | # | NWFSC |
| 2007 | 1 | 11 | 2215.42 | 0.3563784 | # | NWFSC |
| 2008 | 1 | 11 | 1358.48 | 0.3903119 | # | NWFSC |
| 2009 | 1 | 11 | 1220.85 | 0.386901 | # | NWFSC |
| 2010 | 1 | 11 | 855.85 | 0.3188051 | # | NWFSC |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2001 | 1 | 12 | 0.369 | 0.021 | # | pre-recruit index |
| 2002 | 1 | 12 | 0.583 | 0.021 | # | pre-recruit index |
| 2003 | 1 | 12 | 0.123 | 0.029 | # | pre-recruit index |
| 2004 | 1 | 12 | 0.353 | 0.021 | # | pre-recruit index |
| 2005 | 1 | 12 | 0.519 | 0.028 | # | pre-recruit index |
| 2006 | 1 | 12 | 0.115 | 0.017 | # | pre-recruit index |
| 2007 | 1 | 12 | 0.225 | 0.022 | # | pre-recruit index |
| 2008 | 1 | 12 | 0.243 | 0.021 | # | pre-recruit index |
| 2009 | 1 | 12 | 0.262 | 0.021 | # | pre-recruit index |
| 2010 | 1 | 12 | 0.625 | 0.033 | # | pre-recruit index |

| | | | | |
|---|---|---|---|---|
| # Pier Index | | 32 | obs | |
| 1954 | 1 | 13 | 0.1 | 0.72528 |
| 1955 | 1 | 13 | 0.01 | 0.88207 |
| 1956 | 1 | 13 | 0.1 | 0.72528 |
| 1957 | 1 | 13 | 0.01 | 0.88207 |
| 1958 | 1 | 13 | 0.01593 | 1.54141 |
| 1966 | 1 | 13 | 0.76471 | 0.74688 |
| 1980 | 1 | 13 | 0.1078 | 0.5675 |
| 1981 | 1 | 13 | 0.01668 | 0.71192 |
| 1982 | 1 | 13 | 0.01 | 0.88207 |
| 1983 | 1 | 13 | 0.01 | 0.88207 |
| 1984 | 1 | 13 | 0.08304 | 0.56998 |
| 1985 | 1 | 13 | 0.05492 | 0.61209 |
| 1986 | 1 | 13 | 0.06104 | 0.54481 |
| 1987 | 1 | 13 | 0.07279 | 0.54011 |
| 1988 | 1 | 13 | 0.14651 | 0.39676 |
| 1989 | 1 | 13 | 0.03599 | 0.8973 |
| 1993 | 1 | 13 | 0.09198 | 0.56186 |
| 1994 | 1 | 13 | 0.01 | 0.88207 |
| 1995 | 1 | 13 | 0.02682 | 0.8694 |
| 1996 | 1 | 13 | 0.01 | 0.88207 |
| 1997 | 1 | 13 | 0.01 | 0.88207 |
| 1998 | 1 | 13 | 0.01 | 0.88207 |
| 1999 | 1 | 13 | 0.08153 | 0.66772 |
| 2000 | 1 | 13 | 0.01 | 0.88207 |
| 2001 | 1 | 13 | 0.01 | 0.88207 |
| 2002 | 1 | 13 | 0.01 | 0.88207 |
| 2003 | 1 | 13 | 0.01713 | 0.70799 |
| 2004 | 1 | 13 | 0.01 | 0.88207 |
| 2005 | 1 | 13 | 0.05629 | 0.77327 |
| 2006 | 1 | 13 | 0.01 | 0.88207 |

DRAFT

2007 1 13 0.01 0.88207
2008 1 13 0.01 0.88207
2009 1 13 0.10024 0.63688

#impingement
1972 1 14 1.081498823 0.53295
1973 1 14 0.259325532 0.5834
1974 1 14 0.159835516 0.45561
1975 1 14 0.306401577 0.39862
1976 1 14 0.023219121 0.41032
1977 1 14 0.771328406 0.44772
1978 1 14 0.130167483 0.52614
1979 1 14 0.049954159 0.38914
1980 1 14 0.019524608 0.48278
1981 1 14 0.009536932 0.59967
1982 1 14 0.001457321 0.67585
1984 1 14 0.01972994 0.48843
1985 1 14 0.026307506 0.35308
1986 1 14 0.014595918 0.40102
1987 1 14 0.006518048 0.63352
1988 1 14 0.156822144 0.42722
1989 1 14 0.02186896 0.65176
1990 1 14 0.007665479 0.53995
1991 1 14 0.041142176 0.3786
1992 1 14 0.017166439 0.58308
1995 1 14 0.019559837 0.63674
1996 1 14 0.006634418 0.69229
1997 1 14 0.004508517 0.70812
1999 1 14 0.06060139 0.55093
2000 1 14 0.012255996 0.54458
2001 1 14 0.001699715 0.72195
2002 1 14 0.012410641 0.50146
2003 1 14 0.048994218 0.62496
2004 1 14 0.002481634 0.67372
2005 1 14 0.085269324 0.40251
2007 1 14 0.00381591 0.70406
2008 1 14 0.004342091 0.62414
2009 1 14 0.082489813 0.40111
2010 1 14 0.178638522 0.41895

2 #_discard_type (1=bio or num; 2=fraction)
0 #_N_discard_obs

0 #_N_meanbodywt_obs

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

-1 #_comp_tail_compression
1e-007 #_add_to_comp
0 #_combine males into females at or below this bin number
29 #_N_LengthBins
16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 72 76

204 #_N_Length_obs
# trawl fishery south of 38 26 currently#fish Female

Male

#Yr Seas Flt/Svy Gender Part Stewart, max400 16 18 20 22 24 26
28 30 32 34 36 38 40 42 44 46 48 50
52 54 56 58 60 62 64 66 68 72 76 16
18 20 22 24 26 28 30 32 34 36 38 40
42 44 46 48 50 52 54 56 58 60 62 64
66 68 72 76

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1978 | 1 | 1 | 3 | 0 | 196.8 | 0 | 0 | 0 | 0 | 0 | 4 | 20 |
| | 40 | 26 | 15 | 8 | 13 | 19 | 20 | 47 | 67 | 54 | 32 | 30 |
| | 19 | 26 | 17 | 15 | 12 | 8 | 10 | 6 | 3 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 2 | 14 | 13 | 10 | 4 | 10 | 19 | 27 | 48 |
| | 80 | 60 | 60 | 23 | 22 | 23 | 17 | 10 | 3 | 4 | 0 | 0 |
| | 1 | 0 | 1 | | | | | | | | | |
| 1979 | 1 | 1 | 3 | 0 | 211.7 | 0 | 1 | 0 | 0 | 0 | 3 | 31 |
| | 55 | 64 | 75 | 66 | 42 | 27 | 20 | 17 | 29 | 41 | 48 | 52 |
| | 36 | 15 | 18 | 15 | 11 | 7 | 3 | 7 | 4 | 2 | 0 | 0 |
| | 1 | 0 | 0 | 1 | 4 | 3 | 16 | 26 | 19 | 18 | 12 | 17 |
| | 39 | 55 | 70 | 33 | 21 | 24 | 16 | 13 | 5 | 2 | 0 | 0 |
| | 1 | 0 | 0 | | | | | | | | | |
| 1980 | 1 | 1 | 3 | 0 | 244.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 3 | 2 | 5 | 10 | 33 | 115 | 111 | 65 | 14 | 6 | 16 | 24 |
| | 30 | 20 | 17 | 13 | 10 | 11 | 9 | 15 | 6 | 5 | 0 | 0 |
| | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 7 | 20 | 63 | 101 | 68 |
| | 23 | 23 | 33 | 24 | 27 | 20 | 16 | 7 | 9 | 7 | 1 | 0 |
| | 1 | 0 | 0 | | | | | | | | | |
| 1981 | 1 | 1 | 3 | 0 | 165 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 6 | 7 | 2 | 2 | 4 | 9 | 35 | 87 | 80 | 32 | 8 | 4 |
| | 8 | 9 | 12 | 5 | 7 | 4 | 2 | 1 | 2 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 4 | 8 | 6 | 26 | 79 |
| | 73 | 27 | 11 | 20 | 14 | 11 | 10 | 5 | 2 | 1 | 1 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1982 | 1 | 1 | 3 | 0 | 342 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 2 | 6 | 2 | 11 | 37 | 62 | 56 | 52 | 55 | 75 | 91 | 83 |
| | 47 | 19 | 18 | 27 | 26 | 20 | 18 | 7 | 5 | 9 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 1 | 8 | 10 | 20 | 49 | 59 | 62 |
| | 91 | 162 | 116 | 58 | 40 | 42 | 27 | 20 | 12 | 4 | 4 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1983 | 1 | 1 | 3 | 0 | 349 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 1 | 1 | 6 | 11 | 16 | 33 | 70 | 74 | 71 | 73 | 142 |
| | 100 | 41 | 25 | 29 | 14 | 22 | 16 | 10 | 6 | 11 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 2 | 1 | 3 | 9 | 11 | 25 | 66 |
| | 111 | 132 | 148 | 94 | 68 | 60 | 25 | 16 | 9 | 3 | 2 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1984 | 1 | 1 | 3 | 0 | 400 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1 | 0 | 8 | 11 | 26 | 45 | 48 | 60 | 78 | 93 |
| | 97 | 110 | 71 | 47 | 26 | 27 | 20 | 16 | 12 | 13 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 5 | 10 | 31 | 57 |
| | 94 | 134 | 155 | 165 | 133 | 100 | 53 | 23 | 16 | 9 | 3 | 2 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1985 | 1 | 1 | 3 | 0 | 340.8 | 0 | 0 | 0 | 0 | 1 | 3 | 18 |
| | 22 | 35 | 15 | 1 | 5 | 8 | 8 | 15 | 31 | 43 | 40 | 58 |
| | 31 | 43 | 49 | 37 | 22 | 9 | 11 | 15 | 10 | 7 | 0 | 0 |
| | 0 | 0 | 0 | 6 | 9 | 12 | 21 | 7 | 3 | 3 | 11 | 33 |
| | 43 | 63 | 77 | 96 | 94 | 62 | 35 | 24 | 7 | 2 | 3 | 3 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1986 | 1 | 1 | 3 | 0 | 369 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 36 | 88 | 157 | 231 | 191 | 120 | 37 | 13 | 7 | 9 | 18 | 26 |
| | 28 | 16 | 24 | 24 | 15 | 8 | 4 | 2 | 3 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 3 | 2 | 19 | 82 | 155 | 184 | 150 | 69 | 16 |
| | 11 | 13 | 20 | 35 | 23 | 22 | 18 | 6 | 3 | 1 | 1 | 0 |
| | 0 | 1 | 0 | | | | | | | | | |
| 1987 | 1 | 1 | 3 | 0 | 342.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 5 | 30 | 53 | 83 | 173 | 227 | 173 | 64 | 6 | 11 | 9 |
| | 9 | 16 | 11 | 9 | 7 | 3 | 2 | 0 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 5 | 17 | 42 | 59 | 124 | 215 | 203 |
| | 101 | 15 | 10 | 22 | 20 | 28 | 10 | 2 | 2 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1988 | 1 | 1 | 3 | 0 | 258.3 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| | 7 | 13 | 15 | 19 | 24 | 46 | 82 | 97 | 117 | 82 | 41 | 18 |
| | 10 | 8 | 7 | 9 | 5 | 7 | 3 | 2 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 3 | 8 | 9 | 25 | 40 | 72 | 102 |
| | 152 | 83 | 36 | 9 | 15 | 18 | 5 | 2 | 1 | 0 | 0 | 1 |
| | 1 | 0 | 0 | | | | | | | | | |
| 1989 | 1 | 1 | 3 | 0 | 189.4 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| | 13 | 15 | 27 | 43 | 27 | 16 | 15 | 22 | 28 | 25 | 42 | 28 |
| | 15 | 4 | 6 | 2 | 2 | 2 | 4 | 3 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 2 | 4 | 11 | 22 | 27 | 29 | 28 | 29 | 28 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 45 | 64 | 47 | 17 | 9 | 4 | 6 | 3 | 1 | 0 | 1 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1990 | 1 | 1 | 3 | 0 | 314.4 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| | 18 | 65 | 141 | 121 | 124 | 90 | 22 | 32 | 10 | 17 | 11 | 11 |
| | 24 | 13 | 8 | 7 | 2 | 0 | 4 | 2 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 4 | 38 | 87 | 138 | 147 | 131 | 65 | 29 |
| | 23 | 22 | 31 | 19 | 15 | 10 | 6 | 5 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1991 | 1 | 1 | 3 | 0 | 361.7 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| | 8 | 5 | 7 | 24 | 95 | 194 | 211 | 133 | 71 | 40 | 20 | 16 |
| | 23 | 21 | 25 | 15 | 3 | 7 | 2 | 4 | 3 | 3 | 0 | 0 |
| | 0 | 0 | 0 | 2 | 6 | 10 | 5 | 10 | 49 | 156 | 259 | 181 |
| | 106 | 51 | 35 | 33 | 24 | 24 | 10 | 8 | 0 | 6 | 1 | 0 |
| | 1 | 0 | 0 | | | | | | | | | |
| 1992 | 1 | 1 | 3 | 0 | 260 | 0 | 0 | 0 | 0 | 0 | 1 | 2 |
| | 8 | 32 | 28 | 33 | 18 | 15 | 39 | 107 | 150 | 85 | 39 | 24 |
| | 14 | 22 | 20 | 22 | 15 | 10 | 6 | 2 | 3 | 2 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 7 | 17 | 25 | 29 | 21 | 54 | 113 |
| | 149 | 89 | 49 | 46 | 19 | 20 | 10 | 13 | 4 | 5 | 2 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1993 | 1 | 1 | 3 | 0 | 219.6 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| | 15 | 30 | 19 | 17 | 53 | 57 | 43 | 51 | 55 | 56 | 48 | 28 |
| | 20 | 20 | 12 | 7 | 4 | 3 | 2 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 8 | 22 | 19 | 31 | 46 | 60 | 71 |
| | 93 | 63 | 36 | 21 | 22 | 14 | 7 | 5 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1994 | 1 | 1 | 3 | 0 | 94.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1 | 6 | 13 | 9 | 12 | 11 | 15 | 12 | 16 | 15 |
| | 8 | 4 | 0 | 4 | 1 | 2 | 1 | 0 | 1 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 5 | 9 | 11 | 26 |
| | 29 | 43 | 22 | 9 | 9 | 8 | 0 | 2 | 1 | 1 | 1 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1995 | 1 | 1 | 3 | 0 | 76.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 2 | 4 | 5 | 13 | 13 | 8 | 27 |
| | 8 | 6 | 4 | 3 | 4 | 3 | 3 | 1 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 4 | 9 |
| | 21 | 42 | 23 | 19 | 9 | 3 | 0 | 1 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1996 | 1 | 1 | 3 | 0 | 82.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 1 | 0 | 2 | 1 | 2 | 16 | 8 | 2 | 16 | 22 | 29 |
| | 18 | 17 | 14 | 10 | 5 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 1 | 10 | 12 |
| | 19 | 30 | 59 | 21 | 9 | 11 | 4 | 2 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1997 | 1 | 1 | 3 | 0 | 103.7 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | 0 | 0 | 0 | 2 | 2 | 3 | 3 | 8 | 12 | 13 | 20 | 31 |
| | 16 | 15 | 14 | 14 | 5 | 6 | 7 | 1 | 5 | 4 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 7 | 8 | 14 |
| | 12 | 31 | 23 | 29 | 16 | 15 | 7 | 12 | 5 | 2 | 1 | 2 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1998 | 1 | 1 | 3 | 0 | 59.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 2 | 6 | 6 | 6 | 2 | 6 | 8 | 7 | 10 | 16 | 9 |
| | 10 | 13 | 9 | 8 | 3 | 2 | 8 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 9 | 5 | 5 | 6 | 8 |
| | 9 | 19 | 23 | 27 | 10 | 13 | 8 | 0 | 2 | 0 | 0 | 1 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1999 | 1 | 1 | 3 | 0 | 78.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 4 | 17 | 27 | 16 | 10 | 8 | 13 | 15 | 15 |
| | 11 | 14 | 8 | 7 | 5 | 7 | 2 | 0 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 5 | 4 | 22 | 17 | 16 |
| | 16 | 21 | 27 | 44 | 38 | 16 | 5 | 3 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2000 | 1 | 1 | 3 | 0 | 25.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 4 | 6 | 3 | 1 | 3 | 1 | 6 | 4 | 8 | 7 | 6 | 3 |
| | 1 | 0 | 3 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 6 | 4 | 3 | 5 | 2 | 5 | 1 |
| | 7 | 6 | 4 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2001 | 1 | 1 | 3 | 0 | 92.2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| | 10 | 39 | 31 | 17 | 34 | 15 | 9 | 2 | 9 | 15 | 12 | 17 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7 | 7 | 2 | 6 | 1 | 5 | 1 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 2 | 15 | 42 | 23 | 21 | 19 | 6 | 7 |
| | 7 | 17 | 22 | 14 | 7 | 3 | 1 | 1 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2002 | 1 | 1 | 3 | 0 | 38 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 1 | 6 | 9 | 13 | 10 | 5 | 1 | 1 | 7 |
| | 7 | 6 | 3 | 3 | 6 | 6 | 0 | 0 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 10 | 14 | 15 |
| | 5 | 6 | 4 | 8 | 5 | 2 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| #2003 | 1 | 1 | 3 | 0 | 1.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2004 | 1 | 1 | 3 | 0 | 33.2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 3 | 2 | 5 | 8 | 17 |
| | 18 | 13 | 1 | 6 | 2 | 4 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 1 |
| | 3 | 3 | 9 | 8 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| #2005 | 1 | 1 | 3 | 0 | 1.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| #2007 | 1 | 1 | 3 | 0 | 5.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| | 1 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| #2008 | 1 | 1 | 3 | 0 | 2.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |

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| #Yr | Seas | Flt/Svy | Gender | Part | Stewart, max400 | 16 | 18 | 20 | 22 | 24 | 26 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 |
| | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 72 | 76 | 16 |
| | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 |
| | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 |
| | 66 | 68 | 72 | 76 | | | | | | | | |
| 1979 | 1 | 2 | 3 | 0 | 5.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 0 | 1 | 1 | 4 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1980 | 1 | 2 | 3 | 0 | 18.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| | 1 | 3 | 1 | 1 | 4 | 4 | 3 | 2 | 1 | 6 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 1 | 1 | 1 | 4 | 6 | 4 | 3 | 1 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1982 | 1 | 2 | 3 | 0 | 17.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 1 |
| | 0 | 2 | 2 | 1 | 2 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 |
| | 0 | 1 | 0 | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1983 | 1 | 2 | 3 | 0 | 18.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 3 | 1 | 2 | 5 |
| | 2 | 3 | 5 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 |
| | 1 | 2 | 1 | 3 | 5 | 4 | 3 | 3 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1984 | 1 | 2 | 3 | 0 | 22.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| | 2 | 3 | 3 | 0 | 3 | 2 | 2 | 1 | 2 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 1 | 2 | 5 | 7 | 5 | 4 | 0 | 2 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1985 | 1 | 2 | 3 | 0 | 34.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1 | 0 | 3 | 2 | 2 | 6 | 9 | 4 | 5 | 9 |
| | 4 | 3 | 2 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 11 |
| | 2 | 5 | 3 | 5 | 7 | 3 | 2 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1986 | 1 | 2 | 3 | 0 | 72.7 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 0 | 0 | 2 | 1 | 4 | 6 | 4 | 2 | 3 | 17 | 9 | 14 |
| | 17 | 14 | 13 | 16 | 5 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 4 | 3 | 2 | 3 | 3 |
| | 2 | 4 | 17 | 23 | 25 | 20 | 11 | 2 | 3 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1987 | 1 | 2 | 3 | 0 | 56.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1 | 0 | 1 | 6 | 7 | 11 | 8 | 15 | 9 | 6 | 6 | 5 |
| | 11 | 5 | 6 | 3 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 4 | 12 | 13 | 10 | 10 |
| | 13 | 6 | 16 | 12 | 6 | 6 | 3 | 4 | 3 | 0 | 1 | 1 |
| | 1 | 0 | 0 | | | | | | | | | |
| 1988 | 1 | 2 | 3 | 0 | 23.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 8 | 5 | 9 | 9 | 4 |
| | 1 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 10 |
| | 7 | 5 | 3 | 5 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1989 | 1 | 2 | 3 | 0 | 44.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 5 | 9 | 7 | 7 |
| | 10 | 4 | 7 | 1 | 3 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| | 7 | 7 | 6 | 12 | 7 | 1 | 5 | 2 | 2 | 0 | 0 | 1 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1990 | 1 | 2 | 3 | 0 | 23.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 4 | 2 | 0 | 3 | 2 | 6 | 1 | 2 |
| | 7 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 4 | 4 | 3 |
| | 5 | 2 | 7 | 5 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1991 | 1 | 2 | 3 | 0 | 49.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1 | 0 | 0 | 4 | 6 | 6 | 3 | 4 | 3 | 4 |
| | 3 | 6 | 7 | 4 | 5 | 1 | 0 | 2 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 10 | 10 |
| | 4 | 8 | 1 | 3 | 8 | 6 | 3 | 1 | 1 | 0 | 2 | 1 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1992 | 1 | 2 | 3 | 0 | 111.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 5 | 8 | 8 | 2 | 10 | 25 | 46 | 37 | 15 | 5 |
| | 9 | 2 | 4 | 6 | 4 | 3 | 0 | 2 | 1 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 9 | 2 | 4 | 16 |
| | 37 | 25 | 10 | 13 | 5 | 7 | 4 | 0 | 2 | 0 | 1 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1993 | 1 | 2 | 3 | 0 | 109.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 2 | 0 | 2 | 4 | 14 | 16 | 48 | 25 | 15 | 11 |
| | 5 | 3 | 4 | 1 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 2 | 2 | 7 | 17 |
| | 19 | 11 | 10 | 8 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1994 | 1 | 2 | 3 | 0 | 86.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 4 | 2 | 10 | 13 | 8 | 21 | 28 |
| | 22 | 12 | 6 | 4 | 6 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 3 |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 14 | 19 | 8 | 10 | 4 | 1 | 2 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1995 | 1 | 2 | 3 | 0 | 39.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 5 | 1 | 3 | 11 | 10 |
| | 10 | 9 | 5 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 5 |
| | 2 | 10 | 5 | 2 | 1 | 0 | 0 | 2 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1996 | 1 | 2 | 3 | 0 | 105.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1 | 1 | 0 | 7 | 10 | 10 | 15 | 24 | 33 | 26 |
| | 21 | 23 | 12 | 4 | 1 | 3 | 0 | 1 | 0 | 2 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 4 | 2 | 9 | 12 |
| | 21 | 20 | 28 | 12 | 7 | 3 | 3 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1997 | 1 | 2 | 3 | 0 | 76.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 5 | 10 | 17 | 21 | 38 |
| | 44 | 25 | 17 | 10 | 5 | 2 | 2 | 3 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 5 |
| | 4 | 12 | 12 | 14 | 5 | 5 | 2 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1998 | 1 | 2 | 3 | 0 | 58.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 1 | 1 | 1 | 5 | 8 | 13 | 16 | 14 | 17 |
| | 17 | 10 | 11 | 3 | 1 | 0 | 2 | 0 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 5 |
| | 11 | 10 | 12 | 8 | 8 | 5 | 3 | 0 | 1 | 0 | 3 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1999 | 1 | 2 | 3 | 0 | 23.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 6 | 8 | 6 |
| | 9 | 11 | 4 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| | 1 | 2 | 4 | 10 | 3 | 7 | 4 | 3 | 5 | 1 | 1 | 1 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2000 | 1 | 2 | 3 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 2 |
| | 3 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | 6 | 1 | 3 | 2 | 3 | 1 | 1 | 3 | 2 | 3 | 1 | 1 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2001 | 1 | 2 | 3 | 0 | 40.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 1 | 3 | 10 | 5 | 0 | 3 | 1 | 4 | 3 | 5 | 6 |
| | 11 | 5 | 8 | 4 | 5 | 3 | 2 | 0 | 2 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 8 | 3 | 2 | 1 |
| | 3 | 7 | 3 | 6 | 6 | 7 | 5 | 5 | 7 | 3 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2002 | 1 | 2 | 3 | 0 | 6.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 3 | 3 |
| | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |

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| #Yr | Seas | Flt/Svy | Gender | Part | Stewart, max400 | | 16 | 18 | 20 | 22 | 24 | 26 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 |
| | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 72 | 76 | 16 |
| | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 |
| | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 |
| | 66 | 68 | 72 | 76 | | | | | | | | |
| 1978 | 1 | 3 | 3 | 0 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 3 | 3 | 3 | 3 | 2 | 7 | 4 | 2 |
| | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 |
| | 4 | 9 | 5 | 4 | 1 | 2 | 1 | 1 | 0 | 0 | 1 | 0 |
| | 0 | 0 | 1 | | | | | | | | | |
| #1979 | 1 | 3 | 3 | 0 | 3.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 |
| | 1 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 2 | 2 | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| #1982 | 1 | 3 | 3 | 0 | 2.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| | 0 | 1 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1983 | 1 | 3 | 3 | 0 | 41.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 3 | 2 | 5 | 3 | 3 |
| | 5 | 3 | 1 | 0 | 0 | 3 | 2 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| | 4 | 5 | 1 | 4 | 2 | 5 | 1 | 2 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1984 | 1 | 3 | 3 | 0 | 88.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 4 |
| | 2 | 2 | 1 | 1 | 3 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1 | 2 | 4 | 7 | 2 | 5 | 5 | 0 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1985 | 1 | 3 | 3 | 0 | 348.5 | 1 | 1 | 2 | 2 | 1 | 0 | 0 |
| | 1 | 0 | 0 | 1 | 4 | 8 | 14 | 38 | 35 | 47 | 38 | 32 |
| | 22 | 28 | 25 | 17 | 12 | 14 | 7 | 3 | 3 | 5 | 0 | 2 |
| | 3 | 0 | 5 | 0 | 0 | 1 | 0 | 0 | 1 | 3 | 4 | 23 |
| | 63 | 88 | 103 | 60 | 42 | 32 | 24 | 15 | 11 | 3 | 7 | 1 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1986 | 1 | 3 | 3 | 0 | 338.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 2 | 1 | 0 | 2 | 7 | 7 | 4 | 8 | 28 | 56 | 67 |
| | 80 | 99 | 67 | 37 | 21 | 14 | 7 | 8 | 2 | 9 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 9 | 3 | 8 |
| | 10 | 24 | 91 | 133 | 158 | 159 | 84 | 30 | 12 | 7 | 4 | 0 |
| | 0 | 1 | 0 | | | | | | | | | |
| 1987 | 1 | 3 | 3 | 0 | 263.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 4 | 16 | 42 | 65 | 45 | 20 | 20 | 28 |
| | 57 | 44 | 48 | 35 | 17 | 11 | 5 | 4 | 2 | 3 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 7 | 35 | 63 |
| | 42 | 36 | 45 | 67 | 107 | 93 | 43 | 26 | 7 | 3 | 3 | 1 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1988 | 1 | 3 | 3 | 0 | 225.4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 1 | 1 | 0 | 2 | 5 | 24 | 61 | 105 | 111 | 62 | 38 |
| | 20 | 16 | 10 | 14 | 8 | 7 | 4 | 4 | 1 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 2 | 13 | 34 |
| | 104 | 113 | 72 | 34 | 31 | 19 | 10 | 12 | 8 | 5 | 2 | 0 |
| | 2 | 0 | 0 | | | | | | | | | |
| 1989 | 1 | 3 | 3 | 0 | 323.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 0 | 4 | 3 | 4 | 4 | 12 | 43 | 89 | 130 | 120 | 117 |
| | 84 | 45 | 30 | 6 | 8 | 9 | 5 | 4 | 3 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 13 | 28 |
| | 90 | 165 | 155 | 100 | 50 | 26 | 21 | 12 | 8 | 5 | 0 | 1 |
| | 0 | 1 | 0 | | | | | | | | | |
| 1990 | 1 | 3 | 3 | 0 | 232.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 1 | 2 | 7 | 33 | 49 | 24 | 45 | 60 | 41 | 58 | 53 |
| | 60 | 35 | 25 | 11 | 11 | 4 | 4 | 3 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 12 | 16 | 28 | 23 |
| | 46 | 61 | 76 | 60 | 39 | 15 | 5 | 5 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1991 | 1 | 3 | 3 | 0 | 89.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1 | 2 | 5 | 21 | 51 | 51 | 34 | 21 | 10 | 8 |
| | 6 | 5 | 4 | 4 | 2 | 0 | 1 | 2 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 8 | 26 | 28 |
| | 24 | 16 | 14 | 15 | 11 | 4 | 3 | 0 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1992 | 1 | 3 | 3 | 0 | 234.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 3 | 6 | 8 | 7 | 20 | 83 | 151 | 164 | 106 | 50 |
| | 20 | 12 | 16 | 6 | 11 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 8 | 15 | 64 |
| | 147 | 145 | 66 | 29 | 22 | 13 | 4 | 2 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1993 | 1 | 3 | 3 | 0 | 111.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 3 | 5 | 0 | 7 | 3 | 8 | 9 | 41 | 69 | 51 | 29 | 12 |
| | 19 | 11 | 15 | 3 | 5 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 1 | 3 | 6 | 33 |
| | 37 | 31 | 13 | 10 | 11 | 6 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1994 | 1 | 3 | 3 | 0 | 80 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 7 | 14 | 29 | 24 | 20 |
| | 10 | 0 | 1 | 2 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 5 |
| | 19 | 21 | 15 | 11 | 4 | 3 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1995 | 1 | 3 | 3 | 0 | 70.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 6 | 3 | 12 | 16 | 31 |
| | 17 | 8 | 2 | 9 | 1 | 4 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 6 |
| | 16 | 27 | 24 | 8 | 6 | 2 | 2 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1996 | 1 | 3 | 3 | 0 | 43.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 10 | 12 | 19 |
| | 10 | 4 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 4 | 17 | 21 | 10 | 5 | 2 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1997 | 1 | 3 | 3 | 0 | 24.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 7 | 6 | 8 |
| | 8 | 6 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| | 3 | 10 | 12 | 7 | 3 | 2 | 2 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1998 | 1 | 3 | 3 | 0 | 33.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 6 | 4 | 16 | 16 |
| | 10 | 9 | 3 | 5 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 |
| | 5 | 6 | 13 | 16 | 6 | 4 | 0 | 0 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| #1999 | 1 | 3 | 3 | 0 | 4.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 4 | 5 |
| | 7 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| #2002 | 1 | 3 | 3 | 0 | 4.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 2 | 0 | 7 | 11 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| #2004 | 1 | 3 | 3 | 0 | 4.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 0 | 2 | 0 | 4 | 2 | 3 | 3 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |

| #Yr | Seas | Flt/Svy | Gender | Part | Neff | 16 | 18 | 20 | 22 | 24 | 26 | 28 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 |
| | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 72 | 76 | 16 | 18 |
| | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 |
| | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 |
| | 68 | 72 | 76 | | | | | | | | | |
| 1980 | 1 | 4 | 0 | 0 | 400 | 4 | 2 | 3 | 20 | 30 | 63 | 64 |
| | 101 | 87 | 208 | 427 | 435 | 312 | 169 | 173 | 104 | 68 | 89 | 68 |
| | 52 | 64 | 33 | 15 | 5 | 4 | 5 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1981 | 1 | 4 | 0 | 0 | 400 | 1 | 1 | 2 | 7 | 13 | 31 | 74 |
| | 116 | 181 | 172 | 197 | 177 | 176 | 187 | 256 | 210 | 118 | 76 | 67 |
| | 60 | 45 | 31 | 18 | 6 | 6 | 1 | 1 | 3 | 0 | 0 | 0 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1982 | 1 | 4 | 0 | 0 | 386 | 0 | 0 | 0 | 0 | 3 | 5 | 16 |
| | 25 | 27 | 44 | 108 | 207 | 208 | 164 | 213 | 253 | 190 | 121 | 83 |
| | 59 | 51 | 18 | 11 | 4 | 5 | 1 | 2 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1983 | 1 | 4 | 0 | 0 | 196.4 | 0 | 0 | 0 | 1 | 0 | 0 | 3 |
| | 7 | 8 | 45 | 59 | 66 | 61 | 62 | 59 | 73 | 42 | 35 | 42 |
| | 38 | 45 | 19 | 10 | 9 | 12 | 2 | 7 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1984 | 1 | 4 | 0 | 0 | 262.9 | 23 | 17 | 35 | 29 | 9 | 2 | 8 |
| | 4 | 6 | 6 | 14 | 17 | 35 | 48 | 59 | 87 | 46 | 53 | 30 |
| | 23 | 17 | 11 | 4 | 4 | 5 | 0 | 2 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1985 | 1 | 4 | 0 | 0 | 330.6 | 1 | 10 | 27 | 74 | 126 | 96 | 94 |
| | 185 | 194 | 104 | 42 | 11 | 17 | 22 | 35 | 53 | 49 | 57 | 49 |
| | 35 | 26 | 11 | 12 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1986 | 1 | 4 | 0 | 0 | 298.2 | 5 | 5 | 5 | 13 | 36 | 47 | 52 |
| | 60 | 145 | 284 | 264 | 133 | 63 | 16 | 18 | 19 | 20 | 27 | 19 |
| | 21 | 25 | 3 | 9 | 5 | 3 | 0 | 1 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1987 | 1 | 4 | 0 | 0 | 50.2 | 0 | 0 | 2 | 3 | 5 | 7 | 11 |
| | 7 | 5 | 10 | 12 | 20 | 12 | 6 | 9 | 7 | 3 | 0 | 5 |
| | 4 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1988 | 1 | 4 | 0 | 0 | 49.9 | 0 | 0 | 0 | 1 | 3 | 4 | 3 |
| | 1 | 2 | 3 | 9 | 9 | 8 | 5 | 10 | 7 | 6 | 1 | 3 |
| | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1989 | 1 | 4 | 0 | 0 | 117.4 | 0 | 0 | 3 | 8 | 18 | 19 | 37 |
| | 42 | 53 | 54 | 18 | 24 | 22 | 29 | 32 | 30 | 25 | 21 | 11 |
| | 9 | 5 | 9 | 5 | 4 | 4 | 3 | 1 | 2 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1993 | 1 | 4 | 0 | 0 | 24.3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 3 | 1 | 9 | 8 | 2 | 3 | 4 | 3 | 4 | 2 | 5 | 2 |
| | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1994 | 1 | 4 | 0 | 0 | 34.8 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | 2 | 0 | 6 | 5 | 8 | 10 | 11 | 11 | 3 | 8 | 10 | 5 |
| | 2 | 2 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1995 | 1 | 4 | 0 | 0 | 21.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1 | 0 | 0 | 1 | 0 | 2 | 0 | 7 | 4 | 2 | 4 | 6 |
| | 3 | 2 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1996 | 1 | 4 | 0 | 0 | 51 | 0 | 0 | 0 | 1 | 1 | 3 | 3 |
| | 7 | 7 | 6 | 3 | 7 | 1 | 5 | 7 | 7 | 7 | 12 | 7 |
| | 11 | 11 | 4 | 2 | 1 | 0 | 1 | 2 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1997 | 1 | 4 | 0 | 0 | 22.3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 4 | 0 | 1 | 8 | 6 | 10 | 3 | 2 | 5 | 0 | 4 | 5 |
| | 0 | 1 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1998 | 1 | 4 | 0 | 0 | 53.4 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | 2 | 5 | 8 | 5 | 9 | 10 | 13 | 7 | 7 | 15 | 6 | 3 |
| | 4 | 5 | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1999 | 1 | 4 | 0 | 0 | 181.4 | 7 | 13 | 11 | 8 | 3 | 0 | 2 |
| | 5 | 3 | 9 | 8 | 7 | 11 | 21 | 25 | 38 | 44 | 53 | 41 |
| | 50 | 33 | 28 | 19 | 12 | 1 | 3 | 3 | 2 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2000 | 1 | 4 | 0 | 0 | 167.5 | 0 | 0 | 2 | 2 | 20 | 43 | 58 |
| | 66 | 46 | 41 | 12 | 11 | 7 | 8 | 8 | 16 | 19 | 29 | 22 |
| | 35 | 24 | 19 | 16 | 11 | 7 | 4 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2001 | 1 | 4 | 0 | 0 | 109.4 | 0 | 0 | 0 | 1 | 0 | 6 | 18 |
| | 42 | 72 | 69 | 49 | 43 | 18 | 11 | 9 | 5 | 8 | 8 | 6 |
| | 3 | 3 | 3 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2002 | 1 | 4 | 0 | 0 | 201.3 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| | 3 | 7 | 23 | 62 | 112 | 129 | 113 | 95 | 37 | 20 | 25 | 31 |
| | 18 | 12 | 11 | 13 | 2 | 1 | 1 | 2 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2003 | 1 | 4 | 0 | 0 | 36.8 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| | 0 | 0 | 0 | 0 | 2 | 14 | 16 | 21 | 29 | 17 | 4 | 5 |
| | 6 | 0 | 3 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2004 | 1 | 4 | 0 | 0 | 325.8 | 1 | 3 | 5 | 14 | 8 | 17 | 27 |
| | 44 | 24 | 27 | 20 | 25 | 48 | 55 | 105 | 135 | 116 | 97 | 52 |
| | 37 | 21 | 8 | 8 | 5 | 4 | 2 | 2 | 0 | 2 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2005 | 1 | 4 | 0 | 0 | 399.9 | 0 | 2 | 0 | 0 | 3 | 6 | 20 |
| | 77 | 148 | 195 | 185 | 143 | 91 | 54 | 58 | 74 | 86 | 84 | 83 |
| | 68 | 34 | 17 | 8 | 6 | 3 | 3 | 0 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2006 | 1 | 4 | 0 | 0 | 400 | 1 | 0 | 1 | 2 | 8 | 17 | 28 |
| | 29 | 46 | 69 | 128 | 224 | 334 | 263 | 169 | 96 | 80 | 72 | 98 |
| | 82 | 56 | 28 | 13 | 6 | 2 | 4 | 2 | 1 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2007 | 1 | 4 | 0 | 0 | 400 | 2 | 3 | 0 | 5 | 5 | 18 | 44 |
| | 74 | 133 | 228 | 173 | 167 | 158 | 184 | 208 | 209 | 148 | 107 | 74 |
| | 68 | 58 | 38 | 24 | 3 | 6 | 0 | 2 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2008 | 1 | 4 | 0 | 0 | 400 | 0 | 0 | 0 | 0 | 7 | 15 | 23 |
| | 27 | 51 | 74 | 151 | 247 | 267 | 193 | 209 | 171 | 120 | 88 | 65 |
| | 31 | 25 | 20 | 12 | 11 | 2 | 1 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2009 | 1 | 4 | 0 | 0 | 400 | 0 | 0 | 1 | 4 | 5 | 12 | 33 |
| | 43 | 94 | 148 | 177 | 173 | 209 | 273 | 238 | 190 | 127 | 109 | 95 |
| | 51 | 30 | 30 | 14 | 14 | 10 | 1 | 4 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2010 | 1 | 4 | 0 | 0 | 400 | 0 | 0 | 2 | 6 | 20 | 62 | 83 |
| | 129 | 118 | 93 | 101 | 126 | 154 | 208 | 198 | 170 | 135 | 111 | 54 |
| | 35 | 23 | 17 | 12 | 4 | 6 | 0 | 2 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |

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| #"year | Seas | Flt/Svy | Gender | Part | Stewart, max400 | | 16 | 18 | 20 | 22 | 24 | 26 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 |
| | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 72 | 76 | 16 |
| | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 |
| | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 |
| | 66 | 68 | 72 | 76 | | | | | | | | |
| 1978 | 1 | 5 | 3 | 0 | -98 | 0 | 0 | 0 | 0 | 2 | 4 | 2 |
| | 4 | 0 | 3 | 5 | 8 | 7 | 9 | 28 | 32 | 15 | 14 | 7 |
| | 3 | 9 | 13 | 10 | 4 | 8 | 11 | 20 | 9 | 2 | 1 | 0 |
| | 0 | 0 | 0 | 3 | 1 | 1 | 3 | 1 | 5 | 5 | 11 | 7 |
| | 19 | 18 | 20 | 16 | 22 | 19 | 17 | 14 | 12 | 12 | 13 | 3 |
| | 0 | 1 | 1 | | | | | | | | | |
| 1979 | 1 | 5 | 3 | 0 | -22 | 0 | 0 | 0 | 0 | 0 | 3 | 1 |
| | 7 | 25 | 44 | 26 | 7 | 0 | 4 | 7 | 20 | 14 | 11 | 11 |
| | 7 | 9 | 11 | 17 | 18 | 12 | 23 | 32 | 13 | 12 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 2 | 4 | 2 | 4 | 4 | 3 | 7 | 4 |
| | 14 | 10 | 22 | 14 | 16 | 17 | 26 | 34 | 34 | 35 | 16 | 13 |
| | 4 | 3 | 1 | | | | | | | | | |
| 1980 | 1 | 5 | 3 | 0 | -86.7 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 0 | 1 | 4 | 2 | 15 | 33 | 23 | 9 | 5 | 4 | 4 | 3 |
| | 8 | 6 | 3 | 7 | 5 | 2 | 8 | 7 | 6 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 2 | 1 | 0 | 1 | 0 | 12 | 15 | 20 | 6 |
| | 6 | 3 | 8 | 4 | 4 | 5 | 8 | 5 | 4 | 8 | 4 | 3 |
| | 2 | 0 | 0 | | | | | | | | | |
| 1981 | 1 | 5 | 3 | 0 | -59.3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 0 | 11 | 13 | 2 | 1 | 4 | 8 | 9 | 15 | 19 | 5 | 4 |
| | 6 | 4 | 6 | 2 | 2 | 3 | 5 | 3 | 2 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 2 | 0 | 6 | 8 | 5 | 3 | 4 | 6 |
| | 17 | 11 | 8 | 7 | 8 | 4 | 9 | 6 | 7 | 1 | 3 | 1 |
| | 2 | 0 | 0 | | | | | | | | | |
| 1982 | 1 | 5 | 3 | 0 | -63 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | 0 | 0 | 1 | 5 | 3 | 3 | 8 | 7 | 5 | 14 | 16 | 15 |
| | 9 | 6 | 6 | 10 | 3 | 3 | 2 | 7 | 2 | 2 | 0 | 0 |
| | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 4 | 3 |
| | 5 | 14 | 20 | 8 | 7 | 7 | 5 | 7 | 6 | 2 | 1 | 2 |
| | 1 | 0 | 0 | | | | | | | | | |
| 1983 | 1 | 5 | 3 | 0 | -40.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 3 | 6 | 3 | 10 | 4 | 3 | 10 |
| | 7 | 8 | 4 | 2 | 2 | 4 | 4 | 1 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 1 | 0 | 4 | 5 |
| | 5 | 11 | 9 | 3 | 12 | 7 | 8 | 4 | 2 | 1 | 5 | 1 |
| | 0 | 0 | 0 | | | | | | | | | |

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1984 1 5 3 0 -20.7 0 0 0 0 0 0 0
0 0 0 1 0 1 2 4 0 1 7 2
3 2 10 4 2 1 3 2 0 1 0 0
0 0 0 0 0 0 0 3 0 0 4 4
2 3 3 3 4 5 2 4 3 2 0 1
0 0 0

#YEAR

1980 1 5 0 0 104.7 0 1 0 1 5 4 11
2 3 3 14 11 28 16 14 15 21 13 15
13 4 12 10 7 3 11 7 4 4 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1981 1 5 0 0 68.7 1 0 1 0 0 0 0
1 3 8 4 8 9 28 25 41 23 9 7
14 11 13 11 6 7 7 8 5 2 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1982 1 5 0 0 92.9 0 0 0 0 1 0 0
0 3 3 7 7 14 15 11 38 38 49 46
24 21 8 3 11 7 1 4 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1983 1 5 0 0 95.5 0 0 0 0 0 0 3
1 4 3 5 2 4 9 19 26 37 42 55
53 36 23 13 8 10 3 1 0 2 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1984 1 5 0 0 94.8 1 1 1 1 0 0 0
2 3 5 7 9 8 13 15 13 17 16 18
13 9 6 12 2 7 4 2 1 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1985 1 5 0 0 175.4 2 5 12 38 52 53 63
65 24 15 7 7 13 13 15 13 20 19 19
15 13 21 14 14 8 7 4 3 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1986 1 5 0 0 234.9 0 0 1 5 8 8 18
29 72 190 204 142 66 18 4 5 7 13 21
17 19 24 19 15 11 14 8 3 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1987 1 5 0 0 68 0 0 0 0 1 0 3
3 15 24 33 27 18 9 6 4 3 4 3
4 6 9 9 12 9 5 10 6 2 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1988 1 5 0 0 42.6 0 0 0 0 0 1 1
1 2 1 4 4 4 4 1 6 5 4 4
1 0 1 2 0 1 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1989 | 1 | 5 | 0 | 0 | 52.4 | 0 | 0 | 0 | 0 | 1 | 3 | 0 |
| | 2 | 5 | 4 | 24 | 11 | 3 | 3 | 7 | 13 | 15 | 10 | 8 |
| | 3 | 3 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| #YEAR | 16 | 18 | 20 | 22 | 168 | 26 | 28 | 30 | 32 | 34 | 36 | 38 |
| | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 |
| | 64 | 66 | 68 | 72 | 76 | 16 | 18 | 20 | 22 | 24 | 26 | 28 |
| | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 |
| | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 72 | 76 | | |
| 1993 | 1 | 5 | 0 | 0 | 37.7 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 1 | 6 | 5 | 2 | 3 | 4 | 4 | 6 | 4 | 4 | 6 |
| | 3 | 1 | 1 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1994 | 1 | 5 | 0 | 0 | 32.9 | 0 | 0 | 1 | 0 | 0 | 4 | 5 |
| | 3 | 3 | 1 | 3 | 4 | 9 | 5 | 1 | 3 | 1 | 1 | 2 |
| | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1995 | 1 | 5 | 0 | 0 | 38.3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 2 | 4 | 5 | 6 | 6 | 1 | 6 | 8 | 6 | 9 | 3 | 4 |
| | 3 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1996 | 1 | 5 | 0 | 0 | 109.6 | 0 | 0 | 0 | 2 | 2 | 1 | 3 |
| | 7 | 9 | 15 | 13 | 9 | 19 | 16 | 16 | 13 | 11 | 6 | 14 |
| | 19 | 12 | 13 | 4 | 7 | 8 | 4 | 1 | 2 | 3 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1997 | 1 | 5 | 0 | 0 | 216.6 | 0 | 0 | 0 | 1 | 5 | 4 | 4 |
| | 2 | 10 | 21 | 25 | 32 | 44 | 31 | 60 | 48 | 53 | 63 | 71 |
| | 55 | 49 | 84 | 37 | 29 | 22 | 11 | 20 | 6 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1998 | 1 | 5 | 0 | 0 | 152.5 | 0 | 0 | 0 | 0 | 0 | 3 | 8 |
| | 9 | 22 | 18 | 24 | 13 | 26 | 35 | 40 | 43 | 41 | 41 | 31 |
| | 35 | 29 | 27 | 24 | 14 | 6 | 8 | 2 | 5 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1999 | 1 | 5 | 0 | 0 | 212.9 | 2 | 0 | 0 | 0 | 0 | 3 | 1 |
| | 2 | 3 | 14 | 22 | 30 | 49 | 38 | 39 | 43 | 63 | 47 | 55 |
| | 47 | 40 | 25 | 44 | 17 | 20 | 6 | 7 | 6 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2000 | 1 | 5 | 0 | 0 | 85.2 | 0 | 0 | 0 | 0 | 3 | 10 | 25 |
| | 18 | 11 | 11 | 18 | 10 | 14 | 13 | 19 | 22 | 11 | 14 | 8 |
| | 2 | 9 | 5 | 14 | 8 | 13 | 10 | 5 | 0 | 4 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2001 | 1 | 5 | 0 | 0 | 82.9 | 0 | 0 | 1 | 0 | 1 | 1 | 2 |
| | 3 | 23 | 36 | 55 | 33 | 12 | 14 | 18 | 19 | 20 | 20 | 22 |
| | 14 | 11 | 11 | 3 | 2 | 1 | 0 | 2 | 1 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2002 | 1 | 5 | 0 | 0 | 42.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 1 | 2 | 12 | 26 | 44 | 29 | 17 | 1 | 8 | 6 | 10 |
| | 9 | 5 | 3 | 4 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2004 1 5 0 0 60 0 0 0 0 0 0 1
0 2 1 3 2 9 6 5 9 4 9 4
8 2 6 1 2 2 1 3 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2005 1 5 0 0 138.7 0 0 1 1 0 0 1
5 3 5 4 6 10 8 16 26 24 39 37
26 14 14 5 7 3 1 3 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2006 1 5 0 0 162.5 0 0 0 0 0 1 1
1 3 6 3 11 19 17 15 24 22 23 26
17 24 11 12 13 7 5 11 5 2 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2007 1 5 0 0 174.1 0 0 0 0 0 2 0
1 5 7 11 15 14 26 25 18 22 12 14
23 12 18 9 11 8 3 5 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2008 1 5 0 0 110.494 1 0 0 0 0 0 0
0 1 0 2 6 13 16 19 14 15 17 10
12 13 8 8 4 3 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2009 1 5 0 0 118.67 0 0 0 0 1 1 5
7 2 6 4 5 7 12 16 15 6 19 16
20 21 14 10 16 5 5 1 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2010 1 5 0 0 112.392 0 0 1 0 0 4 6
13 10 6 4 13 12 12 12 17 16 5 14
8 8 7 5 2 5 2 2 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 0 0

#

#year Seas Flt/Svy Gender Part Stewart, max400 16 18 20 22 24 26
28 30 32 34 36 38 40 42 44 46 48 50
52 54 56 58 60 62 64 66 68 72 76 16
18 20 22 24 26 28 30 32 34 36 38 40
42 44 46 48 50 52 54 56 58 60 62 64
66 68 72 76
1978 1 6 3 0 179.5 0 0 0 0 1 1 0
0 0 0 0 0 3 5 27 52 42 16 8
4 15 15 16 9 17 18 19 12 5 0 0
0 0 0 0 0 0 0 0 0 1 7 18
51 53 19 12 24 23 37 27 14 9 3 1
0 0 0
1979 1 6 3 0 67.4 0 0 0 0 0 0 0
1 2 5 1 0 1 0 1 1 7 8 11
4 3 2 6 3 5 4 5 2 3 0 0
0 0 0 0 0 1 2 4 2 0 1 0
2 7 13 6 5 8 14 9 11 4 1 1
0 2 2
1980 1 6 3 0 220.9 0 0 0 0 0 0 0
0 0 8 17 61 96 55 44 10 3 7 8

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 11 | 10 | 6 | 2 | 2 | 6 | 4 | 1 | 4 | 5 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 28 | 77 | 71 | 39 |
| | 14 | 4 | 9 | 9 | 13 | 12 | 4 | 4 | 12 | 0 | 3 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1981 | 1 | 6 | 3 | 0 | 195.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 1 | 0 | 0 | 4 | 12 | 35 | 83 | 104 | 65 | 24 | 2 |
| | 0 | 3 | 0 | 2 | 2 | 4 | 2 | 4 | 6 | 5 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 12 | 24 | 73 |
| | 111 | 65 | 15 | 2 | 6 | 6 | 11 | 7 | 10 | 5 | 3 | 2 |
| | 2 | 0 | 0 | | | | | | | | | |
| 1982 | 1 | 6 | 3 | 0 | 243.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1 | 3 | 19 | 19 | 38 | 13 | 36 | 67 | 94 | 90 |
| | 49 | 15 | 2 | 4 | 6 | 4 | 1 | 2 | 5 | 9 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 9 | 19 | 21 | 19 |
| | 38 | 98 | 97 | 39 | 18 | 8 | 8 | 19 | 20 | 6 | 5 | 2 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1983 | 1 | 6 | 3 | 0 | 365.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 2 | 9 | 16 | 39 | 36 | 46 | 41 | 50 | 54 |
| | 110 | 79 | 31 | 11 | 7 | 11 | 11 | 11 | 11 | 28 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 4 | 16 | 36 |
| | 50 | 51 | 111 | 126 | 64 | 25 | 20 | 17 | 28 | 21 | 10 | 2 |
| | 1 | 0 | 0 | | | | | | | | | |
| 1984 | 1 | 6 | 3 | 0 | 245.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 10 | 14 | 21 | 28 | 37 |
| | 34 | 78 | 68 | 33 | 13 | 9 | 12 | 10 | 6 | 36 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 4 | 9 |
| | 16 | 28 | 64 | 105 | 108 | 54 | 23 | 16 | 26 | 22 | 6 | 3 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1985 | 1 | 6 | 3 | 0 | 196.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 1 | 0 | 3 | 0 | 1 | 6 | 2 | 18 | 23 |
| | 23 | 28 | 43 | 55 | 20 | 9 | 3 | 3 | 3 | 9 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 3 |
| | 9 | 11 | 23 | 55 | 85 | 78 | 31 | 17 | 17 | 8 | 6 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1986 | 1 | 6 | 3 | 0 | 167.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 4 | 14 | 13 | 9 | 5 | 0 | 1 | 0 | 4 | 7 |
| | 11 | 20 | 20 | 38 | 29 | 26 | 9 | 4 | 4 | 3 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 9 | 32 | 21 | 15 | 4 |
| | 0 | 0 | 5 | 22 | 36 | 78 | 50 | 19 | 11 | 9 | 6 | 1 |
| | 1 | 0 | 0 | | | | | | | | | |
| 1987 | 1 | 6 | 3 | 0 | 255.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 2 | 7 | 27 | 64 | 118 | 101 | 50 | 16 | 2 | 2 |
| | 3 | 4 | 9 | 17 | 22 | 26 | 25 | 9 | 2 | 7 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 12 | 65 | 113 | 112 |
| | 58 | 14 | 5 | 4 | 21 | 43 | 36 | 26 | 12 | 6 | 3 | 2 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1988 | 1 | 6 | 3 | 0 | 178.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 10 | 6 | 21 | 37 | 54 | 63 | 30 | 15 |
| | 3 | 1 | 1 | 3 | 8 | 10 | 10 | 3 | 3 | 3 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 10 | 20 | 39 |
| | 89 | 101 | 26 | 13 | 6 | 11 | 31 | 17 | 6 | 7 | 3 | 1 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1989 | 1 | 6 | 3 | 0 | 129.2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 1 | 2 | 3 | 1 | 0 | 1 | 1 | 6 | 15 | 27 | 26 | 25 |
| | 20 | 13 | 3 | 2 | 3 | 3 | 5 | 4 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 2 | 3 | 1 | 5 |
| | 17 | 45 | 68 | 34 | 16 | 6 | 25 | 24 | 6 | 5 | 2 | 2 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1990 | 1 | 6 | 3 | 0 | 160.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 6 | 10 | 8 | 14 | 18 | 13 | 10 | 15 | 9 | 6 | 15 |
| | 14 | 21 | 13 | 5 | 1 | 1 | 5 | 10 | 4 | 4 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 2 | 6 | 14 | 17 | 18 | 20 | 24 | 20 |
| | 16 | 21 | 20 | 44 | 36 | 26 | 21 | 20 | 10 | 8 | 5 | 2 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1991 | 1 | 6 | 3 | 0 | 124 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 4 | 1 | 5 | 28 | 39 | 45 | 21 | 22 | 8 | 4 |
| | 9 | 20 | 18 | 9 | 7 | 2 | 2 | 2 | 1 | 2 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 22 | 49 | 68 |
| | 36 | 20 | 13 | 17 | 25 | 21 | 13 | 14 | 18 | 8 | 1 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1992 | 1 | 6 | 3 | 0 | 45.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 6 | 17 | 18 | 13 | 9 |
| | 13 | 1 | 4 | 9 | 5 | 3 | 2 | 2 | 2 | 3 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 7 |
| | 8 | 19 | 18 | 6 | 5 | 10 | 9 | 5 | 8 | 2 | 1 | 1 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1993 | 1 | 6 | 3 | 0 | 43.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 3 | 10 | 10 | 19 |
| | 10 | 2 | 4 | 6 | 6 | 2 | 1 | 2 | 2 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 5 |
| | 7 | 24 | 31 | 17 | 29 | 12 | 3 | 7 | 3 | 6 | 1 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1994 | 1 | 6 | 3 | 0 | 53.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 2 | 1 | 6 | 3 | 6 | 6 | 5 |
| | 10 | 14 | 8 | 7 | 4 | 4 | 6 | 1 | 4 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 11 |
| | 18 | 11 | 22 | 35 | 29 | 14 | 10 | 11 | 7 | 5 | 4 | 1 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1995 | 1 | 6 | 3 | 0 | 40.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| | 1 | 1 | 6 | 3 | 5 | 5 | 9 | 4 | 0 | 4 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 3 |
| | 2 | 0 | 1 | 10 | 14 | 9 | 7 | 13 | 12 | 16 | 8 | 2 |
| | 4 | 0 | 0 | | | | | | | | | |
| 1996 | 1 | 6 | 3 | 0 | 18.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 3 | 2 |
| | 3 | 3 | 4 | 4 | 0 | 0 | 2 | 3 | 1 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 1 | 0 | 2 | 3 | 8 | 5 | 4 | 2 | 1 | 1 | 1 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1997 | 1 | 6 | 3 | 0 | 17.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 1 | 0 | 3 | 4 | 3 | 2 | 0 | 3 | 7 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | 0 | 0 | 0 | 2 | 3 | 8 | 9 | 5 | 6 | 4 | 4 | 3 |
| | 1 | 0 | 0 | | | | | | | | | |
| 1998 | 1 | 6 | 3 | 0 | 21.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 3 | 9 | 9 | 5 |
| | 2 | 0 | 0 | 2 | 7 | 8 | 5 | 5 | 2 | 3 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 3 | 1 | 1 | 1 | 3 | 3 | 8 | 12 | 5 | 1 | 2 | 1 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1999 | 1 | 6 | 3 | 0 | 7.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1 | 0 | 0 | 0 | 0 | 2 | 1 | 4 | 2 | 4 | 1 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2000 | 1 | 6 | 3 | 0 | 13.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 0 |
| | 0 | 1 | 3 | 2 | 0 | 10 | 5 | 5 | 1 | 4 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | 1 | 5 | 5 | 3 | 0 | 2 | 4 | 3 | 1 | 1 | 3 | 1 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2001 | 1 | 6 | 3 | 0 | 7.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 3 | 3 | 1 | 1 | 0 |
| | 1 | 0 | 0 | | | | | | | | | |
| 2002 | 1 | 6 | 3 | 0 | 23.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1 | 0 | 0 | 0 | 6 | 21 | 11 | 6 | 5 | 0 | 1 | 0 |
| | 1 | 0 | 0 | 0 | 1 | 0 | 3 | 3 | 1 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 15 | 10 | 7 |
| | 2 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 3 | 1 | 1 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| #2005 | 1 | 6 | 3 | 0 | 1.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| #2007 | 1 | 6 | 3 | 0 | 2.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| #2008 | 1 | 6 | 3 | 0 | 9.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 4 | 1 | 0 | 0 |
| | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 2 | 0 | 1 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |

| #Yr | Seas | Flt/Svy | Gender | Part | Nsamp | 16 | 18 | 20 | 22 | 24 | 26 | 28 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 |
| | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 72 | 76 | 16 | 18 |
| | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 |
| | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 |
| | 68 | 72 | 76 | | | | | | | | | |
| #1977 | 1 | 8 | 3 | 0 | 163 | 0 | 0 | 0 | 0.001 | 0.001 | 0 | 0.001 |
| | 0.001 | 0.004 | 0.0071 | 0.0071 | 0.0307 | 0.0501 | 0.047 | 0.0409 | 0.0317 | 0.0358 | 0.0153 | 0.0143 |
| | 0.0266 | 0.0153 | 0.0225 | 0.0184 | 0.0255 | 0.0194 | 0.0174 | 0.0276 | 0.003 | 0.001 | 0 | 0 |
| | 0 | 0 | 0.002 | 0.001 | 0.004 | 0.002 | 0.0051 | 0.0081 | 0.0112 | 0.0225 | 0.0603 | 0.0552 |
| | 0.044 | 0.0327 | 0.0276 | 0.0358 | 0.0327 | 0.045 | 0.0307 | 0.045 | 0.0245 | 0.0276 | 0.0092 | 0.003 |
| | 0.004 | 0 | 0 | | | | | | | | | |
| 1980 | 1 | 8 | 3 | 0 | 81 | 0 | 0 | 0 | 0 | 0.0078 | 0.0216 | 0.0078 |
| | 0 | 0 | 0 | 0.0078 | 0.0451 | 0.1119 | 0.1375 | 0.1041 | 0.0176 | 0 | 0.0039 | 0.0039 |
| | 0.0058 | 0 | 0.0019 | 0.0019 | 0.0019 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0.0078 | 0.0353 | 0.0137 | 0.0019 | 0 | 0 | 0.0098 | 0.0648 | 0.1611 | 0.1335 |
| | 0.053 | 0.0039 | 0.0019 | 0.0019 | 0.0039 | 0.0019 | 0.0039 | 0.0078 | 0.0039 | 0.0039 | 0.0019 | 0 |
| | 0.0019 | 0 | 0 | | | | | | | | | |
| 1983 | 1 | 8 | 3 | 0 | 75 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0.002 | 0 | 0.002 | 0.0041 | 0.0062 | 0.0062 | 0.0083 | 0.0188 | 0.0167 | 0.0439 |
| | 0.0899 | 0.1087 | 0.0313 | 0.0062 | 0.0083 | 0.0083 | 0 | 0.0083 | 0.0062 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0041 | 0 | 0 | 0.0083 |
| | 0.0271 | 0.0271 | 0.0585 | 0.1778 | 0.1485 | 0.0606 | 0.0439 | 0.0376 | 0.0167 | 0.0083 | 0.0041 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1986 | 1 | 8 | 3 | 0 | 39 | 0 | 0 | 0 | 0 | 0.019 | 0.0095 | 0.0047 |
| | 0.0047 | 0.019 | 0.0428 | 0.0523 | 0.0476 | 0.0238 | 0 | 0 | 0 | 0 | 0 | 0.0047 |
| | 0.0047 | 0 | 0.0095 | 0.0142 | 0.0333 | 0.0476 | 0.0285 | 0.0285 | 0 | 0.0047 | 0 | 0 |
| | 0 | 0 | 0.0047 | 0.038 | 0.0238 | 0 | 0.038 | 0.0761 | 0.1523 | 0.0761 | 0.0142 | 0 |
| | 0 | 0 | 0.0047 | 0 | 0.0238 | 0.0238 | 0.038 | 0.0238 | 0.0238 | 0.019 | 0.0142 | 0 |
| | 0.0047 | 0 | 0 | | | | | | | | | |
| 1989 | 1 | 8 | 3 | 0 | 400 | 0.0014 | 0 | 0 | 0.0044 | 0.0404 | 0.1596 | 0.1456 |
| | 0.0147 | 0.0066 | 0.0132 | 0.0206 | 0.0066 | 0.0007 | 0.0022 | 0.0007 | 0 | 0.0044 | 0.0103 | 0.0036 |
| | 0.0117 | 0.0036 | 0.0022 | 0.0014 | 0 | 0.0022 | 0.0014 | 0.0014 | 0 | 0 | 0.008 | 0.0007 |
| | 0 | 0.0103 | 0.0699 | 0.2008 | 0.142 | 0.0117 | 0.0044 | 0.011 | 0.0125 | 0.0044 | 0 | 0.0007 |
| | 0.0014 | 0.0095 | 0.0125 | 0.0183 | 0.0073 | 0.0014 | 0.0029 | 0.0051 | 0.0029 | 0.0007 | 0 | 0 |
| | 0.0007 | 0 | 0 | | | | | | | | | |
| 1992 | 1 | 8 | 3 | 0 | 78 | 0 | 0 | 0 | 0 | 0.0076 | 0.0329 | 0.0482 |
| | 0.0228 | 0.0228 | 0.0304 | 0.0203 | 0.0228 | 0.0101 | 0.0279 | 0.0609 | 0.0532 | 0.0507 | 0.0101 | 0 |
| | 0.005 | 0.0025 | 0.0076 | 0 | 0 | 0.0025 | 0.0025 | 0 | 0 | 0 | 0 | 0 |
| | 0.0025 | 0 | 0.0126 | 0.0532 | 0.0507 | 0.0152 | 0.0279 | 0.038 | 0.0964 | 0.0304 | 0.0406 | 0.0482 |
| | 0.0583 | 0.0304 | 0.0126 | 0.0203 | 0.0025 | 0.0076 | 0.0025 | 0 | 0 | 0.0025 | 0.0025 | 0 |
| | 0 | 0.0025 | 0 | | | | | | | | | |
| 1995 | 1 | 8 | 3 | 0 | 63 | 0 | 0 | 0.0178 | 0.0773 | 0.0952 | 0.0119 | 0.0178 |
| | 0.0238 | 0.0178 | 0.0178 | 0.0238 | 0 | 0 | 0 | 0.0059 | 0.0178 | 0.0178 | 0.0059 | 0.0119 |
| | 0.0059 | 0.0119 | 0.0297 | 0.0178 | 0.0119 | 0.0178 | 0 | 0.0178 | 0.0119 | 0 | 0 | 0.0178 |
| | 0.0476 | 0.0714 | 0.0535 | 0.0178 | 0.0178 | 0.0119 | 0.0357 | 0.0297 | 0.0119 | 0.0059 | 0 | 0.0059 |
| | 0.0059 | 0.0059 | 0.0357 | 0.0119 | 0.0357 | 0.0178 | 0.0297 | 0.0119 | 0.0178 | 0.0119 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1998 | 1 | 8 | 3 | 0 | 31 | 0 | 0 | 0 | 0 | 0.0169 | 0 | 0 |
| | 0.0677 | 0.1525 | 0.1186 | 0.0508 | 0.0508 | 0 | 0 | 0 | 0.0338 | 0 | 0 | 0.0169 |
| | 0 | 0 | 0.0169 | 0 | 0.0169 | 0.0169 | 0 | 0.0169 | 0 | 0 | 0 | 0 |
| | 0.0169 | 0.0169 | 0 | 0 | 0.0338 | 0.0338 | 0.0677 | 0.0338 | 0.0169 | 0 | 0 | 0 |
| | 0 | 0.0169 | 0.0169 | 0.0847 | 0.0169 | 0 | 0.0169 | 0.0338 | 0 | 0.0169 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2001 | 1 | 8 | 3 | 0 | 34 | 0 | 0.014 | 0.014 | 0.0281 | 0 | 0 | 0 |
| | 0.014 | 0.1267 | 0.0704 | 0.1267 | 0.014 | 0.014 | 0.014 | 0.014 | 0 | 0 | 0 | 0.014 |
| | 0 | 0 | 0.014 | 0 | 0 | 0 | 0 | 0.0281 | 0.014 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0.014 | 0.0563 | 0.0845 | 0.1408 | 0.014 | 0.0281 | 0 |
| | 0 | 0 | 0 | 0.0422 | 0.014 | 0.0281 | 0.014 | 0 | 0.014 | 0.014 | 0.014 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2004 | 1 | 8 | 3 | 0 | 65 | 0.0045 | 0 | 0 | 0.0045 | 0.0273 | 0.0593 | 0.0045 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0.0091 | 0.0045 | 0.0182 | 0.0319 | 0.0228 | 0.0456 |
| | 0.073 | 0.0456 | 0.0273 | 0.0182 | 0.0182 | 0.0182 | 0.0136 | 0.0228 | 0.0091 | 0.0045 | 0 | 0 |
| | 0.0045 | 0.0182 | 0.0273 | 0.0547 | 0.0091 | 0.0045 | 0 | 0 | 0.0045 | 0 | 0 | 0.0091 |
| | 0.0091 | 0.0136 | 0.0136 | 0.073 | 0.0593 | 0.0319 | 0.0547 | 0.0182 | 0.0273 | 0.0228 | 0.0273 | 0.0182 |
| | 0.0136 | 0 | 0 | | | | | | | | | |

#CPFV observer LFs

| #Year | Seas | Flt/Svy | Gender | Part | NSamp | 16 | 18 | 20 | 22 | 24 | 26 | 28 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 |
| | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 72 | 76 | 16 | 18 |
| | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 |
| | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 |
| | 68 | 72 | 76 | | | | | | | | | |
| 1987 | 1 | 9 | 0 | 0 | 197.5 | 3 | 1 | 2 | 0 | 0 | 4 | 6 |
| | 6 | 16 | 33 | 69 | 107 | 101 | 101 | 111 | 76 | 65 | 29 | 26 |
| | 29 | 29 | 26 | 20 | 21 | 19 | 2 | 14 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1988 | 1 | 9 | 0 | 0 | 300.3 | 1 | 4 | 10 | 2 | 7 | 6 | 9 |
| | 16 | 30 | 22 | 54 | 78 | 92 | 140 | 198 | 129 | 130 | 80 | 44 |
| | 22 | 18 | 26 | 20 | 15 | 22 | 18 | 28 | 5 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1989 | 1 | 9 | 0 | 0 | 361 | 1 | 0 | 1 | 13 | 24 | 24 | 49 |
| | 57 | 63 | 55 | 55 | 59 | 45 | 65 | 114 | 133 | 186 | 126 | 111 |
| | 95 | 55 | 19 | 26 | 15 | 10 | 12 | 12 | 9 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1990 | 1 | 9 | 0 | 0 | 192.6 | 0 | 1 | 2 | 1 | 8 | 18 | 25 |
| | 83 | 157 | 124 | 58 | 58 | 80 | 53 | 31 | 44 | 42 | 55 | 47 |
| | 36 | 24 | 12 | 7 | 2 | 2 | 1 | 5 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1991 | 1 | 9 | 0 | 0 | 179.1 | 0 | 0 | 1 | 3 | 1 | 4 | 8 |
| | 1 | 3 | 6 | 18 | 24 | 54 | 103 | 123 | 75 | 66 | 57 | 57 |
| | 64 | 50 | 42 | 37 | 28 | 16 | 8 | 15 | 6 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1992 | 1 | 9 | 0 | 0 | 395.8 | 0 | 0 | 4 | 2 | 4 | 9 | 21 |
| | 34 | 59 | 50 | 41 | 49 | 78 | 109 | 191 | 196 | 181 | 132 | 122 |
| | 73 | 58 | 86 | 77 | 56 | 23 | 15 | 17 | 12 | 3 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1993 | 1 | 9 | 0 | 0 | 296.9 | 1 | 0 | 0 | 2 | 0 | 1 | 8 |
| | 21 | 25 | 25 | 28 | 41 | 43 | 45 | 66 | 72 | 143 | 113 | 122 |
| | 78 | 57 | 49 | 66 | 60 | 30 | 21 | 29 | 12 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1994 | 1 | 9 | 0 | 0 | 210.4 | 0 | 0 | 0 | 1 | 3 | 10 | 12 |
| | 6 | 8 | 13 | 25 | 57 | 50 | 48 | 66 | 58 | 63 | 63 | 49 |
| | 51 | 36 | 25 | 17 | 21 | 14 | 8 | 11 | 5 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1995 | 1 | 9 | 0 | 0 | 224.5 | 0 | 0 | 2 | 3 | 3 | 12 | 9 |
| | 22 | 18 | 32 | 33 | 41 | 32 | 42 | 60 | 72 | 84 | 73 | 50 |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 36 | 30 | 34 | 17 | 17 | 7 | 8 | 8 | 5 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1996 | 1 | 9 | 0 | 0 | 185 | 1 | 0 | 0 | 0 | 1 | 4 | 5 |
| | 7 | 18 | 22 | 24 | 26 | 24 | 41 | 43 | 53 | 51 | 53 | 45 |
| | 32 | 38 | 25 | 22 | 17 | 13 | 5 | 10 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1997 | 1 | 9 | 0 | 0 | 257.5 | 0 | 0 | 0 | 1 | 5 | 4 | 9 |
| | 3 | 12 | 24 | 29 | 33 | 49 | 35 | 75 | 63 | 63 | 86 | 83 |
| | 82 | 76 | 67 | 52 | 47 | 29 | 16 | 28 | 11 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1998 | 1 | 9 | 0 | 0 | 124.7 | 0 | 0 | 0 | 0 | 0 | 1 | 5 |
| | 7 | 15 | 15 | 8 | 10 | 18 | 30 | 33 | 39 | 37 | 36 | 32 |
| | 33 | 29 | 27 | 21 | 10 | 10 | 6 | 3 | 7 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| #Year | Seas | Flt/Svy | Gender | Part | NSamp | 16 | 18 | 20 | 22 | 24 | 26 | 28 |
| | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 |
| | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 72 | 76 | 16 | 18 |
| | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 |
| | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 |
| | 68 | 72 | 76 | | | | | | | | | |
| 2004 | 1 | 10 | 3 | 0 | 57 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| | 13 | 5 | 1 | 2 | 5 | 9 | 12 | 20 | 50 | 57 | 108 | 106 |
| | 42 | 24 | 11 | 6 | 7 | 3 | 1 | 2 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1 | 4 | 7 | 20 | 7 | 4 | 3 | 6 | 7 | 20 |
| | 24 | 51 | 59 | 35 | 26 | 7 | 11 | 4 | 3 | 1 | 1 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2005 | 1 | 10 | 3 | 0 | 65 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 4 | 4 | 8 | 14 | 6 | 7 | 2 | 2 | 10 | 26 | 56 |
| | 79 | 72 | 50 | 14 | 11 | 8 | 7 | 11 | 2 | 2 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 3 | 10 | 20 | 14 | 6 |
| | 6 | 11 | 16 | 48 | 43 | 35 | 18 | 11 | 10 | 6 | 1 | 0 |
| | 0 | 1 | 0 | | | | | | | | | |
| 2006 | 1 | 10 | 3 | 0 | 70 | 0 | 0 | 0 | 1 | 1 | 8 | 20 |
| | 7 | 2 | 3 | 1 | 5 | 18 | 33 | 38 | 44 | 25 | 22 | 37 |
| | 52 | 59 | 45 | 18 | 4 | 7 | 2 | 3 | 1 | 0 | 0 | 0 |
| | 1 | 1 | 6 | 13 | 15 | 13 | 1 | 2 | 10 | 12 | 25 | 17 |
| | 23 | 21 | 6 | 14 | 24 | 36 | 22 | 12 | 3 | 2 | 2 | 0 |
| | 1 | 0 | 0 | | | | | | | | | |
| 2007 | 1 | 10 | 3 | 0 | 78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 4 | 25 | 40 | 18 | 12 | 14 | 21 | 26 | 27 | 30 | 28 |
| | 30 | 43 | 27 | 20 | 8 | 3 | 3 | 4 | 1 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 2 | 6 | 15 | 16 | 22 | 10 | 11 |
| | 15 | 14 | 28 | 32 | 35 | 16 | 24 | 6 | 2 | 2 | 0 | 1 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2008 | 1 | 10 | 3 | 0 | 90 | 0 | 0 | 0 | 0 | 1 | 2 | 4 |
| | 8 | 4 | 9 | 8 | 21 | 39 | 28 | 20 | 24 | 21 | 34 | 28 |
| | 31 | 35 | 39 | 29 | 15 | 7 | 4 | 2 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 1 | 8 | 5 | 4 | 6 | 11 | 24 | 35 | 17 |
| | 13 | 24 | 19 | 22 | 18 | 18 | 11 | 7 | 6 | 1 | 1 | 1 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2009 | 1 | 10 | 3 | 0 | 80 | 0 | 0 | 0 | 0 | 1 | 2 | 3 |
| | 3 | 4 | 7 | 14 | 16 | 15 | 18 | 35 | 25 | 24 | 29 | 17 |
| | 38 | 31 | 42 | 17 | 13 | 2 | 3 | 3 | 1 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 2 | 2 | 4 | 3 | 8 | 5 | 15 | 11 | 24 |
| | 15 | 18 | 18 | 21 | 21 | 28 | 21 | 5 | 5 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2010 | 1 | 10 | 3 | 0 | 64 | 0 | 0 | 0 | 0 | 0 | 1 | 3 |
| | 3 | 5 | 2 | 4 | 5 | 4 | 6 | 13 | 18 | 2 | 15 | 11 |
| | 4 | 12 | 13 | 18 | 3 | 3 | 5 | 2 | 1 | 0 | 2 | 1 |
| | 0 | 0 | 0 | 0 | 5 | 5 | 3 | 3 | 2 | 5 | 6 | 8 |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 9 | 11 | 10 | 10 | 10 | 5 | 10 | 0 | 1 | 1 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| #year | Seas | Flt/Svy | Gender | Part | Nsamp | 16 | 18 | 20 | 22 | 24 | 26 | 28 |
| | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 |
| | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 72 | 76 | 16 | 18 |
| | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 |
| | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 |
| | 68 | 72 | 76 | | | | | | | | | |
| 2003 | 1 | 11 | 3 | 0 | 53.904 | 28235.5 | 19683.5 | 0 | 0 | 0 | 14677 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 19773 | 12373 | 12590 | 31816 | 33936 | 82649 | 55254 |
| | 12159 | 11412 | 19250.5 | 13105 | 20986 | 12487 | 14788 | 6029 | 5077 | 3832 | 41589.5 | 36535.5 |
| | 0 | 0 | 0 | 27911 | 12487 | 0 | 0 | 9024 | 30739 | 0 | 59320 | 45082 |
| | 38462 | 99249 | 39067 | 33419 | 21508 | 47151 | 33186 | 28779.5 | 0 | 0 | 0 | 6029 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2004 | 1 | 11 | 3 | 0 | 95.24 | 0 | 0 | 0 | 9015 | 38855 | 151044 | 257610 |
| | 316953 | 22193 | 150585 | 119209 | 169096 | 63290 | 71791 | 176752 | 217938 | 83366 | 279525 | 250018 |
| | 840875 | 204934 | 131428 | 58799 | 34468 | 11301 | 44503 | 12658 | 0 | 0 | 14448 | 0 |
| | 0 | 25368 | 23409 | 165924 | 320652 | 358702 | 232678 | 74084 | 171619 | 96158 | 168656 | 135720 |
| | 169682 | 542970 | 452187 | 266385 | 820258 | 429010 | 52210 | 12013 | 11301 | 21430 | 22378 | 0 |
| | 20332 | 0 | 0 | | | | | | | | | |
| 2005 | 1 | 11 | 3 | 0 | 76.26 | 12041 | 0 | 0 | 6099 | 0 | 19905 | 93519 |
| | 11484 | 143365 | 95153 | 213206 | 44473 | 0 | 39619 | 10022 | 21842 | 36056 | 82164 | 114577 |
| | 135087 | 77615 | 46055 | 18435 | 18435 | 17562 | 10022 | 70913 | 13884 | 0 | 78455 | 0 |
| | 6099 | 0 | 43348 | 26004 | 28896 | 0 | 137041 | 186601 | 103421 | 80779 | 11389 | 21363 |
| | 44058 | 32670 | 150622 | 248487 | 191348 | 167876 | 62870 | 16232 | 33745 | 34131 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2006 | 1 | 11 | 3 | 0 | 74.156 | 0 | 0 | 22460 | 11717 | 34763 | 82996 | 20114 |
| | 11369 | 0 | 35756 | 18325 | 11150 | 114592 | 178976 | 30919 | 22877 | 0 | 18668 | 33384 |
| | 34315 | 34315 | 66592 | 0 | 16465 | 0 | 16465 | 39661 | 13721 | 6462 | 0 | 0 |
| | 23434 | 46601 | 229159 | 335595 | 20963 | 12159 | 0 | 0 | 33647 | 23597 | 252133 | 213932 |
| | 35560 | 11438 | 22877 | 33620 | 35036 | 20395 | 25396 | 22068 | 7259 | 18957 | 5235 | 10342 |
| | 8442 | 0 | 0 | | | | | | | | | |
| 2007 | 1 | 11 | 3 | 0 | 51.666 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 32757 | 34745 | 112013 | 32559 | 22146 | 0 | 23370 | 11375 | 124584 | 97164 | 11685 | 11685 |
| | 33342 | 22115 | 68650 | 27640 | 45602 | 11682 | 0 | 0 | 0 | 0 | 0 | 10246 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 98696 | 135710 | 38700 | 0 | 20002 | 70111 |
| | 56177 | 61278 | 46741 | 30433 | 97274 | 113547 | 63830 | 35380 | 32807 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2008 | 1 | 11 | 3 | 0 | 41.318 | 0 | 0 | 0 | 0 | 44005 | 20487 | 0 |
| | 0 | 0 | 0 | 12235 | 12235 | 12235 | 0 | 0 | 0 | 11621 | 9830 | 19264 |
| | 16848 | 46848 | 22030 | 26727 | 32181 | 39130 | 31938 | 14466 | 19560 | 0 | 9606 | 0 |
| | 7464 | 10244 | 10244 | 0 | 0 | 0 | 10244 | 0 | 10244 | 22479 | 12235 | 0 |
| | 31800 | 17194 | 7944 | 15887 | 45376 | 34191 | 108031 | 66513 | 49869 | 18143 | 15887 | 15887 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2009 | 1 | 11 | 3 | 0 | 37.8 | 7571 | 11385 | 11385 | 9159 | 23220 | 23285 | 30916 |
| | 7935 | 31479 | 31018 | 24075 | 0 | 7783 | 7783 | 29543 | 7783 | 6592 | 15878 | 16203 |
| | 28984 | 9897 | 36217 | 16717 | 9785 | 0 | 8606 | 11416 | 0 | 0 | 7571 | 30341 |
| | 31929 | 16726 | 16139 | 18415 | 0 | 0 | 0 | 23069 | 25929 | 33705 | 7783 | 21902 |
| | 22597 | 15566 | 7783 | 17568 | 21313 | 51157 | 9785 | 9159 | 24354 | 5301 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2010 | 1 | 11 | 3 | 0 | -72.846 | 632379 | 875222 | 64453 | 9072 | 36288 | 43555 | 0 |
| | 9072 | 9057 | 9057 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7267 | 0 |
| | 0 | 7267 | 25618 | 7267 | 15878 | 0 | 0 | 0 | 8101 | 0 | 661027 | 914011 |
| | 82933 | 36287 | 70194 | 17082 | 0 | 9072 | 15408 | 27171 | 9072 | 0 | 0 | 0 |
| | 7615 | 0 | 0 | 36403 | 0 | 60028 | 29069 | 9874 | 16723 | 12059 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |

# this is the Gotshall and Miller LF data from Central California sampling programs

| #year | Seas | Flt/Svy | Gender | Part | #_samp | 16 | 18 | 20 | 22 | 24 | 26 | 28 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 |
| | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 72 | 76 | 16 | 18 |
| | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 |
| | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 |
| | 68 | 72 | 76 | | | | | | | | | |
| #1959 | 1 | 14 | 0 | 0 | -10 | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 3 | 3 | 4 | 5 | 12 | 19 | 28 | 24 | 40 | 24 |
| | 24 | 15 | 14 | 5 | 4 | 6 | 3 | 1 | 0 | 3 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| #1960 | 1 | 14 | 0 | 0 | -95 | 0 | 1 | 2 | 1 | 0 | 0 | 0 |
| | 0 | 1 | 5 | 4 | 5 | 25 | 42 | 121 | 123 | 166 | 122 | 103 |
| | 105 | 58 | 26 | 20 | 14 | 5 | 5 | 2 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| #1961 | 1 | 14 | 0 | 0 | -25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 6 | 2 | 2 | 2 | 1 | 5 | 22 | 44 | 51 | 57 | 25 |
| | 10 | 13 | 2 | 6 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| #1966 | 1 | 14 | 0 | 0 | -30 | 140 | 3 | 2 | 1 | 1 | 3 | 5 |
| | 2 | 10 | 28 | 40 | 35 | 14 | 6 | 1 | 10 | 12 | 28 | 30 |
| | 25 | 15 | 13 | 21 | 3 | 4 | 3 | 3 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |

# this is the observer LF data

| #Yr | Seas | Flt/Svy | Gender | Part | Neff | 16 | 18 | 20 | 22 | 24 | 26 | 28 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 |
| | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 72 | 76 | 16 | 18 |
| | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 |
| | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 |
| | 68 | 72 | 76 | | | | | | | | | |
| 2002 | 1 | 15 | 0 | 0 | 24.38 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 1 | 1 | 8 | 19 | 10 | 16 | 9 | 15 | 11 |
| | 11 | 7 | 7 | 3 | 3 | 1 | 0 | 3 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2003 | 1 | 15 | 0 | 0 | 8.83 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 5 | 6 | 4 |
| | 6 | 2 | 4 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2004 | 1 | 15 | 0 | 0 | 60.36 | 0 | 0 | 12 | 4 | 7 | 0 | 2 |
| | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 7 | 9 | 24 | 28 | 45 |
| | 40 | 21 | 26 | 24 | 18 | 14 | 11 | 9 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2005 | 1 | 15 | 0 | 0 | 123.2 | 0 | 0 | 0 | 0 | 0 | 2 | 1 |
| | 0 | 0 | 2 | 6 | 8 | 5 | 8 | 21 | 34 | 49 | 66 | 85 |
| | 88 | 88 | 56 | 50 | 35 | 32 | 16 | 22 | 8 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2006 | 1 | 15 | 0 | 0 | 38.80 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 1 | 2 | 5 | 11 | 20 | 19 | 13 | 10 | 14 |
| | 27 | 14 | 11 | 13 | 9 | 7 | 4 | 5 | 2 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2007 | 1 | 15 | 0 | 0 | 44.46 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |
| | 1 | 0 | 1 | 2 | 1 | 1 | 0 | 3 | 2 | 8 | 23 | 13 |
| | 17 | 21 | 15 | 14 | 12 | 12 | 10 | 8 | 1 | 2 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 2008 | 1 | 15 | 0 | 0 | 2.828 | 0 | 0 | 0 | 0 | 1 | 2 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |

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| #Yr | Seas | Flt/Svy | Gender | Part | Neff | 16 | 18 | 20 | 22 | 24 | 26 | 28 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 |
| | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 72 | 76 | 16 | 18 |
| | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 |
| | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 |
| | 68 | 72 | 76 | | | | | | | | | |
| 1975 | 1 | 16 | 0 | 0 | 400 | 3 | 8 | 18 | 22 | 124 | 435 | 1059 |
| | 2645 | 3183 | 2660 | 2729 | 2587 | 1969 | 910 | 662 | 705 | 717 | 495 | 354 |
| | 236 | 129 | 69 | 57 | 41 | 19 | 10 | 12 | 7 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1976 | 1 | 16 | 0 | 0 | 400 | 7 | 5 | 9 | 35 | 91 | 160 | 381 |
| | 1136 | 2293 | 2505 | 2364 | 3574 | 3567 | 2634 | 1841 | 1329 | 1140 | 895 | 687 |
| | 463 | 292 | 154 | 131 | 87 | 43 | 31 | 31 | 14 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1977 | 1 | 16 | 0 | 0 | 400 | 35 | 86 | 114 | 66 | 36 | 48 | 126 |
| | 252 | 276 | 290 | 438 | 1081 | 1428 | 1372 | 1514 | 1256 | 815 | 587 | 485 |
| | 389 | 279 | 162 | 96 | 77 | 49 | 41 | 25 | 8 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1978 | 1 | 16 | 0 | 0 | 400 | 24 | 26 | 293 | 978 | 1346 | 1444 | 1622 |
| | 1729 | 1059 | 343 | 261 | 389 | 669 | 863 | 1218 | 1390 | 1348 | 1042 | 752 |
| | 625 | 464 | 295 | 189 | 106 | 41 | 34 | 21 | 6 | 2 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1986 | 1 | 16 | 0 | 0 | 400 | 3 | 1 | 17 | 23 | 25 | 60 | 139 |
| | 373 | 629 | 701 | 610 | 497 | 335 | 133 | 68 | 58 | 86 | 91 | 79 |
| | 72 | 47 | 38 | 13 | 8 | 2 | 1 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1987 | 1 | 16 | 0 | 0 | 400 | 1 | 0 | 0 | 1 | 3 | 15 | 36 |
| | 100 | 134 | 171 | 305 | 548 | 596 | 382 | 191 | 110 | 66 | 57 | 54 |
| | 48 | 45 | 31 | 29 | 13 | 6 | 3 | 3 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1988 | 1 | 16 | 0 | 0 | 341 | 7 | 6 | 7 | 14 | 1 | 17 | 38 |
| | 89 | 106 | 80 | 49 | 103 | 137 | 186 | 260 | 239 | 178 | 93 | 69 |
| | 73 | 26 | 22 | 30 | 12 | 11 | 7 | 8 | 1 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |
| 1989 | 1 | 16 | 0 | 0 | 400 | 9 | 11 | 33 | 167 | 289 | 286 | 390 |
| | 715 | 679 | 318 | 117 | 120 | 134 | 183 | 260 | 340 | 290 | 207 | 190 |
| | 113 | 65 | 33 | 33 | 16 | 16 | 7 | 4 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | | |

21 #_N_age_bins
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
0 #_N_ageerror_definitions
0 #_N_Agecomp_obs
1 #_Lbin_method: 1=poplenbins; 2=datalenbins; 3=lengths
1 #_combine males into females at or below this bin number
#Yr Seas Flt/Svy Gender Part Ageerr Lbin_lo Lbin_hi Nsamp datavector(female-male)

0 #_N_MeanSize-at-Age_obs
#Yr Seas Flt/Svy Gender Part Ageerr Ignore datavector(female-male)

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1 #_N_environ_variables
0 #_N_environ_obs
1 # N sizefreq methods to read
25 #Sizefreq N bins per method
1 #Sizetfreq units(bio/num) per method
1 #Sizefreq scale(kg/lbs/cm/inches) per method
1e-005 #Sizefreq mincomp per method
20 #Sizefreq N obs per method
#_Sizefreq bins

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.2 | 0.4 | 0.6 | 0.8 | 1 | 1.2 | 1.4 | 1.6 | 1.8 | 2 | 2.2 | 2.4 | 2.6 |
| | 2.8 | 3 | 3.2 | 3.4 | 3.6 | 3.8 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 |

#_Year season Fleet Partition Gender SampleSize <data>
# southern California RecFIN

| # | #Yr | Seas | Flt/Svy | Gender | Part | Nsamp | 0.2 | 0.4 | 0.6 | 0.8 | 1 | 1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.4 | 1.6 | 1.8 | 2 | 2.2 | 2.4 | 2.6 | 2.8 | 3 | 3.2 | 3.4 | 3.6 |
| | 3.8 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | 0.2 | 0.4 | 0.6 | 0.8 | 1 |
| | 1.2 | 1.4 | 1.6 | 1.8 | 2 | 2.2 | 2.4 | 2.6 | 2.8 | 3 | 3.2 | 3.4 |
| | 3.6 | 3.8 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | | | | |
| 1 | 1980 | 1 | 4 | 0 | 0 | -176 | 253 | 258 | 821 | 536 | 209 | 121 |
| | 81 | 81 | 66 | 55 | 41 | 35 | 21 | 10 | 5 | 4 | 4 | 2 |
| | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1 | 1981 | 1 | 4 | 0 | 0 | -148 | 211 | 395 | 367 | 302 | 316 | 240 |
| | 110 | 72 | 58 | 60 | 31 | 33 | 16 | 8 | 3 | 3 | 4 | 0 |
| | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1 | 1982 | 1 | 4 | 0 | 0 | -135 | 40 | 82 | 313 | 320 | 268 | 306 |
| | 174 | 115 | 71 | 54 | 39 | 19 | 9 | 6 | 1 | 4 | 3 | 0 |
| | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1 | 1983 | 1 | 4 | 0 | 0 | -99 | 8 | 58 | 123 | 103 | 79 | 80 |
| | 41 | 39 | 36 | 42 | 33 | 17 | 7 | 12 | 3 | 9 | 8 | 0 |
| | 1 | 4 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1 | 1984 | 1 | 4 | 0 | 0 | -181 | 127 | 13 | 30 | 63 | 79 | 102 |
| | 47 | 45 | 30 | 19 | 8 | 14 | 4 | 3 | 2 | 3 | 3 | 0 |
| | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1 | 1985 | 1 | 4 | 0 | 0 | -147 | 669 | 281 | 30 | 29 | 49 | 63 |
| | 55 | 50 | 42 | 26 | 21 | 8 | 13 | 1 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1 | 1986 | 1 | 4 | 0 | 0 | -119 | 253 | 567 | 266 | 41 | 24 | 20 |
| | 32 | 16 | 18 | 20 | 21 | 2 | 7 | 2 | 5 | 2 | 1 | 0 |
| | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1 | 1987 | 1 | 4 | 0 | 0 | -32 | 37 | 20 | 33 | 10 | 12 | 6 |
| | 1 | 4 | 1 | 5 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1 | 1988 | 1 | 4 | 0 | 0 | -39 | 12 | 12 | 13 | 11 | 12 | 8 |
| | 4 | 2 | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1 | 1989 | 1 | 4 | 0 | 0 | -50 | 139 | 105 | 42 | 41 | 49 | 28 |
| | 26 | 14 | 7 | 6 | 4 | 8 | 5 | 1 | 4 | 1 | 4 | 2 |
| | 0 | 1 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |

# Northern California RecFIN

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| #use | YEAR | Seas | Flt/Svy | Gender | Part | Nsamp | 0.2 | 0.4 | 0.6 | 0.8 | 1 | 1.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.4 | 1.6 | 1.8 | 2 | 2.2 | 2.4 | 2.6 | 2.8 | 3 | 3.2 | 3.4 | 3.6 |
| | 3.8 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | 0.2 | 0.4 | 0.6 | 0.8 | 1 |
| | 1.2 | 1.4 | 1.6 | 1.8 | 2 | 2.2 | 2.4 | 2.6 | 2.8 | 3 | 3.2 | 3.4 |
| | 3.6 | 3.8 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | | | | |
| 1 | 1980 | 1 | 5 | 0 | 0 | -70 | 24 | 4 | 27 | 42 | 16 | 16 |
| | 22 | 14 | 11 | 14 | 3 | 6 | 9 | 6 | 3 | 3 | 5 | 1 |
| | 3 | 12 | 2 | 5 | 0 | 1 | 3 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1 | 1981 | 1 | 5 | 0 | 0 | -34 | 2 | 12 | 12 | 16 | 46 | 48 |
| | 21 | 6 | 6 | 13 | 10 | 12 | 6 | 8 | 5 | 3 | 4 | 6 |
| | 1 | 4 | 7 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1 | 1982 | 1 | 5 | 0 | 0 | -50 | 1 | 7 | 13 | 22 | 18 | 48 |
| | 44 | 50 | 31 | 26 | 15 | 7 | 4 | 5 | 7 | 4 | 4 | 1 |
| | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1 | 1983 | 1 | 5 | 0 | 0 | -46 | 3 | 9 | 6 | 11 | 21 | 33 |
| | 47 | 44 | 46 | 48 | 29 | 17 | 13 | 8 | 7 | 6 | 5 | 1 |
| | 2 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1 | 1984 | 1 | 5 | 0 | 0 | -69 | 6 | 8 | 16 | 15 | 21 | 17 |
| | 18 | 17 | 16 | 9 | 8 | 5 | 6 | 9 | 1 | 5 | 2 | 1 |
| | 4 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1 | 1985 | 1 | 5 | 0 | 0 | -99 | 301 | 37 | 13 | 21 | 21 | 20 |
| | 17 | 18 | 17 | 11 | 12 | 16 | 9 | 13 | 10 | 8 | 2 | 4 |
| | 1 | 3 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1 | 1986 | 1 | 5 | 0 | 0 | -105 | 84 | 365 | 266 | 45 | 5 | 10 |
| | 12 | 14 | 16 | 18 | 14 | 19 | 16 | 17 | 6 | 6 | 10 | 7 |
| | 3 | 6 | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1 | 1987 | 1 | 5 | 0 | 0 | -37 | 9 | 55 | 50 | 19 | 8 | 5 |
| | 2 | 2 | 5 | 4 | 4 | 7 | 5 | 11 | 7 | 8 | 2 | 3 |
| | 5 | 6 | 4 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1 | 1988 | 1 | 5 | 0 | 0 | -36 | 3 | 10 | 10 | 7 | 4 | 8 |
| | 5 | 3 | 1 | 1 | 0 | 1 | 2 | 0 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1 | 1989 | 1 | 5 | 0 | 0 | -36 | 8 | 17 | 27 | 3 | 11 | 14 |
| | 16 | 8 | 8 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |

0 # no tag data
0 # no morphcomp data

999

ENDDATA

DRAFT

## STARTER File

```
#C starter comment here
boc.up12.dat
boc.up8.ctl
0  # 0=use init values in control file; 1=use ss3.par (takes last run's estimates as starting- much faster!!!)
0 # run display detail (0,1,2)
1 # detailed age-structured reports in REPORT.SSO (0,1)
0 # write detailed checkup.sso file (0,1)
0 # write parm values to ParmTrace.sso (0=no,1=good,active; 2=good,all; 3=every_iter,all_parms; 4=every,active)
1
0 # Include prior_like for non-estimated parameters (0,1)
1 # Use Soft Boundaries to aid convergence (0,1) (recommended)
3 # Number of bootstrap datafiles to produce
#-1 # for running with fixed params
7 # Turn off estimation for parameters entering after this phase
10 # MCMC burn interval
2 # MCMC thin interval
#0.001 # jitter initial parm value by this fraction
0  # jitter off
-1 # min yr for sdreport outputs (-1 for styr)
-2 # max yr for sdreport outputs (-1 for endyr; -2 for endyr+Nforecastyrs
0 # N individual STD years
#vector of year values
# 1973 1976
0.0001 # final convergence criteria (e.g. 1.0e-04)
0 # retrospective year relative to end year (e.g. -4)
1 # min age for calc of summary biomass
1 # Depletion basis:  denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel X*B_styr
0.25 # Fraction (X) for Depletion denominator (e.g. 0.4)
3 # (1-SPR)_reporting:  0=skip; 1=rel(1-SPR); 2=rel(1-SPR_MSY); 3=rel(1-SPR_Btarget); 4=notrel
1 # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num); 3=sum(frates)
3 # F_report_basis: 0=raw; 1=rel Fspr; 2=rel Fmsy ; 3=rel Fbtgt
999 # check value for end of file
```

## FORECAST File

```
1 # read 10 advanced options
 1 # Do West Coast gfish rebuilder output (0/1)
 2000 # Rebuilder:  first year catch could have been set to zero (Ydecl)(-1 to set to endyear+1)
 2009 # Rebuilder:  year for current age structure (Yinit) (-1 to set to endyear+1)
 1 # Control rule method (1=west coast adjust catch; 2=adjust F)
 0.4 # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40)
 0.1 # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)
 1 # Control rule fraction of Flimit (e.g. 0.75)
 1 # basis for max forecast catch by seas and area (0=none; 1=deadbio; 2=retainbio; 3=deadnum; 4=retainnum)
 0 # 0= no implementation error; 1=use implementation error in forecast (not coded yet)
 0.1 # stddev of log(realized F/target F) in forecast (not coded yet)
# end of advanced options
# max forecast catch
# rows are seasons, columns are areas
 -1000
1 # fleet allocation (in terms of F) (1=use endyr pattern, no read; 2=read below)
#  0.000897327 0.000385902 0 0.00692334 0.000251874 0.000148217
0 # Number of forecast catch levels to input (rest calc catch from forecast F
# 2 basis for input forecatch:  1=retained catch; 2=total dead catch
# year season fleet catch                                   72
# year season fleet catch                                   72
999 # verify end of input
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# BOCACCIONOMICS: THE EFFECTIVENESS OF PRE-RECRUIT INDICES FOR ASSESSMENT AND MANAGEMENT OF BOCACCIO

JOHN C. FIELD, ALEC D. MACCALL, STEPHEN RALSTON
Fisheries Ecology Division
Southwest Fishery Science Center
National Marine Fisheries Service

MILTON S. LOVE
University of California, Santa Barbara

ERIC F. MILLER
MBC Applied Environmental Sciences

## ABSTRACT

Bocaccio (*Sebastes paucispinis*) has been one of the most important species of rockfish to both commercial and recreational fisheries in California Current waters over the last century. Actions taken to rebuild the stock of bocaccio residing off of California have been responsible for dramatic changes on both commercial and recreational groundfish management and total allowable yields of most groundfish species in California waters over the last decade, including a virtual cessation of commercial and recreational fishing in 2003. In retrospect, it was determined that a strong 1999 year class was moving through the fishery at that time, resulting in high catch rates during a period in which management sought to drastically reduce catch. This results in a paradox, in which rebuilding requires strong year classes, which requires further constraints on fishing during periods in which the condition of the stock seems to be improving. Although this paradox exists for all stocks undergoing rebuilding, it is particularly pronounced for bocaccio as they have among the greatest variability in recruitment observed in any species of West Coast rockfish, as well as very rapid growth and very young age at recruitment to the recreational fishery. Consequently, accurate indices of the strength of incoming year classes both improve stock assessment estimates of future (near term) abundance trends, as well as aid regulators in making management decisions during those infrequent periods of high abundance of young fish. We discuss several indices of recruitment strength based on data on young bocaccio, evaluate their relative performance in the early detection of strong year classes, and consider both the oceanographic factors that may drive recruitment variability, as well as the spatial patterns of recruitment events which may aid in interpreting these indices.

## INTRODUCTION

Bocaccio (*Sebastes paucispinis*) have long been one of the most important targets of both commercial and recreational fisheries in California waters, accounting for between 25 and 30% of the commercial and recreational rockfish (*Sebastes* spp.) catch over the past century. However, this percentage has declined in recent years as a result of stock declines, restrictive management actions and the development of alternative fisheries. Catches and abundance began to fall during the 1980s and declined rapidly in the 1990s, due to a combination of high harvest rates and poor ocean conditions (MacCall 2003; Field et al. 2009). More recently, since the southern sub-stock of bocaccio (currently representing the population of bocaccio south of Cape Blanco, OR)[1] was declared overfished by the Pacific Fishery Management Council (PFMC) in 1999,[2] management measures have been responsible for even more significant reductions of both commercial and recreational catches. Management measures included a virtual cessation of most commercial and recreational fishing in 2003, following a very pessimistic assessment of stock status in 2002 (MacCall et al. 2002).

The landings limitations and area closures that followed the 2002 assessment led to considerable economic hardships during a period in which many fishermen complained bitterly that bocaccio were "more abundant than ever before." Management constraints implemented to rebuild bocaccio, as well as six other species of rockfishes that were declared overfished, have substantially reduced rockfish landings coastwide since then (Berkeley et al. 2004, Punt and Ralston 2007). Although the stock is still estimated to have been in an overfished condition throughout the 1990s, the most recent assessment indicates that the population was not as depleted as estimated in the 2002 assessment (MacCall 2003, Field et al. 2009). Additionally, it is now clear that a relatively strong (relative to parental biomass) 1999 year class had indeed been moving through the fishery at that time, following a decade of record-low recruitment

[1]This paper investigates the recruitment and abundance trends of the southern sub-stock of bocaccio only, currently defined as waters south of Cape Blanco, Oregon to the U.S./Mexico border (Field et al. 2009). Bocaccio in U.S. waters north of Cape Blanco are likely to be more connected from a population perspective to bocaccio off of British Columbia, Canada, for which abundance has also been estimated to be at very low levels (Stanley et al. 2009).

[2]The PFMC is the management body charged with implementing the requirements of federal law for west coast groundfish fisheries, and defines a stock or population as being "overfished" if the stock is at or below the minimum stock size threshold (MSST). The MSST for West Coast rockfish is currently defined as 25% of the estimated spawning biomass or spawning potential that would occur in an unfished condition.

levels that began in 1990. Thus, the fishermen's complaints had validity, in that the bocaccio population was undergoing a significant increase in abundance during a period in which management sought to drastically reduce catch.

Consequently, management of bocaccio in recent years has been complicated by both changes in management regimes and objectives, and variable population trajectories driven (to a large extent) by highly variable recruitment. Despite the significant socio-economic hardships, management actions have been effective at reducing mortality. This combined with several recent strong year classes (1999, 2003, 2005), have resulted in an increase in abundance and spawning output over the past decade. Although the current estimate of abundance is substantially higher than those of the 1990s, the population will remain in "rebuilding" status until it has recovered to the target level of abundance, currently set to 40% of the unfished abundance for West Coast groundfish (Punt and Ralston 2007; Field and He 2009). In an analysis of the likely time to rebuild to this target level, recruitment variability remains among the most significant factors contributing to rebuilding success or failure by the currently adopted management target of 2026 (Field and He 2009). Rebuilding plans and targets are developed by simulating forward projections of the population under a variety of harvest rates to determine the probability of recovering to target abundance levels (40% of the unfished spawning potential) by target years that are defined by law (Punt 2003; Punt and Ralston 2007). For bocaccio, the current target is the year 2026, and while the most recent assessment projects that this rebuilding target has a greater than 75% probability of being met (at current harvest rates), this leaves an approximately 25% probability of not achieving this target. Most of the uncertainty regarding the probability of rebuilding is a consequence of recruitment stochasticity and the inability to accurately forecast future recruitment events.

Information regarding the magnitude and the determinants of impending year class strength can be of utility for tactical management actions, such as short-term catch projections and consideration of seasonal and area closures, particularly with respect to avoiding the mismatch between stock trends and management actions that took place following the 1999 year class and the overfishing declaration. In this manuscript, we will first briefly describe the early life history of bocaccio and introduce four fishery-independent sources of information regarding recruitment success as indexed by the abundance of young-of-the-year (YOY) bocaccio, and describe the methods typically used to develop recruitment indices from these data. Next we will provide a short overview of the structure and results of the most recent bocaccio assessment, including biomass trends and exploitation rates, but with a focus on the estimation of recruitment in either the most recent or in past stock assessments. Then we will evaluate the relative performance of the recruitment indices in predicting impending strong year classes (assuming that the stock assessment estimates of recruitment based on length composition data represent "true" recruitment). Finally, we will consider the performance of recruitment indices, including the spatial patterns of recruitment events and how these indices may relate to climate variables, and discuss how these indices could or should be used in future assessments and management.

## DATA AND METHODS

### Life history

Like all rockfish, bocaccio are primitively viviparous and bear live young at parturition. Copulation typically takes place during September–October, although fertilization is often delayed, and parturition occurs during the winter months (Moser 1967; Wyllie Echeverria, 1987). Figure 1 provides a conceptual overview of early life history stages of bocaccio following parturition. Early stage larvae (pre-flexion, approximately 0 to 20 days) are weak swimmers, however post-flexion late-stage larvae do have some swimming capabilities. Bocaccio are one of a very few number of *Sebastes* species for which data on larval abundance and distribution are available from 1951 to the present from California Cooperative Oceanic Fisheries Investigation research collections, as the larvae of most *Sebastes* species cannot be distinguished using morphological characteristics (Moser et al. 1977). These data have long been used as an indicator of population abundance in stock assessments (MacCall 2003; Field et al. 2009), under the assumption that larval abundance is a reflection of the female reproductive effort and thus spawning biomass. More recently, Ralston and MacFarlane 2010 have used these data to estimate total (rather than relative) spawning biomass. However, as year class strength for most California Current fish populations is thought to be set following parturition (Lasker 1977, Hollowed 1992), larval abundance data are not considered a reliable indicator of recruitment.

Both larval and juvenile stages are typically found in the mixed layer from 10 to 100 meters depth, (Ahlstrom 1959; Ross and Larson 2003). Pelagic juveniles are capable swimmers, and there is some evidence that both larval and juvenile stages of bocaccio tend to occur in the shallower sections of the water column (Ross and Larson 2003), which would imply greater dispersal relative to more deeply oriented larval and juvenile rockfish based on the propagule dispersal models

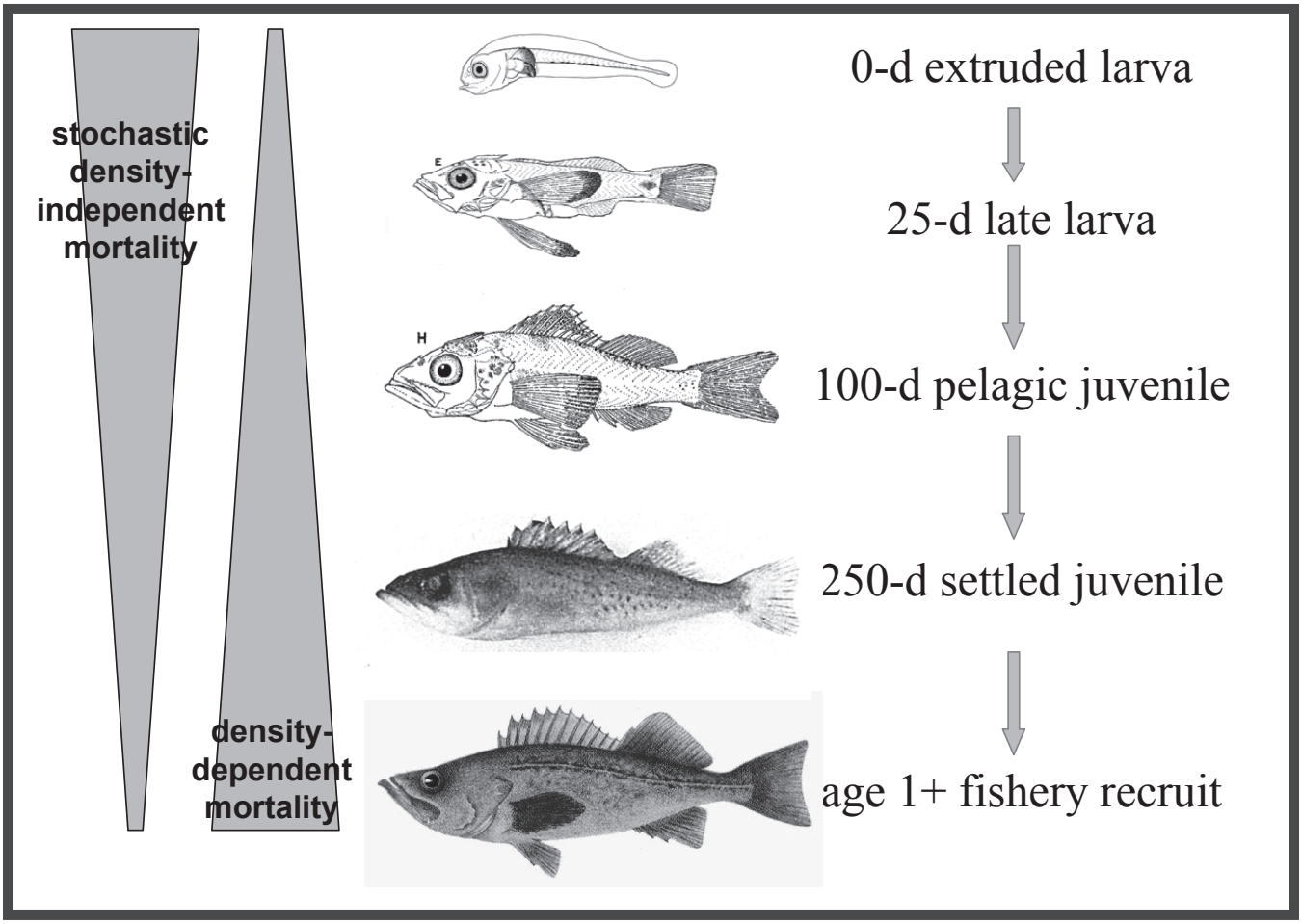



Figure 1. Ontogenetic sequence of bocaccio life history stages, as related to a conceptual model of the nature of density dependent and density independent mortality sources for each stage.

of Peterson et al. (2010). This may also lead to relatively greater dispersal to nearshore habitats immediately prior to settlement to benthic habitats, as bocaccio are entrained in surface waters that are pushed closer to the coastline than waters at depth. Settlement to nearshore and demersal habitats begins in late spring and extends throughout the summer months. Pelagic YOY typically recruit to shallow habitats, and subadult bocaccio are more common in shallower water than adults, with an apparent ontogenetic movement of adults to deeper water with size and/or age. Adult bocaccio occur in a broad range of habitats and depths, including midwater, although high densities tend to be more associated with more complex (e.g., rocky, high relief) substrates.

The rapid growth of bocaccio is also initiated at the juvenile stage; Woodbury and Ralston (1991) describe linear species-specific growth rates (and interannual variability in the same) for juvenile rockfish in approximately the first 50 to 150 days of life. Bocaccio growth rates ranged from 0.56 to 0.97 mm/day, the highest rate amongst the *Sebastes* species. This rapid growth continues into the settled juvenile and young adult stages, with fish growing to a mean size of 27 and 36 cm (fork length) by ages 1.5 and 2.5 respectively, the most rapid growth of any West Coast *Sebastes*. As bocaccio have been proven to be very difficult to age (Andrews et al. 2005; Piner et al. 2006), and age data are consequently not routinely developed or used in assessments, this rapid growth provides the primary means of estimating recruitment variability and year-class (cohort) strength from length frequency data (Ralston and Ianelli 1998). Such rapid growth is fueled by almost exclusive piscivory; Phillips (1964) reported that recently settled YOY typically preyed on other YOY rockfishes, surfperches (Embiotocidae), jack mackerel (*Trachurus symetricus*) and other small inshore species, and that such patterns of piscivory are retained throughout their life.[3]

[3]Juvenile rockfish appear to dominate the prey spectrum of juvenile bocaccio, as the original food habits notes of Phillips report that *Sebastes jordani, S. goodei, S. mystinus* and other species represented more than 60% of all prey, while the *Sebastes* genus, primarily *S. jordani*, represented 40% of the prey of adult *S. paucispinis.* Access to Phillip's original notes was graciously provided by Tim Thomas of the Monterey Maritime Museum.

**Stock assessment results**

The most recent bocaccio assessment was adopted as the scientific basis for management actions by the PFMC in September 2009 (Field et al. 2009). The resulting abundance trends and recruitment estimates were highly consistent with previous assessments (MacCall 2003; MacCall 2007), although changes in the estimated catch history resulted in a generally more optimistic perception of the stock status and productivity. The modeling framework used in this assessment (and most other West Coast groundfish assessments) is the age structured model Stock Synthesis III (Methot 2009a, 2009b). The model treats a cohort, or year class, as a collection of fish whose size-at-age is characterized by a mean and a variance, such that the numbers at age are distributed across defined length bins. Several sources of both fishery-dependent (catch per unit effort data) and fishery independent (surveys of larval abundance, trawl surveys, and juvenile abundance indices) information are available for this species, and there are hundreds of thousands of length observations across various fisheries and surveys which inform population structure and estimates of recruitment. In order to evaluate the performance of the recruitment indices independently from their effect in the assessment model, the adopted stock assessment model was re-run with the recruitment indices removed. This is done to avoid contaminating the estimated "true" recruitment time series,[4] based exclusively on fishery and survey abundance and length frequency data, to recruitment indices derived solely from the suite of juvenile (age-0) abundance data explored in this manuscript.

**Juvenile abundance data**

We evaluate four sources of juvenile abundance data for consideration as indices of impending recruitment for bocaccio assessment and management. The first is an index of pelagic juvenile abundance based on data from a standardized midwater trawl survey specifically designed to estimate the abundance of pelagic juvenile rockfishes, and to develop indices of year-class strength for use in groundfish stock assessments (Ralston and Howard 1995). The remaining three indices reflect a slightly later life history stage for YOY rockfish, as settling or recently settled juveniles from power plant impingement studies, recreational pier fisheries, and submersible (*in situ*) surveys of fish abundance at both oil platforms and natural reef habitats in the Southern California Bight. We develop these data sources into relative recruitment indices, and subsequently contrast them with the recruitment estimates from the statistical catch-at-age model in order evaluate their performance in early detection of recruitment events. Each of these four datasets represents a different region of the range of the population of bocaccio subpopulation (fig. 2), although most of the data overlap spatially. Although the southern subpopulation is currently considered to range from the U.S./Mexico border to Cape Blanco, Oregon, recruitment of YOY bocaccio is rarely observed north of 38°N, the approximate northern boundary of the midwater trawl survey. Recruits are rarely observed between this region and the apparent center of the northern subpopulation off of Vancouver Island, Canada.

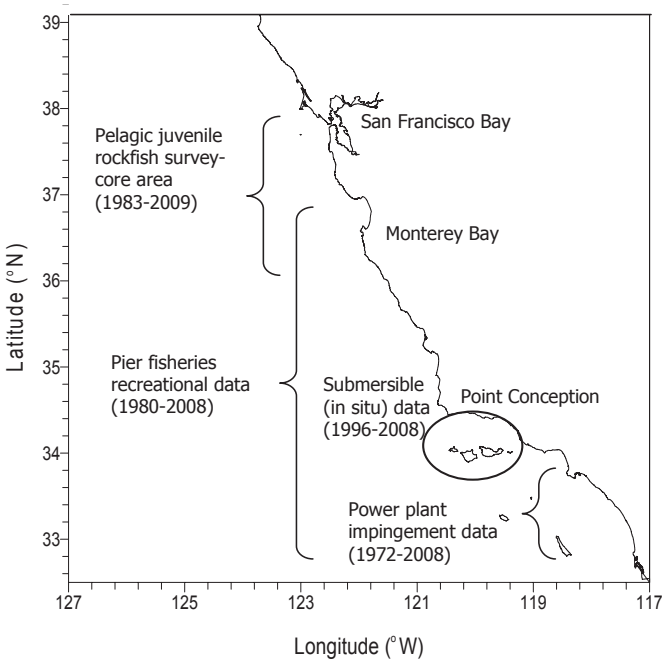



Figure 2. Spatial distribution of the four sources of data on juvenile abundance used to develop recruitment indices.

The midwater trawl survey samples YOY rockfish when they are ~100 days old, an ontogenetic stage that occurs after year-class strength is established from the larval stage, but well before cohorts recruit to commercial and recreational fisheries. This survey has encountered strong interannual variability in the abundance of the rockfishes that are routinely indexed, as well as high apparent synchrony in abundance among the ten most frequently encountered species. This synchronicity appears to be related to physical climate indicators (S. Ralston and J. Field, unpublished data). Several past assessments have used this survey as an index of year-class strength, including assessments for widow rockfish (*Sebastes entomelas*, He et al. 2005), Pacific hake (*Mer-*

[4]In most age structured stock assessment models, annual recruitment estimates are estimated with parameters that represent lognormally distributed deviations around the "expected" recruitment based on the spawner recruit relationship (Maunder and Deriso 2003, Methot 2009). The standard deviation of these parameters, $\sigma_R$, defines the magnitude of recruitment variability. For bocaccio this value is fixed at 1 and estimated to be (effectively) slightly greater (1.1).

*luccius productus,* Helser et al. 2006[5]), shortbelly rockfish (*S. jordani*, Field et al. 2007) and chilipepper rockfish (*S. goodei*, Field 2008). The midwater trawl survey has taken place during May–June every year since 1983, with a historical range (1983–2003) between 36°30' to 38°20' N latitude (approximately Carmel to just north of Point Reyes, CA). Beginning in 2004, the spatial coverage expanded to effectively cover a broader range of the California Current, from Cape Mendocino in the north to the U.S./Mexico border in the south (Sakuma et al. 2006). Although the expanded survey frame is considered to be a more appropriate index for use in stock assessments[6], the time series of the expanded survey is thus far insufficient to accurately assess performance relative to the time series from the core area. Consequently, we focus on the long-term data for this evaluation, in order to address the long-term performance of the index. The survey index is calculated after the raw catch data are adjusted to a common age of 100 days to account for interannual differences in age structure (Ralston and Howard 1995).

The power plant impingement index represents data collected from coastal cooling water intakes at five Southern California electrical generating stations from 1972 to 2008 (and ongoing). These data have been previously described and published by Love et al. (1998) and Miller et al. (2009) with respect to trends in abundance of *Sebastes* species and queenfish (*Seriphus politus*), respectively (See either of these manuscripts for additional information, and the precise location of the facilities). The dataset includes observations on over 13 million fish encountered in three basic types of power plant impingement surveys (E. Miller unpublished data). The three principle "types" of survey data include fish sampled off of intake screens during normal operations (typically over a 24 hour period, however we aggregated normal operations data by month for any given plant), fish abundances estimated during heat treatments (a periodic event in which a given volume of water is treated at high temperatures to kill off biofouling organisms [mussels, barnacles, etc.; Graham et al. 1977], and all fishes are subsequently enumerated), and a third set of impingement survey data that are unique to the San Onofre power plant but were not used in this analysis due to the low frequency of occurrence of bocaccio in those data (Miller et al. 2009). Fish are identified to the lowest possible taxon, and standardized length measurements are obtained for all species. The frequency of all of these sampling methods is irregular, as a result of changes in operating schedules, regulatory requirements and changes in ownership over time, however the time series is uninterrupted at the annual scale from 1972–2008.

Recreational fisheries catch, and often target, bocaccio of all sizes throughout their range, including high catches of YOY bocaccio in pier fisheries in central and southern California during good recruitment years. Since 1980 (but excluding 1990–1992), these pier fisheries have been sampled, first by the Marine Recreational Fisheries Statistics Survey (MRFSS) and then by the California Recreational Fisheries Survey (CRFS), with data analyzed and made available on the RecFIN internet site. The stock assessment also incorporated data from studies in the 1950s and 1960s that were insightful with respect to several large historical recruitment events.[7] Catches of bocaccio typically take place during infrequent strong recruitment years from San Mateo county (south of the entrance to San Francisco Bay) through Ventura county (somewhat north of Palos Verdes peninsula in the Southern California Bight), with the highest catch rates being observed in San Luis Obispo county. Juveniles were rarely observed at piers south of Los Angeles County, and in analyzing spatial patterns of recruitment, MacCall (2003) concluded that there was no evidence of separate recruitment events north and south of Point Conception in these data. For this analysis, RecFIN records of bocaccio catch per angler hour were summarized by years, 2-month sampling periods ("waves," using only waves 3, 4 and 5, corresponding to data from May through October, as bocaccio catches in other waves were very infrequent), and counties, such that each combination constitutes a single record.

In southern California, settling juvenile bocaccio recruit to a variety of habitats, including both natural reefs and oil platforms, often in large numbers during strong recruitment years. Observational data collected from submersible (*in situ*) surveys have been used to assess the abundance of rockfish and other species on both natural reefs and oil platforms to develop absolute abundance indices for other species of rockfishes (e.g., Love et al. 2005; Yoklavich et al. 2007) and to characterize assemblages of rockfish communities (Love et al. 2009); details of the survey methods and results can be found in those publications. Over the course of these

[5]The index evolved to a coastwide index following the 2006 assessment, but has not been used on the most recent assessment (Hamel and Stewart 2009), although it continues to be reported in the assessment documentation.

[6]See discussion in J. Hastie and S. Ralston, 2006, "Summary Report of Pre-Recruit Survey Workshop, September 13-15, 2006, Southwest Fisheries Science Center Santa Cruz, California," prepared for the PFMC (reported in April 2007 in the NWFSC Supplemental Science Report, Agenda Item E.1.b) and available online at http://www.pcouncil.org/bb/2007/0407/E1b_NWFSC3_sup.pdf.

[7]URL for recfin: http://www.recfin.org/data.htm. Historical data are from Miller and Gotschall (1965), who reported large numbers of YOY bocaccio in piers throughout central California in 1956 and 1957; an event also observed by one of the coauthors (M. Love). Large numbers of bocaccio were also observed in pier fisheries in the Central California region during the fall of 1966, for which bocaccio accounted for 26% of the 1.3 million fish estimated to have been caught in pier fisheries in that year (Miller and Odemar 1968).

surveys, bocaccio catches have been shown to be very patchily distributed, with the highest catch (observation) rates at oil platforms relative to natural reef habitats (Love et al. 2006). For all of the submersible data, we obtained dive-specific "catch" (observation) rates, which were standardized to reflect observations per 100 square meters. Only bocaccio smaller than 30 cm were included in developing the catch rate index.

All of the recruitment indices were developed using a Delta-GLM (generalized linear model) approach, consistent with the approach used in past assessments (MacCall 2003; Field et al. 2009). The Delta-GLM approach combines a binomial model for presence/absence information with a model of catch per unit effort for positive observations (Stefansson 1996, Maunder and Punt 2004). Akaike's Information Criterion (AIC) was used to determine the appropriate error distributions and to assess the most parsimonious model with respect to the number of covariates (Dick 2004). Year effects are independently estimated covariates which reflect a relative index of abundance for each year, error estimates for these parameters are developed with a jackknife routine. Seasonal (or temporal) effects are estimated using month, two-month periods, or season as covariates depending upon the resolution of the original data. For the midwater trawl survey, which takes place over an approximate 50 day period in May and June, bins of 10 Julian day periods are used, while two month periods ("waves") were used for the recreational pier fisheries data, one month periods were used for the impingement data, and no temporal effects were used for the submersible data (which only takes place during weather windows in late fall). Similarly, spatial effects are described by spatial covariates, represented by individual trawl stations for the midwater trawl survey data, counties for the recreational pier fishery data, individual power plants for the impingement data, and habitat types (oil rig base, oil rig midwater, and natural reef) as well as depth for the submersible data. For the impingement data, "survey type" was also included as a factor, with only two types estimated, these being the "normal operations" and "heat treatment" types described previously.

The resulting recruitment indices were compared to the estimated recruitments from the stock assessment. The natural logarithm of both the predictor (indices) and response (assessment recruits) values were used for the regression, to best mimic the behavior of stock assessment models which perform maximum likelihood parameter estimations (Maunder and Punt 2004, Methot 2009). In addition to comparing the results of the recruitment indices to the results of the assessment, we evaluate the extent to which the recruitment indices improve the predictive ability of the stock assessment model. This is done by retrospectively estimating the magnitude and confidence in estimates of one of the strongest recruitment events in recent years, the 1999 year class, when data are sequentially removed from the model going backwards in time. By sequentially removing entire years of data for two models with and without the recruitment indices we can compare both the absolute recruitment estimates and the confidence in those estimates. The estimated precision of the absolute values of annual recruitment are provided by the asymptotic approximation used in the stock synthesis model (Methot 2009a, b). This allows us to better evaluate how well the recruitment indices may, or may not, perform with respect to predicting strong incoming year classes of bocaccio.

## RESULTS

The bocaccio stock assessment model that was re-run without the recruitment indices suggested a biomass trend and recruitment estimates nearly identical to those from the adopted assessment model (fig. 3). As with bocaccio assessments done over the past 10 years, the results indicate that the spawning output (a reflection of the spawning biomass, accounting for the greater fecundity of larger fish) fluctuated significantly through the 1960s and 1970s, peaking near 1970 and declined rapidly through the rest of the 1980s and 1990s. These declines were primarily a result of high exploitation rates, although a period of anomalously poor recruitment appears to have taken place throughout most of the 1990s. The estimated recruitment time series illustrates that recruitment has a high degree of interannual variability, but that the relative size of the strong recruitment events have declined in concert with the decline of spawning output through the year 2000. Since that time, fishing mortality has declined markedly due to severe management restrictions, and the stock has been increasing at a fairly rapid rate coincident with a series of several relatively strong year classes (1999, 2003, 2005). Note that the differences in the magnitude of recruitment events in the late 1950s and early 1960s, shown in Figure 3, results from exclusion of the recreational pier fishery time series in the model used for evaluating the performance of recruitment indices, as there were a mix of qualitative and quantitative data used in the full assessment.

For all of the models, several alternative model structures were explored and evaluated using AIC, and the most parsimonious model (explaining the greatest amount of relative variance with the lowest number of parameters) was used. Similarly, for each of the recruitment data sources, the year effects from the delta-GLM models led to an improvement in the AIC, indicating that the year effects provided information potentially usable as a recruitment index. We provide a summary

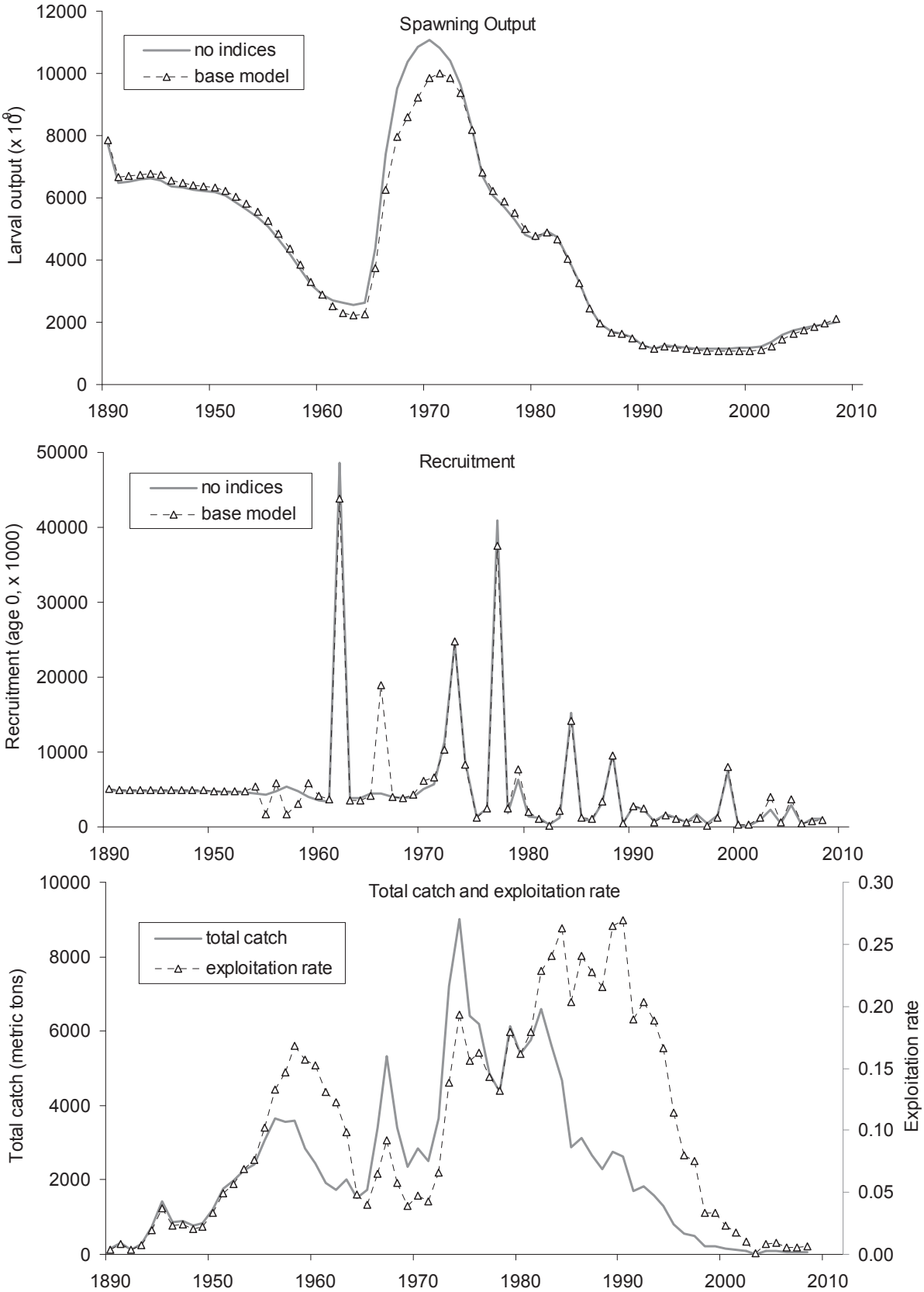



Figure 3. Estimated reproductive potential (spawning output) and recruitment of bocaccio from the base 2009 model (dashed lines) relative to the same model in which all juvenile indices are removed (solid lines), to avoid confounding the performance of the various indices.

TABLE 1
**Summary of data availability, the number of parameter estimated, and GLM model performance for the four recruitment indices.**

| | Pelagic trawl | Recreational Pier | Power Plant Impingement | Delta Submersible |
|---|---|---|---|---|
| Time period | 1983–2008 | 1980–2008 | 1972–2008 | 1995–2008 |
| Number of years* | 17 | 19 | 31 | 13 |
| Temporal parameters | 6 | 0 | 12 | 0 |
| Spatial parameters | 34 | 6 | 6 | 7 |
| Data points | 2225 | 312 | 2628 | 914 |
| Coefficients of variation | | | | |
| average | 0.56 | 0.73 | 0.60 | 0.41 |
| maximum | 0.87 | 1.11 | 0.83 | 0.63 |
| minimum | 0.34 | 0.40 | 0.37 | 0.30 |
| Change to AIC | | | | |
| Remove year | | | | |
| binomial | 123.3 | 0.2 | 36.7 | 6.4 |
| positive | 75.4 | 3.9 | 78.2 | 5.0 |
| Remove spatial | | | | |
| binomial | 18.9 | 45.6 | 25.5 | 41.3 |
| positive | –9.0 | 66.2 | –5.7 | 87.6 |
| Remove temporal | | | | |
| binomial | 0.5 | n/a | 5.8 | n/a |
| positive | 7.6 | n/a | 14.3 | n/a |
| Null model | | | | |
| binomial | 142.7 | 66.2 | 71.6 | 51.3 |
| positive | 93.1 | 49.6 | 167.4 | 92.8 |

of available data for each index, listing the time period for which data are available, the number of observations, the number of covariates used in the GLM, and both the null and final model AIC (tab. 1). The mean, and range, of the estimated coefficients of variation that result from the jackknife routine are also reported in this table. We focus subsequent discussion on the year effects (covariates) for each model, although the intra-annual (seasonal) and spatial covariates are also relevant.

All four of the resulting indices tracked most of the strong recruitment events estimated from the assessment model (fig. 4a-d). All of the indices were significantly correlated to the assessment estimates of recruitment (at the $p<0.05$ level), with coefficients of determination ($R^2$) values ranging from 0.28 for the pier fishery index to 0.58 for the power plant impingement data, with the juvenile trawl survey and submersible survey having coefficients of 0.35 and 0.41 respectively. One particular challenge with this type of model is how to deal with missing data. Many indices have years with insufficient numbers of positive observations to estimate a year effect (generally speaking, two positive observations in a given year are necessary), despite having fairly comprehensive sampling coverage (and data) overall. For the correlations shown here, those years have been dropped, although one approach to including that information is to use some fraction of the minimum estimated value for years with insufficient numbers of positive observations (for example, half). This is consistent with the practice frequently used in stock assessments. Although admittedly ad-hoc, this approach recognizes that there is information in the data regarding the relative strength of a given year class when data are collected and no juveniles are observed (the year class is presumably weak in such circumstances, although differences in sampling intensity are also relevant). The juvenile trawl survey index, the pier fishery index and the impingement survey index have eight, ten, and five years that meet this criteria respectively (there are no years of submersible data with this problem); if half of the minimum estimated values are used for these years and added to the regressions, the resulting $R^2$ values are 0.21, 0.45 and 0.46 respectively. Thus, the information content of the juvenile survey and the impingement survey are slightly degraded, that of the pier fishery is slightly improved, if this approach is adopted.

Another challenge is how to address the problem of errors in variables (EIV). In ordinary regression models, the independent variables are assumed to be measured without error, such that all error is a function of the dependent variable. This issue has a deep history in fisheries science and in the fisheries literature (Ricker 1975, Hilborn and Walters 1992), a comprehensive review of which is beyond the scope of this manuscript, but it is worth noting that the issue remains generally unresolved (Kimura 2000). We explored several approaches to addressing the issue, ultimately settling upon reporting both the "standard" linear regression relationship and the geometric mean estimate of the functional regression (GM regression; Ricker 1975), both of which are presented in Figure 4. Note that the coefficients of variation are unchanged among the two models, it is

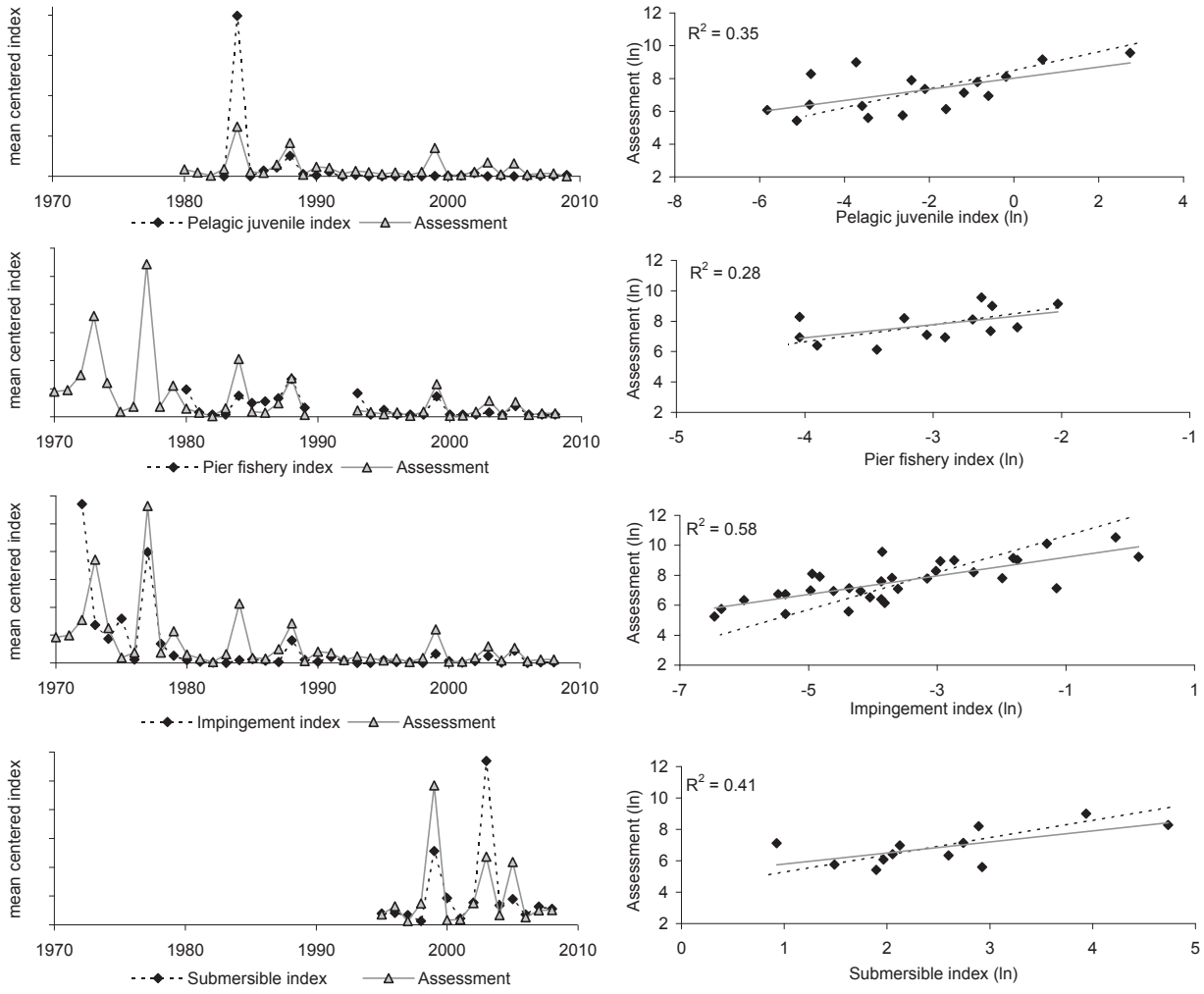



Figure 4. Mean-centered estimates of recruitment from the base stock assessment model (absent recruitment index data) relative to mean-centered indices of juvenile abundance from the data sources reported here (left panels). Corresponding regression results for each index (right panels), with both ordinary least squares regression (solid grey line) and geometric mean regression (dotted black line).

only the slope and intercept parameters that differ, and neither of these parameters are utilized further for the purposes of this manuscript.

While the recreational pier fishery index has a relatively modest correlation to assessment estimates of recruitment, this index does capture the magnitude of the 1984, 1988 and importantly the 1999 year class. The midwater trawl survey was among the noisier of indices ($R^2 = 0.35$), although this index captured the magnitude of the 1984 and (perhaps to a lesser extent) the 1988 year classes, there have been very few bocaccio juveniles observed in the catches since that time. Consequently, this index did not detect the strong year classes observed in 1999, 2003 and 2005, which may be an artifact of changes in the relative distribution of spawning biomass (and subsequent recruitment) over recent years. In fact, the failure of the juvenile survey to capture the magnitude of the 1999 year class for bocaccio or any other species contributed to the decision to expand the geographic range of the juvenile rockfish survey, under the assumption that expanding the survey accross space would lead to more effective predictions of coastwide recruitment events (Sakuma et al. 2006). The power plant impingement index also compares favorably with the stock assessment estimates of recruitment ($R^2 = 0.58$), and as the only index that precedes the 1980s it is reassuring to observe that the index does particularly well with respect to capturing the magnitude of the 1973, 1977 and 1988 year classes. This index also captures apparently strong recruitment in 2005 and 2007, which are now showing up in fishery data. Interestingly, this index appears to miss the magnitude of the 1984 and 1999 year classes, although it does recognize some recruitment in both of those years. Finally, although it is the shortest of the time series evaluated here, the submersible index also performs fairly

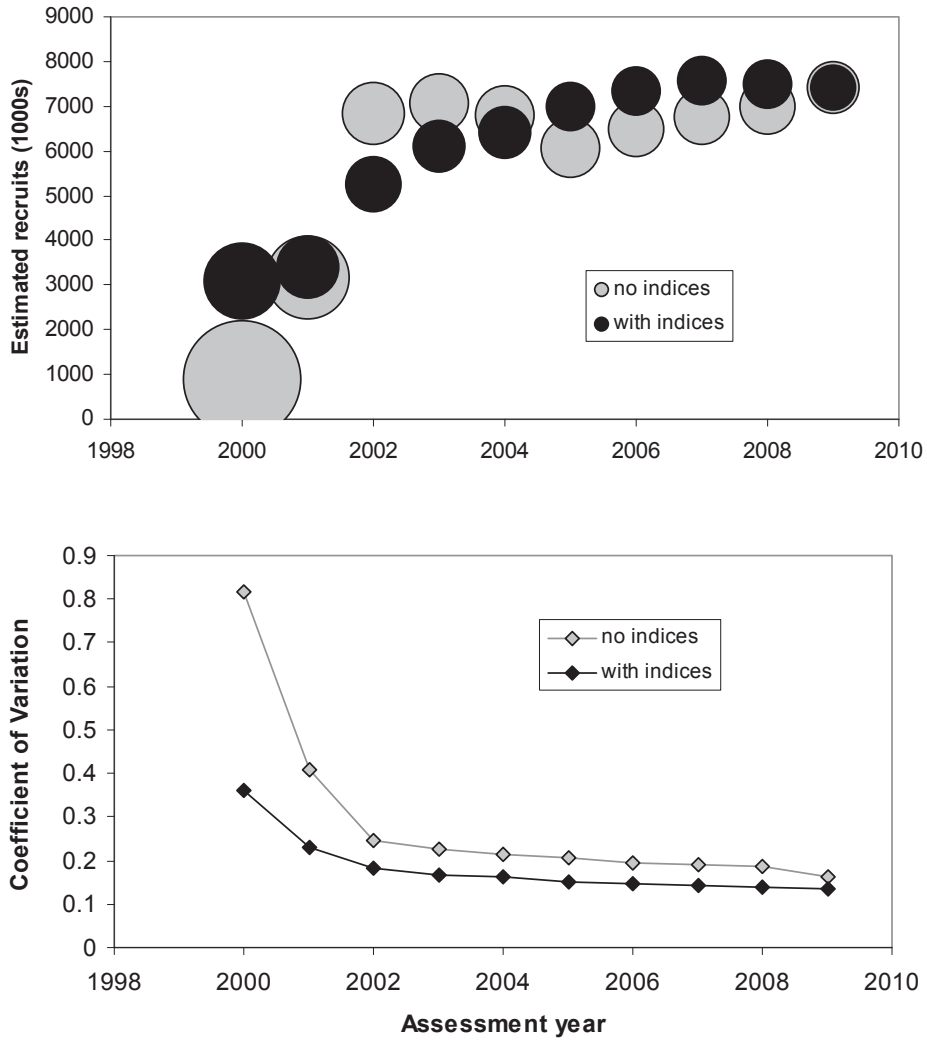



Figure 5a (top). Relative information content of the 1999 recruitment from retrospective bocaccio assessment models with (black) and without (grey) the juvenile indices developed in this manuscruipt. Size of bubbles corresponds to the CV of the estimates, which are also shown in Figure 5b (bottom).

well in capturing the magnitude of large year classes ($R^2 = 0.41$), although it overestimates the 2003 and underestimates the 1999 year class.

The comparison of estimates of the magnitude of the 1999 year class with retrospective model runs with and without all of the recruitment indices is shown (fig. 5a), along with the estimates of the CV of that recruitment point estimate in subsequent years. Here, we can see that the information content of informative indices is limited to the first 1–2 years before fish show up in fishery and survey data. For example, an assessment done in 2000 using data through 1999 would predict considerably greater recruitment with the recruitment indices than without them, due to the limited information available on that cohort available in length frequency data and the statistical "penalties" imposed on data with low information content in the model (thus the first two years represent primarily a recruitment estimation drawn from the spawner recruit curve), with considerably greater confidence (CV of 0.38 versus 0.85). However, by 2001 fishery-based length frequency data for bocaccio have already demonstrated the presence of the 1999 year class, and although the recruitment indices lead to a smaller variance estimate of that year class strength, the magnitude is generally well established based on simply the recreational fishery length composition data alone. As this example includes all of the recruitment indices in the model simultaneously, which would not necessarily be an optimal approach in a typical assessment, the difference among the estimated recruitments after the second year is negligible. That these recruitment events appear so strongly defined so early in the fishery reflects the unique life history of bocaccio, which grow very rapidly and are encountered by sport fisheries in particular at very young ages, whereas other *Sebastes* species are typically not vulner-

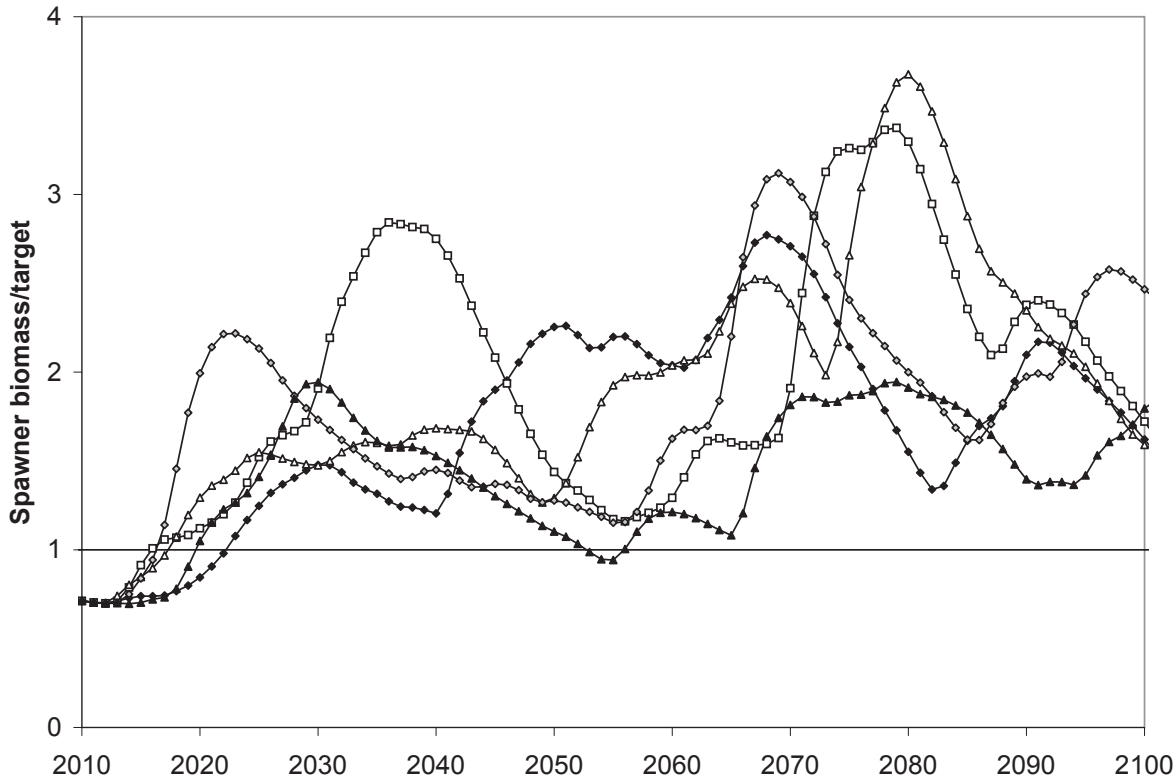



Figure 6. Five example trajectories, of the thousands simulated in the rebuilding analysis for bocaccio rockfish, illustrating the significance of highly variable recruitment events on population trends (harvest rates are constant set to current level in all scenarios). These individual trajectories are used to assess the probability of rebuilding by management targets.

able to fisheries until individuals reach ages of 3–10 years. For such slower-growing species, recruitment indices would be more useful in assessing abundance and productivity in the long term. For bocaccio, the period in which recruitment indices are useful in forecasting productivity is relatively brief (one to two years), although given the significance of changing bocaccio bycatch rates on other fisheries, improved forecasting of such recruitment events is still of great importance to resource management activities.

## DISCUSSION

The southern bocaccio population is fortunate to have multiple sources of informative data that can provide estimates of the magnitude of recruitment events. As such, bocaccio are a good case study for evaluating the effectiveness of pre-recruit indices for West Coast groundfish, particularly as the correlation coefficients from this evaluation are comparable to or considerably greater than the correlations between the spawner recruit curve and subsequent recruitments. Currently, only two of these indices (the midwater trawl survey, albeit an index based on greater spatial resolution and shorter duration, and the recreational pier fishery index) are used are used in the stock assessment. Both of the other indices described here hold considerable potential for future assessments, and should be evaluated accordingly in the future. Moreover, the performance of most these indices is consistent with what DeOliveira and Butterworth (2005) describe as a reasonable threshold for the application of indicators (albeit, environmental indicators in their case) for improving stock assessment models, for which indicators should be able to explain approximately 50% or more of the total variation in recruitment.

Moreover, the data from these recruitment indices could provide insights into the physical and biological conditions that either enable or repress strong recruitment events. The high recruitment variability exhibited by this species leads to considerable uncertainty with respect to the estimated time to rebuild to target levels for this stock, as illustrated by five equally plausible trajectories of stock biomass developed as a part of a comprehensive rebuilding analysis (fig. 6, from Field and He 2009). Essentially, thousands of these individual trajectories are used to assess the probability of rebuilding by management targets, using the methods developed in Punt (2003). The rebuilding analysis also indicates that upon rebuilding to target biomass levels, the chance of returning to an overfished condition in the future remains significant if the default harvest policies are followed, simply due to the highly vari-

able nature of recruitment for this stock. Comparable results have been described for Pacific hake (*Merluccius productus*), another species with highly variable recruitment and population trajectories (Haltuch et al. 2008). Consequently, for stocks with such high variability in recruitment, such that harvest policies based on constant harvest rates may not be optimal for either ecological or socio-economic stability.

The potential for bocaccio recruitment indices to provide insights beyond just the bocaccio stock should also be explored. Several other commercially and ecologically important species have recruitment trends that covary with bocaccio rockfish, including chilipepper and Pacific hake. There is also some synchrony in recruitment variability of other species, for example nearly all of the assessed groundfish stocks on the U.S. west coast experienced good to excellent recruitment in 1999, and most also experienced strong recruitment in 1980 and 1984. Similarly, there tends to be poor recruitment during strong El Niño events, such as those 1982–83, 1986–87 and 1997–98 El Niño events (it is noteworthy to consider that many of the strongest recruitment events for West Coast groundfish have taken place in years that immediately followed these El Niño events). However, thus far the degree of synchrony in groundfish recruitment has been relatively modest; the leading principal components explain 25–45% of the variance for groundfish recruitment deviations for well-informed stocks (range reflects the subset of stocks evaluated), which is comparable to results for other regions (Mueter et al. 2007). While suggestive of some generalized response to ocean conditions, this fraction of the total variance is relatively modest in comparison to the high amount of synchrony observed in juvenile rockfish abundance in the pelagic stage, where the leading principle component explains 85% of the variance for the ten most abundant rockfish species (J. Field and S. Ralston, unpublished data). The spatial component of recruitment for shelf rockfish has also been shown to be strongly coherent over broad spatial scales (Field and Ralston 2005), although this reflects post-settlement and recruitment based primarily on fishery data and may not reflect the patchy nature of recruitment prior to dispersal. All of these observations suggest that many of the processes contributing to variable year class strength for rockfish, and perhaps other groundfish, occur at the post settlement stage, and vary considerably among species, again consistent with expectations for most marine species more generally (Ralston and Howard 1995, Houde 2008). For bocaccio, a closer evaluation of both the synchrony and the spatial structure of strong recruitment events using the different indices could lead to insights regarding the nature of the physical and biological ocean conditions that lead to strong year classes.

The geographic frame of the various indices also appears to be informative with respect to stock structure trends. The data used in the most recent assessment suggest that the stock biomass south of Point Conception appears to be rebuilding at a more rapid rate than to the north, based on the relative influence of data from these respective regions. The patterns observed in the recruitment index time series are consistent with this, in that the strong recruitment in 1984 seemed to be a "northern" recruitment event. This recruitment event was strongest in the central California data, including both the midwater trawl survey and the recreational pier fishery index (particularly Santa Cruz and San Luis Obispo counties). Since the 1990s however, the signal from the pier survey index has been dominated by San Luis Obispo and Santa Barbara Counties, and both the impingement index and the visual survey index suggest that recruitment south of Point Conception is strongly correlated with the model estimates of recruitment for the entire stock. This too is consistent with the abundance indices that suggest greater population increases in the southern part of the stock range relative to the central portion (Field et al. 2009), indicating that both recruitment and rebuilding may have a regional component.

With respect to further utility of these recruitment indicators, it may be that they are also useful for managers contemplating the duration of fishing seasons and seasonal depth restrictions. As one of several rebuilding species of rockfish on the West Coast, bocaccio is a constraining species for fisheries on healthy populations, and regulations focus on minimizing the catch of bocaccio while allowing opportunities to exploit more productive stocks. Thus, effective forecasting catches of this constraining species is key for maintaining fishing opportunities, while avoiding the chance of exceeding the allowable catch of bocaccio. Given the dramatic spikes in both catch rates and the percentage of the total southern California rockfish catch that is bocaccio following strong recruitment events (fig. 7)[8], improved predictions of future catch rates of constraining species could be of considerable value not only in assessments that include future year projections, but in year-to-year management activities as well. The latter point may be particularly true in a management regime in which the bocaccio stock assessment is performed every two years at most, and with a greater lag between the data and the time period in which the results are applied to management, making "fine tuning" of management measures

[8]There are statistically significant relationships among these variables, the $R^2$ between the assessment recruitment and a one-year lagged change in the percentage of all southern California rockfish (with an arcsine transform to account for proportionality) is 0.34, while the $R^2$ between recruits and one year lagged catch per angler hour is 0.35. However, a linear regression may be too simplistic, as both relationships show signs of non-linearity.

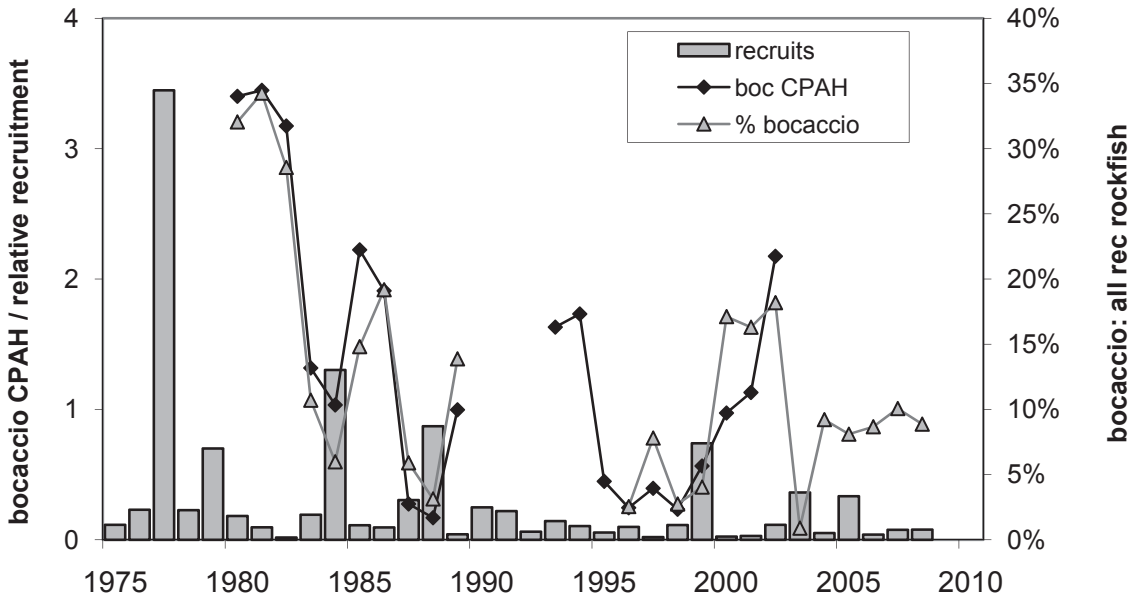



Figure 7. Estimated annual recruitment (grey bars) relative to Southern California recreational fishery catch rates (catch per angler hour, black line) and to the percentage of the total recreational catch represented by bocaccio (grey line).

in response to changing conditions even more important. In such a scenario, integrating all of the indices into a single indicator of impending recruitment, using principle components analysis or comparable means, might be more useful for management with respect to predicting spikes in bocaccio catches in recreational fisheries.

We have shown that there are several sources of information that could improve the prediction of strong year classes in stock assessment of bocaccio. Such information is useful to assessing stock status and productivity, to tracking rebuilding success, and likely to improving real time management of commercial and recreational fisheries that routinely encounter large numbers of young bocaccio during strong recruitment events. Additionally, these data could be informative with respect to recruitment trends for species of groundfish that tend to covary with bocaccio, and could ultimately lead to an improved understanding of the oceanographic processes that drive variable recruitment. In the long term, such information should aid both scientists and managers, by improving the ability to monitor and respond to the variable abundance and catch rates of bocaccio, as well as by leading to a greater appreciation for the connectivity between environmental changes in coastal ecosystems and fisheries productivity.

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# Status update of the U.S. canary rockfish resource in 2011

John R. Wallace
Jason M. Cope
National Marine Fisheries Service
Northwest Fisheries Science Center
2725 Montlake Blvd. E.
Seattle WA, 98112
206-860-3456 (phone)
206-860-6792 (fax)
John.Wallace@noaa.gov

## Table of Contents


Executive Summary ..... 4
Stock ..... 4
Catches ..... 4
Data and Assessment ..... 5
Stock biomass ..... 6
Recruitment ..... 7
Reference points ..... 9
Exploitation status ..... 9
Management performance ..... 12
Unresolved problems and major uncertainties ..... 13
Forecasts ..... 13
Decision table ..... 14
Research and data needs ..... 15
Rebuilding projections ..... 17
1. Introduction ..... 21
1.1 Distribution and Stock Structure ..... 21
1.2 Life history and ecosystem interactions ..... 21
1.3 Historical and Current Fishery ..... 22
1.4 Management History and performance ..... 22
1.5 Fisheries in Canada and Alaska ..... 22
2. Assessment ..... 22
2.1 Fishery Independent Data ..... 23
*2.1.1 NWFSC trawl survey* ..... 23
*2.1.2 Triennial trawl survey* ..... 24
*2.1.3 Pre-recruit survey* ..... 24
*2.1.4 Canadian survey data* ..... 24
*2.1.5 Other fishery independent data* ..... 24
2.2 Biological Data ..... 25
*2.2.1 Weight-Length* ..... 25
*2.2.2 Maturity and fecundity* ..... 25
*2.2.3 Natural Mortality* ..... 25
*2.2.4 Ageing Precision and Bias* ..... 25
*2.2.5 Research removals* ..... 25
2.3 Fishery Dependent Data ..... 25
*2.3.1 Historical Catch Reconstruction* ..... 25
*2.3.2 Recent Landings (1981 to present)* ..... 25
*2.3.3 Discards* ..... 26
*2.3.4 Recreational Fishery* ..... 27
*2.3.5 Foreign Catches* ..... 27
*2.3.6 Fishery Logbooks* ..... 27
*2.3.7 Fishery Biological Sampling* ..... 28
2.4 History of Modeling Approaches ..... 28
*2.4.1 Previous assessments* ..... 28
*2.4.2 Pre-assessment workshop, GAP and GMT input* ..... 28
*2.4.3 Response to the review panel recommendations in 2007* ..... 28

2.5 Model Description ..... 29
*2.5.1 Link from the 2007 to the updated assessment model* ..... 29
*2.5.2 Summary of data for fleets and areas* ..... 30
*2.5.3 Modeling software* ..... 30
*2.5.4 Sample Weighting* ..... 30
*2.5.5 Priors* ..... 31
*2.5.6 General model specifications* ..... 31
*2.5.7 Estimated and fixed parameters* ..... 32
2.6 Model Selection and Evaluation ..... 33
*2.6.1 Key assumptions and structural choices* ..... 33
*2.6.2 Alternate models explored* ..... 33
*2.6.3 Convergence status* ..... 33
2.7 Response to SSC recommendations ..... 33
2.8 Base-case model results ..... 34
2.9 Uncertainty and Sensitivity Analysis ..... 35
*2.9.1 Sensitivity analysis* ..... 35
*2.9.2 Likelihood profiles* ..... 36
3. Rebuilding parameters ..... 36
4. Reference points ..... 36
5. Harvest projections and decision tables ..... 36
6. Regional management considerations ..... 37
7. Research needs ..... 37
8. Acknowledgements ..... 38
9. Literature cited ..... 39
10. Tables ..... 41
11. Figures ..... 57
12. Appendix A: Fits to fishery length and age data ..... 88
13. Appendix B: SS Data file ..... 115
14. Appendix C: SS Control file ..... 251
15. Appendix D: SS Starter file ..... 274
16. Appendix E: SS Forecast file ..... 273**Error! Bookmark not defined.**

## Executive Summary

*Stock*

This updated assessment reports the status of the canary rockfish (*Sebastes pinniger*) resource off the coast of the United States from southern California to the U.S.-Canadian border using data through 2010. As in 2007 and 2009, the resource is modeled as a single stock.

*Catches*

Inclusion of reconstructed landings for California's commercial fishery in the 2009 assessment resulted in a substantial reduction, from 2007, in the amount of pre-1981 canary catch included in the modeling (Figure a). Since 2009, reconstruction of Oregon's commercial landings prior to 1986 has been completed, and those data are included in this updated assessment. The revised Oregon landings are higher inmost years between 1941 and 1986. The net result of this revision is that the total estimated catch, from 1916 to 1986, is 36.5% higher than in 2009, and only 4.3% lower than in 2007.

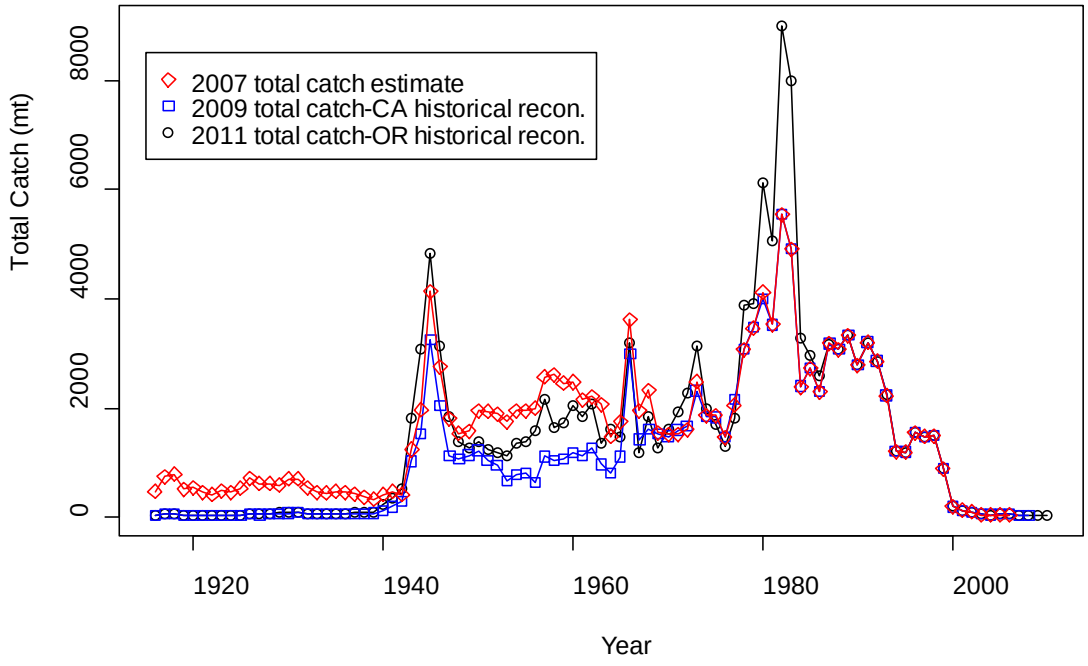



Figure a. Comparison of 1916-current, total canary catch time series used in assessments conducted in 2007, 2009 (including the reconstruction of California landings), and in 2011 (including the recent reconstruction of Oregon landings).

Recent canary rockfish catches were revised based on current total mortality estimates (2002-2009) and the GMT scorecard (2010). Where only aggregated catches

were available, these were pro-rated to modeled fleets as was done in the 2007 and 2009 assessments.

Table a. Recent canary rockfish catches (mt).

| Year | Commercial trawl | Commercial non-trawl | At-sea whiting bycatch | Recreational | Research |
|---|---|---|---|---|---|
| 2001 | 63.09 | 17.58 | 4.05 | 46.71 | 1.61 |
| 2002 | 65.46 | 3.90 | 5.24 | 17.34 | 0.13 |
| 2003 | 23.78 | 0.76 | 0.93 | 30.21 | 1.08 |
| 2004 | 12.92 | 9.77 | 5.22 | 16.35 | 2.24 |
| 2005 | 35.47 | 4.47 | 1.44 | 10.31 | 4.54 |
| 2006 | 24.70 | 6.52 | 1.09 | 22.01 | 7.78 |
| 2007 | 16.92 | 6.62 | 2.00 | 14.69 | 2.50 |
| 2008 | 14.97 | 6.39 | 5.96 | 10.28 | 2.90 |
| 2009 | 8.91 | 7.76 | 5.05 | 18.87 | 0.50 |
| 2010 | 15.90 | 10.30 | 5.22 | 16.11 | 1.82 |

*Data and Assessment*

This updated assessment used the newest version of Stock Synthesis available (3.21a, released 23 April 2011). Change in assessment results from 2009 due to Synthesis updates was negligible. The model data sources are unchanged, including updated catch, length- and age-frequency data from 11 fishing fleets. Biological data is derived from both port and on-board observer sampling programs. The National Marine Fisheries Service (NMFS) Northwest Fisheries Science Center (NWFSC) trawl survey relative biomass indices and biological sampling provide updated fishery independent information on relative trend and demographics of the canary stock. The Southwest Fisheries Science Center (SWFSC)/NWFSC/Pacific Whiting Conservation Cooperative (PWCC) coast-wide pre-recruit survey provides an updated indicator of recent recruitment strength. The use of time-varying selectivity (for commercial fisheries) and catchability (Triennial survey) is unchanged from the 2007 and 2009 assessments.

As in 2007 and 2009, 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 stock productivity (expressed via the steepness parameter of the stock-recruitment relationship) are presented. The base-case model (steepness = 0.51) is considered to be twice as likely as the two alternate states (steepness = 0.35, 0.72), based on the results of a 2007 meta-analysis of west coast rockfish (M. Dorn, personal communication). In order to best capture this source of uncertainty, all three states of nature will again be used as probability-weighted input to the rebuilding analysis.

*Stock biomass*

Based on the revised catch series, canary rockfish were very lightly exploited until the early 1940's, when catches increased and a decline in biomass began. The spawning biomass experienced an accelerated rate of decline during the late 1970s, and finally reached a minimum (9.7% of unexploited, below the estimate of 12% from the 2009 assessment) in the mid-1990s. Current depletion is estimated to have increased by over 50% since 2002. The canary rockfish spawning stock biomass is estimated to have been gradually increasing since that time, in response to reductions in harvest and above average recruitment in the preceding decade. However, this trend is very uncertain.

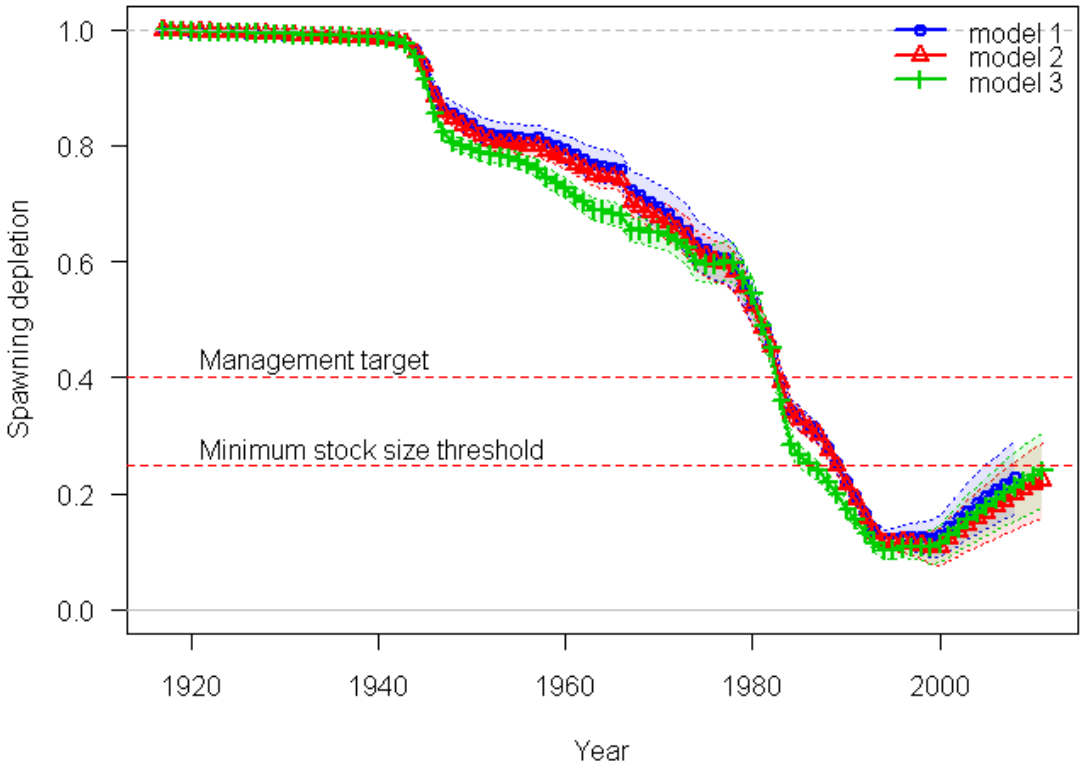



Figure b. Estimated spawning biomass time-series (1916-2008) for the 2009 assessment base-case model (model 1) with approximate asymptotic 95% confidence interval (dashed lines), the 2011 base model without the Oregon historical catch reconstruction (model 2) and the 2011 base-case model (model 3).

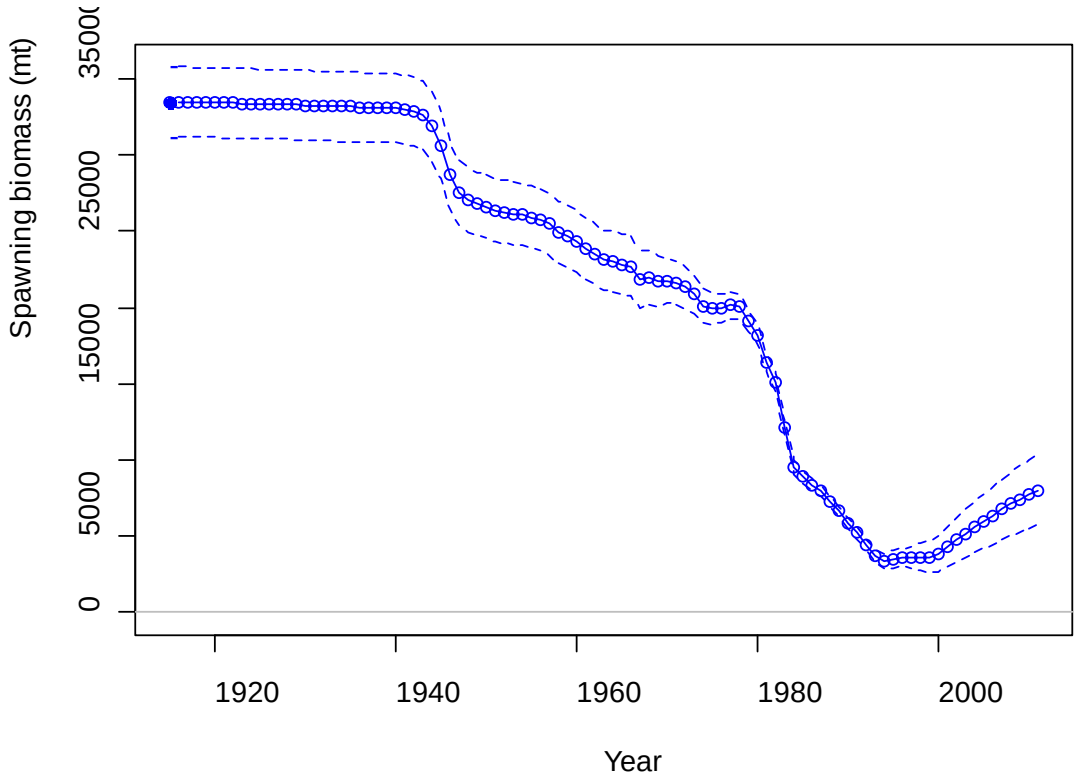



Figure c. Estimated spawning biomass time-series (1916-2011) for the base-case model (circles) with approximate asymptotic 95% confidence interval (dashed lines).

Table b. Recent trend in estimated canary rockfish spawning biomass and relative depletion level.

| Year | Spawning biomass (mt) | ~95% confidence interval | Estimated depletion | ~95% confidence interval |
|---|---|---|---|---|
| 2002 | 4756 | 3331-6180 | 14.2% | 0.10-0.18 |
| 2003 | 5198 | 3638-6757 | 15.5% | 0.11-0.20 |
| 2004 | 5608 | 3923-7293 | 16.7% | 0.12-0.21 |
| 2005 | 5999 | 4198-7799 | 17.9% | 0.13-0.23 |
| 2006 | 6385 | 4479-8290 | 19.1% | 0.14-0.24 |
| 2007 | 6752 | 4749-8756 | 20.1% | 0.15-0.26 |
| 2008 | 7111 | 5015-9206 | 21.2% | 0.15-0.27 |
| 2009 | 7456 | 5274-9637 | 22.2% | 0.16-0.28 |
| 2010 | 7772 | 5516-10029 | 23.2% | 0.17-0.29 |
| 2011 | 8036 | 5719-10353 | 24.0% | 0.18-0.30 |

*Recruitment*

The degree to which canary rockfish recruitment declined over the last 50 years is closely related to the level of productivity (stock-recruit steepness) modeled for the stock. High steepness values imply little relationship between spawning stock and recruitment,

while low steepness values indicate a strong positive correlation. After a period of above-average recruitments, recent year-class strengths (1997-2010) have generally been low, with only 2 of the 10 years (2001 and 2007) producing large estimated recruitments (the 2011 recruitment is based only on the stock-recruit function). Because of the limited number of years it has been observed, the strength of the 2007 year-class is subject to greater uncertainty than other strong recruitment events in the last 30 years. As the larger recruitments from the late 1980s and early 1990s move through the population in future projections, the effects of recent poor recruitment may tend to slow the rate of recovery.

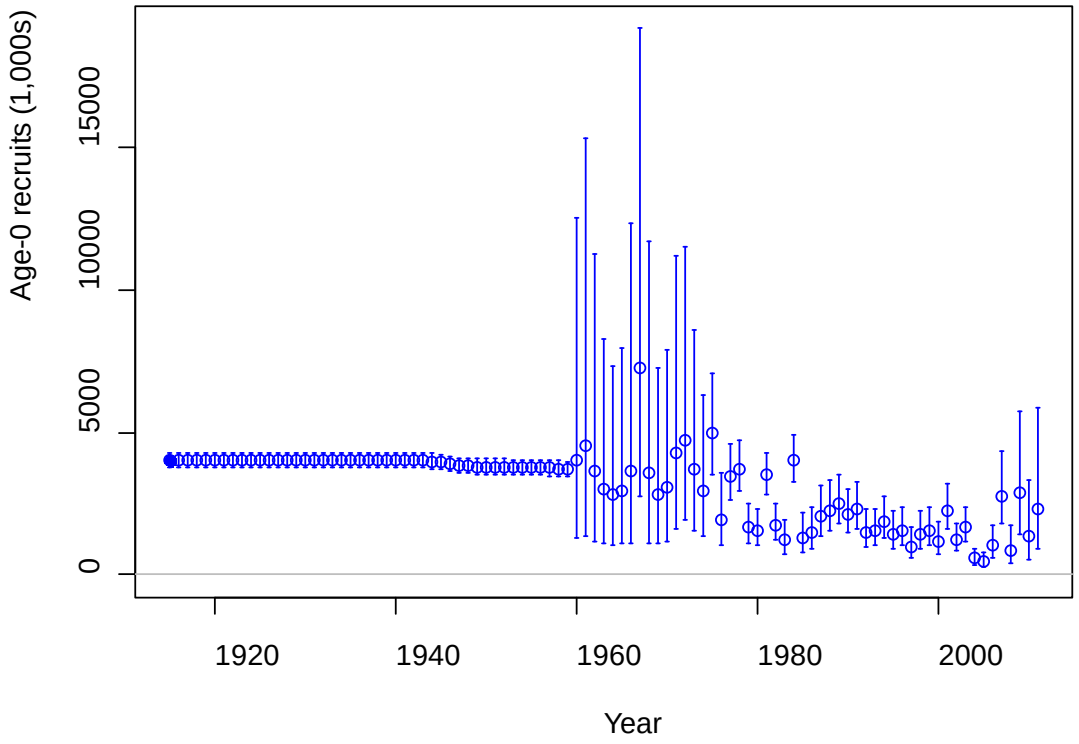



Figure d. Time series of estimated canary rockfish recruitments for the base-case model (circles) with approximate asymptotic 95% confidence interval.

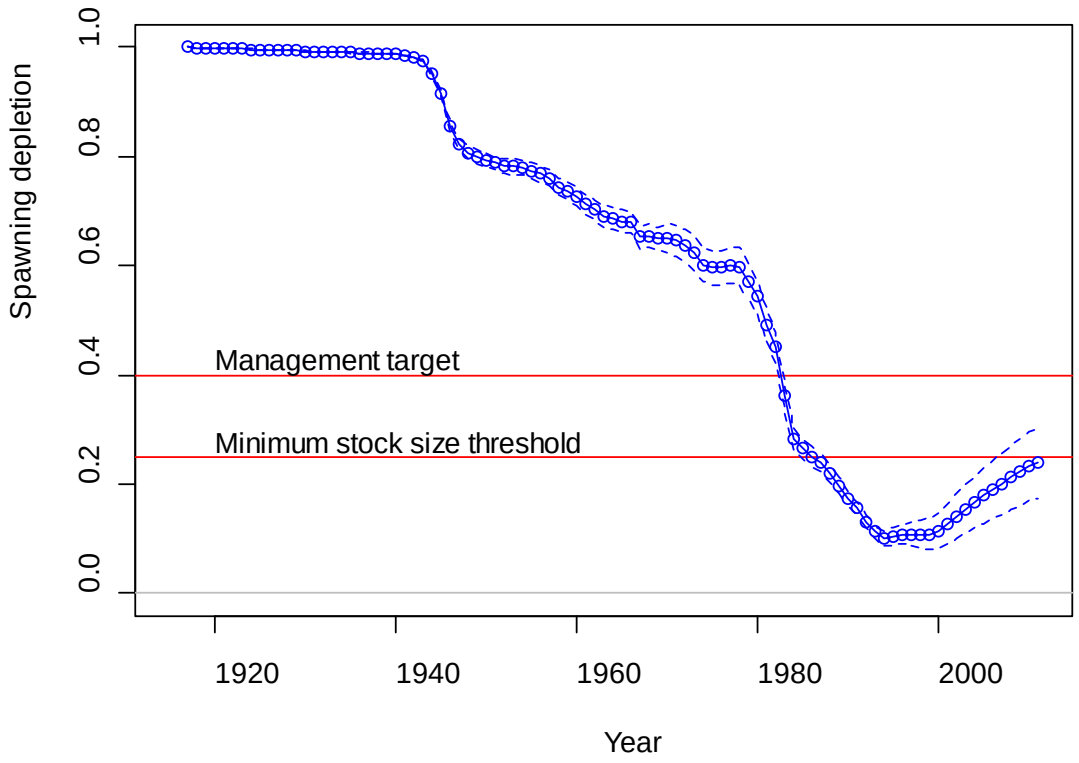



Figure e. Time series of depletion level as estimated in the base-case model (circles) with approximate asymptotic 95% confidence interval (dashed lines).

*Reference points*

Unfished spawning stock biomass, in the base-case model, was estimated to be 33,512 mt (nearly 30% higher than the 2009 estimate of 25,993, and slightly above the 2007 estimate of 32,561 mt). The target stock size ($SB_{40\%}$) is therefore 13,405 mt and the overfished threshold ($SB_{25\%}$) is 8,379 mt. Maximum sustained yield (MSY) applying current fishery selectivity and allocations (a 'bycatch-only' scenario) was estimated in the assessment model to occur at a spawning stock biomass of 12,589 mt and produce an MSY catch of 966 mt (close to the 960 mt estimate in the 2009 update). This sustainable yield is achieved at an SPR of 52.5%, nearly identical to the estimate from the 2007 assessment (52.9%). This is nearly identical to the yield, 964 mt, generated by the SPR (54.0%) that stabilizes the stock at the $SB_{40\%}$ target. The fishing mortality target/overfishing level (SPR = 50.0%) generates a yield of 961 mt at a stock size of 111,487 mt.

*Exploitation status*

The abundance of canary rockfish was estimated to have dropped below the $SB_{40\%}$ management target in 1983 and the overfished threshold in 1990. In hindsight, the spawning stock biomass passed through the target and threshold levels at a time when the annual catch was averaging more than twice the current estimate of the MSY. The stock remains slightly below the overfished threshold (unlike the 2007 estimate), although the spawning stock biomass still appears to have been steadly increasing since 1999. The

degree of increase is very sensitive to the value for steepness (state of nature), and is projected to slow as recent (and largely below average) recruitments begin to contribute to the spawning biomass. Fishing mortality rates in excess of the current F-target for rockfish of $SPR_{50\%}$ are estimated to have begun in the late 1970s and persisted through 1999. Recent management actions appear to have curtailed the rate of removal such that overfishing has not occurred since 1999, and recent SPR values are in excess of 70% (> 90% since 2003). Relative exploitation rates (catch/biomass of age-5 and older fish) are estimated to have been less than 1% since 2001. These patterns are largely insensitive to the three states of nature.

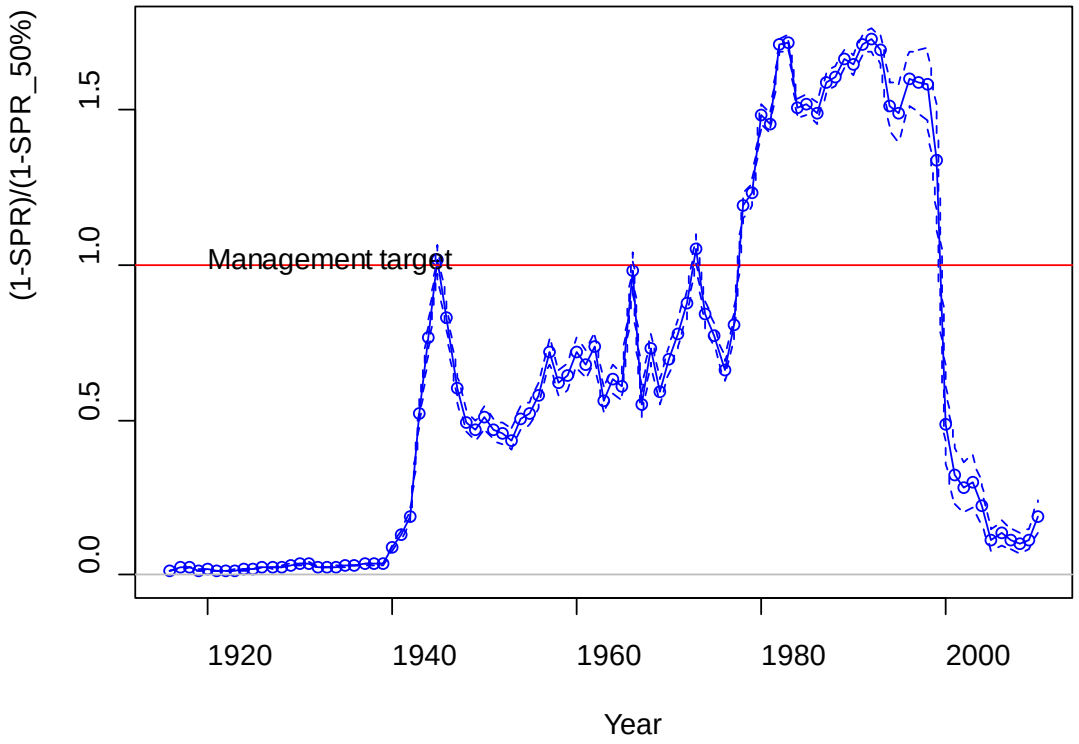



Figure f. Time series of relative spawning potential ratio (1-SPR/1-$SPR_{Target=0.5}$) for the base-case model (circles) and alternate states of nature (light lines). Values of relative SPR above 1 reflect harvests in excess of the current overfishing proxy.

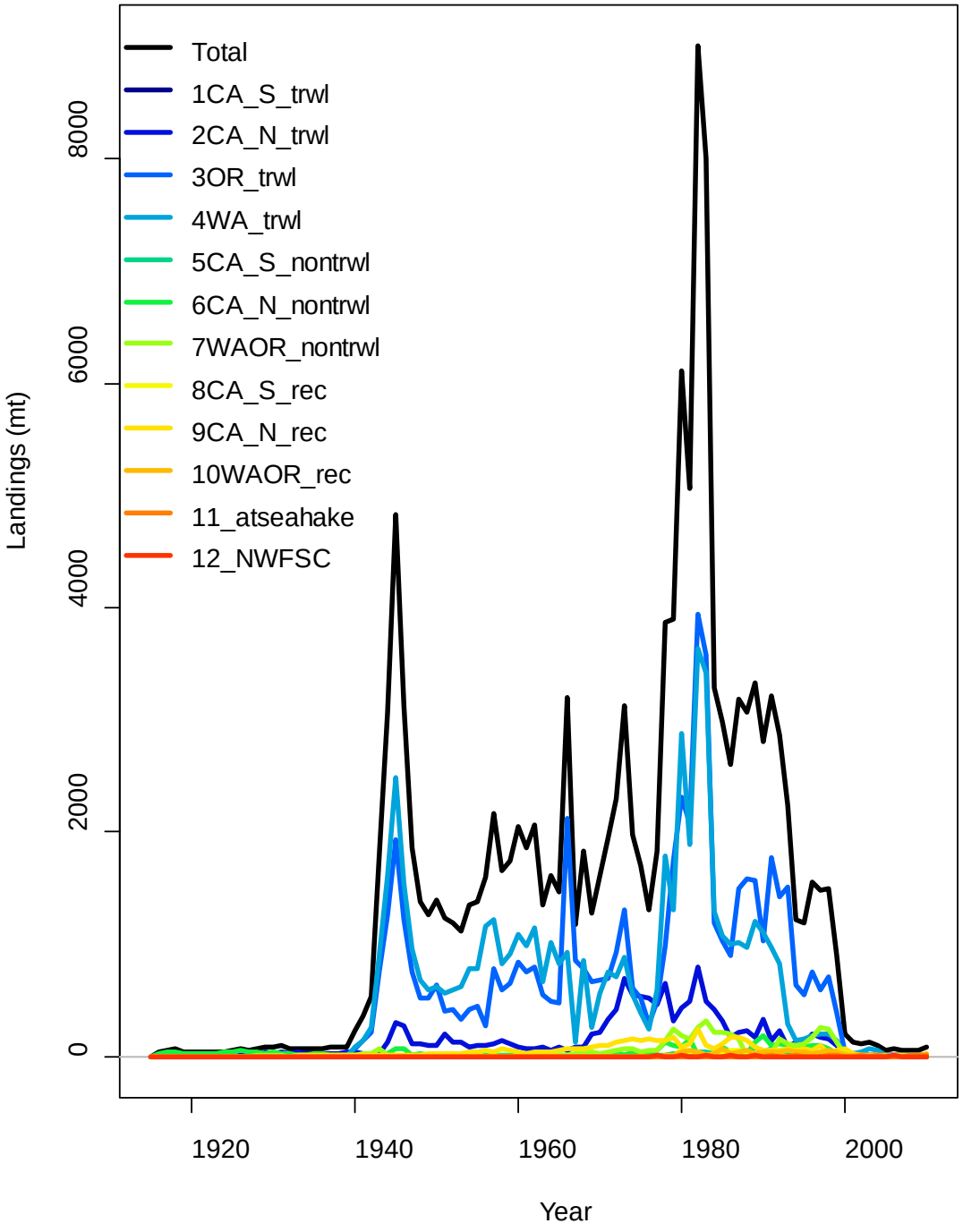



Figure g. Time series of estimated exploitation rate (catch/age 5 and older biomass) for the base-case model (circles) and alternate states of nature (light lines). Horizontal line indicates the overfishing limit/target ($F_{50\%}$) from the base case.

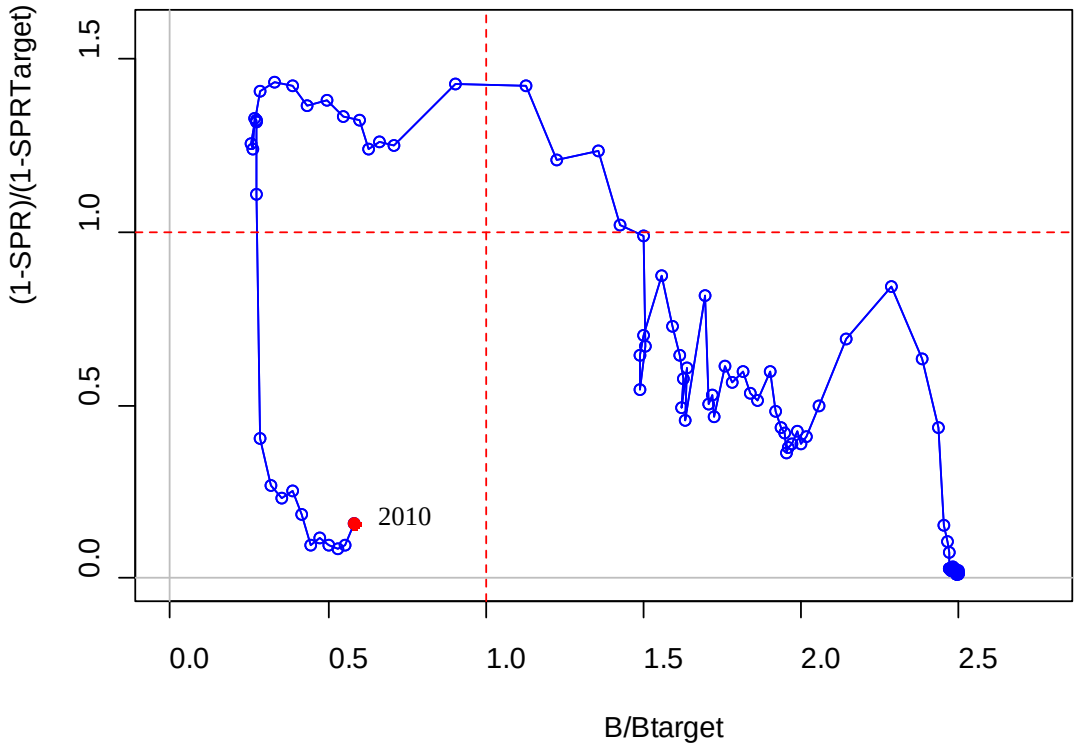



Figure h. Estimated relative spawning potential ratio relative to the proxy target/limit of 50% vs. estimated spawning biomass relative to the proxy 40% level from the base-case model. Higher biomass occurs on the right side of the x-axis, higher exploitation rates occur on the upper side of the y-axis.

*Management performance*

Following the 1999 declaration that the canary rockfish stock was overfished, the canary OY was reduced by over 70% in 2000 and by the same margin again over the next three years. Managers employed several tools in an effort to constrain catches to these dramatically lower targets. These included: reductions in trip/bag limits for canary and co-occurring species, the institution of spatial closures, and new gear restrictions intended to reduce trawling in rocky shelf habitats and the coincident catch of rockfish in shelf flatfish trawls.

Table c. Recent trend in estimated total canary rockfish catch and commercial landings (mt) relative to management guidelines.

| Year | ABC (mt)[3] | OY (mt)[3] | Commercial landings (mt)[1] | Total Catch (mt) |
|---|---|---|---|---|
| 1999 | 1,045[2] | 857[2] | 666.3 | 898.7 |
| 2000 | 287 | 200 | 55.7 | 199.9 |
| 2001 | 228 | 93 | 42.6 | 133.0 |
| 2002 | 228 | 93 | 69.9 | 120.5 |
| 2003 | 272 | 44 | 75.8 | 134.4 |
| 2004 | 256 | 47.3 | 49.3 | 103.4 |
| 2005 | 270 | 46.8 | 10.9 | 53.9 |
| 2006 | 279 | 47 | 7.7 | 64.8 |
| 2007 | 172 | 44 | 12.1 | 57.4 |
| 2008 | 179 | 44 | 8.2 | 53.8 |
| 2009 | 937 | 105 | 11.7 | 58.1 |
| 2010 | 940 | 105 | 14.3 | 81.8 |

[1] Excludes all at-sea whiting, recreational and research catches.
[2] Includes the Columbia and Vancouver INPFC areas only.
[3] The terms ABC and OY from this period have been replaced by OFL and ACL, respectively.

*Unresolved problems and major uncertainties*

As in the 2007 and 2009 assessments, 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. Specifically, there appears to be conflicting information between the length- and age-frequency data regarding the degree of stock decline, making the model results sensitive to the relative weighting of each. This issue was not revisited as part of the update. The relationship between the degree of domed shape in the selectivity curves and the increase in female natural mortality with age remains a source of uncertainty that is included in model results, as it has been in previous assessments for canary rockfish. Uncertainty in the steepness parameter of the stock-recruitment relationship is significant and will likely persist in future assessments; this uncertainty is included in the assessment and rebuilding projections through explicit consideration of the three states of nature. Given the change in this update caused by the revised historical Oregon catch estimates, future assessments are likely to be sensitive to additional revised estimates from ongoing efforts in Washington should they prove appreciably different from the time-series used here.

*Forecasts*

The forecasts reported here are intended to illustrate harvest options for management consideration until the full rebuilding analysis is complete. In the interim, the total catch in 2011 and 2012 are set equal to the ACL of 102 and 107, respectively The exploitation rate for 2013 and beyond is based upon an SPR of 92.2%, which

approximates the harvest level upon which the 2011 and 2012 ACLs were based. This SPR represents a decrease in fishing mortality from the rebuilding SPR target indentified in the 2009 rebuilding strategy of 88.7%. Both values, along with many other management options are reported in the rebuilding analysis.

As in 2007 and 2009, uncertainty in the rebuilding forecast will be based upon the three states of nature for steepness and random variability in future recruitment deviations for each rebuilding simulation. Current medium-term forecasts predict slow increases in abundance and available catch, with ACL values for 2013 and 2014 and slightly larger than those predicted from the 2009 assessment. The following table shows the projection of expected canary rockfish catch, spawning biomass and depletion.

Table d. Projection of potential canary rockfish OFL, ACL, spawning biomass and depletion for the base-case model based on the SPR = 0.922 fishing mortality target used for the last rebuilding plan (ACL) and $F_{50\%}$ overfishing limit/target (OFL). Assuming the ACL of 102 and 107 mt are respectively achieved exactly in 2011 and 2012.

| Year | OFL[1] (mt) | ACL[1] (mt) | Age 5+ biomass (mt) | Spawning biomass (mt) | Depletion |
|---|---|---|---|---|---|
| 2011 | **586** | **102** | 19,275 | 8,036 | 24.0% |
| 2012 | **594** | **107** | 20,161 | 8,273 | 24.7% |
| 2013 | NA | 78 | 20,563 | 8,470 | 25.3% |
| 2014 | NA | 83 | 21,521 | 8,658 | 25.8% |
| 2015 | NA | 87 | 22,142 | 8,866 | 26.5% |
| 2016 | NA | 91 | 23,025 | 9,108 | 27.2% |
| 2017 | NA | 96 | 23,980 | 9,395 | 28.0% |
| 2018 | NA | 100 | 25,001 | 9,726 | 29.0% |
| 2019 | NA | 105 | 26,076 | 10,101 | 30.1% |
| 2020 | NA | 109 | 27,194 | 10,517 | 31.4% |
| 2021 | NA | 112 | 28,344 | 10,966 | 32.7% |
| 2022 | NA | 116 | 29,516 | 11,441 | 34.1% |

[1]OFL/ACL value for 2011 has been adopted by the PFMC and the value for 2012 is likely to be adopted (John DeVore, personal com.), and hence are not based on the results of this update.

*Decision table*

The format of this decision table is unchanged from the 2007 and 2009 assessments. Because canary rockfish is currently managed under a rebuilding plan, this decision table is only intended to better compare and contrast the base case with uncertainty among states of nature. The results of the rebuilding plan integrate these three states of nature as well as projected recruitment variability. Relative probabilities of each state of nature are based on a meta-analysis for steepness of West Coast rockfish (M. Dorn, AFSC, personal communication). Landings in 2011-2012 are 102 and 107 mt, respectively, for all cases. Selectivity and fleet allocations are projected at the average 2008-2010 values.

Table e. 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 a 2007 meta-analysis for steepness of West Coast rockfish (M. Dorn, AFSC, personal communication). Landings in 2011-2012 are 102 and 107 mt, respectively for all cases. Selectivity and fleet allocations are projected at the average 2008-2010 values.

| | | | **State of nature** | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Low steepness (0.35) | | Base case (steepness = 0.51) | | High steepness (0.72) | |
| 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) |
| Rebuilding SPR 92.2% catches from low steepness state of nature | 2013 | 14 | 5.4% | 1,821 | 25.3% | 8470 | 46.5% | 15,297 |
| | 2014 | 15 | 5.5% | 1,850 | 25.8% | 8,659 | 47.8% | 15,699 |
| | 2015 | 16 | 5.5% | 1,881 | 26.5% | 8,867 | 49.1% | 16,130 |
| | 2016 | 16 | 5.7% | 1,919 | 27.2% | 9,111 | 50.6% | 16,612 |
| | 2017 | 17 | 5.8% | 1,965 | 28.2% | 9,398 | 52.2% | 17,148 |
| | 2018 | 17 | 5.9% | 2,019 | 29.0% | 9,730 | 53.9% | 17,724 |
| | 2019 | 18 | 6.1% | 2,081 | 30.2% | 10,106 | 55.8% | 18,328 |
| | 2020 | 18 | 6.3% | 2,150 | 31.4% | 10,522 | 57.7% | 18,949 |
| | 2021 | 19 | 6.6% | 2,225 | 32.7% | 10,973 | 59.6% | 19,575 |
| | 2022 | 19 | 6.8% | 2,305 | 34.2% | 11,449 | 61.5% | 20,199 |
| Rebuilding SPR 92.2% catches from base case | 2013 | 78 | 5.4% | 1,821 | 25.3% | 8,470 | 46.5% | 15,297 |
| | 2014 | 83 | 5.4% | 1,849 | 25.8% | 8,658 | 47.8% | 15,699 |
| | 2015 | 87 | 5.5% | 1,880 | 26.5% | 8,866 | 49.1% | 16,129 |
| | 2016 | 91 | 5.6% | 1,917 | 27.2% | 9,108 | 50.5% | 16,610 |
| | 2017 | 96 | 5.8% | 1,962 | 28.0% | 9,395 | 52.2% | 17,145 |
| | 2018 | 100 | 5.9% | 2,015 | 29.0% | 9,726 | 53.9% | 17,720 |
| | 2019 | 105 | 6.1% | 2,076 | 30.1% | 10,101 | 55.8% | 18,323 |
| | 2020 | 109 | 6.3% | 2,144 | 31.4% | 10,517 | 57.6% | 18,943 |
| | 2021 | 112 | 6.5% | 2,218 | 32.7% | 10,966 | 59.5% | 19,568 |
| | 2022 | 116 | 6.8% | 2,298 | 34.1% | 11,441 | 61.4% | 20,191 |
| Rebuilding SPR 92.2% catches from high steepness state of nature | 2013 | 141 | 5.4% | 1,821 | 25.3% | 8,470 | 46.5% | 15,297 |
| | 2014 | 150 | 5.4% | 1,848 | 25.8% | 8,658 | 47.8% | 15,698 |
| | 2015 | 156 | 5.5% | 1,878 | 26.5% | 8,864 | 49.1% | 16,127 |
| | 2016 | 160 | 5.6% | 1,915 | 27.2% | 9,106 | 50.5% | 16,608 |
| | 2017 | 165 | 5.8% | 1,959 | 28.0% | 9,392 | 52.2% | 17,142 |
| | 2018 | 169 | 5.9% | 2,011 | 29.0% | 9,722 | 53.9% | 17,716 |
| | 2019 | 174 | 6.1% | 2,071 | 30.1% | 10,096 | 55.7% | 18,319 |
| | 2020 | 178 | 6.3% | 2,139 | 31.4% | 10,512 | 57.6% | 18,938 |
| | 2021 | 183 | 6.5% | 2,212 | 32.7% | 10,960 | 59.5% | 19,562 |
| | 2022 | 187 | 6.8% | 2,291 | 34.1% | 11,435 | 61.4% | 20,184 |
| Status quo (catch = 105 mt) | 2013 | 105 | 5.4% | 1,821 | 25.3% | 8,470 | 46.5% | 15,297 |
| | 2014 | 105 | 5.4% | 1,849 | 25.8% | 8,658 | 47.8% | 15,698 |
| | 2015 | 105 | 5.5% | 1,879 | 26.5% | 8,865 | 49.1% | 16,128 |
| | 2016 | 105 | 5.6% | 1,916 | 27.2% | 9,108 | 50.5% | 16,609 |
| | 2017 | 105 | 5.8% | 1,961 | 28.0% | 9,394 | 52.2% | 17,144 |
| | 2018 | 105 | 5.9% | 2,014 | 29.0% | 9,725 | 53.9% | 17,719 |
| | 2019 | 105 | 6.1% | 2,075 | 30.1% | 10,100 | 55.8% | 18,322 |
| | 2020 | 105 | 6.3% | 2,143 | 31.4% | 10,516 | 57.6% | 18,942 |
| | 2021 | 105 | 6.5% | 2,217 | 32.7% | 10,966 | 59.5% | 19,567 |
| | 2022 | 105 | 6.8% | 2,297 | 34.1% | 11,440 | 61.4% | 20,190 |

*Research and data needs*

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

1. Expanded Assessment Region: Given the high occurrence of canary rockfish close to the US-Canada border, a joint US-Canada assessment should be considered in the future.
2. Many assessments (including this one) have derived historical catch by applying various ratios to the total rockfish catch prior to the period when most species were delineated. Based on the sensitivity of this update to the revised catch history for California, a comprehensive historical catch reconstruction for all rockfish species is needed for Washington and Oregon as well.
3. Habitat relationships: The historical and current relationship between canary rockfish distribution and habitat features should be investigated to provide more precise estimates of abundance from the surveys, and to guide survey augmentations that could better track rebuilding through targeted application of newly developed survey technologies. Such studies could also assist determining the possibility of dome-shaped selectivity, aid in evaluation of spatial structure and the use of fleets to capture geographically-based patterns in stock characteristics.
4. Meta-population model: The spatial patterns show patchiness in the occurrence of large vs. small canary; reduced occurrence of large/old canary south of San Francisco; and concentrations of canary rockfish near the US-Canada border. The feasibility of a meta-population model that has linked regional sub-populations should be explored as a more accurate characterization of the coast-wide population's structure. Tagging of other direct information on adult movement will be essential to this effort.
5. Increased computational power and/or efficiency is required to move toward fully Bayesian approaches that may better integrate over both parameter and model uncertainty.
6. Additional exploration of surface ages from the late 1970s and inclusion into or comparison with the assessment model, or re-aging of the otoliths could improve the information regarding that time period when the stock underwent the most dramatic decline. Auxiliary biological data collected by ODFW from recreational catches and hook-and-line projects may also increase the performance of the assessment model in accurately estimating recent trends and stock size.
7. Due to inconsistencies between studies and scarcity of appropriate data, new data are needed on both the maturity and fecundity relationships for canary rockfish.
8. Re-evaluation of the pre-recruit index as a predictor of recent year class strength should be ongoing as future assessments generate a longer series of well-estimated recent recruitments to compare with the coast-wide survey index.
9. Meta-analysis or other summary of the degree of recruitment variability and the relative steepness for other rockfish and groundfish stocks should be ongoing, as this information is likely to be very important for model results (as it is here) in the foreseeable future.

*Rebuilding projections*

The rebuilding projections will be presented in a separate document after the assessment has been reviewed in June 2011.

Table f. Summary of recent trends in estimated canary rockfish exploitation and stock levels from the base-case model; all values reported at the beginning of the year.

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| Commercial landings (mt)[1] | 69.9 | 75.8 | 49.3 | 10.9 | 7.7 | 12.1 | 8.2 | 11.7 | 14.3 | |
| Total catch (mt) | 120.5 | 134.4 | 103.4 | 53.9 | 64.8 | 57.4 | 53.8 | 58.1 | 81.8 | |
| ABC (mt) (*now OFL*) | 228 | 272 | 256 | 270 | 279 | 172 | 179 | 937 | 940 | 586 |
| OY (*now ACL*) | 93 | 44 | 47.3 | 46.8 | 47 | 44 | 44 | 105 | 105 | 102 |
| SPR | 86% | 85% | 89% | 94% | 93% | 94% | 95% | 94% | 91% | NA |
| Exploitation rate (catch/age 5+ biomass) | 0.009236 | 0.009663 | 0.007012 | 0.00348 | 0.00392 | 0.003323 | 0.002967 | 0.003118 | 0.004318 | NA |
| Age 5+ biomass (mt) | 72,675 | 71,878 | 75,178 | 79,903 | 78,907 | 79,940 | 80,470 | 79,986 | 76,799 | 76,010 |
| Spawning biomass (mt) | 4,756 | 5,198 | 5,608 | 5,999 | 6,385 | 6,752 | 7,111 | 7,456 | 7,772 | 8,036 |
| ~95% Confidence interval | 3,331-6,180 | 3,638-6,757 | 3,923-7,293 | 4,198-7,799 | 4,479-8,290 | 4,749-8,756 | 5,015-9,206 | 5,274-9,637 | 5,516-10,029 | 5,719-10,353 |
| Recruitment (1000s) | 1,237 | 1,681 | 590 | 451 | 1,037 | 2,793 | 847 | 2,859 | 1,361 | 2,295 |
| ~95% Confidence interval | 746-1,728 | 1,078-2,284 | 309-872 | 185-717 | 505-1,569 | 1,526-4,059 | 212-1,481 | 791-4,926 | 61-2,661 | 0-4,591 |
| Depletion | 14.19% | 15.51% | 16.73% | 17.90% | 19.05% | 20.15% | 21.22% | 22.25% | 23.19% | 23.98% |
| ~95% Confidence interval | 0.10-0.18 | 0.11-0.20 | 0.12-0.21 | 0.13-0.23 | 0.14-0.24 | 0.15-0.26 | 0.15-0.27 | 0.16-0.28 | 0.17-0.29 | 0.18-0.30 |

[1]Excludes all at-sea whiting, recreational and research catches.

Table g. Summary of canary rockfish reference points from the base-case model. Values are based on 1994-1998 fishery selectivity and allocation to reflect the performance of recent targeted fishing rather than the current bycatch-only environment.

| Quantity | Estimate | ~95% Confidence interval |
|---|---|---|
| Unfished spawning stock biomass ($SB_0$, mt) | 33,512 | 31,230-35,794 |
| Unfished 5+ biomass (mt) | 85,144 | 80,378-89,909 |
| Unfished recruitment ($R_0$, thousands) | 4,035 | 3,768-4,303 |
| ***Reference points based on $SB_{40\%}$*** | | |
| *MSY* Proxy Spawning Stock Biomass ($SB_{40\%}$) | 13,405 | 12,492-14,318 |
| SPR resulting in $SB_{40\%}$ ($SPR_{SB40\%}$) | 0.54 | 0.544-0.544 |
| Exploitation rate resulting in $SB_{40\%}$ | 0.0285 | 0.0270-0.0299 |
| Yield with $SPR_{SB40\%}$ at $SB_{40\%}$ (mt) | 964 | 891-1,036 |
| ***Reference points based on SPR proxy for MSY*** | | |
| Spawning Stock Biomass at SPR ($SB_{SPR}$)(mt) | 11,487 | 10,705-12,269 |
| $SPR_{MSY\text{-}proxy}$ | 0.5 | NA |
| Exploitation rate corresponding to SPR | 0.0331 | 0.0314-0.0348 |
| Yield with $SPR_{MSY\text{-}proxy}$ at $SB_{SPR}$ (mt) | 961 | 890-1,033 |
| ***Reference points based on estimated MSY values*** | | |
| Spawning Stock Biomass at *MSY* ($SB_{MSY}$) (mt) | 12,589 | 11,756-13,421 |
| $SPR_{MSY}$ | 0.525 | 0.523-0.537 |
| Exploitation Rate corresponding to $SPR_{MSY}$ | 0.0304 | 0.0290-0.0318 |
| *MSY* (mt) | 966 | 893-1,038 |

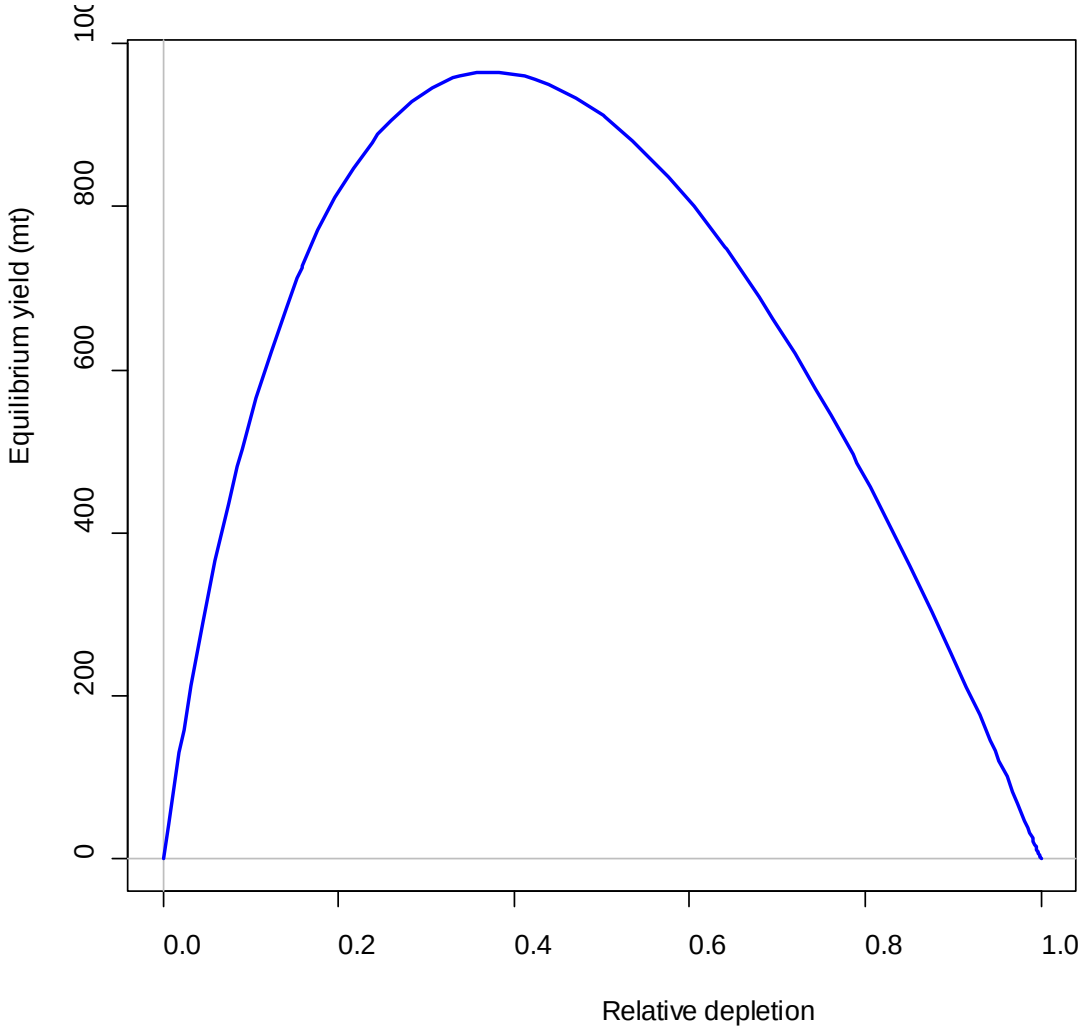



Figure i. Equilibrium yield curve for the base-case model. Values are based on 1994-1998 fishery selectivity and allocation to reflect the performance of a targeted fishery.

## 1. Introduction

This updated assessment does not attempt to reiterate all background information for canary rockfish presented in the 2007 assessment document. Instead, only a few key assumptions are restated, along with a detailed description of changes made during the course of the update. Those interested in a more complete description of canary rockfish life-history and the details of previous assessments should refer to the 2007 assessment (Stewart 2008).

### *1.1 Distribution and Stock Structure*

Canary rockfish (*Sebastes pinniger*) are distributed in the northeastern Pacific Ocean from the western Gulf of Alaska to northern Baja California; however, the species is most abundant from British Columbia to central California (Miller and Lea 1972, Hart 1973, Love et al. 2002). Adults are primarily found along the continental shelf shallower than 300 m, although they are occasionally observed in deeper waters. Juvenile canary rockfish are found in shallow and intertidal areas (Love et al. 2002).

There exists little direct information regarding the likely stock structure of canary rockfish off the U.S. Pacific coast, and the assumption of a single pan-mictic stock remains unchanged in this updated assessment. As in past assessments, this updated assessment treats the U.S. canary rockfish resource from the Mexican border to the Canadian border as a single coast-wide stock. The fishing fleets are separated geographically (Figure 1 in the 2007 assessment; Stewart 2008) to account for potential spatial patterns while retaining a coast-wide assessment area. The use of the U.S.-Canadian border as a biological boundary comprises a significant source of uncertainty and potential model misspecification as pelagic larvae, juveniles, and possibly adults likely cross this line while making their ontogenetic shift to deeper water or moving between areas of rocky habitat.

### *1.2 Life history and ecosystem interactions*

Canary rockfish spawn in the winter, producing pelagic larvae and juveniles that remain in the upper water column for 3-4 months (Love et al. 2002). These juveniles settle in shallow water around nearshore rocky reefs, where they may congregate for up to three years (Boehlert 1980, Sampson 1996) before moving into deeper water. The mean size of individuals captured in the trawl survey shows a characteristic ontogenetic shift to deeper water with increasing body size. The degree to which this ontogenetic shift may be accompanied by a component of latitudinal dispersal from shallow rocky reefs is unknown. Canary rockfish are a medium to large-bodied rockfish; achieving a maximum size of around 70 cm. Female canary rockfish reach slightly larger sizes than males.

Adult canary rockfish primarily inhabit areas in and around rocky habitat. They form very dense schools, leading to an extremely patchy population distribution that is reflected in both fishery and survey encounter rates. This distribution may have effects on the calculation and interpretation of population indices and age- or size-composition data.

Canary rockfish are relatively long-lived, with a maximum observed age of 95 years, however only males are commonly observed above the age of 50, while females tend

to be rare above age 30. The degree to which this pattern reflects behavioral differences translating to reduced availability to fishery and survey fishing gear, or an increase in relative mortality for older females has been the focus of much discussion and remains unclear. A similar pattern has been observed for yellowtail rockfish (*Sebastes flavidus*), a closely related, but more pelagic species with a similar distribution (Wallace and Lai 2005).

### *1.3 Historical and Current Fishery*

The historical and current fisheries are described in detail in the 2007 assessment (Stewart 2008). The recently revised Oregon historical catch reconstruction (Karnowski, et al. In prep.) for canary rockfish is the major source of difference between this update and the 2009 assessment update. The historical period (before 1986) of the catch history for canary rockfish has been revised by ODFG for this updated assessment. The net result of this revision is that the total estimated catch, from 1916 to 1986, is 36.5% higher than in 2009, and only 4.3% lower than in 2007 (Figure 1)

### *1.4 Management History and performance*

The management history is described in detail in the 2007 assessment (Stewart 2008). Since the assessment conducted in 1999 (California and Washington-Oregon), which found the stock to be depleted and resulted in an overfished determination in the year 2000, OYs for canary have been reduced dramatically. Both commercial and recreational fishing opportunities have been severely restricted and recent removals have been primarily from bycatch. Table 1 summarizes the coast-wide ABC's and catch in recent years. In recent years, the total mortality has been slightly above the OY (higher in retrospect based on current methods used for total mortality estimates), but well below the ABC.

### *1.5 Fisheries in Canada and Alaska*

The background provided in the 2007 assessment on Canadian and Alaskan fisheries for canary rockfish has not been updated for this assessment.

## 2. Assessment

The following sources of data, identical in scope to those used in 2007 and 2009, 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) Pre-recruit survey index of recruitment strength from 2001-2010.
3) Estimates of fecundity, maturity, length-weight relationships and ageing error from various sources (not re-estimated as part of this update).
4) Commercial (targeted and bycatch) and recreational landings from 1916-2010. The historical time series of catch estimates from Oregon has been revised (see below for details).

5) Estimates of discard rates, total mortality and discard mortality (recreational only) from various sources (updated only for 2002-2010).

6) Research catches from 1977-2010.

7) Fishery biological data (age and length) from 1968-2010

Data availability by source and year, as well as a delineation between data available for the 2007 assessment and what is new in this analysis, is presented in Table 2. A description of each of the specific data sources is presented below.

## *2.1 Fishery-Independent Data*

### *2.1.1 NWFSC trawl survey*

The NWFSC shelf and slope trawl survey time series has been extended (only 2003-2009 was available for the 2009 update) to include 2009 and 2010. Three sources of information are produced by this survey: an index of relative abundance, length-frequency distributions, and age-frequency distributions. See the 2007 document (Stewart 2008) for a more detailed description of survey design and methods.

The NWFSC survey encounters canary infrequently, generally in less than 10% of the total tows conducted. These catches are infrequently very large: 4.9 mt in a single 12-15 minute tow in 2006. Tows of this magnitude were not observed in either 2009 or 2010.

As in 2007 and 2009, an index of abundance based on a Generalized Linear Mixed Model (GLMM), including vessel-specific differences in catchability (via inclusion of random effects), was calculated for the survey time series. The GLMM approach explicitly models both the zero catches as well as allows for skewness in the distribution of catch rates through the use of a Gamma or lognormal error structure. This update's GLMM index was generated using the same basic method, but reprogrammed by the first author using an R package which uses OpenBUGS (http://www.openbugs.info/) from the statistical language R. Although point estimates and confidence intervals differed slightly between the two implementations applied to data through 2008 (Figure 2), the basic trend remained unchanged.

The biomass index shows a relatively flat biomass trend over the period 2003-2010 with a large increase only in 2006 (Figure 2). The sensitivity of the index to the very large tow in 2006 is not a new phenomenon, and was explored as part of the 2007 assessment. As in 2007, twenty-eight bins, from 12 to 66 cm, were used to summarize the length frequency of the survey catches in each year, the first bin including all observations less than 12 cm and the last bin including all fish larger than 66 cm. These bins are populated with a modest, but consistent degree of sampling: 32-53 tows and 308-799 fish per year ( Table 4). Broadly, the length frequency distributions for the NWFSC survey from 2003-2010 show a range of sizes captured from a few 12-14 cm individuals out to some 67 cm females (Figure 11). No clear cohorts, nor any obvious trend, are visible in the length data; however the size distributions for both males and females in 2008 showed a very large number of small canary rockfish.

As in 2007 and 2009, age-frequency data from the NWFSC survey was compiled as conditional age-at-length distributions by sex and year. The method and rationale is presented in the 2007 assessment document and remains unchanged. Age distributions included 35 bins from age 1 to age 35, with the last bin including all fish of greater age.

Approximately half as many fish were sampled for age as for length, but these fish were collected from a similar number of tows (Table **4**). These distributions show a tight range of ages at a given length, and clearly show the growth trajectory of females reaching larger sizes than males for a given age (Figures 19-20). It is often useful for interpretation to compute the marginal age-compositions, and include these in the assessment model (with the likelihood contribution turned off, so they do not affect model fit in any way) for comparison of the 'implied' fit to the margin of the age-length key. The marginal age compositions allow for easier visual tracking of strong cohorts (although this information is still imparted to the model using conditional age-at-length observations, it is harder to visualize) and offer a view of the data more familiar for those accustomed to diagnosing model fit based on marginal age-composition data. Although these NWFSC age distributions seem to show some diagonal structure, close inspection reveals that it does not track consistently through any of the recent cohorts (15).

### *2.1.2 Triennial trawl survey*

The largest source of fishery-independent data regarding the abundance of canary rockfish is the triennial shelf trawl survey conducted by NMFS starting in 1977 (Dark and Wilkins 1994). The 2007 assessment contains a through description of the survey, and methods for analyzing the data for use in the canary assessment. The data are unchanged from those used in 2007. The GLMM-based indexes show a decline in the population through the mid-1990s and then a flat or slightly increasing trajectory (Figure 3). It is uncertain why the 1980 observation was lower than 1983 when the population was likely declining rapidly under very large removals, but this pattern is present for other species as well.

Size and conditional age-frequency distributions from the triennial survey are unchanged from those used in 2007.

### *2.1.3 Pre-recruit survey*

The coast-wide mid-water trawl survey of pre-recruit pelagic juvenile rockfish conducted by the Southwest Fisheries Science Center (SWFSC) and the PWCC/NWFSC was included in the 2007 and 2009 assessments as a pre-density dependent recruitment strength index. This ANOVA analysis was updated to include the 2009 and 2010 survey data for use in 2011 stock assessments (S. Ralston, personal communication). The ANOVA variance estimates as used in 2009, and subsequently tuned (see below), were again used for this update. The index shows relatively large year-classes in 2002 and 2004 (Figure 4).

### *2.1.4 Canadian survey data*

Canadian surveys for the area most likely to be linked to the U.S. resource, the waters off Vancouver Island, were not re-evaluated for this updated assessment.

### *2.1.5 Other fishery independent data*

Since they were not included in the 2007 assessment, the NWFSC's cooperative fishery independent hook-and-line survey targeting rockfish in the Southern California

Bight, the Oregon State University hook-and-line sampling (D. Sampson and S. Heppell), and the OSU 'volcano trawl' video sampling (D. Sampson and S. Heppell) were not revaluated for this update. However, these and other data sets may prove worth investigating in future canary assessments.

*2.2 Biological Data*

See the 2007 assessment document for a description of the source of biological parameters estimated outside the assessment model. These values are treated as fixed and therefore uncertainty reported for the stock assessment results does not include any uncertainty associated with these quantities. All input values remain unchanged from the 2007 assessment (Table 5).

*2.2.1 Weight-Length*

The weight-length relationship used for this update is identical to that used in 2007 (Table 5).

*2.2.2 Maturity and fecundity*

The maturity-at-length and fecundity relationships used for this update are identical to those used in 2007 (Table 5).

*2.2.3 Natural Mortality*

The natural mortality rate used for males and females < age 6 in this update is identical (0.06) to that used in 2007 (Table 5). As in the 2007 assessment, the degree of increase for older females (age 14+) is treated as an estimated parameter.

*2.2.4 Ageing Precision and Bias*

The ageing imprecision and bias estimates used for this update are identical to those used in 2007. That document provides a description of the data and methods upon which they are based.

*2.2.5 Research removals*

Research catches have historically been only a tiny fraction of the total removals from the canary rockfish population. However, as total mortality has been very low since 2000, the relative contribution of research removals to the total has increased. This was particularly true in 2006, when research catches comprised 7.8 mt (Table 6). As in 2007 and 2009, research catches are explicitly accounted for in this updated stock assessment.

***2.3 Fisher- Dependent Data***

*2.3.1 Oregon Historical Catch Reconstruction*

Historical landings of canary rockfish in Oregon were provided by Oregon Department of Fish and Wildlife (ODFW), which in collaboration with Northwest Fisheries Science Center (NWFSC), conducted a reconstruction of west coast groundfish landings in Oregon.

Historically, rockfish in Oregon were landed in three mixed species market categories, including ROCKFISH (also known as Other Rockfish or Unspecified Rockfish), POP (Pacific Ocean Perch) and ANIMAL FOOD (also called Mink Food or Miscellaneous by some sources).

The Oregon historical reconstruction included four steps:

1) Determine the annual landings in each market category by gear;
2) Derive species compositions for each market category by gear, year and spatial stratum (when available);
3) Apply the year and gear specific species compositions to the historical landings in each market category (from Step 1) to obtain a species-specific time-series of landings;
4) Sum the species-specific landings by gear across market categories to obtain a final per-species time-series of landings in Oregon.

A variety of data sources were used to reconstruct historical landings of each market category, including Oregon Department of Fish and Wildlife's pounds and value reports derived from the Oregon fish ticket line data (1969-1977), Fisheries Statistics of the United States (1927-1977), Fisheries statistics of Oregon (Cleaver 1951, Smith 1956), Reports of the Technical Sub-Committee of the International Trawl Fishery Committee (1942-1975) and many others.

Trawl species compositions of market categories were derived from historical sampling program of Oregon trawlers conducted by ODFW between 1963 and 1993 (Dauglas 1998). The spatial strata used to derive trawl species compositions were defined by PMFC areas and depth of the catch (<50fm, 51-80fm, 81-120fm and >120fm). For non-trawl catches the earliest available species compositions were assumed for the historical period.

The detailed description of the sources used and the methodology employed in the Oregon reconstruction efforts is available in Gertseva et al. (2010) and Karnowski et al. (2011).

*2.3.2 Recent Landings (1981 to present)*

As in 2007 and 2009, recent landings reflect the most current information from the PacFIN, CalCOM, NORPAC, RECFIN and State recreational databases. Commercial landings estimates of canary rockfish from 1981 to 2008 were generated from the PacFIN database (Extraction: May`, 2009`, Daspit et al. 1997) for Oregon and Washington and California.

*2.3.3 Discards*

As in the 2005, 2007, and 2009 assessments, discard rates were applied to convert landings to total catch estimates. Those documents provide a description of the rationale for this approach. Values were 0.0123% for all commercial fleets until 1994 and then 16% for all commercial fleets until 1999. Beginning with the year 2001, there were discard observations collected by the West Coast Groundfish Observer Program that were

considered applicable to some fleets. Discard rates used for 2002- 2010 were calculated to be consistent with total mortality estimates created for the submission to national NMFS reports, the Pacific Council, and the GMT. By working backward from the total mortality (or total discard by weight) and the current landings estimate, a likely discard rate was developed for each fleet. Because the delineations over geography, between gear types and tribal vs. non-tribal sectors often differ from GMT "scorecards" and other summaries available from the Council, it may be misleading to compare the actual discard rates and comparisons should focus on total mortality values. Where updated landings, bycatch estimates or research catches were available the most up to date information has been included in this assessment. The trawl fleets had a discard rates based on at-sea observer data on a year-specific basis for 2002-2010. The non-trawl fleets had similarly high discard rates. Recreational discarding was incorporated through the use of the landed and discarded dead (A + B1) categories.

As in 2007 and 2009, this updated assessment treats observations of the discarded canary rockfish in a similar manner to those collected from port samples. Biological observations from each tow are expanded from the fish actually measured to the total number of fish in the biological sample. This number is then further expanded to the estimated total number of fish in the discard for that tow. Expanded length- (or age-) frequencies were then brought to the fleet level by multiplying each value by the ratio of total discarded weight for that fleet to the total discard that was sampled by the observer program. This allowed port and observer samples to be combined into a set of biological observations representing the entire catch of canary rockfish for that fleet and year. Observer samples comprised much of the biological data for the commercial trawl and non-trawl fleets in 2004-2010, due to limitations on landing canary, which have restricted the access of port samplers to a very small fraction of the total mortality.

### *2.3.4 Recreational Fishery*

Estimates of recreational catch from 1981-2006 remain unchanged from the 2009 assessment. For the most recent years, 2007-2010, updated state estimates are included.

No attempt was made as part of this updated assessment to correct for the 2009 discovery of large numbers of recreationally caught rockfish that are not apportioned to species and therefore not included in recreational catch estimates. This should be revisited as part of the next full assessment for canary rockfish if available.

### *2.3.5 Foreign Catches*

Foreign catches are included in the catch estimates for trawl fleets by state (Table 6), as was done in the 2007 and 2009 assessments.

### *2.3.6 Fishery Logbooks*

As in 2007 and 2009, no logbook information is included in this assessment.

*2.3.7 Fishery Biological Sampling*

Commercial length-frequency distributions were developed for each fleet for which observations were available, following the methods used for the 2007 and 2009 assessments. The same bin structure as was used for research observations.

Generally, the fishery length-frequency data have become much sparser in recent years, and small sample-sizes preclude much obvious signal from data sources that have never shown evidence of strong cohorts. Weighted age-frequency distributions were compiled by fleet and method of ageing, as was done in 2007 and 2009. Break-and-burn ages read by CAP or ODFW were treated separately from those read by WDFW following the development of separate ageing error keys in the 2007 assessment. Surface ages are again excluded due to high levels of bias and imprecision for older fish. Again following the 2007 methods, commercial age data was not treated as conditional age-at-length data due to prohibitive model run time. Therefore, marginal commercial age-frequency distributions were used for all fishery age-frequency data.

New age data were sparse and this generally reflects low levels of landings and sampling of canary rockfish from fishery sources. One exception was the at-sea whiting fishery, which provides a few hundred age structures per year. The 2009 and 2010 age data are included in this assessment, in addition to 44 new ages from 2008.

## *2.4 History of Modeling Approaches*

*2.4.1 Previous assessments*

The 2007 assessment document contains a detailed description of the history of canary rockfish assessments.

*2.4.2 Pre-assessment workshop, GAP and GMT input*

Because this is an updated assessment, there was no formal or informal discussion of data, modeling or management issues for 2011. This has been a valuable part of the assessment process in recent years and should be continued for the next full assessment.

*2.4.3 Response to the review panel recommendations in 2007*

The STAR panel reports from the 2007 review outlined a number of recommendations for future research and data collection. As this was an updated assessment these issues were not revisited, but are reiterated here for consideration in future canary and other assessments:

- *For the next canary rockfish stock assessment*
  - *Assumptions about stock structure and distributional boundaries should be reviewed in light of information on Canadian/Alaskan catches.*
  - *A catch history should be reconstructed using all available data including catch by gear and by region. The reconstruction should include an envelope of high and low values to set bounds for exploration of alternative catch histories. As has been previously recommended, the reconstruction needs to be done comprehensively across all rockfish species to ensure efficiency and consistency.*

- *Evaluate the feasibility of a bi-lateral assessment with Canadian scientists, perhaps through the TSC (Technical Subcommittee of US Canada groundfish working group).*
- *Investigate the importance of calendar date and other covariates on catch rates from the triennial survey and propose adjustments to account for seasonal and other variation in selectivity/availability.*

- *Generic issues for groundfish assessments*
  - *Establish a meta database of all data relevant to groundfish stock assessment. The database should include enough detail about the nature and quality of the data that a stock assessment author can make a well informed decision on whether it could be useful for their stock assessment.*
  - *Establish accessible online databases for all data relevant to groundfish stock assessment, so that assessment authors can obtain the raw data if required.*
  - *Establish a database for historical groundfish catch histories, "best" guesses and estimates of uncertainty (and processes for updating and revising the database).*
  - *Develop a concise set of documents that provide details of common data sources and methods used for analyzing the data to derive assessment model inputs.*
  - *Develop standard and appropriate methods for modeling age and length data, including choice of distribution, initial variance assumptions, and tuning methods (current methods can and should be improved).*
  - *Routinely produce and present supporting documentation for any derived indices which are included in a stock assessment model (e.g., GLMM derived trawl survey abundance indices).*

### *2.5 Model Description*

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

The bridge from the 2009 stock assessment model to the current base case followed three general steps: 1) upgrade to the newest version of SS, 2) rebuild all of the data inputs to reflect the best information currently available, including recent catch series, fishery biological data, and GLMM-based indices of survey abundance and 3) replace the historical catch reconstruction with the revised reconstruction produced by the SWFSC and CDF&G. A thorough description of the 2007 assessment model is presented separately below; this section linking the models is intended only to more clearly identify the effects of these changes.

Rebuilding the data streams was performed as described above. This incorporated all recently available assessment data as well as revised catch estimates from total mortality reports and standard sources for the period 1981-2008 (Table 2). These new data resulted in a slightly more pessimistic view of the recent stock recovery trajectory, just inside the lower 95% confidence interval from the 2007 assessment. This downward revision of recent spawning biomass was not attributable to a single data source, but appears to be incrementally informed by each updated series (Figure 5).

Addition of the fully revised catch history reduced the scale of the entire time-series estimate of spawning biomass by an average of 14% (19% in the first 10 years of the series and 47% in the last 10). The central portion of the time-series estimates remained largely unchanged (~1960-1990; Figure 5).

*2.5.2 Summary of data for fleets and areas*

As in the 2007 and 2009 assessments, fishery removals were divided among 11 fleets: 1) Southern California trawl, 2) Northern California trawl, 3) Oregon trawl, 4) Washington trawl, 5) Southern California non-trawl, 6) Northern California non-trawl, 7) Oregon and Washington non-trawl, 8) Southern California recreational, 9) Northern California recreational, 10) Oregon and Washington recreational and 11) the canary bycatch from the at-sea whiting fishery. Removals associated with research projects (the trawl surveys, and other much smaller sources of permitted mortality due to scientific research) are treated as a fishing fleet, only in that the removals are included in the total. The data available for each fleet are described in Table 2; data that were new since the 2007 assessment are clearly identified.

*2.5.3 Modeling software*

This assessment used the Stock Synthesis modeling framework written by Dr. Richard Methot at the NWFSC. The most recent version (3.03d) was used, since it included several corrections to the older version (2.00g) used during the 2009 assessment.

*2.5.4 Sample Weighting*

The approach to sample weighting remains unchanged from the 2007 and 2009 assessments: variance and sample sizes were first derived from the raw data sources using the same methods as in 2007, the variances and sample sizes were then iteratively re-weighted to ensure consistency between the input sample sizes (or standard errors), and the effective sample sizes (and root-mean-squared errors) based on model fit. This approach attempts to reduce the potential for particular data sources to have a disproportionate effect of total model fit, while creating estimates of uncertainty that are commensurate with the uncertainty inherent in the input data. Iterative re-weighting was applied to the length, age and survey data from 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. For index data, the mean input standard error was compared with the root-mean-squared-error of the model fit to assess consistency of data and model fit. Where the mean effective sample size was greater than the mean input sample size, no change was made. This choice reflects the post-hoc nature of model tuning and the potential for increasing weight on those data sources that are consistent with model predictions, thereby reducing the perceived uncertainty in model results. Table 7 shows the results of this re-weighting for compositional data, with the length and age data from a few fleets down-weighted slightly and the at-sea whiting bycatch data down-weighted substantially. This is not unexpected, since the sampling for at-sea data is on a per haul basis, and those fishing operations tend to move only when the large aggregations of whiting they are targeting move. Therefore, fish within hauls would be expected to be less representative of independent samples, and even fish from multiple hauls may be collected from a very small geographic area. Table 8 reports the results for index data. A small additional variance component was added to the early triennial observations (0.02) and the NWFSC trawl survey observations (0.09) resulting in reasonably close agreement between mean input

standard errors and root-mean-squared-errors as well as a similar degree of observation error for all survey indices. The big change from the 2007 assessment was in the weighting of the pre-recruit index: in 2007 the mean input SE was 0.31 and an additional 0.11 was added during tuning. In this updated assessment, the input SE was much lower 0.05, due to the use of an alternate method of calculating this value, and a much larger additional component was added (0.93) to achieve consistency. This reflects substantially more information informing the recent recruitment estimates, apparently in conflict with the signal from the pre-recruit index.

Following the logic applied in the 2007 assessment, the lambda values (emphasis; a direct multiplier on the likelihood component) were again reduced to 0.5 for length and age data from a given fleet where both types of data are available. This is consistent with previous canary assessments, and many other west coast groundfish assessments.

*2.5.5 Priors*

Uniform (noninformative) priors exactly matching those used in 2007 and 2009 were applied to all estimated parameters in the base-case model. Parameter bounds were selected to be sufficiently wide to avoid truncating the searching procedure during maximum likelihood estimation. All parameter bounds and priors are provided in this document (Table 9).

The use of a prior on stock-recruitment steepness (M. Dorn, AFSC, personal communication) was explored during the 2007 STAR panel. Concern over the influence of recently revised (2007 assessments) steepness profiles led to the recalculation of the posterior predictive distribution from the meta-analysis performed in 2006 removing the darkblotched rockfish profile. The revised prior was shifted to slightly lower steepness values than the earlier analysis, resulting in a distribution with the mean of the middle 50% equal to 0.511, the mean of the lower 50% equal to 0.345 and the mean of the upper 50% equal to 0.72. Although this prior is likely to be updated for 2009, it was unavailable for this assessment. As in 2007 and 2009, the base case uses the mean of the middle 50% of the prior distribution (0.511) as a point estimate, and a 'states-of-nature" approach to uncertainty in this parameter.

*2.5.6 General model specifications*

Stock synthesis has a broad suite of structural options available for each application. These options were configured in the newest version to most closely match the behavior of the 2007 model and its sensitivity to new and potentially important aspects are considered below (see *2.9.1 Sensitivity analyses*). The assessment remains sex-specific, including separate growth curves for males and females, and therefore tracking the spawning biomass of only females for use in calculating management quantities. Further, as has been done in previous canary assessments (and discussed above) natural mortality is allowed to increase (linearly) for females starting at age 6 and reaching an estimated asymptote at age 14, after which mortality is constant. Males and young females are assumed to have a natural mortality of 0.06.

For the internal population dynamics, ages 0-39 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 35, 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. No seasons are used to structure removals or biological predictions, so data collection is assumed to be relatively continuous throughout the year. Fishery removals occur instantaneously at the mid-point of each year and recruitment on the 1st of January. Since the time-series is started in 1916, the stock is assumed to be in equilibrium at the beginning of the modeled period. The sex-ratio at birth is fixed at 1:1, although by allowing increased natural mortality on females, size-based selectivity, and dimorphic growth is can vary appreciably due to differential mortality by age and sex.

*2.5.7 Estimated and fixed parameters*

A full list of all estimated parameters and values of key parameters that are fixed is provided in Table 9, with the exception of recent recruitment deviations this parameter estimation framework remains unchanged from the 2007 assessment.

Time-invariant sex-specific growth is fully estimated in this assessment. This requires nine parameters, 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 in this assessment. Recruitment deviations are estimated for each year of the period informed by the data (1960+). 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 may reduce unwarranted patterns in early deviations.

Double-normal selectivity was used for all fishing and survey fleets in the base-case model (unchanged from 2007). The initial selectivity parameter was fixed to a value of -9.0 resulting in the smallest length bin always having a derived selectivity value of 0.0. An exception to this was applied to the NWFSC trawl survey, where the initial selectivity was estimated, based on the frequency of small fish relative to all other fleets in the model. The ascending width parameter was estimated for all fleets, as was the peak and final selectivity parameters. For fishing fleets, the width of the flat-top on selectivity was fixed at -4.0, as this parameter is often redundant. For surveys this parameter was estimated. Where estimated selectivity curves were strongly asymptotic, then the descending width parameter was fixed at a value of 4.0 to avoid full redundancy as the estimated final selectivity parameter approached the upper bound and the derived selectivity value for lengths greater than the peak selectivity approached 1.0. For fleets that showed strongly dome-shaped selectivity, the descending width parameter was estimated to allow the ability to fit a greater range of domed shapes. For survey fleets, catchability parameters were directly estimated.

An identical approach to time-blocks was applied in this and the 2007 assessment. When a time-block was added to the specification for a fleet, three parameters were allowed to vary: the ascending width, the peak and the final selectivity parameter. This was intended to allow flexibility in the full curve (ascending side, location and descending side) with the minimum amount of parameters.

### *2.6 Model Selection and Evaluation*

#### *2.6.1 Key assumptions and structural choices*

Following the terms of reference for an updated assessment, all assumptions and structural choices remained unchanged, and were not reevaluated for 2011.

#### *2.6.2 Alternate models explored*

A 'standard' update, ignoring the newly available historical catch reconstruction is presented for comparison with the base case presented here (Figure 5).

Exploration of the statistical support for time-blocks on fishery selectivity and additional flexibility for static curves was performed as part of the 2007 assessment. This exercise was not repeated here, but should be in the next full assessment, as likelihood contributions change due to iterative reweighting. It is also possible that the larger OY available to the 2009 fishery will require an additional time block in future assessments if fishing behavior changed appreciably. Time-blocks remain unchanged from the 2007 assessment allowing changes in selectivity at up to five points for each fleet: 1) 1979, roughly the average year for conversion of older fishing gear to high-rise and larger footrope trawl gear, 2) 1995, when the first canary-specific trip limits were imposed, 3) 2000, when canary were first managed under a rebuilding plan and OYs were drastically reduced, 4) 2002, when the Rockfish Conservation Areas (RCA) were first implemented, eliminating large portions of historical fishing grounds from legal rockfish harvest, and 5) 2005, when selectivity flatfish trawl gear was required shoreward of the RCA.

Sex-specific selectivity curves have been a topic of much exploration in canary assessments prior to 2007 (when selectivity was modeled as not sex-specific) and although not revisited here, they should be periodically revisited in future assessments. Likewise the trade-off between age- and length-based selectivity curves was explored in 2007 and not revisited here, but remains a significant source of uncertainty in the canary assessment.

Given the considerable uncertainty in the value for steepness used in the base case, an alternate model estimating this parameter was evaluated for comparison only. Values of this magnitude for a long-lived rockfish have been considered quite implausible in the past and the general agreement among reviewers in recent assessments has been that steepness is very poorly estimated with the data available for canary rockfish.

#### *2.6.3 Convergence status*

To test for convergence, 100 trials were performed using a 'jitter' value of 0.1 for the base-case model. Sixty-nine of these trials returned to the global minimum, inverting the Hessian and producing small gradients, 18 got close the global minimum but failed to completely converge, and 13 terminated without any sign of convergence. The spread of this search appears to indicate that the jitter was sufficient to search a large portion of the likelihood surface, and that the base case is not stuck in a local minimum. Results of runs that appeared to converge all showed very similar levels of ending depletion and spawning biomass.

### *2.7 Response to SSC recommendations*

If the SSC determines that additional analysis beyond completion of a rebuilding plan for the updated 2009 assessment is warranted, this work will be completed subsequent

to the June 2011 review. All STAR recommendations from 2007 that were incorporated into the final base-case model are retained for 2011; the 2007 document provides a point-by-point list of these changes made during that review.

### *2.8 Base-case model results*

The biological parameters estimated from the base-case model appear to be quite reasonable and consistent with the 2009 assessment ( Table 10) and inspection of the raw data. Female and male canary rockfish showed similar growth trajectories to about age 10, with females growing to a maximum size (60 cm) that was about 8 cm larger than males (Table 11, Figure 6). Males are estimated to grow slightly faster than females, with both sexes showing a relatively tight distribution of lengths for a given age and with the relative CV decreasing with age. As in the 2009 assessment, natural mortality for females is estimated to increase from 0.06 at age 6 to 0.097 at age 14 (Figure 7). With this difference in sex-specific natural mortality, a male-dominated sex-ratio would be expected for older ages, but given the dimorphic growth a female-dominated sex ration, what is observered would be expected for larger sizes regardless of age.

Estimated selectivity curves for the NWFSC survey selected more small canary with the peak at a smaller size (48 vs. 61 cm, Table 10) reflecting the capture of many small canary in 2008. Catchability (Table 10) for fully selected canary in the NWFSC survey was estimated to be 0.691 (vs. 0.125 in 2009), 0.234 (vs. 0.111) for the early triennial survey (1980-1992) and 0.170 (vs. 0.078) for the later triennial survey (1995-2004). The best error structure for the NWFSC survey GLMM, given the data, changed from log-normal in 2009 to gamma for this update. This resulted in an absolute scale change for the NWFSC index (Figure 8), however the mean standardized index is close to that from 2009 (Figure 2). This change means the NWFSC survey catchability (Q) has now increased to reflect this change, and hence can no longer be easily compared to the 2009 value. Selectivity curves for the various fishing fleets showed very similar patterns to those observed in the 2009 assessment.

The base-case model was able to fit the trawl survey indices quite well (Figures 8-9), despite the relatively small contribution to the total likelihood value. The base-case model fit the coast-wide pre-recruit index much worse than the pre-iteration input standard error (0.05) which was inflated by a factor of 0.93, to achieve consistency with an *rmse* of 0.92 (Table 8). This lack of fit primarily reflects conflict between the implied strengths of the 2002 and 2004 year-classes between this survey and the years of accumulated length and age data from other sources. In more recent years, the value of $\sigma_r$ is also influencial in shifting recruitment sizes away from index-derived quantitiess and toward the stock-recruit expectation.

The base-case model fit the length and age distributions from the NWFSC and triennial surveys slightly better than expected based on the input sample sizes ( Table 7, Figures 11-22). Although there is some lack-of-fit in specific years of the two time-series of length-frequency data, there are no strong trends in the Pearson residuals.

The implied fit to the marginal age-frequency data (not included in the likelihood, but used for comparison only) was also reasonably good for both surveys although the data are clearly quite noisy (Figures 15-16). The Pearson residuals reflect the noise in the data,

both within and between years, but show no clear patterns (Figures 17-18). Pearson residuals for the fit to survey conditional age-at-length data are somewhat difficult to interpret. They generally show the effect of small sample sizes within rows on each year-specific key, as well as a few fish that deviate from expected growth pattern dramatically (Figures 19-22).

Fits to the fishery length- and age-frequency data did not require tuning to make average effective sample sizes equal to or greater than average input sample sizes (Table 7, Appendix A). Fits were varied, but generally reflect the heterogeneity in data quantity and quality among fleets. It is uncertain whether patterns observed in the fit to these data are a function of heterogeneity in sampling intensity over areas or ports within each fleet (observation error) or more continuous changes in fishery selectivity that is reflected in the size and age of the fish captured (process error).

Based on the revised catch series, canary rockfish were very lightly exploited until the early 1940's, when catches increased and a decline in biomass began (Figure 27). The rate of decline in spawning biomass accelerated during the late 1970s, and finally reached a minimum in the mid-1990s. The canary rockfish spawning stock biomass is estimated to have been gradually increasing since that time, in response to reductions in harvest and above average recruitment in the preceding decade. However, this trend is very uncertain. The base model asymptotic interval for 2011 spawning biomass remains broad: 5,719-10,353 mt. The time series of population trends for the base case is reported in Table 13, and the uncertainty in Table 14.

### *2.9 Uncertainty and Sensitivity Analysis*

As in 2007 and 2009, 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 stock productivity (via the steepness parameter of the stock-recruitment relationship) are presented.

#### *2.9.1 Sensitivity analysis*

The already described sensitivity to the fixed value for stock-recruit steepness and the revised historical catch series appear to be the greatest sources of change to model results in this updated assessment. Beyond those aspects of the model, a full evaluation of structural choices and data weighting was not repeated for this update. However, it is expected that the conflicting signals in the age and length data, seen in alternative weighting schemes as well as the approach to time-varying triennial survey and fishery selectivity and catchability, remains as was identified in 2007.

An attempt to identify new factors most likely to be explored in the next full assessment included data weighting, time periods for recruitment deviation estimation and evaluation of a newly identified uncertainty in stock-recruit dynamics: the relative fraction of the bias correction applied to 'fully-informed' recruitment deviations. The latter structural decision reflects the reality that the appropriate degree of bias correction to apply is, in theory at least, a function of the ratio of the variance of the data informing recruitment deviations (relative to the true deviations) and the total variance of the data and true

recruitment variability (R. Methot, personal communication). The default in recent assessments has been to assume that the correct fraction of the bias correction to apply is 1.0, but given sparse and noisy data, ageing error as well as conflicting signal from different data sources it is quite likely that a new default somewhat lower than 1.0 will emerge from ongoing simulation analyses at the NWFSC.

*2.9.2 Likelihood profiles*

New likelihood profiles were not completed for this update; however, alternate values for stock-recruit steepness suggested little change in the likelihood surface for this parameter relative to the 2007 assessment, with most of the density close to a value of 1.0.

## 3. Rebuilding parameters

Revised rebuilding projections will be presented in a separate document after the assessment has been reviewed in September 2011. As in 2007 and 2009, the base-case assessment model includes parameter uncertainty from a variety of sources, but still likely underestimates the true uncertainty in recent trend and current stock status. For this reason, the three states of nature for stock-recruit steepness will be resampled in proportion to their relative probability and combined for the rebuilding analysis, identical to the approach taken in the 2007 and 2009 rebuilding analysis.

## 4. Reference points

Unfished spawning stock biomass, in the base-case model, was estimated to be 33,512 mt (nearly 30% higher than the 2009 estimate of 25,993, and slightly above the 2007 estimate of 32,561 mt). The target stock size ($SB_{40\%}$) is therefore 13,405 mt and the overfished threshold ($SB_{25\%}$) is 8,379 mt. Maximum sustainable yield (MSY), applying current fishery selectivity and allocations (a 'bycatch-only' scenario), was estimated in the assessment model to occur at a spawning stock biomass of 12,589 mt and produce an MSY catch of 966 mt (close to the 960 mt estimate in the 2009 update). This sustainable yield is achieved at an SPR of 52.5%, nearly identical to the estimate from the 2007 assessment (52.9%). This, in turn, is nearly identical to the yield, 964 mt, generated by the SPR (54.0%) that stabilizes the stock at the $SB_{40\%}$ target. The fishing mortality target/overfishing level (SPR = 50.0%) generates a yield of 961 mt at a stock size of 111,487 mt.

Fishing mortality rates in excess of the current F-target for rockfish of $SPR_{50\%}$ are estimated to have begun in the late 1970s and persisted through 1999 (Table 1, Figures 28-30). Recent management actions appear to have curtailed the rate of removal such that overfishing has not occurred since 1999, and recent SPR values are in excess of 70% (> 90% since 2003). Relative exploitation rates (catch/biomass of age-5 and older fish) are estimated to have been less than 1% since 2001. These patterns are largely insensitive to the three states of nature.

## 5. Harvest projections and decision tables

The forecast reported here will be replaced by the rebuilding analysis to be completed in September-October 2011 following SSC review of the stock assessment. In the interim, the total catch in 2011 and 2012 is set equal to the OY (102 and 107 mt, respectivly). The exploitation rate for 2013 and beyond is based upon an SPR of 92.2%,

which approximates the harvest rate in the current rebuilding plan. As in 2009, uncertainty in the rebuilding forecast will be based upon the three states of nature for steepness and random variability in future recruitment deviations for each rebuilding simulation. Current medium-term forecasts predict slow increases in abundance and available catch, with OY values for 2013 and 2014 higher than those predicted from the 2009 assessment (Table 15).

Because canary rockfish is currently managed under a rebuilding plan, the decision table provided with this update (Table 16) (**Error! Reference source not found.**) is only intended to better compare and contrast the base-case results with those from alternative states of nature which are plausible, given the perceived uncertainty in the base case. The results of the rebuilding plan will integrate these three states of nature, along with projected recruitment variability. Various alternate probabilities of rebuilding by target and limit time-periods and fishing mortality rates will also be evaluated in the rebuilding analysis. The format of this decision table is unchanged from the 2007 and 2009 assessments. Relative probabilities of each state of nature are based on a meta-analysis for steepness of West Coast rockfish (M. Dorn, AFSC, personal communication). Landings in 2011-2012 are 102 and 107 mt, repectvely, for all cases. Selectivity and fleet allocations are projected at the average 2008-2010 values.

## 6. Regional management considerations

As in 2007 and 2009, 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 canary rockfish off the U.S. coat and very limited tagging data to describe adult movement, which may be significant across depth and latitude. Future efforts to specifically address regional management concerns will require a more spatially explicit model that likely includes the portion of the canary rockfish stock residing in Canadian waters off Vancouver Island.

## 7. Research needs

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

1. Expanded Assessment Region: Given the high occurrence of canary rockfish close to the US-Canada border, a joint US-Canada assessment should be considered in the future.
2. Many assessments (including this one) have derived historical catch by applying various ratios to the total rockfish catch prior to the period when most species were delineated. Based on the sensitivity of this update to the revised catch history for California, a comprehensive historical catch reconstruction for all rockfish species is needed for Washington and Oregon as well.
3. Habitat relationships: The historical and current relationship between canary rockfish distribution and habitat features should be investigated to provide more precise estimates of abundance from the surveys, and to guide survey augmentations that could better track rebuilding through targeted application of newly developed survey technologies. Such studies could also assist determining the possibility of dome-shaped

selectivity, aid in evaluation of spatial structure and the use of fleets to capture geographically-based patterns in stock characteristics.

4. Meta-population model: The spatial patterns show patchiness in the occurrence of large vs. small canary; reduced occurrence of large/old canary south of San Francisco; and concentrations of canary rockfish near the US-Canada border. The feasibility of a meta-population model that has linked regional sub-populations should be explored as a more accurate characterization of the coast-wide population's structure. Tagging of other direct information on adult movement will be essential to this effort.
5. Increased computational power and/or efficiency is required to move toward fully Bayesian approaches that may better integrate over both parameter and model uncertainty.
6. Additional exploration of surface ages from the late 1970s and inclusion into or comparison with the assessment model, or re-aging of the otoliths could improve the information regarding that time period when the stock underwent the most dramatic decline. Auxiliary biological data collected by ODFW from recreational catches and hook-and-line projects may also increase the performance of the assessment model in accurately estimating recent trends and stock size.
7. Due to inconsistencies between studies and scarcity of appropriate data, new data are needed on both the maturity and fecundity relationships for canary rockfish.
8. Re-evaluation of the pre-recruit index as a predictor of recent year class strength should be ongoing as future assessments generate a longer series of well-estimated recent recruitments to compare with the coast-wide survey index.
9. Meta-analysis or other summary of the degree of recruitment variability and the relative steepness for other rockfish and groundfish stocks should be ongoing, as this information is likely to be very important for model results (as it is here) in the foreseeable future.
10. Re-visit West Coast Groundfish Observer Program (WCGOP) estimates of discards. Discrepnacies in landings and discard estimates were recognized due to recent updates within PacFIN as well as the development of new discard estimation methods. Reconciliation of landing estimates between WCGOP and PacFIN need to be made to ensure proper use of each data set.

## 8. Acknowledgements

This assessment draws heavily on the text and analyses in the 2009, 2007 and earlier documents, and has benefited greatly from the efforts of all authors contributing to those analyses. All those who provided data sources for the 2007 assessment that have not been revisited in this update are recognized again for these important contributions. Many people at various state and federal agencies assisted with assembling the data sources included in this updated assessment. Jason Jannot provided total mortality estimates from recent years and summarized biological data from the West Coast Observer Program. Vanessa Tuttle provided biological sampling data from the at-sea whiting fishery. Steve Ralston provided analysis of pre-recruit survey data collected by the SWFSC and NWFSC/PWCC. Beth Horness provided summary statistics from the NWFSC trawl survey. Comments and suggestions from Jim Hastie substantially improved the quality of the document.

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## 10. Tables

Table 1. Recent trend in estimated total canary rockfish catch and commercial landings (mt) relative to management guidelines.

| Year | ABC (mt) | OY (mt) | Commercial landings (mt)[1] | Total Catch (mt) |
|---|---|---|---|---|
| 1999 | 1,045[2] | 857[2] | 666.3 | 898.7 |
| 2000 | 287 | 200 | 55.7 | 199.9 |
| 2001 | 228 | 93 | 42.6 | 133.0 |
| 2002 | 228 | 93 | 69.9 | 120.5 |
| 2003 | 272 | 44 | 75.8 | 134.4 |
| 2004 | 256 | 47.3 | 49.3 | 103.4 |
| 2005 | 270 | 46.8 | 10.9 | 53.9 |
| 2006 | 279 | 47 | 7.7 | 64.8 |
| 2007 | 172 | 44 | 12.1 | 57.4 |
| 2008 | 179 | 44 | 8.2 | 53.8 |
| 2009 | 937 | 105 | 11.7 | 58.1 |
| 2010 | 940 | 105 | 14.3 | 81.8 |

[1]Excludes all at-sea whiting, recreational and research catches.
[2]Includes the Columbia and Vancouver INPFC areas only.

**Table 2. Summary of data sources available in 2009. "X" denotes data used in 2009, "N" denotes new data for this update.**

| | 1916-27 | 1928-31 | 1932-49 | 1950-65 | 1966-67 | 1968-72 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Catches*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| S. CA trawl | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N | N | N | N | N | N | N | N | N |
| N. CA trawl | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N | N | N | N | N | N | N | N | N |
| OR trawl | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N | N | N | N | N | N | N | N | N |
| WA trawl | | | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N | N | N | N | N | N | N | N | N |
| S. CA non-trawl | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N | N | N | N | N | N | N | N | N |
| N. CA non- | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N | N | N | N | N | N | N | N | N |
| OR/WA non-trl | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N | N | N | N | N | N | N | N | N |
| S. CA Rec. | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N |
| N. CA Rec. | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N |
| OR/WA Rec. | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N |
| At-sea whiting | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N |
| Foreign | | | | | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | N | N |
| Research | | | | | | | | | | | X | | | X | | | X | | | X | | | X | | | X | | | X | | | X | | | X | X | X | X | X | X | X | N | N |
| WCGOP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | N | N |
| ***Fishery Data*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Age* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| S. CA trawl | | | | | | | | | | | | | | X | X | | X | X | X | | | | | | | | | | | | | | | | X | X | | | | | | | | |
| N. CA trawl | | | | | | | | | | | | | | X | X | X | X | X | X | | X | | | | | | | | | | | | | | X | X | X | X | X | | | | N | |
| OR trawl | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N |
| WA trawl | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N |
| OR/WA non-trl | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | | X | X | X | | X | X | | | | | | | | | | |
| WCGOP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | | N | N | | | |
| At-sea whiting | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | | N | N | | | |
| *Length* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| At-sea whiting | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | N | N | | | |
| S. CA trawl | | | | | | | | | | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N |
| N. CA trawl | | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | |
| OR trawl | | | | | | | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N |
| WA trawl | | | | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N |
| S. CA non-trawl | | | | | | | | | | X | X | X | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | | X | X | X | X | X | | N | |
| N. CA non- | | | | | | | | | | | | | X | X | X | X | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | |
| OR/WA non-trl | | | | | | | | | | | | X | | | | | | | | | X | | X | | | | | | | X | X | X | X | X | X | X | | X | | X | X | | |
| S. CA Rec. | | | | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N |

Table 2. Continued. Summary of data sources available in 2009. "X" denotes data used in 2007, "N" denotes new data for this update.

| | 1916-27 | 1928-31 | 1932-49 | 1950-65 | 1966-67 | 1968-72 | 1973-77 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Fishery Data*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Length* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| N. CA Rec. | | | | | | | | | | X | X | X | X | X | X | X | X | X | X | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N |
| OR/WA Rec. | | | | | | | | | | X | X | X | X | X | X | X | X | X | X | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | N | N |
| WCGOP discards | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | N | N |
| ***Survey data*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Index* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triennial survey | | | | | | | | | | X | | | X | | | X | | | X | | | X | | | X | | | X | | | X | | | X | | | | | | | |
| NWFSC survey | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | N | N |
| Pre-recruit index | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | N | N |
| *Age* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triennial survey | | | | | | | | | | | | | X | | | | | X | | | | X | | | X | | | X | | | X | | | X | | | | | | | |
| NWFSC survey | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | N | N |
| *Length* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triennial survey | | | | | | | | | | | | | X | | | X | | | X | | | X | | | X | | | X | | | X | | | X | | | | | | | |
| NWFSC survey | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | N | N |
| ***For comparison*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PGCT hook-and-line | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | | | | | |
| YOY core area | | | | | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | |
| NWFSC Hook and Line | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | | | | | |
| N. CA trawl CPUE | | | | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| OR/WA Rec. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | | | | | | | | | | |
| N. CA Rec. CPFV CPUE | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | |

**Table 3. Summary of sampling used in the calculation of biomass indices for the shelf trawl surveys.**

| | Triennial | | NWFSC | |
|---|---|---|---|---|
| Year | Number of tows | Positive tows | Number of tows | Positive tows |
| 1980 | 314 | 77 | NA | NA |
| 1983 | 493 | 185 | NA | NA |
| 1986 | 484 | 169 | NA | NA |
| 1989 | 452 | 93 | NA | NA |
| 1992 | 431 | 69 | NA | NA |
| 1995 | 450 | 43 | NA | NA |
| 1998 | 479 | 86 | NA | NA |
| 2001 | 474 | 74 | NA | NA |
| 2003 | NA | NA | 524 | 50 |
| 2004 | 383 | 63 | 463 | 42 |
| 2005 | NA | NA | 619 | 56 |
| 2006 | NA | NA | 622 | 32 |
| 2007 | NA | NA | 650 | 48 |
| 2008 | NA | NA | 649 | 36 |
| 2009 | NA | NA | 651 | 33 |
| 2010 | NA | NA | 665 | 51 |

**Table 4. Summary of data used to produce NWFSC survey length and age-at-length frequencies.**

| | Length data | | Age-at-length data | |
|---|---|---|---|---|
| Year | Number of Samples | Number of fish | Number of samples | Number of Fish |
| 2003 | 50 | 423 | 202 | 262 |
| 2004 | 37 | 482 | 186 | 254 |
| 2005 | 53 | 534 | 182 | 234 |
| 2006 | 32 | 623 | 178 | 246 |
| 2007 | 48 | 673 | 254 | 496 |
| 2008 | 36 | 799 | 257 | 434 |
| 2009 | 33 | 308 | 157 | 236 |
| 2010 | 51 | 495 | 221 | 345 |

**Table 5. Summary of fixed biological parameters used in this stock assessment**

| Quantity | Value | Source |
|---|---|---|
| Natural mortality | 0.06 | All canary assessments since 1994, males and females < age 6, with a linear ramp to an estimated value for females age 14+. |
| Weight-length coefficient (*a*) | 0.0000155 | 2005 assessment, pooled over both sexes from fishery and survey data combined. |
| Weight-length exponent (*b*) | 3.03 | |
| Length at 50% maturity | 40.5 | 2005 assessment Oregon and Washington trawl fisheries sampled during fall and winter months only. |
| Maturity logistic slope | -0.25 | |
| Fecundity eggs/gram intercept | 1.0 | No fecundity relationship available, so weight is assumed to be a reasonable proxy. |
| Fecundity slope | 0.0 | |

Table 6. Total catches (mt) of canary rockfish by fleet used in the assessment model. Foreign catches are included in state trawl fisheries. See text for description of sources.

| Year | S. CA trawl | N. CA trawl | Oregon trawl | WA trawl | S. CA non-trawl | N. CA non-trawl | OR-WA non-trawl | At-sea whiting bycatch | S. CA rec. | N. CA rec. | OR/WA rec. | Research catches |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1916 | 0 | 10.63 | 0 | 0 | 0 | 26.31 | 2.79 | 0 | 0 | 0 | 0 | 0 |
| 1917 | 0 | 16.13 | 0 | 0 | 0 | 42.72 | 2.93 | 0 | 0 | 0 | 0 | 0 |
| 1918 | 0 | 16.4 | 0 | 0 | 0 | 44.9 | 3.07 | 0 | 0 | 0 | 0 | 0 |
| 1919 | 0 | 13.28 | 0 | 0 | 0 | 25.31 | 3.22 | 0 | 0 | 0 | 0 | 0 |
| 1920 | 0 | 13.2 | 0 | 0 | 0 | 27.56 | 3.36 | 0 | 0 | 0 | 0 | 0 |
| 1921 | 0 | 10.01 | 0 | 0 | 0 | 25.07 | 3.5 | 0 | 0 | 0 | 0 | 0 |
| 1922 | 0 | 8.95 | 0 | 0 | 0 | 23.25 | 3.65 | 0 | 0 | 0 | 0 | 0 |
| 1923 | 0 | 11.14 | 0 | 0 | 0 | 27.49 | 3.79 | 0 | 0 | 0 | 0 | 0 |
| 1924 | 0 | 5.89 | 0 | 0 | 0 | 34.46 | 3.93 | 0 | 0 | 0 | 0 | 0 |
| 1925 | 0 | 3.74 | 0 | 0 | 0 | 43.04 | 4.08 | 0 | 0 | 0 | 0 | 0 |
| 1926 | 0 | 12.58 | 0 | 0 | 0 | 49.92 | 4.22 | 0 | 0 | 0 | 0 | 0 |
| 1927 | 0 | 15.54 | 0 | 0 | 0 | 40.52 | 4.33 | 0 | 0 | 0 | 0 | 0 |
| 1928 | 0 | 19.16 | 8.16 | 0 | 0 | 34.99 | 7.23 | 0 | 0 | 0 | 0 | 0 |
| 1929 | 0 | 34.55 | 14.19 | 0 | 0 | 23.92 | 12.37 | 0 | 1.29 | 0 | 0 | 0 |
| 1930 | 0 | 29.84 | 13.14 | 0 | 0 | 34.09 | 11.28 | 0 | 2.09 | 0 | 0 | 0 |
| 1931 | 0 | 41.45 | 10.06 | 0 | 0 | 33.12 | 9.06 | 0 | 3.14 | 0 | 0 | 0 |
| 1932 | 0 | 28.35 | 3.69 | 0.8 | 0 | 27.4 | 2.88 | 0 | 4.19 | 0 | 0 | 0 |
| 1933 | 0 | 38.45 | 5.39 | 0.49 | 0 | 10.97 | 4.75 | 0 | 5.23 | 0 | 0 | 0 |
| 1934 | 0 | 33 | 5.86 | 0.02 | 0 | 15.27 | 5.12 | 0 | 6.28 | 0 | 0 | 0 |
| 1935 | 0 | 33.72 | 5.4 | 0.39 | 0 | 23.17 | 4.6 | 0 | 7.33 | 0 | 0 | 0 |
| 1936 | 0 | 20.21 | 13.41 | 1.42 | 0 | 20.92 | 11 | 0 | 8.38 | 0 | 0 | 0 |
| 1937 | 0 | 30.8 | 17.03 | 2.78 | 0 | 13.28 | 13.1 | 0 | 9.99 | 0 | 0 | 0 |
| 1938 | 0 | 31.36 | 15.47 | 0 | 0 | 13.62 | 12.93 | 0 | 9.8 | 0 | 0 | 0 |
| 1939 | 0 | 41.59 | 11.49 | 3.95 | 0 | 12.96 | 7.36 | 0 | 8.58 | 0 | 0 | 0 |
| 1940 | 0 | 33.96 | 68.56 | 90.98 | 0 | 9.52 | 16.31 | 0 | 12.18 | 0 | 0 | 0 |
| 1941 | 0 | 26.94 | 144.08 | 140.06 | 0 | 12.32 | 21.82 | 0 | 11.14 | 0 | 0 | 0 |
| 1942 | 0 | 6.48 | 210.19 | 263.08 | 0 | 9.23 | 30.31 | 0 | 12.09 | 0 | 0 | 0 |
| 1943 | 0 | 32.1 | 766.49 | 919.69 | 0 | 7.62 | 75.02 | 0 | 13.04 | 0 | 0 | 0 |
| 1944 | 0 | 133.92 | 1,258.48 | 1613.87 | 0 | 28.63 | 19.29 | 0 | 13.99 | 0 | 0 | 0 |
| 1945 | 0 | 304.19 | 1,937.94 | 2490.17 | 0 | 69.7 | 12.3 | 0 | 14.94 | 0 | 0 | 0 |
| 1946 | 0 | 275.87 | 1,215.83 | 1533.24 | 0 | 71.77 | 15.11 | 0 | 15.89 | 0 | 0 | 0 |
| 1947 | 0 | 110.71 | 755.22 | 955.81 | 0 | 16.42 | 7.64 | 0 | 8.97 | 0 | 0 | 0 |
| 1948 | 0 | 114.62 | 519.74 | 681.06 | 0 | 32.11 | 12.57 | 0 | 18.11 | 0 | 0 | 0 |
| 1949 | 0 | 96.72 | 528.54 | 589.71 | 0 | 12.42 | 8.38 | 0 | 23.42 | 0 | 0 | 0 |
| 1950 | 0 | 92.93 | 633.7 | 617.6 | 0 | 10.06 | 7.79 | 0 | 28.53 | 0 | 0 | 0 |
| 1951 | 0 | 199.38 | 409.14 | 568.18 | 0 | 16.32 | 5.99 | 0 | 31.99 | 0 | 0 | 0 |
| 1952 | 0 | 134.15 | 418.88 | 588.55 | 0 | 12.33 | 5.71 | 0 | 28.55 | 0 | 0 | 0 |
| 1953 | 0 | 134.01 | 334.79 | 616.88 | 0 | 7.17 | 2.98 | 0 | 25.07 | 0 | 0 | 0 |
| 1954 | 0 | 90.29 | 421.04 | 783.29 | 0 | 17.49 | 3.48 | 0 | 33.86 | 0 | 0 | 0 |
| 1955 | 0 | 100.28 | 442.74 | 788.93 | 0 | 4.12 | 4.31 | 0 | 43.75 | 0 | 0 | 0 |
| 1956 | 0 | 99.01 | 271.93 | 1168.75 | 0 | 6.36 | 2.75 | 0 | 49.41 | 0 | 0 | 0 |
| 1957 | 0 | 114.58 | 779.74 | 1217.38 | 0 | 6.88 | 5.96 | 0 | 42.61 | 0 | 0 | 0 |
| 1958 | 0 | 147.85 | 599.62 | 831.98 | 0 | 9.02 | 1.19 | 0 | 65.93 | 0 | 0 | 0 |
| 1959 | 0 | 108.66 | 658.62 | 910.93 | 0 | 6.46 | 2.45 | 0 | 52.38 | 0 | 0 | 0 |
| 1960 | 0 | 83.92 | 834.55 | 1085.39 | 0 | 8.97 | 1.63 | 0 | 41.37 | 0 | 0 | 0 |
| 1961 | 0 | 66.84 | 760.81 | 985.01 | 0 | 6.36 | 4.52 | 0 | 30.22 | 0 | 0 | 0 |
| 1962 | 0 | 66.25 | 795.34 | 1151.08 | 0 | 9.39 | 4.13 | 0 | 36.8 | 0 | 0 | 0 |
| 1963 | 0 | 90.9 | 544.63 | 662.01 | 0 | 8.25 | 3.7 | 0 | 39.79 | 0 | 0 | 0 |
| 1964 | 0 | 59.74 | 489.43 | 1009.03 | 0 | 7.09 | 8.25 | 0 | 38.2 | 0 | 0 | 0 |
| 1965 | 0 | 80.37 | 483.87 | 823.58 | 0 | 8.73 | 16.79 | 0 | 57.6 | 0 | 0 | 0 |
| 1966 | 0 | 59.46 | 2,127.32 | 923.56 | 0 | 6.57 | 17.36 | 0 | 65.34 | 0 | 0 | 0 |
| 1967 | 0 | 81.41 | 854.51 | 133.16 | 0 | 7.53 | 31.09 | 0 | 70.75 | 0 | 0 | 0 |
| 1968 | 0 | 77.62 | 788.7 | 854.16 | 0 | 4.8 | 31.89 | 0 | 76.65 | 0 | 0 | 0 |
| 1969 | 2.28 | 201.51 | 671.26 | 261.7 | 3.2 | 15.82 | 45.52 | 0 | 82.16 | 0 | 0 | 0 |

Table 6. Continued. Total catches (mt) of canary rockfish by fleet used in the assessment model.

| Year | S. CA trawl | N. CA trawl | Oregon trawl | WA trawl | S. CA non-trawl | N. CA non-trawl | OR-WA non-trawl | At-sea whiting bycatch | S. CA rec. | N. CA rec. | OR/WA rec | Research catches |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1970 | 3.02 | 215.09 | 679.36 | 570.03 | 3.6 | 8.4 | 33.61 | 0 | 104.22 | 0 | 0 | 0 |
| 1971 | 1.67 | 328.87 | 702.64 | 759.29 | 4.65 | 16.54 | 38.23 | 0 | 93.06 | 0 | 0 | 0 |
| 1972 | 3.32 | 420.27 | 927.41 | 716.27 | 5.83 | 35.12 | 62.93 | 0 | 121.34 | 0 | 0 | 0 |
| 1973 | 5.04 | 697.64 | 1,306.06 | 889.66 | 7.87 | 11.73 | 66.9 | 0 | 141.51 | 0 | 0 | 0 |
| 1974 | 3.92 | 551.04 | 602.41 | 546.11 | 9.89 | 40.22 | 73.59 | 0 | 153.15 | 0 | 0 | 0 |
| 1975 | 5.06 | 539.51 | 525.46 | 388.43 | 10.93 | 25.11 | 45.08 | 0 | 150.16 | 4.01 | 0 | 0 |
| 1976 | 5.63 | 524 | 283.49 | 238.77 | 10.83 | 39.32 | 52.49 | 0 | 156.59 | 2.11 | 0 | 0 |
| 1977 | 5.13 | 456.35 | 489.01 | 595.35 | 9.99 | 49.67 | 57.1 | 0 | 149.55 | 4.47 | 0 | 11.66 |
| 1978 | 0 | 655.43 | 990.18 | 1,790.10 | 15.02 | 131.35 | 136.81 | 0 | 144.37 | 10.3 | 0 | 0 |
| 1979 | 4.36 | 311.05 | 1,750.53 | 1,300.09 | 22.92 | 106.04 | 239.32 | 0 | 165.42 | 4.86 | 0 | 0 |
| 1980 | 10.38 | 433.41 | 2,309.41 | 2879.89 | 17.21 | 78.8 | 183.14 | 74.36 | 86.37 | 34.98 | 0 | 5.31 |
| 1981 | 34.18 | 494.01 | 2,082.84 | 1883.83 | 40.14 | 164.77 | 160.46 | 35.05 | 118.04 | 48.89 | 0 | 0 |
| 1982 | 0.9 | 797.71 | 3,941.26 | 3635.34 | 37.82 | 10.68 | 262.09 | 34.33 | 241.28 | 44.47 | 0 | 0 |
| 1983 | 7.39 | 499.24 | 3,580.68 | 3412.49 | 47.41 | 10.04 | 320.1 | 11.63 | 93.99 | 6.82 | 0 | 10.49 |
| 1984 | 1.8 | 414.82 | 1,188.43 | 1289.2 | 32.35 | 20.88 | 210.46 | 31.77 | 75.66 | 26.65 | 0 | 0 |
| 1985 | 6.98 | 316.25 | 1,029.50 | 1,071.19 | 29.74 | 82.1 | 213.19 | 43.47 | 120.33 | 63.37 | 0 | 0 |
| 1986 | 0.81 | 166.16 | 902.13 | 1006.99 | 12.37 | 43.98 | 206.26 | 61.4 | 165.45 | 24.21 | 0 | 11.78 |
| 1987 | 0 | 209.24 | 1,491.39 | 1,016.63 | 20.1 | 23.78 | 160 | 57.02 | 168.13 | 34.34 | 0 | 0 |
| 1988 | 0.28 | 223.62 | 1,576.42 | 979.31 | 21.64 | 31.73 | 0 | 46.59 | 137.65 | 56.59 | 0 | 0 |
| 1989 | 5.13 | 178.43 | 1,573.63 | 1,208.85 | 87.48 | 129.52 | 0 | 29.71 | 85.89 | 31.56 | 0 | 5.1 |
| 1990 | 0.95 | 326.72 | 1,029.44 | 1,099.48 | 39.83 | 180.05 | 17.35 | 10.02 | 61.34 | 38.43 | 0 | 0 |
| 1991 | 0.45 | 148.99 | 1,776.39 | 971.64 | 69.21 | 92.36 | 27.91 | 10.02 | 61.34 | 43.75 | 5.06 | 0 |
| 1992 | 2.21 | 223.75 | 1,423.29 | 825.03 | 19.24 | 107.82 | 152.43 | 10.02 | 61.34 | 38.43 | 1.81 | 1.17 |
| 1993 | 4.91 | 85.25 | 1,513.80 | 289.81 | 14.07 | 94.22 | 116.69 | 0 | 64.82 | 51.07 | 0.72 | 0 |
| 1994 | 0.33 | 126.13 | 644.15 | 149.54 | 13.03 | 82.8 | 104.87 | 0 | 53.46 | 38.78 | 4.83 | 0 |
| 1995 | 29.44 | 109.56 | 548.61 | 161.15 | 35.22 | 79.31 | 118.68 | 1.23 | 68.33 | 43.53 | 0.31 | 1.07 |
| 1996 | 11.39 | 206.97 | 758.21 | 189.85 | 31.4 | 104.98 | 166.36 | 2.49 | 60.59 | 25.24 | 1.35 | 0 |
| 1997 | 4.14 | 170.64 | 589.85 | 203.44 | 8.43 | 96.29 | 254.41 | 1.75 | 100.85 | 46.68 | 3.63 | 0 |
| 1998 | 4.05 | 154.93 | 716.05 | 203.02 | 8.73 | 71.53 | 250.13 | 1.14 | 25.46 | 53.49 | 5.47 | 0.97 |
| 1999 | 1.88 | 102.77 | 387.85 | 139.97 | 2.93 | 33.84 | 123.96 | 2.81 | 62.05 | 35.02 | 5.63 | 0 |
| 2000 | 0.17 | 12.45 | 38.36 | 32.7 | 0.87 | 7.18 | 10.25 | 0.41 | 76.64 | 18.46 | 2.35 | 0 |
| 2001 | 0.11 | 10.76 | 32.57 | 19.65 | 0.48 | 6.08 | 11.02 | 0 | 33.37 | 13.34 | 4.05 | 1.61 |
| 2002 | 3.65 | 16.25 | 27.71 | 44.41 | 0.01 | 0.23 | 5.57 | 0.21 | 6 | 11.13 | 5.24 | 0.13 |
| 2003 | 3.57 | 5.38 | 14.62 | 77.4 | 0 | 0.01 | 1.17 | 0.06 | 18.05 | 12.1 | 0.93 | 1.08 |
| 2004 | 3.6 | 5.83 | 15.59 | 48.95 | 0.05 | 0.02 | 5.54 | 1.48 | 9.11 | 5.76 | 5.22 | 2.24 |
| 2005 | 3.57 | 5.9 | 15.8 | 10.87 | 0.03 | 0.04 | 1.4 | 1.49 | 2 | 6.82 | 1.44 | 4.54 |
| 2006 | 3.86 | 5.8 | 14.22 | 9.12 | 0.11 | 0 | 0.81 | 5.73 | 12.3 | 3.98 | 1.09 | 7.78 |
| 2007 | 10.7 | 5.51 | 12.96 | 8.76 | 0 | 0 | 0.33 | 3.47 | 7.44 | 3.78 | 2 | 2.5 |
| 2008 | 3.8 | 5.32 | 12.88 | 8.4 | 0.01 | 0 | 4.26 | 2.2 | 4.8 | 3.28 | 5.96 | 2.9 |
| 2009 | 3.79 | 5.75 | 15 | 9.86 | 0 | 0.01 | 3.45 | 3.55 | 7.65 | 3.5 | 5.05 | 0.5 |
| 2010 | 2.43 | 3.55 | 8.94 | 5.85 | 0.02 | 0.02 | 10.17 | 7.23 | 15.67 | 20.9 | 5.22 | 1.82 |

Table 7. Input and effective sample sizes used for tuning the composition data in the base model.

| Type of data | Fleet | Input adjustment | Average input after adjustment | Average effective N | Harmonic mean effective N |
|---|---|---|---|---|---|
| Length | S. Cal. trawl | 0.90 | 13.97 | 14.08 | 5.80 |
| | N. Cal. trawl | 1.00 | 63.46 | 64.19 | 40.03 |
| | OR trawl | 1.00 | 130.77 | 192.224 | 91.14 |
| | WA trawl | 1.00 | 99.70 | 215.12 | 101.51 |
| | S. Cal. non-trawl | 0.82 | 46.49 | 48.07 | 8.95 |
| | N. Cal. non-trawl | 1.00 | 73.20 | 112.04 | 11.10 |
| | OR-WA non-trawl | 1.00 | 24.26 | 51.67 | 11.58 |
| | S. Cal. rec | 0.88 | 123.59 | 124.28 | 54.19 |
| | N. Cal. rec | 0.82 | 78.78 | 79.94 | 44.63 |
| | OR-WA rec | 0.90 | 90.60 | 106.52 | 28.92 |
| | At-sea hake fishery | 0.73 | 134.33 | 138.39 | 72.96 |
| | NWFSC trawl survey | 1.00 | 86.88 | 123.13 | 97.84 |
| | Triennial survey (1980-1992) | 1.00 | 167.15 | 253.87 | 153.04 |
| | Triennial survey (1995-2004) | 1.00 | 97.34 | 115.34 | 67.97 |
| Age | S. Cal. trawl | 1.00 | 6.73 | 7.65 | 3.90 |
| | N. Cal. Trawl | 0.98 | 51.23 | 51.86 | 7.54 |
| | OR trawl | 1.00 | 126.74 | 203.17 | 123.99 |
| | WA trawl – WDFW error | 1.00 | 64.30 | 85.88 | 14.25 |
| | WA trawl – CAP error | 1.00 | 68.49 | 115.41 | 85.63 |
| | OR-WA non-trawl | 1.00 | 8.10 | 21.85 | 15.64 |
| | At-sea hake fishery | 0.36 | 64.29 | 73.35 | 40.23 |
| | NWFSC trawl survey | 1.00 | 4.71 | 6.34 | 1.80 |
| | Triennial survey (1980-1992) | 1.00 | 6.08 | 8.17 | 2.46 |
| | Triennial survey (1995-2004) | 0.90 | 5.39 | 5.65 | 2.44 |

**Table 8. Adjusted mean input standard errors and root-mean-squared error (RMSE) of fits to index data used to tune the base model. ~95% confidence interval intersection is reported as number of predictions inside the interval/number of data points.**

| Fleet | Additional variance added | Mean input standard error after adjustment | RMSE |
|---|---|---|---|
| NWFSC trawl survey | 0.5 | 0.77 | 0.62 |
| Triennial survey (1980-1992) | 0.5 | 0.64 | 0.72 |
| Triennial survey (1995-2004) | 0.5 | 0.73 | 0.22 |
| Pre-recruit index | 0.93 | 0.97 | 0.92 |

**Table 9. Description of model parameters in the base-case assessment model.**

| Parameter | Number estimated | Bounds (low, high) | Prior (Mean, SD) |
|---|---|---|---|
| Natural mortality (*M*, male and female to age 6) | - | NA | Fixed at 0.06 |
| Natural mortality (*M*, female age 14+, as exp. offset) | 1 | (-3,3) | Uniform |
| Stock and recruitment | | | |
| Ln($R_0$) | 1 | (5,11) | Uniform |
| Steepness ($h$) | - | NA | Fixed at 0.511 |
| $\sigma_r$ | - | NA | Fixed at 0.50 |
| Ln(Recruitment deviations): 1960-2009 | 50 | (-10, 10) | Uniform |
| Catchability | | | |
| Ln($Q$) – NWFSC survey | - | Analytic solution | |
| Ln($Q$) – Triennial survey (1980-1992) | - | Analytic solution | |
| Ln($Q$) – Triennial survey (1995-2004) | - | Analytic solution | |
| Ln($Q$) – Pre-recruit survey | - | Analytic solution | |
| Selectivity (double normal) | | | |
| *Fisheries:* | | | |
| Length at peak selectivity | 25 | (20,60) | Uniform |
| Width of top (as logistic) | - | NA | Fixed at -4.0 |
| Ascending width (as exp[width]) | 24 | (-1,10) | Uniform |
| Descending width (as exp[width]) | 7 | NA | Fixed at 1.0 |
| Initial selectivity (as logistic) | - | NA | Fixed at -9.0 |
| Final selectivity (as logistic) | 23 | (-5,5) | Uniform |
| *Surveys:* | | | |
| Length at peak selectivity | 2 | (15,66) | Uniform |
| Width of top (as logistic) | 2 | (-4,4) | Uniform |
| Ascending width (as exp[width]) | 2 | (-1,10) | Uniform |
| Descending width (as exp[width]) | - | NA | Fixed at 1.0 |
| Initial selectivity (as logistic) | 1 | (-5,5) | Fixed at -9.0 |
| Final selectivity (as logistic) | 2 | (-5,5) | Uniform |
| Individual growth | | | |
| *Females:* | | | |
| Length at age 1 | 1 | (2,10) | Uniform |
| Length at age 20 | 1 | (45,75) | Uniform |
| von Bertalanffy *K* | 1 | (0.01,0.25) | Uniform |
| CV of length at age 1 | 1 | (0.01,0.25) | Uniform |
| CV of length at age 20 offset to age 1 | 1 | (-3,3) | Uniform |
| *Males:* | | | |
| Length at age 1 offset to females | - | NA | Fixed at 0.0 |
| Length at age 20 offset to females | 1 | (-3,3) | Uniform |
| von Bertalanffy K offset to females | 1 | (-3,3) | Uniform |
| CV of length at age 1 offset to females | 1 | (-3,3) | Uniform |
| CV of length at age 20 offset to females | 1 | (-3,3) | Uniform |
| Total: 99 + 50 recruitment deviations = 149 estimated parameters | | | |

**Table 10. Comparison of summary 2009 and 2011 base-case model results.**

| Model | 2009 | 2011 |
|---|---|---|
| Description | Base case | Base case |
| **Convergence** | | |
| Maximum gradient component | 0.00097 | 0.00147 |
| Likelihood penalties | 0.0 | 0.0 |
| **Negative log-likelihoods** | | |
| Total | 4,963.0 | 6,254.8 |
| Indices | -4.8 | 3.8 |
| Length-frequency data | 2,360.5 | 3088.9 |
| Age-frequency data | 2,626.1 | 3178.6 |
| Recruitment | -18.8 | -16.6 |
| Priors | 0.0 | 0.0 |
| Forecast recruitment | 0.0 | 0.0 |
| **Select parameters** | | |
| *Stock-recruit, productivity* | | |
| $R_0$ | 3,335 | 8,309 |
| Steepness ($h$) | 0.511 | 0.511 |
| Female M age 14+ | 0.097 | 0.060 |
| *Survey catchability and selectivity* | | |
| NWFSC survey catchability ($Q$) | 0.125 | 0.691 |
| NWFSC survey peak selectivity | 48.349 | 52.114 |
| NWFSC survey width of selectivity top | 3.112 | 2.624 |
| NWFSC survey ascending width | 4.601 | 5.312 |
| NWFSC survey descending width | 4.000 | 4.000 |
| NWFSC survey final selectivity | 4.825 | 3.222 |
| 1980-1992 Triennial survey catchability ($Q$) | 0.111 | 0.234 |
| 1995-2004 Triennial survey catchability ($Q$) | 0.087 | 0.170 |
| Triennial survey peak selectivity | 61.254 | 60.989 |
| Triennial survey width of selectivity top | -4.000 | -4.000 |
| Triennial survey ascending width | 7.009 | 6.905 |
| Triennial survey final selectivity | -4.999 | -4.999 |
| *Individual growth* | | |
| Female and male length at age 1 | 6.639 | 8.034 |
| Female mean length at age 20 | 59.844 | 60.317 |
| Female von Bertalanffy $K$ | 0.131 | 0.125 |
| Female CV of length-at-age at age 1 | 0.134 | 0.123 |
| Female CV of length-at-age at age 20 | 0.037 | -1.231 |
| Male mean length at age 20 | 52.309 | 58.904 |
| Male von Bertalanffy $K$ | 0.170 | 0.257 |
| Male CV of length-at-age at age 1 | 0.168 | 0.239 |
| Male CV of length-at-age at age 20 | 0.040 | -1.413 |
| **Management quantities** | | |
| $SB_0$ | 25,993 | 33,512 |
| 2009 Spawning biomass | 6,170 | 7,456 |
| 2011 Spawning biomass | NA | 8,036 |
| 2009 Depletion | 21.7% | 22.2% |
| 2011 Depletion | NA | 23.9% |
| 2010 *SPR* | NA | 90.5% |
| 2010 Exp. rate: yield/age 5+ Biomass | NA | 0.0043 |

**Table 11. Canary rockfish growth parameter estimates and standard errors.**

| Parameter | Value | SD |
|---|---|---|
| *Females:* | | |
| Length at age 1 | 8.034 | 0.358132 |
| Length at age 20 | 60.317 | 0.309147 |
| von Bertalanffy *K* | 0.125 | 0.002163 |
| CV of length at age 1 | 0.123 | 0.008164 |
| CV of length at age 20 | -1.231 | 0.127064 |
| *Males:* | | |
| Length at age 1 | 58.904 | Not est. |
| Length at age 20 | 0.257 | NA |
| von Bertalanffy *K* | 0.239 | NA |
| CV of length at age 1 | -1.413 | NA |
| CV of length at age 20 | 58.904 | NA |

**Table 12. Canary rockfish catchability and productivity parameter estimates and standard errors.**

| Parameter | Value | SD |
|---|---|---|
| *Catchability:* | | |
| NWFSC survey catchability ($Q$) | 0.691 | NA |
| 1980-1992 triennial survey catchability ($Q$) | 0.234 | NA |
| 1995-2004 triennial survey catchability ($Q$) | 0.170 | NA |
| *Productivity:* | | |
| $R_0$ | 4035 | 137 |
| Steepness ($h$) | 0.511 | Not est. |
| Female natural mortality ($M$) age 14+ | 0.060 | NA |

**Table 13. Time-series of population estimates from the base-case model.**

| Year | Total biomass (mt) | Spawning biomass (mt) | Depletion | Age-0 recruits (1000s) | Total catch (mt) | SPR | Relative exploitation rate |
|---|---|---|---|---|---|---|---|
| 1916 | 86,756 | 33,512 | 100.00% | 4,035 | 39.73 | 99.21% | 0.0004666 |
| 1917 | 86,717 | 33,496 | 99.95% | 4,035 | 61.78 | 98.77% | 0.0007259 |
| 1918 | 86,657 | 33,472 | 99.88% | 4,034 | 64.37 | 98.72% | 0.0007569 |
| 1919 | 86,597 | 33,447 | 99.80% | 4,034 | 41.81 | 99.17% | 0.000492 |
| 1920 | 86,560 | 33,431 | 99.76% | 4,033 | 44.12 | 99.12% | 0.0005194 |
| 1921 | 86,523 | 33,415 | 99.71% | 4,033 | 38.58 | 99.23% | 0.0004544 |
| 1922 | 86,494 | 33,402 | 99.67% | 4,032 | 35.85 | 99.29% | 0.0004224 |
| 1923 | 86,468 | 33,392 | 99.64% | 4,032 | 42.42 | 99.15% | 0.0004999 |
| 1924 | 86,437 | 33,379 | 99.60% | 4,032 | 44.28 | 99.11% | 0.000522 |
| 1925 | 86,405 | 33,366 | 99.56% | 4,031 | 50.86 | 98.97% | 0.0005998 |
| 1926 | 86,369 | 33,351 | 99.52% | 4,031 | 66.72 | 98.66% | 0.0007872 |
| 1927 | 86,318 | 33,331 | 99.46% | 4,030 | 60.39 | 98.80% | 0.0007129 |
| 1928 | 86,275 | 33,314 | 99.41% | 4,030 | 69.54 | 98.63% | 0.0008214 |
| 1929 | 86,225 | 33,293 | 99.35% | 4,029 | 86.32 | 98.31% | 0.0010202 |
| 1930 | 86,161 | 33,266 | 99.27% | 4,028 | 90.44 | 98.21% | 0.0010697 |
| 1931 | 86,096 | 33,239 | 99.18% | 4,027 | 96.83 | 98.07% | 0.0011461 |
| 1932 | 86,027 | 33,210 | 99.10% | 4,027 | 67.31 | 98.61% | 0.0007974 |
| 1933 | 85,989 | 33,196 | 99.06% | 4,026 | 65.28 | 98.66% | 0.0007736 |
| 1934 | 85,954 | 33,182 | 99.02% | 4,026 | 65.55 | 98.63% | 0.0007772 |
| 1935 | 85,921 | 33,170 | 98.98% | 4,025 | 74.61 | 98.43% | 0.0008849 |
| 1936 | 85,880 | 33,154 | 98.93% | 4,025 | 75.34 | 98.41% | 0.000894 |
| 1937 | 85,840 | 33,139 | 98.89% | 4,025 | 86.98 | 98.17% | 0.0010326 |
| 1938 | 85,789 | 33,119 | 98.83% | 4,024 | 83.18 | 98.24% | 0.0009881 |
| 1939 | 85,744 | 33,101 | 98.77% | 4,023 | 85.93 | 98.21% | 0.0010213 |
| 1940 | 85,698 | 33,083 | 98.72% | 4,023 | 231.51 | 95.60% | 0.0027531 |
| 1941 | 85,514 | 33,002 | 98.48% | 4,021 | 356.36 | 93.47% | 0.0042471 |
| 1942 | 85,218 | 32,868 | 98.08% | 4,017 | 531.38 | 90.65% | 0.0063554 |
| 1943 | 84,768 | 32,664 | 97.47% | 4,011 | 1,813.96 | 73.90% | 0.0218126 |
| 1944 | 83,109 | 31,906 | 95.21% | 3,987 | 3,068.18 | 61.82% | 0.0376448 |
| 1945 | 80,323 | 30,641 | 91.43% | 3,947 | 4,829.24 | 49.26% | 0.0613479 |
| 1946 | 75,974 | 28,678 | 85.58% | 3,879 | 3,127.71 | 58.45% | 0.0420537 |
| 1947 | 73,462 | 27,557 | 82.23% | 3,837 | 1,854.77 | 69.96% | 0.0258075 |
| 1948 | 72,301 | 27,047 | 80.71% | 3,817 | 1,378.21 | 75.30% | 0.0194879 |
| 1949 | 71,660 | 26,790 | 79.94% | 3,807 | 1,259.19 | 76.69% | 0.0179628 |
| 1950 | 71,168 | 26,610 | 79.41% | 3,800 | 1,390.61 | 74.60% | 0.019972 |
| 1951 | 70,570 | 26,394 | 78.76% | 3,791 | 1,231.00 | 76.59% | 0.0178296 |
| 1952 | 70,142 | 26,273 | 78.40% | 3,786 | 1188.17 | 77.21% | 0.0173152 |
| 1953 | 69,763 | 26,172 | 78.10% | 3,782 | 1120.9 | 78.25% | 0.0164247 |
| 1954 | 69,454 | 26,103 | 77.89% | 3,779 | 1349.45 | 74.75% | 0.0198628 |
| 1955 | 68,927 | 25,932 | 77.38% | 3,772 | 1384.13 | 73.98% | 0.0205318 |
| 1956 | 68,376 | 25,744 | 76.82% | 3,764 | 1598.21 | 71.08% | 0.023902 |

Table 13. continued. Time-series of population estimates from the base-case model.

| Year | Total biomass (mt) | Spawning biomass (mt) | Depletion | Age-0 recruits (1000s) | Total catch (mt) | SPR | Relative exploitation rate |
|---|---|---|---|---|---|---|---|
| 1957 | 67,629 | 25,471 | 76.00% | 3,752 | 2,167.15 | 63.97% | 0.0327761 |
| 1958 | 66,359 | 24,940 | 74.42% | 3,729 | 1,655.59 | 69.05% | 0.0255285 |
| 1959 | 65,624 | 24,651 | 73.56% | 3,716 | 1,739.50 | 67.95% | 0.0271286 |
| 1960 | 64,837 | 24,329 | 72.60% | 4,052 | 2,055.83 | 64.04% | 0.03246 |
| 1961 | 63,785 | 23,877 | 71.25% | 4,570 | 1,853.76 | 66.12% | 0.0297664 |
| 1962 | 62,971 | 23,529 | 70.21% | 3,653 | 2,062.99 | 63.23% | 0.033567 |
| 1963 | 62,026 | 23,111 | 68.96% | 3,008 | 1349.28 | 71.96% | 0.0223124 |
| 1964 | 61,842 | 23,026 | 68.71% | 2,795 | 1611.74 | 68.35% | 0.0267688 |
| 1965 | 61,418 | 22,842 | 68.16% | 2,951 | 1,470.94 | 69.75% | 0.0245915 |
| 1966 | 61,110 | 22,739 | 67.85% | 3,671 | 3,199.61 | 50.88% | 0.0535272 |
| 1967 | 59,134 | 21,864 | 65.24% | 7,295 | 1,178.45 | 72.53% | 0.0203533 |
| 1968 | 59,058 | 21,946 | 65.49% | 3,583 | 1,833.82 | 63.45% | 0.0317164 |
| 1969 | 58,427 | 21,755 | 64.92% | 2,833 | 1,283.45 | 70.43% | 0.0225349 |
| 1970 | 58,447 | 21,790 | 65.02% | 3,060 | 1,617.33 | 65.34% | 0.0285863 |
| 1971 | 58,199 | 21,642 | 64.58% | 4,303 | 1,944.95 | 61.15% | 0.0347183 |
| 1972 | 57,643 | 21,326 | 63.64% | 4,727 | 2,292.49 | 56.32% | 0.0407174 |
| 1973 | 56,756 | 20,877 | 62.30% | 3,683 | 3,126.41 | 47.53% | 0.0563349 |
| 1974 | 55,119 | 20,132 | 60.07% | 2,926 | 1,980.33 | 57.92% | 0.0368997 |
| 1975 | 54,689 | 19,978 | 59.61% | 4,969 | 1,693.75 | 61.36% | 0.031982 |
| 1976 | 54,496 | 19,979 | 59.62% | 1,962 | 1,313.23 | 67.10% | 0.0248486 |
| 1977 | 54,710 | 20,147 | 60.12% | 3,475 | 1,828.28 | 59.71% | 0.0343067 |
| 1978 | 54,381 | 20,071 | 59.89% | 3,732 | 3,873.56 | 40.59% | 0.0730829 |
| 1979 | 51,999 | 19,104 | 57.01% | 1,695 | 3,904.59 | 38.58% | 0.0773241 |
| 1980 | 49,588 | 18,214 | 54.35% | 1,539 | 6,113.26 | 25.86% | 0.12591 |
| 1981 | 45,008 | 16,432 | 49.03% | 3,498 | 5,062.21 | 27.33% | 0.115838 |
| 1982 | 41,385 | 15,086 | 45.02% | 1,750 | 9,005.88 | 14.72% | 0.223643 |
| 1983 | 33,899 | 12,099 | 36.10% | 1,217 | 8,000.28 | 14.36% | 0.241234 |
| 1984 | 27,522 | 9,504 | 28.36% | 4,019 | 3,292.02 | 24.89% | 0.123567 |
| 1985 | 25,698 | 8,887 | 26.52% | 1,309 | 2,976.12 | 24.35% | 0.120788 |
| 1986 | 24,170 | 8,393 | 25.04% | 1,507 | 2,601.54 | 25.72% | 0.110997 |
| 1987 | 22,976 | 8,008 | 23.90% | 2,068 | 3,180.63 | 20.62% | 0.143621 |
| 1988 | 21,164 | 7,325 | 21.86% | 2,277 | 3,073.83 | 19.80% | 0.153297 |
| 1989 | 19,417 | 6,644 | 19.83% | 2,495 | 3,335.30 | 17.08% | 0.177289 |
| 1990 | 17,397 | 5,823 | 17.38% | 2,111 | 2,803.61 | 17.95% | 0.168109 |
| 1991 | 15,926 | 5,218 | 15.57% | 2,306 | 3,207.12 | 14.55% | 0.213035 |
| 1992 | 14,102 | 4,426 | 13.21% | 1,505 | 2,866.54 | 13.91% | 0.217361 |
| 1993 | 12,676 | 3,786 | 11.30% | 1,570 | 2,235.36 | 15.57% | 0.190075 |
| 1994 | 11,908 | 3,406 | 10.16% | 1,900 | 1,217.92 | 24.67% | 0.109894 |
| 1995 | 12,120 | 3,474 | 10.37% | 1,454 | 1,196.44 | 25.60% | 0.105456 |
| 1996 | 12,322 | 3,616 | 10.79% | 1,576 | 1,558.83 | 20.19% | 0.133276 |
| 1997 | 12,116 | 3,626 | 10.82% | 1,000 | 1,480.11 | 20.62% | 0.1291 |

Table 13. continued. Time-series of population estimates from the base-case model.

| Year | Total biomass (mt) | Spawning biomass (mt) | Depletion | Age-0 recruits (1000s) | Total catch (mt) | SPR | Relative exploitation rate |
|---|---|---|---|---|---|---|---|
| 1998 | 11,929 | 3,658 | 10.91% | 1,439 | 1,494.97 | 21.01% | 0.132806 |
| 1999 | 11,655 | 3,644 | 10.87% | 1,561 | 898.71 | 33.26% | 0.0810999 |
| 2000 | 11,885 | 3,837 | 11.45% | 1,174 | 199.84 | 75.83% | 0.0176274 |
| 2001 | 12,757 | 4,293 | 12.81% | 2,266 | 133.04 | 83.87% | 0.0108491 |
| 2002 | 13,634 | 4,756 | 14.19% | 1,237 | 120.54 | 85.94% | 0.0092364 |
| 2003 | 14,514 | 5,198 | 15.51% | 1,681 | 134.37 | 84.96% | 0.0096634 |
| 2004 | 15,343 | 5,608 | 16.73% | 590 | 103.39 | 88.75% | 0.007012 |
| 2005 | 16,182 | 5,999 | 17.90% | 451 | 53.9 | 94.19% | 0.0034846 |
| 2006 | 17,023 | 6,385 | 19.05% | 1,037 | 64.8 | 93.03% | 0.0039227 |
| 2007 | 17,778 | 6,752 | 20.15% | 2,793 | 57.45 | 94.21% | 0.0033233 |
| 2008 | 18,408 | 7,111 | 21.22% | 847 | 53.81 | 94.79% | 0.0029666 |
| 2009 | 19,029 | 7,456 | 22.25% | 2,859 | 58.11 | 94.25% | 0.0031184 |
| 2010 | 19,585 | 7,772 | 23.19% | 1,361 | 81.82 | 90.52% | 0.0043182 |
| 2011 | 20,140 | 8,036 | 23.98% | 2,295 | NA | NA | NA |

**Table 14. Asymptotic standard deviation estimates for spawning biomass and recruitment.**

| 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) |
|---|---|---|---|---|---|---|---|---|
| 1916 | 1164 | 137 | 1955 | 1041 | 138 | 1994 | 246 | 371 |
| 1917 | 1164 | 136 | 1956 | 1038 | 138 | 1995 | 282 | 324 |
| 1918 | 1164 | 136 | 1957 | 1034 | 138 | 1996 | 327 | 346 |
| 1919 | 1163 | 136 | 1958 | 1030 | 138 | 1997 | 381 | 278 |
| 1920 | 1163 | 136 | 1959 | 1027 | 138 | 1998 | 442 | 328 |
| 1921 | 1163 | 136 | 1960 | 1024 | 2547 | 1999 | 509 | 345 |
| 1922 | 1162 | 136 | 1961 | 1020 | 3115 | 2000 | 581 | 273 |
| 1923 | 1162 | 136 | 1962 | 1017 | 2279 | 2001 | 654 | 396 |
| 1924 | 1162 | 136 | 1963 | 1013 | 1658 | 2002 | 727 | 251 |
| 1925 | 1162 | 136 | 1964 | 1010 | 1468 | 2003 | 796 | 308 |
| 1926 | 1161 | 136 | 1965 | 1001 | 1603 | 2004 | 860 | 144 |
| 1927 | 1161 | 136 | 1966 | 981 | 2511 | 2005 | 919 | 136 |
| 1928 | 1161 | 136 | 1967 | 942 | 3830 | 2006 | 972 | 272 |
| 1929 | 1160 | 136 | 1968 | 891 | 2376 | 2007 | 1022 | 646 |
| 1930 | 1160 | 136 | 1969 | 833 | 1449 | 2008 | 1069 | 324 |
| 1931 | 1159 | 136 | 1970 | 776 | 1580 | 2009 | 1113 | 1055 |
| 1932 | 1158 | 136 | 1971 | 725 | 2240 | 2010 | 1151 | 663 |
| 1933 | 1158 | 136 | 1972 | 677 | 2272 | 2011 | 1182 | 1171 |
| 1934 | 1158 | 136 | 1973 | 630 | 1665 | | | |
| 1935 | 1158 | 136 | 1974 | 580 | 1194 | | | |
| 1936 | 1157 | 136 | 1975 | 530 | 894 | | | |
| 1937 | 1157 | 136 | 1976 | 485 | 615 | | | |
| 1938 | 1156 | 136 | 1977 | 447 | 512 | | | |
| 1939 | 1156 | 136 | 1978 | 412 | 453 | | | |
| 1940 | 1155 | 136 | 1979 | 375 | 351 | | | |
| 1941 | 1154 | 136 | 1980 | 341 | 328 | | | |
| 1942 | 1152 | 136 | 1981 | 310 | 364 | | | |
| 1943 | 1149 | 136 | 1982 | 285 | 314 | | | |
| 1944 | 1138 | 136 | 1983 | 257 | 300 | | | |
| 1945 | 1124 | 136 | 1984 | 232 | 417 | | | |
| 1946 | 1102 | 136 | 1985 | 214 | 348 | | | |
| 1947 | 1088 | 136 | 1986 | 199 | 361 | | | |
| 1948 | 1078 | 136 | 1987 | 187 | 445 | | | |
| 1949 | 1071 | 137 | 1988 | 178 | 439 | | | |
| 1950 | 1064 | 137 | 1989 | 175 | 435 | | | |
| 1951 | 1058 | 137 | 1990 | 177 | 384 | | | |
| 1952 | 1053 | 137 | 1991 | 185 | 405 | | | |
| 1953 | 1049 | 137 | 1992 | 200 | 329 | | | |
| 1954 | 1045 | 137 | 1993 | 219 | 321 | | | |

Table 15. Projection of potential canary rockfish OFL, ACL, spawning biomass and depletion for the base-case model based on the SPR = 0.922 fishing mortality target used for the last rebuilding plan (ACL) and $F_{50\%}$ overfishing limit/target (OFL). Assuming the ACL of 102 and 107 mt are respectively achieved exactly in 2011 and 2012.

| Year | OFL[1] (mt) | ACL[1] (mt) | Age 5+ biomass (mt) | Spawning biomass (mt) | Depletion |
|---|---|---|---|---|---|
| 2011 | **586** | **102** | 19,275 | 8,036 | 24.0% |
| 2012 | **594** | **107** | 20,161 | 8,273 | 24.7% |
| 2013 | NA | 78 | 20,563 | 8,470 | 25.3% |
| 2014 | NA | 83 | 21,521 | 8,658 | 25.8% |
| 2015 | NA | 87 | 22,142 | 8,866 | 26.5% |
| 2016 | NA | 91 | 23,025 | 9,108 | 27.2% |
| 2017 | NA | 96 | 23,980 | 9,395 | 28.0% |
| 2018 | NA | 100 | 25,001 | 9,726 | 29.0% |
| 2019 | NA | 105 | 26,076 | 10,101 | 30.1% |
| 2020 | NA | 109 | 27,194 | 10,517 | 31.4% |
| 2021 | NA | 112 | 28,344 | 10,966 | 32.7% |
| 2022 | NA | 116 | 29,516 | 11,441 | 34.1% |

[1]OFL/ACL values for 2011 have been adopted by the PFMC and the values for 2012 are likely to be adopted (John DeVore, personal com.), and hence these numbers are not based on the results of this update.

Table 16. 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 a 2007 meta-analysis for steepness of west coast rockfish (M. Dorn, AFSC, personal communication). Landings in 2011-2012 are 102 and 107 mt, respectively for all cases. Selectivity and fleet allocations are projected at the average 2008-2010 values.

| | | | **State of nature** | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Low steepness (0.35) | | Base case (steepness = 0.51) | | High steepness (0.72) | |
| 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) |
| Rebuilding SPR 92.2% catches from low steepness state of nature | 2013 | 14 | 5.4% | 1,821 | 25.3% | 8470 | 46.5% | 15,297 |
| | 2014 | 15 | 5.5% | 1,850 | 25.8% | 8,659 | 47.8% | 15,699 |
| | 2015 | 16 | 5.5% | 1,881 | 26.5% | 8,867 | 49.1% | 16,130 |
| | 2016 | 16 | 5.7% | 1,919 | 27.2% | 9,111 | 50.6% | 16,612 |
| | 2017 | 17 | 5.8% | 1,965 | 28.2% | 9,398 | 52.2% | 17,148 |
| | 2018 | 17 | 5.9% | 2,019 | 29.0% | 9,730 | 53.9% | 17,724 |
| | 2019 | 18 | 6.1% | 2,081 | 30.2% | 10,106 | 55.8% | 18,328 |
| | 2020 | 18 | 6.3% | 2,150 | 31.4% | 10,522 | 57.7% | 18,949 |
| | 2021 | 19 | 6.6% | 2,225 | 32.7% | 10,973 | 59.6% | 19,575 |
| | 2022 | 19 | 6.8% | 2,305 | 34.2% | 11,449 | 61.5% | 20,199 |
| Rebuilding SPR 92.2% catches from base case | 2013 | 78 | 5.4% | 1,821 | 25.3% | 8,470 | 46.5% | 15,297 |
| | 2014 | 83 | 5.4% | 1,849 | 25.8% | 8,658 | 47.8% | 15,699 |
| | 2015 | 87 | 5.5% | 1,880 | 26.5% | 8,866 | 49.1% | 16,129 |
| | 2016 | 91 | 5.6% | 1,917 | 27.2% | 9,108 | 50.5% | 16,610 |
| | 2017 | 96 | 5.8% | 1,962 | 28.0% | 9,395 | 52.2% | 17,145 |
| | 2018 | 100 | 5.9% | 2,015 | 29.0% | 9,726 | 53.9% | 17,720 |
| | 2019 | 105 | 6.1% | 2,076 | 30.1% | 10,101 | 55.8% | 18,323 |
| | 2020 | 109 | 6.3% | 2,144 | 31.4% | 10,517 | 57.6% | 18,943 |
| | 2021 | 112 | 6.5% | 2,218 | 32.7% | 10,966 | 59.5% | 19,568 |
| | 2022 | 116 | 6.8% | 2,298 | 34.1% | 11,441 | 61.4% | 20,191 |
| Rebuilding SPR 92.2% catches from high steepness state of nature | 2013 | 141 | 5.4% | 1,821 | 25.3% | 8,470 | 46.5% | 15,297 |
| | 2014 | 150 | 5.4% | 1,848 | 25.8% | 8,658 | 47.8% | 15,698 |
| | 2015 | 156 | 5.5% | 1,878 | 26.5% | 8,864 | 49.1% | 16,127 |
| | 2016 | 160 | 5.6% | 1,915 | 27.2% | 9,106 | 50.5% | 16,608 |
| | 2017 | 165 | 5.8% | 1,959 | 28.0% | 9,392 | 52.2% | 17,142 |
| | 2018 | 169 | 5.9% | 2,011 | 29.0% | 9,722 | 53.9% | 17,716 |
| | 2019 | 174 | 6.1% | 2,071 | 30.1% | 10,096 | 55.7% | 18,319 |
| | 2020 | 178 | 6.3% | 2,139 | 31.4% | 10,512 | 57.6% | 18,938 |
| | 2021 | 183 | 6.5% | 2,212 | 32.7% | 10,960 | 59.5% | 19,562 |
| | 2022 | 187 | 6.8% | 2,291 | 34.1% | 11,435 | 61.4% | 20,184 |
| Status quo (catch = 105 mt) | 2013 | 105 | 5.4% | 1,821 | 25.3% | 8,470 | 46.5% | 15,297 |
| | 2014 | 105 | 5.4% | 1,849 | 25.8% | 8,658 | 47.8% | 15,698 |
| | 2015 | 105 | 5.5% | 1,879 | 26.5% | 8,865 | 49.1% | 16,128 |
| | 2016 | 105 | 5.6% | 1,916 | 27.2% | 9,108 | 50.5% | 16,609 |
| | 2017 | 105 | 5.8% | 1,961 | 28.0% | 9,394 | 52.2% | 17,144 |
| | 2018 | 105 | 5.9% | 2,014 | 29.0% | 9,725 | 53.9% | 17,719 |
| | 2019 | 105 | 6.1% | 2,075 | 30.1% | 10,100 | 55.8% | 18,322 |
| | 2020 | 105 | 6.3% | 2,143 | 31.4% | 10,516 | 57.6% | 18,942 |
| | 2021 | 105 | 6.5% | 2,217 | 32.7% | 10,966 | 59.5% | 19,567 |
| | 2022 | 105 | 6.8% | 2,297 | 34.1% | 11,440 | 61.4% | 20,190 |

## 11. Figures

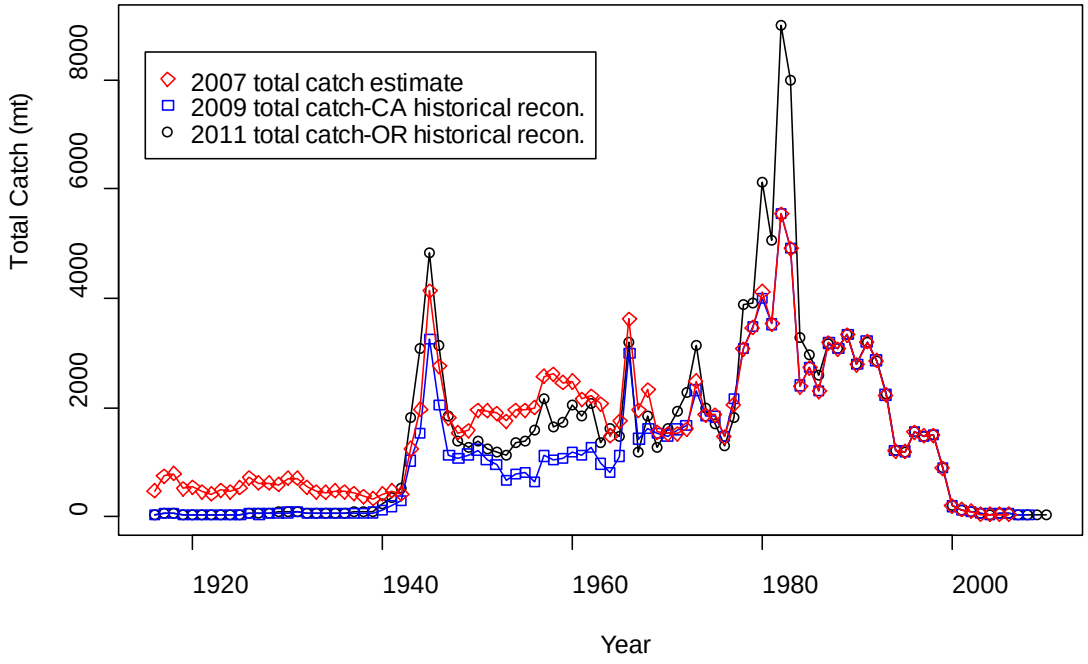



**Figure 1. Comparison of the 2007 and recently revised canary rockfish catch history, 1916-2008.**

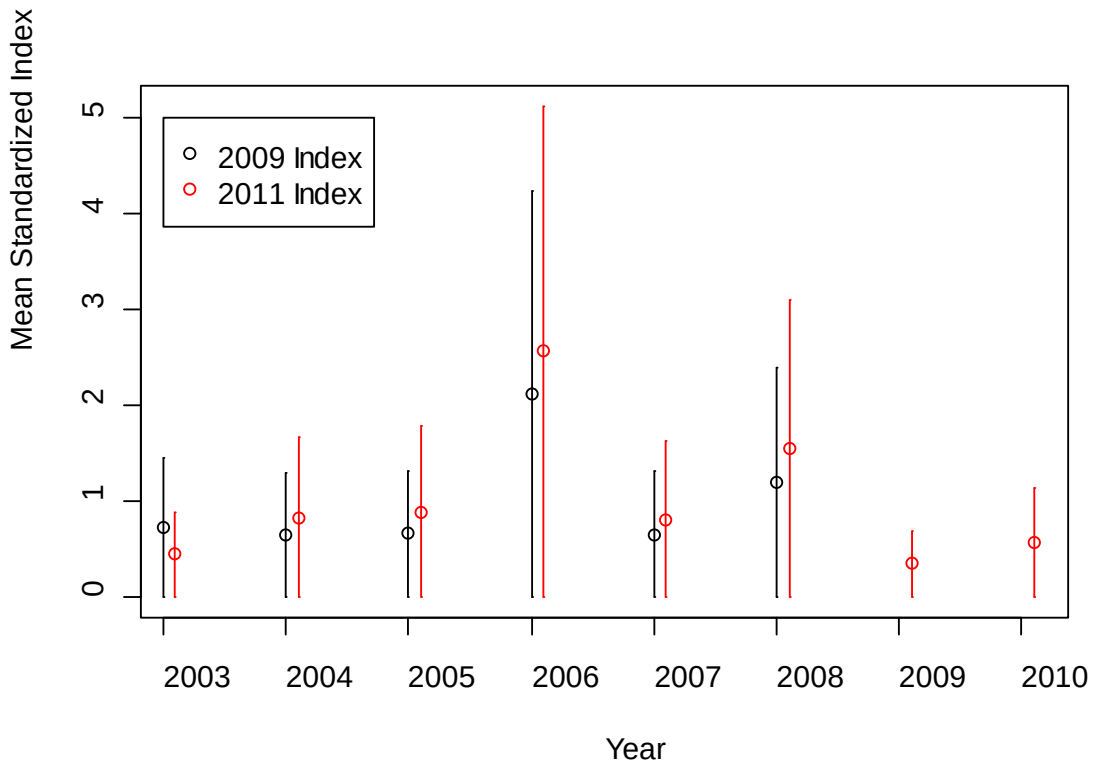



**Figure 2. Comparison of 2009 GLMM-based index of abundance and the indices (using data through 2010) generated for this update from the NWFSC trawl survey. Vertical lines indicate +/- 95% confidence intervals based on an assumption of lognormal error.**

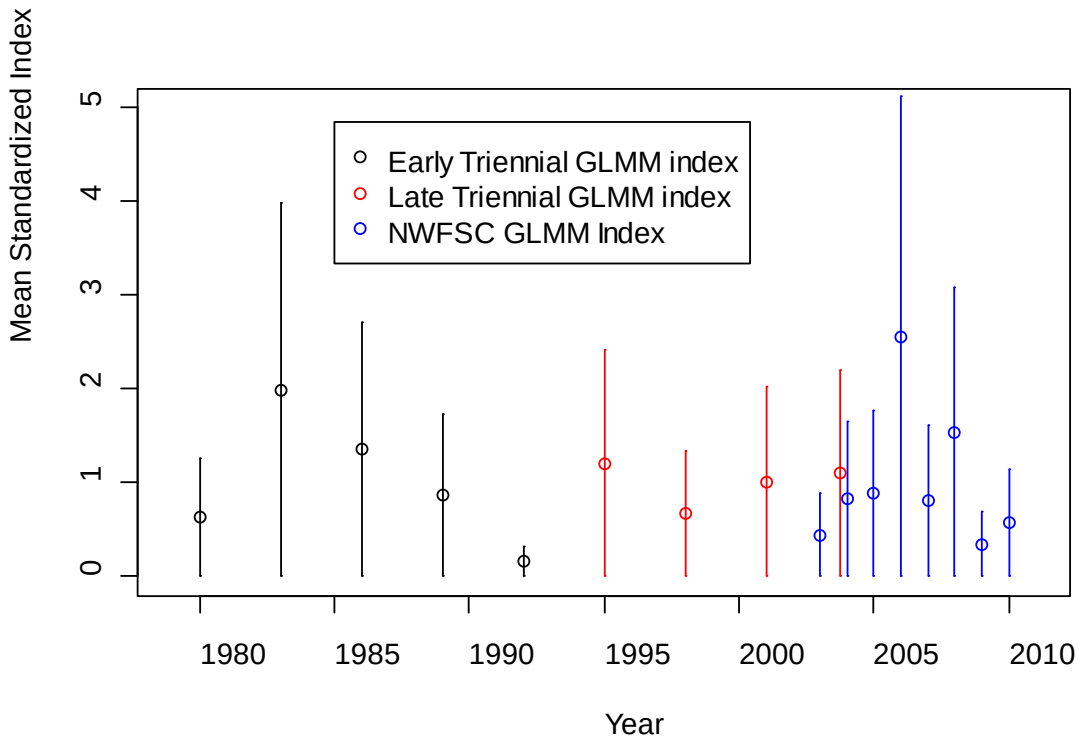



Figure 3. Triennial and NWFSC GLMM indices. Vertical lines indicate +/- 95% confidence intervals based on lognormal error.

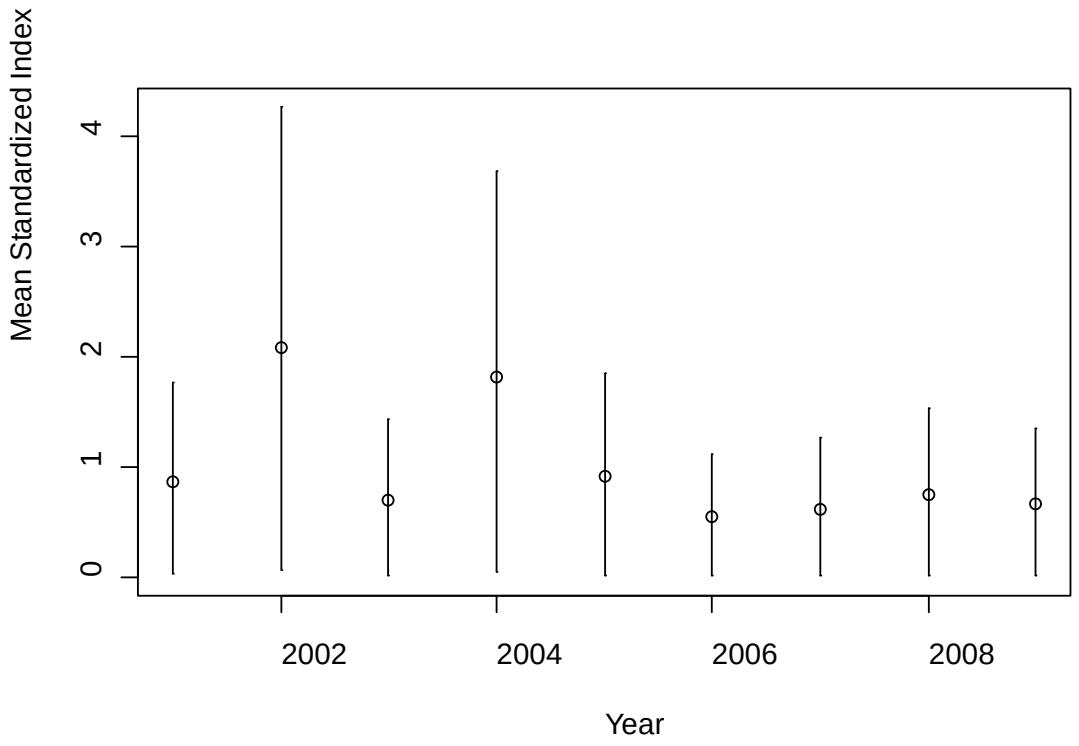



Figure 4. Coast-wide pre-recruit index for canary rockfish, 2001-2008.

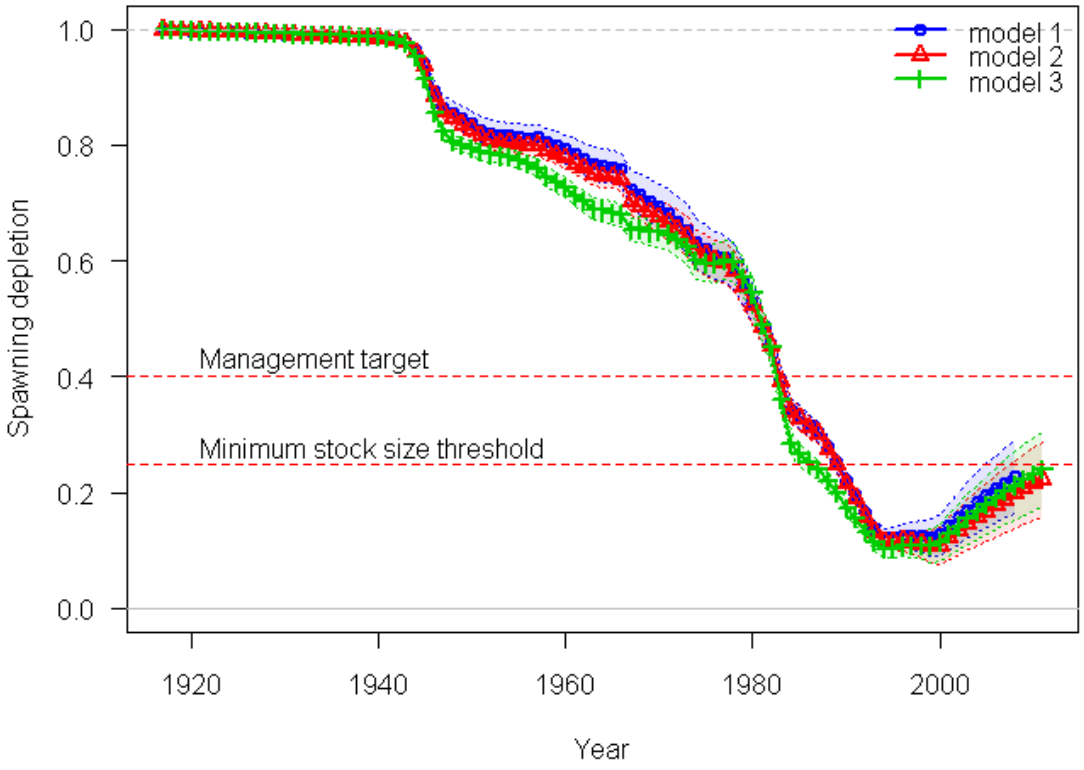



**Figure 5. Estimated spawning biomass time-series (1916-2008) for the 2009 assessment base-case model (model 1) with approximate asymptotic 95% confidence interval (dashed lines), the 2011 base model without the Oregon historical catch reconstruction (model 2) and the 2011 base-case model (model 3).**

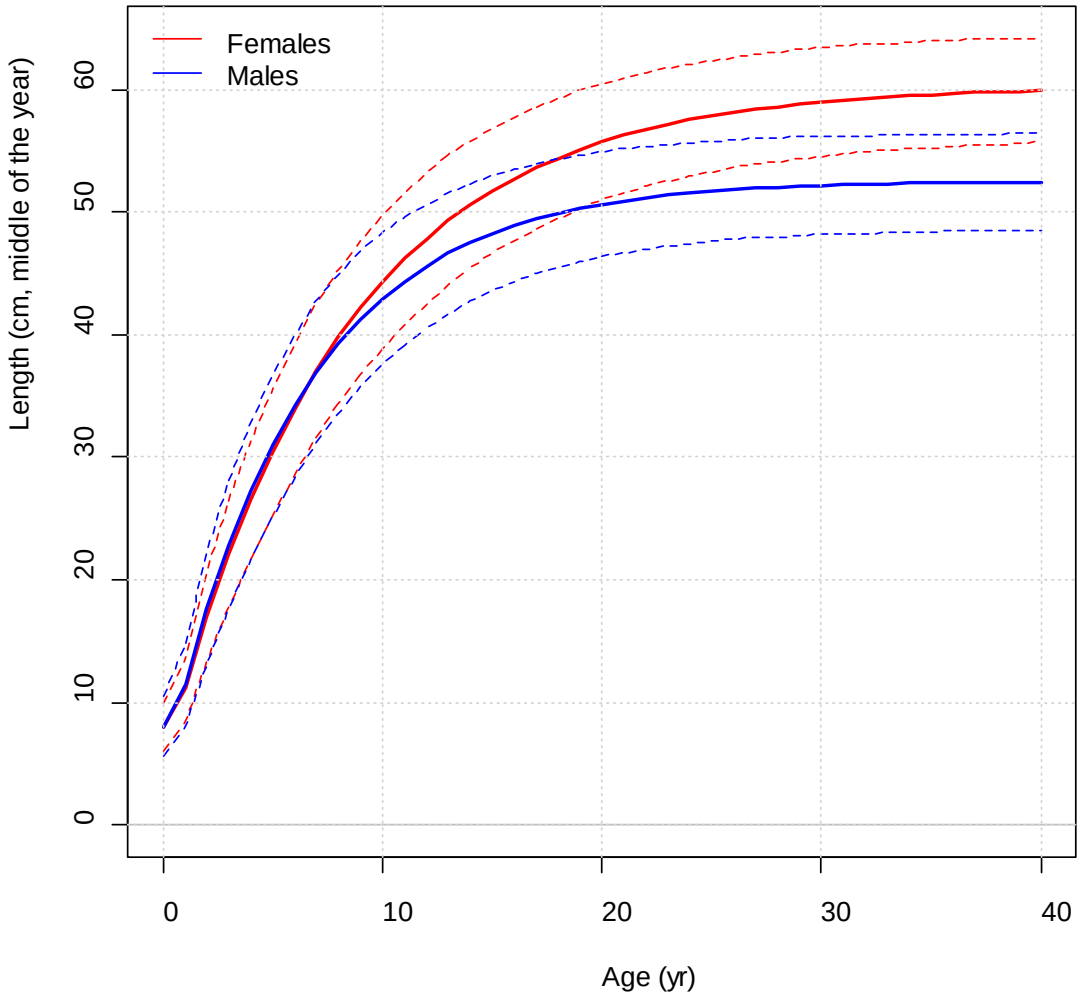



**Figure 6. Growth curve for females (upper solid line) and males (lower solid line) with ~95% interval (dashed lines) indicating the expectation and individual variability of length-at-age for the base-case model.**

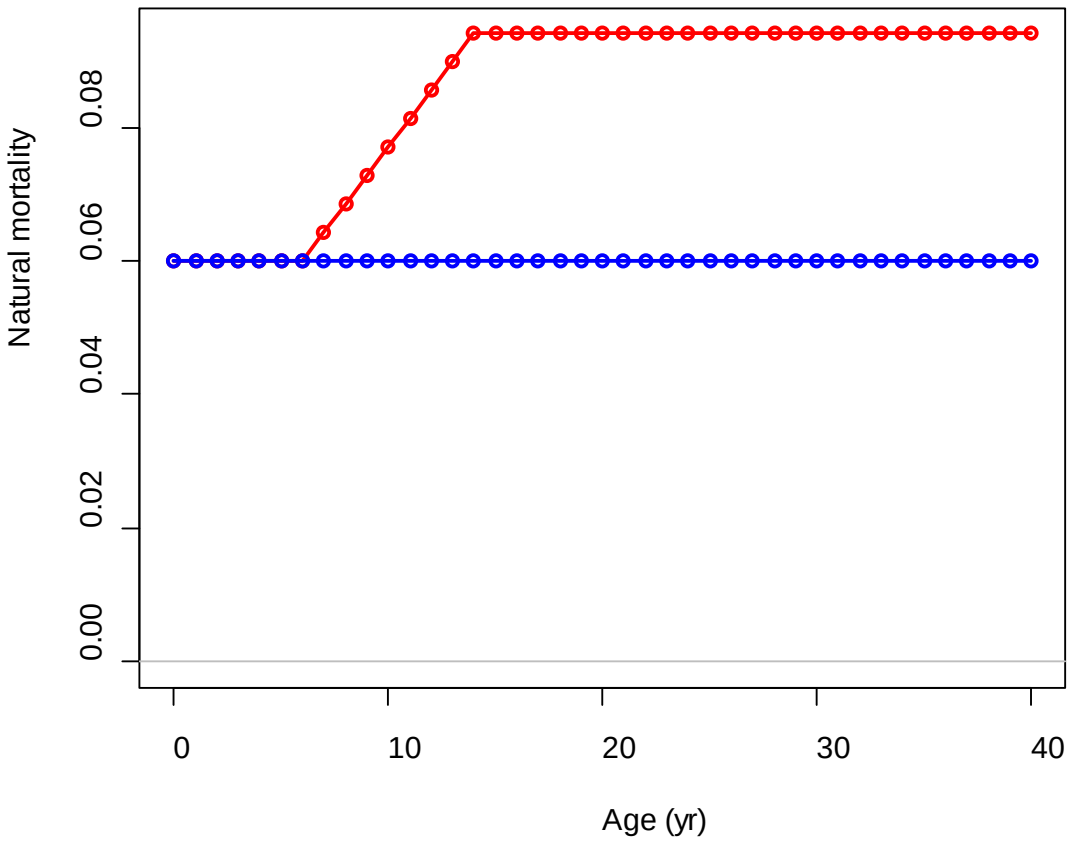



**Figure 7. Natural mortality at age for males (horizontal line at 0.06) and females (linear ramp from 0.06 at age 6 to estimated value at age 14).**

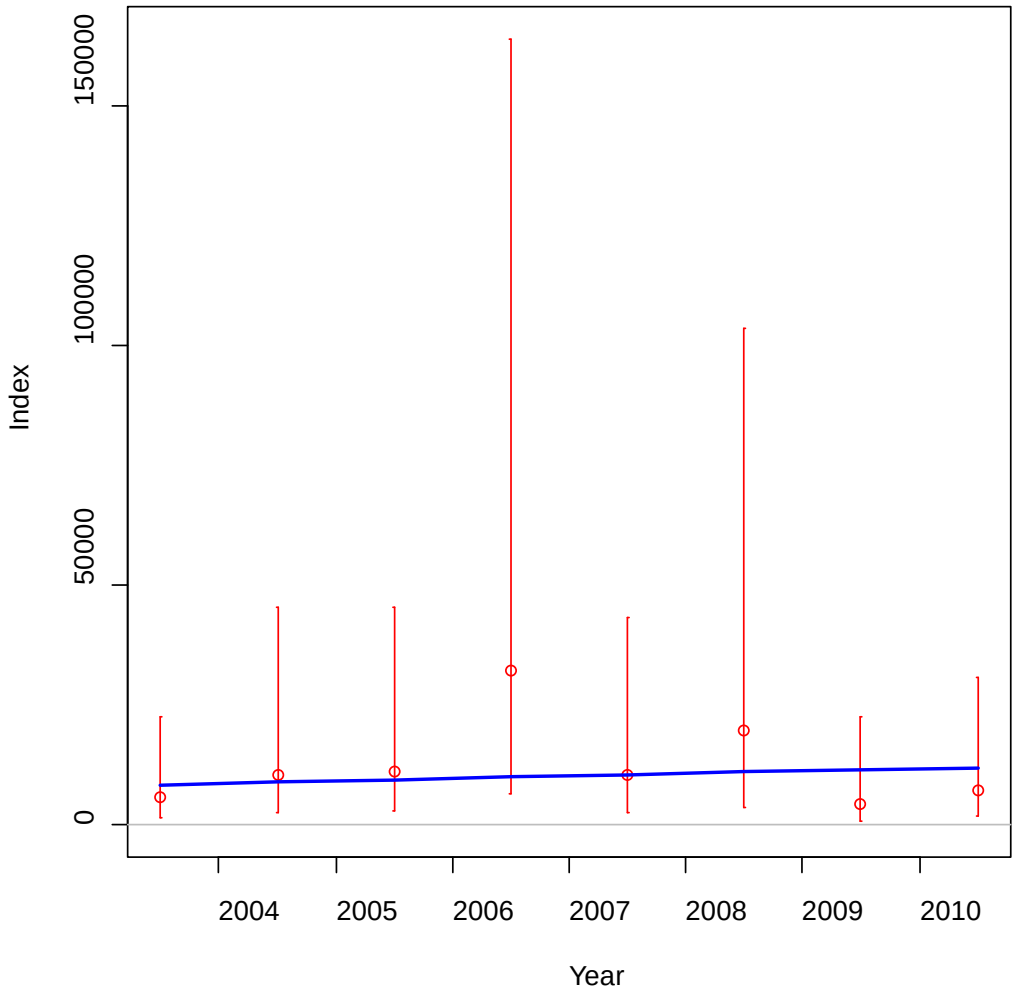



**Figure 8. Fit to the NWFSC (upper panel) survey GLMM-based time series of relative biomass in the base-case model.**

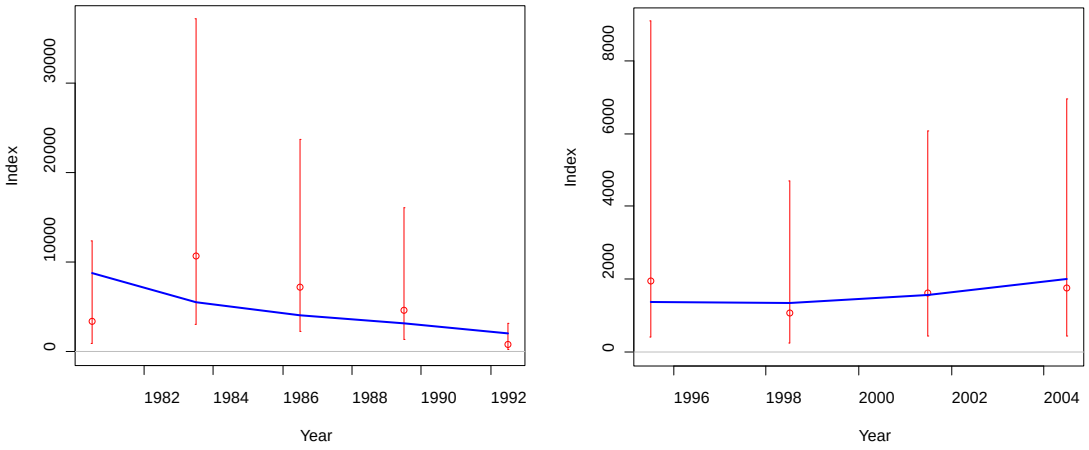



**Figure 9. Fit to the triennial survey GLMM-based time series of relative biomass in the base-case model.**

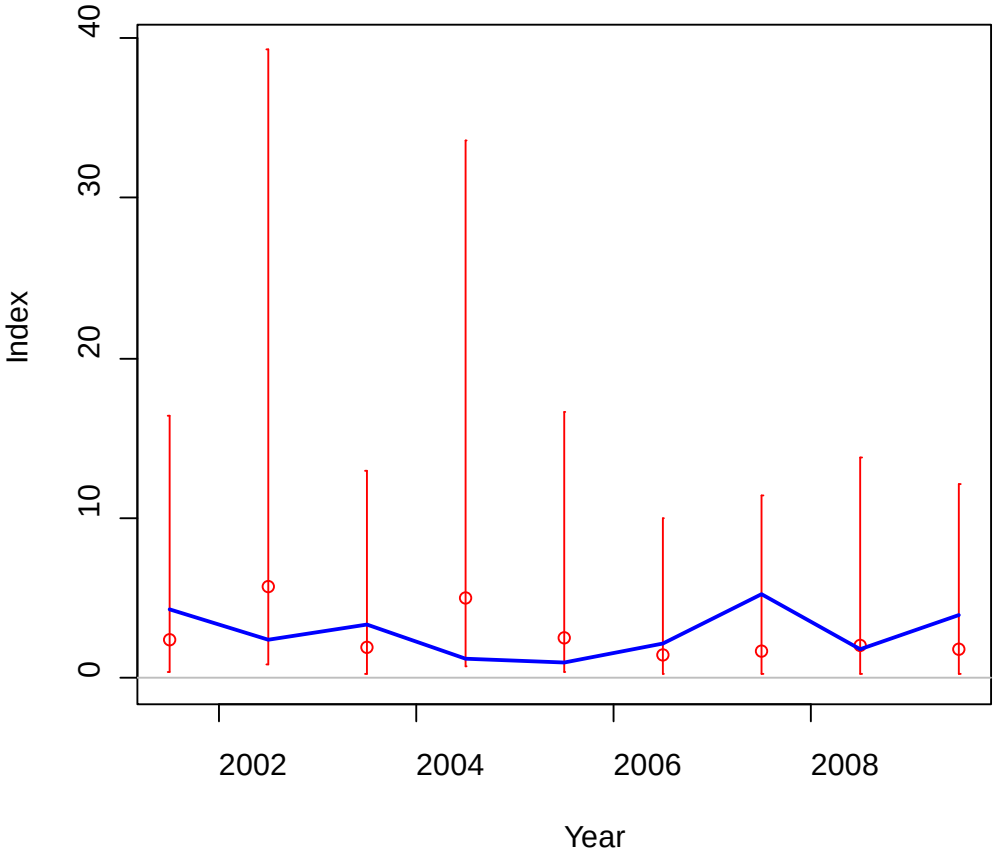



**Figure 10. Fit to the coast-wide pre-recruit index.**

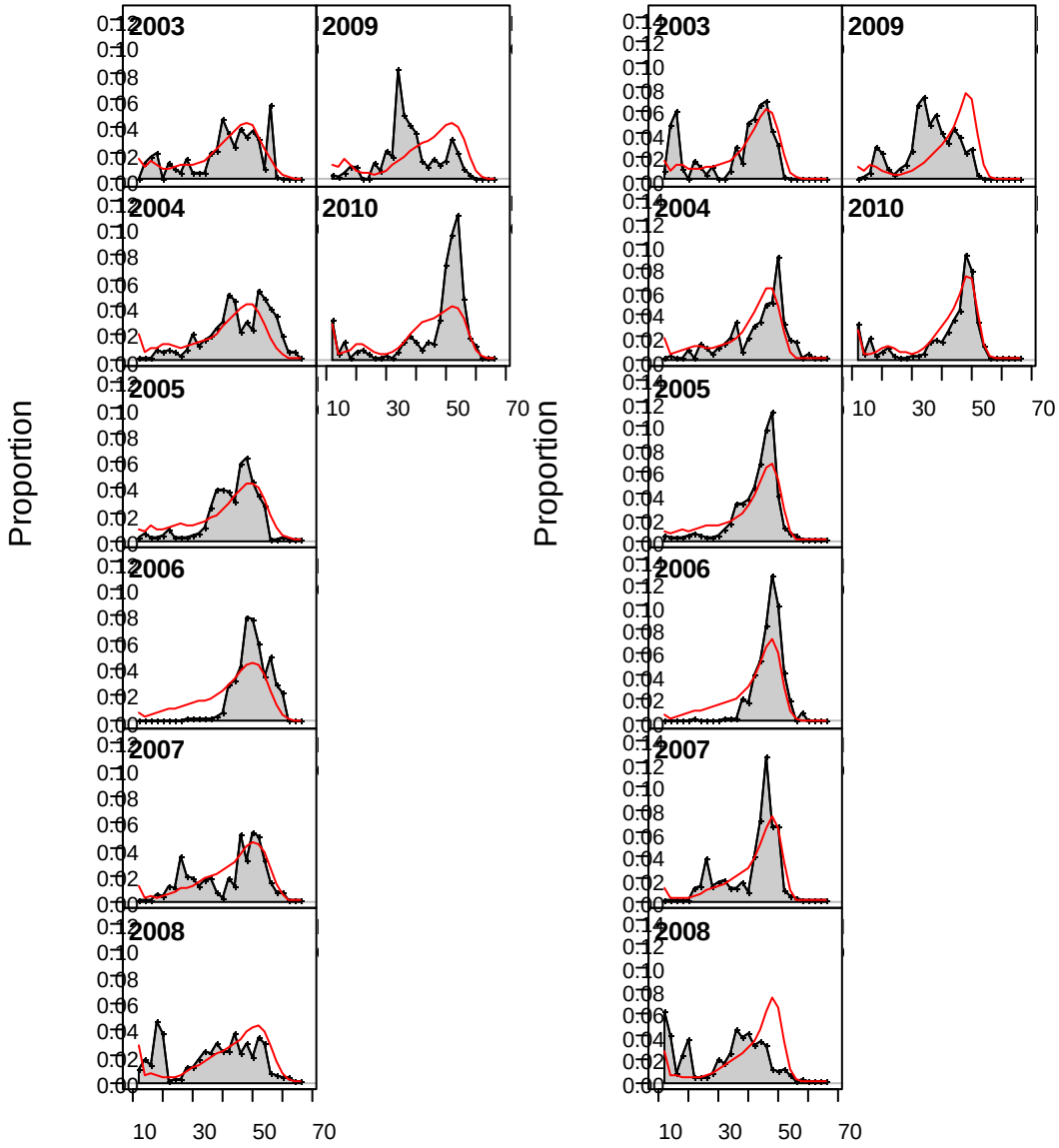



**Figure 11. Fit to the NWFSC survey female (left panels) and male (right panels) length-frequencies.**

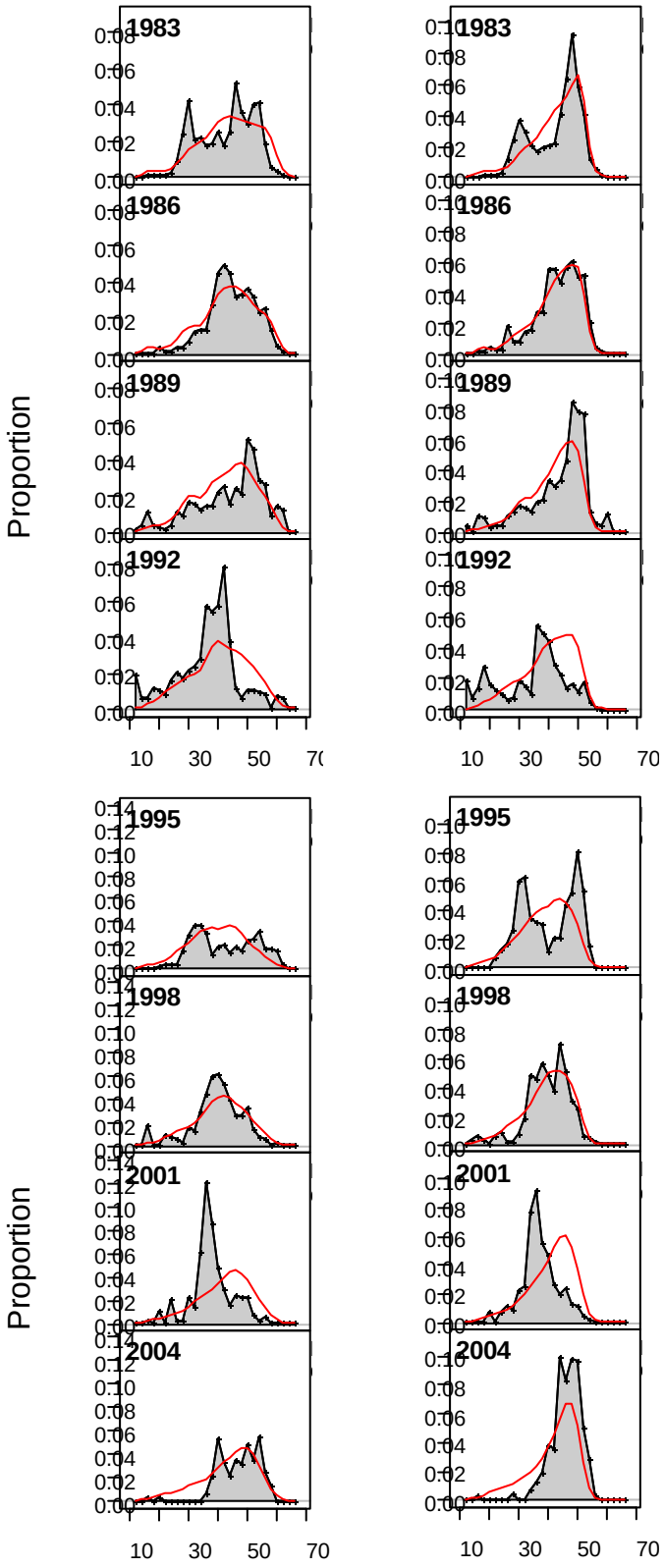



**Figure 12. Fit to the triennial survey female (left panels) and male (right panels) length-frequencies; 1980-1992 (upper panels) and 1995-2004 (lower panels).**

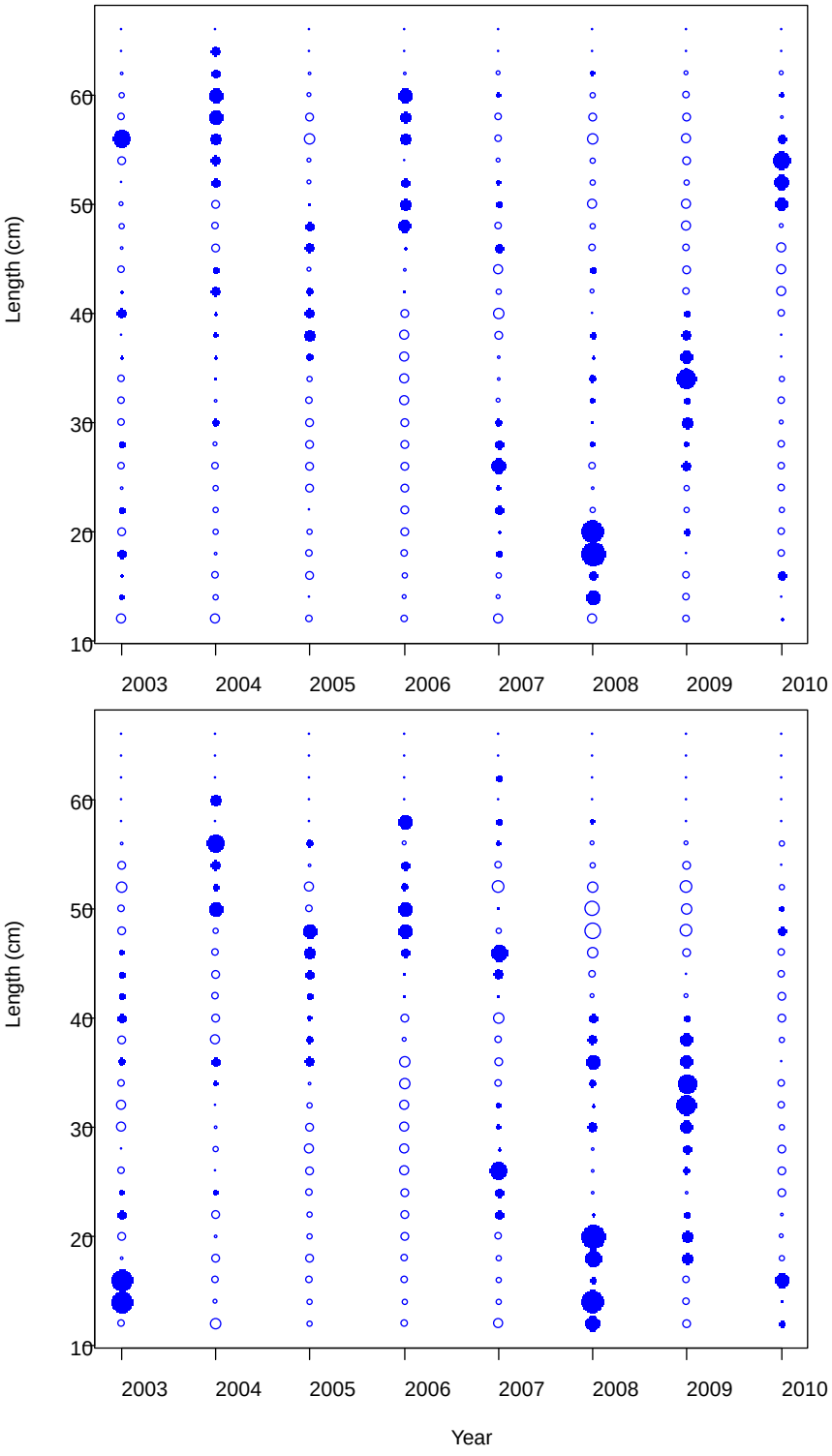



**Figure 13. Pearson residuals for the fit to NWFSC survey female (upper panel, maximum = 5.73) and male (lower panel, maximum = 5.01) length-frequencies.**

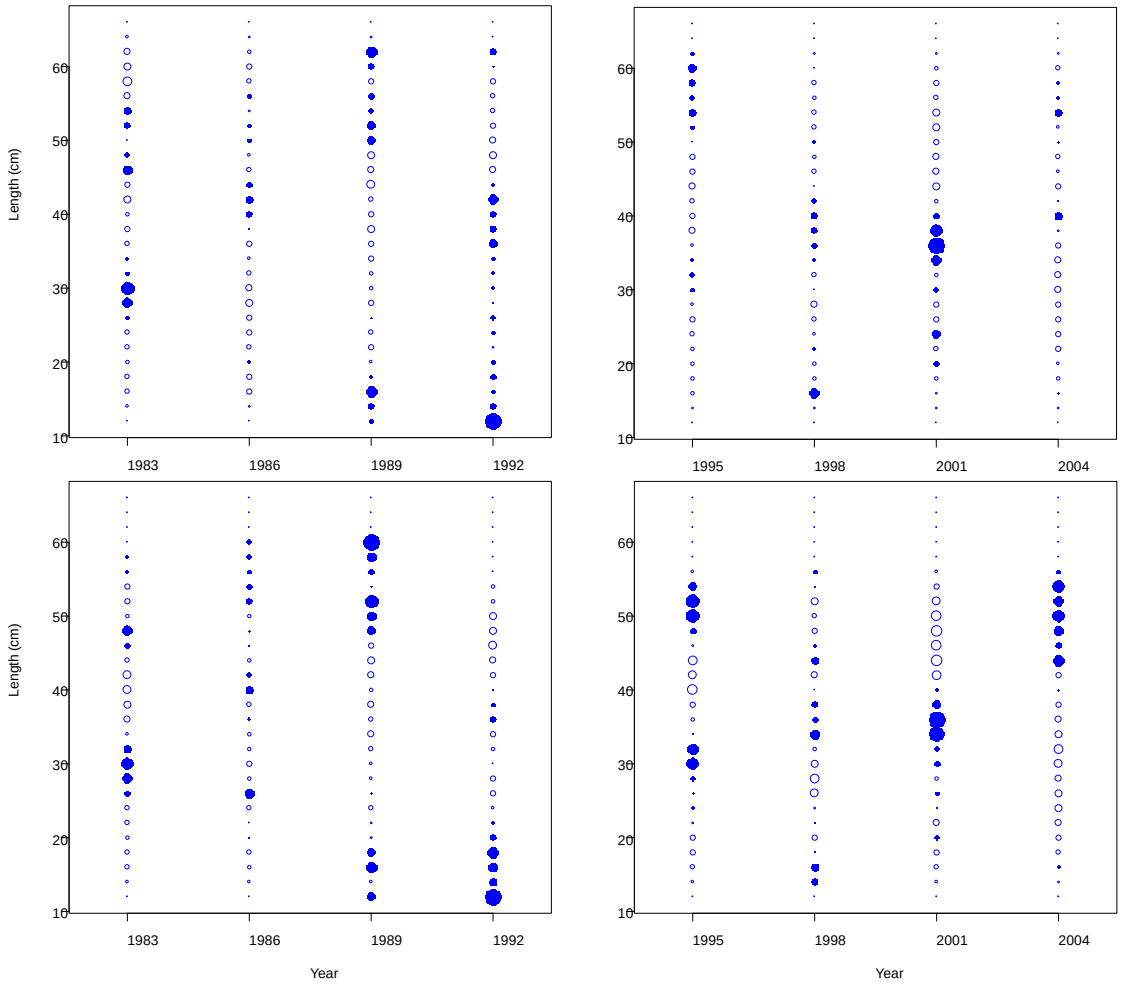



Figure 14. Pearson residuals for the fit to triennial survey female (upper panels, maximum = 4.71, 5.94) and male (lower panels, maximum = 4.78, 3.62) length-frequencies; 1980-1992 (left panels) and 1995-2004 (right panels).

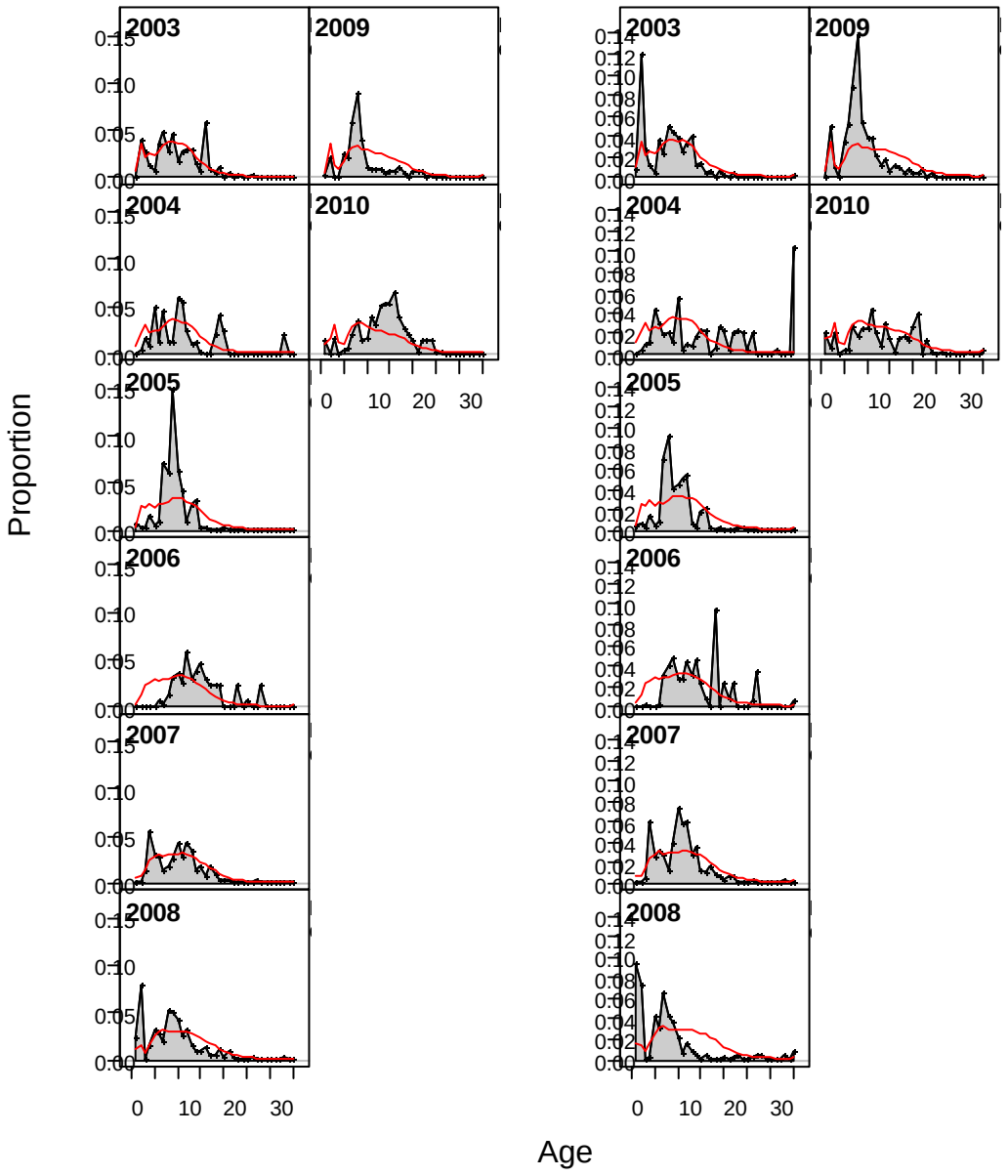



**Figure 15. Implied fit to the NWFSC survey female (left panels) and male (right panels) marginal age-frequencies. Fits are provided for evaluation only, but not included in the model likelihood.**

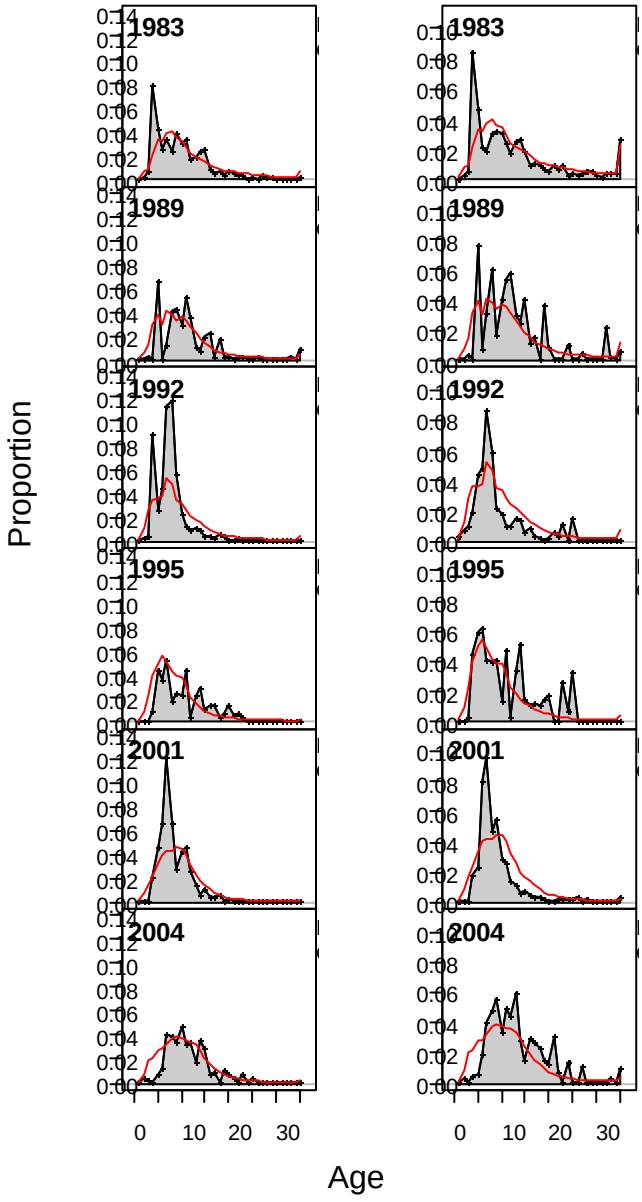



**Figure 16. Implied fit to the triennial survey female (left panels) and male (right panels) marginal age-frequencies. Fits are provided for evaluation only, but not included in the model likelihood.**

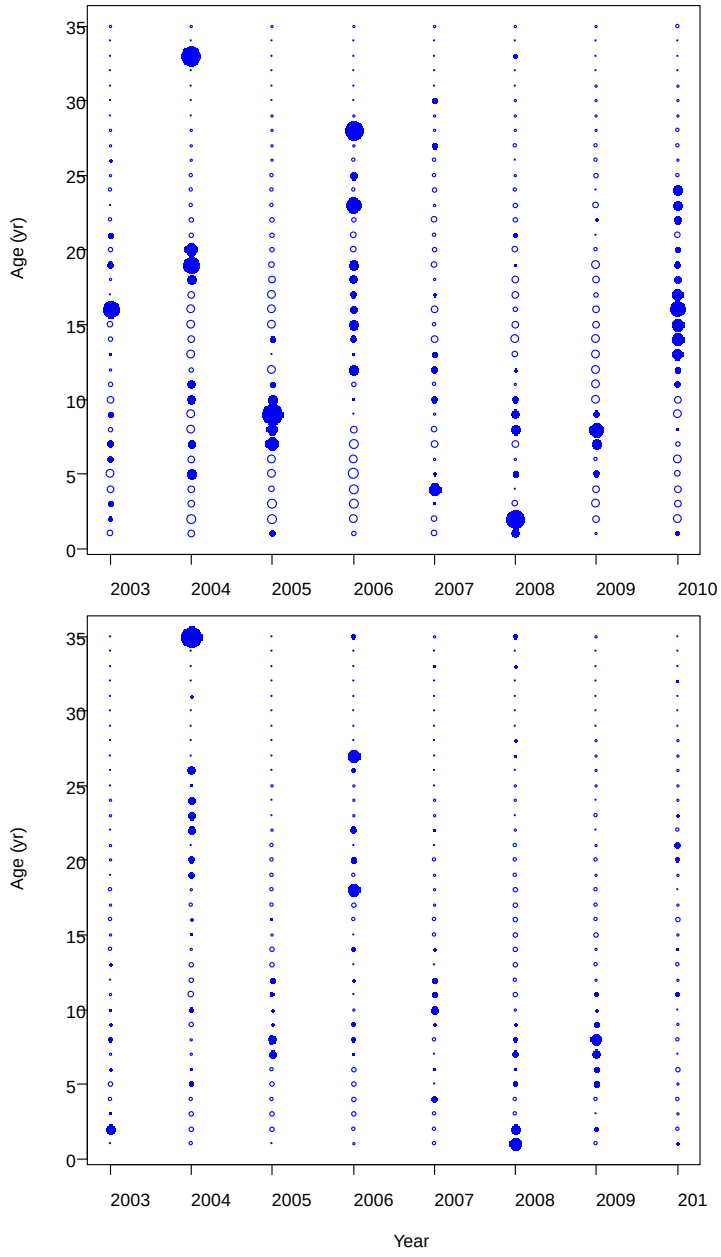



**Figure 17. Pearson residuals for the implied fit to the NWFSC survey female (upper panel) and male (lower panel) marginal age-frequencies (for evaluation only, not included in the model fit).**

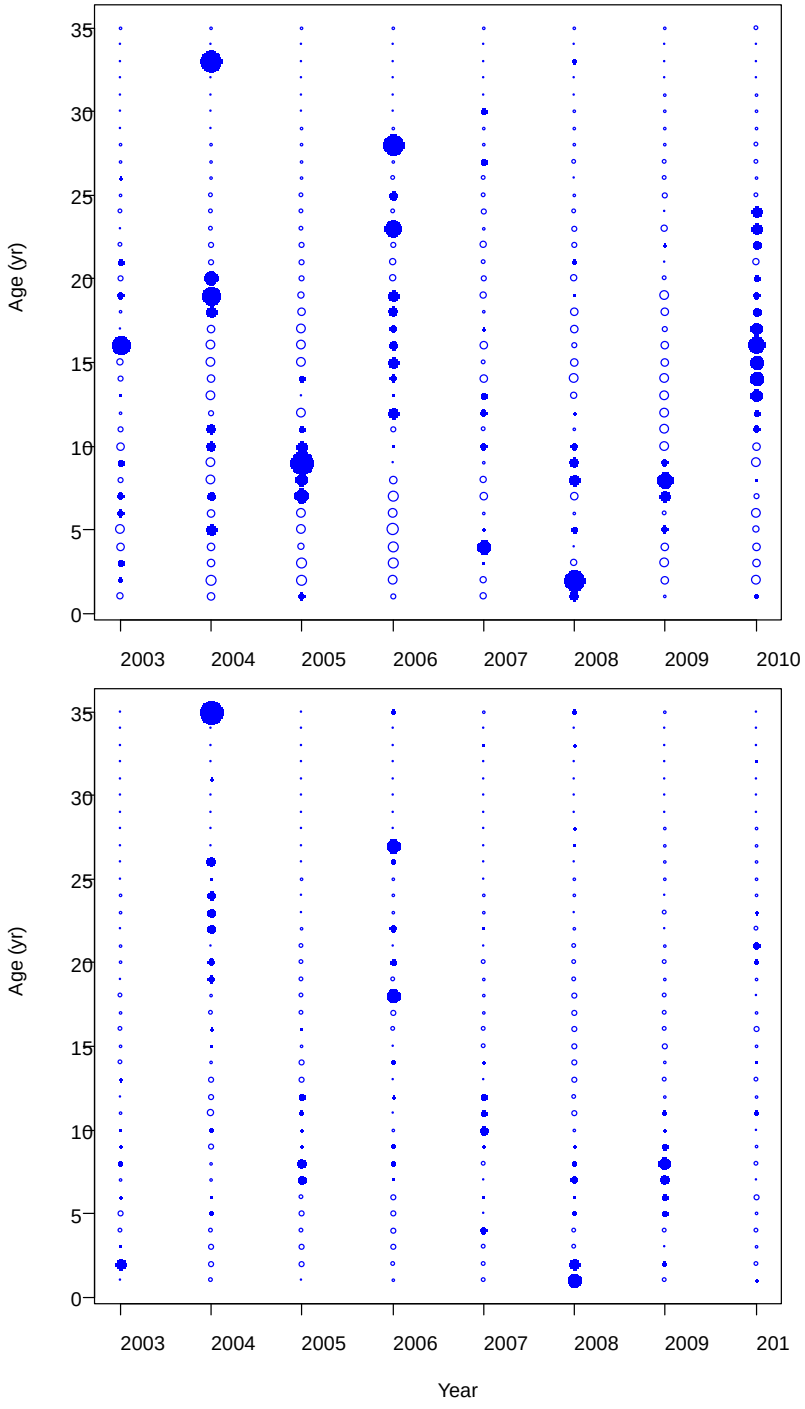



**Figure 18. Pearson residuals for the implied fit to the triennial survey female (upper panel) and male (lower panel) marginal age-frequencies (for evaluation only, not included in the model fit).**

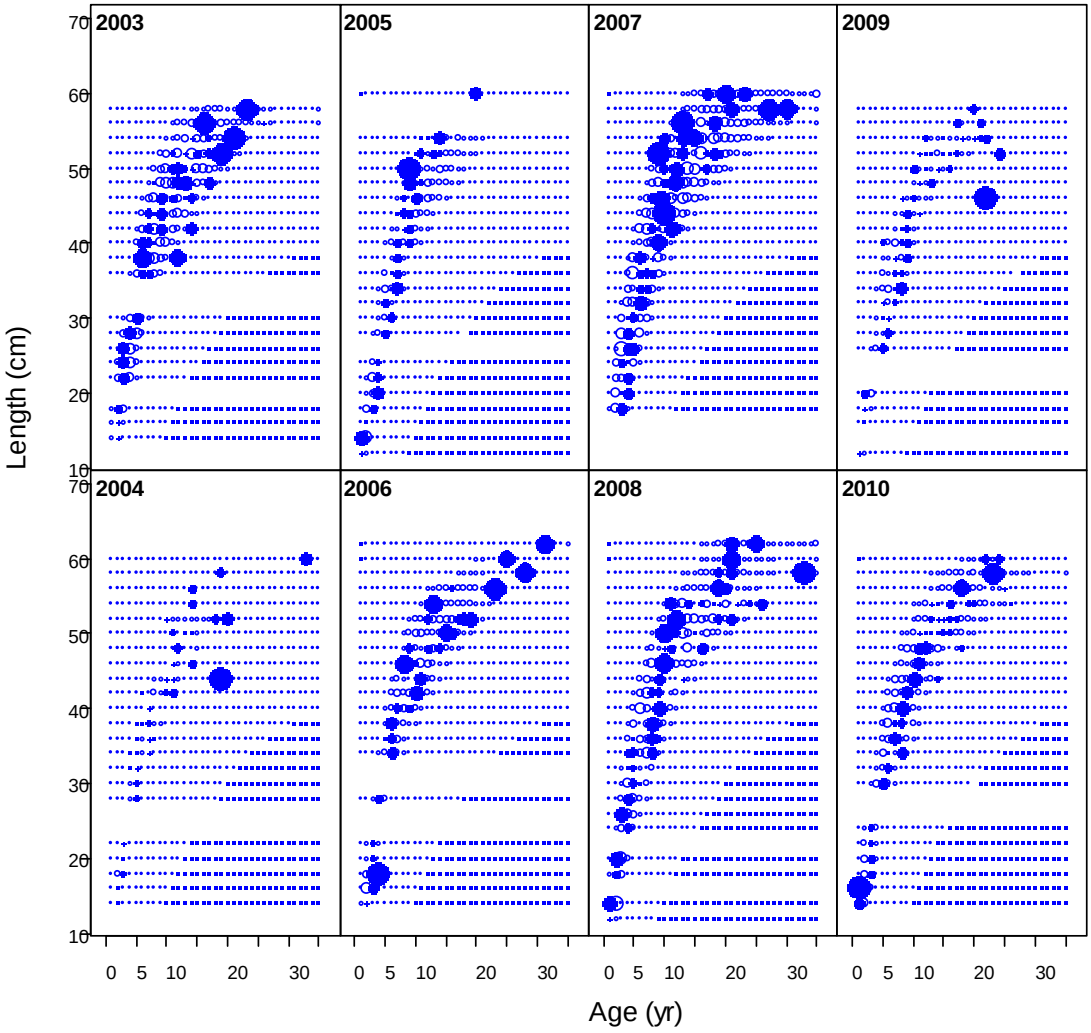



**Figure 19. Pearson residuals for the fit to the NWFSC survey female conditional age-at-length frequencies (max = 25.89).**

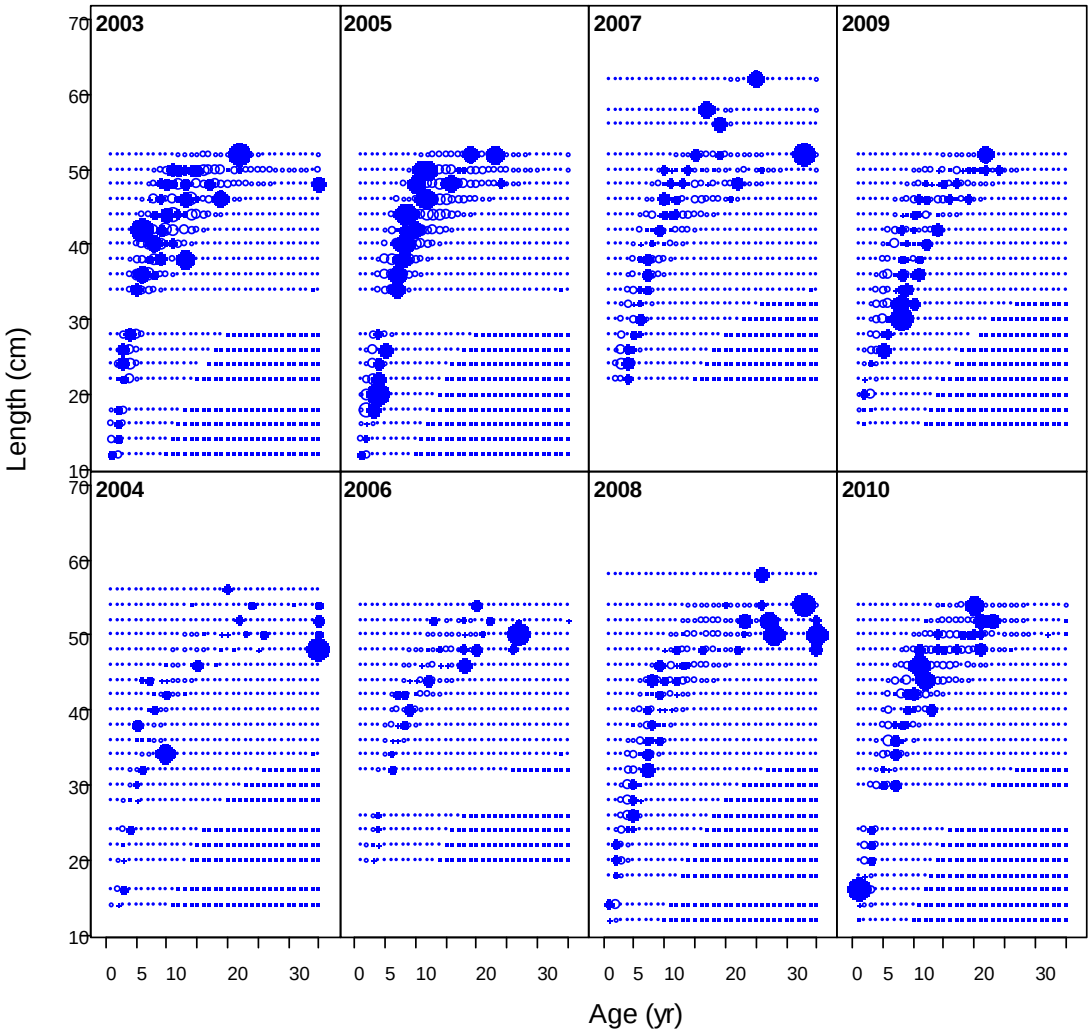



**Figure 20. Pearson residuals for the fit to the NWFSC survey male conditional age-at-length frequencies (max = 25.22).**

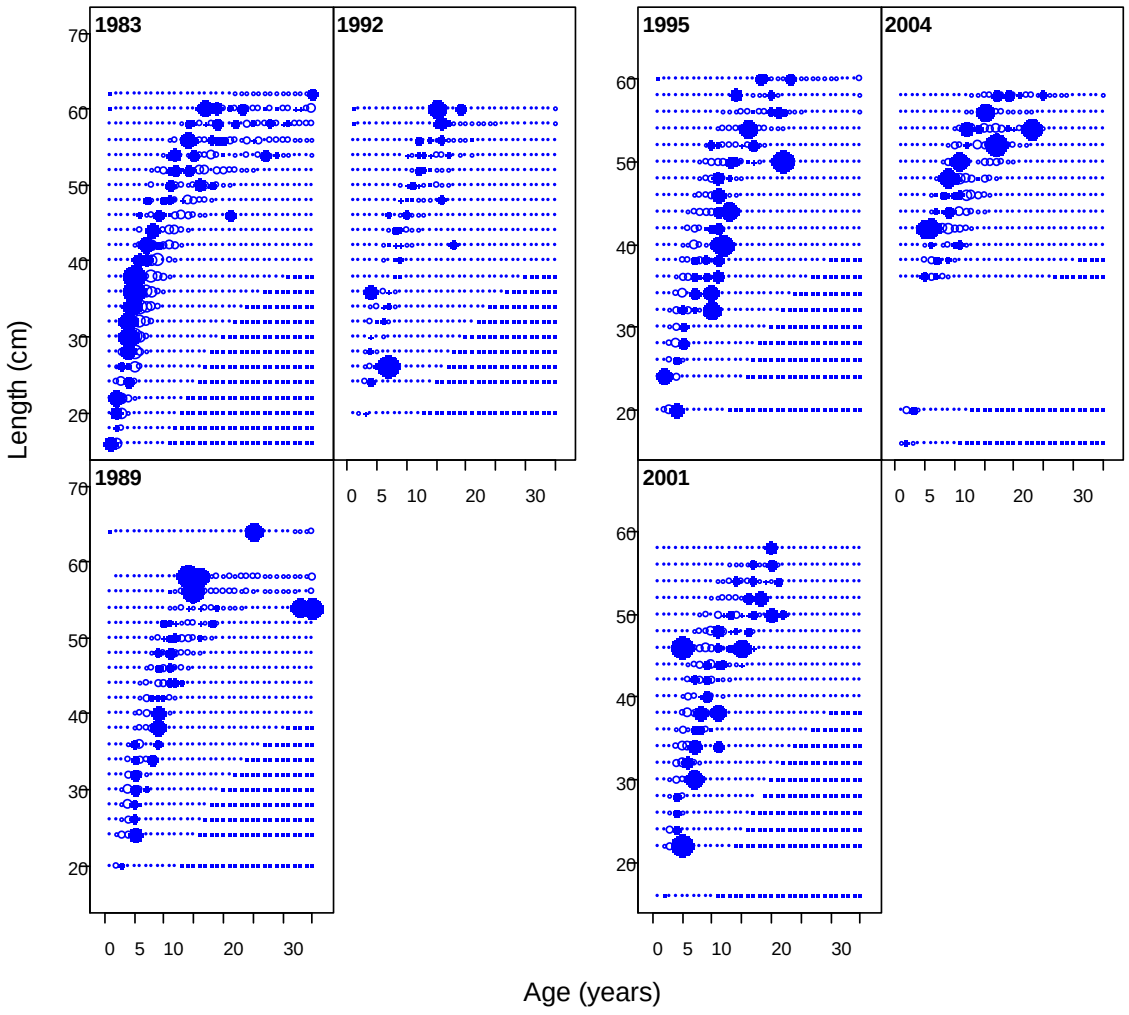



**Figure 21. Pearson residuals for the fit to the triennial survey female conditional age-at-length frequencies.**

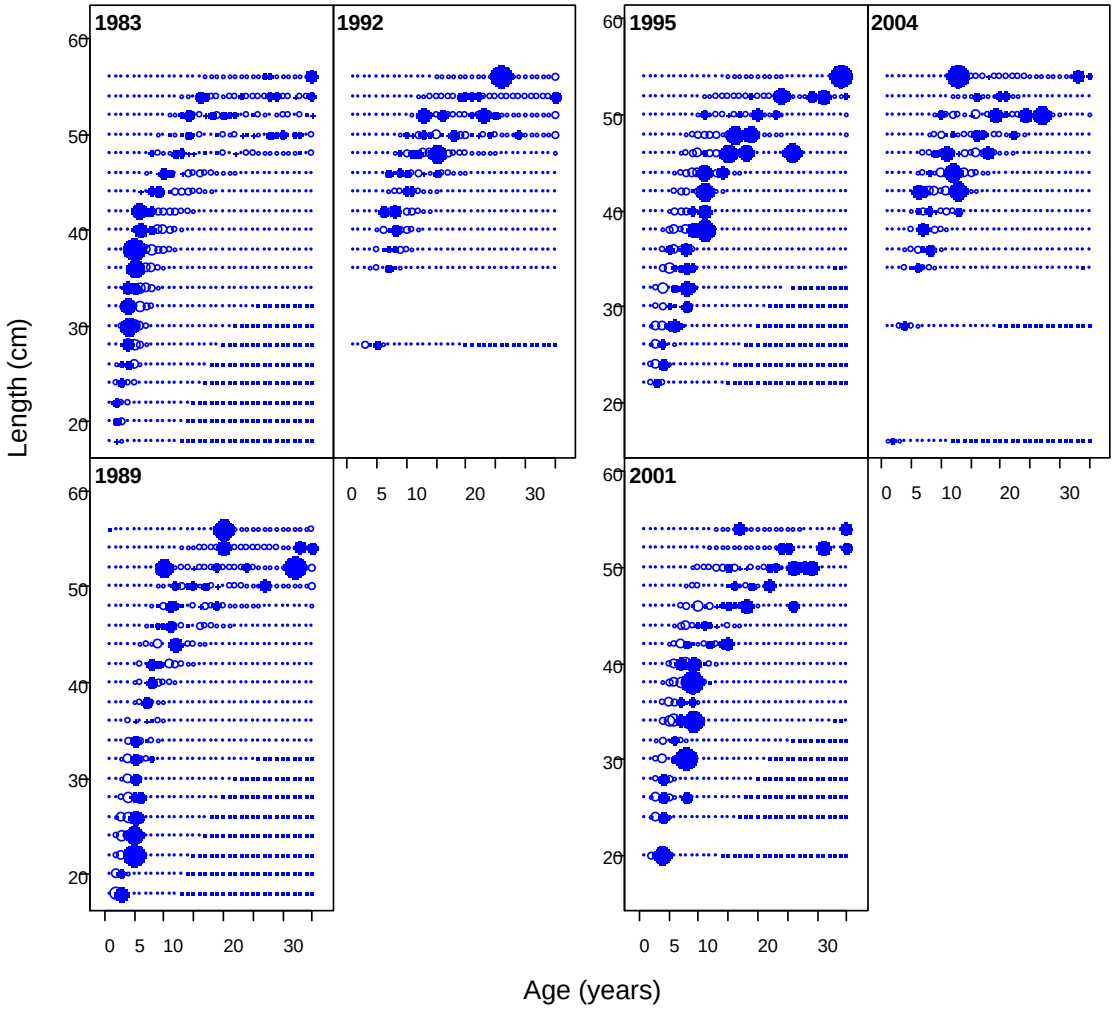



**Figure 22. Pearson residuals for the fit to the triennial survey male conditional age-at-length frequencies.**

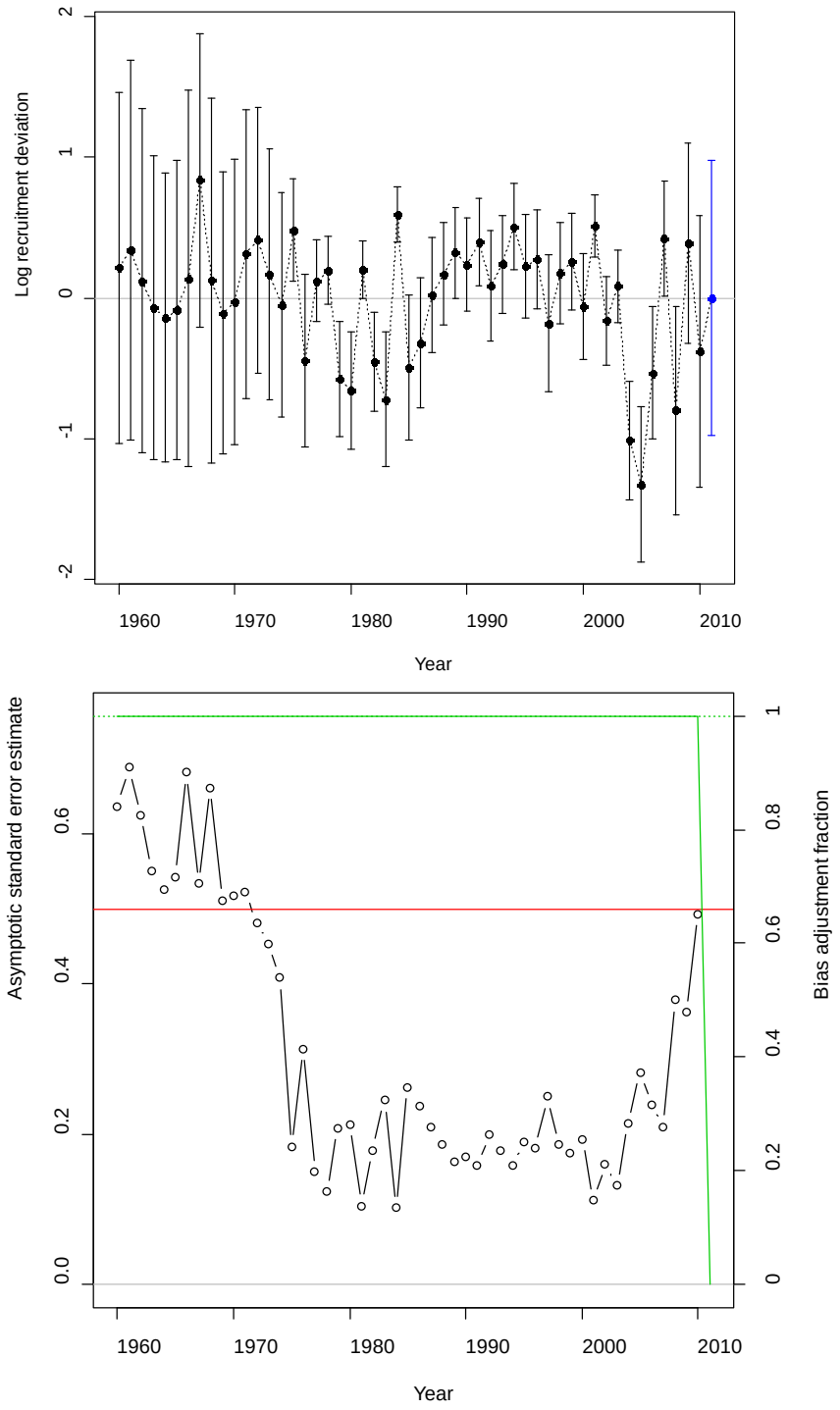



**Figure 23. Log recruitment deviations (upper panel) and standard deviations of the recruitent deviations (lower panel) from the base-case model run.**

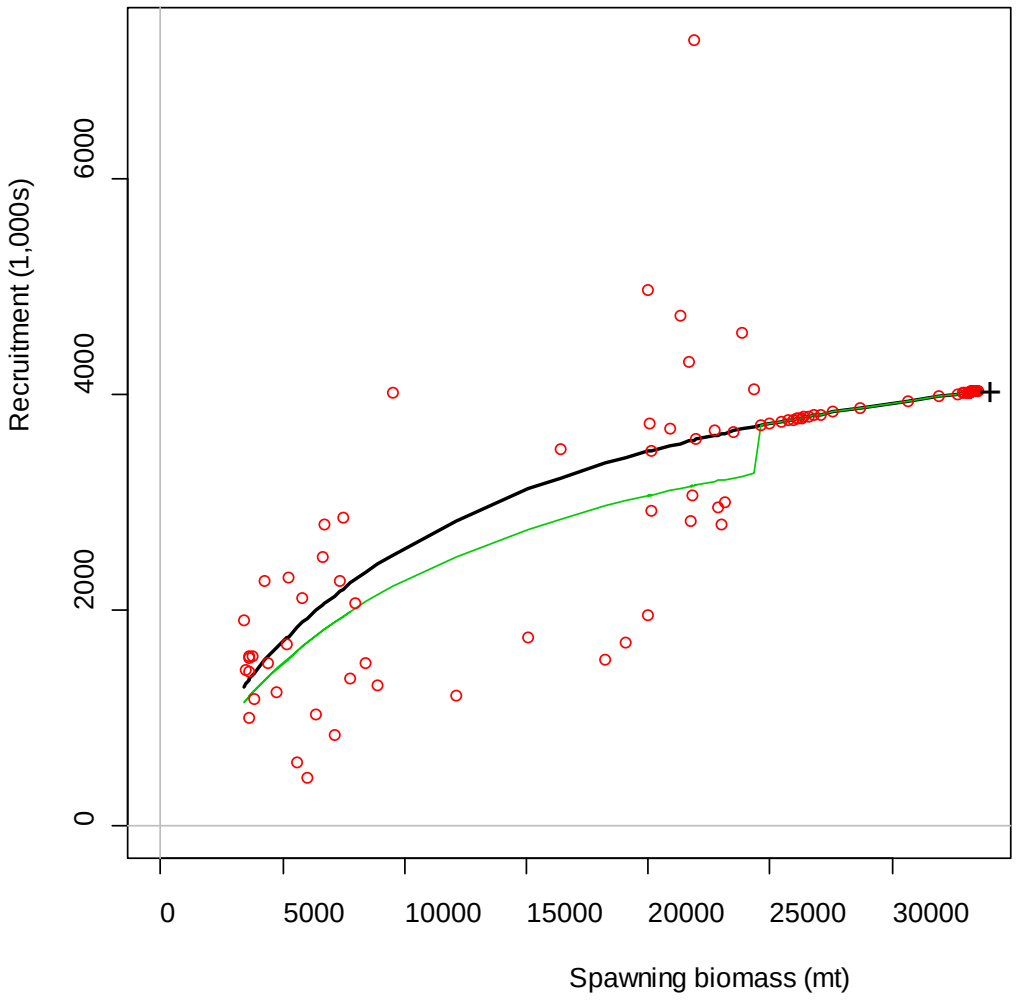



**Figure 24. Stock-recruit function with predicted recruitments (points) and bias-corrected expectation (light line).**

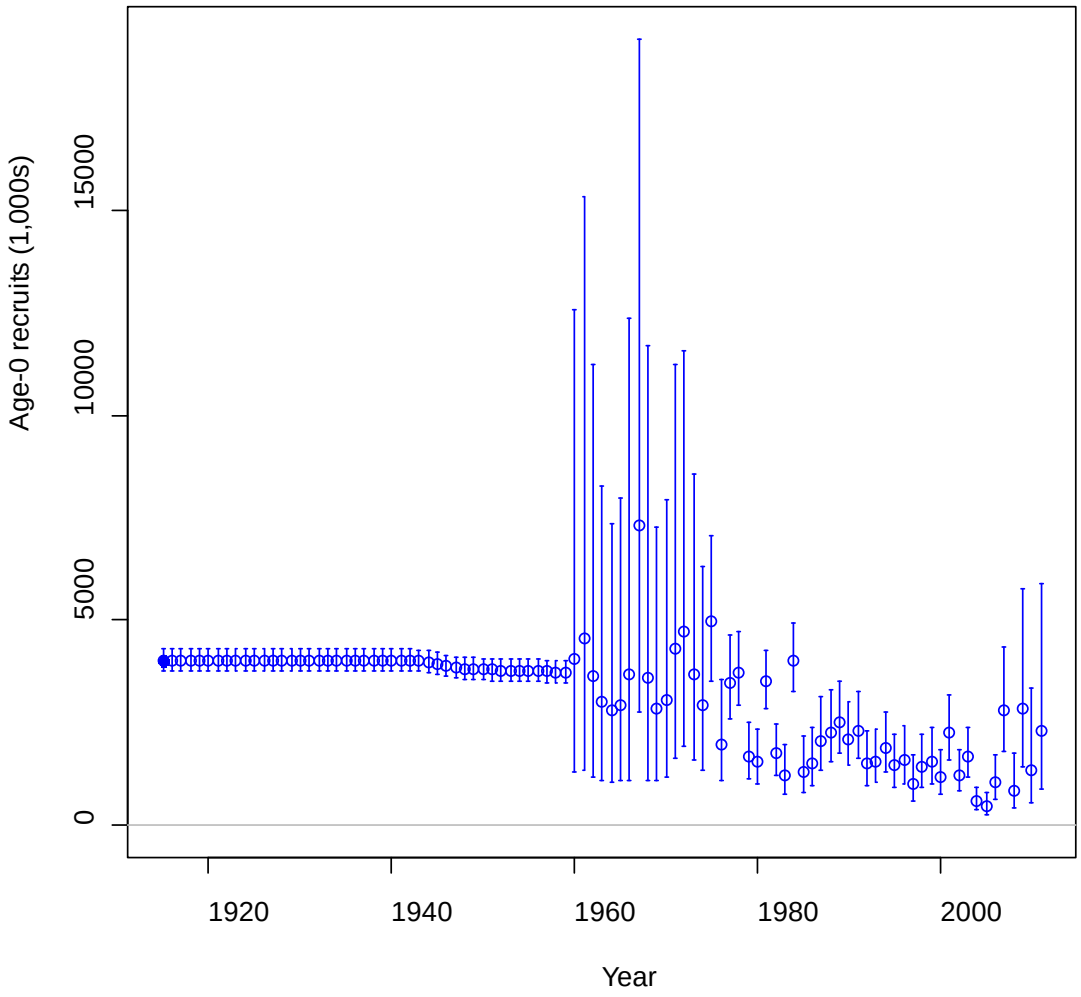



**Figure 25. Time series of estimated canary rockfish recruitments for the base-case model (circles), approximate asymptotic 95% confidence interval (error bars).**

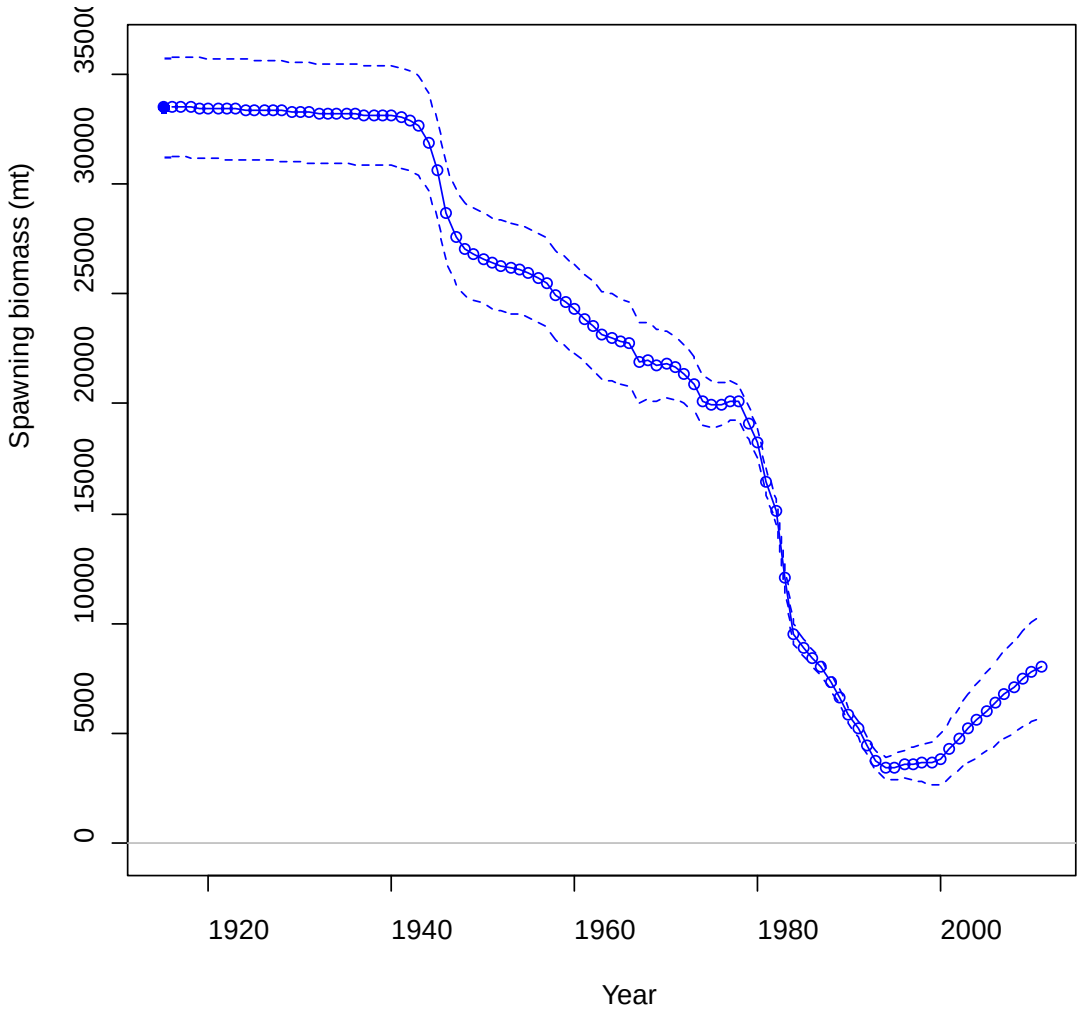



Figure 26. Estimated spawning biomass time-series (1916-2011) for the base-case model (circles) with approximate asymptotic 95% confidence interval (dashed lines).

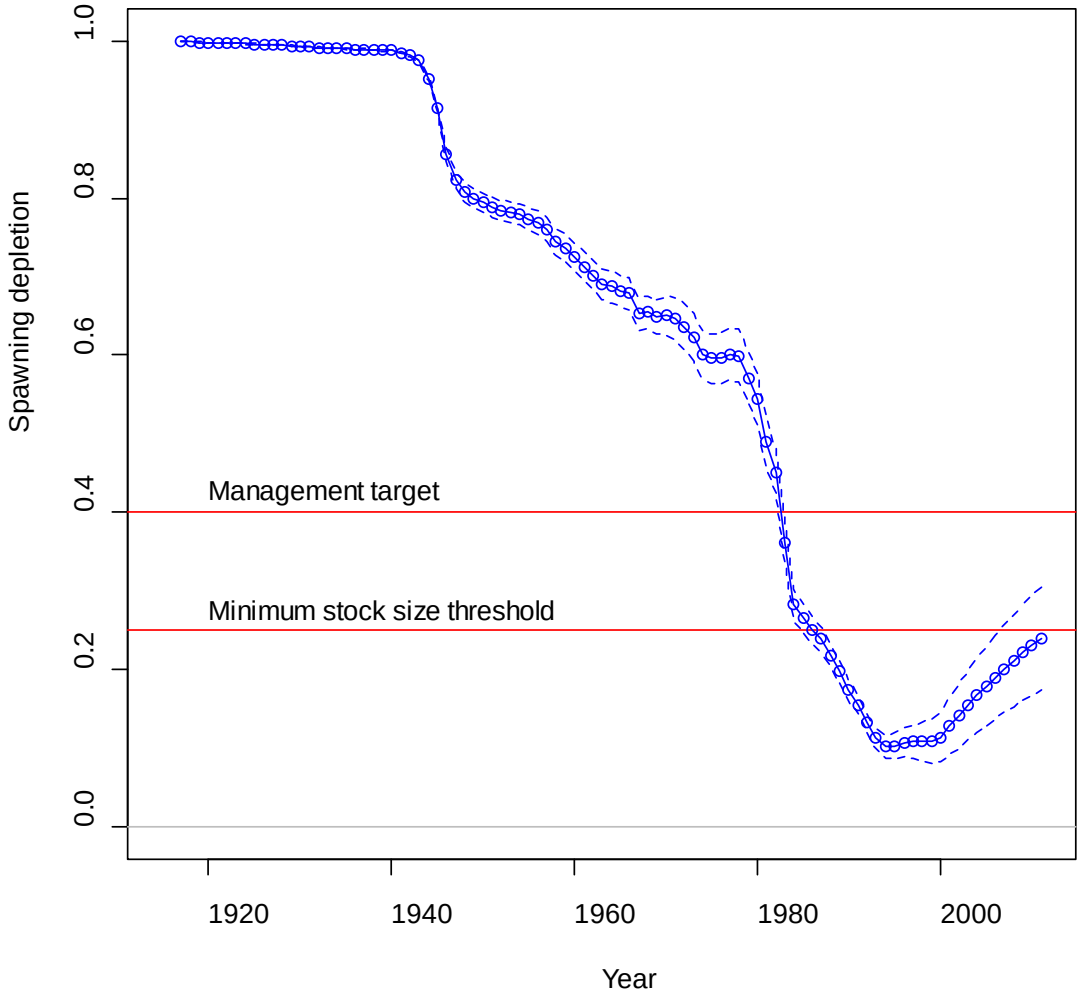



**Figure 27. Time series of depletion level as estimated in the base-case model (circles) with approximate asymptotic 95% confidence interval (dashed lines).**

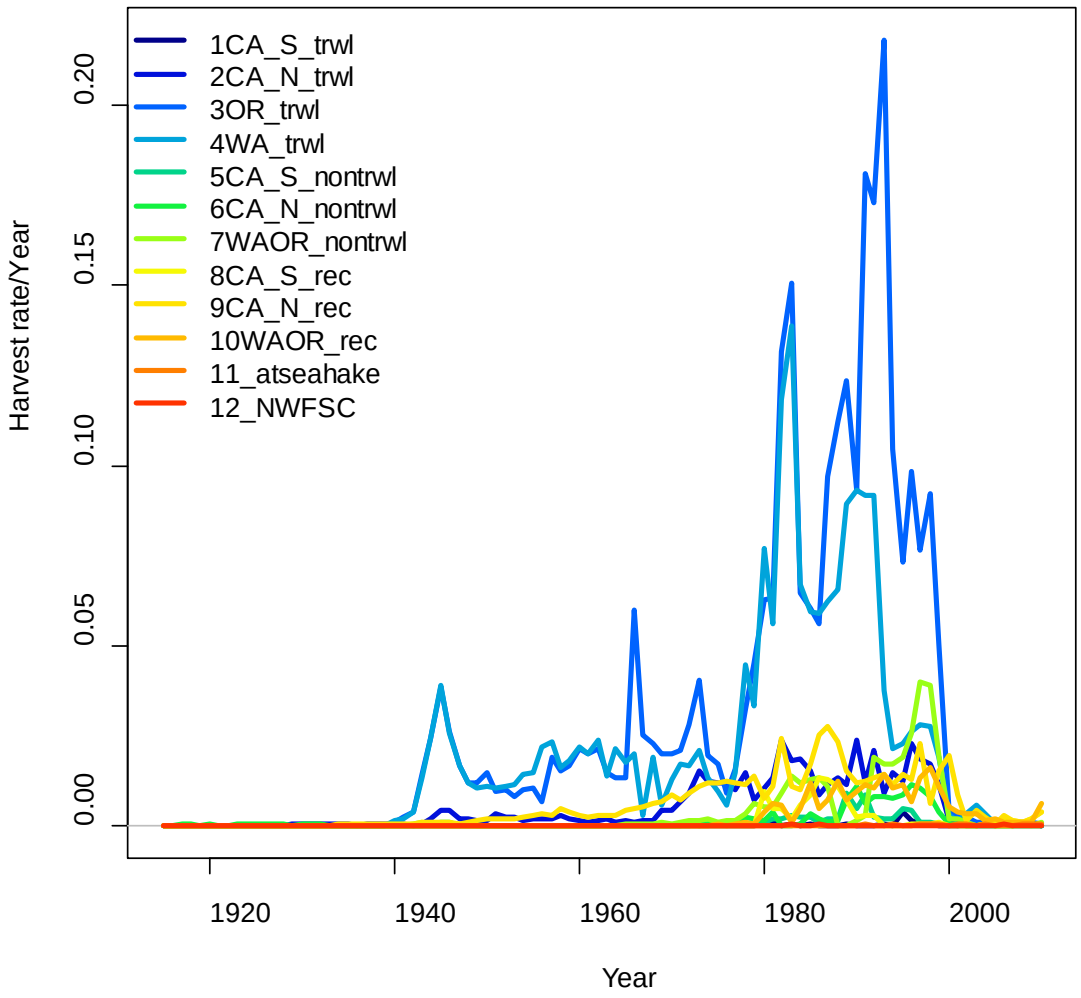



Figure 28. Time-series of harvest rate per year (F) for the fishing fleets. The Oregon trawl fleet is the upper line from 1979-1999 and the Washington trawl fleet is the second highest line 1983-1996.

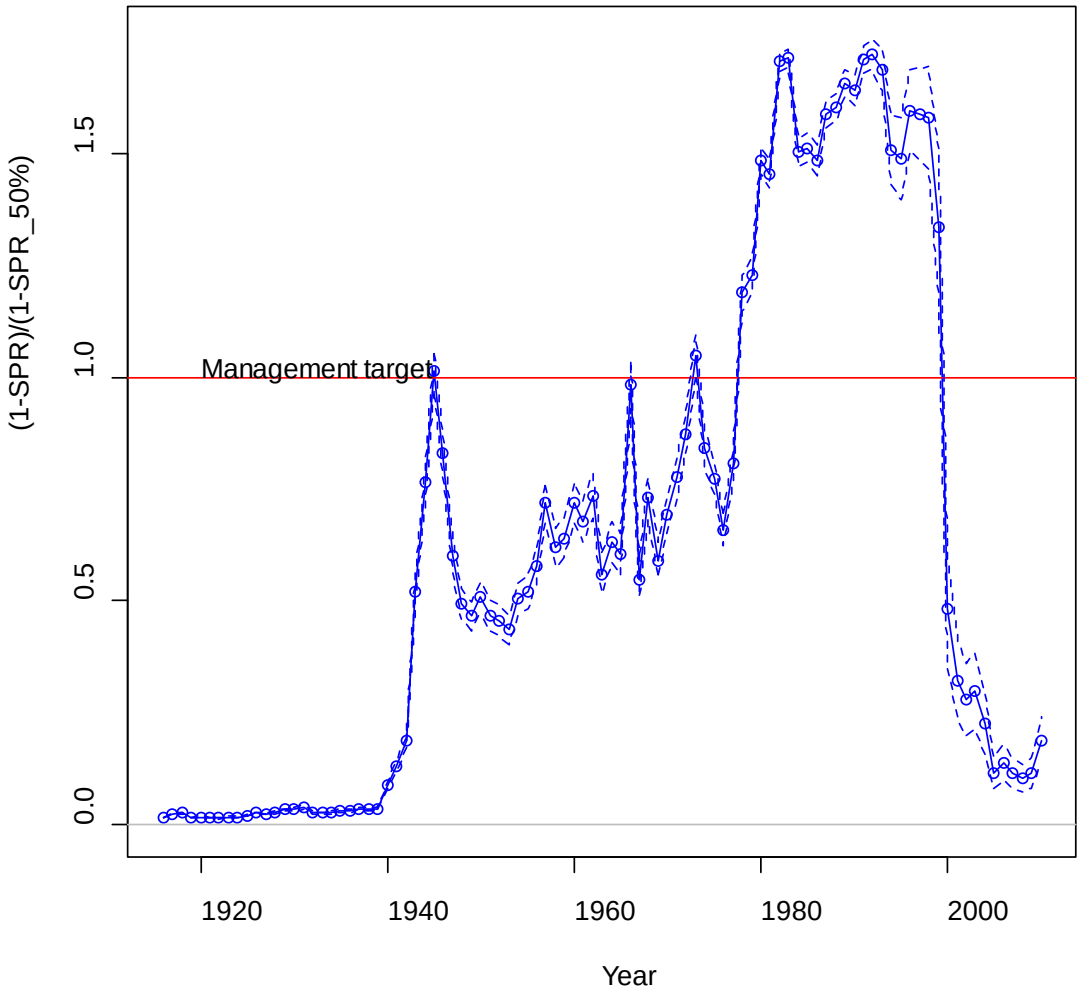



Figure 29. Time series of relative spawning potential ratio (1-SPR/1-$SPR_{Target=0.5}$) for the base-case model (circles) and alternate states of nature (light lines). Values of relative SPR above 100% reflect harvests in excess of the current overfishing proxy.

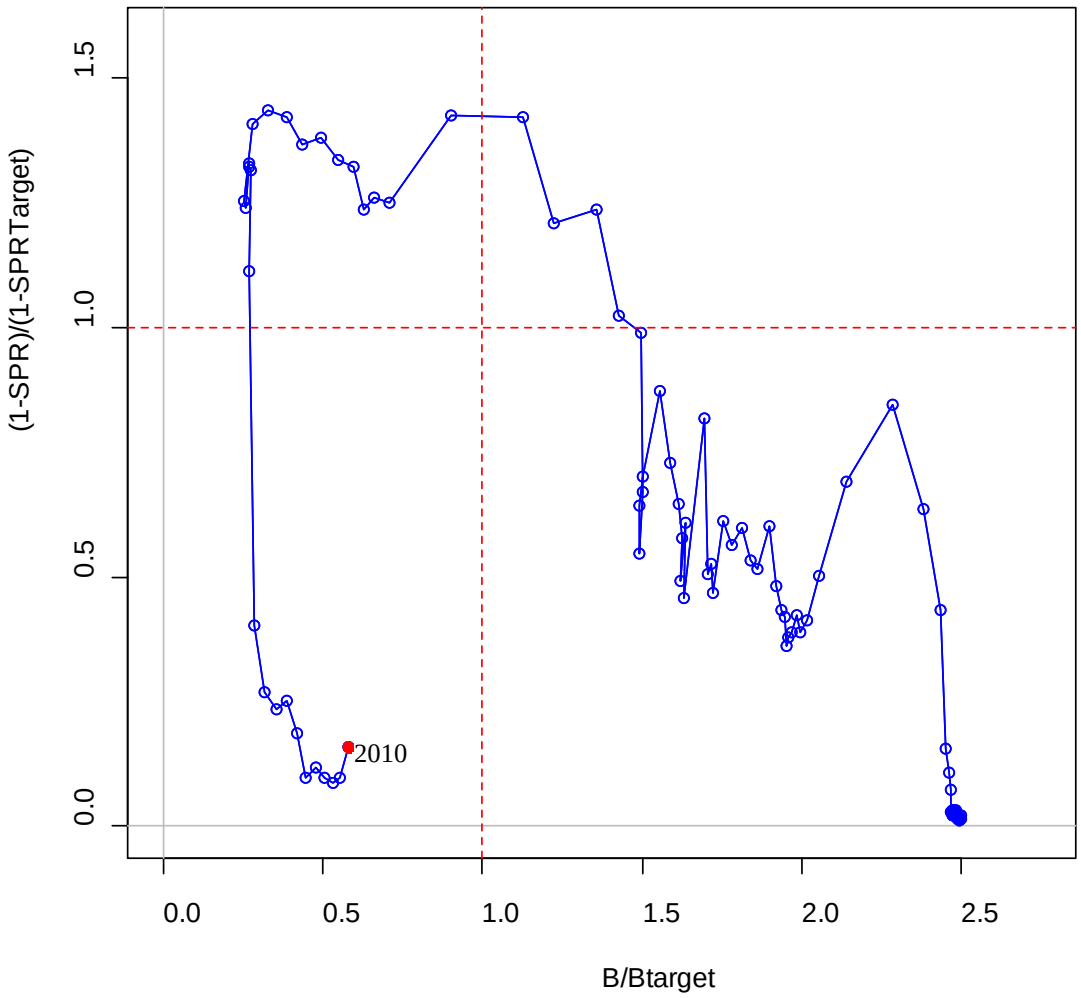



**Figure 30. Estimated relative spawning potential ratio relative to the proxy target/limit of 50% vs. estimated spawning biomass relative to the proxy 40% level from the base-case model. Higher biomass occurs on the right side of the x-axis, higher exploitation rates occur on the upper side of the y-axis.**

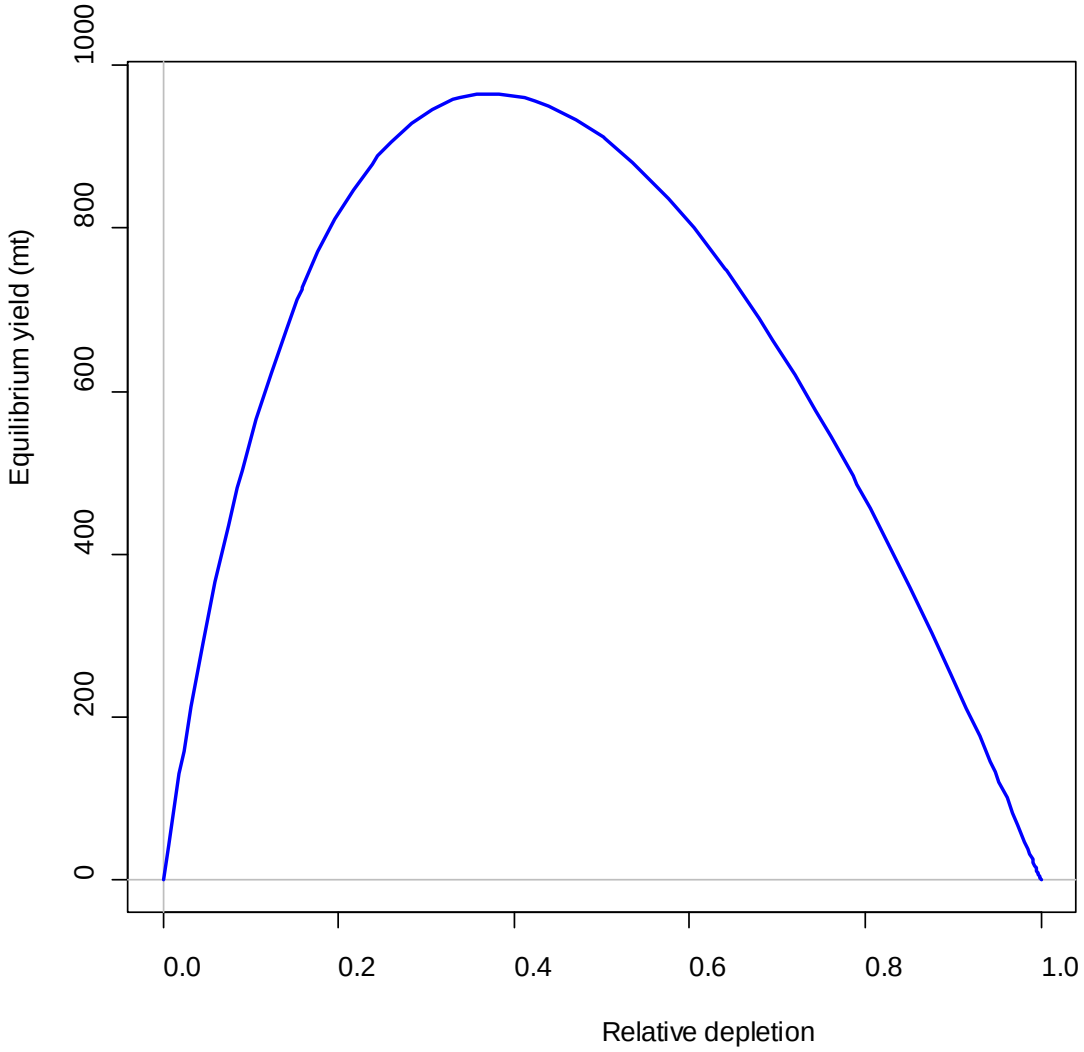



Figure 31. Equilibrium yield curve for the base-case model. Values are based on 1994-1998 fishery selectivity and allocation to reflect the performance of a targeted fishery.

## 12. Appendix A: Fits to fishery length and age data

In this appendix, plots of the fit to compositional data are presented for length and age data by fishing fleet.

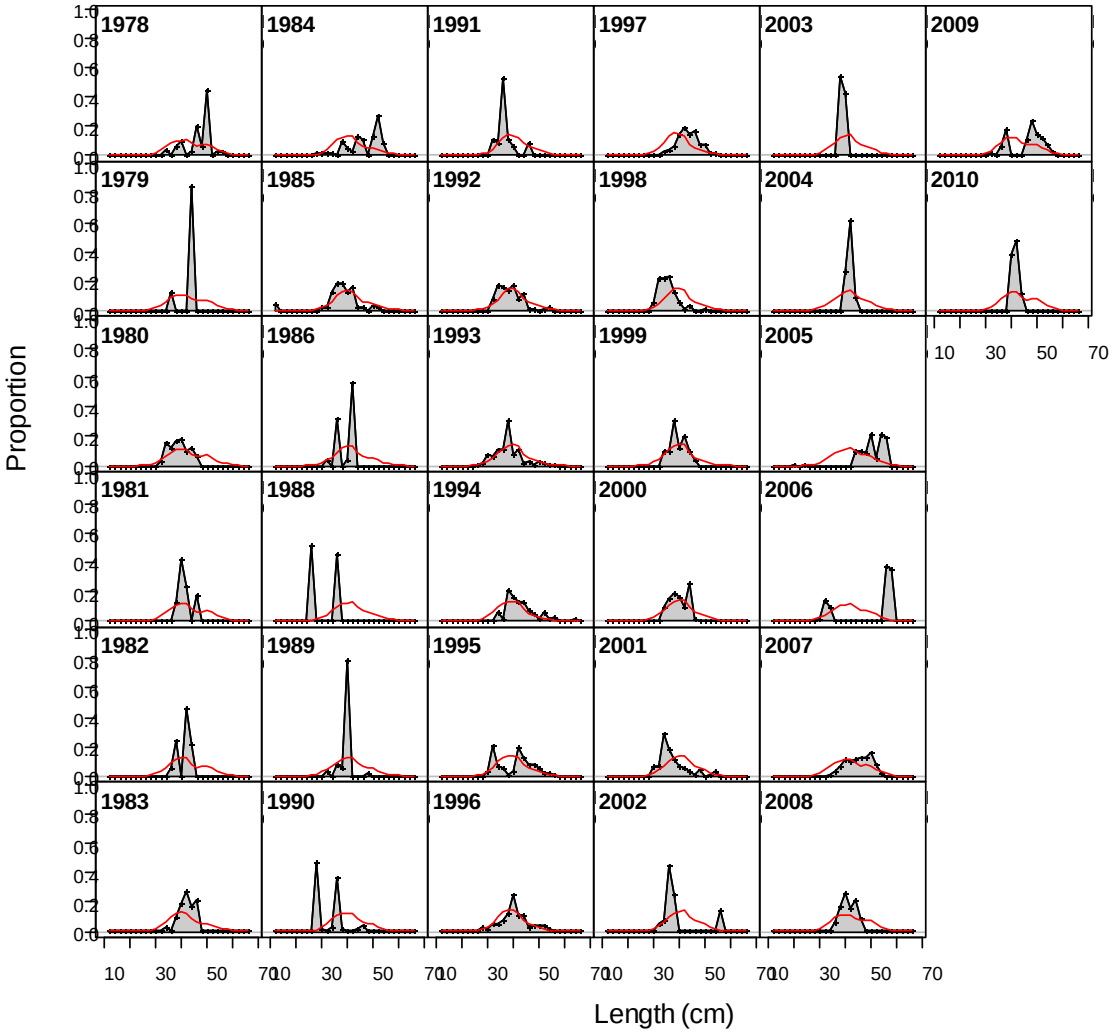



**Figure A1. Fit to length-frequency observations (sexes combined) for the Southern California trawl fleet.**

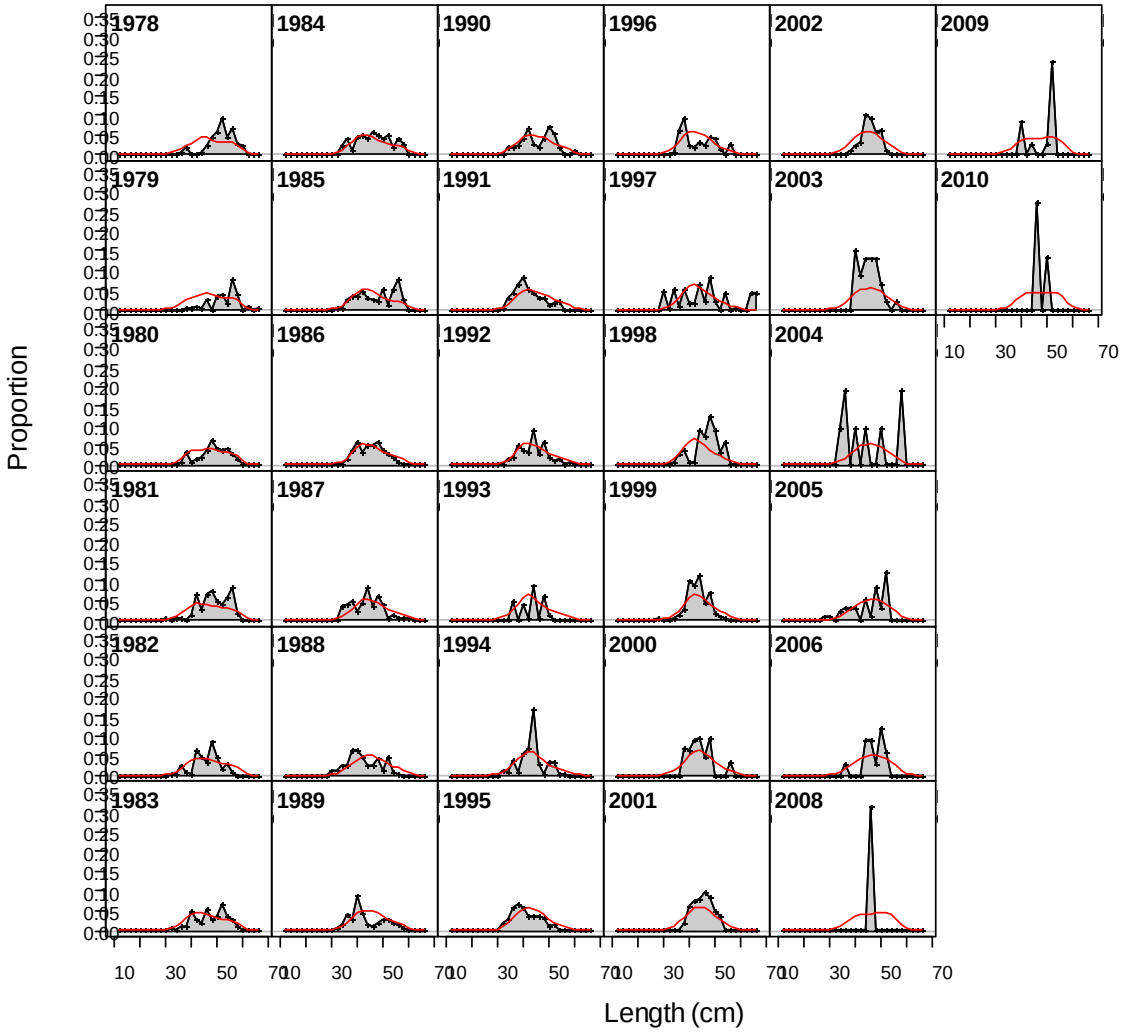



**Figure A2. Fit to female length-frequency observations for the Northern California trawl fleet.**

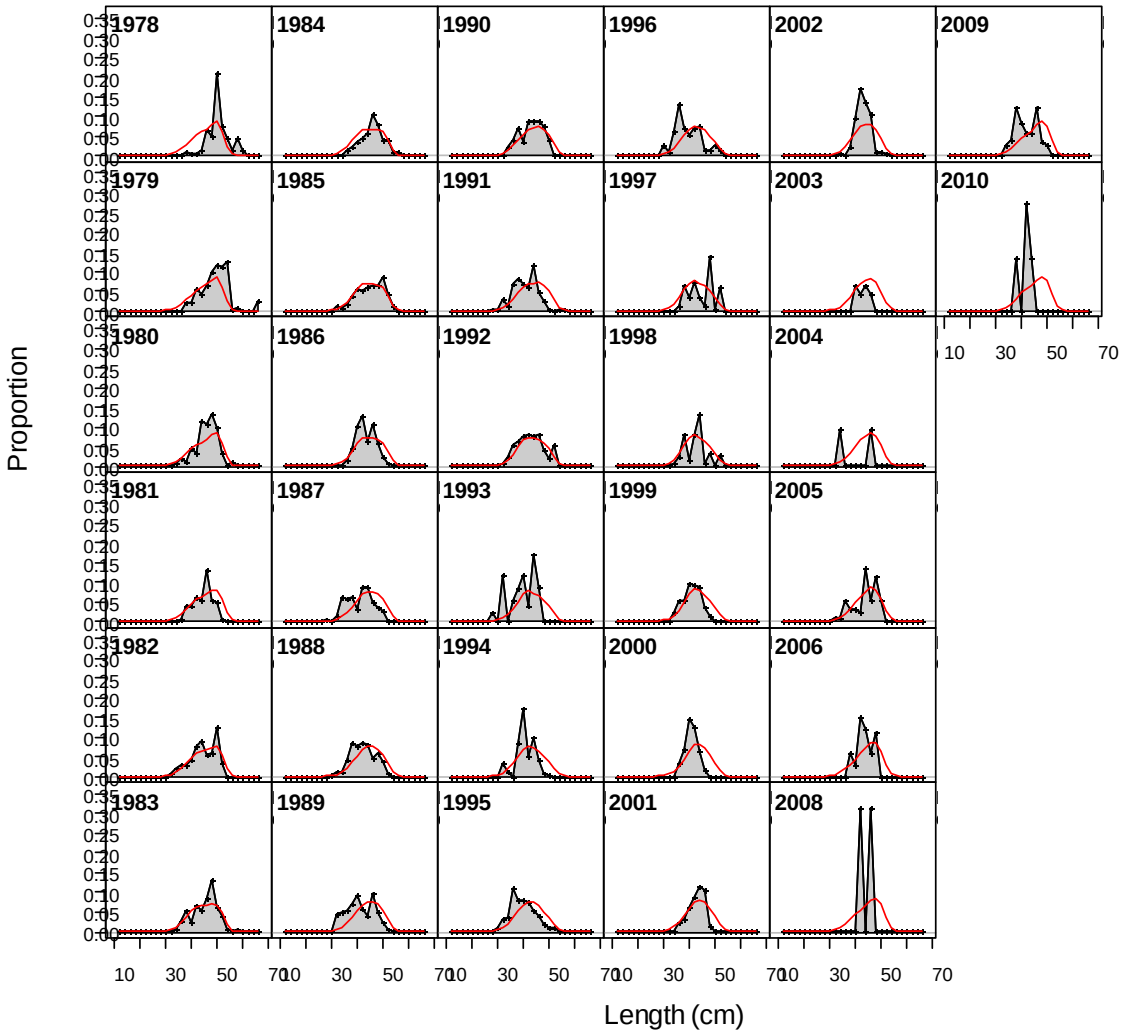



**Figure A3. Fit to male length-frequency observations for the Northern California trawl fleet.**

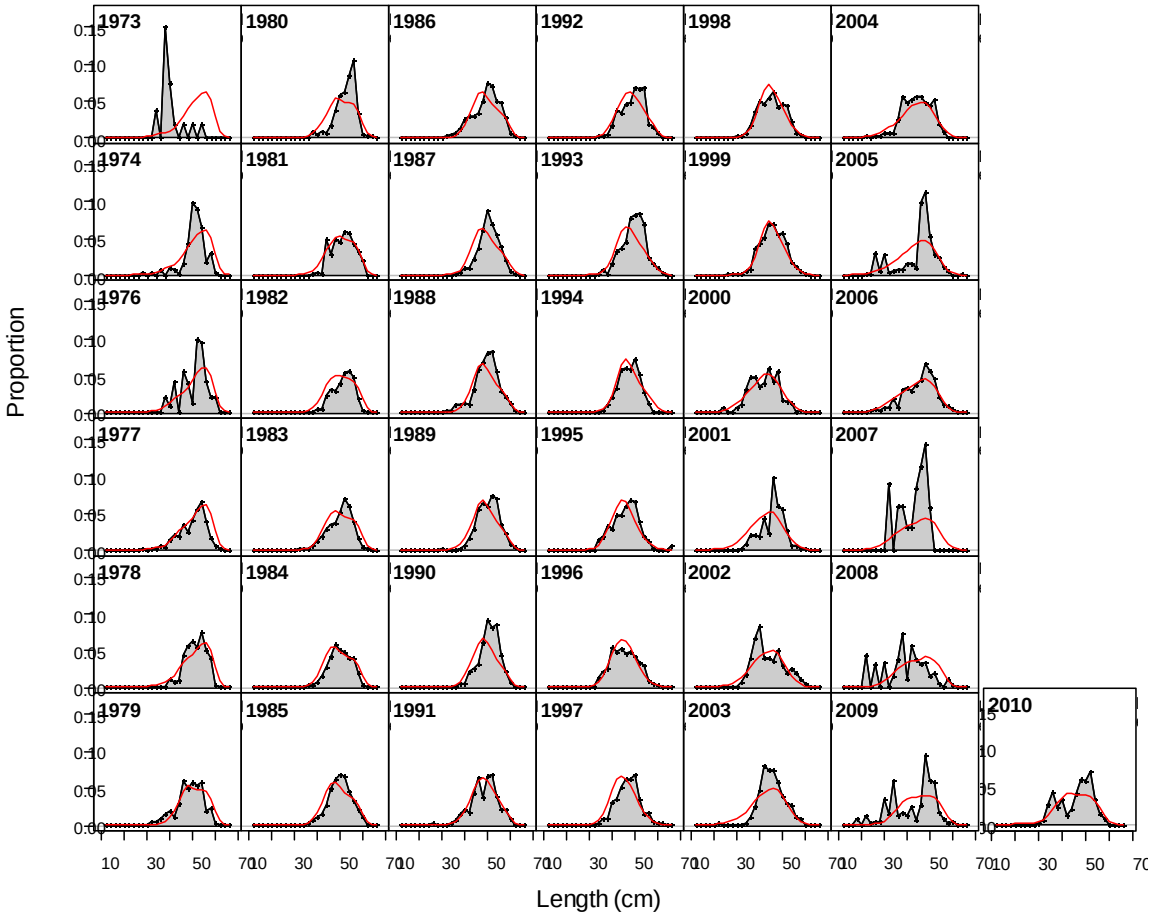



**Figure A4. Fit to female length-frequency observations for the Oregon trawl fleet.**

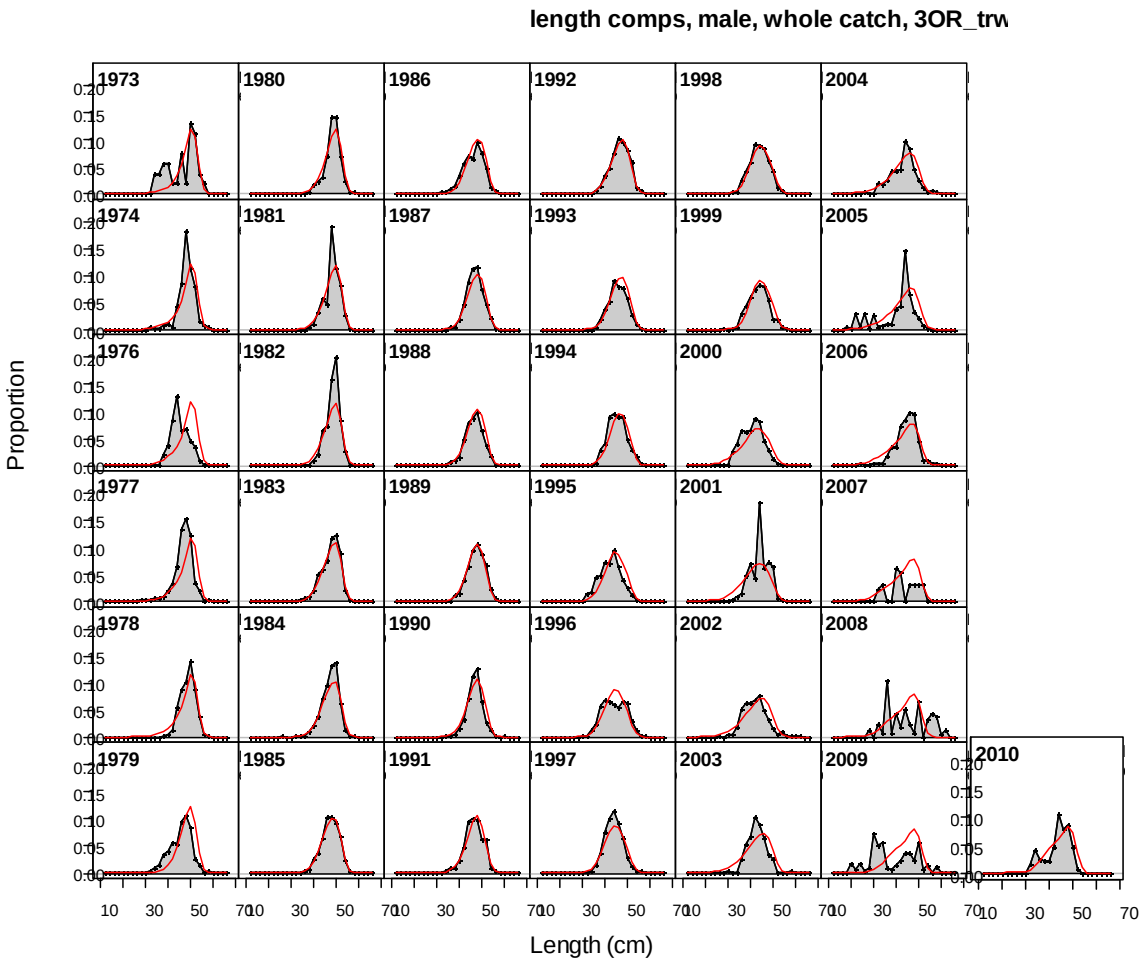



**Figure A5. Fit to male length-frequency observations for the Oregon trawl fleet.**

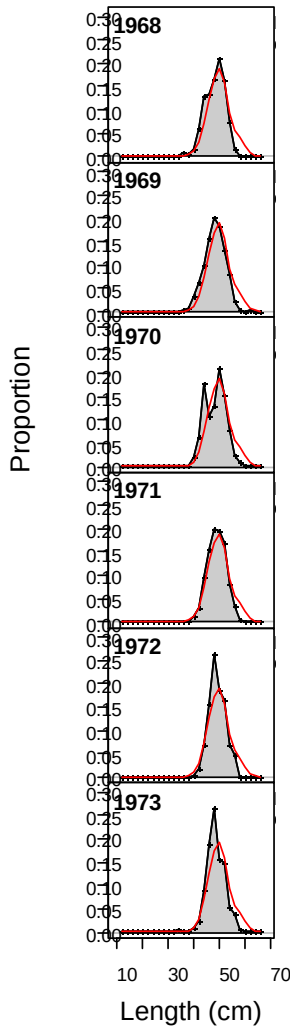



**Figure A6. Fit to combined sex length-frequency observations for the historical Washington trawl fleet.**

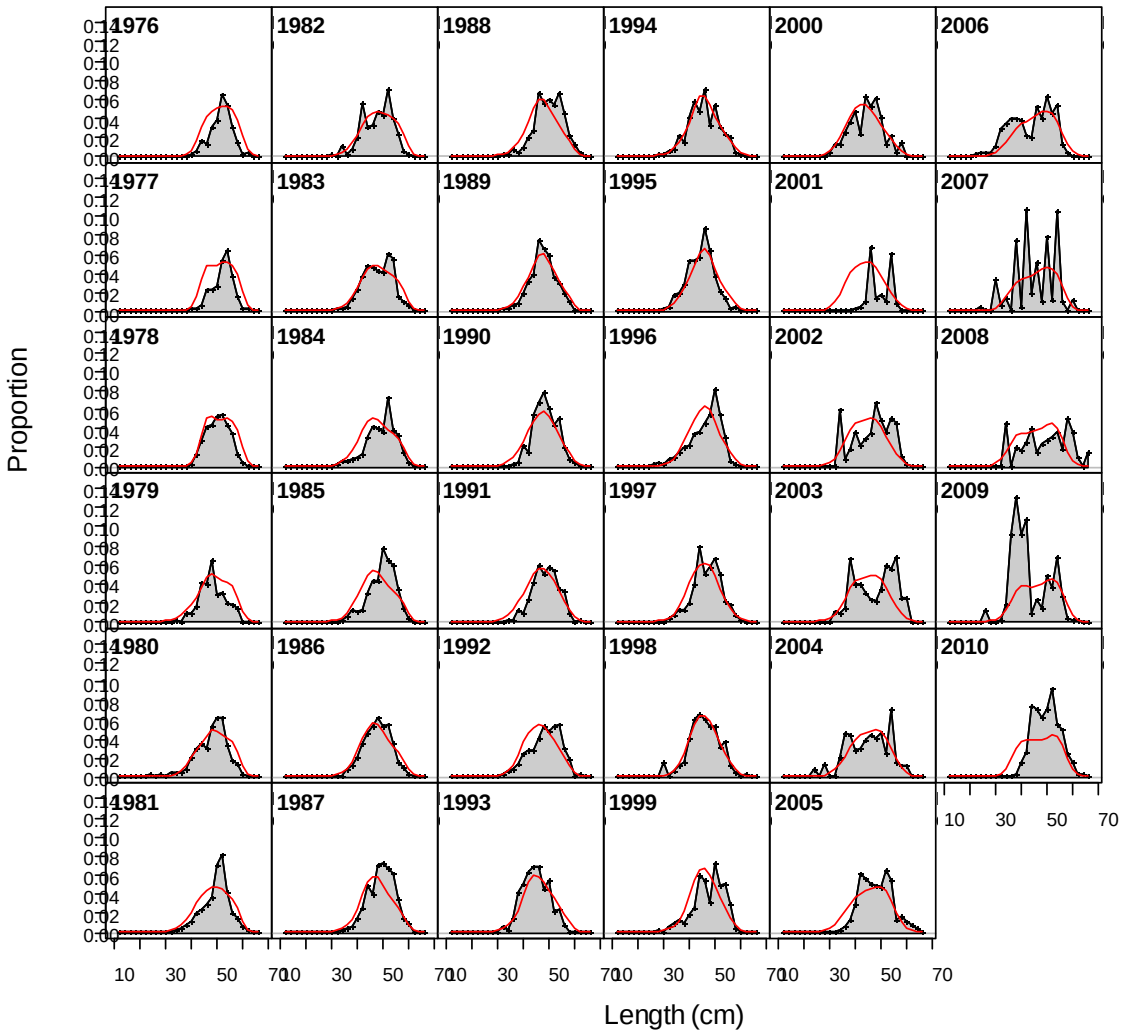



**Figure A7. Fit to female length-frequency observations for the Washington trawl fleet.**

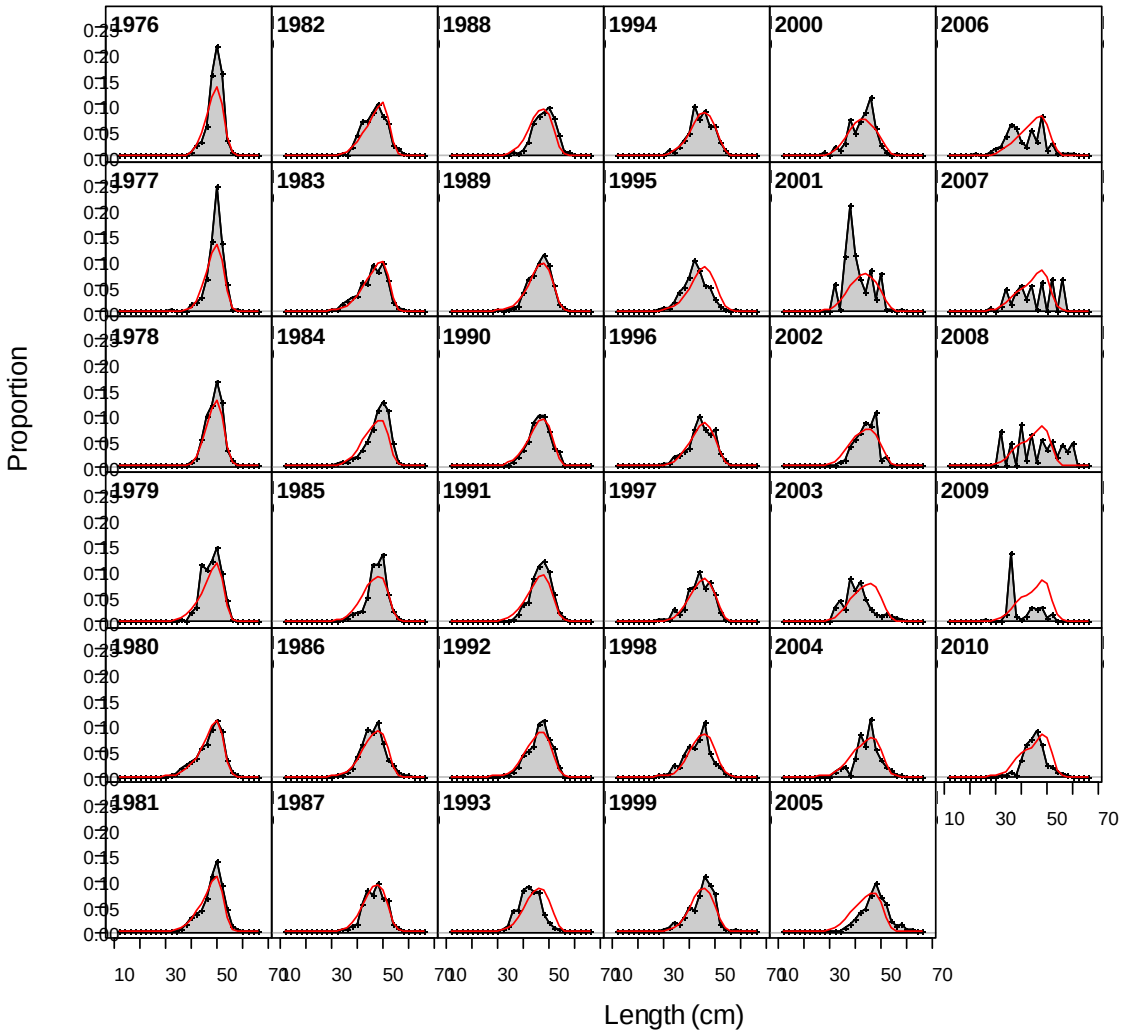



**Figure A8. Fit to male length-frequency observations for the Washington trawl fleet.**

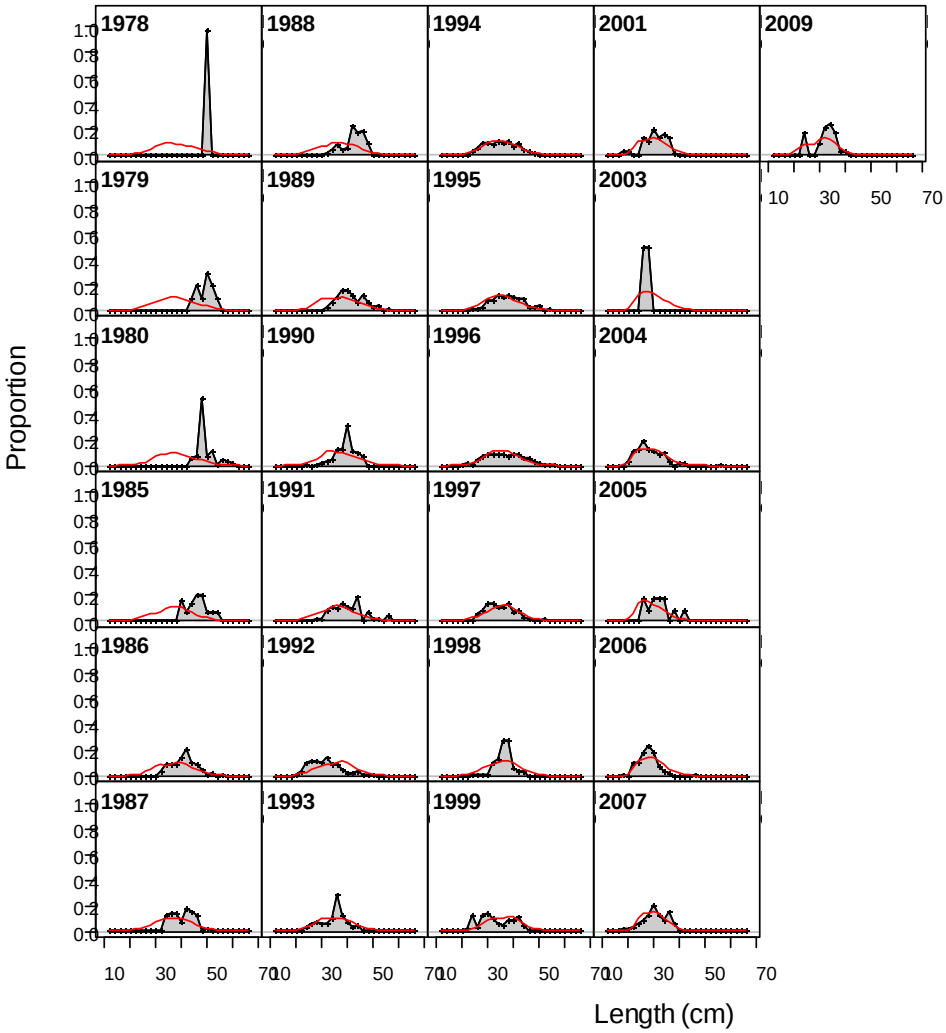



**Figure A9. Fit to sexes combined length-frequency observations for the southern California non-trawl fleet.**

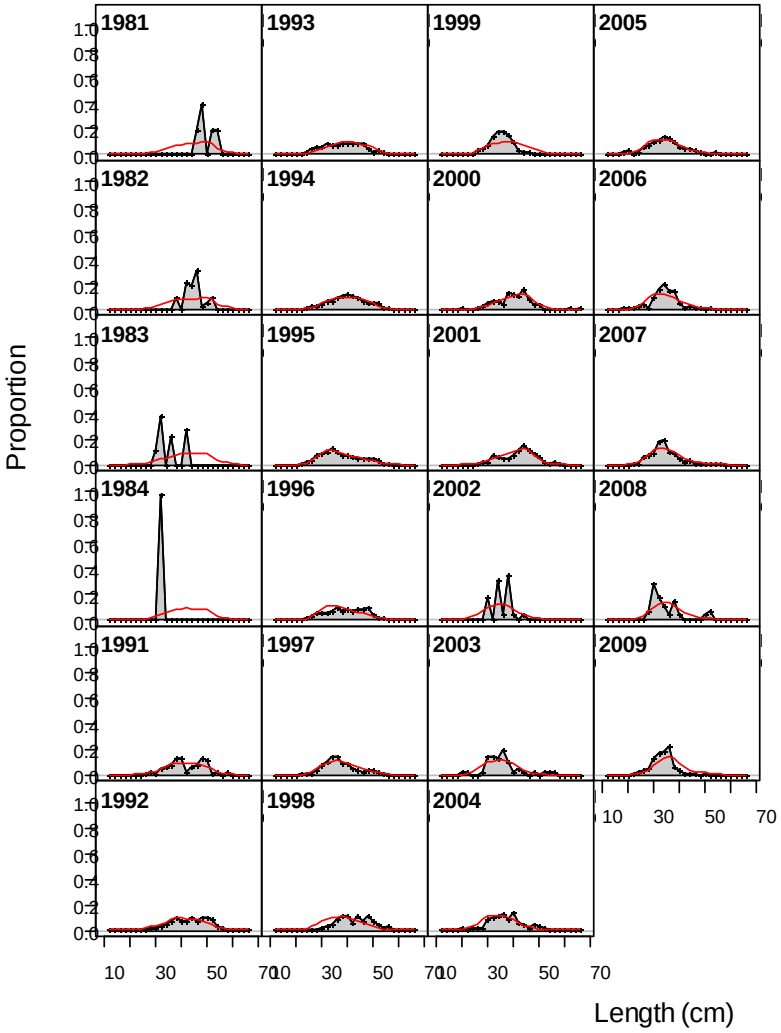



**Figure A10. Fit to sexes combined length-frequency observations for the northern California non-trawl fleet.**

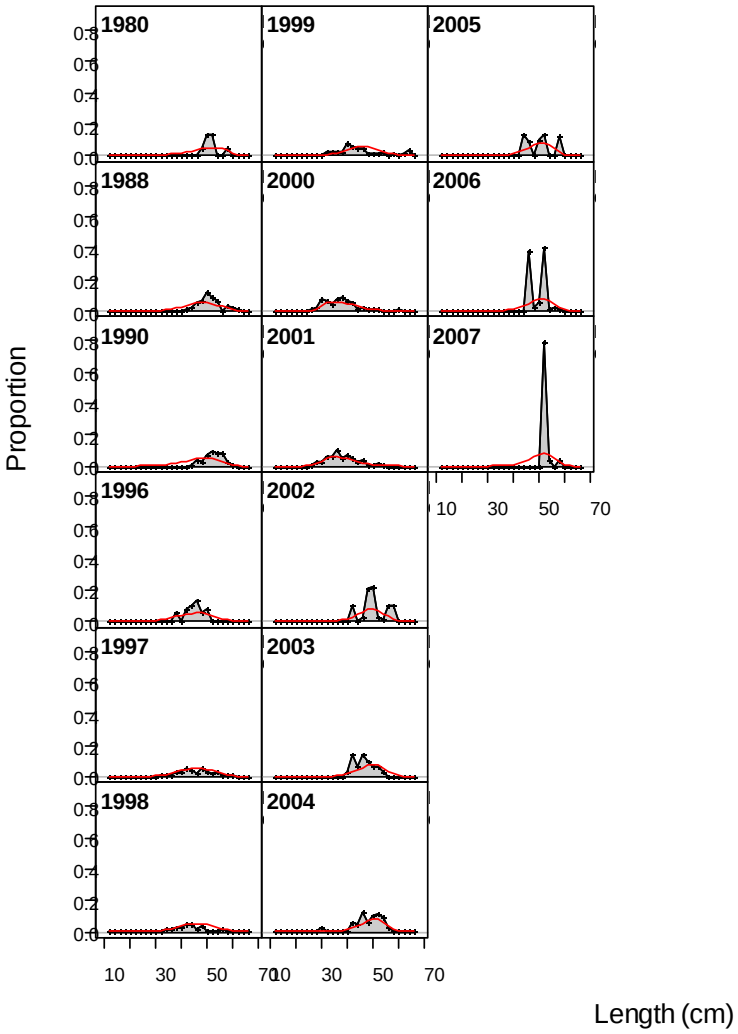



**Figure A11. Fit to female length-frequency observations for the Oregon-Washington non-trawl fleet.**

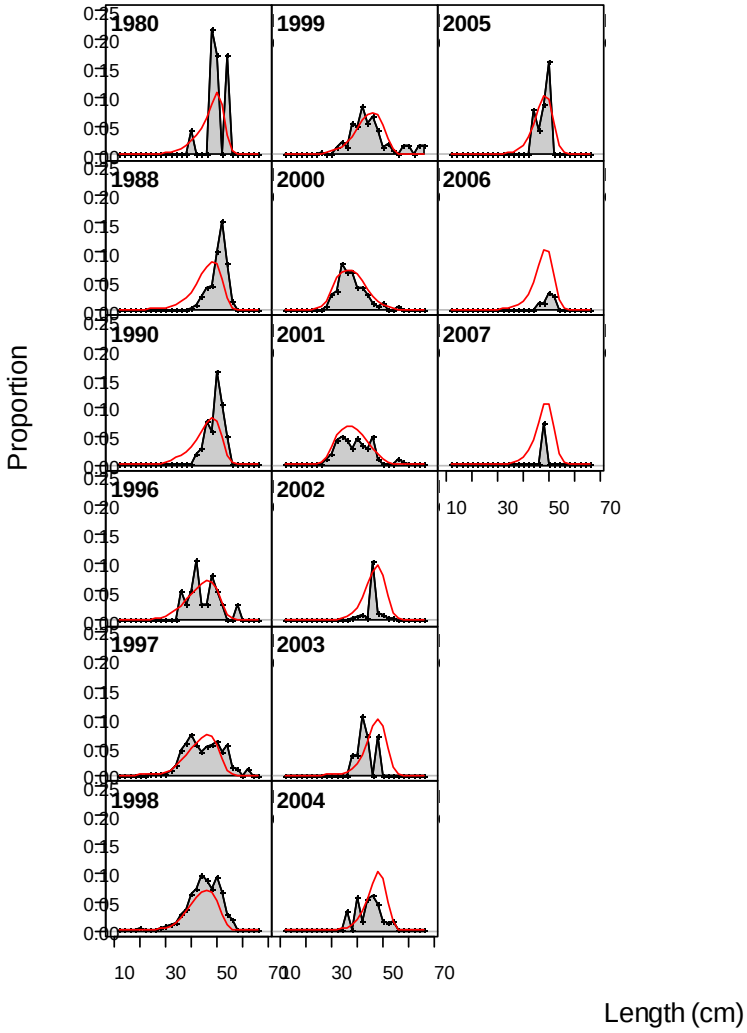



**Figure A12. Fit to male length-frequency observations for the Oregon-Washington non-trawl fleet.**

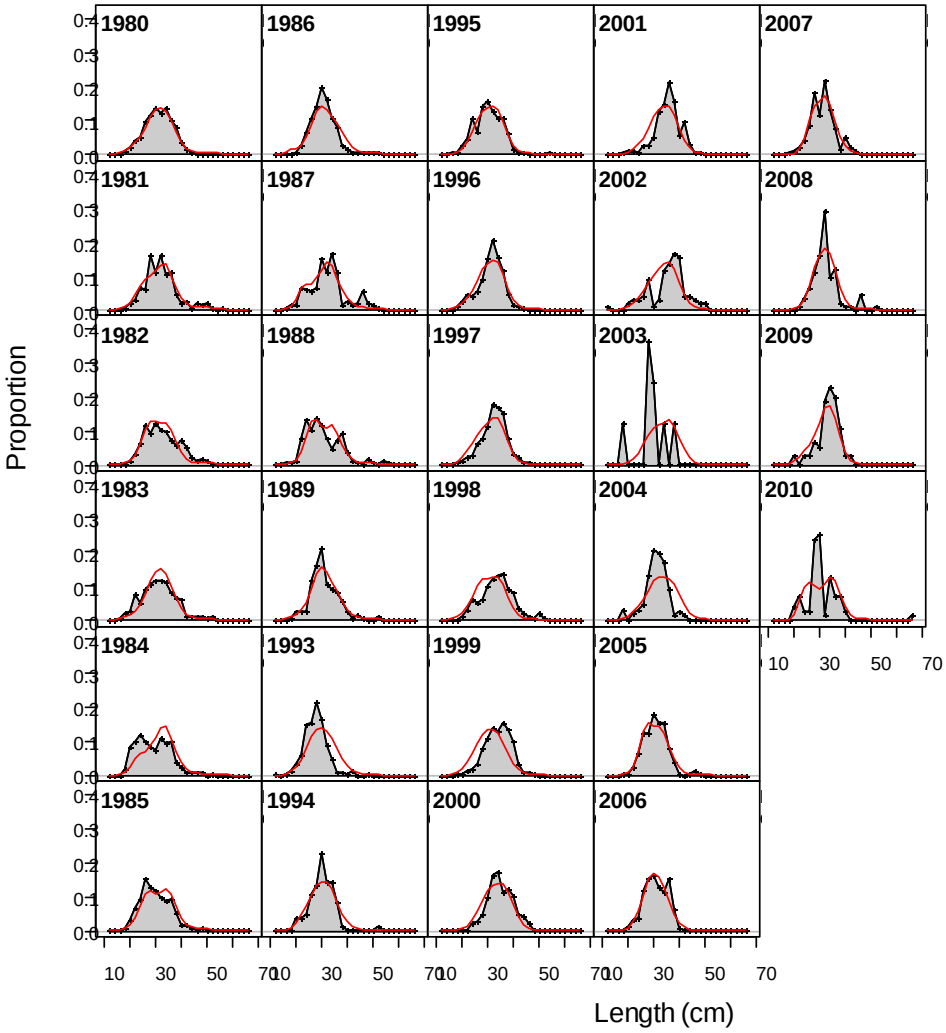



**Figure A13. Fit to combined sex length-frequency observations for the southern California recreational fleet.**

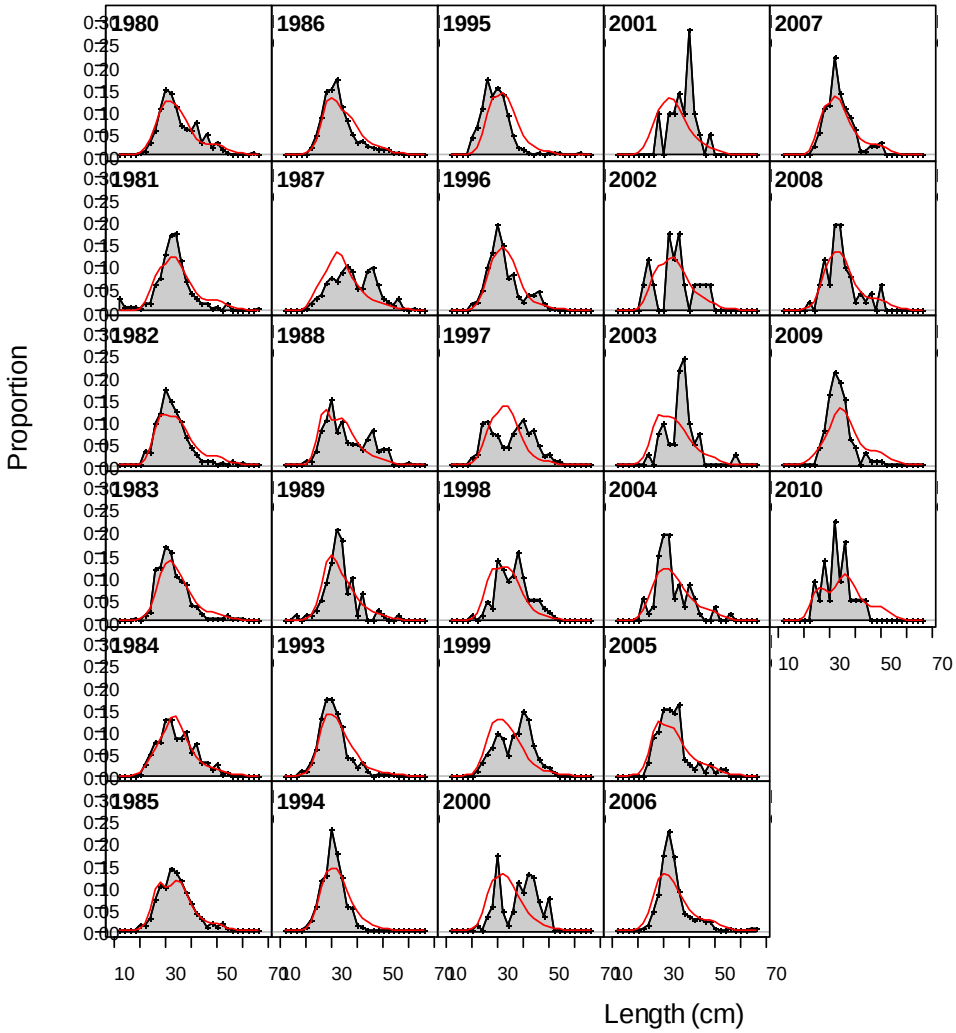



**Figure A14. Fit to combined sex length-frequency observations for the northern California recreational fleet.**

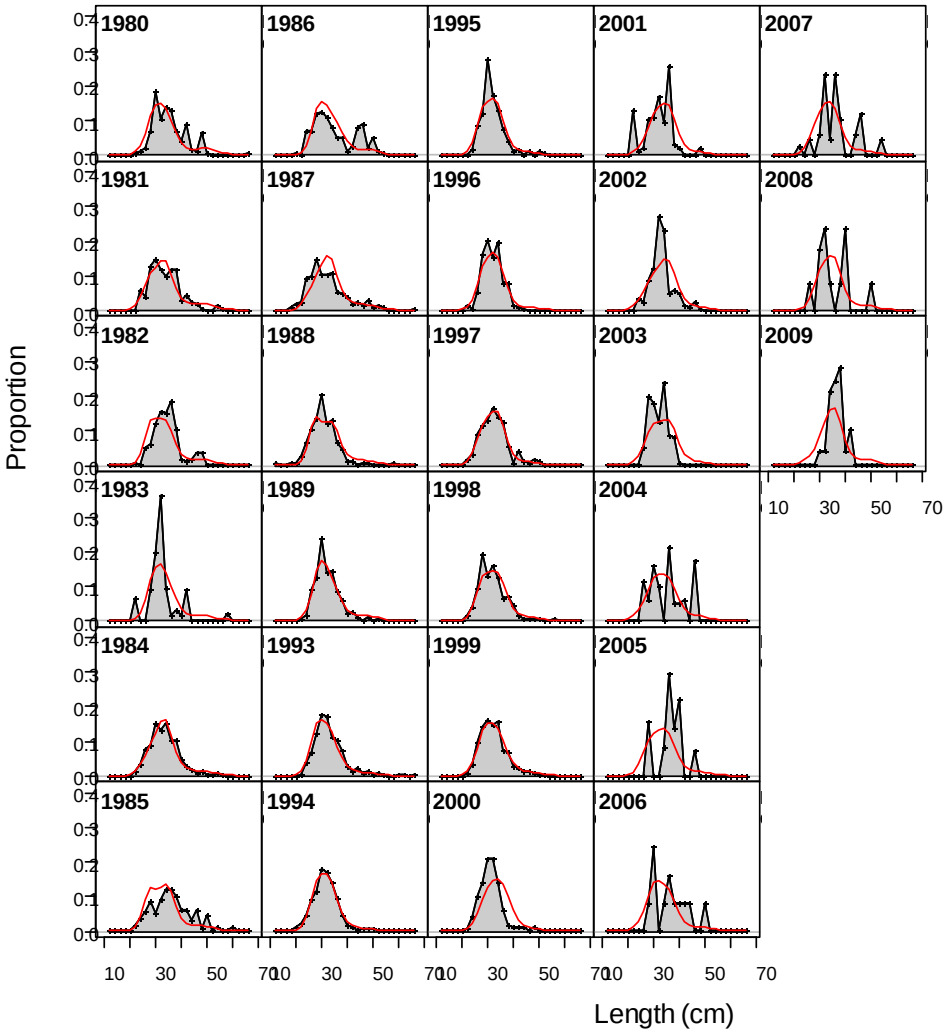



**Figure A15. Fit to combined sex length-frequency observations for the Oregon-Washington recreational fleet.**

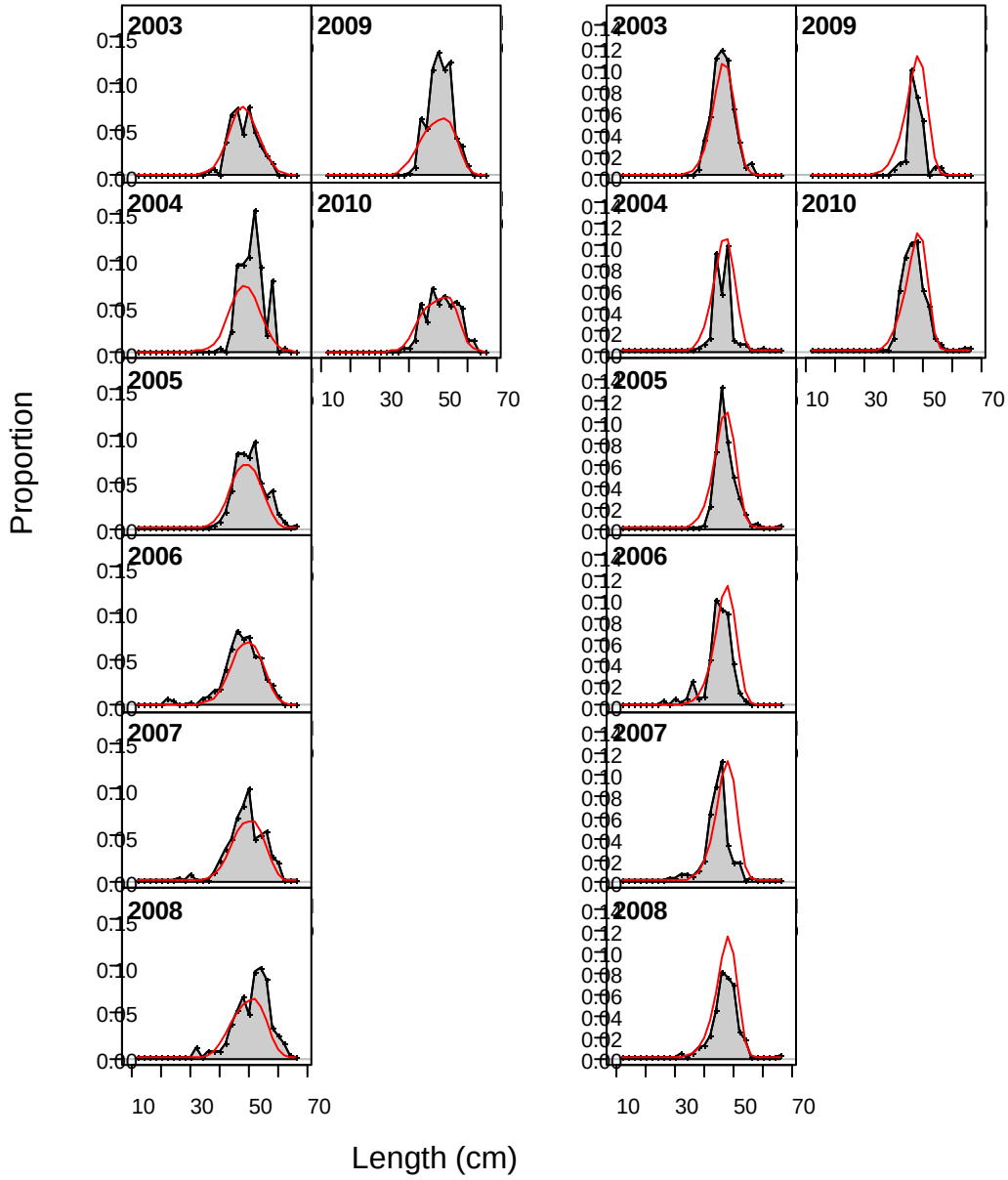



**Figure A16. Fit to female (left panels) and male (right panels) length-frequency observations for the at-sea whiting fleet.**

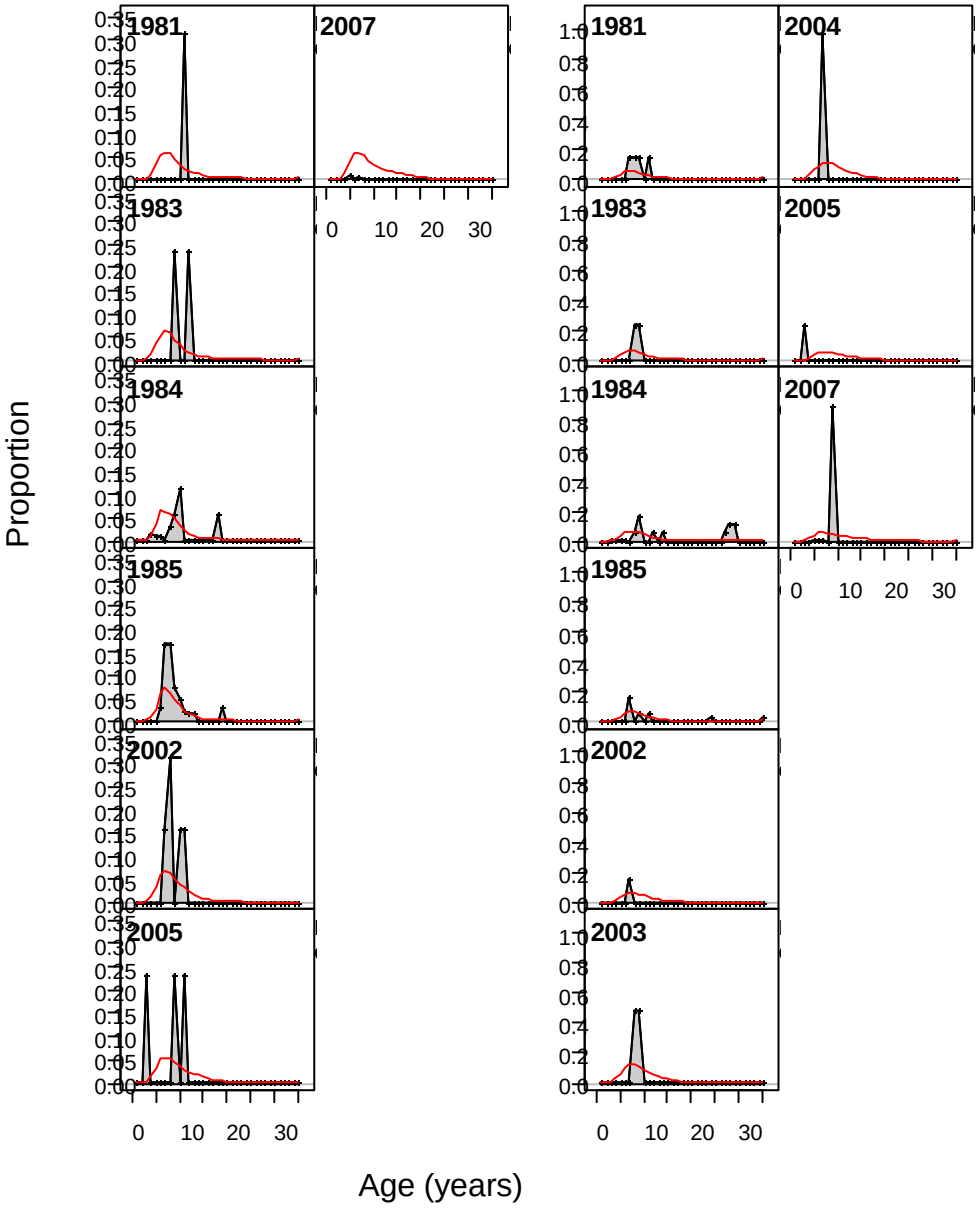



**Figure A17. Fit to the southern California fishery female (left panels) and male (right panels) age-frequencies.**

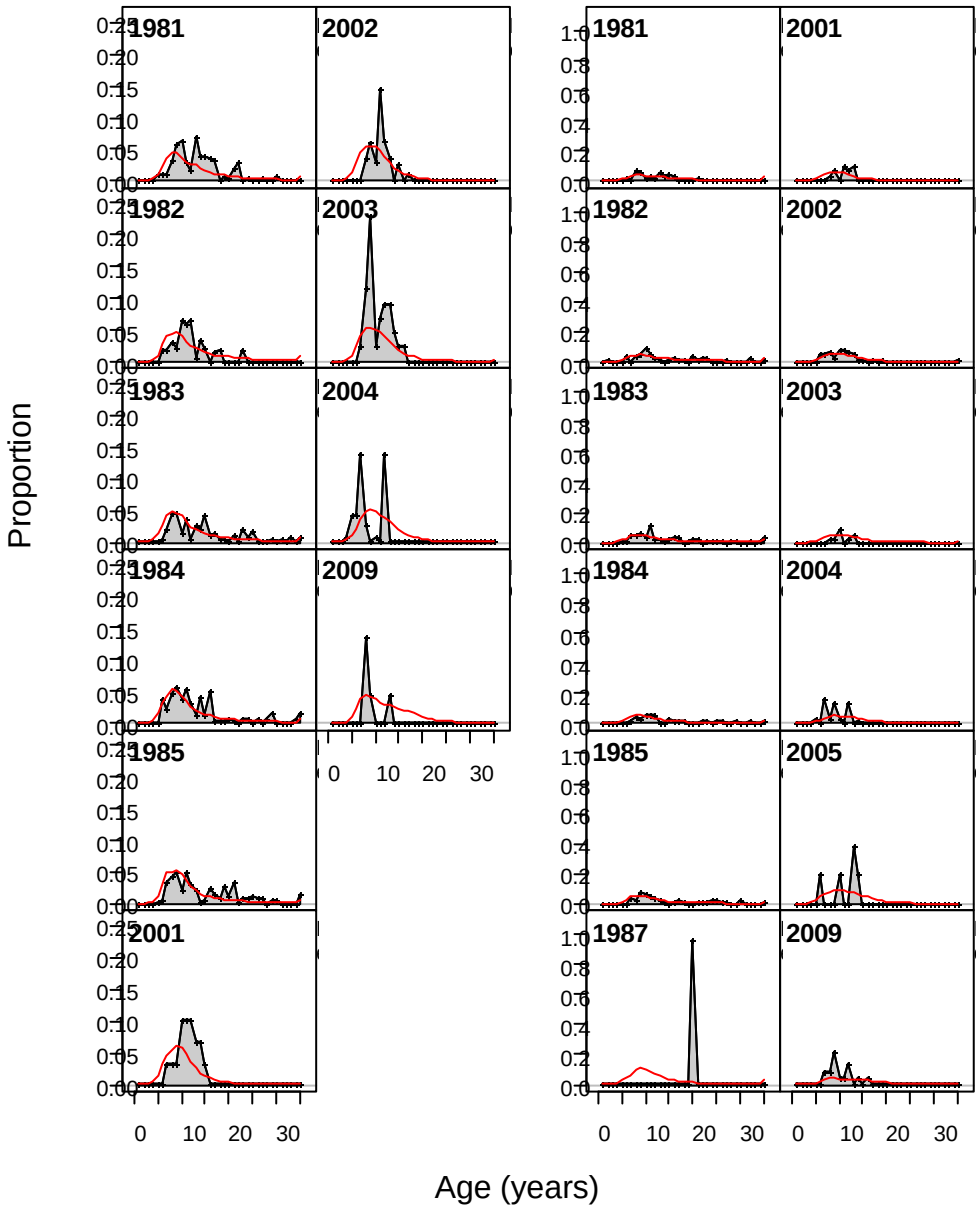



**Figure A18. Fit to the northern California trawl fishery female (left panels) and male (right panels) age-frequencies.**

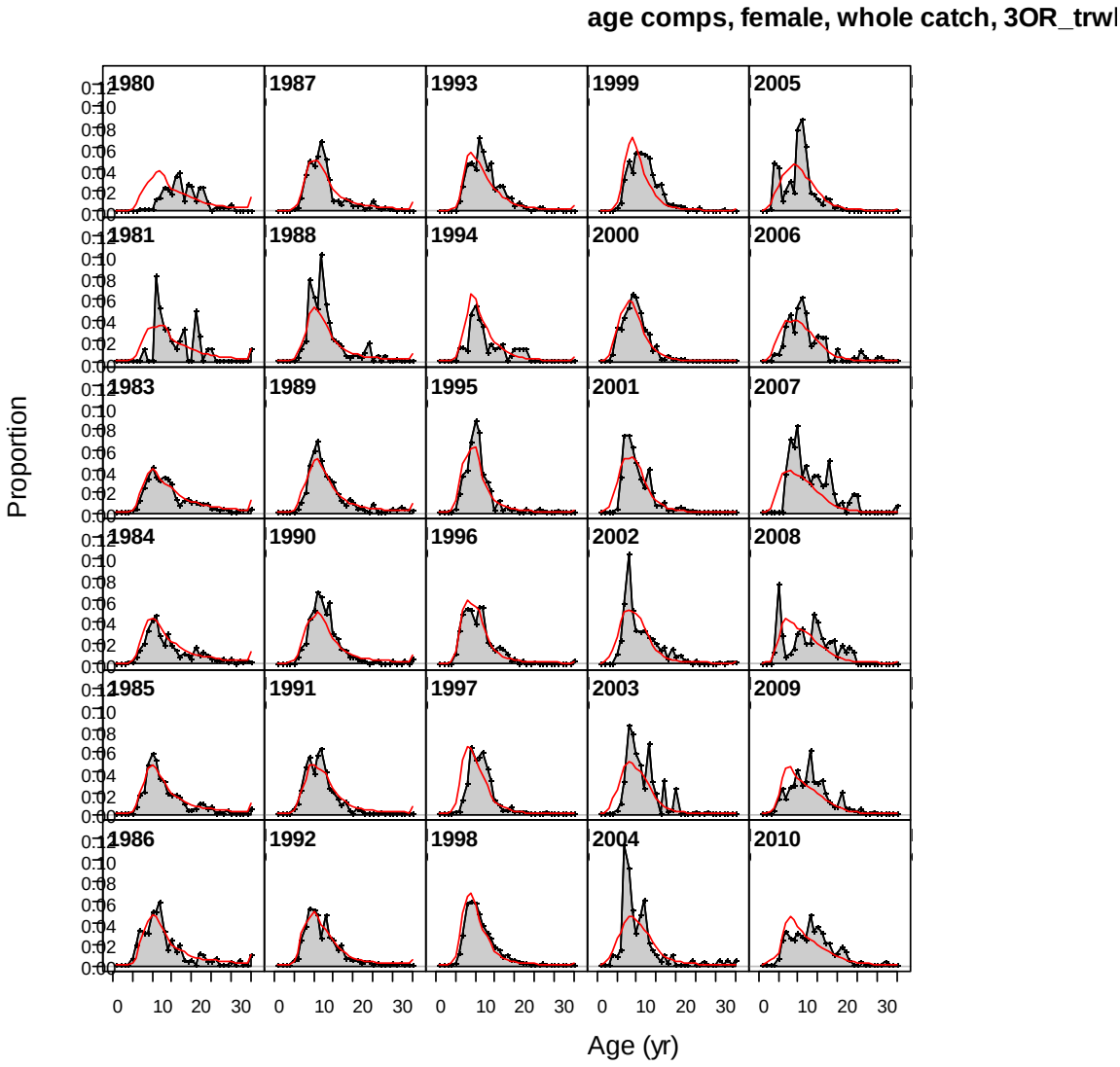



**Figure A19. Fit to the Oregon trawl fishery female age-frequencies.**

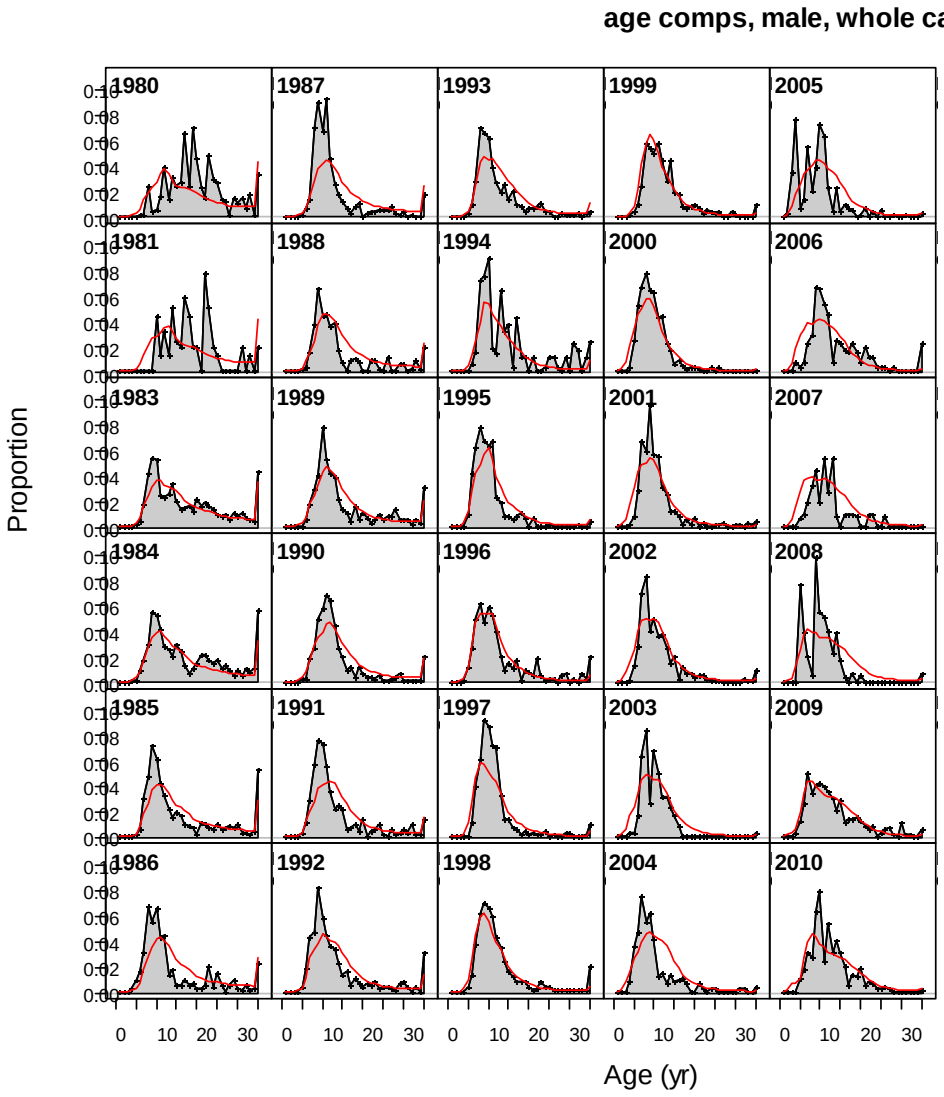



**Figure A20. Fit to the Oregon trawl fishery male age-frequencies.**

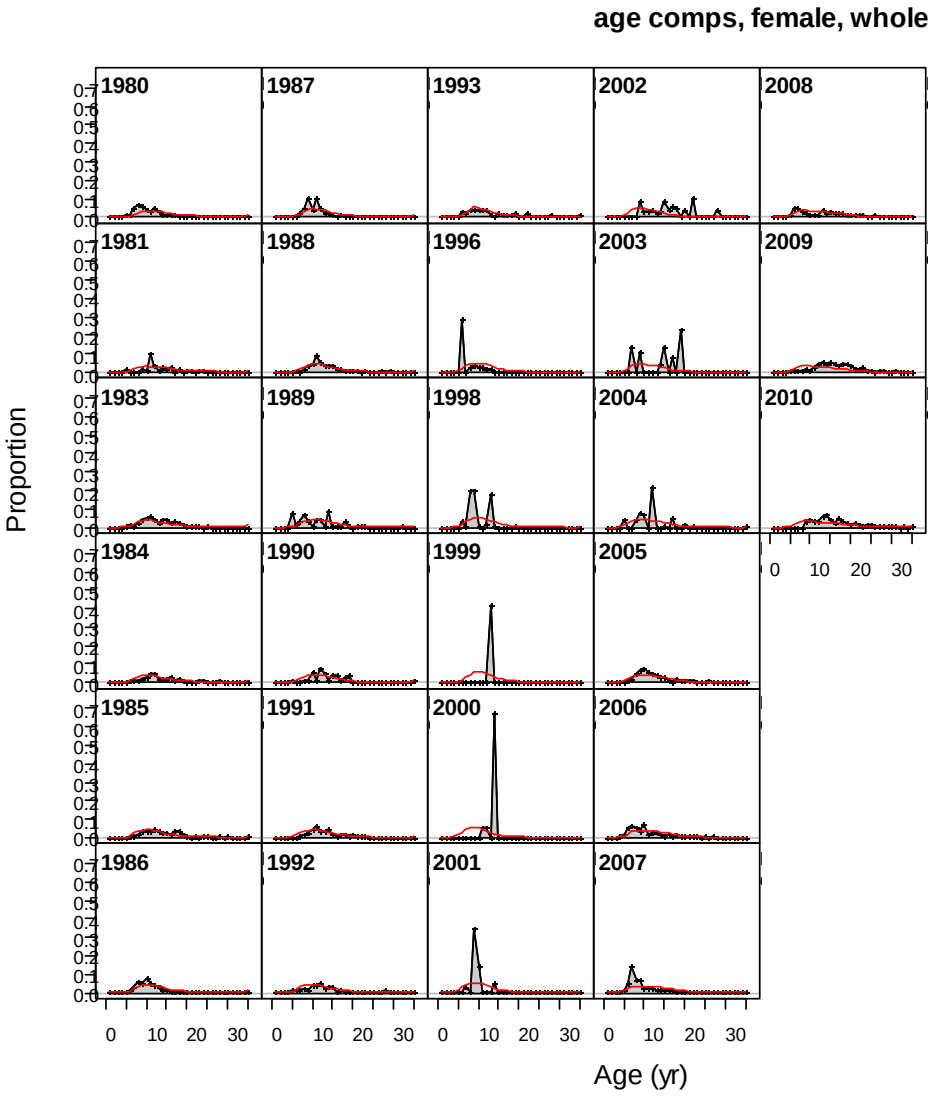



**Figure A21. Fit to the Washington trawl fishery female age-frequencies based on WDFW ageing-error.**

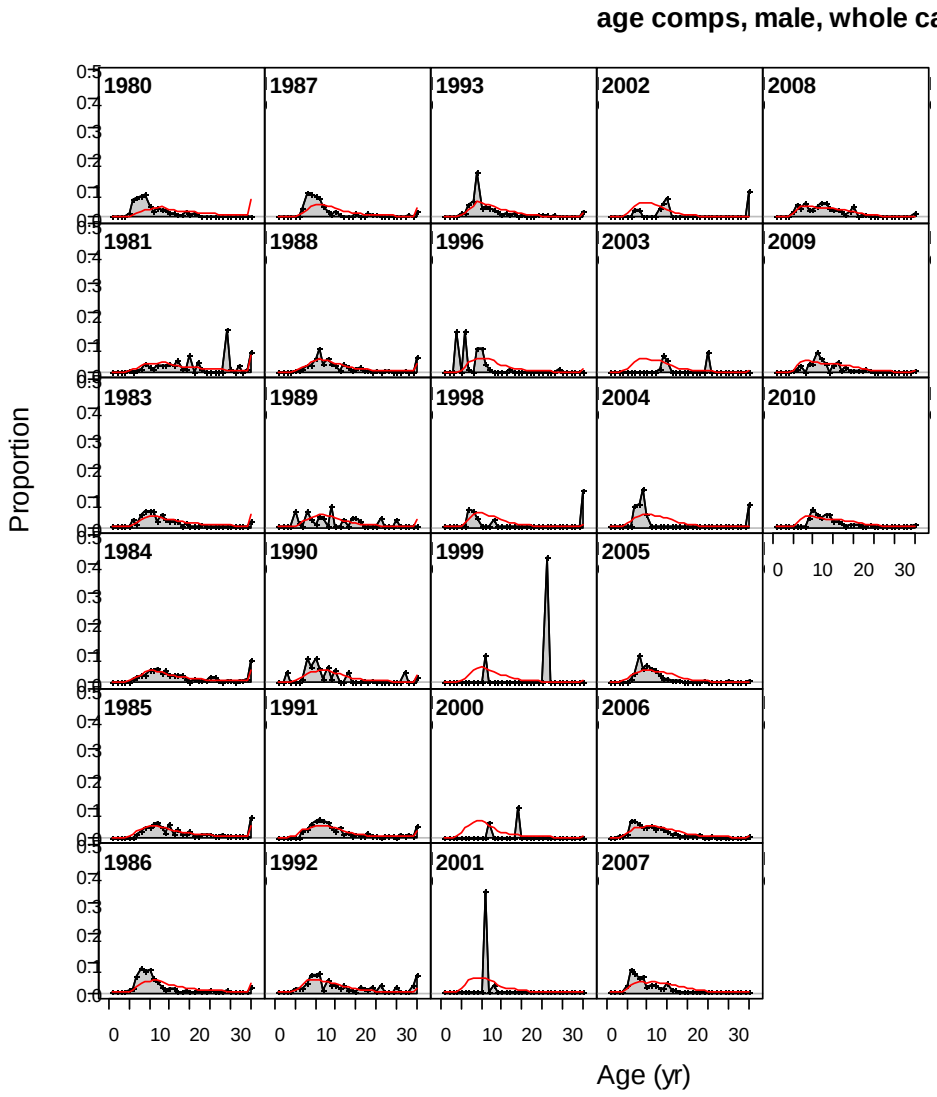



**Figure A22. Fit to the Washington trawl fishery male age-frequencies based on WDFW ageing-error.**

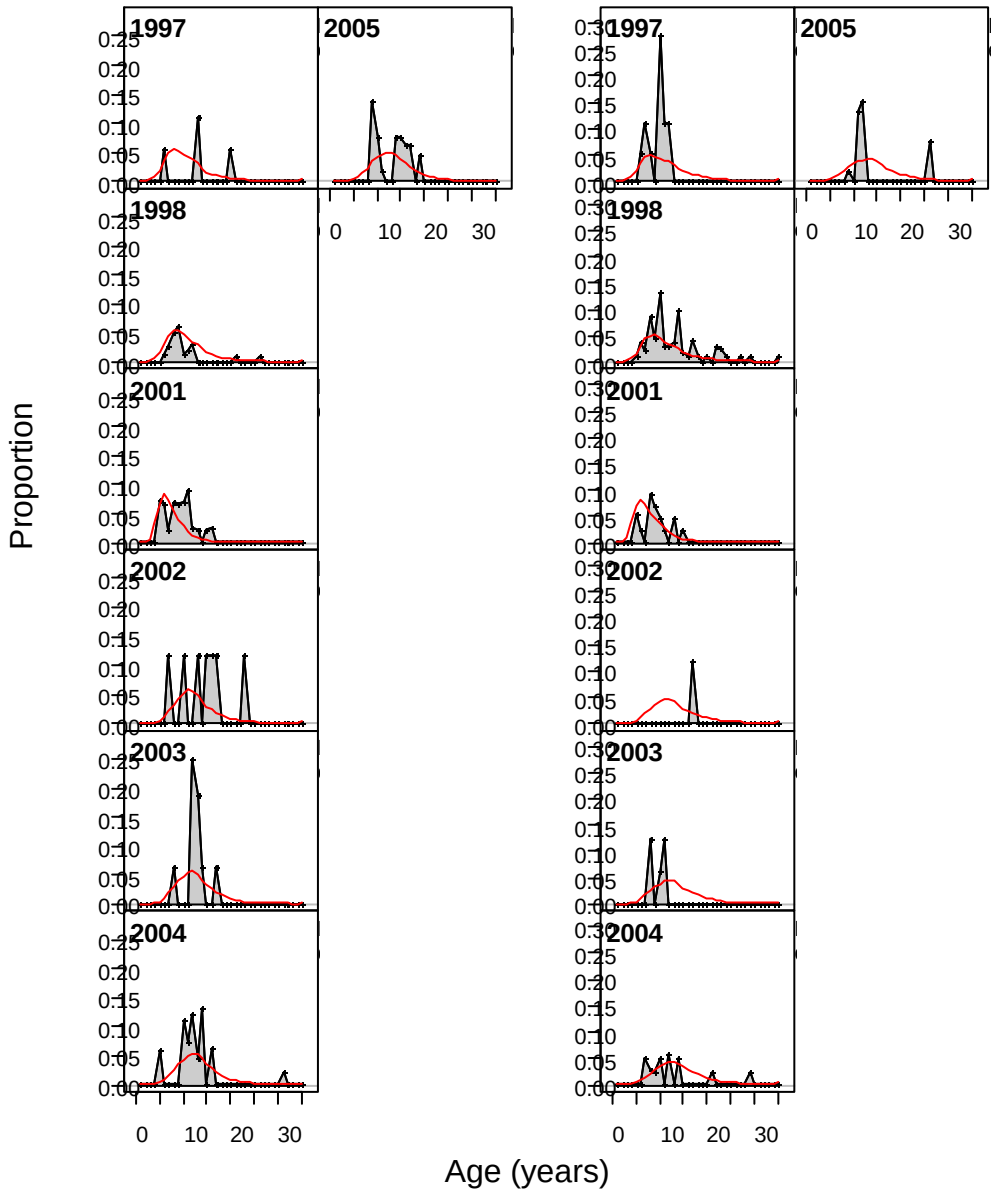



**Figure A23. Fit to the Washington-Oregon non-trawl fishery female (left panels) and male (right panels) age-frequencies.**

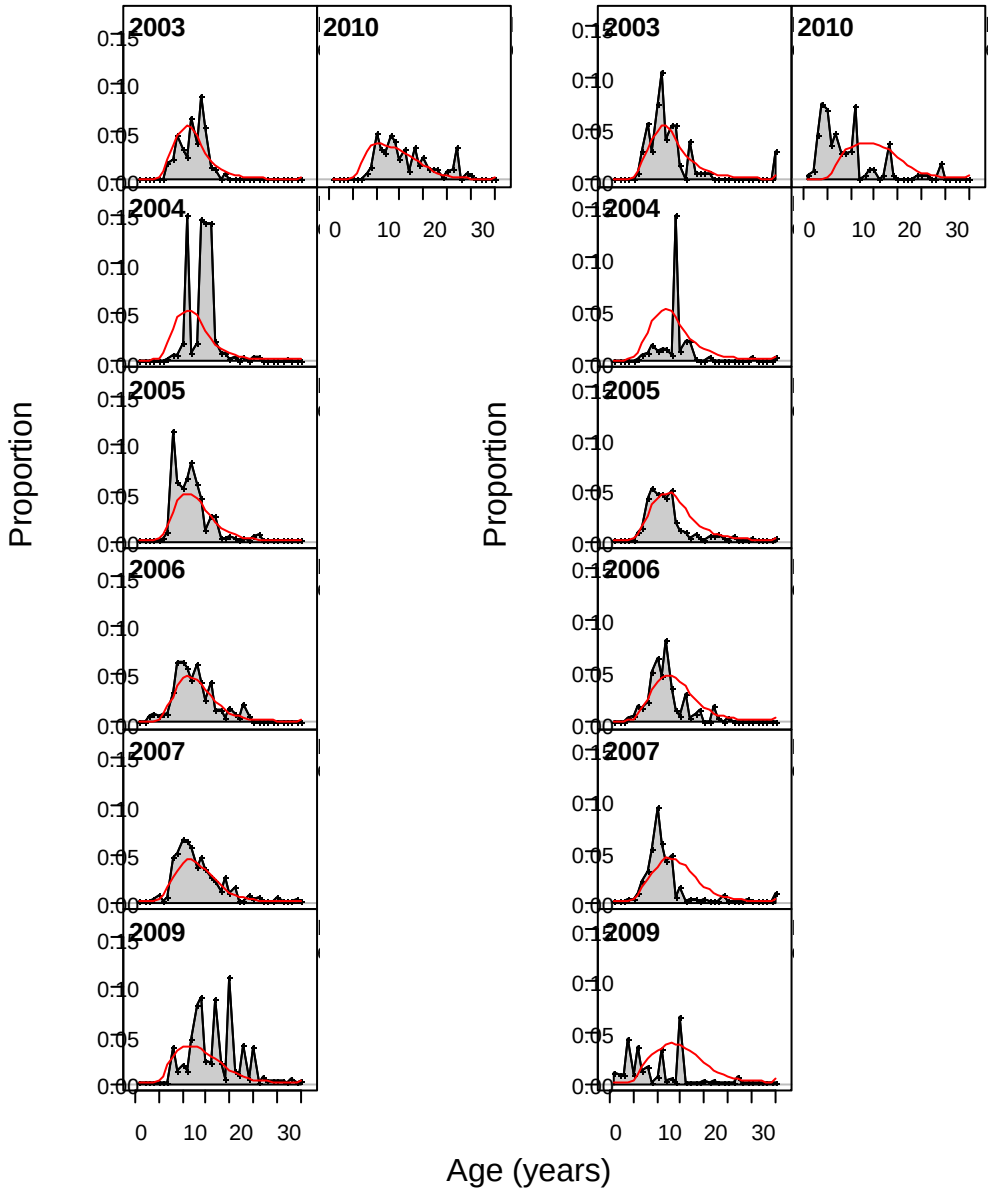



**Figure A24. Fit to the at-sea whiting bycatch fishery female (left panels) and male (right panels) age-frequencies.**

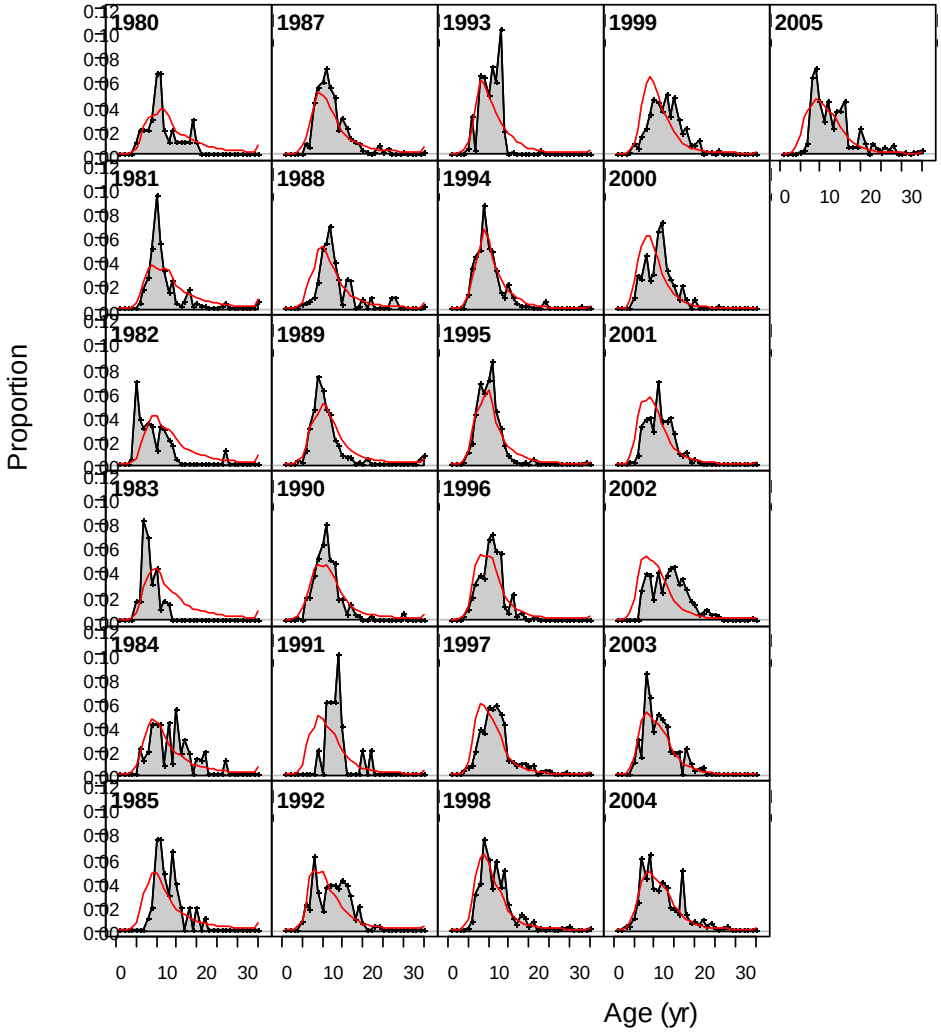



**Figure A25. Fit to the Washington trawl fishery female age-frequencies based on CAP ageing-error.**

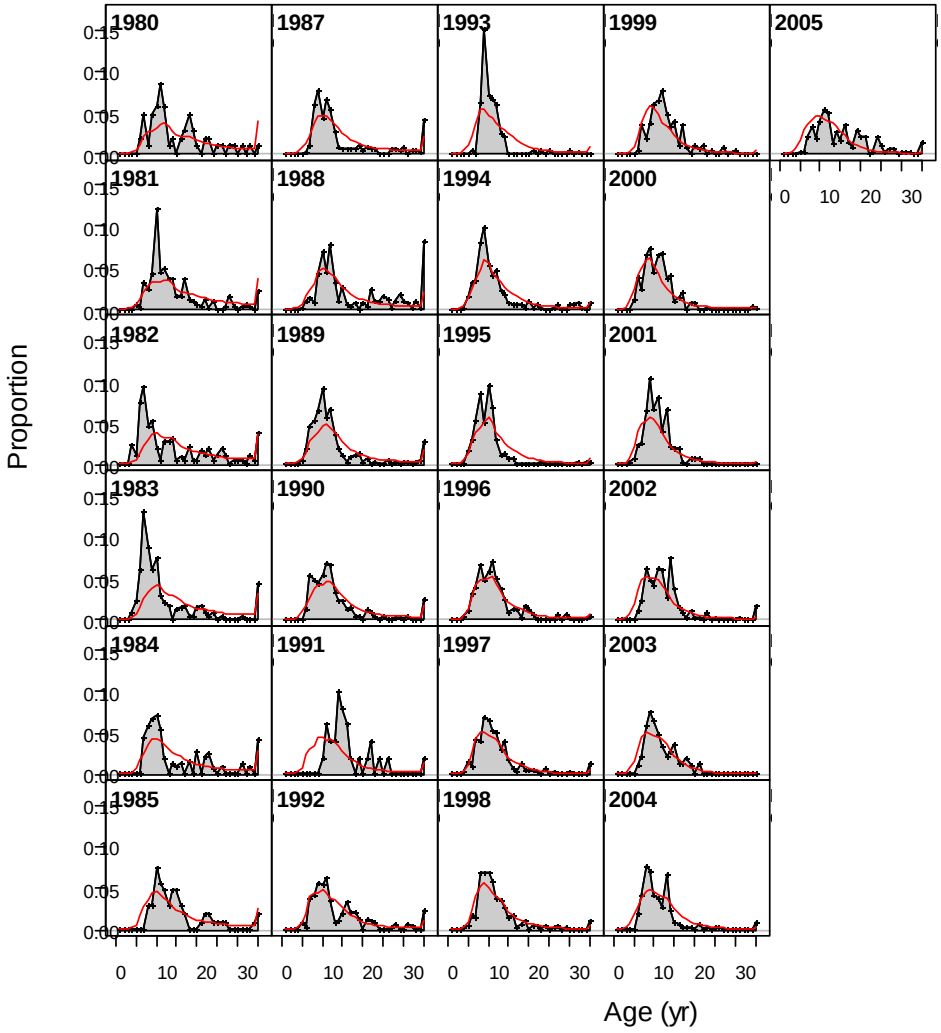



**Figure A26. Fit to the Washington trawl fishery male age-frequencies based on CAP ageing-error.**

# 13. Appendix B: SS Data file

# Data file for 2011 Canary rockfish updated stock assessment

### Global model specifications ###
**1916 # Start year**
**2010 # End year**
**1 # Number of seasons/year**
**12 # Number of months/season (vector, by season)**
**1 # Spawning occurs at beginning of season**
**12 # Number of fishing fleets**
**6 # Number of survey fleets**
**1 # Number of areas**
**# Fleet names (separated by "%")**
**1CA_S_trwl%2CA_N_trwl%3OR_trwl%4WA_trwl%5CA_S_nontrwl%6CA_N_nontrwl%7WAOR_nontrwl%8CA_S_rec%9CA_N_rec%10WAOR_rec%11_atseahake%12_NWFSC%13_Early_tri%14_pre_recruit%15_WAtrl_mirror%16_NWFSC_mirror%17_Late_tri%18_Tri_mirror**
**# Fleet timing (proportion of season)**
**0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5**
**1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 # Area of each fleet**
**1 1 1 1 1 1 1 1 1 1 1 1 # Units for catch by fishing fleet: 1=Biomass(mt),2=Numbers(1000s)**
**0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 # SE of log(catch) by fleet for equilibrium and continuous options**
1 # Number of genders (1=combined,2=females and males)
**40 # Accumulator age (plus group for population dynamics)**

### Catch section ###

# Initial equilibrium catch (landings + discard) by fishing fleet

0 0 0 0 0 0 0 0 0 0 0 0

95 # Number of lines catch data

# Catch series - Updated for 2011

# Catch(by fleet) YearSeason

#CA_S CA_N OR WA CA_S CA_N_ WAOR_ CA_S CA_N WAOR _atsea _NWFSC Year Season
15_WAtrl_mirror 16_NWFSC_mirror 18_Tri_mirror

#_trwl _trwl _trwl _trwl _nontrwl nontrwl nontrwl _rec _rec _rec hake

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 10.63 | 0 | 0 | 0 | 26.31 | 2.79 | 0 | 0 | 0 | 0 | 0 |
| | 1916 | 1 | | | | | | | | | |
| 0 | 16.13 | 0 | 0 | 0 | 42.72 | 2.93 | 0 | 0 | 0 | 0 | 0 |
| | 1917 | 1 | | | | | | | | | |
| 0 | 16.4 | 0 | 0 | 0 | 44.9 | 3.07 | 0 | 0 | 0 | 0 | 0 |
| | 1918 | 1 | | | | | | | | | |
| 0 | 13.28 | 0 | 0 | 0 | 25.31 | 3.22 | 0 | 0 | 0 | 0 | 0 |
| | 1919 | 1 | | | | | | | | | |
| 0 | 13.2 | 0 | 0 | 0 | 27.56 | 3.36 | 0 | 0 | 0 | 0 | 0 |
| | 1920 | 1 | | | | | | | | | |
| 0 | 10.01 | 0 | 0 | 0 | 25.07 | 3.5 | 0 | 0 | 0 | 0 | 0 |
| | 1921 | 1 | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 8.95<br>1922 | 0<br>1 | 0 | 0 | 23.25 | 3.65 | 0 | 0 | 0 | 0 | 0 |
| 0 | 11.14<br>1923 | 0<br>1 | 0 | 0 | 27.49 | 3.79 | 0 | 0 | 0 | 0 | 0 |
| 0 | 5.89<br>1924 | 0<br>1 | 0 | 0 | 34.46 | 3.93 | 0 | 0 | 0 | 0 | 0 |
| 0 | 3.74<br>1925 | 0<br>1 | 0 | 0 | 43.04 | 4.08 | 0 | 0 | 0 | 0 | 0 |
| 0 | 12.58<br>1926 | 0<br>1 | 0 | 0 | 49.92 | 4.22 | 0 | 0 | 0 | 0 | 0 |
| 0 | 15.54<br>1927 | 0<br>1 | 0 | 0 | 40.52 | 4.33 | 0 | 0 | 0 | 0 | 0 |
| 0 | 19.16<br>1928 | 8.16<br>1 | 0 | 0 | 34.99 | 7.23 | 0 | 0 | 0 | 0 | 0 |
| 0 | 34.55<br>1929 | 14.19<br>1 | 0 | 0 | 23.92 | 12.37 | 0 | 1.29 | 0 | 0 | 0 |
| 0 | 29.84<br>1930 | 13.14<br>1 | 0 | 0 | 34.09 | 11.28 | 0 | 2.09 | 0 | 0 | 0 |
| 0 | 41.45<br>1931 | 10.06<br>1 | 0 | 0 | 33.12 | 9.06 | 0 | 3.14 | 0 | 0 | 0 |
| 0 | 28.35<br>1932 | 3.69<br>1 | 0.8 | 0 | 27.4 | 2.88 | 0 | 4.19 | 0 | 0 | 0 |
| 0 | 38.45<br>1933 | 5.39<br>1 | 0.49 | 0 | 10.97 | 4.75 | 0 | 5.23 | 0 | 0 | 0 |
| 0 | 33<br>1934 | 5.86<br>1 | 0.02 | 0 | 15.27 | 5.12 | 0 | 6.28 | 0 | 0 | 0 |
| 0 | 33.72<br>1935 | 5.4<br>1 | 0.39 | 0 | 23.17 | 4.6 | 0 | 7.33 | 0 | 0 | 0 |
| 0 | 20.21<br>1936 | 13.41<br>1 | 1.42 | 0 | 20.92 | 11 | 0 | 8.38 | 0 | 0 | 0 |
| 0 | 30.8<br>1937 | 17.03<br>1 | 2.78 | 0 | 13.28 | 13.1 | 0 | 9.99 | 0 | 0 | 0 |
| 0 | 31.36<br>1938 | 15.47<br>1 | 0 | 0 | 13.62 | 12.93 | 0 | 9.8 | 0 | 0 | 0 |
| 0 | 41.59<br>1939 | 11.49<br>1 | 3.95 | 0 | 12.96 | 7.36 | 0 | 8.58 | 0 | 0 | 0 |
| 0 | 33.96<br>1940 | 68.56<br>1 | 90.98 | 0 | 9.52 | 16.31 | 0 | 12.18 | 0 | 0 | 0 |
| 0 | 26.94<br>1941 | 144.08<br>1 | 140.06 | 0 | 12.32 | 21.82 | 0 | 11.14 | 0 | 0 | 0 |
| 0 | 6.48<br>1942 | 210.19<br>1 | 263.08 | 0 | 9.23 | 30.31 | 0 | 12.09 | 0 | 0 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 32.1 1943 | 766.49 1 | 919.69 | 0 | 7.62 | 75.02 | 0 | 13.04 | 0 | 0 | 0 |
| 0 | 133.92 1944 | 1258.48 1 | 1613.87 | 0 | 28.63 | 19.29 | 0 | 13.99 | 0 | 0 | 0 |
| 0 | 304.19 1945 | 1937.94 1 | 2490.17 | 0 | 69.7 | 12.3 | 0 | 14.94 | 0 | 0 | 0 |
| 0 | 275.87 1946 | 1215.83 1 | 1533.24 | 0 | 71.77 | 15.11 | 0 | 15.89 | 0 | 0 | 0 |
| 0 | 110.71 1947 | 755.22 1 | 955.81 | 0 | 16.42 | 7.64 | 0 | 8.97 | 0 | 0 | 0 |
| 0 | 114.62 1948 | 519.74 1 | 681.06 | 0 | 32.11 | 12.57 | 0 | 18.11 | 0 | 0 | 0 |
| 0 | 96.72 1949 | 528.54 1 | 589.71 | 0 | 12.42 | 8.38 | 0 | 23.42 | 0 | 0 | 0 |
| 0 | 92.93 1950 | 633.7 1 | 617.6 | 0 | 10.06 | 7.79 | 0 | 28.53 | 0 | 0 | 0 |
| 0 | 199.38 1951 | 409.14 1 | 568.18 | 0 | 16.32 | 5.99 | 0 | 31.99 | 0 | 0 | 0 |
| 0 | 134.15 1952 | 418.88 1 | 588.55 | 0 | 12.33 | 5.71 | 0 | 28.55 | 0 | 0 | 0 |
| 0 | 134.01 1953 | 334.79 1 | 616.88 | 0 | 7.17 | 2.98 | 0 | 25.07 | 0 | 0 | 0 |
| 0 | 90.29 1954 | 421.04 1 | 783.29 | 0 | 17.49 | 3.48 | 0 | 33.86 | 0 | 0 | 0 |
| 0 | 100.28 1955 | 442.74 1 | 788.93 | 0 | 4.12 | 4.31 | 0 | 43.75 | 0 | 0 | 0 |
| 0 | 99.01 1956 | 271.93 1 | 1168.75 | 0 | 6.36 | 2.75 | 0 | 49.41 | 0 | 0 | 0 |
| 0 | 114.58 1957 | 779.74 1 | 1217.38 | 0 | 6.88 | 5.96 | 0 | 42.61 | 0 | 0 | 0 |
| 0 | 147.85 1958 | 599.62 1 | 831.98 | 0 | 9.02 | 1.19 | 0 | 65.93 | 0 | 0 | 0 |
| 0 | 108.66 1959 | 658.62 1 | 910.93 | 0 | 6.46 | 2.45 | 0 | 52.38 | 0 | 0 | 0 |
| 0 | 83.92 1960 | 834.55 1 | 1085.39 | 0 | 8.97 | 1.63 | 0 | 41.37 | 0 | 0 | 0 |
| 0 | 66.84 1961 | 760.81 1 | 985.01 | 0 | 6.36 | 4.52 | 0 | 30.22 | 0 | 0 | 0 |
| 0 | 66.25 1962 | 795.34 1 | 1151.08 | 0 | 9.39 | 4.13 | 0 | 36.8 | 0 | 0 | 0 |
| 0 | 90.9 1963 | 544.63 1 | 662.01 | 0 | 8.25 | 3.7 | 0 | 39.79 | 0 | 0 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 59.74 | 489.43 | 1009.03 | 0 | 7.09 | 8.25 | 0 | 38.2 | 0 | 0 | 0 |
| | 1964 | 1 | | | | | | | | | |
| 0 | 80.37 | 483.87 | 823.58 | 0 | 8.73 | 16.79 | 0 | 57.6 | 0 | 0 | 0 |
| | 1965 | 1 | | | | | | | | | |
| 0 | 59.46 | 2127.32 | 923.56 | 0 | 6.57 | 17.36 | 0 | 65.34 | 0 | 0 | 0 |
| | 1966 | 1 | | | | | | | | | |
| 0 | 81.41 | 854.51 | 133.16 | 0 | 7.53 | 31.09 | 0 | 70.75 | 0 | 0 | 0 |
| | 1967 | 1 | | | | | | | | | |
| 0 | 77.62 | 788.7 | 854.16 | 0 | 4.8 | 31.89 | 0 | 76.65 | 0 | 0 | 0 |
| | 1968 | 1 | | | | | | | | | |
| 2.28 | 201.51 | 671.26 | 261.7 | 3.2 | 15.82 | 45.52 | 0 | 82.16 | 0 | 0 | 0 |
| | 1969 | 1 | | | | | | | | | |
| 3.02 | 215.09 | 679.36 | 570.03 | 3.6 | 8.4 | 33.61 | 0 | 104.22 | 0 | 0 | 0 |
| | 1970 | 1 | | | | | | | | | |
| 1.67 | 328.87 | 702.64 | 759.29 | 4.65 | 16.54 | 38.23 | 0 | 93.06 | 0 | 0 | 0 |
| | 1971 | 1 | | | | | | | | | |
| 3.32 | 420.27 | 927.41 | 716.27 | 5.83 | 35.12 | 62.93 | 0 | 121.34 | 0 | 0 | 0 |
| | 1972 | 1 | | | | | | | | | |
| 5.04 | 697.64 | 1306.06 | 889.66 | 7.87 | 11.73 | 66.9 | 0 | 141.51 | 0 | 0 | 0 |
| | 1973 | 1 | | | | | | | | | |
| 3.92 | 551.04 | 602.41 | 546.11 | 9.89 | 40.22 | 73.59 | 0 | 153.15 | 0 | 0 | 0 |
| | 1974 | 1 | | | | | | | | | |
| 5.06 | 539.51 | 525.46 | 388.43 | 10.93 | 25.11 | 45.08 | 0 | 150.16 | 4.01 | 0 | 0 |
| | 1975 | 1 | | | | | | | | | |
| 5.63 | 524 | 283.49 | 238.77 | 10.83 | 39.32 | 52.49 | 0 | 156.59 | 2.11 | 0 | 0 |
| | 1976 | 1 | | | | | | | | | |
| 5.13 | 456.35 | 489.01 | 595.35 | 9.99 | 49.67 | 57.1 | 0 | 149.55 | 4.47 | 0 | 11.66 |
| | 1977 | 1 | | | | | | | | | |
| 0 | 655.43 | 990.18 | 1790.1 | 15.02 | 131.35 | 136.81 | 0 | 144.37 | 10.3 | 0 | 0 |
| | 1978 | 1 | | | | | | | | | |
| 4.36 | 311.05 | 1750.53 | 1300.09 | 22.92 | 106.04 | 239.32 | 0 | 165.42 | 4.86 | 0 | 0 |
| | 1979 | 1 | | | | | | | | | |
| 10.38 | 433.41 | 2309.41 | 2879.89 | 17.21 | 78.8 | 183.14 | 74.36 | 86.37 | 34.98 | 0 | 5.31 |
| | 1980 | 1 | | | | | | | | | |
| 34.18 | 494.01 | 2082.84 | 1883.83 | 40.14 | 164.77 | 160.46 | 35.05 | 118.04 | 48.89 | 0 | 0 |
| | 1981 | 1 | | | | | | | | | |
| 0.9 | 797.71 | 3941.26 | 3635.34 | 37.82 | 10.68 | 262.09 | 34.33 | 241.28 | 44.47 | 0 | 0 |
| | 1982 | 1 | | | | | | | | | |
| 7.39 | 499.24 | 3580.68 | 3412.49 | 47.41 | 10.04 | 320.1 | 11.63 | 93.99 | 6.82 | 0 | 10.49 |
| | 1983 | 1 | | | | | | | | | |
| 1.8 | 414.82 | 1188.43 | 1289.2 | 32.35 | 20.88 | 210.46 | 31.77 | 75.66 | 26.65 | 0 | 0 |
| | 1984 | 1 | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.98 | 316.25<br>1985 | 1029.5<br>1 | 1071.19 | 29.74 | 82.1 | 213.19 | 43.47 | 120.33 | 63.37 | 0 | 0 |
| 0.81 | 166.16<br>1986 | 902.13<br>1 | 1006.99 | 12.37 | 43.98 | 206.26 | 61.4 | 165.45 | 24.21 | 0 | 11.78 |
| 0 | 209.24<br>1987 | 1491.39<br>1 | 1016.63 | 20.1 | 23.78 | 160 | 57.02 | 168.13 | 34.34 | 0 | 0 |
| 0.28 | 223.62<br>1988 | 1576.42<br>1 | 979.31 | 21.64 | 31.73 | 0 | 46.59 | 137.65 | 56.59 | 0 | 0 |
| 5.13 | 178.43<br>1989 | 1573.63<br>1 | 1208.85 | 87.48 | 129.52 | 0 | 29.71 | 85.89 | 31.56 | 0 | 5.1 |
| 0.95 | 326.72<br>1990 | 1029.44<br>1 | 1099.48 | 39.83 | 180.05 | 17.35 | 10.02 | 61.34 | 38.43 | 0 | 0 |
| 0.45 | 148.99<br>1991 | 1776.39<br>1 | 971.64 | 69.21 | 92.36 | 27.91 | 10.02 | 61.34 | 43.75 | 5.06 | 0 |
| 2.21 | 223.75<br>1992 | 1423.29<br>1 | 825.03 | 19.24 | 107.82 | 152.43 | 10.02 | 61.34 | 38.43 | 1.81 | 1.17 |
| 4.91 | 85.25<br>1993 | 1513.8<br>1 | 289.81 | 14.07 | 94.22 | 116.69 | 0 | 64.82 | 51.07 | 0.72 | 0 |
| 0.33 | 126.13<br>1994 | 644.15<br>1 | 149.54 | 13.03 | 82.8 | 104.87 | 0 | 53.46 | 38.78 | 4.83 | 0 |
| 29.44 | 109.56<br>1995 | 548.61<br>1 | 161.15 | 35.22 | 79.31 | 118.68 | 1.23 | 68.33 | 43.53 | 0.31 | 1.07 |
| 11.39 | 206.97<br>1996 | 758.21<br>1 | 189.85 | 31.4 | 104.98 | 166.36 | 2.49 | 60.59 | 25.24 | 1.35 | 0 |
| 4.14 | 170.64<br>1997 | 589.85<br>1 | 203.44 | 8.43 | 96.29 | 254.41 | 1.75 | 100.85 | 46.68 | 3.63 | 0 |
| 4.05 | 154.93<br>1998 | 716.05<br>1 | 203.02 | 8.73 | 71.53 | 250.13 | 1.14 | 25.46 | 53.49 | 5.47 | 0.97 |
| 1.88 | 102.77<br>1999 | 387.85<br>1 | 139.97 | 2.93 | 33.84 | 123.96 | 2.81 | 62.05 | 35.02 | 5.63 | 0 |
| 0.17 | 12.45<br>2000 | 38.36<br>1 | 32.7 | 0.87 | 7.18 | 10.25 | 0.41 | 76.64 | 18.46 | 2.35 | 0 |
| 0.11 | 10.76<br>2001 | 32.57<br>1 | 19.65 | 0.48 | 6.08 | 11.02 | 0 | 33.37 | 13.34 | 4.05 | 1.61 |
| 3.65 | 16.25<br>2002 | 27.71<br>1 | 44.41 | 0.01 | 0.23 | 5.57 | 0.21 | 6 | 11.13 | 5.24 | 0.13 |
| 3.57 | 5.38<br>2003 | 14.62<br>1 | 77.40 | 0.00 | 0.01 | 1.17 | 0.06 | 18.05 | 12.1 | 0.93 | 1.08 |
| 3.60 | 5.83<br>2004 | 15.59<br>1 | 48.95 | 0.05 | 0.02 | 5.54 | 1.48 | 9.11 | 5.76 | 5.22 | 2.24 |
| 3.57 | 5.90<br>2005 | 15.80<br>1 | 10.87 | 0.03 | 0.04 | 1.40 | 1.49 | 2 | 6.82 | 1.44 | 4.54 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.86 | 5.80 | 14.22 | 9.12 | 0.11 | 0.00 | 0.81 | 5.73 | 12.3 | 3.98 | 1.09 | 7.78 |
| | 2006 | 1 | | | | | | | | | |
| 10.70 | 5.51 | 12.96 | 8.76 | 0.00 | 0.00 | 0.33 | 3.47 | 7.44 | 3.78 | 2.00 | 2.5 |
| | 2007 | 1 | | | | | | | | | |
| 3.80 | 5.32 | 12.88 | 8.40 | 0.01 | 0.00 | 4.26 | 2.20 | 4.80 | 3.28 | 5.96 | 2.9 |
| | 2008 | 1 | | | | | | | | | |
| 3.79 | 5.75 | 15.00 | 9.86 | 0.00 | 0.01 | 3.45 | 3.55 | 7.65 | 3.50 | 5.05 | 0.5 |
| | 2009 | 1 | | | | | | | | | |
| 2.43 | 3.55 | 8.94 | 5.85 | 0.02 | 0.02 | 10.17 | 7.23 | 15.67 | 20.90 | 5.22 | 1.82 |
| | 2010 | 1 | | | | | | | | | |

### Abundance indices ###

26 # Total number of observations (all fleets) (#_N_cpue)

#_Units:  0=numbers; 1=biomass; 2=F

#_Errtype:  -1=normal; 0=lognormal; >0=T

| #_Fleet | Units | Errtype | | |
|---|---|---|---|---|
| 1 | 1 | 0 | # | 1CA_S_trwl |
| 2 | 1 | 0 | # | 2CA_N_trwl |
| 3 | 1 | 0 | # | 3OR_trwl |
| 4 | 1 | 0 | # | 4WA_trwl |
| 5 | 1 | 0 | # | 5CA_S_nontrwl |
| 6 | 1 | 0 | # | 6CA_N_nontrwl |
| 7 | 1 | 0 | # | 7WAOR_nontrwl |
| 8 | 1 | 0 | # | 8CA_S_rec |
| 9 | 1 | 0 | # | 9CA_N_rec |
| 10 | 1 | 0 | # | 10WAOR_rec |
| 11 | 1 | 0 | # | 11_atseahake |
| 12 | 1 | 0 | # | 12_NWFSC |
| 13 | 1 | 0 | # | 13_Early_tri |
| 14 | 0 | 0 | # | 14_pre_recruit |
| 15 | 1 | 0 | # | 15_WAtrl_mirror |
| 16 | 1 | 0 | # | 16_NWFSC_mirror |
| 17 | 1 | 0 | # | 17_Late_tri |

```
18          1          0          #          18_Tri_mirror


# Year      Seas       Type       Value      s(log space)
# 2009 NWFSC survey - GLMM based with gamma error (n=8) - Updated 20 Apr 2011
#                  _NWFSC
2003        1          12          5642.23 0.206
2004        1          12          10512.53 0.245
2005        1          12          11246.51 0.214
2006        1          12          32382.00 0.328
2007        1          12          10271.06 0.235
2008        1          12          19534.86 0.352
2009        1          12          4389.24 0.336
2010        1          12          7227.09 0.237
#  Early Triennial survey - GLMM based (n=5) - Updated 21 Apr 2011
#                  _Early_tri
1980        1          13          3409.84    0.158
1983        1          13    10713.95         0.134
1986        1          13          7272.73    0.102
1989        1          13          4638.18    0.133
1992        1          13          861.22     0.168
# Late Triennial survey - GLMM based (n=4) - Updated 21 Apr 2011
#                  _Late_tri
1995        1          17          1947.78    0.285
1998        1          17          1074.56    0.254
2001        1          17          1635.44    0.170
2004        1          17          1774.41    0.196
# Pre-recruit index Revised for 2009 (n=9)
# Mean input SE = 0.047 (was 6.64x greater in 2007) + 0.375 adjustment - Updated 21 Apr 2011
#                  _pre_recruit
2001        1          14          2.38  0.054
2002        1          14          5.71  0.053
```

2003 1 14 1.92 0.044

2004 1 14 4.96 0.046

2005 1 14 2.49 0.038

2006 1 14 1.51 0.035

2007 1 14 1.71 0.038

2008 1 14 2.06 0.039

2009 1 14 1.82 0.038

### Discard section ###

# Discard observation setup

0 #_N_fleets_with_discard

0 # Total number of discard observations all fleets and years

# Mean body weight observations

0 # Total number of mean body weight observations

30 #_DF_meanwt

## Population size structure

3 # Length bin method: 1=Use data bins,2=generate from min/max/width read below, 3=Read count and vector below

30 # Count of population bins

# Lower edge of bins

8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66

-1 # Minimum proportion for compressing tails of observed compositional data

0.001 # Constant added to expected frequencies

0 # Combine males and females at and below this bin number

28 # Number of length bins

# Lower edge of length bins by bin

12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66

### length composition data ###

312 # Total number of length observations all fleets and years

# Gender: 0=sexes combined into length bins, 1=females only (0s male bins), 2=males only (0s for female bins), 3=both males and females, total should sum to 1.0

# Year Seas Type Gender Partition Nsamp Data: females then males

# 2011 Southern California trawl fleet (n=30)

1978 1 1 0 0 9.21 0 0 0 0 0 0
0 0 0 0 0 36.75325 0 67.19697 103.95022 0 21.73913
208.18626 61.38711 451.37755 0 21.73913 21.73913 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1979 1 1 0 0 2.28 0 0 0 0 0 0
0 0 0 0 0 0 51.6129 0 0 0 354.32692
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1980 1 1 0 0 14.45 0 0 0 0 0 0
0 0 0 0 121.76471 669.15126 506.66666 716.5967 768.92033 430.43613 510.92888
285.94 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1981 1 1 0 0 9.38 0 0 0 0 0 0
0 0 0 0 0 0 0 271.7884615 879.5896885
493.7285367 0 374.5306122 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0

1982 1 1 0 0 4.69 0 0 0 0 0 0
0 0 0 0 0 0 54.6 257.6422018 0 500
228.8 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0

1983 1 1 0 0 8.66 0 0 0 0 0 0
0 0 0 0 0 37.0408163 0 115.4166667
212.0171166 309.7270766 192.0171166 238.8372093 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0

1984 1 1 0 0 18.83 0 0 0 0 0 0
0 29.877551 59.755102 119.510204 109.5510204 93.5941915 24.4749711
603.1632653 324.2826087 137.0093458 810.6796117 702.5882353 0
824.2826087 1658.048033 500 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1985 1 1 0 0 32.73 171.3207547 0 0 0 0
0 0 0 0 119.9185635 90.0094961 527.6007593
787.6976493 795.7559878 515.3457244 664.0846327 102.4770777
111.295098 0 154.3269231 77.1634615 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0

1986 1 1 0 0 3.55 0 0 0 0 0 0
0 0 0 0 12.9591837 0 105.3 0 12.9591837
183.3 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0

1988 1 1 0 0 3.41 0 0 0 0 0 0
0 81.81 0 0 0 0 71.9958879 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0

1989 1 1 0 0 5.07 0 0 0 0 0 0
0 0 0 0 21.4615384 0 53.6538462 36.9038462
532.1923077 0 0 0 10.7307692 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0

1990 1 1 0 0 8.90 0 0 0 0 0 0
0 0 222.7990654 7.5 3.75 11.86 171.36125 9.55 0 3.75
8.11 17.9313725 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0

1991 1 1 0 0 8.76 0 0 0 0 0 0
0 0 0 0.7088608 83.0546762 63.4044164 414.9436735
85.4511112 45.5111111 0.7088608 0 62.6955556 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0

1992 1 1 0 0 14.93 0 0 0 0 0 0
0 0 0 0 49.7728571 99.9788093 93.5015247
85.1026188 102.1530612 48.4931973 70.1564626 4.4859813 5.1666667 0
5.1666667 10.8703704 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0

1993 1 1 0 0 49.98 0 0 0 0 0 0
0 15.6185158 59.5259383 253.1475428 229.9486807 368.4702333
371.8077533 1050.393493 253.6125338 370.1500121 64.4630154
84.8043099 17.8424547 81.4494418 49.3918036 15.6442308 3.2178218
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0

1994 1 1 0 0 14.83 0 0 0 0 0 0
0 0 0 0 0 40.286247 9.9955207 148.3938414 117.2055354
94.3406186 91.555442 50.2483862 36.6737708 12.0103093 45.8963124
12.0103093 16.9430016 0 0 0 12.0103093 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0

1995 1 1 0 0 13.28 0 0 0 0 0 0
0 0 0 30.48 196.9303226 63.7545833 53.5945833 12.16
27.1145833 183.3514493 116.0076993 71.7785326 78.2133152
49.6639493 22.1145833 22.1145833 10.16 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0

1996 1 1 0 0 42.91 0 0 0 0 0 0
0 2.5714286 58.7589286 53.643617 137.0168259 131.3431123 178.4191272
278.562743 600.0516522 269.2882356 253.1958774 59.0065554
85.5728155 99.9766617 85.5728155 42.7864078 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0

1997 1 1 0 0 48.98 0 0 0 0 0 0
0 0 3.0851064 7.0851064 23.228554 85.3796648 125.6838593 183.3232179
436.7562792 574.8167819 439.4557894 483.3556633 208.3741298
210.5980128 29.19 58.38 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0

1998 1 1 0 0 23.73 0 0 0 0 0 0
0 0 0 60.7042553 240.0974468 236.3539362 242.1889361
135.5595745 61.1304492 11.2348936 37.0948936 0 4.6 8.4148936
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0

1999 1 1 0 0 11.90 0 0 0 0 0 0
0 0 0 0 0 30.9288889 31.3177778 95.8288889
36.8577778 61.6288889 28.8777778 11.08 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

2000 1 1 0 0 8.73 0 0 0 0 0 0
0 0 0 0 0 7.5 11.9444444 15 12.5 7.5
20.0979097 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0

2001 1 1 0 0 20.45 0 0 0 0 0 0
0 0 0 7.6905747 7.0411494 32.1920487 20.3857471 12.6034483
6.9730237 6.2495109 3.9730237 1 4.9730237 0 1 3.622449 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0

2002 1 1 0 0 4.38 0 0 0 0 0 0
0 0 0 0 131.6391403 198.6389128 1154.493783
644.0763238 0 0 0 0 0 0 0 0
356.1529412 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 0 0 0 0 0
0 0

2003 1 1 0 0 9.35 0 0 0 0 0 0
0 0 0 0 0 0 0 163449.7335 129029.852
576.0656194 0 0 0 0 1152.131239 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0

2004 1 1 0 0 5.97 0 0 0 0 0 0
0 0 0 0 0 0 0 0 91315.93754
208407.8193 30791.86924 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0

2005 1 1 0 0 9.21 0 0 0 0 306.4778756
0 306.4778756 0 0 0 0 0 0 0 0
0 22853.13644 22674.41594 21793.61308 51241.32868 12830.73644
51088.53278 45961.49835 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0

2006 1 1 0 0 22.9 0 0 0 0 0
18.29336184 6.09778728 6.09778728 12.19557456 485.2414092
8066.132744 5272.142128 6.09778728 148.7860096 12.19557456
6.09778728 42.68451096 24.39114912 6.09778728 0 6.09778728
6.09778728 22264.73561 20756.52312 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0

2007 1 1 0 0 24.49 0 0 1.57531612 0 0
0 0 0 0 17.64354054 164.1479397 264.6531082
1386.597122 3351.782971 5260.45152 4751.186848 5474.573459
5958.693936 5963.374047 7782.686444 3914.912983 1229.714979
5.827868683 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0

2008 1 1 0 0 9.76 0 0 0 0 0 0
0 0 0 59.67462814 0 35.41008428 355.6703756
1044.098815 1584.385535 913.708632 1313.879906 554.4605099 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0

2009 1 1 0 0 10.14 0 0 0 0 0 0
0 0 180.5461324 0 442.3030523 51.87446275 1237.235553
3790.086489 0 0 0 2424.200439 5034.53736 2960.104484
2516.703201 1506.897421 643.2492735 135.8764528 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0

2010 1 1 0 0 4.104 0 0 0 0 0 0
0 0 0 0 0 0 0 0 2200.004668
2727.001576 664.3805362 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0

# 2007 Northern California trawl fleet (n=28)

1978 1 2 3 0 113.09 0 0 0 0 0 0
0 0 0 0 0 0 118.620576 640.855595 0
37.87037 172.292127 816.027507 1487.747031 2096.798161 3191.75492
1603.777512 2335.164309 932.833843 756.792783 82.006941 53.48563 0
0 0 0 0 0 0 0 0 0 0 6.7
0 0 280.532271 159.785714 142.948124 493.097262
2354.266288 1684.743894 7371.176821 2611.463314 1502.707674
528.929746 1582.674231 469.962406 0 0 0

1979 1 2 3 0 53.18 0 0 0 0 0 0
0 0 0 0 0 0 0 31.37931 31.37931 114.583333
31.37931 281.930233 1.865385 380.830711 454.21914 181.704828 912.439928
441.447048 10.223279 96.257377 4.178947 23.751938 0 0 0 0 0
0 0 0 0 0 0 0 0 239.010207
268.647158 652.729227 501.387821 729.824654 1183.067607
1351.687493 1302.679503 1476.261677 54.505555 89.7 0 0 0
280.733333

1980 1 2 3 0 116.02 0 0 0 0 0 0
0 0 0 0 0 67.963434 131.315789 587.133664 88.713516
288.939401 368.491804 685.828172 1171.152206 809.393528
667.799892 800.639099 495.422916 304.898459 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 138.240703 375.199351 203.075686 879.121821 620.87789
2227.287931 2024.224985 2501.730777 1888.276231 593.223662 0
233.910714 0 0 0 0 0

1981 1 2 3 0 74.29 0 0 0 0 0 0
0 0 0 124.75 0 124.75 53.4448244 8.1489362 255.4818868
1234.751363 518.8917677 1280.517625 1410.581854 919.6851325
770.2782992 1116.949268 1567.728721 350.1341303 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 93.0024225 759.482274 794.3314014 1180.161028
1033.105838 2523.177679 1033.681141 912.8045213 128.3242762 0
0 0 0 0 0 0

1982 1 2 3 0 120.16 0 0 0 0 0 0
0 0 0 0 88.4693878 32.8371428 1007.440033
323.488755 176.7080594 2458.002137 1772.1635 1246.304479 3264.786854
1813.534221 683.7733475 1058.516111 263.7513975 10.8461538 4.2884615
0 0 0 0 0 0 0 0 0 0 0
0 0 303.2238449 818.0348666 1167.88308 1113.406082
1606.889284 2910.729196 3384.928817 2145.195514 2343.928141
4794.319474 1312.38659 4.2884615 0 0 0 0 0 0

1983 1 2 3 0 174.44 0 0 0 0 0 0
0 0 0 53.6363636 291.6075229 77.6906558 441.218364
538.544462 2402.817271 1221.64721 973.0557754 2650.612503
1256.343337 1705.737494 3263.409513 1726.524794 1231.428868
464.482247 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 145.1014394 182.2048485 1202.329627
2517.8163 1167.65492 3270.181734 2635.771907 3990.073468 6261.49987
2948.148886 2004.594796 361.1772969 54.0395349 206.961165 0
0 0 0

1984 1 2 3 0 116.06 0 0 0 0 0 0
0 0 6.6438356 0 47.634434 749.7551379 1402.351341 315.1686367
1483.620261 1688.484195 1307.060526 1880.950895 1684.637748
1396.472342 1584.174496 656.5174063 1398.353281 893.0375056 10.9
0 0 0 0 0 0 0 0 0 0 0
0 13.2876712 63.0530261 97.9116912 433.7604463 796.8425966
1270.532623 1522.899657 1935.217138 3576.827901 2702.52329
1339.322596 1371.599481 340.3931452 356.1529412 0 0 0
0 0

1985 1 2 3 0 122.96 0 0 0 0 0 0
0 0 0 0 131.6391403 205.236851 1174.287597
1379.988011 1489.251662 2077.991069 1318.103597 1006.907644

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 959.1333095 | 2290.333141 | 569.7772609 | 2268.699416 | 3271.737375 | | | | | | |
| | 1128.889796 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| | 0 | 0 | 0 | 0 | 24.7327273 | 451.5098311 | 292.9054633 | | | | |
| | 658.188647 | 1564.19122 | 2381.488066 | 2210.192169 | 2546.026142 | | | | | | |
| | 2715.40301 | 2788.996369 | 3620.307485 | 1820.516493 | 583.6080116 | 2.7111111 | | | | | |
| | 0 | 0 | 0 | 0 | 0 | | | | | | |
| 1986 | 1 | 2 | 3 | 0 | 106.68 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 45.7142857 | 0 | 27.1262136 | 272.4644907 | | | | |
| | 799.8412897 | 1213.732792 | 699.954717 | 1006.509521 | 1038.55708 | | | | | | |
| | 1274.744999 | 749.7632428 | 637.2293199 | 381.5464686 | 162.8707338 | | | | | | |
| | 34.4039216 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| | 0 | 0 | 0 | 45.7142857 | 0 | 8.5882353 | 13.1346154 | 313.2680762 | | | |
| | 959.9147094 | 2200.004668 | 2727.001576 | 1335.099892 | 2259.124011 | | | | | | |
| | 1221.029807 | 487.6268166 | 139.2749821 | 29.2079208 | 0 | 0 | 0 | | | | |
| | 0 | 0 | 0 | | | | | | | | |
| 1987 | 1 | 2 | 3 | 0 | 103.23 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1078.018227 | 1268.571344 | 1506.259631 | | | |
| | 606.7591491 | 1277.376256 | 2535.875084 | 1104.191711 | 1834.800406 | | | | | | |
| | 1257.061249 | 175.6027272 | 429.1086868 | 192.239724 | 184.5454545 | | | | | | |
| | 148.9393939 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| | 0 | 0 | 88.2040816 | 0 | 363.5950495 | 1806.253371 | 1735.420442 | | | | |
| | 1914.220942 | 971.7152224 | 2642.324304 | 2682.562774 | 1416.198514 | | | | | | |
| | 1010.69907 | 771.3737156 | 49.2353952 | 0 | 0 | 0 | 0 | 0 | | | |
| | 0 | 0 | | | | | | | | | |
| 1988 | 1 | 2 | 3 | 0 | 86.12 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 218.4825371 | 205.7661583 | 497.7446001 | 516.6489736 | | | | |
| | 1310.129926 | 1303.178279 | 1009.176446 | 475.697781 | 538.3533831 | | | | | | |
| | 841.1609838 | 288.9236938 | 954.0637786 | 124.5436938 | 75.95 | 0 | 3.6 | | | | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| | 0 | 99.5876289 | 254.6893213 | 263.4307196 | 908.9894449 | 1770.909898 | | | | | |
| | 1654.45194 | 1787.748824 | 1665.893625 | 958.8669768 | 1287.201241 | | | | | | |
| | 777.6895077 | 120.0891089 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 1989 | 1 | 2 | 3 | 0 | 74.02 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 48.1568627 | 142.5841176 | 313.0685106 | 881.2309814 | | | | |
| | 538.9568289 | 1831.72314 | 946.6937907 | 342.2584096 | 251.5827463 | 417.69 | | | | | |
| | 617.8785149 | 610.7258886 | 380.9460606 | 262.9985149 | 97.6060606 | 0 | | | | | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| | 0 | 57.5 | 988.6802263 | 1089.307809 | 1150.039032 | 1489.473443 | | | | | |
| | 1961.042627 | 1203.075266 | 845.1249546 | 2063.035095 | 1054.603658 | | | | | | |
| | 483.9469997 | 82.4373738 | 0 | 21.8686869 | 0 | 0 | 0 | 0 | | | |
| | 0 | | | | | | | | | | |
| 1990 | 1 | 2 | 3 | 0 | 86.75 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 95.46 | 587.393573 | 614.022586 | 828.204582 | | | |
| | 1464.47111 | 2419.169212 | 960.1408962 | 699.9427342 | 1481.635347 | | | | | | |
| | 2505.191785 | 1910.185249 | 618.1985544 | 101.9702971 | 26.8834951 | | | | | | |
| | 330.340484 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| | 0 | 0 | 0 | 0 | 105.5843434 | 791.8729063 | 1402.144381 | | | | |
| | 2518.281471 | 1210.52657 | 3112.644551 | 3081.663932 | 3096.058823 | | | | | | |
| | 2732.753312 | 1367.064497 | 0 | 46.3366337 | 0 | 0 | 0 | 0 | | | |
| | 0 | 0 | | | | | | | | | |
| 1991 | 1 | 2 | 3 | 0 | 52.46 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 50.73 | 369.5609804 | 588.0744457 | 869.8504854 | | | |
| | 1089.170336 | 670.5044593 | 569.519125 | 387.5290365 | 417.6859088 | | | | | | |
| | 175.5224345 | 202.2009804 | 302.1280877 | 0 | 0 | 0 | 0 | 0 | | | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 21.79 | 50.73 | |
| | 424.9880392 | 186.5823077 | 937.7912774 | 1088.95382 | 933.3932039 | | | | | | |
| | 800.9637274 | 1592.862786 | 603.0278269 | 343.2073364 | 21.49 | 0 | | | | | |
| | 25.3431373 | 25.3431373 | 0 | 0 | 0 | 0 | 0 | | | | |
| 1992 | 1 | 2 | 3 | 0 | 45.67 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 17.37 | 264.79 | 369.25 | 928.76 | 656.9 | 591.15 | 1660.83 |
| | 544.2716832 | 1093.5 | 368.34 | 167.27 | 253.45 | 0 | 74.95 | 0 | 0 | 0 | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 95.32 | 430.5412621 | | 961.67 | 1155.453316 | | 1402.64 | 1482.16 | 1419.53 | 1462.87 | 788.88 | |
| | 367.96 | 961.35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 1993 | 1 | 2 | 3 | 0 | 18.80 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 217.36 | 0 | 189.0016667 | | 25.8 | |
| | 414.4983673 | | 12.9 | 292.9183674 | | 66.1 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 108.68 | 0 | 555.4454545 | | 0 | 240.7916667 | | 384.35 | 548.9983673 | | 194.14 | |
| | 802.8467346 | | 419.4638219 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | | | | | | | | | |
| 1994 | 1 | 2 | 3 | 0 | 22.01 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 128.24 | 64.12 | 408.7536634 | | 64.12 | 584.8036634 | | |
| | 726.0320326 | | 1823.865376 | | 314.246092 | | 21.5 | 363.0160163 | | 344.6336634 | | |
| | 16.25 | 21.08 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 368.6836634 | | 128.24 | 0 | | |
| | 929.4373267 | | 1842.435376 | | 528.9974024 | | 1055.40099 | | 435.0097554 | | | |
| | 71.0084449 | | 15.8613861 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | | | | | | | | | | | |
| 1995 | 1 | 2 | 3 | 0 | 40.39 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 7.5940594 | 69.4740594 | | 109.3568276 | | 221.0267124 | | | |
| | 242.2950414 | | 210.8799839 | | 132.8174257 | | 126.64059 | 139.0845464 | | 117.3491089 | | |
| | 35.0716832 | | 57.1665306 | | 8.8316832 | 8.8316832 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30.94 | | |
| | 121.3165804 | | 130.3287088 | | 404.4361722 | | 292.7457264 | | 297.6579996 | | | |
| | 282.1150414 | | 192.9302889 | | 150.2449464 | | 62.1057426 | | 39.63 | 34.18 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | |
| 1996 | 1 | 2 | 3 | 0 | 42.08 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 14.5098039 | | 8.9432943 | 40.7151125 | | 458.6494869 | | | |
| | 692.3374081 | | 156.2938614 | | 123.6075065 | | 222.3702174 | | 178.9734653 | | 314.7 | |
| | 294.7634653 | | 104.55 | 0 | 209.1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 188.4280303 | | | |
| | 64.9654545 | | 453.0789762 | | 967.8485779 | | 506.204717 | | 396.9058595 | | | |
| | 531.189829 | | 539.4227272 | | 94.36 | 106.1863636 | | 209.1 | 104.55 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | | | | | | | |
| 1997 | 1 | 2 | 3 | 0 | 23.01 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 137.7021277 | | 4.32 | 140.0621277 | | 23.4774257 | | | |
| | 141.2421277 | | 48.7380838 | | 45.1980838 | | 185.8617381 | | 63.4071227 | | | |
| | 231.7656285 | | 56.0955096 | | 1.18 | 123.6346154 | | 0 | 13.2574257 | | 0 | |
| | 0 | 123.6346154 | | 123.6346154 | | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | | 3.54 | 35.4806581 | | 177.7985058 | | | |
| | 100.0677807 | | 212.3765896 | | 91.9587821 | | 29.5806581 | | 387.2270785 | | | |
| | 13.2574257 | | 166.4726992 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 1998 | 1 | 2 | 3 | 0 | 19.25 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 3.32 | 13.7 | 58.5848936 | | 80.2027451 | | 13.7 | |
| | 10.17 | 186.4382353 | | 143.3854902 | | 259.7909804 | | 186.2282353 | | 63.1827451 | | |
| | 123.0454902 | | 0 | 3.32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10.17 | 44.42 | | |
| | 161.4438144 | | 30.51 | 161.8617528 | | 269.7509804 | | 10.17 | 63.1827451 | | 6.85 | |
| | 59.8627451 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 1999 | 1 | 2 | 3 | 0 | 44.19 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 55.4455446 | | 0 | 0 | 44.8796703 | | 113.6955446 | | | |
| | 228.2996703 | | 823.4934991 | | 717.881124 | | 923.302707 | | 368.7658416 | | | |
| | 580.8982842 | | 155.0258089 | | 86.1755446 | | 41.3296703 | | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 169.8866337 | | 441.7534991 | | 436.3076575 | | 799.9000348 | | |
| | 754.0714536 | | 708.8616505 | | 302.0421782 | | 105.5888782 | | 19.2430693 | | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2000 | 1 | 2 | 3 | 0 | 13.14 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6.490909 | 6.3363636 | 8.6472727 | 9.190909 | |
| | 4.3054545 | 9.1258505 | 0 | 0 | 0 | 3.2454545 | 0 | 0 | 0 | 0 | 0 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 3.2454545 | 6.4909091 | 14.2181818 | | 12.1872727 | | 6.3363636 | 1.7 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 2001 | 1 | 2 | 3 | 0 | 21.77 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0.8148148 | 4.471243 | 17.3156253 | | |
| | 19.8741457 | | 21.8619864 | | 26.492062 | 23.0518864 | | 13.1845185 | | 9.3810445 | 0.8148148 |
| | 0 | 0.8148148 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5.7446809 | 8.0647124 | 16.849699 | 23.48374 |
| | 30.3116208 | | 29.0723276 | | 4.2781818 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | |
| 2002 | 1 | 2 | 3 | 0 | 55.57 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 44.17027974 | | 120.4298313 | |
| | 150.7405713 | | 505.216765 | | 470.7995681 | | 283.4321811 | | 322.6398192 | | |
| | 44.17027974 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16.19148896 | |
| | 12.4549915 | | 124.569427 | | 491.5980601 | | 873.9867017 | | 699.2338857 | | |
| | 538.0616201 | | 48.23196083 | | 58.7858299 | | 17.157386 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | | | | | | | | |
| 2003 | 1 | 2 | 3 | 0 | 13.9 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 89.12647226 | | |
| | 50.92941272 | | 76.39411908 | | 76.39411908 | | 76.39411908 | | 38.19705954 | | |
| | 12.73235318 | | 0 | 12.73235318 | | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 38.19705954 | | 25.46470636 | | 38.19705954 | | 25.46470636 | | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 2004 | 1 | 2 | 3 | 0 | 29.006 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 47.44098742 | | 94.88197484 | 0 | | |
| | 47.44098742 | | 0 | 47.44098742 | | 0 | 0 | 47.44098742 | 0 | 0 | |
| | 0 | 94.88197484 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 47.44098742 | 0 | 0 | |
| | 0 | 0 | 0 | 47.44098742 | | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | | | | | | | |
| 2005 | 1 | 2 | 3 | 0 | 17.28 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 4.782822224 | | 4.782822224 | | 0 | 9.565644449 | | 14.34846667 | |
| | 14.34846667 | | 14.34846667 | | 0 | 22.84041632 | | 4.782822224 | | 36.82097396 | |
| | 13.98055716 | | 55.24647708 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 4.782822224 | | 4.782822224 | | 23.91411112 | | 14.34846667 | | 14.34846667 | | |
| | 9.443008104 | | 59.90666296 | | 22.84041632 | | 50.34101851 | | 22.84041632 | | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 2006 | 1 | 2 | 3 | 0 | 17.314 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 11.62746703 | 0 | 0 | 0 | |
| | 35.15598839 | | 34.8824011 | | 11.62746703 | | 46.50986813 | | 23.39172771 | | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23.25493407 | | |
| | 11.62746703 | | 58.54771611 | | 46.64666178 | | 23.25493407 | | 44.43060329 | | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 2008 | 1 | 2 | 3 | 0 | 15.45 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 11.76426068 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 11.76426068 | | 0 | 11.76426068 | | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 2009 | 1 | 2 | 3 | 0 | 20.35 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100.9249736 | | 0 |
| | 32.81609577 | | 0 | 0 | 32.81609577 | | 278.5901719 | | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 32.81609577 | | 46.43169531 | | 144.8799826 | | |
| | 98.4482873 | | 65.63219154 | | 68.10887781 | | 144.8799826 | | 44.58035645 | | |
| | 32.81609577 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |

2010 1 2 3 0 13.762 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
23.52852136 0 11.76426068 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 11.76426068 0 23.52852136 11.76426068
0 0 0 0 0 0 0 0 0 0 0

### add recent if CA sex-specific PACFIN data translation issue is resolved

# 2009 Oregon trawl fleet (n=35)

1973 1 3 3 0 7.06 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 2.767 0.000 11.067 5.534 1.383 0.000
1.383 0.000 1.383 0.000 1.383 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
2.767 2.767 4.150 4.150 1.383 1.383 5.534 1.383 9.684 8.301 2.767
1.383 0.000 0.000 0.000 0.000 0.000

1974 1 3 3 0 28.24 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 24.747 0.000 24.747 0.000 52.608 0.000 68.672 49.493 3.501
112.604 297.103 682.084 622.474 443.902 127.509 210.032 27.861 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 24.747
3.501 3.501 47.040 62.724 31.356 297.103 589.811 1267.139 787.810 545.257 117.393
52.608 24.747 0.000 0.000 0.000 0.000

1976 1 3 3 0 14.12 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 17.878 7.734 35.757 0.000
48.312 33.346 10.144 84.571 81.658 35.757 17.878 17.878 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 17.878 30.433 71.513 109.680 56.046 58.456 38.167 28.023 7.734
0.000 0.000 0.000 0.000 0.000 0.000

1977 1 3 3 0 56.48 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 10.035 0.000 7.015 8.817 25.867 22.360 75.969 108.127 101.339
186.671 130.426 216.905 302.398 353.411 205.652 87.728 34.806 12.703 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 10.035 10.035 10.523
27.196 22.360 41.604 101.474 171.606 340.748 721.575 818.309 660.887 182.312 98.129
6.175 9.195 0.000 0.000 0.000 0.000

1978 1 3 3 0 49.42 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 4.576 0.000 0.000 5.077 2.538 52.257 33.175 41.638
192.485 248.087 275.452 237.034 327.842 222.822 177.763 12.783 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 7.884 24.169 55.158 237.074 386.665 443.795 619.595 386.876 170.014
20.024 7.115 0.000 0.000 0.000 0.000

1979 1 3 3 0 42.36 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 139.595 139.595 285.251 430.908 570.503 309.497 887.753
1863.734 1502.698 1782.579 1668.419 1812.213 595.119 674.996 87.807 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 139.595
285.251 449.092 1007.472 1239.908 1738.589 1643.333 2917.632 3310.562 2570.775 792.297 466.007
16.571 87.807 0.000 0.000 0.000 0.000

1980 1 3 3 0 141.20 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 529.666 324.938 548.544 355.317
1116.778 2677.047 4085.327 4420.780 6007.093 7404.078 2318.382 245.628 98.561 67.431 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 106.540
0.000 12.166 186.011 1276.679 1658.574 2122.953 5007.381 10026.331 9962.347 4938.313 1549.075
234.513 205.102 0.000 0.000 0.000 0.000

1981 1 3 3 0 56.48 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 12.810 93.949 28.655 1550.905

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 867.224 | 1582.421 | 1454.409 | 1924.873 | 1815.211 | 1391.160 | 1041.089 | 647.915 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 130.002 | 319.001 | 1033.063 | 1884.398 | 1516.291 | 6138.146 | 3655.290 | 2679.977 | 871.421 |
| | 28.655 | 0.000 | 5.805 | 0.000 | 0.000 | 0.000 | | | | | |
| 1982 | 1 | 3 | 3 | 0 | 141.20 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 9.017 | 0.000 | 0.000 | 0.000 | 400.058 | 548.729 | 2418.367 |
| | 3251.310 | 2956.585 | 4184.768 | 5553.225 | 5847.335 | 5019.142 | 1981.069 | 190.392 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 108.261 | 161.793 | 1054.331 | 2172.285 | 6673.095 | 7521.086 | 16415.656 | 20898.089 | 8702.756 | 2538.404 |
| | 0.000 | 25.281 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1983 | 1 | 3 | 3 | 0 | 211.80 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 3.850 | 29.134 | 2.194 | 69.169 | 232.232 | 143.434 | 520.891 | 1140.820 | 1700.040 | 2511.753 |
| | 3139.140 | 3302.596 | 4494.634 | 6201.973 | 5332.770 | 3416.903 | 1505.128 | 416.233 | 95.706 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 32.894 | 0.000 | 0.000 | 0.000 | 0.000 | 12.089 | 72.013 |
| | 192.001 | 577.067 | 657.338 | 1839.690 | 4466.876 | 5169.244 | 6583.045 | 10375.226 | 10827.528 | 8021.602 | 1756.419 |
| | 244.261 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1984 | 1 | 3 | 3 | 0 | 148.26 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 17.522 | 20.731 | 63.507 | 86.288 | 221.446 | 178.029 | 510.951 | 1066.040 | 1818.113 |
| | 2801.550 | 3923.414 | 3349.916 | 3230.294 | 2638.690 | 2692.555 | 1212.545 | 136.994 | 54.783 | 0.000 | 5.842 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 17.522 | 0.000 | 0.000 | 42.681 |
| | 55.972 | 188.489 | 576.803 | 1358.854 | 2399.715 | 4744.397 | 6376.978 | 8683.630 | 9059.273 | 4197.339 | 866.269 |
| | 59.674 | 61.902 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1985 | 1 | 3 | 3 | 0 | 204.74 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 70.482 | 0.000 | 213.051 | 438.151 | 680.199 | 973.023 | 1883.103 |
| | 3472.248 | 4269.249 | 4698.941 | 4536.364 | 3194.266 | 2273.431 | 1420.308 | 742.949 | 57.052 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 54.159 |
| | 111.787 | 147.877 | 483.305 | 1726.332 | 2558.299 | 4418.456 | 7120.686 | 7123.870 | 6392.525 | 4627.339 | 1575.495 |
| | 296.211 | 29.210 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1986 | 1 | 3 | 3 | 0 | 112.96 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 62.230 | 147.967 | 174.093 | 412.692 | 875.275 | 983.481 | 979.619 |
| | 1159.100 | 1707.175 | 2557.653 | 2403.195 | 1702.999 | 1603.104 | 915.202 | 176.236 | 36.180 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 47.130 | 110.931 |
| | 116.014 | 310.297 | 500.720 | 1203.755 | 1899.580 | 2400.882 | 2256.635 | 3258.785 | 2590.162 | 1680.375 | 421.265 |
| | 222.148 | 23.984 | 5.493 | 0.000 | 0.000 | 0.000 | | | | | |
| 1987 | 1 | 3 | 3 | 0 | 247.10 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 9.872 | 292.634 | 781.952 | 760.217 | 1769.957 |
| | 2780.376 | 4721.009 | 6882.012 | 5433.266 | 4336.392 | 3042.508 | 1566.308 | 444.154 | 29.222 | 4.297 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 468.935 | 423.696 | 1362.027 | 3648.631 | 6887.822 | 8807.806 | 9129.378 | 5730.582 | 3641.156 | 1724.807 |
| | 76.928 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1988 | 1 | 3 | 3 | 0 | 162.38 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 142.237 | 68.896 | 431.438 | 443.590 | 543.976 | 491.472 | 1401.241 |
| | 2524.938 | 2982.357 | 3480.504 | 3572.088 | 2451.055 | 1265.547 | 884.575 | 513.358 | 71.306 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 38.894 |
| | 51.954 | 250.707 | 445.338 | 659.524 | 2089.245 | 3433.124 | 3759.669 | 4211.985 | 2760.504 | 1640.899 | 736.894 |
| | 42.444 | 13.060 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1989 | 1 | 3 | 3 | 0 | 162.38 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 52.444 | 0.000 | 4.272 | 18.637 | 86.693 | 265.565 | 652.639 | 1163.761 |
| | 2254.093 | 2510.662 | 2341.395 | 2967.213 | 2763.622 | 1366.293 | 898.639 | 348.098 | 155.498 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 45.843 | 20.627 | 394.937 | 590.997 | 1597.005 | 2541.268 | 3744.838 | 4205.683 | 3400.449 | 2642.521 | 920.867 |
| | 194.054 | 38.402 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1990 | 1 | 3 | 3 | 0 | 155.32 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 10.681 | 19.659 | 143.849 | 176.767 | 706.872 | 870.104 |
| | 1084.757 | 2037.653 | 3122.297 | 2773.690 | 2905.506 | 1521.265 | 745.985 | 211.299 | 17.102 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 8.978 | 49.944 | 114.918 | 487.226 | 1119.973 | 2372.451 | 3800.779 | 4329.034 | 2226.857 | 933.485 | 447.579 |
| | 55.334 | 0.000 | 28.807 | 0.000 | 0.000 | 0.000 | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1991 | 1 | 3 | 3 | 0 | 141.92 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 86.511 | 0.000 | 14.428 | 38.336 | 145.081 | 396.569 | 756.014 | 1108.295 | 926.465 | 2404.667 |
| | 3494.247 | 2011.002 | 3593.851 | 3714.005 | 2195.521 | 1136.582 | 1078.195 | 400.973 | 47.827 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 14.428 | 14.428 | 43.284 | 43.284 |
| | 148.462 | 477.587 | 539.362 | 1231.479 | 2539.539 | 5231.619 | 5423.404 | 5299.238 | 3396.074 | 3284.686 | 422.550 |
| | 251.542 | 12.110 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1992 | 1 | 3 | 3 | 0 | 222.23 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 115.721 | 84.226 | 338.482 | 1564.111 | 3372.224 | 2960.916 |
| | 4114.962 | 4372.073 | 6306.535 | 6120.810 | 6331.147 | 1628.552 | 1381.475 | 548.907 | 7.947 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 61.661 | 538.151 | 1243.056 | 3063.813 | 4374.532 | 6927.215 | 9621.340 | 8857.575 | 7501.344 | 5368.191 | 961.550 |
| | 654.096 | 38.932 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1993 | 1 | 3 | 3 | 0 | 155.32 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 12.065 | 467.221 | 42.059 | 987.307 | 2210.612 | 2425.457 |
| | 3012.190 | 5169.135 | 5495.870 | 5607.836 | 4603.483 | 1537.435 | 1012.900 | 605.948 | 243.725 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 8.885 | 271.891 | 1205.304 | 2497.950 | 3536.264 | 6026.149 | 5401.431 | 5071.262 | 3800.353 | 1886.889 | 607.080 |
| | 203.017 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1994 | 1 | 3 | 3 | 0 | 105.90 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 32.208 | 27.112 | 81.736 | 285.624 | 499.882 | 835.149 | 1463.266 |
| | 1517.552 | 1461.971 | 1800.963 | 1293.953 | 688.914 | 339.352 | 17.912 | 0.000 | 9.668 | 34.382 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 5.895 | 17.912 |
| | 37.921 | 55.605 | 724.931 | 984.675 | 2249.048 | 2385.906 | 2226.832 | 2199.997 | 1209.730 | 726.068 | 410.231 |
| | 74.401 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1995 | 1 | 3 | 3 | 0 | 112.96 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 173.919 | 210.237 | 371.597 | 318.813 | 538.281 | 555.071 |
| | 690.314 | 775.748 | 768.604 | 459.198 | 203.750 | 135.526 | 17.509 | 2.442 | 0.000 | 0.000 | 66.512 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.883 | 7.187 | 154.642 |
| | 183.923 | 502.315 | 546.710 | 829.713 | 790.391 | 1079.112 | 726.910 | 441.560 | 282.438 | 135.866 | 44.253 |
| | 10.020 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1996 | 1 | 3 | 3 | 0 | 134.14 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 3.360 | 0.000 | 22.509 | 21.514 | 226.132 | 366.721 | 439.109 | 943.300 | 832.196 | 895.728 |
| | 801.951 | 850.336 | 735.966 | 580.049 | 512.687 | 158.433 | 87.282 | 61.812 | 0.000 | 7.498 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.284 | 2.284 | 0.000 | 5.643 | 33.966 |
| | 207.001 | 407.200 | 1009.203 | 1166.363 | 1147.551 | 1033.274 | 954.265 | 1132.426 | 1088.164 | 506.036 | 197.169 |
| | 9.781 | 33.345 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1997 | 1 | 3 | 3 | 0 | 197.68 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 45.981 | 202.905 | 251.392 | 823.556 | 981.736 | 1422.651 |
| | 1689.262 | 1685.030 | 1854.608 | 965.222 | 388.379 | 425.215 | 131.957 | 59.311 | 42.118 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 22.783 | 6.139 | 0.000 | 13.770 | 28.752 |
| | 102.378 | 407.209 | 1023.103 | 2020.949 | 2698.830 | 3085.063 | 2538.051 | 1716.999 | 792.469 | 307.146 | 106.658 |
| | 80.142 | 1.252 | 4.238 | 0.000 | 0.000 | 0.000 | | | | | |
| 1998 | 1 | 3 | 3 | 0 | 197.68 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 52.626 | 58.361 | 178.399 | 453.731 | 1011.004 | 1413.360 | 1296.899 | 1511.663 |
| | 1754.953 | 1165.058 | 1272.065 | 1202.941 | 644.173 | 146.375 | 113.829 | 13.165 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.186 | 0.000 | 0.000 | 72.852 |
| | 118.176 | 745.610 | 1159.350 | 1657.024 | 2610.224 | 2505.880 | 2395.278 | 1739.195 | 1161.664 | 333.896 | 191.658 |
| | 16.105 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1999 | 1 | 3 | 3 | 0 | 197.68 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 13.190 | 11.742 | 24.209 | 44.948 | 128.620 | 197.192 | 885.817 | 1049.915 | 1276.502 | 1713.185 |
| | 1723.515 | 1352.987 | 1406.514 | 1058.130 | 439.894 | 269.870 | 115.495 | 12.073 | 1.526 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.914 | 7.828 | 3.914 | 14.834 | 0.000 | 59.341 |
| | 132.177 | 764.762 | 1073.316 | 1490.506 | 1847.700 | 2069.803 | 1965.025 | 1370.473 | 450.852 | 438.714 | 142.545 |
| | 14.952 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 2000 | 1 | 3 | 3 | 0 | 93.21 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 4.673 | 0.000 | 0.000 | 4.673 | 9.346 | 24.697 | 39.210 | 38.617 | 29.244 | 32.287 | 49.268 |
| | 33.846 | 45.633 | 14.350 | 11.543 | 9.760 | 1.112 | 2.512 | 1.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 21.804 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 31.379 | 51.861 | 50.307 | 51.936 | 71.330 | 65.346 | 36.608 | 22.285 | 10.717 | 2.440 | 1.512 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 2001 | 1 | 3 | 3 | 0 | 159.30 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 6.879 | 42.735 | 157.739 | 428.298 | 467.502 | 379.021 | 950.854 | 476.394 |
| | 2166.331 | 1308.553 | 1223.460 | 592.477 | 105.563 | 113.457 | 48.874 | 27.167 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 13.757 | 41.253 |
| | 166.149 | 315.970 | 1052.224 | 1524.417 | 908.815 | 4022.688 | 1367.975 | 1583.057 | 1420.601 | 91.604 | 39.941 |
| | 5.785 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 2002 | 1 | 3 | 3 | 0 | 306.928 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 98.86559642 | | 269.7670634 | | 595.2650446 | | |
| | 1017.186445 | | 1242.492917 | | 608.0596026 | | 608.3735256 | | 556.8397593 | | |
| | 760.6565566 | | 455.019523 | | 281.3994592 | | 373.2206942 | | 281.4168543 | | |
| | 179.2845744 | | 87.76179468 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 6.2068575 | 0 | 62.84047194 | | 72.31793155 | | 279.9192301 | |
| | 757.7950677 | | 925.7384429 | | 939.9061057 | | 1034.755003 | | 1161.843252 | | |
| | 751.0413356 | | 490.8942002 | | 247.869758 | | 52.99679037 | | 129.9882925 | | |
| | 11.31070454 | | 12.413715 | 6.2068575 | 6.2068575 | 0 | 0 | | | | |
| 2003 | 1 | 3 | 3 | 0 | 125.136 | 0 | 0 | 0 | 0 | 0 | 4.3349753 |
| | 0 | 0 | 0 | 0 | 0 | 4.639296611 | | 28.76643536 | | 73.80198642 | |
| | 140.6937644 | | 239.6300191 | | 220.1768194 | | 222.4545743 | | 174.9957982 | | |
| | 116.311347 | | 84.47138579 | | 78.94642226 | | 32.48597675 | | 25.08190607 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 7.220393897 | 0 | | 4.639296611 | | 72.86826726 | | 157.8618748 | | |
| | 196.5049018 | | 305.0995755 | | 264.8849817 | | 189.2935967 | | 102.0138341 | | |
| | 77.64600011 | 0 | 4.359087827 | | 0 | | 7.220393897 | 0 | 0 | 0 | |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 3 | 3 | 0 | 161.688 | 0 | 0 | 0 | 0 | 0 | |
| | 5.976290068 | 0 | 7.968386757 | | 5.976290068 | | 17.23933738 | | 21.10671996 | | |
| | 20.78852272 | | 84.40808335 | | 188.600115 | | 158.8472213 | | 175.5062725 | | |
| | 183.4020305 | | 183.8308333 | | 156.888047 | | 143.8161838 | | 174.2961464 | | |
| | 58.63086651 | | 28.04170466 | | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 11.95258014 | | 0 | 2.643378622 | | |
| | 61.26077072 | | 60.55842823 | | 86.61132349 | | 142.4496219 | | 144.6372894 | | |
| | 153.888852 | | 326.6961474 | | 284.647631 | | 149.9611939 | | 86.05981638 | | |
| | 38.59118691 | | 8.678380129 | | 22.54608829 | | 5.976290068 | 0 | 0 | 0 | |
| | 0 | | | | | | | | | | |
| 2005 | 1 | 3 | 3 | 0 | 260.02 | 0 | 0 | 0 | 0 | 0 | |
| | 7.883113451 | | 7.883113451 | | 325.835356 | | 63.06490761 | | 294.3029022 | | |
| | 23.64934035 | | 65.03568597 | | 70.94802106 | | 85.47957809 | | 162.0433637 | | |
| | 155.6982083 | | 102.1323923 | | 1041.022318 | | 1198.912236 | | 550.6912904 | | |
| | 287.0580046 | | 245.9563628 | | 132.7201579 | | 49.04056907 | 0 | 0 | | |
| | 2.708817619 | 0 | 0 | | 0 | 0 | 47.29868071 | | 23.64934035 | | |
| | 302.1860156 | | 55.18179416 | | 302.1860156 | | 31.5324538 | | 294.3029022 | | |
| | 50.20450321 | | 73.85384356 | | 105.3862974 | | 117.846386 | | 406.9328604 | | |
| | 475.6381426 | | 1559.889729 | | 712.532065 | | 357.1938826 | | 237.6635725 | | |
| | 84.4883868 | | 31.5324538 | | 5.013967675 | | 0 | 0 | 0 | 0 | |
| 2006 | 1 | 3 | 3 | 0 | 220.66 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 3.991749941 | | 5.735770001 | | 2.867884685 | | 9.397676778 | | 8.263108031 | | |
| | 26.00963055 | | 9.523964655 | | 44.75458504 | | 47.17026342 | | 42.48764951 | | |
| | 52.74465296 | | 62.66679415 | | 94.46924637 | | 79.43605885 | | 63.76114712 | | |
| | 30.46710174 | | 13.6811709 | | 13.60716226 | | 5.089487879 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 3.173620152 | 0 | 0 | | |
| | 3.154673185 | | 3.173620152 | | 6.08351909 | | 25.37799242 | | 49.24962839 | | |
| | 48.91217931 | | 101.4776027 | | 119.1319425 | | 137.3939985 | | 134.8723433 | | |
| | 63.38870453 | | 14.39768614 | | 12.66972904 | | 6.229861224 | | 3.199106757 | 0 | |
| | 0 | 0 | 0 | | | | | | | | |
| 2007 | 1 | 3 | 3 | 0 | 44.316 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 69.88125388 | | 0 | 46.56698207 | | 46.41278715 | |
| | 23.28349104 | | 23.28349104 | | 64.55990747 | | 86.97914792 | | 111.346404 | | |
| | 43.88117084 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17.91074399 | |

23.28349104 0 0 47.29247237 40.14395167 0 23.28349104
22.71560203 23.28349104 23.12929612 0 0 0 0 0
0 0

2008 1 3 3 0 89.152 0 0 0 0 0
16.66608396 0 12.12702566 0 12.74651593 0 5.869784702
14.06656498 27.15864885 4.266218613 21.68577067 14.06196073
12.28158575 12.68558111 5.691207406 7.386730264 1.532820638 0
4.598460392 1.333822257 0 0 0 0 0 0 0
0 0 0 0 4.540372061 0 8.935424456 2.59574344
39.03601268 2.804144947 16.5773123 7.371956985 19.5100371
8.665682145 3.099277524 24.38174012 0 11.61149438 16.08517631
13.72592364 1.532820638 4.336964064 0 0

2009 1 3 3 0 297.742 0 0 0 32.66890951 0
48.96713606 6.495527777 17.79273959 19.8102782 140.5539271
54.2798208 234.4513496 51.55175013 68.83777829 47.61069889
97.11731782 21.92238031 105.5523387 370.6842951 237.218086
226.2324189 68.19234718 30.0200864 6.292436855 16.51704169
1.852059573 0 0 0 0 3.942830389 0 64.86147624
20.32658516 66.52927804 10.86471804 37.14591566 279.6666038
200.312394 223.9193635 37.93426158 26.14059297 55.37593753
87.60665572 140.852481 144.1534106 88.17009428 221.2170214
20.82650738 51.49523139 0 42.56800776 0 3.942830389 0
0

2010 1 3 3 0 83.818 0 0 0 0 0 0
0 0 0 3.160907707 7.682176002 39.93389295 65.03529641
34.81497234 48.1796852 18.83719377 30.22697208 61.1173614
90.02506431 86.92888779 106.4113099 50.80873038 22.6723054
13.35822965 0 0 0 0 0 0 0 0 0
0 0 0 0 0 26.26403086 65.39893133 36.99906731
35.03011224 33.17918267 73.01454639 159.2855594 119.7976894
129.1669051 72.76787353 12.18861843 0 0 0 0 0
0 0

# 2009 Washington trawl fleet, updated 2007-2008 (n=40)

1968 1 4 0 0 14.12 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 104.085 38.004 226.321 832.678 1805.744
1873.525 2314.542 2929.124 2288.164 1030.921 226.321 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

1969 1 4 0 0 14.12 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 18.083 90.417 386.539 735.425 1168.734
1878.545 2396.969 2178.432 1588.417 969.766 244.894 18.083 0.000 18.083 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

1970 1 4 0 0 7.06 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 204.703 736.932 2006.092
1228.219 1473.863 2374.558 1719.507 900.694 245.644 81.881 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

1971 1 4 0 0 56.48 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 25.493 15.118 698.672 2224.221 6999.636
11321.446 14441.291 14121.699 12357.950 5995.173 2521.231 373.407 6.235 0.000 6.235 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1972 | 1 | 4 | 0 | 0 | 14.12 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 108.600 | 434.400 | 1954.115 |
| | 4396.130 | 7330.157 | 5212.799 | 4564.854 | 1956.170 | 1250.156 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1973 | 1 | 4 | 0 | 0 | 7.06 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 18.303 | 0.000 | 0.000 | 36.606 | 91.516 | 384.366 |
| | 805.339 | 1153.099 | 677.217 | 640.611 | 219.638 | 164.728 | 18.303 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| #1975 | 1 | 4 | 0 | 0 | 35.3 | 0.000 | 0.000 | 0.000 | 0.000 | 36.129 | 0.000 |
| | 0.000 | 167.114 | 828.813 | 756.238 | 1829.934 | 2569.234 | 7512.123 | 8574.651 | 10358.947 | 7042.944 | 2111.533 |
| | 835.555 | 631.673 | 859.008 | 939.614 | 454.918 | 318.678 | 42.103 | 2.403 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1976 | 1 | 4 | 3 | 0 | 21.18 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 1.008 | 0.000 | 3.023 | 0.000 | 6.046 | 86.268 | 343.811 | 931.058 |
| | 796.239 | 1838.937 | 2309.179 | 4016.321 | 3367.749 | 1844.658 | 887.294 | 126.756 | 204.962 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 1.008 | 3.023 | 9.070 | 344.819 | 1162.651 | 1691.521 | 3574.652 | 9669.922 | 13300.935 | 9859.485 | 1941.759 |
| | 459.482 | 0.000 | 1.008 | 0.000 | 0.000 | 0.000 | | | | | |
| 1977 | 1 | 4 | 3 | 0 | 14.12 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 33.108 | 33.108 | 108.279 |
| | 357.943 | 333.791 | 410.319 | 811.682 | 975.864 | 568.259 | 243.423 | 42.063 | 42.063 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 16.554 |
| | 0.000 | 0.000 | 0.000 | 207.602 | 233.111 | 377.211 | 975.864 | 2103.970 | 3727.878 | 2050.781 | 832.307 |
| | 42.063 | 42.063 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1978 | 1 | 4 | 3 | 0 | 35.3 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 4.419 | 4.419 | 8.837 | 13.256 | 37.109 | 354.250 | 812.191 |
| | 1227.754 | 1256.701 | 1529.120 | 1585.175 | 1283.201 | 1008.062 | 363.237 | 115.907 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 8.837 | 17.675 | 259.606 | 442.456 | 1463.045 | 2897.746 | 3446.808 | 4816.816 | 3652.448 | 917.330 |
| | 378.096 | 0.000 | 0.000 | 25.650 | 0.000 | 0.000 | | | | | |
| 1979 | 1 | 4 | 3 | 0 | 56.48 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 34.895 | 0.000 | 515.372 | 496.375 | 998.847 | 2518.755 |
| | 2409.665 | 3833.332 | 1742.858 | 1843.348 | 1145.716 | 1036.302 | 825.716 | 20.444 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 246.780 | 17.447 | 958.533 | 1675.576 | 6724.120 | 6135.442 | 7048.722 | 8759.053 | 5719.057 | 2486.972 |
| | 129.184 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1980 | 1 | 4 | 3 | 0 | 127.08 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 197.856 | 0.000 | 197.856 | 31.514 | 625.082 | 427.226 | 521.769 | 903.344 | 2597.881 | 3704.160 | 4290.218 |
| | 3738.236 | 6563.053 | 7713.342 | 7701.902 | 4094.748 | 2073.082 | 1580.696 | 327.456 | 159.428 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 260.885 |
| | 625.082 | 1708.905 | 2877.867 | 3689.800 | 4346.649 | 6969.248 | 7760.286 | 11343.321 | 13596.222 | 11141.158 | 4157.758 |
| | 1112.224 | 436.195 | 0.000 | 0.000 | 38.941 | 0.000 | | | | | |
| 1981 | 1 | 4 | 3 | 0 | 127.08 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 5.299 | 10.599 | 14.541 | 42.782 | 108.724 | 154.700 | 312.742 | 358.338 |
| | 450.688 | 545.602 | 1060.315 | 1241.733 | 637.714 | 302.818 | 215.344 | 78.870 | 28.205 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 5.299 | 10.061 |
| | 24.613 | 39.835 | 236.931 | 412.858 | 503.982 | 636.692 | 971.332 | 1650.396 | 2094.412 | 1390.323 | 685.355 |
| | 190.354 | 75.473 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1982 | 1 | 4 | 3 | 0 | 91.78 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 24.886 | 0.000 | 328.546 | 43.122 | 202.863 | 557.287 | 1585.350 | 869.278 |
| | 926.152 | 1345.255 | 1221.470 | 2008.117 | 1128.658 | 641.997 | 136.741 | 44.692 | 17.475 | 5.032 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.209 | 0.000 | 29.096 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 102.623 | 39.920 | 442.944 | 1193.196 | 1940.341 | 1971.903 | 2377.540 | 2918.537 | 2252.714 | 1828.661 | 566.036 |
| | 419.091 | 110.787 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1983 | 1 | 4 | 3 | 0 | 120.02 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 43.912 | 165.137 | 247.407 | 367.088 | 1020.018 | 1715.425 | 2842.822 | 3647.473 |
| | 3476.488 | 3301.649 | 3060.912 | 4643.066 | 4229.710 | 1137.740 | 735.821 | 449.790 | 64.881 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 20.393 | 84.769 | 269.560 |
| | 1061.569 | 1350.783 | 2080.169 | 2201.005 | 4388.296 | 4022.645 | 6836.583 | 5901.799 | 7087.699 | 4676.106 | 1300.412 |
| | 396.186 | 142.642 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1984 | 1 | 4 | 3 | 0 | 120.02 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 32.631 | 97.892 | 229.178 | 236.408 | 325.627 | 369.959 | 569.673 | 1328.340 |
| | 1775.337 | 1740.033 | 1547.440 | 3062.303 | 1635.041 | 1404.509 | 627.224 | 176.806 | 25.298 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 66.685 | 168.482 |
| | 293.714 | 400.137 | 596.430 | 760.519 | 1374.774 | 2116.568 | 2997.191 | 4677.699 | 5316.577 | 4694.119 | 1861.550 |
| | 301.851 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1985 | 1 | 4 | 3 | 0 | 127.08 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 2.989 | 15.839 | 103.330 | 238.384 | 559.357 | 531.192 | 605.844 | 1490.291 |
| | 2030.809 | 2058.868 | 3694.619 | 3111.035 | 2832.487 | 1655.595 | 681.362 | 176.185 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.989 | 16.735 | 8.966 |
| | 134.994 | 327.628 | 574.765 | 745.689 | 1028.635 | 2307.471 | 5325.174 | 5336.196 | 6305.292 | 2654.871 | 896.536 |
| | 331.726 | 66.706 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1986 | 1 | 4 | 3 | 0 | 120.02 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 35.285 | 32.496 | 56.564 | 317.902 | 494.064 | 810.430 | 1425.069 | 1827.439 |
| | 2162.542 | 2469.396 | 2173.539 | 2203.401 | 1389.945 | 628.182 | 387.079 | 85.347 | 12.121 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 17.642 |
| | 114.467 | 298.140 | 595.463 | 1519.995 | 2483.161 | 3714.314 | 3509.131 | 4297.254 | 2672.789 | 1361.153 | 936.321 |
| | 394.696 | 71.085 | 19.863 | 0.000 | 0.000 | 0.000 | | | | | |
| 1987 | 1 | 4 | 3 | 0 | 176.5 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 28.077 | 32.720 | 75.542 | 238.493 | 321.462 | 833.518 | 1530.834 | 2950.135 |
| | 2330.603 | 4218.695 | 4258.030 | 3938.331 | 3673.934 | 2095.398 | 811.689 | 591.427 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 140.982 |
| | 177.379 | 249.819 | 557.568 | 758.980 | 3345.156 | 4763.938 | 4288.003 | 5709.554 | 3956.157 | 3728.052 | 843.278 |
| | 493.721 | 37.343 | 5.002 | 0.000 | 0.000 | 0.000 | | | | | |
| 1988 | 1 | 4 | 3 | 0 | 134.14 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 3.460 | 17.731 | 80.829 | 45.926 | 243.570 | 96.744 | 304.190 | 714.261 | 999.777 |
| | 2523.393 | 2094.367 | 2206.616 | 2014.405 | 2461.060 | 1696.944 | 822.223 | 473.125 | 125.072 | 21.110 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 13.770 | 22.969 |
| | 65.405 | 253.439 | 130.450 | 383.261 | 1050.815 | 2459.113 | 2934.398 | 3182.969 | 3479.590 | 2729.951 | 1551.980 |
| | 237.927 | 323.413 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1989 | 1 | 4 | 3 | 0 | 127.08 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 53.174 | 88.492 | 116.308 | 289.100 | 372.638 | 881.412 | 1513.833 | 1878.578 |
| | 3642.322 | 3246.403 | 2851.711 | 1747.321 | 1451.045 | 930.003 | 524.341 | 24.538 | 8.420 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 22.857 | 140.874 | 16.190 |
| | 198.857 | 343.503 | 438.646 | 1720.645 | 2983.983 | 3468.546 | 4565.652 | 5343.947 | 4305.480 | 2391.239 | 601.283 |
| | 310.756 | 0.000 | 6.230 | 0.000 | 0.000 | 0.000 | | | | | |
| 1990 | 1 | 4 | 3 | 0 | 120.02 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 8.864 | 4.432 | 26.592 | 112.955 | 197.503 | 1124.477 | 762.708 | 2733.743 |
| | 3408.024 | 3979.719 | 3121.514 | 2249.299 | 2550.504 | 988.332 | 390.145 | 176.454 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 39.716 | 13.296 | 22.160 |
| | 130.526 | 476.762 | 865.413 | 1659.118 | 2518.488 | 4321.956 | 5053.284 | 5045.810 | 3552.408 | 1720.371 | 1363.853 |
| | 100.939 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1991 | 1 | 4 | 3 | 0 | 155.32 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 132.032 | 113.271 | 954.080 | 602.738 | 1829.870 | 3195.848 |
| | 4568.224 | 3884.806 | 4384.573 | 4207.931 | 2604.531 | 2467.894 | 706.180 | 9.774 | 74.582 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.538 |
| | 75.092 | 336.273 | 1085.855 | 2486.687 | 2889.712 | 6601.191 | 8277.912 | 9176.603 | 7461.456 | 4147.401 | 1276.834 |
| | 502.043 | 74.582 | 0.000 | 0.000 | 3.321 | 0.000 | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1992 | 1 | 4 | 3 | 0 | 141.2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 19.331 | 0.000 | 65.605 | 167.228 | 413.396 | 593.861 | 898.962 | 1686.336 | 1954.679 | 1933.381 |
| | 2827.834 | 3725.351 | 3291.025 | 3724.332 | 3757.101 | 2063.323 | 1296.034 | 55.827 | 134.573 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 15.040 | 15.226 | 108.965 |
| | 225.978 | 604.399 | 1410.847 | 3039.418 | 3430.809 | 4193.906 | 7117.286 | 7542.803 | 4968.539 | 3774.365 | 1218.769 |
| | 5.845 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1993 | 1 | 4 | 3 | 0 | 120.02 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 1.174 | 0.000 | 0.000 | 145.991 | 55.140 | 339.713 | 1015.904 | 1258.626 | 1583.087 | 1731.309 |
| | 1730.824 | 1129.471 | 1365.677 | 554.052 | 565.490 | 200.104 | 1.184 | 1.184 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.998 | 1.998 | 86.438 |
| | 280.548 | 1017.158 | 1047.291 | 2009.383 | 2190.674 | 1956.893 | 1933.797 | 893.195 | 471.622 | 185.563 | 91.737 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1994 | 1 | 4 | 3 | 0 | 105.9 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 25.065 | 25.065 | 119.353 | 173.235 | 498.026 | 347.428 | 999.240 | 1403.804 | 1148.810 |
| | 1693.197 | 784.059 | 1287.478 | 714.886 | 581.939 | 480.321 | 90.763 | 59.231 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.759 | 37.138 | 290.499 |
| | 209.174 | 450.722 | 769.290 | 1102.292 | 2358.564 | 1672.643 | 2080.482 | 1350.925 | 1409.134 | 622.703 | 255.417 |
| | 3.862 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1995 | 1 | 4 | 3 | 0 | 155.32 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 13.626 | 21.888 | 42.826 | 155.416 | 184.139 | 260.684 | 505.212 | 510.585 | 547.770 |
| | 837.511 | 612.709 | 348.875 | 195.276 | 120.347 | 19.413 | 41.192 | 2.565 | 0.000 | 1.809 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 6.813 | 6.813 | 11.023 | 45.444 | 60.663 |
| | 166.635 | 330.332 | 438.269 | 642.684 | 938.887 | 754.765 | 465.388 | 432.425 | 216.576 | 77.676 | 34.031 |
| | 0.000 | 31.708 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1996 | 1 | 4 | 3 | 0 | 105.9 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 11.263 | 23.895 | 17.558 | 46.323 | 69.688 | 100.866 | 143.980 | 152.860 | 246.662 | 253.588 |
| | 316.023 | 382.446 | 576.702 | 381.673 | 210.927 | 40.580 | 18.140 | 3.449 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.969 | 16.569 | 9.477 | 20.321 | 31.888 |
| | 122.682 | 138.799 | 201.275 | 244.161 | 512.928 | 684.214 | 513.045 | 443.938 | 500.053 | 168.263 | 80.697 |
| | 0.000 | 0.000 | 8.188 | 0.000 | 0.000 | 0.000 | | | | | |
| 1997 | 1 | 4 | 3 | 0 | 120.02 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 1.161 | 43.012 | 86.023 | 161.666 | 168.856 | 281.573 | 561.911 | 1121.116 |
| | 704.254 | 806.316 | 955.923 | 710.574 | 304.057 | 252.957 | 95.198 | 14.749 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 40.691 | 40.691 | 47.718 |
| | 333.713 | 172.561 | 310.326 | 929.052 | 955.761 | 1403.580 | 911.236 | 1101.395 | 766.225 | 214.752 | 62.384 |
| | 14.749 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1998 | 1 | 4 | 3 | 0 | 141.61 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 201.351 | 9.389 | 71.792 | 158.772 | 203.049 | 523.069 | 761.094 | 831.782 |
| | 778.245 | 685.331 | 676.433 | 411.148 | 463.548 | 137.832 | 45.995 | 0.000 | 36.865 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 15.560 | 35.388 | 76.959 |
| | 296.725 | 256.734 | 553.538 | 764.909 | 722.775 | 934.879 | 1380.343 | 585.381 | 312.343 | 222.569 | 78.751 |
| | 8.665 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1999 | 1 | 4 | 3 | 0 | 120.534 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 4.915 | 12.006 | 1.779 | 33.232 | 58.200 | 87.069 | 59.032 | 125.859 | 179.031 | 415.199 |
| | 386.455 | 212.276 | 507.216 | 343.535 | 361.064 | 201.140 | 24.138 | 0.000 | 0.000 | 0.000 | 1.821 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.088 | 0.000 | 0.000 | 34.497 | 55.505 |
| | 113.264 | 92.731 | 198.116 | 330.745 | 295.913 | 500.312 | 775.089 | 638.619 | 523.905 | 108.118 | 24.862 |
| | 11.499 | 17.417 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 2000 | 1 | 4 | 3 | 0 | 38.602 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 1.481 | 4.205 | 4.690 | 8.643 | 12.707 | 16.409 | 8.126 | 22.247 |
| | 18.609 | 21.784 | 14.554 | 4.205 | 7.264 | 1.012 | 5.065 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.158 | 0.000 | 6.556 |
| | 3.871 | 8.643 | 24.919 | 15.925 | 23.617 | 30.244 | 40.264 | 19.303 | 7.055 | 2.082 | 0.593 |
| | 1.012 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 2001 | 1 | 4 | 3 | 0 | 57.16 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.606 | 26.627 | 28.342 | 44.598 | 86.517 | 154.969 |
| | 1085.183 | 213.889 | 264.800 | 153.320 | 976.554 | 118.618 | 20.205 | 0.000 | 5.386 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 845.704 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 23.467 | 1722.602 | 3349.163 | 1767.405 | 1014.791 | 569.248 | 1275.507 | 379.867 | 1175.550 | 50.445 | 66.011 |
| | 0.000 | 22.930 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 2002 | 1 | 4 | 3 | 0 | 145.12 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 356.1335508 | 38.42773558 | 106.4990929 | | | |
| | 217.0147332 | 132.4261379 | 173.1431022 | 200.420579 | 397.8390792 | | | | | | |
| | 284.9177117 | 215.1178573 | 301.7466482 | 269.853779 | 69.6909059 | | | | | | |
| | 11.75192124 | 3.625927805 | 3.625927805 | 0 | 0 | 0 | 0 | 0 | | | |
| | 0 | 0 | 0 | 0 | 0 | 4.073019649 | 4.291671732 | 44.49454432 | | | |
| | 69.46144037 | 229.063026 | 299.3955674 | 389.8577344 | 507.6423096 | | | | | | |
| | 464.5014098 | 621.6698736 | 73.91518411 | 99.84919177 | 3.100152888 | | | | | | |
| | 8.858823048 | 8.876427597 | 0 | 0 | 0 | 0 | | | | | |
| 2003 | 1 | 4 | 3 | 0 | 87.888 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 6.139657716 | 4.807232872 | 7.732238132 | | | | |
| | 36.55104078 | 21.49599618 | 21.57193275 | 17.21232423 | 12.82807006 | | | | | | |
| | 12.27931543 | 18.53951952 | 32.83942852 | 30.71080892 | 37.82496357 | | | | | | |
| | 13.79102234 | 13.95376754 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 15.07006894 | 21.76787736 | | | |
| | 13.70484533 | 46.53206703 | 33.09012427 | 43.43240323 | 25.12603058 | | | | | | |
| | 13.95376754 | 8.372260521 | 6.250321995 | 7.185122195 | 4.727101225 | | | | | | |
| | 3.149996199 | 1.240785951 | 0 | 0 | 0 | 0 | | | | | |
| 2004 | 1 | 4 | 3 | 0 | 152.35 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 4.406003003 | 0 | 8.150135874 | 0 | 0.451391706 | 12.23555929 | | | | | |
| | 28.5357691 | 26.60004877 | 17.3090083 | 18.29997077 | 23.33100978 | | | | | | |
| | 27.38854083 | 25.29812254 | 28.63930518 | 14.49356315 | 43.81165241 | | | | | | |
| | 9.449169699 | 7.157893294 | 6.879262792 | 0.717174991 | 0.464302227 | | | | | | |
| | 0.875569136 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 5.726242725 | 10.18773752 | 11.17243794 | 1.848679671 | 21.60650428 | | | | | |
| | 50.97140729 | 36.63295334 | 68.44560391 | 32.83555273 | 20.33142554 | | | | | | |
| | 11.68558109 | 8.247908143 | 0.457319915 | 2.203001502 | 0 | 0 | 0 | | | | |
| | 0 | | | | | | | | | | |
| 2005 | 1 | 4 | 3 | 0 | 401.998 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1.10987516 | 3.813934639 | 14.37504541 | | | | |
| | 27.75469324 | 67.92640766 | 145.3327156 | 131.3442255 | 118.8111742 | | | | | | |
| | 115.2333251 | 110.0318391 | 151.5201171 | 126.5163501 | 30.66559732 | | | | | | |
| | 37.44159678 | 24.79080658 | 17.72763416 | 8.324063697 | 0 | 0 | 0 | | | | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.10987516 | | |
| | 4.41536256 | 15.07093638 | 35.62549034 | 57.10664323 | 86.52035238 | | | | | | |
| | 103.0209119 | 164.7353124 | 227.8712336 | 161.8336616 | 125.2414841 | | | | | | |
| | 53.29548387 | 27.57437319 | 32.60172448 | 10.98776408 | 12.48609555 | | | | | | |
| | 0.713491174 | 0 | | | | | | | | | |
| 2006 | 1 | 4 | 3 | 0 | 192.604 | 0 | 0 | 0 | 0 | 0 | |
| | 0.401405955 | 0.890042848 | 0.846427379 | 0.802811909 | 2.354275799 | | | | | | |
| | 6.255018323 | 7.47044081 | 8.506042611 | 8.552872426 | 8.227865524 | | | | | | |
| | 4.71619216 | 4.373930002 | 11.58579434 | 8.61619733 | 13.71755024 | | | | | | |
| | 9.865046071 | 11.87191776 | 2.537381221 | 0.936036561 | 0 | 0 | 0 | | | | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0.890042848 | 0.445021424 | | | |
| | 0.445021424 | 1.599837341 | 2.885499667 | 3.69238949 | 8.138592969 | | | | | | |
| | 13.25321401 | 11.71329241 | 5.756484128 | 3.869238795 | 11.2944175 | | | | | | |
| | 6.07570156 | 17.19908773 | 2.443742086 | 4.925169173 | 0.738035509 | | | | | | |
| | 0.649984549 | 0.589254399 | 0.571109145 | 0 | 0 | 0 | | | | | |
| 2007 | 1 | 4 | 3 | 0 | 129.138 | 0 | 0 | 0 | 0 | 0.390383088 | |
| | 0.352674684 | 12.04027813 | 0 | 0 | 81.53995241 | 15.75738533 | | | | | |
| | 33.4688169 | 0 | 180.0751401 | 10.74801586 | 256.8035931 | 45.85809148 | | | | | |
| | 121.6978586 | 21.62135341 | 188.4536614 | 27.17665633 | 250.6816976 | | | | | | |
| | 22.5158764 | 0 | 26.78411486 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| | 0.390383088 | 0.390383088 | 0 | 0 | 0 | 10.22873679 | 0 | | | | |
| | 18.08657481 | 100.5302981 | 25.92252545 | 87.61000981 | 121.5569783 | | | | | | |
| | 55.94362963 | 114.1894383 | 4.568503984 | 133.0733482 | 0 | 150.3987995 | | | | | |
| | 0 | 152.2618672 | 0 | 0 | 0 | 0 | 0 | | | | |
| 2008 | 1 | 4 | 3 | 0 | 127.284 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 79.6744845 | 0 | 33.77750746 | | | |

27.91703883 42.76455202 70.753833 26.07833918 42.26701224 46.9576002
52.6015203 63.31827068 33.27597241 89.56256066 63.11236202
14.80610414 0 25.66187323 0 0 0 0 0 0
0 0 0 0 118.9216772 0 79.85770407 0
139.8996045 21.89854096 108.9368153 15.18095325 91.88803571
56.47617357 81.71374646 32.98393228 74.37507608 46.92283622
78.44925674 0 0 0

2009 1 4 3 0 138.87 0 0 0 0 0 0
0 15.15120093 0 0.170907749 0.984127073 20.66482701
112.2067168 159.4636478 112.7513359 130.9024196 10.82990492
27.53179418 16.16361086 58.47881485 44.45341907 84.16637849
32.77114859 3.971135115 1.365846838 1.125059146 0.308692587
0.308692587 0 0 0 0 0 0 0 2.443742086
0 0 1.605588913 17.06005012 161.9662427 10.84823792
4.502929349 10.39326879 32.47591048 28.27824748 33.70588538
7.038620132 15.60177441 1.962349199 0.929589504 1.239187671 0
0 0 0

2010 1 4 3 0 152.184 0 0 0 0 0 0
0 0 0 0.346478197 0 0 0 1.056257356
5.04217013 8.657554298 25.00919765 23.67858366 20.82911969
23.77660638 31.27891647 18.12775668 16.38521388 8.287615922
4.898159301 0.801685513 0.925933568 0 0 0 0 0
0 0 0 0 0 0 0.774588595 0.201374132
2.738152159 1.232182964 10.88924764 21.30693226 23.90494673
29.67445162 20.85042049 7.478223444 6.596369458 2.844950029
2.129789416 0.565545686 0 0 0 0

# 2011 California South non-trawl fleet no 2008 or 2010 (n=25)

1978 1 5 0 0 1.138 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 155.769231 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0

1979 1 5 0 0 2.38 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 5.102041
10.204082 5.102041 15.306123 10.204082 5.102041 0 0 0 0 0 0
0 0 0 0 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 5 0 0 8.14 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 14.423077
19.23077 128.344231 17.528667 28.547539 1.552795 12.720975 9.615385 4.807692 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0

1985 1 5 0 0 8.416 0 0 0 0 0 0
0 0 0 0 2.172185 0 4.344371 0 99.14279 39.355556 79.893617
118.391963 117.853901 39.787234 39.893617 39.355556 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0

1986 1 5 0 0 42.8 0 0 0 0 0 0
0 0 0 0 35.122195 88.536521 85.652273 88.53637 140.140043 202.02677
102.894765 90.543284 48.272934 8.788462 28.683644 0 4.267677 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0

1987 1 5 0 0 30.56 0 0 0 0 14.103093 0
0 0 0 0 0 242.091683 268.485149 266.77394
135.711547 361.897354 292.364077 238.470094 24.000978 50.449512 13.910795
8.816178 0 0 3.113208 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0

1988 1 5 0 0 25.972 0 0 0 0 0 0
0 3.707071 0 3.707071 20.750373 46.277146 86.763573 55.235479 69.175557 259.0428
204.725494 217.969255 105.381908 9.610526 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0

1989 1 5 0 0 72.54 0 0 0 0 0 0
0 0 12.27 7.326733 74.27697 175.021397 329.4444 479.535344
466.563555 359.872034 208.215837 365.635163 197.286374 58.407283
112.627327 0 18.63531 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0

1990 1 5 0 0 30.592 0 0 0 0 0 0
2.691589 0 8.737345 13.932535 22.158915 35.070509 97.287122 97.475343 247.187963 93.303613
83.571667 61.660194 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0

1991 1 5 0 0 17.97 0 0 0 0 0 0
0 0 5.769231 9.202021 33.750067 46.010101 43.32427 58.124328 48.307573 43.980063 79.789828
0 27.306593 5.731481 5.731481 0 15.673469 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1992 1 5 0 0 249.868 0 0 0 0 57.448721
176.465379 555.044924 679.8155 682.496865 596.829185 780.714735
529.549599 503.663751 295.236615 99.649403 129.227127 177.299372
58.866318 62.069737 70.536481 15.020164 6.961538 14.461538 6.961538 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1993 1 5 0 0 146.61 0 0 0 0 0 13.477234
36.736276 73.577552 79.192808 70.005012 66.162799 111.929037 327.779904 139.084215
86.512829 31.826094 52.113691 5.616162 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0

1994 1 5 0 0 182.286 0 0 0 11.141304 27.84619 29.099068
103.777175 197.041855 346.007909 360.516803 314.157782
398.863659 364.078038 408.474339 236.289254 359.785115
159.917557 115.168451 58.564862 21.801111 20.111111 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0

1995 1 5 0 0 96.78 0 0 0 0 7.68 13.88
56.041667 60.323333 112.081667 281.668744 279.797857 421.692824
404.148721 428.122229 377.791066 348.366747 339.113769
112.732995 74.809516 126.780701 12.884211 52.669828 2.346939 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1996 | 1 | 5 | 0 | 0 | 131.204 | 0 | 0 | 0 | 0 | 45.857143 | 84.062857 |
| | 68.574929 | 251.630323 | | 379.173798 | | 477.618965 | | 459.06708 | 501.780647 | | |
| | 478.718823 | | 388.259279 | | 496.245166 | | 494.646526 | | 361.967866 | | |
| | 323.868918 | | 190.728976 | | 117.457801 | | 10.52381 | 55.449222 | 28.252336 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 1997 | 1 | 5 | 0 | 0 | 123.516 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 10 | 131 | 221 | 358 | 359 | 268 | 267 | 345 | 185 | 199 | 70 |
| | 49 | 18 | 2 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1998 | 1 | 5 | 0 | 0 | 47.836 | 0 | 0 | 0 | 0.000 | 0.000 | 0.000 |
| | 6.909 | 20.000 | 10.000 | 23.855 | 138.492 | 190.691 | 385.066 | 397.390 | 82.753 | 53.969 | 49.218 |
| | 2.360 | 0.000 | 0.000 | 5.520 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1999 | 1 | 5 | 0 | 0 | 32.042 | 0 | 0 | 0 | 0.000 | 0.000 | 3.983 |
| | 27.440 | 8.208 | 27.496 | 33.131 | 22.251 | 14.329 | 11.247 | 18.270 | 19.652 | 26.005 | 9.478 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2001 | 1 | 5 | 0 | 0 | 8.45 | 0 | 0 | 0 | 1.387 | 1.387 | 0.000 |
| | 0.000 | 5.754 | 5.037 | 8.974 | 5.733 | 7.326 | 5.733 | 0.754 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2003 | 1 | 5 | 0 | 0 | 2.276 | 0 | 0 | 0 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 1.000 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2004 | 1 | 5 | 0 | 0 | 29.834 | 0 | 0 | 0 | 0.000 | 10.250 | 37.350 |
| | 39.733 | 61.267 | 39.850 | 34.583 | 26.850 | 30.750 | 10.167 | 0.000 | 6.100 | 6.100 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2005 | 1 | 5 | 0 | 0 | 7.518 | 0 | 0 | 0 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 2.000 | 1.000 | 2.000 | 2.000 | 2.000 | 0.000 | 1.000 | 0.000 | 1.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2006 | 1 | 5 | 0 | 0 | 23.178 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 19.32 |
| | 19.99 | 34.24 | 42.57 | 33.48 | 13.91 | 6.41 | 3.75 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | |
| 2007 | 1 | 5 | 0 | 0 | 38.592 | 0.00 | 1.00 | 0.00 | 2.00 | 2.00 | 3.40 |
| | 7.60 | 11.00 | 15.80 | 26.60 | 16.00 | 10.60 | 19.20 | 7.80 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00

2009 1 5 0 0 16.38 0 0 0 0 0 0
7 0 0 4 9 10 7 1 1 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

# 2011 California North non-trawl fleet (n=23; none for 2010)

1981 1 6 0 0 1.69 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
70.080 140.160 0.000 70.080 70.080 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

1982 1 6 0 0 9.24 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 417.046 15.846 987.064 882.483
1452.501 151.569 235.277 464.034 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

1983 1 6 0 0 2.83 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 7.079 24.845 0.000 14.158 0.000 0.000 17.765 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

1984 1 6 0 0 1.14 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 18.535 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

1991 1 6 0 0 25.60 0.000 0.000 0.000 0.000 0.000 0.000
0.000 15.605 25.102 16.096 50.694 74.278 88.011 141.983 138.892 27.645 67.149
85.826 143.667 120.960 13.909 21.712 0.000 27.818 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

1992 1 6 0 0 152.19 0.000 0.000 0.000 0.000 0.000 0.000
14.640 54.689 140.879 129.079 218.686 305.756 449.891 622.561 419.241 396.772 573.629
457.581 608.464 625.995 487.455 180.227 121.049 21.797 5.366 1.838 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

1993 1 6 0 0 202.66 0.000 0.000 0.000 0.000 39.252 42.253
143.422 245.319 351.505 385.579 544.492 448.920 460.477 561.082 537.158 553.973 551.546
538.886 281.341 143.749 162.796 70.734 52.494 7.908 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

1994 1 6 0 0 249.58 0.000 0.000 0.000 0.000 0.000 10.455
58.932 157.765 198.098 343.086 465.128 471.821 681.149 812.397 904.115 863.386 692.537
494.980 443.115 359.383 444.154 90.914 82.388 2.920 2.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1995 | 1 | 6 | 0 | 0 | 168.79 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.967 |
| | 68.671 | 115.859 | 272.873 | 326.421 | 393.972 | 481.528 | 392.515 | 303.636 | 295.934 | 216.465 | 203.654 |
| | 185.228 | 181.730 | 178.553 | 127.320 | 25.850 | 28.690 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1996 | 1 | 6 | 0 | 0 | 166.62 | 0.000 | 0.000 | 0.000 | 3.060 | 8.074 | 33.708 |
| | 123.337 | 211.515 | 370.010 | 341.345 | 359.481 | 406.174 | 563.921 | 391.582 | 519.850 | 436.825 | 472.194 |
| | 532.126 | 585.326 | 267.354 | 135.712 | 63.777 | 28.693 | 9.564 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1997 | 1 | 6 | 0 | 0 | 109.25 | 0.000 | 0.000 | 0.000 | 0.000 | 3.961 | 19.800 |
| | 13.860 | 26.849 | 77.854 | 160.787 | 226.902 | 320.700 | 322.333 | 208.149 | 207.819 | 103.785 | 83.153 |
| | 60.349 | 81.996 | 84.766 | 50.031 | 19.091 | 2.191 | 1.600 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1998 | 1 | 6 | 0 | 0 | 50.57 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 4.000 | 9.800 | 20.560 | 36.053 | 62.527 | 81.003 | 77.903 | 44.640 | 84.160 |
| | 53.343 | 83.170 | 54.587 | 35.520 | 15.110 | 20.663 | 5.870 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1999 | 1 | 6 | 0 | 0 | 143.70 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 4.708 | 26.667 | 36.282 | 57.677 | 116.000 | 144.400 | 144.248 | 121.300 | 77.040 | 28.400 | 15.760 |
| | 9.540 | 7.340 | 3.000 | 1.200 | 1.000 | 1.000 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 2000 | 1 | 6 | 0 | 0 | 36.42 | 0.000 | 0.000 | 0.000 | 0.000 | 2.387 | 0.000 |
| | 0.000 | 1.194 | 5.194 | 10.000 | 12.000 | 12.922 | 7.961 | 26.358 | 22.613 | 19.515 | 31.403 |
| | 15.608 | 8.777 | 7.010 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.194 | 0.000 | 1.194 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 2001 | 1 | 6 | 0 | 0 | 54.08 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 1.000 | 5.260 | 7.520 | 23.560 | 20.891 | 16.111 | 14.800 | 23.847 | 35.369 | 48.937 |
| | 36.639 | 28.111 | 20.240 | 6.714 | 4.160 | 5.610 | 2.900 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 2002 | 1 | 6 | 0 | 0 | 6.04 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 4.000 | 0.000 | 7.000 | 1.000 | 8.000 | 1.000 | 0.000 | 1.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 2003 | 1 | 6 | 0 | 0 | 13.55 | 0.000 | 0.000 | 0.000 | 0.000 | 1.983 | 1.983 |
| | 0.000 | 0.000 | 1.983 | 12.387 | 12.387 | 11.898 | 17.821 | 8.983 | 1.983 | 3.966 | 1.983 |
| | 0.000 | 1.983 | 0.000 | 1.983 | 1.983 | 1.983 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |

2004 1 6 0 0 74.05 0.000 0.000 0.000 0.000 3.000 1.000
4.026 4.000 3.000 15.044 18.000 19.000 21.044 15.000 24.000 11.000 7.026
4.000 7.000 5.000 3.000 1.000 2.000 0.000 0.000 0.000 0.000 0.000
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0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

2005 1 6 0 0 46.39 0.000 0.000 0.000 3.000 4.000 1.000
2.000 8.000 9.000 12.000 14.000 18.000 16.000 12.000 7.000 5.000 5.000
4.000 2.000 0.000 1.000 2.000 0.000 0.000 0.000 1.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

2006 1 6 0 0 33.97 0.000 0.000 0.000 1.000 1.000 1.000
4.000 5.000 2.000 11.000 21.000 25.000 19.000 19.000 7.000 1.000 3.000
1.000 1.000 0.000 1.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
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0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

2007 1 6 0 0 54.394 0.000 0.000 0.000 0.000 0.000 1.000
1.000 14.000 16.200 18.000 41.200 43.000 21.000 19.400 10.200 6.000 9.000
1.000 3.000 3.000 3.000 3.000 1.000 0.000 0.000 0.000 0.000 0.000
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0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

2008 1 6 0 0 7.726 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 2.000 8.000 5.000 3.000 1.000 4.000 1.000 0.000 0.000
0.000 0.000 1.000 2.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

2009 1 6 0 0 25.834 0 0 0 0 0 1
2 4 5 12 16 18 21 6 4 1 1
1 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

# 2011 OR-WA non-trawl fleet (n=15; no samples after 2007)

1980 1 7 3 0 4.04 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.898 2.694 2.694 0.000 0.000 0.898 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.898 0.000 0.000 0.000 4.491 3.592 0.000 3.592
0.000 0.000 0.000 0.000 0.000 0.000

1988 1 7 3 0 21.18 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 89.134 177.891
344.952 433.709 808.346 573.733 425.603 26.127 198.110 128.361 103.144 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 15.752 57.631 145.933 249.909 266.571 670.514 1027.201 526.473
103.144 0.000 0.000 0.000 0.000 0.000

1990 1 7 3 0 7.06 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 25.435
101.742 76.306 203.483 254.354 228.918 228.918 76.306 25.435 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 50.871 76.306 203.483 152.612 432.401 279.789 127.177
0.000 0.000 0.000 0.000 0.000 0.000

1996 1 7 3 0 6.11 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 2.029 0.000 3.044 4.059

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5.073 | 2.029 | 3.044 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 2.029 | 1.015 | 2.029 | 4.059 | 1.015 | 1.015 | 3.044 | 2.029 | 1.015 | 0.000 |
| | 0.000 | 1.015 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1997 | 1 | 7 | 3 | 0 | 77.66 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 2.632 | 0.000 | 8.257 | 6.637 | 12.054 | 44.234 | 48.590 | 83.747 | 63.589 |
| | 32.941 | 81.483 | 41.605 | 33.193 | 36.578 | 20.011 | 19.371 | 5.436 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.752 | 2.752 | 2.264 | 4.352 | 11.633 |
| | 22.462 | 62.896 | 78.738 | 102.397 | 75.465 | 59.806 | 69.282 | 73.443 | 82.031 | 59.036 | 75.930 |
| | 21.177 | 13.467 | 0.000 | 13.467 | 0.000 | 0.000 | | | | | |
| 1998 | 1 | 7 | 3 | 0 | 54.23 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 20.783 | 21.124 | 32.702 | 43.625 | 69.784 | 73.268 |
| | 20.062 | 55.367 | 7.348 | 9.580 | 6.086 | 25.679 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 4.394 | 0.000 | 0.000 | 0.000 | 3.846 | 7.692 | 16.181 |
| | 20.177 | 38.828 | 52.952 | 94.156 | 107.508 | 139.738 | 128.532 | 105.051 | 137.777 | 96.859 | 41.116 |
| | 26.227 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 1999 | 1 | 7 | 3 | 0 | 28.18 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.973 | 0.000 | 1.259 | 7.824 | 6.785 | 7.870 | 7.981 | 25.272 | 17.279 | 15.002 |
| | 14.587 | 5.398 | 5.464 | 4.140 | 7.336 | 0.000 | 5.234 | 0.000 | 5.234 | 10.467 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.973 | 0.000 | 0.000 | 4.048 |
| | 7.140 | 4.268 | 17.289 | 15.186 | 27.351 | 17.902 | 21.329 | 13.621 | 4.314 | 6.252 | 2.277 |
| | 0.000 | 5.234 | 5.234 | 0.000 | 5.234 | 5.234 | | | | | |
| 2000 | 1 | 7 | 3 | 0 | 48.29 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 2.000 | 3.018 | 14.935 | 11.623 | 7.067 | 14.001 | 16.039 | 12.023 | 9.145 | 2.091 |
| | 3.041 | 1.996 | 1.067 | 2.015 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.022 | 4.861 | 5.962 |
| | 14.923 | 12.090 | 12.086 | 7.100 | 7.243 | 5.097 | 2.067 | 1.091 | 1.996 | 0.000 | 0.000 |
| | 1.067 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 2001 | 1 | 7 | 3 | 0 | 55.36 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 1.000 | 6.073 | 7.251 | 12.512 | 14.331 | 22.977 | 10.404 | 16.677 | 11.022 | 6.537 |
| | 8.662 | 2.448 | 2.102 | 3.568 | 1.075 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.250 | 4.253 | 9.126 |
| | 10.417 | 9.221 | 5.840 | 9.948 | 7.481 | 5.997 | 10.801 | 2.232 | 0.000 | 0.000 | 0.000 |
| | 2.157 | 1.157 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 2002 | 1 | 7 | 3 | 0 | 13.45 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.867 | 0.000 | 155.510 | 0.000 |
| | 29.200 | 315.887 | 335.354 | 29.200 | 24.333 | 160.377 | 150.643 | 0.000 | 4.867 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 4.867 | 9.733 | 14.600 | 4.867 | 150.643 | 19.467 | 14.600 | 4.867 | 4.867 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 2003 | 1 | 7 | 3 | 0 | 8.73 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 127.509 | 510.037 | 255.019 |
| | 510.037 | 382.528 | 254.764 | 255.019 | 127.509 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 127.509 | 127.509 | 382.528 | 255.019 | 0.000 | 255.019 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 2004 | 1 | 7 | 3 | 0 | 17.87 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 68.062 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 145.602 | 128.770 |
| | 315.757 | 151.569 | 263.139 | 286.665 | 238.217 | 80.723 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 87.304 | 0.000 | 145.602 | 43.508 | 141.063 | 153.324 | 119.694 | 41.753 | 34.031 | 38.970 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| 2005 | 1 | 7 | 3 | 0 | 10.62 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 66.273 |
| | 44.969 | 0.000 | 51.359 | 66.273 | 0.000 | 0.000 | 59.647 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 38.345 | 21.302 | 42.603 | 79.051 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |

2006 1 7 3 0 7.11 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
583.655 25.560 76.681 626.256 8.520 25.560 8.520 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 17.040 17.040 42.601 34.081 0.000
0.000 0.000 0.000 0.000 0.000 0.000

2007 1 7 3 0 3.97 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 108.510 5.342 0.000 5.342 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 9.975 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000

# 2009 California South recreational fleet (n=28)

1980 1 8 0 0 206.624 0 0 1 6 12 23
29 53 64 78 69 76 56 45 19 9 4
0 1 0 0 0 0 0 0 1 0 1
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1981 1 8 0 0 101.602 0 0 0 1 5 7
15 14 37 26 37 25 26 10 5 6 1
5 3 4 1 0 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1982 1 8 0 0 124.432 0 0 0 1 3 9
17 32 25 33 28 27 20 16 19 14 6
4 5 3 1 0 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1983 1 8 0 0 121.948 0 0 1 5 7 19
13 23 27 29 29 28 21 16 15 3 2
2 3 1 2 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1984 1 8 0 0 147.918 0 0 0 6 27 32
38 32 27 23 35 30 31 13 7 2 3
2 2 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1985 1 8 0 0 273.806 0 0 0 4 22 47
66 107 91 84 67 63 64 36 12 12 4
1 3 2 1 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1986 1 8 0 0 254.808 0 1 1 2 4 19
50 78 105 145 119 80 59 21 10 3 5
3 3 3 4 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1987 1 8 0 0 68.528 0 0 1 2 2 10
9 8 10 23 17 25 17 2 4 2 3

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 8 | 3 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1988 | 1 | 8 | 0 | 0 | 100.082 | 0 | 0 | 1 | 1 | 2 | 15 |
| | 25 | 19 | 26 | 22 | 15 | 9 | 14 | 17 | 7 | 2 | 1 |
| | 0 | 3 | 1 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1989 | 1 | 8 | 0 | 0 | 189.31 | 0 | 0 | 1 | 2 | 14 | 12 |
| | 14 | 59 | 82 | 106 | 53 | 46 | 40 | 28 | 12 | 4 | 9 |
| | 2 | 1 | 1 | 6 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1993 | 1 | 8 | 0 | 0 | 143.672 | 1 | 0 | 1 | 3 | 8 | 14 |
| | 34 | 36 | 50 | 38 | 20 | 11 | 2 | 2 | 1 | 3 | 0 |
| | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1994 | 1 | 8 | 0 | 0 | 74.662 | 0 | 0 | 0 | 0 | 3 | 3 |
| | 4 | 9 | 11 | 19 | 12 | 12 | 7 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1995 | 1 | 8 | 0 | 0 | 113.674 | 0 | 0 | 1 | 2 | 7 | 12 |
| | 28 | 17 | 37 | 41 | 34 | 28 | 28 | 16 | 4 | 1 | 2 |
| | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1996 | 1 | 8 | 0 | 0 | 237.978 | 0 | 1 | 1 | 6 | 17 | 29 |
| | 27 | 37 | 61 | 100 | 137 | 104 | 76 | 31 | 8 | 7 | 2 |
| | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1997 | 1 | 8 | 0 | 0 | 318.288 | 0 | 0 | 0 | 7 | 16 | 29 |
| | 33 | 74 | 94 | 136 | 209 | 198 | 180 | 94 | 39 | 27 | 10 |
| | 8 | 3 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1998 | 1 | 8 | 0 | 0 | 219.938 | 0 | 0 | 0 | 0 | 6 | 20 |
| | 37 | 32 | 38 | 60 | 74 | 79 | 83 | 54 | 49 | 22 | 12 |
| | 7 | 4 | 12 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1999 | 1 | 8 | 0 | 0 | 238.562 | 0 | 0 | 0 | 2 | 2 | 10 |
| | 12 | 21 | 53 | 72 | 90 | 83 | 101 | 87 | 65 | 23 | 7 |
| | 7 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 1 | 8 | 0 | 0 | 102.814 | 0 | 0 | 0 | 1 | 0 | 1 |
| | 6 | 8 | 15 | 30 | 50 | 53 | 34 | 38 | 32 | 14 | 13 |
| | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2001 | 1 | 8 | 0 | 0 | 75.942 | 0 | 0 | 0 | 1 | 2 | 2 |
| | 1 | 4 | 4 | 8 | 20 | 23 | 34 | 25 | 9 | 15 | 5 |
| | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2002 | 1 | 8 | 0 | 0 | 54.214 | 1 | 0 | 0 | 0 | 2 | 3 |
| | 3 | 4 | 9 | 1 | 3 | 12 | 14 | 17 | 16 | 4 | 4 |
| | 3 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2003 | 1 | 8 | 0 | 0 | 12.518 | 0 | 0 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 3 | 2 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2004 | 1 | 8 | 0 | 0 | 136.874 | 0 | 0 | 0 | 5 | 0 | 3 |
| | 5 | 7 | 20 | 32 | 30 | 26 | 14 | 2 | 4 | 2 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2005 | 1 | 8 | 0 | 0 | 169.672 | 0 | 0 | 0 | 1 | 1 | 6 |
| | 16 | 31 | 30 | 44 | 38 | 38 | 19 | 9 | 1 | 0 | 1 |
| | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2006 | 1 | 8 | 0 | 0 | 243.858 | 0 | 0 | 0 | 0 | 5 | 12 |
| | 15 | 47 | 61 | 65 | 52 | 46 | 61 | 25 | 2 | 1 | 1 |
| | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2007 | 1 | 8 | 0 | 0 | 139.636 | 0 | 0 | 0 | 1 | 2 | 4 |
| | 9 | 18 | 39 | 25 | 47 | 28 | 16 | 3 | 11 | 4 | 2 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2008 | 1 | 8 | 0 | 0 | 69.248 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 3 | 6 | 10 | 15 | 27 | 9 | 11 | 2 | 1 | 1 | 0 |
| | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2009 | 1 | 8 | 0 | 0 | 49.04 | 0 | 0 | 0 | 0 | 2 | 0 |
| | 2 | 2 | 5 | 4 | 14 | 17 | 15 | 8 | 2 | 2 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2010 | 1 | 8 | 0 | 0 | 54.488 | 0 | 0 | 0 | 0 | 3 | 5 |
| | 2 | 2 | 17 | 18 | 1 | 9 | 5 | 5 | 2 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |

# 2009 California North recreational fleet (n=28)

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1980 | 1 | 9 | 0 | 0 | 108.368 | 0 | 0 | 0 | 0 | 1 | 3 |
| | 9 | 18 | 35 | 50 | 47 | 37 | 22 | 20 | 19 | 25 | 9 |
| | 16 | 6 | 10 | 4 | 2 | 0 | 0 | 0 | 0 | 1 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1981 | 1 | 9 | 0 | 0 | 76.464 | 6 | 2 | 2 | 2 | 1 | 3 |
| | 3 | 13 | 17 | 29 | 39 | 40 | 25 | 15 | 9 | 6 | 3 |
| | 3 | 1 | 2 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1982 | 1 | 9 | 0 | 0 | 118.854 | 0 | 0 | 0 | 0 | 0 | 12 |
| | 11 | 37 | 46 | 67 | 57 | 47 | 38 | 25 | 16 | 9 | 4 |
| | 3 | 3 | 0 | 2 | 0 | 4 | 0 | 2 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1983 | 1 | 9 | 0 | 0 | 77.186 | 0 | 0 | 0 | 1 | 0 | 2 |
| | 4 | 23 | 24 | 33 | 31 | 20 | 18 | 16 | 7 | 6 | 3 |
| | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1984 | 1 | 9 | 0 | 0 | 105.396 | 0 | 0 | 0 | 0 | 1 | 6 |
| | 12 | 19 | 19 | 31 | 31 | 21 | 21 | 24 | 13 | 18 | 7 |
| | 7 | 3 | 6 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1985 | 1 | 9 | 0 | 0 | 163.616 | 0 | 0 | 0 | 0 | 5 | 6 |
| | 12 | 31 | 45 | 43 | 61 | 58 | 50 | 37 | 28 | 17 | 13 |
| | 4 | 7 | 3 | 8 | 2 | 0 | 1 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1986 | 1 | 9 | 0 | 0 | 199.598 | 0 | 0 | 1 | 0 | 1 | 12 |
| | 30 | 59 | 97 | 100 | 116 | 74 | 53 | 33 | 18 | 21 | 14 |
| | 11 | 9 | 9 | 7 | 2 | 2 | 0 | 1 | 0 | 1 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1987 | 1 | 9 | 0 | 0 | 134.034 | 0 | 0 | 0 | 0 | 1 | 7 |
| | 13 | 17 | 29 | 35 | 30 | 41 | 47 | 42 | 24 | 24 | 42 |
| | 45 | 28 | 13 | 9 | 6 | 13 | 2 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1988 | 1 | 9 | 0 | 0 | 93.67 | 0 | 0 | 0 | 0 | 2 | 2 |
| | 7 | 17 | 22 | 32 | 16 | 21 | 11 | 10 | 10 | 8 | 13 |
| | 17 | 7 | 8 | 8 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1989 | 1 | 9 | 0 | 0 | 30.316 | 0 | 0 | 1 | 0 | 1 | 1 |
| | 2 | 4 | 7 | 11 | 17 | 15 | 5 | 8 | 1 | 5 | 0 |
| | 0 | 2 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1993 | 1 | 9 | 0 | 0 | 138.68 | 0 | 0 | 0 | 3 | 3 | 10 |
| | 22 | 46 | 62 | 62 | 51 | 39 | 15 | 14 | 7 | 10 | 4 |
| | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1994 | 1 | 9 | 0 | 0 | 146.788 | 0 | 0 | 0 | 0 | 3 | 10 |
| | 23 | 47 | 52 | 95 | 73 | 50 | 23 | 22 | 5 | 3 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1995 | 1 | 9 | 0 | 0 | 88.844 | 0 | 0 | 0 | 0 | 9 | 15 |
| | 25 | 40 | 31 | 36 | 32 | 21 | 10 | 4 | 3 | 1 | 0 |
| | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1996 | 1 | 9 | 0 | 0 | 163.724 | 0 | 0 | 0 | 0 | 7 | 9 |
| | 22 | 45 | 62 | 92 | 70 | 34 | 38 | 15 | 9 | 17 | 16 |
| | 20 | 7 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1997 | 1 | 9 | 0 | 0 | 137.144 | 0 | 0 | 1 | 2 | 9 | 15 |
| | 57 | 59 | 42 | 40 | 23 | 25 | 43 | 51 | 61 | 43 | 46 |
| | 27 | 13 | 14 | 6 | 6 | 1 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1998 | 1 | 9 | 0 | 0 | 49.286 | 0 | 0 | 0 | 0 | 2 | 0 |
| | 2 | 6 | 4 | 20 | 17 | 13 | 15 | 23 | 14 | 7 | 7 |
| | 7 | 4 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1999 | 1 | 9 | 0 | 0 | 118.922 | 0 | 0 | 0 | 0 | 0 | 4 |
| | 10 | 17 | 23 | 33 | 29 | 16 | 32 | 34 | 51 | 44 | 24 |
| | 13 | 8 | 6 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2000 | 1 | 9 | 0 | 0 | 48.49 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 0 | 3 | 5 | 16 | 4 | 1 | 4 | 10 | 8 | 12 | 11 |
| | 6 | 3 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2001 | 1 | 9 | 0 | 0 | 19.726 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 2 | 0 | 2 | 2 | 3 | 2 | 6 | 2 | 1 |
| | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2002 | 1 | 9 | 0 | 0 | 14.622 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 2 | 1 | 0 | 0 | 3 | 2 | 3 | 1 | 0 | 1 | 1 |
| | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2003 | 1 | 9 | 0 | 0 | 38.728 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1 | 0 | 3 | 4 | 2 | 2 | 9 | 10 | 4 | 2 | 3 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2004 | 1 | 9 | 0 | 0 | 85.904 | 0 | 0 | 0 | 0 | 0 | 3 |
| | 1 | 2 | 9 | 12 | 12 | 3 | 5 | 2 | 5 | 3 | 1 |
| | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2005 | 1 | 9 | 0 | 0 | 121.012 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 5 | 14 | 16 | 24 | 24 | 23 | 26 | 6 | 4 | 2 | 5 |
| | 1 | 4 | 1 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2006 | 1 | 9 | 0 | 0 | 148.74 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 3 | 9 | 17 | 36 | 47 | 35 | 19 | 8 | 7 | 5 | 6 |
| | 4 | 4 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2007 | 1 | 9 | 0 | 0 | 93.804 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 3 | 7 | 15 | 16 | 31 | 20 | 15 | 12 | 8 | 1 | 1 |
| | 3 | 3 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2008 | 1 | 9 | 0 | 0 | 36.452 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 0 | 3 | 6 | 3 | 10 | 10 | 5 | 4 | 1 | 2 | 1 |
| | 2 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2009 | 1 | 9 | 0 | 0 | 67.904 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 4 | 8 | 16 | 21 | 19 | 15 | 6 | 4 | 0 | 3 |
| | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |

2010 1 9 0 0 20.174 0 0 0 0 0 0
2 1 3 1 5 2 4 1 1 1 1
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

# 2009 OR-WA recreational fleet (n=28)

1980 1 10 0 0 130.916 0 0 0 0 0 206
288 602 1938 5195 2930 4003 3711 1967 1202 2485 490
349 1776 189 40 0 0 0 0 0 0 123
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1981 1 10 0 0 51.594 0 0 0 0 0 0
3076 2180 7125 8165 6364 5457 6445 6549 1603 2453 1370
1084 286 0 0 863 286 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1982 1 10 0 0 137.156 0 0 0 0 145 373
0 2119 2602 4991 6504 6203 7768 4497 780 417 780
1560 1560 0 0 0 0 0 145 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1983 1 10 0 0 53.488 0 0 0 0 0 465
0 0 612 1369 2496 659 97 194 97 612 0
0 0 0 0 0 0 148 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1984 1 10 0 0 146.438 0 0 0 0 0 328
939 2252 2488 4478 3865 4435 3050 2954 1361 803 501
194 350 58 58 238 56 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1985 1 10 0 0 167.646 0 0 0 56 0 1235
2502 3877 6214 3731 6299 8722 8702 7143 4474 4362 2151
4276 577 3218 170 790 0 57 790 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1986 1 10 0 0 75.356 0 0 0 0 100 0
1430 1383 2455 2533 2185 1615 975 1013 215 535 1646
1826 375 1032 250 125 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1987 1 10 0 0 113.88 0 0 0 276 788 924
3486 3680 5645 3905 4017 4191 2118 1927 1410 747 980
523 1018 402 591 424 0 0 0 0 0 193
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

1988 1 10 0 0 165.924 469 0 0 469 483 2323
5248 8847 11118 16528 9744 10868 5300 3722 1122 843 284

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 642 | 534 | 0 | 0 | 341 | 36 | 469 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1989 | 1 | 10 | 0 | 0 | 84.048 | 0 | 0 | 0 | 0 | 0 | 225 |
| | 552 | 2884 | 3947 | 7619 | 4511 | 4672 | 2794 | 1937 | 705 | 765 | 297 |
| | 0 | 255 | 0 | 180 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1993 | 1 | 10 | 0 | 0 | 235.146 | 0 | 0 | 0 | 0 | 0 | 120 |
| | 1162 | 1917 | 3543 | 5078 | 5012 | 3199 | 2905 | 2095 | 757 | 420 | 669 |
| | 314 | 368 | 65 | 216 | 113 | 0 | 0 | 42 | 71 | 0 | 85 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1994 | 1 | 10 | 0 | 0 | 223.702 | 0 | 0 | 0 | 0 | 219 | 502 |
| | 1032 | 2089 | 2701 | 4214 | 3901 | 3303 | 2236 | 1129 | 401 | 243 | 92 |
| | 202 | 121 | 140 | 0 | 49 | 0 | 0 | 0 | 0 | 0 | 69 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1995 | 1 | 10 | 0 | 0 | 198.32 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 315 | 1807 | 2623 | 6054 | 3758 | 2826 | 1604 | 894 | 245 | 337 | 0 |
| | 229 | 0 | 229 | 115 | 0 | 73 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1996 | 1 | 10 | 0 | 0 | 130.852 | 0 | 0 | 0 | 0 | 0 | 234 |
| | 89 | 859 | 2578 | 3175 | 2387 | 3089 | 1239 | 1216 | 217 | 144 | 79 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1997 | 1 | 10 | 0 | 0 | 313.182 | 0 | 0 | 0 | 37 | 0 | 524 |
| | 916 | 2648 | 3312 | 3818 | 4749 | 4141 | 3576 | 1577 | 173 | 1194 | 324 |
| | 273 | 543 | 285 | 33 | 0 | 76 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1998 | 1 | 10 | 0 | 0 | 315.746 | 0 | 0 | 0 | 0 | 76 | 793 |
| | 2192 | 5171 | 10638 | 7279 | 8882 | 6772 | 3595 | 3835 | 2547 | 732 | 397 |
| | 254 | 353 | 162 | 0 | 0 | 162 | 0 | 0 | 0 | 76 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1999 | 1 | 10 | 0 | 0 | 292.676 | 0 | 0 | 0 | 0 | 0 | 274 |
| | 1216 | 3411 | 5086 | 5675 | 5117 | 5451 | 2574 | 2355 | 1065 | 839 | 470 |
| | 389 | 258 | 70 | 65 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2000 | 1 | 10 | 0 | 0 | 161.268 | 0 | 0 | 0 | 0 | 0 | 140 |
| | 786 | 2055 | 2833 | 4281 | 4218 | 2817 | 1187 | 372 | 276 | 259 | 226 |
| | 0 | 212 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2001 | 1 | 10 | 0 | 0 | 107.324 | 0 | 0 | 0 | 0 | 0 | 1360 |
| | 115 | 231 | 1099 | 1182 | 1793 | 993 | 2745 | 317 | 237 | 17 | 17 |
| | 23 | 236 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2002 | 1 | 10 | 0 | 0 | 91.632 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 292 | 220 | 775 | 1099 | 2417 | 2047 | 449 | 523 | 445 | 111 | 66 |
| | 226 | 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2003 | 1 | 10 | 0 | 0 | 20.968 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 37 | 147 | 135 | 93 | 176 | 64 | 61 | 4 | 2 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2004 | 1 | 10 | 0 | 0 | 45.072 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 14 | 7 | 19 | 12 | 0 | 26 | 6 | 6 | 7 | 0 |
| | 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2005 | 1 | 10 | 0 | 0 | 114.594 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 17 | 0 | 0 | 9 | 32 | 15 | 24 | 0 | 0 |
| | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2006 | 1 | 10 | 0 | 0 | 34.244 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 3 | 9 | 0 | 3 | 6 | 3 | 3 | 3 | 3 |
| | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2007 | 1 | 10 | 0 | 0 | 60.728 | 0 | 0 | 0 | 0 | 0 | 3 |
| | 0 | 5 | 0 | 7 | 27 | 5 | 27 | 12 | 0 | 0 | 7 |
| | 14 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2008 | 1 | 10 | 0 | 0 | 59.694 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 4 | 0 | 9 | 12 | 4 | 0 | 4 | 12 | 0 | 0 |
| | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2009 | 1 | 10 | 0 | 0 | 62.694 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 4 | 4 | 22 | 25 | 29 | 4 | 11 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| # 2010 | 1 | 10 | 0 | 0 | 64.694 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0

# 2009 At-sea hake fishery (n=8)

2003 1 11 3 0 96.55 0 0 0 0 0 0
0 0 0 0 0 0 2 3 0 16.111111 29.51634
32.738562 20.26634 33.710784 20.873483 14.301587 9.151261 5.722222 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 2.6 14.643791 24.322222 49.410458 52.599673 48.207143 28.317927 13.857143 3
4.634921 0 0 0 0 0

2004 1 11 3 0 118.47 0 0 0 0 0 0
0 0 0 0 0 0 0 0 3.5 0 32.728571
136.17437 135.745798 150.712465 223.222549 133.012465 24.95
112.702941 0 6.25 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 3.5 9.571429 17.828571
133.931513 77.771429 144.62437 15.85 9.25 8.6 0 0 3 0
0 0

2005 1 11 3 0 202.4 0 0 0 0 0 0
0 0 0 0 0 0 0 1.75 5 11.5 27.277778
55.72 55.8 51.67 63.882222 33.888889 22.97 27.498889 10.826667 4.333333 0 2
0 0 0 0 0 0 0 0 0 0 0
0 0 0 1 14.5 48.586667 90.476667 55.525556 32.386667 18.36 9.493333
2 2.333333 0 0 0 1

2006 1 11 3 0 182.29 0 0 0 0 0 3
2 0 0 1 0 3 4 8 9 21 33.095238
43.5 38.833333 40.095238 28.333333 27.3 15.428571 11 4 0 0 0
0 0 0 0 0 0 0 2 0 3 1
3 11.8 3 4 22.633333 53.8 48.345238 46.761905 20.8 5.833333 2
0 0 0 0 0 0

2007 1 11 3 0 260.72 0 0 0 0 0 0
0 2.2 0 6.6 0 0 1.833333 9.666667 22.914787 34.407644 45.785965
68.555013 80.901116 99.077056 45.254762 48.647619 52.935965 25.964286 20.364719 0 0 0
0 0 0 0 0 0 0 0 2 2.2 6.2
6.619048 3.809524 9.359524 19.571679 62.355263 87.979073 111.800684 34.281385 17.485965 16.45
0 2.25 0 0 0 0 0

2008 1 11 3 0 243.67 0 0 0 0 0 0
0 0 0 0 8.5 0 5.9 5.9 6.4 12.333333 32.329469
44.932925 58.090574 41.54071 81.634804 85.330859 74.025614 28.506803 19.666667 13.5 2 0
0 0 0 0 0 0 0 0 0 0 3.833333
0 4 7.9 10.073913 17.356463 37.847732 70.180519 65.647066 59.151545 20.059215 15.186667
0 0 0 0 0 2

2009 1 11 3 0 152.47 0 0 0 0 0 0
0 0 0 0 0 0 0 0 2 10.166667 70.238095
57.071429 129.984524 153.859524 130.417857 140.442857 45.475 36.1
11.5 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 5 12.8 13.666667
112.517857 83.046429 59.371429 0 8.341667 9 0 0 0 0
0

2010 1 11 3 0 141.52 0 0 0 0 0 0
0 0 0 0 0 0 0 2 2 6.538462 29.975962
19.475962 39.975962 30.038462 35.705128 28.916667 31.75 27.9375 6.666667 6.4375 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 6.538462 33.975962 51.951923 58.951923 60.291667 33.663462 25.375 6.833333
4 1 0 0 2 2

# 2011 NWFSC survey (n=8)

2003 1 12 3 0 79.61 0 44826 59768 75454 0 44108
25955 14562 55788 14562 16294 16335 73767 77071 171841 133675 91294

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 140749 | 122148 | 135561 | 115897 | 28364 | 215365 | 4550 | 0 | 0 | 0 | 0 |
| | 25736 | 179303 | 228422 | 34178 | 0 | 57216 | 40558 | 14562 | 40600 | 0 | 0 |
| | 26983 | 103833 | 55412 | 185165 | 201620 | 243358 | 259818 | 158344 | 112437 | 4818 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2004 | 1 | 12 | 3 | 0 | 70.74 | 0 | 10557 | 10557 | 60840 | 42228 | 54303 |
| | 39726 | 13242 | 60949 | 164065 | 91708 | 129306 | 152789 | 210391 | 240754 | 436458 | 391257 |
| | 174882 | 252665 | 195185 | 466997 | 408304 | 343507 | 290182 | 157496 | 39374 | 39374 | 0 |
| | 0 | 21114 | 12244 | 0 | 70228 | 8637 | 116495 | 79454 | 44913 | 89745 | 118154 |
| | 163850 | 278933 | 60253 | 162161 | 249829 | 285836 | 423252 | 445253 | 799448 | 268261 | 140608 |
| | 129657 | 0 | 39374 | 0 | 0 | 0 | | | | | |
| 2005 | 1 | 12 | 3 | 0 | 90.38 | 11604 | 30110 | 8973 | 7028 | 14056 | 49195 |
| | 7028 | 7028 | 7028 | 14056 | 25089 | 54232 | 144922 | 226795 | 223607 | 219676 | 168729 |
| | 343364.4705 | | 363927 | 262829 | 193830 | 153203 | 0 | 0 | 9282 | 0 | 0 |
| | 0 | 23208 | 11604 | 14056 | 7028 | 21084 | 28112 | 20370 | 14056 | 7028 | 20001 |
| | 56003 | 85342 | 188564 | 183711 | 202661 | 273409 | 395608 | 565053.5295 | | 658264 | 227012 |
| | 57996 | 36276 | 18138 | 0 | 0 | 0 | 0 | 0 | | | |
| 2006 | 1 | 12 | 3 | 0 | 75.61 | 0 | 9256 | 9256 | 9256 | 8621 | 7697 |
| | 0 | 0 | 11422 | 53421.5 | 49009 | 65725 | 56121 | 134157 | 295661 | 1306098 | 1390397 |
| | 1913744 | 3732031 | 3622889 | 2763348 | 1555589 | 2250090 | 1279241 | 971683 | 8888 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 8224 | 26884 | 7697 | 7697 | 0 | 4412.5 | 78979 |
| | 42775 | 37284 | 871544 | 756833 | 1864268 | 2490314 | 3935794 | 5996239 | 4811381 | 1962030 | 769947 |
| | 0 | 307558 | 0 | 0 | 0 | 0 | | | | | |
| 2007 | 1 | 12 | 3 | 0 | 95.11 | 0 | 0 | 0 | 32767.00024 | | 24576 |
| | 62520 | 55905 | 203678 | 112772 | 106352 | 63229 | 92026 | 99786 | 42907 | 14007 | 106282 |
| | 65867 | 303592 | 182580 | 314848 | 296942 | 189478 | 83952 | 41866 | 40511 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0.999755919 | | 0 | 62521 | 78887 | 228402 | 72796 |
| | 95731 | 108618 | 66088 | 63924 | 97831 | 47650 | 231109 | 428611 | 760736 | 391891 | 388516 |
| | 52870 | 19644 | 16122 | 8685 | 0 | 7220 | 0 | 0 | | | |
| 2008 | 1 | 12 | 3 | 0 | 91.93 | 72570.96918 | | 142928.7893 | | 97196.25383 | |
| | 378630.0682 | | 303211 | 0 | 16434 | 8213 | 88286 | 84715 | 132467 | 185419 | 169540 |
| | 237181 | 182302 | 182065 | 300446 | 180027 | 232308 | 145166 | 280937 | 237387 | 51170 | 40513 |
| | 20111 | 18583 | 0 | 0 | 504460.0308 | | 331896.2107 | | 62846.74617 | | |
| | 191494.9318 | | 301572 | 27565 | 21738 | 31671 | 52319 | 166141 | 127559 | 196385 | 383617 |
| | 317466 | 344443 | 261496 | 284198 | 261155 | 92487 | 67446 | 91350 | 46791 | 0 | 8844 |
| | 0 | 0 | 0 | 0 | | | | | | | |
| 2009 | 1 | 12 | 3 | 0 | 54.56 | 7938 | 4280 | 13012 | 27254.73469 | | |
| | 27051.12499 | | 0.99976641 | | 0 | 35120 | 17787 | 62347 | 45603 | 243399 | 139740 |
| | 116990 | 99410 | 36965 | 26873 | 44453 | 27801 | 37587 | 87461 | 54269 | 18965 | 9816 |
| | 0 | 0 | 0 | 0 | 0 | 4280 | 12840 | 82284.26531 | | 64033.87501 | |
| | 24910.00023 | | 8106 | 25578 | 34240 | 72028 | 185870 | 207729 | 138863 | 159634 | 116943 |
| | 90397 | 124126 | 106697 | 65070 | 74915 | 8185 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | | | | | | | | | |
| 2010 | 1 | 12 | 3 | 0 | 85.65 | 268972.5 | 25951.5 | 108022 | 7727 | 40315 | 60450 |
| | 25907 | 0 | 0 | 18038 | 9464 | 45231 | 109474 | 151727 | 118170 | 53800 | 111861 |
| | 101213 | 269285 | 647507 | 847532 | 987134 | 410900 | 136421 | 85784 | 0 | 0 | 0 |
| | 276688.5 | 41394.5 | 167828 | 24079 | 60450 | 83494 | 23044 | 0 | 0 | 16840 | 17147 |
| | 43820 | 136956 | 147337 | 132629 | 211814 | 300043 | 381255 | 822168 | 697151 | 282289 | 102076 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |

# Triennnial survey (n=10)

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1983 | 1 | 13 | 3 | 0 | 215.16 | 0 | 0 | 3578 | 3578 | 13121 | 14688 |
| | 22563 | 113129 | 317694 | 562889 | 275905 | 287613 | 220792 | 246952 | 334313 | 233752 | 335422 |
| | 699948 | 484401 | 391119 | 537382 | 545882 | 236888 | 73064 | 37180 | 1813 | 0 | 0 |
| | 0 | 0 | 0 | 8946 | 14313 | 9641 | 27423 | 143716 | 326252 | 499398 | 389346 |
| | 261883 | 212402 | 244898 | 267583 | 293468 | 542581 | 850132 | 1241293 | 789315 | 540169 | 155779 |
| | 55125 | 11196 | 0 | 0 | 0 | 0 | | | | | |
| 1986 | 1 | 13 | 3 | 0 | 215.16 | 0 | 3015 | 1386 | 2202 | 20059 | 7538 |
| | 10696 | 19221 | 19347 | 40982 | 71310 | 84335 | 84117 | 166954 | 274047 | 301968 | 277293 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 192250 | 201573 | 219700 | 195734 | 141261 | 154333 | 78156 | 30502 | 8970 | 0 | 0 |
| | 0 | 0 | 7148 | 10128 | 22063 | 19363 | 14420 | 112850 | 51652 | 52758 | 87857 |
| | 96422 | 164530 | 167154 | 335559 | 336212 | 284279 | 344089 | 370193 | 307445 | 312377 | 125384 |
| | 24739 | 8430 | 5836 | 0 | 0 | 0 | | | | | |
| 1989 | 1 | 13 | 3 | 0 | 175.77 | 5678 | 22712 | 73814 | 23116 | 15040 | 5678 |
| | 20314 | 69517 | 56203 | 107797 | 103159 | 75084 | 94889 | 94610 | 142711 | 162765 | 102671 |
| | 161590 | 133711 | 343786 | 305478 | 190954 | 173833 | 54169 | 94060 | 77410 | 0 | 0 |
| | 22712 | 0 | 68136 | 63175 | 19125 | 25160 | 22807 | 68265 | 81616 | 114142 | 104050 |
| | 81889 | 127530 | 137864 | 221340 | 196940 | 221243 | 304104 | 560162 | 523668 | 512477 | 86396 |
| | 31795 | 26226 | 75161 | 0 | 0 | 0 | | | | | |
| 1992 | 1 | 13 | 3 | 0 | 62.49 | 34885 | 10902 | 10966 | 20773 | 19820 | 14781 |
| | 30338 | 38288 | 31921 | 40398 | 42616 | 51985 | 106892 | 101108 | 107399 | 146992 | 69708 |
| | 21254 | 11877 | 20135 | 19809 | 17140 | 14090 | 1234 | 12073 | 11881 | 0 | 0 |
| | 34885 | 13301 | 25589 | 50418 | 28793 | 22995 | 16755 | 9768 | 11997 | 34329 | 26400 |
| | 18422 | 100552 | 90942 | 82939 | 52979 | 41260 | 25057 | 28979 | 21189 | 31815 | 7830 |
| | 1479 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1995 | 1 | 17 | 3 | 0 | 84.12 | 0 | 0 | 0 | 0 | 2425 | 6219 |
| | 9051 | 7444 | 34124 | 65169 | 84732 | 83277 | 68180 | 27715 | 41353 | 47699 | 28838 |
| | 40874 | 34870 | 54909 | 56214 | 71852 | 39778 | 40100 | 32907 | 6853 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 13408 | 28080 | 35758 | 58054 | 137785 | 144116 |
| | 78322 | 72250 | 69039 | 25359 | 47640 | 47653 | 100883 | 120910 | 187447 | 124051 | 34202 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 1998 | 1 | 17 | 3 | 0 | 113.54 | 0 | 196 | 22571 | 196 | 1570 | 11689 |
| | 9864 | 7606 | 4191 | 21373 | 16103 | 40348 | 59768 | 79399 | 82635 | 70273 | 52250 |
| | 34294 | 35430 | 43633 | 18110 | 10390 | 7156 | 701 | 2824 | 0 | 0 | 0 |
| | 0 | 3982 | 7963 | 4963 | 1177 | 8729 | 11097 | 2159 | 1766 | 10547 | 24342 |
| | 65749 | 61566 | 76257 | 65988 | 50491 | 93704 | 68243 | 41814 | 33539 | 7181 | 6747 |
| | 2105 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2001 | 1 | 17 | 3 | 0 | 100.86 | 0 | 0 | 3606 | 0 | 32110 | 0 |
| | 67475 | 3520 | 7040 | 77336 | 44391 | 205336 | 414378 | 293143 | 161288 | 96909 | 54077 |
| | 79501 | 72585 | 72892 | 23599 | 7090 | 16502 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 22492 | 0 | 22492 | 35200 | 26012 | 74040 | 83963 |
| | 262245 | 311511 | 186368 | 156321 | 90186 | 65787 | 79815 | 40142 | 36151 | 13856 | 3684 |
| | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| 2004 | 1 | 17 | 3 | 0 | 90.84 | 0 | 0 | 4597 | 0 | 4040 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 10782 | 35686 | 91136 | 56932 | 36869 |
| | 60475 | 55129 | 84106 | 59555 | 94921 | 41846 | 22135 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 4040 | 0 | 0 | 0 | 0 | 0 | 6603 | 0 | 0 |
| | 11675 | 21407 | 32063 | 64495 | 59598 | 171145 | 144096 | 170212 | 166250 | 86653 | 47887 |
| | 4230 | 0 | 0 | 0 | 0 | 0 | | | | | |

### Age data ###

35 # Number of age bins for data inputs

# Lower edge of age bins (first is a minus group, last is a plus group)

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

2 # Number of ageing error types

# Vectors of: Average age at true age (to accumulator age)

# SD of ageing precision at true age

# definition 1 CAP/NWFSC/ODFW

0.5 1.418732 2.33746 3.2562 4.17493 5.09366 6.01239 6.93113 7.84986 8.76859 9.68732 10.6061
11.5248 12.4435 13.3623 14.281 15.1997 16.1184 17.0372 17.9559 18.8746 19.7933 20.712
21.6307 22.5494 23.4681 24.3868 25.3055 26.2242 27.1429 28.0616 28.9803 29.899 30.8177
31.7364 32.6551 33.5738 34.4925 35.4112 36.3299 37.2486

0.0976918 0.0976918 0.195384 0.293075 0.390767 0.488459 0.586151 0.683843 0.781535 0.879226 0.976918 1.07461
1.1723 1.26999 1.36769 1.46538 1.56307 1.66076 1.75845 1.85614 1.95384 2.0515278 2.1492196
2.2469114 2.3446032 2.442295 2.5399868 2.6376786 2.7353704 2.8330622 2.930754 3.0284458 3.1261376 3.2238294
3.3215212 3.419213 3.5169048 3.6145966 3.7122884 3.8099802 3.907672

# definition 2 WDFW

0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5
12.5 13.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5 21.5 22.5
23.5 24.5 25.5 26.5 27.5 28.5 29.5 30.5 31.5 32.5 33.5
34.5 35.5 36.5 37.5 38.5 39.5 40.5

0.112926 0.112926 0.225851 0.338777 0.451702 0.564628 0.677553 0.790479 0.903404 1.01633 1.12926 1.24218
1.35511 1.46803 1.58096 1.69388 1.80681 1.91973 2.03266 2.14559 2.25851 2.371446 2.484372
2.597298 2.710224 2.82315 2.936076 3.049002 3.161928 3.274854 3.38778 3.500706 3.613632 3.726558
3.839484 3.95241 4.065336 4.178262 4.291188 4.404114 4.51704

### Age composition data ###

675 # Number of age comp observations using restricted length ranges

2 # Length bin refers to: 1=population length bin indices; 2=data length bin indices; 3= actual pop? data? lengths match bins?

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

# Conditional ages for surveys, marginal for fishing fleets

# Year Season Type Gender Partition ageerr Lbin_lo Lbin_hi Nsamps Data: females then males

# 2011 Southern California trawl fleet age error key 1, unchanged from 2007 (n=9)

1981 1 1 3 0 1 -1 -1 4.83 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 1000.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 500.000 500.000 500.000 0.000 500.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 #

1983 1 1 3 0 1 -1 -1 3.55 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 500.000 0.000 0.000 500.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 500.000 500.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 #

1984 1 1 3 0 1 -1 -1 18.69 0.000 0.000 0.000
123.718 96.225 94.482 0.000 280.996 500.000 1000.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 500.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 13.746 123.718 68.732 96.225 0.000 513.746 1500.000 0.000 0.000 500.000
0.000 500.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 500.000 1000.000 1000.000 0.000 0.000 0.000 0.000 0.000
0.000 #

1985 1 1 3 0 1 -1 -1 18.97 0.000 0.000 0.000
0.000 0.000 364.773 2026.000 1982.173 890.773 559.273 242.250 182.800 182.800 0.000
0.000 0.000 0.000 0.000 364.773 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 2000.000 26.000 742.250 91.400 716.667 91.400
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
364.773 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
364.773 #

2002 1 1 3 0 1 -1 -1 1.83 0.000 0.000 0.000
0.000 0.000 0.000 1.000 2.000 0.000 1.000 1.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 1.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 #

2003 1 1 2 0 1 -1 -1 1.28 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 1.000 1.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 #

2004 1 1 2 0 1 -1 -1 1.14 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 1.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 #

2005 1 1 3 0 1 -1 -1 3.55 0.000 0.000 1.000
0.000 0.000 0.000 0.000 0.000 1.000 0.000 1.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
0.000

2007 1 1 3 0 1 -1 -1 4.898 0 0 0
0 3.5384615 0.8846154 1.7692308 0.8846154 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 4.4230769 5.3076923 0.8846154 0 377.5 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

# 2011 Northern California trawl fleet age key 1, unchanged from 2007
(n=12)

1981 1 2 3 0 1 -1 -1 64.39 0 0 0
0 171.871 155.052 143.855 552.491 960.329 1078.854 476.593 252.977 1164.645 612.456

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 614.869 | 571.3 | 520.123 | 14.04 | 124.939 | 44.745 | 329.82 | 465.292 | 0 | 71.3 | 0 |
| | 11.489 | 49.48 | 0 | 0 | 135.129 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 37.002 | 252.396 | 64.149 | 1172.284 | 1017.173 | 370.414 | 604.302 | 357.478 |
| | 930.652 | 604.664 | 724.354 | 427.77 | 0 | 12.17 | 0 | 60.526 | 404.792 | 0 | 71.3 |
| | 0 | 0 | 37.489 | 0 | 0 | 0 | 0 | 0 | 15.023 | 0 | 0 |
| | 26.776 | | | | | | | | | | |
| 1982 | 1 | 2 | 3 | 0 | 1 | -1 | -1 | 79.98 | 0 | 0 | 0 |
| | 0 | 0 | 455.671 | 505.739 | 809.562 | 534.882 | 1664.928 | 1515.326 | 1705.311 | 157.233 | 895.207 |
| | 551.145 | 0 | 381.29 | 441.215 | 11.588 | 0 | 15.135 | 0 | 429.253 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 439.254 | 0 | 0 | 30.154 | 974.703 | 137.143 | 1009.961 | 1363.132 | 2457.232 | 1390.602 | 821.069 |
| | 257.505 | 147.106 | 380.196 | 762.581 | 221.857 | 468.665 | 49.057 | 887.256 | 167.18 | 572.83 | 721.857 |
| | 0 | 0 | 0 | 221.857 | 0 | 0 | 0 | 0 | 500 | 0 | 0 |
| | 221.857 | | | | | | | | | | |
| 1983 | 1 | 2 | 3 | 0 | 1 | -1 | -1 | 167.1 | 0 | 0 | 0 |
| | 5.747 | 93.377 | 219.512 | 952.225 | 2093.845 | 2071.412 | 562.523 | 1666.687 | 225.84 | 1206.857 | 921.75 |
| | 1972.97 | 464.367 | 655.391 | 211.598 | 193.744 | 8.84 | 457.666 | 0 | 859.848 | 283.133 | 769.938 |
| | 0 | 0 | 54.392 | 250.705 | 0 | 205.045 | 0 | 359.848 | 0 | 364.923 | 0 |
| | 0 | 0 | 0 | 303.942 | 103.889 | 1867.813 | 1936.779 | 2824.357 | 1371.667 | 4971.029 | 1015.804 |
| | 905.464 | 531.908 | 749.27 | 1574.26 | 1477.369 | 37.216 | 596.812 | 902.296 | 820.007 | 27.843 | 564.893 |
| | 127.532 | 323.87 | 359.848 | 0 | 52.019 | 62.04 | 0 | 0 | 500 | 0 | 205.045 |
| | 1400.464 | | | | | | | | | | |
| 1984 | 1 | 2 | 3 | 0 | 1 | -1 | -1 | 109.4 | 0 | 0 | 0 |
| | 0 | 0 | 1163.744 | 740.745 | 1490.822 | 1832.411 | 1163.223 | 1672.036 | 1004.852 | 398.358 | 1296.562 |
| | 399.151 | 1603.336 | 137.387 | 106.831 | 80.773 | 201.809 | 68.85 | 0 | 147.961 | 154.25 | 0 |
| | 235.778 | 0 | 199.282 | 525.262 | 0 | 24.386 | 0 | 0 | 229.966 | 476.896 | 0 |
| | 0 | 0 | 0 | 56.725 | 169.882 | 567.39 | 1413.331 | 878.886 | 1800.631 | 1602.013 | 1773.945 |
| | 77.472 | 0 | 972.6 | 305.052 | 414.354 | 426.362 | 10.9 | 143.35 | 0 | 334.353 | 432.588 |
| | 0 | 500.51 | 504.399 | 0 | 142.608 | 376.596 | 10.9 | 166.157 | 293.26 | 146.63 | 158.861 |
| | 540.507 | | | | | | | | | | |
| 1985 | 1 | 2 | 3 | 0 | 1 | -1 | -1 | 112.37 | 0 | 0 | 0 |
| | 0 | 78.393 | 208.954 | 1380.992 | 1828.328 | 2118.386 | 888.288 | 2023.116 | 1224.364 | 815.748 | 139.485 |
| | 190.525 | 1057.559 | 633.697 | 302.63 | 1089.635 | 434.647 | 1384.695 | 108.774 | 325.874 | 293.774 | 434.647 |
| | 347.121 | 288.03 | 0 | 190.525 | 186.804 | 0 | 0 | 0 | 2.386 | 576.061 | 0 |
| | 0 | 0 | 0 | 24.733 | 117.263 | 1527.011 | 918.644 | 3339.029 | 2520.794 | 2081.283 | 1501.902 |
| | 1062.287 | 599.978 | 139.485 | 415.724 | 769.725 | 453.161 | 0 | 16.76 | 340.399 | 347.121 | 470.495 |
| | 1107.642 | 951.585 | 190.525 | 614.351 | 105.98 | 0 | 884.767 | 0 | 0 | 0 | 44.225 |
| | 299.298 | | | | | | | | | | |
| 1987 | 1 | 2 | 2 | 0 | 1 | -1 | -1 | 1.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 159.1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 2 | 3 | 0 | 1 | -1 | -1 | 4.86 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 1.818 | 1.818 | 1.818 | 5.455 | 5.455 | 5.455 | 3.636 | 3.636 |
| | 1.818 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 1.818 | 3.636 | 0 | 5.455 | 3.636 |
| | 5.455 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2002 | 1 | 2 | 3 | 0 | 1 | -1 | -1 | 14.52 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 4.495 | 7.773 | 3.795 | 18.61 | 8.061 | 4.495 | 0 |
| | 3.495 | 0 | 1.378 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 6.448 | 7.606 | 7.931 | 4.031 | 10.479 | 10.463 | 8.984 |
| | 7.485 | 1 | 1.3 | 0 | 1 | 0 | 1.3 | 0 | 0 | 0 | 0 |

0 0 0 0 0 0 0 0 0 0 0
1.378

2003 1 2 3 0 1 -1 -1 8.66 0 0 0
0 0 0 1 5 10 1 3 4 4 2
1 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 1 1 4 0 1
2 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

2004 1 2 3 0 1 -1 -1 9.93 0 0 0
1 5 5 16.6 3 0 1 0 16.6 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 3 0 18.6 3 16.6 3 0 15.6
0 2 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

2005 1 2 2 0 1 -1 -1 2.69 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0 1 0 0
2 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

2009 1 2 3 0 1 -1 -1 5.898 0 0 0
0 0 0 0 8.578947 2.789474 0 0 0 2.789474 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 5.578947 5.578947 13.947368 2.789474 3 8.368421
0 2.789474 0 2.789474 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

# 2011 Oregon trawl fleet with age error key 1 (n=30)

1980 1 3 3 0 1 -1 -1 56.48 0 0 0
0 0 0 19.05 35.52 32.94 16.47 246.15 295.52 515.24 496.79
351.5 783.85 869.63 199.17 604.65 544.89 222.54 521.91 517.59 163.83 0
83.9 63.46 65.89 63.46 130.89 0 0 0 0 0 0
0 0 0 0 9.53 16.47 576.13 101.56 108.51 379.03 929.28
317.98 717.08 549.37 620.61 1542.47 567 1651.31 1082.51 537.62 326.8 1143.93
678.94 621.85 318.04 273.26 32.94 351.55 256.79 348.56 145.58 415.01 25.81
795.78

1981 1 3 3 0 1 -1 -1 10.28 0 0 0
0 0 0 0 230.6 0 0 1588.75 982.3 606.45 606.45
375.85 230.6 375.85 606.45 0 0 922.4 461.2 0 230.6 230.6
0 0 0 0 0 0 0 0 0 230.6 0
0 0 0 0 0 0 0 0 837.05 230.6 606.45
230.6 982.3 461.2 375.85 1127.55 837.05 375.85 375.85 0 1503.4 982.3
375.85 230.6 0 0 0 0 0 375.85 0 230.6 0
375.85

1983 1 3 3 0 1 -1 -1 204.74 0 0 0
0 213.85 243.32 1067.23 2195.06 2894.85 3879.9 3054.13 2751.51 3001.94 2812.47
2441.26 1118.25 575.7 963.69 1087.08 899.33 856.22 698.73 708.53 758.73 356.84
246.49 188.01 229.87 208.72 40.59 8.66 151.48 110.21 137.31 313.64 0
0 0 0 58.21 412.78 1536.55 3802.6 4895.68 4690.51 2230.23 2085.7
2325.31 2980.21 1874.6 1216.73 1364.16 1401.06 1057.61 1990.86 1478.44 1755.86 1479.07
1160.92 826.63 755.42 839.71 536.18 1019.78 705.68 949.37 605.53 501.43 355.5
3867.99

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1984 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 134.14 | 0 | 0 | 0 |
| | 21.34 | 44.67 | 297.88 | 678.21 | 1051.87 | 1813.32 | 2405.42 | 2707.95 | 1561.48 | 989.46 | 1656.51 |
| | 1000.46 | 680.96 | 312.68 | 509.46 | 396.11 | 273.4 | 934.27 | 404.89 | 651.02 | 449.53 | 245.7 |
| | 196.46 | 186.68 | 228.52 | 94.46 | 211.96 | 0 | 115.79 | 58.37 | 132.08 | 108.46 | 0 |
| | 0 | 0 | 13.58 | 32.34 | 487.31 | 970.32 | 1686.67 | 3250.02 | 3101.09 | 2451.24 | 1624.48 |
| | 1503.43 | 1119.42 | 1687.9 | 1367.79 | 737.54 | 395.19 | 588.85 | 807.48 | 1235.68 | 1265.38 | 992.92 |
| | 799.76 | 1025.54 | 621.04 | 756.9 | 528.96 | 266.94 | 512.33 | 270.61 | 586.62 | 459.05 | 607.24 |
| | 3300.09 | | | | | | | | | | |
| 1985 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 169.44 | 0 | 0 | 0 |
| | 0 | 0 | 347.4 | 892.9 | 1054.64 | 2274.97 | 2811.71 | 2492.57 | 1614.09 | 1467.35 | 962.32 |
| | 886.83 | 871.8 | 773.2 | 457.97 | 189.74 | 195.55 | 220.49 | 464.78 | 503.64 | 277.28 | 328.44 |
| | 0 | 67.79 | 0 | 192.89 | 18.73 | 7.33 | 54.49 | 0 | 59.69 | 221.41 | 0 |
| | 0 | 0 | 0 | 68.94 | 283.65 | 1450.61 | 2293.48 | 3475.91 | 2941.36 | 2071.01 | 1565.44 |
| | 1053.33 | 744.22 | 924.04 | 781.65 | 491.77 | 421.4 | 324.54 | 104.04 | 527.74 | 461.53 | 333.2 |
| | 269.89 | 489.42 | 290.3 | 361.34 | 424.52 | 365.72 | 485.23 | 131.69 | 120.15 | 108.18 | 191.72 |
| | 2552.09 | | | | | | | | | | |
| 1986 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 112.96 | 0 | 0 | 0 |
| | 0 | 115.75 | 332.04 | 597.07 | 533.66 | 538.7 | 895.69 | 911.89 | 1072.01 | 578.14 | 259.14 |
| | 433.14 | 227.18 | 329 | 75.73 | 50.59 | 77 | 0 | 197.54 | 175.05 | 46.17 | 53.45 |
| | 119.85 | 0 | 0 | 2.64 | 59.48 | 0 | 82.17 | 0 | 0 | 169.04 | 0 |
| | 0 | 0 | 46.99 | 173.73 | 276.85 | 553.37 | 1198.85 | 979.17 | 1180.24 | 760.34 | 789.55 |
| | 226.57 | 309.14 | 88.05 | 86.1 | 166.57 | 90.36 | 117.36 | 54.94 | 33.67 | 103.98 | 359.56 |
| | 71.87 | 252.85 | 98.8 | 0 | 87.7 | 165.19 | 46.68 | 25.33 | 99.53 | 22.69 | 53.45 |
| | 398.3 | | | | | | | | | | |
| 1987 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 204.74 | 0 | 0 | 0 |
| | 0 | 37.21 | 212.34 | 794.35 | 2129.22 | 2945.26 | 2629.97 | 3209.99 | 4059.39 | 3070.66 | 1858.35 |
| | 587.41 | 550.7 | 370 | 633.2 | 613.02 | 261.54 | 231.17 | 335.65 | 82.74 | 163.21 | 538.77 |
| | 155.12 | 114.89 | 187.71 | 75.32 | 59.43 | 0 | 66.38 | 0 | 4.95 | 9.9 | 0 |
| | 0 | 0 | 0 | 32.66 | 355.17 | 822.27 | 4310.45 | 5579.25 | 4110.6 | 5705.4 | 2803.37 |
| | 1591.15 | 1049.07 | 760.37 | 397.08 | 120.89 | 463.18 | 671.68 | 0 | 100.18 | 215.33 | 233.51 |
| | 313.26 | 349.13 | 311.5 | 440.98 | 143.06 | 20.59 | 190.19 | 4.95 | 55.77 | 2 | 1 |
| | 1089.11 | | | | | | | | | | |
| 1988 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 70.6 | 0 | 0 | 0 |
| | 0 | 0 | 68.9 | 213.76 | 358.77 | 1394.78 | 1091.61 | 900.07 | 1821.75 | 978.38 | 658 |
| | 377.13 | 334.92 | 265.26 | 83.34 | 57.36 | 97.7 | 96.64 | 57.36 | 163.84 | 327.67 | 0 |
| | 92.53 | 0 | 92.53 | 0 | 0 | 27.3 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 19.99 | 65.67 | 267.61 | 664.41 | 1172.29 | 779.35 | 799.97 | 636.23 |
| | 669.43 | 297.71 | 123.03 | 0 | 142.61 | 171.08 | 128.67 | 0 | 0 | 147.14 | 163.84 |
| | 39.27 | 0 | 194.33 | 0 | 0 | 92.53 | 105.85 | 0 | 27.3 | 142.61 | 39.27 |
| | 336.42 | | | | | | | | | | |
| 1989 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 155.32 | 0 | 0 | 0 |
| | 4.27 | 6.55 | 125.42 | 370.49 | 689.64 | 1617.32 | 2116.64 | 2477.78 | 1813.23 | 1254.55 | 1170.62 |
| | 1021.98 | 664.86 | 435.97 | 210.8 | 488.26 | 329.02 | 95.27 | 196.23 | 33.37 | 14.1 | 298.77 |
| | 0 | 0 | 0 | 80.03 | 95.51 | 45.84 | 151.76 | 95.27 | 79.26 | 64.36 | 0 |
| | 0 | 0 | 0 | 6.55 | 176.48 | 623.92 | 1093.26 | 1468.3 | 2833.55 | 1901.38 | 1531.16 |
| | 1438.69 | 769.44 | 487.09 | 410.98 | 153.26 | 573.08 | 217.81 | 378.43 | 248.76 | 80.74 | 203.56 |
| | 329.98 | 198.67 | 299.45 | 292.12 | 491.06 | 194.78 | 194.48 | 207.19 | 60.82 | 171.09 | 77.45 |
| | 1127.34 | | | | | | | | | | |
| 1990 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 141.2 | 0 | 0 | 0 |
| | 0 | 4.49 | 194.63 | 434.19 | 568.09 | 1310.92 | 1546.2 | 2061.42 | 1920.85 | 1431.23 | 1780.18 |
| | 852.48 | 696.77 | 409.35 | 372 | 158.55 | 172.78 | 131.11 | 86.6 | 85.9 | 0 | 14.44 |
| | 78.01 | 0 | 0 | 0 | 102.7 | 0 | 0 | 66.36 | 0 | 117.17 | 0 |
| | 0 | 0 | 0 | 52.45 | 69.36 | 567.73 | 810.15 | 1521.39 | 1745.46 | 2078.78 | 1963.51 |
| | 1355.73 | 826.72 | 597.59 | 281.34 | 374.28 | 118.84 | 336.56 | 184.54 | 97.36 | 103.99 | 54.48 |
| | 153.53 | 18.47 | 21.99 | 61.4 | 100.21 | 174.77 | 13.95 | 4.54 | 34.06 | 17.1 | 8.73 |
| | 600.63 | | | | | | | | | | |
| 1991 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 139.3 | 0 | 0 | 0 |
| | 14.43 | 263.33 | 511.35 | 1217.2 | 2454.17 | 2885.91 | 2056.63 | 3004.19 | 3368.6 | 2137.68 | 1340.45 |
| | 1143.29 | 776.91 | 418.42 | 605.16 | 204.88 | 46.75 | 260.47 | 187.14 | 63.21 | 0 | 42.28 |
| | 0 | 118.37 | 4.6 | 0 | 0 | 0 | 0 | 0 | 0 | 43.94 | 0 |
| | 0 | 0 | 43.28 | 163.89 | 558.29 | 1522.27 | 3025.42 | 4076.05 | 3925.59 | 2995.57 | 1915.95 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1143.95 | 1348.41 | 1143.72 | 270.69 | 350.63 | 493.29 | 230.77 | 736.93 | 0 | 227.31 | 299.15 |
| | 544.6 | 69.57 | 8.18 | 315.45 | 81.47 | 167.86 | 335.9 | 142.56 | 501.44 | 75.22 | 58.86 |
| | 705.99 | | | | | | | | | | |
| 1992 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 208.64 | 0 | 0 | 0 |
| | 2.55 | 413.58 | 463.3 | 2033.28 | 3041.33 | 4515.75 | 4390.17 | 3976.01 | 2159.07 | 4030.45 | 2278.95 |
| | 2040.72 | 1200.88 | 1617.42 | 500.68 | 514.04 | 404.87 | 327.69 | 179.64 | 219.02 | 256.07 | 0 |
| | 113.53 | 0 | 52.63 | 0 | 167.59 | 47.19 | 79.24 | 0 | 0 | 52.63 | 0 |
| | 0 | 0 | 0 | 282.33 | 1623.17 | 3676.17 | 3970.48 | 6987.89 | 4881.46 | 3766.99 | 3041.58 |
| | 2820.58 | 1956.42 | 1137.78 | 1303.64 | 402.65 | 875.22 | 547.43 | 337.7 | 605.52 | 409.48 | 647.44 |
| | 169.96 | 313.25 | 374.95 | 196.26 | 48.76 | 539.12 | 676 | 297.76 | 15.98 | 291.15 | 11.4 |
| | 2649.2 | | | | | | | | | | |
| 1993 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 155.32 | 0 | 0 | 0 |
| | 0 | 29.85 | 634.34 | 1569.56 | 3019.89 | 3095.63 | 2703.16 | 4714.31 | 3855.04 | 2706.53 | 3081.15 |
| | 1376.19 | 1544.73 | 1587.66 | 821.81 | 812.34 | 353.07 | 493.51 | 278.48 | 184.19 | 24.11 | 42.75 |
| | 216.37 | 168.79 | 20.85 | 0 | 24.13 | 44.98 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1.94 | 115.11 | 612.23 | 1868.88 | 4720.11 | 4477.75 | 4165.49 | 2607.38 | 1789.61 |
| | 1274.51 | 1721.1 | 870.31 | 1341.18 | 611.38 | 553.96 | 253.86 | 439.53 | 391.98 | 522.45 | 747.37 |
| | 248.36 | 230.17 | 12.42 | 7.63 | 129.57 | 75.44 | 80.14 | 108.24 | 143.66 | 0 | 150.52 |
| | 244.2 | | | | | | | | | | |
| 1994 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 28.24 | 0 | 0 | 0 |
| | 0 | 5.89 | 86.45 | 83.34 | 70.57 | 290.96 | 344.15 | 264.6 | 219.41 | 58.78 | 108.56 |
| | 71.55 | 90.05 | 105.93 | 5.89 | 34.38 | 71.55 | 71.55 | 71.55 | 71.55 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 5.89 | 0 | 36.19 | 95.96 | 463.38 | 481.89 | 571.58 | 114.94 | 89.91 |
| | 409.98 | 204.51 | 239.04 | 18.51 | 267.53 | 71.55 | 71.55 | 0 | 71.55 | 0 | 0 |
| | 18.51 | 71.55 | 71.55 | 18.51 | 0 | 71.55 | 0 | 143.09 | 105.93 | 0 | 71.55 |
| | 148.99 | | | | | | | | | | |
| 1995 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 98.84 | 0 | 0 | 0 |
| | 0 | 35.25 | 183.29 | 375.95 | 427.26 | 706.13 | 929.99 | 823.84 | 385.01 | 304.66 | 228.74 |
| | 24.7 | 126.23 | 25.38 | 57.4 | 25.38 | 32.44 | 0 | 0 | 34.04 | 0 | 5.24 |
| | 28.29 | 25.38 | 0 | 0 | 0 | 25.38 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 99.97 | 442.74 | 665.36 | 834.07 | 722.72 | 679.62 | 714.8 | 248.22 |
| | 197.24 | 82.33 | 84.22 | 49.86 | 89.39 | 117.58 | 74.94 | 0 | 75.2 | 0 | 4 |
| | 2.02 | 14.47 | 5.24 | 5.24 | 0 | 0 | 0 | 0 | 7.26 | 2.02 | 0 |
| | 45.53 | | | | | | | | | | |
| 1996 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 127.08 | 0 | 0 | 0 |
| | 3.36 | 160.51 | 534.04 | 791.92 | 863.43 | 832.35 | 633.67 | 891.68 | 889.35 | 343.43 | 275.18 |
| | 198.46 | 248.04 | 224.59 | 156.89 | 57.34 | 65.77 | 0 | 38.78 | 0 | 0 | 10.22 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 49.84 | 0 |
| | 0 | 0 | 3.04 | 185.66 | 429.31 | 829.92 | 1018.71 | 779.63 | 986.75 | 858.1 | 656.72 |
| | 337.01 | 155.98 | 244.5 | 159.71 | 277.98 | 11.14 | 144.71 | 129.01 | 72.46 | 298.68 | 83.19 |
| | 18.24 | 38.78 | 33.34 | 0 | 90.68 | 94.5 | 0 | 33.34 | 0 | 101.43 | 33.34 |
| | 336.67 | | | | | | | | | | |
| 1997 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 197.68 | 0 | 0 | 0 |
| | 0 | 51.59 | 64.83 | 349.07 | 818.04 | 1736.64 | 1421.12 | 1485.09 | 1605.77 | 1205.97 | 869.35 |
| | 354.36 | 225.61 | 90.33 | 108.79 | 172.03 | 63.49 | 67.89 | 61.87 | 72.27 | 1.25 | 20.93 |
| | 0 | 1.25 | 55.88 | 0 | 0 | 0 | 0 | 27.9 | 0 | 25.3 | 0 |
| | 0 | 0 | 20.88 | 4.09 | 308.4 | 1099.7 | 1660.68 | 2509.52 | 2396.53 | 1987.46 | 1923.81 |
| | 912.12 | 395.82 | 374.02 | 207.74 | 146.71 | 40.69 | 122.27 | 55.51 | 73.22 | 32.75 | 60.9 |
| | 119.25 | 0 | 26.97 | 0 | 9.55 | 74.45 | 62.76 | 0 | 0 | 12.32 | 30.84 |
| | 254.48 | | | | | | | | | | |
| 1998 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 197.68 | 0 | 0 | 0 |
| | 2.07 | 36 | 327.77 | 792.85 | 1678.77 | 1731.38 | 1655.66 | 1395.26 | 1091.29 | 854.64 | 706.85 |
| | 481.61 | 383.38 | 207.73 | 278.32 | 152.15 | 126.02 | 73.71 | 60.84 | 51.47 | 5.78 | 5.78 |
| | 18.27 | 42.7 | 0 | 5.78 | 0 | 0 | 0 | 10.56 | 0 | 18.6 | 0 |
| | 0 | 4.14 | 0 | 89.44 | 393.44 | 1072.2 | 1778.63 | 1994.73 | 1877.68 | 1679.61 | 1226.51 |
| | 976.08 | 669.63 | 458.28 | 355.6 | 207.04 | 218.68 | 223.54 | 111.14 | 37.93 | 87.07 | 205.03 |
| | 99.25 | 92.03 | 27.04 | 12.9 | 48.02 | 25.69 | 26.45 | 20.94 | 46.42 | 20.94 | 43.88 |
| | 574 | | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1999 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 197.68 | 0 | 0 | 0 |
| | 9 | 88.84 | 188.82 | 727.04 | 1194.62 | 921.11 | 1389.45 | 1378.86 | 1329.71 | 1244.84 | 867.28 |
| | 582.05 | 613.98 | 402.39 | 151.59 | 158.48 | 127.16 | 115.89 | 64.67 | 8.7 | 30.25 | 0 |
| | 67.94 | 0 | 9.93 | 0 | 0 | 0 | 33.71 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 27 | 107.78 | 231.3 | 603.84 | 1435.07 | 1332.68 | 1234.18 | 1425.47 | 1110.01 |
| | 700.26 | 1107.75 | 448.5 | 433.63 | 184.38 | 169.78 | 176.09 | 239.13 | 156.69 | 50.48 | 116.86 |
| | 84.61 | 43.37 | 92.91 | 0 | 0 | 82.37 | 33.71 | 0 | 0 | 0 | 3.46 |
| | 219.35 | | | | | | | | | | |
| 2000 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 83.62 | 0 | 0 | 0 |
| | 4.67 | 23.7 | 22.43 | 30.52 | 37.79 | 47.37 | 44.8 | 34.34 | 23.33 | 19.55 | 7.48 |
| | 11.21 | 1.51 | 2.15 | 3.54 | 2.22 | 1.95 | 1.11 | 1.15 | 1 | 0 | 0 |
| | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1.98 | 17.89 | 37.86 | 49.57 | 56.73 | 47.62 | 45.69 | 30.95 | 31.99 |
| | 15.84 | 12.61 | 3.9 | 6.1 | 3.71 | 1.11 | 2.43 | 2.27 | 1.04 | 0 | 0 |
| | 2.15 | 0 | 2.12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 125.29 | 0 | 0 | 0 |
| | 0 | 4.1 | 38.58 | 84.08 | 84.15 | 71.38 | 53.93 | 36.72 | 27.53 | 46.64 | 21.51 |
| | 8.27 | 7.05 | 11.18 | 2.5 | 2.1 | 3.2 | 4.64 | 3.61 | 1.03 | 2.38 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1.12 | 8.53 | 32.21 | 77.64 | 67.76 | 109.39 | 64.38 | 63.92 | 35.59 |
| | 28.76 | 14.27 | 13.55 | 9.58 | 2.22 | 6.62 | 0.97 | 7.72 | 0 | 2.97 | 0 |
| | 0 | 1.42 | 1.84 | 2.84 | 0 | 0 | 0.84 | 1.22 | 0 | 2.64 | 1.42 |
| | 4.88 | | | | | | | | | | |
| 2002 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 178.93 | 0 | 0 | 0 |
| | 0 | 16.71 | 37.41 | 99.06 | 185.37 | 88.18 | 55.67 | 53.49 | 55.52 | 42.61 | 40.62 |
| | 34.03 | 21.3 | 28.36 | 7.04 | 25.29 | 11.22 | 11.8 | 5.08 | 4.95 | 0 | 5.1 |
| | 0 | 0 | 0 | 0 | 0 | 1.12 | 0 | 1 | 1.12 | 2.25 | 0 |
| | 0 | 0 | 1 | 22.67 | 49.03 | 123.32 | 146.9 | 70.71 | 87.49 | 62.46 | 64.63 |
| | 45.97 | 25.83 | 34.91 | 3.12 | 19.96 | 10.62 | 10.75 | 6.27 | 7.46 | 8.29 | 4.11 |
| | 1 | 1 | 1.25 | 0 | 0 | 0 | 0 | 0 | 3.11 | 1.01 | 1.01 |
| | 15.43 | | | | | | | | | | |
| 2003 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 71.36 | 0 | 0 | 0 |
| | 0 | 5.6 | 17.43 | 53.6 | 151.65 | 136.21 | 102.06 | 83.91 | 43.98 | 121.1 | 56.27 |
| | 34.54 | 0 | 57.05 | 4.97 | 5.85 | 43.27 | 0 | 0 | 0 | 0 | 3.97 |
| | 0 | 0 | 3.97 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 5.83 | 5.6 | 28.7 | 113.66 | 150.22 | 46.81 | 121.04 | 89.61 | 56.13 |
| | 54.9 | 42.05 | 29.75 | 14.27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 5.85 | | | | | | | | | | |
| 2004 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 121.27 | 0 | 0 | 0 |
| | 52.03 | 42.14 | 80.95 | 642.46 | 514.63 | 289.82 | 165.7 | 267.37 | 348.35 | 115.6 | 76.53 |
| | 50.32 | 15.41 | 52.56 | 7.94 | 55.59 | 0 | 0 | 0 | 0 | 24.42 | 0 |
| | 0 | 12.78 | 0 | 0 | 0 | 24.42 | 0 | 24.42 | 0 | 21.95 | 0 |
| | 0 | 0 | 43.91 | 201.19 | 261.67 | 423.86 | 309.45 | 342.23 | 230.96 | 66.43 | 77.79 |
| | 37.44 | 72.67 | 42.6 | 53.33 | 55.48 | 35.36 | 0 | 0 | 35.36 | 11.63 | 0 |
| | 12.78 | 12.78 | 0 | 0 | 0 | 0 | 0 | 16.88 | 12.78 | 0 | 0 |
| | 24.95 | | | | | | | | | | |
| 2005 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 156.83 | 0 | 0 | 22.54 |
| | 499.53 | 454.46 | 97.75 | 200.21 | 315.66 | 192.28 | 853.61 | 964.5 | 683.5 | 183.04 | 173.87 |
| | 124.78 | 59.88 | 136.15 | 119.21 | 25.68 | 43.61 | 22.12 | 8.13 | 0 | 4.39 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 22.54 | 386.85 | 841.31 | 72.32 | 149.34 | 609.89 | 219.59 | 426.67 | 799.94 | 700.6 | 248.48 |
| | 45.82 | 255.43 | 39.16 | 101.72 | 75.73 | 53.87 | 0 | 10.66 | 75.58 | 0 | 45.07 |
| | 0 | 51.66 | 0 | 0 | 4.76 | 0 | 0 | 5.84 | 0 | 0 | 0 |
| | 19.4 | | | | | | | | | | |
| 2006 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 79.4 | 0 | 0 | 0 |
| | 10.35 | 10.03 | 20.71 | 49.06 | 64.87 | 39.61 | 74.88 | 88.58 | 67.97 | 20.91 | 26.92 |
| | 36.46 | 34.12 | 32.74 | 0 | 0 | 16.65 | 0 | 0 | 0 | 5.55 | 0 |
| | 14.91 | 5.43 | 0 | 0 | 5.55 | 5.41 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 10.89 | 5.52 | 10.64 | 32.56 | 42.16 | 97.16 | 95.76 | 77.14 | 65.55 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10.68 | 35.09 | 32.85 | 24.61 | 21.97 | 32.76 | 22.1 | 11.32 | 27.72 | 16.28 | 16.08 |
| | 5.54 | 5.54 | 5.52 | 0 | 5.52 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 31.97 | | | | | | | | | | |
| 2007 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 52.77 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 23.06 | 45.16 | 39.76 | 53.27 | 21.34 | 28.17 | 16.92 | 22.41 |
| | 22.35 | 16.53 | 17.42 | 31.33 | 11.05 | 4.63 | 6 | 0 | 5.69 | 10.86 | 10.44 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4.44 | 0 |
| | 0 | 0 | 0 | 4.43 | 5.96 | 11.72 | 20.49 | 28.12 | 11.76 | 34.47 | 17.55 |
| | 34.26 | 5.5 | 0 | 5.76 | 5.69 | 6.03 | 5.58 | 0 | 0 | 6.03 | 5.76 |
| | 0 | 0 | 5.29 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 68.84 | 0 | 0 | 0 |
| | 7.32 | 51.21 | 18.17 | 3.66 | 6.54 | 9.06 | 18.54 | 22.03 | 12.94 | 13.08 | 32.24 |
| | 26.38 | 16.25 | 10.68 | 13.76 | 14.16 | 3.75 | 11.09 | 6.7 | 10.53 | 6.92 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 51.21 | 25.63 | 13.24 | 3.66 | 65.96 | 36.9 | 33.99 | 26.86 |
| | 14.73 | 26 | 11.05 | 2.43 | 0 | 3.77 | 0 | 3.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 3.77 | | | | | | | | | | |
| 2009 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 146.792 | 0 | 0 | 0 |
| | 2.0925553 | 9.3681847 | 14.4932452 | | 9.1132713 | 15.5692952 | | 17.0331179 | | 25.3384784 | |
| | 16.7870823 | | 19.03439 | 36.4969433 | | 18.6281219 | | 17.2906985 | | 19.5992313 | |
| | 12.3118978 | | 7.2343818 | 4.204539 | 4.1559596 | 12.9444367 | | 3.0075738 | 2.9488291 | 2.0379242 | 1 |
| | 3.6191237 | 0 | 0 | 1.3105802 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 2.0925553 | 7.1790007 | 15.9310813 | | 30.1996987 | | 20.9865393 | | |
| | 25.0714211 | | 25.7447506 | | 23.9571792 | | 21.2769225 | | 18.4151556 | | |
| | 12.3757234 | | 17.1426863 | | 6.879579 | 8.2673854 | 8.2573631 | 8.7647022 | 7.7486083 | 4.9317406 | 3.2783221 |
| | 5.3404898 | 0 | 1.9608086 | 3.5289641 | 4.0958998 | 1.0645377 | 0 | 6.5645377 | 1.0379242 | 0.9917355 | 0 |
| | 0 | 3.3049157 | | | | | | | | | |
| 2010 | 1 | 3 | 3 | 0 | 1 | -1 | -1 | 77.23 | 0 | 0 | 0 |
| | 0 | 2.4705882 | 10.6386995 | | 13.9228992 | | 11.4753185 | | 10.5993598 | | |
| | 12.9548041 | | 11.6713378 | | 10.3070547 | | 21.10332 | 13.9532251 | | 15.7292023 | |
| | 13.2454596 | | 9.0060009 | 8.7772302 | 3.946545 | 4.5370505 | 7.4931692 | 5.3676939 | 2.0628475 | 0 | 0 |
| | 1.0152284 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 4.9411765 | 7.4117647 | 13.8261929 | | 11.8715767 | | 28.0410943 | |
| | 34.7698006 | | 10.5543718 | | 23.4121578 | | 13.5892115 | | 18.0260708 | | |
| | 13.5292808 | | 9.0002948 | 2 | 5.9821816 | 5.5024839 | 8.1016557 | 2.0232929 | 3.4863548 | 3.0659241 | 1.034749 |
| | 1.0311751 | 1.455898 | 1.0311751 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.7014306 |
| # | 2011 | Washington | | trawl | fleet | with | age | error | key | 2 | (n=27) |
| 1980 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 63.54 | 0 | 0 | 0 |
| | 197.856 | 593.568 | 396.629 | 1782.537 | 2489.546 | 2108.809 | 1338.983 | 1203.147 | 1742.406 | 979.166 | 523.004 |
| | 349.047 | 550.754 | 313.489 | 140.015 | 158.685 | 1.833 | 19.765 | 40.447 | 93.676 | 93.676 | 0 |
| | 0 | 0 | 0.917 | 0 | 0 | 0 | 0 | 0.917 | 0.917 | 34.681 | 0 |
| | 0 | 0 | 0 | 407.868 | 2179.166 | 2375.189 | 2605.64 | 2680.213 | 1307.968 | 680.679 | 1099.193 |
| | 923.254 | 969.905 | 424.226 | 461.088 | 208.162 | 339.534 | 672.852 | 262.307 | 529.635 | 263.6 | 23.08 |
| | 138.003 | 24.312 | 45.244 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 21.852 | | | | | | | | | | |
| 1981 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 105.9 | 0 | 0 | 0 |
| | 0 | 128.193 | 9.959 | 10.724 | 12.287 | 122.478 | 74.761 | 594.275 | 195.686 | 45.926 | 170.838 |
| | 119.875 | 134.728 | 18.468 | 86.509 | 5.229 | 42.607 | 45.413 | 3.074 | 42.659 | 41.096 | 0 |
| | 1.512 | 0 | 1.211 | 0 | 0 | 0 | 2.506 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 25.279 | 6.387 | 14.254 | 61.684 | 155.147 | 78.437 | 71.992 | 121.15 |
| | 131.121 | 127.297 | 157.244 | 139.759 | 235.427 | 52.422 | 47.504 | 323.773 | 6.14 | 190.745 | 46.19 |
| | 2.506 | 2.423 | 2.723 | 4.017 | 5.363 | 812.664 | 50.744 | 0 | 140.832 | 4.824 | 45.92 |
| | 375.698 | | | | | | | | | | |
| 1983 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 56.48 | 0 | 0 | 0 |
| | 0 | 47.393 | 204.351 | 116.651 | 376.633 | 543.503 | 647.165 | 786.236 | 513.667 | 313.955 | 571.866 |
| | 612.908 | 372.35 | 456.148 | 305.658 | 144.816 | 98.026 | 13.324 | 114.722 | 51.957 | 0 | 60.237 |
| | 0 | 3.242 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 47.357 | 348.393 | 116.006 | 602.288 | 716.108 | 737.761 | 708.251 | 301.112 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 626.935 | 366.265 | 263.968 | 243.317 | 297.65 | 34.542 | 193.193 | 58.379 | 11.017 | 13.485 | 110.841 |
| | 76.964 | 9.635 | 6.484 | 53.907 | 63.479 | 7.062 | 56.995 | 6.423 | 3.242 | 53.248 | 8.791 |
| | 250.507 | | | | | | | | | | |
| 1984 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 35.3 | 0 | 0 | 0 |
| | 0 | 0 | 1.763 | 2.545 | 2.818 | 4.64 | 6.184 | 10.739 | 10.565 | 3.864 | 4.321 |
| | 5.228 | 6.569 | 2.269 | 4.346 | 1.86 | 0.626 | 0.723 | 1.096 | 1.86 | 2.955 | 0.764 |
| | 1.096 | 1.096 | 1.428 | 0.332 | 0.764 | 0.332 | 0 | 0 | 0.764 | 1.29 | 0 |
| | 0 | 0 | 0 | 0.295 | 2.738 | 3.719 | 4.725 | 5.817 | 9.012 | 9.617 | 10.829 |
| | 6.161 | 8.972 | 5.959 | 5.091 | 4.767 | 5.779 | 3.15 | 0.589 | 2.449 | 1.253 | 1.45 |
| | 1.979 | 3.629 | 3.407 | 1.338 | 0 | 1.86 | 1.51 | 0.764 | 1.018 | 1.096 | 2.586 |
| | 16.689 | | | | | | | | | | |
| 1985 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 77.66 | 0 | 0 | 0 |
| | 0 | 24.966 | 77.114 | 160.98 | 525.73 | 876.991 | 1055.242 | 1039.556 | 1143.94 | 971.531 | 679.445 |
| | 808.435 | 415.751 | 872.222 | 841.102 | 443.115 | 255.738 | 34.561 | 286.07 | 30.222 | 181.618 | 95.63 |
| | 0 | 27.688 | 190.57 | 23.349 | 93.582 | 13.594 | 3.407 | 3.407 | 23.349 | 108.796 | 0 |
| | 0 | 0 | 0 | 13.746 | 31.687 | 298.628 | 568.105 | 874.201 | 911.162 | 1282.77 | 1454.375 |
| | 914.483 | 478.458 | 1288.801 | 346.835 | 694.629 | 319.681 | 341.64 | 582.884 | 97.176 | 74.795 | 237.387 |
| | 282.908 | 273.95 | 119.666 | 167.058 | 225.247 | 128.492 | 162.235 | 155.68 | 76.885 | 148.458 | 51.446 |
| | 1783.508 | | | | | | | | | | |
| 1986 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 120.02 | 0 | 0 | 0 |
| | 0 | 18.529 | 408.778 | 806.492 | 1723.598 | 1383.059 | 2148.497 | 1304.307 | 1014.918 | 822.288 | 325.707 |
| | 449.712 | 90.307 | 74.703 | 18.4 | 17.6 | 0 | 26.342 | 120.097 | 39.983 | 0 | 13.617 |
| | 32.008 | 0 | 0 | 74.703 | 25.212 | 0 | 0 | 0 | 98.591 | 215.059 | 0 |
| | 0 | 0 | 36.8 | 183.963 | 399.326 | 1417.868 | 2273.825 | 1973.574 | 2032.468 | 1279.494 | 1012.664 |
| | 517.203 | 231.766 | 387.022 | 330.388 | 56.983 | 85.667 | 214.376 | 85.947 | 98.591 | 236.679 | 15.508 |
| | 29.126 | 135.406 | 0 | 30.599 | 39.983 | 236.995 | 112.24 | 0 | 0 | 98.591 | 39.983 |
| | 528.395 | | | | | | | | | | |
| 1987 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 35.3 | 0 | 0 | 0 |
| | 0 | 9.514 | 14.482 | 232.047 | 591.465 | 1198.636 | 464.937 | 1283.877 | 566.967 | 258.992 | 248.608 |
| | 132.23 | 4.968 | 117.748 | 87.805 | 8.7 | 31.07 | 14.482 | 82.837 | 0 | 4.968 | 0 |
| | 0 | 0 | 0 | 0 | 4.968 | 8.7 | 0 | 0 | 0 | 4.968 | 0 |
| | 0 | 0 | 0 | 9.514 | 28.543 | 330.994 | 1014.186 | 928.203 | 835.81 | 766.291 | 422.688 |
| | 207.915 | 107.677 | 227.922 | 96.506 | 8.7 | 8.7 | 9.514 | 121.481 | 0 | 0 | 121.481 |
| | 82.837 | 92.773 | 4.968 | 0 | 0 | 0 | 0 | 0 | 4.968 | 112.78 | 0 |
| | 241.169 | | | | | | | | | | |
| 1988 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 116.84 | 0 | 0 | 0 |
| | 3.46 | 54.692 | 144.477 | 114.149 | 628.071 | 1233.436 | 1497.347 | 3014.89 | 1784.404 | 1085.264 | 1188.129 |
| | 1026.811 | 643.289 | 495.689 | 405.392 | 297.493 | 143.862 | 226.799 | 0 | 155.249 | 0 | 7.193 |
| | 9.395 | 125.072 | 0 | 125.072 | 0 | 0 | 0 | 18.149 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 112.942 | 180.53 | 392.496 | 666.557 | 769.119 | 1432.41 | 2562.971 | 909.355 |
| | 1497.354 | 816.099 | 754.66 | 130.905 | 858.614 | 601.765 | 174.833 | 335.49 | 550.31 | 200.236 | 167.64 |
| | 7.193 | 101.727 | 24.992 | 116.112 | 162.441 | 0.918 | 27.544 | 9.395 | 71.329 | 12.392 | 0 |
| | 1575.847 | | | | | | | | | | |
| 1989 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 55.05 | 0 | 0 | 0 |
| | 6.23 | 1244.059 | 293.912 | 594.113 | 1103.508 | 552.055 | 68.305 | 645.017 | 651.91 | 106.366 | 1413.011 |
| | 68.305 | 50.847 | 44.284 | 523.088 | 38.363 | 0 | 15.275 | 31.508 | 8.42 | 0 | 0 |
| | 0 | 4.671 | 0 | 0 | 0 | 0 | 14.668 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 949.548 | 222.815 | 65.124 | 891.13 | 391.225 | 165.293 | 619.173 | 474.863 |
| | 90.786 | 1231.735 | 27.759 | 29.943 | 462.358 | 4.671 | 500 | 514.668 | 284.773 | 0 | 4.671 |
| | 0 | 10.603 | 499.729 | 0 | 13.091 | 25.271 | 437.087 | 14.668 | 0 | 0 | 0 |
| | 25.254 | | | | | | | | | | |
| 1990 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 59.99 | 0 | 0 | 0 |
| | 0 | 144.113 | 37.798 | 44.916 | 231.478 | 154.412 | 938.048 | 233.747 | 1191.783 | 728.206 | 190.805 |
| | 586.219 | 526.559 | 128.421 | 512.798 | 531.691 | 21.448 | 12.798 | 20.486 | 0 | 0 | 11.206 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 10.243 | 0 | 0 | 98.687 | 0 |
| | 0 | 500 | 0 | 17.728 | 22.16 | 156.157 | 1265.852 | 835.947 | 1222.395 | 742.329 | 166.946 |
| | 778.705 | 203.822 | 621.793 | 45.518 | 21.763 | 515.419 | 0 | 0 | 1.343 | 80.598 | 1.343 |
| | 59.149 | 0 | 10.243 | 0 | 0 | 11.52 | 20.486 | 10.243 | 500 | 10.243 | 10.243 |
| | 262.278 | | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1991 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 141.2 | 0 | 0 | 0 |
| | 0 | 0 | 108.733 | 427.936 | 1266.002 | 1556.286 | 2991.128 | 4253.078 | 2618.288 | 2117.95 | 2867.729 |
| | 992.425 | 750.62 | 1218.003 | 1015.89 | 525.707 | 1002.853 | 488.385 | 324.756 | 376.611 | 139.321 | 95.622 |
| | 3.321 | 45.588 | 4.992 | 142.128 | 0 | 0 | 0 | 0 | 0 | 3.321 | 0 |
| | 0 | 0 | 0 | 0 | 61.924 | 1472.776 | 1957.819 | 3038.192 | 3808.162 | 4293.543 | 3812.485 |
| | 3256.649 | 2156.356 | 1559.364 | 2307.786 | 741.689 | 1013.608 | 109.686 | 710.021 | 423.87 | 364.805 | 895.027 |
| | 260.072 | 230.59 | 0 | 184.908 | 100.503 | 184.908 | 45.588 | 796.244 | 274.587 | 517.603 | 189.141 |
| | 2787.822 | | | | | | | | | | |
| 1992 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 71.62 | 0 | 0 | 0 |
| | 19.331 | 222.05 | 230.699 | 271.872 | 523.226 | 304.573 | 868.709 | 845.847 | 1132.027 | 409.754 | 745.978 |
| | 710.722 | 119.446 | 264.023 | 50.24 | 35.236 | 50.24 | 50.24 | 4.371 | 50.24 | 0 | 0 |
| | 0 | 0 | 240.214 | 0 | 0 | 50.24 | 0 | 0 | 0 | 50.24 | 0 |
| | 0 | 0 | 24.121 | 261.448 | 258.702 | 371.445 | 725.46 | 1340.597 | 1389.456 | 1428.147 | 231.265 |
| | 908.499 | 615.515 | 613.302 | 248.579 | 603.836 | 173.861 | 240.214 | 4.371 | 468.045 | 328.311 | 227.831 |
| | 500 | 55.827 | 554.611 | 12.383 | 50.24 | 29.649 | 378.551 | 0 | 50.24 | 0 | 505.902 |
| | 1358.979 | | | | | | | | | | |
| 1993 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 106.84 | 0 | 0 | 0 |
| | 30.452 | 79.111 | 458.197 | 306.947 | 674.386 | 637.764 | 652.093 | 546.905 | 554.96 | 197.263 | 64.93 |
| | 274.84 | 211.131 | 216.108 | 218.352 | 262.574 | 0 | 23.146 | 307.598 | 0 | 0 | 12.594 |
| | 94.817 | 23.146 | 189.635 | 94.817 | 0 | 0 | 0 | 94.817 | 0 | 202.921 | 0 |
| | 0 | 0 | 33.759 | 236.664 | 221.391 | 659.123 | 777.382 | 2306.465 | 476.4 | 564.54 | 421.125 |
| | 350.784 | 320.239 | 84.014 | 182.213 | 84.285 | 160.702 | 24.32 | 94.817 | 0 | 11.419 | 23.146 |
| | 94.817 | 94.817 | 133.274 | 0 | 94.817 | 0 | 0 | 0 | 0 | 0 | 23.146 |
| | 288.293 | | | | | | | | | | |
| 1996 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 9.45 | 0 | 0 | 0 |
| | 0 | 0 | 78.838 | 0 | 7.353 | 11.029 | 7.353 | 7.353 | 3.676 | 3.676 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 37.581 | 0 | 37.581 | 3.676 | 0 | 22.059 | 22.059 | 7.353 | 3.676 |
| | 0 | 0 | 0 | 0 | 3.676 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 3.676 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1998 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 16.83 | 0 | 0 | 0 |
| | 0 | 0 | 89.681 | 8.74 | 543.005 | 555.416 | 6.555 | 0 | 48.861 | 502.185 | 2.185 |
| | 0 | 0 | 0 | 0 | 2.185 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 2.185 | 2.185 | 10.925 | 160.503 | 149.578 | 89.681 | 4.37 | 6.555 | 0 |
| | 72.44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 344.046 | | | | | | | | | | |
| 1999 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 2.41 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 500 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 112.96 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 500 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2000 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 3.69 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7.992 | 7.992 | 0 | 103.473 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7.992 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 15.755 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 4.97 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 12.403 | 0 | 153.281 | 62.996 | 0 | 0 | 0 | 22.657 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 153.281 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12.403 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2002 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 21.55 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 82.917 | 24.553 | 31.157 | 37.535 | 22.82 | 24.553 |
| | 82.917 | 38.171 | 51.169 | 44.858 | 0 | 40.42 | 0 | 100.692 | 0 | 0 | 0 |
| | 0 | 0 | 38.929 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 22.634 | 22.634 | 0 | 0 | 0 | 0 |
| | 29.787 | 42.327 | 60.168 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 82.917 | | | | | | | | | | |
| 2003 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 12.79 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 25.889 | 0 | 20.796 | 0 | 0 | 0 | 0 | 7.824 |
| | 25.362 | 0 | 15.598 | 0 | 42.394 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2.288 | 10.184 | 7.323 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 12.238 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 16.86 | 0 | 0 | 0 |
| | 0 | 20.645 | 0 | 0 | 18.285 | 36.549 | 31.851 | 0 | 96.72 | 0 | 0 |
| | 0.773 | 0 | 25.23 | 0 | 0 | 7.273 | 0 | 1.8 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.773 | 0 |
| | 0 | 0 | 0 | 0 | 0.769 | 33.758 | 35.78 | 58.815 | 18.787 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0.773 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 34.531 | | | | | | | | | | |
| 2005 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 111.69 | 0 | 0 | 0 |
| | 0 | 0 | 8.754 | 15.213 | 35.013 | 42.591 | 52.945 | 37.835 | 35.07 | 25.698 | 18.751 |
| | 16.92 | 6.73 | 3.471 | 12.262 | 6.775 | 5.295 | 4.681 | 5.422 | 0 | 1.013 | 3.331 |
| | 4.37 | 1.043 | 2.374 | 0 | 0 | 0 | 0.935 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 1.36 | 6.366 | 18.74 | 62.162 | 30.532 | 38.227 | 32.048 | 26.756 |
| | 14.622 | 8.44 | 8.168 | 4.91 | 4.943 | 3.351 | 2.105 | 1.013 | 1.043 | 2.196 | 2.037 |
| | 3.366 | 0 | 1.024 | 0 | 0.777 | 0.777 | 2.748 | 0 | 1.132 | 1.132 | 0 |
| | 5.811 | | | | | | | | | | |
| 2006 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 114.56 | 0 | 0 | 1.071 |
| | 3.108 | 11.058 | 35.018 | 40.37 | 36.314 | 24.766 | 48.765 | 13.782 | 19.815 | 16.105 | 12.37 |
| | 6.27 | 8.604 | 7.284 | 8.566 | 5.022 | 3.899 | 5.766 | 1.917 | 2.951 | 0 | 1.822 |
| | 1.386 | 2.516 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 3.213 | 1.071 | 6.038 | 37.518 | 38.731 | 29.907 | 22.715 | 20.519 | 24.198 | 17.363 |
| | 21.211 | 18.255 | 13.095 | 7.319 | 10.967 | 2.89 | 1.614 | 4.215 | 3.669 | 1.386 | 5.061 |
| | 0 | 0.471 | 0.922 | 0 | 0.517 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2.833 | | | | | | | | | | |
| 2007 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 121.72 | 0 | 0 | 0.849 |
| | 0.712 | 12.422 | 57.429 | 161.446 | 82.329 | 74.695 | 23.863 | 25.74 | 21.515 | 17.568 | 15.887 |
| | 9.899 | 15.65 | 13.21 | 8.275 | 6.959 | 5.617 | 2.974 | 1.95 | 2.73 | 2.612 | 2.741 |
| | 3.025 | 0.885 | 2.343 | 0.482 | 0.969 | 0 | 0 | 0 | 0 | 0.9 | 0 |
| | 0 | 0 | 2.82 | 28.603 | 86.629 | 73.077 | 54.512 | 64.508 | 22.209 | 29.878 | 26.507 |
| | 18.76 | 15.273 | 37.072 | 9.687 | 9.83 | 4.971 | 2.224 | 3.267 | 3.781 | 0 | 1.56 |
| | 2.84 | 0 | 0.855 | 0 | 0 | 0.885 | 1.205 | 1.06 | 0 | 0 | 0 |
| | 3.851 | | | | | | | | | | |
| 2008 | 1 | 4 | 3 | 0 | 2 | -1 | -1 | 125.21 | 0 | 0 | 0 |
| | 0 | 8.87 | 45.258 | 43.983 | 27.045 | 20.86 | 14.047 | 8.239 | 14.178 | 35.353 | 22.302 |
| | 24.574 | 19.293 | 16.264 | 21.913 | 9.505 | 14.943 | 7.928 | 7.884 | 7.774 | 0 | 6.385 |
| | 9.059 | 3.345 | 3.024 | 0 | 3.542 | 0.922 | 1.009 | 0.515 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 14.755 | 36.442 | 29.746 | 41.165 | 21.458 | 21.685 | 30.579 | 46.311 |
| | 41.522 | 25.68 | 19.896 | 21.764 | 19.521 | 6.813 | 15.687 | 30.514 | 3.228 | 6.719 | 7.796 |
| | 2.361 | 0 | 0 | 2.959 | 1.11 | 0.515 | 0 | 0.98 | 0 | 0 | 3.077 |
| | 10.583 | | | | | | | | | | |

2009 1 4 3 0 2 -1 -1 132.46 0 0 0
0 5.822206 6.268792 4.150923 2.592681 11.64788 5.969261 15.89173 27.7564 34.07335 29.80372
36.1813 29.29693 24.88853 31.45937 28.4763 21.95581 11.67635 12.07496 15.65964 8.035462 4.963084
1.740833 3.65026 2.715278 2.520414 0.8176005 2.709899 0 0 0 0 0
0 0 0 3.75448 8.038945 13.79804 0 19.6097 17.03672 43.17959 29.13136
16.98544 0 15.08734 23.2503 3.036659 10.11494 4.829712 3.200198 2.084193 1.960529 6.122958
1.992012 0.8176005 0.9280946 0 0 1.266593 0.8176005 0.9121365 0 0.9574804 0
2.024113

2010 1 4 3 0 2 -1 -1 110.698 0 0 0
0 0 0 0 0 25.79286 31.7829 28.4012 27.6104 43.60954 56.82587
35.96018 19.78639 36.38142 23.00436 18.5807 13.60084 18.68036 8.74541 7.389368 8.949546 10.76456
3.914979 5.174366 3.267997 1.665521 2.087104 0.4989884 0 7.06E+00 0 3.528987 0
0 0 0 0 0 0 0 23.15435 45.77541 31.42575 24.78265
35.05582 34.02227 13.57575 17.62971 9.643106 4.352908 5.78942 8.510998 6.01843 0 3.899785
4.470925 1.035425 0 1.710429 0 3.513634 2.309978 0 0.4989884 0 0
6.5154762

# 2009 OR-WA non-trawl fleet, unchanged from 2007 (n=7)

1997 1 7 3 0 1 -1 -1 3.35 0 0 0
0 0 1.004 0 0 0 0 0 0 2.008 0
0 0 0 0 0 1.004 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1.004 2.008 1.004 0 5.021 2.008 2.008
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

1998 1 7 3 0 1 -1 -1 16.01 0 0 0
0 0 4.245 8.489 15.88 19.375 4.245 5.941 9.088 0 0
0 0 0 0 0 0 2.795 0 0 0 0
2.795 0 0 0 0 0 0 0 0 0 0
0 0 0 3.846 11.538 7.391 27.02 14.678 41.304 9.436 9.44
11.237 30.813 6.293 2.795 13.333 2.795 0 2.795 0 9.788 8.384
2.795 0 0 2.795 0 2.795 0 0 0 0 0
2.795

2001 1 7 3 0 1 -1 -1 10.38 0 0 0
0 3.355 3.084 1.028 3.139 3.084 3.139 4.167 1.084 1.028 0
1.028 1.084 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 2.393 1.143 0 4.223 3.139 2.111 1.028 0
2.056 0 1.028 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

2002 1 7 3 0 1 -1 -1 2.1 0 0 0
0 0 0 1.034 0 0 1.034 0 0 1.034 0
1.034 1.034 1.034 0 0 0 0 0 1.034 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1.034 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

2003 1 7 3 0 1 -1 -1 4.93 0 0 0
0 0 0 0 1 0 0 0 4 2.998 1
0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 2 0 1 2 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

2004 1 7 3 0 1 -1 -1 11.55 0 0 0
0 109.346 0 0 0 0 207.528 141.69 231.099 87.017 251.058
0 121.753 0 0 0 0 0 0 0 0 0

0 0 0 0 0 43.53 0 0 0 0 0
0 0 0 0 0 91.842 54.673 43.53 98.182 0 110.61
0 98.182 0 0 0 0 0 0 43.53 0 0
0 0 0 0 0 43.53 0 0 0 0 0
0

2005 1 7 3 0 1 -1 -1 8.35 0 0 0
0 0 0 0 0 7.778 4.278 1 0 0 4.278
4.278 3.5 3.5 0 2.5 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 0 7.5 8.5
0 0 0 0 0 0 0 0 0 0 0
0 0 4.278 0 0 0 0 0 0 0 0
0

# 2009 At-sea hake fishery, no ages read from 2008 (n=7)

2003 1 11 3 0 1 -1 -1 101.734 0 0 0
0 0 0 7.5 10.166667 22.277778 15.333333 10.833333 30.668254 18.15909 42.35909
25.834921 5.857143 5 0 3 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 2.333333 13.204545 26.054545 13.433333 35.741414 50.987878 18.961111
25.557143 25.356133 6.555556 0 17.5 2.833333 3 3 2.5 0 0
0 0 0 0 0 0 0 0 0 0 0
12.992064

2004 1 11 3 0 1 -1 -1 126.15 0 0 0
0 0 0 2 10.892857 12.3 39.942857 358.259524 17.9 42.642857
350.7 341.066667 337.4 48.716667 15.7 15.8 3 5.5 0 7.8
0 7.8 7.8 0 0 0 0 0 3.6 0 0
0 0 0 0 0 0 1 13.25 15.292857 37.442857 20.5
26.742857 26.8 13.75 338.4 19.2 42.7 45.8 1 0 0 6
0 0 0 0 0 0 0 0 7.8 0 0
0 0 6

2005 1 11 3 0 1 -1 -1 209.57 0 0 0
0 0 2 5.416667 80.6 42.216667 37.75 45.333333 56.966666 41.033334 31.616666
7.25 18.266667 17.2 2 2 2.666667 2 0 2 0 2.8
5 0 0 0 0 0 0 0 0 0 0
0 0 0 0 5.333333 9 29.633333 35.966667 31.783334 32.55 29.166666
34.65 12.333333 7.5 5.666667 2 4.5 2 0 3 3 4.8
2 0 2.5 0 0 0 2 0 0 0 0
1.5

2006 1 11 3 0 1 -1 -1 193.878 0 0 2.8
4 2.8 5 5 16.8 34.7 35 31.666667 24.666667 34.066667 23.5
12.166667 22.833333 6.466667 6.75 2 7.7 5 2 10.666667 3.75 0
0 0 0 0 0 0 0 0 0 0 0
0 0 2 2.8 8.8 8 10.8 26.866667 35.033333 24.75 45.3
18.666667 6 3.5 15 2 4 6 0 0 8.4 2
0 1.75 0 0 0 0 0 0 0 0 0
0

2007 1 11 3 0 1 -1 -1 261.544 0 0 0
2.2 6.6 0 6 46.633333 49.75 64.366667 63.683333 57.433333 36.866667 46.333333
34 25.833333 22 12 26.35 8.6 14.45 1 0 6.2 2
5 0 0 0 4 0 0 0 2.25 0 0
0 0 2 2.2 9.2 21.016667 30.6 50.733333 91.55 57.516667 39.433333
44.8 4.6 14.75 0 2.4 2.8 1.4 2 0 0 0
6 0 0 0 0 2 0 0 0 0 0
9.45

2009 1 11 3 0 1 -1 -1 168.016 0 0 0
0 0 0 0 42.333333 13.5 21.666667 13.5 53.333333 92.679825
101.666667 25.666667 24.013158 100.083333 23.539474 6 127.3 14.2 9.526316
46.359649 4.263158 43.333333 0 6.263158 2.5 1.5 2.263158 2.5 0 6
0 2.263158 12 9.666667 8 49.833333 9 40.333333 14.666667 17.789474 0
6 37.833333 3 5.526316 0 74.666667 0 0 0 0 2

0 2 0 0 0 0 7.429825 0 0 0 0
0 0 0 0

2010 1 11 3 0 1 -1 -1 158.258 0 0 0
0 0 0 0 3.733333 7.807843 27.47451 18 16.272727 26.82656 23.142424
12.272727 17.607843 4.2 19.30303 8.636364 13.436364 5.441176 5.5 5.866667 1.666667 5
6.5 19.166667 0 3.8 2 0 0 0 0 0 2
4 24.885383 43.282353 40.490196 19.00303 25.87754 15.00303 14.636364 15.713904 42.547237 0
2 6.133333 6 0 2 20.966667 1.636364 0 0 0 0
2 1.636364 1.666667 0 0 8.866667 0 0 0 0 0
0

# 2010 NWFSC survey conditionals (n=327)

2003 1 12 1 0 1 2 2 1.07 0 34864 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

2003 1 12 1 0 1 3 3 1.14 0 69729 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

2003 1 12 1 0 1 4 4 2.28 0 45570 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

2003 1 12 1 0 1 6 6 3.21 0 0 64464
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

2003 1 12 1 0 1 7 7 2.14 0 0 26172
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

2003 1 12 1 0 1 8 8 1.07 0 0 14779
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 2003 | 1 | 12 | 1 | 0 | 1 | 9 | 9 | 3.21 | 0 | 0 | 0 |
| | 44421 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 1 | 0 | 1 | 10 | 10 | 1.07 | 0 | 0 | 0 |
| | 0 | 14779 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 1 | 0 | 1 | 13 | 13 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 29310 | 27244 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 1 | 0 | 1 | 14 | 14 | 4.28 | 0 | 0 | 0 |
| | 0 | 6219 | 54488 | 0 | 0 | 0 | 0 | 0 | 4107 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 1 | 0 | 1 | 15 | 15 | 7.77 | 0 | 0 | 0 |
| | 0 | 0 | 54488 | 91084 | 62773 | 10194 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 1 | 0 | 1 | 16 | 16 | 6.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 33463 | 5765 | 58620 | 18271 | 0 | 0 | 0 | 5386 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 1 | 0 | 1 | 17 | 17 | 6.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 29310 | 29310 | 68406 | 29310 | 7287 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 1 | 0 | 1 | 18 | 18 | 9.91 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 38589 | 18541 | 37506 | 10769 | 12322 | 13053 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 1 | 0 | 1 | 19 | 19 | 9.84 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 4107 | 0 | 0 | 4515 | 42872 | 41368 | 12438 |
| | 0 | 0 | 5386 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 1 | 0 | 1 | 20 | 20 | 10.98 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35849 | 49091 | 31213 | 22515 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 1 | 0 | 1 | 21 | 21 | 9.77 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18580 | 6219 | 24328 | 0 |
| | 24799 | 5712 | 18580 | 0 | 38200 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 1 | 0 | 1 | 22 | 22 | 2.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5712 |
| | 0 | 0 | 5712 | 0 | 0 | 0 | 18580 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 1 | 0 | 1 | 23 | 23 | 3.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 219981 | 0 | 18580 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 6219 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 1 | 0 | 1 | 24 | 24 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4550 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 2 | 0 | 1 | 1 | 1 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25953 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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|---|---|---|---|---|---|---|---|---|---|---|---|
| 2003 | 1 | 12 | 2 | 0 | 1 | 2 | 2 | 1.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 104593 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 2 | 0 | 1 | 3 | 3 | 4.77 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 313093 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 2 | 0 | 1 | 4 | 4 | 2.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 34178 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 2 | 0 | 1 | 6 | 6 | 3.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 13405 | 44463 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 2 | 0 | 1 | 7 | 7 | 3.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 40993 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 2 | 0 | 1 | 8 | 8 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 14779 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 2 | 0 | 1 | 9 | 9 | 2.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 41035 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 2 | 0 | 1 | 12 | 12 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 14118 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 2 | 0 | 1 | 13 | 13 | 7.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 82595 | 4107 | 29310 | 4107 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 2 | 0 | 1 | 14 | 14 | 7.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 8213 | 32250 | 4550 | 29310 | 5186 | 0 | 0 |
| | 6219 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 2 | 0 | 1 | 15 | 15 | 10.91 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 11321 | 116109 | 7287 | 33612 | 27244 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 2 | 0 | 1 | 16 | 16 | 15.12 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 45648 | 28642 | 15384 | 56344 | 0 | 6219 | 12322 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 2 | 0 | 1 | 17 | 17 | 19.68 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 5006 | 27414 | 32495 | 69139 | 0 | 40458 |
| | 24170 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 2 | 0 | 1 | 18 | 18 | 19.75 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 4034 | 0 | 29705 | 21896 | 18658 | 46015 |
| | 71384 | 0 | 23130 | 5765 | 0 | 0 | 18580 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 2 | 0 | 1 | 19 | 19 | 16.26 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10326 | 20110 | 22114 | 4550 |
| | 35065 | 15740 | 5765 | 5712 | 18580 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 5386 | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 2003 | 1 | 12 | 2 | 0 | 1 | 20 | 20 | 11.91 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18034 | 18580 |
| | 19497 | 24345 | 22811 | 0 | 0 | 0 | 0 | 6449 | 0 | 5712 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2003 | 1 | 12 | 2 | 0 | 1 | 21 | 21 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5386 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 12 | 1 | 0 | 1 | 2 | 2 | 1.07 | 0 | 10557 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 12 | 1 | 0 | 1 | 3 | 3 | 1.07 | 0 | 10557 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 12 | 1 | 0 | 1 | 4 | 4 | 3.21 | 0 | 0 | 56073 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 12 | 1 | 0 | 1 | 5 | 5 | 1.28 | 0 | 0 | 42228 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 12 | 1 | 0 | 1 | 6 | 6 | 3.28 | 0 | 0 | 41531 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 1 | 0 | 1 | 9 | 9 | 2.21 | 0 | 0 | 0 |
| | 10557 | 69919 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 1 | 0 | 1 | 10 | 10 | 3.35 | 0 | 0 | 0 |
| | 0 | 152176 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 12 | 1 | 0 | 1 | 11 | 11 | 4.28 | 0 | 0 | 0 |
| | 23649 | 58608 | 9777 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 12 | 1 | 0 | 1 | 12 | 12 | 6.7 | 0 | 0 | 0 |
| | 23649 | 90668 | 23649 | 65415 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 12 | 1 | 0 | 1 | 13 | 13 | 4.7 | 0 | 0 | 0 |
| | 0 | 63087 | 0 | 128527 | 34959 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 1 | 0 | 1 | 14 | 14 | 5.42 | 0 | 0 | 0 |
| | 0 | 9860 | 33426 | 79696 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 12 | 1 | 0 | 1 | 15 | 15 | 5.49 | 0 | 0 | 0 |
| | 0 | 0 | 8300 | 70938 | 31371 | 21232 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 1 | 0 | 1 | 16 | 16 | 7.63 | 0 | 0 | 0 |
| | 0 | 0 | 23649 | 39504 | 0 | 21232 | 213594 | 182695 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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|---|---|---|---|---|---|---|---|---|---|---|---|
| 2004 | 1 | 12 | 1 | 0 | 1 | 17 | 17 | 9.77 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 21232 | 30165 | 34939 | 221308 | 182695 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 182695 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 1 | 0 | 1 | 18 | 18 | 4.35 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 6900 | 6445 | 34603 | 0 | 0 | 28474 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 12 | 1 | 0 | 1 | 19 | 19 | 11.84 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 16584 | 18838 | 28474 | 191739 | 35023 | 11535 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 1 | 0 | 1 | 20 | 20 | 8.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 10139 | 71513 | 28474 | 38317 | 27133 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 12 | 1 | 0 | 1 | 21 | 21 | 9.63 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 56948 | 0 | 0 | 8699 | 12516 |
| | 17664 | 0 | 0 | 182695 | 0 | 197260 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 12 | 1 | 0 | 1 | 22 | 22 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14565 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 1 | 0 | 1 | 23 | 23 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6900 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 1 | 0 | 1 | 24 | 24 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 182695 | 14565 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 1 | 0 | 1 | 25 | 25 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 2 | 0 | 1 | 2 | 2 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 21114 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 2 | 0 | 1 | 3 | 3 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 12244 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 2 | 0 | 1 | 5 | 5 | 3.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 8722 | 61507 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 2 | 0 | 1 | 6 | 6 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 8637 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 2 | 0 | 1 | 7 | 7 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 45516 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 12 | 2 | 0 | 1 | 9 | 9 | 3.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 31671 | 34959 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 2 | 0 | 1 | 10 | 10 | 3.42 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 10291 | 174797 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 2 | 0 | 1 | 11 | 11 | 5.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 20417 | 117217 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 2 | 0 | 1 | 12 | 12 | 5.63 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 9860 | 53228 | 44881 | 10139 | 0 | 0 | 182695 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 2 | 0 | 1 | 13 | 13 | 8.98 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 53228 | 88250 | 72868 | 14565 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 2 | 0 | 1 | 14 | 14 | 4.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 54679 | 0 | 6900 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 2 | 0 | 1 | 15 | 15 | 7.63 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 8933 | 24550 | 84927 | 6900 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 2 | 0 | 1 | 16 | 16 | 9.84 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 31155 | 70938 | 21232 | 205862 | 13555 | 0 |
| | 21232 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 2 | 0 | 1 | 17 | 17 | 9.63 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 2 | 0 | 1 | 18 | 18 | 10.84 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 9421 | 21232 | 49846 | 0 | 14565 |
| | 21232 | 43039 | 190963 | 0 | 0 | 11535 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2004 | 1 | 12 | 2 | 0 | 1 | 19 | 19 | 6.84 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6900 | 0 | 0 | 65647 |
| | 0 | 68236 | 6900 | 0 | 0 | 28474 | 28474 | 0 | 28474 | 0 | 0 |
| | 0 | 28474 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 389039 | | | | | | | | | | |
| 2004 | 1 | 12 | 2 | 0 | 1 | 20 | 20 | 6.91 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7344 | 6900 | 0 |
| | 7344 | 0 | 0 | 189594 | 0 | 0 | 197260 | 182695 | 0 | 0 | 182695 |
| | 0 | 0 | 182695 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 182695 | | | | | | | | | | |
| 2004 | 1 | 12 | 2 | 0 | 1 | 21 | 21 | 6.42 | 0 | 0 | 0 |
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| | 6900 | 7267 | 0 | 6900 | 0 | 0 | 0 | 0 | 0 | 182695 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 182695 | | | | | | | | | | |
| 2004 | 1 | 12 | 2 | 0 | 1 | 22 | 22 | 3.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 28474 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11535 |
| | 182695 | 0 | 0 | 0 | 0 | 0 | 0 | 28474 | 0 | 0 | 0 |
| | 182695 | | | | | | | | | | |
| 2004 | 1 | 12 | 2 | 0 | 1 | 23 | 23 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11535 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 1 | 0 | 1 | 1 | 1 | 1.07 | 11604 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 1 | 0 | 1 | 2 | 2 | 2.21 | 30110 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 1 | 0 | 1 | 3 | 3 | 1.07 | 0 | 8973 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 1 | 0 | 1 | 4 | 4 | 1.07 | 0 | 0 | 10332 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 1 | 0 | 1 | 5 | 5 | 1.14 | 0 | 0 | 0 |
| | 20664 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 1 | 0 | 1 | 6 | 6 | 2.42 | 0 | 0 | 0 |
| | 61992 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 1 | 0 | 1 | 7 | 7 | 1.07 | 0 | 0 | 0 |
| | 10332 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 1 | 0 | 1 | 9 | 9 | 1.07 | 0 | 0 | 0 |
| | 0 | 10332 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 1 | 0 | 1 | 10 | 10 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 10332 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 1 | 0 | 1 | 11 | 11 | 1.07 | 0 | 0 | 0 |
| | 0 | 22573 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 1 | 0 | 1 | 12 | 12 | 4.28 | 0 | 0 | 0 |
| | 0 | 0 | 20664 | 205726 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | | | | | | | | | | |
| 2005 | 1 | 12 | 1 | 0 | 1 | 13 | 13 | 3.28 | 0 | 0 | 0 |
| | 0 | 0 | 22573 | 34569 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2005 | 1 | 12 | 1 | 0 | 1 | 14 | 14 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 11523 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 1 | 0 | 1 | 15 | 15 | 6.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 125436 | 25897 | 117568 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2005 | 1 | 12 | 1 | 0 | 1 | 16 | 16 | 5.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 22573 | 114459 | 194276 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2005 | 1 | 12 | 1 | 0 | 1 | 17 | 17 | 8.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 22573 | 131704 | 116121 | 7811 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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|---|---|---|---|---|---|---|---|---|---|---|---|
| 2005 | 1 | 12 | 1 | 0 | 1 | 18 | 18 | 12.98 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 91413 | 91413 | 323345 | 31822 | 7811 | 11022 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 1 | 0 | 1 | 19 | 19 | 11.84 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 188887 | 27885 | 106739 | 6134 | 15205 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 1 | 0 | 1 | 20 | 20 | 9.63 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 194276 | 0 | 15166 | 8694 | 25154 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 1 | 0 | 1 | 21 | 21 | 10.84 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 12332 | 91413 | 14840 | 106956 | 99224 |
| | 17568 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 1 | 0 | 1 | 22 | 22 | 5.35 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5406 | 12083 | 7767 | 91413 |
| | 0 | 9121 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 1 | 0 | 1 | 25 | 25 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 9282 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 2 | 0 | 1 | 1 | 1 | 1.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23208 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 2 | 0 | 1 | 2 | 2 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 11604 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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| 2005 | 1 | 12 | 2 | 0 | 1 | 3 | 3 | 1.14 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 20664 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 2 | 0 | 1 | 4 | 4 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 10332 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 2 | 0 | 1 | 5 | 5 | 2.14 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 2 | 0 | 1 | 6 | 6 | 1.21 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 2 | 0 | 1 | 7 | 7 | 1.07 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 2 | 0 | 1 | 8 | 8 | 2.14 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 2 | 0 | 1 | 9 | 9 | 1.07 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 2 | 0 | 1 | 12 | 12 | 2.14 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 11071 | 0 | 102863 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 2 | 0 | 1 | 13 | 13 | 6.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 2 | 0 | 1 | 14 | 14 | 7.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 136376 | 165800 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 2 | 0 | 1 | 15 | 15 | 8.63 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 22573 | 8320 | 180389 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2005 | 1 | 12 | 2 | 0 | 1 | 16 | 16 | 14.19 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 24932 | 70471 | 27633 | 111440 | 7811 | 7811 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2005 | 1 | 12 | 2 | 0 | 1 | 17 | 17 | 16.61 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 125603 | 172736 | 27409 | 31137 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2005 | 1 | 12 | 2 | 0 | 1 | 18 | 18 | 13.68 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 13336 | 32775 | 40379 | 207396 | 282051 |
| | 15416 | 7811 | 0 | 7127 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2005 | 1 | 12 | 2 | 0 | 1 | 19 | 19 | 13.12 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8577 | 91413 | 40275 | 8577 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | 16388 | 0 | 99224 | 124675 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 11022 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2005 | 1 | 12 | 2 | 0 | 1 | 20 | 20 | 7.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13983 | 22159 |
| | 9282 | 0 | 0 | 0 | 8320 | 7394 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2005 | 1 | 12 | 2 | 0 | 1 | 21 | 21 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 9282 | 0 | 0 | 0 | 8577 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2006 | 1 | 12 | 1 | 0 | 1 | 2 | 2 | 1.07 | 0 | 9256 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2006 | 1 | 12 | 1 | 0 | 1 | 3 | 3 | 1.07 | 0 | 0 | 9256 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2006 | 1 | 12 | 1 | 0 | 1 | 4 | 4 | 1.07 | 0 | 0 | 0 |
| | 9256 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 1 | 0 | 1 | 5 | 5 | 1.07 | 0 | 0 | 8621 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 1 | 0 | 1 | 6 | 6 | 1.07 | 0 | 0 | 7697 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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|---|---|---|---|---|---|---|---|---|---|---|---|
| 2006 | 1 | 12 | 1 | 0 | 1 | 9 | 9 | 1.07 | 0 | 0 | 0 |
| | 11422 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 1 | 0 | 1 | 12 | 12 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 41456 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2006 | 1 | 12 | 1 | 0 | 1 | 13 | 13 | 2.21 | 0 | 0 | 0 |
| | 0 | 8553 | 45249 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2006 | 1 | 12 | 1 | 0 | 1 | 14 | 14 | 3.21 | 0 | 0 | 0 |
| | 0 | 0 | 157567 | 17106 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2006 | 1 | 12 | 1 | 0 | 1 | 15 | 15 | 4.35 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 39729 | 0 | 28289 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2006 | 1 | 12 | 1 | 0 | 1 | 16 | 16 | 11.05 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 74529 | 208337 | 166455 | 1099078 | 199023 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2006 | 1 | 12 | 1 | 0 | 1 | 17 | 17 | 8.84 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 70525 | 157567 | 181701 | 437897 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2006 | 1 | 12 | 1 | 0 | 1 | 18 | 18 | 8.98 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 342684 | 44115 | 188374 | 0 | 0 | 15246 | 15246 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 1 | 0 | 1 | 19 | 19 | 8.77 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 1076454 | 209471 | 560660 | 1356783 | 0 | 1099078 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 1 | 0 | 1 | 20 | 20 | 13.05 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 332962 | 296688 | 296635 |
| | 2152907 | 1091699 | 8888 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 1 | 0 | 1 | 21 | 21 | 12.05 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1103764 | 31603 | 31946 |
| | 15246 | 8115 | 1085714 | 1076454 | 1076454 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 1 | 0 | 1 | 22 | 22 | 5.35 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1076454 | 330380 |
| | 0 | 0 | 0 | 9418 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2006 | 1 | 12 | 1 | 0 | 1 | 23 | 23 | 4.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 289748 | 0 | 0 | 0 | 0 | 0 | 0 | 1076454 | 15246 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2006 | 1 | 12 | 1 | 0 | 1 | 24 | 24 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1076454 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 1 | 0 | 1 | 25 | 25 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 280330 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 1 | 0 | 1 | 26 | 26 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 8888 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 2 | 0 | 1 | 5 | 5 | 1.07 | 0 | 0 | 0 |
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| | 0 | 8224 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 2 | 0 | 1 | 6 | 6 | 3.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 19187 | 7697 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 2 | 0 | 1 | 7 | 7 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 2 | 0 | 1 | 8 | 8 | 1.07 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 2 | 0 | 1 | 11 | 11 | 2.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 13254 | 41456 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 2 | 0 | 1 | 12 | 12 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 7417 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 2 | 0 | 1 | 13 | 13 | 2.14 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 2 | 0 | 1 | 14 | 14 | 6.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2006 | 1 | 12 | 2 | 0 | 1 | 15 | 15 | 8.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 43352 | 189609 | 1514350 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2006 | 1 | 12 | 2 | 0 | 1 | 16 | 16 | 14.33 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 225440 | 304129 | 111553 | 175061 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2006 | 1 | 12 | 2 | 0 | 1 | 17 | 17 | 15.26 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 22624 | 29616 | 504688 | 595463 | 0 | 1115498 |
| | 0 | 7167 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 2 | 0 | 1 | 18 | 18 | 15.17 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 8553 | 157567 | 455002 | 1295688 | 364691 |
| | 53803 | 1104534 | 1076454 | 23799 | 0 | 2152907 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2006 | 1 | 12 | 2 | 0 | 1 | 19 | 19 | 15.33 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15917 | 17106 | 597973 |
| | 302927 | 1083806 | 0 | 10854 | 15246 | 1076454 | 0 | 1076454 | 0 | 0 | 0 |
| | 0 | 0 | 280330 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2006 | 1 | 12 | 2 | 0 | 1 | 20 | 20 | 7.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 7130 | 0 | 0 | 0 | 280330 | 0 | 0 | 304516 | 0 | 0 |
| | 0 | 9260 | 0 | 1356784 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 2006 | 1 | 12 | 2 | 0 | 1 | 21 | 21 | 4.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1076454 | 22624 | 0 | 280330 | 0 | 1076454 | 0 | 0 | 0 | 1076454 | 0 |
| | 0 | 0 | 0 | 280330 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 280330 | | | | | | | | | | |
| 2006 | 1 | 12 | 2 | 0 | 1 | 22 | 22 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7804 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 4 | 4 | 2.21 | 0 | 8370 | 16740 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 5 | 5 | 2.21 | 0 | 0 | 16740 |
| | 8370 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 6 | 6 | 3.49 | 0 | 0 | 21740 |
| | 33480 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 7 | 7 | 6.56 | 0 | 0 | 31822 |
| | 36795 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 8 | 8 | 7.89 | 0 | 0 | 0 |
| | 152151 | 53980 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 9 | 9 | 6.05 | 0 | 0 | 0 |
| | 78575 | 35569 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 10 | 10 | 6.7 | 0 | 0 | 0 |
| | 26740 | 53172 | 12144 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 11 | 11 | 3.35 | 0 | 0 | 0 |
| | 0 | 12144 | 48158 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 12 | 12 | 3.56 | 0 | 0 | 0 |
| | 0 | 24288 | 47741 | 24288 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 13 | 13 | 6.7 | 0 | 0 | 0 |
| | 0 | 0 | 48576 | 40448 | 20096 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 14 | 14 | 4.28 | 0 | 0 | 0 |
| | 0 | 0 | 15181 | 6456 | 7595 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 15 | 15 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 18050 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 16 | 16 | 8.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 5553 | 50113 | 27272 | 6456 | 32743 | 18050 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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|---|---|---|---|---|---|---|---|---|---|---|---|
| 2007 | 1 | 12 | 1 | 0 | 1 | 17 | 17 | 6.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 6293 | 67499 | 8685 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 18 | 18 | 12.26 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 32743 | 76779 | 94160 | 20411 | 29776 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 19 | 19 | 6.63 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 29776 | 46640 | 69555 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 20 | 20 | 12.61 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 49012 | 58797 | 122169 | 61914 | 0 |
| | 6861 | 32743 | 36100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 21 | 21 | 11.12 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 32743 | 0 | 0 | 8685 | 66514 | 36100 |
| | 24881 | 0 | 32743 | 35420 | 18050 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 22 | 22 | 8.91 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 8685 | 0 | 8685 | 47688 | 32743 |
| | 72354 | 6861 | 27272 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 23 | 23 | 5.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32743 | 7489 |
| | 6868 | 0 | 6861 | 24911 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 1 | 0 | 1 | 24 | 24 | 2.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 18050 | 0 | 0 | 0 | 0 |
| | 0 | 18050 | 0 | 0 | 11726 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2007 | 1 | 12 | 1 | 0 | 1 | 25 | 25 | 3.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 6861 | 0 | 0 | 18050 | 0 | 0 | 11726 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 2 | 0 | 1 | 6 | 6 | 3.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 23425 | 40165 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 2 | 0 | 1 | 7 | 7 | 5.77 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 85719 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 2 | 0 | 1 | 8 | 8 | 8.17 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 175534 | 48782 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 2 | 0 | 1 | 9 | 9 | 6.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 34019 | 33466 | 12144 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2007 | 1 | 12 | 2 | 0 | 1 | 10 | 10 | 5.77 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 26740 | 15055 | 43939 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2007 | 1 | 12 | 2 | 0 | 1 | 11 | 11 | 5.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 52081 | 48576 | 6456 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2007 | 1 | 12 | 2 | 0 | 1 | 12 | 12 | 3.35 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 32658 | 24288 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2007 | 1 | 12 | 2 | 0 | 1 | 13 | 13 | 7.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 7279 | 20705 | 43610 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2007 | 1 | 12 | 2 | 0 | 1 | 14 | 14 | 7.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 27793 | 60090 | 6927 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2007 | 1 | 12 | 2 | 0 | 1 | 15 | 15 | 6.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 7279 | 8370 | 16769 | 8126 | 7284 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 2 | 0 | 1 | 16 | 16 | 12.4 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 27690 | 43654 | 101451 | 27279 | 32743 | 6861 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 2 | 0 | 1 | 17 | 17 | 13.89 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 76685 | 129174 | 115487 | 128321 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 2 | 0 | 1 | 18 | 18 | 24.06 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 11726 | 55910 | 232223 | 137986 | 178504 |
| | 67879 | 78171 | 28563 | 0 | 18050 | 0 | 0 | 0 | 18050 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 2 | 0 | 1 | 19 | 19 | 20.96 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 63307 | 39854 | 6861 | 13317 | 34286 | 7732 | 11726 | 0 | 0 | 32743 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 2 | 0 | 1 | 20 | 20 | 17.66 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32743 | 21864 | 24911 |
| | 36644 | 96446 | 31773 | 54879 | 31772 | 43498 | 18587 | 11726 | 18050 | 6868 | 0 |
| | 6868 | 0 | 12246 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 2 | 0 | 1 | 21 | 21 | 4.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 12352 | 0 | 0 | 0 | 6868 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11726 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 2 | 0 | 1 | 23 | 23 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 7753 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 2 | 0 | 1 | 24 | 24 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 8685 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2007 | 1 | 12 | 2 | 0 | 1 | 26 | 26 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 7220 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 1 | 1 | 1.07 | 38423 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 2 | 2 | 1.28 | 153694 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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|---|---|---|---|---|---|---|---|---|---|---|---|
| 2008 | 1 | 12 | 1 | 0 | 1 | 4 | 4 | 2.49 | 0 | 268964 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 5 | 5 | 2.7 | 0 | 384235 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2008 | 1 | 12 | 1 | 0 | 1 | 7 | 7 | 1.07 | 0 | 0 | 0 |
| | 7246 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2008 | 1 | 12 | 1 | 0 | 1 | 8 | 8 | 1.07 | 0 | 0 | 8213 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 9 | 9 | 3.21 | 0 | 0 | 0 |
| | 50134 | 9003 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 10 | 10 | 3.42 | 0 | 0 | 0 |
| | 7246 | 75202 | 18007 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 11 | 11 | 8.63 | 0 | 0 | 0 |
| | 25067 | 67189 | 34071 | 14218 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 12 | 12 | 11.05 | 0 | 0 | 0 |
| | 25067 | 73037 | 53562 | 9003 | 27909 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 13 | 13 | 8.84 | 0 | 0 | 0 |
| | 0 | 25067 | 37811 | 29229 | 50629 | 9902 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 14 | 14 | 9.12 | 0 | 0 | 0 |
| | 0 | 0 | 75202 | 62640 | 156639 | 10728 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 15 | 15 | 10.91 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 32743 | 57175 | 89750 | 9902 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 16 | 16 | 7.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 84425 | 76870 | 28569 | 9902 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 17 | 17 | 7.26 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 57138 | 197227 | 65620 | 57139 | 28569 | 28569 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 18 | 18 | 7.77 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 17241 | 132780 | 9902 | 9902 | 9902 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 19 | 19 | 6.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 9902 | 36343 | 57139 | 37050 | 28569 | 0 |
| | 9902 | 28569 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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|---|---|---|---|---|---|---|---|---|---|---|---|
| 2008 | 1 | 12 | 1 | 0 | 1 | 20 | 20 | 8.84 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 62122 | 20103 | 44825 | 0 | 7774 |
| | 20103 | 10201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 21 | 21 | 10.4 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28569 | 135451 | 57139 | 10201 |
| | 10201 | 19439 | 20402 | 0 | 35784 | 0 | 25067 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2008 | 1 | 12 | 1 | 0 | 1 | 22 | 22 | 9.33 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28569 | 0 | 0 | 48971 |
| | 30603 | 47252 | 9902 | 30603 | 25067 | 0 | 10201 | 9902 | 0 | 8481 | 0 |
| | 10201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 23 | 23 | 2.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 17975 | 10201 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 24 | 24 | 2.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 10201 | 0 | 10201 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10201 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 25 | 25 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 10201 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 1 | 0 | 1 | 26 | 26 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 9345 | 0 | 0 | 0 | 9238 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2008 | 1 | 12 | 2 | 0 | 1 | 1 | 1 | 4.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2008 | 1 | 12 | 2 | 0 | 1 | 2 | 2 | 6.19 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 554355 |
| | 8176 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 2 | 0 | 1 | 4 | 4 | 3.35 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 131622 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2008 | 1 | 12 | 2 | 0 | 1 | 5 | 5 | 4.91 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 410160 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 2 | 0 | 1 | 6 | 6 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 38423 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2008 | 1 | 12 | 2 | 0 | 1 | 7 | 7 | 2.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 14492 | 7246 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2008 | 1 | 12 | 2 | 0 | 1 | 8 | 8 | 4.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 31671 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2008 | 1 | 12 | 2 | 0 | 1 | 9 | 9 | 4.35 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 48563 | 9003 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2008 | 1 | 12 | 2 | 0 | 1 | 10 | 10 | 9.05 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 159696 | 42926 | 9003 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2008 | 1 | 12 | 2 | 0 | 1 | 11 | 11 | 6.63 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 9003 | 25562 | 79528 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2008 | 1 | 12 | 2 | 0 | 1 | 12 | 12 | 11.12 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 25067 | 81258 | 123282 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 2 | 0 | 1 | 13 | 13 | 12.54 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 34566 | 33117 | 152787 | 77917 | 47091 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 2 | 0 | 1 | 14 | 14 | 12.33 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 25067 | 52002 | 24333 | 115104 | 41626 | 19804 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 2 | 0 | 1 | 15 | 15 | 13.54 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 8696 | 113926 | 33117 | 76687 | 45885 | 25067 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 2 | 0 | 1 | 16 | 16 | 9.19 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 33117 | 44963 | 87964 | 28569 | 10728 | 27578 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 2 | 0 | 1 | 17 | 17 | 15.05 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 69461 | 8545 | 50107 | 15388 | 45686 |

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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2008 | 1 | 12 | 2 | 0 | 1 | 18 | 18 | 13.05 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 41626 | 25617 | 0 | 34907 |
| | 52051 | 32877 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2008 | 1 | 12 | 2 | 0 | 1 | 19 | 19 | 6.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7973 | 0 | 25067 |
| | 0 | 0 | 7215 | 28569 | 0 | 0 | 8027 | 0 | 0 | 10201 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 9547 | | | | | | | | | | |
| 2008 | 1 | 12 | 2 | 0 | 1 | 20 | 20 | 6.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 7774 | 0 | 0 | 9902 | 0 | 0 | 0 | 0 | 0 | 0 | 10201 |
| | 0 | 0 | 0 | 0 | 35268 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 38626 | | | | | | | | | | |
| 2008 | 1 | 12 | 2 | 0 | 1 | 21 | 21 | 5.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25067 |
| | 0 | 0 | 0 | 25067 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 10201 | | | | | | | | | | |
| 2008 | 1 | 12 | 2 | 0 | 1 | 22 | 22 | 4.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8288 | 0 | 0 | 0 |
| | 0 | 0 | 8481 | 0 | 0 | 0 | 0 | 0 | 0 | 25067 | 0 |
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| 2008 | 1 | 12 | 2 | 0 | 1 | 24 | 24 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 8844 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 1 | 0 | 1 | 1 | 1 | 1.07 | 8511 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 1 | 0 | 1 | 3 | 3 | 1.07 | 0 | 8732 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 1 | 0 | 1 | 4 | 4 | 2.21 | 0 | 25365 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 1 | 0 | 1 | 5 | 5 | 3.21 | 0 | 24911 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 1 | 0 | 1 | 8 | 8 | 2.14 | 0 | 0 | 0 |
| | 0 | 16666 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 1 | 0 | 1 | 9 | 9 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 8560 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 1 | 0 | 1 | 10 | 10 | 2.14 | 0 | 0 | 0 |
| | 0 | 8106 | 8106 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 1 | 0 | 1 | 11 | 11 | 2.14 | 0 | 0 | 0 |
| | 0 | 10295 | 0 | 8106 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2009 | 1 | 12 | 1 | 0 | 1 | 12 | 12 | 7.19 | 0 | 0 | 0 |
| | 0 | 27104 | 16666 | 72694 | 145388 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 1 | 0 | 1 | 13 | 13 | 7.56 | 0 | 0 | 0 |
| | 0 | 0 | 20590 | 50157 | 32946 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | | | | | | | | | | |
| 2009 | 1 | 12 | 1 | 0 | 1 | 14 | 14 | 5.42 | 0 | 0 | 0 |
| | 0 | 0 | 8868 | 38503 | 0 | 29635 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 1 | 0 | 1 | 15 | 15 | 8.63 | 0 | 0 | 0 |
| | 0 | 8868 | 0 | 0 | 61161 | 48798 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 1 | 0 | 1 | 16 | 16 | 2.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 10295 | 18401 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 1 | 0 | 1 | 17 | 17 | 3.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 20041 | 0 | 7326 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2009 | 1 | 12 | 1 | 0 | 1 | 18 | 18 | 4.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 7093 | 0 | 18394 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9149 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 1 | 0 | 1 | 19 | 19 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7093 | 0 | 10892 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 1 | 0 | 1 | 20 | 20 | 4.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 10892 | 0 | 7730 | 0 | 10295 |
| | 0 | 9149 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 1 | 0 | 1 | 21 | 21 | 6.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9149 | 9149 | 10478 | 0 |
| | 11417 | 10892 | 19444 | 0 | 0 | 0 | 0 | 0 | 0 | 8185 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 8185 | 0 | 0 | 9786 | 0 | 9149 | 8185 | 10295 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 1 | 0 | 1 | 23 | 23 | 2.14 | 0 | 0 | 0 |
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| | 0 | 0 | 10295 | 0 | 0 | 0 | 9149 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 1 | 0 | 1 | 24 | 24 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 10295 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 2 | 0 | 1 | 3 | 3 | 1.07 | 0 | 0 | 0 |
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| | 8560 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 2 | 0 | 1 | 4 | 4 | 3.63 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 68166 | 8560 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 2 | 0 | 1 | 5 | 5 | 4.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 7791 | 8560 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 2009 | 1 | 12 | 2 | 0 | 1 | 7 | 7 | 1.07 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 16351 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 17120 | 17120 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2009 | 1 | 12 | 2 | 0 | 1 | 10 | 10 | 3.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 16666 | 0 | 21529 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2009 | 1 | 12 | 2 | 0 | 1 | 11 | 11 | 9.19 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 43317 | 24083 | 86118 | 73456 | 0 | 8106 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2009 | 1 | 12 | 2 | 0 | 1 | 12 | 12 | 10.19 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 21529 | 58248 | 68877 | 60032 | 43059 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | 1 | 12 | 2 | 0 | 1 | 13 | 13 | 5.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 31824 | 53354 | 0 | 8868 | 8868 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2009 | 1 | 12 | 2 | 0 | 1 | 14 | 14 | 7.12 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 16508 | 68707 | 94223 | 39676 | 0 | 21529 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2009 | 1 | 12 | 2 | 0 | 1 | 15 | 15 | 8.84 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 18797 | 0 | 40692 | 43838 | 20590 | 10892 | 21529 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2009 | 1 | 12 | 2 | 0 | 1 | 16 | 16 | 8.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 42716 | 10892 | 31434 | 10295 | 0 |
| | 0 | 21529 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2009 | 1 | 12 | 2 | 0 | 1 | 17 | 17 | 5.91 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 17681 | 20590 | 41180 | 29372 | 0 |
| | 10295 | 10295 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2009 | 1 | 12 | 2 | 0 | 1 | 18 | 18 | 8.77 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30026 | 27154 |
| | 10295 | 0 | 0 | 22834 | 7386 | 0 | 11417 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2009 | 1 | 12 | 2 | 0 | 1 | 19 | 19 | 5.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10295 |
| | 10295 | 10295 | 17621 | 0 | 18480 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2009 | 1 | 12 | 2 | 0 | 1 | 20 | 20 | 7.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 8185 | 0 | 8185 | 0 | 9788 | 11417 | 10295 | 9149 | 10892 | 0 |
| | 8024 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2009 | 1 | 12 | 2 | 0 | 1 | 21 | 21 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8185 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 2 | 2 | 1.07 | 7716 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 3 | 3 | 2.98 | 108022 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 4 | 4 | 1.07 | 0 | 0 | 7727 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 5 | 5 | 3.35 | 0 | 0 | 40315 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 6 | 6 | 2.49 | 0 | 0 | 60450 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 7 | 7 | 1.21 | 0 | 0 | 25907 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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|---|---|---|---|---|---|---|---|---|---|---|---|
| 2010 | 1 | 12 | 1 | 0 | 1 | 10 | 10 | 2.14 | 0 | 0 | 0 |
| | 0 | 19752 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 11 | 11 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 9464 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 12 | 12 | 4.35 | 0 | 0 | 0 |
| | 0 | 0 | 19752 | 9464 | 17730 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 13 | 13 | 6.84 | 0 | 0 | 0 |
| | 0 | 0 | 10288 | 96169 | 9875 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 14 | 14 | 10.19 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 67367 | 78632 | 17730 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 15 | 15 | 6.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 166113 | 25859 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 16 | 16 | 7.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 10288 | 37526 | 7700 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 17 | 17 | 9.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 10288 | 28370 | 126520 | 0 | 8266 | 0 | 7072 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 18 | 18 | 3.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 6931 | 0 | 106405 | 8498 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 19 | 19 | 8.63 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 114199 | 129917 | 0 | 0 |
| | 7072 | 7794 | 0 | 8653 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 20 | 20 | 8.84 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 113518 | 114903 | 115058 | 114613 |
| | 120954 | 106405 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 21 | 21 | 6.98 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 212810 | 221462 |
| | 221463 | 221018 | 212810 | 0 | 0 | 7072 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 22 | 22 | 12.4 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 106405 | 106405 |
| | 106405 | 220604 | 122627 | 106405 | 153465 | 113939 | 0 | 0 | 0 | 0 | 0 |
| | 7794 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 23 | 23 | 4.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 106405 | 8653 | 0 | 0 | 7794 | 0 | 0 | 8426 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 1 | 0 | 1 | 24 | 24 | 6.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 8653 | 0 | 7794 | 8653 | 121993 | 9948 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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|---|---|---|---|---|---|---|---|---|---|---|---|
| 2010 | 1 | 12 | 1 | 0 | 1 | 25 | 25 | 1.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 106405 | 0 | 106405 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 2 | 0 | 1 | 1 | 1 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7716 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 2 | 0 | 1 | 2 | 2 | 3.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15432 |
| | 7727 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 2 | 0 | 1 | 3 | 3 | 6.54 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 146602 |
| | 21226 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 2 | 0 | 1 | 4 | 4 | 3.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 15443 | 8636 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 2 | 0 | 1 | 5 | 5 | 2.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 60450 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 2 | 0 | 1 | 6 | 6 | 3.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 83494 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 2 | 0 | 1 | 7 | 7 | 2.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 23044 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 2 | 0 | 1 | 10 | 10 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 10288 | 0 | 8266 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 2 | 0 | 1 | 11 | 11 | 1.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 10288 | 10288 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 2 | 0 | 1 | 12 | 12 | 4.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 7700 | 27546 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 2 | 0 | 1 | 13 | 13 | 8.91 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 10288 | 0 | 72666 | 28589 | 8266 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 2 | 0 | 1 | 14 | 14 | 6.98 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 59142 | 60906 | 35863 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 2 | 0 | 1 | 15 | 15 | 10.84 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 17988 | 26196 | 33055 | 18117 | 0 | 0 |
| | 8123 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2010 | 1 | 12 | 2 | 0 | 1 | 16 | 16 | 13.19 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 38565 | 14709 | 123851 | 145401 | 8615 | 0 |
| | 7700 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |

2010 1 12 2 0 1 17 17 18.19 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 15691 7794 35888 23764 137264
16194 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

2010 1 12 2 0 1 18 18 12.84 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 8208 228568 23908
8266 16222 0 0 0 8653 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

2010 1 12 2 0 1 19 19 14.19 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 106405 0
14866 129335 121433 7794 115319 7440 0 0 106405 0 0
0 0 7534 0 0 0 0 0 0 0 0
0

2010 1 12 2 0 1 20 20 9.84 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
6034 113141 0 0 0 123039 106405 114199 106405 0 0
16574 0 0 0 0 0 0 0 8498 0 0
8498

2010 1 12 2 0 1 21 21 4.35 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 8013
0 0 0 0 0 0 0 0 114831 0 106405
0 0 0 0 0 0 0 0 0 0 0
8498

2010 1 12 2 0 1 22 22 3.21 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 7794 0 0 0 0 106405 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

# Triennial survey conditionals (n=217)

1983 1 13 1 0 1 3 3 1.14 68.35 68.35 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

1983 1 13 1 0 1 4 4 1.14 0 136.7 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 5 | 5 | 2.28 | 0 | 1071.566 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 6 | 6 | 2.21 | 0 | 934.8661 | 68.35 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 7 | 7 | 3.35 | 0 | 0 | 137.2792 |
| | 1003.216 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 8 | 8 | 6.26 | 0 | 0 | 1938.661 |
| | 3215.278 | 68.35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 9 | 9 | 9.92 | 0 | 0 | 205.05 |
| | 10639.04 | 119.23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 10 | 10 | 13.81 | 0 | 0 | 119.23 |
| | 25256.28 | 853.0851 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 11 | 11 | 13.69 | 0 | 0 | 0 |
| | 8851.196 | 3270.325 | 274.4051 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1983 | 1 | 13 | 1 | 0 | 1 | 12 | 12 | 15.85 | 0 | 0 | 0 |
| | 3267.589 | 9369.206 | 477.7368 | 54.4775 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 13 | 13 | 13.59 | 0 | 0 | 0 |
| | 68.35 | 5273.543 | 618.1973 | 316.8574 | 0 | 54.4775 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 14 | 14 | 16.01 | 0 | 0 | 0 |
| | 0 | 1383.82 | 654.8543 | 828.5237 | 70.01429 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 15 | 15 | 17.45 | 0 | 0 | 0 |
| | 0 | 68.35 | 550.0615 | 929.3401 | 196.795 | 0 | 140.3946 | 12.32 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 16 | 16 | 17.89 | 0 | 0 | 0 |
| | 0 | 0 | 81.0598 | 1671.057 | 333.7599 | 998.1472 | 266.9624 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 17 | 17 | 14.52 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 343.8408 | 1242.1 | 806.5965 | 457.311 | 128.4152 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 18 | 18 | 16.22 | 0 | 0 | 0 |
| | 0 | 0 | 68.35 | 90.16302 | 324.1718 | 1710.85 | 1391.807 | 1020.459 | 343.8105 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 68.92924 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 19 | 19 | 13.52 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 128.4152 | 112.1718 | 443.0446 | 1089.583 | 1217.146 | 469.8548 | 581.7685 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 20 | 20 | 13.45 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 183.7386 | 367.176 | 1227.444 | 264.4086 | 395.431 | 432.1307 |
| | 243.4962 | 994.9313 | 0 | 280.35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 21 | 21 | 15.36 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 671.5023 | 1241.905 | 756.8156 | 1724.974 |
| | 1074.298 | 126.0443 | 12.32 | 256.8303 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 22 | 22 | 16.29 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 216.24 | 687.621 | 302.9686 | 318.8861 |
| | 1037.639 | 271.051 | 254.4594 | 12.32 | 151.7807 | 274.6082 | 175.1462 | 111.9137 | 128.4152 | 0 | 68.35 |
| | 0 | 198.6124 | 0 | 70.1973 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 23 | 23 | 12.75 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 68.35 | 555.8105 |
| | 278.1823 | 57.69429 | 68.35 | 376.3055 | 323.9137 | 338.0443 | 54.4775 | 68.35 | 91.71552 | 0 | 128.4152 |
| | 0 | 68.35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 68.35 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 24 | 24 | 8.12 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 68.35 |
| | 57.69429 | 0 | 68.35 | 0 | 212 | 68.35 | 68.35 | 151.7807 | 68.35 | 0 | 111.9137 |
| | 0 | 0 | 160.0655 | 0 | 68.35 | 68.35 | 0 | 0 | 0 | 68.35 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 25 | 25 | 5.63 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 68.35 | 212 | 0 | 216.24 | 0 | 111.9137 | 0 | 212 | 0 | 0 |
| | 0 | 68.35 | 0 | 68.35 | 0 | 0 | 68.35 | 68.35 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 1 | 0 | 1 | 26 | 26 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 68.35 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1983 | 1 | 13 | 2 | 0 | 1 | 4 | 4 | 1.35 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 341.75 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 2 | 0 | 1 | 5 | 5 | 1.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 546.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 2 | 0 | 1 | 6 | 6 | 2.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 119.23 | 68.35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 2 | 0 | 1 | 7 | 7 | 3.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 866.5161 | 137.2792 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 2 | 0 | 1 | 8 | 8 | 6.54 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 2599.548 | 4424.702 | 68.35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 2 | 0 | 1 | 9 | 9 | 9.01 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 1783.912 | 12160.72 | 136.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 2 | 0 | 1 | 10 | 10 | 13.46 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 21146.27 | 666.6092 | 54.4775 | 68.35 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 2 | 0 | 1 | 11 | 11 | 15.39 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 50.88 | 12016.17 | 6404.001 | 80.67 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 2 | 0 | 1 | 12 | 12 | 12.01 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 3910.154 | 6571.06 | 328.8826 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 2 | 0 | 1 | 13 | 13 | 11.24 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 54.4775 | 2676.789 | 643.4669 | 262.5429 | 12.32 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 2 | 0 | 1 | 14 | 14 | 14.66 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 2528.666 | 752.7975 | 425.3714 | 57.69429 | 101.76 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 2 | 0 | 1 | 15 | 15 | 15.87 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 208.0558 | 1549.219 | 859.4029 | 1584.102 | 122.8275 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 2 | 0 | 1 | 16 | 16 | 19.8 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1142.769 | 1002.724 | 1528.884 | 519.3132 | 506.8623 | 212 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 2 | 0 | 1 | 17 | 17 | 17.22 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 128.4152 | 280.35 | 1431.522 | 2042.251 | 1088.317 | 1126.82 | 216.24 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1983 | 1 | 13 | 2 | 0 | 1 | 18 | 18 | 14.69 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 248.6137 | 996.5949 | 2889.601 | 2068.12 | 956.2608 |
| | 1268.925 | 194.3943 | 196.7652 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |

1983 1 13 2 0 1 19 19 22.54 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 494.1973 0 601.4855 767.8779 2585.586
3146.363 2109.39 2240.413 1280.573 1209.2 692.3563 867.8847 23.36552 503.876 710.9865 277.4352
0 0 0 0 0 0 0 0 0 180.2637 23.36552
138.5473

1983 1 13 2 0 1 20 20 21.61 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 128.4152 428.24 320.5743
1025.795 2080.831 1261.96 472.9337 805.596 684.1397 925.579 265.1152 385.3137 210.9455 925.579
647.526 687.621 194.3943 323.9137 816.3572 608.9256 1072.866 186.1094 563.9412 628.4005 198.6124
906.11772

1983 1 13 2 0 1 21 21 16.9 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
485.9343 1031.431 57.69429 0 624.1605 844.6405 0 967.971 819.7265 813.6653 327.3886
128.4152 380.5037 91.71552 115.3886 254.4594 111.9137 0 0 269.6943 0 305.5628
2021.1464

1983 1 13 2 0 1 22 22 12.75 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 57.69429 343.8105 212 0 0 57.69429 0 0 269.6943
0 0 0 23.36552 343.8105 396.5037 0 0 186.1094 0 0
1264.83428

1983 1 13 2 0 1 23 23 4.35 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 57.69429 57.69429 0 0 0 0 0 0
463.0405

1989 1 13 1 0 1 5 5 1.07 0 0 17.19367
0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0
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1989 1 13 1 0 1 7 7 1.07 0 0 0
0 17.19367 0 0 0 0 0 0 0 0 0
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0

1989 1 13 1 0 1 8 8 2.56 0 0 17.19367
35.3694 103.162 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 1 | 0 | 1 | 9 | 9 | 2.63 | 0 | 0 | 0 |
| | 0 | 228.428 | 17.19367 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 1 | 0 | 1 | 10 | 10 | 4.63 | 0 | 0 | 0 |
| | 0 | 257.4364 | 0 | 17.19367 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 1 | 0 | 1 | 11 | 11 | 2.63 | 0 | 0 | 0 |
| | 0 | 300.1489 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 1 | 0 | 1 | 12 | 12 | 2.28 | 0 | 0 | 0 |
| | 0 | 52.56307 | 0 | 0 | 34.38735 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 1 | 0 | 1 | 13 | 13 | 4.56 | 0 | 0 | 0 |
| | 0 | 70.7388 | 0 | 62.41367 | 34.38735 | 35.3694 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 1 | 0 | 1 | 14 | 14 | 2.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 7.59 | 0 | 41.97735 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 1 | 0 | 1 | 15 | 15 | 3.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 35.3694 | 120.3148 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |

1989 1 13 1 0 1 16 16 3.49 0 0 0
0 0 0 0 179.3333 164.1313 126.1813 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

1989 1 13 1 0 1 17 17 3.35 0 0 0
0 0 0 0 65.48333 0 0 191.6647 126.1813 37.63 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

1989 1 13 1 0 1 18 18 3.21 0 0 0
0 0 0 0 0 44.41478 0 65.48333 1.39 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

1989 1 13 1 0 1 19 19 3.49 0 0 0
0 0 0 0 0 163.8113 40.76583 333.8944 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

1989 1 13 1 0 1 20 20 5.56 0 0 0
0 0 0 0 0 0 85.18062 166.9472 252.3627 0 0
1.39 65.48333 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

1989 1 13 1 0 1 21 21 2.42 0 0 0
0 0 0 0 0 0 126.1813 126.1813 126.1813 39.29 0
0 126.1813 0 126.1813 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

1989 1 13 1 0 1 22 22 3.56 0 0 0
0 0 0 0 0 0 0 0 1.39 0 126.1813
40.76583 126.1813 0 0 126.1813 0 0 0 0 0 0
0 0 0 0 0 0 0 126.1813 0 252.3626 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

1989 1 13 1 0 1 23 23 6.7 0 0 0
0 0 0 0 0 0 0 108.0475 0 0 126.1813
5807.062 40.76583 65.48333 126.1813 0 0 0 0 126.1813 0 0
126.1813 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 1 | 0 | 1 | 24 | 24 | 5.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.39 | 0 | 2883.886 |
| | 1.39 | 2883.886 | 0 | 126.1813 | 0 | 108.0475 | 0 | 108.0475 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 1 | 0 | 1 | 27 | 27 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2883.886 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 2 | 0 | 1 | 4 | 4 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 17.19367 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 2 | 0 | 1 | 5 | 5 | 1.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 34.38735 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 2 | 0 | 1 | 6 | 6 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 35.3694 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 2 | 0 | 1 | 7 | 7 | 2.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 86.95042 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 2 | 0 | 1 | 8 | 8 | 2.63 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 192.0766 | 17.19367 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 1989 | 1 | 13 | 2 | 0 | 1 | 9 | 9 | 2.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 120.3557 | 35.3694 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 2 | 0 | 1 | 10 | 10 | 1.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 247.5858 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 2 | 0 | 1 | 11 | 11 | 2.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 229.4101 | 0 | 0 | 17.19367 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 2 | 0 | 1 | 12 | 12 | 2.35 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 123.3019 | 0 | 35.3694 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 2 | 0 | 1 | 13 | 13 | 3.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 35.3694 | 35.3694 | 54.82367 | 34.38735 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 2 | 0 | 1 | 14 | 14 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 37.63 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 2 | 0 | 1 | 15 | 15 | 2.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 44.41478 | 106.0232 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1989 | 1 | 13 | 2 | 0 | 1 | 16 | 16 | 5.63 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 65.48333 | 252.9609 | 170.5961 | 85.18062 | 0 | 0 |

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1989 1 13 2 0 1 17 17 6.77 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 44.41478 0 150.6639 170.5961 378.544
95.735 0 0 0 0 0 0 0 0 0 0
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1989 1 13 2 0 1 18 18 9.19 0 0 0
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0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 44.41478 126.1813 189.6893 373.6975 80.05583
80.05583 126.1813 65.48333 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

1989 1 13 2 0 1 19 19 7.05 0 0 0
0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 44.41478 0 298.1675 271.7205
165.4713 126.1813 39.29 126.1813 0 0 126.1813 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
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1989 1 13 2 0 1 20 20 5.98 0 0 0
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1989 1 13 2 0 1 21 21 4.56 0 0 0
0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 65.48333 0 1.39
0 0 39.29 0 0 0 78.58 0 0 0 0
65.48333 0 0 0 0 0 0 0 191.6647 0 0
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1989 1 13 2 0 1 22 22 4.28 0 0 0
0 0 0 0 0 0 0 0 0 0 0
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1989 1 13 2 0 1 23 23 1.07 0 0 0
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|---|---|---|---|---|---|---|---|---|---|---|---|
| 1992 | 1 | 13 | 1 | 0 | 1 | 5 | 5 | 1.07 | 0 | 0 | 6.72 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 1 | 0 | 1 | 7 | 7 | 1.07 | 0 | 0 | 0 |
| | 46.93345 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 1 | 0 | 1 | 8 | 8 | 1.14 | 0 | 0 | 0 |
| | 0 | 46.93345 | 0 | 46.93345 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 1 | 0 | 1 | 9 | 9 | 1.14 | 0 | 0 | 0 |
| | 93.8669 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 1 | 0 | 1 | 10 | 10 | 1.21 | 0 | 0 | 0 |
| | 93.8669 | 46.93345 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 1 | 0 | 1 | 11 | 11 | 2.21 | 0 | 0 | 0 |
| | 0 | 46.93345 | 53.65345 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 1 | 0 | 1 | 12 | 12 | 2.21 | 0 | 0 | 0 |
| | 0 | 0 | 46.93345 | 51.62182 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 1 | 0 | 1 | 13 | 13 | 2.35 | 0 | 0 | 0 |
| | 93.8669 | 0 | 0 | 93.8669 | 4.688372 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 1 | 0 | 1 | 14 | 14 | 1.42 | 0 | 0 | 0 |
| | 0 | 0 | 46.93345 | 93.8669 | 93.8669 | 46.93345 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 1 | 0 | 1 | 15 | 15 | 2.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 98.55527 | 103.2436 | 93.8669 | 4.688372 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 1 | 0 | 1 | 16 | 16 | 3.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 98.55527 | 140.8003 | 98.55527 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 12.78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 1 | 0 | 1 | 17 | 17 | 3.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 51.62182 | 56.31019 | 0 | 5.12 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 1 | 0 | 1 | 18 | 18 | 3.35 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 8.96 | 4.688372 | 4.688372 | 46.93345 | 4.688372 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 1 | 0 | 1 | 19 | 19 | 2.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 12.78 | 14.06512 | 12.78 | 0 | 0 | 0 |
| | 0 | 12.78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 1 | 0 | 1 | 20 | 20 | 5.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 12.78 | 22.7 | 17.55867 | 4.688372 | 12.78 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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|---|---|---|---|---|---|---|---|---|---|---|---|
| 1992 | 1 | 13 | 1 | 0 | 1 | 21 | 21 | 2.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12.78 | 12.78 | 4.778667 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 1 | 0 | 1 | 22 | 22 | 4.91 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 4.778667 | 0 | 17.46837 | 22.26837 | 22.24704 |
| | 0 | 0 | 25.56 | 4.8 | 0 | 4.778667 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 1 | 0 | 1 | 23 | 23 | 2.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12.78 | 0 | 12.78 |
| | 0 | 38.34 | 0 | 0 | 0 | 0 | 4.8 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 1 | 0 | 1 | 24 | 24 | 3.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 4.688372 | 12.78 | 4.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 1 | 0 | 1 | 25 | 25 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 12.78 | 0 | 0 | 0 | 8.96 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 2 | 0 | 1 | 9 | 9 | 1.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 46.93345 | 46.93345 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 2 | 0 | 1 | 13 | 13 | 1.35 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 46.93345 | 140.8003 | 46.93345 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 2 | 0 | 1 | 14 | 14 | 2.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 46.93345 | 103.2436 | 93.8669 | 0 | 0 | 0 | 0 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 2 | 0 | 1 | 15 | 15 | 2.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 51.62182 | 98.55527 | 4.688372 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 2 | 0 | 1 | 16 | 16 | 2.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 51.62182 | 0 | 140.8003 | 46.93345 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 2 | 0 | 1 | 17 | 17 | 1.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4.688372 | 4.688372 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 2 | 0 | 1 | 18 | 18 | 3.77 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 4.688372 | 4.688372 | 17.46837 | 22.15674 | 4.688372 | 0 |
| | 12.78 | 4.778667 | 12.78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 2 | 0 | 1 | 19 | 19 | 4.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4.778667 | 0 | 12.78 | 14.24571 |
| | 0 | 0 | 39.84837 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 2 | 0 | 1 | 20 | 20 | 6.05 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4.8 | 4.8 | 0 |
| | 17.55867 | 12.78 | 0 | 9.808372 | 9.376744 | 17.58 | 0 | 0 | 4.688372 | 4.8 | 0 |
| | 4.688372 | 0 | 0 | 0 | 0 | 4.8 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1992 | 1 | 13 | 2 | 0 | 1 | 21 | 21 | 3.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 12.78 | 5.12 | 0 | 12.78 | 0 | 0 | 0 | 0 | 4.8 | 0 | 12.78 |
| | 0 | 5.12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 1992 | 1 | 13 | 2 | 0 | 1 | 22 | 22 | 3.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 4.778667 | 5.12 | 4.8 | 4.778667 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 14.336001 | | | | | | | | | | |
| 1992 | 1 | 13 | 2 | 0 | 1 | 23 | 23 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 5.12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 5 | 5 | 1.07 | 0 | 0 | 0 |
| | 10.95 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 7 | 7 | 1.07 | 0 | 12.702 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 8 | 8 | 1.07 | 0 | 0 | 0 |
| | 87.7344 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 9 | 9 | 2.28 | 0 | 0 | 0 |
| | 0 | 282.4432 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 10 | 10 | 4.56 | 0 | 0 | 0 |
| | 15.05625 | 350.9376 | 106.9744 | 12.702 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 11 | 11 | 7.84 | 0 | 0 | 0 |
| | 0 | 223.197 | 34.29625 | 53.31978 | 0 | 0 | 21.37778 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 12 | 12 | 5.63 | 0 | 0 | 0 |
| | 0 | 0 | 49.3525 | 77.05181 | 12.702 | 0 | 12.702 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 13 | 13 | 5.91 | 0 | 0 | 0 |
| | 0 | 0 | 42.8145 | 128.1946 | 46.12478 | 25.404 | 0 | 12.702 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 14 | 14 | 5.35 | 0 | 0 | 0 |
| | 0 | 0 | 15.05625 | 87.7344 | 0 | 40.61778 | 0 | 12.702 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 15 | 15 | 5.49 | 0 | 0 | 0 |
| | 0 | 0 | 15.05625 | 0 | 19.24 | 15.05625 | 12.702 | 61.27941 | 60.54941 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 16 | 16 | 5.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 21.98778 | 43.48556 | 60.54941 | 72.59441 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 17 | 17 | 4.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 70.17 | 0 | 60.54941 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 18 | 18 | 3.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 132.7694 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 1995 | 1 | 17 | 1 | 0 | 1 | 19 | 19 | 3.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 75.60566 | 0 | 19.24 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 20 | 20 | 6.63 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 149.3494 | 111.6202 |
| | 0 | 19.24 | 19.24 | 0 | 0 | 0 | 0 | 60.54941 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 21 | 21 | 3.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 60.54941 | 50.32 | 0 | 0 | 2.44 |
| | 50.32 | 0 | 100.64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 22 | 22 | 4.35 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.732 | 0.7507692 |
| | 0 | 51.13333 | 0.8133333 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 23 | 23 | 3.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.732 |
| | 0 | 0 | 50.32 | 0 | 0 | 110.8694 | 121.0988 | 60.54941 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 24 | 24 | 1.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 60.54941 |
| | 0 | 0 | 0 | 0 | 0 | 60.54941 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 1 | 0 | 1 | 25 | 25 | 2.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 60.54941 | 50.32 | 0 | 0 | 0 | 60.54941 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 2 | 0 | 1 | 6 | 6 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 19.24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 2 | 0 | 1 | 7 | 7 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 34.29625 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 2 | 0 | 1 | 8 | 8 | 3.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 106.9744 | 15.05625 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 2 | 0 | 1 | 9 | 9 | 7.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 100.4364 | 164.6944 | 106.9744 | 12.702 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 2 | 0 | 1 | 10 | 10 | 4.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 30.1125 | 87.7344 | 34.07978 | 12.702 | 12.702 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 2 | 0 | 1 | 11 | 11 | 9.26 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 240.8336 | 250.1664 | 36.43403 | 91.83441 | 21.37778 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 2 | 0 | 1 | 12 | 12 | 6.84 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 166.0177 | 117.8469 | 87.7344 | 24.09 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 2 | 0 | 1 | 13 | 13 | 8.84 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 50.525 | 16.51625 | 27.10125 | 53.31978 | 0 | 0.73 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 1995 | 1 | 17 | 2 | 0 | 1 | 14 | 14 | 5.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 15.78625 | 0 | 43.48556 | 0 | 31.942 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 2 | 0 | 1 | 15 | 15 | 3.35 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 61.27941 | 12.775 | 60.54941 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 2 | 0 | 1 | 16 | 16 | 4.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19.24 | 0.732 | 69.56 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 2 | 0 | 1 | 17 | 17 | 8.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19.99077 | 176.7402 | 50.32 |
| | 0.732 | 60.54941 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 2 | 0 | 1 | 18 | 18 | 6.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 62.03018 | 0 |
| | 0.7507692 | 1.970769 | 110.8694 | 0 | 0 | 50.32 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 19.24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 2 | 0 | 1 | 19 | 19 | 7.84 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.482769 | 0 |
| | 2.314872 | 19.99077 | 0 | 121.0988 | 1.22 | 50.32 | 60.54941 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 2 | 0 | 1 | 20 | 20 | 2.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 60.54941 | 0 |
| | 0 | 0 | 50.32 | 0 | 50.32 | 0 | 0 | 100.64 | 0 | 0 | 50.32 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1995 | 1 | 17 | 2 | 0 | 1 | 21 | 21 | 4.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1.501538 | 0 | 0 | 0 | 0 | 50.32 | 0 | 0 | 0 | 0 |
| | 121.0988 | 50.32 | 0 | 0 | 0 | 50.32 | 0 | 60.54941 | 0 | 0 | 0 |
| | 51.05 | | | | | | | | | | |
| 1995 | 1 | 17 | 2 | 0 | 1 | 22 | 22 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 60.54941 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 3 | 3 | 1.07 | 0 | 22.94 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 6 | 6 | 1.07 | 0 | 0 | 0 |
| | 0 | 22.94 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 7 | 7 | 1.14 | 0 | 0 | 0 |
| | 555.8538 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 8 | 8 | 1.07 | 0 | 0 | 0 |
| | 22.94 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 9 | 9 | 1.14 | 0 | 0 | 0 |
| | 45.88 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 10 | 10 | 3.28 | 0 | 0 | 0 |
| | 0 | 68.82 | 0 | 277.9269 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 2001 | 1 | 17 | 1 | 0 | 1 | 11 | 11 | 5.49 | 0 | 0 | 0 |
| | 0 | 22.94 | 349.4469 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 12 | 12 | 6.56 | 0 | 0 | 0 |
| | 0 | 1.64 | 45.88 | 601.7338 | 0 | 0 | 0 | 22.94 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 13 | 13 | 12.54 | 0 | 0 | 0 |
| | 0 | 0 | 627.3738 | 950.6008 | 556.9138 | 7.438095 | 22.94 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 14 | 14 | 13.4 | 0 | 0 | 0 |
| | 0 | 22.94 | 24 | 325.9269 | 1165.026 | 0 | 24 | 285.365 | 7.81 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 15 | 15 | 12.26 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 279.5669 | 647.6138 | 858.0702 | 70.46 | 47.22941 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 16 | 16 | 11.05 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 286.425 | 47.22941 | 323.8069 | 32.78751 | 68.82 | 7.438095 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 17 | 17 | 10.91 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 48.86941 | 1.06 | 34.3681 | 24.58 | 0 | 0 |
| | 1.64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 18 | 18 | 17.33 | 0 | 0 | 0 |
| | 0 | 22.94 | 0 | 0 | 0 | 1.06 | 25.92941 | 93.4 | 27.56941 | 38.56 | 1.06 |
| | 45.88 | 0 | 1.64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 19 | 19 | 14.33 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 22.94 | 0 | 346.7469 | 24.58 | 98.86 | 75.92 |
| | 22.94 | 45.88 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 20 | 20 | 11.98 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 22.94 | 0 | 56.04 | 70.16941 | 0 |
| | 30.04 | 22.94 | 22.94 | 0 | 0 | 22.94 | 0 | 7.1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 21 | 21 | 3.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1.64 | 22.94 | 0 | 22.94 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 22 | 22 | 4.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24.28941 |
| | 0 | 0 | 22.94 | 0 | 7.1 | 0 | 7.438095 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 23 | 23 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 8.52 | 0 | 0 | 7.438095 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 1 | 0 | 1 | 24 | 24 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 7.1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 2 | 0 | 1 | 5 | 5 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1.06 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 2001 | 1 | 17 | 2 | 0 | 1 | 7 | 7 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 22.94 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 2 | 0 | 1 | 8 | 8 | 3.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 24.58 | 0 | 0 | 0 | 1.06 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 2 | 0 | 1 | 9 | 9 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 300.8669 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 2 | 0 | 1 | 10 | 10 | 4.42 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 308.305 | 300.8669 | 0 | 277.9269 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 2 | 0 | 1 | 11 | 11 | 3.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 22.94 | 45.88 | 1.06 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 2 | 0 | 1 | 12 | 12 | 11.54 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 9.8 | 48 | 1436.864 | 601.7338 | 856.7208 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 2 | 0 | 1 | 13 | 13 | 10.33 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 1.64 | 323.8069 | 891.3608 | 287.3769 | 286.7969 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 2 | 0 | 1 | 14 | 14 | 15.19 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 50.7 | 30.3781 | 24 | 555.8538 | 24.36 | 0 | 7.438095 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 2 | 0 | 1 | 15 | 15 | 17.26 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 311.005 | 1.06 | 372.6763 | 3.28 | 54.62 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 2 | 0 | 1 | 16 | 16 | 17.68 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 1.64 | 0 | 94.45882 | 79.61941 | 58.31941 | 30.3781 | 49.16 |
| | 1.64 | 22.94 | 22.94 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 2 | 0 | 1 | 17 | 17 | 15.12 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22.94 | 55.33 | 67.18 | 38.82751 |
| | 24.58 | 7.81 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 2 | 0 | 1 | 18 | 18 | 18.82 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 45.88 | 0 | 78.90941 | 24.58 |
| | 65.1181 | 52.98 | 45.88 | 30.04 | 22.94 | 45.88 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 7.438095 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 2 | 0 | 1 | 19 | 19 | 6.77 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22.94 | 22.94 |
| | 22.94 | 22.94 | 22.94 | 45.88 | 7.1 | 0 | 22.94 | 0 | 0 | 22.94 | 1.64 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2001 | 1 | 17 | 2 | 0 | 1 | 20 | 20 | 6.98 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 53.3181 | 0 | 30.3781 | 22.94 | 0 | 1.64 | 0 | 22.94 | 22.94 |
| | 0 | 0 | 30.3781 | 0 | 22.94 | 22.94 | 0 | 0 | 0 | 0 | 0 |
| | 1.06 | | | | | | | | | | |
| 2001 | 1 | 17 | 2 | 0 | 1 | 21 | 21 | 2.35 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 22.94 | 22.94 | 0 | 0 | 0 | 0 | 0 | 22.94 | 0 | 0 | 0 |
| | 30.378095 | | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2001 | 1 | 17 | 2 | 0 | 1 | 22 | 22 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 22.94 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 22.94 | | | | | | | | | | |
| 2004 | 1 | 17 | 1 | 0 | 1 | 3 | 3 | 1.07 | 0 | 3.94 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 1 | 0 | 1 | 5 | 5 | 1.07 | 0 | 0 | 14.97 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 1 | 0 | 1 | 13 | 13 | 1.14 | 0 | 0 | 0 |
| | 0 | 10.4016 | 0 | 10.4016 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 1 | 0 | 1 | 14 | 14 | 2.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 25.3716 | 10.4016 | 10.4016 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 1 | 0 | 1 | 15 | 15 | 4.49 | 0 | 0 | 0 |
| | 0 | 0 | 14.97 | 23.64 | 20.8032 | 10.4016 | 14.97 | 10.4016 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 1 | 0 | 1 | 16 | 16 | 6.63 | 0 | 0 | 0 |
| | 0 | 14.97 | 55.6884 | 58.1748 | 14.97 | 0 | 7.03 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 1 | 0 | 1 | 17 | 17 | 7.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 14.97 | 22 | 58.7784 | 29.94 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 1 | 0 | 1 | 18 | 18 | 9.7 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 3.09 | 14.97 | 18.06 | 28.1 | 26.97 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 1 | 0 | 1 | 19 | 19 | 6.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 111.3768 | 70.6584 | 0 | 3.09 | 10.4016 | 23.96 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 1 | 0 | 1 | 20 | 20 | 10.77 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 3.09 | 43.84 | 6.18 | 12.08 | 8.99 |
| | 3.09 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 1 | 0 | 1 | 21 | 21 | 8.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3.09 | 16.5816 | 14.97 | 3.94 |
| | 3.94 | 0 | 55.6884 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 1 | 0 | 1 | 22 | 22 | 6.49 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 74.85 | 0 | 55.6884 |
| | 3.09 | 8.99 | 0 | 0 | 26.97 | 14.97 | 0 | 0 | 55.6884 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 1 | 0 | 1 | 23 | 23 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 55.6884 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 1 | 0 | 1 | 24 | 24 | 2.28 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 55.6884 | 0 | 55.6884 | 0 | 26.97 | 0 | 0 | 0 | 26.97 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2004 | 1 | 17 | 2 | 0 | 1 | 3 | 3 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 14.97 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 2 | 0 | 1 | 9 | 9 | 1.07 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 3.09 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 2 | 0 | 1 | 12 | 12 | 2.21 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 14.97 | 25.3716 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 2 | 0 | 1 | 13 | 13 | 2.14 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 10.4016 | 14.97 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 2 | 0 | 1 | 14 | 14 | 4.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 13.4916 | 62.7432 | 18.06 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 2 | 0 | 1 | 15 | 15 | 7.77 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 20.8032 | 14.97 | 69.18 | 41.3116 | 10.4016 | 0 | 0 |
| | 8.99 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 2 | 0 | 1 | 16 | 16 | 10.77 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 25.3716 | 33.03 | 7.03 | 6.18 | 14.97 | 0 | 0 |
| | 55.6884 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 17 | 2 | 0 | 1 | 17 | 17 | 16.82 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 6.18 | 52.06 | 48.2 | 21.15 | 52.06 | 211.5684 |

3.09 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

2004 1 17 2 0 1 18 18 20.68 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 3.09 36.12 21.15 109.9084 36.12
54.02 14.97 14.97 0 0 26.97 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0

2004 1 17 2 0 1 19 19 9.19 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 55.6884 111.3768
56.91 41.94 26.97 139.5284 97.6284 26.97 0 0 0 26.97 0
0 0 0 0 0 0 0 0 0 0 0
0

2004 1 17 2 0 1 20 20 12.33 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 29.94 3.09 0
18.06 33.03 55.6884 0 29.94 14.97 109.6284 0 26.97 0 0
53.94 0 0 53.94 0 0 0 0 0 0 0
0

2004 1 17 2 0 1 21 21 1.21 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 55.6884 0 0 0 55.6884 55.6884 0 0
0 0 0 0 0 0 0 0 0 0 0
0

2004 1 17 2 0 1 22 22 4.28 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
74.85 0 0 0 0 14.97 0 0 0 0 0
0 0 0 0 0 0 0 0 0 14.97 0
14.97

# Unchanged from 2007 WA Trawl age error key 1 (n=25)

1980 1 15 3 0 1 -1 -1 14.12 0 0 0
0 1.138 2.276 2.276 2.276 3.414 7.966 7.966 2.276 1.138 2.276
1.138 1.138 1.138 1.138 3.414 1.138 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 2.276 5.69 1.138 5.69 6.828 10.242 6.828
1.138 2.276 0 2.276 3.414 5.69 3.414 1.138 0 2.276 2.276
0 1.138 1.138 0 1.138 1.138 0 1.138 0 1.138 0
1.138

1981 1 15 3 0 1 -1 -1 35.3 0 0 0
0 0 19.166 68.332 110.669 212.922 397.324 229.214 131.123 58.653 99.62
21.933 10.967 23.17 68.382 10.967 19.166 5.483 10.967 0 0 0
5.483 19.166 0 0 0 0 0 0 0 27.366 0
0 0 0 25.887 5.483 135.102 103.598 176.202 510.172 184.052 208.568
155.64 154.269 66.987 65.616 152.71 47.578 40.966 23.17 10.967 51.824 5.483
43.816 0 0 13.683 65.616 13.683 0 13.683 19.166 13.683 0
95.699

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1982 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 21.18 | 0 | 0 | 0 |
| | 4.269 | 74.658 | 41.598 | 33.65 | 37.919 | 33.787 | 12.807 | 34.239 | 30.786 | 22.474 | 16.712 |
| | 4.495 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 12.443 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 24.886 | 12.443 | 83.786 | 104.403 | 50.951 | 58.674 | 21.433 | 4.269 | 29.745 |
| | 29.381 | 35.281 | 4.269 | 8.764 | 4.495 | 22.474 | 4.495 | 4.495 | 17.979 | 13.033 | 21.433 |
| | 4.495 | 12.443 | 21.433 | 12.443 | 0 | 4.495 | 4.269 | 4.495 | 0 | 12.443 | 4.495 |
| | 41.824 | | | | | | | | | | |
| 1983 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 14.12 | 0 | 0 | 0 |
| | 0 | 285.283 | 285.283 | 1569.058 | 1296.316 | 570.566 | 815.882 | 155.183 | 297.824 | 232.774 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 142.642 | 427.925 | 1141.133 | 2515.04 | 1659.19 | 1153.674 | 1426.416 | 570.566 | 375.416 |
| | 297.824 | 0 | 220.233 | 285.283 | 297.824 | 77.591 | 77.591 | 285.283 | 310.365 | 142.642 | 77.591 |
| | 155.183 | 0 | 77.591 | 0 | 0 | 0 | 0 | 77.591 | 0 | 0 | 0 |
| | 840.964 | | | | | | | | | | |
| 1984 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 21.18 | 0 | 0 | 0 |
| | 0 | 0 | 152.652 | 76.326 | 129.21 | 287.883 | 287.883 | 287.883 | 46.863 | 299.261 | 58.905 |
| | 369.545 | 123.189 | 199.515 | 123.189 | 0 | 93.726 | 76.326 | 129.21 | 0 | 0 | 0 |
| | 0 | 76.326 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 311.325 | 411.735 | 458.598 | 493.418 | 376.251 | 140.588 |
| | 6.021 | 94.389 | 64.926 | 93.726 | 0 | 105.768 | 6.021 | 187.451 | 6.021 | 152.652 | 176.073 |
| | 46.863 | 6.021 | 58.905 | 0 | 0 | 0 | 0 | 93.726 | 0 | 58.905 | 0 |
| | 293.219 | | | | | | | | | | |
| 1985 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 7.06 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 48.931 | 97.861 | 391.445 | 391.445 | 244.653 | 146.792 | 342.514 |
| | 195.723 | 97.861 | 0 | 97.861 | 0 | 97.861 | 0 | 48.931 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 146.792 | 146.792 | 391.445 | 293.584 | 244.653 |
| | 146.792 | 244.653 | 244.653 | 146.792 | 97.861 | 0 | 0 | 0 | 48.931 | 97.861 | 97.861 |
| | 48.931 | 48.931 | 48.931 | 48.931 | 0 | 0 | 0 | 0 | 0 | 0 | 48.931 |
| | 97.861 | | | | | | | | | | |
| 1987 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 84.72 | 0 | 0 | 0 |
| | 0 | 0 | 314.668 | 181.42 | 1672.042 | 2157.026 | 2323.814 | 2777.587 | 2166.543 | 1851.626 | 755.256 |
| | 1169.988 | 804.219 | 505.732 | 367.263 | 302.464 | 72.159 | 23.77 | 0 | 37.343 | 260.564 | 62.686 |
| | 166.382 | 0 | 0 | 0 | 23.77 | 0 | 0 | 0 | 0 | 42.346 | 0 |
| | 0 | 0 | 0 | 9.874 | 106.725 | 427.262 | 2379.18 | 2977.99 | 1680.528 | 2570.071 | 2146.587 |
| | 1060.484 | 326.843 | 199.689 | 275.267 | 252.504 | 257.835 | 410.78 | 174.627 | 336.861 | 231.434 | 214 |
| | 0 | 15.472 | 30.944 | 199.689 | 232.857 | 198.775 | 353.972 | 0 | 132.412 | 138.105 | 74.687 |
| | 1596.282 | | | | | | | | | | |
| 1988 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 35.3 | 0 | 0 | 0 |
| | 7.962 | 31.846 | 39.808 | 56.96 | 88.819 | 214.853 | 485.45 | 523.221 | 664.417 | 374.519 | 231.878 |
| | 37.671 | 235.155 | 227.738 | 0 | 12.557 | 73.441 | 0 | 80.857 | 0 | 0 | 0 |
| | 0 | 80.857 | 80.857 | 0 | 0 | 0 | 11.556 | 0 | 11.556 | 12.557 | 0 |
| | 0 | 0 | 0 | 7.962 | 95.767 | 129.071 | 69.517 | 406.365 | 667.137 | 427.669 | 746.275 |
| | 312.735 | 84.997 | 246.711 | 46.225 | 37.671 | 73.441 | 0 | 73.441 | 24.113 | 235.155 | 80.857 |
| | 80.857 | 154.298 | 103.97 | 11.556 | 92.413 | 161.714 | 80.857 | 73.441 | 12.557 | 80.857 | 11.556 |
| | 792.499 | | | | | | | | | | |
| 1989 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 91.78 | 0 | 0 | 0 |
| | 125.467 | 100.465 | 526.406 | 1444.355 | 2215.856 | 3493.773 | 2947.182 | 2161.451 | 1948.887 | 978.729 | 778.55 |
| | 362.258 | 246.616 | 290.12 | 0 | 51.073 | 0 | 214.229 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 218.285 | 341.862 | 0 |
| | 0 | 25.093 | 54.045 | 173.713 | 881.338 | 2243.636 | 2521.382 | 3072.295 | 4354.315 | 2677.73 | 3225.23 |
| | 1728.132 | 953.597 | 496.604 | 102.329 | 384.357 | 471.094 | 573.24 | 92.095 | 273.182 | 0 | 92.794 |
| | 68.159 | 0 | 214.229 | 0 | 107.115 | 51.073 | 120.061 | 102.146 | 51.073 | 69.687 | 206.578 |
| | 1359.841 | | | | | | | | | | |
| 1990 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 77.66 | 0 | 0 | 0 |
| | 37.596 | 0 | 822.504 | 838.17 | 1724.91 | 2403.423 | 2948.462 | 3715.324 | 2325.52 | 2222.534 | 750.774 |
| | 801.003 | 198.969 | 601.608 | 195.933 | 135.03 | 3.035 | 3.035 | 127.895 | 0 | 0 | 0 |
| | 0 | 0 | 3.035 | 0 | 211.824 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 5.836 | 564.907 | 2546.672 | 2188.533 | 2037.928 | 2493.554 | 3198.335 | 3090.009 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1505.896 | 1066.52 | 1035.383 | 561.823 | 709.498 | 209.646 | 212.776 | 6.071 | 604.643 | 344.771 | 209.741 |
| | 0 | 225.316 | 3.035 | 6.071 | 97.434 | 97.434 | 3.035 | 212.776 | 3.035 | 30.461 | 3.035 |
| | 1128.254 | | | | | | | | | | |
| 1991 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 7.06 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 186.491 | 0 | 559.474 | 559.474 | 559.474 | 932.456 |
| | 372.982 | 0 | 0 | 0 | 0 | 186.491 | 0 | 186.491 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 186.491 | 559.474 | 372.982 |
| | 372.982 | 932.456 | 745.965 | 559.474 | 186.491 | 0 | 186.491 | 0 | 186.491 | 372.982 | 0 |
| | 186.491 | 0 | 186.491 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 186.491 | | | | | | | | | | |
| 1992 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 84.72 | 0 | 0 | 0 |
| | 0 | 385.145 | 1039.991 | 892.503 | 3116.253 | 1571.725 | 801.596 | 1796.922 | 1846.628 | 1865.441 | 1735.802 |
| | 2060.908 | 1863.535 | 1420.915 | 402.264 | 969.284 | 277.959 | 0 | 0 | 144.649 | 144.649 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14.574 | 0 | 0 |
| | 0 | 0 | 0 | 398.997 | 110.513 | 1936.558 | 2139.602 | 2865.718 | 2716.253 | 3138.851 | 1752.359 |
| | 451.253 | 570.138 | 913.504 | 1644.213 | 1101.756 | 1096.679 | 680.079 | 21.415 | 614.964 | 535.429 | 478.947 |
| | 0 | 0 | 0 | 144.649 | 334.297 | 0 | 4.838 | 340.404 | 215.706 | 15.04 | 0 |
| | 1211.333 | | | | | | | | | | |
| 1993 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 32.19 | 0 | 0 | 0 |
| | 0 | 41.572 | 378.135 | 24.273 | 813.573 | 793.459 | 591.422 | 893.955 | 736.212 | 1284.448 | 227.523 |
| | 0 | 16.138 | 0 | 0 | 0 | 0 | 0 | 0 | 37.504 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 2.034 | 6.101 | 52.613 | 10.168 | 772.277 | 1878.367 | 881.002 | 835.084 | 743.937 |
| | 297.304 | 248.889 | 0 | 0 | 0 | 0 | 0 | 0 | 37.504 | 0 | 53.643 |
| | 0 | 37.504 | 0 | 0 | 0 | 0 | 37.504 | 0 | 16.138 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 1994 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 105.9 | 0 | 0 | 0 |
| | 11.793 | 303.052 | 815.389 | 1068.324 | 1207.547 | 2090.416 | 1244.078 | 1171.043 | 767.828 | 311.398 | 222.589 |
| | 488.298 | 204.705 | 101.889 | 34.691 | 49.007 | 49.007 | 0 | 18.71 | 20.141 | 155.749 | 0 |
| | 0 | 1.759 | 0 | 1.097 | 0 | 0 | 17.613 | 54.717 | 0 | 18.19 | 0 |
| | 0 | 0 | 25.065 | 376.347 | 785.208 | 821.024 | 1975.058 | 2407.59 | 1297.573 | 971.284 | 1156.39 |
| | 524.855 | 439.259 | 166.417 | 139.613 | 140.949 | 135.314 | 38.22 | 247.029 | 22.479 | 139.41 | 18.71 |
| | 0 | 0 | 41.041 | 139.41 | 0 | 0 | 139.41 | 113.371 | 157.023 | 6.869 | 0 |
| | 191.946 | | | | | | | | | | |
| 1995 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 155.32 | 0 | 0 | 0 |
| | 6.813 | 89.151 | 158.557 | 404.822 | 651.775 | 564.748 | 672.1 | 820.07 | 429.091 | 294.382 | 144.893 |
| | 68.908 | 23.451 | 8.749 | 5.13 | 12.591 | 5.977 | 47.39 | 0 | 5.13 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8.117 | 0 | 0 |
| | 0 | 0 | 6.813 | 157.825 | 287.799 | 512.595 | 824.41 | 483.796 | 930.294 | 671.771 | 280.718 |
| | 110.676 | 116.835 | 66.458 | 71.22 | 8.632 | 10.369 | 12.591 | 9.948 | 0 | 0 | 25.387 |
| | 4.257 | 0 | 0 | 0 | 4.058 | 0 | 0 | 0 | 16.259 | 0 | 14.929 |
| | 32.492 | | | | | | | | | | |
| 1996 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 98.84 | 0 | 0 | 0 |
| | 17.094 | 56.984 | 120.955 | 198.925 | 254.682 | 236.982 | 455.987 | 492.082 | 393.291 | 380.645 | 79.515 |
| | 31.367 | 140.331 | 11.698 | 37.42 | 8.188 | 0 | 3.155 | 3.511 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 20.65 | 66.958 | 207.306 | 264.271 | 452.88 | 328.607 | 397.931 | 485.39 | 339.48 |
| | 262.084 | 171.886 | 51.18 | 88.719 | 85.209 | 8.188 | 110.703 | 85.209 | 41.87 | 0 | 0 |
| | 0 | 0 | 0 | 43.338 | 0 | 33.682 | 10.477 | 0 | 0 | 0 | 8.188 |
| | 20.953 | | | | | | | | | | |
| 1997 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 120.02 | 0 | 0 | 0 |
| | 42.501 | 87.323 | 114.824 | 273.283 | 543.503 | 496.606 | 809.017 | 779.741 | 824.275 | 724.531 | 596.595 |
| | 172.991 | 142.488 | 101.233 | 126.945 | 120.775 | 84.891 | 115.048 | 0 | 22.017 | 49.347 | 37.9 |
| | 0 | 0 | 0 | 34.598 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 43.661 | 212.569 | 119.037 | 603.479 | 573.911 | 990.154 | 943.757 | 757.181 | 740.893 |
| | 439.659 | 581.648 | 260.589 | 109.79 | 45.842 | 184.521 | 64.877 | 66.234 | 76.954 | 43.669 | 14.749 |
| | 100.299 | 0 | 56.615 | 0 | 14.749 | 0 | 31.636 | 0 | 0 | 0 | 0 |
| | 195.584 | | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1998 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 112.96 | 0 | 0 | 0 |
| | 5.595 | 7.553 | 83.71 | 364.494 | 476.123 | 935.2 | 728.423 | 416.294 | 699.45 | 442.869 | 615.2 |
| | 271.347 | 118.811 | 52.603 | 159.584 | 113.465 | 33.113 | 77.443 | 0 | 11.608 | 0 | 22.757 |
| | 0 | 0 | 23.987 | 11.608 | 36.865 | 0 | 0 | 0 | 0 | 11.608 | 0 |
| | 0 | 0 | 17.469 | 54.187 | 204.535 | 190.023 | 854.959 | 843.092 | 861.502 | 717.876 | 457.856 |
| | 439.627 | 345.411 | 180.176 | 208.889 | 24.514 | 84.147 | 126.786 | 0 | 46.973 | 60.852 | 0 |
| | 42.687 | 0 | 23.987 | 48.831 | 0 | 36.865 | 0 | 0 | 0 | 0 | 0 |
| | 125.337 | | | | | | | | | | |
| 1999 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 105.9 | 0 | 0 | 0 |
| | 9.957 | 55.355 | 32.538 | 100.256 | 146.397 | 233.871 | 320.371 | 302.713 | 256.557 | 357.168 | 217.04 |
| | 330.586 | 198.855 | 121.465 | 151.106 | 49.122 | 47.882 | 74.813 | 0 | 4.977 | 6.257 | 0 |
| | 17.417 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 1.088 | 2.176 | 6.003 | 33.421 | 246.614 | 139.806 | 263.381 | 433.396 | 467.628 | 557.502 |
| | 335.087 | 243.625 | 287.164 | 74.749 | 249.033 | 59.834 | 3.37 | 73.904 | 46.671 | 70.862 | 0 |
| | 24.862 | 0 | 2.45 | 55.516 | 0 | 17.417 | 23.673 | 0 | 0 | 0 | 0 |
| | 2.527 | | | | | | | | | | |
| 2000 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 36.64 | 0 | 0 | 0 |
| | 0 | 3.212 | 10.002 | 8.895 | 16.26 | 8.451 | 10.653 | 23.115 | 25.803 | 11.313 | 9.077 |
| | 6.821 | 2.596 | 6.821 | 2.596 | 0 | 2.596 | 0 | 0 | 0 | 0 | 0 |
| | 0.617 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 4.344 | 13.603 | 8.833 | 23.59 | 26.293 | 15.972 | 23.526 | 23.964 |
| | 12.841 | 14.564 | 3.152 | 4.841 | 6.821 | 0 | 2.596 | 2.596 | 0 | 0 | 0.617 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.012 |
| | 0.617 | | | | | | | | | | |
| 2001 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 52.26 | 0 | 0 | 0 |
| | 1.248 | 1.248 | 5.963 | 24.416 | 28.733 | 30.514 | 21.519 | 53.55 | 27.944 | 27.583 | 30.326 |
| | 19.766 | 6.18 | 5.58 | 7.513 | 1.51 | 3.02 | 0.91 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 2.497 | 4.751 | 17.559 | 19.195 | 51.598 | 82 | 53.592 | 64.353 | 30.953 |
| | 52.942 | 17.13 | 14.945 | 14.92 | 1.51 | 1.117 | 5.438 | 4.67 | 5.438 | 0 | 1.117 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 1.117 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2002 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 105.56 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 29.532 | 48.568 | 45.443 | 20.673 | 49.737 | 28.312 | 46.294 | 52.844 |
| | 55.333 | 37.873 | 43.055 | 32.171 | 18.309 | 14.675 | 4.186 | 6.038 | 9.875 | 4.079 | 3.96 |
| | 2.003 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.924 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 13.388 | 29.46 | 77.625 | 59.585 | 52.653 | 78.294 | 75.888 |
| | 33.767 | 95.232 | 46.651 | 19.005 | 10.053 | 1.112 | 13.045 | 3.423 | 1.521 | 0 | 8.842 |
| | 0 | 1.112 | 0 | 0 | 0 | 0 | 0 | 1.112 | 0 | 0 | 0 |
| | 19.907 | | | | | | | | | | |
| 2003 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 56.6 | 0 | 0 | 0 |
| | 0 | 3.134 | 8.169 | 4.121 | 24.11 | 18.518 | 10.287 | 14.354 | 13.282 | 11.597 | 5.459 |
| | 4.854 | 5.342 | 0 | 6.173 | 2.399 | 1.083 | 1.16 | 1.93 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 3.181 | 6.188 | 16.741 | 21.946 | 18.779 | 13.751 | 9.685 |
| | 6.313 | 7.843 | 10.364 | 3.971 | 3.561 | 5.72 | 3.235 | 0 | 3.774 | 0 | 0.367 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | | | | | | | | | | |
| 2004 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 126.79 | 0 | 0 | 11.803 |
| | 11.803 | 42.788 | 103.303 | 266.781 | 193.116 | 281.273 | 152.938 | 143.441 | 176.494 | 158.225 | 82.358 |
| | 78.557 | 55.982 | 226.019 | 55.06 | 26.307 | 29.505 | 18.967 | 35.721 | 13.685 | 22.038 | 4.805 |
| | 0 | 7.283 | 11.803 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 82.353 | 190.135 | 341.613 | 317.556 | 183.337 | 170.26 | 122.757 |
| | 297.883 | 100.273 | 35.397 | 31.418 | 11.3 | 13.099 | 8.975 | 0 | 32.656 | 0 | 10.306 |
| | 5.035 | 11.803 | 10.081 | 0 | 0 | 0 | 0 | 0 | 4.431 | 5.153 | 0 |
| | 33.975 | | | | | | | | | | |
| 2005 | 1 | 15 | 3 | 0 | 1 | -1 | -1 | 109.14 | 0 | 0 | 0 |
| | 0 | 1 | 2 | 9 | 68.769 | 76.644 | 46.785 | 27.986 | 47.013 | 22.6 | 37.75 |
| | 38.443 | 46.95 | 6 | 5.579 | 6.279 | 23.05 | 8.421 | 0 | 9.15 | 4 | 1 |
| | 5.75 | 3.4 | 6.5 | 0 | 0 | 1 | 0 | 1 | 1 | 2 | 0 |
| | 0 | 0 | 0 | 1 | 2 | 21.173 | 35.894 | 20.691 | 41.863 | 57.751 | 53.608 |

13.2 28.171 18.05 37.7 16.05 9 31.85 21.35 21.05 0 2
22.3 11.95 2 5.75 7.5 0 1 1 1 0 0
16.1

# NWFSC marginals for plotting only (n=8)

2003 1 16 3 0 1 -1 -1 1 0 150163 105415
44421 20998 138286 181101 101955 175809 66122 103737 113058 109231 59104
24799 225693 29678 18580 38200 0 18580 0 4550 0 0
6219 0 0 0 0 0 0 0 0 0 25953
465269 100235 41035 14118 136456 85360 192767 169574 149943 92269 121925
156335 40085 51706 11477 18580 0 18580 6449 0 11098 0
0 0 0 0 0 0 0 0 0 0 0
5386

2004 1 16 3 0 1 -1 -1 1 0 21114 139832
57855 444318 98801 405312 96495 100887 527272 499980 220213 82039 101123
17664 0 0 182695 365390 211825 0 0 0 0 0
0 0 0 0 0 0 0 182695 0 0 0
29836 82388 97338 391308 268348 169261 188784 91638 486814 20455 80212
56708 147016 197863 196494 0 40009 225734 194230 28474 182695 194230
182695 28474 182695 0 0 0 0 28474 0 0 0
937124

2005 1 16 3 0 1 -1 -1 1 41714 8973 10332
92988 32905 53569 422400 363473 902541 371373 250546 49562 166104 190637
17568 9121 0 0 0 9282 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 23208
32268 10332 85666 26292 51414 415440 555599 241721 270641 300602 320598
41086 7811 99224 131802 8320 7394 9282 0 0 0 8577
11022 0 0 0 0 0 0 0 0 0 0
0

2006 1 16 3 0 1 -1 -1 1 0 9256 25574
20678 8553 244272 131364 621546 1472880 1678624 1197580 2793509 1419991 1773285
2168153 1389562 1094602 1085872 1076454 0 0 0 1076454 15246 280330
0 0 1076454 0 0 8888 0 0 0 0 0
0 27411 23091 13254 71497 1473406 1932042 2308886 1241443 1312794 2078162
1433184 2225261 1076454 314983 15246 4586145 0 1084258 304516 1076454 0
0 9260 280330 1637114 0 0 0 0 0 0 0
280330

2007 1 16 3 0 1 -1 -1 1 0 8370 87042
336111 179153 171800 76745 110547 161137 255588 167276 256920 208859 76332
110964 39604 109837 60331 18050 18050 18050 0 11726 0 0
0 18050 0 0 11726 0 0 0 0 0 0
0 23425 362177 156663 193094 170504 79076 242172 444380 358216 369460
167830 214471 79549 68196 92793 51230 44934 11726 36100 39611 0
6868 7220 12246 0 0 0 0 0 0 11726 0
0

2008 1 16 3 0 1 -1 -1 1 192117 653199 8213
114760 249498 218653 147833 433915 411620 335336 211323 255797 124179 66946
70809 105461 30304 30603 89027 10201 65015 9902 0 8481 9238
10201 0 0 0 0 0 0 10201 0 0 762897
588381 0 14492 340879 252564 535976 340562 303539 177955 51183 133238
59825 32877 7215 38471 0 0 8027 8288 0 10201 35268
0 0 17325 25067 35268 0 0 0 0 25067 0
58374

2009 1 16 3 0 1 -1 -1 1 8511 59008 0
0 71039 62790 169460 256883 116875 29286 23568 26028 21370 10295
19602 20041 29739 9786 0 19444 17334 19444 0 8185 0
0 0 0 0 0 0 0 0 0 0 0
142131 25226 0 98317 151422 255526 403683 158055 110178 110982 58978
30885 50304 17621 31019 25866 9788 22834 10295 9149 19077 0
8024 0 0 0 0 0 0 0 0 0 0
0

2010 1 16 3 0 1 -1 -1 1 115738 0 134399
0 19752 39504 173000 292926 116416 134220 334122 261584 434273 449552
455894 555821 335437 221463 170771 121011 7794 122852 121993 116353 8426
7794 0 0 0 0 0 0 0 0 0 169750
44396 175624 0 30864 17988 224173 146091 208829 207614 367352 169185
61183 258698 129227 7794 115319 139132 106405 220604 327641 0 106405
16574 0 7534 0 0 0 0 0 8498 0 0
16996

# Triennial marginals for plotting only (n=6)

1983 1 18 3 0 1 -1 -1 1 1789 27621 80600
1059623 578322 328239 455316 310005 528206 407144 449496 221668 239010 325851
340611 110404 63951 91723 47288 76521 63016 32924 35911 0 25245
0 34643 17757 12483 5752 5285 5914 1882 0 17236 0
28974 65062 1151279 623300 291965 254776 414736 421507 411595 318627 229723
346672 348890 254518 123781 140138 125471 78397 66843 129371 84449 116694
33654 52942 34438 51080 67770 58411 31775 12439 52663 43691 48611
351654

1989 1 18 3 0 1 -1 -1 1 0 0 14750
9047 391794 5374 71823 240849 253224 174674 312362 216568 66085 40123
119000 138201 19245 104940 15765 11239 0 11239 13040 0 0
13040 0 0 0 0 0 0 15765 0 53141 0
0 17937 0 456863 42011 186880 358492 97395 237381 321245 344866
175432 146428 239875 63776 90733 0 219836 47245 0 0 0
58086 0 0 27941 0 0 0 0 128119 12985 0
33978

1992 1 18 3 0 1 -1 -1 1 0 4220 5728
151991 42311 76086 192645 200244 96084 38175 20818 15026 15986 14965
6108 6537 2020 9137 6037 974 237 4300 0 0 0
0 0 0 0 0 0 0 0 0 0 4220
10234 16394 31408 75863 81925 147870 100347 36390 29768 16729 15134
23985 23226 9475 13975 5204 1632 271 2158 8780 4947 16996
815 24158 0 0 0 0 0 0 0 0 0
0

1995 1 18 3 0 1 -1 -1 1 0 0 0
16624 98129 77798 115218 37344 52032 47063 95381 5527 48649 62711
21805 29220 27184 6437 13595 28240 11667 14378 6437 0 0
0 0 0 0 0 0 0 0 0 0 0
0 4469 101537 132293 137491 90822 87870 91782 29427 107383 3989
76203 115488 32880 23927 26678 23927 32675 37688 0 0 57027
13267 73671 0 0 0 0 0 0 0 0 0
0

2001 1 18 3 0 1 -1 -1 1 0 3606 0
141990 302895 433694 804794 432377 182530 282111 298648 170197 94137 38023
65388 27718 29857 32156 7562 12413 2206 4390 0 0 0
0 0 0 0 0 0 0 0 0 0 0
3606 0 113833 154619 529211 636973 310154 365015 187195 167463 92678
71492 41027 42252 31139 20996 17928 8929 4646 0 11013 12465
9877 9877 16081 0 6098 4646 0 2653 0 0 0
17319

2004 1 18 3 0 1 -1 -1 1 0 4597 4040
0 12219 20380 69183 64844 57050 81643 55347 56950 29254 60550
48432 10488 13147 0 16671 10599 6295 0 10376 0 6295
0 0 0 0 0 0 0 0 0 0 0
4040 0 6603 7635 32011 68320 81561 95154 56375 83791 74036
103490 48771 24302 48961 45334 39525 25374 19609 52600 11036 0
21353 0 0 18025 0 0 0 0 0 3372 0
14838

```
0          # Total number of size-at-age observations
0          # Total number of environmental variables
0          # Total number of environmental observations
0          # No Weight frequency data
0          # No tagging data
0          # No morph composition data
999        # End file marker
```

## 14. Appendix C: SS Control file

```
# Control file for 2011 canary assessment update

# Control file for 2009 canary assessment update
# updated to run in SSv3.20

# Morph setup
1           # Number of growth patterns
1           # N sub morphs within growth patterns

# Time block setup
13          # Number of time block designs for time varying parameters
1           # Blocks in design 1
1           # Blocks in design 2
1           # Blocks in design 3
1           # Blocks in design 4
2           # Blocks in design 5
2           # Blocks in design 6
2           # Blocks in design 7
2           # Blocks in design 8
3           # Blocks in design 9
3           # Blocks in design 10
3           # Blocks in design 11
3           # Blocks in design 12
2     # Blocks in design 13

1995 2010             # Block Design 1 Trip limits
2000 2010             # Block Design 2 footrope/overfished declaration
2002 2010                     # Block Design 3 RCA
2005 2010                     # Block Design 4 Flatfish trawl

1995 1999 2000 2010           # Block Design 5 trip limits + footrope
1995 2001 2002 2010           # Block Design 6 trip limits + RCA
2000 2001 2002 2010           # Block Design 7 footrope + RCA
2000 2004 2005 2010           # Block Design 8 footrope + flatfish trawl

2000 2001 2002 2004 2005 2010 # Block Design 9 footrope + RCA + flatfish trawl
1995 1999 2000 2001 2002 2010 # Block Design 10 trip limits + footrope + RCA
1995 1999 2000 2004 2005 2010 # Block Design 11 trip limits + footrope + flatfish trawl
1979 1994 1995 1999 2000 2010 # Block Design 12 roller gear + trip limits + footrope
1979 1999 2000 2010       # Block Design 13 roller gear + footrope/overfished declaration


# Mortality and growth specifications
0.5         # Fraction female at birth
1           # M setup: 0=single Par,1=N_breakpoints,2=Lorenzen,3=agespecific;_4=agespec_withseasinterpolate
2           # Number of M breakpoints
6 14        # Ages at M breakpoints
1           # Growth model: 1=VB with L1 and L2, 2=VB with A0 and Linf, 3=Richards, 4=Read vector of L@A
1           # Age for growth Lmin
80          # Age for growth Lmax
0.0         # SD constant added to LAA (0.1 mimics v1.xx for compatibility only)
0           # Variability about growth: 0=CV~f(LAA) [mimic v1.xx], 1=CV~f(A), 2=SD~f(LAA), 3=SD~f(A)
1           # maturity option: 1=length logistic, 2=age logistic, 3=read maturity at age for each growth pattern
2           # First age allowed to mature
1     # maturity option
0           # hermaphro
3           # mg parm offset option:
1           # mg parm adjust method 1=do V1.23 approach, 2=use logistic transform between bounds approach

# Mortality and growth parameters
# Lo        Hi        Init      Prior     Prior     Prior     Param     Env       Use       Dev       Dev       Dev
          Block     block
# bnd       bnd       value     mean      type      SD        phase     var       dev       minyr     maxyr     SD
          design    switch
# Females
0.04      0.08      0.06      0.06      0         50        -50       0         0         0         0         0.5
          0         0         #M1_natM_young
```

```
0       0.9     0.45    0.4     -1      50      3       0       0       0       0       0.5
        0       0       #M1_natM_old_as_exponential_offset(rel_young)
2       9       3.8     4       -1      50      2       0       0       0       0       0.5
        0       0       #M1_Lmin
50      70      59.0    60      -1      50      2       0       0       0       0       0.5
        0       0       #M1_Lmax
0.02    0.21    0.14    0.14    -1      50      2       0       0       0       0       0.5
        0       0       #M1_VBK
0.02    0.21    0.14    0.15    -1      50      2       0       0       0       0       0.5
        0       0       #M1_CV-young
-3      3       -1.3    -1.3    -1      50      2       0       0       0       0       0.5
        0       0       #M1_CV-old_as_exponential_offset(rel_young)
# Males
-3      3       0       0       0       50      -50     0       0       0       0       0.5
        0       0       #M2_natM_young_as_exponential_offset(rel_morph_1)
-3      3       0       0       0       50      -50     0       0       0       0       0.5
        0       0       #M2_natM_old_as_exponential_offset(rel_young)
-3      3       0       0       0       50      -50     0       0       0       0       0.5
        0       0       #M2_Lmin_as_exponential_offset
-3      3       -0.12   0       -1      50      2       0       0       0       0       0.5
        0       0       #M2_Lmax_as_exponential_offset
-3      3       0.24    0       -1      50      2       0       0       0       0       0.5
        0       0       #M2_VBK_as_exponential_offset
-3      3       0.04    0       -1      50      2       0       0       0       0       0.5
        0       0       #M2_CV-young_as_exponential_offset(rel_CV-young_for_morph_1)
-3      3       -1.3    0       -1      50      2       0       0       0       0       0.5
        0       0       #M2_CV-old_as_exponential_offset(rel_CV-young)
# Weight-Length and maturity parameters (L in cm, W in kg)
# Lo    Hi      Init    Prior   Prior   Prior   Param   Env     Use     Dev     Dev     Dev
        Block   block
# bnd   bnd     value   mean    type    SD      phase   var     dev     minyr   maxyr   SD
        design  switch
# Females
0       1       1.55E-05 1.55E-05 0     50      -50     0       0       0       0.5     0
        0       #Female wt-len-1
2       4       3.03    3.03    0       50      -50     0       0       0       0       0.5
        0       0       #Female wt-len-2
40      41      40.5    40.5    0       50      -50     0       0       0       0       0.5
        0       0       #Female mat-len-1
-3      3       -0.25   -0.25   0       50      -50     0       0       0       0       0.5
        0       0       #Female mat-len-2
-3      3       1.0     1.0     0       50      -50     0       0       0       0       0.5
        0       0       #Female eggs/gm intercept
-1      1       0.0     0.0     0       50      -50     0       0       0       0       0.5
        0       0       #Female eggs/gm slope
# Males
0       1       1.55E-05 1.55E-05 0     50      -50     0       0       0       0.5     0
        0       #Female wt-len-1
2       4       3.03    3.03    0       50      -50     0       0       0       0       0.5
        0       0       #Female wt-len-2

# Distribute recruitment among growth pattern x area x season
0       999     1       1       0       50      -50     0       0       0       0       0.5
        0       0       # GP 1
0       999     1       1       0       50      -50     0       0       0       0       0.5
        0       0       # Area 1
0       999     1       1       0       50      -50     0       0       0       0       0.5
        0       0       # Season 1
# Cohort growth (K) deviation parameter
-1      1       1       1       0       50      -50     0       0       1980    1983    0.5
        0       0
# Seasonal effects on biology parameters (0=none)
 0 0 0 0 0 0 0 0 0 0

# Spawner-recruit parameters
1       # S-R function: 1=B-H w/flat top, 2=Ricker, 3=standard B-H, 4=no steepness or bias adjustment
# Lo    Hi      Init    Prior   Prior   Prior   Param
# bnd   bnd     value   mean    type    SD      phase
 7      11      8.5     8.5     -1      50      1       # Ln(R0)
 0.21   0.99    0.511   0.4     0       50      -6      # Steepness
```

```
 0       2       0.5     0.4     0       50      -50     # Sigma R
-5       5       0       0       0       50      -50     # Environmental link coefficient
-5       5       0       0       0       50      -50     # Initial equilibrium offset to virgin
 0       2       0       1       0       50      -50     # Autocorrelation in rec devs
0 # index of environmental variable to be used
0 # env target parameter: 1=rec devs, 2=R0, 3=steepness
1 # rec dev type: 0=none, 1=devvector (zero-sum), 2=simple deviations (no sum constraint)

# Recruitment residuals
1960    # Start year recruitment residuals
2010    # End year recruitment residuals
1       # Phase

1 # Read 11 advanced recruitment options: 0=no, 1=yes
0       # first year for early rec devs
-4      # phase for early rec devs
5       # Phase for forecast recruit deviations
1       # Lambda for forecast recr devs before endyr+1
1959    #_last_yr_nobias_adj_in_MPD
1960    # first year of full bias correction (linear ramp up from this year minus the plus-age to this year)
2010    # last year for full bias correction in_MPD
2011    #_first_recent_yr_nobias_adj_in_MPD
1.0     # max bias adjustment
0       # placeholder
-5      # Lower bound rec devs
5       # Upper bound rec devs
0 # read intitial values for rec devs

# Fishing mortality setup
0.2     # F ballpark
1999    # F ballpark year
1       # F method:  1=Pope's; 2=Instan. F; 3=Hybrid (recommended)
0.9     # max F or harvest rate, depends on F_Method

# Initial F setup by fishing fleet
# Lo    Hi      Init    Prior   P_type  SD      Phase
0       1       0       0.01    0       50      -50 # 1_CA_S_trwl
0       1       0       0.01    0       50      -50 # 2CA_N_trwl
0       1       0       0.01    0       50      -50 # 3OR_trwl
0       1       0       0.01    0       50      -50 # 4WA_trwl
0       1       0       0.01    0       50      -50 # 5CA_S_nontrwl
0       1       0       0.01    0       50      -50 # 6CA_N_nontrwl
0       1       0       0.01    0       50      -50 # 7WAOR_nontrwl
0       1       0       0.01    0       50      -50 # 8CA_S_rec
0       1       0       0.01    0       50      -50 # 9CA_N_rec
0       1       0       0.01    0       50      -50 # 10WAOR_rec
0       1       0       0.01    0       50      -50 # 11atseahake
0       1       0       0.01    0       50      -50 # 12_NWFSC/research

# Catchability (Q_setup)
#
#Den-dep env-var extra_se Q_type
0       0       0       0       #       1CA_S_trwl
0       0       0       0       #       2CA_N_trwl
0       0       0       0       #       3OR_trwl
0       0       0       0       #       4WA_trwl
0       0       0       0       #       5CA_S_nontrwl
0       0       0       0       #       6CA_N_nontrwl
0       0       0       0       #       7WAOR_nontrwl
0       0       0       0       #       8CA_S_rec
0       0       0       0       #       9CA_N_rec
0       0       0       0       #       10WAOR_rec
0       0       0       0       #       11_atseahake
0       0       0       0       #       12_NWFSC
0       0       0       0       #       13_Early_tri
0       0       0       0       #       14_pre_recruit
0       0       0       0       #       15_WAtrl_mirror
0       0       0       0       #       16_NWFSC_mirror
0       0       0       0       #       17_Late_tri
0       0       0       0       #       18_Tri_mirror
```

```
# Selectivity section
# Size-based setup
# A=Selex option: 1-24
# B=Do_retention: 0=no, 1=yes
# C=Male offset to female: 0=no, 1=yes, 2=Female offset to male
# D=Mirror selex (#)
# A   B C D
  24  0 2 0  # 1CA_S_trwl
  24  0 2 0  # 2CA_N_trwl
  24  0 2 0  # 3OR_trwl
  24  0 2 0  # 4WA_trwl
  24  0 2 0  # 5CA_S_nontrwl
  24  0 2 0  # 6CA_N_nontrwl
  24  0 2 0  # 7WAOR_nontrwl
  24  0 2 0  # 8CA_S_rec
  24  0 2 0  # 9CA_N_rec
  24  0 2 0  # 10WAOR_rec
  24  0 2 0  # 11atseahake
  24  0 2 0  # 12_NWFSC/research
  24  0 2 0  # 13_Early_triennial
  32  0 0 0  # 14_pre_recruit
  5   0 0 4  # 15WA_trwl_mirror
  5   0 0 12 # 16_NWFSC_mirror
  5   0 0 13 # 17_Late_triennial
  5   0 0 13 # 18_triennial_mirror
# Age-based setup
  10 0 0 0   # 1CA_S_trwl
  10 0 0 0   # 2CA_N_trwl
  10 0 0 0   # 3OR_trwl
  10 0 0 0   # 4WA_trwl
  10 0 0 0   # 5CA_S_nontrwl
  10 0 0 0   # 6CA_N_nontrwl
  10 0 0 0   # 7WAOR_nontrwl
  10 0 0 0   # 8CA_S_rec
  10 0 0 0   # 9CA_N_rec
  10 0 0 0   # 10WAOR_rec
  10 0 0 0   # 11atseahake
  10 0 0 0   # 12_NWFSC/research
  10 0 0 0   # 13_Early_triennial
  10 0 0 0   # 14_pre_recruit
  10 0 0 0   # 15WA_trwl_mirror
  10 0 0 0   # 16_NWFSC_mirror
  10 0 0 0   # 17_Late_triennial
  10 0 0 0   # 18_triennial_mirror
# Selectivity and retention parameters
# Lo        Hi        Init      Prior     Prior     Prior     Param     Env       Use       Dev       Dev       Dev
            Block     block
# bnd       bnd       value     mean      type      SD        phase     var       dev       minyr     maxyr     SD
            design    switch
# 1CA_S_trwl double normal
20          60        40        50        -1        50        4         0         0         0         0         0.5
            0         2         # PEAK
-9.0        4.0       -4        -4        0         50        -50       0         0         0         0         0.5
            0         0         # TOP (logistic)
0.0         9.0       4.3       4.2       -1        50        5         0         0         0         0         0.5
            0         2         # Asc WIDTH exp
0.0         9.0       2.5       2.6       -1        50        5         0         0         0         0         0.5
            0         0         # Desc WIDTH exp
-9.0        5.0       -9.0      -9.0      0         50        -50       0         0         0         0         0.5
            0         0         # INIT (logistic)
-5.0        5.0       -1.0      5         -1        50        5         0         0         0         0         0.5
            0         2         # FINAL (logistic)
# Female offsets
10          60        40        50        0         50        -50       0         0         0         0         0.5
            0         0         # female dogleg
-4          0         0         0         0         50        -50       0         0         0         0         0.5
            0         0         # female offset at minage
-4          0         0         0         0         50        -6        0         0         0         0         0.5
            0         0         # female offset at dogleg
```

```
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at maxage

# 2CA_N_trwl double normal
20      60      43      50      -1      50      4       0       0       0       0       0.5
        0       0       # PEAK
-9.0    4.0     -4      -4      0       50      -50     0       0       0       0       0.5
        0       0       # TOP (logistic)
0.0     9.0     3.9     2.0     -1      50      5       0       0       0       0       0.5
        0       0       # Asc WIDTH exp
0.0     9.0     2.7     2.4     -1      50      5       0       0       0       0       0.5
        0       0       # Desc WIDTH exp
-9.0    5.0     -9.0    -9.0    0       50      -50     0       0       0       0       0.5
        0       0       # INIT (logistic)
-5.0    5.0     2.0     5       -1      50      5       0       0       0       0       0.5
        0       0       # FINAL (logistic)
# Female offsets
10      60      45      50      0       50      -50     0       0       0       0       0.5
        0       0       # female dogleg
-4      0       0       0       0       50      -50     0       0       0       0       0.5
        0       0       # female offset at minage
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at dogleg
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at maxage

#fishery-3OR_trwl double normal
20      60      50      50      -1      50      4       0       0       0       0       0.5
        12      2       # PEAK
-9.0    4.0     -4      -4      0       50      -50     0       0       0       0       0.5
        0       0       # TOP (logistic)
0.0     9.0     4.0     4.0     -1      50      5       0       0       0       0       0.5
        12      2       # Asc WIDTH exp
0.0     9.0     4.0     4.0     0       50      -7      0       0       0       0       0.5
        0       0       # Desc WIDTH exp
-9.0    5.0     -9.0    -9.0    0       50      -50     0       0       0       0       0.5
        0       0       # INIT (logistic)
-5.0    12      1       5       -1      50      4       0       0       0       0       0.5
        12      2       # FINAL (logistic)
# Female offsets
10      60      50      44      0       50      -50     0       0       0       0       0.5
        0       0       # female dogleg
-4      0       0       0       0       50      -50     0       0       0       0       0.5
        0       0       # female offset at minage
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at dogleg
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at maxage

#fishery-4WA_trwl double normal
20      60      50      50      -1      50      4       0       0       0       0       0.5
        13      2       # PEAK
-4.0    4.0     -4      -4      0       50      -50     0       0       0       0       0.5
        0       0       # TOP (logistic)
0.0     9.0     4.5     4.5     -1      50      5       0       0       0       0       0.5
        13      2       # Asc WIDTH exp
0.0     9.0     4.4     4.4     -1      50      5       0       0       0       0       0.5
        0       0       # Desc WIDTH exp
-9.0    5.0     -9.0    -9.0    0       50      -50     0       0       0       0       0.5
        0       0       # INIT (logistic)
-5.0    5.0     -3.3    5       -1      50      5       0       0       0       0       0.5
        13      2       # FINAL (logistic)
# Female offsets
10      60      50      44      0       50      -50     0       0       0       0       0.5
        0       0       # female dogleg
-4      0       0       0       0       50      -50     0       0       0       0       0.5
        0       0       # female offset at minage
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at dogleg
```

```
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at maxage

#fishery-5CA_S_nontrwl double normal
20      60      34      50      -1      50      4       0       0       0       0       0.5
        2       2       # PEAK
-4.0    4.0     -4      -4      0       50      -50     0       0       0       0       0.5
        0       0       # TOP (logistic)
0.0     9.0     4.3     4.1     -1      50      5       0       0       0       0       0.5
        2       2       # Asc WIDTH exp
0.0     9.0     4.3     4.3     -1      50      5       0       0       0       0       0.5
        0       0       # Desc WIDTH exp
-9.0    5.0     -9.0    -9.0    0       50      -50     0       0       0       0       0.5
        0       0       # INIT (logistic)
-5.0    5.0     -1.8    5       -1      50      5       0       0       0       0       0.5
        2       2       # FINAL (logistic)
# Female offsets
10      60      35      44      0       50      -50     0       0       0       0       0.5
        0       0       # female dogleg
-4      0       0       0       0       50      -50     0       0       0       0       0.5
        0       0       # female offset at minage
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at dogleg
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at maxage

#fishery-6CA_N_nontrwl double normal
15      60      40      50      -1      50      4       0       0       0       0       0.5
        10      2       # PEAK
-4.0    4.0     -4      -4      0       50      -50     0       0       0       0       0.5
        0       0       # TOP (logistic)
0.0     9.0     4.7     4.2     -1      50      5       0       0       0       0       0.5
        10      2       # Asc WIDTH exp
0.0     9.0     4.0     4.0     0       50      -7      0       0       0       0       0.5
        0       0       # Desc WIDTH exp
-9.0    5.0     -9.0    -9.0    0       50      -50     0       0       0       0       0.5
        0       0       # INIT (logistic)
-5.0    5.0     4.99    0.9     -1      50      -5      0       0       0       0       0.5
        10      2       # FINAL (logistic)
# Female offsets
10      60      40      44      0       50      -50     0       0       0       0       0.5
        0       0       # female dogleg
-4      0       0       0       0       50      -50     0       0       0       0       0.5
        0       0       # female offset at minage
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at dogleg
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at maxage

#fishery-7WAOR_nontrwl double normal
15      60      49      50      -1      50      4       0       0       0       0       0.5
        7       2       # PEAK
-4.0    4.0     -4      -4      0       50      -50     0       0       0       0       0.5
        0       0       # TOP (logistic)
0.0     9.0     4.7     5.8     -1      50      5       0       0       0       0       0.5
        7       2       # Asc WIDTH exp
0.0     9.0     4.0     4.0     0       50      -7      0       0       0       0       0.5
        0       0       # Desc WIDTH exp
-9.0    5.0     -9.0    -9.0    0       50      -50     0       0       0       0       0.5
        0       0       # INIT (logistic)
-5.0    5.0     4.0     5       -1      50      5       0       0       0       0       0.5
        7       2       # FINAL (logistic)
# Female offsets
10      60      53      44      0       50      -50     0       0       0       0       0.5
        0       0       # female dogleg
-4      0       0       0       0       50      -50     0       0       0       0       0.5
        0       0       # female offset at minage
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at dogleg
```

```
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at maxage

#fishery-8CA_S_rec double normal
15      60      30      50      -1      50      4       0       0       0       0       0.5
        8       2       # PEAK
-4.0    4.0     -4      -4      0       50      -50     0       0       0       0       0.5
        0       0       # TOP (logistic)
0.0     9.0     3.9     4.0     -1      50      5       0       0       0       0       0.5
        8       2       # Asc WIDTH exp
0.0     9.0     3.7     3.7     -1      50      5       0       0       0       0       0.5
        0       0       # Desc WIDTH exp
-9.0    5.0     -9.0    -9.0    0       50      -50     0       0       0       0       0.5
        0       0       # INIT (logistic)
-5.0    5.0     -3.5    5       -1      50      5       0       0       0       0       0.5
        8       2       # FINAL (logistic)
# Female offsets
10      60      30      44      0       50      -50     0       0       0       0       0.5
        0       0       # female dogleg
-4      0       0       0       0       50      -50     0       0       0       0       0.5
        0       0       # female offset at minage
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at dogleg
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at maxage

#fishery-9CA_N_rec double normal
15      60      28      50      -1      50      4       0       0       0       0       0.5
        0       2       # PEAK
-4.0    4.0     -4      -4      0       50      -50     0       0       0       0       0.5
        0       0       # TOP (logistic)
0.0     9.0     3.1     3.1     -1      50      5       0       0       0       0       0.5
        0       2       # Asc WIDTH exp
0.0     9.0     4.4     4.4     -1      50      5       0       0       0       0       0.5
        0       0       # Desc WIDTH exp
-9.0    5.0     -9.0    -9.0    0       50      -50     0       0       0       0       0.5
        0       0       # INIT (logistic)
-5.0    5.0     -2.3    5       -1      50      5       0       0       0       0       0.5
        0       2       # FINAL (logistic)
# Female offsets
10      60      28      44      0       50      -50     0       0       0       0       0.5
        0       0       # female dogleg
-4      0       0       0       0       50      -50     0       0       0       0       0.5
        0       0       # female offset at minage
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at dogleg
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at maxage

#fishery-10WAOR_rec double normal
15      60      31      50      -1      50      4       0       0       0       0       0.5
        2       2       # PEAK
-4.0    4.0     -4      -4      0       50      -50     0       0       0       0       0.5
        0       0       # TOP (logistic)
0.0     9.0     3.2     3.2     -1      50      5       0       0       0       0       0.5
        2       2       # Asc WIDTH exp
0.0     9.0     3.3     2.3     -1      50      5       0       0       0       0       0.5
        0       0       # Desc WIDTH exp
-9.0    5.0     -9.0    -9.0    0       50      -50     0       0       0       0       0.5
        0       0       # INIT (logistic)
-5.0    5.0     -2.4    5       -1      50      5       0       0       0       0       0.5
        2       2       # FINAL (logistic)
# Female offsets
10      60      31      50      0       50      -50     0       0       0       0       0.5
        0       0       # female dogleg
-4      0       0       0       0       50      -50     0       0       0       0       0.5
        0       0       # female offset at minage
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at dogleg
```

```
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at maxage

#fishery-11atseahake double normal
15      60      48      50      -1      50      4       0       0       0       0       0.5
        0       0       # PEAK
-4.0    4.0     -4      -4      0       50      -50     0       0       0       0       0.5
        0       0       # TOP (logistic)
0.0     9.0     3.6     3.7     -1      50      5       0       0       0       0       0.5
        0       0       # Asc WIDTH exp
0.0     9.0     4.0     4.0     0       50      -7      0       0       0       0       0.5
        0       0       # Desc WIDTH exp
-9.0    5.0     -9.0    -9.0    0       50      -50     0       0       0       0       0.5
        0       0       # INIT (logistic)
-5.0    5.0     4.0     5       -1      50      5       0       0       0       0       0.5
        0       0       # FINAL (logistic)
# Female offsets
10      60      48      50      0       50      -50     0       0       0       0       0.5
        0       0       # female dogleg
-4      0       0       0       0       50      -50     0       0       0       0       0.5
        0       0       # female offset at minage
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at dogleg
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at maxage

#survey-12_NWFSC double normal
20      65      60      50      -1      50      4       0       0       0       0       0.5
        0       0       # PEAK    value
-4.0    4.0     -4.0    -4      -1      50      4       0       0       0       0       0.5
        0       0       # TOP     logistic
0.0     9.0     8.8     4.0     -1      50      4       0       0       0       0       0.5
        0       0       # WIDTH up exp
0.0     9.0     4.0     4.0     0       50      -7      0       0       0       0       0.5
        0       0       # WIDTH dn exp
-9.0    5.0     -8.0    -9.0    -1      50      4       0       0       0       0       0.5
        0       0       # INIT    logistic
-5.0    5.0     4.5     5       -1      50      4       0       0       0       0       0.5
        0       0       # FINAL (logistic)
# Add female offsets
10      60      55      50      0       50      -50     0       0       0       0       0.5
        0       0       # female dogleg
-4      0       0       0       0       50      -50     0       0       0       0       0.5
        0       0       # female offset at minage
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at dogleg
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at maxage

#survey-13_Early triennial double normal
20      65      62      50      -1      50      4       0       0       0       0       0.5
        0       0       # PEAK    value
-4.0    4.0     -3.6    -4      -1      50      4       0       0       0       0       0.5
        0       0       # TOP     logistic
0.0     9.0     7.4     4.0     -1      50      4       0       0       0       0       0.5
        0       0       # WIDTH   exp
0.0     9.0     4.0     4.0     0       50      -7      0       0       0       0       0.5
        0       0       # WIDTH   exp
-9.0    5.0     -9.0    -9.0    0       50      -50     0       0       0       0       0.5
        0       0       # INIT    logistic
-5.0    5.0     4.5     5       -1      50      4       0       0       0       0       0.5
        0       0       # FINAL (logistic)
# Female offsets
10      60      55      50      0       50      -50     0       0       0       0       0.5
        0       0       # female dogleg
-4      0       0       0       0       50      -50     0       0       0       0       0.5
        0       0       # female offset at minage
-4      0       0       0       0       50      -6      0       0       0       0       0.5
        0       0       # female offset at dogleg
```

```
-4          0          0          0          0          50         -6         0          0          0          0          0.5
            0          0          # female offset at maxage
### Mirrors, leave fixed ###
#15_Wa trawl mirror for second age key
-2          0          -1         0          0          50         -50        0          0          0          0          0.5
            0          0          # Min mirror bin
-2          0          -1         0          0          50         -50        0          0          0          0          0.5
            0          0          # Max mirror bin
#16_NWFSC mirror for marginal ages
-2          0          -1         0          0          50         -50        0          0          0          0          0.5
            0          0          # Min mirror bin
-2          0          -1         0          0          50         -50        0          0          0          0          0.5
            0          0          # Max mirror bin
#17_Late_triennial
-2          0          -1         0          0          50         -50        0          0          0          0          0.5
            0          0          # Min mirror bin
-2          0          -1         0          0          50         -50        0          0          0          0          0.5
            0          0          # Max mirror bin
#17_triennial mirror for marginal ages
-2          0          -1         0          0          50         -50        0          0          0          0          0.5
            0          0          # Min mirror bin
-2          0          -1         0          0          50         -50        0          0          0          0          0.5
            0          0          # Max mirror bin
############################

1           # Selex block setup: 0=Read one line apply all, 1=read one line each parameter
# Lo        Hi         Init       Prior      P_type     SD         Phase
20          60         46         50         -1         50         4 # OR trawl peak 1979-1994
20          60         46         50         -1         50         4 # OR trawl peak 1995-1999
20          60         41         50         -1         50         4 # OR trawl peak 2000-2006
0.0         9.0        4.0        4.0        -1         50         5 # OR trawl ascending width 1979-1994
0.0         9.0        4.0        4.0        -1         50         5 # OR trawl ascending width 1995-1999
0.0         9.0        3.7        3.9        -1         50         5 # OR trawl ascending width 2000-2006
-5.0        12.0       0.2        5          -1         50         5 # OR trawl final 1979-1994
-5.0        9.0        0.2        5          -1         50         5 # OR trawl final 1995-1999
-5.0        9.0        0.15       5          -1         50         5 # OR trawl final 2000-2006


20          60         41         50         -1         50         4 # WA trawl peak 1979-1999
20          60         41         50         -1         50         4 # WA trawl peak 2000-2006
0.0         9.0        3.6        4.6        -1         50         5 # WA trawl ascending width 1979-1999
0.0         9.0        3.6        4.6        -1         50         5 # WA trawl ascending width 2000-2006
-5.0        5.0        4.5        5          -1         50         5 # WA trawl final 1979-1999
-5.0        5.0        4.5        5          -1         50         5 # WA trawl final 2000-2006

20          60         24         50         -1         50         4 # S CA nontrawl peak 2000-2006
0.0         9.0        1.6        1.3        -1         50         5 # S CA nontrawl ascending width 2000-2006
-5.0        5.0        -4.5       5          -1         50         5 # S CA nontrawl final 2000-2006

20          60         33         50         -1         50         4 # N CA nontrawl peak 1995-1999
20          60         41         50         -1         50         4 # N CA nontrawl peak 2000-2001
20          60         33         50         -1         50         4 # N CA nontrawl peak 2002-2006
0.0         9.0        3.5        4.2        -1         50         -4 # N CA nontrawl ascending width 1995-1999
0.0         9.0        4.8        4.2        -1         50         5 # N CA nontrawl ascending width 2000-2001
0.0         9.0        3.9        4.2        -1         50         5 # N CA nontrawl ascending width 2002-2006
-5.0        5.0        0.1        5          -1         50         5 # N CA nontrawl final 1995-1999
-5.0        5.0        -0.3       5          -1         50         5 # N CA nontrawl final 2000-2001
-5.0        5.0        -2.9       5          -1         50         5 # N CA nontrawl final 2002-2006

15          60         33         50         -1         50         4 # OR/WA nontrawl peak 2000-2001
15          60         58         50         -1         50         4 # OR/WA nontrawl peak 2002-2006
0.0         9.0        2.9        5.8        -1         50         5 # OR/WA nontrawl ascending width 2000-2001
0.0         9.0        5.2        5.8        -1         50         5 # OR/WA nontrawl ascending width 2002-2006
-5.0        5.0        -1.6       5          -1         50         5 # OR/WA nontrawl final 2000-2001
-5.0        5.0        4.8        5          -1         50         5 # OR/WA nontrawl final 2002-2006

20          60         31         50         -1         50         4 # S CA rec peak 2000-2001
20          60         30         50         -1         50         4 # S CA rec peak 2002-2006
0.0         9.0        4.0        4.0        -1         50         5 # S CA rec ascending width 2000-2001
0.0         9.0        3.1        4.0        -1         50         5 # S CA rec ascending width 2002-2006
```

```
-5.0    5.0    -4.5    5    -1    50    5 # S CA rec final 2000-2001
-5.0    5.0    -4.8    5    -1    50    5 # S CA rec final 2002-2006

20      60     30      50   -1    50    4 # OR/WA rec peak 2000-2006
0.0     9.0    3.2     3.2  -1    50    5 # OR/WA rec ascending width 2000-2006
-5.0    5.0    -3.6    5    -1    50    5 # OR/WA rec final 2000-2006

1 # Selex parm adjust method 1=do V1.23 approach, 2=use new logistic approach
0 # Tagging flag: 0=none,1=read parameters for tagging

### Likelihood related quantities ###
# variance/sample size adjustment by fleet
1 # Do variance adjustments
#1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  17  18  #
0.00 0.00 0.00  0.00  0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.50 0.50  0.93  0.00 0.00 0.50 0.00 # constant added to survey CV # Changed 13 from 0.02, 12 from 0.09, and 13 from 0.0 - all to 0.50
0.00 0.00 0.00  0.00  0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00 0.00 0.00 0.00 # constant added to discard SD
0.00 0.00 0.00  0.00  0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00 0.00 0.00 0.00 # constant added to body weight SD
0.90 1.00 1.00  1.00  0.82 1.00  1.00 0.88 0.82 0.90 0.73 1.00 1.00  1.00  1.00 1.00 1.00 1.00 # multiplicative scalar for length comps
1.00 0.98 1.00  1.00  1.00 1.00  1.00 1.00 1.00 1.00 0.36 1.00 1.00  1.00  1.00 1.00 0.90 1.00 # multiplicative scalar for agecomps
1.00 1.00 1.00  1.00  1.00 1.00  1.00 1.00 1.00 1.00 1.00 1.00 1.00  1.00  1.00 1.00 1.00 1.00 # multiplicative scalar for length at age obs

# removed for SSv3.20: 30    # DF For discard T-distribution (discard_like)
# removed for SSv3.20: 30    # DF For meanbodywt T-distribution (DF_for_meanbodywt_like)
1    # Max number of lambda phases: read this number of values for each component below
1    # SD offset (CPUE, discard, mean body weight, recruitment devs): 0=omit log(s) term, 1=include

16 # N changes to default Lambdas = 1.0
# Component codes:
#  1=survey
#  2=discard
#  3=mean body weight
#  4=length frequency
#  5=age frequency
#  6=Weight frequency
#  7=size at age
#  8=catch
#  9=initial equilibrium catch
#  10=rec devs
#  11=parameter priors
#  12=parameter deviations
#  13=Crash penalty
#  14=Morph composition
#  15=Tag composition
#  16=Tag return
# Component fleet/survey  phase  value  wtfreq_method
 4 1 1 0.5 1 # Len data half fleet 1
 4 2 1 0.5 1 # Len data half fleet 2
 4 3 1 0.5 1 # Len data half fleet 3
 4 4 1 0.5 1 # Len data half fleet 4
 4 7 1 0.5 1 # Len data half fleet 7
 4 11 1 0.5 1 # Len data half fleet 11
 5 1 1 0.5 1 # Age data half fleet 1
 5 2 1 0.5 1 # Age data half fleet 2
 5 3 1 0.5 1 # Age data half fleet 3
 5 4 1 0.5 1 # Age data half fleet 4
 5 7 1 0.5 1 # Age data half fleet 7
 5 11 1 0.5 1 # Age data half fleet 11
 5 15 1 0.5 1 # Age data half fleet 15
 5 11 1 0.5 1 # Age data half fleet 11
 5 16 1 0 1 # Ghost age data zero fleet 16 NWFSC mirror
 5 18 1 0 1 # Ghost age data zero fleet 18 Triennial mirror

0 # extra SD

999 # end file marker
```

## 15. Appendix D: STARTER file

```
# 2009 Canary update starter file

Canary_data.SS                  # Data file
Canary_control.SS     # Control file

0           # Read initial values from .par file: 0=no,1=yes
1           # DOS display detail: 0,1,2
2           # Report file detail: 0,1,2
0           # Detailed checkup.sso file (0,1)
0           # Write parameter iteration trace file during minimization
0           # Write cumulative report: 0=skip,1=short,2=full
0           # Include prior likelihood for non-estimated parameters
0           # Use Soft Boundaries to aid convergence (0,1) (recommended)
0           # N bootstrap datafiles to create
25          # Last phase for estimation
1           # MCMC burn-in
1           # MCMC thinning interval
0           # Jitter initial parameter values by this fraction
-1          # Min year for spbio sd_report (neg val = styr-2, virgin state)
-2          # Max year for spbio sd_report (-1=endyr+1, -2=entire forecast)
0           # N individual SD years
0.0001      # Ending convergence criteria
0           # Retrospective year relative to end year
5           # Min age for summary biomass
1           # Depletion basis: denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel X*B_styr
1.0         # Fraction (X) for Depletion denominator (e.g. 0.4)
1           # (1-SPR)_reporting:  0=skip; 1=rel(1-SPR); 2=rel(1-SPR_MSY); 3=rel(1-SPR_Btarget); 4=notrel
1           # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num); 3=sum(frates)
0           # F_report_basis: 0=raw; 1=rel Fspr; 2=rel Fmsy ; 3=rel Fbtgt

999 # end of file marker
```

## 16. Appendix D: Forecast file

```
1            # Benchmarks: 0=skip; 1=calc F_spr,F_btgt,F_msy
2            # MSY: 1= set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt); 4=set to F(endyr)
0.5          # SPR target (e.g. 0.40)
0.5          # Biomass target (e.g. 0.40)
# Enter either: actual year, -999 for styr, 0 for endyr, neg number for rel. endyr
0 0 0 0 0 0 # Bmark_years: beg_bio end_bio beg_selex end_selex beg_alloc end_alloc
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 (use first-last alloc yrs); 5=input annual F
1            # N forecast years
1.0          # F scalar (only used for Do_Forecast==5)
# Enter either: actual year, -999 for styr, 0 for endyr, neg number for rel. endyr
0 0 0 0 # Fcast_years:  beg_selex end_selex beg_alloc end_alloc
1            # Control rule method (1=catch=f(SSB) west coast; 2=F=f(SSB) )
0.4          # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40)
0.1          # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)
1.0          # 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 (fixed at 3 for now)
-1           # Forecast loop control #3 (reserved)
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 any fixed inputs)
0.0          # stddev of log(realized catch/target catch) in forecast
0            # Do West Coast gfish rebuilder output (0/1)
1999         # Rebuilder:  first year catch could have been set to zero (Ydecl)(-1 to set to 1999)
2002         # 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
2            # basis for fcast catch tuning and for fcast catch caps and allocation  (2=deadbio; 3=retainbio; 5=deadnum; 6=retainnum)
-1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1  # max totalcatch by fleet (-1 to have no max)
-1           # max totalcatch by area (-1 to have no max)
0 0 0 0 0 0 0 0 0 0 0 0              # fleet assignment to allocation group (enter group ID# for each fleet, 0 for not included in an alloc group)
# assign fleets to groups
# allocation fraction for each of: 2 allocation groups
24 # 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)
2011    1    1    5.2753
2011    1    2    7.6971
2011    1    3    19.3849
2011    1    4    12.6934
2011    1    5    0.0158
2011    1    6    0.0158
2011    1    7    9.4134
2011    1    8    6.8337
2011    1    9    14.8046
2011    1    10   14.5729
2011    1    11   8.5448
2011    1    12   2.7482
2012    1    1    5.5339
2012    1    2    8.0744
2012    1    3    20.3352
2012    1    4    13.3156
2012    1    5    0.0166
2012    1    6    0.0166
2012    1    7    9.8749
2012    1    8    7.1687
2012    1    9    15.5303
2012    1    10   15.2873
2012    1    11   8.9636
2012    1    12   2.8829

999 # verify end of input
```

# Cowcod Status Report

May 10, 2011

Cowcod (*Sebastes levis*) is managed as a single stock in U.S. waters extending from the U.S.-Mexico border to just north of Cape Mendocino (40° 10′ N. latitude). It was declared overfished in 2000 following the first assessment of the substock in the Southern California Bight (SCB), defined as U.S. waters south of 34° 27′ N. latitude (Butler et al. 1999). The most recent benchmark or "full" assessment (Dick et al. 2007) has been updated once (Dick et al., 2009), and indicated that spawning biomass of cowcod in the SCB was between 3.8% and 21.0% of its unfished level in 2009.

From 2002-2009, total mortality of cowcod has remained below the target level in all years except for 2007 (Table 1). The majority of discard mortality during this time period comes from the limited-entry trawl fishery north of 34° 27′ N. latitude (NWFSC, 2010). The establishment of coastwide Rockfish Conservation Areas and Cowcod Conservation Areas south of Point Conception (34° 27′ N. latitude) has been effective at minimizing cowcod bycatch.

Table 1. Total mortality (mt) of cowcod by year and area. Commercial mortality estimates are from the West Coast Groundfish Observer Program and recreational estimates are from RecFIN (catch types A and B1).

| | COMMERCIAL | | RECREATIONAL | | | | |
|---|---|---|---|---|---|---|---|
| YEAR | North of 34° 27′ | South of 34° 27′ | North of 34° 27′ | South of 34° 27′ | TOTAL | ABC | OY |
| **2002** | 2.90 | 0.00 | 0.09 | 0.49 | 3.47 | 24 | 4.8 |
| **2003** | 0.26 | 0.00 | -- | -- | 0.26 | 24 | 4.8 |
| **2004** | 0.74 | 0.02 | -- | 0.45 | 1.21 | 24 | 4.8 |
| **2005** | 0.59 | 0.00 | -- | 0.15 | 0.74 | 24 | 4.2 |
| **2006** | 0.87 | 0.00 | -- | 0.07 | 0.94 | 24 | 4.2 |
| **2007** | 4.70 | 0.00 | 0.19 | 0.11 | 5.00 | 36 | 4 |
| **2008** | 0.20 | 0.00 | -- | 0.25 | 0.44 | 36 | 4 |
| **2009** | 0.45 | 0.00 | -- | 0.11 | 0.56 | 13 | 4 |
| **Grand Total** | **10.72** | **0.02** | **0.28** | **1.61** | **12.64** | | |

Retention of cowcod was prohibited from 2000-2010 in all fisheries and estimates of total mortality from that time period are essentially estimates of discarded catch. The precision of discard estimates for this species is often low due to small sample size and infrequent encounters. Beginning in 2011, the rationalized trawl fleet is permitted to retain cowcod associated with Individual Fishing Quotas. Mandatory onboard observers record estimates of retained and discarded catch. Observer data from the rationalized trawl fleet has potential to provide important information for future assessments, particularly for the region north of Point Conception. Retention of cowcod remains prohibited in fisheries that are not subject to the requirement for 100% observer coverage, i.e. non-IFQ commercial fleets and the recreational fishery.

Authors of previous cowcod stock assessments made the assumption that the population in the SCB was an isolated, independent stock (Butler et al., 1999; Piner et al, 2005; Dick et al., 2009). No methods were available to directly estimate OFL for the region north of Point Conception, and abundance of the stock in Mexican waters remains unknown. Recent (and ongoing) investigations using genetics and otolith microchemistry have identified evidence of stock structure in cowcod (Attachment A). This information may help inform future Council decisions regarding management.

The procedure for calculating the cowcod OFL was revised for the 2011-2012 management cycle. The Council's Scientific and Statistical Committee classified the stock assessment for cowcod in the SCB as

a Category 2 (data-moderate) assessment. Sustainable yield from Point Conception to Cape Mendocino was estimated using a new Category 3 (data-poor) method, Depletion-Based Stock Reduction Analysis or DB-SRA. The 2011-2012 OFL for the combined stock south of 40° 10′ N. latitude is now the sum of the OFLs from these two models (Table 2). To account for scientific uncertainty, the Acceptable Biological Catche (ABC) was derived from the Council's ABC control rule (Table 2). The ACL calculation followed the convention from previous management cycles, and was set equal to twice the ACL associated with the SCB substock.

Table 2. Components of the calculations used to establish 2011-2012 OFLs, ABCs, and ACLs for cowcod in the combined Monterey-Conception Area (U.S. waters south of 40° 10′ N. latitude).

| | Area | | |
|---|---|---|---|
| | **South of 34°27′ N. Lat.** | **34°27′ N. Lat. - 40°10′ N. Lat.** | **Monterey + Conception (South of 40°10′ N. Lat.)** |
| **Model** | Stock Synthesis | DB-SRA | -- |
| **OFL [mt][1]** | 6.4 | 6.8 | 13.2 |
| **Stock Category** | 2(c) | 3(d) | -- |
| **Assessment Uncertainty (σ)** | 0.72 | 1.44 | -- |
| **P*** | 0.4 | 0.4 | -- |
| **% Reduction in OFL** | 16.7% | 30.6% | -- |
| **ABC [mt][1]** | 5.3 | 4.8 | 10.1 |
| **2011-2012 ACL [mt][2]** | 1.5 | 1.5 | 3.0 |

[1] **The Council does not specify area-specific OFLs or ABCs for cowcod. Values shown illustrate the steps taken to calculate the combined Monterey-Conception OFL and ABC**

[2] **The ACL for cowcod is based on results of a rebuilding analysis. The ACL for the Monterey and Conception areas (combined) is currently defined as twice the ACL from the area south of 34° 27′ N. Lat.**

E.J. Dick
NOAA Fisheries, SWFSC
Fisheries Ecology Division
edward.dick@noaa.gov

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# Cowcod Species of Concern 2009 Grant: Final Progress Report

PI: Victor Simon
Collaborators: Jon E. Hess, Paul Chittaro, Anna Elz, Libby Gilbert-Horvath, and John Carlos Garza
Corresponding author: Jon E. Hess; e-mail:hesj@critfc.org; Columbia River Inter-Tribal Fish Commission; 3059-F National Fish Hatchery Rd; Hagerman, ID 83332

In 2009 we were awarded funding from the Species of Concern Internal Grant Program. Our project focused on the use of genetic and otolith tools to evaluate stock structure and population bottlenecks in a depleted rockfish, cowcod (*Sebastes levis*). The objectives of this project were to investigate whether A) this species is composed of one continuous stock or are there major differences in stock composition, specifically, between the two marine biogeographic regions separated by Point Conception, and B) determine if cowcod populations experienced a loss of genetic variation due to a population bottleneck (i.e. dramatic change in effective population size). To address these objectives we utilized archived tissue and otoliths from individuals that were collected along the coast of California and Oregon (by NMFSC Hook and Line Survey and their West Coast Groundfish Bottom Trawl Survey) during 2003-2008 (Figure 1).

In summary, from our genetic analysis we detected significant structure that suggested a minimum of two management units for this species. Further, cowcod have low genetic diversity, relative to other rockfishes, yet neither cowcod stock appears to have suffered detectable loss in genetic variation despite declines in abundance. From our otolith chemistry analysis we detected several regions along California's coast that varied significantly in terms of trace element concentrations. However, only marginally significant differences were detected between regions separated by Point Conception when we compared the chemical signature corresponding to an individuals' entire life. These otolith chemistry results lead us to speculate that the movement of individuals and/or the yearly fluctuations of the element composition of water prevent any large-scale geographic correlations from emerging.

## Results

Genetic analysis:

The microsatellite dataset was analyzed with the program STRUCTURE, and when the number of clusters was set to K=2, two spatially segregated groups of individuals were observed with northern and southern distributions (clusters designated in purple and red colors respectively, Figure 1). STRUCTURE analysis revealed a possible third cluster (K=3) was also supported and further divided the southern region (third cluster indicated with green color, Figure 1). MtDNA haplotype frequencies were also observed to differ significantly between regions separated by Point Conception (Figure 2).

Kriging analysis performed in ArcMap (ESRI) using the individual STRUCTURE assignment values (Figure 1) indicated the spatial boundary between STRUCTURE populations is not located exactly at Point Conception (boundary A, Figure 1), but appears to be located further south near the Channel Islands (boundary B, Figure 1).

The location of boundary B as a more accurate division between distinct genetic lineages is supported using *F*-stastistics. The microsatellite pairwise $F_{ST}$ value was found to be higher between regions divided by boundary B ($F_{ST}$ = 0.092) compared to those divided by boundary A ($F_{ST}$ = 0.066, Table 1). In contrast, the mitochondrial pairwise $F_{ST}$ values were nearly equivalent when comparing regional divisions using either boundary A or B (Table 1).

The cowcod regions divided at boundary B were found to have higher mtDNA gene diversity in the southern region versus northern (Table 1). This trend was not as dramatic when comparing microsatellite gene diversity, moreover, the northern region had slightly higher microsatellite allelic richness (Table 1). Compared to other rockfishes, cowcod are relatively low in genetic diversity; they were found either in the bottom third (mtDNA gene diversity; Figure 3) or the least genetically diverse (msat gene diversity; Figure 4).

Among the four tests we conducted to obtain evidence for population bottlenecks, two tests using BOTTLENECK and M-ratio analyses were found not to be significant (Table 2). However, our estimates of effective population size using LDNe indicated infinite and relatively small effective sizes for the northern and southern regions, respectively (Table 2). In addition, calculation of Tajima's D using the mtDNA sequences showed significantly negative values for both northern and southern regions which suggests rapid demographic expansion has occurred (Table 2).

Otolith chemical analysis:

The chemistry at the edge of the otolith was used to assess the extent to which spatial variability existed in trace elemental concentrations. Since we were interested in assessing spatial variability we focused on fish collected within a year so as to prevent any temporal variability in trace elemental signatures from confounding our analysis.

Using quadratic discriminant function analysis (a multivariate approach to assessing the extent to which individuals can be correctly assigned to a region from which they were collected) to analyze otolith edge concentrations, we detected significant differences among three regions in 2004 and 2005 (see below and see Figure 5 A, B, D, & E). Interestingly, the spatial pattern of elemental differences varied between the two

years of data. Unfortunately, given that fish were collected from different locations in 2004 and 2005 we are unable to speculate as to whether the temporal differences are due to circulation patterns (i.e., location, strength, and/or duration of ocean currents) or are a result of sampling different areas.

Otoliths of fish collected in 2004 (Wilks Lambda = 0.60; Approx F (10,78) = 2.68 p = 0.02) showed barium to be positively correlated with discriminant function 1 (Figure 5D). For discriminant function 2 magnesium and manganese were positively correlated while lead was negatively correlated. Fish collected in 2005 (Wilks Lambda = 0.66; Approx F(10, 88) = 1.99; $p<0.05$) showed differentiation along discriminant function 1 for which strontium and barium were negatively correlated and magnesium was positively associated. Manganese and lead were positively associated with discriminant function 2, while magnesium was negatively correlated (Figure 5E).

Jack-knife classification (wherein one individual at a time is removed from the dataset, treated as an unknown sample, and reclassified to assess the accuracy of the differentiation) revealed moderate levels of correct classification; for fish collected in 2004 jack-knife classification was 63%, while 67% for those collected in 2005.

As otoliths grow throughout the life of an individual they continually record the environment in which the fish reside. This environmental record is the result of ions of trace elements found in the water being absorbed by a fish and deposited onto the otolith. By analyzing the chemistry of the entire otolith will therefore provide information corresponding to the entire life of the fish. For our purposes we were interested in determining the extent to which fish from different populations (north and south of our genetic boundaries; see Figure 1) varied in terms of their trace elemental concentrations. Our analysis indicated that there was marginal significant differences between fish collected north and south of Point Conception (Wilks Lambda = 0.89; Approx F(5,90) = 2.149; p = 0.06), and that 72% of the individuals could be correctly classified to the region from which they were collected (Figure 5 C & F; magnesium and manganese were positively and negatively associated with discriminant function 1, respectively).

## Discussion and Management Implications

Based on the genetic analyses, there are a minimum of two genetically distinct stocks (i.e. lineages) of cowcod with greatest support for separation at boundary B. The precise mechanism responsible for the genetic differentiation observed among these lineages is presently unknown. The presence of these two lineages combined with our finding that there are chemical differences that distinguish the environments inhabited by these lineages, supports the idea of separate ecological compartments as proposed by Longhurst (2007). We expected that if cowcod was shown to represent more than one population, these populations would be separated at Point Conception, because other studies demonstrated this location to be both an inter- and intra-specific biogeographic boundary. However, the location of the genetic boundary between these lineages appears to be further south of Point Conception. Future studies should investigate how stable is the location for boundary B. If boundary B were found to be relatively stable over time, perhaps oceanographic features restrict gene exchange between coastal and island habitats. Although it is possible that Point Conception really does delineate a boundary

between two ecological compartments that are also relevant for cowcod, but shifts in upwelling or stochastic processes in recruitment blur this boundary during particular time periods. If this were the case, it would help explain why whole otolith microchemistry was unable to show a large difference between cowcod samples collected north and south of Point Conception, despite the fact that highly genetically diverged lineages are present.

Compared to other rockfishes, cowcod has relatively low genetic diversity, but it is difficult to say whether a bottleneck event occurred and is the primary cause of this low genetic diversity. From stock assessments, we are certain that the abundance of cowcod has declined at least to 3.4% - 16.3% of historical biomass (Dick et al. 2007). However, it is possible that even this severe decline would present a challenge for genetic detection given the fact that the effective population size of marine fishes can be disproportionately higher than abundance estimates. The only tests that may support a bottleneck event are the LDNe estimates which showed a remarkably low effective size of the southern population. In addition, the Tajima's D statistics showed that both the northern and southern populations may have experienced rapid demographic expansion, presumably following a severe reduction.

The low effective population size estimate of the southern population seems strange given the fact that we found generally higher genetic diversity of the southern stock compared to it northern counterpart. The way that LDNe estimates effective population size is related to linkage disequilibrium which is not only influenced by effective population size but also cryptic population structure (i.e Wahlund effects). Since we found that the southern region could be further divided into two groups using STRUCTURE, the low effective size estimate may simply be due to this Wahlund effect. It is interesting though that only the southern region could be further resolved into two STRUCTURE groups. This may be due to multiple sweepstakes-type of recruitment events that occurred in this region, and could be tested by evaluating age structure among these groups. We would expect one group to be generally composed of older age classes than the other.

Our study supports managing cowcod as two separate stocks. The challenge to managers will be in demarcating these stocks. For simplicity, Point Conception may be a useful proxy for the boundary between the major genetic lineages; however, a biologically more accurate boundary would require a higher resolution parsing of these regions to reflect boundary B. Our analyses support that these lineages occupy different environments and so are not likely ecologically interchangeable. Overfishing may not be the sole reason for the low genetic diversity observed in this species, but care should be taken to prevent any further loss of the level of diversity that is present.

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Table 1. Genetic diversity measures and *F*-statistics for regions separated by either boundary A or B.

| | | | Pairwise $F_{ST}$ | | Gene diversity | | Allelic | # of | |
|---|---|---|---|---|---|---|---|---|---|
| **Boundary** | **Population** | **N** | **Microsatellite** | **Mitochondrial** | **Microsatellite** | **Mitochondrial** | **richness** | **haplotypes** | $F_{IS}$ |
| A | North | 141 | 0.066 | 0.348 | 0.331 ± 0.059 | 0.546 ± 0.045 | 4.836 | 11 | 0.060 |
| | South | 153 | | | 0.358 ± 0.064 | 0.753 ± 0.033 | 4.218 | 24 | 0.147 |
| B | North | 168 | 0.092 | 0.343 | 0.328 ± 0.059 | 0.516 ± 0.043 | 4.871 | 11 | 0.061 |
| | South | 126 | | | 0.357 ± 0.063 | 0.785 ± 0.032 | 4.265 | 22 | 0.136 |

Table 2. Tests for evidence of bottlenecks. The analyses BOTTLENECK, M-ratio, and LDNe were performed using the microsatellite data. Tajima's D was estimated using the mitochondrial data.

| | BOTTLENECK (Two-phase mutation model) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Boundary B | # Loci with Het. | | Wilcoxon Test | | M-ratio | | | Tajima's D |
| Population | Deficit | Excess | 1-tail *P* H-excess | M-ratio | *P* | LDNe (95%CI) | Tajima's D | *P* |
| North | 17 | 6 | 1.000 | 0.794 | 0.337 | Infinite | -1.424 | 0.048 |
| South | 6 | 10 | 0.372 | 0.791 | 0.319 | 16.0 (11.8-21.2) | -1.411 | 0.046 |

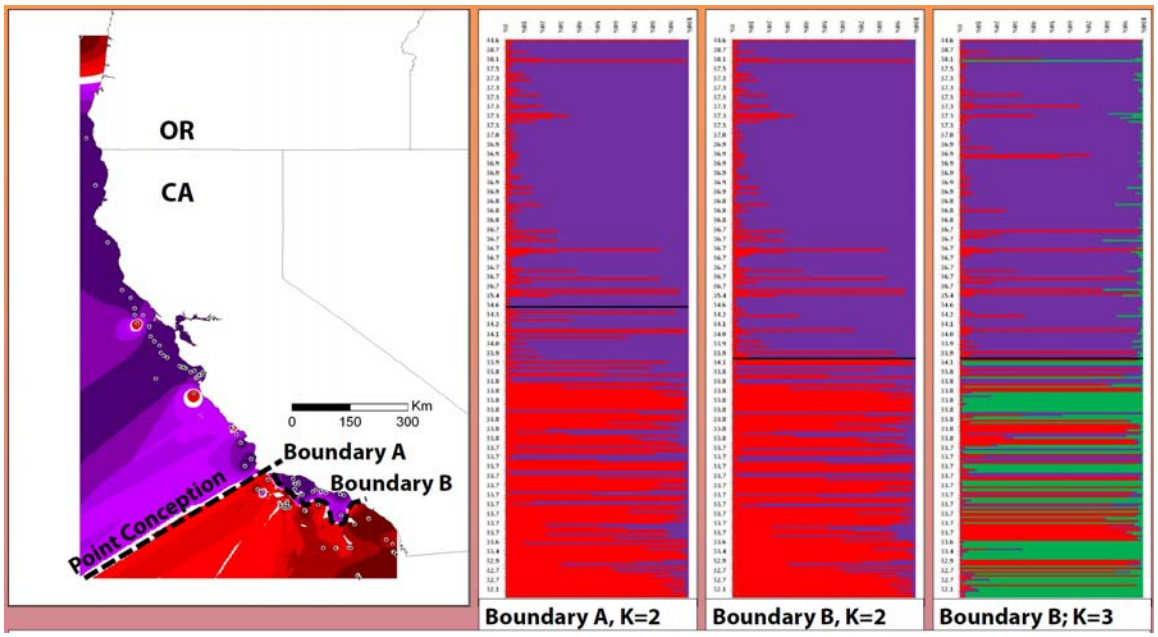



**Figure 1. Map of cowcod samples.** The circles indicate locations where cowcod were collected, and shading in two colors corresponds to areas of high averages of individual assignment (Q=55-100%) to one of two STRUCTURE clusters. The clusters come into contact in a region of the Channel Islands and mainland coast south of Point Conception (boundary B). Vertical STRUCTURE plots show all individual Q scores by latitude, for either boundary A (Point Conception) or boundary B, and either two or three clusters (K).

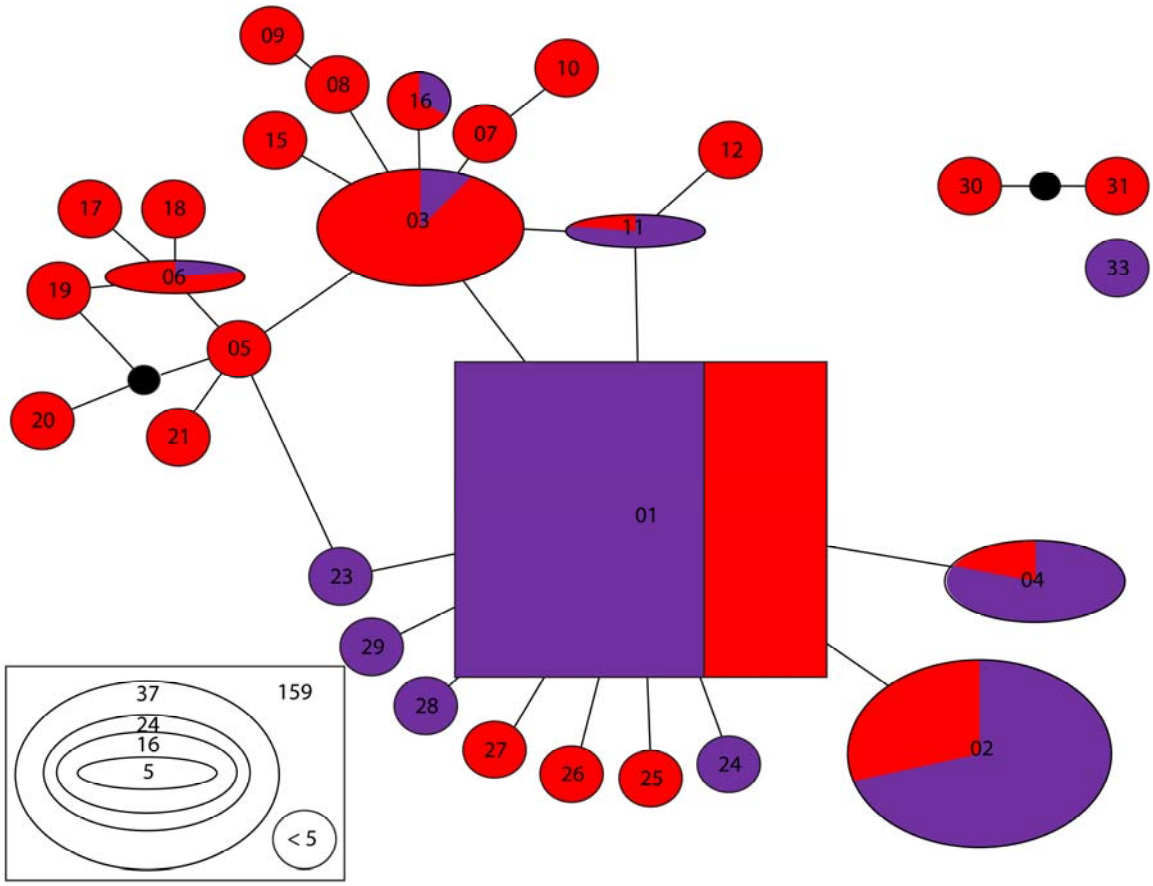



**Figure 2. Mitochondrial sequence network and haplotype frequencies for two cowcod populations.** Each shape in the network represents a unique sequence, solid dots are unobserved haplotypes, and lines represent a single mutation. Size of the shape is scaled to the overall frequency (legend of sample sizes; bottom left). Pie charts indicate haplotype frequencies for two regions separated by boundary B (Fig. 1). Purple and red colors indicate proportions of individuals from the northern and southern region, respectively. Haplotypes 30, 31 and 33 represent large in-dels that cannot be connected to main network.

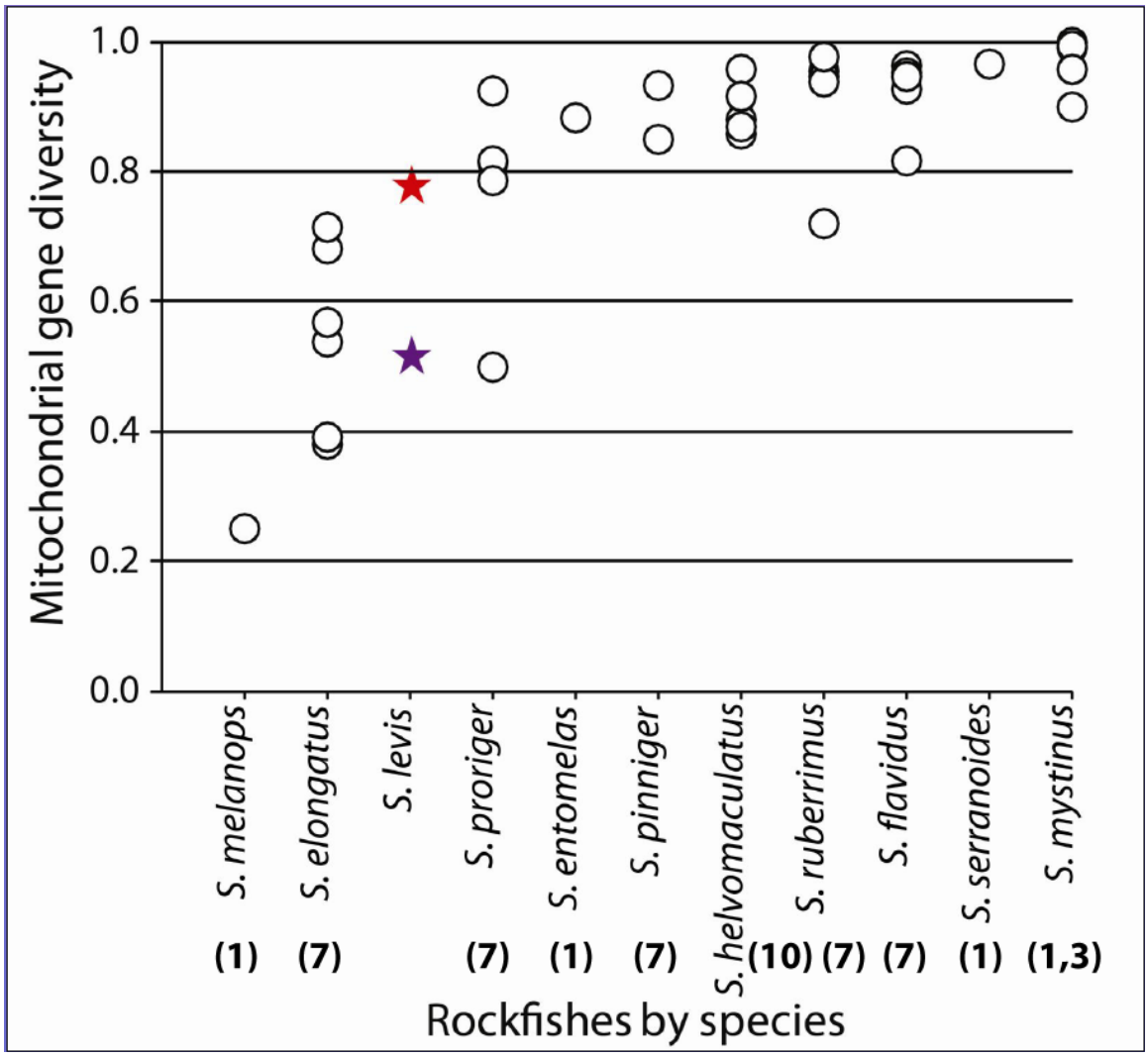



**Figure 3. Comparison of mitochondrial d-loop gene diversity among rockfishes.** Data from eleven different rockfish species were compared to cowcod populations north and south of boundary B (purple and red stars, respectively). Each data point is based on individual collections from both published and unpublished studies (#'s= citations).

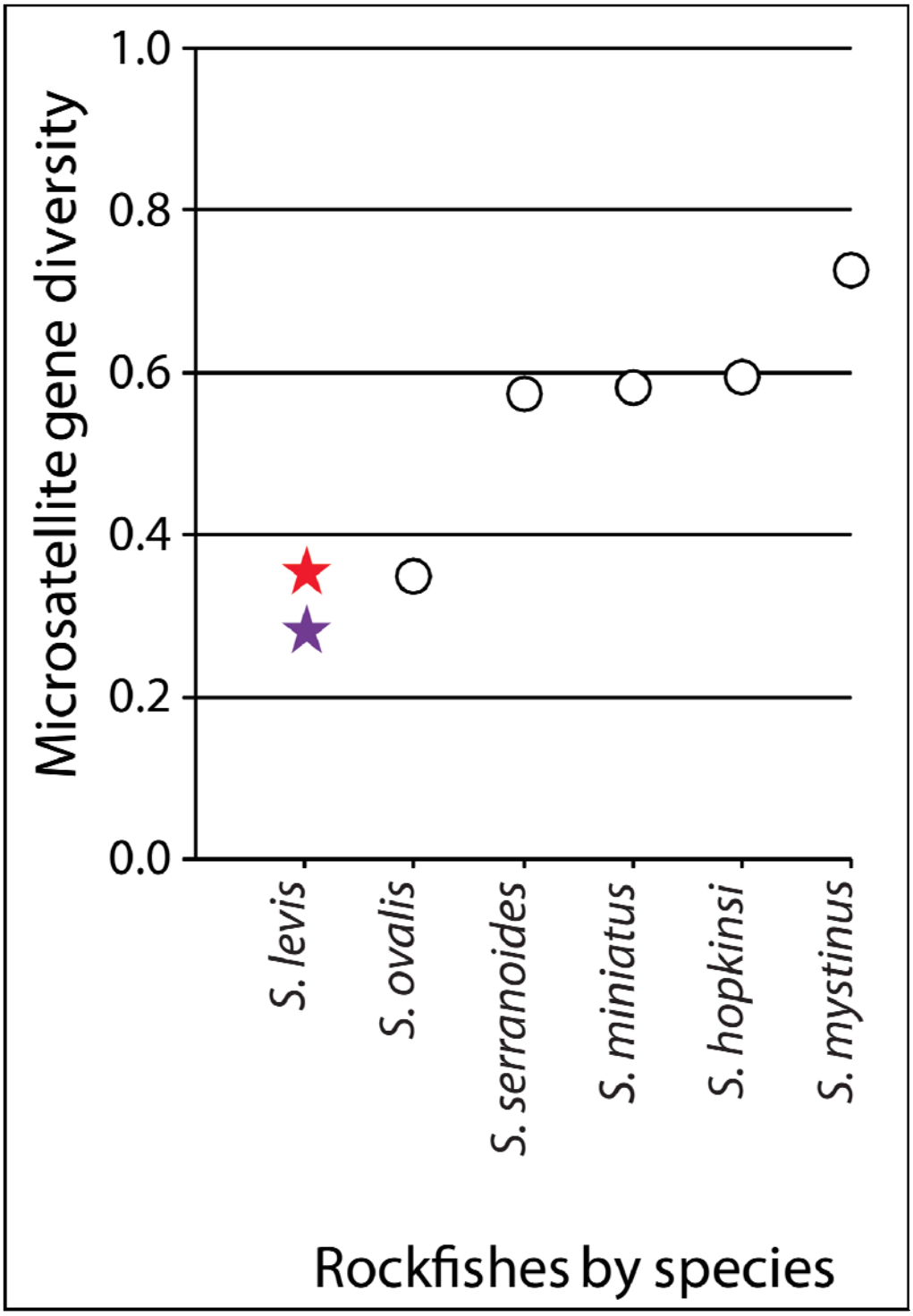



**Figure 4. Comparison of microsatellite gene diversity among rockfishes.** Data from five rockfish species genotyped with the same 24 loci are compared to cowcod populations north and south of boundary B (purple and red stars, respectively). None of the loci were discovered in these species (i.e. no ascertainment bias). All collections came from Central or Southern California (Gilbert-Horvath, L. and Garza, J.C.; unpublished data).

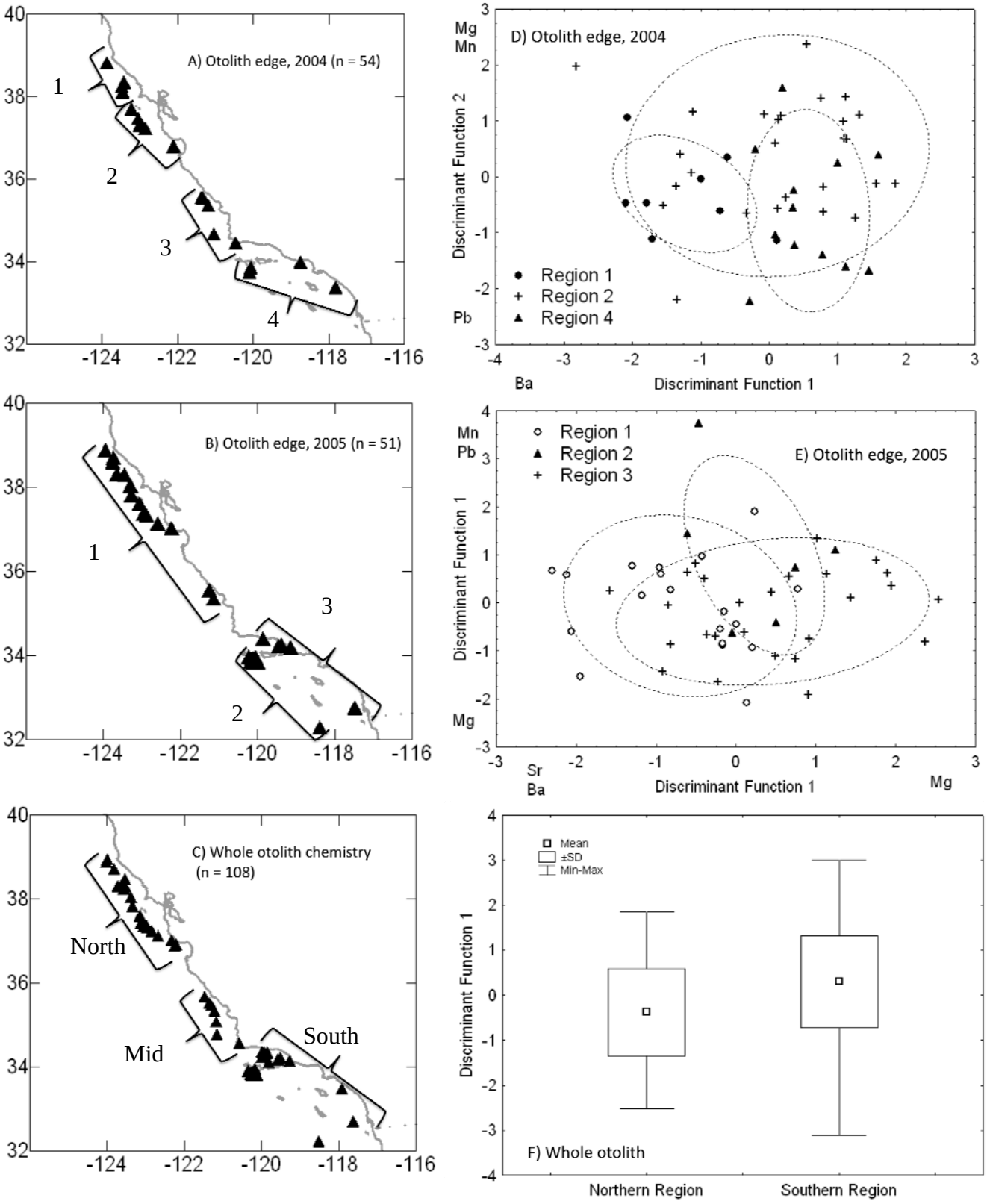



Figure 5: Locations (triangles) from which fish were collected, and used for otolith edge analysis (2004, A; 2005 B) and whole otolith analysis (C). Factor scores produced from discriminant function analyses (DFA) of chemical signatures derived from otolith edges

(2004, D; 2005, E) and whole otoliths (F) provide a visual representation of the the degree of overlap in trace element concentrations. DFA indicated significant differences (Wilks lambda $p < 0.05$; jack-knife classification of 63%) in otolith edge concentrations among fish (collected in 2004, A & D) from regions 1, 2, and 4. A DFA of fish collected in 2005 (B & E) indicated that three regions were significantly different (Wilks lambda $p < 0.05$; jack-knife classification of 67%) also in terms of edge concentrations. Finally, marginal significance (Wilks lambda $p = 0.06$; jack-knife classification of 72%) was detected from the DFA of whole otolith trace elemental concentrations (C & F)

Genetic and otolith related tasks that were completed using Species of Concern Grant funding.

| Location of work | Collaborators | Purpose | Task |
|---|---|---|---|
| NWFSC | Anna Elz & Jon Hess | Genetic data collection | -Tissue samples (n=204) were successfully extracted.<br>-Following tissue exchange with SWFSC, 320 individuals were sequenced for 500bp of the control region (d-loop) of the mitochondrial genome. |
| NWFSC | Jon Hess | Microsatellites analysis | -16 loci were found to be polymorphic (more than 1 allele present) in both stocks north and south of Point Conception.<br>-Basic diversity statistics were conducted and a STRUCTURE analysis, and heuristic spatial interpolation were performed (Figure 1). |
| NWFSC | Jon Hess | Mitochondrial sequence analysis | -33 haplotypes (unique sequences) found among 320 individuals.<br>-Calculated frequencies of haplotypes in the northern and southern cowcod populations (Figure 2). |
| SWFSC | Libby Gilbert-Horvath and John Carlos Garza | Genetic data collection | -122 tissue samples were successfully extracted.<br>-24 microsatellite loci were optimized for genotyping.<br>-We used the following published loci:Sme4, Spi14, Spi6, Sra15-8, Sal3, Seb25, Sme11, Sme3, Sme5, Spi4, Sra16-5, Sal4, Sra7-2, Ssc51, Sth45, Seb9, Sme13, Sra1523, Sth37, Sal2, Seb37, Spi12, Sra6-52, and Ssc1 (Westerman et al 2005, Gomez-Uchida et al. 2003, Miller et al. 2000, Seeb unpublished).<br>-After tissue exchange with NWFSC, 294 individuals were successfully genotyped for at least 16 loci out of a total possible 24 loci available. |
| NWFSC | Paul Chittaro | Otolith microstructure and chemistry data collection | -200 otoliths were polished and digital images taken.<br>-Microstructural analysis conducted at NWFSC. Estimates obtained of daily somatic growth and annual somatic growth.<br>-Microchemical analysis using LA-ICPMS (GeoAnalystical Lab, Washington State University) was used to acquire trace elemental (magnesium, manganese, strontium, barium, and lead) concentrations along a transect from the otolith core to its edge.<br>-Multivariate analyses conducted to investigate spatial and temporal variability in trace elemental concentrations and population structure. |

## Dissemination of project results

The genetics and otolith chemistry aspects of this project have been disseminated separately. Below are the corresponding abstracts submitted to AFS 2010, Pittsburgh.

National American Fisheries Society September 13, 2010; Pittsburgh, PA
Poster presentation entitled "Genetic Evaluation of Stock Structure and Population Bottlenecks in the Severely Depleted Cowcod"
Co-authored by- Jon E. Hess, Paul Chittaro, Anna Elz, , Libby Gilbert-Horvath, Victor Simon and John Carlos Garza

Abstract:

Cowcod (*Sebastes levis*) range from Oregon to Baja California and are currently assumed to be one continuous population. Since 2004, it has been on the National Marine Fisheries Service "Species of Concern" list due to its dramatic decline in abundance (<3.4% - 16.3% of historical biomass). We address the following questions: 1) Is there population subdivision within the species, specifically, between two marine biogeographic regions separated by Point Conception, and 2) Have cowcod populations experienced loss of genetic variation due to a reduction in population size? Sixteen variable microsatellite loci were genotyped and ~500 bp of the mitochondrial control region were sequenced for 294 fish distributed throughout the species range. We observed significant structure when fish were grouped into two regions separated by Point Conception ($F_{ST}$=0.066). However, upon further inspection, an individual-based spatial analysis using Bayesian cluster assignment of the microsatellite genotypes localized this genetic break further south ($F_{ST}$=0.092), corresponding to separation between a Channel Islands region versus the mainland. These results indicate a minimum of two management units in this species. In general, cowcod shows low genetic diversity compared to other rockfishes. However, neither cowcod stock appears to have suffered detectable loss in genetic variation, despite declines in abundance.

National American Fisheries Society September 13, 2010; Pittsburgh, PA
Oral presentation presentation entitled: "Differential Somatic Growth Rates and Population Subdivision of a Region Separated by Point Conception, CA, in a Depleted Rockfish (Sebastes levis)."
Co-authored by- Paul Chittaro, Jon E. Hess, Victor Simon, and John Carlos Garza

Abstract:

Cowcod rockfish (*Sebastes levis*), a once commonly harvested species was declared overfished in 2000, and added to the National Marine Fisheries Service Species of Concern list in 2004. To assist in the management of this species, we used otolith chemistry and microstructure to obtain information related to population structure and the spatial variability in daily and annual somatic growth. Using trace element concentrations from the otolith edge (representing less than one year of growth) of fish collected in 2004 and 2005, we observed significant spatial variability that permitted the correct classification (using QDFA) of fish to their location of collection (63% and 75% jack=knife classification). To investigate whether individuals collected from recently

identified genetic populations (separated at Point Conception, CA) occupied chemically distinct environments during their lives, we examined whole otolith elemental signatures (representing the concentration averaged over a fish's entire life). Results indicated that cowcod collected north (n=48) and south (n=48) of Point Conception could be moderately differentiated (jack-knife classification of 72%). Next, we tested how variable otolith chemical profiles were among fish from different locations and different populations yet of the same age and hatch year. Using age-specific barium concentrations, acquired from laser ablations of the otolith edge to core, we observed instances where fish from different locations or populations varied significantly in their concentrations for one or more years of their lives. Finally, using otolith microstructural analyses we detected significantly higher juvenile somatic growth for fish collected south of Point Conception compared to those north, yet no differences were observed in terms of annual increments. Overall, these results suggest that chemical differences in the environment exist that would permit more detailed analyses of population structure and connectedness, although temporal variability in elemental concentrations will need to be considered in future research. Additionally, our observation of growth differences between populations highlights the need for research to examine factors that are responsible for improved growth and whether this results in increased survival.

DRAFT

Agenda Item E.2.a
(Full Document; Electronic Only) Attachment 4
June 2011

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# Status and Future Prospects for the Darkblotched Rockfish Resource in Waters off Washington, Oregon, and California as Updated in 2011

by

Andi Stephens
Owen S. Hamel
Ian Taylor
Chantel Wetzel

*May 20, 2011*

Northwest Fisheries Science Center
U. S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
2725 Montlake Blvd East
Seattle, Washington 98112-2097

DRAFT

# Status and Future Prospects for the Darkblotched Rockfish Resource in Waters off Washington, Oregon, and California as Updated in 2009

## Executive Summary

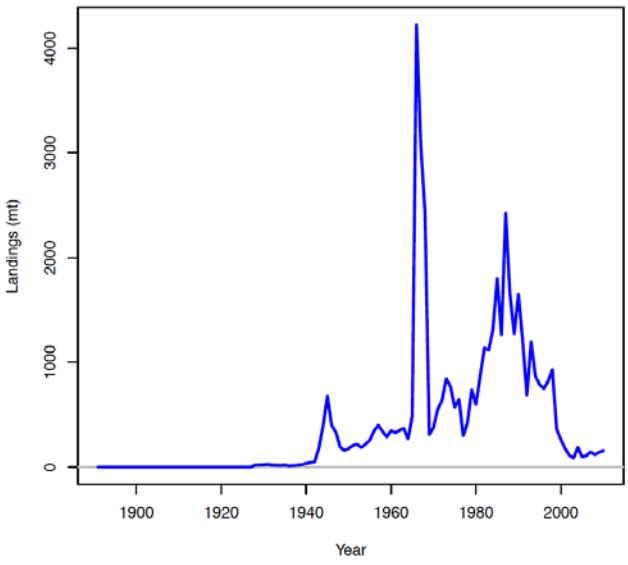
*Stock*

This updated assessment applies to the darkblotched rockfish (*Sebastes crameri*) resource in the combined US Vancouver, Columbia, Eureka and Monterey INPFC areas. The darkblotched rockfish (*Sebastes crameri*) population in these areas was modeled as a single stock as there are no clear stock delineations for darkblotched rockfish in U.S. waters. However, management actions on a coast-wide stock should account for problems in effort concentration because areas of high concentration do exist. In addition, with the stock extending northwards into Canadian waters, management and assessment of stock status might be improved through greater cooperation with British Columbia.

*Catches*

The largest landings (removals between 2,300 and 4,200 metric tons (mt)) of darkblotched were taken from 1966-1968, primarily by foreign vessels. From 1969 to 1981, the fishery proceeded with more moderate landings of between 200 and 1000 mt per year, with the foreign fishery ending in 1977. A second peak in landings occurred between 1982 and 1993, with landings exceeding 1,100 mt in 10 of 12 years, reaching over 2,400 mt in 1987. Management measures reduced landings to below 950 mt since 1994, below 400 mt since 1999, and below 200 mt in recent years.

*Landings history from 1892-2010*




*Landings estimates for the past 10 years*

| *Year* | *Landings(mt)* |
|---|---|
| *2001* | *175* |
| *2002* | *112* |
| *2003* | *84* |
| *2004* | *188* |
| *2005* | *97* |
| *2006* | *107* |
| *2007* | *144* |
| *2008* | *116* |
| *2009* | *140* |
| *2010* | *155* |

*Data and Assessment*

This updated assessment used the Stock Synthesis (SS) model, version 3.21d. New data and updates to the data used in the previous assessment were used in this new assessment. They are as follows:

Recently reconstructed Oregon historical landings replaced data used previously for the period 1928-86. Landings data for 1983-2008 were checked and new landings data were added for 2009 and 2010. Fishery length compositions for 1983-2008 were updated by the addition of new 2009 and 2010 length compositions. The fishery conditional age-at-length data were updated to include otoliths aged in 2009 and 2010. New discard estimates and discard length compositions for 2008 and 2009 were added.

Four fishery independent surveys were included in this updated assessment as in the previous assessment. The NWFSC Bottom Trawl Survey was again treated as two separate survey indices (Shelf and Slope) and each index was updated with data from the 2009 and 2010 surveys.. Two included historical surveys had no new data: the AFSC Slope Survey (1997 and 1999-2001) and the NMFS Triennial Survey (1980-2004). The "super years" from the AFSC Slope Survey continue to be excluded, as is the 1977 Triennial Shelf Survey. GLMM-based biomass indices and CV's were recalculated for all four surveys with updated software using a gamma distribution rather than the lognormal previously modeled. All length compositions for the NWFSC Slope and NWFSC Survey were reconstructed for 2003-2010, as were the conditional age-at-length compositions. The AFSC Slope Survey conditional age-at-length from 2001 and the fishery discard otoliths from 2004 and 2005 remain unchanged.

A number of sources of uncertainty were explicitly included in this assessment. For example, allowance was made for uncertainty in natural mortality and the parameters of the stock-recruitment relationship. There were additional sources of uncertainty that were not included in the current model, including the degree of connection between the stocks of darkblotched rockfish off British Columbia and those in US waters; the effect of the PDO, ENSO and other climatic variables on recruitment, growth and survival of darkblotched rockfish; and gender-based differences in survival.

The reference case, on which this update is based, was selected by extensive model testing with an attempt to balance the sources of uncertainty.

*Reference Points and Management Performance*

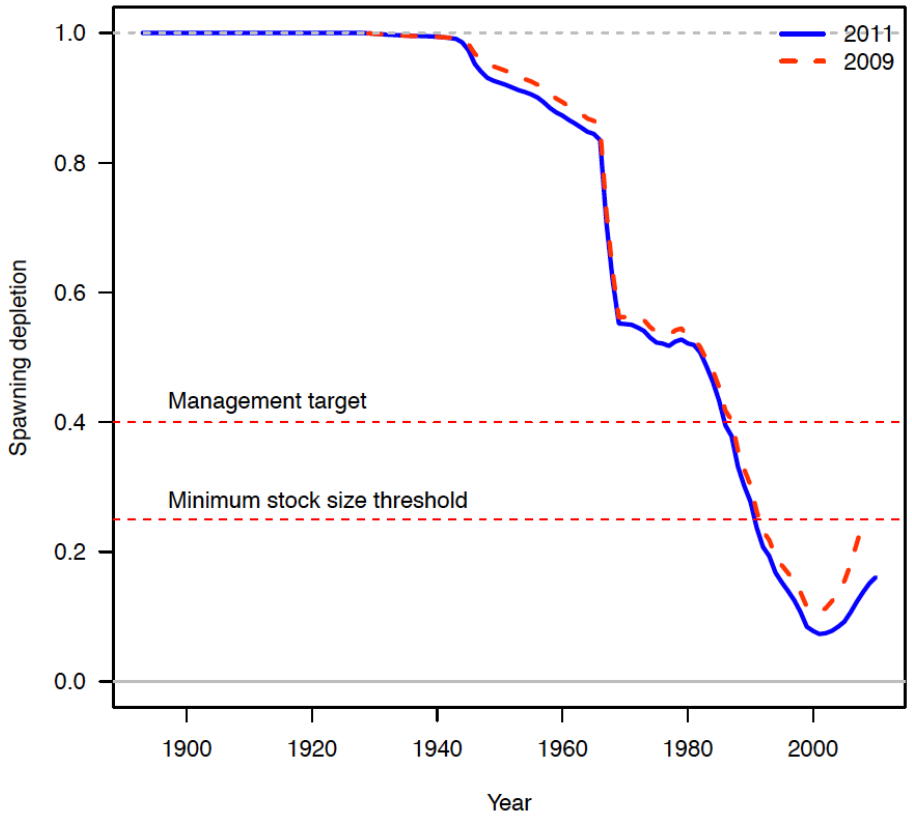
For West Coast rockfish, a stock is considered overfished when it is below 25% of unfished spawning biomass (or output), and recovered when it reaches 40% of unfished spawning biomass. Overfishing is considered to be occurring when catch exceeds the OFL specified for a particular year. The point estimate for the depletion of the spawning output at the start of 2011 is 16.8%. This assessment suggests that darkblotched rockfish on the West Coast remain below the overfished threshold, and the spawning output appears to have increased steadily over the past 10 years (which is essentially the same period in which a formal rebuilding plan has been in place). Since 2003, overfishing is estimated to have occurred once, with estimated catch barely exceeding the OFL by 1 mt in 2004.

**Summary of past 10 years**

| *Year* | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *OFL (previously ABC)* | 302-349 | 187 | 205 | 240 | 269 | 294 | 456 | 487 | 437 | 440 | 508 |
| *ACL (previously OY* | 130 | 168 | 172 | 240 | 269 | 200 | 290 | 330 | 285 | 291 | 298 |
| *Landings(mt)* | 175 | 112 | 84 | 188 | 97 | 107 | 144 | 116 | 140 | 155 | NA |
| *Discards(mt)** | 95 | 150 | 114 | 53 | 26 | 106 | 141 | 114 | 138 | 153 | NA |
| *Catch (mt)** | 270 | 262 | 198 | 241 | 122 | 214 | 285 | 230 | 278 | 308 | NA |
| *F* | 6.05% | 5.32% | 3.66% | 4.07% | 1.93% | 3.13% | 3.95% | 3.06% | 3.51% | 8.05% | NA |
| *Expl. Rate* | 7.8% | 7.1% | 5.0% | 5.3% | 2.3% | 3.6% | 4.5% | 3.6% | 4.1% | 4.4% | NA |
| *1+ Biomass* | 4,465 | 4,919 | 5,411 | 5,927 | 6,346 | 6,843 | 7,227 | 7,538 | 7,933 | 8,335 | 8,540 |
| *Sp. Output* | 2,171 | 2,208 | 2,316 | 2,505 | 2,737 | 3,166 | 3,654 | 4,094 | 4,488 | 4,771 | 4,995 |
| *Sp. Out. sd* | 239 | 259 | 287 | 322 | 367 | 430 | 509 | 591 | 665 | 731 | 794 |
| *Sp. Out. cv* | 0.110 | 0.117 | 0.124 | 0.129 | 0.134 | 0.136 | 0.139 | 0.144 | 0.148 | 0.153 | 0.159 |
| *Recruits($10^3$)* | 819 | 446 | 1,093 | 1,577 | 1,971 | 1,618 | 1,912 | 3,999 | 736 | 1,686 | 1,729 |
| *Rec. sd* | 159 | 91 | 176 | 253 | 326 | 298 | 363 | 753 | 328 | 1358 | 1393 |
| *Rec. cv* | 0.194 | 0.203 | 0.161 | 0.160 | 0.166 | 0.184 | 0.190 | 0.188 | 0.446 | 0.806 | NA |
| *Depletion* | 0.073 | 0.074 | 0.078 | 0.084 | 0.092 | 0.101 | 0.123 | 0.138 | 0.151 | 0.161 | 0.168 |
| *Depl. sd* | 0.007 | 0.008 | 0.009 | 0.010 | 0.011 | 0.013 | 0.016 | 0.018 | 0.021 | 0.023 | 0.025 |
| *Depl. cv* | 0.096 | 0.108 | 0.115 | 0.119 | 0.120 | 0.129 | 0.130 | 0.130 | 0.139 | 0.143 | 0.149 |

* The *discard* reported in this table is a model estimate, and *catch* is equal to landings plus the model-based discard estimates.

***Estimated depletion level, 1892-2011for the new model (solid line) and 1928 to 2009 for the 2007 model (dashed line).***




***Summary of major quantities from assessment***

| | *Value* | *sd* | *cv* |
|---|---|---|---|
| $SpOut_0$ ($10^8$ eggs) | 29,653 | 600 | 0.020 |
| $B_0$ (mt)(1+ Biomass) | 34014 | 675 | 0.020 |
| $R_0$ ($10^3$ fish) | 3151 | 68 | 0.022 |
| $SpOut_{msy}$ ($10^8$ eggs) | 11875 | 238 | 0.020 |
| $F_{msy}$ | 0.037 | 0.0002 | 0.0046 |
| *Basis for above* | $F_{50\%SPR}$ | | |
| *Exploitation rate at MSY* | 0.037 | | |
| *MSY* | 602 | | |

***Summary of Darkblotched rockfish reference points***

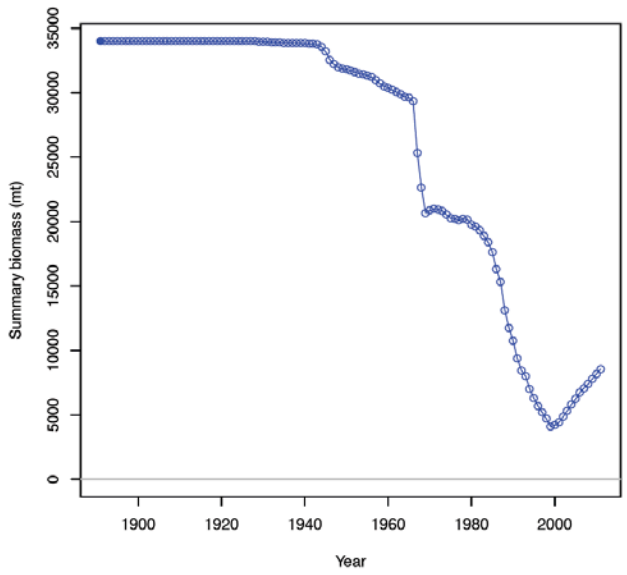
| | $F_{msy}=F_{spr}$ (0.5) | $F_{msy} = F_{Btarg}(B_{40})$ | Calculated $F_{msy}$ |
|---|---|---|---|
| SPR | 0.50 | 0.50 | 0.42 |
| F | 0.037 | 0.037 | 0.047 |
| Exploitation Rate | 0.037 | 0.037 | 0.047 |
| MSY (mt) | 602 | 602 | 623 |
| Sp. Out. msy | 11,861 | 11,861 | 9,050 |
| B/B0 (Sp. Out.) | 0.40 | 0.40 | 0.305 |
| SPR | 0.50 | 0.50 | 0.42 |

*Note that when steepness (h) = 0.6, the reference $F_{spr}$ = 0.5 will result in an equilibrium biomass of $B_{40}$; therefore, the first two columns in the above table are identical (since when h = 0.6 and biomass = $B_{40}$, expected recruitment = $0.8R_0$)

*Stock Biomass*

The point estimates of summary (age 1+) biomass show an upward trend over the past ten years, nearly doubling during that time.

***1+ Biomass Levels from 1892 to 2010***



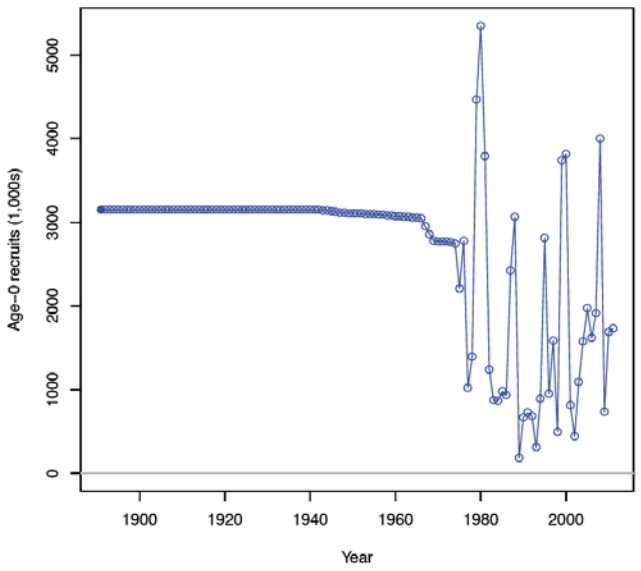

***Biomass estimates for the past 10 years***

| *Year* | *Total 1+ biomass(mt)* |
|---|---|
| *2002* | 4,835 |
| *2003* | 5,311 |
| *2004* | 5,812 |
| *2005* | 6,218 |
| *2006* | 6,706 |
| *2007* | 7,078 |
| *2008* | 7,369 |
| *2009* | 7,774 |
| *2010* | 8,165 |
| *2011* | 8,540 |

*Recruitment*

The first year for which recruitment appears to be reliably estimated is 1975. The recruitment pattern for darkblotched rockfish is similar to that of many rockfish species, with highly variable recruitment from year to year. With a few exceptions, the 1980's and 1990's provided rather poor year-classes compared with average historical recruitment levels, however there appear to be very high recruitments in 1999, 2000 and 2008.

***Recruitment estimates (1892-2010)***



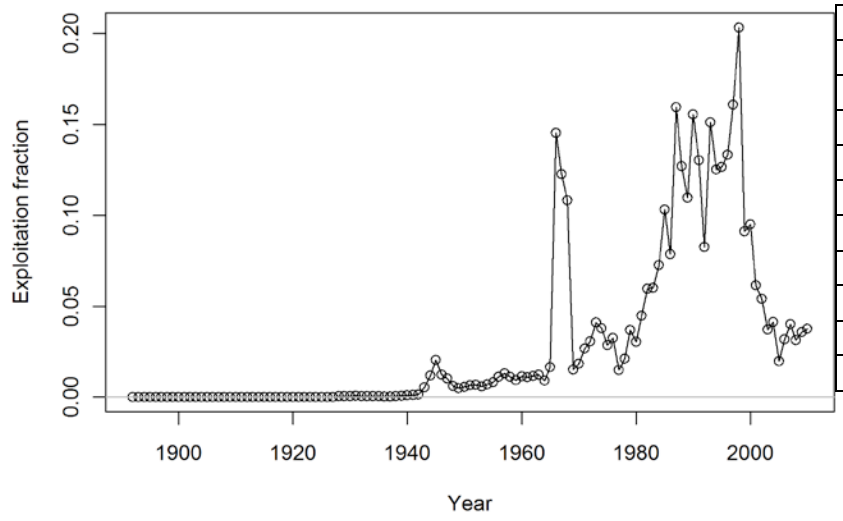

***Recruitment estimates for the past 10 years (Thousands of age-0 recruits)***

| *Year* | *Recruitment* |
|---|---|
| *2002* | 446 |
| *2003* | 1,093 |
| *2004* | 1,577 |
| *2005* | 1,971 |
| *2006* | 1,618 |
| *2007* | 1,912 |
| *2008* | 3,999 |
| *2009* | 736 |
| *2010* | 1,686 |
| *2011* | 1,729 |

*Exploitation Status*

The exploitation rate (percent of biomass taken) on fully-selected animals peaked near 15% in the mid-1960's when foreign fishing was intensive. The exploitation rate dropped by the late 1960's, but increased slowly and steadily from the late 1970's to 1987 at 15% and stayed high until 1998 with the continuing decline in exploitable biomass. Over the past 10 years the exploitation rate has fallen from over 6% to below 4%.

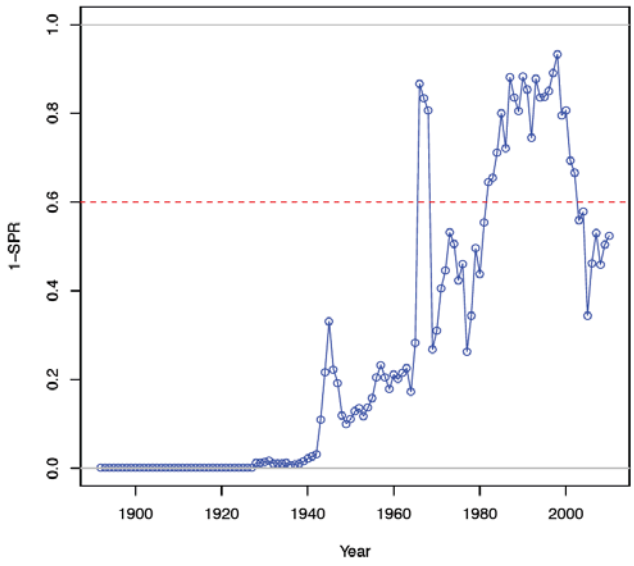
***Exploitation Fraction (1892-2010)***



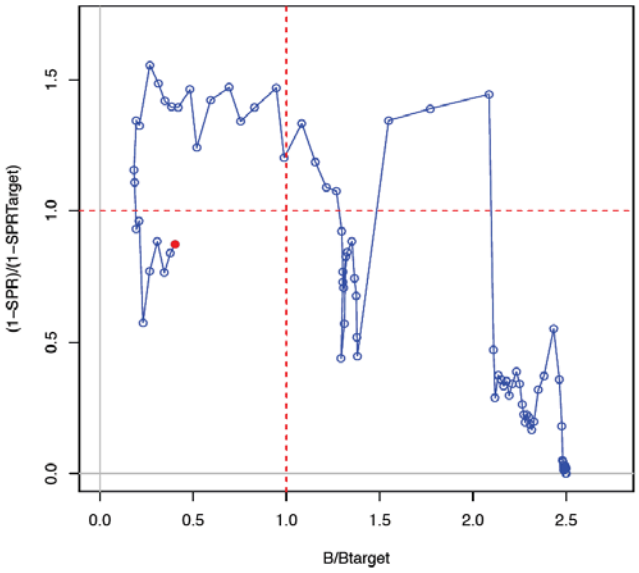

***Exploitation Fraction the past 10 years***

| *Year* | *Exploitation rate* |
|---|---|
| *2001* | 6.14% |
| *2002* | 5.41% |
| *2003* | 3.73% |
| *2004* | 4.14% |
| *2005* | 1.97% |
| *2006* | 3.19% |
| *2007* | 4.03% |
| *2008* | 3.13% |
| *2009* | 3.58% |
| *2010* | 3.77% |

***One minus SPR for 1892-2010***




***Relative Fishing Intensity versus B/Btarget for 1892-2010***



### *Major quantities from assessment*

| | *Value* | *sd* | *cv* |
|---|---|---|---|
| $SpOut_0$ ($10^8$ eggs) | 29,653 | 600 | 0.020 |
| $B_0$ (mt)(1+ Biomass) | 34014 | 675 | 0.020 |
| $R_0$ ($10^3$ fish) | 3151 | 68 | 0.022 |
| $SpOut_{msy}$ ($10^8$ eggs) | 11875 | 238 | 0.020 |
| $F_{msy}$ | 0.037 | 0.0002 | 0.0046 |
| Basis for above | $F_{50\%SPR}$ | | |
| Exploitation rate at MSY | 0.037 | | |
| MSY | 602 | | |

### *Reference points*

| | **$F_{msy}$=$F_{spr}$ (0.5)** | **$F_{msy}$ = $F_{Btarg}$($B_{40}$)** | **Calculated $F_{msy}$** |
|---|---|---|---|
| SPR | 0.50 | 0.50 | 0.42 |
| F | 0.037 | 0.037 | 0.047 |
| Exploitation Rate | 0.037 | 0.037 | 0.047 |
| MSY (mt) | 602 | 602 | 623 |
| Sp. Out. msy | 11,861 | 11,861 | 9,050 |
| B/B0 (Sp. Out.) | 0.40 | 0.40 | 0.305 |
| SPR | 0.50 | 0.50 | 0.42 |

*Note that when steepness (h) = 0.6, the reference $F_{spr}$ = 0.5 will result in an equilibrium biomass of $B_{40}$; therefore, the first two columns in the above table are identical (since when h = 0.6 and biomass = $B_{40}$, expected recruitment = $0.8R_0$)

The major axes of uncertainty in the model are steepness and natural mortality. The decision table below uses natural mortality (M) as the major axis of uncertainty. The three landings series are based upon $F_{SPR}$ = 77% ("Low Landings"), 40:10 rule catches (with 2009 and 2010 landings to meet catch ACLs; "Medium Landings"), and 2005 rebuilding plan SPR (0.50) = OFL with 2009-10 ACLs; "High Landings"). Discard, and thus total catch, is estimated within the model.

| | | | LOW STATE M = 0.05 | | | MEDIUM STATE M = 0.07 | | | HIGH STATE M = 0.09 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | Landings | Catch | Sp. Out. | Depl. | Catch | Sp. Out. | Depl. | Catch | Sp. Out. | Depl. |
| Low[1] Landings | 2013 | 124 | 62 | 876 | 2.8% | 63 | 5,468 | 18.4% | 63 | 13,624 | 44.3% |
| | 2014 | 133 | 67 | 906 | 2.9% | 67 | 5,892 | 20.0% | 68 | 14,555 | 47.3% |
| | 2015 | 140 | 71 | 940 | 3.0% | 71 | 6,371 | 21.5% | 71 | 15,610 | 50.7% |
| | 2016 | 146 | 74 | 968 | 3.1% | 74 | 6,852 | 23.1% | 75 | 46,646 | 54.1% |
| | 2017 | 152 | 77 | 987 | 3.2% | 77 | 7,299 | 24.6% | 78 | 17552 | 57.1% |
| | 2018 | 157 | 80 | 994 | 3.2% | 78 | 7,707 | 26.0% | 80 | 18,306 | 59.5% |
| | 2019 | 162 | 82 | 991 | 3.2% | 82 | 8,083 | 27.3% | 83 | 18,927 | 61.5% |
| | 2020 | 168 | 85 | 978 | 3.2% | 85 | 8,435 | 28.4% | 86 | 19,443 | 63.2% |
| | 2021 | 173 | 88 | 955 | 3.1% | 88 | 8,772 | 29.6% | 88 | 19,880 | 64.6% |
| | 2022 | 179 | 91 | 925 | 3.0% | 91 | 9,098 | 30.1% | 92 | 20,259 | 65.9% |
| Medium Landings | 2013 | 201 | 100 | 876 | 3.0% | 101 | 5,462 | 18.4% | 102 | 13624 | 44.3% |
| | 2014 | 230 | 114 | 853 | 2.7% | 116 | 5,837 | 19.7% | 117 | 14480 | 47.1% |
| | 2015 | 256 | 127 | 815 | 2.6% | 130 | 6,240 | 21.0% | 130 | 15480 | 50.3% |
| | 2016 | 277 | 198 | 752 | 2.4% | 140 | 6,626 | 22.3% | 141 | 16422 | 53.3% |
| | 2017 | 296 | 147 | 662 | 2.1% | 150 | 6,960 | 23.5% | 151 | 17220 | 56.0% |
| | 2018 | 311 | 154 | 549 | 1.8% | 158 | 7,241 | 24.4% | 189 | 17852 | 58.0% |
| | 2019 | 325 | 160 | 418 | 1.3% | 165 | 7,482 | 25.2% | 166 | 18345 | 59.6% |
| | 2020 | 338 | 165 | 272 | 1.0% | 171 | 7,692 | 25.9% | 173 | 18729 | 60.9% |
| | 2021 | 344 | 124 | 118 | 0.5% | 174 | 7,881 | 26.6% | 176 | 19032 | 61.9% |
| | 2022 | 361 | 49 | 23 | 0.0% | 183 | 8,062 | 27.2% | 184 | 19281 | 62.7% |
| High Landings | 2013 | 330 | 164 | 876 | 2.8% | 166 | 5,468 | 18.4% | 167 | 13,624 | 44.3% |
| | 2014 | 345 | 171 | 764 | 2.4% | 175 | 5,742 | 19.4% | 175 | 14,406 | 46.8% |
| | 2015 | 356 | 176 | 642 | 2.1% | 180 | 6,055 | 20.4% | 181 | 15,297 | 49.7% |
| | 2016 | 363 | 189 | 498 | 2.1% | 184 | 6,354 | 21.4% | 185 | 16156 | 52.5% |
| | 2017 | 370 | 181 | 340 | 1.6% | 187 | 6,609 | 22.3% | 189 | 16,879 | 54.9% |
| | 2018 | 376 | 170 | 175 | 1.1% | 191 | 6,821 | 23.0% | 192 | 17,446 | 56.7% |
| | 2019 | 382 | 61 | 30 | 1.0% | 194 | 7,002 | 23.6% | 195 | 17,887 | 58.1% |
| | 2020 | 389 | 37 | 10 | 0.0% | 197 | 7,161 | 24.2% | 199 | 18,229 | 59.2% |
| | 2021 | 395 | 27 | 6 | 0.0% | 200 | 7,307 | 24.6% | 202 | 18,498 | 60.1% |
| | 2022 | 402 | 19 | 4 | 0.0% | 204 | 7,446 | 25.1% | 205 | 18,717 | 60.8% |
| | 2013 | 124 | 62 | 876 | 2.8% | 63 | 5,468 | 18.4% | 63 | 13,624 | 44.3% |
| | 2014 | 133 | 67 | 906 | 2.9% | 67 | 5,892 | 20.0% | 68 | 14,555 | 47.3% |

[1]The SPR value used for the low landings was revised from the previous update value of SPR = 64.9% to SPR = 77% to add additional contrast because the forecasted landing based on the previous value was similar to the forecast landings used for the "Medium Landings" case.

**Future Research Needs**

Future research needs include:

- Inclusion of the recently revised historical rockfish landings. (was this different than what you included?
- Investigation into the best available methods and data for constructing and using conditional age at length compositions from data taken across space and time within years.
- A thorough investigation of historical darkblotched rockfish mortality in the shrimp fishery.
- Mapping of “trawlable” and “untrawlable” habitat and construction of a prior on survey q.

# 1. Introduction

This assessment used combined data from the International North Pacific Fisheries Commission (INPFC) U.S. Vancouver, Columbia, Eureka and Monterey areas. The darkblotched rockfish (*Sebastes crameri*) population in these areas was modeled as a single stock.

Darkblotched rockfish (*Sebastes crameri*) are found from the Bering Sea to near Santa Catalina I., California at depths of 29-549 m (16-300 fm; Eschmeyer et al.1983). Commercially important concentrations are found from Northern CA through the Canadian border, on or near the bottom, in depths of approximately 183-366 m (100-200 fm) (Figure 1). This species co-occurs with an assemblage of slope rockfish, including Pacific ocean perch (*Sebastes alutus*), splitnose rockfish (*Sebastes diploproa*), yellowmouth rockfish (*Sebastes reedi*), and sharpchin rockfish (*Sebastes zacentrus)*. Pacific ocean perch and darkblotched rockfish are the most abundant members of that assemblage off the coasts of Oregon and Washington, but splitnose rockfish and darkblotched rockfish dominate off the northern coast of California. In the early years of the fishery, darkblotched rockfish were designated as part of the "Pacific ocean perch" market category for red-colored northern slope rockfish.

There are no clear stock delineations for darkblotched rockfish in U.S. waters. No distinct breaks are seen in the fishery landings and catch distributions (Figure 1). Survey catches imply a continuous distribution over most of the range, with the largest catches occurring over a swath of latitude and depth. For the purpose of this assessment, the species is treated as a unit stock from the Mexican border to the U.S.-Canadian border. However, management actions on a coast-wide stock should account for problems in effort concentration because areas of high concentration do exist.

Additional information on stock gentics, sexually dimorphic growth, migration to deeper waters, and historical fishing practices can be found in the last full assessment (Hamel, 2007).

# 2. Data

## 2.1. Fishery removals and regulations

Darkblotched landings information was obtained for the fishery off the West Coast of the continental United States from 1892 through 2010 (Figure 2; Tables 4-5). Reconstructed Oregon historical landings were updated for 1892-19?86 (Karnowski, Mark: personal communication, 2011). For Oregon and Washington, darkblotched landings during the period 1928-1962 were estimated by apportioning combined rockfish landings using the earliest available species proportions in a given area. Since the fleet fished shallower than 100 fm in years before 1945-1948, the available darkblotched proportions were reduced for those years. Landings from 1963-1977 were mainly available in the literature, but some estimation was required. The 1978-1980 landings were taken from CalCom and Tagart (1985). Landings from 1983-2010 were extracted from PacFIN on May 6, 2011 and darkblotched bycatch information from the At-Sea-Hake Observer Program was taken from the Northwest Regional office website (NWR, 2011) for 2005-2010.

***Discards***

The new discard rates for 2002-2010 (Table 3) were obtained from the West Coast Groundfish Observer Program.. Additional information on past discards can be found in Hamel (2007).

***Fishery Length compositions***

Fishery length compositions (Figures 3-6) were estimated from PacFIN for the years 1977-1978 and 1981-2010. Fishery length compositions were constructed using BDS data retrieved from PacFIN on May 6, 2011. Length, age and sex data were acquired at the trip level, and then aggregated to the state level as was done in the 2007 assessment, and 2009 update. For each trip, the length composition of the sampled individuals was scaled up to represent the length composition of the trip landings through use of an expansion factor. In this assessment, the expansion factor was calculated as:

$$\text{Expansion Factor} = (WT_{total}/WT_{sampled})^{0.9}$$

with total weight divided by sample weight being the equivalent of total estimated number over sampled number. The exponent 0.9 was used in acknowledgment of the reduced information that occurs with any expansion to the trip level. The initial effective N value (input N) for each state was calculated via Stewart's Method (Ian Stewart, pers. Comm.), which for fisheries is:

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

The geometric mean was adjusted to account for the lack of proportional sampling in each state as in Hamel (2007). The input $N_{effective}$ was capped at 500 in this assessment.

The length composition of discarded darkblotched rockfish in 1986 was estimated using data from observed groundfish trawls in that year (Rogers, 2005). The length compositions of discards in more recent years (2002-2010) were calculated with observer data from boats using bottom trawl gear. Individual lengths were scaled up by a straight expansion factor to the total discard for each observed tow. Due to significant missing sex data across the full range of length bins, all discard length-, age- and conditional age-at-length compositions were developed as combined-sex length compositions (Figures 7-8). Input N values for discard length compositions were calculated via Stewart's Method (Table 6B).

***Fishery conditional age-at-length compositions***

Conditional age-at-length compositions were constructed from age and length data available from PacFIN for the years 2003-2010. These years were used because all of the ages in PacFIN for those years were from otoliths aged between 2004 and 2010, a period in which ageing methods have been invariant, with three agers doing all of the ageing. Double-read analysis indicates minimal or no bias between agers and relatively good precision. In constructing conditional age-at-length compositions, instead of expanding samples up to trips, as with the length data, each age-at-length data point was considered independent for the purposes of creating each composition, although total input N (across all length bins) was still based on Stewart's method as described above. This total input N was spread among the length bins according to the number of fish contributing to data in that bin. For the early years, in keeping with the 2007 assessment (Hamel, 2007), this update only uses data from the years 1991 and 1998 (Table 7).

Since rockfish grow significantly in a single year and fishing occurs throughout the year, length bins were pooled according to estimated growth for each age. The bins were 0-10 cm, 11-15 cm, 16-20 cm, 21-24 cm, 25-27 cm, and 28-30 cm, with two centimeter bins for length from 31 cm to 50 cm, and a plus group at 51 cm and above. The compositions and input sample sizes (Table 7) were developed by the same method as described above for the PacFIN data. Residuals for the age-at-length compositions are shown in Figures 26-30.

**2.2. Surveys**

***NMFS Cruises***

The results from four fishery-independent surveys are used in this assessment:

1. The NMFS Triennial Shelf Survey that was conducted every third year from 1980-2004
2. The AFSC Slope Survey for the years 1997 and 1999-2001.
3. The NWFSC Slope Survey for the years 1999-2010.
4. The shelf portion of the NWFSC survey for the years 2003-2010.

Neither the 1977 Triennial Shelf Survey, due to concerns about the first year of the survey's implementation, nor the AFSC Slope Survey "super years", consisting of combined data from multiple years of partial coastal coverage, were used in this assessment. The "POP" survey from 1979 and 1985 was not used, as selectivity likely changed between the two survey years which used separate methods. The previous solution of mirroring the AFSC Slope Survey was unlikely to produce realistic selectivities for the POP survey. These two years of data were also relatively insignificant given the other data available.

***Indices***

In the 2007 and 2009 assessments, indices of abundance were derived for the four surveys based on a Generalized Linear Mixed Model (GLMM) following the methods of Helser et al (2004, Table 8), including vessel-specific differences in catchability (via inclusion of random effects) .. The GLMM approach explicitly models both the zero and positive catches, as well as allowing for skewness in the distribution of catch rates through the use of a Gamma or lognormal error structure. Coefficients of variation (CVs) about the indices were produced using an MCMC technique.

The GLMM indices for this update were generated for all four surveys using the same basic method but using software reprogrammed by John Wallace (John.Wallace@noaa.gov) to use OpenBUGS (http://www.openbugs.info/) from the statistical language R. Although point estimates and confidence intervals differed slightly between the two implementations applied to data through 2008, the basic trends were largely unchanged. Any discrepancies may likely be attributed to the use of the Gamma rather than the lognormal error structure, as in past assessments.

GLMM results are reported coastwide, combining the U.S. Vancouver and Columbia INPFC areas with the Eureka and Monterey INPFC areas. While darkblotched rockfish are occasionally seen in the Conception INPFC area, the numbers there are negligible compared to those further north. Depth ranges were limited to those which were covered in all years of each survey.

***Length compositions***

Length compositions were derived for each survey, except for the 1999 NWFSC Slope Survey, for which length data were not available and the 2004 Triennial Survey where age compositions, instead of length compositions, were used (Figures 9-24).

Length, age, and sex data were acquired at the tow level, and then aggregated within INPFC areas and depth strata. For each trip, the length composition of the sampled individuals was scaled up to represent the length composition of the trip landings through use of an expansion factor. In this assessment, the expansion factor was calculated as:

$$\text{Expansion Factor} = (WT_{total}/WT_{sampled})$$

with total weight divided by sample weight being the equivalent of total estimated number over sampled number. No down weighting exponent was used, as the survey data are taken at the tow level rather than the trip level. The initial effective N (input N) were calculated via Stewart's Method (Ian Stewart, pers. Comm.), which for surveys is

$$N_{effective} = N_{trips} + 0.0707 N_{fish} \quad \text{if } N_{fish}/N_{trips} < 55$$
$$N_{effective} = 4.89 N_{trips} \quad \text{if } N_{fish}/N_{trips} \geq 55$$

where $N_{fish}$ is the total number of fish sampled across all trips (Table 6C).

***Age compositions***

The 2004 Triennial Survey age composition is included in this assessment as derived in the 2005 assessment (Figures 25).

***Conditional-age-at length compositions***

Conditional age-at-length compositions were constructed from age and length data using the same methods as for survey length compositions. These compositions were constructed for the 2001 AFSC Slope Survey and the 2003-2010 NWFSC Slope and Shelf Surveys (see Figures 31-35 for the residuals for the survey compositions). These years and surveys were used because all of the ages in PacFIN for those years were from otoliths aged between 2004 and 2010, a period in which ageing methods have been invariant, with three agers doing all of the ageing. Total input N for each year was based on Stewart's method as described above (Table 7). This total input N was distributed among the length bins according to the number of fish contributing to data in that bin.

A summary of data sources and years included in the base model is given in Table 9.

**2.3. Biology and life history**

***Natural mortality***

In the 2000 and 2003 assessments, M = 0.05 was selected based on fit to the data (Rogers et al. 2000). Lenarz (1993) suggested a range of natural morality estimates (0.025-0.05) based on a maximum age range of 60-105 years, using Hoenig's method. In 2005, indirect estimates of M for darkblotched rockfish from Gunderson et al. (2003) were considered in selecting a value for M. Gunderson estimated M based on a meta-analysis of the relationship of the Gonadosomatic Index or GSI (ovary weight/somatic body weight). This method produced a value of M = 0.107

for darkblotched rockfish with a 95% confidence interval of 0.07-0.14. The 2005 and 2007 assessments used 0.07 based on balancing the estimates using GSI and Hoenig's method.

However, the correct interval to use when conducting meta-analyses and predicting an unobserved point is a prediction interval, not a confidence interval. The prediction interval for both Hoenig's method and the GSI method are quite large ((0.005 - 0.375) for Hoenig's (using log-log regression), and either (-0.186 - 0.323) (untransformed) or (0.062-0.205) (log-log) for Gunderson's method). In addition, the values of both maximum age and GSI for darkblotched are towards the edge of the data used in constructing the meta-analyses, so assuming a linear relationship in either space is somewhat suspect. Therefore it is hard to define what the correct prediction interval is for either method. However, observation error in the data used in the meta-analysis can cause prediction intervals to be too wide, and therefore the situation may not be quite as dire. In any case, M continues to be a very difficult parameter to pin down. In this updated assessment, M was not changed from the value used in the last assessment. In so far as this value does balance the point estimates well, there is support for using this value.

***Sex ratio, maturation and fecundity***

In this assessment, the sex ratio at birth is assumed to be 1:1. Maturity-at-length for females was based on the work of Nichol (1990) with 50% maturity occurring at 34.5 cm (Figure 36):

$$P_{Mat} = \frac{1}{-e^{(-0.6449L+22.2)}}$$

Fecundity-at-weight was derived by converting Nichol's (1990) fecundity-at-length equation (Figure 37) using his length-weight relationship:

$$Eggs = 14{,}580W + 132{,}500W^2,$$

where W = weight is in kg.

***Length-weight relationship***

The length-weight relationship was estimated by Rogers (2005) using available survey data. Sexes were combined because means did not differ substantially. The equation was fit to mean weight at length from 6374 fish measured in West Coast surveys:

$$W = 0.000021L^{2.96142}$$

where W is weight (kg) and L is fork length (cm). This equation differs slightly from Nichol's (1990) equation, but this difference in the weight-length relationship results in quite minimal changes to the resultant weight and fecundity-at-age estimates.

***Length at age***

Length at age was estimated within the assessment model. No latitudinal or temporal changes in length at age were assumed, although male and female growth rate and $L_{\infty}$ were estimated separately. The CV of length at age was also estimated and allowed to change linearly with mean length at age (Figure 38).

### 2.4 Changes in data from the 2009 update assessment

Changes in data for this assessment included new 2009 and 2010 landings data; new 2002-2009 discard rate estimates; updated 2003-2010 NWFSC Slope Survey and Shelf Survey data; and new GLMM estimates for the AFSC Slope, NMFS Triennial Trawl, and NWFSC Slope Survey and Shelf Survey. Updated or new conditional age-at-length data includes: new 2009 and 2010, and updated NWFSC survey data for 2003-2010.

## 3. Assessment model

### 3.1 History of Modeling approaches

There have been eight previous assessments of darkblotched rockfish off of the U. S. West Coast (Lenarz 1993, Rogers et al. 1996, Rogers et al. 2000, Methot and Rogers 2001, Rogers 2003, Rogers 2005, Hamel 2007, Wallace and Hamel 2009). These assessments began with life-history-based analyses of sustainable catch rates and have progressed to statistical age-based modeling. The first full assessment of the darkblotched rockfish stock was conducted in 2000. That assessment was updated twice in 2001 and 2003. The 2005 and 2007 assessments were the second and third full assessments for this species. Hamel (2007) gives a detailed history on each of the assessments prior to 2007.

### 3.2 Current Model

***Model***

This assessment uses Stock Synthesis (SS) version 3.21d, released by Dr. Richard Methot in May 2011. The base model's parameters, both those that were estimated and those that were fixed, are given in Table 10.

***Length and age bins***

The length frequency bins were the same as in the 2007 and 2009 assessments. The first bin contained all fish less than 7 cm, followed 1 cm length bins up to 32 cm, and then 2 cm bins from 33-34 cm to 49-50 cm, and a maximum bin of all fish $\geq$ 51cm in length.

***Growth***

Growth parameters were estimated within the model, including the size at age 1.7, the size at age 29, the von Bertalanffy growth rate parameter (K) and the CV of length at age 1.7. Exponential offsets were also estimated for the CV at age 29, for male size at age 29 and for von Bertalanffy K. Table 11 gives the estimates of these values for the current model and those arrived at in the previous assessment.

***Recruitment, stock-recruitment steepness and natural mortality***

$R_0$ is estimated in the model, along with recruitment deviations from 1975 through 2009, with $\sigma_r$ = 0.8. Stock-recruitment steepness is fixed at 0.6 as in the last assessment, and natural mortality is set at 0.07 which is the value used in the 2005,2007, and 2009 assessments. This value balances the estimates from various meta-analyses. See Hamel (2007) for more details.

***Selectivity and Retention***

In the previous update assessment, all 6 parameters of the double normal selectivity function were estimated for the fishery and each survey, along with the inflection point and slope of the logistic retention function. Various blocking schemes on fishery selectivity were tested in an effort to account for changes in depth of fishing and codend mesh size. However, these blocks resulted either in unrealistic selectivity patterns, due to the sparseness or vagaries of the data, or almost no change at all. Therefore a single selectivity pattern was assumed for all years of the fishery. Retention was blocked to reflect changes in recent years. The length at the inflection point was allowed to change in 2000 and the asymptotic retention was allowed to change at 2000, 2004, and 2006.

Similar to all the final runs for the 2007 and 2009 assessments, all the runs in this update have both the fishery and the NWFSC Slope Survey selectivities forced to be asymptotic, while the others are allowed to be domed shaped (Figures 41-44). The pattern of retention has changed in recent years due to regulations (Table 1 & 3; Figure 39). Modeled and observed discards are shown in Figures 45 and 46.

***Weighting***

Iterative re-weighting was applied to the 2007 base model and the details can be found there (Hamel, 2007). That re-weighting was found to be sufficient for this update and no additional re-weighting was performed.

## 4. Results

### 4.1. Reference model results

Figures 48-52 show the time trajectories of the estimates of summary biomass, fishery exploitation rate, recruitment, and depletion in spawning output. The fit to the stock-recruitment relationship (Figure 50) indicates a substantial amount of variability. The exploitation rate first peaked at 11-14% in 1966-1968 due to fishing by foreign fleets. The two highest exploitation rates were attained in 1987 (15%) and 1998 (16%), averaging 11-12% in the intervening years. The fishing mortality rate has been less than 4% over the past 7 years.

Figures 51 and 52 provide a comparison of the time trajectories of spawning output, depletion, and summary (1+) biomass for the current and the 2007 assessments. The fits of the base model to the various indices are summarized in Figures 53 and 54 (survey biomass indices), and Figures 3-8 and 11-28 (composition data). The estimated growth parameters are given in Table 11.

### 4.2. Retrospective analysis

Retrospective analyses were conducted as if the assessment were carried out in the years from 2006 to 20010 (without the last 1-5 years of data). No consistent retrospective pattern was seen (Figure 55).

## 5. Future research

Future research needs include:

- Inclusion of the recently revised historical rockfish landings.
- Investigation into the best available methods and data for constructing and using conditional age at length compositions from data taken across space and time within years.
- A thorough investigation of historical darkblotched rockfish mortality in the shrimp fishery.
- Mapping of “trawlable” and “untrawlable” habitat and construction of a prior on survey q.

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Table 1. Recent management regulations affecting darkblotched rockfish landings.

| Area | Year | Period | 2-mo landing limit for slope rockfish (lbs) | RCA Depth (fm) | | Small footrope required |
|---|---|---|---|---|---|---|
| | | | | min | max | |
| N of 40° 10' | 2003 | Jan-Dec | 1,800 | 0-100 | 200-250 | shoreward of RCA |
| | 2004 | Jan-Apr | 4,000 | 60-75 | 200 | shoreward of RCA |
| | | May-Sep | 8,000 | 60-75 | 150 | shoreward of RCA |
| | | Oct | 8,000 | 0 | 250 | shoreward of RCA |
| | | Nov-Dec | 1,800 | 0 | 250 | shoreward of RCA |
| | 2005 | Jan-Dec | 4,000 | 75-100 | 200 | [*] shoreward of RCA |
| | 2006 | Jan-Feb | 2,000 | 75 | 200 | [*] shoreward of RCA |
| | | Mar-Jun | 4,000 | 75 | 200 | [*] shoreward of RCA |
| | | Jul-Dec | 1,000 | 75-100 | 200 | [*] shoreward of RCA |
| | 2007 | Jan-Apr | 4,000 | 75 (Jan-Mar) | 250 (Jan-Mar) | [*] shoreward of RCA |
| | | Mar-Dec | 1,500 | [#] 60-75 | 150-200 | [*] shoreward of RCA |
| | 2008 | Jan-Apr | 4,000 | [#] 75 (Jan-Mar) | 250 (Jan-Mar) | [*] shoreward of RCA |
| | | May-Dec | 1,500 | [#] 60-75 | 150-200 | [*] shoreward of RCA |
| | 2009 | Jan-Aug | 1,500 | [#] 75-100 | 150-200 | [*] shoreward of RCA |
| | | Sep-Dec | 4,000 | [#] 75 | 200 | [*] shoreward of RCA |
| | 2010 | Jan-Apr | 6,000 | [#] 75 | 200 | [*] shoreward of RCA |
| | | May-Aug | 2,000 | [#] 75-100 | 150-200 | [*] shoreward of RCA |
| | | Sep-Oct | 4,000 | [#] 75 | 200 | [*] shoreward of RCA |
| | | Nov | 4,000 (mo) | [#] 75 | 200 | [*] shoreward of RCA |
| | | Dec | 0 | [#] 75 | 250 | [*] shoreward of RCA |
| 40 °10' to 38° | 2003 | Jan-Dec | 1,800 | 0-60 | 200-250 | shoreward of RCA |
| | 2004 | Jan-Apr | 7,000 | 75 | 150 | shoreward of RCA |
| | | May-Sep | 50,000 | 75-100 | 150 | shoreward of RCA |
| | | Oct | 50,000 | 75 | 150 | shoreward of RCA |
| | | Nov-Dec | 10,000 | 0 | 200 | shoreward of RCA |
| | 2005 | Jan-Feb | 4,000 | 75 | 200 | shoreward of RCA |
| | | Mar-Oct | 8,000 | 100 | 200 | shoreward of RCA |
| | | Nov-Dec | 1,000 | 75 | 200 | shoreward of RCA |
| | 2006 | Jan-Feb | 4,000 | 75 | 200 | shoreward of RCA |
| | | Mar-Jun | 8,000 | 100 | 200 | shoreward of RCA |
| | | Jul-Dec | 1,000 | 75 | 200 | shoreward of RCA |
| | 2007 | Jan-Jun | 15,000 | 100 | 150-200 | shoreward of RCA |
| | | Jul-Oct | 10,000 | 100 | 150 | shoreward of RCA |
| | | Nov-Dec | 15,000 | 100 | 200 | shoreward of RCA |
| | 2008 | Jan-Dec | 15,000 | 100 | 150 | shoreward of RCA |
| | 2009 | Jan-Jun | 15,000 | 100 | 150 | shoreward of RCA |
| | | Jul-Aug | 10,000 | 100 | 150 | shoreward of RCA |
| | | Sep-Oct | 15,000 | 100 | 150 | shoreward of RCA |
| | | Nov-Dec | 16,000 | 100 | 150 | shoreward of RCA |
| | 2010 | Jan-Dec | 15,000 | 100 | 150 | shoreward of RCA |

[*] Use of selective flatfish gear (which is a type of small footrope gear) was required.

[#] During these periods, the RCA extended to the shore north of 48°10' N. lat. This was also the case during April-September 2007 and all of 2008 in the area between 42°40.5' N. lat. and 43°20.83' N. lat.

Table 2. Management performance (Bold indicates overfishing).

| *Year* | *2001* | *2002* | *2003* | *2004* | *2005* | *2006* | *2007* | *2008* | *2009* | *2010* |
|---|---|---|---|---|---|---|---|---|---|---|
| *OFL (previously ABC)* | 302-349 | 187 | 205 | 240 | 269 | 294 | 456 | 487 | 437 | 440 |
| *ACL (previously OY)* | 130 | 168 | 172 | 240 | 269 | 200 | 290 | 330 | 285 | 300 |
| *Landings (mt)* | 175 | 112 | 84 | 188 | 97 | 107 | 144 | 116 | 140 | 155 |
| *Modeled Discards (mt)* | 95 | 150 | 114 | 53 | 26 | 106 | 141 | 114 | 138 | 153 |
| *Modeled Total Catch (mt) from the assessment** | 270 | 262 | 198 | 241 | 122 | 214 | 285 | 230 | 278 | 308 |

* These total catch values are based on model-based estimates of discard. These are not the estimates which are used to determine whether overfishing has occurred.

Table 3. Input discard rates used in the assessment.

| Year | Discard % | CV |
|---|---|---|
| 1986 | 5 | 0.3 |
| 2000 | 32 | 0.2 |
| 2001 | 41 | 0.2 |
| 2002 | 56 | 0.1 |
| 2003 | 60.2 | 0.1 |
| 2004 | 16 | 0.1 |
| 2005 | 22.4 | 0.1 |
| 2006 | 49.4 | 0.1 |
| 2007 | 48.6 | 0.1 |
| 2008 | 53.1 | 0.1 |
| 2009 | 54.3 | 0.1 |

Table 4. Estimates of darkblotched rockfish landings from 1928-1977 for Oregon, Washington, and foreign fleets from Rogers (2005).

| Year | California | Oregon | Washington | Foreign | Total |
|---|---|---|---|---|---|
| 1928 | 18 | 0 | | | 18 |
| 1929 | 19 | 0 | | | 19 |
| 1930 | 21 | 0 | 0 | | 21 |
| 1931 | 26 | 0 | 0 | | 26 |
| 1932 | 16 | 0 | 0 | | 16 |
| 1933 | 16 | 0 | 0 | | 16 |
| 1934 | 15 | 0 | 0 | | 15 |
| 1935 | 17 | 0 | 0 | | 17 |
| 1936 | 11 | 0 | 0 | | 11 |
| 1937 | 13 | 1 | 0 | | 14 |
| 1938 | 16 | 0 | 0 | | 16 |
| 1939 | 23 | 1 | 0 | | 24 |
| 1940 | 20 | 13 | 0 | | 33 |
| 1941 | 22 | 19 | 0 | | 41 |
| 1942 | 12 | 36 | 0 | | 48 |
| 1943 | 57 | 125 | 0 | | 182 |
| 1944 | 177 | 218 | 0 | | 395 |
| 1945 | 334 | 337 | 2 | | 673 |
| 1946 | 189 | 209 | 1 | | 399 |
| 1947 | 199 | 130 | 1 | | 330 |
| 1948 | 99 | 89 | 3 | | 191 |
| 1949 | 70 | 86 | 1 | | 157 |
| 1950 | 73 | 101 | 2 | | 176 |
| 1951 | 106 | 96 | 2 | | 204 |
| 1952 | 78 | 136 | 2 | | 216 |
| 1953 | 87 | 96 | 2 | | 185 |
| 1954 | 79 | 136 | 2 | | 217 |
| 1955 | 131 | 123 | 2 | | 256 |
| 1956 | 149 | 189 | 7 | | 345 |
| 1957 | 190 | 205 | 4 | | 399 |
| 1958 | 180 | 153 | 6 | | 339 |
| 1959 | 139 | 142 | 5 | | 286 |
| 1960 | 151 | 189 | 7 | | 347 |
| 1961 | 120 | 197 | 8 | | 325 |
| 1962 | 107 | 235 | 7 | | 349 |
| 1963 | 136 | 225 | 8 | | 369 |
| 1964 | 85 | 175 | 8 | | 268 |
| 1965 | 97 | 380 | 8 | | 485 |
| 1966 | 84 | 320 | 8 | 3807 | 4219 |
| 1967 | 102 | 262 | 8 | 2706 | 3078 |
| 1968 | 110 | 17 | 8 | 2288 | 2423 |
| 1969 | 65 | 80 | 11 | 153 | 309 |
| 1970 | 77 | 145 | 6 | 149 | 377 |
| 1971 | 91 | 174 | 9 | 278 | 552 |
| 1972 | 111 | 148 | 3 | 374 | 636 |
| 1973 | 1 | 67 | 9 | 768 | 845 |
| 1974 | 253 | 144 | 24 | 346 | 767 |
| 1975 | 66 | 102 | 109 | 293 | 570 |
| 1976 | 136 | 322 | 72 | 118 | 648 |
| 1977 | 120 | 130 | 45 | | 295 |

Table 5. Estimated landings for 1978-2010. State values from PacFIN (extracted May 6, 2011) except for 1978-1982 Oregon landings (Mark Karnowski, ODFW, pers. comm.). At-Sea Hake "landings" (including discards) from Vanessa Tuttle, At-Sea Hake Observer Program (pers. comm.) for 1991-2010, and extended back to 1981 using a ratio estimator from years with data.

| Year | California | Oregon | Washington | Other | At Sea Hake | Total |
|---|---|---|---|---|---|---|
| 1978 | 78 | 156 | 189 | | | 423 |
| 1979 | 159 | 497 | 81 | | | 737 |
| 1980 | 164 | 334 | 98 | | | 596 |
| 1981 | 522 | 266 | 37 | | 46 | 870 |
| 1982 | 170 | 941 | 24 | | 3 | 1137 |
| 1983 | 510 | 582 | 22 | | 0 | 1114 |
| 1984 | 596 | 625 | 82 | | 11 | 1314 |
| 1985 | 802 | 848 | 111 | | 36 | 1797 |
| 1986 | 417 | 622 | 215 | | 10 | 1264 |
| 1987 | 1647 | 686 | 68 | | 19 | 2420 |
| 1988 | 750 | 789 | 108 | | 8 | 1655 |
| 1989 | 441 | 737 | 91 | | 6 | 1275 |
| 1990 | 870 | 764 | 16 | | 0 | 1651 |
| 1991 | 333 | 774 | 54 | | 45 | 1206 |
| 1992 | 187 | 451 | 20 | | 29 | 687 |
| 1993 | 285 | 892 | 9 | | 8 | 1194 |
| 1994 | 292 | 550 | 9 | | 15 | 866 |
| 1995 | 366 | 342 | 28 | | 49 | 787 |
| 1996 | 408 | 309 | 19 | | 6 | 748 |
| 1997 | 452 | 342 | 22 | | 4 | 820 |
| 1998 | 497 | 395 | 20 | | 14 | 929 |
| 1999 | 113 | 227 | 10 | | 11 | 362 |
| 2000 | 114 | 129 | 9 | | 8 | 259 |
| 2001 | 87 | 66 | 8 | 2 | 12 | 175 |
| 2002 | 50 | 52 | 7 | 0 | 3 | 112 |
| 2003 | 11 | 61 | 2 | 5 | 4 | 84 |
| 2004 | 39 | 134 | 7 | 1 | 7 | 188 |
| 2005 | 18 | 65 | 1 | 2 | 11 | 97 |
| 2006 | 23 | 71 | 2 | 1 | 11 | 107 |
| 2007 | 41 | 87 | 3 | 1 | 12 | 144 |
| 2008 | 34 | 72 | 3 | 1 | 6 | 116 |
| 2009 | 47 | 88 | 2 | 1 | 1 | 140 |
| 2010 | 17 | 152 | 7 | 1 | 13 | 183 |

Table 6A. Raw numbers of fish and trips sampled and input Ns used for fisheries length compositions. Any input 'N' that was greater than 500 was capped at 500.

| Year | WA fish | OR fish | CA fish | Total Fish | WA trips | OR trips | CA trips | Total Trips | Input N | ReWt N |
|---|---|---|---|---|---|---|---|---|---|---|
| 1977 | 0 | 304 | 0 | 0 | 5 | 0 | 304 | 5 | 22 | 13.86 |
| 1978 | 0 | 200 | 0 | 0 | 2 | 0 | 200 | 2 | 9 | 5.67 |
| 1981 | 0 | 0 | 199 | 0 | 0 | 31 | 199 | 31 | 44 | 27.72 |
| 1982 | 0 | 300 | 459 | 0 | 2 | 57 | 759 | 59 | 89 | 56.07 |
| 1983 | 0 | 0 | 792 | 792 | 0 | 0 | 115 | 115 | 165 | 103.95 |
| 1984 | 0 | 70 | 1925 | 1995 | 0 | 1 | 161 | 162 | 332 | 209.16 |
| 1985 | 0 | 201 | 2967 | 3168 | 0 | 2 | 207 | 209 | 485 | 305.55 |
| 1986 | 0 | 0 | 2437 | 2437 | 0 | 0 | 145 | 145 | 267 | 168.21 |
| 1987 | 0 | 0 | 2704 | 2704 | 0 | 0 | 124 | 124 | 410 | 258.3 |
| 1988 | 0 | 0 | 1343 | 1343 | 0 | 0 | 93 | 93 | 185 | 116.55 |
| 1989 | 0 | 0 | 1107 | 1107 | 0 | 0 | 92 | 92 | 135 | 85.05 |
| 1990 | 0 | 100 | 873 | 973 | 0 | 1 | 91 | 92 | 179 | 112.77 |
| 1991 | 0 | 200 | 764 | 964 | 0 | 2 | 75 | 77 | 143 | 90.09 |
| 1992 | 0 | 0 | 429 | 429 | 0 | 0 | 49 | 49 | 57 | 35.91 |
| 1993 | 0 | 0 | 566 | 566 | 0 | 0 | 56 | 56 | 66 | 41.58 |
| 1994 | 0 | 200 | 595 | 795 | 0 | 2 | 51 | 53 | 118 | 74.34 |
| 1995 | 0 | 188 | 793 | 981 | 0 | 7 | 55 | 62 | 182 | 114.66 |
| 1996 | 370 | 833 | 1044 | 2247 | 28 | 23 | 81 | 132 | 426 | 268.38 |
| 1997 | 586 | 802 | 947 | 2335 | 32 | 22 | 58 | 112 | 405 | 255.15 |
| 1998 | 456 | 541 | 1353 | 2350 | 28 | 13 | 80 | 121 | 413 | 260.19 |
| 1999 | 342 | 430 | 773 | 1545 | 26 | 9 | 41 | 76 | 250 | 157.5 |
| 2000 | 653 | 224 | 906 | 1783 | 20 | 7 | 53 | 80 | 275 | 173.25 |
| 2001 | 892 | 1005 | 897 | 2794 | 25 | 30 | 60 | 115 | 471 | 296.73 |
| 2002 | 1129 | 610 | 994 | 2733 | 48 | 20 | 48 | 116 | 440 | 277.2 |
| 2003 | 580 | 1447 | 590 | 2617 | 28 | 60 | 38 | 126 | 456 | 287.28 |
| 2004 | 616 | 1305 | 562 | 2483 | 20 | 58 | 33 | 111 | 430 | 270.9 |
| 2005 | 117 | 1275 | 571 | 1963 | 9 | 54 | 34 | 97 | 360 | 226.8 |
| 2006 | 505 | 1457 | 1309 | 3271 | 10 | 62 | 73 | 145 | 500 | 315 |
| 2007 | 579 | 2155 | 1840 | 4574 | 22 | 79 | 89 | 190 | 500 | 315 |
| 2008 | 350 | 2689 | 2188 | 5227 | 12 | 102 | 104 | 218 | 500 | 315 |
| 2009 | 359 | 2829 | 1464 | 4652 | 11 | 137 | 69 | 217 | 482 | 303.66 |
| 2010 | 209 | 2856 | 1099 | 4164 | 5 | 136 | 62 | 203 | 466 | 293.58 |

Table 6B. Raw numbers of fish and hauls sampled and input Ns used for discard length composition data.

| Year | Fish | Hauls | Input N | ReWt N |
|---|---|---|---|---|
| 1986 | | | 100 | 63 |
| 2002 | 674 | 70 | 127 | 80.01 |
| 2003 | 856 | 93 | 159 | 100.17 |
| 2004 | 783 | 123 | 177 | 111.51 |
| 2005 | 1529 | 255 | 319 | 200.97 |
| 2006 | 1159 | 296 | 276 | 173.88 |
| 2007 | 574 | 170 | 188 | 118.44 |
| 2008 | 263 | 73 | 76 | 47.88 |
| 2009 | 1167 | 324 | 367 | 231.21 |
| 2010 | 115 | 31 | 40 | 25.2 |

Table 6C. Raw numbers of fish and hauls sampled and input Ns used for survey length composition data.

| Survey | Year | Fish | Hauls | Input N | ReWt N |
|---|---|---|---|---|---|
| Triennial | 1980 | 656 | 11 | 54 | 38.34 |
| | 1983 | 4438 | 43 | 210 | 149.1 |
| | 1986 | 1834 | 38 | 168 | 119.28 |
| | 1989 | 6054 | 85 | 416 | 295.36 |
| | 1992 | 1445 | 33 | 135 | 95.85 |
| | 1995 | 2389 | 106 | 275 | 195.25 |
| | 1998 | 2943 | 110 | 318 | 225.78 |
| | 2001 | 2980 | 184 | 395 | 280.45 |
| | 2004 | 3578 | 152 | 405 | 287.55 |
| AFSC slope | 1997 | 313 | 20 | 42 | 24.36 |
| | 1999 | 228 | 26 | 42 | 24.36 |
| | 2000 | 223 | 20 | 36 | 20.88 |
| | 2001 | 324 | 14 | 37 | 21.46 |
| NW slope | 2000 | 296 | 25 | 46 | 40.48 |
| | 2001 | 494 | 45 | 79 | 69.52 |
| | 2002 | 1027 | 54 | 123 | 108.24 |
| | 2003 | 1742 | 64 | 183 | 161.04 |
| | 2004 | 557 | 53 | 82 | 72.16 |
| | 2005 | 1023 | 49 | 117 | 102.96 |
| | 2006 | 1133 | 66 | 144 | 126.72 |
| | 2007 | 1074 | 65 | 137 | 120.56 |
| | 2008 | 1130 | 60 | 139 | 122.32 |
| NW shelf | 2003 | 633 | 36 | 80 | 80 |
| | 2004 | 505 | 37 | 71 | 71 |
| | 2005 | 960 | 61 | 129 | 129 |
| | 2006 | 792 | 64 | 120 | 120 |
| | 2007 | 1012 | 67 | 138 | 138 |
| | 2008 | 517 | 51 | 88 | 88 |

Table 7. Number of trips (fishery) or hauls, number of fish, and total input N's for conditional age-at-length and age compositions used in the assessment.

| Fleet | Year | Trips/Hauls | Fish | Total input N | ReWT N |
|---|---|---|---|---|---|
| Fishery | 1991 | 33 | 354 | 46 | 46 |
| | 1998 | 51 | 854 | 44 | 44 |
| | 2003 | 85 | 1900 | 633 | 633 |
| | 2004 | 38 | 1168 | 432 | 432 |
| | 2005 | 51 | 1121 | 416 | 416 |
| | 2006 | 61 | 1421 | 523 | 523 |
| | 2007 | 78 | 1991 | 817 | 817 |
| | 2008 | 69 | 1815 | 678 | 678 |
| | 2009 | 46 | 1186 | 1186 | 1186 |
| | 2010 | 29 | 783 | 783 | 783 |
| Discard | | | | | |
| | 2004 | 47 | 246 | 81 | 81 |
| | 2005 | 80 | 504 | 150 | 150 |
| Triennial | (Age composition) | | | | |
| | 2004 | 134 | 1121 | 213 | 106.5 |
| AFSC slope | | | | | |
| | 2001 | 18 | 191 | 32 | 32 |
| NWFSC slope | 2003 | 64 | 465 | 465 | 116.25 |
| | 2004 | 53 | 349 | 349 | 87.25 |
| | 2005 | 49 | 401 | 401 | 100.25 |
| | 2006 | 66 | 491 | 491 | 122.75 |
| | 2007 | 65 | 515 | 515 | 128.75 |
| | 2008 | 60 | 492 | 492 | 123 |
| | 2009 | 64 | 610 | 610 | 152.5 |
| | 2010 | 51 | 428 | 428 | 107 |
| NWFSC shelf | 2003 | 36 | 280 | 280 | 42 |
| | 2004 | 37 | 238 | 238 | 35.7 |
| | 2005 | 61 | 394 | 394 | 59.1 |
| | 2006 | 63 | 442 | 442 | 66.3 |
| | 2007 | 67 | 452 | 452 | 67.8 |
| | 2008 | 51 | 256 | 256 | 38.4 |
| | 2009 | 62 | 521 | 521 | 78.15 |
| | 2010 | 66 | 469 | 469 | 70.35 |

Table 8. GLMM-based biomass indices used in the assessment model.

Triennial Shelf Survey

| | Total Biomass | |
|---|---|---|
| Year | Median | SD of the log |
| 1980 | 6809 | 0.113 |
| 1983 | 15998 | 0.083 |
| 1986 | 8969 | 0.095 |
| 1989 | 4275 | 0.088 |
| 1992 | 7588 | 0.103 |
| 1995 | 6152 | 0.096 |
| 1998 | 3193 | 0.095 |
| 2001 | 3917 | 0.096 |
| 2004 | 8891 | 0.101 |

AFSC Slope Survey

| | Total Biomass | |
|---|---|---|
| Year | Median | SD of the log |
| 1997 | 1606.293 | 0.248 |
| 1999 | 2756.346 | 0.227 |
| 2000 | 934.142 | 0.245 |
| 2001 | 1992.919 | 0.283 |

NWFSC Slope Survey

| | Total Biomass | |
|---|---|---|
| Year | Median | SD of the log |
| 1999 | 2205.061 | 0.193 |
| 2000 | 10663.288 | 0.228 |
| 2001 | 2153.85 | 0.205 |
| 2002 | 3025.156 | 0.206 |
| 2003 | 29534.603 | 0.22 |
| 2004 | 3359.529 | 0.233 |
| 2005 | 21951.282 | 0.265 |
| 2006 | 4921.375 | 0.163 |
| 2007 | 4954.338 | 0.157 |
| 2008 | 4144.408 | 0.172 |
| 2009 | 7452.022 | 0.162 |
| 2010 | 3570.572 | 0.18 |

NWFSC Shelf Survey

| | Total Biomass | |
|---|---|---|
| Year | Median | SD of the log |
| 2003 | 2329.28 | 0.227 |
| 2004 | 3684.936 | 0.217 |
| 2005 | 2346.148 | 0.164 |
| 2006 | 1518.052 | 0.168 |
| 2007 | 2053.659 | 0.158 |
| 2008 | 4203.075 | 0.18 |
| 2009 | 1494.096 | 0.155 |
| 2010 | 1894.938 | 0.163 |

Table 9. Data sources and years included in the Base Model.

| Indices | Years |
|---|---|
| Triennial Shelf | 1980 1983 1986 19891992 1995 1998 2001 2004 |
| AFSC Slope | 1997 1999-2001 |
| NWFSC Slope | 2000-2010 |
| NWFSC Shelf | 2003-2010 |
| | |
| Discard | 1986, 2000-2009 |
| | |
| Length Comps | |
| Fishery landings | 1977-1978, 1981-2010 |
| Fishery discard | 1986, 2002-2010 |
| Triennial Shelf | 1980 1983 1986 19891992 1995 1998 2001 |
| AFSC Slope | 1997 1999-2001 |
| NWFSC Slope | 2000-2010 |
| NWFSC Shelf | 2003-2010 |
| | |
| Age Comps | |
| Triennial Shelf | 2004 |
| | |
| Age-at-length | |
| Fishery landings | 1991, 1998, 2003-2010 |
| Fishery discard | 2004 2005 |
| AFSC Slope | 2001 |
| NWFSC Slope | 2003-2010 |
| NWFSC Shelf | 2003-2010 |

Table 10. Parameters in the base model.

| Mortality and growth | | | |
|---|---|---|---|
| 1 | 0.07 | Fixed | Natural mortality (M) |
| 2 | 0 | Fixed | Old offset |
| 3 | 15.3973 | Estimated | Size at age 1.7 (in cm) |
| 4 | 42.624 | Estimated | Size at age 29 (females) |
| 5 | 0.19362 | Estimated | Von-Bertalanffy K (females) |
| 6 | 0.061925 | Estimated | cv of size at age (young) |
| 7 | -0.07136 | Estimated | cv of size at age offset (old) |
| 8 | 0 | Fixed | M offset Male |
| 9 | 0 | Fixed | M offset old male |
| 10 | 0 | Fixed | Male offset for size at age 1.7 |
| 11 | -0.09988 | Estimated | Male offset for size at age 29 |
| 12 | 0.201463 | Estimated | Male offset for K |
| 13 | 0 | Fixed | offsest for cv of young Male |
| 14 | 0 | Fixed | offset for cv of old Male |
| biology_parms | | | |
| 15 | 0.000021 | Fixed | scalar for weight at length |
| 16 | 2.96142 | Fixed | Exponent for weight at length |
| 17 | 34.59 | Fixed | size at 50% maturity |
| 18 | -0.6429 | Fixed | logistic parameter for maturity ogive |
| 19 | 0.1458 | Fixed | eggs/kg intercept |
| 20 | 1.325 | Fixed | Fec.slope |
| 21 | 2.10E-05 | Fixed | scalar for weight at length |
| 22 | 2.96142 | Fixed | Exponent for weight at length |
| #_size_sel: | Fishery | | Fishery selectivity |
| 1 | 34.1718 | Estimated | Peak |
| 2 | -2.95647 | Estimated | Width of peak |
| 3 | 3.2635 | Estimated | VarAscend |
| 4 | 0.426178 | Estimated | Var Descending |
| 5 | -2.20016 | Estimated | Initial |
| 6 | 9 | Fixed | Final |
| #_retention | Fishery | | |
| 7 | 25.0352 | Estimated | size at 50% selectivity through 1999 |
| 8 | 1.9115 | Estimated | logarithmic slope |
| 9 | 1 | Fixed | final |
| 10 | 0 | Fixed | intial |
| #_size_sel: | Triennial | | |
| 11 | 20.6399 | Estimated | Peak |
| 12 | -5.90521 | Estimated | Width of peak (Low Bound) |
| 13 | 2.00361 | Estimated | VarAscend |
| 14 | 4.3321 | Estimated | Var Descending |
| 15 | -0.63539 | Estimated | Initial |
| 16 | -27.7604 | Estimated | Final |

Table 10 continued. Parameters in the base model.

| | | | |
|---|---|---|---|
| #_size_sel: | AFSC sl | | |
| 17 | 23.6479 | Estimated | Peak |
| 18 | -1.03846 | Estimated | Width of peak |
| 19 | 2.59013 | Estimated | VarAscend |
| 20 | 2.13559 | Estimated | Var Descending |
| 21 | -5 | Fixed | Initial |
| 22 | -3.98952 | Estimated | Final |
| #_size_sel: | NWFSC sl | | |
| 23 | 24.5247 | Estimated | Peak |
| 24 | 1.30591 | Estimated | Width of peak |
| 25 | 3.06505 | Estimated | VarAscend |
| 26 | 4.02585 | Estimated | Var Descending |
| 27 | -5 | Fixed | Initial |
| 28 | 9 | Fixed | Final |
| #_size_sel: | NWFSC sh | | |
| 29 | 16.6574 | Estimated | Peak |
| 30 | -1.35117 | Estimated | Width of peak |
| 31 | -0.5 | Estimated | VarAscend |
| 32 | 3.08112 | Estimated | Var Descending |
| 33 | -1.24671 | Estimated | Initial |
| 34 | -5 | Fixed | Final |
| sel_parm_blockparms | | | |
| 35 | 26.4641 | Estimated | size at 50% selectivity 2000 - 2003 |
| 36 | 0.68589 | Estimated | final retention 2000 - 2003 |
| 37 | | | |
| 38 | 0.825291 | Estimated | final retention 2004 - 2005 |
| 39 | 0.520278 | Estimated | final retention 2006 - 2008 |

Table 11. Growth parameters estimated in the model. All length units are in centimeters.

| Update model year | 2009 | 2011 |
|---|---|---|
| Female length at age 1.7 | 14.8 | 15.4 |
| Female length at age 29 | 42.73 | 42.6 |
| Female VBK | 0.2 | 0.19 |
| Female CV of length at age, at age 1.7 | 0.066 | 0.063 |
| Female CV of length at age, exponential offset (old) | -0.179 | -0.071 |
| Male offset at age 1.7 | 0 | 0 |
| Male offset at age 29 | -0.098 | -0.099 |
| Male offset for K | 0.187 | 0.201 |
| Male offsest for CV at age 1.7 | 0 | 0 |
| Male CV of length at age, exponential offset (old) | 0 | 0 |

Table 12. Time series of total and summary biomass, spawning output, depletion, recruitment and F.

| Year | Total Biom. | Sum. Biom. | Sp. Out. | Depletion | Recruit | F |
|---|---|---|---|---|---|---|
| 1928 | 34,013 | 33,996 | 29,652 | 100.0% | 3,151 | 0.05% |
| 1929 | 33,995 | 33,978 | 29,635 | 99.9% | 3,151 | 0.06% |
| 1930 | 33,977 | 33,960 | 29,617 | 99.9% | 3,151 | 0.06% |
| 1931 | 33,957 | 33,940 | 29,597 | 99.8% | 3,150 | 0.08% |
| 1932 | 33,933 | 33,916 | 29,573 | 99.7% | 3,150 | 0.05% |
| 1933 | 33,921 | 33,904 | 29,559 | 99.7% | 3,150 | 0.05% |
| 1934 | 33,908 | 33,891 | 29,546 | 99.6% | 3,150 | 0.04% |
| 1935 | 33,898 | 33,881 | 29,534 | 99.6% | 3,149 | 0.05% |
| 1936 | 33,886 | 33,869 | 29,521 | 99.6% | 3,149 | 0.03% |
| 1937 | 33,880 | 33,863 | 29,514 | 99.5% | 3,149 | 0.04% |
| 1938 | 33,873 | 33,856 | 29,505 | 99.5% | 3,149 | 0.05% |
| 1939 | 33,863 | 33,846 | 29,495 | 99.5% | 3,149 | 0.07% |
| 1940 | 33,846 | 33,829 | 29,478 | 99.4% | 3,148 | 0.10% |
| 1941 | 33,822 | 33,805 | 29,453 | 99.3% | 3,148 | 0.12% |
| 1942 | 33,789 | 33,772 | 29,420 | 99.2% | 3,147 | 0.14% |
| 1943 | 33,752 | 33,735 | 29,382 | 99.1% | 3,147 | 0.55% |
| 1944 | 33,583 | 33,566 | 29,217 | 98.5% | 3,144 | 1.19% |
| 1945 | 33,210 | 33,194 | 28,855 | 97.3% | 3,137 | 2.05% |
| 1946 | 32,577 | 32,560 | 28,234 | 95.2% | 3,125 | 1.24% |
| 1947 | 32,238 | 32,221 | 27,880 | 94.0% | 3,118 | 1.03% |
| 1948 | 31,982 | 31,965 | 27,602 | 93.1% | 3,113 | 0.60% |
| 1949 | 31,876 | 31,859 | 27,465 | 92.6% | 3,110 | 0.50% |
| 1950 | 31,811 | 31,794 | 27,372 | 92.3% | 3,108 | 0.56% |
| 1951 | 31,733 | 31,716 | 27,272 | 92.0% | 3,106 | 0.65% |
| 1952 | 31,631 | 31,614 | 27,155 | 91.6% | 3,104 | 0.69% |
| 1953 | 31,523 | 31,506 | 27,035 | 91.2% | 3,101 | 0.59% |
| 1954 | 31,450 | 31,433 | 26,951 | 90.9% | 3,100 | 0.70% |
| 1955 | 31,349 | 31,333 | 26,842 | 90.5% | 3,097 | 0.83% |
| 1956 | 31,214 | 31,197 | 26,702 | 90.0% | 3,094 | 1.11% |
| 1957 | 30,997 | 30,980 | 26,484 | 89.3% | 3,090 | 1.30% |
| 1958 | 30,735 | 30,718 | 26,220 | 88.4% | 3,084 | 1.12% |
| 1959 | 30,541 | 30,524 | 26,018 | 87.7% | 3,080 | 0.95% |
| 1960 | 30,409 | 30,392 | 25,872 | 87.2% | 3,077 | 1.15% |
| 1961 | 30,222 | 30,205 | 25,676 | 86.6% | 3,072 | 1.09% |
| 1962 | 30,065 | 30,049 | 25,508 | 86.0% | 3,068 | 1.17% |
| 1963 | 29,891 | 29,875 | 25,324 | 85.4% | 3,064 | 1.25% |
| 1964 | 29,705 | 29,689 | 25,130 | 84.7% | 3,060 | 0.91% |
| 1965 | 29,627 | 29,611 | 25,036 | 84.4% | 3,057 | 1.65% |
| 1966 | 29,339 | 29,323 | 24,748 | 83.5% | 3,051 | 14.53% |
| 1967 | 25,367 | 25,351 | 21,007 | 70.8% | 2,949 | 12.27% |
| 1968 | 22,646 | 22,631 | 18,361 | 61.9% | 2,858 | 10.84% |
| 1969 | 20,667 | 20,651 | 16,369 | 55.2% | 2,776 | 1.51% |
| 1970 | 20,859 | 20,844 | 16,342 | 55.1% | 2,775 | 1.83% |
| 1971 | 20,996 | 20,981 | 16,313 | 55.0% | 2,773 | 2.66% |
| 1972 | 20,964 | 20,949 | 16,186 | 54.6% | 2,768 | 3.07% |
| 1973 | 20,851 | 20,836 | 16,030 | 54.1% | 2,760 | 4.11% |
| 1974 | 20,530 | 20,515 | 15,722 | 53.0% | 2,746 | 3.79% |
| 1975 | 20,288 | 20,276 | 15,497 | 52.3% | 2,210 | 2.85% |
| 1976 | 20,237 | 20,222 | 15,451 | 52.1% | 2,778 | 3.24% |
| 1977 | 20,083 | 20,078 | 15,342 | 51.7% | 1,027 | 1.49% |
| 1978 | 20,238 | 20,230 | 15,543 | 52.4% | 1,397 | 2.12% |

Table 12 continued. Time series of total and summary biomass, spawning output, depletion, recruitment and F.

| Year | Total Biom. | Sum. Biom. | Sp. Out. | Depletion | Recruit | F |
|---|---|---|---|---|---|---|
| 1979 | 20,192 | 20,168 | 15,638 | 52.7% | 4,464 | 3.69% |
| 1980 | 19,805 | 19,776 | 15,458 | 52.1% | 5,345 | 3.04% |
| 1981 | 19,642 | 19,621 | 15,384 | 51.9% | 3,788 | 4.49% |
| 1982 | 19,344 | 19,337 | 15,039 | 50.7% | 1,243 | 5.96% |
| 1983 | 18,871 | 18,867 | 14,398 | 48.6% | 873 | 6.00% |
| 1984 | 18,408 | 18,403 | 13,703 | 46.2% | 869 | 7.25% |
| 1985 | 17,652 | 17,646 | 12,840 | 43.3% | 977 | 10.33% |
| 1986 | 16,288 | 16,283 | 11,717 | 39.5% | 937 | 7.86% |
| 1987 | 15,335 | 15,322 | 11,217 | 37.8% | 2,423 | 15.95% |
| 1988 | 13,154 | 13,137 | 9,831 | 33.2% | 3,063 | 12.72% |
| 1989 | 11,744 | 11,743 | 8,951 | 30.2% | 187 | 10.97% |
| 1990 | 10,754 | 10,750 | 8,228 | 27.7% | 669 | 15.56% |
| 1991 | 9,389 | 9,385 | 7,039 | 23.7% | 726 | 13.04% |
| 1992 | 8,452 | 8,448 | 6,157 | 20.8% | 682 | 8.25% |
| 1993 | 8,001 | 8,000 | 5,737 | 19.3% | 310 | 15.12% |
| 1994 | 7,001 | 6,996 | 4,978 | 16.8% | 889 | 12.53% |
| 1995 | 6,299 | 6,283 | 4,539 | 15.3% | 2,812 | 12.65% |
| 1996 | 5,690 | 5,685 | 4,140 | 14.0% | 950 | 13.33% |
| 1997 | 5,188 | 5,179 | 3,714 | 12.5% | 1,583 | 16.10% |
| 1998 | 4,676 | 4,673 | 3,174 | 10.7% | 499 | 20.34% |
| 1999 | 4,112 | 4,091 | 2,505 | 8.4% | 3,743 | 9.11% |
| 2000 | 4,200 | 4,180 | 2,313 | 7.8% | 3,818 | 9.51% |
| 2001 | 4,396 | 4,391 | 2,171 | 7.3% | 819 | 6.14% |
| 2002 | 4,837 | 4,835 | 2,208 | 7.4% | 446 | 5.41% |
| 2003 | 5,317 | 5,311 | 2,316 | 7.8% | 1,093 | 3.73% |
| 2004 | 5,820 | 5,812 | 2,505 | 8.4% | 1,577 | 4.14% |
| 2005 | 6,228 | 6,218 | 2,737 | 9.2% | 1,971 | 1.97% |
| 2006 | 6,714 | 6,706 | 3,166 | 10.7% | 1,618 | 3.19% |
| 2007 | 7,089 | 7,078 | 3,654 | 12.3% | 1,912 | 4.03% |
| 2008 | 7,390 | 7,369 | 4,094 | 13.8% | 3,999 | 3.13% |
| 2009 | 7,778 | 7,774 | 4,488 | 15.1% | 736 | 3.58% |
| 2010 | 8,174 | 8,165 | 4,771 | 16.1% | 1,686 | 3.77% |
| 2011 | 8,550 | 8,540 | 4,995 | 16.8% | 1,729 | NA |

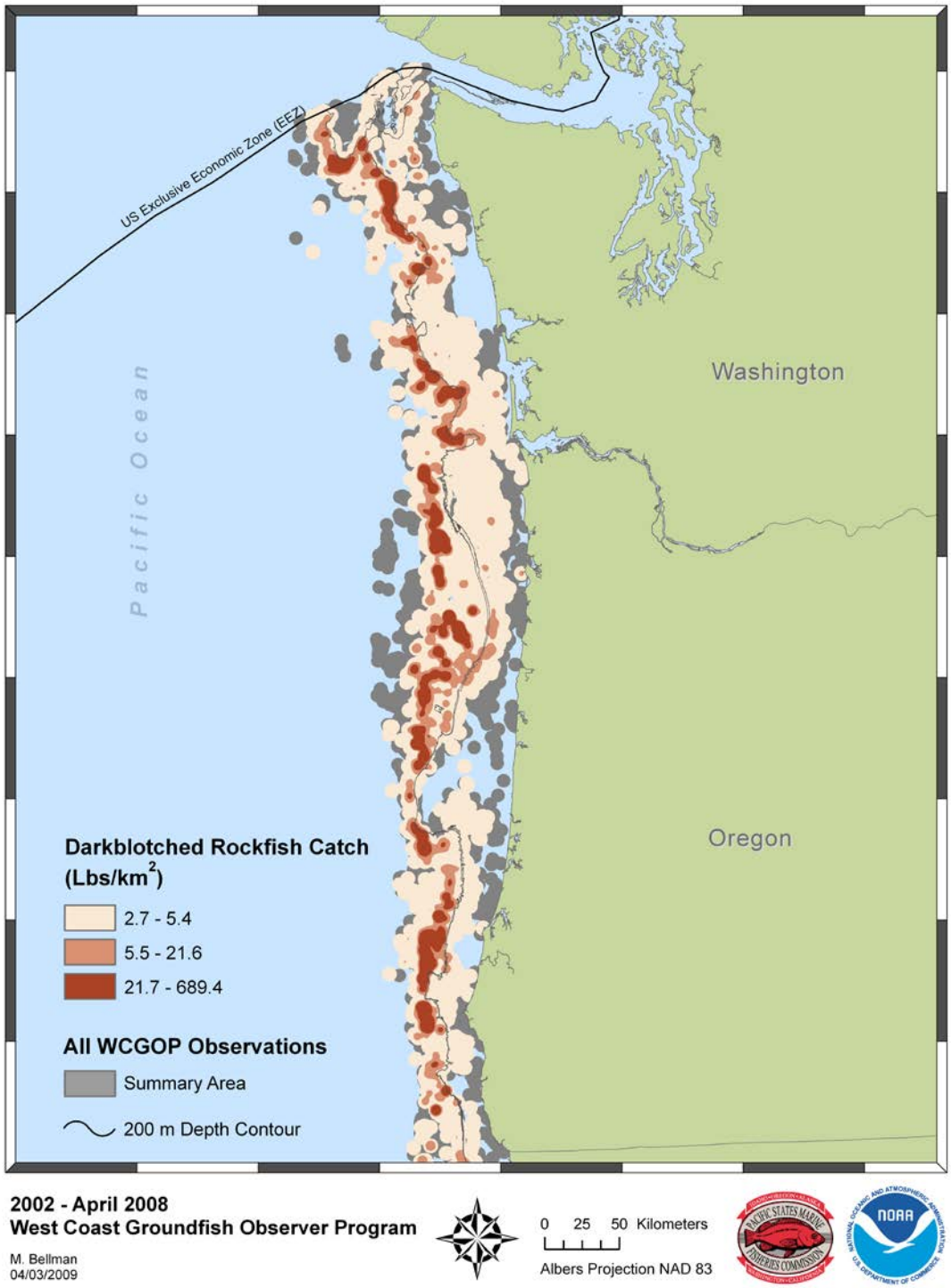



Figure 1. Map of density of occurrence of darkblotched rockfish off of (A) Washington and Oregon and (B) Northern and Central California (next page) from 2002 – April 2008.

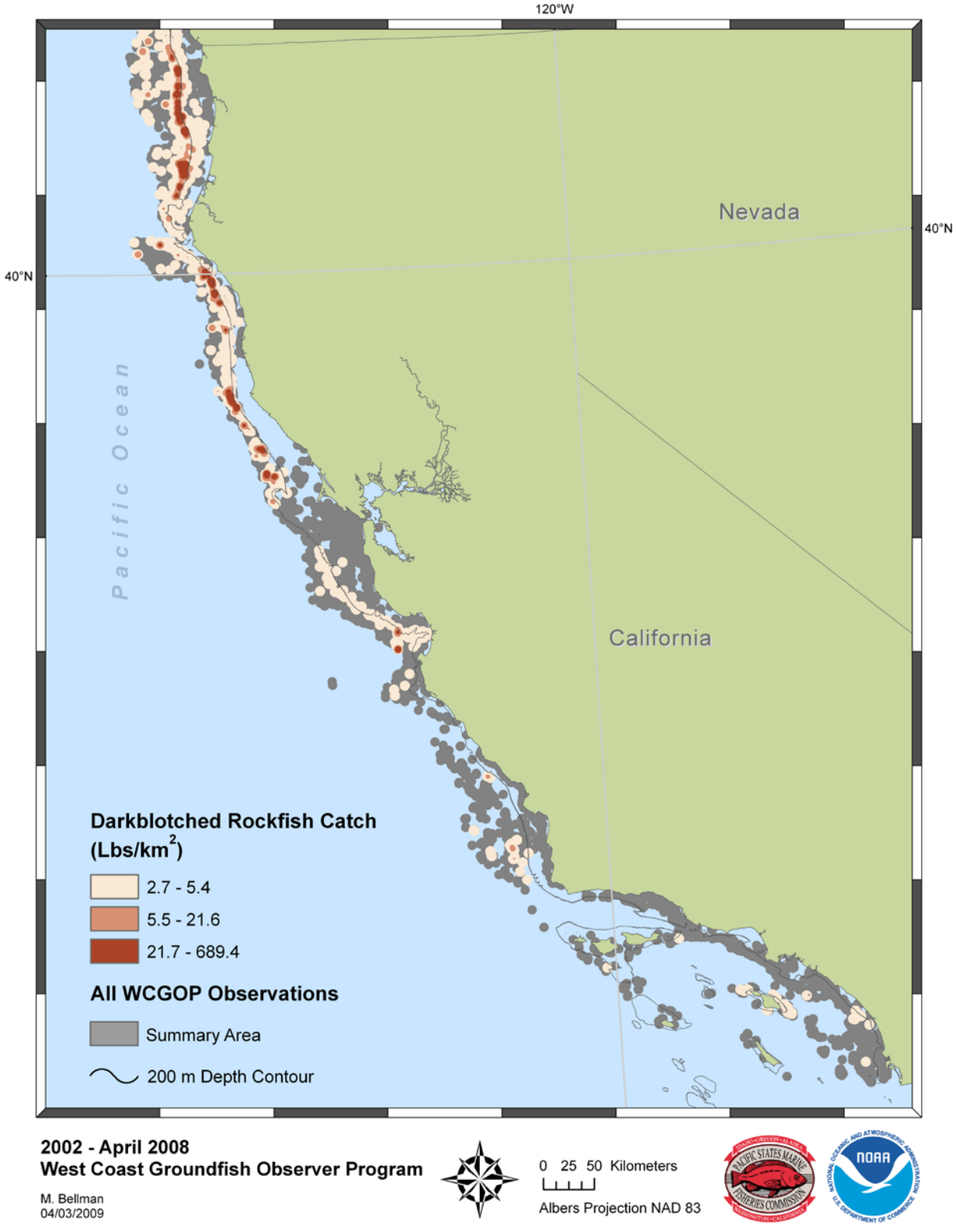



Figure 1 (cont.)

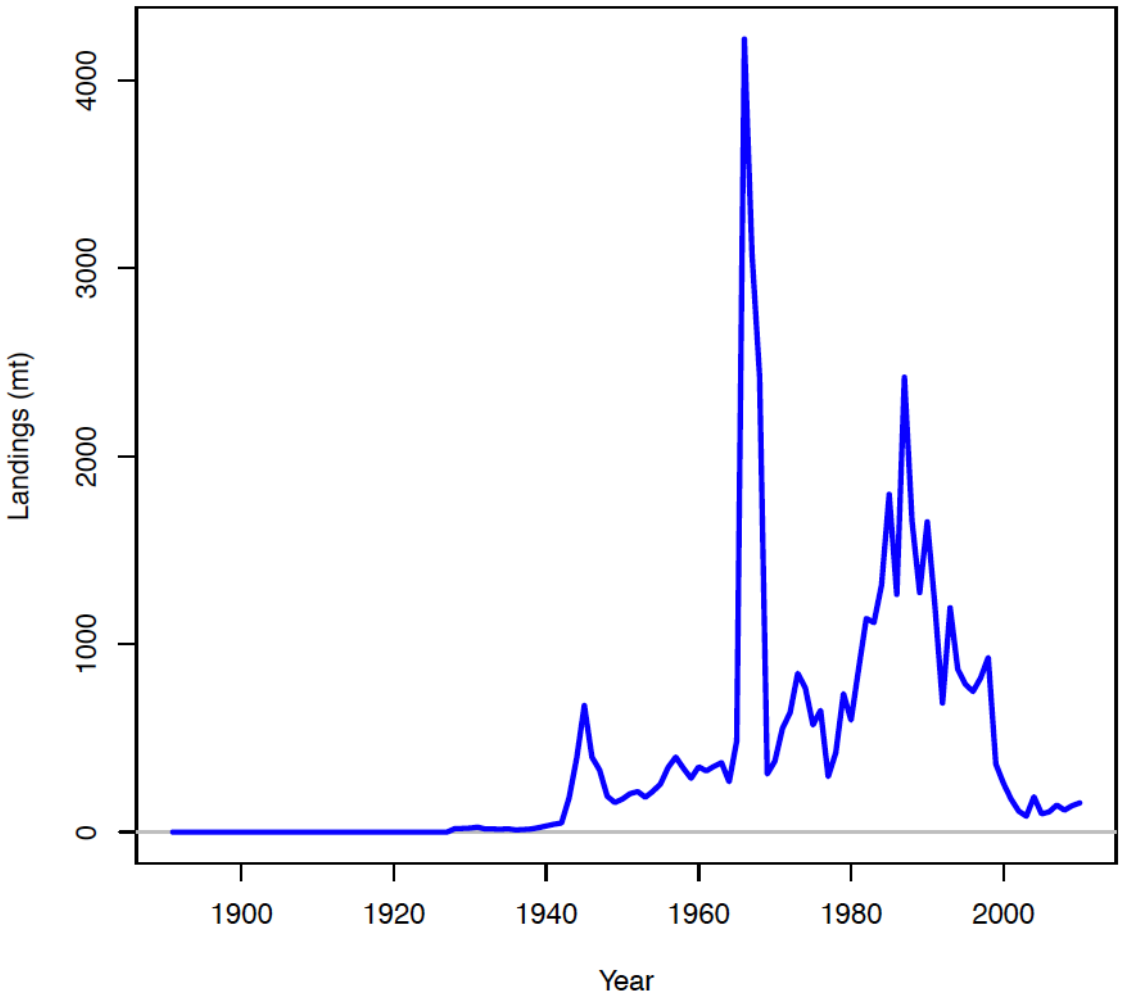



Figure 2. Time series of estimated fishery landings.

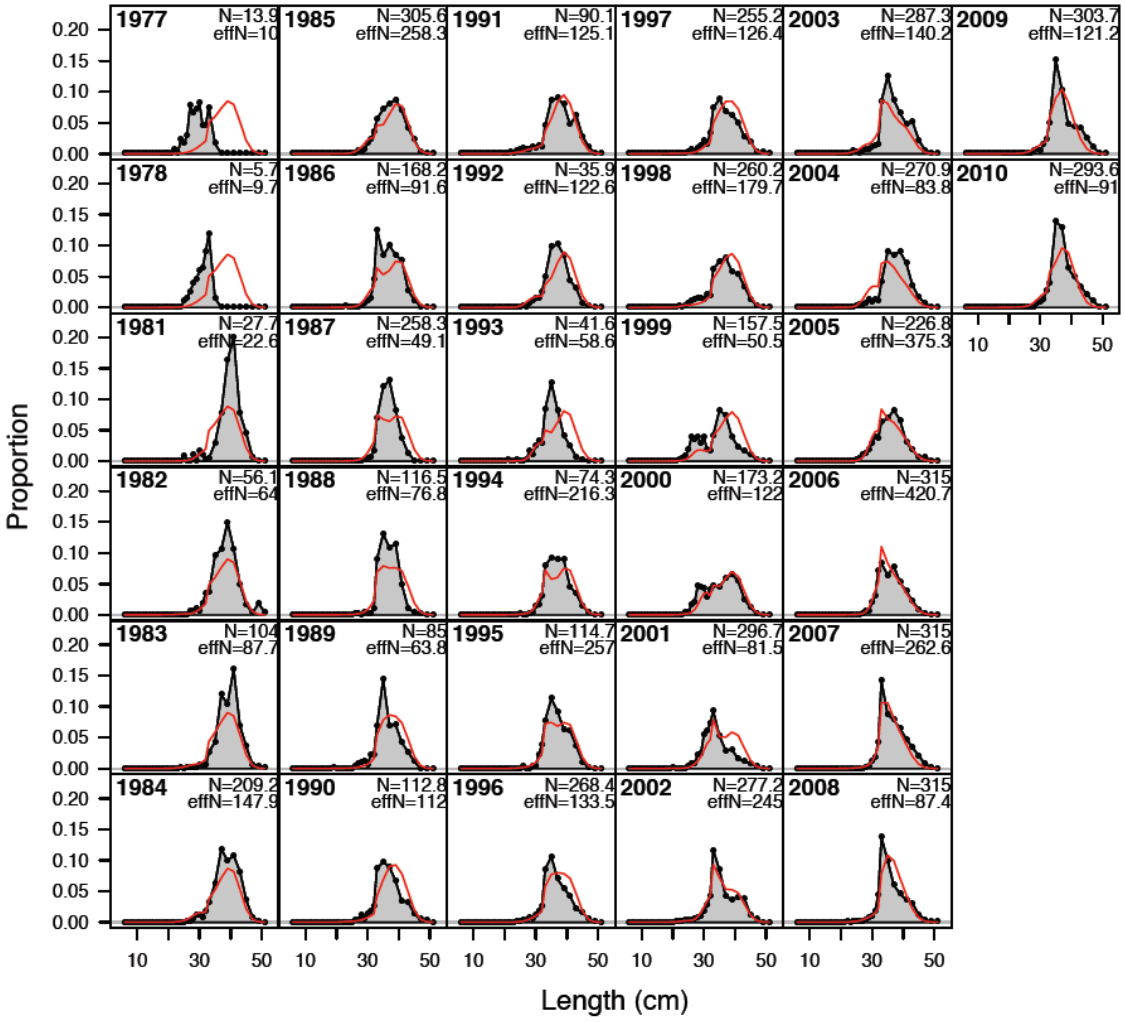



Figure 3. Female fishery length compositions and model fits.

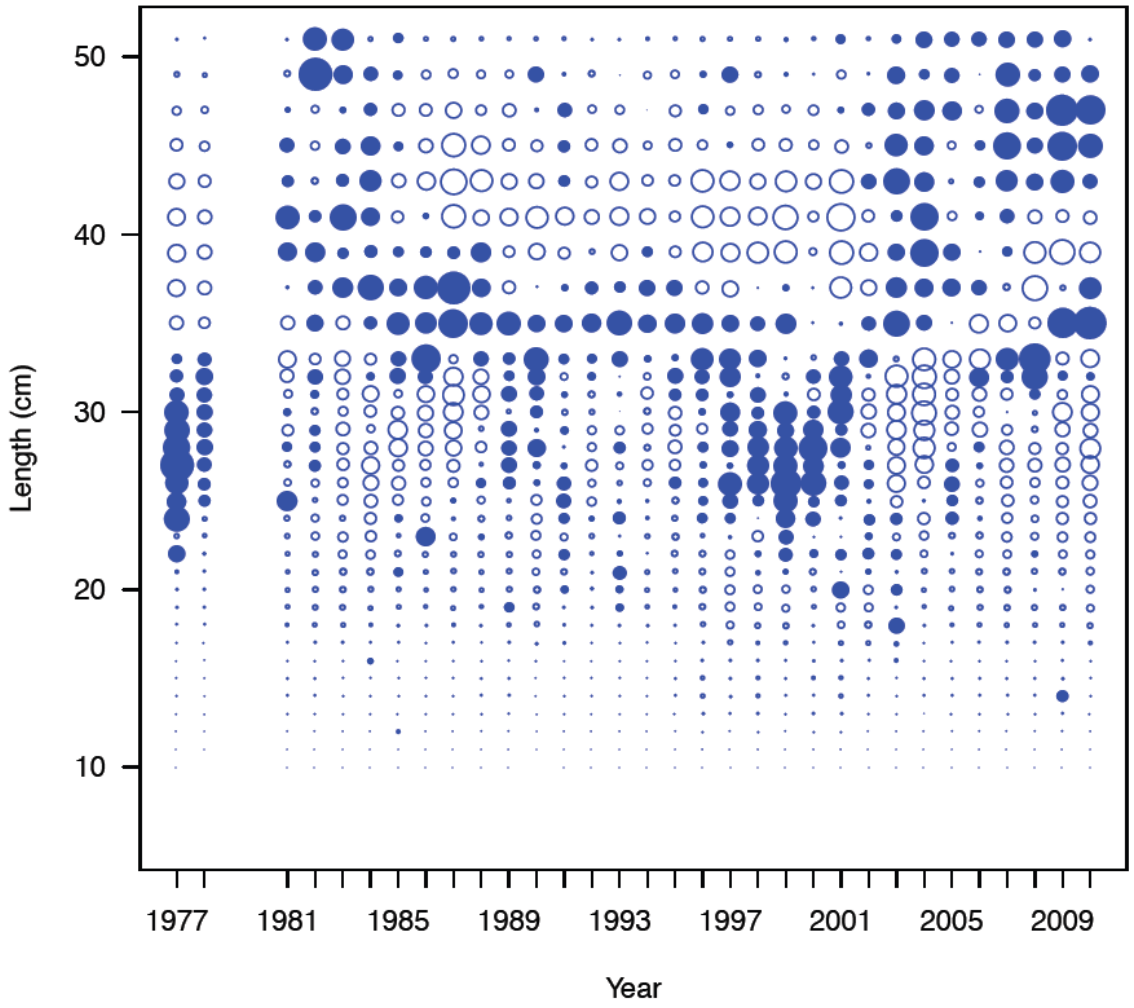



Figure 4. Pearson residuals for female length-composition fits to fishery data.

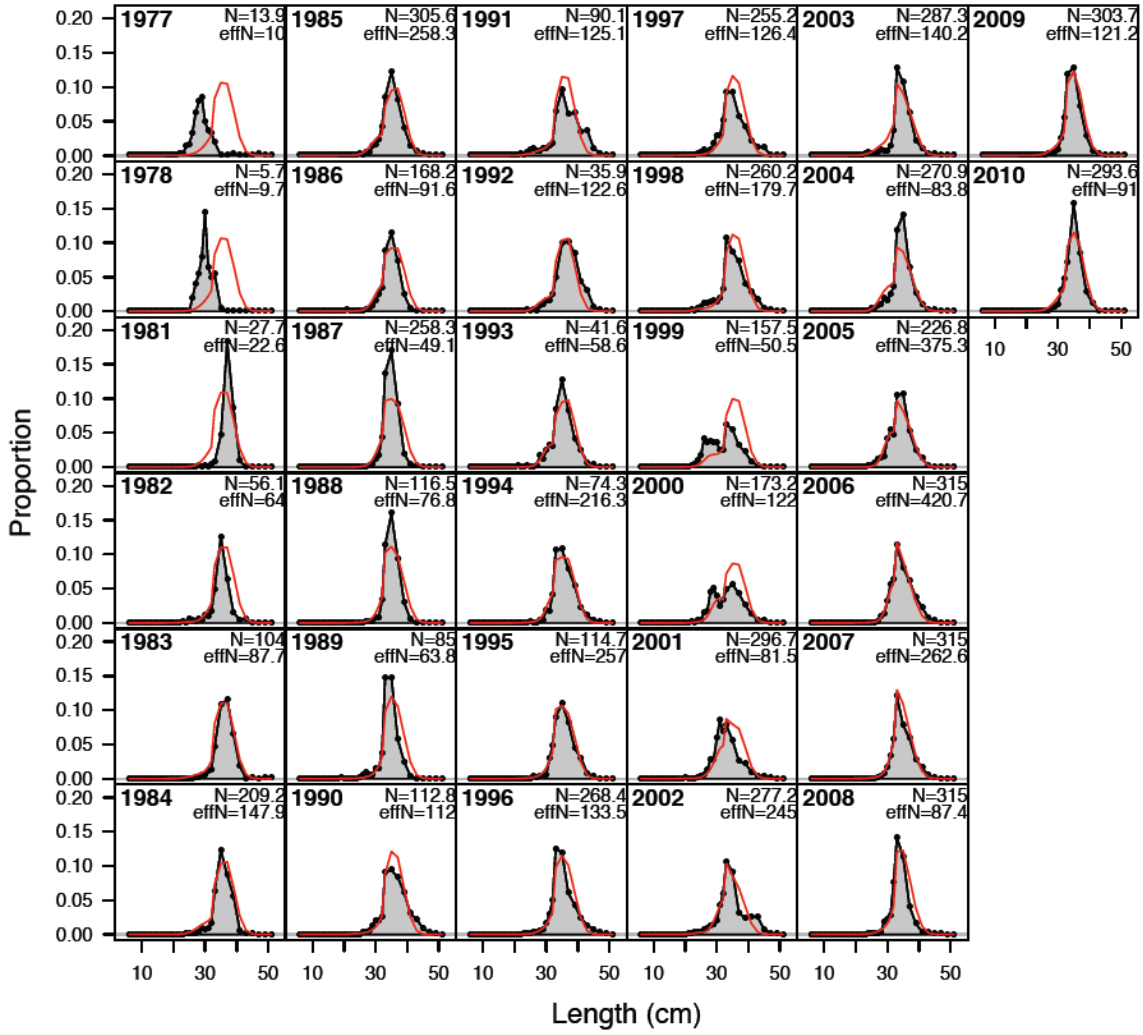



Figure 5. Male fishery lengths compositions and model fits

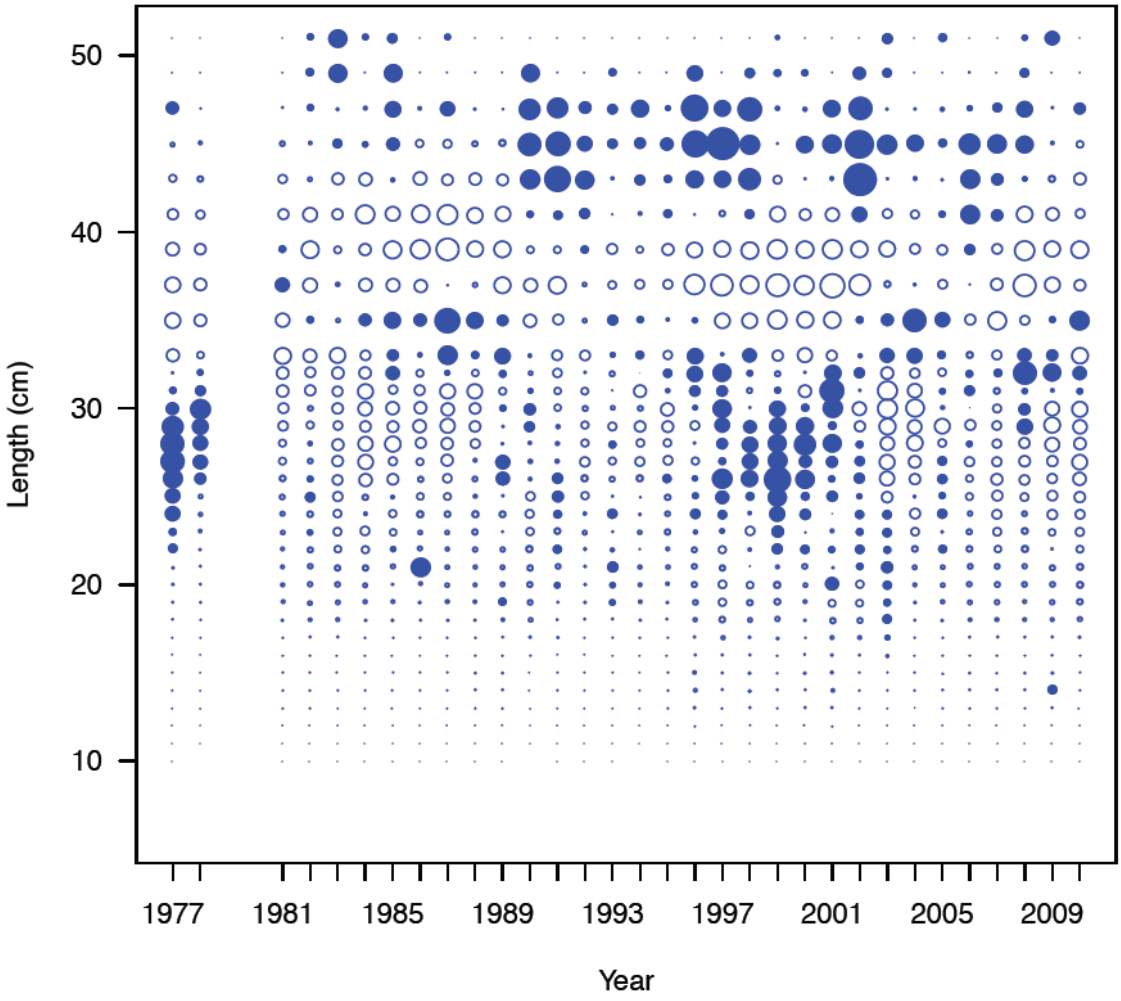



Figure 6. Pearson residuals for male length-composition fits to fishery data.

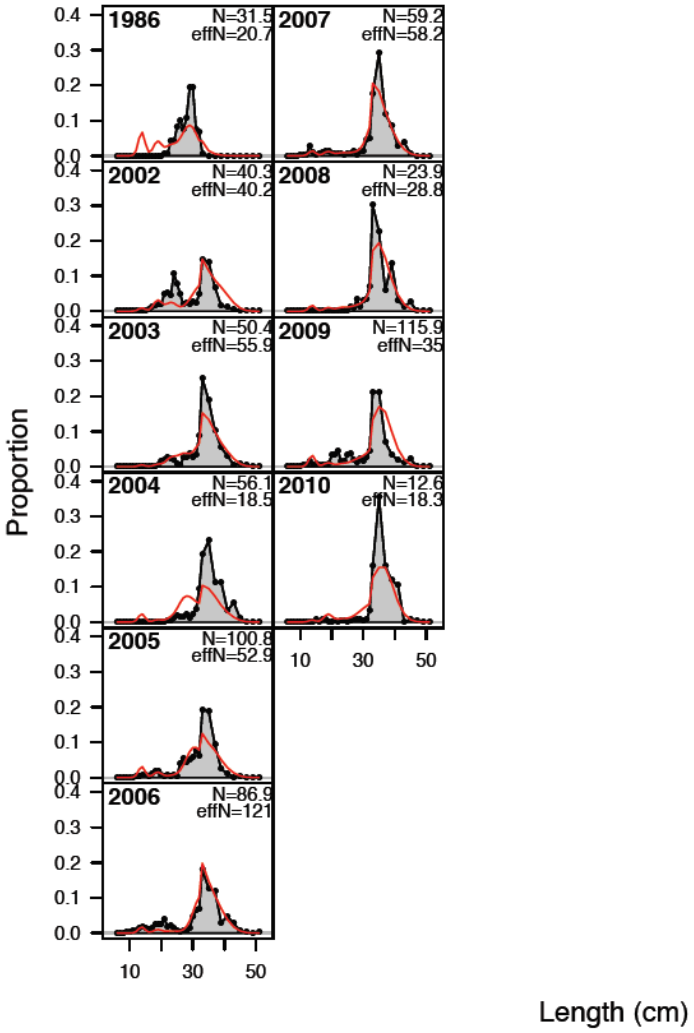



Figure 7. Combined-sex fishery discard length compositions and model fits.

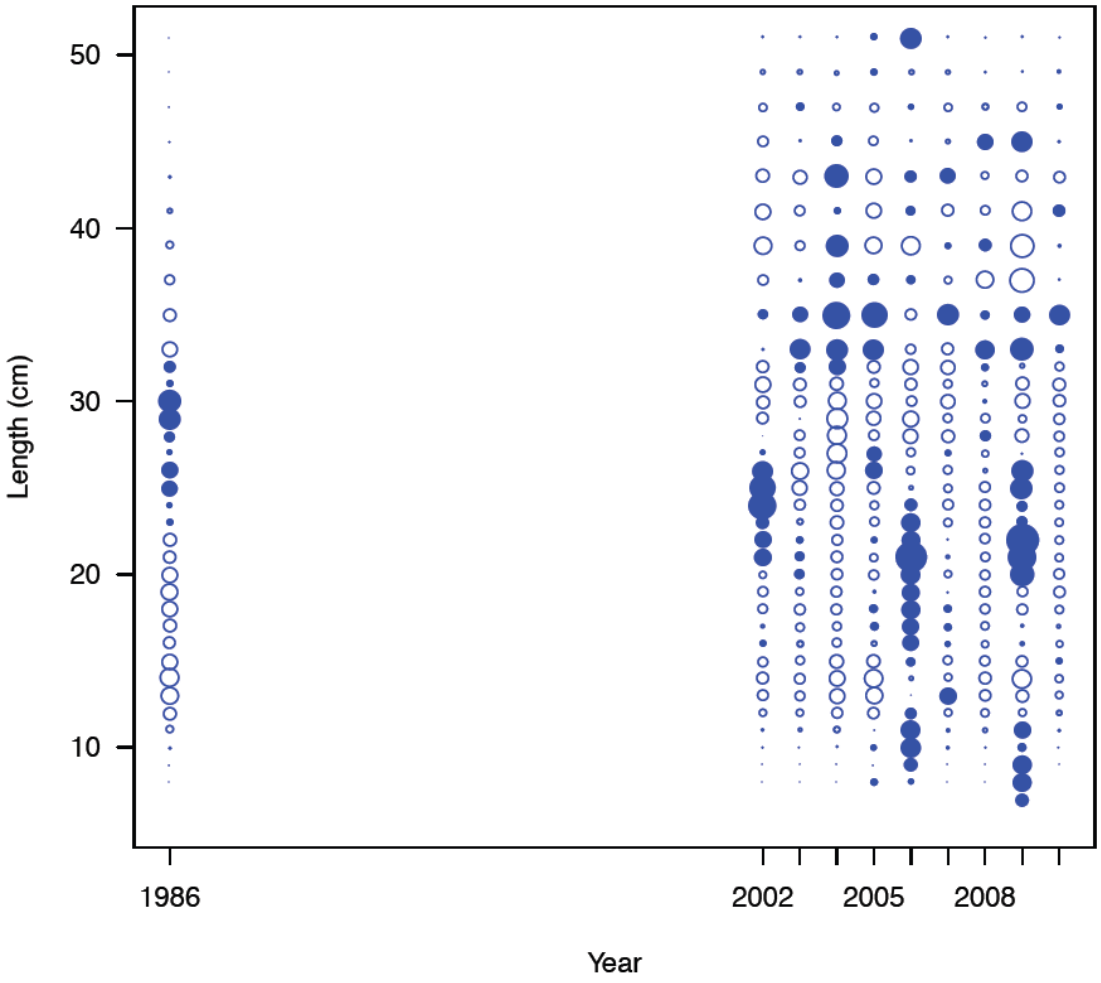



Figure 8. Pearson residuals for length-composition fits to fishery discard data.

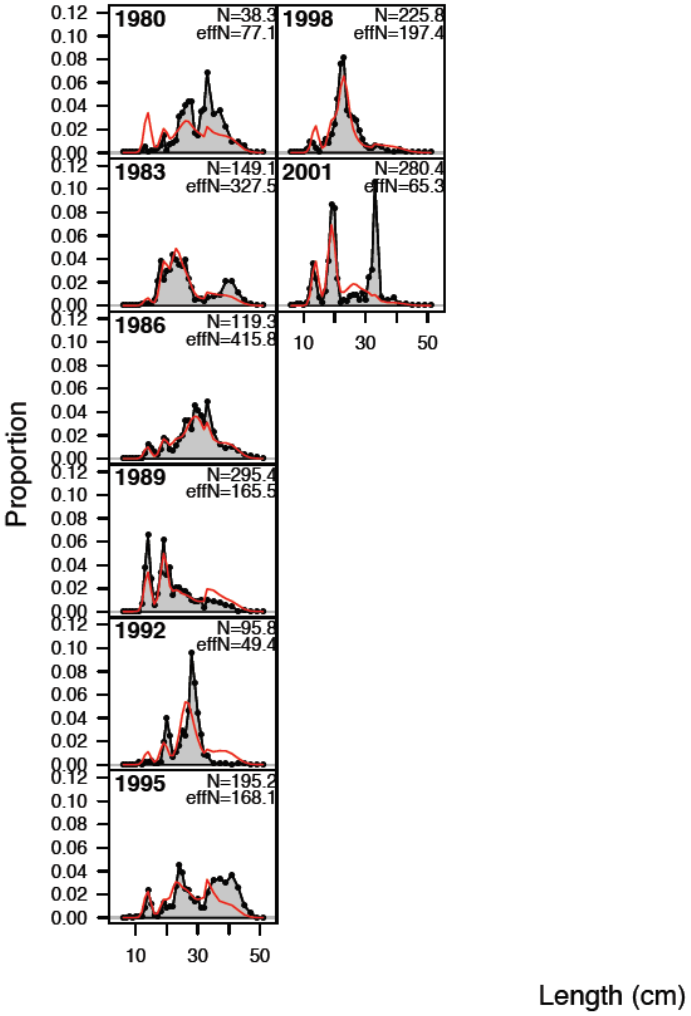



Figure 9. Triennial Shelf Survey female length compositions and model fits.

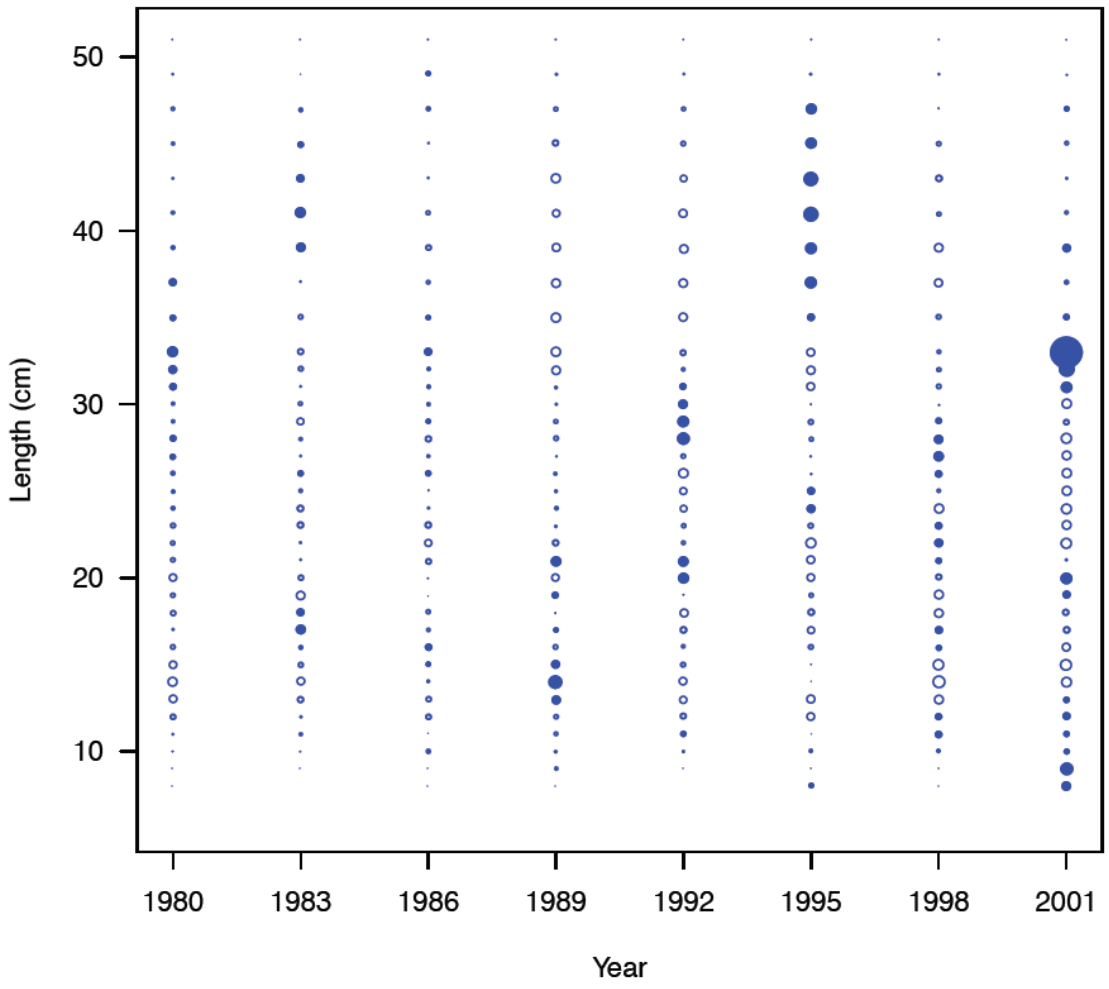



Figure 10. Pearson residuals for female length-composition fits to Triennial Survey data.

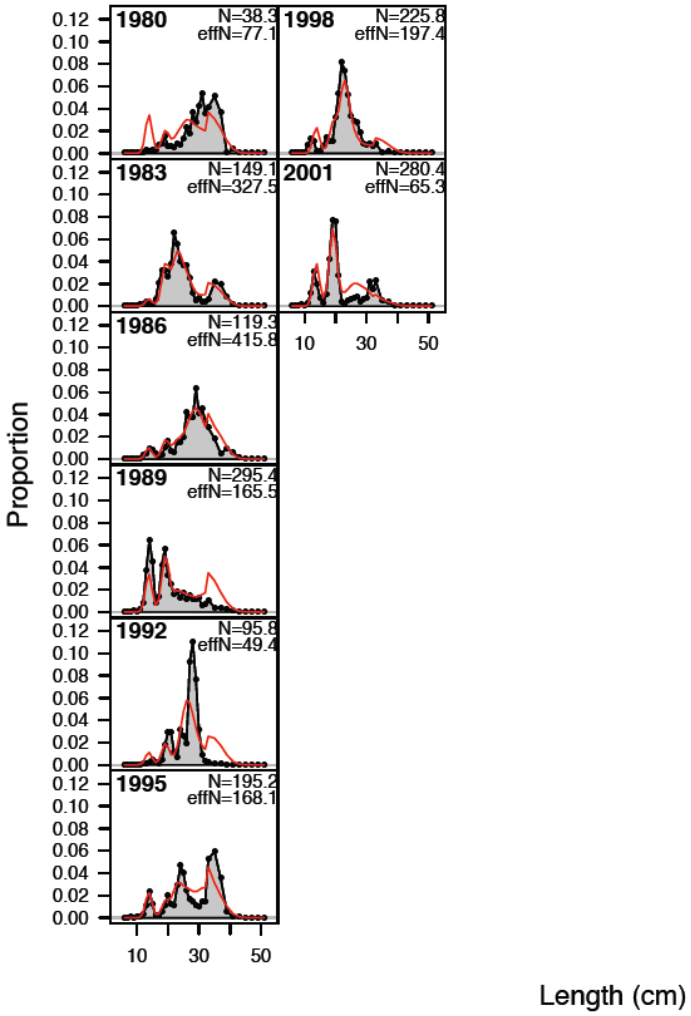



Figure 11. Triennial Shelf Survey male length compositions and model fits

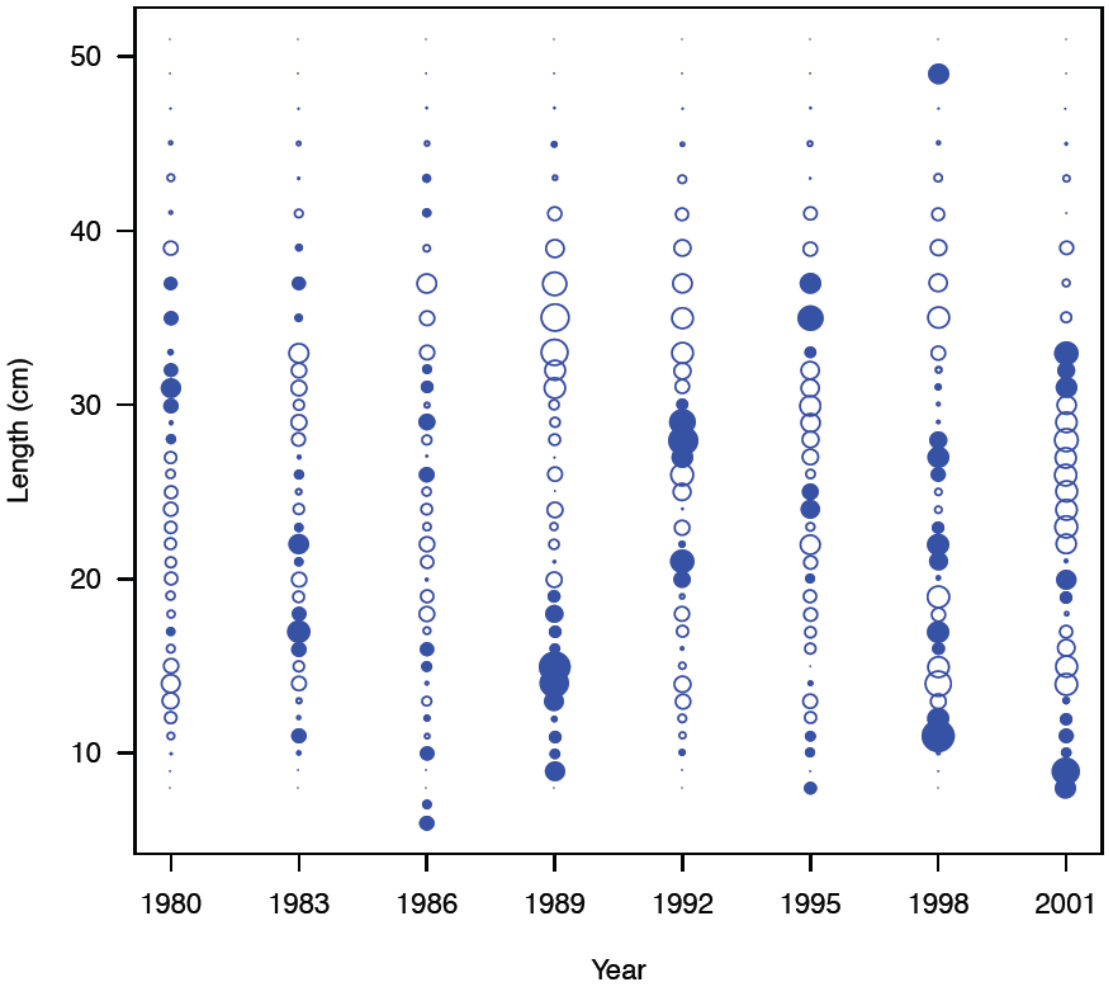



Figure 12. Pearson residuals for male length-composition fits to Triennial Survey data.

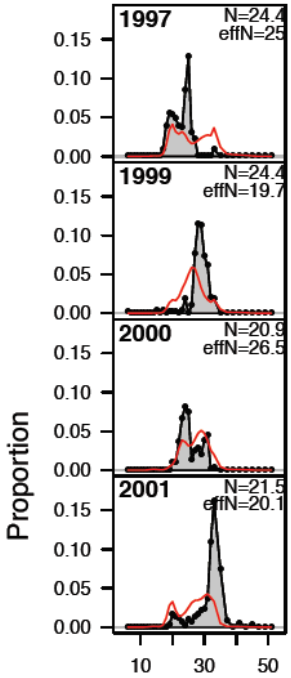



Figure 13. AFSC Slope Survey female length compositions and model fits

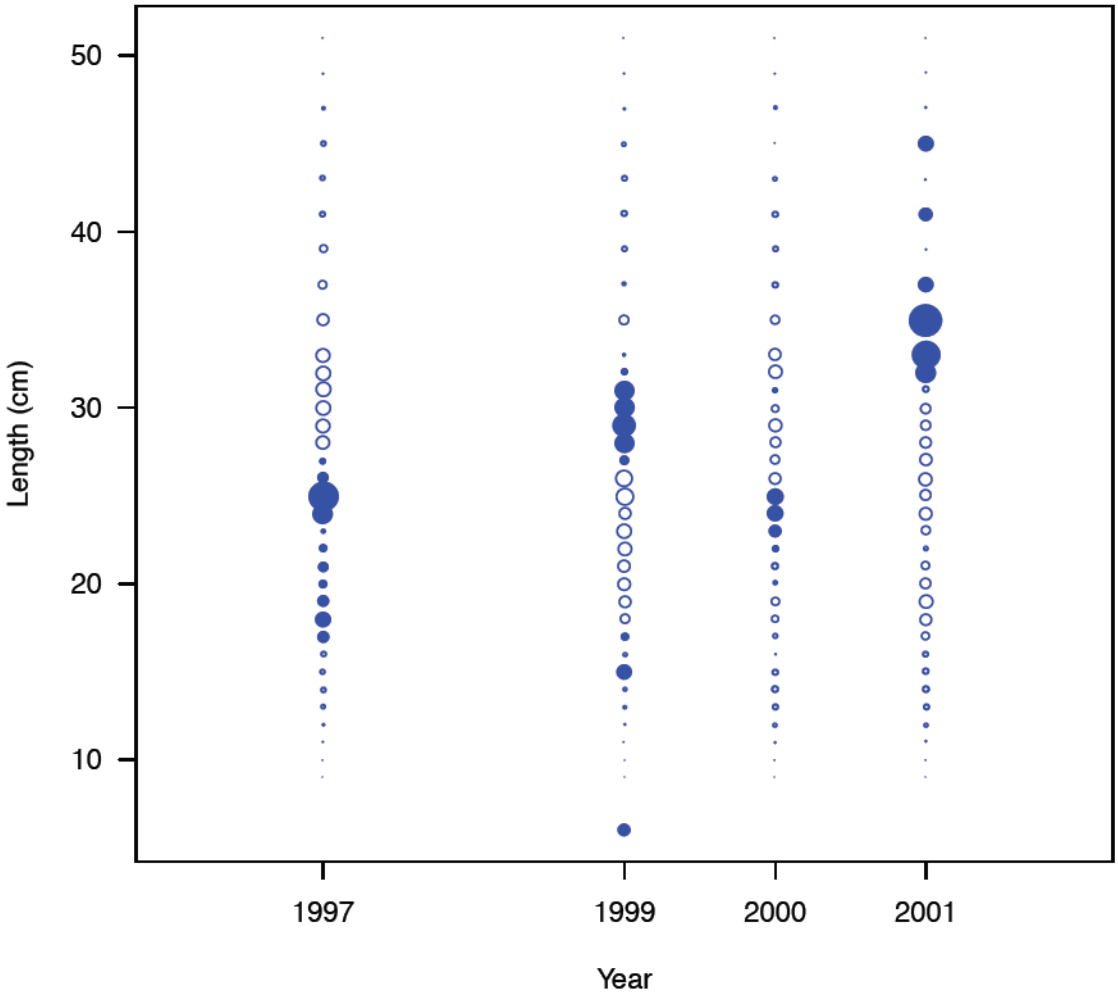



Figure 14. Pearson residuals for female length-composition fits to AFSC Slope Survey data.

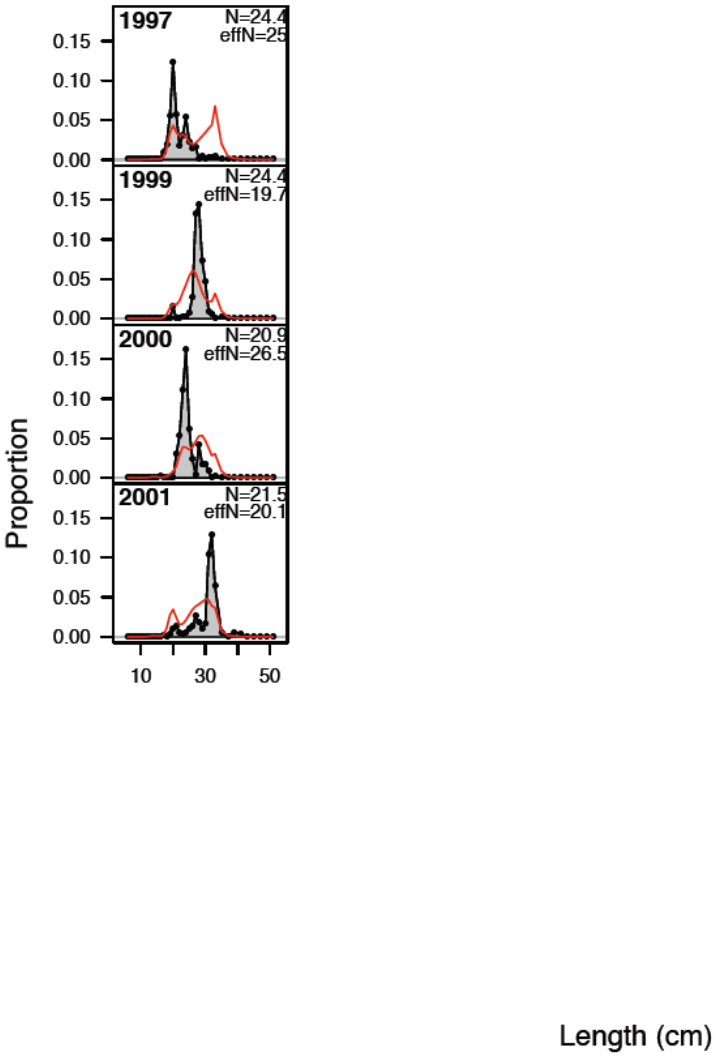



Figure 15. AFSC Slope Survey male length compositions and model fits

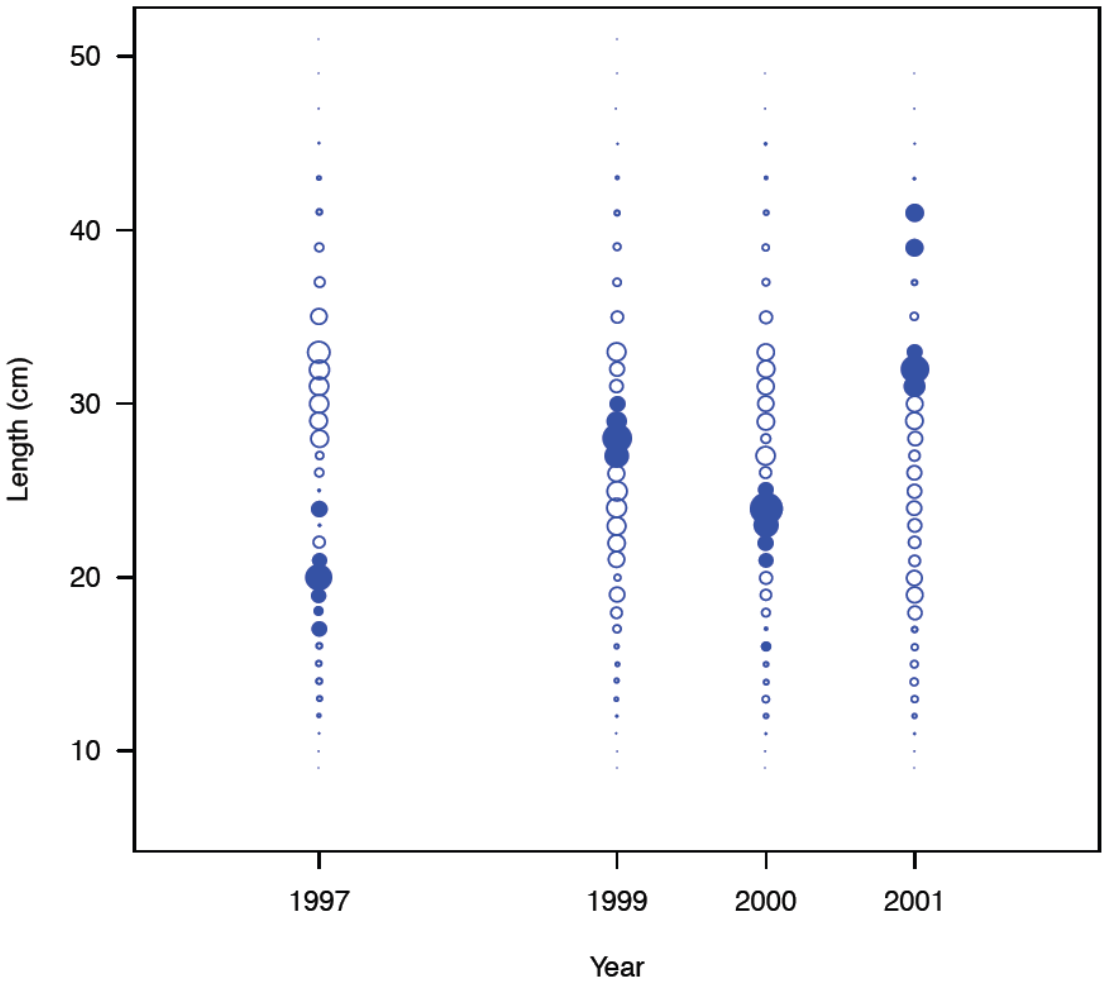



Figure 16. Pearson residuals for male length-composition fits to AFSC Slope Survey data.

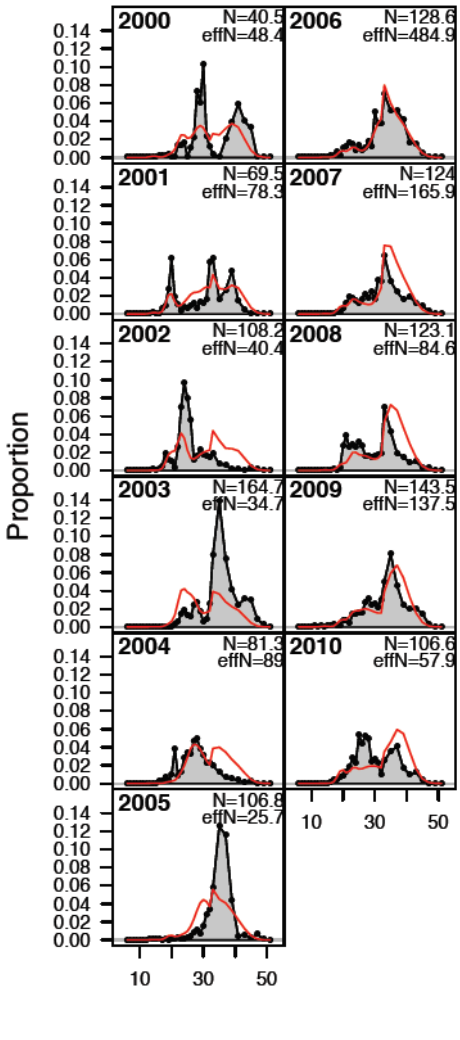



Figure 17. NWFSC Slope Survey female length compositions and model fits

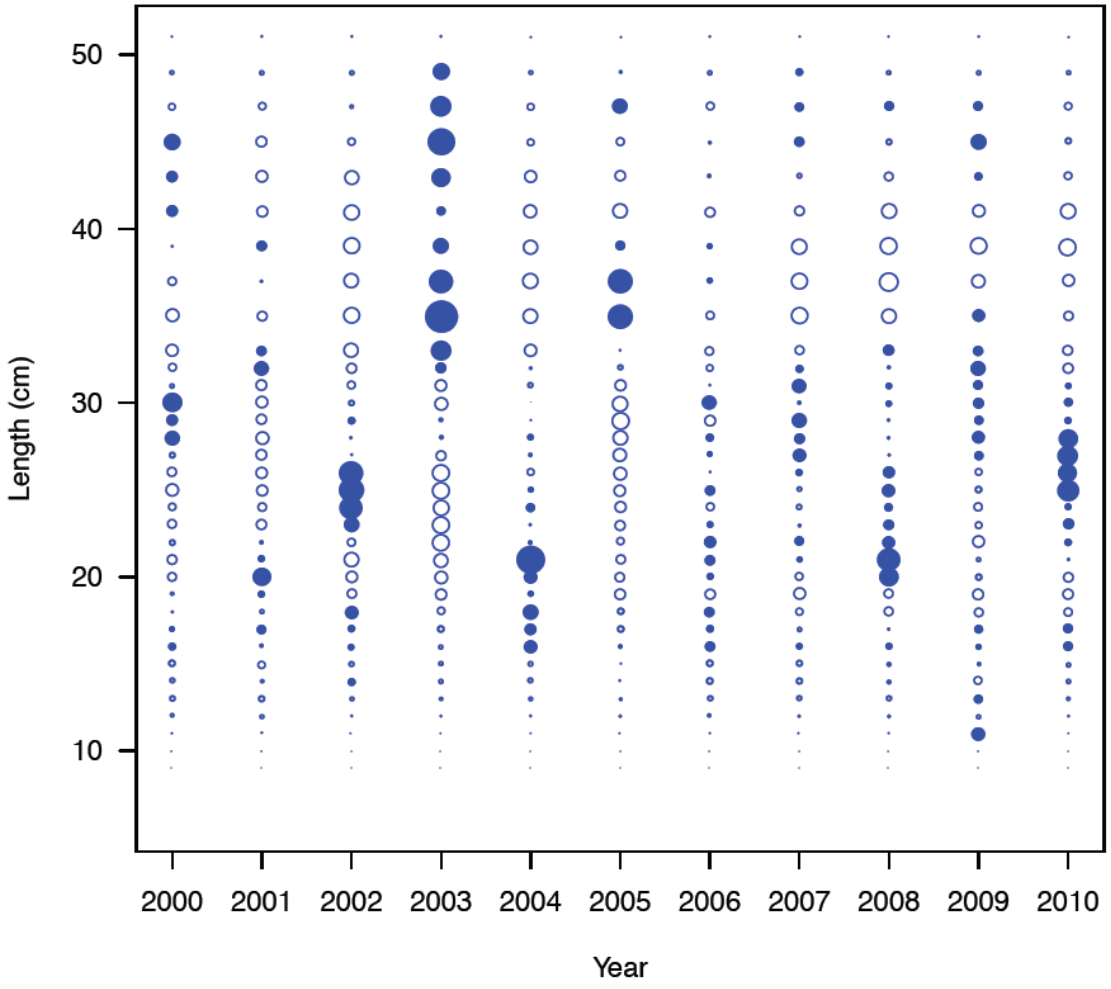



Figure 18. Pearson residuals for female length-composition fits to NWFSC Slope Survey data.

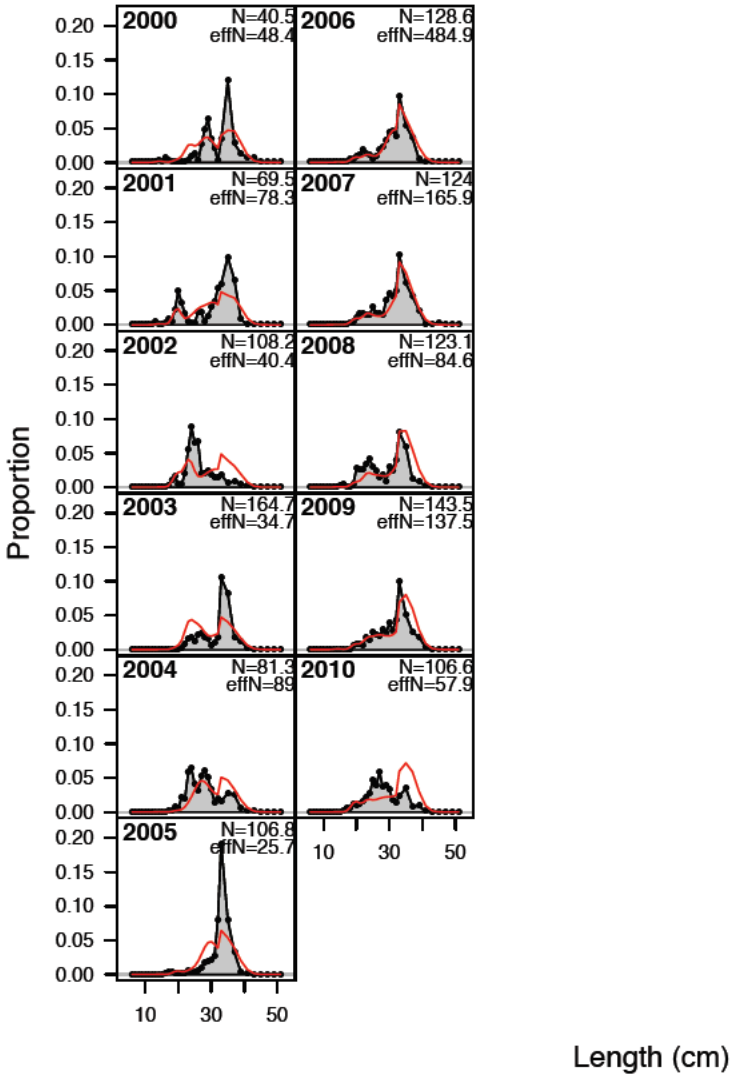



Figure 19. NWFSC Slope Survey male length compositions and model fits

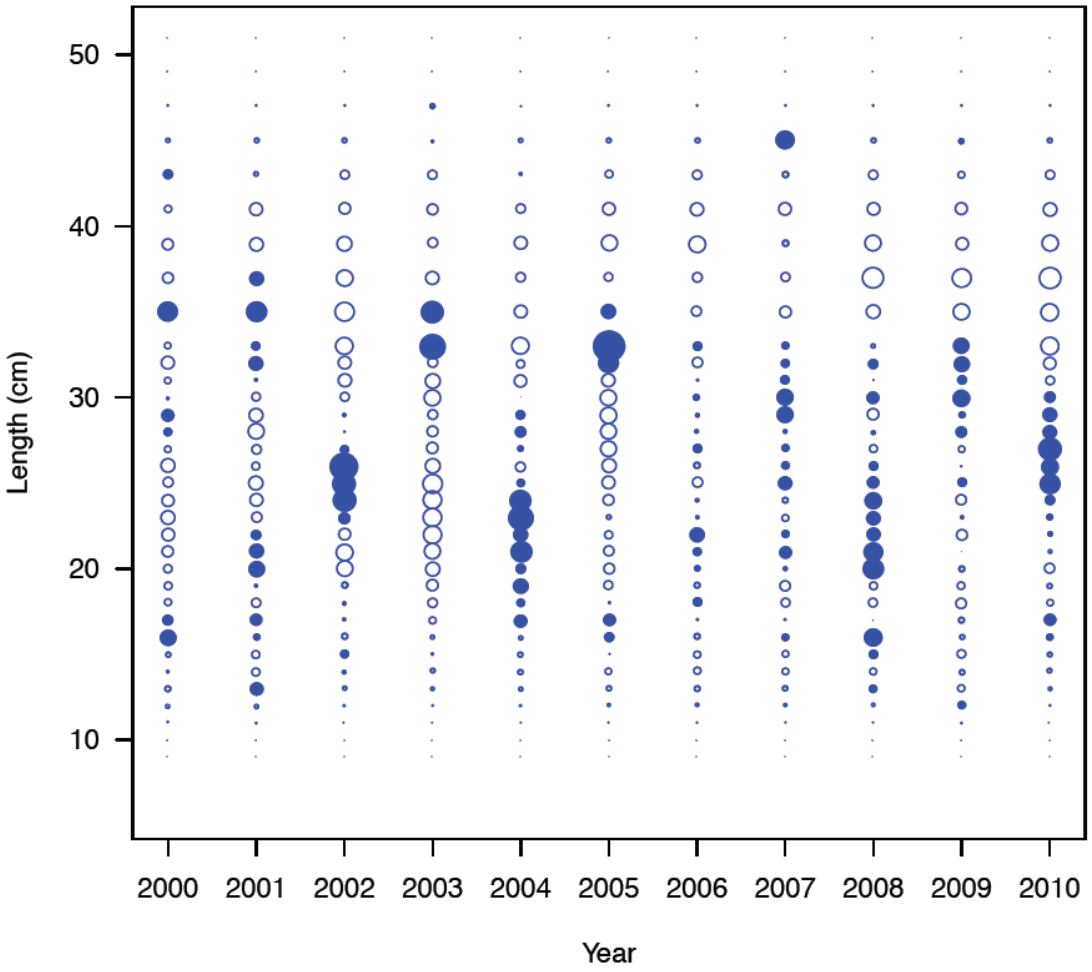



Figure 20. Pearson residuals for male length-composition fits to NWFSC Slope Survey data.

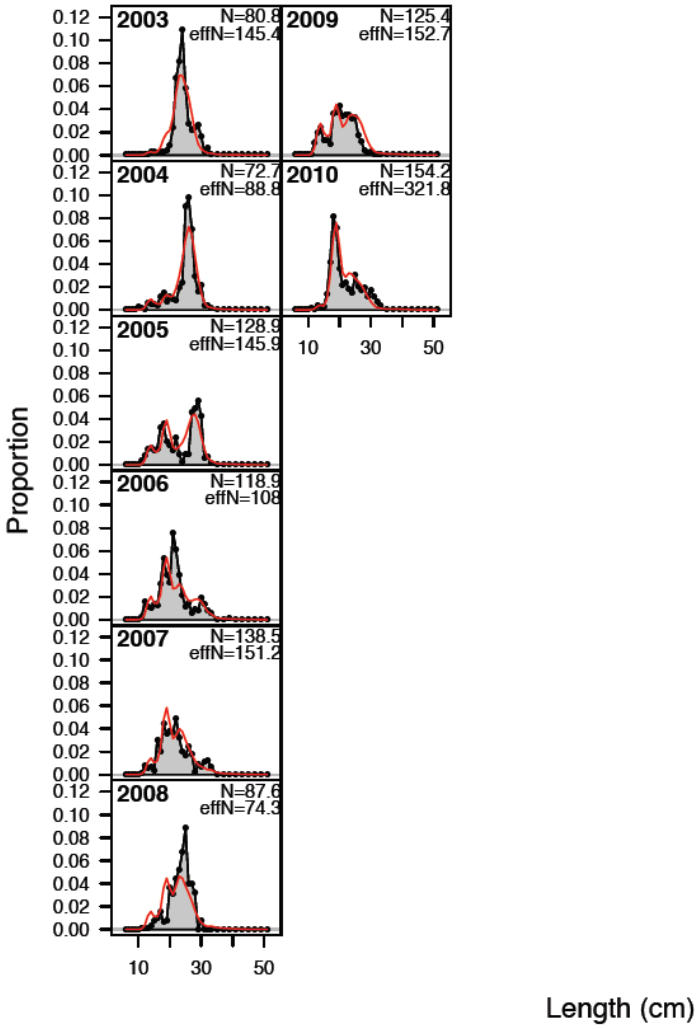



Figure 21. NWFSC Shelf Survey female length compositions and model fits

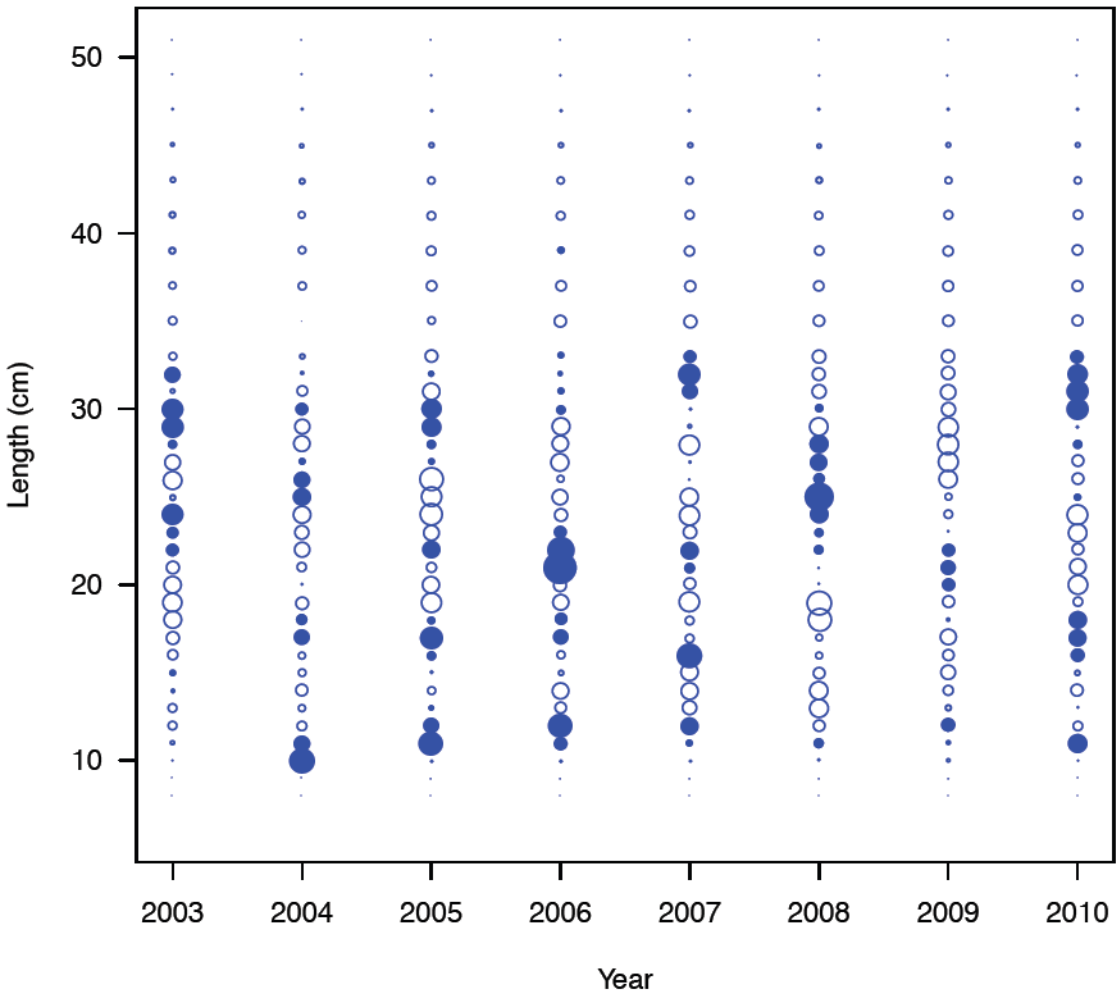



Figure 22. Pearson residuals for female length-composition fits to NWFSC Shelf Survey data.

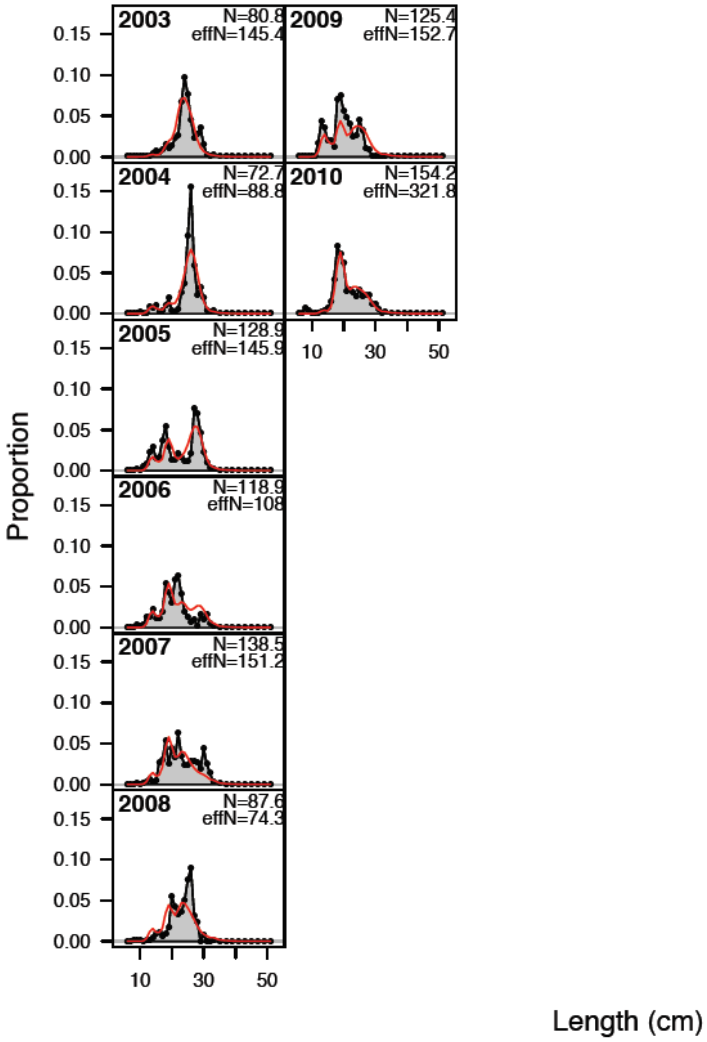



Figure 23. NWFSC Shelf Survey male length compositions and model fits

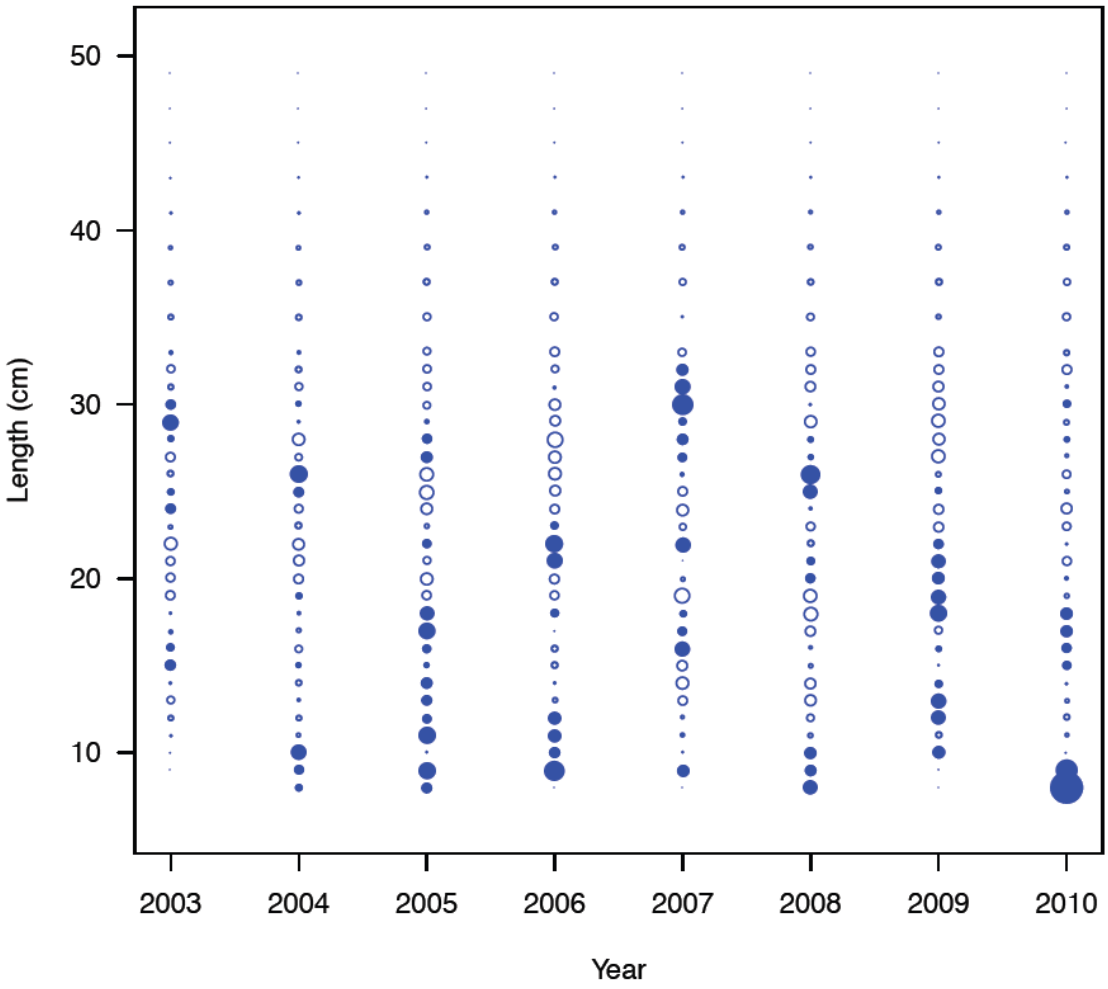



Figure 24. Pearson residuals for male length-composition fits to NWFSC Shelf Survey data.

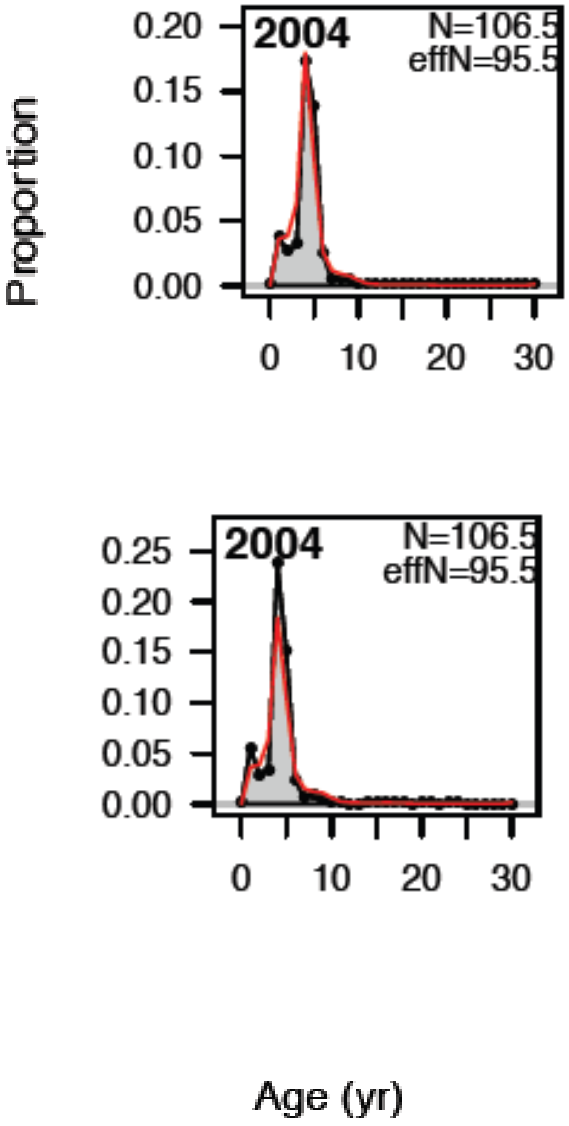



Figure 25. Triennial female (top) and male 2004 age composition and model fit.

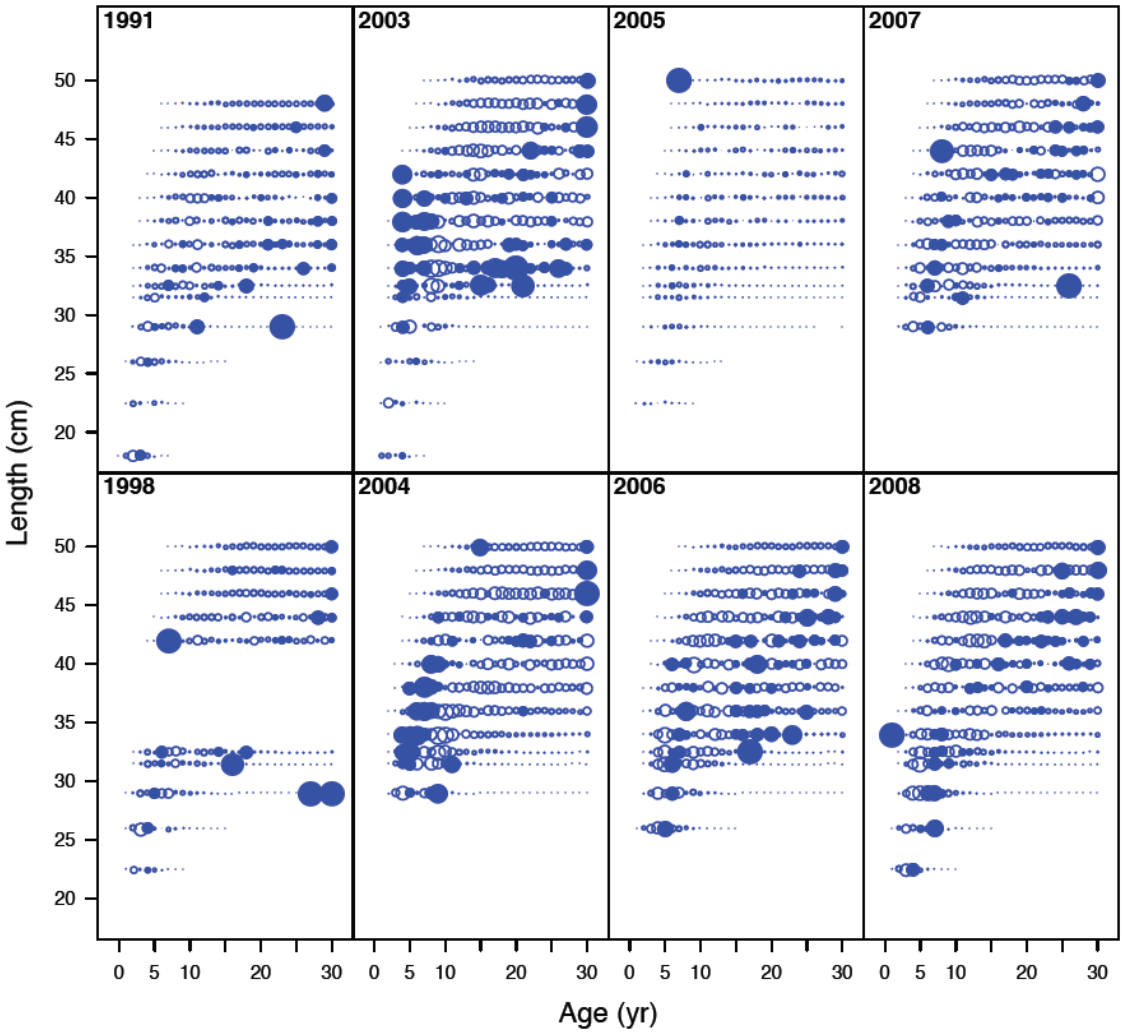



Figure 26. Pearson residuals for the conditional Age-at-Length fits for females in the fishery (whole catch).

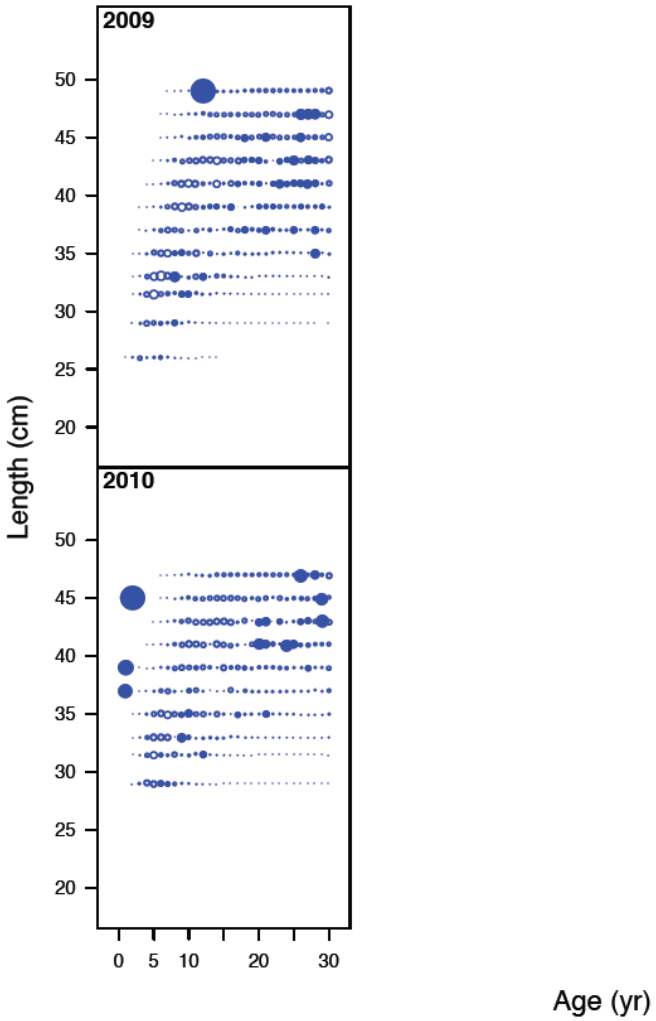



Figure 26. Pearson residuals for the conditional Age-at-Length fits for females in the fishery (cont'd).

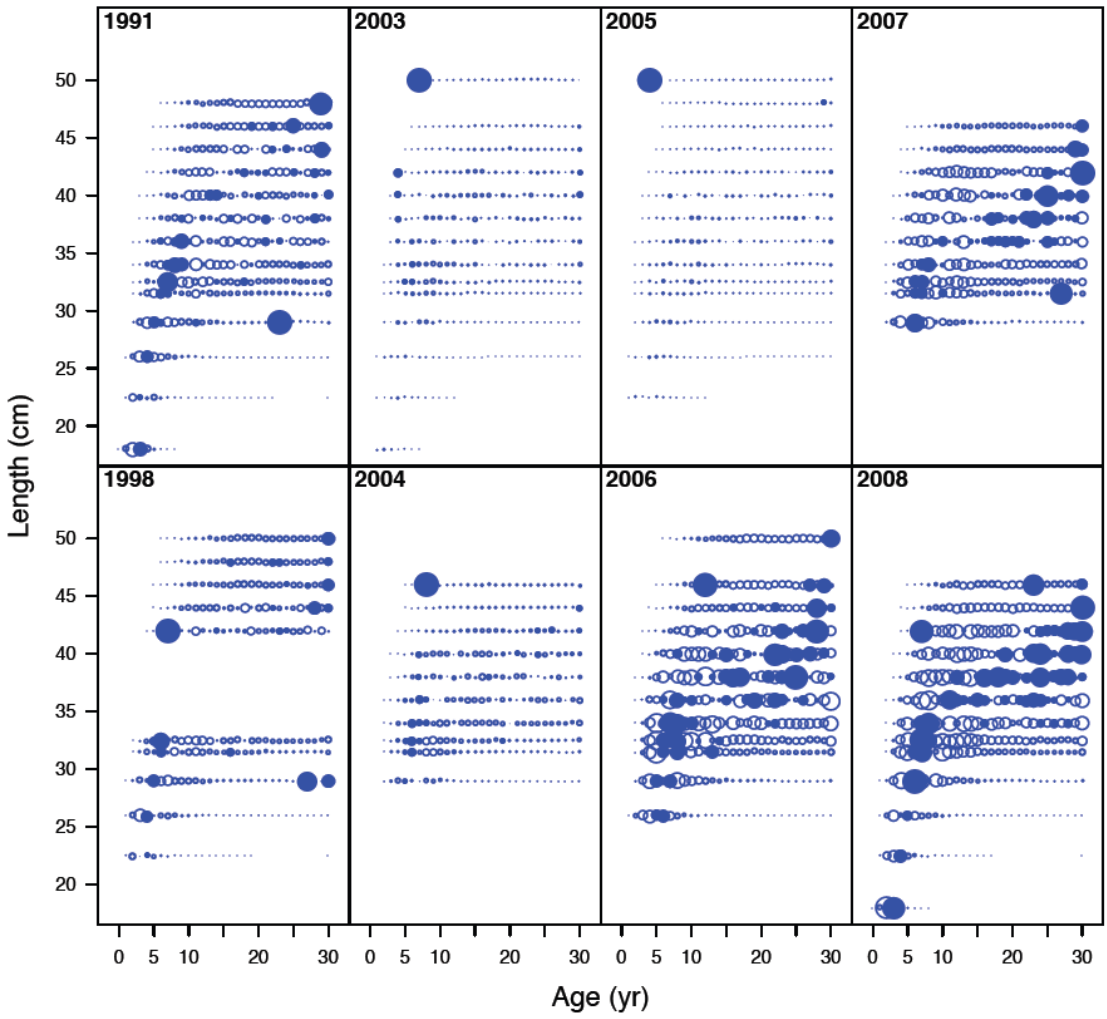



Figure 27. Pearson residuals for the conditional Age-at-Length fits for males in the fishery (whole catch).

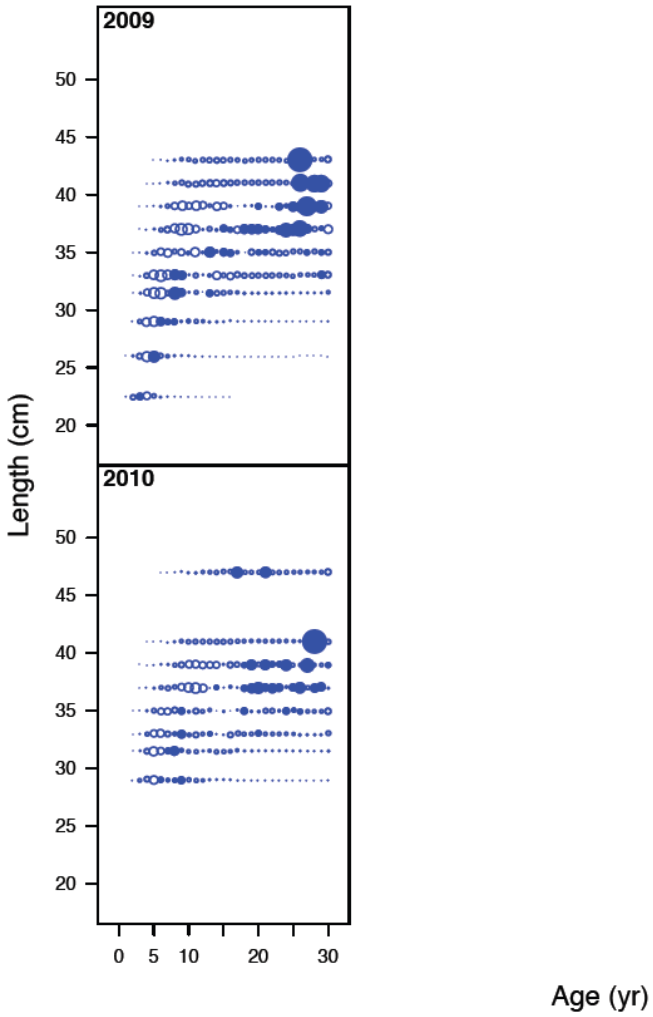



Figure 27. Pearson residuals for the conditional Age-at-Length fits for males in the fishery (cont'd).

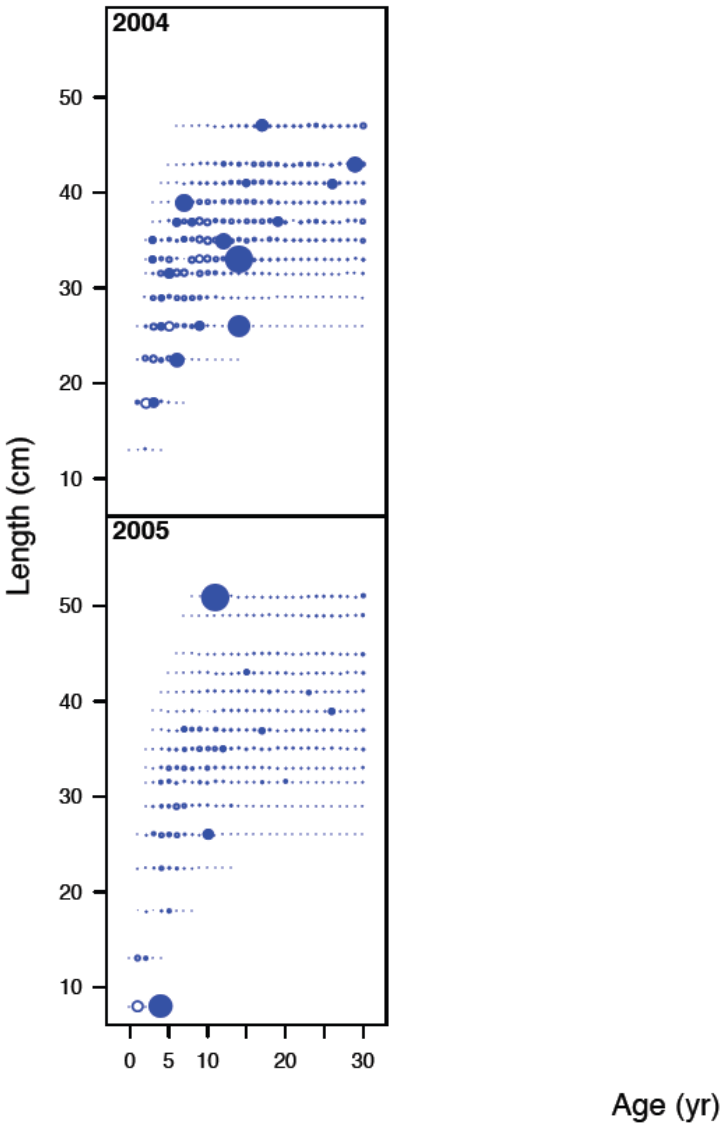



Figure 30. Pearson residuals, sexes combined, for fishery discards.

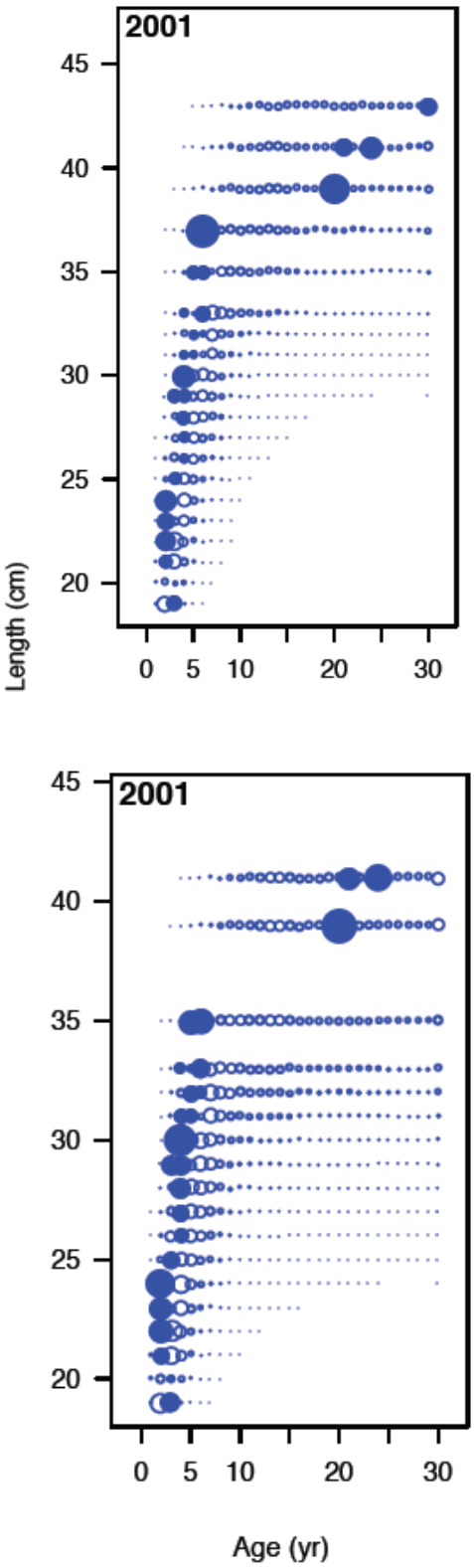



Figure 31. Pearson residuals for the conditional Age-at-Length fits for females (top) and males in the AFSC Slope survey.

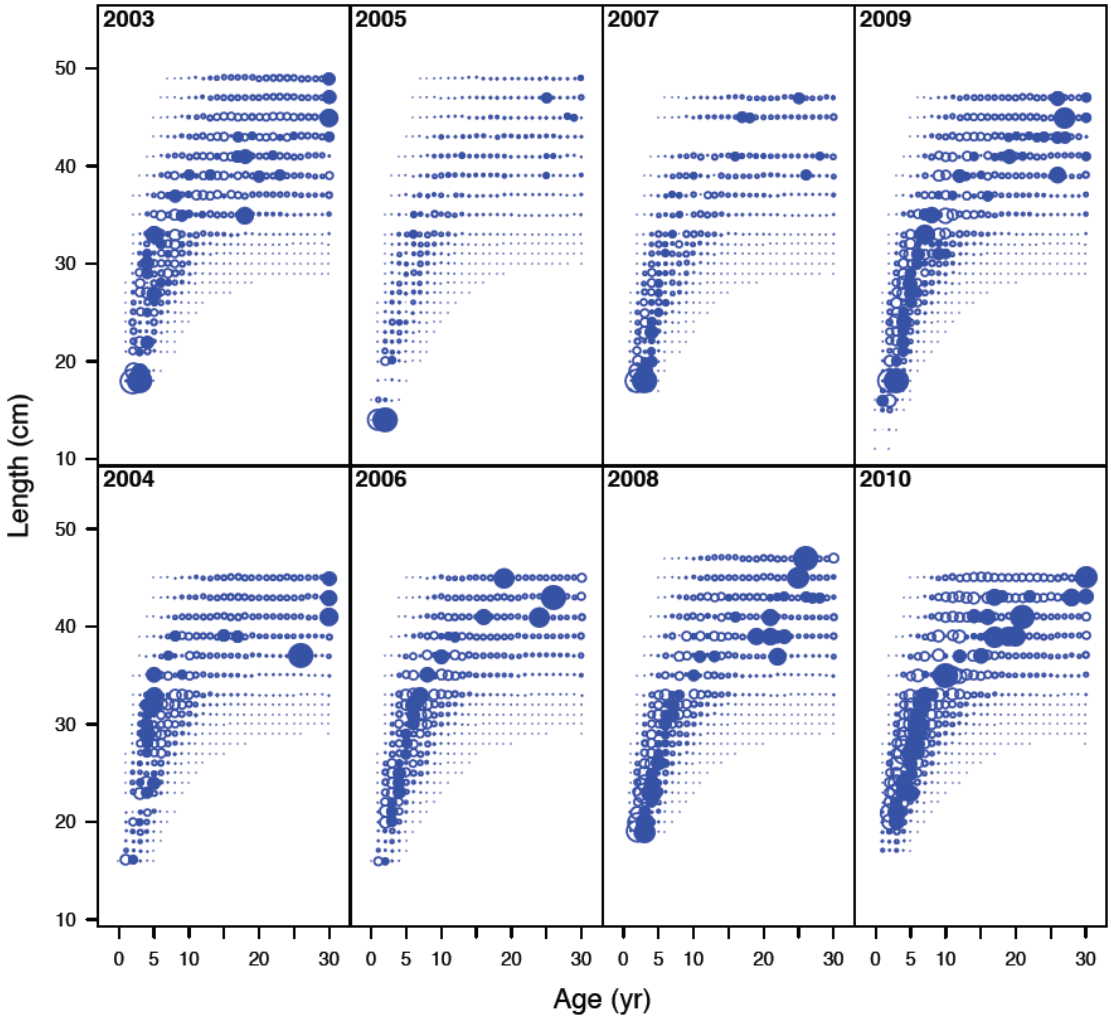



Figure 32. Pearson residuals for the conditional Age-at-Length fits for females in the NWFSC Slope survey.

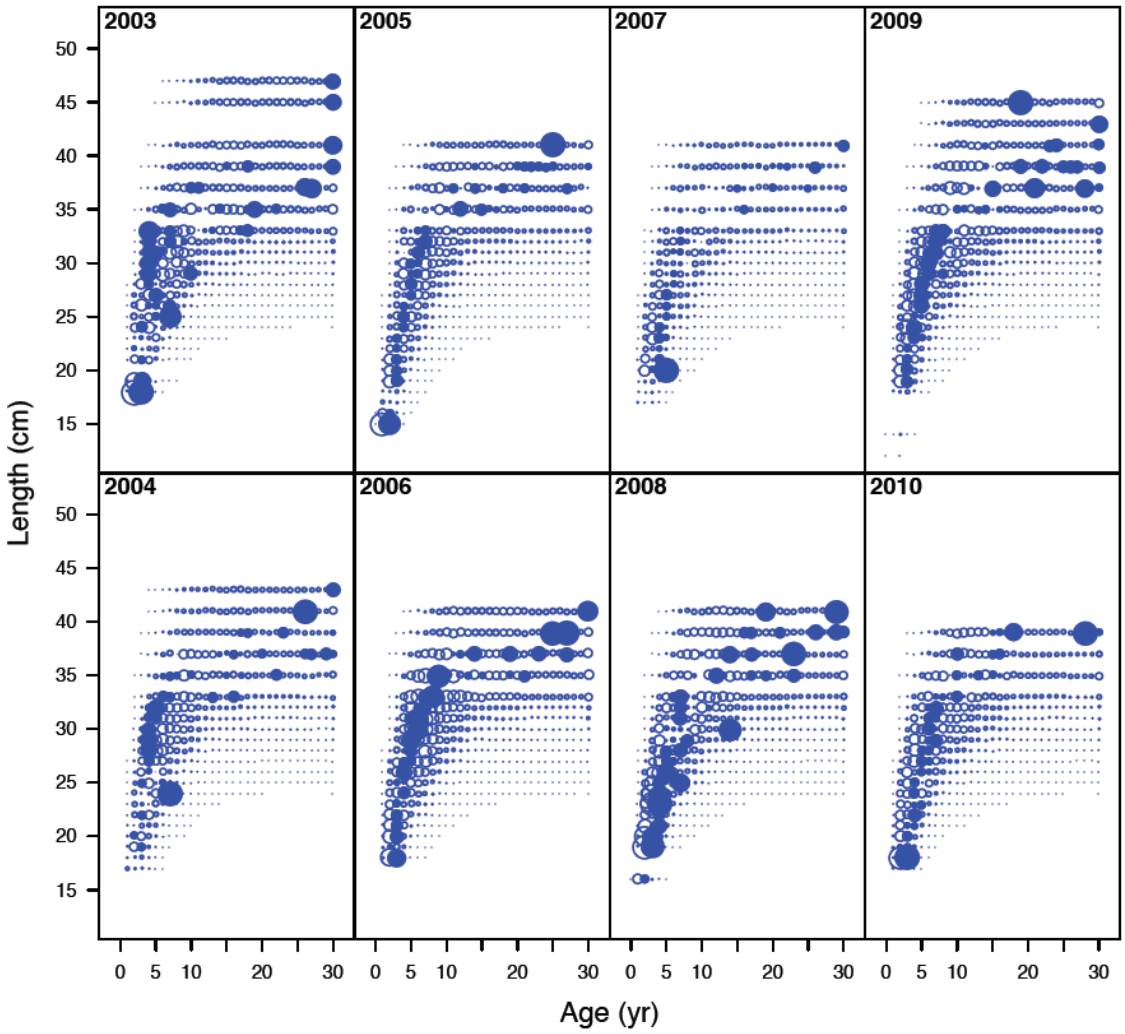



Figure 33. Pearson residuals for the conditional Age-at-Length fits for males in the NWFSC Slope survey.

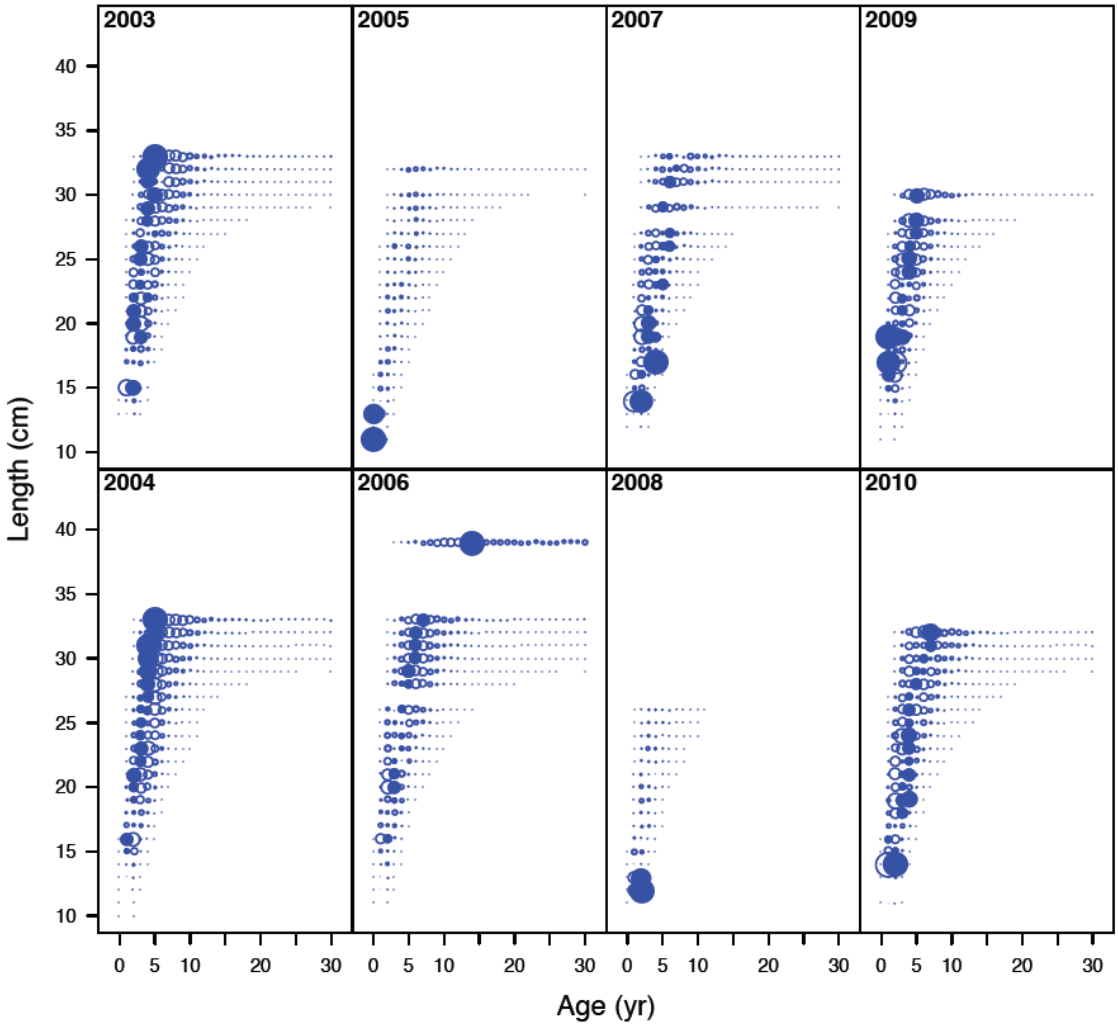



Figure 34. Pearson residuals for the conditional Age-at-Length fits for females in the NWFSC Shelf survey.

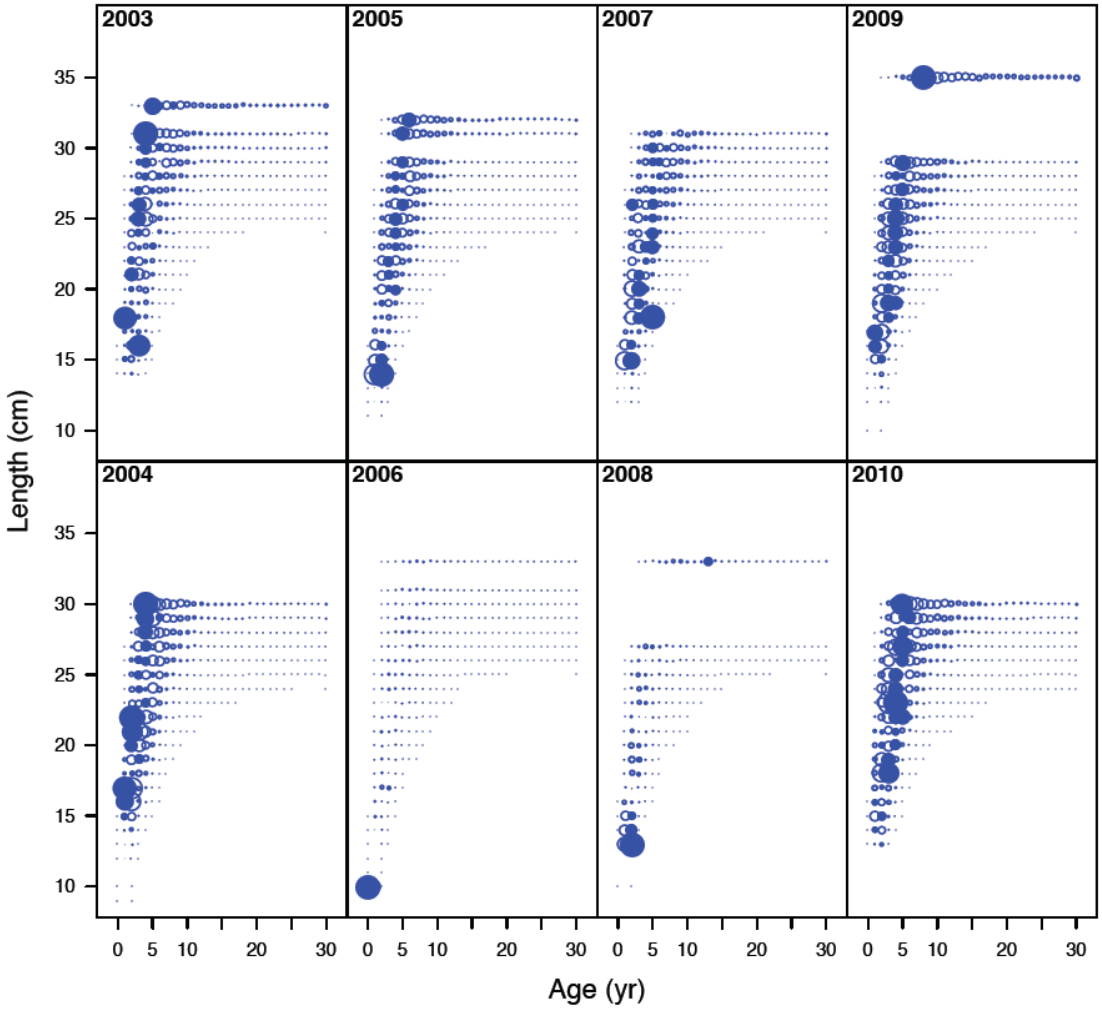



Figure 35. Pearson residuals for the conditional Age-at-Length fits for males in the NWFSC Shelf survey.

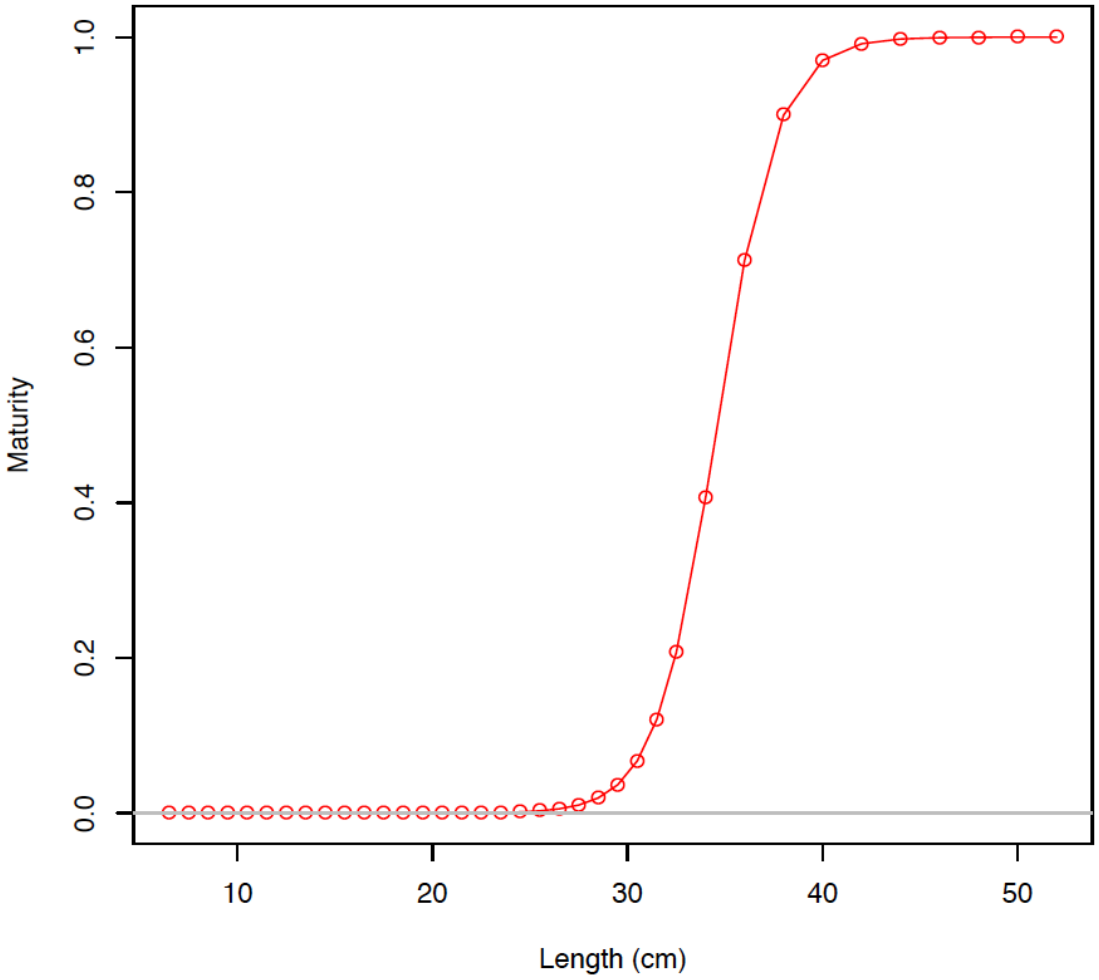



Figure 36. Maturity ogive for female darkblotched rockfish.

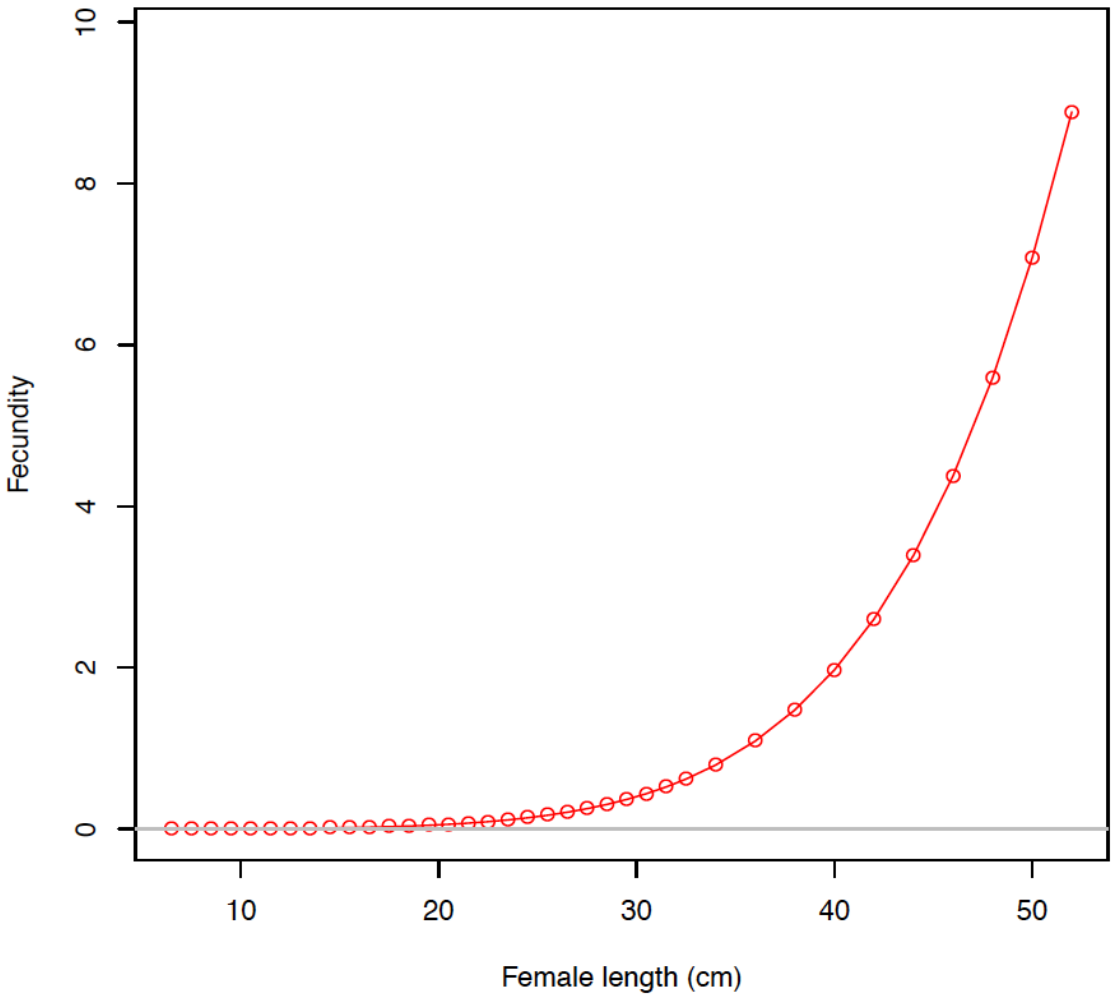



Figure 37. Length-to-spawning output relationship.

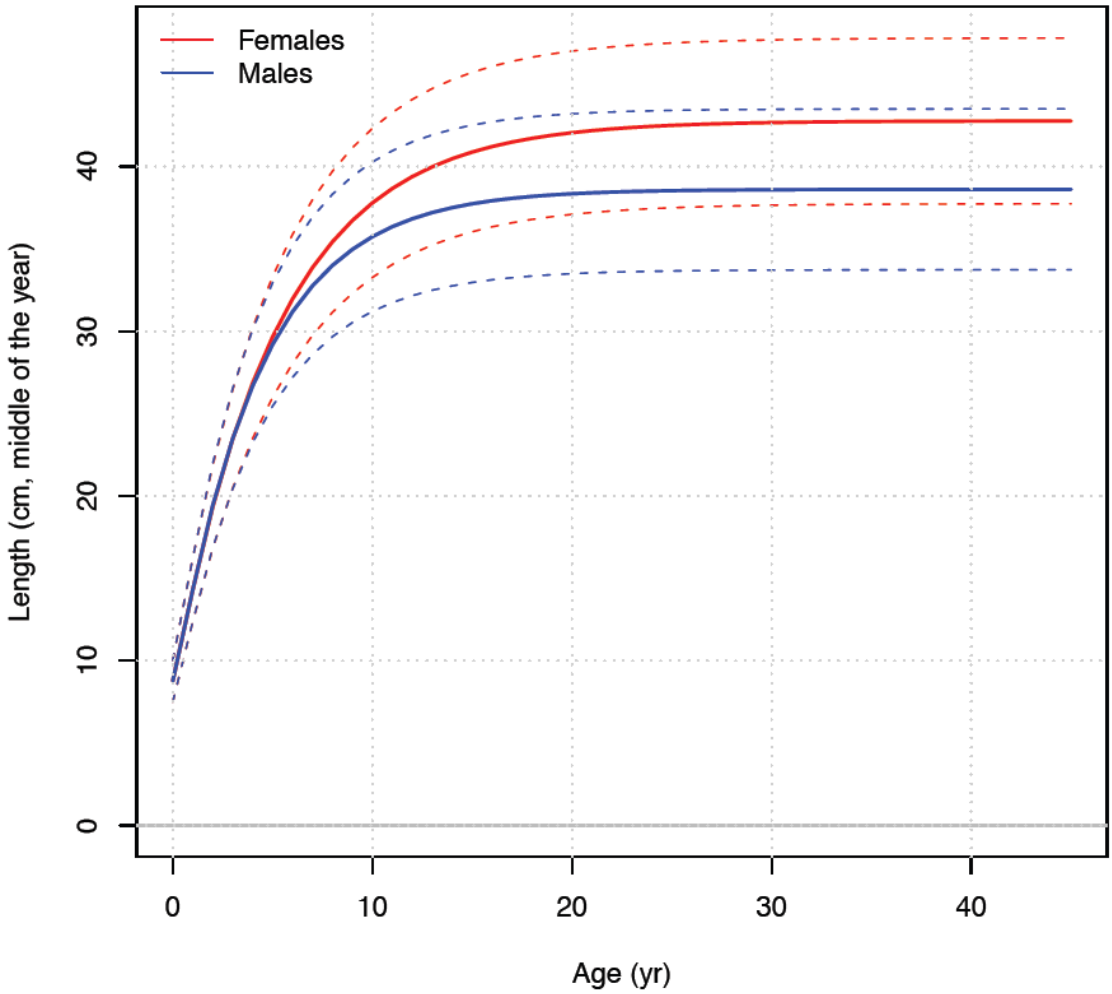



Figure 38. Growth curve for female (upper) and male darkblotched rockfish estimated in the model (ending year).

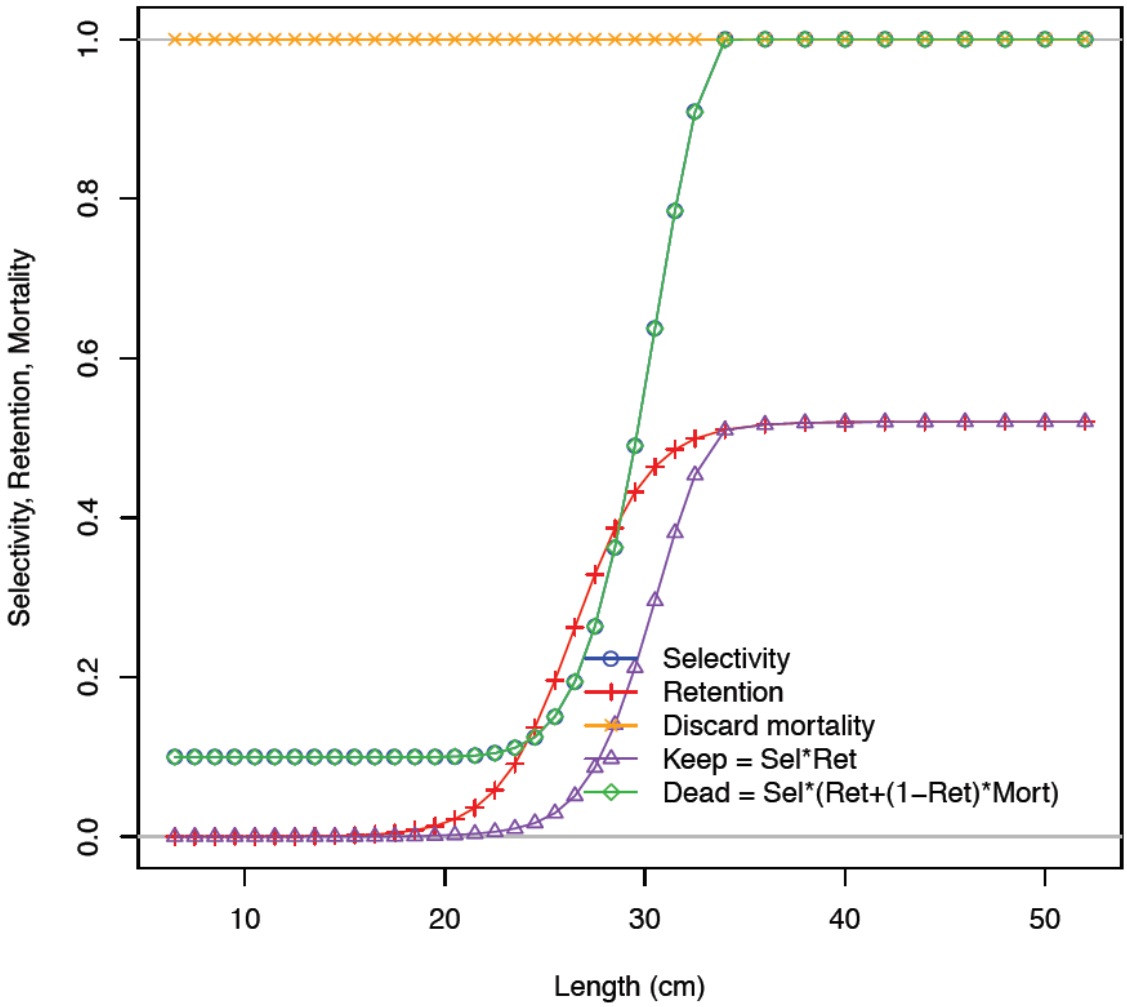



Figure 39. Female ending year fishery mortality, selectivity and 2003-2008 retention (as the proportion retained at length).

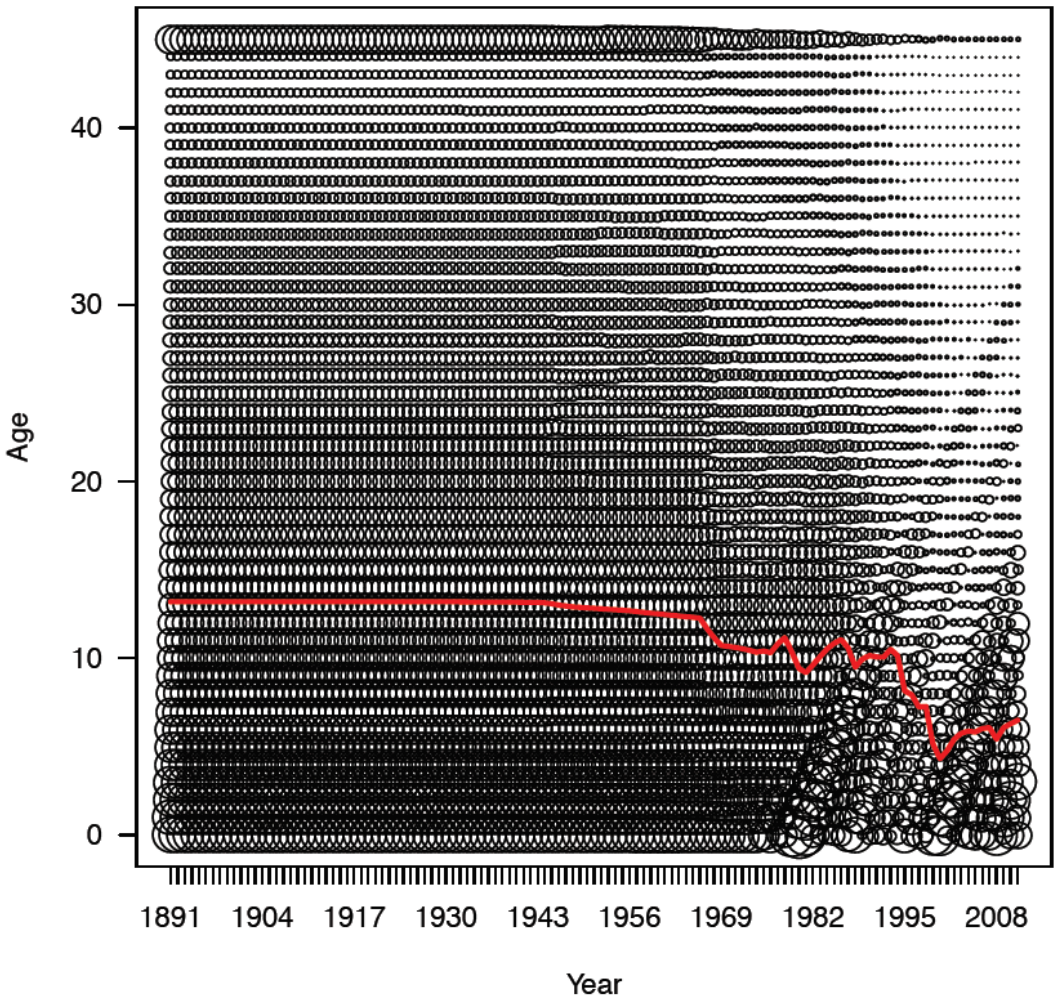



Figure 40. Proportion at age, by year, using the mean age of females in the population.

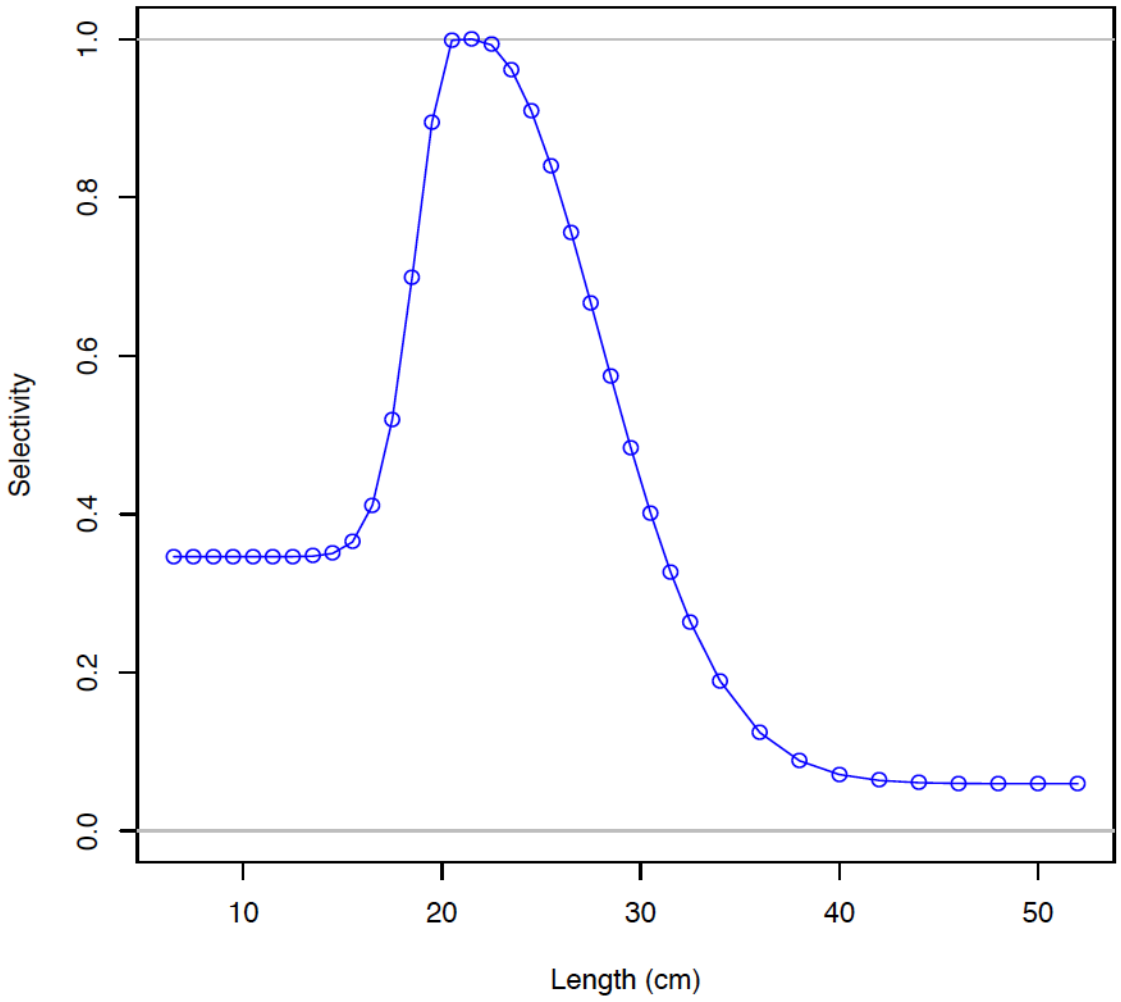



Figure 41. Female ending year selectivity for the Triennial Shelf Survey.

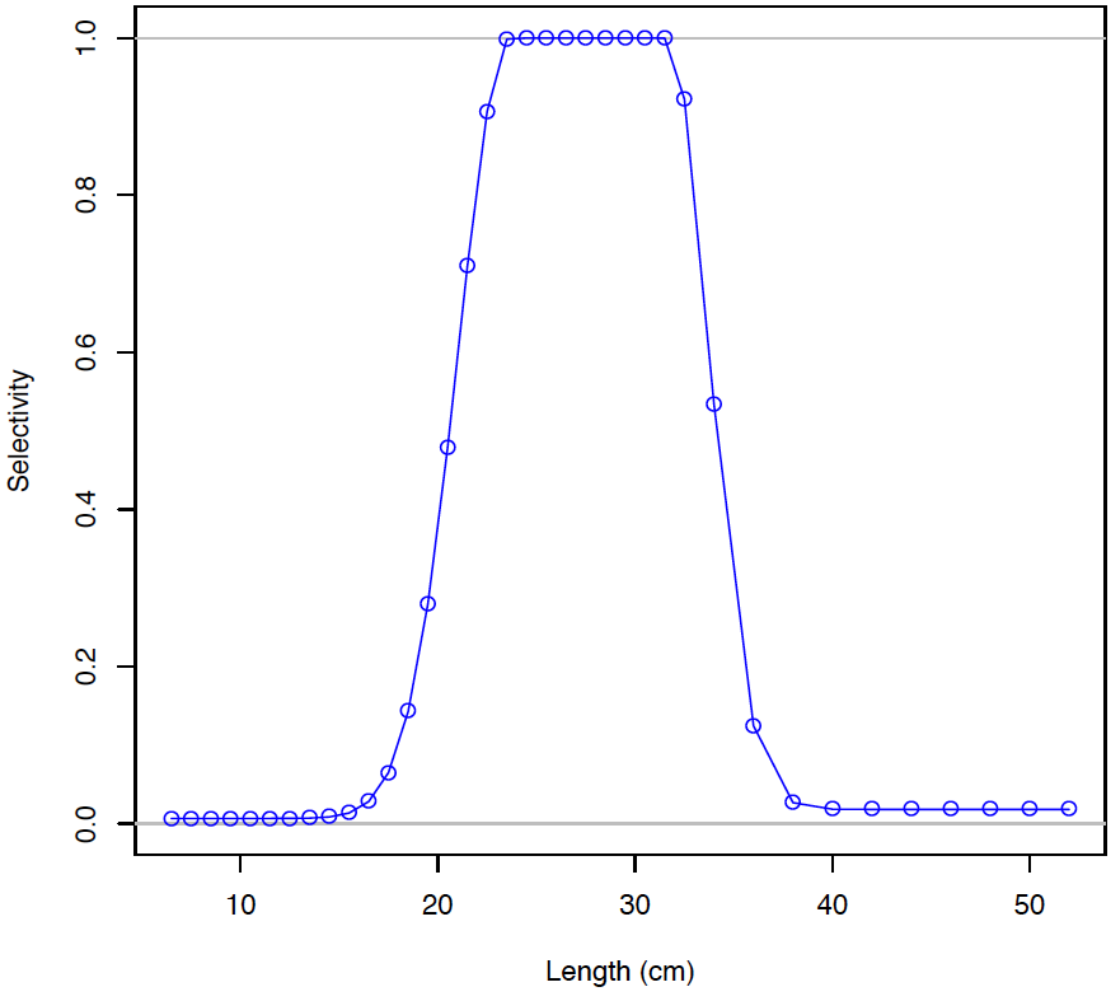



Figure 42. Female ending year selectivity for the AFSC Slope Survey.

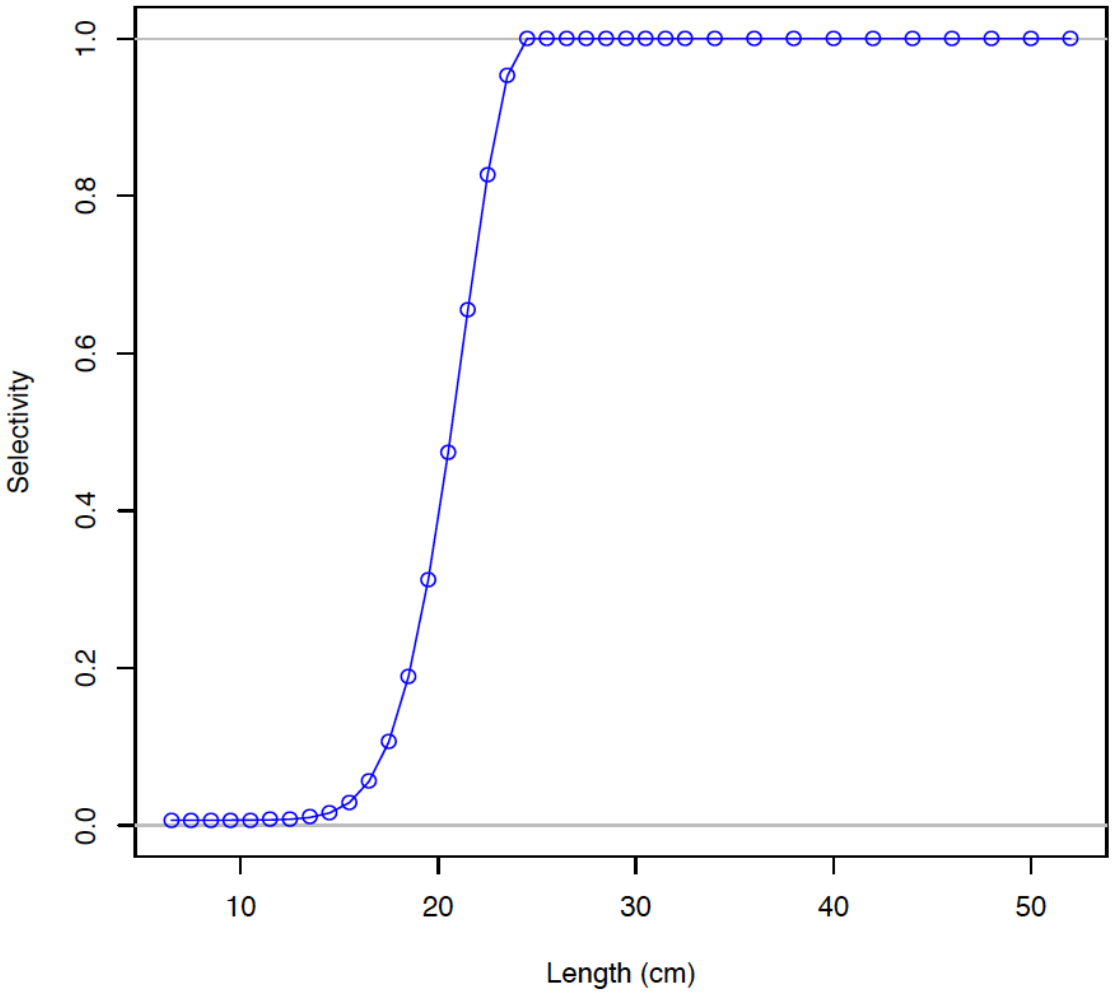



Figure 43. Female ending year selectivity for the NWFSC Slope Survey.

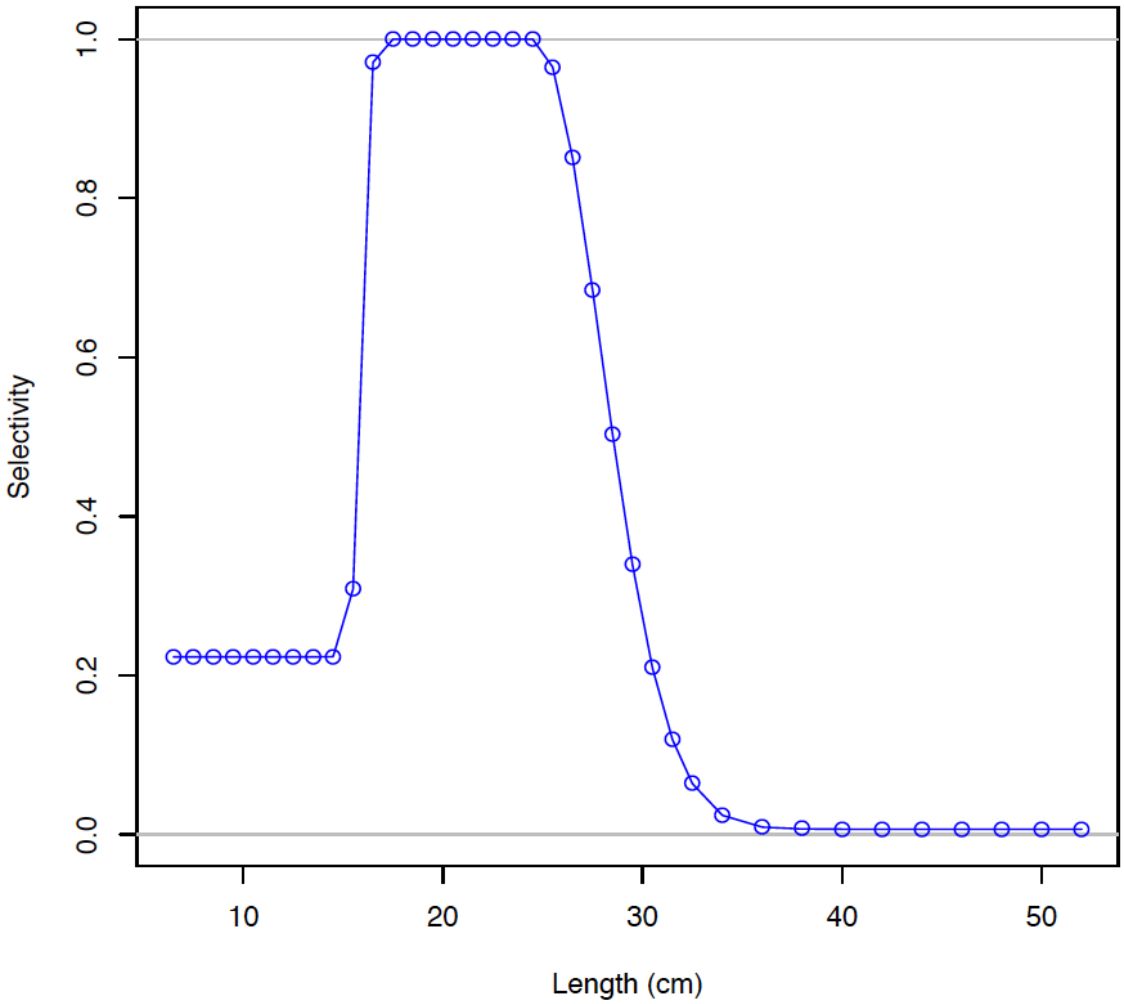



Figure 44. Female ending year selectivity for the NWFSC Shelf Survey.

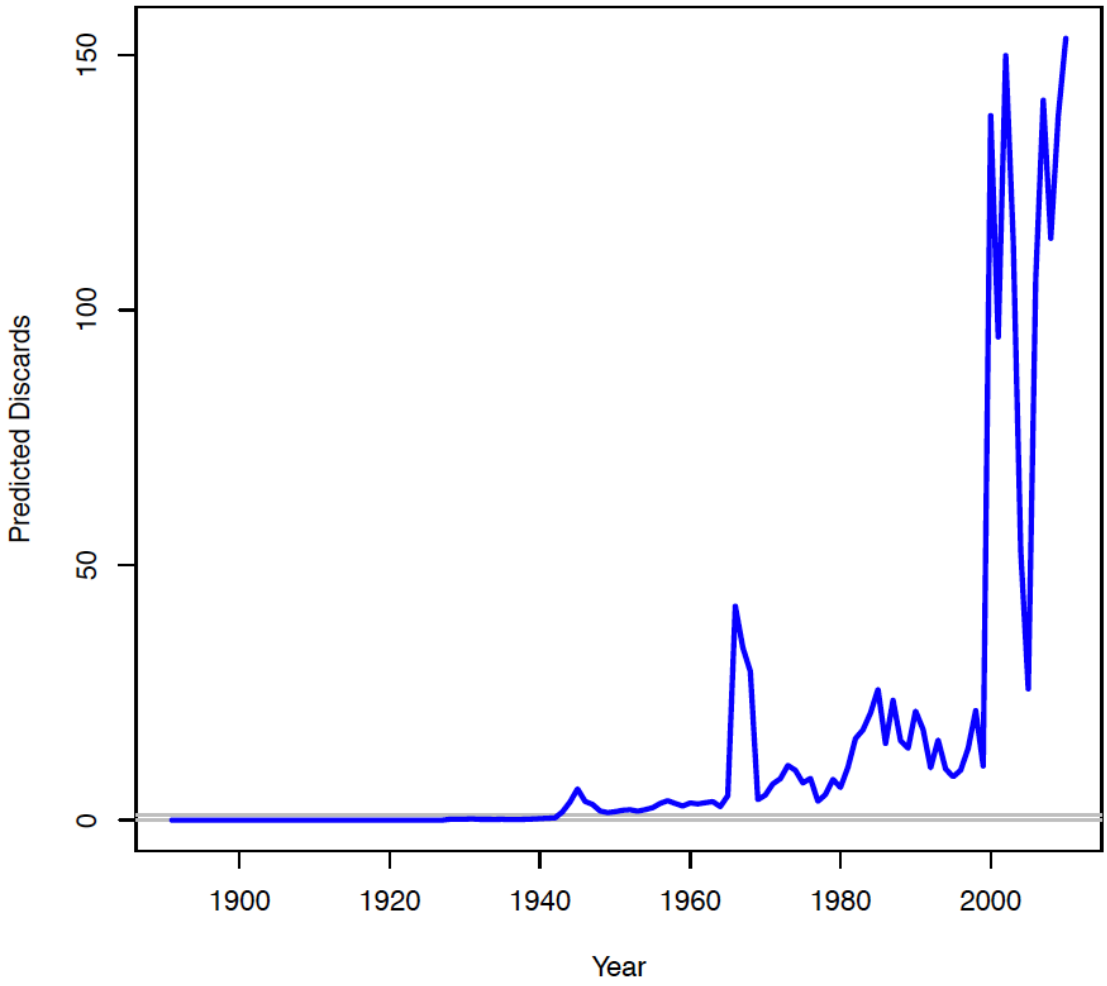



Figure 45. Time series of estimated discards (mt).

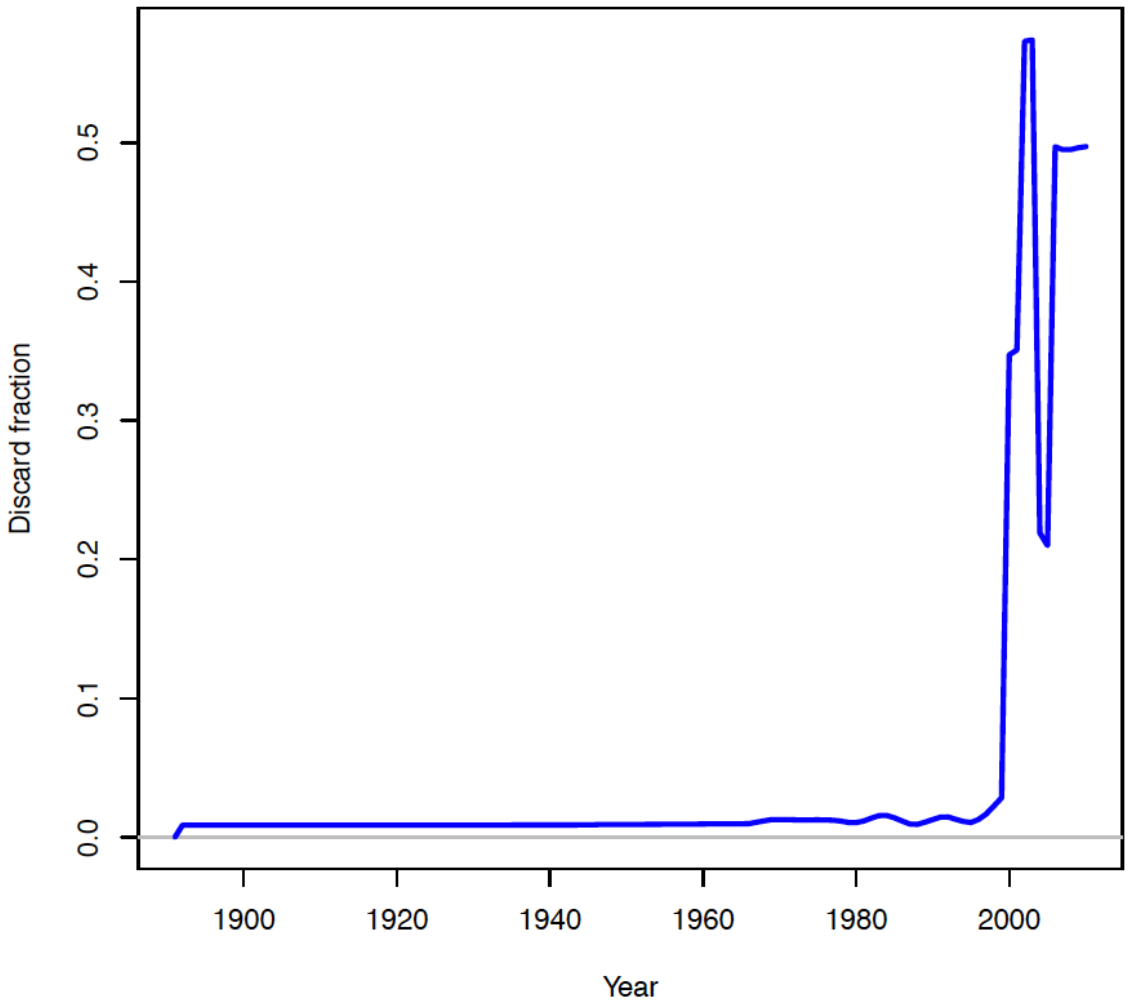



Figure 46. Time series of estimated discard fraction by weight.

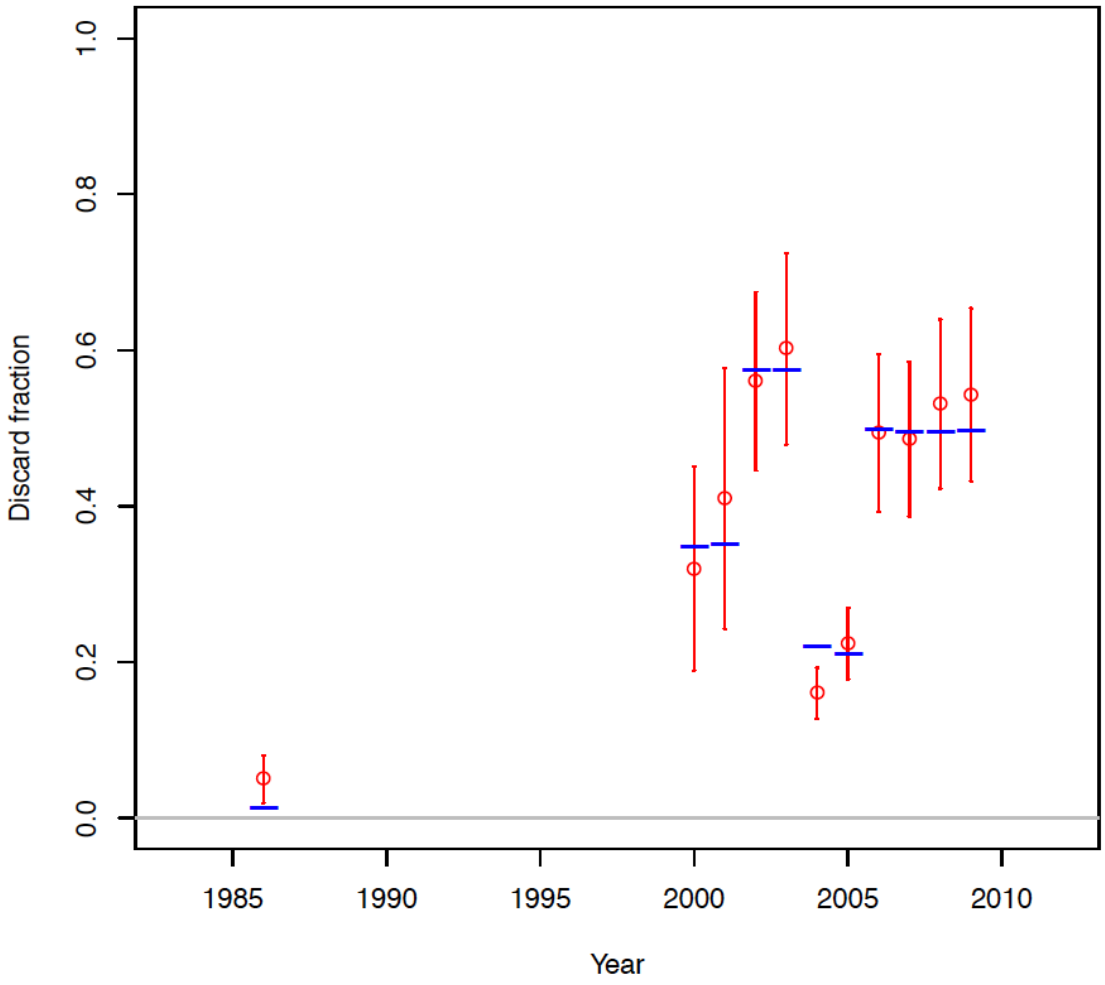



Figure 47. Fit to discard fraction data.

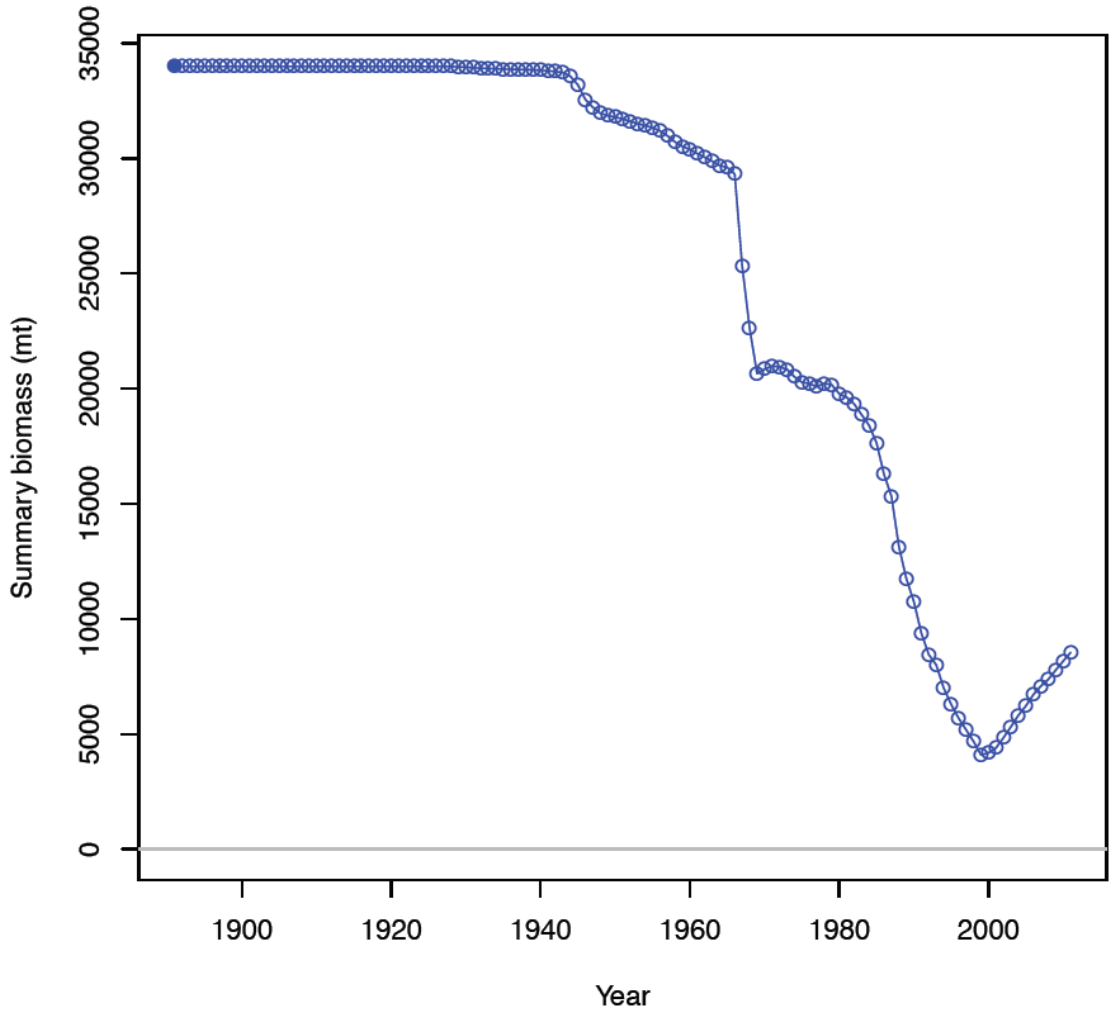



Figure 48. Time series of summary biomass.

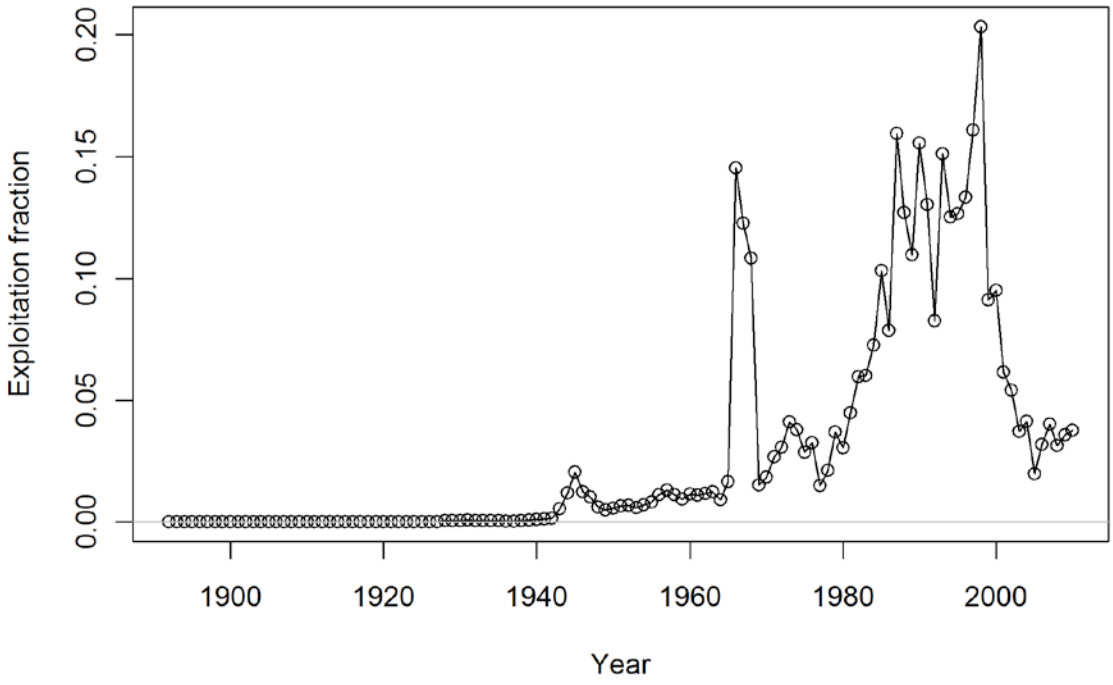



Figure 49. Time series of exploitation fraction (catch/summary biomass).

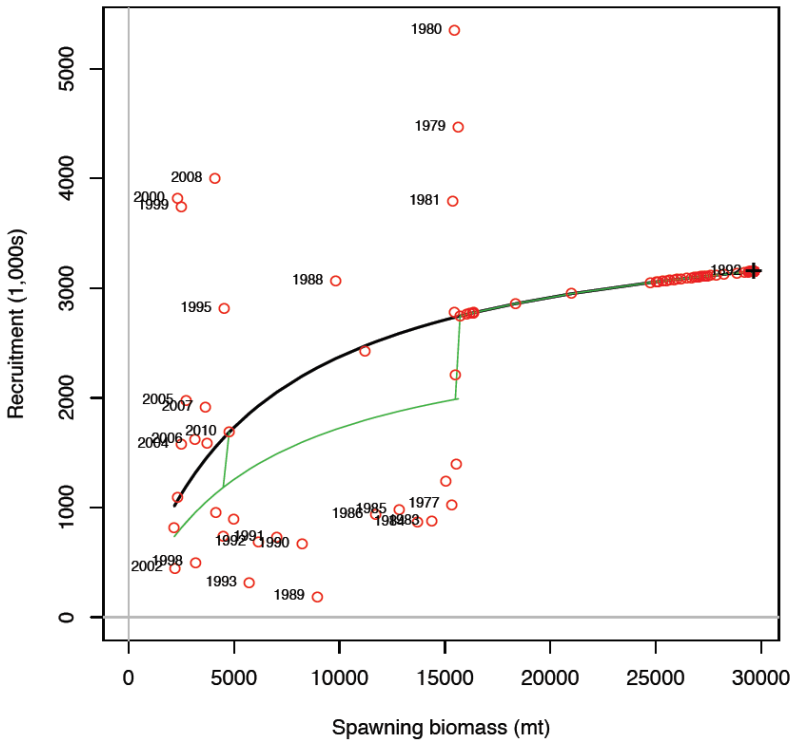



Figure 50. Time series of recruitment and spawner-recruit curve. The top line is the expected-mean recruitment curve and the bottom line is bias-adjusted.

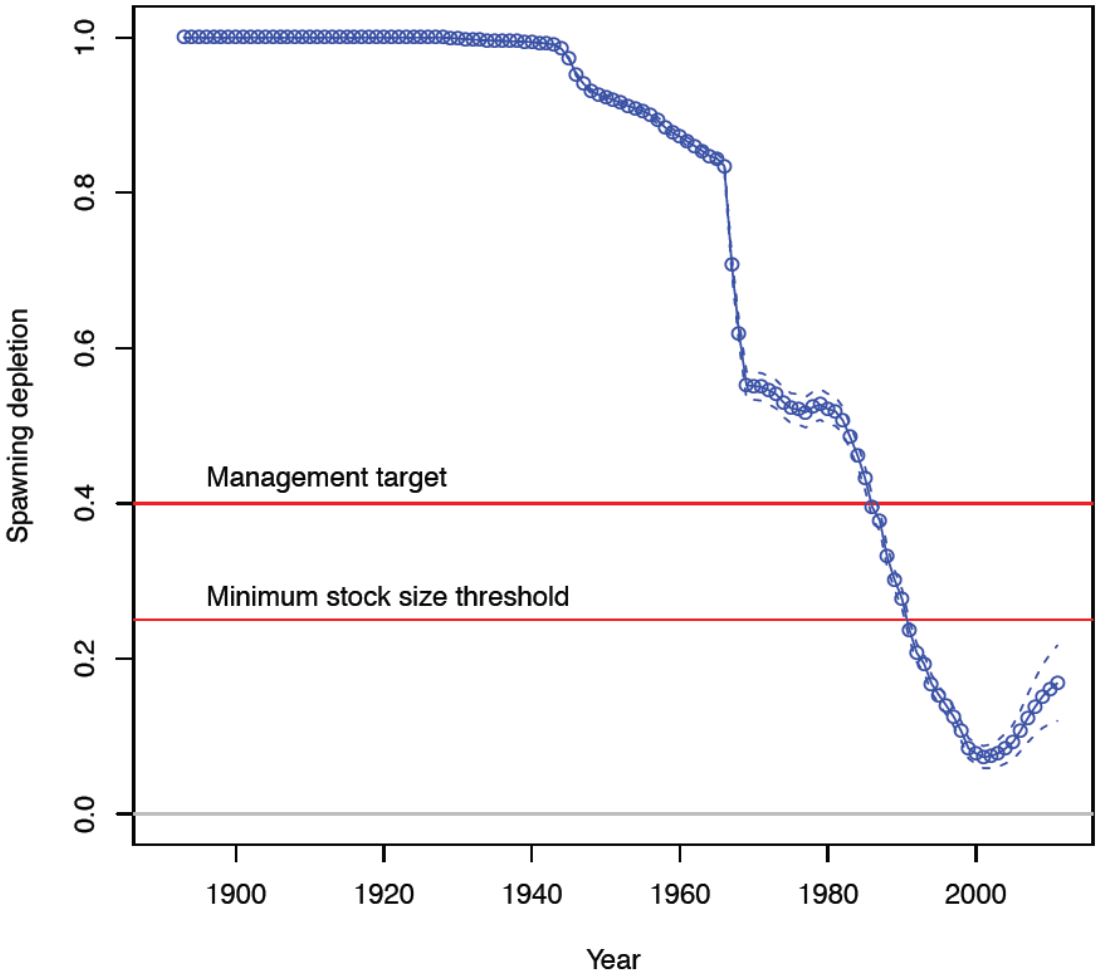
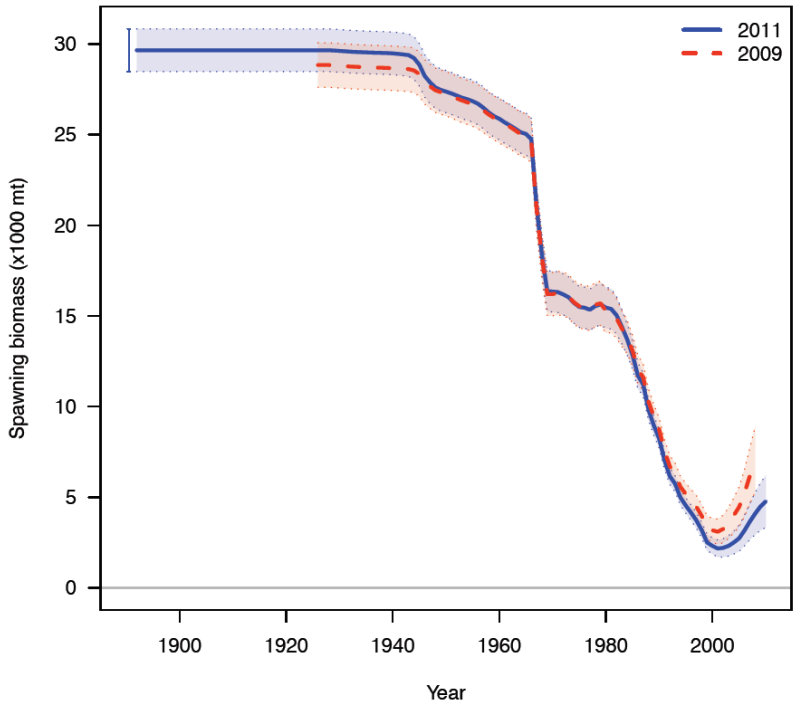



Figure 51. Time series of spawning output depletion level with 95% confidence intervals.

(A)




(B)

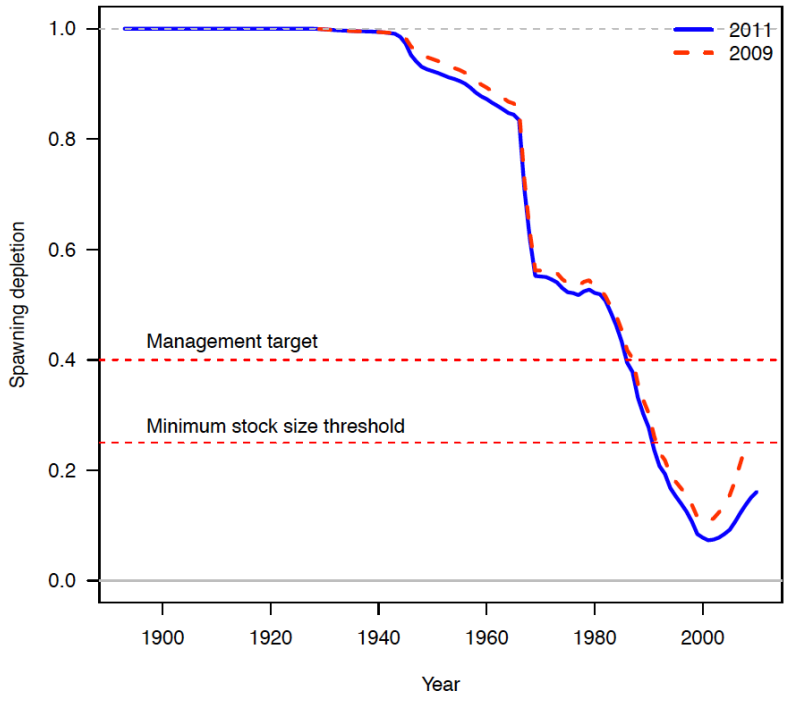



Figure 52. Comparison of histories of spawning output (A) and depletion (B) between the 2009 (dashed line) and 2011 (solid) assessments.

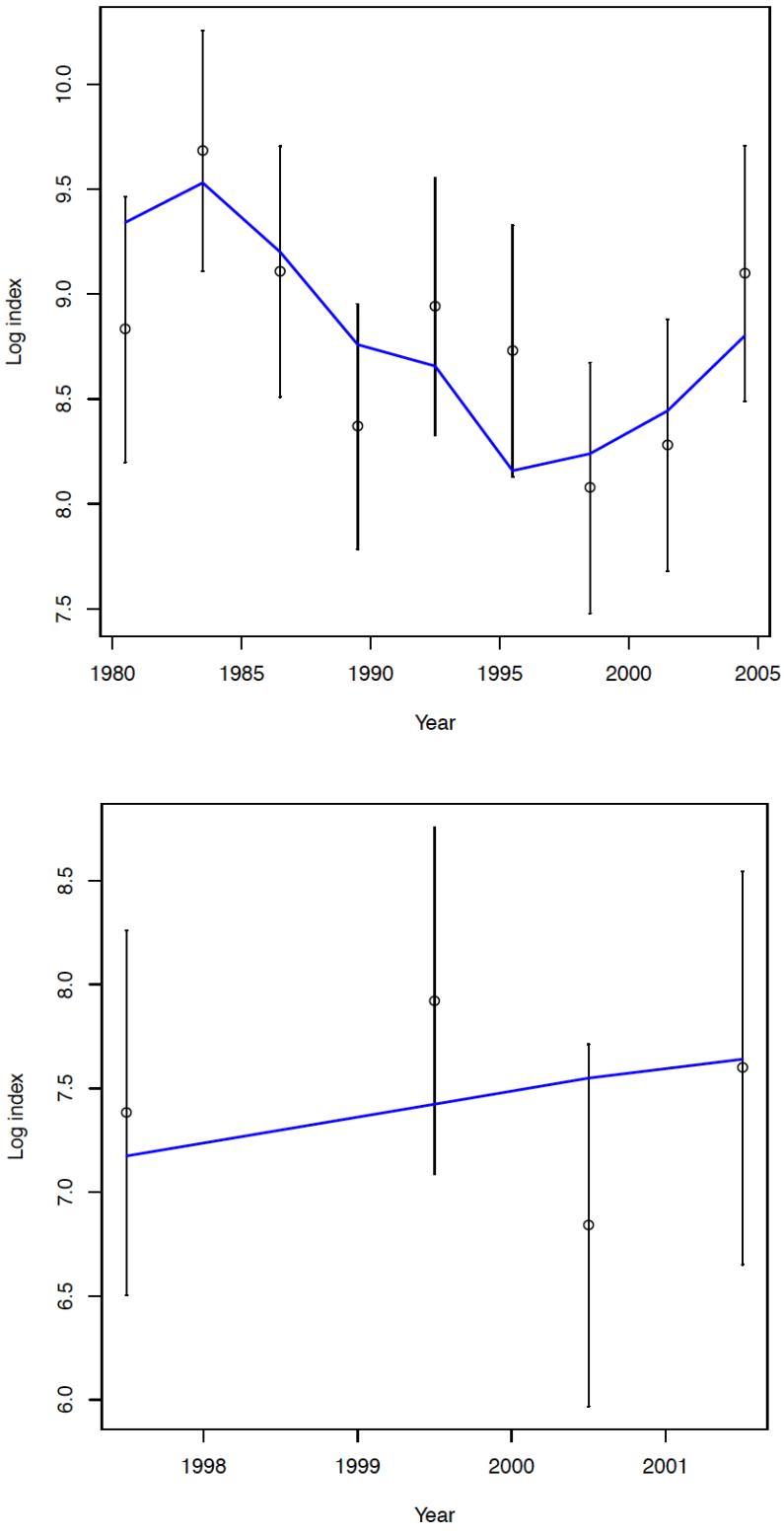



Figure 53. Model fits to Triennial shelf (top) and AFSC Slope Survey indices.

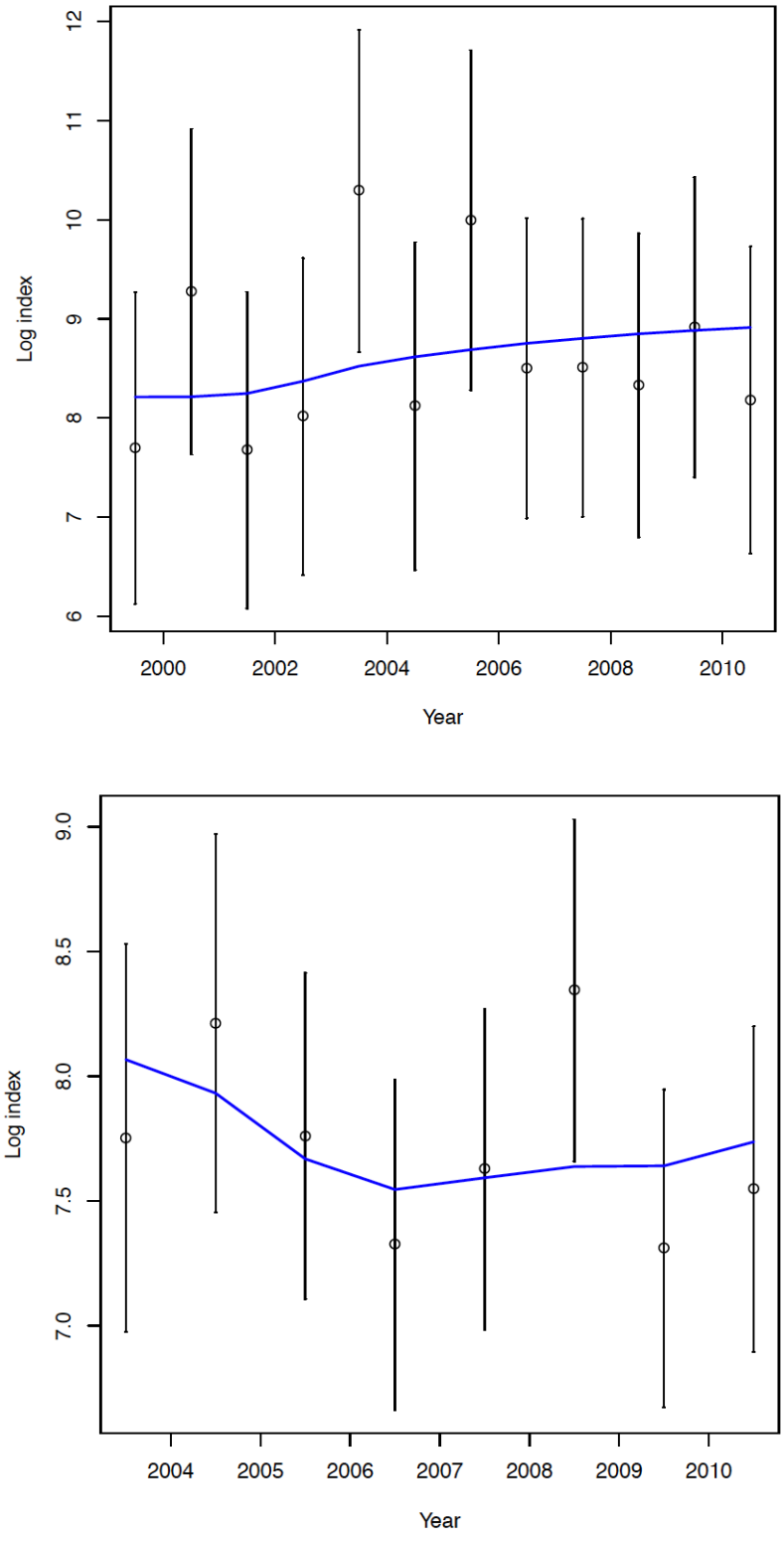



Figure 54. Model fits to NWFSC slope (top) and NMFSC shelf survey indices.

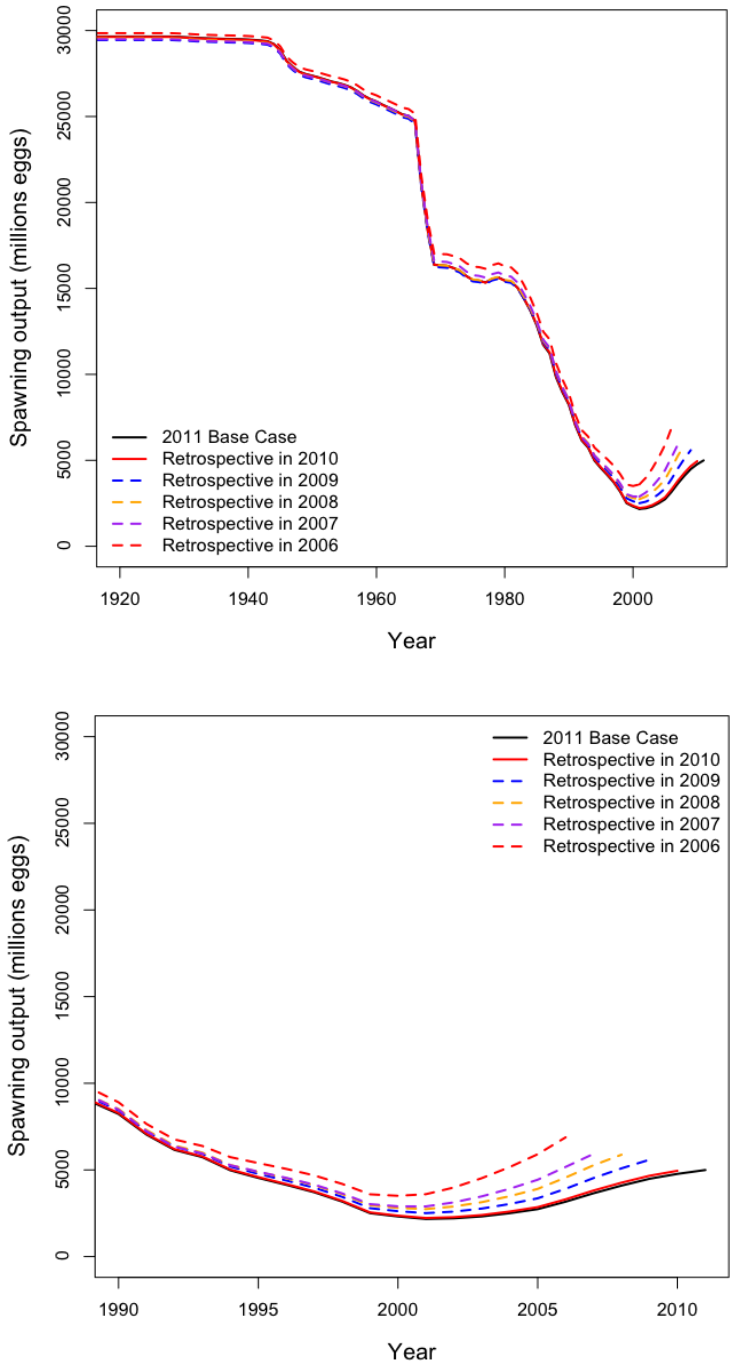



Figure 55. Retrospective pattern showing spawning output estimates from current assessment ("2011") and retrospective assessments as if conducted in 2006-2010. Top panel shows the timeseries 1920-2011, bottom panel covers the last

# Appendix A. Stock Synthesis Data file for Darkblotched Rockfish

```
# data file for darkblotched rockfish in SS v3.x 2008
# Annotated by Ian Stewart, NWFSC
# updated to run in SSv3.20

### Global model specifications ###
1892  # Start year
2010  # End year
1     # N seasons per year
12    # Months per season
1     # Spawning Season
1     # N fishing fleets
4     # N surveys
1     # Number of areas
FISHERY%TRIENNIAL%SLOPE%NWSLOPE%NWSHELF #Names divided by "%"
0.5  0.7  0.92  0.6  0.6 #Timing of each fishery/survey (.42 POP)
1 1 1 1 1   # Area of each fleet
1     # Units for catch by fishing fleet:
1=Biomass(mt),2=Numbers(1000s)
0.01  # SE of log(catch) by fleet for equilibrium and continuous
options
2     # Number of Genders
45    # Accumulator age

### Catch section ###
# Initial equilibrium catch (landings + discard) by fishing fleet
0     # Fleet 1

119 # Number of lines catch data
# Landed catch (only) time series by fleet
# Catch(by fleet) Year  Season
0.103   1892   1
0.103   1893   1
0.103   1894   1
0.027   1895   1
0.006   1896   1
0.007   1897   1
0.004   1898   1
0.006   1899   1
0.009   1900   1
0.011   1901   1
0.014   1902   1
0.016   1903   1
0.019   1904   1
0.021   1905   1
0.024   1906   1
0.027   1907   1
0.029   1908   1
0.032   1909   1
0.034   1910   1
0.037   1911   1
0.039   1912   1
0.042   1913   1
0.044   1914   1
0.047   1915   1
```

```
0.049   1916   1
0.052   1917   1
0.055   1918   1
0.057   1919   1
0.06   1920   1
0.062   1921   1
0.065   1922   1
0.067   1923   1
0.07   1924   1
0.072   1925   1
0.075   1926   1
0.078   1927   1
18.13   1928   1
19.205   1929   1
21.172   1930   1
26.14   1931   1
16.161   1932   1
16.143   1933   1
15.09   1934   1
17.136   1935   1
11.373   1936   1
13.555   1937   1
16.166   1938   1
23.588   1939   1
32.52   1940   1
41.298   1941   1
48.025   1942   1
182.23   1943   1
394.78   1944   1
673.248   1945   1
398.577   1946   1
330.246   1947   1
190.923   1948   1
157.017   1949   1
175.594   1950   1
204.303   1951   1
215.539   1952   1
185.185   1953   1
216.832   1954   1
256.433   1955   1
344.554   1956   1
398.876   1957   1
339.386   1958   1
286.141   1959   1
347.326   1960   1
325.201   1961   1
349.46   1962   1
369.317   1963   1
267.8   1964   1
484.686   1965   1
4219.407   1966   1
3077.582   1967   1
2423.12   1968   1
308.846   1969   1
376.998   1970   1
551.678   1971   1
635.514   1972   1
```

```
844.921   1973   1
766.883   1974   1
570.162   1975   1
647.629   1976   1
295.275   1977   1
423.066   1978   1
736.711   1979   1
595.541   1980   1
870.186   1981   1
1137.168   1982   1
1114.261   1983   1
1313.935   1984   1
1796.87   1985   1
1264.466   1986   1
2420.255   1987   1
1654.791   1988   1
1274.667   1989   1
1650.953   1990   1
1206.03   1991   1
686.875   1992   1
1193.669   1993   1
866.285   1994   1
786.537   1995   1
748.065   1996   1
819.843   1997   1
929.04   1998   1
361.984   1999   1
259.455   2000   1
175.149   2001   1
111.604   2002   1
84.322   2003   1
187.919   2004   1
96.728   2005   1
107.482   2006   1
143.911   2007   1
116.296   2008   1
140.069   2009   1
154.928   2010   1  # Total from Scorecard

33   # number of Survey data points    (#_N_cpue)
#_Units:  0=numbers; 1=biomass; 2=F
#_Errtype:  -1=normal; 0=lognormal; >0=T
#_Fleet Units Errtype
1 1 0 # fleet (fishery or survey) # 1
2 1 0 # fleet (fishery or survey) # 2
3 1 0 # fleet (fishery or survey) # 3
4 1 0 # fleet (fishery or survey) # 4
5 1 0 # fleet (fishery or survey) # 4
#
1980  1  2  6842.61  0.113  # Triennial
1983  1  2  16026.402  0.083
1986  1  2  9014.588  0.095
1989  1  2  4306.441  0.088
1992  1  2  7622.88  0.103
1995  1  2  6173.616  0.096
1998  1  2  3216.884  0.095
2001  1  2  3942.592  0.096
```

```
2004  1  2  8932.481  0.101
1997  1  3  1606.293  0.248  #AFSC
1999  1  3  2756.346  0.227
2000  1  3  934.142  0.245
2001  1  3  1992.919  0.283
1999  1  4  2205.061  0.193  #NW Slope
2000  1  4  10663.288  0.228
2001  1  4  2153.85  0.205
2002  1  4  3025.156  0.206
2003  1  4  29534.603  0.22
2004  1  4  3359.529  0.233
2005  1  4  21951.282  0.265
2006  1  4  4921.375  0.163
2007  1  4  4954.338  0.157
2008  1  4  4144.408  0.172
2009  1  4  7452.022  0.162
2010  1  4  3570.572  0.18
2003  1  5  2329.28  0.227  # NW Shelf
2004  1  5  3684.936  0.217
2005  1  5  2346.148  0.164
2006  1  5  1518.052  0.168
2007  1  5  2053.659  0.158
2008  1  5  4203.075  0.18
2009  1  5  1494.096  0.155
2010  1  5  1894.938  0.163


1 #_N_fleets_with_discard
#_discard_units (1=same_as_catchunits(bio/num); 2=fraction; 3=numbers)
#_discard_errtype:  >0 for DF of T-dist(read CV below); 0 for normal
with CV; -1 for normal with se; -2 for lognormal
#_Fleet units errtype
1     2     30 # FISHERY1
# fill in this table
11   # Discards N observations #_N_discard_obs
1986  1  1  0.05  0.3
2000  1  1  0.32  0.2
2001  1  1  0.41  0.2
2002  1  1  0.56  0.1
2003  1  1  0.602  0.1
2004  1  1  0.16  0.1
2005  1  1  0.224  0.1
2006  1  1  0.494  0.1
2007  1  1  0.486  0.1
2008  1  1  0.531  0.1
2009  1  1  0.543  0.1
0   # Mean Body Weight #N_meanbodywt_obs
30 #_DF_meanwt

## Population size structure
3  # Length bin method: 1=Use data bins,
  # 2=generate from min/max/width read below
  # 3=Read count and vector below
37 # Count of population bins
# Lower edge of bins
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  35  37  39  41  43  45  47  49  51
```

```
-1    # Minimum proportion for compressing tails of observed
compositional data
0.0001      # Constant added to expected frequencies

0     # Combine males and females at and below this bin number

37 # Number of Length Bins
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  35  37  39  41  43  45  47  49  51

73   # Length Composition Observations - 1983-2008 Updated 11.May.2009
-JRW
#Year Seas  Fleet Gender      Part  effn  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    35    37    39    41    43    45    47    49    51    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    35    37    39    41    43    45
      47    49    51
1977  1     1     3     2     22    0.00  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.006578947 0     0.023026316 0.016447368 0.029605263 0.078947368
      0.065789474 0.072368421 0.082236842 0.046052632 0.046052632
      0.075657895 0.016447368 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0.003289474 0.003289474
      0.013157895 0.016447368 0.032894737 0.0625      0.078947368
      0.085526316 0.049342105 0.036184211 0.032894737 0.019736842 0
      0     0.003289474 0     0     0     0.003289474 0     0
1978  1     1     3     2     9     0.00  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.01  0.015 0.025 0.04  0.045 0.06  0.065 0.09  0.12
      0.015 0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0.02  0.04  0.055 0.08
      0.145 0.065 0.05  0.055 0.005 0     0     0     0     0     0
      0     0
1981  1     1     3     2     44    0.00  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.009352168 0     0.000923447 0.009658981 0
      0.017071936 0.009914631 0.002308139 0.004315309 0.029660242
      0.079223767 0.163936007 0.201138023 0.07768508  0.045483208
      0.007295434 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.001580486 0     0.001576187 0
      0.004283547 0.007270873 0.046535231 0.184208021 0.087405632
      0.009173651 0     0     0     0     0
1982  1     1     3     2     89    0.00  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.000209381 0     0.000276902 0.001000681 0.00038614  0.005672158
      0.006879098 0.010054919 0.006879155 0.01852027  0.035607596
      0.035969079 0.09680007  0.106453931 0.150588258 0.107370175
      0.050012385 0.016759029 0.003351308 0.018290696 0.003854013 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.002052348 0.000400223 0.00490636
```

```
      0.003430074 0.001632034 0.005899893 0.004138135 0.010646879
      0.008556366 0.01623941  0.049246598 0.12613895  0.064697219
      0.015629436 0.004155975 0.005121676 0.000582645 0.000582645
      0.000582645 0.000425247
1983  1     1     3     2     165   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.001436253 0.000640144 0.001623491 0.001550364 0.002568905
      0.001631408 0.005490415 0.006200823 0.004880457 0.02629336
      0.043581878 0.11995565  0.105118332 0.161450797 0.069672418
      0.036127869 0.006750827 0.004831328 0.002521959 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     2.894e-05   0.000508026 0.000200907 0.000619296
      0.00087674  0.001105158 0.004593141 0.004854462 0.010252466
      0.013841374 0.046059499 0.107873795 0.116588641 0.065169305
      0.018075785 0.000642701 0.002397549 0     0.001992768 0.001992768
1984  1     1     3     2     332   0     0     0     0     0     0
      0     0     0     0     0.000123029 0     0     0     0     0
      0     0     0.000229561 0.000387029 0.000594001 0.000822722
      0.006404647 0.011997875 0.011162728 0.007756905 0.018850844
      0.031464026 0.06305443  0.118815542 0.10033663  0.108346922
      0.082382059 0.036430253 0.008618094 0.002385729 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.002142319 0.002291479 0.000710311
      0.000651822 0.002990391 0.009200048 0.007620995 0.007943567
      0.016599816 0.063568776 0.123856417 0.087160378 0.056576816
      0.005849984 0.001224734 0.001247875 0     0     0.000201245
1985  1     1     3     2     485   0     0     0     0     0     0
      5.3584e-05  0     0     0     0     0     0     0     0
      0.000357638 4.3009e-05  0.000319699 0.001269967 0.000735044
      0.001171229 0.004361312 0.003897284 0.006913197 0.017094358
      0.023591055 0.034986178 0.056976028 0.071982767 0.081785821
      0.088103246 0.069949645 0.041359911 0.023224914 0.002611598
      0.001255309 0.000363115 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     3.1286e-05  0
      0.000411222 0.00010021  0.000356477 0.002282826 0.001589442
      0.005602972 0.004021602 0.01323916  0.016109365 0.024100215
      0.041991327 0.085148054 0.122832404 0.082271629 0.041210365
      0.014892136 0.00637586  0.002400775 0.001131825 0.001131825
      0.000363115
1986  1     1     3     2     267   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.002336091 0     0.000126758 0.000621894 0.001640218 0.00208535
      0.00672149  0.011036079 0.015074762 0.045183599 0.126151576
      0.084583946 0.100371265 0.085564688 0.076254721 0.028088509
      0.011719856 0.001699998 5.0139e-05  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.002336091 0     0.000126758 5.0139e-05  0.000296866 0.001435623
      0.003141301 0.004869212 0.007668502 0.015612004 0.025412968
      0.034391943 0.088043782 0.115193453 0.073064835 0.024754509
      0.004291074 0     0     0     0     0
1987  1     1     3     2     410   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      4.1431e-05  4.1431e-05  0.000330214 0.000820605 0.000308121
      0.000313303 0.000196718 0.001589481 0.003966118 0.006879617
      0.017025068 0.070754205 0.120441187 0.131445907 0.083398876
      0.037759342 0.013432351 0.001293588 0.000611052 9.8283e-05  0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     6.1606e-05  0.000155231 0.000147465
      0.000224129 0.000296763 0.000230189 0.002043342 0.003611713
      0.012226573 0.017828825 0.043823948 0.138174013 0.170389614
      0.093054994 0.019980372 0.003507247 0.00228702  0     0.001033204
      0     0.00017685
1988  1     1     3     2     185   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.000637007 0.000165217 0.000165217 0.002345454 0.001640025
      0.000700713 0.004456563 0.002270845 0.002821435 0.010988893
      0.090579565 0.131666501 0.109219912 0.115514134 0.049461409
      0.011305879 0.003530126 0.002174828 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.000582841 0.00079032  0.001916613
      0.001222563 0.002439905 0.007123079 0.007670696 0.032937274
      0.114279354 0.160855833 0.094558388 0.03031777  0.005411952 0
      0.000249688 0     0     0
1989  1     1     3     2     135   0     0     0     0     0     0
      0     0     0     0     0     0     0     0.000880136 0     0
      0     0     0.000322198 0.000644397 0.003991556 0.007215661
      0.009078429 0.01231198  0.006565148 0.0215359   0.022136969
      0.069202458 0.145445632 0.069490923 0.070972882 0.042012125
      0.026856672 0.011252273 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.000880136
      0     0     0     0.000322198 0     0.000811716 0.006312287
      0.00933858  0.004528414 0.006255233 0.014922144 0.015230329
      0.037842581 0.14781916  0.148776411 0.057694405 0.025100248
      0.004153434 0     0     9.7385e-05  0     0
1990  1     1     3     2     179   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0.00259181  0.003859105 0.011520278 0.006322889
      0.013098289 0.018055826 0.026792846 0.087766574 0.097510064
      0.090205401 0.066591828 0.033612053 0.032885332 0.013565733
      0.004619517 0.003377364 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0.00259181  0.003859105 0.005332824 0.012510343
      0.019285743 0.019602689 0.025245983 0.092407164 0.094416337
      0.084017947 0.061951237 0.030518326 0.022057287 0.008925143
      0.003072653 0.001830501 0
1991  1     1     3     2     143   0     0     0     0     0     0
      0     0     0     0     0     6.1898e-05  6.1898e-05  0
      0.000452421 0     0.00221914  0.000660687 0.004588875 0.007958897
      0.00966071  0.007431082 0.007223661 0.011229918 0.008498161
      0.013591667 0.011570672 0.045651443 0.087068102 0.090413418
      0.080171553 0.047294787 0.061924478 0.02851248  0.010901837
      0.000923142 0     0     0     0     0     0     0     0     0
      0     0     0     6.1898e-05  6.1898e-05  0     0.000452421 0
      0.00221914  0.000660687 0.004588875 0.007958897 0.00966071
      0.007431082 0.007223661 0.011229918 0.009421304 0.013591667
      0.017569165 0.064340245 0.096295661 0.060420953 0.062865532
      0.034604477 0.037007363 0.010976639 0.003286879 0     0
1992  1     1     3     2     57    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.001593168 0     0.002622574 0.001100646 0.007628311
      0.010303436 0.015781925 0.015141792 0.024788256 0.049146609
      0.099610034 0.10300208  0.08527745  0.044195291 0.030892303
      0.007023758 0.001892367 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0.001593168 0     0.002622574 0.001100646 0.007628311
      0.010303436 0.015781925 0.015141792 0.024788256 0.049146609
      0.099610034 0.10300208  0.08527745  0.044195291 0.030892303
      0.007023758 0.001892367 0     0
1993  1     1     3     2     66    0     0     0     0     0     0
      0     0     0     0     0     0     0     0.000631702 0.000631702
      0.0017728   0.000593859 0.000291456 0.002888005 0.001140241
      0.00094086  0.001973107 0.017324776 0.011251648 0.024815141
      0.032329211 0.029534349 0.08474358  0.127818176 0.082980239
      0.04186255  0.024871842 0.006435325 0.003274328 0.001263403
      0.000631702 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.000631702 0.000631702 0.0017728
      0.000593859 0.000291456 0.002888005 0.001140241 0.00094086
      0.001973107 0.017324776 0.011251648 0.024815141 0.032329211
      0.029534349 0.08474358  0.127818176 0.082980239 0.04186255
      0.024871842 0.006435325 0.003274328 0.001263403 0.000631702 0
1994  1     1     3     2     118   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.00020866  0.000231057 0.000907239 0.001182532 0.000584972
      0.000108868 0.003049058 0.003939803 0.01353596  0.016554972
      0.031306079 0.079808668 0.093285611 0.089740561 0.089687212
      0.045390788 0.034948283 0.014104074 0.004227847 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.00020866  0.000231057 0.000907239
      0.001182532 0.000584972 0.000108868 0.003049058 0.003939803
      0.01977914  0.016554972 0.041874976 0.1076652   0.108180226
      0.078933885 0.054874164 0.022573309 0.01094191  0.003059619
      0.002548163 0     0
1995  1     1     3     2     182   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      9.5118e-05  0.000425522 0.00060939  0.004239351 0.00074805
      0.000292776 0.002965204 0.004331131 0.023143704 0.039500619
      0.07812888  0.113716017 0.092757198 0.06313496  0.061395171
      0.036907142 0.010958689 0.001263698 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.000133531 9.5118e-05  0.000425522 0.00060939
      0.00410582  0.000881581 0.003236496 0.003098735 0.005374058
      0.028974464 0.047846212 0.090431485 0.110694086 0.083150362
      0.044604438 0.030286025 0.007920012 0.003232916 0.000287128 0
      0
1996  1     1     3     2     426   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      1.588e-05   0.000213695 0.001157808 0.001700513 0.002849475
      0.004016581 0.007134804 0.00537882  0.011702558 0.018303034
      0.025977223 0.08642447  0.106513086 0.070356406 0.055109452
      0.042956227 0.021736995 0.015486979 0.006042648 0.000926796 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     1.588e-05   0.000491638 0.001554118
      0.001671954 0.002719564 0.002582506 0.005850281 0.006783373
      0.015902117 0.029125931 0.049481104 0.126285613 0.120209417
      0.061039891 0.043174299 0.024189687 0.013383917 0.00755857
      0.003049893 0.000926796 0
1997  1     1     3     2     405   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      4.7134e-05  0.000867301 0.001943861 0.003248878 0.007014217
      0.003024128 0.009128099 0.012666853 0.021107281 0.016318144
      0.032969464 0.074486885 0.088829466 0.068553337 0.063565645
```

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      0.051016508 0.027464778 0.019917234 0.003239272 0.002383729 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.000213475 4.7134e-05  0.001119278
      0.002157336 0.003808635 0.008169718 0.004293645 0.009093009
      0.017643086 0.029962476 0.028604997 0.052009173 0.093828083
      0.092304855 0.057852098 0.043065035 0.022371714 0.013003364
      0.011384431 0.001276246 0     0
1998  1     1     3     2     413   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.000797371
      0.001876738 0.001309351 0.003698056 0.005963145 0.01184596
      0.013243921 0.014736572 0.014193339 0.013773672 0.020740638
      0.018831027 0.06262017  0.074695358 0.081250383 0.058642014
      0.05486104  0.03417459  0.013779083 0.002991611 0.000394304 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.000640209 0.001719577 0.001309351
      0.003540895 0.005963145 0.011531637 0.012154347 0.014617594
      0.015607313 0.014071748 0.019034049 0.031727772 0.106950262
      0.087953807 0.073038072 0.040548562 0.029504485 0.018095727
      0.004628395 0.002550408 0.000394304 0
1999  1     1     3     2     250   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.000638363
      0.002248491 0.003909166 0.008567244 0.018163122 0.038543696
      0.03622928  0.040175258 0.029613328 0.040003522 0.017833741
      0.01599999  0.042250902 0.082916498 0.074289    0.039215736
      0.023356861 0.015750712 0.010739085 0.002810879 0.000748465
      0.000146076 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0.000320783 0.002248491
      0.004201319 0.00915155  0.017753149 0.042251447 0.036080494
      0.038717133 0.036801613 0.035755503 0.024794674 0.024538463
      0.063058955 0.055063425 0.031671335 0.022093618 0.007405969
      0.002756546 0.00054081  0.000207078 0.000292153 0.000146076
2000  1     1     3     2     275   0     0     0     0     0     0
      0     0     2.4194e-05  0     4.8388e-05  0     0     0     0
      0     0.001007258 0.000926306 0.004148516 0.004090782 0.016485625
      0.019899879 0.046642127 0.046218475 0.044040289 0.028294553
      0.042023218 0.046766705 0.046045875 0.059220171 0.066197094
      0.055022987 0.025003032 0.01163735  0.001779498 0.000461644 0
      0     0     0     0     0     0     0     0     2.4194e-05  0
      4.8388e-05  0     0     0     0     0     0.001407317 0.000926306
      0.003948486 0.004320173 0.015885535 0.017104655 0.046047675
      0.050440962 0.039982529 0.023798923 0.033773881 0.049319235
      0.056268047 0.04287132  0.026253559 0.012722841 0.004625115
      0.003823301 0.00017926  0.000244331 0
2001  1     1     3     2     471   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.001822252
      0.000265276 0.000746193 0.000370923 0.000772511 0.003180596
      0.006934874 0.008559135 0.022109286 0.023688143 0.055037687
      0.060861913 0.072840025 0.093798775 0.052626359 0.029321933
      0.030344565 0.016275055 0.01109205  0.008689432 0.003622286
      5.0593e-05  0.000296739 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0.001822252 0.000265276
      0.000597823 0.0003288   0.00092088  0.004035226 0.005569569
      0.01264606  0.028099141 0.027200349 0.059280771 0.085456704
      0.068846828 0.078611092 0.056240855 0.025735964 0.022209656
      0.009988192 0.004308912 0.003343174 0.001185875 0     0
2002  1     1     3     2     440   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.000735667
```

```
      0.002030145 0.002486726 0.004124887 0.003036015 0.004197409
      0.006239814 0.008457617 0.010169893 0.016982577 0.02789801
      0.042336035 0.11728523  0.084674237 0.041647623 0.037148416
      0.040971525 0.039136811 0.010906269 0.004851177 0.000438473 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.001050441 0.002030145 0.002801501
      0.004124887 0.003665565 0.006068289 0.008456286 0.013227342
      0.014514378 0.020329007 0.041794402 0.060263364 0.106973845
      0.091905537 0.032273957 0.023523879 0.026040429 0.025566311
      0.006839737 0.002200282 0.000595861 0
2003  1     1     3     2     456   0     0     0     0     0     0
      0     0     0     0     5.9307e-05  8.5996e-05  0.00072094
      5.3377e-05  0.000593608 0.000391167 0.001721796 0.001382777
      0.005072991 0.00280281  0.001959858 0.004803839 0.007812889
      0.00631773  0.010347258 0.012853647 0.014979635 0.085495582
      0.125912668 0.087502828 0.065772195 0.048588664 0.051962513
      0.022515293 0.005705496 0.001857224 0.000261071 0     0     0
      0     0     0     0     0     0     0     5.9307e-05  0.000139372
      0.000393584 0.000349103 0.000577674 0.001333008 0.001569857
      0.003298966 0.005126584 0.002454585 0.002042078 0.004172502
      0.008015649 0.007336594 0.00675156  0.013592299 0.03607883
      0.128467137 0.107311594 0.06325779  0.022249008 0.010608784
      0.003216542 0.003326932 0     0.000324227 0.000413273
2004  1     1     3     2     430   0     0     0     0     0     0
      0     1.0212e-05  0     0     0     0     0     0     0     0
      0     6.3314e-05  6.5358e-05  0.003311848 0.00437655  0.005341742
      0.006193434 0.013228205 0.009556716 0.013503421 0.010763691
      0.041366328 0.090878746 0.08578879  0.090882711 0.071946447
      0.035671553 0.016762704 0.00661227  0.000788894 0.00075066  0
      0     0     0     0     0     0     1.0212e-05  0     0     0
      0     0     0     0     0     0     2.0424e-05  6.5358e-05
      0.003769013 0.004375148 0.008571534 0.010391343 0.019032098
      0.015669576 0.025874675 0.035906514 0.119714202 0.142393596
      0.064246359 0.027347028 0.009405462 0.002982051 0.002361814 0
      0     0
2005  1     1     3     2     360   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.000134112 3.7885e-05  0.001350752 0.00191949  0.005319015
      0.009661229 0.011657174 0.018751979 0.029831504 0.040164833
      0.037804737 0.063658879 0.069373578 0.08304808  0.066464513
      0.030687786 0.018471032 0.005984545 0.005826327 0.001304693
      0.000668552 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0.000520108 0.000153767
      0.001350752 0.001786406 0.005181985 0.010746105 0.013606973
      0.015346904 0.041196376 0.053956701 0.047167212 0.106098735
      0.107433571 0.052581164 0.024679277 0.012717445 0.002062593
      0.000847783 0.000137449 0     0.000307999
2006  1     1     3     2     500   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.000149666 0.000665147 0.00039911  0.000641807 0.00265252
      0.006994549 0.006734521 0.020236915 0.031373256 0.071320441
      0.083663425 0.064626266 0.079011365 0.052615338 0.03828512
      0.022316193 0.008813746 0.001122067 0.000225883 0.000552475 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.000149666 0.000365815 0.000299332
      0.000774755 0.001580278 0.009132527 0.013038615 0.032207533
      0.056530838 0.064473846 0.114356447 0.0813114   0.061520167
```

```
      0.038168702 0.022696643 0.007830448 0.002980889 0.000155959
      2.6328e-05  0
2007  1     1     3     2     500   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.000110748 0.000103064 0.000444043 0.000571913 0.001320021
      0.004646295 0.011874818 0.01783044  0.042889971 0.142415177
      0.087756652 0.079047158 0.064864578 0.047789974 0.034209035
      0.020919026 0.007116702 0.002514457 0.000662877 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     2.9237e-05  0     0     0     0     0.000132301 0.001525587
      0.003624163 0.007764166 0.017138902 0.033463368 0.058378047
      0.121350723 0.078230425 0.059434081 0.02848038  0.016026962
      0.004492846 0.002478623 0.000363241 0     0
2008  1     1     3     2     500   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.00014154
      5.1044e-05  0.000520408 0.000310173 0.000664839 0.001017032
      0.001524311 0.001654559 0.003897288 0.007448754 0.01037049
      0.018365575 0.04476795  0.138069608 0.100277558 0.060251414
      0.046134947 0.036271929 0.030863331 0.012237088 0.00420151
      0.000800815 0.000639582 0     0     0     0     0     0     0
      0     0     0     0     0     0     3.1859e-05  0     4.5964e-05
      4.5964e-05  0.000305452 0.000788478 0.000804498 0.001062131
      0.001909855 0.003938387 0.018523387 0.021955691 0.028409813
      0.076763026 0.142091285 0.1147318   0.041662195 0.016188562
      0.003686465 0.002892181 0.002242789 0.000987472 0.000309306
      0.000141696
2009  1     1     3     2     482   0     0     0     0     0     0
      0     0     0.000371652 0     0     0     0     0     0.000129068
      0     0     0     0     0.000437844 0.001136122 0.001840645
      0.005423222 0.006390016 0.005084748 0.014829899 0.023870322
      0.050872247 0.152954607 0.103261874 0.047188512 0.04373399
      0.042793084 0.024917094 0.011320703 0.001252033 0.000732242 0
      0     0     0     0     0     0     0     0.000371652 0     0
      0     0     0     0     0     0.000329512 0.000180756 0
      0.0003812   0.001519417 0.002894099 0.002923002 0.003797808
      0.009290591 0.025682764 0.054631747 0.11974403  0.129280791
      0.072037806 0.028157977 0.00742735  0.001853998 0.000223333 0
      0     0.000732242
2010  1     1     3     2     466   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     9.01E-05    0.007887184 0.009040126
      0.012501908 0.027292607 0.039631607 0.139877237 0.130303199
      0.063424753 0.048943609 0.034340013 0.020916103 0.010249135
      0.001465377 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      9.83E-05    0.000104093 0     9.83E-05    0.005006614 0.007131646
      0.009980167 0.02980445  0.04692023  0.071180238 0.158777545
      0.084261454 0.028049743 0.011714869 0.000357131 0     0.000552359
      0     0
# 2006-2008 above, capped at 500. Original values were 2006:560,
2007:798, 2008:927 .
#
# Discard: effective N cut by half for proper re-weighting
1986  1     1     0     1     50    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.006756757
      0.006756757 0.040540541 0.040540541 0.081081081 0.101351351
      0.074324324 0.108108108 0.195945946 0.195945946 0.074324324
```

```
      0.067567568 0.006756757 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2002  1     1     0     1     64    0     0     0     0     0
      0.00041424  0.00041424  0.00041424  0     0.00041424  0.006253056
      0.0108097   0.015760858 0.019903261 0.020060936 0.050030254
      0.052840082 0.044758088 0.106417853 0.078939885 0.047944158
      0.018276196 0.02329974  0.018635895 0.02497316  0.022490632
      0.047450852 0.147400774 0.140001816 0.068056168 0.015385119
      0.011358431 0.005472095 0.001824032 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0
2003  1     1     0     1     80    0     0     0     0     0     0
      0     0.000159518 0     0.000159518 0.000239277 0.000239277
      7.98e-05    0.004341226 0.014743057 0.019828823 0.02629995
      0.024196474 0.018065404 0.008267206 0.003283008 0.025905685
      0.025627316 0.037638259 0.026243917 0.032938354 0.086507537
      0.251770105 0.18890752  0.102759684 0.054014741 0.030278445
      0.004763829 0.008754163 0.003987948 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2004  1     1     0     1     89    0     0     0     0     0     0
      0.000276003 0.000276003 0.00185588  0.000138001 0.000414004
      0.000414004 0.000552005 0.001551674 0.000751266 0.000414004
      0.003730114 0.003538167 0.012179536 0.017373038 0.013803292
      0.013706765 0.021865287 0.009471137 0.021798839 0.035470092
      0.093270332 0.191551429 0.23113931  0.111632928 0.113682272
      0.033110814 0.055456389 0.010439413 0.000138001 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0
2005  1     1     0     1     160   0     0     0.000272538 0
      0.000272538 0.000817614 0.002316572 0.004921714 0.005714552
      0.006745522 0.003732086 0.008784993 0.016621945 0.016408976
      0.006897648 0.004148586 0.00698651  0.003582724 0.005470468
      0.005090898 0.041261323 0.05589004  0.044983846 0.051031259
      0.057880738 0.07685997  0.060261066 0.191349634 0.188997867
      0.092902313 0.024045815 0.011390572 0.001372423 0.002169634 0
      0.000545076 0.000272538 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2006  1     1     0     1     138   0     0     0.000200323 0.000924567
      0.00221896  0.004807747 0.008045894 0.013035963 0.015937219
      0.012973469 0.009842171 0.01277015  0.023765952 0.025781913
      0.024328604 0.040716146 0.017457473 0.019727798 0.011803636
      0.004669062 0.003713676 0.006333282 0.005034445 0.013050924
      0.046932145 0.065521584 0.068953686 0.180782107 0.127503982
      0.119578898 0.02923694  0.046906327 0.026658341 0.006302463
      0.002080275 0     0.002403874 0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2007  1     1     0     1     94    0     0     0     0     0.000124014
      0.00062007  0.001279462 0.028796534 0.010066219 0.003458168
      0.003820077 0.007375606 0.014055948 0.01232497  0.006820771
      0.006305378 0.007267222 0.00511489  0.003186612 0.004979368
      0.004967861 0.013572875 0.003017675 0.013655258 0.013101592
      0.045856035 0.050625537 0.175849797 0.291182956 0.117633473
      0.08570034  0.025932864 0.038112241 0.005196188 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     1     0     1     38    0     0     0     0     0     0
      0     0     0     0     0.000283681 0.00014184  0.000340417 0
      0.000538994 0.000765938 0.000482258 0.000283681 0.00014184
      0.000936147 0.011035187 0.010382721 0.033706169 0.011035187
      0.031351618 0.03467999  0.07105276  0.301971187 0.226593083
      0.058381701 0.136223569 0.030438961 0.012964217 0.026127011 0
      0.00014184  0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     1     0     1     184   0     0.00075317  0.001506341
      0.001552689 0.000428728 0.004557084 0.005053602 0.01423956
      0.006026428 0.009607638 0.005070182 0.004826237 0.004557113
      0.006687281 0.031852782 0.033500535 0.045810134 0.013862431
      0.015203414 0.033726876 0.038868807 0.018538749 0.011877807
      0.022798977 0.016248423 0.024954556 0.045570018 0.211786159
      0.21243818  0.070312746 0.034936237 0.018138178 0.013087157
      0.0213321   5.79e-05    0.000231745 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2010  1     1     0     1     20    0     0     0     0     0     0
      0     0     0     0.007098587 0     0.007098587 0.007098587 0
      0     0.002310985 0.001155492 0.002149295 0.002149295 0
      0.003123378 0.00567887  0.00567887  0.006672672 0.004543096
      0.00567887  0.031375756 0.158434865 0.356247676 0.160042722
      0.118465282 0.105485008 0     0.006246757 0.00326535  0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
#Triennial
1980  1     2     3     0     54    0     0     0     0     0
      0.0006      0.0016      0.0044      0     0.0014      0.0016
      0.004 0.0059      0.0141      0.0011      0.0071      0.0084
      0.0103      0.0305      0.0339      0.0402      0.044 0.0434
      0.0171      0.0151      0.0348      0.0378      0.0692
      0.0327      0.0365      0.0226      0.0096      0.0094
      0.0058      0     0     0     0     0     0     0     0     0
      0.001 0.003 0.0016      0.0028      0.0023      0.0078      0.009
      0.0147      0.0066      0.0059      0.0056      0.0079
      0.0074      0.0132      0.0227      0.0171      0.0368
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```
      0.0272      0.042 0.0541      0.0356      0.0414      0.0513
      0.0366      0     0.0036      0     0     0     0     0
1983  1     2     3     0     210   0     0     0     0     0
      0.0006      0.0011      0.0019      0.001 0.0019      0.0043
      0.0205      0.038 0.0223      0.0293      0.031 0.0442
      0.0396      0.0352      0.034 0.0398      0.0232      0.0151
      0.005 0.0062      0.0061      0.004 0.0072      0.0075      0.009
      0.0205      0.0212      0.011 0.0044      0.0013      0.0001
      0     0     0     0     0     0.0001      0.0012      0.0013
      0.0043      0.002 0.0017      0.0055      0.0207      0.0315
      0.0316      0.026 0.0377      0.0656      0.0553      0.0402
      0.0369      0.0365      0.0256      0.0112      0.0053
      0.0074      0.0036      0.0043      0.0063      0.0216
      0.0197      0.0085      0.0015      0.0006      0     0     0
      0
1986  1     2     3     0     168   0     0     0     0     0.0005
      0.0003      0.0004      0.0044      0.0125      0.009 0.0057
      0.0029      0.0082      0.0173      0.0148      0.0073
      0.0063      0.0105      0.0169      0.0201      0.0325
      0.0332      0.0256      0.0458      0.0418      0.0375
      0.0304      0.0492      0.0233      0.0116      0.0092
      0.0096      0.007 0.0036      0.002 0.0008      0     0.0007
      0.0003      0     0     0.0007      0.0001      0.003 0.0052
      0.0097      0.0082      0.0047      0.0026      0.0032
      0.0106      0.0163      0.0069      0.0061      0.0153
      0.0148      0.0197      0.0424      0.0378      0.0378      0.064
      0.0412      0.0459      0.0343      0.0282      0.0184
      0.0048      0.0096      0.0056      0.0016      0     0     0
      0
1989  1     2     3     0     416   0     0     0     0.0002
      0.0002      0.0005      0.0061      0.0384      0.0657
      0.0285      0.0049      0.015 0.0332      0.0615      0.0318
      0.0374      0.0136      0.0204      0.0206      0.0175
      0.0168      0.0141      0.0097      0.0087      0.0086
      0.0101      0.0033      0.0097      0.0088      0.0071
      0.0055      0.0047      0.0004      0.0008      0.0002      0
      0     0     0     0     0.0008      0.0003      0.0018
      0.0083      0.0378      0.0647      0.0453      0.0079
      0.0139      0.0419      0.0571      0.0333      0.0246
      0.0157      0.0177      0.0125      0.0172      0.011 0.0151
      0.0111      0.0114      0.012 0.0053      0.0069      0.0105
      0.0039      0.0033      0.0028      0.0009      0.0005
      0.0002      0     0     0
1992  1     2     3     0     135   0     0     0     0     0.0002
      0.0016      0     0.0015      0.0022      0.0035      0.0014
      0.0004      0.0021      0.019 0.0399      0.0247      0.0061
      0.0108      0.0161      0.0287      0.025 0.0466      0.0958
      0.0707      0.0447      0.0256      0.0084      0.0078
      0.0005      0.0007      0.0004      0.0002      0.0006
      0.0007      0     0     0     0     0     0     0     0.0002
      0     0.0013      0.0015      0.0016      0.0048      0.0025
      0.0011      0.0038      0.0179      0.0288      0.0287
      0.0109      0.007 0.0312      0.0263      0.0188      0.0929
      0.111 0.0769      0.0313      0.0085      0.0031      0.0016
      0.0009      0.0013      0.0002      0     0     0     0     0
      0
```

```
1995  1     2     3     0     275   0     0     0.0004      0
      0.0003      0.0006      0.0007      0.0082      0.023 0.0121
      0.002 0.0006      0.0056      0.0132      0.0085      0.0089
      0.0096      0.0264      0.0454      0.0386      0.0243
      0.0237      0.0172      0.0134      0.0164      0.0086
      0.0083      0.0215      0.0327      0.0337      0.03  0.037
      0.0262      0.0101      0.0043      0     0     0     0
      0.0004      0     0.0003      0.0013      0.0027      0.0107
      0.0239      0.0122      0.0017      0.0016      0.005 0.0108
      0.0195      0.0121      0.0111      0.0287      0.047 0.0403
      0.024 0.0162      0.0141      0.0108      0.0093      0.0147
      0.0147      0.0529      0.0599      0.0354      0.0055
      0.0011      0.0008      0     0     0     0
1998  1     2     3     0     318   0     0     0     0     0.0003
      0.0022      0.0093      0.0078      0.0032      0.0009
      0.0067      0.0116      0.0079      0.0155      0.0246
      0.0465      0.0765      0.0818      0.0362      0.0321
      0.0294      0.0271      0.0189      0.0111      0.0055
      0.0036      0.0034      0.0064      0.0047      0.0013
      0.0003      0.0029      0.0004      0.0003      0.0003      0
      0     0     0     0     0     0     0.007 0.0129      0.0106
      0.0012      0.0016      0.0061      0.0139      0.0107
      0.0105      0.0327      0.0535      0.0817      0.0745
      0.0525      0.0337      0.0293      0.0277      0.0181
      0.0084      0.0075      0.0084      0.0064      0.0087
      0.0008      0.0016      0.0003      0     0     0     0     0.001
      0
2001  1     2     3     0     395   0     0     0.0009      0.0016
      0.0005      0.0023      0.0143      0.0359      0.0226
      0.0063      0.003 0.0117      0.0386      0.0867      0.0836
      0.0232      0.0022      0.0044      0.0039      0.0076      0.009
      0.0093      0.0049      0.0111      0.0045      0.0246
      0.0304      0.1062      0.0068      0.0043      0.0064
      0.0017      0.0016      0.0002      0.0006      0     0     0
      0     0.0009      0.0016      0.0003      0.0024      0.0113
      0.0307      0.0198      0.0076      0.0025      0.011 0.0422
      0.0774      0.0761      0.0275      0.0043      0.0015
      0.0045      0.0064      0.0071      0.0083      0.0042
      0.0059      0.0066      0.0224      0.0149      0.0225
      0.0044      0.0033      0.0004      0.0007      0     0     0
      0     0
#AFSC
1997  1     3     3     0     42    0     0     0     0     0     0
      0     0     0     0     0     0.0099      0.0396      0.0556
      0.0545      0.0484      0.039 0.0366      0.085 0.1285      0.03
      0.0226      0.0009      0.0009      0.0004      0     0.0009
      0.0084      0.0003      0     0     0.0008      0.0005      0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0.0099      0.0198      0.0561      0.1236
      0.0567      0.0178      0.0315      0.0533      0.0232
      0.0138      0.0164      0     0.0033      0.0009      0.0032
      0.0021      0.0038      0.0013      0.0004      0     0.0001
      0     0     0     0     0
1999  1     3     3     0     42    0.0014      0     0     0     0
      0     0     0     0     0.0034      0     0.0034      0.0005
      0.0014      0.0014      0.0018      0.0005      0.0034
      0.0189      0     0.0098      0.0772      0.116 0.113 0.0734
```

```
      0.0615      0.0199      0.0194      0.0001      0.0011
      0.0004      0.0001      0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.0005      0     0.0152      0     0     0.0015      0.0028
      0.0074      0.0277      0.1335      0.1448      0.0736
      0.0469      0.0092      0.0058      0.0005      0.0024
      0.0005      0     0     0     0     0     0     0
2000  1     3     3     0     36    0     0     0     0     0     0
      0     0     0     0.0001      0.0006      0     0     0.0007
      0.0101      0.01  0.0366      0.0676      0.0821      0.0756
      0.0131      0.026 0.0282      0.021 0.0385      0.0448
      0.0022      0.0034      0     0.0002      0.0002      0
      0.0002      0.0002      0.0003      0     0     0     0     0
      0     0     0     0     0     0.0007      0.0006      0.0019
      0.0007      0     0     0     0.0299      0.0533      0.1108
      0.1628      0.0624      0.0239      0.0041      0.0416
      0.0169      0.0173      0.0078      0     0.0027      0.0002
      0.0005      0     0     0     0.0001      0     0     0
2001  1     3     3     0     37    0     0     0     0     0     0
      0     0     0     0     0     0     0     0.003 0.0162
      0.0138      0.0121      0.0074      0.0013      0.0101
      0.0068      0.0126      0.0159      0.0213      0.0238
      0.0368      0.1106      0.1632      0.0754      0.0084
      0.0008      0.0058      0.0006      0.0039      0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.0014      0     0.0037      0.0106      0.0135      0.0053
      0.0034      0.0042      0.0101      0.0129      0.0261
      0.0185      0.0104      0.0163      0.1051      0.1296      0.064
      0.0046      0.0008      0.0058      0.0039      0     0     0
      0     0
#NWFSC Slope and Shelf
2000  1     4     3     0     46    0     0     0     0     0     0
      0     0     0.000719347 0     0.002472138 0.001406115 0.001406115
      0.002819034 0     0.00071448  0.013552271 0.013446374 0.016939868
      0     0.010745129 0.022304662 0.073931755 0.061157049 0.1028647
      0.023696561 0.0115264   0.004181701 0     0.020293282 0.039464483
      0.059196724 0.039909532 0.032887032 0     0     0     0     0
      0     0     0     0     0     0     0.002125462 0.00070917
      0.006690594 0.002812286 0     0.000698439 0.001406115 0
      0.001373314 0.002095344 0.008094524 0.012508235 0.002230945
      0.025701386 0.049054231 0.062974307 0.035100691 0.021124224
      0.002457977 0.033610445 0.119811842 0.027476135 0.013154791
      0.006577395 0.006577395 0     0     0     0
2001  1     4     3     0     79    0     0     0     0     0     0
      0     0     0.001230496 0     0.000717904 0.006849279 0.00949804
      0.027383138 0.061277025 0.018617255 0.010225538 0.002640537
      0.007275526 0.006000075 0.008308387 0.011524563 0.005988288
      0.013767361 0.011677244 0.01628674  0.057666125 0.061119135
      0.016837983 0.026615893 0.047780213 0.014559002 0.004852909 0
      0     0     0     0     0     0     0     0     0     0
      0.004068122 0     0     0.001973619 0.007672991 0.005199115
      0.02290083  0.049420236 0.032377764 0.016325665 0.004542887
      0.002786092 0.002769371 0.018230207 0.01827242  0.004205179
      0.011811012 0.025400473 0.034766939 0.052916008 0.060207707
      0.099753544 0.066273569 0.007931206 0     0.001496387 0     0
      0     0
```

```
2002  1     4     3     0     123   0     0     0     0     0     0
      0     0     0.001044436 0     0.001068986 0.004077679 0.019285241
      0.011193339 0.010209487 0.003424601 0.02519036  0.070657637
      0.097064281 0.079620477 0.056097769 0.012345736 0.01589208
      0.023109528 0.017606678 0.016315885 0.014008219 0.019262343
      0.006875332 0.005770886 0.001066832 0.001565721 0.000478359
      0.002972802 0.000997777 0     0     0     0     0     0     0
      0     0     0     0.000497453 0.001044436 0     0.00256436
      0.009344938 0.015279632 0.00461289  0.003429626 0.020434336
      0.055651928 0.087920621 0.065948487 0.066459435 0.020870487
      0.019036012 0.023715372 0.01889618  0.013316523 0.013919496
      0.01829055  0.006051125 0.009022778 0.004658974 0.00183189  0
      0     0     0     0
2003  1     4     3     0     187.1594    0     0     0     0     0
      0     0     0     0     0     0     0     0.059886393 0.019961129
      0.032416177 0.259596847 0.584645045 1.409220281 1.918125415
      1.2793242   1.125596761 2.410771378 2.64783796  1.705223728
      0.574566823 0.830533827 2.634424369 7.987150117 13.9799962
      7.568924942 4.151428139 2.474852523 3.119711488 3.0111828
      0.855564116 0.246624968 0     0     0     0     0     0     0
      0     0     0     0.019961129 0     0     0.019961129 0.059886393
      0.020724358 0.235942773 0.703077674 1.541829729 1.832758007
      1.26250613  2.170114016 2.361504077 1.850225122 1.554651367
      0.57957889  0.942827575 1.787270791 10.5875387  8.267254974
      1.803896552 1.193944774 0.259879302 0.011971269 0.026223209
      0.018906432 0     0
2004  1     4     3     0     92.3799     0     0     0     0     0
      0     0     0     0     0     0.214326928 0.214326928 0.642968557
      0.321667683 0.913136154 3.867238352 0.863702428 1.216732344
      2.867021567 3.394555101 3.269949834 4.68282757  4.964133955
      3.77560928  3.181108516 2.259095567 2.225018943 1.945509925
      1.246920785 0.627440278 0.487918082 0.376603555 0.131574652
      0.245028903 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.214326928 0.225233404 0.81505123
      0.601445695 2.091182297 1.874287701 5.770773016 6.362278167
      4.041962055 3.170373218 5.208844956 6.065052239 5.036664467
      3.298719944 1.440253969 2.000604747 1.601968154 2.759631904
      2.471343907 0.588130502 0.254089103 0.173366508 0     0     0
      0
2005  1     4     3     0     121.3261    0     0     0     0     0
      0     0     0.040484114 0.040484114 0.040484114 0.05330201  0
      0.115098931 0     0.129009791 0.075067997 0.212235035 0.129574045
      0.119253084 0.22791863  0.322340096 0.796606692 1.058438321
      0.711191076 1.593635464 2.820412524 3.43335676  5.743439303
      12.57850128 11.66605369 4.368570004 0.419609488 0.553333244
      0.221707394 0.631768993 0.033064396 0     0     0     0     0
      0     0     0     0     0     0.040484114 0.121447899 0.264875046
      0.242891355 0.207432212 0.126939379 0.099655254 0.231233067
      0.536418953 0.333740692 0.365632151 0.617644871 0.965691846
      1.692228854 1.998778723 2.193424139 2.765928691 8.078735559
      19.25726935 8.06496243  3.233113233 0.334744798 0.061743605
      0.030043193 0     0     0     0
2006  1     4     3     0     146.1031    0     0     0     0     0
      0     0     0     0     0     0.160473795 0.201802715 0.686336739
      0.20570432  1.016071049 1.227384602 1.678468573 1.458303454
      0.738116774 1.397131466 0.788221604 1.127045249 1.838175017
      1.180078985 5.023117283 3.77143681  3.80839939  7.004343968
```

```
      5.190464822 5.202774874 4.1352156   1.692950988 1.458433148
      0.552677026 0     0     0     0     0     0     0     0
      0     0     0     0     0     0.074108891 0.553617302 0.536876063
      0.977238725 1.060588261 1.911721904 1.26445526  1.068942668
      0.50861374  0.803655102 1.832814362 2.217873655 3.245833253
      4.504506354 4.636523287 3.893964519 9.812667811 5.448392295
      3.566521457 0.463815526 0.074141314 0     0     0     0     0
2007  1     4     3     0     140.9318    0     0     0     0     0
      0     0     0     0     0     0.088089872 0.071968357 0.219061466
      0.141019247 0.612303206 1.115628992 1.841587625 1.782848468
      1.439027598 1.23242824  1.560253347 2.249529873 1.749901221
      2.486951255 1.584750002 3.812612659 3.562226157 6.505735713
      3.626511015 2.428639658 1.594508423 1.901747789 1.23266717
      0.924195427 0.291960394 0.073854649 0     0     0     0     0
      0     0     0     0     0     0     0.088089872 0.088089872
      0.165792559 0.372932655 1.09723135  1.710012417 1.615848682
      1.411626052 1.503765166 2.582535997 1.709698035 1.64047109
      1.520854979 3.514704155 4.546041011 4.182451793 5.00828334
      10.19507285 6.111965811 4.158671929 2.115892318 0.149117731
      0.08422926  0.296613249 0     0     0
2008  1     4     3     0     139.891     0     0     0     0     0
      0     0     0     0.088986442 0.088986442 0.088986442 0.104451624
      0.072405701 0.285465877 2.678541233 3.86274904  2.560209697
      2.945641473 2.644898299 3.131235392 2.785576258 1.579844019
      1.595755424 1.42503955  1.557368425 1.697928957 1.873377154
      7.078414693 4.316194734 1.934181034 1.504819688 0.867142232
      0.952476684 0.370448046 0.307154707 0     0     0     0     0
      0     0     0     0     0.088986442 0     0.1518453   0.335031959
      0.078535409 0.104451624 0.417031474 2.692151062 2.686620234
      2.564742393 3.378783979 4.132409196 2.926172019 2.407295808
      1.396704331 1.833968537 0.917659476 2.919549117 2.422514392
      4.048965324 8.047295977 5.956079355 1.116393515 0.799774164
      0.178759648 0     0     0     0     0
2009  1     4     3     0     163.0507    0     0     0     0     0
      0.108545223 0     0.160338986 0     0.133144683 0.100227977
      0.23540901  0.126674759 0.212699834 0.645505976 0.751241551
      0.435469723 1.365712512 1.358495066 1.543682686 1.632878282
      2.702082671 3.163406315 2.44230619  2.503405302 2.201527057
      3.053503524 5.038584549 8.106600294 4.596790969 2.386078854
      1.94950933  2.033231696 1.488821509 0.28886966  0     0     0
      0     0     0     0     0     0.05932912  0     0.059200237 0
      0.022932574 0.044851268 0.073944446 0.514818661 0.733515849
      0.879282469 0.686121291 1.824071847 1.32197823  2.566712609
      2.151417365 1.92979883  2.975855841 2.36889446  3.905454215
      2.800764053 4.359311239 9.959834057 5.117838973 2.571696083
      1.845526563 0.325979358 0.086858518 0.049267657 0     0     0
2010  1     4     3     0     121.1344    0     0     0     0     0
      0     0     0     0     0     0.151268146 0.445201174 0.34679689
      0.633631631 0.838462803 1.280748821 1.7680183   2.786663802
      2.19948506  5.387480496 4.427576568 5.235619839 5.001566007
      2.433064882 2.641036364 2.243461252 0.972524419 2.505931927
      3.585084688 4.073468089 1.700957866 1.001095316 1.196884765
      0.368174699 0     0     0     0     0     0     0     0     0
      0     0     0     0     0.085357184 0.484650579 0.479673484
      1.194123662 0.973282834 1.2326606   1.595881904 2.120301844
      2.630335609 4.662009607 3.924013027 5.876764514 3.659788518
      3.844450604 3.266929797 1.755788865 1.348496568 2.422447079
```

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      3.449103335 0.820414907 0.864023742 0.085297933 0     0     0
      0     0
2003  1     5     3     0     80.7531     0     0     0     0     0
      0     0     0.101899283 0.328826032 0.282074766 0.113298409
      0.239761077 0.2895972   0.356408289 0.816200551 2.390269798
      6.757817887 8.237477292 10.93827843 5.888663363 2.710913534
      2.202439908 2.442349454 2.593144555 1.647891376 0.27931984
      0.582048306 0.083010716 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.345025659 0.718590375 0.608162368 0.810179304 1.490332683
      1.010975495 1.328814814 2.255525854 2.5761201   6.768474668
      9.820817609 7.719666611 4.554536654 2.357837551 2.765170736
      3.595888264 1.445528012 0.255267848 0     0.291395326 0     0
      0     0     0     0     0     0     0
2004  1     5     3     0     72.7035     0     0     0     0
      0.241958655 0.1993424   0.069000045 0.577869342 0.487118758
      0.518602341 0.419791832 1.16732181  1.525883945 0.727010147
      1.146013683 0.918356972 0.857875352 1.877705344 2.353240975
      9.039174779 9.823127258 7.081344762 2.918199956 1.629512714
      2.182478332 0.37822932  0.334478883 0.167247485 0.083623743 0
      0     0     0     0     0     0     0     0     0     0.055526616
      0.091353871 0.231429271 0     0.091353871 0.859540427 0.655436074
      0.966941755 0.208335411 0.367064472 0.932514127 1.891605096
      0.38508267  0.225114858 0.500463486 2.633657221 3.677578509
      9.608775055 15.56720804 6.000671178 2.282077138 3.189052079
      1.974762297 0.334478883 0.167239442 0.37822932  0     0     0
      0     0     0     0     0     0
2005  1     5     3     0     128.872     0     0     0     0     0
      0.402328574 0.79693333  1.396909311 1.50460693  1.196876963
      1.385965218 3.268663915 3.535619874 1.98394366  1.644253068
      1.274720453 2.335861612 0.864280661 0.261241786 0.946567163
      0.958189208 4.536943819 4.939066585 5.637151998 4.201877832
      0.534299319 0.724767692 0.127334034 0.063667017 0     0     0
      0     0     0     0     0     0     0     0.080518982 0.201182446
      0     0.511648437 0.768023492 2.192571479 2.907036713 1.505514903
      1.683320089 3.712141793 5.450775554 2.901637304 1.366946225
      1.262129904 2.145732215 1.56139757  1.077956806 1.071661531
      2.103372282 7.574655903 7.009110231 4.701080995 2.187172071
      0.968043734 0.334981243 0.199318076 0     0     0     0     0
      0     0     0     0
2006  1     5     3     0     118.9237    0     0     0     0     0
      0.176123618 1.546015764 1.13782704  1.053084893 1.376894558
      1.221272445 3.094417535 5.359671737 3.960512105 3.27514459
      7.642029978 6.100877    3.925007284 2.087807907 1.167470582
      1.500370415 0.587476394 0.882446497 0.731959486 1.9379563
      1.334957893 0.785981795 0.602985439 0     0     0.109458067 0
      0     0     0     0     0     0     0     0     0.293141695
      0.101962893 0.360235172 1.271962124 1.34223262  2.171395953
      1.126519442 1.046367765 1.97466709  5.356663294 4.263859166
      3.087350286 5.887588731 6.426541007 4.061256059 1.942741281
      1.231672322 0.696701047 0.883354217 0.182983388 1.52858754
      0.96897815  1.592491029 0.484489075 0.118509332 0     0     0
      0     0     0     0     0     0
2007  1     5     3     0     138.5484    0     0     0     0     0
      0.065919188 0.793734057 0.584624986 0.604769443 0.309976601
      2.955134842 2.002803688 4.39304461  3.53752528  3.801626595
      3.678592342 4.947514361 3.172400016 1.95451509  1.69821235
```

```
      2.395291001 1.814051356 0.153189489 0.831855459 0.683671359
      1.067734423 1.257168293 0.70399458  0     0     0     0     0
      0     0     0     0     0     0     0     0.09972791  0
      0.080410236 0.281687214 0.55454796  0.320791817 0.377795155
      2.748159765 2.979837778 5.330035586 2.576557595 4.471656034
      3.379084601 6.295986315 3.520687955 2.354599869 2.307383854
      2.842960496 2.864367472 2.689435824 1.911365954 4.360152052
      2.482661857 1.367331545 0.242236256 0.153189489 0     0     0
      0     0     0     0     0
2008  1     5     3     0     87.5519     0     0     0     0     0
      0.114538916 0.110108257 0.043886066 0.317349708 0.698404603
      0.959411209 1.554502856 0.608316583 0.791381388 3.666604361
      3.074962167 4.438958906 5.244954763 6.756187091 8.878649145
      3.927306244 3.988628505 3.151173146 0     0.776133098 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.171960734 0.11133324  0.133638892 0     0.105543521
      0.151416375 0.467077924 0.964067361 0.992906254 0.621785297
      0.88243233  1.764943888 5.442993609 4.27763297  3.270453537
      3.535683589 5.027645296 7.57316513  8.957261334 3.202134858
      2.375040048 0     0.822779946 0     0     0.046646848 0     0
      0     0     0     0     0     0     0
2009  1     5     3     0     125.4179    0     0     0     0     0
      0.093313797 1.038601275 1.974954951 2.364312033 1.231543338
      1.236431203 0.933418618 3.579765172 3.727909596 4.284798855
      3.421903485 3.553712147 3.457942723 3.214555081 3.239473841
      1.777464133 1.118315581 0.422905614 0.128721589 0.269651149 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.134427997 0     1.737788229 4.381608996
      3.551396842 2.046741092 1.999990645 1.181413482 7.039812718
      7.526728322 5.619431721 4.808256517 4.077333517 2.385500579
      2.605653319 4.489960581 3.203504763 1.107253569 0.854288985
      0.089887614 0     0     0     0     0.089326328 0     0     0
      0     0     0     0     0
2010  1     5     3     0     154.1629    0     0     0     0     0
      0.141392361 0.028646942 0.317278195 0.206854351 0.297725859
      1.374297112 4.201739647 8.195432208 7.125314504 3.617054494
      2.197720981 2.37444812  1.871997795 1.480557033 3.000591469
      2.013922627 1.722085898 1.963817102 1.150137452 1.719327698
      1.141223887 0.652074688 0.326032019 0     0     0     0     0
      0     0     0     0     0     0     0.677931482 0.297140141 0
      0     0.030073964 0.267928779 0.396414042 0.642607353 1.455573492
      4.21105789  8.243109665 7.29401198  6.221806989 2.697029727
      2.926801632 2.601632215 2.131875612 2.884523431 2.150618593
      2.339219836 2.291063155 1.150637975 1.23568425  0.570564021 0
      0.163021334 0     0     0     0     0     0     0     0     0
#
#
31 # Number of Age Bins
0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  17  18  19
20  21  22  23  24  25  26  27  28  29  30

1 # Number of Aging Error Matrices
0.5  1.5  2.5  3.5  4.5  5.5  6.5  7.5  8.5  9.5  10.5  11.5  12.5
13.5  14.5  15.5  16.5  17.5  18.5  19.5  20.5  21.5  22.5  23.5  24.5
25.5  26.5  27.5  28.5  29.5  30.5  31.5  32.5  33.5  34.5  35.5  36.5
37.5  38.5  39.5  40.5  41.5  42.5  43.5  44.5  45.5
```

```
0.05  0.1   0.158113883  0.324442842  0.376192055  0.484366512
0.719693812  0.737838276  0.758854932  0.781541625  0.83763068
0.907620383  0.977610085  1.047599788  1.117589491  1.187579194
1.257568896  1.327558599  1.397548302  1.467538004  1.537527707
1.60751741  1.677507113  1.747496815  1.817486518  1.887476221
1.957465924  2.027455626  2.097445329  2.167435032  2.237424735
2.307414437  2.37740414  2.447393843  2.517383546  2.587373248
2.657362951  2.727352654  2.797342356  2.867332059  2.937321762
3.007311465  3.077301167  3.14729087  3.217280573  3.5

1003   # Number of age comp observations using restricted length ranges
***
2   # Length bin refers to: 1=population length bin indices; 2=data
length bin indices; 3= actual pop? data? lengths match bins?
0 #_combine males into females at or below this bin number
#Year Seas  Fleet Gender      Part
1991  1     1     1     0     1     11    15    0.1   0     0     0
      1     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     1     0     1     16    19    0.3   0     0     0
      0.8   0.2   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     1     0     1     20    22    1.4   0     0     0
      0     0.95  0.05  0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     1     0     1     23    25    1.4   0     0     0
      0     0.047619048 0.571428571 0.285714286 0     0     0     0
      0.047619048 0     0     0     0     0     0     0     0     0
      0     0     0.047619048 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
1991  1     1     1     0     1     26    27    1     0     0     0
      0     0     0     0.357142857 0.285714286 0.142857143 0.071428571
      0.071428571 0     0.071428571 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
1991  1     1     1     0     1     27    28    1.7   0     0     0
      0     0     0.041666667 0.125 0.583333333 0.083333333 0     0
      0.083333333 0     0     0.041666667 0     0     0     0.041666667
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
1991  1     1     1     0     1     28    29    2.8   0     0     0
      0     0     0     0     0.125 0.25  0.275 0.15  0     0.1   0
      0     0     0     0.025 0     0.025 0     0     0     0     0
      0     0.025 0     0     0     0.025 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     1     0     1     29    30    4.1   0     0     0
      0     0     0     0.016949153 0     0.06779661  0.220338983
      0.152542373 0.050847458 0.118644068 0.050847458 0.033898305 0
      0     0.050847458 0     0     0.016949153 0.050847458 0.016949153
      0.033898305 0.016949153 0     0     0     0.016949153 0
      0.084745763 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
1991  1     1     1     0     1     30    31    2.6   0     0     0
      0     0     0     0     0     0     0.078947368 0.026315789
      0.105263158 0.131578947 0.052631579 0.052631579 0     0.078947368
      0     0.052631579 0     0.026315789 0.078947368 0.026315789
      0.026315789 0     0.026315789 0     0.026315789 0.052631579 0
      0.157894737 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
1991  1     1     1     0     1     31    32    3.9   0     0     0
      0     0     0     0     0     0     0.01754386  0     0.01754386
      0.01754386  0.122807018 0.105263158 0.035087719 0.035087719
      0.052631579 0.035087719 0.052631579 0.070175439 0.01754386
      0.01754386  0.01754386  0.01754386  0.01754386  0.01754386
      0.01754386  0.035087719 0.01754386  0.263157895 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
1991  1     1     1     0     1     32    33    1.7   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.04  0.04  0.04  0.08  0.12  0.04  0.08  0.08  0     0     0
      0.08  0.04  0     0.08  0     0.28  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     1     0     1     33    34    1.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.05  0     0     0.05  0.05  0     0.1   0.05  0.1
      0.05  0.05  0     0     0.2   0.3   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     1     0     1     34    35    0.5   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.142857143 0     0     0.142857143
      0     0     0.285714286 0     0     0     0     0.428571429 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
1991  1     1     1     0     1     35    36    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.5   0.5   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     2     0     1     11    15    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     1     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     2     0     1     16    19    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.8   0.2
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     2     0     1     20    22    1.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0.95
      0.05  0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1991  1     1     2     0     1     23    25    1.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.047619048 0.571428571 0.285714286 0     0     0     0
      0.047619048 0     0     0     0     0     0     0     0     0
      0     0     0.047619048 0     0     0     0     0     0     0
1991  1     1     2     0     1     26    27    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.357142857 0.285714286 0.142857143 0.071428571 0.071428571
      0     0.071428571 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
1991  1     1     2     0     1     27    28    1.7   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.041666667 0.125 0.583333333 0.083333333 0     0     0.083333333
      0     0     0.041666667 0     0     0     0.041666667 0     0
      0     0     0     0     0     0     0     0     0     0
1991  1     1     2     0     1     28    29    2.8   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.125 0.25  0.275 0.15  0     0.1   0     0     0
      0     0.025 0     0.025 0     0     0     0     0     0     0.025
      0     0     0     0.025
1991  1     1     2     0     1     29    30    4.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0.016949153 0     0.06779661  0.220338983 0.152542373
      0.050847458 0.118644068 0.050847458 0.033898305 0     0
      0.050847458 0     0     0.016949153 0.050847458 0.016949153
      0.033898305 0.016949153 0     0     0     0.016949153 0
      0.084745763
1991  1     1     2     0     1     30    31    2.6   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.078947368 0.026315789 0.105263158
      0.131578947 0.052631579 0.052631579 0     0.078947368 0
      0.052631579 0     0.026315789 0.078947368 0.026315789 0.026315789
      0     0.026315789 0     0.026315789 0.052631579 0     0.157894737
1991  1     1     2     0     1     31    32    3.9   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.01754386  0     0.01754386  0.01754386
      0.122807018 0.105263158 0.035087719 0.035087719 0.052631579
      0.035087719 0.052631579 0.070175439 0.01754386  0.01754386
      0.01754386  0.01754386  0.01754386  0.01754386  0.01754386
      0.035087719 0.01754386  0.263157895
1991  1     1     2     0     1     32    33    1.7   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.04  0.04
      0.04  0.08  0.12  0.04  0.08  0.08  0     0     0     0.08  0.04
      0     0.08  0     0.28
1991  1     1     2     0     1     33    34    1.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.05  0     0     0.05  0.05  0     0.1   0.05  0.1   0.05  0.05
      0     0     0.2   0.3
1991  1     1     2     0     1     34    35    0.5   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0.142857143 0     0     0.142857143 0     0
      0.285714286 0     0     0     0     0.428571429
1991  1     1     2     0     1     35    36    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.5   0.5
1998  1     1     1     0     1     16    19    1     0     0     0
      0.785714286 0.214285714 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
1998  1     1     1     0     1     20    22    3.3   0     0     0
      0.020833333 0.8125      0.145833333 0.020833333 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
1998  1     1     1     0     1     23    25    2.6   0     0     0
      0     0.243243243 0.594594595 0.081081081 0     0.027027027 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0.027027027 0     0
      0.027027027 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
1998  1     1     1     0     1     26    27    1.9   0     0     0
      0     0     0.142857143 0.428571429 0.25  0.035714286 0.071428571
      0.035714286 0     0     0     0     0     0.035714286 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
1998  1     1     1     0     1     27    28    3.7   0     0     0
      0     0     0.092592593 0.444444444 0.185185185 0.074074074
      0.055555556 0.074074074 0.037037037 0     0     0.018518519 0
      0     0     0.018518519 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0
1998  1     1     1     0     1     28    29    0     0     0     0
      0     0     0.076923077 0.05982906  0.196581197 0.153846154
      0.213675214 0.076923077 0.034188034 0.034188034 0     0.025641026
      0.025641026 0.025641026 0.017094017 0.008547009 0.008547009 0
      0.008547009 0.025641026 0     0     0     0     0.008547009 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
1998  1     1     1     0     1     29    30    0     0     0     0
      0     0     0.032520325 0.016260163 0.040650407 0.130081301
      0.162601626 0.048780488 0.073170732 0.073170732 0.016260163
      0.06504065  0.032520325 0.073170732 0.024390244 0.016260163
      0.040650407 0.032520325 0.024390244 0.024390244 0.016260163 0
      0.008130081 0     0.008130081 0.016260163 0     0.024390244 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
1998  1     1     1     0     1     30    31    0     0     0     0
      0     0     0.0078125   0.015625    0.0234375   0.03125
      0.1015625   0.1328125   0.0859375   0.046875    0.046875
      0.03125     0.046875    0.0703125   0.09375     0.0234375
      0.0390625   0.0234375   0.0234375   0.0078125   0.0234375   0
      0.015625    0.015625    0     0.015625    0.0234375   0.0546875
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
```

```
1998  1     1     1     0     1     31    32    0     0     0     0
      0     0     0     0     0     0.010416667 0     0.020833333
      0.083333333 0.052083333 0.03125     0.0625      0.114583333
      0.083333333 0.072916667 0.052083333 0.03125     0.03125
      0.020833333 0.020833333 0.041666667 0.020833333 0.020833333 0
      0.041666667 0     0.041666667 0.145833333 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
1998  1     1     1     0     1     32    33    5.3   0     0     0
      0     0     0     0     0.038961039 0.012987013 0.012987013
      0.025974026 0     0.025974026 0.025974026 0.051948052 0.051948052
      0.064935065 0.064935065 0.103896104 0.025974026 0.038961039
      0.025974026 0.051948052 0.064935065 0.051948052 0.012987013
      0.012987013 0     0.025974026 0     0.207792208 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
1998  1     1     1     0     1     33    34    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.045454545 0.022727273 0.090909091 0     0.068181818
      0.022727273 0     0.068181818 0.022727273 0.045454545 0.022727273
      0     0.045454545 0.159090909 0     0.386363636 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
1998  1     1     1     0     1     34    35    0.8   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.090909091 0     0     0.090909091 0     0     0.818181818 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
1998  1     1     1     0     1     35    36    0.5   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.142857143 0     0     0     0     0     0.142857143
      0.142857143 0     0     0     0     0     0     0.571428571 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
1998  1     1     1     0     1     36    37    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
1998  1     1     2     0     1     16    19    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.785714286
      0.214285714 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
1998  1     1     2     0     1     20    22    3.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0.020833333
      0.8125      0.145833333 0.020833333 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
1998  1     1     2     0     1     23    25    2.6   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.243243243 0.594594595 0.081081081 0     0.027027027 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.027027027 0     0     0.027027027
1998  1     1     2     0     1     26    27    1.9   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.142857143 0.428571429 0.25  0.035714286 0.071428571 0.035714286
      0     0     0     0     0     0.035714286 0     0     0     0
      0     0     0     0     0     0     0     0     0     0
1998  1     1     2     0     1     27    28    3.7   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.092592593 0.444444444 0.185185185 0.074074074 0.055555556
      0.074074074 0.037037037 0     0     0.018518519 0     0     0
      0.018518519 0     0     0     0     0     0     0     0     0
      0     0     0
1998  1     1     2     0     1     28    29    0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.076923077 0.05982906  0.196581197 0.153846154 0.213675214
      0.076923077 0.034188034 0.034188034 0     0.025641026 0.025641026
      0.025641026 0.017094017 0.008547009 0.008547009 0     0.008547009
      0.025641026 0     0     0     0     0.008547009 0     0     0
1998  1     1     2     0     1     29    30    0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.032520325 0.016260163 0.040650407 0.130081301 0.162601626
      0.048780488 0.073170732 0.073170732 0.016260163 0.06504065
      0.032520325 0.073170732 0.024390244 0.016260163 0.040650407
      0.032520325 0.024390244 0.024390244 0.016260163 0     0.008130081
      0     0.008130081 0.016260163 0     0.024390244
1998  1     1     2     0     1     30    31    0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.0078125   0.015625    0.0234375   0.03125     0.1015625
      0.1328125   0.0859375   0.046875    0.046875    0.03125
      0.046875    0.0703125   0.09375     0.0234375   0.0390625
      0.0234375   0.0234375   0.0078125   0.0234375   0     0.015625
      0.015625    0     0.015625    0.0234375   0.0546875
1998  1     1     2     0     1     31    32    0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0.010416667 0     0.020833333 0.083333333
```

```
      0.052083333 0.03125     0.0625      0.114583333 0.083333333
      0.072916667 0.052083333 0.03125     0.03125     0.020833333
      0.020833333 0.041666667 0.020833333 0.020833333 0     0.041666667
      0     0.041666667 0.145833333
1998  1     1     2     0     1     32    33    5.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.038961039 0.012987013 0.012987013 0.025974026 0
      0.025974026 0.025974026 0.051948052 0.051948052 0.064935065
      0.064935065 0.103896104 0.025974026 0.038961039 0.025974026
      0.051948052 0.064935065 0.051948052 0.012987013 0.012987013 0
      0.025974026 0     0.207792208
1998  1     1     2     0     1     33    34    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.045454545 0.022727273 0.090909091 0     0.068181818 0.022727273
      0     0.068181818 0.022727273 0.045454545 0.022727273 0
      0.045454545 0.159090909 0     0.386363636
1998  1     1     2     0     1     34    35    0.8   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.090909091 0
      0     0.090909091 0     0     0.818181818
1998  1     1     2     0     1     35    36    0.5   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.142857143 0     0     0     0     0     0.142857143 0.142857143
      0     0     0     0     0     0     0.571428571
1998  1     1     2     0     1     36    37    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     1
2003  1     1     1     0     1     11    15    2.6   0     0
      0.647058824 0.294117647 0.058823529 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     1     1     0     1     16    19    7.8   0     0     0
      0.762711864 0.220338983 0.016949153 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
```

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2003  1     1     1     0     1     20    22    3.9   0     0     0
      0.173913043 0.695652174 0.086956522 0.043478261 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     1     1     0     1     23    25    6.4   0     0     0
      0     0.648648649 0.054054054 0.189189189 0.108108108 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     1     1     0     1     26    27    13.5  0     0     0
      0     0.096153846 0.211538462 0.269230769 0.25  0.096153846
      0.057692308 0.019230769 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2003  1     1     1     0     1     27    28    18.4  0     0     0
      0     0.037037037 0.234567901 0.222222222 0.296296296 0.074074074
      0.024691358 0.037037037 0.012345679 0.012345679 0     0
      0.024691358 0.012345679 0     0     0     0     0.012345679 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2003  1     1     1     0     1     28    29    42.4  0     0     0
      0     0.025089606 0.078853047 0.150537634 0.365591398 0.150537634
      0.05734767  0.010752688 0.003584229 0.025089606 0.003584229
      0.021505376 0.003584229 0.017921147 0.025089606 0.014336918
      0.007168459 0.017921147 0.003584229 0.003584229 0     0.003584229
      0     0.007168459 0.003584229 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2003  1     1     1     0     1     29    30    46.6  0     0     0
      0     0.007672634 0.025575448 0.145780051 0.301790281 0.217391304
      0.076726343 0.043478261 0.046035806 0.002557545 0.007672634
      0.007672634 0.007672634 0.007672634 0.010230179 0.00511509
      0.017902813 0.012787724 0.010230179 0.00511509  0.002557545
      0.002557545 0.00511509  0.002557545 0.007672634 0     0
      0.020460358 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2003  1     1     1     0     1     30    31    43.8  0     0     0
      0     0.006896552 0.006896552 0.044827586 0.186206897 0.275862069
      0.075862069 0.089655172 0.062068966 0.031034483 0.037931034
      0.006896552 0.04137931  0.020689655 0.020689655 0.027586207
      0.013793103 0     0     0     0.003448276 0.003448276 0.020689655
      0.006896552 0.003448276 0     0     0.013793103 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
```

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2003  1     1     1     0     1     31    32    36.2  0     0     0
      0     0.005102041 0     0     0.06122449  0.030612245 0.06122449
      0.081632653 0.020408163 0.035714286 0.12755102  0.020408163
      0.06122449  0.076530612 0.081632653 0.066326531 0     0.015306122
      0.045918367 0.040816327 0.010204082 0.025510204 0.045918367 0
      0.005102041 0     0     0.081632653 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     1     1     0     1     32    33    29.4  0     0     0
      0     0.005882353 0     0     0     0.011764706 0.023529412
      0.023529412 0.023529412 0.035294118 0.070588235 0.011764706
      0.035294118 0.082352941 0.094117647 0.058823529 0.064705882
      0.035294118 0.082352941 0.070588235 0.058823529 0.052941176
      0.035294118 0     0.011764706 0.017647059 0     0.094117647 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     1     1     0     1     33    34    23.1  0     0     0
      0     0     0     0     0     0     0     0.013422819 0     0
      0     0     0     0.026845638 0.040268456 0.013422819 0.026845638
      0.013422819 0.053691275 0.174496644 0.026845638 0.080536913
      0.067114094 0.013422819 0.026845638 0.013422819 0.067114094
      0.342281879 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2003  1     1     1     0     1     34    35    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.03125     0
      0.09375     0.03125     0.03125     0.0625      0     0.03125
      0.71875     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2003  1     1     1     0     1     35    36    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
      0.076923077 0     0.076923077 0     0     0     0.846153846 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     1     1     0     1     36    37    2.8   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     1     2     0     1     11    15    2.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.473684211
      0.473684211 0.052631579 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     1     2     0     1     16    19    9.9   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0.070588235
      0.788235294 0.129411765 0.011764706 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2003  1     1     2     0     1     20    22    2.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.105263158
      0.842105263 0     0.052631579 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     1     2     0     1     23    25    12.1  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.033898305
      0.576271186 0.13559322  0.220338983 0.033898305 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2003  1     1     2     0     1     26    27    18.7  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.014705882 0.25  0.441176471 0.161764706 0.102941176 0.014705882
      0.014705882 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2003  1     1     2     0     1     27    28    39    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.018867925 0.194968553 0.364779874 0.176100629 0.150943396
      0.025157233 0.018867925 0.006289308 0.006289308 0.012578616 0
      0     0.018867925 0     0     0     0     0.006289308 0     0
      0     0     0     0     0     0     0
2003  1     1     2     0     1     28    29    76.9  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.013435701 0.042226488 0.211132438 0.307101727 0.184261036
      0.076775432 0.013435701 0.013435701 0.009596929 0.013435701
      0.011516315 0.009596929 0.032629559 0.021113244 0.011516315 0
      0.013435701 0.001919386 0.005758157 0     0.001919386 0
      0.003838772 0.001919386 0     0     0
2003  1     1     2     0     1     29    30    71.8  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.006711409 0.004474273 0.082774049 0.161073826 0.149888143
      0.067114094 0.060402685 0.058165548 0.024608501 0.03803132
      0.03803132  0.020134228 0.042505593 0.035794183 0.017897092
      0.020134228 0.024608501 0.031319911 0.026845638 0.020134228
      0.006711409 0.008948546 0.002237136 0.011185682 0.008948546 0
      0.031319911
2003  1     1     2     0     1     30    31    57    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.007246377 0     0.010869565 0.028985507 0.028985507 0.036231884
```

```
      0.014492754 0.036231884 0.018115942 0.047101449 0.050724638
      0.014492754 0.072463768 0.043478261 0.057971014 0.028985507
      0.043478261 0.065217391 0.065217391 0.06884058  0.061594203
      0.043478261 0.028985507 0.018115942 0.028985507 0     0.079710145
2003  1     1     2     0     1     31    32    25.9  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.011627907 0     0     0     0.023255814 0     0     0
      0.011627907 0.011627907 0.023255814 0     0.034883721 0
      0.034883721 0     0.011627907 0.058139535 0.023255814 0
      0.034883721 0.058139535 0.069767442 0.034883721 0.046511628 0
      0.511627907
2003  1     1     2     0     1     32    33    11.5  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.027777778 0     0     0     0     0     0     0     0     0
      0     0     0     0.055555556 0     0.027777778 0     0
      0.055555556 0     0.138888889 0     0     0.055555556 0.027777778
      0     0.611111111
2003  1     1     2     0     1     33    34    3.6   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.222222222 0     0     0     0     0
      0     0     0     0     0.777777778
2003  1     1     2     0     1     34    35    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     1
2003  1     1     2     0     1     36    37    0.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.666666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.333333333
2004  1     1     1     0     1     23    25    7.1   0     0     0
      0     0.064516129 0.64516129  0.161290323 0     0.064516129
      0.064516129 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
2004  1     1     1     0     1     26    27    13    0     0     0
      0     0.148148148 0.518518519 0.111111111 0.185185185 0     0
      0     0.037037037 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
```

```
2004  1     1     1     0     1     27    28    15    0     0     0
      0     0.111111111 0.444444444 0.148148148 0.148148148 0.148148148
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2004  1     1     1     0     1     28    29    26    0     0     0
      0     0.044444444 0.133333333 0.277777778 0.311111111 0.155555556
      0.055555556 0.011111111 0     0.011111111 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2004  1     1     1     0     1     29    30    29    0     0     0
      0     0     0     0.131147541 0.270491803 0.360655738 0.163934426
      0.049180328 0.008196721 0     0     0     0.008196721 0     0
      0     0     0     0.008196721 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2004  1     1     1     0     1     30    31    27    0     0     0
      0     0     0.01010101  0.01010101  0.171717172 0.242424242
      0.272727273 0.151515152 0.050505051 0.03030303  0.03030303
      0.01010101  0     0     0     0.01010101  0     0     0     0
      0.01010101  0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     1     1     0     1     31    32    24    0     0     0
      0     0     0     0     0.014705882 0.161764706 0.220588235
      0.117647059 0.073529412 0.073529412 0.058823529 0.044117647
      0.044117647 0.029411765 0.058823529 0.029411765 0     0.014705882
      0.014705882 0     0.014705882 0.014705882 0     0     0     0
      0     0.014705882 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2004  1     1     1     0     1     32    33    16    0     0     0
      0     0     0     0     0     0.022727273 0     0     0.068181818
      0.045454545 0.045454545 0.068181818 0.068181818 0.045454545
      0.068181818 0.045454545 0.068181818 0.068181818 0.090909091
      0.090909091 0     0.045454545 0.068181818 0     0     0.022727273
      0.022727273 0.045454545 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0
2004  1     1     1     0     1     33    34    19    0     0     0
      0     0     0     0     0     0     0.021276596 0     0
      0.042553191 0     0     0.021276596 0.106382979 0.106382979
      0.021276596 0     0.042553191 0.063829787 0     0.021276596
      0.063829787 0.063829787 0.063829787 0     0.021276596 0.021276596
      0.319148936 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
2004  1     1     1     0     1     34    35    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.05  0     0     0     0     0     0     0     0.1
      0     0     0     0     0.05  0.8   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     1     1     0     1     35    36    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     1     1     0     1     36    37    2.7   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.2   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.8   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     1     2     0     1     23    25    13.9  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.035087719
      0.140350877 0.631578947 0.122807018 0.070175439 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2004  1     1     2     0     1     26    27    24.9  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.046511628 0.348837209 0.418604651 0.139534884 0.023255814 0
      0     0     0.023255814 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2004  1     1     2     0     1     27    28    31.3  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.037735849 0.169811321 0.320754717 0.301886792 0.056603774
      0.037735849 0.037735849 0     0     0     0.018867925 0     0
      0     0     0.018867925 0     0     0     0     0     0     0
      0     0     0     0
2004  1     1     2     0     1     28    29    57.8  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.037433155 0.165775401 0.219251337 0.278074866 0.181818182
      0.064171123 0.016042781 0.021390374 0.005347594 0     0
      0.005347594 0     0     0     0.005347594 0     0     0     0
      0     0     0     0     0     0
2004  1     1     2     0     1     29    30    53    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.013157895 0.039473684 0.164473684 0.197368421 0.184210526
      0.131578947 0.039473684 0.026315789 0.026315789 0.006578947
```

```
      0.013157895 0.013157895 0.026315789 0.026315789 0.006578947
      0.019736842 0.013157895 0.019736842 0.006578947 0     0
      0.006578947 0     0.006578947 0     0.013157895
2004  1     1     2     0     1     30    31    35.5  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.057971014 0.086956522 0.072463768 0.072463768
      0.057971014 0.086956522 0.057971014 0.014492754 0.043478261 0
      0.130434783 0.072463768 0.014492754 0.014492754 0     0
      0.028985507 0.028985507 0.028985507 0.028985507 0     0.014492754
      0.014492754 0.072463768
2004  1     1     2     0     1     31    32    14.2  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.043478261 0     0     0     0     0.043478261 0
      0.086956522 0     0     0     0.086956522 0.086956522 0.043478261
      0.086956522 0     0.043478261 0.130434783 0     0.043478261 0
      0.043478261 0.043478261 0.217391304
2004  1     1     2     0     1     32    33    2.6   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.25  0     0.25
      0     0     0     0.5
2004  1     1     2     0     1     33    34    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     1
2004  1     1     2     0     1     34    35    1.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0.5   0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0.5
2005  1     1     1     0     1     16    19    0.1   0     0     0
      0.8   0.2   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     1     1     0     1     20    22    2.9   0     0     0
      0     0.818181818 0.181818182 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     1     1     0     1     23    25    13.8  0     0     0
      0     0.135416667 0.6875      0.15625     0.020833333 0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2005  1     1     1     0     1     26    27    11.7  0     0     0
      0     0     0.459459459 0.486486486 0.027027027 0.027027027 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2005  1     1     1     0     1     27    28    12    0     0     0
      0     0     0.164179104 0.671641791 0.074626866 0.029850746
      0.029850746 0.029850746 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2005  1     1     1     0     1     28    29    25.4  0     0     0
      0     0     0.125 0.383928571 0.214285714 0.116071429 0.116071429
      0.017857143 0.017857143 0     0     0     0     0.008928571 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2005  1     1     1     0     1     29    30    29.3  0     0     0
      0     0     0     0.115853659 0.280487805 0.323170732 0.158536585
      0.06097561  0     0.012195122 0     0.012195122 0.024390244 0
      0     0     0     0     0     0     0     0.012195122 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0
2005  1     1     1     0     1     30    31    22.5  0     0     0
      0     0     0     0.012738854 0.21656051  0.152866242 0.25477707
      0.21656051  0.031847134 0.025477707 0.012738854 0     0.012738854
      0.025477707 0.012738854 0     0     0.012738854 0     0
      0.006369427 0     0     0     0     0     0     0.006369427 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2005  1     1     1     0     1     31    32    24.3  0     0     0
      0     0     0     0     0.043478261 0.108695652 0.065217391
      0.152173913 0.02173913  0.130434783 0.02173913  0.054347826
      0.086956522 0.152173913 0.032608696 0.043478261 0.02173913
      0.02173913  0     0     0     0.02173913  0     0     0     0
      0     0.02173913  0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2005  1     1     1     0     1     32    33    17.1  0     0     0
      0     0     0     0     0     0.071428571 0.035714286 0.071428571
      0     0.035714286 0.035714286 0.035714286 0.071428571 0.035714286
      0.142857143 0.071428571 0.017857143 0     0.035714286 0.107142857
      0.035714286 0.107142857 0     0     0.035714286 0.035714286 0
      0.017857143 0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2005  1     1     1     0     1     33    34    17    0     0     0
      0     0     0     0     0     0     0     0     0     0.057142857
      0.028571429 0.028571429 0     0     0.057142857 0.085714286
      0.057142857 0.085714286 0.028571429 0     0.142857143 0.028571429
      0     0     0.085714286 0.057142857 0     0.257142857 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     1     1     0     1     34    35    9     0     0     0
      0     0     0     0     0     0     0     0.055555556 0     0
      0     0     0     0     0.055555556 0     0.055555556 0.055555556
      0.055555556 0     0     0.055555556 0.055555556 0.055555556
      0.055555556 0     0.055555556 0.444444444 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2005  1     1     1     0     1     35    36    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0.076923077 0.076923077 0
      0.076923077 0.076923077 0     0     0.153846154 0     0
      0.538461538 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2005  1     1     1     0     1     36    37    4.8   0     0     0
      0     0     0     0     0.166666667 0     0     0     0     0
      0     0     0     0     0     0     0     0     0.166666667 0
      0     0     0     0     0     0     0     0.666666667 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     1     2     0     1     16    19    1.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.8   0.2
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     1     2     0     1     20    22    4.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.060606061
      0.757575758 0.181818182 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     1     2     0     1     23    25    22.3  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.066037736 0.754716981 0.160377358 0.018867925 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2005  1     1     2     0     1     26    27    18.1  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0.318181818 0.545454545 0.090909091 0.045454545 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2005  1     1     2     0     1     27    28    20.3  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.194805195 0.480519481 0.142857143 0.103896104 0.077922078 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2005  1     1     2     0     1     28    29    44.3  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.036036036 0.220720721 0.252252252 0.112612613 0.121621622
      0.108108108 0.018018018 0.009009009 0     0.027027027 0
      0.022522523 0.009009009 0.027027027 0.009009009 0     0.009009009
      0.009009009 0.009009009 0     0     0     0     0     0     0
2005  1     1     2     0     1     29    30    47.4  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.015873016 0.05952381  0.111111111 0.234126984 0.103174603
      0.079365079 0.047619048 0.015873016 0.055555556 0.015873016
      0.031746032 0.031746032 0.007936508 0.031746032 0.03968254
      0.03968254  0.007936508 0.015873016 0.023809524 0.015873016
      0.007936508 0     0     0.007936508 0     0
2005  1     1     2     0     1     30    31    32.5  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.016260163 0.016260163 0.113821138 0.048780488
      0.024390244 0.048780488 0.016260163 0     0.06504065  0.016260163
      0.048780488 0.032520325 0.032520325 0.048780488 0.032520325
      0.048780488 0.056910569 0.06504065  0.097560976 0.06504065
      0.016260163 0.048780488 0.016260163 0.024390244
2005  1     1     2     0     1     31    32    20.4  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.0625      0.03125     0     0.09375     0.03125
      0     0.03125     0.046875    0     0     0.015625    0.0625
      0.0625      0     0.0625      0     0.0625      0     0.0625
      0.03125     0     0.03125     0     0.3125
2005  1     1     2     0     1     32    33    8.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.066666667
      0     0     0.066666667 0     0.1   0     0     0.066666667 0
      0.066666667 0.066666667 0     0     0     0     0.566666667
2005  1     1     2     0     1     33    34    1.7   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.2   0
```

```
      0     0     0.2   0     0.2   0     0     0     0     0     0
      0     0     0     0.4
2005  1     1     2     0     1     34    35    0.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.333333333 0.333333333 0     0     0     0     0
      0     0.333333333 0     0     0     0
2005  1     1     2     0     1     35    36    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     1     0
2005  1     1     2     0     1     36    37    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     1
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     1     1     0     1     20    22    0.1   0     0     0
      0     0     1     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     1     1     0     1     23    25    8.6   0     0     0
      0     0     0.228571429 0.6   0.114285714 0.057142857 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     1     1     0     1     26    27    19.4  0     0     0
      0     0     0.048780488 0.597560976 0.280487805 0.073170732 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2006  1     1     1     0     1     27    28    23.8  0     0     0
      0     0     0.037974684 0.35443038  0.443037975 0.126582278
      0.012658228 0.012658228 0     0     0     0     0     0
      0.012658228 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0
2006  1     1     1     0     1     28    29    40.6  0     0     0
      0     0     0.006329114 0.186708861 0.386075949 0.208860759
      0.088607595 0.047468354 0.041139241 0.003164557 0     0
      0.006329114 0.006329114 0     0.006329114 0     0.006329114 0
      0     0.006329114 0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2006  1     1     1     0     1     29    30    40.1  0     0     0
      0     0     0     0.083333333 0.148148148 0.296296296 0.115740741
      0.12037037  0.074074074 0.046296296 0.027777778 0     0.023148148
      0     0.018518519 0.018518519 0.013888889 0.00462963  0     0
      0     0     0.009259259 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     1     1     0     1     30    31    40.7  0     0     0
      0     0     0     0.008547009 0.064102564 0.094017094 0.158119658
      0.162393162 0.141025641 0.132478632 0.025641026 0.02991453
      0.047008547 0.021367521 0.034188034 0.008547009 0.008547009
      0.025641026 0.004273504 0     0     0     0.008547009 0.004273504
      0     0     0     0.021367521 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0
2006  1     1     1     0     1     31    32    31.3  0     0     0
      0     0     0     0.013422819 0.013422819 0.053691275 0
      0.10738255  0.127516779 0.093959732 0.060402685 0.020134228
      0.053691275 0.040268456 0.073825503 0.127516779 0.053691275
      0.006711409 0.033557047 0.020134228 0.020134228 0     0.026845638
      0.013422819 0     0     0     0.040268456 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2006  1     1     1     0     1     32    33    22.5  0     0     0
      0     0     0     0     0     0     0     0.018348624 0.036697248
      0.027522936 0.036697248 0.064220183 0.100917431 0.036697248
      0.110091743 0.064220183 0.055045872 0     0.073394495 0.027522936
      0.036697248 0.064220183 0.027522936 0.055045872 0.036697248
      0.018348624 0.036697248 0.073394495 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     1     1     0     1     33    34    14.5  0     0     0
      0     0     0     0     0     0     0     0     0     0.028985507
      0     0     0.028985507 0.014492754 0.028985507 0.028985507
      0.057971014 0.072463768 0     0.072463768 0     0.057971014
      0.144927536 0.057971014 0.057971014 0.101449275 0.057971014
      0.188405797 0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2006  1     1     1     0     1     34    35    6.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.095238095 0     0     0.095238095 0     0     0
      0.095238095 0     0.095238095 0.095238095 0.047619048 0
      0.142857143 0.333333333 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0
2006  1     1     1     0     1     35    36    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0.2
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```
      0     0     0     0     0.2   0.6   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     1     1     0     1     36    37    0.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     1     2     0     1     20    22    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.5   0.5   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     1     2     0     1     23    25    14.5  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.31372549  0.333333333 0.352941176 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     1     2     0     1     26    27    34.2  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.027027027 0.371621622 0.304054054 0.189189189 0.054054054
      0.013513514 0.013513514 0.013513514 0.013513514 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0
2006  1     1     2     0     1     27    28    40.9  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.00990099  0.297029703 0.356435644 0.227722772 0.02970297
      0.00990099  0.04950495  0     0.00990099  0.00990099  0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0
2006  1     1     2     0     1     28    29    65.3  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.122159091 0.306818182 0.215909091 0.079545455 0.133522727
      0.059659091 0.042613636 0     0.005681818 0.011363636 0
      0.005681818 0.005681818 0     0     0.005681818 0.005681818 0
      0     0     0     0     0     0     0
2006  1     1     2     0     1     29    30    55.6  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.007042254 0.056338028 0.035211268 0.133802817 0.116197183
      0.154929577 0.126760563 0.077464789 0.042253521 0.028169014
      0.031690141 0.021126761 0.007042254 0.035211268 0.045774648
```

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      0.01056338  0     0.021126761 0.014084507 0.007042254 0.007042254
      0.014084507 0     0.007042254 0     0
2006  1     1     2     0     1     30    31    35.1  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.022727273 0.015151515 0.037878788 0.060606061
      0.159090909 0.022727273 0.060606061 0.007575758 0.068181818
      0.083333333 0.090909091 0.045454545 0.03030303  0.015151515
      0.037878788 0     0.03030303  0.015151515 0.075757576 0.022727273
      0.015151515 0     0     0.083333333
2006  1     1     2     0     1     31    32    18.8  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0.028985507 0     0.028985507 0.043478261
      0.028985507 0.072463768 0.014492754 0.086956522 0.028985507
      0.014492754 0.072463768 0.057971014 0.043478261 0.043478261
      0.101449275 0.072463768 0     0.057971014 0.028985507 0.057971014
      0     0.028985507 0.086956522
2006  1     1     2     0     1     32    33    6.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0.095238095 0.047619048 0
      0.047619048 0.047619048 0     0     0.047619048 0.095238095 0
      0     0.047619048 0.095238095 0.047619048 0.047619048 0.095238095
      0     0.19047619  0     0.095238095
2006  1     1     2     0     1     33    34    0.6   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.111111111 0     0     0     0.111111111 0     0.111111111 0
      0     0     0     0     0.333333333 0     0.333333333
2006  1     1     2     0     1     34    35    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.2   0     0.2   0.2
2006  1     1     2     0     1     36    37    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     1
2007  1     1     1     0     1     20    22    0     0     0     0
      0     0     1     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
```

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2007  1     1     1     0     1     23    25    5     0     0     0
      0     0     0.2   0.6   0.2   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     1     1     0     1     26    27    23    0     0     0
      0     0     0.03030303  0.242424242 0.363636364 0.242424242
      0.060606061 0.03030303  0.03030303  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2007  1     1     1     0     1     27    28    33    0     0     0
      0     0     0.04109589  0.328767123 0.246575342 0.287671233
      0.04109589  0.04109589  0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.01369863  0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2007  1     1     1     0     1     28    29    64    0     0     0
      0     0     0     0.116666667 0.46  0.27  0.093333333 0.04  0
      0.013333333 0     0.003333333 0     0.003333333 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2007  1     1     1     0     1     29    30    62    0     0     0
      0     0     0     0.026315789 0.271929825 0.337719298 0.171052632
      0.070175439 0.057017544 0.035087719 0.01754386  0     0
      0.004385965 0     0.004385965 0     0     0.004385965 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2007  1     1     1     0     1     30    31    46    0     0     0
      0     0     0     0.008403361 0.067226891 0.12605042  0.218487395
      0.201680672 0.12605042  0.12605042  0.042016807 0.025210084
      0.008403361 0.025210084 0.008403361 0     0     0     0.008403361
      0     0.008403361 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2007  1     1     1     0     1     31    32    50    0     0     0
      0     0     0     0     0.008130081 0.073170732 0.048780488
      0.105691057 0.138211382 0.105691057 0.06504065  0.048780488
      0.040650407 0.048780488 0.040650407 0.040650407 0.032520325
      0.048780488 0.032520325 0.024390244 0.024390244 0.008130081
      0.024390244 0.008130081 0.008130081 0.008130081 0.016260163 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2007  1     1     1     0     1     32    33    38    0     0     0
      0     0     0     0     0     0.011363636 0.011363636 0.011363636
```

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      0.034090909 0.079545455 0.034090909 0.068181818 0.102272727
      0.045454545 0.102272727 0.102272727 0.068181818 0.056818182
      0.034090909 0.056818182 0.045454545 0     0.011363636 0.034090909
      0.045454545 0.034090909 0.011363636 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2007  1     1     1     0     1     33    34    35    0     0     0
      0     0     0     0     0     0.041666667 0     0.013888889 0
      0.013888889 0.013888889 0.013888889 0     0.027777778 0.055555556
      0.055555556 0.083333333 0.069444444 0.083333333 0.013888889
      0.027777778 0.069444444 0.069444444 0.027777778 0.069444444
      0.055555556 0.027777778 0.166666667 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     1     1     0     1     34    35    26    0     0     0
      0     0     0     0     0     0     0     0     0     0.01754386
      0     0     0     0.01754386  0     0.035087719 0     0.035087719
      0.01754386  0.035087719 0     0.105263158 0.035087719 0.105263158
      0.035087719 0.070175439 0.070175439 0.421052632 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     1     1     0     1     35    36    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0.071428571 0     0     0
      0.071428571 0.071428571 0.071428571 0     0.285714286 0.071428571
      0.357142857 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2007  1     1     1     0     1     36    37    9.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.111111111 0.111111111 0     0     0.777777778 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     1     2     0     1     23    25    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.181818182 0.590909091 0.136363636 0.045454545 0.045454545 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2007  1     1     2     0     1     26    27    49.8  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.042253521 0.23943662  0.422535211 0.197183099 0.028169014
      0.056338028 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0.014084507 0     0
      0
2007  1     1     2     0     1     27    28    64.3  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0.189189189 0.405405405 0.261261261 0.081081081 0.036036036
      0.027027027 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
2007  1     1     2     0     1     28    29    95.9  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.064935065 0.277056277 0.333333333 0.125541126 0.086580087
      0.038961039 0.038961039 0.008658009 0.008658009 0.004329004
      0.004329004 0.004329004 0.004329004 0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     1     2     0     1     29    30    85.3  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.023668639 0.071005917 0.112426036 0.124260355 0.136094675
      0.106508876 0.088757396 0.023668639 0.041420118 0.023668639
      0.023668639 0.029585799 0.029585799 0.035502959 0.029585799
      0.029585799 0.01183432  0.00591716  0.00591716  0.017751479
      0.01183432  0     0     0.00591716  0.01183432
2007  1     1     2     0     1     30    31    57.7  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.024793388 0.033057851 0.05785124  0.090909091
      0.05785124  0.090909091 0.082644628 0.049586777 0.024793388
      0.033057851 0.066115702 0.05785124  0.024793388 0.049586777
      0.024793388 0.049586777 0.05785124  0.008264463 0.041322314
      0.008264463 0.016528926 0.016528926 0.016528926 0.016528926
2007  1     1     2     0     1     31    32    29.9  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.01754386  0     0.01754386  0     0.070175439
      0.01754386  0.01754386  0     0.035087719 0.01754386  0.052631579
      0.052631579 0.035087719 0.052631579 0     0.070175439 0.01754386
      0.052631579 0.140350877 0.01754386  0.035087719 0.052631579
      0.01754386  0.210526316
2007  1     1     2     0     1     32    33    19.4  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.04  0.04  0.04  0.04  0     0     0     0.08  0.04
      0.04  0     0     0.68
2007  1     1     2     0     1     33    34    2.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.333333333 0.666666667
2007  1     1     2     0     1     34    35    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     1
2008  1     1     1     0     1     16    19    1     0     0     0
      0.125 0.875 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     1     1     0     1     20    22    2     0     0     0
      0     0.5   0.375 0     0.125 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     1     1     0     1     23    25    7     0     0     0
      0     0     0.1   0.5   0.3   0.1   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     1     1     0     1     26    27    16    0     0     0
      0     0     0     0.125 0.375 0.25  0.208333333 0.041666667 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     1     1     0     1     27    28    28    0     0     0
      0     0     0     0.066666667 0.3   0.416666667 0.15  0.016666667
      0.033333333 0.016666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2008  1     1     1     0     1     28    29    53    0     0.007874016
      0     0     0     0     0.019685039 0.216535433 0.42519685
      0.216535433 0.086614173 0.023622047 0     0     0     0.003937008
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0
2008  1     1     1     0     1     29    30    53    0     0     0
      0     0     0     0.00456621  0.118721461 0.296803653 0.264840183
      0.159817352 0.063926941 0.03196347  0.02283105  0.01826484  0
      0.00456621  0     0.00456621  0     0     0.00456621  0.00456621
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     1     1     0     1     30    31    47    0     0     0
      0     0     0     0     0.035714286 0.125 0.151785714 0.142857143
      0.098214286 0.142857143 0.133928571 0.071428571 0.035714286 0
      0.008928571 0     0.008928571 0.026785714 0     0     0.008928571
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```
      0     0     0     0     0.008928571 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     1     1     0     1     31    32    32    0     0     0
      0     0     0     0     0     0.011111111 0.011111111 0.155555556
      0.066666667 0.088888889 0.177777778 0.044444444 0.044444444
      0.077777778 0.033333333 0.033333333 0.011111111 0.044444444
      0.022222222 0.022222222 0.011111111 0.011111111 0.011111111
      0.033333333 0.022222222 0.011111111 0.022222222 0.033333333 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2008  1     1     1     0     1     32    33    28    0     0     0
      0     0     0     0     0     0     0.013888889 0.055555556
      0.041666667 0.027777778 0.041666667 0.013888889 0.027777778
      0.041666667 0.097222222 0.041666667 0.069444444 0.069444444
      0.055555556 0.083333333 0.041666667 0.041666667 0.027777778
      0.013888889 0.013888889 0.041666667 0.013888889 0.125 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     1     1     0     1     33    34    28    0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.02739726  0.02739726  0.068493151 0.02739726  0     0.02739726
      0.04109589  0.02739726  0.04109589  0.082191781 0.082191781
      0.02739726  0.082191781 0.054794521 0.095890411 0.054794521
      0.054794521 0.178082192 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0
2008  1     1     1     0     1     34    35    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.027027027 0.027027027 0.081081081 0     0.027027027
      0.027027027 0.027027027 0.054054054 0.027027027 0.054054054
      0.081081081 0.027027027 0.054054054 0.081081081 0.405405405 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2008  1     1     1     0     1     35    36    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0.055555556 0.055555556 0
      0     0.055555556 0.166666667 0     0     0     0     0.666666667
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2008  1     1     1     0     1     36    37    2.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     1     2     0     1     11    15    0.1   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     1     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     1     2     0     1     16    19    0.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.333333333
      0.666666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     1     2     0     1     20    22    2.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0.6
      0.4   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     1     2     0     1     23    25    9.9   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.285714286 0.571428571 0     0.142857143 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     1     2     0     1     26    27    33.2  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.019230769 0.173076923 0.326923077 0.288461538 0.192307692 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2008  1     1     2     0     1     27    28    51.4  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.048076923 0.326923077 0.375 0.182692308 0.048076923
      0.019230769 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2008  1     1     2     0     1     28    29    89.2  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.024193548 0.161290323 0.370967742 0.189516129 0.112903226
      0.032258065 0.048387097 0.016129032 0.008064516 0.004032258
      0.012096774 0     0     0     0.004032258 0.004032258 0     0
      0.004032258 0     0.004032258 0     0.004032258 0     0
2008  1     1     2     0     1     29    30    71.2  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.00621118  0.01863354  0.080745342 0.167701863 0.093167702
      0.155279503 0.111801242 0.093167702 0.062111801 0.049689441
      0.02484472  0.01242236  0.00621118  0.01863354  0.00621118
      0.01863354  0.01863354  0.01863354  0.01242236  0.00621118
      0.00621118  0     0.00621118  0     0.00621118
2008  1     1     2     0     1     30    31    54.2  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.009708738 0.029126214 0.077669903 0.038834951
      0.048543689 0.155339806 0.058252427 0.019417476 0.048543689
      0.067961165 0.009708738 0.067961165 0.048543689 0.048543689
      0.019417476 0.029126214 0.019417476 0.038834951 0.009708738
      0.019417476 0.029126214 0.029126214 0.009708738 0.067961165
2008  1     1     2     0     1     31    32    22.6  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.041666667 0.020833333 0.041666667
      0.020833333 0.041666667 0.020833333 0.020833333 0.020833333
      0.020833333 0.041666667 0.083333333 0.041666667 0     0.041666667
      0.083333333 0.083333333 0     0.020833333 0.020833333 0.0625
      0.041666667 0.229166667
2008  1     1     2     0     1     32    33    12.9  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0.047619048 0     0     0     0     0     0.095238095
      0     0     0     0     0     0     0     0.047619048 0.047619048
      0     0.047619048 0.047619048 0.047619048 0.047619048 0.095238095
      0.095238095 0.380952381
2008  1     1     2     0     1     33    34    2.6   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     1
2008  1     1     2     0     1     34    35    1.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0.5   0     0     0
      0     0     0     0.5
2004  1     1     0     1     1     6     10    0.3   0     1     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     1     0     1     1     11    15    2.0   0     0
      0.360267704 0.639732296 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     1     0     1     1     16    19    6.9   0     0     0
      0.18687718  0.633465624 0.015283836 0.16437336  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2004  1     1     0     1     1     20    22    23.5  0     0     0
      0.028177033 0.815321692 0.079759691 0.031086902 0     0.006389873
      0.012065037 0     0     0     0     0.027199771 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2004  1     1     0     1     1     23    25    11.9  0     0     0
      0     0.459105107 0.433720654 0.094300618 0.012873622 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2004  1     1     0     1     1     26    27    6.6   0     0     0
      0     0     0.855328304 0.019638039 0.007517975 0.109997706 0
      0.007517975 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2004  1     1     0     1     1     28    28    9.6   0     0     0
      0.008361935 0     0.008361935 0.111673272 0.206642815 0.082251627
      0.025085806 0     0     0     0     0.55762261  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2004  1     1     0     1     1     29    29    9.3   0     0     0
      0.006191144 0     0     0.071905774 0.241350402 0.153387248
      0.089539286 0     0     0.412861571 0     0.006191144 0
      0.006191144 0.012382288 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     1     0     1     1     30    30    5.6   0     0     0
      0     0     0     0.112206577 0     0.416327063 0     0
      0.15298569  0.014413174 0     0.014413174 0     0.014413174 0
      0.079015935 0.167398864 0     0.014413174 0     0     0     0
      0     0.014413174 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     1     0     1     1     31    31    2.0   0     0     0
      0     0     0     0     0.683483227 0.129163295 0     0
      0.129163295 0     0     0     0     0     0.037691579 0     0
      0.010249302 0     0     0.010249302 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2004  1     1     0     1     1     32    32    1.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.499759277 0     0     0     0     0     0     0     0
      0     0     0.420927421 0     0     0     0.079313303 0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     1     0     1     1     33    33    1.7   0     0     0
      0     0     0     0     0     0     0     0     0     0.135301967
      0     0     0.039482925 0     0     0     0     0     0     0
      0     0     0.039482925 0     0     0     0     0.715966752 0.06976543
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2004  1     1     0     1     1     35    35    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     1     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     1     0     1     1     1     5     0.6   0     0.5   0
      0     0.5   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     1     0     1     1     6     10    6.5   0     0.902615215
      0.097384785 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     1     0     1     1     11    15    28.0  0     0.027508021
      0.925548717 0.041075355 0     0.005867908 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2005  1     1     0     1     1     16    19    12.5  0     0
      0.181179359 0.694366592 0.058753328 0.015530433 0.050170288 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2005  1     1     0     1     1     20    22    14.6  0     0     0
      0     0.108146403 0.837391598 0.003658727 0     0     0
      0.050803272 0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2005  1     1     0     1     1     23    25    28.3  0     0     0
      0     0.235490856 0.656550272 0.064892281 0.022111163 0.014317768
      0.00319436  0     0     0     0.0034433   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2005  1     1     0     1     1     26    27    17.0  0     0     0
      0     0     0.525418748 0.251239335 0.136687013 0.062880344 0
      0.003728904 0     0     0     0     0     0     0.010022829 0
      0     0.010022829 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2005  1     1     0     1     1     28    28    14.6  0     0     0
      0     0     0.008942898 0.425634874 0.042357471 0.315330958
      0.178824073 0.006614778 0.022294948 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2005  1     1     0     1     1     29    29    15.8  0     0     0
      0     0     0     0.021200933 0.28160237  0.27102761  0.015048084
      0.077760663 0.003762021 0.263111014 0.057176617 0.003762021 0
      0.003667656 0     0     0     0     0     0     0     0
      0.001881011 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2005  1     1     0     1     1     30    30    8.0   0     0     0
      0     0     0     0.004005645 0.295551827 0     0.028039518
      0.324406324 0.017602319 0     0     0.004005645 0.008011291 0
      0.299557472 0     0.010808667 0.004005645 0     0     0
      0.004005645 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     1     0     1     1     31    31    1.8   0     0     0
      0     0     0     0     0     0     0.138378637 0.16724949
      0.083624745 0     0     0     0     0.145475333 0     0     0
      0     0     0     0     0     0     0.465271795 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
2005  1     1     0     1     1     32    32    0.6   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0.5   0     0     0     0     0.5   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     1     0     1     1     33    33    1.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0.776895387 0     0     0.223104613 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     1     0     1     1     34    34    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     1     0     1     1     36    36    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     1     0     1     1     37    37    0.3   0     0     0
      0     0     0     0     0     0     0     0     1     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     1     0     1     20    22    1.062 0     0     0
      0     4     1     1     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     1     0     1     23    25    1.24  0     0     0
      0     0     2     3     1     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     1     0     1     26    27    6.198 0     0     0
      0     0     0     7     10    5     7     5     1     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     1     0     1     28    28    20.542      0     0
      0     0     0     0     0     10    47    28    21    3     6
      1     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2009  1     1     1     0     1     29    29    30.989      0     0
      0     0     0     0     1     4     39    68    38    10    7
      2     3     1     1     0     0     0     0     0     0     0
      0     0     0     0     1     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2009  1     1     1     0     1     30    30    15.406      0     0
      0     0     0     0     0     0     7     19    21    9     7
      7     4     3     3     0     2     0     1     2     0     0
      0     1     0     0     1     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2009  1     1     1     0     1     31    31    11.156      0     0
      0     0     0     0     0     0     0     1     5     5     9
      10    10    5     6     1     1     1     2     2     2     0
      0     0     1     0     0     1     1     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2009  1     1     1     0     1     32    32    12.573      0     0
      0     0     0     0     0     0     0     0     0     1     5
      7     2     5     1     5     3     3     4     2     4     6
      3     3     3     4     3     1     2     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2009  1     1     1     0     1     33    33    10.094      0     0
      0     0     0     0     0     0     0     0     0     0     0
      1     0     2     1     0     4     4     5     3     2     4
      3     5     0     4     3     2     2     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2009  1     1     1     0     1     34    34    3.01  0     0     0
      0     0     0     0     0     0     0     0     0     1     0
      0     0     1     0     2     0     0     3     0     0     0
      0     2     0     1     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     1     0     1     35    35    2.479 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     1     1     1     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     1     0     1     36    36    0.354 0     0     0
      0     0     0     0     0     0     0     0     0     1     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     2     0     1     16    19    0.177 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     1     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     2     0     1     20    22    0.885 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      5     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     2     0     1     23    25    2.656 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      1     7     3     2     1     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     2     0     1     26    27    8.854 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     5     18    15    7     2     1     2     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     1     2     0     1     28    28    31.344      0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     6     42    59    37    14    8     7     1
      2     0     0     0     0     0     0     0     0     0     0
      0     0     0     1     0
2009  1     1     2     0     1     29    29    24.26 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     1     13    25    32    8     10    17    8     9
      5     1     1     0     2     2     0     0     0     0     0
      1     0     1     1
2009  1     1     2     0     1     30    30    14.521      0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     1     2     4     5     7     5     7
      8     4     0     4     4     4     3     2     3     5     3
      5     2     0     1     0
2009  1     1     2     0     1     31    31    7.969 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     2     0     1     3     1     1
      2     1     1     1     2     1     1     2     1     2     2
      6     2     3     1
2009  1     1     2     0     1     32    32    1.948 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     1
      0     1     1     0
2009  1     1     2     0     1     33    33    0.708 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     1
      0     0     0     0
2010  1     1     1     0     1     23    25    2.801 0     0     0
      0     0     3     9     4     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     1     1     0     1     26    27    3.326 0     0     0
      0     0     0     10    6     0     1     1     0     1     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     1     1     0     1     28    28    10.152      0     0
      0     0     0     0     5     7     9     19    11    5     1
      1     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2010  1     1     1     0     1     29    29    21.179      0     0
      0     0     0     0     1     3     9     30    48    17    5
      3     0     1     1     2     0     0     0     1     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2010  1     1     1     0     1     30    30    11.552      0     1
      0     0     0     0     0     0     3     10    24    11    7
      4     3     2     0     1     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0
2010  1     1     1     0     1     31    31    8.227 0     1     0
      0     0     0     0     0     0     1     6     14    3     6
      4     0     4     0     2     1     1     1     1     0     0
      0     0     1     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     1     1     0     1     32    32    7.177 0     0     0
      0     0     0     0     0     0     0     0     1     1     3
      0     1     1     1     1     0     6     4     2     1     6
      3     1     1     0     0     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     1     1     0     1     33    33    6.651 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     1     0     1     4     5     1     3     1
      1     2     2     0     6     1     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     1     1     0     1     34    34    4.201 0     0     1
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     1     0     0     1     0     1
      1     1     0     1     4     2     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     1     1     0     1     35    35    1.4   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     2     0     1     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
#2010 1     1     1     0     1     36    36    0.7   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     1     2     0     1     23    25    3.326 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     1
      2     8     4     2     2     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     1     2     0     1     26    27    6.826 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     4     12    11    5     3     2     1     1     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     1     2     0     1     28    28    14.353      0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     2     6     11    20    19    9     5     5     2
      2     0     0     0     0     1     0     0     0     0     0
      0     0     0     0     0
2010  1     1     2     0     1     29    29    18.029      0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     1     3     20    24    15    9     5     5
      5     3     2     3     1     1     0     0     1     2     1
      1     0     0     0     0
2010  1     1     2     0     1     30    30    12.253      0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     1     2     3     1     2     5     7
```

```
      4     4     2     3     4     5     3     4     3     1     2
      3     0     2     2     2
2010  1     1     2     0     1     31    31    4.026 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     1
      0     0     1     2     0     2     1     1     2     0     0
      2     0     0     2
2010  1     1     2     0     1     32    32    0.525 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     1     0     0
2010  1     1     2     0     1     35    35    0.35  0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     1     0     0     0     1     0     0     0     0     0
      0     0     0     0
2004  1     2     3     0     1     1     -1    213   0.00110392
      0.037170243 0.02591038  0.031416999 0.173777906 0.13906161
      0.024789484 0.004510081 0.003999326 0.003803302 0     0
      0.000139717 0     0     0     0     0.00E+00    0.00E+00    0
      0     0     0     0.00E+00    0     0     0.000275636 0     0
      0.000132646 0     0.00110392  0.055804462 0.027995229 0.033750929
      0.238206031 0.151271425 0.023363925 0.005680731 0.009593011
      0.003336342 0.000902929 0.000810247 0     0     0.000255318
      0.000252794 0.000252794 9.31E-05    9.31E-05    0     0.000255318
      0.000524036 0     9.31E-05    0.000269875 0     0     0     0
      0     0
2001  1     3     1     0     1     14    14    1.0   0     0
      0.833333333 0.166666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     1     0     1     15    15    1.5   0     0
      0.888888889 0.111111111 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     1     0     1     16    16    2.6   0     0     1
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     17    17    1.4   0     0     1
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     18    18    0.7   0     0     0.5
      0.5   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     19    19    0.3   0     0     0.5
      0.5   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     20    20    0.5   0     0     0
      0.666666667 0.333333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2001  1     3     1     0     1     21    21    0.2   0     0     0
      0     1     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     22    22    0.3   0     0     0
      0     1     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     23    23    0.3   0     0     0
      0     1     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     24    24    1.0   0     0     0
      0.166666667 0.666666667 0.166666667 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     1     0     1     25    25    0.2   0     0     0
      0     1     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     26    26    1.0   0     0     0
      0     0.166666667 0.5   0.333333333 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2001  1     3     1     0     1     27    27    1.5   0     0     0
      0     0     0.444444444 0.555555556 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2001  1     3     1     0     1     28    28    3.1   0     0     0
      0     0.055555556 0.166666667 0.777777778 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     1     0     1     29    29    1.2   0     0     0
      0     0     0.285714286 0.571428571 0.142857143 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     1     0     1     30    30    0.2   0     0     0
      0     0     0     1     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     31    31    0.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     1     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     32    32    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0.5   0     0     0.5
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     1     0     1     33    33    0.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     1     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     14    14    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.833333333
      0.166666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     2     0     1     15    15    1.9   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.888888889
      0.111111111 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     2     0     1     16    16    2.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     1     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     17    17    1.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     1     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     18    18    0.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.5   0.5   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     19    19    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0.5   0.5   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     20    20    0.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.666666667
      0.333333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2001  1     3     2     0     1     21    21    0.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     1
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     22    22    0.9   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     1
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     23    23    0.9   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     1
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     24    24    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0.166666667
      0.666666667 0.166666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     2     0     1     25    25    0.5   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     1
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     26    26    1.5   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.166666667 0.5   0.333333333 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     2     0     1     27    27    2.0   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.444444444 0.555555556 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2001  1     3     2     0     1     28    28    1.0   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      0.055555556 0.166666667 0.777777778 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2001  1     3     2     0     1     29    29    0.3   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0.285714286 0.571428571 0.142857143 0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2001  1     3     2     0     1     31    31    0.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     1     0     0     0     0     0     0
      0     0     0     0
2001  1     3     2     0     1     32    32    0.2   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0.5   0     0     0.5   0     0
      0     0     0     0
2003  1     4     1     0     1     13    13    1     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     14    14    1     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     16    16    2     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     17    17    2     0     0     0
      50    50    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     18    18    5     0     0     0
      80    20    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     19    19    8     0     0     0
      62.5  37.5  0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     20    20    6     0     0     0
      16.66666667 83.33333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2003  1     4     1     0     1     21    21    11    0     0     0
      18.18181818 63.63636364 18.18181818 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2003  1     4     1     0     1     22    22    12    0     0     0
      0     50    50    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     23    23    18    0     0     0
      0     61.11111111 16.66666667 16.66666667 5.555555556 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     4     1     0     1     24    24    16    0     0     0
      0     62.5  25    12.5  0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     25    25    10    0     0     0
      0     50    20    20    10    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     26    26    5     0     0     0
      0     20    20    20    40    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     27    27    7     0     0     0
      0     0     14.28571429 57.14285714 14.28571429 0     14.28571429
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     4     1     0     1     28    28    19    0     0     0
      0     0     31.57894737 10.52631579 31.57894737 10.52631579
      10.52631579 5.263157895 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2003  1     4     1     0     1     29    29    23    0     0     0
      0     0     0     0     17.39130435 17.39130435 39.13043478
      13.04347826 4.347826087 4.347826087 0     0     0     0     0
      4.347826087 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2003  1     4     1     0     1     30    30    19    0     0     0
      0     0     0     0     15.78947368 47.36842105 15.78947368
      15.78947368 0     0     0     0     5.263157895 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
2003  1     4     1     0     1     31    31    9     0     0     0
      0     0     0     0     0     0     11.11111111 22.22222222
      11.11111111 0     22.22222222 0     0     11.11111111 0     0
      0     11.11111111 0     0     11.11111111 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2003  1     4     1     0     1     32    32    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      14.28571429 0     0     28.57142857 28.57142857 0     0     0
      14.28571429 0     0     0     0     0     0     0     14.28571429
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2003  1     4     1     0     1     33    33    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     10    20    0     10    0     0     0     10    0
      10    0     0     0     0     40    0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     34    34    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     100   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     35    35    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     100   0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     1     0     1     36    36    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     100   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     11    11    1     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     12    12    1     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     13    13    3     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     14    14    2     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     15    15    4     0     0     50
      50    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     16    16    4     0     0     25
      75    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     18    18    2     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     19    19    2     0     0     0
      50    0     50    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     20    20    9     0     0     0
      11.11111111 66.66666667 22.22222222 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     1     0     1     21    21    7     0     0     0
      14.28571429 71.42857143 14.28571429 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     1     0     1     22    22    23    0     0     0
      4.347826087 73.91304348 21.73913043 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     1     0     1     23    23    13    0     0     0
      0     69.23076923 30.76923077 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2004  1     4     1     0     1     24    24    12    0     0     0
      0     83.33333333 16.66666667 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2004  1     4     1     0     1     25    25    17    0     0     0
      0     41.17647059 47.05882353 11.76470588 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     1     0     1     26    26    11    0     0     0
      0     27.27272727 54.54545455 9.090909091 9.090909091 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2004  1     4     1     0     1     27    27    14    0     0     0
      0     21.42857143 78.57142857 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2004  1     4     1     0     1     28    28    13    0     0     0
      0     0     46.15384615 23.07692308 30.76923077 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     1     0     1     29    29    5     0     0     0
      0     0     20    0     0     20    60    0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     30    30    4     0     0     0
      0     0     0     0     25    25    25    0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     25    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     31    31    3     0     0     0
      0     0     0     0     0     33.33333333 0     0     0     0
      0     0     33.33333333 0     33.33333333 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     1     0     1     32    32    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     100   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     33    33    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     100   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     1     0     1     34    34    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     100   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     9     9     1     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     11    11    1     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     13    13    3     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     15    15    1     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     16    16    2     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     17    17    4     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     18    18    3     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     19    19    1     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     20    20    3     0     0     0
      33.33333333 33.33333333 33.33333333 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     4     1     0     1     21    21    7     0     0     0
      0     57.14285714 42.85714286 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     4     1     0     1     22    22    12    0     0     0
      8.333333333 16.66666667 66.66666667 8.333333333 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2005  1     4     1     0     1     23    23    14    0     0     0
      0     7.142857143 64.28571429 28.57142857 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     4     1     0     1     24    24    8     0     0     0
      0     12.5  87.5  0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     25    25    18    0     0     0
      0     5.555555556 66.66666667 27.77777778 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     4     1     0     1     26    26    13    0     0     0
      0     0     46.15384615 53.84615385 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     4     1     0     1     27    27    13    0     0     0
      0     7.692307692 23.07692308 61.53846154 7.692307692 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2005  1     4     1     0     1     28    28    18    0     0     0
      0     0     5.555555556 83.33333333 11.11111111 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     4     1     0     1     29    29    25    0     0     0
      0     0     4     28    28    28    0     12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     30    30    10    0     0     0
      0     0     0     0     0     30    40    10    20    0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     31    31    7     0     0     0
      0     0     0     0     0     14.28571429 0     0     42.85714286
      0     0     14.28571429 0     0     0     0     14.28571429 0
      0     0     0     0     14.28571429 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2005  1     4     1     0     1     32    32    6     0     0     0
      0     0     0     0     0     0     0     0     0     16.66666667
      33.33333333 0     0     0     0     0     0     0     0     0
      0     0     16.66666667 16.66666667 0     0     0     16.66666667
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2005  1     4     1     0     1     33    33    8     0     0     0
      0     0     0     0     0     0     0     12.5  0     0     12.5
      12.5  0     0     12.5  0     0     0     12.5  12.5  0     12.5
      0     0     0     0     0     12.5  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     34    34    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     33.33333333 33.33333333 33.33333333 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     4     1     0     1     35    35    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     1     0     1     36    36    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     100   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     11    11    2     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     12    12    1     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     13    13    6     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     14    14    2     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     15    15    5     0     0     40
      60    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     16    16    9     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     17    17    10    0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     18    18    9     0     0     0
      55.55555556 44.44444444 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     4     1     0     1     19    19    8     0     0     0
      37.5  62.5  0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     20    20    13    0     0     0
      15.38461538 84.61538462 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     4     1     0     1     21    21    8     0     0     0
      0     75    25    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     22    22    4     0     0     0
      0     25    75    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     23    23    9     0     0     0
      0     11.11111111 66.66666667 11.11111111 11.11111111 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2006  1     4     1     0     1     24    24    4     0     0     0
      0     0     75    25    0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     25    25    24    0     0     0
      0     0     29.16666667 66.66666667 4.166666667 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     4     1     0     1     26    26    16    0     0     0
      0     0     18.75 75    6.25  0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     27    27    18    0     0     0
      0     0     0     88.88888889 11.11111111 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     4     1     0     1     28    28    43    0     0     0
      0     0     0     13.95348837 69.76744186 16.27906977 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     4     1     0     1     29    29    24    0     0     0
      0     0     0     4.166666667 25    50    20.83333333 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     4     1     0     1     30    30    14    0     0     0
      0     0     0     0     7.142857143 0     21.42857143 57.14285714
      14.28571429 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2006  1     4     1     0     1     31    31    8     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
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     32    32    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     50    0     0     0     0     0     0     0     50
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     33    33    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     1     0     1     34    34    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     100   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     1     0     1     12    12    1     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     1     0     1     13    13    2     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     1     0     1     14    14    1     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     1     0     1     15    15    3     0     0     0
      66.66666667 33.33333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     1     0     1     16    16    8     0     0     0
      75    25    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     1     0     1     17    17    14    0     0     0
      78.57142857 21.42857143 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     1     0     1     18    18    11    0     0     0
      18.18181818 81.81818182 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     1     0     1     19    19    7     0     0     0
      14.28571429 85.71428571 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     1     0     1     20    20    9     0     0     0
      0     66.66666667 33.33333333 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     1     0     1     21    21    9     0     0     0
      0     88.88888889 0     11.11111111 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     1     0     1     22    22    12    0     0     0
      0     41.66666667 50    8.333333333 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     1     0     1     23    23    6     0     0     0
      0     0     83.33333333 16.66666667 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     1     0     1     24    24    12    0     0     0
      0     0     50    33.33333333 8.333333333 8.333333333 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     4     1     0     1     25    25    12    0     0     0
      0     0     33.33333333 33.33333333 25    8.333333333 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     4     1     0     1     26    26    19    0     0     0
      0     0     10.52631579 47.36842105 26.31578947 15.78947368 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2007  1     4     1     0     1     27    27    18    0     0     0
      0     0     0     33.33333333 44.44444444 11.11111111 11.11111111
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2007  1     4     1     0     1     28    28    40    0     0     0
      0     0     0     12.5  52.5  30    5     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     1     0     1     29    29    24    0     0     0
      0     0     0     12.5  20.83333333 45.83333333 16.66666667
      4.166666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2007  1     4     1     0     1     30    30    15    0     0     0
      0     0     0     6.666666667 26.66666667 33.33333333 13.33333333
      6.666666667 13.33333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2007  1     4     1     0     1     31    31    9     0     0     0
      0     0     0     0     0     0     0     33.33333333 22.22222222
      22.22222222 11.11111111 0     0     0     0     0     0     0
      0     0     0     0     0     11.11111111 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2007  1     4     1     0     1     32    32    8     0     0     0
      0     0     0     0     0     0     0     0     0     12.5  0
      12.5  0     25    12.5  0     12.5  12.5  0     0     0     0
      0     0     0     12.5  0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     1     0     1     34    34    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     50    50    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     1     0     1     35    35    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      50    0     0     0     0     50    0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     14    14    1     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     15    15    16    0     0     0
      93.75 6.25  0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     16    16    18    0     0     0
      94.44444444 5.555555556 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     4     1     0     1     17    17    11    0     0     0
      72.72727273 27.27272727 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     4     1     0     1     18    18    14    0     0     0
      7.142857143 85.71428571 7.142857143 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     4     1     0     1     19    19    10    0     0     0
      0     90    10    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     20    20    15    0     0     0
      0     86.66666667 13.33333333 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     4     1     0     1     21    21    12    0     0     0
      0     33.33333333 58.33333333 8.333333333 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     4     1     0     1     22    22    8     0     0     0
      0     37.5  50    12.5  0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     23    23    9     0     0     0
      0     22.22222222 55.55555556 22.22222222 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     4     1     0     1     24    24    5     0     0     0
      0     0     60    40    0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     25    25    4     0     0     0
      0     0     25    75    0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     26    26    9     0     0     0
      0     0     0     44.44444444 55.55555556 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     4     1     0     1     27    27    8     0     0     0
      0     0     0     25    62.5  12.5  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     28    28    38    0     0     0
      0     0     0     0     26.31578947 47.36842105 23.68421053
      2.631578947 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2008  1     4     1     0     1     29    29    16    0     0     0
      0     0     0     0     12.5  18.75 31.25 31.25 6.25  0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     30    30    15    0     0     0
      0     0     0     0     6.666666667 6.666666667 13.33333333
      13.33333333 26.66666667 6.666666667 20    0     0     0     0
      0     0     0     0     6.666666667 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0
2008  1     4     1     0     1     31    31    11    0     0     0
      0     0     0     0     0     9.090909091 0     18.18181818 0
      18.18181818 0     0     0     0     0     0     18.18181818 0
      18.18181818 9.090909091 9.090909091 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2008  1     4     1     0     1     32    32    5     0     0     0
      0     0     0     0     0     0     0     0     0     20    20
      0     0     20    0     0     0     0     40    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     33    33    8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     12.5  0     0     0     0     0     12.5  12.5  12.5  0
      0     12.5  12.5  12.5  0     12.5  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     1     0     1     34    34    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      66.66666667 0     0     0     0     33.33333333 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     4     1     0     1     35    35    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     6     6     1     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     8     8     3     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     10    10    2     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     11    11    1     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     12    12    4     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     13    13    2     0     0     50
      50    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     14    14    3     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     15    15    7     0     0
      42.85714286 57.14285714 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     4     1     0     1     16    16    9     0     0
      22.22222222 55.55555556 22.22222222 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2009  1     4     1     0     1     17    17    7     0     0     0
      57.14285714 42.85714286 0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     4     1     0     1     18    18    11    0     0     0
      54.54545455 45.45454545 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     4     1     0     1     19    19    9     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     20    20    12    0     0     0
      8.333333333 83.33333333 8.333333333 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     4     1     0     1     21    21    20    0     0     0
      0     60    40    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     22    22    18    0     0     0
      0     27.77777778 55.55555556 16.66666667 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     4     1     0     1     23    23    19    0     0     0
      0     10.52631579 78.94736842 5.263157895 5.263157895 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2009  1     4     1     0     1     24    24    10    0     0     0
      0     0     80    20    0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     25    25    12    0     0     0
      0     0     33.33333333 50    16.66666667 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     4     1     0     1     26    26    10    0     0     0
      0     0     0     70    0     0     20    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     27    27    11    0     0     0
      0     0     0     36.36363636 18.18181818 18.18181818 18.18181818
      9.090909091 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2009  1     4     1     0     1     28    28    24    0     0     0
      0     0     0     8.333333333 62.5  16.66666667 4.166666667
      4.166666667 4.166666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
2009  1     4     1     0     1     29    29    44    0     0     0
      0     0     0     0     15.90909091 40.90909091 36.36363636
      2.272727273 2.272727273 2.272727273 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2009  1     4     1     0     1     30    30    16    0     0     0
      0     0     0     0     0     6.25  37.5  12.5  25    6.25  0
      6.25  0     6.25  0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     31    31    16    0     0     0
      0     0     0     0     0     6.25  0     6.25  12.5  31.25 18.75
      6.25  12.5  0     0     0     0     0     0     0     0     0
      0     6.25  0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     32    32    12    0     0     0
      0     0     0     0     0     0     0     0     0     8.333333333
      0     25    8.333333333 0     8.333333333 8.333333333 16.66666667
      0     8.333333333 0     0     0     0     0     0     0     0
      16.66666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2009  1     4     1     0     1     33    33    8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     12.5  12.5  0     12.5  12.5  12.5
      0     12.5  12.5  0     0     12.5  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     34    34    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     50    0     0     50    0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     1     0     1     35    35    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     33.33333333 0     0     0     66.66666667 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     4     1     0     1     12    12    3     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     13    13    4     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     14    14    5     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     15    15    5     0     0     60
      40    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     16    16    7     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     17    17    5     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     18    18    8     0     0     0
      37.5  50    12.5  0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     19    19    14    0     0     0
      28.57142857 64.28571429 7.142857143 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     4     1     0     1     20    20    12    0     0     0
      16.66666667 58.33333333 25    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     4     1     0     1     21    21    15    0     0     0
      0     60    40    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     22    22    9     0     0     0
      0     0     77.77777778 22.22222222 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     4     1     0     1     23    23    13    0     0     0
      0     7.692307692 61.53846154 30.76923077 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     4     1     0     1     24    24    7     0     0     0
      0     0     28.57142857 71.42857143 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     4     1     0     1     25    25    13    0     0     0
      0     0     23.07692308 69.23076923 7.692307692 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     4     1     0     1     26    26    8     0     0     0
      0     0     12.5  62.5  25    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     27    27    6     0     0     0
      0     0     0     50    50    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     28    28    15    0     0     0
      0     0     0     13.33333333 46.66666667 26.66666667 0
      13.33333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2010  1     4     1     0     1     29    29    24    0     0     0
      0     0     0     0     12.5  12.5  8.333333333 66.66666667 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     4     1     0     1     30    30    18    0     0     0
      0     0     0     0     0     5.555555556 5.555555556 27.77777778
      22.22222222 22.22222222 5.555555556 0     11.11111111 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2010  1     4     1     0     1     31    31    10    0     0     0
      0     0     0     0     0     0     0     20    10    0     10
      10    10    0     20    0     10    10    0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     1     0     1     32    32    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      33.33333333 0     33.33333333 0     0     0     0     33.33333333
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     4     1     0     1     33    33    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     11.11111111 0     22.22222222 11.11111111 0     0     0
      11.11111111 0     0     0     0     0     11.11111111 0
      33.33333333 0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2010  1     4     1     0     1     34    34    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     100   0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     2     0     1     13    13    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     2     0     1     14    14    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     2     0     1     16    16    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     2     0     1     17    17    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     10    80    10
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     2     0     1     18    18    21    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     4.761904762
      76.19047619 19.04761905 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     4     2     0     1     19    19    20    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     75    20
      5     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     2     0     1     20    20    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     30.76923077
      46.15384615 15.38461538 0     7.692307692 0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     4     2     0     1     21    21    23    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     4.347826087
      73.91304348 17.39130435 0     4.347826087 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     4     2     0     1     22    22    24    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     8.333333333
      50    37.5  4.166666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2003  1     4     2     0     1     23    23    23    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      65.2173913  21.73913043 8.695652174 4.347826087 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2003  1     4     2     0     1     24    24    23    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     4.347826087
      60.86956522 17.39130435 4.347826087 4.347826087 4.347826087 0
      4.347826087 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2003  1     4     2     0     1     25    25    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     50
      20    10    20    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     2     0     1     26    26    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      18.18181818 45.45454545 36.36363636 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     4     2     0     1     27    27    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     10
      10    10    50    0     20    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     4     2     0     1     28    28    33    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      6.060606061 9.090909091 9.090909091 33.33333333 18.18181818
      6.060606061 3.03030303  3.03030303  3.03030303  3.03030303  0
```

```
      0     0     3.03030303  3.03030303  0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     4     2     0     1     29    29    24    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     8.333333333 29.16666667 16.66666667 12.5  0     4.166666667
      4.166666667 0     8.333333333 0     0     0     4.166666667
      8.333333333 0     0     4.166666667 0     0     0     0     0
      0     0     0
2003  1     4     2     0     1     30    30    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     25    25    0     0     0     0
      0     0     0     0     0     0     0     0     0     0     25
      25    0     0     0
2003  1     4     2     0     1     31    31    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     20
      0     0     20    0     0     0     0     0     0     0     0
      0     0     0     60
2003  1     4     2     0     1     32    32    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     100
2003  1     4     2     0     1     34    34    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     100
2003  1     4     2     0     1     35    35    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     100
2004  1     4     2     0     1     12    12    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     13    13    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     14    14    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     75    25    0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     15    15    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     16    16    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     25    50    25
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     17    17    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     18    18    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     50    50
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     19    19    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     25
      66.66666667 0     0     8.333333333 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     2     0     1     20    20    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     26.66666667
      46.66666667 20    6.666666667 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     2     0     1     21    21    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     75
      25    0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     22    22    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     80
      20    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     23    23    25    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     88
      12    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     24    24    21    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      76.19047619 23.80952381 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     2     0     1     25    25    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      53.33333333 46.66666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     4     2     0     1     26    26    8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     25
      75    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     27    27    8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     12.5
      87.5  0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     28    28    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     30    40    10    0     0     0     0     10    0     0
      10    0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     4     2     0     1     29    29    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     6.666666667 20    26.66666667 0     26.66666667 0     0
```

```
      0     0     6.666666667 0     6.666666667 0     0     0     0
      6.666666667 0     0     0     0     0     0     0
2004  1     4     2     0     1     30    30    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     8.333333333 0     0     0     0     0
      8.333333333 8.333333333 16.66666667 8.333333333 0     0
      8.333333333 0     0     0     0     0     8.333333333 8.333333333
      0     8.333333333 16.66666667
2004  1     4     2     0     1     31    31    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     25    25    0     0     0     0     25    0     0     0
      0     0     0     25
2004  1     4     2     0     1     32    32    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0
2004  1     4     2     0     1     33    33    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     100
2005  1     4     2     0     1     10    10    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     11    11    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     12    12    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     13    13    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     14    14    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     75    25    0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     15    15    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     50    50    0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     16    16    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     17    17    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     18    18    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     19    19    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     25    75
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     20    20    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     21    21    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     60
      40    0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     22    22    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     20
      73.33333333 6.666666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     4     2     0     1     23    23    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      5.882352941 82.35294118 11.76470588 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2005  1     4     2     0     1     24    24    21    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      57.14285714 42.85714286 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     4     2     0     1     25    25    24    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      58.33333333 41.66666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     4     2     0     1     26    26    19    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      5.263157895 26.31578947 63.15789474 5.263157895 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2005  1     4     2     0     1     27    27    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      12.5  37.5  50    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     28    28    20    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      10    25    30    10    10    5     10    0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     29    29    21    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     4.761904762 4.761904762 14.28571429 4.761904762 23.80952381
      4.761904762 23.80952381 0     0     9.523809524 4.761904762
```

```
      4.761904762 0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     4     2     0     1     30    30    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     12.5  25    6.25  0     12.5  0
      6.25  6.25  12.5  0     0     6.25  0     0     0     0     0
      6.25  0     0     6.25
2005  1     4     2     0     1     31    31    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     10    0
      0     10    0     0     10    10    10    10    10    10    0
      0     0     0     20
2005  1     4     2     0     1     32    32    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0
2006  1     4     2     0     1     13    13    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     83.33333333
      16.66666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     4     2     0     1     14    14    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     2     0     1     15    15    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     40    60    0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     2     0     1     16    16    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     2     0     1     17    17    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     2     0     1     18    18    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     88.88888889
      11.11111111 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     4     2     0     1     19    19    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     42.85714286
      57.14285714 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     4     2     0     1     20    20    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     50    50
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     2     0     1     21    21    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     2     0     1     22    22    14    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      42.85714286 42.85714286 14.28571429 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2006  1     4     2     0     1     23    23    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      16.66666667 50    33.33333333 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     4     2     0     1     24    24    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      68.75 18.75 12.5  0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     2     0     1     25    25    18    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      5.555555556 88.88888889 5.555555556 0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     4     2     0     1     26    26    20    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     90    10    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     4     2     0     1     27    27    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     40    53.33333333 6.666666667 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     4     2     0     1     28    28    54    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     7.407407407 40.74074074 42.59259259 5.555555556 1.851851852
      1.851851852 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
2006  1     4     2     0     1     29    29    32    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     6.25  46.875      21.875      3.125 6.25  6.25
      0     3.125 0     0     0     3.125 0     3.125 0     0     0
      0     0     0     0     0     0
2006  1     4     2     0     1     30    30    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     18.18181818 18.18181818
      9.090909091 18.18181818 0     0     0     0     18.18181818 0
      0     0     9.090909091 0     0     0     9.090909091 0     0
      0
2006  1     4     2     0     1     31    31    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     50    0
      50    0     0     0
2006  1     4     2     0     1     32    32    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     100
2007  1     4     2     0     1     12    12    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     2     0     1     13    13    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     2     0     1     14    14    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     2     0     1     15    15    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     60    20
      20    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     2     0     1     16    16    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     69.23076923
      30.76923077 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     2     0     1     17    17    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     71.42857143
      28.57142857 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     2     0     1     18    18    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     20    70
      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
2007  1     4     2     0     1     19    19    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     9.090909091
      81.81818182 9.090909091 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     4     2     0     1     20    20    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     7.692307692
      61.53846154 30.76923077 0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     4     2     0     1     21    21    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      46.15384615 46.15384615 7.692307692 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2007  1     4     2     0     1     22    22    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     4     2     0     1     23    23    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      42.85714286 42.85714286 0     14.28571429 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     4     2     0     1     24    24    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      26.66666667 40    13.33333333 20    0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     4     2     0     1     25    25    14    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      21.42857143 14.28571429 42.85714286 21.42857143 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2007  1     4     2     0     1     26    26    21    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     28.57142857 52.38095238 19.04761905 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     4     2     0     1     27    27    23    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     4.347826087 56.52173913 21.73913043 13.04347826 4.347826087
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2007  1     4     2     0     1     28    28    55    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     12.72727273 38.18181818 32.72727273 7.272727273 1.818181818
      3.636363636 1.818181818 1.818181818 0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0
2007  1     4     2     0     1     29    29    27    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     3.703703704 22.22222222 22.22222222 11.11111111 3.703703704
      11.11111111 11.11111111 3.703703704 3.703703704 0     7.407407407
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0
2007  1     4     2     0     1     30    30    18    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     16.66666667 5.555555556 5.555555556 11.11111111
      11.11111111 11.11111111 0     11.11111111 5.555555556 5.555555556
      0     0     11.11111111 0     0     0     0     5.555555556 0
      0     0     0     0
2007  1     4     2     0     1     31    31    8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      12.5  0     12.5  0     12.5  12.5  12.5  0     0     0     25
      0     0     0     12.5
2007  1     4     2     0     1     32    32    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     100
2008  1     4     2     0     1     11    11    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     2     0     1     14    14    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     2     0     1     15    15    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     2     0     1     16    16    14    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     71.42857143
```

```
      28.57142857 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     4     2     0     1     17    17    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     70    30
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     2     0     1     18    18    19    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     5.263157895
      94.73684211 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     4     2     0     1     19    19    23    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     4.347826087
      82.60869565 13.04347826 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     4     2     0     1     20    20    19    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      78.94736842 15.78947368 0     5.263157895 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2008  1     4     2     0     1     21    21    14    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      28.57142857 71.42857143 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     4     2     0     1     22    22    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     20
      60    20    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     2     0     1     23    23    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      71.42857143 0     28.57142857 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     4     2     0     1     24    24    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      33.33333333 22.22222222 11.11111111 33.33333333 0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2008  1     4     2     0     1     25    25    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      30    20    20    20    0     0     0     0     0     10    0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     2     0     1     26    26    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      10    10    50    20    10    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     4     2     0     1     27    27    19    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     5.263157895 36.84210526 31.57894737 21.05263158 0
      5.263157895 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
2008  1     4     2     0     1     28    28    34    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     8.823529412 32.35294118 26.47058824 26.47058824 5.882352941
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2008  1     4     2     0     1     29    29    33    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     6.060606061 15.15151515 24.24242424 12.12121212
      3.03030303  21.21212121 9.090909091 0     0     0     3.03030303
      0     3.03030303  0     0     0     3.03030303  0     0     0
      0     0     0     0
2008  1     4     2     0     1     30    30    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     14.28571429 0     0     0
      42.85714286 0     0     14.28571429 0     0     0     0     0
      28.57142857 0     0     0     0     0     0     0
2008  1     4     2     0     1     31    31    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      14.28571429 14.28571429 0     0     0     14.28571429 0     0
      0     0     14.28571429 0     0     14.28571429 28.57142857
2008  1     4     2     0     1     32    32    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     50    0     0     0     0     0     0     0
      0     0     50    0
2009  1     4     2     0     1     7     7     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     2     0     1     9     9     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     2     0     1     13    13    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     2     0     1     14    14    8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     75    25    0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     2     0     1     15    15    8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     37.5  62.5  0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     2     0     1     16    16    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     11.11111111
      88.88888889 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     4     2     0     1     17    17    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     2     0     1     18    18    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      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     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     4     2     0     1     19    19    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     2     0     1     20    20    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     13.33333333
      66.66666667 20    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     4     2     0     1     21    21    18    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      33.33333333 61.11111111 5.555555556 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2009  1     4     2     0     1     22    22    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      13.33333333 80    6.666666667 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     4     2     0     1     23    23    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      82.35294118 17.64705882 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     4     2     0     1     24    24    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      29.41176471 52.94117647 5.882352941 11.76470588 0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2009  1     4     2     0     1     25    25    20    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      15    60    15    5     5     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     2     0     1     26    26    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      5.882352941 41.17647059 41.17647059 11.76470588 0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2009  1     4     2     0     1     27    27    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     43.75 25    25    6.25  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     4     2     0     1     28    28    43    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     2.325581395 18.60465116 32.55813953 23.25581395 18.60465116
      2.325581395 2.325581395 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
2009  1     4     2     0     1     29    29    31    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     3.225806452 22.58064516 29.03225806 16.12903226
      3.225806452 9.677419355 9.677419355 3.225806452 3.225806452 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0
2009  1     4     2     0     1     30    30    26    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     3.846153846 0     7.692307692 0     11.53846154
      7.692307692 7.692307692 23.07692308 3.846153846 0     0     0
      3.846153846 15.38461538 0     0     0     0     0     0
      7.692307692 0     7.692307692
2009  1     4     2     0     1     31    31    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     15.38461538
      7.692307692 0     0     0     15.38461538 0     0     15.38461538
      0     0     7.692307692 7.692307692 7.692307692 0     0
      23.07692308
2009  1     4     2     0     1     32    32    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     20    0
      0     0     0     0     0     0     0     20    20    0     0
      0     0     0     40
2009  1     4     2     0     1     33    33    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     100
2009  1     4     2     0     1     34    34    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     100   0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     2     0     1     12    12    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     2     0     1     13    13    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     66.66666667
      33.33333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     4     2     0     1     14    14    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     2     0     1     15    15    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     66.66666667
      33.33333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     4     2     0     1     16    16    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     33.33333333
      55.55555556 11.11111111 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2010  1     4     2     0     1     17    17    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     60    40
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     2     0     1     18    18    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     60    30
      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
2010  1     4     2     0     1     19    19    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     36.36363636
```

```
      63.63636364 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     4     2     0     1     20    20    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     9.090909091
      72.72727273 18.18181818 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     4     2     0     1     21    21    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      47.05882353 41.17647059 11.76470588 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2010  1     4     2     0     1     22    22    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      15.38461538 61.53846154 23.07692308 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2010  1     4     2     0     1     23    23    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      63.63636364 36.36363636 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     4     2     0     1     24    24    14    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      28.57142857 35.71428571 35.71428571 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     4     2     0     1     25    25    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     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     0     0     0     0     0     0
      0     0     0     0
2010  1     4     2     0     1     26    26    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      20    50    30    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     2     0     1     27    27    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     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     0     0     0
      0     0     0     0     0     0
2010  1     4     2     0     1     28    28    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     16.66666667 16.66666667 8.333333333 41.66666667
      16.66666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
2010  1     4     2     0     1     29    29    24    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     12.5  33.33333333 16.66666667 12.5  12.5
      0     8.333333333 4.166666667 0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2010  1     4     2     0     1     30    30    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     60    0     0     0     0     20
      20    0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     4     2     0     1     31    31    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      14.28571429 14.28571429 0     28.57142857 0     0     0     0
      0     0     0     0     0     28.57142857 0     14.28571429
2003  1     5     1     0     1     8     8     1     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     9     9     2     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     10    10    2     0     50    50
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     12    12    3     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     13    13    2     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     14    14    3     0     0
      33.33333333 66.66666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     5     1     0     1     15    15    4     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     16    16    4     0     0     50
      50    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     17    17    20    0     0     15
      65    20    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     18    18    21    0     0     0
      90.47619048 9.523809524 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2003  1     5     1     0     1     19    19    24    0     0     0
      66.66666667 33.33333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2003  1     5     1     0     1     20    20    14    0     0     0
      71.42857143 28.57142857 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2003  1     5     1     0     1     21    21    5     0     0     0
      60    40    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     22    22    4     0     0     0
      0     75    25    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     23    23    5     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     24    24    3     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     25    25    2     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     26    26    3     0     0     0
      0     33.33333333 33.33333333 33.33333333 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     5     1     0     1     27    27    4     0     0     0
      0     50    25    25    0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     1     0     1     28    28    1     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     5     5     2     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     6     6     1     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     7     7     1     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     8     8     5     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     9     9     6     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     10    10    7     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     11    11    5     0     80    20
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     12    12    3     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     13    13    10    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     14    14    9     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     15    15    10    0     0     90
      10    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     16    16    4     0     0     75
      25    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     17    17    3     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     18    18    1     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     19    19    4     0     0     0
      50    50    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     20    20    6     0     0     0
      33.33333333 66.66666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2004  1     5     1     0     1     21    21    12    0     0     0
      16.66666667 83.33333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2004  1     5     1     0     1     22    22    9     0     0     0
      11.11111111 88.88888889 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2004  1     5     1     0     1     23    23    3     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     24    24    1     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     25    25    5     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     26    26    1     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     27    27    1     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     1     0     1     28    28    1     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     6     6     3     33.33333333
      66.66666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     5     1     0     1     7     7     5     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     8     8     12    16.66666667
      83.33333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     5     1     0     1     9     9     15    0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     10    10    8     0     75    25
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     11    11    5     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     12    12    14    0     7.142857143
      92.85714286 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     5     1     0     1     13    13    24    0     0
      95.83333333 4.166666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     5     1     0     1     14    14    14    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     15    15    7     0     0
      71.42857143 28.57142857 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     5     1     0     1     16    16    9     0     0
      11.11111111 88.88888889 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     5     1     0     1     17    17    12    0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     18    18    4     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     19    19    3     0     0     0
      66.66666667 33.33333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     5     1     0     1     20    20    5     0     0     0
      40    60    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     21    21    2     0     0     0
      50    50    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     22    22    8     0     0     0
      0     50    50    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     23    23    4     0     0     0
      0     25    75    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     24    24    10    0     0     0
      0     10    90    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     25    25    8     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     1     0     1     27    27    2     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     6     6     1     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     7     7     11    0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     8     8     10    0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     9     9     9     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     10    10    11    0     90.90909091
      9.090909091 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     5     1     0     1     11    11    10    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     12    12    23    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     13    13    34    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     14    14    30    0     0
      93.33333333 6.666666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     5     1     0     1     15    15    11    0     0
      36.36363636 63.63636364 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     5     1     0     1     16    16    11    0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     17    17    24    0     0
      4.166666667 87.5  8.333333333 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     5     1     0     1     18    18    10    0     0     0
      80    20    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     19    19    5     0     0     0
      60    40    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     20    20    2     0     0     0
      50    50    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     21    21    6     0     0     0
      16.66666667 83.33333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     5     1     0     1     23    23    3     0     0     0
      0     33.33333333 66.66666667 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     5     1     0     1     24    24    1     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     25    25    3     0     0     0
      0     0     0     100   0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     26    26    3     0     0     0
      0     0     0     100   0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     27    27    3     0     0     0
      0     0     0     100   0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     28    28    2     0     0     0
      0     0     0     0     100   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     1     0     1     31    31    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     7     7     3     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     8     8     2     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     9     9     5     0     60    40
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     10    10    1     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     11    11    25    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     12    12    13    0     0
      92.30769231 0     7.692307692 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     5     1     0     1     13    13    43    0     0
      97.6744186  2.325581395 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     5     1     0     1     14    14    21    0     0
      61.9047619  33.33333333 4.761904762 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     5     1     0     1     15    15    16    0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     16    16    22    0     0     0
      95.45454545 4.545454545 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     5     1     0     1     17    17    18    0     0     0
      88.88888889 11.11111111 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     5     1     0     1     18    18    16    0     0     0
      56.25 31.25 12.5  0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     19    19    11    0     0     0
      45.45454545 45.45454545 9.090909091 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     5     1     0     1     20    20    7     0     0     0
      0     85.71428571 14.28571429 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     5     1     0     1     21    21    10    0     0     0
      0     40    40    20    0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     22    22    3     0     0     0
      0     33.33333333 33.33333333 33.33333333 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     5     1     0     1     24    24    1     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     26    26    1     0     0     0
      0     0     0     100   0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     1     0     1     27    27    3     0     0     0
      0     0     0     33.33333333 66.66666667 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     5     1     0     1     28    28    3     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     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     1     0     1     6     6     2     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     1     0     1     7     7     1     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     1     0     1     8     8     1     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     1     0     1     9     9     6     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     1     0     1     10    10    10    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     1     0     1     11    11    11    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     1     0     1     12    12    9     0     0
      88.88888889 11.11111111 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     1     0     1     13    13    11    0     0
      90.90909091 9.090909091 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     1     0     1     14    14    7     0     0
      28.57142857 71.42857143 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     1     0     1     15    15    14    0     0
      7.142857143 92.85714286 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     1     0     1     16    16    11    0     0     0
      90.90909091 9.090909091 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     5     1     0     1     17    17    11    0     0     0
      63.63636364 36.36363636 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     5     1     0     1     18    18    7     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     1     0     1     19    19    7     0     0     0
      0     85.71428571 14.28571429 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     5     1     0     1     20    20    3     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     1     0     1     21    21    2     0     0     0
      0     50    50    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     6     6     1     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     7     7     5     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     8     8     11    0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     9     9     18    0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     10    10    10    0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     11    11    12    0     75    25
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     12    12    6     0     33.33333333
      66.66666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     5     1     0     1     13    13    14    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     14    14    19    0     5.263157895
      73.68421053 21.05263158 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     5     1     0     1     15    15    22    0     0
      68.18181818 31.81818182 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     5     1     0     1     16    16    25    0     0     20
      80    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     17    17    20    0     0     0
      90    10    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     18    18    16    0     0     0
      75    25    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     19    19    11    0     0     0
      18.18181818 81.81818182 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     5     1     0     1     20    20    13    0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     21    21    9     0     0     0
      0     88.88888889 11.11111111 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     5     1     0     1     22    22    3     0     0     0
      0     33.33333333 66.66666667 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     5     1     0     1     23    23    3     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     1     0     1     25    25    1     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     6     6     1     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     8     8     3     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     9     9     2     0     50    50
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     10    10    2     0     50    50
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     11    11    10    0     10    90
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     12    12    29    0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     13    13    47    0     0
      97.87234043 2.127659574 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     5     1     0     1     14    14    41    0     0
      90.24390244 7.317073171 2.43902439  0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2010  1     5     1     0     1     15    15    15    0     0     80
      20    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     16    16    10    0     0     20
      60    20    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     17    17    10    0     0     0
      80    20    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     18    18    8     0     0     0
      50    50    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     19    19    4     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     20    20    8     0     0     0
      12.5  75    12.5  0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     21    21    7     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     22    22    3     0     0     0
      0     66.66666667 33.33333333 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     5     1     0     1     23    23    9     0     0     0
      0     22.22222222 77.77777778 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     5     1     0     1     24    24    3     0     0     0
      0     0     66.66666667 33.33333333 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     5     1     0     1     25    25    6     0     0     0
      0     0     33.33333333 50    16.66666667 0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2010  1     5     1     0     1     26    26    4     0     0     0
      0     0     25    25    50    0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     1     0     1     27    27    1     0     0     0
      0     0     0     0     100   0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     9     9     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     10    10    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     11    11    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     25    50    25    0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     12    12    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     13    13    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     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     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     5     2     0     1     14    14    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     71.42857143
      28.57142857 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     5     2     0     1     15    15    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     50    50    0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     16    16    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     50    50    0
      0     0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     17    17    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     16.66666667
      66.66666667 16.66666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     5     2     0     1     18    18    19    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     78.94736842
      15.78947368 5.263157895 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     5     2     0     1     19    19    23    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     69.56521739
      26.08695652 4.347826087 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     5     2     0     1     20    20    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     21    21    8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     75    12.5
      12.5  0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     22    22    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     28.57142857
      42.85714286 28.57142857 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2003  1     5     2     0     1     23    23    8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     75
      0     25    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     24    24    14    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     7.142857143
      57.14285714 14.28571429 21.42857143 0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2003  1     5     2     0     1     25    25    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     50
      0     50    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     26    26    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2003  1     5     2     0     1     28    28    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     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     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     5     5     2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     7     7     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     8     8     7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     9     9     8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     10    10    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     11    11    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     12    12    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     25    75    0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     13    13    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     14    14    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     87.5  12.5  0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     15    15    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     16    16    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     17    17    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     66.66666667
      33.33333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     5     2     0     1     18    18    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     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     0     0     0     0     0     0
      0     0     0     0     0     0
2004  1     5     2     0     1     19    19    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     33.33333333
      66.66666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2004  1     5     2     0     1     20    20    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     22.22222222
      55.55555556 22.22222222 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     5     2     0     1     21    21    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     13.33333333
      73.33333333 13.33333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     5     2     0     1     22    22    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      69.23076923 30.76923077 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     5     2     0     1     23    23    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      83.33333333 16.66666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2004  1     5     2     0     1     24    24    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     75
      0     25    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     25    25    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2004  1     5     2     0     1     4     4     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     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
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     6     6     3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0   100     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     7     7    10     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0   100     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     8     8    22     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0   100     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     9     9    27     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0 88.88888889 11.11111111
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     5     2     0     1    10    10    12     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0    75    25     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1    11    11     7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0   100     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1    12    12    16     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0   100     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1    13    13    25     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0   100     0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     14    14    21    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     15    15    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     66.66666667 25
      8.333333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     5     2     0     1     16    16    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     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     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     5     2     0     1     17    17    14    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     100   0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     18    18    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     57.14285714
      42.85714286 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2005  1     5     2     0     1     19    19    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     20    80
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     20    20    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     21    21    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     22    22    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     40
      60    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     23    23    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      33.33333333 66.66666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2005  1     5     2     0     1     24    24    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     26    26    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2005  1     5     2     0     1     27    27    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     5     5     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     100   0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     6     6     3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     7     7     10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     8     8     9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     9     9     18    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     10    10    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     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     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     5     2     0     1     11    11    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     12    12    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     83.33333333
      16.66666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     5     2     0     1     13    13    34    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     97.05882353
      2.941176471 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     5     2     0     1     14    14    28    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     89.28571429
      10.71428571 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     5     2     0     1     15    15    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     69.23076923
      30.76923077 0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     5     2     0     1     16    16    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     6.25  93.75 0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     17    17    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     5.882352941
      94.11764706 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2006  1     5     2     0     1     18    18    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     6.666666667 80
      13.33333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     5     2     0     1     19    19    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     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     0     0     0     0     0     0
      0     0     0     0     0     0
2006  1     5     2     0     1     20    20    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     21    21    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     22    22    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     50
      50    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     23    23    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     24    24    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     25    25    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      50    50    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     26    26    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     100   0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2006  1     5     2     0     1     28    28    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     100   0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     7     7     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     8     8     2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     9     9     2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     10    10    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     11    11    23    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     12    12    24    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     13    13    40    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     90    7.5   0
      2.5   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     14    14    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     75    25    0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     15    15    24    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     20.83333333
      79.16666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     5     2     0     1     16    16    20    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     5     95    0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     17    17    21    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     80.95238095
      19.04761905 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2007  1     5     2     0     1     18    18    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     31.25 50
      18.75 0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     19    19    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     40    30
      30    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     20    20    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      66.66666667 33.33333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     5     2     0     1     21    21    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     11.11111111 0
      33.33333333 55.55555556 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     5     2     0     1     22    22    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      33.33333333 50    16.66666667 0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2007  1     5     2     0     1     23    23    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     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     0     0     0     0
      0     0     0     0     0     0     0     0
2007  1     5     2     0     1     24    24    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      50    50    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     25    25    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      50    0     50    0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2007  1     5     2     0     1     26    26    3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     33.33333333 33.33333333 33.33333333 0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     2     0     1     5     5     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     2     0     1     8     8     3     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     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     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     5     2     0     1     9     9     8     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     50    50    0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     2     0     1     10    10    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     6.25  93.75 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     2     0     1     11    11    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     2     0     1     12    12    10    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     2     0     1     13    13    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     81.81818182
      18.18181818 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     2     0     1     14    14    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     46.15384615
      53.84615385 0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     2     0     1     15    15    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     13.33333333
      86.66666667 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     2     0     1     16    16    14    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     7.142857143
      78.57142857 14.28571429 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2008  1     5     2     0     1     17    17    7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     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     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     5     2     0     1     18    18    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     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     0     0     0     0     0     0
      0     0     0     0     0     0
2008  1     5     2     0     1     19    19    5     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     2     0     1     20    20    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      88.88888889 11.11111111 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     2     0     1     21    21    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     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     0     0     0     0
      0     0     0     0     0     0     0
2008  1     5     2     0     1     22    22    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
```

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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2008  1     5     2     0     1     28    28    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     2     0     1     5     5     1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     2     0     1     7     7     7     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     2     0     1     8     8     34    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     2     0     1     9     9     27    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     2     0     1     10    10    14    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     92.85714286 7.142857143
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     5     2     0     1     11    11    15    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     73.33333333 26.66666667
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     5     2     0     1     12    12    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     16.66666667 83.33333333
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     5     2     0     1     13    13    21    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     95.23809524
      4.761904762 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     5     2     0     1     14    14    29    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     75.86206897
      20.68965517 3.448275862 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2009  1     5     2     0     1     15    15    27    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     62.96296296
      37.03703704 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     5     2     0     1     16    16    29    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     24.13793103
      72.4137931  3.448275862 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2009  1     5     2     0     1     17    17    30    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     6.666666667 90
      3.333333333 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     5     2     0     1     18    18    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     47.05882353
      52.94117647 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     5     2     0     1     19    19    9     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     11.11111111
      88.88888889 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0
2009  1     5     2     0     1     20    20    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
```

```
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     2     0     1     21    21    12    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      91.66666667 8.333333333 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2009  1     5     2     0     1     22    22    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     25
      75    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     2     0     1     23    23    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     50
      50    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     2     0     1     24    24    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2009  1     5     2     0     1     29    29    1     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     100   0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     8     8     4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     9     9     4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     100   0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     10    10    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     50    50    0     0
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     11    11    16    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     6.25  93.75 0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     12    12    31    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     100   0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     13    13    47    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     95.74468085
      4.255319149 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     5     2     0     1     14    14    29    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     93.10344828
      6.896551724 0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     5     2     0     1     15    15    38    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     89.47368421
      7.894736842 2.631578947 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2010  1     5     2     0     1     16    16    13    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     53.84615385
      38.46153846 7.692307692 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2010  1     5     2     0     1     17    17    17    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     11.76470588
      58.82352941 23.52941176 5.882352941 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0
2010  1     5     2     0     1     18    18    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     100
      0     0     0     0     0     0     0     0     0     0     0
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      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     19    19    11    0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     27.27272727
      63.63636364 9.090909091 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     5     2     0     1     20    20    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      83.33333333 16.66666667 0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0
2010  1     5     2     0     1     21    21    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     50
      50    0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     22    22    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     23    23    6     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0
      16.66666667 66.66666667 16.66666667 0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0
2010  1     5     2     0     1     24    24    4     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      50    50    0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
2010  1     5     2     0     1     25    25    2     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      100   0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0
#
#
0       # Mean Size at Age Observations
0       # Total number of environmental variables
0       # Total number of environmental observations
0       # No Weight frequency data
```

```
0       # No tagging data
0       # No morph composition data

999 # End data file
```

# Appendix B. Stock Synthesis control file for darkblotched rockfish

```
# darkblotched control file
# updated to run in SSv3.20

# Morph setup
1     # Number of growth patterns
1     # N sub morphs within growth patterns

# Note:  these control the retention function.
# First block is ascending part of the curve.
# Second block controls asymptote.
# Block for 2009-10 added for 2011 update.

2 # Blocks
1  4  # blocks in each design
2000 2010
2000 2001 2002 2003 2004 2005 2006 2010

# Mortality and growth specifications
0.5   # Fraction female at birth
1     # M setup: 0=single
Par,1=N_breakpoints,2=Lorenzen,3=agespecific;_4=agespec_withseasinterpo
late
2     # Number of M breakpoints
4 15  # Ages at M breakpoints
1       # Growth model: 1=VB with L1 and L2, 2=VB with A0 and Linf,
3=Richards, 4=Read vector of L@A
1.7   # Age for growth Lmin
29    # Age for growth Lmax or 999 = Linf
0.1   # SD constant added to LAA (0.1 mimics v1.xx for compatibility
only)
0     # Variability about growth: 0=CV~f(LAA) [mimic v1.xx], 1=CV~f(A),
2=SD~f(LAA), 3=SD~f(A)
1     # Maturity option: 1=length logistic, 2=age logistic, 3=read age-
maturity matrix by growth_pattern
2     # First age allowed to mature
1       # fecundity option
0       # hermaphro
3     # mg parm offset option:
#old key: 1=direct assignment, 2=each pat. x gender offset from pat. 1
gender 1, 3=offsets as SS2 V1.xx with M old and CV old offset from
young values
#new key: 1=none, 2= M, G, CV_G as offset from female-GP1, 3=like SS2
V1.x)

1     # mg parm adjust method 1=do V1.23 approach, 2=use logistic
transform between bounds approach

# Maturity & Growth Parameters
# min       max   init        prior pr_type     sd    phase       env
      UseDev      Minyr Maxyr DevSD use_bl bl_type
0.01  0.15  0.07  0.08  0     0.8   -3    0     0     0     0     0
      0     0     # natM Young
-3    3     0     0     0     0.8   -3    0     0     0     0     0
      0     0     # natM old exp offset
```

```
12    16    14.5  14.6  0     5     2     0     0     0     0     0
      0     0     # Lmin
40    60    42.44 42.5  0     10    2     0     0     0     0     0
      0     0     # Lmax
0.05  0.25  0.215 0.2   0     0.8   3     0     0     0     0     0
      0     0     # VBK
0.05  0.25  0.065 0.07  0     0.8   3     0     0     0     0     0
      0     0     # CV Young
-3    3     0     0     0     0.8   4     0     0     0     0     0
      0     0     # CV old offset
-3    3     0     0     0     0.8   -3    0     0     0     0     0
      0     0     # Male natmort offset
-3    3     0     0     0     0.8   -3    0     0     0     0     0
      0     0     # male natmore offset
-3    3     0     0     0     0.8   -5    0     0     0     0     0
      0     0     # Male Lmin offset
-3    3     -0.12 0     0     0.8   3     0     0     0     0     0
      0     0     # Male Lmax offset *
-3    3     0.233 0     0     0.8   3     0     0     0     0     0
      0     0     # Male VBK offset *
-3    3     0     0     0     0.8   -6    0     0     0     0     0
      0     0     # Male cv Y offset
-3    3     0     0     0     0.8   -6    0     0     0     0     0
      0     0     # Male cv old offset

-3    3     2.10E-05 0   0    0.8   -3    0     0     0     0     0
      0     0     # F L to wt coeff
-3    3     2.96142     2.64694     0     0.8   -3    0     0     0
      0     0     0     0     # F L to Wt exp
0     60    34.59 55    0     0.8   -3    0     0     0     0     0
      0     0     # Mat infl
-3    3     -0.6429     -0.25 0     0.8   -3    0     0     0     0
      0     0     0     # Mat logistic slope (negative)
-3    3     0.1458      1     0     0.8   -3    0     0     0     0
      0     0     0     # fecund intercept
0     2     1.325 1     0     0.8   -3    0     0     0     0     0
      0     0     # fecund multiplier
-3    3     2.10E-05 0  0     0.8   -3    0     0     0     0     0
      0     0     # Male L to wt coeff
-3    3     2.96142     2.64694     0     0.8   -3    0     0     0
      0     0     0     0     # Male L to wt exp

0     1     1     1     0     50    -50   0     0     0     0     0
      0     0     # Recruitment apportionment by growth pattern
0     1     1     1     0     50    -50   0     0     0     0     0
      0     0     # Rec app by Area
0     1     1     1     0     50    -50   0     0     0     0     0
      0     0     # Rec app by Season
0     1     1     1     0     50    -50   0     0     0     0     0
      0     0     # Cohort growth deviation

# Seasonal effects on biology parameters (0=none)
 0 0 0 0 0 0 0 0 0 0

3 #Recruitment Function 1 BH w/flat top, 2 Ricker, 3 BH, 4 none
# Recruitment Parms
# Low High  Init  Prior PrType      SD    phase
```

```
3     31    8.2   8     0     10    1     # R0
0.2   0.95  0.6   0.507 2     0.141 -2    # h
0     2     0.8   0.8   0     0.8   -1    # sigma R
-5    5     0     0     0     1     -3    # Env link coeff
-5    5     0     0     0     1     -3    # Init Equilb offset to
virgin
-1    1     0     0     0     100   -1    # placeholder for
Autocorrelation

0 # index of environmental variable to be used
0 # env target parameter: 0=none, 1=rec devs, 2=R0, 3=steepness

# Recruitment residuals
1       # rec dev type: 0=none, 1=devvector (zero-sum), 2=simple
deviations (no sum constraint)
1975  # Start year recruitment residuals
2009  # End year recruitment residuals
3     # Phase

1 # Read 11 advanced recruitment options: 0=no, 1=yes
0     # first year for early rec devs
-4    # phase for early rec devs
5     # Phase for forecast recruit deviations
1     # Lambda for forecast recr devs before endyr+1
1974  #_last_yr_nobias_adj_in_MPD
1975  # first year of full bias correction (linear ramp up from this
year minus the plus-age to this year)
2009  # last year for full bias correction in_MPD
2010  #_first_recent_yr_nobias_adj_in_MPD
1.0     # Max bias correction
0     # placeholder
-15   # Lower bound rec devs
15    # Upper bound rec devs
0       # read intitial values for rec devs

# Fishing mortality setup
0.06  # F ballpark for tuning early phases
1999  # F ballpark year
1     # F method:  1=Pope's; 2=Instan. F; 3=Hybrid (recommended)
0.9   # max F or harvest rate, depends on F_Method

# Initial Fishing Mortality Parameters
0  1  0  0.01  0  99  -1

# Catchability Specification (Q_setup)
#_Den-dep  env-var  extra_se  Q_type
0          0        0         0 # 1 FISHERY
0          0        0         0 # 2 TRIENNIAL
0          0        0         0 # 3 SLOPE
0          0        0         0 # 4 NWSLOPE
0          0        0         0 # 5 NWSHELF

# Selectivity Specification
#Type Retent      Moffset     Special
#Length
24    1     0     0 #Fishery
24    0     0     0 #Triennial
```

```
24    0     0     0 #AFSC slope
24    0     0     0 #NW slope
24    0     0     0 #NW shelf

10    0     0     0 #Age selects 10 = flat
10    0     0     0
10    0     0     0
10    0     0     0
10    0     0     0

# Selectivity Parameter

#Low  High  Init  Prior PrType      SD    Phase env   usedev      minyr
      maxyear     sd    block blswitch
20    45    36    32    0     50    2     0     0     0     0.5
      0     0     # 1 = baseparm*exp(blockparm)
-6    4     1     0     0     50    2     0     0     0     0
      0     0
-1    9     4     4     0     50    3     0     0     0     0
      0     0

-1    9     5     5.5   0     50    3     0     0     0     0
      0     0

-5    9     -2    -2    0     50    2     0     0     0     0
      0     0

-5    9     9     5     0     50    -3    0     0     0     0
      0     0


15    70    27    35    0     99    2     0     0     0     0.5
      1     2
0.1   10    2     1     0     99    2     0     0     0     0.5
      0     0     # 1 means that parmí = baseparm + blockparm
0.001 1     1     1     0     99    -3    0     0     0     0.5
      2     2     # 2 means that parmí = blockparm
0     0     0     0     0     99    -3    0     0     0     0.5
      0     0


10    45    21    23    0     50    2     0     0     0     0
      0     0
-6    4     -4    -1    0     50    2     0     0     0     0
      0     0
-1    9     4     4     0     50    3     0     0     0     0
      0     0

-1    9     4     6     0     50    4     0     0     0     0
      0     0

-5    9     -2    -4    0     50    2     0     0     0     0
      0     0

-5    9     -3    -1    0     50    3     0     0     0     0
      0     0
```

```
10    45    23    28    0     50    2     0     0     0     0     0
      0     0
-6    4     -1    -1    0     50    2     0     0     0     0     0
      0     0
-1    9     2     4     0     50    3     0     0     0     0     0
      0     0

-1    9     2     4     0     50    3     0     0     0     0     0
      0     0

-5    9     -5    -4    0     50    -4    0     0     0     0     0
      0     0

-5    9     -4    -2    0     50    3     0     0     0     0     0
      0     0



10    45    25    28    0     50    2     0     0     0     0     0
      0     0
-6    4     3     1     0     50    2     0     0     0     0     0
      0     0
-1    9     3     4     0     50    3     0     0     0     0     0
      0     0

-1    9     4     4     0     50    3     0     0     0     0     0
      0     0

-5    9     -5    -4    0     50    -4    0     0     0     0     0
      0     0

-5    9     9     1     0     50    -3    0     0     0     0     0
      0     0

8     45    18    20    0     50    2     0     0     0     0     0
      0     0
-6    4     -1    -1    0     50    3     0     0     0     0     0
      0     0
#-1   9     0     2     0     50    3     0     0     0     0     0
      0     0

-1    9     -0.5  2     0     50    -3    0     0     0     0     0
      0     0

-1    9     3     4     0     50    4     0     0     0     0     0
      0     0

-5    9     -1    -3    0     50    4     0     0     0     0     0
      0     0

-5    9     -5    -4    0     50    -3    0     0     0     0     0
      0     0

1     # Selex block setup: 0=Read one line apply all, 1=read one line
each parameter
# Lo  Hi    Init  Prior P_type      SD    Phase
15  70      25  30      0  99  4
```

```
0.3  1  .7  .7  0  99  3
0.3  1  .8  .8  0  99  3
0.3  1  .6  .6  0  99  3
0.3  1  .6  .6  0  99  3

1 #_env/block/dev_adjust_method (1=standard; 2=logistic trans to keep
in base parm bounds)
0 # Tagging flag: 0=none,1=read parameters for tagging

### Likelihood related quantities ###
# variance/sample size adjustment by fleet
1 # Do variance adjustments
0  .21  .20  .61  .17   # const added to survey cv
0  0  0  0  0   # const added to discard sd
0  0  0  0  0   # const added to body weight sd
.63  .71  .58  .88  1   # mult scalar for length comps
1 .50  1  .25  .15   # mult scalar for age comps
1  1  1  1  1   # mult scalar for length at age obs

# removed for SSv3.20: 30     # DF discard fraction data t-distribution
(discard_like)
# removed for SSv3.20: 30     # DF mean body weight data t-distribution
(DF_for_meanbodywt_like)

1     # Max N lambda phases: read this N values for each item below
0     # SD offset (CPUE, discard, mean body weight, recruitment devs):
0=omit log(s) term, 1=include

0 # N changes to default Lambdas = 1.0
# Component codes:
#  1=survey
#  2=discard
#  3=mean body weight
#  4=length frequency
#  5=age frequency
#  6=Weight frequency
#  7=size at age
#  8=catch
#  9=initial equilibrium catch
#  10=rec devs
#  11=parameter priors
#  12=parameter deviations
#  13=Crash penalty
#  14=Morph composition
#  15=Tag composition
#  16=Tag return
# Component fleet/survey  phase  value  wtfreq_method

0 # extra SD pointer

999 # end of control file
```

# Appendix C. Stock Synthesis Starter file for darkblotched rockfish

```
#V3.21d
#C  generic forecast file
# 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 # MSY: 1= set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt); 4=set to
F(endyr)
#0.4 # SPR target (e.g. 0.40)
#0.342 # Biomass target (e.g. 0.40)
0.5 # SPR target (e.g. 0.40)
0.4 # 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
#  2010 2010 2010 2010 2010 2010 # after processing
1 #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
0.20 # 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 0 0
#  1180659524 1667592815 7631713 0 # after processing
1 # Control rule method (1=catch=f(SSB) west coast; 2=F=f(SSB) )
0.40 # Control rule Biomass level for constant F (as frac of Bzero,
e.g. 0.40); (Must be > the no F level below)
0.10 # 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=OFL only; 2=ABC; 3=get F from forecast ABC
catch with allocations applied)
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)
#-65534 #_Forecast loop control #5 (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 # 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)
2013 # Rebuilder:  first year catch could have been set to zero
(Ydecl)(-1 to set to 1999)
2013 # 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:  FISHERY
#  0
# max totalcatch by fleet (-1 to have no max) must enter value for each
fleet
-1
# max totalcatch by area (-1 to have no max); must enter value for each
fleet
-1
# fleet assignment to allocation group (enter group ID# for each fleet,
0 for not included in an alloc group)
0
#_Conditional on >1 allocation group
# allocation fraction for each of: 0 allocation groups
# no allocation groups
2 # Number of forecast catch levels to input (else calc catch from
forecast F)
3 # 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
# Proportion caught each fleet 2009/2010 or total limit council has ACL
for 2011 and 2012.
# ACLs:  298 296
#Year Seas Fleet Catch(or_F)
2011 1 1 298
2112 1 1 296
#
999 # verify end of input
```

# Appendix D. Stock Synthesis forecast file for darkblotched rockfish

```
#V3.21d
#C  generic forecast file
# 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 # MSY: 1= set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt); 4=set to
F(endyr)
#0.4 # SPR target (e.g. 0.40)
#0.342 # Biomass target (e.g. 0.40)
0.5 # SPR target (e.g. 0.40)
0.4 # 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
#  2010 2010 2010 2010 2010 2010 # after processing
1 #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
0.20 # 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 0 0
#  1180659524 1667592815 7631713 0 # after processing
1 # Control rule method (1=catch=f(SSB) west coast; 2=F=f(SSB) )
0.40 # Control rule Biomass level for constant F (as frac of Bzero,
e.g. 0.40); (Must be > the no F level below)
0.10 # 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=OFL only; 2=ABC; 3=get F from forecast ABC
catch with allocations applied)
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)
#-65534 #_Forecast loop control #5 (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 # 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)
2013 # Rebuilder:  first year catch could have been set to zero
(Ydecl)(-1 to set to 1999)
2013 # 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:  FISHERY
#  0
# max totalcatch by fleet (-1 to have no max) must enter value for each
fleet
-1
# max totalcatch by area (-1 to have no max); must enter value for each
fleet
-1
# fleet assignment to allocation group (enter group ID# for each fleet,
0 for not included in an alloc group)
0
#_Conditional on >1 allocation group
# allocation fraction for each of: 0 allocation groups
# no allocation groups
2 # Number of forecast catch levels to input (else calc catch from
forecast F)
3 # 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
# Proportion caught each fleet 2009/2010 or total limit council has ACL
for 2011 and 2012.
# ACLs:  298 296
#Year Seas Fleet Catch(or_F)
2011 1 1 298
2112 1 1 296
#
999 # verify end of input
```

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# DRAFT
# Status of the U.S. yelloweye rockfish resource in 2011 (Update of 2009 assessment model)

Ian G. Taylor[1] and Chantel Wetzel[2]

[1]National Marine Fisheries Service
Northwest Fisheries Science Center
2725 Montlake Blvd. E.
Seattle WA, 98112
206-861-7603 (phone)
206-860-6792 (fax)
Ian.Taylor@noaa.gov

[2]National Marine Fisheries Service
Northwest Fisheries Science Center

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## Table of Contents


Executive Summary ..... 4
Stock ..... 4
Catches ..... 4
Data and Assessment ..... 5
Stock biomass ..... 6
Recruitment ..... 8
Reference points ..... 9
Exploitation status ..... 10
Management performance ..... 13
Unresolved problems and major uncertainties ..... 13
Forecasts ..... 14
Decision table ..... 15
Research and data needs ..... 17
Rebuilding projections ..... 17
1. Introduction ..... 21
1.1 Distribution and Stock Structure ..... 21
1.2 Life History and Ecosystem Interactions ..... 22
1.3 Historical and Current Fishery ..... 22
1.4 Management History and Performance ..... 23
1.5 Fisheries in Canada and Alaska ..... 23
2. Assessment ..... 23
2.1 Fishery-Independent Data ..... 24
*2.1.1 International Pacific Halibut Commission Survey* ..... 24
*2.1.2 Triennial Bottom Trawl Survey* ..... 25
*2.1.3 NWFSC Bottom Trawl Survey* ..... 25
*2.1.4 Visual Surveys* ..... 26
*2.1.5 Research Removals* ..... 26
2.2 Biological Data ..... 26
2.3 Fishery-Dependent Data ..... 27
*2.3.1 Historical Commercial Catches* ..... 27
*2.3.2 Historical Recreational Catches* ..... 28
*2.3.3 Foreign Catches* ..... 29
*2.3.4 Recent Removals (2002+)* ..... 29
*2.3.5 Fishery Catch-Per-Unit-Effort* ..... 29
*2.3.6 Fishery Biological Data* ..... 30
2.4 History of Modeling Approaches ..... 30
*2.4.1 Previous Assessments* ..... 30
*2.4.2 Pre-Assessment Workshop, GAP and GMT Input* ..... 30
*2.4.3 Response to STAR Panel Recommendations in 2006* ..... 31
2.5 Model Description ..... 32
*2.5.1 Link from the 2009 to the updated assessment model* ..... 32
*2.5.2 Summary of Fleets* ..... 33
*2.5.3 Modeling Software* ..... 33
*2.5.4 Priors* ..... 33
*2.5.5 Sample Weighting* ..... 33


DRAFT

*2.5.6 General Model Specifications* ..... 33
*2.5.7 Estimated and Fixed parameters* ..... 34
2.6 Model Selection and Evaluation ..... 35
*2.6.1 Key Assumptions and Structural Choices* ..... 35
*2.6.2 Alternate Models Explored* ..... 35
2.7 Base-case model Results ..... 35
2.8 Uncertainty and Sensitivity Analysis ..... 37
*2.8.1 Retrospective Analysis* ..... 38
*2.8.2 Likelihood Profiles* ..... 38
3. Rebuilding Parameters ..... 38
4. Reference Points ..... 38
5. Harvest Projections and Decision Tables ..... 39
6. Regional Management Considerations ..... 40
7. Research Needs ..... 40
8. Acknowledgements ..... 41
9. Literature cited ..... 42
10. Tables ..... 44
11. Figures ..... 78
12. Appendix A: Predicted numbers at age by sex and area ..... 128
13. Appendix B: SS Data file ..... 147
14. Appendix C: SS Control file ..... 219
15. Appendix D: SS Starter file ..... 226
16. Appendix E: SS Forecast file ..... 227

DRAFT

## Executive Summary

*Stock*

This update assessment reports the status of the yellowey rockfish (*Sebastes ruberrimus*) resource off the coast of the United States from southern California to the U.S.-Canadian border using data through 2010. Each area is modeled simultaneously with its own unique catch history and fishing fleets (recreational and commercial) but the dynamics follow the current understanding of yelloweye stock structure: large stocks linked via a common stock-recruit relationship with negligible adult movement among areas.

*Catches*

Yelloweye rockfish catches were estimated from a variety of sources, but are very uncertain due to the relatively small contribution of yelloweye to rockfish market categories (prior to sorting requirements) and the relatively large scale of recreational removals (average 61% of the toal in the past 10 years). The accuracy of estimates of rebuilding rates will therefore depend in part on the accuracy of the recreational catch data. Catches include estimates of discarding after 2001 when management restrictions resulted in nearly all yelloweye caught by recreational and commercial fishermen being discarded at sea. Recent catches were based on current total mortality estimates (2002-2009) and the GMT scorecard (2010). Estimated catches increased gradually throughout the first half of the 20$^{th}$ century, with the exception of a brief period of higher removals around World War II. Catches peaked in 1982 at 463 mt, an estimate that is slightly higher than the previous assessment due to the inclusion of a new catch reconstruction for Oregon. Removals were estimated as remaining in excess of 200 mt for all years between 1977 and 1997. Uncertainty in catches is treated explicitly throughout this analysis.

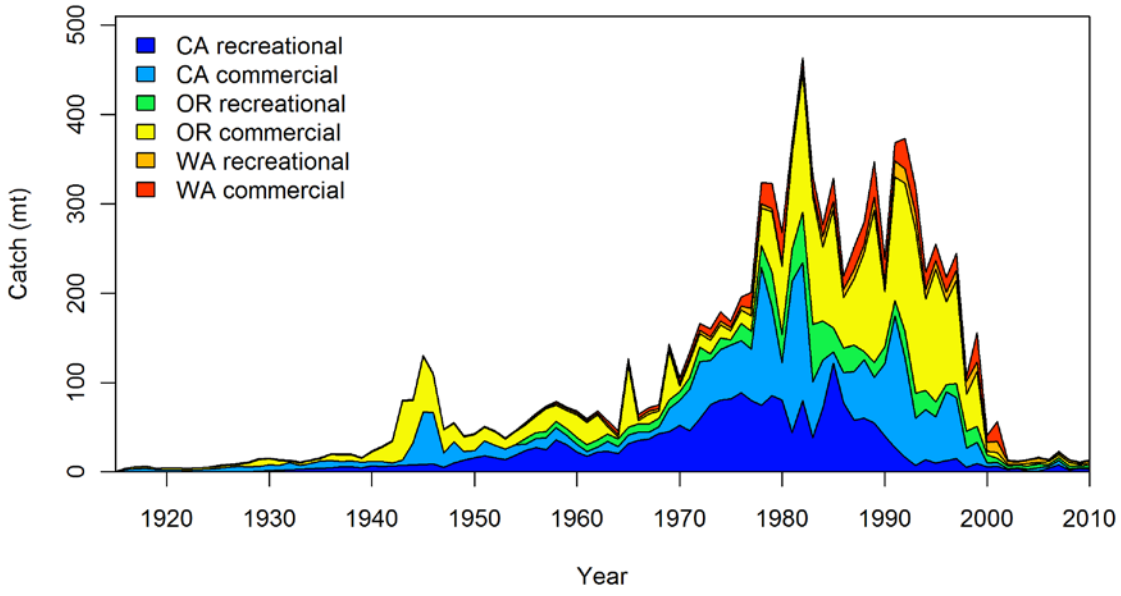



Figure a. Yelloweye rockfish estimated catch history, 1916-2010.

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Table a. Recent yelloweye rockfish catches (mt) by fleet.

| Year | California Recreational | California Commercial[1] | Oregon Recreational | Oregon Commercial[1] | Washington Recreational | Washington Commercial[1] |
|---|---|---|---|---|---|---|
| 2001 | 6.37 | 4.35 | 4.83 | 6.23 | 12.50 | 21.84 |
| 2002 | 2.49 | 0.89 | 3.14 | 1.56 | 3.70 | 1.55 |
| 2003 | 3.74 | 0.70 | 3.02 | 0.92 | 2.60 | 0.98 |
| 2004 | 0.60 | 2.61 | 3.69 | 2.67 | 3.70 | 0.66 |
| 2005 | 0.90 | 3.43 | 4.30 | 1.69 | 5.20 | 0.74 |
| 2006 | 4.10 | 1.86 | 2.49 | 2.92 | 1.70 | 0.76 |
| 2007 | 8.00 | 4.81 | 2.85 | 3.28 | 2.49 | 1.61 |
| 2008 | 1.69 | 1.72 | 3.25 | 3.88 | 2.40 | 0.78 |
| 2009 | 3.84 | 0.61 | 2.05 | 1.61 | 1.63 | 1.15 |
| 2010 | 2.70 | 1.84 | 2.80 | 2.25 | 2.60 | 0.91 |

[1]Includes research catches.

*Data and Assessment*

This stock assessment used the newest version of Stock Synthesis available (3.21d, released 11 May 2011). The model data sources include catch, length- and age-frequency data from six state-specific recreational and commercial fishing fleets. Biological data are derived from both port and on-board observer sampling programs. Yelloweye catch in the IPHC long-line survey for Pacific halibut is also included via an index of relative abundance for Washington and for Oregon as well as length- and age-frequency data. Oregon recreational charter observer data for discarded yelloweye was used to construct a recent index of relative abundance (2004-2010) and included length-frequency observations. Relative biomass indices from the National Marine Fisheries Service (NMFS) Northwest Fisheries Science Center (NWFSC) bottom trawl survey and the Alaska Fisheries Science Center triennial trawl survey are included, along with biological data from the former.

Externally estimated model parameters, including those defining weight-length, maturity, and fecundity relationships, were kept at the values used in the previous assessment. The assessment explicitly accounts for the small degree of dimorphic growth as well as markedly different exploitation histories in waters off the three states. Due to sparse and poorly informative age- and length-frequency data, recruitment is modeled as a deterministic process. Key parameters including natural mortality, stock-recruitment steepness and all growth parameters are estimated.

Although the base case assessment model captures some uncertainty via asymptotic intervals, uncertainty from two sources is examined using alternate states of nature, which bracket the base case, with results reported in the decision table. The magnitude of the estimated-catch time-series was found to have a large influence on the perception of current stock size and the estimate of steepness of the stock-recruit relationship was closely linked to the projected recovery rates. Alternate values of each were selected to bracket the best estimates with marginal probabilities one-half as likely. For historical catch these values, 75% and 150% of the estimated catch series prior to 2000, were subjective, but reflect both the lack of a comprehensive catch reconstruction in Washington and the change in likelihood of the fit to data sources over a reasonable range of catch levels. For steepness the $12.5^{th}$ and $87.5^{th}$ percentiles were calculated from

DRAFT

the likelihood profile as a proxy for the probability distribution about this point estimate. The most optimistic and pessimistic of the nine combinations from these two axes (weighted 6.25% each, relative to 25% for the best estimate on each dimension) are reported in this document. All nine combinations will be included in the rebuilding analysis, in order to more completely portray the uncertain impact of future harvest levels on stock status and rebuilding time.

Table b. Relative probabilities for combinations of the two alternate states of nature. Cells in bold denote those reported throughout this document.

| | | Historical catch | | |
|---|---|---|---|---|
| | | Low | Best estimate | High |
| Steepness | Low | **6.25%** | 12.5% | 6.25% |
| | Estimated value | 12.5% | **Base case: 25%** | 12.5% |
| | High | 6.25% | 12.5% | **6.25%** |

*Stock biomass*

A fecundity relationship is used for yelloweye specifying that spawning output per unit weight increases with fish weight; therefore all reference to spawning output is in terms of eggs produced, instead of spawning biomass. Yelloweye rockfish are estimated to have been lightly exploited until the mid-1970's, when catches increased and a rapid decline in biomass and spawning output began. Spawning output is estimated to have reached a minimum in 2000, at 15.7% of unexploited levels (very similar to the 15.8% from the 2009 assessment). Yelloweye rockfish spawning output is estimated to have been gradually increasing since that time, in response to large reductions in harvest. Although the relative trend in spawning output is quite robust to uncertainty in the estimated removals, the absolute scale of the time series is very sensitive global shifts in removals. The estimated relative depletion level in 2009 is 20.2% (very similar to the estimate of 20.3% from the 2009 assessment) and 21.3% in 2011, corresponding to 219 million eggs. The range over states of nature indicates less uncertainty in level of depletion (18.9-24.0%) than in the absolute scale of the estimated spawning output: 145-371 million eggs in 2011. The portions of the total spawning output within each of the three states differs, with California and Oregon having very similar estimates of spawning output at unexploited equilibrium, with Washington considerably lower. Oregon is estimated to have the largest 2011 spawning output, followed by California, then Washington. Relative depletion also varies by state, with California estimated to be at 17.2% of unexploited conditions, Oregon, 23.9%, and Washington, 27.1%.

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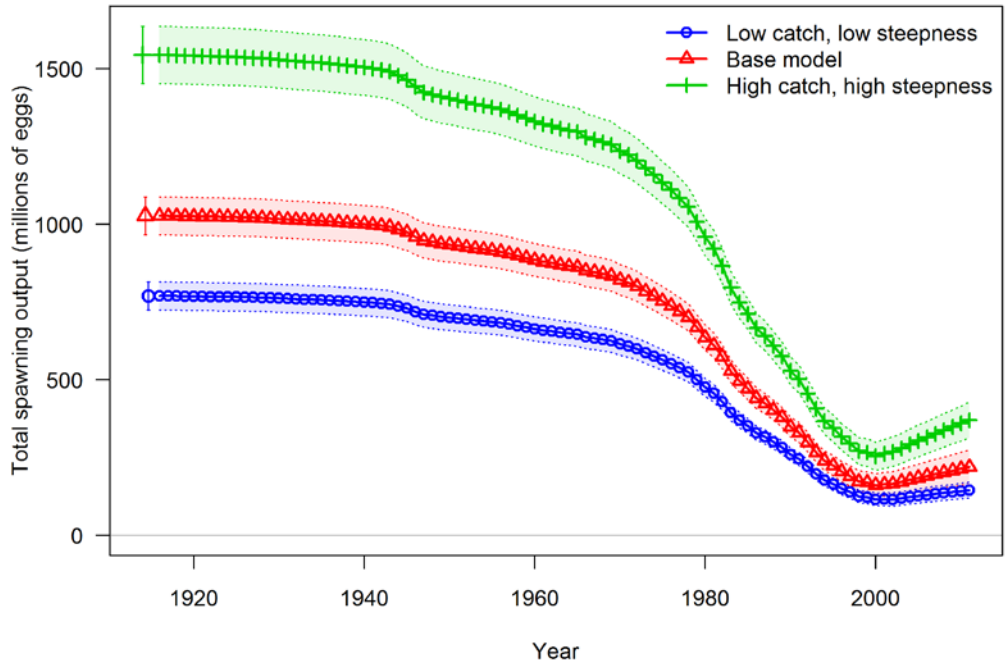



Figure b. Estimated total spawning output time-series (1916-2011, areas combined) for the base-case model with alternate states of nature. Shaded regions show 95% intervals.

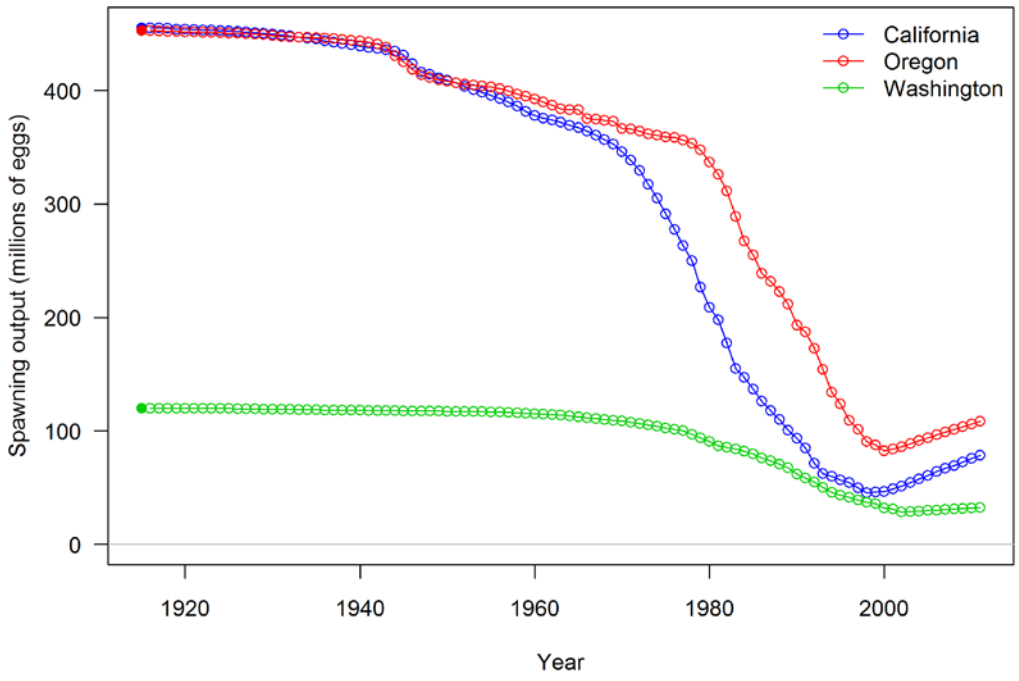



Figure c. Estimated spawning output time-series (1916-2011) by state for the base-case model.

Table c. Recent trend in estimated yelloweye rockfish spawning output, recruitment and relative depletion level.

| Year | Spawning output (millions eggs) | Range of states of nature | Estimated recruitment (1000s) | Range of states of nature | Estimated depletion | Range of states of nature |
|---|---|---|---|---|---|---|
| 2002 | 166 | 115-269 | 86 | 54-154 | 16.10% | 15.0 - 17.4% |
| 2003 | 172 | 119-280 | 89 | 56-158 | 16.70% | 15.5 - 18.1% |
| 2004 | 179 | 123-292 | 91 | 57-162 | 17.40% | 16.0 - 18.9% |
| 2005 | 185 | 127-303 | 93 | 59-166 | 18.00% | 16.4 - 19.6% |
| 2006 | 191 | 130-315 | 95 | 60-170 | 18.60% | 16.9- 20.4% |
| 2007 | 197 | 133-326 | 98 | 61-174 | 19.20% | 17.3- 21.1% |
| 2008 | 202 | 136-337 | 99 | 62-177 | 19.70% | 17.7 - 21.8% |
| 2009 | 208 | 139-348 | 101 | 63-181 | 20.20% | 18.1 - 22.5% |
| 2010 | 214 | 142-360 | 103 | 64-184 | 20.80% | 18.5 - 23.3% |
| 2011 | 219 | 145-371 | 105 | 65-187 | 21.30% | 18.9 - 24.0% |

*Recruitment*

Because year-class strength is modeled as a deterministic process in this assessment, the decline in estimated recruitment tracks closely that of the spawning output. The decline is especially pronounced given the low (and likely imprecise) estimate for steepness of the stock-recruit relationship in the base-case model (0.441), and alternate models (0.383, 0.508). However, the considerable uncertainty in absolute recruitment levels is illustrated by the broad range over the states of nature.

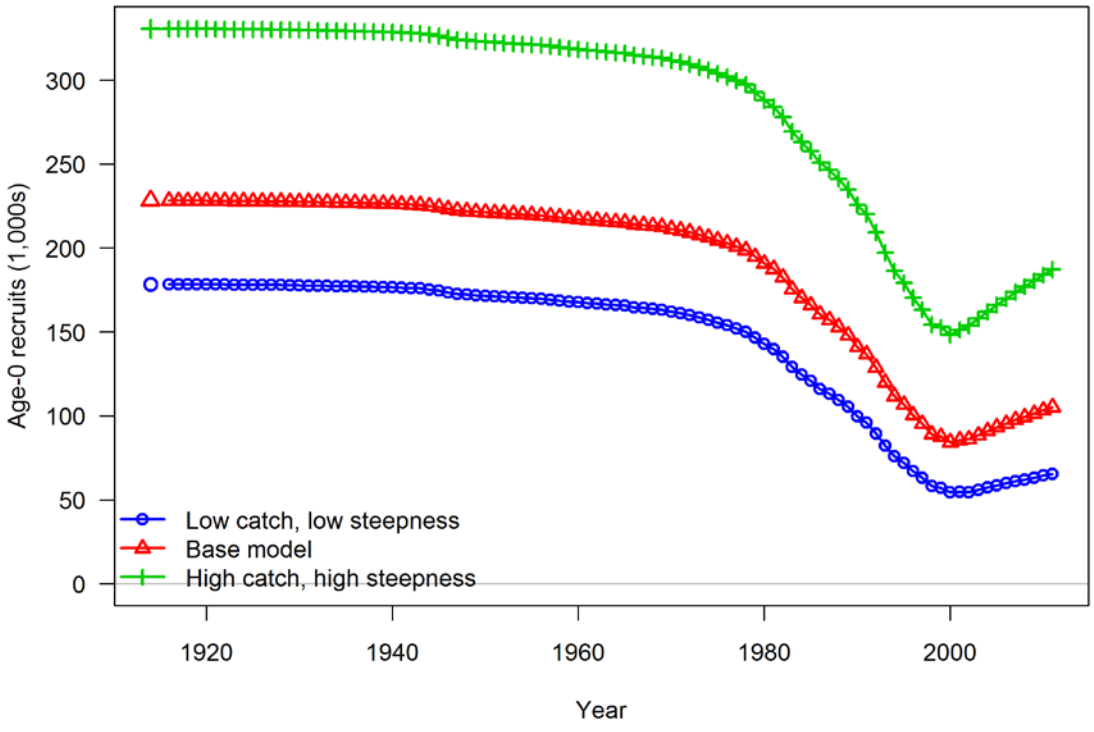



Figure d. Time series of estimated yelloweye rockfish recruitments for the base-case model (solid line) and alternate states of nature (dashed lines).

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*Reference points*

Unfished spawning output was estimated to be 1,028 million eggs (slightly higher than 994 million eggs estimated in the previous assessment). The target stock size ($SB_{40\%}$) is therefore 411 million eggs and the overfished threshold ($SB_{25\%}$) is 257 million eggs. Maximum sustainable yield (MSY), conditioned on current fishery selectivity and allocations, was estimated in the assessment model to occur at a spawning stock biomass of 392 million eggs and produce an MSY catch of 63 mt (slightly above the estimate from the 2009 assessment of 56 mt). However, the yield at MSY is extremely sensitive to the states of nature, resulting in a wide range for this value from 39 to 111 mt. Maximum sustainable yield is estimated to be achieved at an SPR of 57.7% (range of states of nature: 51.1-65.5%). This is nearly identical to the yield, 62 mt, generated by the SPR (59.0%) that stabilizes the stock at the $SB_{40\%}$ target. The fishing mortality target/overfishing level (SPR = 50.0%) results in a smaller equilibrium yield of 58 mt at a spawning output of 275 million eggs (26.7% of the unfished level).

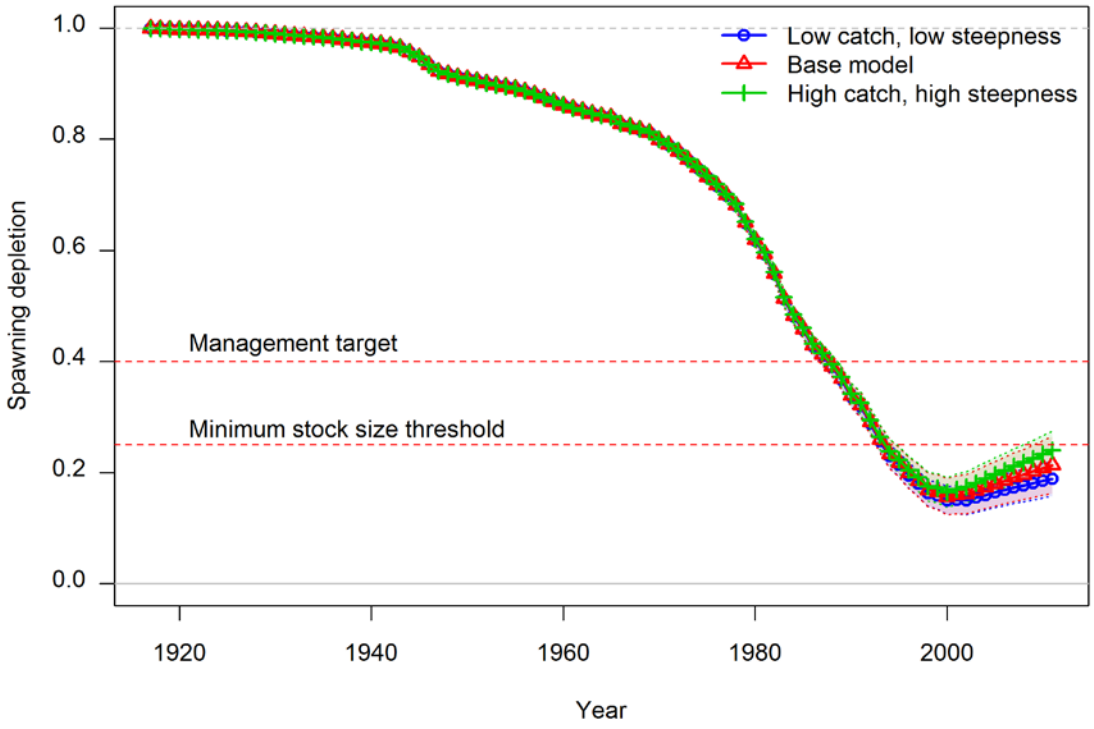



Figure e. Time series of relative spawning depletion as estimated in the base-case model and alternate states of nature. Light shading around each line shows 95% intervals.

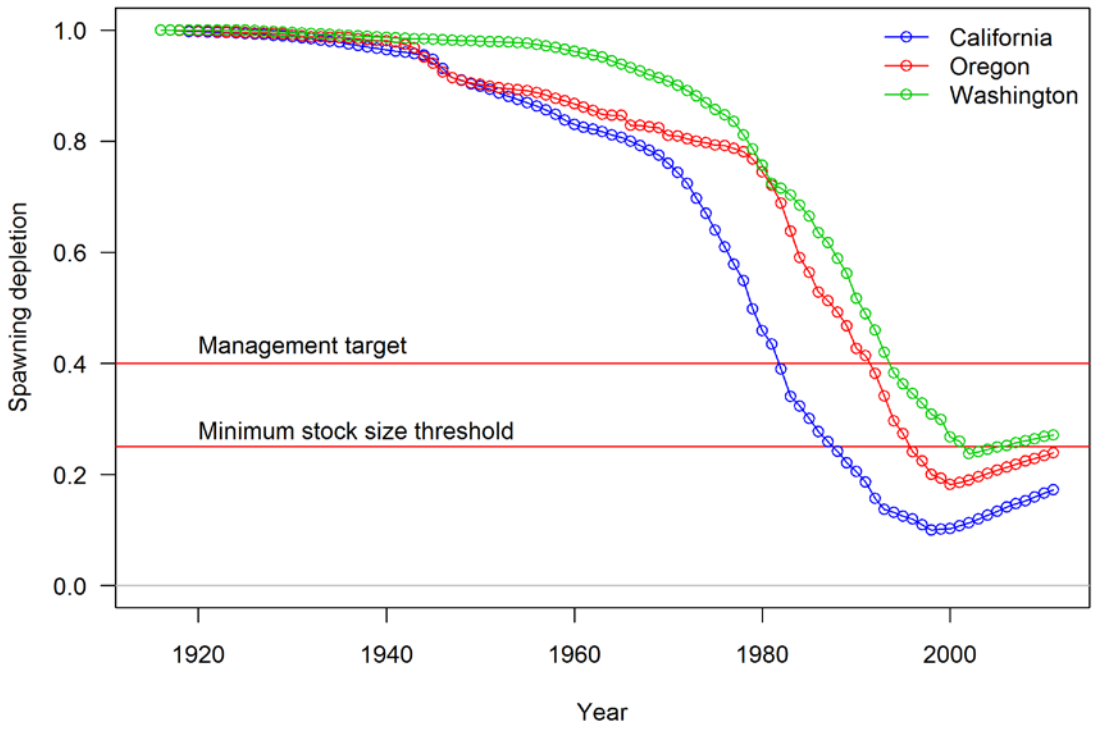



Figure f. Time series of relative spawning depletion by state for the base-case model.

*Exploitation status*

The coast-wide abundance of yelloweye rockfish is estimated to have dropped below the $SB_{40\%}$ management target in 1988 and the overfished threshold in 1994. In hindsight, the spawning output passed through the target and threshold levels with annual catch averaging almost five times the current estimate of the *MSY*. The coast-wide stock remains below the overfished threshold, although the spawning output is estimated to have been increased by 36% since 2000 (from 161 to 219 million eggs), in response to reductions in harvest. The degree of increase is largely insensitive to the magnitude of historical catch and only moderately sensitive to the value of steepness, but the absolute scale of the population reflects alternate removal series very closely. Fishing mortality rates are estimated to have been in excess of the current *F*-target for rockfish of $SPR_{50\%}$ from 1976 through 1999. Relative exploitation rates (catch/biomass of age-8 and older fish) are estimated to have peaked at 12.7% in 1992, but have been at or less than 1.1% after 2001. The alternate states of nature result in estimated exploitation rates ranging from less than 0.9% to less than 1.7% of the period 2002-2010.

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Table d. Recent trend in spawning potential ratio (SPR) and relative exploitation rate (catch/biomass of age-8 and older fish).

| Year | Estimated SPR (%) | Range of states of nature | Relative exploitation rate | Range of states of nature |
|---|---|---|---|---|
| 2001 | 53.9% | 44.7 - 65.2% | 3.2% | 2.0 - 4.5% |
| 2002 | 78.7% | 72.0 - 85.6% | 0.7% | 0.5 - 1.1% |
| 2003 | 79.4% | 72.6 - 86.3% | 0.6% | 0.4 - 0.9% |
| 2004 | 78.6% | 71.5 - 85.7% | 0.7% | 0.4 - 1.1% |
| 2005 | 76.5% | 69.0 - 84.2% | 0.8% | 0.5 - 1.2% |
| 2006 | 77.5% | 69.8 - 85.2% | 0.7% | 0.4 - 1.0% |
| 2007 | 67.5% | 58.3 - 77.7% | 1.1% | 0.7 - 1.7% |
| 2008 | 79.9% | 72.7 - 87.0% | 0.7% | 0.4 - 1.0% |
| 2009 | 83.2% | 76.6 - 89.3% | 0.5% | 0.3 - 0.8% |
| 2010 | 81.0% | 73.8 - 87.9% | 0.6% | 0.4 - 0.9% |

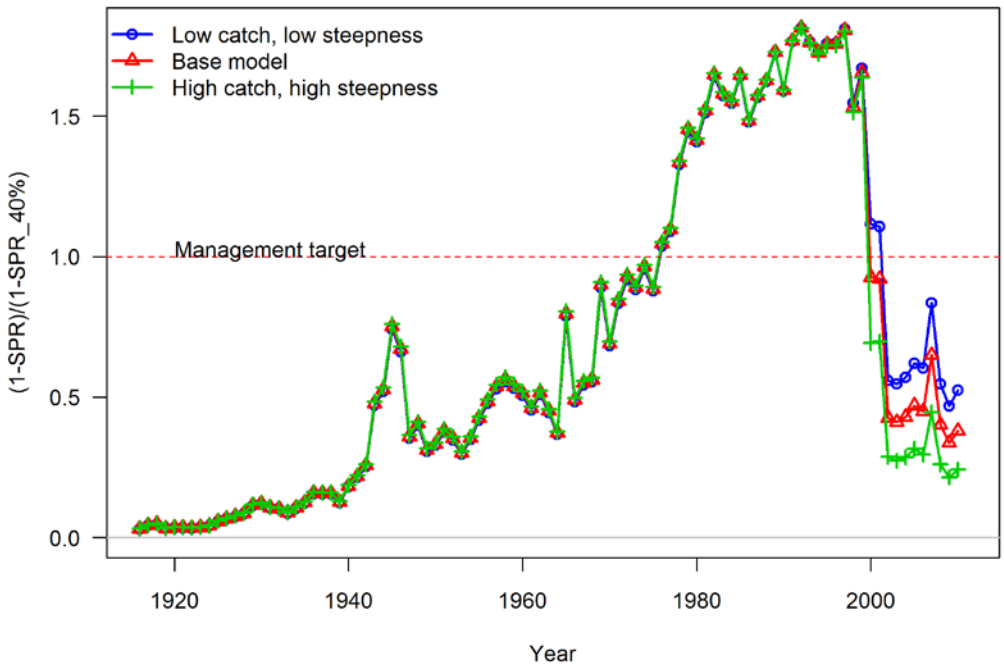



Figure g. Time series of relative spawning potential ratio (1-SPR/1-$SPR_{Target=0.5}$) for the base-case model and alternate states of nature. Values of relative SPR above 1.0 reflect harvests in excess of the current overfishing proxy.

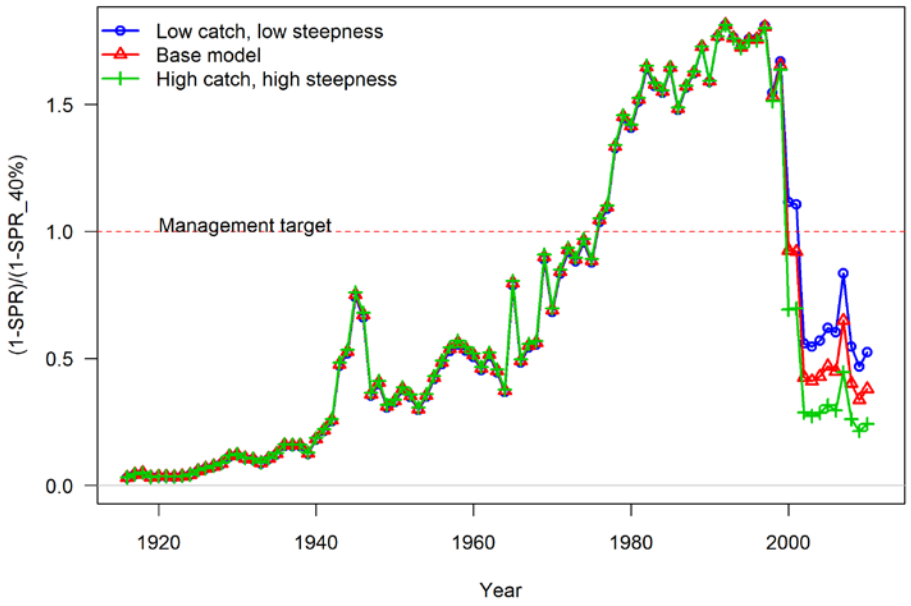



Figure h. Time series of estimated exploitation rate (catch/age 8 and older biomass) for the base-case model (circles) and alternate states of nature (light lines). Horizontal line indicates the overfishing limit/target ($F_{50\%}$) from the base case.

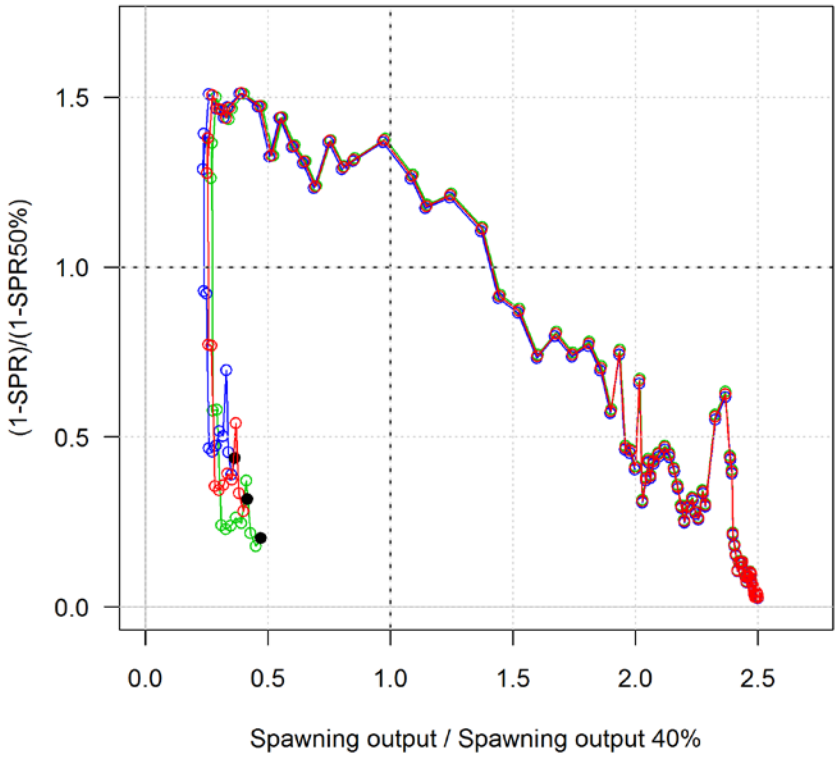



Figure i. Estimated relative spawning potential ratio relative to the proxy target/limit of 50% vs. estimated spawning output relative to the proxy 40% level from the base-case model. Higher spawning output occurs on the right side of the x-axis, higher exploitation rates occur on the upper side of the y-axis.

*Management performance*

Before 2000, yelloweye rockfish were managed as part of the *Sebastes* Complex, which included all *Sebastes* species without individual assessments, OFLs and ACLs (Previously termed ABCs and OYs but referred to under the current terms from here forward). In 2000, the *Sebastes* Complex was divided into three depth-based groups (for areas north and south of 40° 10' N. latitude), and yelloweye rockfish were managed as part of the minor shelf rockfish group until 2002. Since then, there has been species-specific management, and total catch has been below both the OFL and ACL for yelloweye each year. These catch levels represent a 95% reduction from average catches observed in the 1980s and 1990s. Managers have constrained catches by eliminating all retention of yelloweye rockfish in both commercial and recreational fisheries, instituting broad spatial closures (some specifically for moving fixed-gear fleets away from known areas of yelloweye abundance), and creating new gear restrictions intended to reduce trawling in rocky shelf habitats and the coincident catch of rockfish in shelf flatfish trawls. Since 2002, the total 8-year catch (130 mt) has been only 70% of the sum of the ACLs for 2004-2010 and only 39% of the sum of the OFLs for that period. The total 2010 catch (13.6 mt) is estimated to be just 3% of the peak annual catch that occurred in the early 1980s.

Table e. Recent trend in yelloweye rockfish catch (mt) relative to management guidelines.

| Year | OFL (mt)[1] | ACL (mt)[1] | Commercial Catch (mt)[2] | Recreational Catch (mt) | Total Catch (mt) |
|---|---|---|---|---|---|
| 1999 | 39[3] | NA | 117.8 | 38.1 | 155.8 |
| 2000 | 39[3] | NA | 15.5 | 25.3 | 40.9 |
| 2001 | 29[4] | NA | 32.5 | 23.7 | 56.1 |
| 2002 | 27[4] | 13.5[4] | 4.0 | 9.3 | 13.3 |
| 2003 | 52 | 22 | 2.6 | 9.4 | 12.0 |
| 2004 | 53 | 22 | 5.9 | 8.0 | 13.9 |
| 2005 | 54 | 26 | 5.9 | 10.4 | 16.3 |
| 2006 | 55 | 27 | 5.5 | 8.3 | 13.8 |
| 2007 | 47 | 23 | 9.7 | 13.3 | 23.0 |
| 2008 | 47 | 20 | 6.4 | 7.3 | 13.7 |
| 2009 | 31 | 17 | 3.4 | 7.5 | 10.9 |
| 2010 | 32 | 17[5] | 5.0 | 8.1 | 13.6 |

[1] OFL and ACL were called ABC and OY prior to 2010.
[2]Includes research catches.
[3]Includes the Columbia and Vancouver INPFC areas only.
[4]Includes the Columbia, Vancouver and Eureka INPFC areas only.
[5]The 2010 ACL value of 17 mt is the NMFS preferred alternative.

*Unresolved problems and major uncertainties*

Data for yelloweye rockfish are sparse and relatively uninformative, especially regarding current trend. Historical catches are very uncertain, as yelloweye comprise a

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small percentage of overall rockfish removals and actual species-composition samples are infrequently available for historical analyses. Further, the relative contribution of recreational removals was very large, and there is high uncertainty in the exact magnitude of these removals. The management related quantities were found to be very sensitive to alternate catch time-series and this is presented as one of the primary axes of uncertainty.

The choice to model the yelloweye rockfish stock with explicit areas in the assessment model is based on the sedentary life-history of adult yelloweye, and the differences in population trends, as well as historical and current exploitation rates among the three states. The data do not clearly inform this choice, but it does have substantial ramifications for future projections and management decisions and should be considered a major uncertainty in the assessment.

Parameters that generally contribute significant uncertainty to stock assessments, including those defining steepness, natural mortality and growth are estimated, but may be poorly determined due to the short time-series of data, which are primarily available after the biggest period of removals from the stock. Steepness of the stock-recruitment relationship especially is often poorly estimated from a time series like that of yelloweye (a 'one-way trip'), but its value is very important in determining projected rebuilding. For this reason alternate values (from the likelihood profile) are included as a second axis of uncertainty in this assessment.

As in the 2009 assessment, process error in recruitment is not explicitly accounted for in this assessment. This choice was driven by several factors: the lack of substantial reduction in the estimates of uncertainty in recruitment deviations (when estimated) relative to the level of recruitment variability ($\sigma_r$), and the fact that, even when accounted for, recruitment variability did not represent the dominant axis of uncertainty with regard to current management quantities. Previous assessments have struggled with the lack of signal in recruitment deviations; the 2006 and 2007 models estimated deviations over only a short period of the time series (1968-1992).

Currently available fishery-independent indices of abundance are imprecise and not highly informative. It is unclear whether future stock recovery (or lack thereof) will be detectable without more precise survey methods applied over broad portions of the coast. Fishery data are also unlikely to produce conclusive information about the stock for the foreseeable future, due to lack of retention and active avoidance of yelloweye among all fleets. For these reasons, it is unlikely that the major uncertainties in this assessment will soon be resolved.

*Forecasts*

The forecast reported here will be replaced by the rebuilding analysis to be completed in September-October 2011 following SSC review of the stock assessment. In the interim, the total catch in 2011 and 2012 is set equal to the the NMFS preferred alternative ACL (17 mt). The target exploitation rate for 2013 and beyond is based upon an SPR of 71.9%, which approximates the harvest level in the current (2009) rebuilding strategy (71.9% SPR rate). Uncertainty in the rebuilding forecast will be included via integrating over all combinations of the alternate states of nature for catch history and steepness.

Current medium-term forecasts predict increases in coast-wide abundance under the SPR=71.9% rebuilding strategy, however these increases are largely driven by the

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California and Oregon portions of the stock. In fact, the Washington portion is projected to remain at current levels under recent allocation of catch; however, this result is likely to be sensitive to future revision of the estimated Washington historical catch series. Catch allocation used for the forecast reflects the average distribution of catches in 2009-2011 among fleets (recreational, commercial) in: Washington (14%, 7%), Oregon (17%, 18%) and California (28%, 15%). The estimated ACL values for 2013 and 2014 are larger (21.8, 22.1) than those predicted from the 2009 rebuilding analysis (21.0, 20.5). The following table shows the projection of expected yelloweye rockfish catch, spawning output (by area) and depletion. It may be desirable to evaluate specific alternative allocation scenarios, if relative removals based on future management actions will be substantially different than recent values by state.

Table f. Projection of yelloweye rockfish under ACL values calculated in the 2009 rebuilding plan based on the SPR rate (71.9%) used in the rebuilding analysis. Catch allocation used for the forecast reflects the average distribution of catches in 2007-2009 among fleets.

| | | Coast-wide Age 8+ | | Spawning output (million eggs) | | | |
|---|---|---|---|---|---|---|---|
| Year | ACL (mt) [1] | biomass (mt) | Coast-wide Depletion | Coast-wide | California | Oregon | Washington |
| 2011 | 17.0 | 2,193 | 21.3% | 228.9 | 78.5 | 108.3 | 32.5 |
| 2012 | 17.0 | 2,242 | 21.8% | 233.0 | 81.1 | 110.3 | 32.8 |
| 2013 | 21.0 | 2,254 | 22.3% | 228.9 | 83.5 | 112.3 | 33.1 |
| 2014 | 21.3 | 2,283 | 22.7% | 233.0 | 85.8 | 114.0 | 33.3 |
| 2015 | 21.6 | 2,312 | 23.1% | 236.9 | 87.9 | 115.6 | 33.4 |
| 2016 | 21.9 | 2,340 | 23.4% | 240.6 | 89.9 | 117.2 | 33.5 |
| 2017 | 22.1 | 2,368 | 23.8% | 244.2 | 91.9 | 118.7 | 33.6 |
| 2018 | 22.4 | 2,396 | 24.1% | 247.7 | 93.9 | 120.1 | 33.6 |
| 2019 | 22.6 | 2,424 | 24.4% | 251.0 | 95.8 | 121.6 | 33.7 |
| 2020 | 22.8 | 2,452 | 24.7% | 254.2 | 97.6 | 122.9 | 33.7 |
| 2021 | 23.0 | 2,479 | 25.0% | 257.4 | 99.4 | 124.3 | 33.7 |
| 2022 | 23.3 | 2,507 | 25.4% | 260.6 | 101.2 | 125.6 | 33.8 |

[1]ACL values were called OY prior to 2010.

*Decision table*

Because yelloweye rockfish are currently managed under a rebuilding plan, this decision table is only intended to better evaluate the management implications of the considerable uncertainty in the base case assessment model. Various alternate management actions, including a range of SPR rates and fixed ACLs, will be compared in the rebuilding analysis. Landings in 2011-2012 are 17 mt for all cases. Catch allocation used for the forecast reflects the average distribution of catches in 2007-2009 among fleets

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Table g. Decision table of 12-year projections for alternate states of nature (columns) and management options (rows) beginning in 2013. Relative probabilities are based on the joint distribution of alternate historical catch levels and steepness values.

| | | | **State of nature** | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 75% of annual base-case catches before 2000 and steepness = 0.383 | | <u>Base case</u><br>100% of catches before 2000 and steepness = 0.441 | | 150% of annual base-case catches before 2000 and steepness = 0.508 | |
| Relative probability | | | 0.0625 | | 0.25 | | 0.0625 | |
| **Management decision** | Year | Catch (mt) | Depletion | Spawning output (millions eggs) | Depletion | Spawning output (millions eggs) | Depletion | Spawning output (millions eggs) |
| Forecast catch calculated from rebuilding SPR (71.9%) applied to low alternative model. | 2013 | 14.4 | 19.5% | 150 | 22.2% | 229 | 25.3% | 391 |
| | 2014 | 14.7 | 19.8% | 152 | 22.7% | 234 | 26.0% | 401 |
| | 2015 | 14.9 | 20.0% | 154 | 23.2% | 237 | 26.6% | 411 |
| | 2016 | 15.0 | 20.3% | 156 | 23.6% | 242 | 27.2% | 421 |
| | 2017 | 15.1 | 20.5% | 158 | 24.0% | 247 | 27.8% | 430 |
| | 2018 | 15.2 | 20.8% | 160 | 24.5% | 251 | 28.4% | 440 |
| | 2019 | 15.2 | 21.0% | 167 | 24.9% | 255 | 29.0% | 449 |
| | 2020 | 15.3 | 21.2% | 163 | 25.2% | 259 | 29.7% | 458 |
| | 2021 | 15.4 | 21.4% | 165 | 25.6% | 263 | 30.2% | 467 |
| | 2022 | 15.6 | 21.6% | 166 | 26.0% | 267 | 30.8% | 476 |
| Forecast catch calculated from rebuilding SPR (71.9%) applied to base-case model. | 2013 | 21.8 | 19.5% | 150 | 22.3% | 229 | 25.3% | 391 |
| | 2014 | 22.1 | 19.7% | 151 | 22.7% | 233 | 25.9% | 400 |
| | 2015 | 22.4 | 19.8% | 153 | 23.0% | 237 | 26.5% | 409 |
| | 2016 | 22.8 | 20.0% | 154 | 23.4% | 240 | 27.1% | 418 |
| | 2017 | 23.0 | 20.1% | 155 | 23.7% | 244 | 27.6% | 427 |
| | 2018 | 23.3 | 20.2% | 156 | 24.1% | 247 | 28.2% | 436 |
| | 2019 | 23.6 | 20.4% | 158 | 24.4% | 250 | 28.7% | 444 |
| | 2020 | 23.9 | 20.5% | 157 | 24.7% | 254 | 29.3% | 452 |
| | 2021 | 24.1 | 20.5% | 158 | 24.0% | 257 | 29.8% | 460 |
| | 2022 | 24.4 | 20.6% | 159 | 25.3% | 260 | 30.3% | 469 |
| Forecast catch calculated from rebuilding SPR (71.9%) applied to high alternative model. | 2013 | 37.4 | 19.5% | 150 | 22.3% | 229 | 25.3% | 391 |
| | 2014 | 37.8 | 19.4% | 150 | 22.5% | 231 | 25.8% | 399 |
| | 2015 | 38.3 | 19.4% | 149 | 22.7% | 233 | 26.3% | 406 |
| | 2016 | 38.9 | 19.3% | 149 | 22.9% | 235 | 26.8% | 413 |
| | 2017 | 39.5 | 19.3% | 148 | 23.0% | 237 | 27.2% | 420 |
| | 2018 | 40.1 | 19.1% | 147 | 23.2% | 239 | 27.6% | 427 |
| | 2019 | 40.6 | 19.0% | 146 | 23.3% | 240 | 28.1% | 433 |
| | 2020 | 41.2 | 18.9% | 145 | 23.5% | 241 | 28.4% | 440 |
| | 2021 | 41.7 | 18.7% | 144 | 23.6% | 242 | 28.9% | 446 |
| | 2022 | 42.2 | 18.5% | 143 | 23.7% | 244 | 29.3% | 453 |

DRAFT

*Research and data needs*

The available data for yelloweye rockfish are very sparse and generally weakly informative about current status. The following research topics were suggested in the 2009 assessment and are repeated here with minor modifications. Progress on these points could improve the ability of this assessment to reliably model the yelloweye rockfish population dynamics in the future and provide better monitoring of progress toward rebuilding:

1. Develop and implement a comprehensive visual survey.
2. Do a scientific review of current efforts to develop and improve stock size indices for yelloweye based on IPHC (including additional stations) and make recommendations on the best approaches to develop such indices.
3. Explore a recalculation of GLMM estimates in the IPHC survey that explores station effects which allows inclusion of stations that differ over time.
4. Investigate the development of a WA recreational yelloweye CPUE based on the recreational halibut fishery. Consider a full time series and one ending in 2002, since the yelloweye RCA in waters off northern WA was implemented in 2003.
5. Encourage the collection of samples to refine the estimate biological parameters, particularly maturity and fecundity.
6. Continue to evaluate the spatial aspects of the assessments, including growth, the number and placement of boundaries between areas, as well as the northern boundary with Canada.
7. Investigate alternative ways of re-weighting. This issue is relevant for all west coast stock assessments.
8. Investigate how best to account for the variability in dates in trawl surveys through a meta-analysis. This issue is relevant for all west coast stock assessments.
9. Conduct a historical catch reconstruction for WA to match those produced for OR and CA. This issue is relevant for all west coast stock assessments.
10. Access and processing of recreational data (catch and biological sampling) currently entails differing locations and formats for data from each of the three states and RecFIN. RecFIN is difficult to use and estimates from it don't match the total mortality estimates also provided by the state agencies. A single database that holds all raw recreational data in a consistent format would reduce assessment time spent on processing these data and potential introduction of errors or alternate interpretations due to processing.
11. The IPHC data organization should be revisited. Currently biological samples cannot be linked to the station from which they were collected. Age data for 2003-2005 is disconnected from length and sex information and other unknown issues may persist in these data. A thorough evaluation of what data are reliable and a final determination of what information is lost, or can potentially be recovered, is needed.
12. Instigate discard sampling of yelloweye bycatch in the directed Pacific halibut fishery.

*Rebuilding projections*

The rebuilding projections will be presented in a separate document after the assessment has been reviewed by the SSC in June 2011.

DRAFT

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

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| Commercial catch (mt)[1] | 4.0 | 2.6 | 5.9 | 5.9 | 5.5 | 9.7 | 6.4 | 3.4 | 5.0 | NA |
| Total catch (mt) | 13.33 | 11.96 | 13.93 | 16.26 | 13.83 | 23.04 | 13.72 | 10.89 | 13.6 | NA |
| OFL(mt) | 273 | 52 | 53 | 54 | 55 | 47 | 47 | 31 | 31 | 32 |
| ACL | 13.53 | 22 | 22 | 26 | 27 | 23 | 20 | 17 | 17 | 17 |
| SPR | 78.7% | 79.4% | 78.6% | 76.5% | 77.5% | 67.5% | 79.9% | 83.2% | 81.0% | NA |
| Exploitation rate (catch/age 8+ biomass) | 0.7% | 0.6% | 0.7% | 0.8% | 0.7% | 1.1% | 0.7% | 0.5% | 0.6% | NA |
| Age 8+ biomass (mt) | 1789 | 1844 | 1898 | 1948 | 1991 | 2035 | 2067 | 2107 | 2148 | 2186 |
| Spawning output (millions eggs) | 173 | 170 | 161 | 164 | 166 | 172 | 179 | 185 | 191 | 197 |
| (Range of states of nature) | 115-269 | 119-280 | 123-292 | 127-303 | 130-315 | 133-326 | 136-337 | 139-348 | 142-360 | 145-371 |
| Recruitment (1000s) | 86.1 | 88.5 | 90.9 | 93.2 | 95.4 | 97.6 | 99.4 | 101.3 | 103.3 | 105.2 |
| (Range of states of nature) | 54-154 | 56-158 | 57-162 | 59-166 | 60-170 | 61-174 | 62-177 | 63-181 | 64-184 | 65-187 |
| Depletion | 16.1% | 16.7% | 17.4% | 18.0% | 18.6% | 19.2% | 19.7% | 20.2% | 20.8% | 21.3% |
| (Range of states of nature) | 15.0 - 17.4% | 15.5 - 18.1% | 16.0 - 18.9% | 16.4 - 19.6% | 16.9-20.4% | 17.3-21.1% | 17.7 - 21.8% | 18.1 - 22.5% | 18.5 - 23.3% | 18.9 - 24.0% |

[1]Includes research catches.
[2]Includes the Columbia and Vancouver INPFC areas only.
[3]Includes the Columbia, Vancouver and Eureka INPFC areas only.

DRAFT

Table i. Summary of yelloweye rockfish reference points from the base-case model.

| Quantity | Estimate | Range of states of nature |
|---|---|---|
| Unfished spawning output ($SB_0$, millions eggs) | 1,028 | 770-1,545 |
| Unfished 8+ biomass (mt) | 8,882 | 6,700-13,274 |
| Unfished recruitment ($R_0$, thousands) | 228 | 178-331 |
| ***Reference points based on $SB_{40\%}$*** | | |
| *MSY* Proxy Spawning output ($SB_{40\%}$, millions eggs) | 411 | 308-618 |
| Relative spawning depletion at $SB_{40\%}$ | 40.0% | 40.0% |
| SPR resulting in $SB_{40\%}$ ($SPR_{SB40\%}$) | 59.0% | 54.5-64.1% |
| Exploitation rate resulting in $SB_{40\%}$ | 1.60% | 1.36-1.87% |
| Yield with $SPR_{SB40\%}$ at $SB_{40\%}$ (mt) | 62 | 39-110 |
| ***Reference points based on SPR proxy for MSY*** | | |
| Spawning output at $SPR_{MSY\text{-}proxy}$ ($SB_{SPR}$, millions eggs) | 275 | 125-526 |
| Relative spawning depletion at $SB_{SPR}$ | 26.70% | 16.2-34.0% |
| $SPR_{MSY\text{-}proxy}$ | 50.0% | 50.0% |
| Exploitation rate corresponding to SPR | 2.20% | 2.18-2.23% |
| Yield with $SPR_{MSY\text{-}proxy}$ at $SB_{SPR}$ (mt) | 58 | 27-111 |
| ***Reference points based on estimated MSY values*** | | |
| Spawning output at *MSY* ($SB_{MSY}$, millions eggs) | 392 | 312-549 |
| Relative spawning depletion at $SB_{MSY}$ | 38.10% | 35.5-40.5% |
| $SPR_{MSY}$ | 57.70% | 51.5-64.4% |
| Exploitation Rate corresponding to $SPR_{MSY}$ | 1.70% | 1.34-2.09% |
| *MSY* (mt) | 63 | 39-111 |

DRAFT

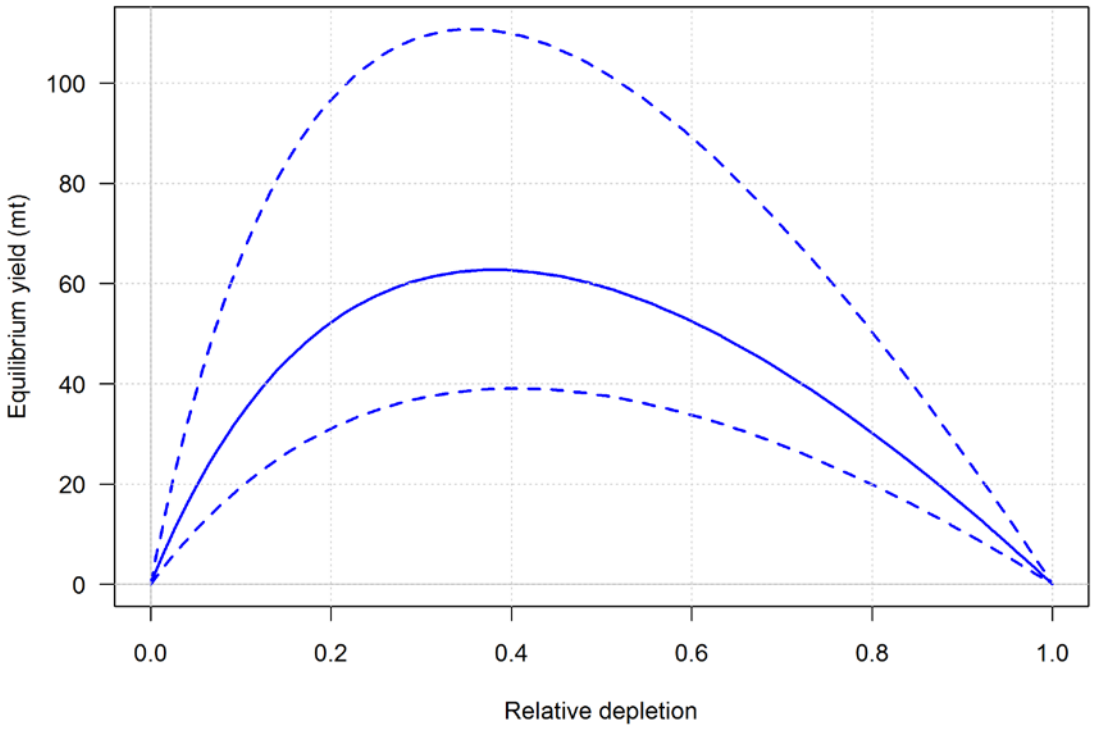



Figure j. Equilibrium yield curve for the base-case model (solid line) and alternate states of nature (dashed lines), reflecting the higher and lower values for historical catch prior to 2000 and for steepness.

DRAFT

## 1. Introduction

This updated assessment does not attempt to reiterate all background information for yelloweye rockfish presented in the 2009 assessment document. Instead, only a few key assumptions are restated, along with a detailed description of changes made during the course of the update. Those interested in a more complete description of yelloweye rockfish life-history and the details of previous assessmetns should refer to the 2009 assessment (Stewart et al. 2009).

### *1.1 Distribution and Stock Structure*

Yelloweye rockfish (*Sebastes ruberrimus*) are distributed in the northeastern Pacific Ocean from the western Gulf of Alaska to northern Baja California (Hart 1973, Eschmeyer and Herald 1983, Love et al. 2002). The species is most abundant from southeast Alaska to central California (Love et al. 2002), with adults found along the continental shelf generally shallower than 400 m. Although smaller yelloweye tend to occur in shallower water, they do not show as pronounced an ontogenetic shift as do many eastern pacific rockfish species. Yelloweye are strongly associated with rocky bottom types, especially areas of high-relief such as caves and large boulders (Love et al. 2002). Mainly solitary, it is widely believed that yelloweye are very sedentary after settlement, with adults moving only short distances during their entire lifetime.

There is relatively little direct information regarding the stock structure of yelloweye rockfish off the U.S. and Canadian coasts. The pelagic larval phase exhibited by all rockfish promotes some mixing of reproductive output, dependent on ocean currents, the duration of the pelagic phase and the timing of annual spawning in relation to annually variable spring transition and upwelling events. However, the sedentary nature of yelloweye rockfish makes adult movement among major rocky habitat areas unlikely. An unpublished genetics study (Yamanaka et al. 2001) of yelloweye rockfish collected from northern Vancouver, B.C. and SE Alaskan waters found little variability among samples and suggested a panmictic stock in the study area. Preliminary results from an analysis of yelloweye collected off Oregon, Washington, Vancouver Island B.C., and the Strait of Georgia B.C. (Lynne Yamanaka, DFO, personal communication, cited in Wallace et al. 2006) suggest that there may be genetic separation between the Strait of Georgia (inside Vancouver Island) and the outer coast (Yamanaka et al. 2006). The yelloweye population residing in the waters of Puget Sound is also thought to be isolated from coastal waters. This Puget Sound stock was proposed for listing under the Endangered Species Act (Federal Register Vol. 73, No. 52, Monday, March 17, 2008, p. 14195-14200) with the result that the stock was considered distinct and proposed to have threatened status (Federal Register / Vol. 74, No. 77, Thursday, April 23, 2009, p. 18516-18542).

A study of otolith isotope levels (Gao et al. 2010) examined ratios of $C^{13}/C^{12}$ and $O^{18}/O^{16}$ in 200 yelloweye rockfish otoliths from the Washington and Oregon coasts. The centroids from these otoliths showed no consistent differences, and suggest there might be a single spawning stock for this portion of the yelloweye rockfish population. Isotopic differences between otolith nuclei and the fifth annual zones may reflect changes in diet from age-1 to age-5. The fifth annual otolith zones differed between Washington and

DRAFT

Oregon samples suggesting that the diet compositions of the two areas are slightly different, an unlikely result if appreciable numbers of age 5+ fish were moving between areas.

### *1.2 Life History and Ecosystem Interactions*

Yelloweye rockfish spawn in late winter through the summer and possibly into the fall in SE Alaska (Love et al. 2002). Little is known about the pelagic juvenile phase, but recruiting juveniles settle in both shallow and deeper depths, often observed in the same areas as adults. These young juveniles are very conspicuous, and easy to identify, due to having markedly different coloration than adults.

Adult yelloweye rockfish are large-bodied, reaching lengths up to 91 cm (Eschmeyer and Herald 1983, Love et al. 2002). They are long-lived (the oldest observed age is 147 years, from Washington in 2005), late-maturing and slow growing. These life-history characteristics would suggest that yelloweye are relatively unproductive and very sensitive to exploitation. This is compounded by their status as an aggressive top-predator on rocky reefs, making hook-and-line gear highly effective, even gear designed for much larger species such as halibut and lingcod. Adult yelloweye are piscivorous predators eating most small pelagic and groundfish species as available.

The cohabitation of adult and juvenile yelloweye likely results in some cannibalism, and large changes in predator biomass (such as the rebuilding of lingcod, *Ophiodon elongatus,* in recent years) could have a strong feedback to juvenile survival and therefore stock productivity. Many rockfishes have shown decadal changes in productivity linked to ocean conditions, and it would not be surprising if yelloweye exhibited similar trends, although this is uncertain. There is evidence that changes in otolith ring width (and likely growth) are correlated with some of the leading environmental indicators of ocean conditions along the west coast (Black et al. 2008). It is very uncertain how future climate change will influence west coast yelloweye growth, productivity or distribution.

### *1.3 Historical and Current Fishery*

Yelloweye rockfish have historically been a prized catch for both commercial and recreational fleets. They have generally yielded a higher price than other rockfish and have therefore largely been retained when encountered, except in recent years when all retention has been prohibited. Throughout the exploitation history, yelloweye were targeted primarily with line-gear due to their affinity for rocky, and largely untrawlable, habitat.

Rockfish catches are recorded back to the beginning of the 20$^{th}$ century, primarily in California, but appreciable quantities were not landed until an early peak around World War II (Ralston et al. 2010). A small fraction of these early catches were yelloweye rockfish. Total removals gradually increased until around 1970 and then increased very rapidly with increases in effort, advances in fishing technology, and the evolution of markets (Table 1, Figure 1). The late-1970s to the late-1990s saw the highest yelloweye catches of the time-series. Since 2002, when yelloweye were declared overfished, total catches have been maintained at much lower levels. Yelloweye are currently caught only incidentally in commercial hook-and-line and sport fisheries targeting other species that are found in association with yelloweye.

DRAFT

### *1.4 Management History and Performance*

The management history is descriped in detail in the 2009 assessment (Stewart et al. 2009). Following the yelloweye assessment in 2001 (Oregon and California) which found the stock to be depleted and resulted in an overfished determination in 2002, an individual OY for the stock was established, at a small fraction of prior catches. In November 2001, the Council adopted a total annual catch limit (ACL) of 13.5 metric tons (mt) for yelloweye for all 2002 commercial, recreational, and tribal fisheries combined for Northern California (Eureka INPFC area), Oregon, and Washington. This was an interim level that allowed for fisheries to take place and potentially catch yelloweye along with other fish, but did not allow prosecution of fisheries that directly targeted yelloweye. Based on the 2002 assessment results (Methot et al. 2002), the Council adopted an ACL of 22 mt for 2003. Since 2002, total catch has been below both the annual OFL and ACLs, which were based on rebuilding analyses which indicated that very long time-periods would be required to rebuild the stock to target levels (Table 1). These catch levels represent a 95% reduction from average catches observed in the 1980s and 1990s. Since 2002, the total 8-year cumulative catch (130 mt) has been only 69% of the sum of the ACLs for 2002-2010 and only 39% of the sum of the OFLs for that period. The total 2010 catch (13.6 mt) is estimated to be just 3% of the peak annual catch that occurred in the early 1980s (Table 2).

### *1.5 Fisheries in Canada and Alaska*

The background provided in the 2009 assessment on Canadian and Alaskan fisheries for yelloweye rockfish has not been updated for this assessment.

## 2. Assessment

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

1) Fishery independent data: including relative abundance indices, length and age data from the International Pacific Halibut Commission's (IPHC) longline survey 1999-2010, and the NWFSC and Triennial bottom trawl surveys 2003-20010 (NWFSC survey) and 1980-2004 (Triennial survey).
2) Estimates of fecundity, maturity, length-weight relationships and ageing error from various sources.
3) Informative priors on natural mortality and stock recruit steepness derived from other fish and yelloweye stocks.
4) Commercial (targeted and bycatch) and recreational catch estimates from 1916-2010.
5) Commercial and recreational fishery biological data (age and length) from 1968-2010.
6) Fishery dependent catch-per-unit-effort series from recreational and charter observer programs from all three states.

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

DRAFT

## *2.1 Fishery-Independent Data*

### *2.1.1 International Pacific Halibut Commission Survey*

The International Pacific Halibut Commission (IPHC) has conducted an annual longline survey for Pacific halibut off the coast of Oregon and Washington (IPHC area "2C") since 1997 (no surveys were performed in 1998 or 2000). Beginning in 1999, this has been a fixed station design, with roughly 1,800 hooks deployed at 84 locations each year station locations differed in 1997 and are therefore not comparable with subsequent surveys. Rockfish bycatch, mainly yelloweye, has been recorded during this survey, although values for 1999 and 2001 are estimates based on subsampling the first 20 hooks of each 100-hook skate. The gear used to conduct this survey, while designed to efficiently sample Pacific halibut, is similar to that used in some earlier line fisheries that targeted yelloweye, and should be capable of sampling at least the adult population. Some variability in exact sampling location is practically unavoidable, and leeway is given in the IPHC methods to center the set on the target coordinates but to allow wind and currents to dictate the actual direction in which the gear is deployed. This can result in different habitats accessed at each fixed location among years.

Yelloweye catch has historically occurred at very few of the 84 stations in the design (Table 4). There are 27 stations in Washington waters, but yelloweye have been captured at only a small subset of these, with 476 fish being observed from 1999-2010. Similarly, in Oregon yelloweye are only observed at a small portion of the total station (57 total stations), with 1479 fish being observed from 1999-2010.

The IPHC longline survey catch data were standardized using a Generalized Linear Model (GLM) with binomial error structure. Catch-per-hook was modeled, rather than catch per station due to the variability in the number of hooks deployed each year. The binomial error structure was logical, given the binary nature of capturing a yelloweye rockfish on each longline hook or not. See the 2009 document (Stewart et. al 2009) for a more detailed description of survey design and methods. The re-analysis of the full time series with two years of additional data made little difference in the estimates for the years available at the time of the previous assessment.

As in 2009, the individual indices for Oregon and Washington are highly variable, with some mixed signals, but very little overall trend. The index trends were somewhat downward from 1999 through 2006, but have shown some increases since then. Given the small sample sizes in the surveys, substantial variability and uncertainty is to be expected. Nevertheless, this survey may be the best index of relative abundance available, as it is based upon sampling the adult yelloweye rockfish population in habitats where it is most abundant.

Biological samples were collected from yelloweye during the course of the IPHC survey. Length and sex information was recorded at sea, and age structures were retained for later ageing by Washington Department of Fish and Wildlife (WDFW) staff.

Length frequency distributions indicate that the IPHC survey caught very few fish smaller than 40 cm, consistent with the use of large hooks intended for halibut, the target species.

Age-frequency data from recent (2006-2010) IPHC surveys were compiled as conditional age-at-length distributions by state, sex and year. This treatment of age data from the survey is consistant with the previous full assessment in 2009. Age distributions

DRAFT

included 64 bins from age 2 to age 65, with the last bin also including all fish of greater age. The choice of these bins reflects the lack of any source for fish younger than age 2, and the need to reduce the computational time by limiting the total number of age bins for each entry. Most data series in the assessment model included very few fish greater than 65 years old; however they were most common in the IPHC survey.

Nearly all fish sampled for length were also aged (Table 5). To aid in inspecting the full conditional age-at-length distributions, they are displayed graphically for each data set in this assessment via the entire matrix of age distribution-at-length. The IPHC age data show many fish older than 65 years in both states, with somewhat more older and larger fish present in Washington than in Oregon.

In aggregate, these age data appear relatively sparse, provide only a short time-series, show no coherent cohort structure and are unlikely to provide much more than estimates of the growth parameters and the diffuse information that there are more old fish remaining in Washington than in Oregon.

### *2.1.2 Triennial Bottom Trawl Survey*

The triennial shelf trawl survey conducted by NMFS starting in 1977 (Dark and Wilkins 1994). The 2009 assessment contains a thorough description of the survey and methods for analyzing the data for use in the yelloweye assessment, which were used for Washington waters only. The data for this area are unchanged from those used in the 2009. As in 2009, the 1977 sample was excluded, and the remaining years were broken into two pieces (1980- 1992 and 1995-2004), due to differences in survey timing (Stewart et al. 2009).

As in 2007 and 2009, an index of abundance based on a Generalized Linear Mixed Model (GLMM), including vessel-specific differences in catchability (via inclusion of random effects), was calculated for the survey time series. The GLMM approach explicitly models both the zero catches as well as allows for skewness in the distribution of catch rates through the use of a Gamma or lognormal error structure. This update's GLMM index was generated using the same basic method, but reprogrammed by John Wallace using an R package which calls OpenBUGS (http://www.openbugs.info/) from the statistical language R. The changes in index values associated with this software update were minimal.

The updated index values were very similar to those used in the 2009 assessment, showing a relatively flat trend over both the early and late portions of the survey (Figure 2). Survey length-frequency distributions from the triennial survey are unchanged from those used in 2009.

### *2.1.3 NWFSC Bottom Trawl Survey*

The NWFSC shelf and slope trawl survey time series has been extended through 2010. Three sources of information are produced by this survey: an index of relative abundance, length-frequency distributions, and age-frequency distributions. See the 2009 document (Stewart et. al 2009) for a more detailed description of survey design and methods.

The biomass index was analyzed using the updated GLMM software described above for the triennial survey. Following the 2009 assessment, this index was only computed for tows in Washington, which was a choice based on insufficient samples in Oregon and California. The data was insufficient to estimate vessel-specific differences in

DRAFT

catchability, so the random effects were not included in this analysis. As in the previous assessment, the resulting index shows a relatively flat trend with the exception of a very large value for 2003, a function of the single very large catch in that year. The additional years (2009 and 2010), and small increases in the index values for 2009 and 2010 relative to 2008, with the estimate 2009 the greatest uncertainty of all points in the timeseries, due to having only 1 tow with yelloweye present, but catching 7 yelloweye in that tow, which is above average for this survey.

The length-frequency distributions for the NWFSC survey from 2003-2010 were constructed using the same size bins as other data sources. These observations are based on very few fish, between 7 and 35 per year. Most notably, the NWFSC length-frequency data show a very truncated size range; almost no fish larger than 60 cm were observed in any year of the survey. Fish less than 20 cm in length are rare, perhaps slightly more so than in the triennial survey. As is the case for the yelloweye length- and age-compositions from other fishery independent sources, neither clear trends, nor visible signs of cohorts appear in the biological data. Age structures were collected for nearly all yelloweye encountered by the NWFSC survey, but have not yet been read and are therefore unavailable for this assessment.

### *2.1.4 Visual Surveys*

Yelloweye are a conspicuous member of the *Sebastes* genus, relatively easily identified during underwater visual surveys conducted by scuba-divers, manned or unmanned underwater vehicles. Density estimates for yelloweye rockfish have provided the basis for recent summaries of yelloweye rockfish population trends and abundance in both southeast Alaska and British Columbia waters (Yamanaka et al. 2006, Brylinsky et al. 2007, Brylinsky et al. 2008). An extensive effort was made specifically for this assessment to summarize existing density estimates from published and unpublished visual studies (W. Wakefield and J. Clemens, NWFSC, personal communication). These estimates, although not strictly comparable among all studies (in many cases the survey locations were non-random, or even selected based on predicted abundance of yelloweye and other species of interest), generally show lower—though variable—yelloweye density off the U.S. west coast compared to British Columbia or southeast Alaska (Stewart et al. 2009). Clear trends over time are not evident, but the observation that at least some locations in California may harbor relatively high densities suggests it is not outside the core range of the species.

### *2.1.5 Research Removals*

Research catches have historically represented only a tiny fraction of the total removals from the yelloweye rockfish population. However, as total mortality has been substantially reduced in recent years, the relative contribution of research removals to the total has increased. This was particularly true in 2007, when research catches totaled 1.7 mt, or 8% of the total estimated removals from the stock. Research catches are included in estimates of total commercial catch, ensuring that all known sources of current mortality are accounted for in recent years.

## ***2.2 Biological Data***

A number of biological parameters were kept at the values used in the 2009 assessment, which were the result of estimates outside of the assessment model. These

DRAFT

included the weight-length relationship, the maturity-at-length relationship, and the fecundity-at-weight relationship (Table 13). Values for these relationships are treated as fixed and therefore uncertainty reported for the stock assessment results does not include any uncertainty associated with these quantities. The ageing imprecision and bias estimates used for this update are also the same as those used in 2009. That document provides a description of the data and methods upon which they are based.

A sex-specific natural mortality rate was estimated in this update by applying the identical prior type, mean, and standard deviation to that used in 2009 (Figure 5).

### *2.3 Fishery-Dependent Data*

#### *2.3.1 Historical Commercial Catches*

The historical commercial catch reconstruction used for this assessment represents an amalgamation of newly available data (unused in previous assessments), and portions of the reconstruction created for the 2009 (and earlier) assessment retained as the best estimates where no additional improvements could be made. The results of this effort, by modeled fishing fleet, are provided in Table 1 and Figure 1. The sources and methods used are summarized by state below.

As in the 2009 assessment, commercial landings in California for the period 1916-1968 relied on estimates from the recent reconstruction efforts by SWFSC and California DFG scientists (Ralston et al. 2010). From 1969 to 2008, CalCOM (documentation: 2004) estimates of yelloweye catch were used. These estimates were updated in June, 2009 to reflect the changes made during that month. Changes in this database among recent assessments illustrate how sensitive the annual totals for individual species are to application of sparse species-composition sampling data to time-varying market categories. A summary of the CalCOM catch estimation concluded that prior to 1992 "many of the landing estimates are not based on actual sampling, which could explain why they are highly erratic" (Pearson et al. 2008); they concluded those earlier landings were unreliable, but later years (from 1992 through 1996) were generally reliable.

Historical landings of yelloweye rockfish in Oregon were provided by Oregon Department of Fish and Wildlife (ODFW), which in collaboration with Northwest Fisheries Science Center (NWFSC), conducted a reconstruction of west coast groundfish landings in Oregon for the years 1892-1986. Catches were only 3.5 tons or less for the years 1892-1915, so the starting date for the model was kept in 1916 as used in the 2009 assessment. Future full assessments could extend the timeseries back to 1892, but this is likely to make very little differences in the results.

Historically, rockfish in Oregon were landed in three mixed species market categories, including ROCKFISH (also known as Other Rockfish or Unspecified Rockfish), POP (Pacific Ocean Perch) and ANIMAL FOOD (also called Mink Food or Miscellaneous by some sources).

The Oregon historical reconstruction included four steps:

1. Determine the annual landings in each market category by gear;
2. Derive species compositions for each market category by gear, year and spatial stratum (when available);
3. Apply the year and gear specific species compositions to the historical landings in each market category (from Step 1) to obtain a species-specific time-series of landings;

4. Sum the species-specific landings by gear across market categories to obtain a final per-species time-series of landings in Oregon.

A variety of data sources were used to reconstruct historical landings of each market category, including Oregon Department of Fish and Wildlife's pounds and value reports derived from the Oregon fish ticket line data (1969-1977), Fisheries Statistics of the United States (1927-1977), Fisheries statistics of Oregon (Cleaver 1951, Smith 1956), Reports of the Technical Sub-Committee of the International Trawl Fishery Committee (1942-1975) and many others.

Trawl species compositions of market categories were derived from historical sampling program of Oregon trawlers conducted by ODFW between 1963 and 1993 (Douglas 1998). The spatial strata used to derive trawl species compositions were defined by PMFC areas and depth of the catch (<50fm, 51-80fm, 81-120fm and >120fm). For non-trawl catches the earliest available species compositions were assumed for the historical period.

The detailed description of the sources used and the methodology employed in the Oregon reconstruction efforts is available in Gertseva et al. (2010) and Karnowski et al. (2011).

Beginning in 1987, the commercial catch estimates from the 2009 assessment were used, which were based on summary catch from the PacFIN system.

For the state of Washington there was also no comprehensive historical reconstruction that could be used directly for this assessment, so historical catch was kept identical to the values used in the 2009 assessment.

The net result of the historical catch reconstruction is shown in Figure 1 and Table 1. In aggregate, the estimated removals from commercial sources are based on sparse sampling of shifting market categories for a rare contributor to the total. Species compositions have been shared across years, areas and sectors, even in the decades. The degree of uncertainty in commercial catch should be an integral part of the conclusions drawn from this assessment.

*2.3.2 Historical Recreational Catches*

Estimates of recreational catch from 1981-2007 remain unchanged from the 2009 assessment. For the most recent years, 2008-2010, updated state estimates are included. Estimates of recreational catch must be far more uncertain than those from commercial sources, due to a much less rigorous sampling program until very recently. For many west coast rockfish species, uncertainty in the recreational removals is relatively less important due to the small magnitude of these removals relative to commercial fisheries; however this is not the case for yelloweye rockfish. Yelloweye have been, until as recently at 2002, one of the most sought-after groundfish species captured by recreational fishermen. Release mortality for yelloweye is generally assumed to be very high, although sample sizes for existing studies are extremely small (e.g., 2 fish in Hannah and Matteson 2007).

For this yelloweye assessment, the recreational catch in the years 2008-2009 have been updated using the values from the total mortality reports (Bellman et al. 2010a, Bellman et al. 2010b), which were provided by each state. These values differ from total mortality estimates calculated from the RecFIN database, but due to various inconsistencies and useability problems with the RecFIN database, the total mortality reports are a more reliable source.

DRAFT

*2.3.3 Foreign Catches*

Foreign catches are included in the catch estimates for trawl fleets by state (Table 1), as was done in the 2009 assessment.

*2.3.4 Recent Removals (2002+)*

Catches explicitly include discards beginning in 2002 when management restrictions have resulted in nearly all yelloweye caught by recreational and commercial fishermen being discarded at sea. Recent catches were based on current total mortality estimates (2002-2009) produced by the West Coast Groundfish Observer Program (WCGOP) and the GMT scorecard (2010). Although these sources are relatively comprehensive in covering all sources of mortality, incidental removals occurring in non-groundfish sectors, such as the fixed-gear halibut fishery are not routinely observed, nor included in these estimates. The methodology used by WCGOP for estimating total mortality has been revised and improved, so the commercial catch for the whole period (2002-2009) has been updated for this assessment. The differences in the overlapping years differ from the the 2009 assessment by less than 2 tons for all combinations of year and state.

In aggregate, all sources of removals have been below both the OFL and ACL set for each year. These catch levels represent a 95% reduction from average catches observed in the 1980s and 1990s. Managers have constrained catches by eliminating all retention of yelloweye rockfish in both commercial and recreational fisheries, instituting broad spatial closures, some specifically for moving fixed-gear fleets away from known areas of yelloweye abundance, and new gear restrictions intended to reduce trawling in rocky shelf habitats and the coincident catch of rockfish in shelf flatfish trawls. During 2002-2010, the total cumulative estimated yelloweye mortality (130 mt) represented only 69% of the summed ACLs and only 39% of the summed OFLs for that period. The total 2010 catch (13.6 mt) is just 3% of the peak annual catch that occurred in the early 1980s.

*2.3.5 Fishery Catch-Per-Unit-Effort*

There are four indices of recreational fishery catch per unit effort that were developed for previous assessments and are included in this update. Methods used to calculate these time-series are described in the 2006 document. The individual indices are described below by state.

The California recreational CPUE series begins in 1980 and ends in 1999 with a gap between 1986 and 1993. The data from this CPUE series remains unchanged from the 2009 assessment. The Oregon recreational CPUE series is unchanged from the 2009 assessment. This series begins in 1979 and ends in 1999 with gaps in 1985 and 1997. The Washington recreational CPUE series begins in 1990 and extends through 1999. The data from this CPUE series remains unchanged from the 2009 assessment.

A new fishery dependent CPUE series was developed for the 2009 assessment based on the recreational charter observing program in Oregon. This program sends samplers on charter sport fishing trips where they record the catch rates and size distributions of yelloweye rockfish for as many anglers as they are capable of monitoring. The CPUE series was updated with data from 2009 and 2010 and was included in the update assessment.

DRAFT

A relative index of abundance from these data was fit using the statistical approach that was applied to the IPHC survey (described in Stewart et al. 2009). Binary data of whether a yelloweye rockfish was captured on each hook of each drift was analyzed with a binomial GLM. Auxiliary variables considered included: port (with sparse observations included in an aggregate port category), day of the calendar year, and depth at which fishing was conducted. In the final model, year and port group were used as factors with a fourth degree polynomial of depth and a second degree polynomial of the number of days into the calendar year.

*2.3.6 Fishery Biological Data*

Length-frequency distributions were developed for each fleet (recreational or commercial) for which observations were available, following the methods used for the 2009 assessment. The same bin structure (2 cm) was used as for fishery independent observations. Sampling statistics (number of samples and number of individual fish) for each fleet and year (Table 9-10) clearly show the different sampling targets employed over different time periods and between state agencies.

The California recreational fishery has yielded a small but relatively consistent number of samples since the early 1990s. Only measured lengths, not length converted from other measurements, are included in the length-frequency observations (this excludes many observations from the earlier years in California). The recreational charter boat sampling program produced over 1,800 lengths during the period 1987-1998. Oregon has collected most of the recreational length data (both sexed and unsexed), while Washington provided samples beginning only in the late 1990s. California provides the majority of the commercial lengths from 1978 to 2007, with sampling in Oregon and Washington beginning only in the early 1990s.

As with the fishery independent data described above, ages from recreational or commercial fisheries, are compiled as conditional age-at-length observations by two cm size bin. There are very few yelloweye ages available from the recreational fisheries (Table 11), and no new recreational age data since the previous assessment. All three states have collected a few ages, but there have been only a total of 83 samples collected from all recreational sources available for this assessment. Commercial age data are not much more numerous than those from recreational sources. Sparse sampling was conducted in the 1980s in California (resulting in only 52 useful ages). Since 2001, the majority of commercial fishery age data were from Washington, including the only new samples since the 2009 assessment (Table 12).

## *2.4 History of Modeling Approaches*

*2.4.1 Previous Assessments*

The 2009 assessment document contains a detailed description of the history of yelloweye rockfish assessments.

*2.4.2 Pre-Assessment Workshop, GAP and GMT Input*

Because this is an updated assessment, there was no formal or informal discussion of data, modeling or management issues for 2011. This has been a valuable part of the assessment process in recent years and should be continued in the future.

DRAFT

*2.4.3 Response to STAR Panel Recommendations in 2006*

The STAR panel report from the 2006 review (the 2007 assessment was an update, and did not go through the STAR process) identified a number of recommendations for future assessments. As this was an updated assessment these issues were not revisited, but are reiterated here for consideration in future yelloweye and other assessments. Although all these recommendations could not be addressed for 2009, progress on each is summarized below:

*1) In the current assessment model, catches are assumed known without error. Because yelloweye rockfish are relatively rare in the fisheries, catches are estimated with considerable error. Ignoring this source of uncertainty will lead to an overestimation of model precision. Future assessments should allow catch to have some error to better propagate this key uncertainty to model estimates. SS2 should be modified to allow error in the catch data. This should not be difficult to code, although it may cause some problems with convergence that may require attention. Allowing for some autocorrelation in F might improve the estimation.*

Preliminary investigation into the direct integration of uncertainty in catches via estimated parameters for annual *F*s indicated that it would not be feasible to integrate over the very broad distribution of possible catches in this manner. The method would probably be much more appropriate for assessments where only some portions of the catch has very great uncertainty associated with points estimates, however for yelloweye the entire time-series for all sectors is very uncertain. The choice of representing catch uncertainty via alternate states of nature represents an imperfect solution, but does attempt to provide those evaluating the results of this assessment with insight into the sensitivity of the model scale to historical catches.

*2) Formal estimates of uncertainty in catch should be produced by modeling the species composition sampling process. This will require an extended analytical effort, but it should be doable. The analysis may lead to using model-based estimates for missing cells, rather than substitution, which may change the best estimates of catch somewhat. Estimates of uncertainties in the total unclassified rockfish landings and in the species fraction estimates in the earlier years may still have to be assumed.*

This topic was not addressed specifically, but it should be noted that model-based catch estimators are an available tool for ongoing state-specific catch reconstructions. It is likely that all three states will have some level of comprehensive catch reconstruction completed for the 2011 assessment cycle; however, the authors are unaware of further exploration of model-based methods for these reconstructions.

*3) Obtain data from Canada for a truly stockwide model.*

This topic has been raised with Canadian scientists and may be more realistically possible after current (2009, L. Yamanaka, personal communication) assessment efforts for coastal waters of B.C. are completed.

*4) Continue efforts on the fishery independent survey programs. The most promising should be expanded stockwide.*

Although a number of projects are being evaluated in 'pilot' studies (e.g., open-ended trawls with cameras, AUV surveys, and others) it is likely to be several years (at a

minimum) before any of these can produce results that might be directly useful as data in a stock assessment framework.

*5) Consider an assessment model incorporating several rockfish species simultaneously.*

The use of the meta-analysis for stock-recruit steepness is a step in this direction, but a formal process for developing (and reviewing) multiple-species assessments needs to be created before this will be a realistic option for stock assessment authors. The approach may be best tested in a 'research-mode' analysis before being applied to a 'production' assessment.

*6) The panel recommends that aging error be explored again in future assessments. The panel was not completely comfortable with decreasing aging error as age increased as is currently in the base model. The panel discussed that it seemed counterintuitive that fish would become easier to age as they became older, and evidence for this pattern was sparse. However, removing the trend in aging error (to either a constant SD or CV) had small effects on model estimates.*

This topic has been resolved using current double-read data and analysis software (see section 2.2.5 above).

*7) Data are sparse in the most recent years of the model since the fisheries have been closed. Because of this, there is considerable uncertainty about current age and size structure of the population as well as uncertainty because most of the CPUE time series end in 2001. This uncertainty will become worse for future assessments if no new data streams are added. The best types of data to add would be surveys that estimate absolute abundance such as the submersible survey conducted in 2001. This survey would need to be expanded to include Oregon and California waters. Another option would be to continue and expand the IPHC survey.*

As soon as actual data are produced by alternate survey methods it should be incorporated into the yelloweye stock assessment. It may be of little value to perform frequent full stock assessments if no new sources of (higher) quality data become available.

## *2.5 Model Description*

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

The bridge from the 2009 stock assessment model to the current base case followed two steps: 1) upgrade to the newest version of SS, and 2) add all new data inputs, including the new Oregon catch reconstruction, recent catch for each fleet, biological data, and extended and re-analyzed GLMM-based indices of survey abundance.

The Stock Synthesis version was updated from 3.03b used in the 2009 assessment to the latest version available 3.21d. The change due to updating the to the latest software version was extremely small, with changes in estimates of 2009 spawning biomass and depletion amounting to less than 0.01% of the values in the previous assessment when the model was configured in the same manner despite many new (and unused for this update) features.

The effect of the new composition data, extended indices, and the Oregon historical catch reconstruction on estimates of equilibrium biomass and current status were also quite small, and are described in detail below.

DRAFT

### *2.5.2 Summary of Fleets*

As in the 2009 assessment, fishery removals were divided among six fleets: 1) California recreational, 2) California commercial, 3) Oregon recreational, 4) Oregon commercial, 5) Washington recreational, and 6) Washington commercial. The California CPFV index of relative abundance and the length frequency distributions from this source are assigned the selectivity from the California recreational fishery. The Oregon charter observer index is treated separately (selectivity estimated independently) from the Oregon recreational fleet. The IPHC data is modeled by state, with each survey utilizing separate selectivity and catchability parameters. There were only sufficient data for a Washington triennial survey index and an Oregon NWFSC survey index, so each had its own fleet. The data available for each fleet are described in Table 3.

### *2.5.3 Modeling Software*

This assessment used the Stock Synthesis modeling framework written by Dr. Richard Methot at the NWFSC. The most recent version (3.21d) was used, since it included many improvements in the output statistics for producing assessment results and several corrections to the older version (3.03b) used during the 2009 assessments.

### *2.5.4 Priors*

As in the 2009 assessment, uniform (and intended to be noninformative) priors were applied to all estimated parameters in the base-case model with only three exceptions where additional information was available (natural mortality, described in section 2.2.4, and steepness, described below). Parameter bounds were selected to be sufficiently wide to avoid truncating the searching procedure during maximum likelihood estimation. A list of all parameter bounds and priors are provided in this document (Table 14).

In addition to the priors for natural mortality, an informative prior for stock-recruitment steepness ($h$) is used for the base-case model. The use of a prior on stock-recruitment steepness based on meta-analysis of rockfish (original basis: Dorn 2002) has become standard practice for U.S. west coast stock assessments. This prior has been kept at the same value used in the 2009 assessment, which was found to be relatively uninformative in that analysis (less than two units of negative log-likelihood over most of the acceptable range for $h$, 0.2-1.0).

### *2.5.5 Sample Weighting*

The approach to sample weighting remains unchanged from the 2009 assessment. The resulting changes in weighting adjustments (Table 15) were minor. This approach attempts to reduce the potential for particular data sources to have a disproportionate effect of total model fit, while creating estimates of uncertainty that are commensurate with the uncertainty inherent in the input data.

### *2.5.6 General Model Specifications*

Stock synthesis has a broad suite of structural options available for each application. These options were configured in the newest version to almost exactly match the behavior of the 2009 model.

DRAFT

This assessment is structured to be sex-specific, including separate growth curves for males and females, and therefore tracks the spawning output of only females for use in calculating management quantities. Growth parameters describing the von Bertalanffy growth equation, as well as the spread of lengths for a given age, were estimated for each sex, except that the length at age one year was forced to be identical for males and females. The parameterization used by Stock Synthesis allows the user to specify the age for the two growth parameters (rather than the length at age zero and the implied length at infinite age). Ages one and 70 were selected to be close to the range of observed data. Based on preliminary analyses, this choice had little effect on estimated growth curves. A list of the growth parameters, bounds and priors is given in Table 14. Natural mortality was freely estimated for each sex, based on the *a priori* evidence that it might differ for males and females.

For the internal population dynamics, ages 0-100 are individually tracked, with the accumulator age of 100 determining when the 'plus-group' calculations are applied. This relatively large number of ages substantially increases the memory and computational requirements of the model. However, this specification is necessary to define a plus-group in which little individual fish growth is expected, since the model does not apply further growth increases to fish in the plus-group.

Three explicit areas are included in the base-case model, representing the three states: California, Oregon and Washington. Although these are political rather than strictly biological boundaries, the yelloweye population appears to be fragmented enough, and adult movement is likely small enough, that the exact placement of these lines is of little importance. What is known to be important (and related to states rather than biology) is the vastly different exploitation history among the three areas from the historical period to the current fishery. Growth is assumed to be identical among the three areas, largely due to the sparseness of the data. Recruitment dynamics are governed by a global stock-recruit function (using spawning output based on the fecundity relationship, rather than strictly spawning biomass as is common among assessments). This relationship is parameterized to include two estimated quantities: the log of unexploited equilibrium recruitment ($R_0$) and steepness ($h$). Recruitment is partitioned via estimation of one additional parameter for each area after the first, which are then renormalized to allocate the total recruits among the areas. The base case does not allow for process error in the stock recruitment relationships (either over time or areas) although this was investigated extensively during preliminary model building and via sensitivity analyses.

No seasons are used to structure removals or biological predictions, so data collection is assumed to be relatively continuous throughout the year. Fishery removals occur instantaneously at the mid-point of each year and recruitment on the 1$^{st}$ of January. Since the time-series is started in 1916, the stock is assumed to be in equilibrium at the beginning of the modeled period. The sex-ratio at birth is fixed at 1:1, although sex-specific natural mortality, size-based selectivity, and dimorphic growth can result in significant departure from equality due to differential mortality over age and sex.

### *2.5.7 Estimated and Fixed parameters*

A full list of all estimated parameters and values of key parameters that are fixed is provided in Table 14, this parameter estimation framework remains unchanged from the 2009 assessment.

DRAFT

A two-parameter logistic function was used to represent the selectivity for all fishing fleets and for the IPHC survey. For all indices of abundance, catchability parameters were solved for analytically, except for the triennial survey, where allowing for a change (unrestricted) in catchability for the time-series including and after 1995 required the direct estimation of catchability for each period. For the historical fishery-dependent time series, where the basic assumptions of CPUE analysis were likely violated, there were four additional parameters estimated to allow for a non-linear relationship between the index and modeled population abundance.

In total, there were nine estimated growth and mortality parameters, four parameters governing the stock recruitment relationship, six catchability related parameters (and seven analytic solutions which could have been treated as estimated parameters), and 23 parameters describing selectivity curves.

### *2.6 Model Selection and Evaluation*

#### *2.6.1 Key Assumptions and Structural Choices*

Following the terms of reference for an updated assessment, all assumptions and structural choices remained unchanged, and were not reevaluated for 2011.

#### *2.6.2 Alternate Models Explored*

A 'standard' update, ignoring the newly available historical catch reconstruction is presented for comparison with the base case presented here.

An extensive evaluation of dome-shaped vs. asymptotic selectivity curves for commercial, recreational and survey fleets was performed as part of the 2009 assessment. In the previous assessment, models very similar to the base case were fit while allowing each fleet to have dome-shaped selectivity. With only one exception, the NWFSC survey, all fleets produced asymptotic curves, requiring the application of informative priors on the descending limbs or fixed parameter values to ensure all parameters remained contributors to the objective function (i.e., when the final selectivity is estimated to be close to 1.0, then the descending width parameter is irrelevant to model fit and if not somehow informed can cause estimation instability). This exercise was repeated across fleets to determine whether additional flexibility was needed beyond a single parameter describing the ascending limb of the selectivity curve. This was found to be the case for the triennial survey, so an additional parameter was estimated, although little change was observed in model results. This exercise was repeated as part of the 2009 STAR panel review, focusing on the IPHC selectivity for Oregon which was found to fit slightly better with dome-shaped selectivity.

This exercise was not repeated here, but should be in the next full assessment.

### *2.7 Base-case model Results*

The biological (growth and mortality) parameters estimated from the base case and alternate models appear to be quite reasonable (Table 16) and commensurate with inspection of the raw data. These parameters are relatively precisely estimated, both in terms of the asymptotic standard error estimates (Table 18) and the alternate states of nature (Table 16). Comparison between the 2009 assessment and the current analysis (Table 18), indicates very little change in parameter estimates due to the new data. Female and male yelloweye rockfish showed similar growth trajectories, beginning to diverge at

DRAFT

approximately age 10; with males growing to a maximum size (66.7 cm) that was about 2.3 cm larger than females (Figure 7). The estimates of growth are almost identical to those in the 2009 assessment (Table 18).

The estimated natural mortality rates for males and females are nearly identical, with females slightly higher than males for both of the alternate states of nature. The estimated female value for the base case, 0.046, is just below the 0.047 estimate from the 2009 assessment and remains consistent with the very protracted age-structure observed in the population.

Estimated selectivity curves for the fishing fleets exhibit the expected pattern that the recreational sectors in all three states access somewhat smaller yelloweye than the commercial fisheries (Figure 8-10). This pattern is most pronounced in Oregon, and, also as expected, the recent charter fishing selectivity is shifted further toward smaller fish. Estimated selectivity curves for the IPHC surveys in both Oregon and Washington appear to access the largest yelloweye available, with Washington especially shifted slightly more than 10 cm larger than Oregon (Figure 11). The NWFSC trawl survey selects far more small yelloweye than did the triennial survey (Figure 12). The decline in selectivity in the NWFSC at about 60 cm is similar, but even more pronounced than the previous assessment.

The base-case model predicts a relatively flat trend through the yelloweye index from the IPHC survey both the Washington and Oregon (Figure 13). The poor residual pattern for the Oregon index (5 positive residuals followed by 5/6 negative residuals) seems unlikely to occur by chance, however, it also seems unlikely, given the life-history characteristics of yelloweye rockfish that any model could predict the negative offset seen between the 2004 and 2005 or 2008 and 2009 survey estimates. This seems likely to be the result of some interaction between survey design and availability of yelloweye at the relatively few stations where they are present in this survey.

The base-case model fits the NWFSC (Figure 14) and triennial (Figure 15) trawl survey indices as well as expected, given the small number of positive hauls on which they are based and the relatively small contribution to the total likelihood value.

Fits to the fishery CPUE series are generally good, tracking the declining trends in California through the 1990s (Figure 16). However, the model exhibits poor fit to the increasing trend in the 1980s portion of the California recreational index. For the Oregon recreational index, the model again tracked the overall decline in the 20-year index, but little of the interannual variability (Figure 17). The Oregon recreational observer index showed a small and very uncertain increasing trend, but during the extent of these observations (2004-2010) the estimated degree of rebuilding among fish available to this fishery has been almost imperceptible. With relatively large variances on many of the observations, the Washington recreational index provided a flat trend, which was largely matched by the slightly declining predictions (Figure 18).

The base case model fits the length distributions from the IPHC surveys in Oregon (Figure 19, Figure 20) and Washington (Figure 21, Figure 22) reasonably well. The few new length samples from the NWFSC survey are consistent with previous data, and the continued absence of samples over 60 cm explains the even stronger domed shape in the estimated selectivity curve (Figure 12).

The fit to the length compositions is similar to that in the 2009 assessment, as expected, given the similar estimates of population trends and the choice to not estimate annual deviations in recruitment. What little new length data has been collected is

DRAFT

consisitent with previous distributions for each data source. There appear to be few patterns in the residuals.

The unsexed Oregon recreational length data (unchanged since the 2009 assessment) continue to show a strong diagonal residual pattern through the 1990s (Figure 32, Figure 33). This residual pattern from 1985-2003 could be due to a strong cohort (or cohorts) in the mid-1980s, although growth would have to be slightly above predicted rates to achieve the observed increase in mean size of this mode during the 10-year span over which it is observed. It is possible that other factors are also influencing this pattern, such as a shift in the targeting by the recreational fleet; however time-varying selectivity was not included for this fishery. The extended Oregon recreational charter observer program also shows some indication of a cohort through the residual patterns (Figure 36).

The new age-frequency data are sparse, but consistent with previous years. Fits to the age-frequency data (Figure 42-52) are reasonably good and very similar to those from the 2009 assessment.

The estimated stock-recruitment relationship for the base case and alternate states of nature are very consistent in their predictions of little surplus production (steepness values 0.383, 0.441, 0.508 (Tables 20-21)), which are similar to the previous assessment. These model runs reveal an almost linear relationship between the magnitude of historical removals and the scale of the estimated population size (Table 20, Figure 53). Because no process error in recruitment is modeled and steepness is relatively low among the states of nature, the time-series' of total recruitment (Figure 54) and spawning output (Figure 55) track one another very tightly. Both show that the aggregate yelloweye population was rapidly reduced from near unexploited conditions to low levels from about 1970 to 2000 (Tables 18-23), and this result is quite conserved among the alternate states of nature (Tables 19 and 21).

The portions of the total spawning output within each of the three states differs, with California and Oregon having very similar estimates of spawning output at unexploited equilibrium, and with Washington having considerably les. Oregon is estimated to have the largest 2011 spawning output, followed by California, then Washington. Relative depletion also varies by state, with California estimated to be at 17.2% of unexploited conditions, Oregon, 23.9%, and Washington, 27.1% (Figure 57 and 59). The matrix of predicted numbers at age, by sex and area, is provided in Appendix A.

### *2.8 Uncertainty and Sensitivity Analysis*

As in 2009, the base-case assessment model captures some uncertainty via asymptotic intervals. Uncertainty from two additional sources is characterized through consideration of alternate states of nature, in which assumptions regarding these two key areas of uncertainty bracket those of the base case, and key results are reported in the decision table. The two axes of uncertainty are the steepness of the spawner-recruit relationship and the magnitude of the historical catch. The sensitivity of the model results to changes in these two dimensions were calculated for total of 9 combinations of low, base, and high assumptions for the two axes.

Alternate values of steepness and historical catch were selected to bracket the best estimates with marginal probabilities one-half as likely. For historical catch, these values, 75% and 150% of the estimated catch series prior to 2000, were subjective, but reflect the lack of a comprehensive catch reconstruction in Washington and the change in likelihood of

DRAFT

the fit to data sources over a reasonable range of catch levels. For steepness the 12.5$^{th}$ and 87.5$^{th}$ percentiles were calculated from the likelihood profile using the $X^2$ critical value of 0.66 (Figure 62) as a proxy for the probability distribution about this point estimate. This results in alternate values for steepness of 0.344 and 0.508 about the maximum likelihood estimate. The most optimistic and pessimistic of the nine combinations from these two axes (weighted 6.25% each relative to 25% for the best estimate on each dimension) are reported in this document and all combinations used to provide a more realistic degree of uncertainty for future projections, decision tables and rebuilding analyses.

*2.8.1 Retrospective Analysis*

A 5-year retrospective analysis was conducted by running the model using data only through 2005 ("Retrospective in 2006"), 2006, 2007, 2008 and 2009 (Figure 60). Very little retrospective pattern is apparent through any of these removals, indicating that the new data is consistent with previous values or the sample sizes are too small to have any impact.

The changes between assessments over the past 10 years have been relatively small, with the change since the previous assessment the smallest difference between assessments yet (Figure 61).

*2.8.2 Likelihood Profiles*

A likelihood profile was conducted for steepness of the stock-recruit relationship ($h$) to elucidate conflicting information among various data sources, to determine how asymmetric the likelihood surfaces surrounding point estimates may be, and to provide an additional evaluation of how precisely parameters are being estimated.

Steepness appears to be informed by the length and age data (Figure 62), with a slight increase in the model estimate of 0.441 relative to the the 0.417 value from the 2009 assessment. Correlation between steepness and natural mortality is similar to the previously estimated relationship (Figure 63), though the values are shifted slightly.

## 3. Rebuilding Parameters

Revised rebuilding projections will be presented in a separate document in September 2011. As in 2009, the base-case assessment model captures some uncertainty via asymptotic intervals; uncertainty from two sources is reported through alternate states of nature bracketing the base-case specifications and will be included explicitly in the decision table.

## 4. Reference Points

The spawning output of yelloweye rockfish was estimated to have dropped below the $SB_{40\%}$ management target in 1989 and the overfished threshold in 1994. In hindsight, the spawning output passed through the target and threshold levels with annual catch averaging almost five times the current estimate of the MSY. The coast-wide stock remains below the overfished threshold, although the spawning output is estimated to have been increasing since 2000 in response to reductions in harvest. The degree of increase is largely insensitive to the magnitude of historical catch and only moderately sensitive to the value for steepness, but the absolute scale of the population reflects alternate removal series very closely. Fishing mortality rates are estimated to have been in excess of the current F-target for rockfish of $SPR_{50\%}$ from 1976 through 1999 (Figure 64, Figure 65, Figure 66). Recent

DRAFT

management actions have reduced the rate such that recent SPR values are in excess of 60% over the last ten years (Figure 67). Relative exploitation rates (catch/biomass of age-8 and older fish) are estimated to have been at or less than 1% after 2001. The alternate states of nature result in estimated exploitation rates ranging from less than 1.7% to less than 0.7%.

Unfished spawning output was estimated to be 1,028 million eggs. The target stock size ($SB_{40\%}$) is therefore 411 million eggs and the overfished threshold ($SB_{25\%}$) is 257 million eggs. Maximum sustained yield (MSY), conditioned on current fishery selectivity and allocations, was estimated in the assessment model to occur at a spawning stock biomass of 392 million eggs and produce an MSY catch of 63 mt (slightly above the estimate from the 2009 assessment of 56.4mt). However, the yield at MSY is extremely sensitive to states of nature resulting in a wide range for this value from 39 to 111 mt. Maximum sustainable yield is estimated to be achieved at an SPR of 57.7% (range of states of nature: 51.1-64.4%). This is nearly identical to the yield, 62 mt, generated by the SPR (59.0%) that stabilizes the stock at the $SB_{40\%}$ target. The fishing mortality target/overfishing level (SPR = 50.0%) results in a smaller equilibrium yield of 58 mt at a spawning output of 275 million eggs (26.7% of the unfished level). In sum, although the estimated MSY spawning output is very close to the proxy level, the harvest rate needed to achieve equilibrium at 40% of the unfished level is lower than the MSY-proxy rate.

## 5. Harvest Projections and Decision Tables

The forecast reported here will be replaced by the rebuilding analysis to be completed in September-October 2011 following SSC review of the stock assessment. In the interim, the total catch in 2011 and 2012 is set equal to the ACL (17 mt). The target exploitation rate for 2013 and beyond is based upon an SPR of 71.9%, which approximates the harvest level in the current (2009) rebuilding strategy (the 71.9% SPR rate represents the target after the 'ramp-down' portion of the strategy is completed in 2010). Uncertainty in the rebuilding forecast will be included via integrating over all combinations of the alternate states of nature for catch history and steepness. Current medium-term forecasts predict increases in coast-wide abundance under the SPR=71.9% rebuilding strategy, however these increases are largely driven by the California and Oregon portions of the stock. In fact, the Washington portion is projected to remain at current levels under recent allocation of catch. Catch allocation used for the forecast reflects the average distribution of the catch in 2008-2009 among fleets in Washington, Oregon, and California. . The estimated ACL values for 2013 and 2014 are larger (21.8, 22.1) than those predicted from the 2007 rebuilding analysis (21.0, 20.5).The projection of expected yelloweye rockfish catch, spawning output (by area) and depletion shows very slow recovery (Table 24). It may be desirable to evaluate specific allocation scenarios, if relative removals based on future management actions will be substantially different than recent values by state.

Because yelloweye rockfish are currently managed under a rebuilding plan, the decision table included here (Table 25) is only intended to better evaluate the management implications of the considerable uncertainty in the base case assessment model. Various alternate management actions including SPR rates and fixed ACLs will be evaluated in the rebuilding analysis. Landings in 2011-2012 are 17 mt for all cases. Catch allocation used for the forecast reflects the same proportions by fleet.

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## 6. Regional Management Considerations

As in 2009, the choice to model the yelloweye rockfish stock with explicit areas in the assessment model is based on the sedentary life-history of adult yelloweye, and the markedly different population trends as well as historical and current exploitation rates among the three states. Current population status differs by state, with both near term forecasts as well as longer term the rates of recovery under ACL catches predicted to be quite different for each area. This information may be valuable for making management and allocation decisions; alternate future projections can easily be added to this assessment, as needed, to better describe the implications of these choices.

The use of area-specific vs. coast-wide assessment models and management tools should be considered a major source of uncertainty. Future efforts, including links to Canadian waters and alternate approaches to meta-population dynamics could produce differing results.

## 7. Research Needs

The available data for yelloweye rockfish are very sparse and generally weakly informative about current status. The following research topics were suggested in the 2009 assessment and are repeated here with minor modifications. Progress on these points could improve the ability of this assessment to reliably model the yelloweye rockfish population dynamics in the future and provide better monitoring of progress toward rebuilding:

1. Develop and implement a comprehensive visual survey.
2. Do a scientific review of current efforts to develop and improve stock size indices for yelloweye based on IPHC (including additional stations) and make recommendations on the best approaches to develop such indices.
3. Explore a recalculation of GLMM estimates in the IPHC survey that explores station effects which allows inclusion of stations that differ over time.
4. Investigate the development of a WA recreational yelloweye CPUE based on the recreational halibut fishery. Consider a full time series and one ending in 2002, since the yelloweye RCA in waters off northern WA was implemented in 2003.
5. Encourage the collection of samples to refine the estimate biological parameters, particularly maturity and fecundity.
6. Continue to evaluate the spatial aspects of the assessments, including growth, the number and placement of boundaries between areas, as well as the northern boundary with Canada.
7. Investigate alternative ways of re-weighting. This issue is relevant for all west coast stock assessments.
8. Investigate how best to account for the variability in dates in trawl surveys through a meta-analysis. This issue is relevant for all west coast stock assessments.
9. Conduct a historical catch reconstruction for WA to match those produced for OR and CA. This issue is relevant for all west coast stock assessments.
10. Access and processing of recreational data (catch and biological sampling) currently entails differing locations and formats for data from each of the three states and RecFIN. RecFIN is difficult to use and estimates from it don't match the total mortality estimates also provided by the state agencies. A single database that holds all raw recreational data in a consistent format would reduce assessment time spent on

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processing these data and potential introduction of errors or alternate interpretations due to processing.

11. The IPHC data organization should be revisited. Currently biological samples cannot be linked to the station from which they were collected. Age data for 2003-2005 is disconnected from length and sex information and other unknown issues may persist in these data. A thorough evaluation of what data are reliable and a final determination of what information is lost, or can potentially be recovered, is needed.
12. Instigate discard sampling of yelloweye bycatch in the directed Pacific halibut fishery.

## 8. Acknowledgements

This update assessment draws heavily on the text and analyses in the 2009 assessment and has benefited greatly from the efforts of Ian Stewart, the primary author of that assessment, as well as his co-authors, John Wallace and Carey McGilliard. Many people at various state and federal agencies assisted with assembling the data sources included in this updated assessment. Claude Dykstra at the IPHC, Farron Wallace, Bob Le Goff at WDFW, and Troy Buell at ODFW all provided valuable data and advice on data availalability. Jason Jannot and Marlene Bellman provided total mortality estimates from recent years and summarized biological data from the West Coast Observer Program, as well as advising on the complexities associated with these data sources. Beth Horness provided summary statistics from the NWFSC trawl survey. Richard Methot has provided extensive guidance in the use of Stock Synthesis and continues to make it an easier and more powerful software to use. Every member of the NWFSC Assessment team has provided some advice, input, or guidance at some point in the preparation of this update assessment, and the results benefit greatly from their contributions. Comments and suggestions from Jim Hastie substantially improved the quality of the document.

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## 10. Tables

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Table 1. Total catches (mt) of yelloweye rockfish by fleet used in the assessment model. Foreign and research catches are included in commercial totals. See text for description of sources.

| Year | California Recreational | California Commercial | Oregon Recreational | Oregon Commercial | Washington Recreational | Washington Commercial |
|---|---|---|---|---|---|---|
| 1916 | 0.00 | 2.20 | 0.00 | 1.70 | 0.00 | 0.00 |
| 1917 | 0.00 | 3.62 | 0.00 | 1.79 | 0.00 | 0.00 |
| 1918 | 0.00 | 4.25 | 0.00 | 1.88 | 0.00 | 0.00 |
| 1919 | 0.00 | 2.16 | 0.00 | 1.97 | 0.00 | 0.00 |
| 1920 | 0.00 | 2.38 | 0.00 | 2.05 | 0.00 | 0.00 |
| 1921 | 0.00 | 2.30 | 0.00 | 2.14 | 0.00 | 0.00 |
| 1922 | 0.00 | 2.06 | 0.00 | 2.23 | 0.00 | 0.00 |
| 1923 | 0.00 | 2.21 | 0.00 | 2.32 | 0.00 | 0.00 |
| 1924 | 0.00 | 2.82 | 0.00 | 2.40 | 0.00 | 0.00 |
| 1925 | 0.00 | 3.86 | 0.00 | 2.49 | 0.00 | 1.00 |
| 1926 | 0.00 | 4.87 | 0.00 | 2.58 | 0.00 | 1.00 |
| 1927 | 0.00 | 5.92 | 0.00 | 2.67 | 0.00 | 1.00 |
| 1928 | 0.00 | 5.52 | 0.00 | 4.45 | 0.00 | 1.00 |
| 1929 | 0.73 | 5.66 | 0.00 | 7.46 | 0.00 | 1.00 |
| 1930 | 1.18 | 6.76 | 0.00 | 6.65 | 0.00 | 1.00 |
| 1931 | 1.76 | 5.62 | 0.00 | 5.21 | 0.00 | 1.00 |
| 1932 | 2.35 | 8.13 | 0.00 | 1.79 | 0.00 | 1.00 |
| 1933 | 2.94 | 4.45 | 0.00 | 2.74 | 0.00 | 1.00 |
| 1934 | 3.53 | 5.78 | 0.00 | 3.11 | 0.00 | 1.00 |
| 1935 | 4.12 | 7.99 | 0.00 | 2.84 | 0.00 | 1.00 |
| 1936 | 4.70 | 8.08 | 0.00 | 6.64 | 0.00 | 1.00 |
| 1937 | 5.61 | 6.08 | 0.00 | 7.57 | 0.00 | 1.00 |
| 1938 | 5.50 | 6.36 | 0.00 | 7.30 | 0.00 | 1.00 |
| 1939 | 4.81 | 6.43 | 0.00 | 3.82 | 0.00 | 1.00 |
| 1940 | 6.85 | 4.57 | 0.00 | 11.15 | 0.00 | 1.00 |
| 1941 | 6.25 | 5.35 | 0.00 | 15.98 | 0.00 | 1.00 |
| 1942 | 6.78 | 3.37 | 0.00 | 23.85 | 0.00 | 1.00 |
| 1943 | 7.30 | 5.89 | 0.00 | 66.05 | 0.00 | 1.00 |
| 1944 | 7.83 | 24.88 | 0.00 | 46.97 | 0.00 | 1.00 |
| 1945 | 8.36 | 58.56 | 0.00 | 62.52 | 0.00 | 1.00 |
| 1946 | 8.88 | 57.74 | 0.00 | 42.38 | 0.00 | 1.00 |
| 1947 | 5.02 | 16.28 | 0.00 | 25.53 | 0.00 | 1.00 |
| 1948 | 10.12 | 23.30 | 0.00 | 20.73 | 0.00 | 1.00 |
| 1949 | 13.09 | 9.89 | 0.00 | 15.93 | 0.00 | 1.00 |
| 1950 | 15.95 | 8.03 | 0.00 | 17.79 | 0.00 | 1.00 |
| 1951 | 17.91 | 16.99 | 0.00 | 15.10 | 0.00 | 1.00 |
| 1952 | 15.95 | 14.15 | 0.00 | 14.88 | 0.00 | 1.00 |
| 1953 | 13.97 | 11.77 | 0.00 | 11.32 | 0.00 | 1.00 |
| 1954 | 18.74 | 11.78 | 0.00 | 14.23 | 0.00 | 1.00 |
| 1955 | 24.06 | 6.98 | 6.20 | 15.04 | 1.00 | 2.00 |
| 1956 | 27.15 | 10.40 | 6.50 | 18.06 | 1.00 | 2.00 |
| 1957 | 24.78 | 13.17 | 6.70 | 25.89 | 1.00 | 2.00 |
| 1958 | 35.91 | 13.41 | 7.00 | 18.30 | 2.00 | 2.00 |
| 1959 | 30.41 | 10.25 | 7.20 | 20.64 | 2.00 | 2.00 |
| 1960 | 22.05 | 8.88 | 7.50 | 25.32 | 2.00 | 2.00 |

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Table 1. Continued. Total catches (mt) of yelloweye rockfish by fleet used in the assessment model.

| Year | California Recreational | California Commercial | Oregon Recreational | Oregon Commercial | Washington Recreational | Washington Commercial |
|---|---|---|---|---|---|---|
| 1961 | 17.68 | 5.25 | 7.70 | 24.63 | 2.00 | 2.00 |
| 1962 | 22.08 | 5.43 | 8.00 | 28.28 | 2.00 | 2.00 |
| 1963 | 23.10 | 10.86 | 8.20 | 8.28 | 3.00 | 4.00 |
| 1964 | 20.82 | 7.52 | 8.50 | 1.94 | 3.00 | 4.00 |
| 1965 | 31.51 | 9.38 | 8.70 | 70.16 | 3.00 | 4.00 |
| 1966 | 35.34 | 8.97 | 9.00 | 3.86 | 3.00 | 4.00 |
| 1967 | 36.60 | 7.85 | 9.20 | 11.35 | 3.00 | 4.00 |
| 1968 | 42.79 | 7.66 | 9.50 | 7.93 | 3.00 | 4.00 |
| 1969 | 44.97 | 25.70 | 9.70 | 55.36 | 3.00 | 4.00 |
| 1970 | 51.89 | 27.70 | 10.00 | 6.31 | 4.00 | 5.10 |
| 1971 | 46.17 | 46.50 | 13.10 | 17.97 | 4.00 | 6.41 |
| 1972 | 59.61 | 63.66 | 16.30 | 14.82 | 4.00 | 7.31 |
| 1973 | 75.02 | 49.51 | 7.40 | 14.98 | 4.00 | 9.21 |
| 1974 | 80.47 | 56.38 | 12.80 | 14.86 | 4.00 | 10.31 |
| 1975 | 81.34 | 60.24 | 6.20 | 9.87 | 4.00 | 7.10 |
| 1976 | 88.56 | 57.96 | 19.40 | 14.86 | 4.30 | 10.30 |
| 1977 | 79.78 | 57.45 | 19.90 | 17.13 | 8.80 | 17.88 |
| 1978 | 74.46 | 154.20 | 24.50 | 41.91 | 4.50 | 23.90 |
| 1979 | 85.49 | 99.33 | 38.80 | 67.38 | 3.50 | 28.50 |
| 1980 | 80.19 | 42.07 | 31.50 | 76.22 | 2.40 | 35.06 |
| 1981 | 43.58 | 169.44 | 36.00 | 106.27 | 3.40 | 9.70 |
| 1982 | 79.60 | 154.33 | 56.90 | 156.56 | 3.40 | 12.60 |
| 1983 | 38.36 | 62.69 | 63.80 | 142.78 | 6.70 | 16.99 |
| 1984 | 71.26 | 53.66 | 43.70 | 82.56 | 12.20 | 13.42 |
| 1985 | 121.87 | 12.22 | 26.80 | 132.95 | 8.80 | 26.41 |
| 1986 | 77.31 | 33.51 | 27.40 | 56.89 | 9.00 | 14.94 |
| 1987 | 57.83 | 54.31 | 29.80 | 73.72 | 10.50 | 25.09 |
| 1988 | 60.07 | 65.44 | 9.40 | 110.73 | 8.30 | 25.56 |
| 1989 | 54.44 | 51.25 | 16.90 | 170.21 | 14.60 | 39.50 |
| 1990 | 40.06 | 81.32 | 18.70 | 61.12 | 9.90 | 26.27 |
| 1991 | 27.38 | 147.30 | 17.20 | 137.74 | 18.00 | 20.36 |
| 1992 | 16.41 | 111.10 | 29.40 | 165.88 | 16.20 | 33.85 |
| 1993 | 7.13 | 52.92 | 27.73 | 183.18 | 18.00 | 29.76 |
| 1994 | 13.78 | 56.02 | 21.57 | 102.19 | 10.30 | 19.58 |
| 1995 | 10.08 | 51.40 | 16.81 | 148.34 | 9.90 | 18.07 |
| 1996 | 12.74 | 76.54 | 8.17 | 92.52 | 10.80 | 16.89 |
| 1997 | 14.58 | 68.68 | 15.38 | 115.42 | 11.40 | 18.68 |
| 1998 | 4.84 | 21.89 | 18.78 | 41.47 | 14.40 | 5.57 |
| 1999 | 9.40 | 23.49 | 18.05 | 61.35 | 10.60 | 32.92 |
| 2000 | 5.71 | 4.02 | 9.52 | 3.64 | 10.10 | 7.86 |
| 2001 | 6.37 | 4.35 | 4.83 | 6.23 | 12.50 | 21.84 |
| 2002 | 2.49 | 0.89 | 3.14 | 1.56 | 3.70 | 1.55 |
| 2003 | 3.74 | 0.70 | 3.02 | 0.92 | 2.60 | 0.98 |
| 2004 | 0.60 | 2.61 | 3.69 | 2.67 | 3.70 | 0.66 |
| 2005 | 0.90 | 3.43 | 4.30 | 1.69 | 5.20 | 0.74 |

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Table 1. Continued. Total catches (mt) of yelloweye rockfish by fleet used in the assessment model.

| Year | California Recreational | California Commercial | Oregon Recreational | Oregon Commercial | Washington Recreational | Washington Commercial |
|---|---|---|---|---|---|---|
| 2006 | 4.10 | 1.86 | 2.49 | 2.92 | 1.70 | 0.76 |
| 2007 | 8.00 | 4.81 | 2.85 | 3.28 | 2.49 | 1.61 |
| 2008 | 1.69 | 1.72 | 3.25 | 3.88 | 2.40 | 0.78 |
| 2009 | 3.84 | 0.61 | 2.05 | 1.61 | 1.63 | 1.15 |
| 2010 | 2.70 | 1.85 | 2.80 | 2.52 | 2.60 | 1.12 |

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Table 2. Recent trend in yelloweye rockfish catch (mt) relative to management guidelines.

| Year | OFL (mt) | ACL (mt) | Commercial Catch (mt)[1] | Recreational Catch (mt) | Total Catch (mt) |
|---|---|---|---|---|---|
| 1999 | 39[2] | NA | 117.8 | 38.1 | 155.8 |
| 2000 | 39[2] | NA | 15.5 | 25.3 | 40.9 |
| 2001 | 29[3] | NA | 32.5 | 23.7 | 56.1 |
| 2002 | 27[3] | 13.5[3] | 4.0 | 9.3 | 13.3 |
| 2003 | 52 | 22 | 2.6 | 9.4 | 12.0 |
| 2004 | 53 | 22 | 5.9 | 8.0 | 13.9 |
| 2005 | 54 | 26 | 5.9 | 10.4 | 16.3 |
| 2006 | 55 | 27 | 5.5 | 8.3 | 13.8 |
| 2007 | 47 | 23 | 9.7 | 13.3 | 23.0 |
| 2008 | 47 | 20 | 6.4 | 7.3 | 13.7 |
| 2009 | 31 | 17 | 3.4 | 7.5 | 10.9 |
| 2010 | 32 | 17 | 5.5 | 8.1 | 13.6 |

[1]Includes research, foreign and discarded catches after 2001.
[2]Includes the Columbia and Vancouver INPFC areas only.
[3]Includes the Columbia, Vancouver and Eureka INPFC areas only.

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Table 3. Summary of data sources available in 2011. All data in the final 2 columns (2009 and 2010) is new for this update.

| | 1916-24 | 1925-27 | 1928 | 1929-54 | 1955-65 | 1966-76 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Catches*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA Recreational | | | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| CA Commercial | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| OR Recreational | | | | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| OR Commercial | | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| WA Recreational | | | | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| WA Commercial | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Foreign | | | | | | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Research | | | | | | | x | | | x | | | x | | | x | | | x | | | x | | | x | | | x | | | x | | x | x | x | x | x | x | x | x |
| WCGOP discards | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | x | x | x | x | x | x | x | x | x |
| ***Fishery Data*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *CPUE* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA Recreational | | | | | | | | | | x | x | x | x | x | x | x | | | | | | x | | x | x | x | x | x | x | | | | | | | | | | | |
| CA Rec. Charter | | | | | | | | | | | | | | | | | | x | x | x | x | x | x | x | x | x | x | x | | | | | | | | | | | | |
| OR Recreational | | | | | | | | | x | x | x | x | x | x | | x | x | x | x | x | x | x | x | x | x | | x | x | | | | | | | | | | | | |
| WA Recreational | | | | | | | | | | | | | | | | | | | | x | x | x | x | x | x | x | x | x | | | | | | | | | | | | |
| OR Rec. Charter | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | x | x | x | x | x | x | x |
| *Age* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA Recreational | | | | | | | | | | | | | x | | | | | | | | | | | | | x | | | | | | | | | | | | | | |
| CA Commercial | | | | | | | | x | x | x | x | x | x | | x | x | | x | | | | | | | | | | | | x | | | | x | | | | | | |
| OR Recreational | | | | | | | | | x | | | | | x | x | x | x | | x | | | | | | | | | | | x | | | | | | | | | | |
| OR Commercial | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | x | x | x | x | x | x | x | x | | | |
| WA Recreational | | | | | | | | | | | | | | | | | | | | | | | | | | | | x | x | x | x | | | x | x | x | | x | x | |
| WA Commercial | | | | | | | | | | | | | | | | | | | | | | | x | | | | | | | x | x | x | x | x | x | x | x | x | x | x |
| *Length* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA Recreational | | | | | | | | | | | | | | | | | | | | | | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| CA Rec. Charter | | | | | | | | | | | | | | | | | x | x | x | x | x | x | | x | x | x | x | x | | | | | | | | | | | | |
| CA Commercial | | | | | | | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | | x | |
| OR Recreational | | | | | | | | x | x | x | x | x | x | x | x | x | x | x | | | | x | | x | x | x | x | x | x | x | x | x | x | | | | | | | |
| OR Rec. Charter | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | x | x | x | x | x | x | x |
| OR Commercial | | | | | | | | | | | | | | | | | | | | | | x | | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | | |
| WA Recreational | | | | | | | | | | | | | | | | | | | | | | | | | | | | x | x | x | x | | | x | x | x | | x | | |
| WA Commercial | | | | | | | | | | x | | | | | | | | | | | | | | x | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |

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**Table 3. Continued.** Summary of data sources available in 2011.

| | 1916-24 | 1925-27 | 1928 | 1929-54 | 1955-65 | 1966-76 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Survey data*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Index* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IPHC (OR) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X |
| IPHC (WA) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X |
| Triennial (WA) | | | | | | | | | | X | | X | | X | | X | | X | | X | | X | | X | | | | X | | X | | | X | | | | | | | |
| NWFSC (OR) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | X |
| *Age* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IPHC (OR) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | X |
| IPHC (WA) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | X |
| *Length* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IPHC (OR) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | X |
| IPHC (WA) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | X |
| Triennial (WA) | | | | | | | | | | X | | X | | X | | X | | X | | X | | X | | X | | | | X | | X | | | X | | | | | | | |
| NWFSC (OR) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | X |

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Table 4. Sample information contributing to the index of abundance from the IPHC long-line survey.

| | Oregon (57 stations) | | Washington (27 stations) | |
|---|---|---|---|---|
| Year | Positive stations | Number of fish | Positive stations | Number of fish |
| 1999 | 6 | 325 | 2 | 11 |
| 2001 | 6 | 149 | 3 | 54 |
| 2002 | 7 | 125 | 2 | 16 |
| 2003 | 8 | 215 | 6 | 101 |
| 2004 | 7 | 151 | 6 | 19 |
| 2005 | 7 | 81 | 7 | 75 |
| 2006 | 5 | 68 | 5 | 22 |
| 2007 | 7 | 102 | 4 | 30 |
| 2008 | 9 | 122 | 6 | 13 |
| 2009 | 7 | 57 | 6 | 108 |
| 2010 | 8 | 84 | 4 | 27 |

Table 5. Number of fish contributing biological information caught in association with the IPHC long-line survey (Note that a few fish were ambiguously allocated to state in the available data).

| | Lengths (sexed) | | Ages (sexed > 2005) | |
|---|---|---|---|---|
| Year | Oregon | Washington | Oregon | Washington |
| 1999 | 0 | 0 | 0 | 0 |
| 2001 | 0 | 0 | 0 | 0 |
| 2002 | 0 | 0 | 0 | 0 |
| 2003 | 217 | 99 | 215 | 99 |
| 2004 | 155 | 17 | 157 | 17 |
| 2005 | 68 | 72 | 62 | 72 |
| 2006 | 58 | 34 | 58 | 34 |
| 2007 | 103 | 268 | 101 | 268 |
| 2008 | 253 | 83 | 251 | 83 |
| 2009 | 57 | 32 | 57 | 32 |
| 2010 | 71 | 27 | 71 | 27 |

Table 6. Summary of sampling used in the calculation of yelloweye biomass indices for the shelf trawl surveys.

| | Triennial (WA only) | | | NWFSC (OR only) | | |
|---|---|---|---|---|---|---|
| Year | Number of tows | Positive tows | Number of fish | Number of tows | Positive tows | Number of fish |
| 1980 | 101 | 3 | 16 | NA | NA | NA |
| 1983 | 176 | 13 | 13 | NA | NA | NA |
| 1986 | 263 | 21 | 114 | NA | NA | NA |
| 1989 | 113 | 14 | 66 | NA | NA | NA |
| 1992 | 107 | 7 | 90 | NA | NA | NA |
| 1995 | 83 | 3 | 38 | NA | NA | NA |
| 1998 | 87 | 7 | 11 | NA | NA | NA |
| 2001 | 87 | 8 | 26 | NA | NA | NA |
| 2003 | NA | NA | NA | 62 | 7 | 100 |
| 2004 | 75 | 5 | 23 | 83 | 5 | 11 |
| 2005 | NA | NA | NA | 118 | 6 | 13 |
| 2006 | NA | NA | NA | 123 | 8 | 35 |
| 2007 | NA | NA | NA | 118 | 5 | 14 |
| 2008 | NA | NA | NA | 105 | 8 | 14 |
| 2009 | NA | NA | NA | 103 | 1 | 7 |
| 2010 | NA | NA | NA | 104 | 8 | 22 |

Table 7. Summary of data used to produce NWFSC and Triennial trawl survey length-frequency data.

| | Triennial (WA only) | | NWFSC (OR only) | |
|---|---|---|---|---|
| Year | Number of Samples | Number of fish | Number of samples | Number of Fish |
| 1980 | 0 | 0 | NA | NA |
| 1983 | 0 | 0 | NA | NA |
| 1986 | 13 | 51 | NA | NA |
| 1989 | 9 | 44 | NA | NA |
| 1992 | 4 | 7 | NA | NA |
| 1995 | 5 | 7 | NA | NA |
| 1998 | 10 | 19 | NA | NA |
| 2001 | 10 | 21 | NA | NA |
| 2003 | NA | NA | 7 | 24 |
| 2004 | 4 | 10 | 5 | 11 |
| 2005 | NA | NA | 6 | 12 |
| 2006 | NA | NA | 8 | 35 |
| 2007 | NA | NA | 5 | 14 |
| 2008 | NA | NA | 8 | 14 |
| 2009 | NA | NA | 1 | 7 |
| 2010 | NA | NA | 8 | 22 |

Table 8. Summary of sampling used to generate the Oregon charter observer CPUE index.

| Year | Number of observed drifts | Number of observed angler-drifts | Number of yelloweye encountered |
|---|---|---|---|
| 2004 | 905 | 41,529 | 22 |
| 2005 | 948 | 39,922 | 21 |
| 2006 | 1,100 | 40,132 | 41 |
| 2007 | 1,396 | 46,624 | 37 |
| 2008 | 1,349 | 42,508 | 52 |
| 2009 | 894 | 29,500 | 31 |
| 2010 | 968 | 29,219 | 17 |

Table 9. Summary of sampling effort generating length-frequency distributions used in the assessment model for the recreational fleets.

| | California | | California Charter | | Oregon | | Oregon Observer | | Washington | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | N trips | N fish | N trips | N fish | N trips | N fish | N trips | N fish | N hauls | N fish |
| 1978 | 0 | 0 | 0 | 0 | NA | 120 | 0 | 0 | 0 | 0 |
| 1979 | 0 | 0 | 0 | 0 | NA | 107 | 0 | 0 | 0 | 0 |
| 1980 | 0 | 0 | 0 | 0 | 13 | 25 | 0 | 0 | 0 | 0 |
| 1981 | 0 | 0 | 0 | 0 | 8 | 13 | 0 | 0 | 0 | 0 |
| 1982 | 0 | 0 | 0 | 0 | 24 | 61 | 0 | 0 | 0 | 0 |
| 1983 | 0 | 0 | 0 | 0 | 8 | 17 | 0 | 0 | 0 | 0 |
| 1984 | 0 | 0 | 0 | 0 | 53 | 348 | 0 | 0 | 0 | 0 |
| 1985 | 0 | 0 | 0 | 0 | 31 | 222 | 0 | 0 | 0 | 0 |
| 1986 | 0 | 0 | 0 | 0 | 14 | 175 | 0 | 0 | 0 | 0 |
| 1987 | 0 | 0 | 16 | 23 | 22 | 165 | 0 | 0 | 0 | 0 |
| 1988 | 0 | 0 | 61 | 276 | 25 | 38 | 0 | 0 | 0 | 0 |
| 1989 | 0 | 0 | 84 | 279 | 36 | 112 | 0 | 0 | 0 | 0 |
| 1990 | 0 | 0 | 31 | 89 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1991 | 0 | 0 | 37 | 112 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1992 | 0 | 0 | 81 | 164 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1993 | 32 | 33 | 77 | 203 | 88 | 163 | 0 | 0 | 0 | 0 |
| 1994 | 37 | 61 | 75 | 189 | 84 | 151 | 0 | 0 | 0 | 0 |
| 1995 | 40 | 47 | 72 | 152 | 50 | 110 | 0 | 0 | 0 | 0 |
| 1996 | 65 | 75 | 64 | 164 | 38 | 73 | 0 | 0 | 0 | 0 |
| 1997 | 8 | 10 | 68 | 144 | 51 | 99 | 0 | 0 | 0 | 0 |
| 1998 | 16 | 18 | 31 | 55 | 74 | 147 | 0 | 0 | 1 | 25 |
| 1999 | 71 | 88 | 0 | 0 | 109 | 246 | 0 | 0 | 4 | 95 |
| 2000 | 41 | 47 | 0 | 0 | 37 | 62 | 0 | 0 | 7 | 189 |
| 2001 | 15 | 15 | 0 | 0 | 204 | 368 | 0 | 0 | 10 | 101 |
| 2002 | 9 | 13 | 0 | 0 | 278 | 448 | 0 | 0 | 0 | 0 |
| 2003 | 13 | 15 | 0 | 0 | 306 | 490 | 2 | 2 | 0 | 0 |
| 2004 | 11 | 15 | 0 | 0 | 0 | 0 | 11 | 21 | 5 | 12 |
| 2005 | 46 | 57 | 0 | 0 | 0 | 0 | 12 | 24 | 2 | 4 |
| 2006 | 60 | 95 | 0 | 0 | 0 | 0 | 24 | 46 | 1 | 1 |
| 2007 | 43 | 57 | 0 | 0 | 0 | 0 | 23 | 52 | 0 | 0 |
| 2008 | 19 | 27 | 0 | 0 | 0 | 0 | 21 | 59 | 3 | 6 |
| 2009 | 38 | 44 | 0 | 0 | 0 | 0 | 14 | 32 | 0 | 0 |
| 2010 | 10 | 12 | 0 | 0 | 0 | 0 | 12 | 20 | 0 | 0 |

Table 10. Summary of sampling effort generating length-frequency distributions used in the assessment model for the commercial fleets.

| | California | | Oregon | | Washington | |
|---|---|---|---|---|---|---|
| Year | N trips | N fish | N trips | N fish | N trips | N fish |
| 1978 | 2 | 15 | 0 | 0 | 0 | 0 |
| 1979 | 15 | 60 | 0 | 0 | 0 | 0 |
| 1980 | 18 | 35 | 0 | 0 | 2 | 4 |
| 1981 | 17 | 62 | 0 | 0 | 0 | 0 |
| 1982 | 10 | 18 | 0 | 0 | 0 | 0 |
| 1983 | 20 | 43 | 0 | 0 | 0 | 0 |
| 1984 | 19 | 30 | 0 | 0 | 0 | 0 |
| 1985 | 20 | 27 | 0 | 0 | 0 | 0 |
| 1986 | 20 | 23 | 0 | 0 | 0 | 0 |
| 1987 | 18 | 26 | 0 | 0 | 0 | 0 |
| 1988 | 14 | 21 | 0 | 0 | 0 | 0 |
| 1989 | 20 | 51 | 0 | 0 | 0 | 0 |
| 1990 | 15 | 28 | 0 | 0 | 0 | 0 |
| 1991 | 27 | 224 | 0 | 0 | 0 | 0 |
| 1992 | 75 | 493 | 13 | 1 | 0 | 0 |
| 1993 | 97 | 710 | 0 | 0 | 2 | 20 |
| 1994 | 82 | 736 | 0 | 0 | 0 | 0 |
| 1995 | 37 | 378 | 73 | 5 | 0 | 0 |
| 1996 | 80 | 526 | 129 | 7 | 24 | 298 |
| 1997 | 53 | 290 | 232 | 7 | 21 | 142 |
| 1998 | 18 | 62 | 95 | 3 | 13 | 63 |
| 1999 | 58 | 508 | 166 | 11 | 8 | 45 |
| 2000 | 14 | 26 | 141 | 34 | 20 | 361 |
| 2001 | 26 | 146 | 219 | 46 | 31 | 583 |
| 2002 | 9 | 12 | 8 | 14 | 36 | 195 |
| 2003 | 3 | 4 | 2 | 30 | 24 | 59 |
| 2004 | 24 | 71 | 14 | 61 | 18 | 51 |
| 2005 | 12 | 54 | 22 | 39 | 16 | 23 |
| 2006 | 6 | 28 | 6 | 15 | 24 | 102 |
| 2007 | 20 | 79 | 3 | 5 | 6 | 29 |
| 2008 | 0 | 0 | 3 | 16 | 1 | 1 |
| 2009 | 5 | 10 | 11 | 24 | 2 | 14 |
| 2010 | 0 | 0 | 0 | 0 | 3 | 27 |

Table 11. Summary of sampling effort generating age-frequency distributions used in the assessment model for the recreational fleets.

| | California | | Oregon | | Oregon Observer | | Washington | |
|---|---|---|---|---|---|---|---|---|
| Year | N trips | N fish | N trips | N fish | N trips | N fish | N trips | N fish |
| 1978 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1979 | 0 | 0 | 1 | 17 | 0 | 0 | 0 | 0 |
| 1980 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1981 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1982 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1983 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1984 | 0 | 0 | 10 | 88 | 0 | 0 | 0 | 0 |
| 1985 | 0 | 0 | 8 | 54 | 0 | 0 | 0 | 0 |
| 1986 | 0 | 0 | 12 | 68 | 0 | 0 | 0 | 0 |
| 1987 | 0 | 0 | 9 | 63 | 0 | 0 | 0 | 0 |
| 1988 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1989 | 0 | 0 | 4 | 17 | 0 | 0 | 0 | 0 |
| 1990 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1991 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1992 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1993 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1994 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1995 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1996 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1997 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1998 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 25 |
| 1999 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 95 |
| 2000 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 189 |
| 2001 | 0 | 0 | 4 | 28 | 0 | 0 | 10 | 101 |
| 2002 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2003 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2004 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 10 |
| 2005 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 4 |
| 2006 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 2007 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2008 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 6 |
| 2009 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2010 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 12. Summary of sampling effort generating age-frequency distributions used in the assessment model for the commercial fleets.

| | California | | Oregon | | Washington | |
|---|---|---|---|---|---|---|
| Year | N trips | N fish | N trips | N fish | N trips | N fish |
| 1978 | 2 | 6 | 0 | 0 | 0 | 0 |
| 1979 | 5 | 10 | 0 | 0 | 0 | 0 |
| 1980 | 5 | 8 | 0 | 0 | 0 | 0 |
| 1981 | 2 | 7 | 0 | 0 | 0 | 0 |
| 1982 | 1 | 1 | 0 | 0 | 0 | 0 |
| 1983 | 1 | 1 | 0 | 0 | 0 | 0 |
| 1984 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1985 | 4 | 10 | 0 | 0 | 0 | 0 |
| 1986 | 2 | 4 | 0 | 0 | 0 | 0 |
| 1987 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1988 | 1 | 5 | 0 | 0 | 0 | 0 |
| 1989 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1990 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1991 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1992 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1993 | 0 | 0 | 0 | 0 | 2 | 19 |
| 1994 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1995 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1996 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1997 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1998 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1999 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2000 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2001 | 1 | 14 | 1 | 9 | 9 | 144 |
| 2002 | 0 | 0 | 3 | 4 | 12 | 104 |
| 2003 | 0 | 0 | 1 | 29 | 5 | 18 |
| 2004 | 0 | 0 | 7 | 16 | 13 | 41 |
| 2005 | 2 | 7 | 14 | 29 | 11 | 19 |
| 2006 | 0 | 0 | 11 | 12 | 24 | 96 |
| 2007 | 0 | 0 | 4 | 4 | 9 | 28 |
| 2008 | 0 | 0 | 0 | 0 | 1 | 1 |
| 2009 | 0 | 0 | 0 | 0 | 2 | 13 |
| 2010 | 0 | 0 | 0 | 0 | 3 | 27 |

Table 13. Summary of fixed biological parameters estimated externally and used as input for this update (identical to values in 2009 assessment).

| Quantity | Value | Source |
|---|---|---|
| Female weight-length coefficient (*a*) | 0.00000977 | All available data pooled from fishery and survey sources. |
| Female weight-length exponent (*b*) | 3.17 | |
| Male weight-length coefficient (*a*) | 0.0000170 | |
| Male weight-length exponent (*b*) | 3.03 | |
| Female length at 50% maturity | 38.78 | Hannah et al., 2009 |
| Female maturity logistic slope | -0.437 | |
| Fecundity eggs/kilogram intercept | 137,900 | Dick, 2009 |
| Fecundity slope | 36,500 | |

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

| Parameter | Number estimated | Bounds (low, high) | Prior (Mean, SD) |
|---|---|---|---|
| Natural mortality (*M*, female) | 1 | (0.01,0.15) | Normal (0.0517,0.0226) |
| Natural mortality (*M*, male) | 1 | (0.01,0.15) | Normal (0.0517,0.0226) |
| Stock and recruitment | | | |
| Ln($R_0$) | 1 | (3,15) | Uniform |
| Ln(Mean recruitment offset Oregon, normalized) | 1 | (-5,5) | Uniform |
| Ln(Mean recruitment offset Washington, normalized) | 1 | (-5,5) | Uniform |
| Steepness (*h*) | 1 | (0.2,1.0) | Beta (0.73,0.189) |
| Catchability | | | |
| *Surveys:* | | | |
| Ln(*Q*) – IPHC Oregon | - | | Analytic solution |
| Ln(*Q*) – IPHC Washington | - | | Analytic solution |
| Ln(*Q*) – NWFSC survey (OR only) | - | | Analytic solution |
| Ln(*Q*) – Triennial survey (1980-1992, WA only) | 1 | (-10,0) | Uniform |
| Ln(*Q*) – Triennial survey offset (1995-2004) to early | 1 | (-4,4) | Uniform |
| *Fisheries:* | | | |
| Ln(*Q*) – Fisheries | - | | Analytic solution |
| Power coefficient for Ln(*Q*) relationship | 4 | (-6,6) | Uniform |
| Selectivity | | | |
| *Fisheries (logistic):* | | | |
| Length selectivity inflection | 7 | (10,70) | Uniform |
| 95% width of selectivity logistic | 7 | (0.001,50) | Uniform |
| *IPHC Surveys (logistic):* | | | |
| Length selectivity inflection | 2 | (10,70) | Uniform |
| 95% width of selectivity logistic | 2 | (0.001,50) | Uniform |
| *Trawl Surveys (double-normal):* | | | |
| Length at peak selectivity | 1 | (20,87) | Uniform |
| Width of top (as logistic) | - | | Fixed at -4 |
| Ascending width (as exp[width]) | 2 | (0,8) | Uniform |
| Descending width (as exp[width]) | 1 | (0,12) | Uniform |
| Initial selectivity (as logistic) | 1 | (-10,10) | |
| Final selectivity (as logistic) | - | | Fixed at 10, or not used |
| Individual growth | | | |
| *Females:* | | | |
| Length at age 1 | 1 | (10,35) | Uniform |
| Length at age 70 | 1 | (40,120) | Uniform |
| von Bertalanffy *K* | 1 | (0.01,0.2) | Uniform |
| CV of length at age 1 | 1 | (0.05,0.2) | Uniform |
| CV of length at age 70 | 1 | (0.05,0.2) | Uniform |
| *Males:* | | | |
| Length at age 1 offset to females | - | NA | Fixed at 0.0 |
| Length at age 70 | 1 | (40,120) | Uniform |
| von Bertalanffy *K* | 1 | (0.01,0.2) | Uniform |
| CV of length at age 1 | 1 | (0.05,0.2) | Uniform |
| CV of length at age 70 | 1 | (0.05,0.2) | Uniform |
| Total: 44 estimated parameters | | | |

Table 15. Input and effective sample sizes used for tuning the composition data in the base model.

| Type of data | Fleet | Input adjustment | Average input after adjustment | Average effective N |
|---|---|---|---|---|
| *Fishery independent:* | | | | |
| Length | IPHC (OR) | 0.73 | 89.6 | 94.0 |
| | IPHC (WA) | 0.62 | 49.0 | 53.7 |
| | Triennial (WA) | 2.08 | 19.7 | 20.3 |
| | NWFSC (OR) | 2.79 | 20.2 | 21.9 |
| Age | IPHC (OR) | 0.74 | 6.3 | 6.8 |
| | IPHC (WA) | 0.9 | 5.7 | 6.0 |
| *Fishery dependent:* | | | | |
| Length | CA Recreational | 1.28 | 48.0 | 48.0 |
| | CA Rec. Charter | 1.52 | 120.6 | 123.8 |
| | CA Commercial | 2.25 | 110.1 | 110.1 |
| | OR Recreational | 0.54 | 72.5 | 73.1 |
| | OR Rec. Charter | 1.44 | 120.6 | 33.3 |
| | OR Commercial | 2.16 | 48.4 | 50.1 |
| | WA Recreational | 5.49 | 63.6 | 64.5 |
| | WA Commercial | 1.57 | 48.9 | 51.7 |
| Age | CA Recreational | 1 | 1.0 | 1.0 |
| | CA Commercial | 1 | 1.2 | 1.5 |
| | OR Recreational | 1 | 1.9 | 2.4 |
| | OR Commercial | 1 | 1.5 | 2.4 |
| | WA Recreational | 1 | 3.2 | 4.0 |
| | WA Commercial | 1 | 2.7 | 3.3 |

[1]Length data with initial input sample sizes (before tuning) based on number of fish instead of number of samples.

Table 16. Estimated parameter values for the base-case model and alternate states of nature.

| Parameter | Low | Base case | High |
|---|---|---|---|
| Natural mortality (*M*, female) | 0.047 | 0.046 | 0.045 |
| Natural mortality (*M*, male) | 0.046 | 0.045 | 0.044 |
| Ln($R_0$) | 5.184 | 5.430 | 5.801 |
| Ln(Mean recruitment offset Oregon, normalized) | -0.005 | -0.006 | -0.005 |
| Ln(Mean recruitment offset Washington, normalized) | -1.312 | -1.336 | -1.356 |
| Steepness (*h*; not estimated in the low or high cases) | 0.383 | 0.441 | 0.508 |
| CA Rec. power coefficient for Ln(*Q*) relationship | -0.025 | 0.044 | 0.120 |
| CA Rec. Obs. power coefficient for Ln(*Q*) relationship | 0.398 | 0.528 | 0.677 |
| OR Rec. power coefficient for Ln(*Q*) relationship | -0.073 | -0.011 | 0.059 |
| WA Rec. power coefficient for Ln(*Q*) relationship | -0.330 | -0.317 | -0.301 |
| Ln(*Q*) – Triennial survey (1980-1992, WA only) | 0.709 | 0.452 | 0.071 |
| Ln(*Q*) – Triennial survey offset (1995-2004) to early | -0.585 | -0.608 | -0.636 |
| CA Rec. length selectivity inflection | 34.157 | 34.310 | 34.464 |
| CA Comm. length selectivity inflection | 36.277 | 36.364 | 36.444 |
| OR Rec. length selectivity inflection | 32.069 | 32.199 | 32.332 |
| OR Rec. Obs. length selectivity inflection | 23.308 | 23.534 | 23.751 |
| OR Comm. length selectivity inflection | 38.157 | 38.295 | 38.419 |
| WA Rec. length selectivity inflection | 38.157 | 38.295 | 38.419 |
| WA Comm. length selectivity inflection | 38.157 | 38.295 | 38.419 |
| CA Rec. 95% width of selectivity logistic | 14.106 | 14.009 | 13.898 |
| CA Comm. 95% width of selectivity logistic | 14.106 | 14.009 | 13.898 |
| OR Rec. 95% width of selectivity logistic | 8.124 | 8.145 | 8.158 |
| OR Rec. Obs. 95% width of selectivity logistic | 4.797 | 4.913 | 5.035 |
| OR Comm. 95% width of selectivity logistic | 11.714 | 11.670 | 11.594 |
| WA Rec. 95% width of selectivity logistic | 12.743 | 12.896 | 12.972 |
| WA Comm. 95% width of selectivity logistic | 12.743 | 12.896 | 12.972 |
| OR IPHC length selectivity inflection | 46.698 | 46.748 | 46.794 |
| WA IPHC length selectivity inflection | 58.003 | 58.169 | 58.295 |
| OR IPHC 95% width of selectivity logistic | 5.188 | 5.198 | 5.201 |
| WA IPHC 95% width of selectivity logistic | 9.621 | 9.654 | 9.681 |
| NWFSC Length at peak selectivity | 57.475 | 57.479 | 57.484 |
| NWFSC ascending width (as exp[width]) | 7.017 | 6.935 | 6.857 |
| Triennial ascending width (as exp[width]) | 6.621 | 6.627 | 6.634 |
| NWFSC descending width (as exp[width]) | 0.000 | 0.000 | 0.000 |
| Triennial initial selectivity (as logistic) | -3.079 | -3.177 | -3.278 |
| Female length at age 1 | 18.796 | 18.717 | 18.614 |
| Female length at age 70 | 62.300 | 62.265 | 62.233 |
| Female von Bertalanffy *K* | 0.047 | 0.047 | 0.048 |
| Female CV of length at age 1 | 0.131 | 0.130 | 0.130 |
| Female CV of length at age 70 | 0.072 | 0.072 | 0.072 |
| Male length at age 70 | 64.630 | 64.594 | 64.562 |
| Male von Bertalanffy *K* | 0.047 | 0.047 | 0.047 |
| Male CV of length at age 1 | 0.133 | 0.132 | 0.132 |
| Male CV of length at age 70 | 0.060 | 0.060 | 0.060 |

Table 17. Estimated parameter values for the 2009 and 2011 base-case model.

| Parameter | 2009 Base Case | 2011 Base Case |
|---|---|---|
| Natural mortality (M, female) | 0.047 | 0.046 |
| Natural mortality (M, male) | 0.047 | 0.045 |
| Ln(R0) | 5.425 | 5.430 |
| Ln(Mean recruitment offset Oregon, normalized) | -0.099 | -0.006 |
| Ln(Mean recruitment offset Washington, normalized) | -1.306 | -1.336 |
| Steepness (h; not estimated in the low or high cases) | 0.417 | 0.441 |
| CA Rec. power coefficient for Ln(Q) relationship | 0.056 | 0.044 |
| CA Rec. Obs. power coefficient for Ln(Q) relationship | 0.546 | 0.528 |
| OR Rec. power coefficient for Ln(Q) relationship | -0.078 | -0.011 |
| WA Rec. power coefficient for Ln(Q) relationship | -0.274 | -0.317 |
| Ln(Q) – Triennial survey (1980-1992, WA only) | 0.355 | 0.452 |
| Ln(Q) – Triennial survey offset (1995-2004) to early | -0.631 | -0.608 |
| CA Rec. length selectivity inflection | 33.837 | 34.310 |
| CA Comm. length selectivity inflection | 36.149 | 36.364 |
| OR Rec. length selectivity inflection | 32.036 | 32.199 |
| OR Rec. Obs. length selectivity inflection | 22.727 | 23.534 |
| OR Comm. length selectivity inflection | 38.864 | 38.295 |
| WA Rec. length selectivity inflection | 42.643 | 38.295 |
| WA Comm. length selectivity inflection | 43.863 | 38.295 |
| CA Rec. 95% width of selectivity logistic | 13.697 | 14.009 |
| CA Comm. 95% width of selectivity logistic | 11.939 | 14.009 |
| OR Rec. 95% width of selectivity logistic | 8.021 | 8.145 |
| OR Rec. Obs. 95% width of selectivity logistic | 4.113 | 4.913 |
| OR Comm. 95% width of selectivity logistic | 12.189 | 11.670 |
| WA Rec. 95% width of selectivity logistic | 12.015 | 12.896 |
| WA Comm. 95% width of selectivity logistic | 10.466 | 12.896 |
| OR IPHC length selectivity inflection | 47.002 | 46.748 |
| WA IPHC length selectivity inflection | 57.989 | 58.169 |
| OR IPHC 95% width of selectivity logistic | 5.318 | 5.198 |
| WA IPHC 95% width of selectivity logistic | 9.829 | 9.654 |
| NWFSC Length at peak selectivity | 52.193 | 57.479 |
| NWFSC ascending width (as exp[width]) | 6.346 | 6.935 |
| Triennial ascending width (as exp[width]) | 6.67 | 6.627 |
| NWFSC descending width (as exp[width]) | 3.169 | 0.000 |
| Triennial initial selectivity (as logistic) | -3.093 | -3.177 |
| Female length at age 1 | 18.393 | 18.717 |
| Female length at age 70 | 62.38 | 62.265 |
| Female von Bertalanffy K | 0.049 | 0.047 |
| Female CV of length at age 1 | 0.128 | 0.130 |
| Female CV of length at age 70 | 0.071 | 0.072 |
| Male length at age 70 | 64.738 | 64.594 |
| Male von Bertalanffy K | 0.048 | 0.047 |
| Male CV of length at age 1 | 0.13 | 0.132 |
| Male CV of length at age 70 | 0.061 | 0.060 |

Table 18. Yelloweye rockfish stock-recruitment, mortality and growth parameter estimates (or derived values) and standard errors from the base-case model.

| Parameter | Value | SD |
|---|---|---|
| $R_0$ – California (1000s Age-0) | 101.1 | NA |
| $R_0$ - Oregon (1000s Age-0) | 100.5 | NA |
| $R_0$ - Washington (1000s Age-0) | 26.6 | NA |
| Steepness ($h$) | 0.441 | 0.054 |
| *Females:* | | |
| Natural mortality ($M$) | 0.046 | 0.0015 |
| Length at age 1 (cm) | 18.717 | 0.6438 |
| Length at age 70 (cm) | 62.264 | 0.3767 |
| von Bertalanffy $K$ | 0.0473 | 0.0017 |
| CV of length at age 1 | 0.130 | 0.0117 |
| CV of length at age 70 | 0.0718 | 0.0043 |
| *Males:* | | |
| Natural mortality ($M$) | 0.045 | 0.001431 |
| Length at age 1 (cm) | | NA |
| Length at age 70 (cm) | 64.594 | 0.3097 |
| von Bertalanffy $K$ | 0.0472 | 0.0014 |
| CV of length at age 1 | 0.132 | 0.0103 |
| CV of length at age 70 | 0.060 | 0.0036 |

Table 19. Comparison of summary quantities among the base case and alternate states of nature.

| Model | Low | Base case | High |
|---|---|---|---|
| **Convergence** | | | |
| Maximum gradient component | 0.0000391 | 0.0000006 | 0.0000137 |
| **Negative log-likelihoods** | | | |
| Total | 6,699.05 | 6,695.62 | 6,693.50 |
| Indices | -27.3843 | -26.8025 | -26.1329 |
| Length-frequency data | 2,688.28 | 2,686.12 | 2,684.67 |
| Age-frequency data | 4,037.06 | 4,035.46 | 4,034.34 |
| Priors | 1.09 | 0.84 | 0.62 |
| **Select parameters** | | | |
| Equilibrium recruitment ($R_0$, 1000s age-0) | 178 | 228 | 331 |
| Steepness ($h$) | 0.383 | 0.441 | 0.508 |
| Male $M$ | 0.046 | 0.045 | 0.044 |
| **Management quantities** | | | |
| Equilibrium spawning output ($SB_0$, millions eggs) | 770 | 1028 | 1,545 |
| 2009 Spawning depletion | 18.9% | 21.3% | 24.0% |
| 2009 age-8+ biomass (mt) | 1,439 | 2,186 | 3,723 |
| 2008 $SPR$ | 73.80% | 81.0% | 87.9% |
| MSY (mt) | 27.4 | 58.9 | 110.8 |

Table 20. Comparison of summary quantities among the 2009 and 2011 base-case models.

| Model | 2009 Base Case | 2011 Base Case |
|---|---|---|
| **Convergence** | | |
| Maximum gradient component | 0.0000018 | 0.0000006 |
| **Negative log-likelihoods** | | |
| Total | 6,102.50 | 6,695.62 |
| Indices | -28.3 | -26.8 |
| Length-frequency data | 2,503.80 | 2,686.12 |
| Age-frequency data | 3,626.10 | 4,035.46 |
| Priors | 0.9 | 0.8 |
| **Select parameters** | | |
| Equilibrium recruitment (R0, 1000s age-0) | 227 | 228 |
| Steepness (h) | 0.417 | 0.441 |
| Male M | 0.047 | 0.045 |
| **Management quantities** | | |
| Equilibrium spawning output (SB0, millions eggs) | 994 | 855 |
| 2009 Spawning depletion | 20.3% | 20.2% |
| 2009 age-8+ biomass (mt) | 2,008 | 2,107 |
| 2008 SPR | 79.30% | 79.9% |
| MSY (mt) | 56.1 | 58 |

Table 21. Time-series of population estimates from the base-case model.

| Year | Age-8+ biomass (mt) | Spawning output (millions eggs) | Spawning depletion | Age-0 recruits (1000s) | Total catch (mt) | SPR | Relative exploitation rate |
|---|---|---|---|---|---|---|---|
| 1916 | 8883 | 1028 | 100.0% | 228 | 3.9 | 98.4% | 0.0% |
| 1917 | 8879 | 1027 | 100.0% | 228 | 5.4 | 97.8% | 0.1% |
| 1918 | 8874 | 1027 | 99.9% | 228 | 6.1 | 97.5% | 0.1% |
| 1919 | 8868 | 1026 | 99.8% | 228 | 4.1 | 98.3% | 0.0% |
| 1920 | 8864 | 1025 | 99.8% | 228 | 4.4 | 98.2% | 0.0% |
| 1921 | 8860 | 1025 | 99.7% | 228 | 4.4 | 98.2% | 0.1% |
| 1922 | 8856 | 1024 | 99.7% | 228 | 4.3 | 98.3% | 0.0% |
| 1923 | 8853 | 1024 | 99.6% | 228 | 4.5 | 98.2% | 0.1% |
| 1924 | 8849 | 1023 | 99.6% | 228 | 5.2 | 97.9% | 0.1% |
| 1925 | 8844 | 1023 | 99.5% | 228 | 7.4 | 97.1% | 0.1% |
| 1926 | 8838 | 1022 | 99.5% | 228 | 8.5 | 96.6% | 0.1% |
| 1927 | 8831 | 1021 | 99.4% | 228 | 9.6 | 96.2% | 0.1% |
| 1928 | 8822 | 1020 | 99.3% | 228 | 11.0 | 95.7% | 0.1% |
| 1929 | 8813 | 1019 | 99.1% | 228 | 14.9 | 94.2% | 0.2% |
| 1930 | 8800 | 1017 | 99.0% | 227 | 15.6 | 93.9% | 0.2% |
| 1931 | 8786 | 1016 | 98.8% | 227 | 13.6 | 94.6% | 0.2% |
| 1932 | 8775 | 1014 | 98.7% | 227 | 13.3 | 94.8% | 0.2% |
| 1933 | 8764 | 1013 | 98.6% | 227 | 11.1 | 95.6% | 0.1% |
| 1934 | 8755 | 1012 | 98.4% | 227 | 13.4 | 94.7% | 0.2% |
| 1935 | 8745 | 1010 | 98.3% | 227 | 16.0 | 93.8% | 0.2% |
| 1936 | 8732 | 1009 | 98.2% | 227 | 20.4 | 92.0% | 0.2% |
| 1937 | 8715 | 1007 | 98.0% | 227 | 20.3 | 92.1% | 0.2% |
| 1938 | 8699 | 1005 | 97.8% | 227 | 20.2 | 92.1% | 0.2% |
| 1939 | 8683 | 1003 | 97.6% | 226 | 16.1 | 93.6% | 0.2% |
| 1940 | 8671 | 1001 | 97.4% | 226 | 23.6 | 90.8% | 0.3% |
| 1941 | 8652 | 999 | 97.2% | 226 | 28.6 | 89.1% | 0.3% |
| 1942 | 8629 | 996 | 96.9% | 226 | 35.0 | 87.1% | 0.4% |
| 1943 | 8600 | 992 | 96.5% | 226 | 80.2 | 76.1% | 0.9% |
| 1944 | 8527 | 983 | 95.7% | 225 | 80.7 | 73.6% | 0.9% |
| 1945 | 8455 | 974 | 94.8% | 224 | 130.4 | 62.5% | 1.5% |
| 1946 | 8337 | 960 | 93.4% | 223 | 110.0 | 66.4% | 1.3% |
| 1947 | 8240 | 948 | 92.2% | 222 | 47.8 | 82.0% | 0.6% |
| 1948 | 8205 | 943 | 91.8% | 222 | 55.2 | 79.7% | 0.7% |
| 1949 | 8164 | 938 | 91.3% | 221 | 39.9 | 84.4% | 0.5% |
| 1950 | 8139 | 934 | 90.9% | 221 | 42.8 | 83.3% | 0.5% |
| 1951 | 8112 | 931 | 90.6% | 221 | 51.0 | 80.9% | 0.6% |
| 1952 | 8078 | 926 | 90.1% | 221 | 46.0 | 82.3% | 0.6% |
| 1953 | 8049 | 922 | 89.8% | 220 | 38.1 | 84.9% | 0.5% |
| 1954 | 8028 | 920 | 89.5% | 220 | 45.8 | 82.3% | 0.6% |
| 1955 | 8000 | 916 | 89.1% | 220 | 55.3 | 78.8% | 0.7% |
| 1956 | 7963 | 911 | 88.7% | 219 | 65.1 | 75.7% | 0.8% |

Table 21. continued. Time-series of population estimates from the base-case model.

| Year | Age-8+ biomass (mt) | Spawning output (millions eggs) | Spawning depletion | Age-0 recruits (1000s) | Total catch (mt) | SPR | Relative exploitation rate |
|---|---|---|---|---|---|---|---|
| 1957 | 7917 | 906 | 88.1% | 219 | 73.5 | 73.1% | 0.9% |
| 1958 | 7864 | 899 | 87.5% | 218 | 78.6 | 71.9% | 1.0% |
| 1959 | 7807 | 892 | 86.8% | 218 | 72.5 | 73.1% | 0.9% |
| 1960 | 7756 | 886 | 86.2% | 217 | 67.8 | 74.3% | 0.9% |
| 1961 | 7711 | 880 | 85.6% | 217 | 59.3 | 76.9% | 0.8% |
| 1962 | 7675 | 875 | 85.2% | 216 | 67.8 | 74.2% | 0.9% |
| 1963 | 7632 | 870 | 84.6% | 216 | 57.4 | 77.4% | 0.8% |
| 1964 | 7600 | 866 | 84.2% | 215 | 45.8 | 81.3% | 0.6% |
| 1965 | 7579 | 863 | 84.0% | 215 | 126.8 | 60.1% | 1.7% |
| 1966 | 7481 | 851 | 82.8% | 214 | 64.2 | 75.4% | 0.9% |
| 1967 | 7444 | 846 | 82.3% | 214 | 72.0 | 72.4% | 1.0% |
| 1968 | 7401 | 841 | 81.8% | 213 | 74.9 | 71.9% | 1.0% |
| 1969 | 7355 | 835 | 81.2% | 213 | 142.7 | 55.0% | 1.9% |
| 1970 | 7245 | 821 | 79.9% | 211 | 105.0 | 65.4% | 1.4% |
| 1971 | 7172 | 813 | 79.1% | 211 | 134.2 | 57.9% | 1.9% |
| 1972 | 7073 | 800 | 77.9% | 209 | 165.7 | 53.6% | 2.3% |
| 1973 | 6944 | 785 | 76.4% | 208 | 160.1 | 55.5% | 2.3% |
| 1974 | 6823 | 770 | 74.9% | 206 | 178.8 | 51.8% | 2.6% |
| 1975 | 6685 | 753 | 73.3% | 205 | 168.8 | 55.7% | 2.5% |
| 1976 | 6559 | 738 | 71.8% | 203 | 195.4 | 47.7% | 3.0% |
| 1977 | 6410 | 719 | 70.0% | 201 | 200.9 | 45.1% | 3.1% |
| 1978 | 6257 | 701 | 68.2% | 199 | 323.5 | 33.3% | 5.2% |
| 1979 | 5988 | 668 | 65.0% | 195 | 323.0 | 27.3% | 5.4% |
| 1980 | 5722 | 636 | 61.9% | 191 | 267.4 | 29.2% | 4.7% |
| 1981 | 5514 | 611 | 59.4% | 188 | 368.4 | 24.0% | 6.7% |
| 1982 | 5212 | 574 | 55.9% | 182 | 463.4 | 17.6% | 8.9% |
| 1983 | 4822 | 528 | 51.4% | 175 | 331.3 | 21.0% | 6.9% |
| 1984 | 4563 | 496 | 48.3% | 170 | 276.8 | 22.4% | 6.1% |
| 1985 | 4362 | 471 | 45.9% | 166 | 329.1 | 17.7% | 7.5% |
| 1986 | 4114 | 441 | 42.9% | 160 | 219.1 | 25.8% | 5.3% |
| 1987 | 3975 | 424 | 41.2% | 157 | 251.3 | 21.4% | 6.3% |
| 1988 | 3806 | 403 | 39.2% | 153 | 279.5 | 18.6% | 7.3% |
| 1989 | 3612 | 380 | 36.9% | 148 | 346.9 | 13.6% | 9.6% |
| 1990 | 3354 | 349 | 33.9% | 141 | 237.4 | 20.4% | 7.1% |
| 1991 | 3203 | 331 | 32.2% | 137 | 368.0 | 11.6% | 11.5% |
| 1992 | 2927 | 299 | 29.1% | 129 | 372.8 | 9.4% | 12.7% |
| 1993 | 2647 | 267 | 26.0% | 120 | 318.7 | 11.9% | 12.0% |
| 1994 | 2418 | 240 | 23.4% | 112 | 223.4 | 13.7% | 9.2% |
| 1995 | 2284 | 224 | 21.8% | 107 | 254.6 | 12.2% | 11.1% |
| 1996 | 2120 | 205 | 19.9% | 100 | 217.7 | 12.2% | 10.3% |
| 1997 | 1992 | 190 | 18.5% | 95 | 244.1 | 9.7% | 12.3% |

Table 21. continued. Time-series of population estimates from the base-case model.

| Year | Age-8+ biomass (mt) | Spawning output (millions eggs) | Spawning depletion | Age-0 recruits (1000s) | Total catch (mt) | SPR | Relative exploitation rate |
|---|---|---|---|---|---|---|---|
| 1998 | 1837 | 173 | 16.9% | 89 | 107.0 | 23.5% | 5.8% |
| 1999 | 1812 | 170 | 16.5% | 88 | 155.8 | 17.3% | 8.6% |
| 2000 | 1739 | 161 | 15.7% | 84 | 40.9 | 53.7% | 2.3% |
| 2001 | 1772 | 164 | 16.0% | 86 | 56.1 | 53.9% | 3.2% |
| 2002 | 1789 | 166 | 16.1% | 86 | 13.3 | 78.7% | 0.7% |
| 2003 | 1844 | 172 | 16.7% | 89 | 12.0 | 79.4% | 0.6% |
| 2004 | 1898 | 179 | 17.4% | 91 | 13.9 | 78.6% | 0.7% |
| 2005 | 1948 | 185 | 18.0% | 93 | 16.3 | 76.5% | 0.8% |
| 2006 | 1991 | 191 | 18.6% | 95 | 13.8 | 77.5% | 0.7% |
| 2007 | 2035 | 197 | 19.2% | 98 | 23.0 | 67.5% | 1.1% |
| 2008 | 2067 | 202 | 19.7% | 99 | 13.7 | 79.9% | 0.7% |
| 2009 | 2107 | 208 | 20.2% | 101 | 10.9 | 83.2% | 0.5% |
| 2010 | 2148 | 214 | 20.8% | 103 | 13.6 | 81.0% | 0.6% |
| 2011 | 2186 | 219 | 21.3% | 105 | NA | NA | NA |

Table 22. Time-series of population estimates from the low state of nature.

| Year | Age-8+ biomass (mt) | Spawning output (millions eggs) | *Spawning depletion* | Age-0 recruits (1000s) | Total catch (mt) | SPR | Relative exploitation rate |
|---|---|---|---|---|---|---|---|
| 1916 | 6,700 | 770 | *100.0%* | 178 | 2.9 | 98.5% | 0.0% |
| 1917 | 6,697 | 770 | *100.0%* | 178 | 4.1 | 97.9% | 0.1% |
| 1918 | 6,693 | 769 | *99.9%* | 178 | 4.6 | 97.6% | 0.1% |
| 1919 | 6,689 | 769 | *99.8%* | 178 | 3.1 | 98.4% | 0.0% |
| 1920 | 6,686 | 768 | *99.8%* | 178 | 3.3 | 98.2% | 0.0% |
| 1921 | 6,683 | 768 | *99.7%* | 178 | 3.3 | 98.2% | 0.0% |
| 1922 | 6,680 | 767 | *99.7%* | 178 | 3.2 | 98.3% | 0.0% |
| 1923 | 6,677 | 767 | *99.6%* | 178 | 3.4 | 98.2% | 0.1% |
| 1924 | 6,674 | 767 | *99.6%* | 178 | 3.9 | 97.9% | 0.1% |
| 1925 | 6,671 | 766 | *99.5%* | 178 | 5.5 | 97.1% | 0.1% |
| 1926 | 6,666 | 766 | *99.5%* | 178 | 6.3 | 96.7% | 0.1% |
| 1927 | 6,661 | 765 | *99.4%* | 178 | 7.2 | 96.3% | 0.1% |
| 1928 | 6,654 | 764 | *99.3%* | 178 | 8.2 | 95.8% | 0.1% |
| 1929 | 6,647 | 763 | *99.2%* | 178 | 11.1 | 94.3% | 0.2% |
| 1930 | 6,637 | 762 | *99.0%* | 178 | 11.7 | 94.0% | 0.2% |
| 1931 | 6,627 | 761 | *98.8%* | 178 | 10.2 | 94.7% | 0.2% |
| 1932 | 6,619 | 760 | *98.7%* | 178 | 10.0 | 94.9% | 0.2% |
| 1933 | 6,611 | 759 | *98.6%* | 177 | 8.3 | 95.6% | 0.1% |
| 1934 | 6,604 | 758 | *98.5%* | 177 | 10.1 | 94.8% | 0.2% |
| 1935 | 6,596 | 757 | *98.3%* | 177 | 12.0 | 93.9% | 0.2% |
| 1936 | 6,587 | 756 | *98.2%* | 177 | 15.3 | 92.2% | 0.2% |
| 1937 | 6,574 | 754 | *98.0%* | 177 | 15.2 | 92.2% | 0.2% |
| 1938 | 6,562 | 753 | *97.8%* | 177 | 15.1 | 92.2% | 0.2% |
| 1939 | 6,549 | 751 | *97.6%* | 177 | 12.0 | 93.8% | 0.2% |
| 1940 | 6,541 | 750 | *97.4%* | 177 | 17.7 | 91.0% | 0.3% |
| 1941 | 6,526 | 748 | *97.2%* | 176 | 21.4 | 89.3% | 0.3% |
| 1942 | 6,509 | 746 | *96.9%* | 176 | 26.3 | 87.3% | 0.4% |
| 1943 | 6,487 | 743 | *96.6%* | 176 | 60.2 | 76.5% | 0.9% |
| 1944 | 6,432 | 737 | *95.7%* | 175 | 60.5 | 74.0% | 0.9% |
| 1945 | 6,379 | 730 | *94.8%* | 175 | 97.8 | 63.0% | 1.5% |
| 1946 | 6,289 | 719 | *93.4%* | 174 | 82.5 | 66.9% | 1.3% |
| 1947 | 6,217 | 710 | *92.3%* | 173 | 35.9 | 82.3% | 0.6% |
| 1948 | 6,191 | 707 | *91.8%* | 172 | 41.4 | 80.1% | 0.7% |
| 1949 | 6,160 | 703 | *91.3%* | 172 | 29.9 | 84.6% | 0.5% |
| 1950 | 6,141 | 700 | *91.0%* | 172 | 32.1 | 83.6% | 0.5% |
| 1951 | 6,120 | 698 | *90.6%* | 171 | 38.3 | 81.3% | 0.6% |
| 1952 | 6,094 | 694 | *90.2%* | 171 | 34.5 | 82.6% | 0.6% |
| 1953 | 6,072 | 691 | *89.8%* | 171 | 28.5 | 85.2% | 0.5% |
| 1954 | 6,056 | 689 | *89.5%* | 170 | 34.3 | 82.6% | 0.6% |
| 1955 | 6,035 | 687 | *89.2%* | 170 | 41.5 | 79.1% | 0.7% |
| 1956 | 6,006 | 683 | *88.7%* | 170 | 48.8 | 76.1% | 0.8% |

Table 22. continued. Time-series of population estimates from the low state of nature.

| Year | Age-8+ biomass (mt) | Spawning output (millions eggs) | Spawning depletion | Age-0 recruits (1000s) | Total catch (mt) | SPR | Relative exploitation rate |
|---|---|---|---|---|---|---|---|
| 1957 | 5,971 | 679 | 88.2% | 169 | 55.2 | 73.6% | 0.9% |
| 1958 | 5,931 | 674 | 87.5% | 169 | 59.0 | 72.3% | 1.0% |
| 1959 | 5,887 | 669 | 86.8% | 168 | 54.4 | 73.5% | 0.9% |
| 1960 | 5,849 | 664 | 86.2% | 168 | 50.8 | 74.7% | 0.9% |
| 1961 | 5,814 | 660 | 85.7% | 167 | 44.4 | 77.3% | 0.8% |
| 1962 | 5,786 | 656 | 85.2% | 167 | 50.8 | 74.6% | 0.9% |
| 1963 | 5,753 | 652 | 84.7% | 166 | 43.1 | 77.8% | 0.7% |
| 1964 | 5,728 | 649 | 84.3% | 166 | 34.3 | 81.6% | 0.6% |
| 1965 | 5,711 | 647 | 84.0% | 166 | 95.1 | 60.6% | 1.7% |
| 1966 | 5,636 | 637 | 82.8% | 165 | 48.1 | 75.8% | 0.9% |
| 1967 | 5,608 | 634 | 82.3% | 164 | 54.0 | 72.8% | 1.0% |
| 1968 | 5,574 | 630 | 81.8% | 164 | 56.2 | 72.3% | 1.0% |
| 1969 | 5,538 | 625 | 81.2% | 163 | 107.0 | 55.5% | 1.9% |
| 1970 | 5,454 | 615 | 79.9% | 162 | 78.8 | 65.9% | 1.4% |
| 1971 | 5,399 | 608 | 79.0% | 161 | 100.6 | 58.4% | 1.9% |
| 1972 | 5,323 | 599 | 77.8% | 160 | 124.3 | 54.0% | 2.3% |
| 1973 | 5,225 | 587 | 76.3% | 159 | 120.1 | 55.9% | 2.3% |
| 1974 | 5,132 | 576 | 74.8% | 157 | 134.1 | 52.2% | 2.6% |
| 1975 | 5,028 | 564 | 73.2% | 156 | 126.6 | 56.1% | 2.5% |
| 1976 | 4,932 | 552 | 71.7% | 154 | 146.5 | 48.1% | 3.0% |
| 1977 | 4,818 | 538 | 69.9% | 152 | 150.7 | 45.5% | 3.1% |
| 1978 | 4,702 | 524 | 68.1% | 150 | 242.6 | 33.6% | 5.2% |
| 1979 | 4,498 | 500 | 64.9% | 147 | 242.3 | 27.7% | 5.4% |
| 1980 | 4,298 | 476 | 61.8% | 143 | 200.6 | 29.6% | 4.7% |
| 1981 | 4,140 | 457 | 59.3% | 140 | 276.3 | 24.4% | 6.7% |
| 1982 | 3,911 | 429 | 55.8% | 135 | 347.5 | 18.0% | 8.9% |
| 1983 | 3,617 | 394 | 51.2% | 129 | 248.5 | 21.4% | 6.9% |
| 1984 | 3,421 | 371 | 48.1% | 124 | 207.6 | 22.7% | 6.1% |
| 1985 | 3,268 | 352 | 45.7% | 121 | 246.8 | 18.0% | 7.6% |
| 1986 | 3,080 | 329 | 42.8% | 116 | 164.3 | 26.1% | 5.3% |
| 1987 | 2,973 | 316 | 41.1% | 113 | 188.4 | 21.7% | 6.3% |
| 1988 | 2,844 | 300 | 39.0% | 110 | 209.6 | 18.8% | 7.4% |
| 1989 | 2,695 | 283 | 36.7% | 105 | 260.2 | 13.7% | 9.7% |
| 1990 | 2,498 | 259 | 33.7% | 100 | 178.0 | 20.5% | 7.1% |
| 1991 | 2,381 | 246 | 31.9% | 96 | 276.0 | 11.7% | 11.6% |
| 1992 | 2,170 | 222 | 28.8% | 89 | 279.6 | 9.4% | 12.9% |
| 1993 | 1,955 | 197 | 25.6% | 82 | 239.0 | 11.8% | 12.2% |
| 1994 | 1,780 | 177 | 23.0% | 76 | 167.6 | 13.7% | 9.4% |
| 1995 | 1,674 | 165 | 21.4% | 72 | 191.0 | 12.1% | 11.4% |
| 1996 | 1,546 | 150 | 19.5% | 67 | 163.2 | 12.0% | 10.6% |
| 1997 | 1,445 | 139 | 18.0% | 63 | 183.1 | 9.5% | 12.7% |

Table 22. continued. Time-series of population estimates from the low state of nature.

| Year | Age-8+ biomass (mt) | Spawning output (millions eggs) | Spawning depletion | Age-0 recruits (1000s) | Total catch (mt) | SPR | Relative exploitation rate |
|---|---|---|---|---|---|---|---|
| 1998 | 1,323 | 125 | 16.3% | 58 | 80.2 | 22.7% | 6.1% |
| 1999 | 1,298 | 122 | 15.9% | 57 | 116.9 | 16.5% | 9.0% |
| 2000 | 1,237 | 115 | 15.0% | 54 | 40.9 | 44.2% | 3.3% |
| 2001 | 1,246 | 116 | 15.1% | 55 | 56.1 | 44.7% | 4.5% |
| 2002 | 1,239 | 115 | 15.0% | 54 | 13.3 | 72.0% | 1.1% |
| 2003 | 1,270 | 119 | 15.5% | 56 | 12.0 | 72.6% | 0.9% |
| 2004 | 1,301 | 123 | 16.0% | 57 | 13.9 | 71.5% | 1.1% |
| 2005 | 1,328 | 127 | 16.4% | 59 | 16.3 | 69.0% | 1.2% |
| 2006 | 1,349 | 130 | 16.9% | 60 | 13.8 | 69.8% | 1.0% |
| 2007 | 1,372 | 133 | 17.3% | 61 | 23.0 | 58.3% | 1.7% |
| 2008 | 1,383 | 136 | 17.7% | 62 | 13.7 | 72.7% | 1.0% |
| 2009 | 1,402 | 139 | 18.1% | 63 | 10.9 | 76.6% | 0.8% |
| 2010 | 1,422 | 142 | 18.5% | 64 | 13.6 | 73.8% | 0.9% |
| 2011 | 1,439 | 145 | 18.9% | 65 | NA | NA | NA |

Table 23. Time-series of population estimates from the high state of nature.

| Year | Age-8+ biomass (mt) | Spawning output (millions eggs) | Spawning depletion | Age-0 recruits (1000s) | Total catch (mt) | SPR | Relative exploitation rate |
|---|---|---|---|---|---|---|---|
| 1916 | 13,274 | 1,545 | 100.0% | 331 | 5.9 | 98.4% | 0.0% |
| 1917 | 13,268 | 1,544 | 100.0% | 331 | 8.1 | 97.8% | 0.1% |
| 1918 | 13,260 | 1,543 | 99.9% | 331 | 9.2 | 97.5% | 0.1% |
| 1919 | 13,252 | 1,542 | 99.8% | 331 | 6.2 | 98.3% | 0.0% |
| 1920 | 13,246 | 1,542 | 99.8% | 331 | 6.6 | 98.2% | 0.1% |
| 1921 | 13,240 | 1,541 | 99.7% | 331 | 6.7 | 98.2% | 0.1% |
| 1922 | 13,234 | 1,540 | 99.7% | 330 | 6.4 | 98.2% | 0.0% |
| 1923 | 13,229 | 1,539 | 99.6% | 330 | 6.8 | 98.1% | 0.1% |
| 1924 | 13,223 | 1,539 | 99.6% | 330 | 7.8 | 97.9% | 0.1% |
| 1925 | 13,216 | 1,538 | 99.5% | 330 | 11.0 | 97.0% | 0.1% |
| 1926 | 13,207 | 1,537 | 99.5% | 330 | 12.7 | 96.6% | 0.1% |
| 1927 | 13,196 | 1,535 | 99.4% | 330 | 14.4 | 96.1% | 0.1% |
| 1928 | 13,183 | 1,534 | 99.3% | 330 | 16.5 | 95.6% | 0.1% |
| 1929 | 13,169 | 1,532 | 99.1% | 330 | 22.3 | 94.1% | 0.2% |
| 1930 | 13,149 | 1,529 | 99.0% | 330 | 23.4 | 93.8% | 0.2% |
| 1931 | 13,129 | 1,527 | 98.8% | 330 | 20.4 | 94.5% | 0.2% |
| 1932 | 13,112 | 1,525 | 98.7% | 330 | 19.9 | 94.7% | 0.2% |
| 1933 | 13,096 | 1,523 | 98.5% | 330 | 16.7 | 95.5% | 0.1% |
| 1934 | 13,083 | 1,521 | 98.4% | 329 | 20.1 | 94.6% | 0.2% |
| 1935 | 13,067 | 1,519 | 98.3% | 329 | 23.9 | 93.7% | 0.2% |
| 1936 | 13,048 | 1,516 | 98.1% | 329 | 30.6 | 91.9% | 0.2% |
| 1937 | 13,023 | 1,513 | 97.9% | 329 | 30.4 | 91.9% | 0.2% |
| 1938 | 12,998 | 1,510 | 97.7% | 329 | 30.2 | 92.0% | 0.2% |
| 1939 | 12,974 | 1,507 | 97.5% | 329 | 24.1 | 93.5% | 0.2% |
| 1940 | 12,957 | 1,505 | 97.4% | 329 | 35.4 | 90.7% | 0.3% |
| 1941 | 12,929 | 1,501 | 97.2% | 328 | 42.9 | 88.9% | 0.3% |
| 1942 | 12,894 | 1,497 | 96.9% | 328 | 52.5 | 86.9% | 0.4% |
| 1943 | 12,850 | 1,491 | 96.5% | 328 | 120.4 | 75.8% | 0.9% |
| 1944 | 12,742 | 1,478 | 95.7% | 327 | 121.0 | 73.3% | 0.9% |
| 1945 | 12,634 | 1,464 | 94.8% | 326 | 195.7 | 62.0% | 1.5% |
| 1946 | 12,456 | 1,443 | 93.4% | 325 | 165.0 | 66.0% | 1.3% |
| 1947 | 12,311 | 1,424 | 92.2% | 324 | 71.7 | 81.8% | 0.6% |
| 1948 | 12,259 | 1,418 | 91.7% | 324 | 82.7 | 79.4% | 0.7% |
| 1949 | 12,198 | 1,409 | 91.2% | 323 | 59.9 | 84.1% | 0.5% |
| 1950 | 12,161 | 1,404 | 90.9% | 323 | 64.2 | 83.1% | 0.5% |
| 1951 | 12,120 | 1,399 | 90.5% | 323 | 76.5 | 80.7% | 0.6% |
| 1952 | 12,069 | 1,392 | 90.1% | 322 | 69.0 | 82.1% | 0.6% |
| 1953 | 12,026 | 1,386 | 89.7% | 322 | 57.1 | 84.7% | 0.5% |
| 1954 | 11,996 | 1,382 | 89.5% | 322 | 68.6 | 82.0% | 0.6% |
| 1955 | 11,954 | 1,377 | 89.1% | 321 | 82.9 | 78.5% | 0.7% |
| 1956 | 11,900 | 1,370 | 88.6% | 321 | 97.7 | 75.4% | 0.8% |

Table 23. continued. Time-series of population estimates from the high state of nature.

| Year | Age-8+ biomass (mt) | Spawning output (millions eggs) | Spawning depletion | Age-0 recruits (1000s) | Total catch (mt) | SPR | Relative exploitation rate |
|---|---|---|---|---|---|---|---|
| 1957 | 11,832 | 1,361 | 88.1% | 320 | 110.3 | 72.8% | 0.9% |
| 1958 | 11,754 | 1,351 | 87.5% | 320 | 117.9 | 71.5% | 1.0% |
| 1959 | 11,669 | 1,341 | 86.8% | 319 | 108.8 | 72.8% | 0.9% |
| 1960 | 11,595 | 1,331 | 86.2% | 318 | 101.6 | 74.0% | 0.9% |
| 1961 | 11,529 | 1,323 | 85.6% | 318 | 88.9 | 76.7% | 0.8% |
| 1962 | 11,477 | 1,316 | 85.2% | 317 | 101.7 | 73.9% | 0.9% |
| 1963 | 11,414 | 1,308 | 84.6% | 317 | 86.2 | 77.1% | 0.8% |
| 1964 | 11,367 | 1,301 | 84.2% | 316 | 68.7 | 81.1% | 0.6% |
| 1965 | 11,338 | 1,297 | 84.0% | 316 | 190.1 | 59.7% | 1.7% |
| 1966 | 11,192 | 1,279 | 82.8% | 315 | 96.3 | 75.2% | 0.9% |
| 1967 | 11,139 | 1,272 | 82.4% | 314 | 108.0 | 72.1% | 1.0% |
| 1968 | 11,076 | 1,264 | 81.8% | 314 | 112.3 | 71.6% | 1.0% |
| 1969 | 11,010 | 1,256 | 81.3% | 313 | 214.1 | 54.6% | 1.9% |
| 1970 | 10,846 | 1,236 | 80.0% | 312 | 157.5 | 65.1% | 1.5% |
| 1971 | 10,740 | 1,223 | 79.1% | 311 | 201.2 | 57.5% | 1.9% |
| 1972 | 10,593 | 1,204 | 78.0% | 310 | 248.6 | 53.2% | 2.3% |
| 1973 | 10,403 | 1,181 | 76.4% | 308 | 240.2 | 55.2% | 2.3% |
| 1974 | 10,224 | 1,159 | 75.0% | 306 | 268.2 | 51.5% | 2.6% |
| 1975 | 10,020 | 1,134 | 73.4% | 304 | 253.1 | 55.5% | 2.5% |
| 1976 | 9,834 | 1,111 | 71.9% | 302 | 293.1 | 47.4% | 3.0% |
| 1977 | 9,612 | 1,084 | 70.1% | 300 | 301.4 | 44.9% | 3.1% |
| 1978 | 9,386 | 1,056 | 68.3% | 297 | 485.2 | 33.0% | 5.2% |
| 1979 | 8,985 | 1,007 | 65.2% | 293 | 484.5 | 27.1% | 5.4% |
| 1980 | 8,590 | 959 | 62.1% | 288 | 401.2 | 29.0% | 4.7% |
| 1981 | 8,281 | 921 | 59.6% | 284 | 552.6 | 23.7% | 6.7% |
| 1982 | 7,831 | 866 | 56.1% | 278 | 695.1 | 17.4% | 8.9% |
| 1983 | 7,249 | 796 | 51.6% | 269 | 497.0 | 20.8% | 6.9% |
| 1984 | 6,865 | 749 | 48.5% | 263 | 415.2 | 22.2% | 6.0% |
| 1985 | 6,567 | 712 | 46.1% | 258 | 493.6 | 17.6% | 7.5% |
| 1986 | 6,199 | 667 | 43.2% | 251 | 328.6 | 25.6% | 5.3% |
| 1987 | 5,995 | 641 | 41.5% | 247 | 376.9 | 21.3% | 6.3% |
| 1988 | 5,747 | 610 | 39.5% | 241 | 419.3 | 18.5% | 7.3% |
| 1989 | 5,462 | 575 | 37.2% | 235 | 520.4 | 13.6% | 9.5% |
| 1990 | 5,081 | 529 | 34.2% | 226 | 356.1 | 20.4% | 7.0% |
| 1991 | 4,862 | 502 | 32.5% | 220 | 552.0 | 11.6% | 11.4% |
| 1992 | 4,456 | 455 | 29.5% | 209 | 559.3 | 9.4% | 12.6% |
| 1993 | 4,044 | 407 | 26.4% | 197 | 478.1 | 12.0% | 11.8% |
| 1994 | 3,711 | 368 | 23.8% | 186 | 335.2 | 13.9% | 9.0% |
| 1995 | 3,519 | 344 | 22.3% | 179 | 381.9 | 12.5% | 10.9% |
| 1996 | 3,283 | 316 | 20.5% | 170 | 326.5 | 12.4% | 9.9% |
| 1997 | 3,103 | 295 | 19.1% | 163 | 366.2 | 10.0% | 11.8% |

Table 23. continued. Time-series of population estimates from the high state of nature.

| Year | Age-8+ biomass (mt) | Spawning output (millions eggs) | Spawning depletion | Age-0 recruits (1000s) | Total catch (mt) | SPR | Relative exploitation rate |
|---|---|---|---|---|---|---|---|
| 1998 | 2,882 | 270 | 17.5% | 154 | 160.4 | 24.3% | 5.6% |
| 1999 | 2,856 | 266 | 17.2% | 153 | 233.7 | 18.2% | 8.2% |
| 2000 | 2,760 | 254 | 16.4% | 148 | 40.9 | 65.4% | 1.5% |
| 2001 | 2,843 | 262 | 17.0% | 151 | 56.1 | 65.2% | 2.0% |
| 2002 | 2,910 | 269 | 17.4% | 154 | 13.3 | 85.6% | 0.5% |
| 2003 | 3,015 | 280 | 18.1% | 158 | 12.0 | 86.3% | 0.4% |
| 2004 | 3,117 | 292 | 18.9% | 162 | 13.9 | 85.7% | 0.4% |
| 2005 | 3,215 | 303 | 19.6% | 166 | 16.3 | 84.2% | 0.5% |
| 2006 | 3,304 | 315 | 20.4% | 170 | 13.8 | 85.2% | 0.4% |
| 2007 | 3,394 | 326 | 21.1% | 174 | 23.0 | 77.7% | 0.7% |
| 2008 | 3,471 | 337 | 21.8% | 177 | 13.7 | 87.0% | 0.4% |
| 2009 | 3,555 | 348 | 22.5% | 181 | 10.9 | 89.3% | 0.3% |
| 2010 | 3,640 | 360 | 23.3% | 184 | 13.6 | 87.9% | 0.4% |
| 2011 | 3,723 | 371 | 24.0% | 187 | NA | NA | NA |

Table 24. Projection of yelloweye rockfish under ACL values calculated in the 2009 rebuilding plan based on the SPR rate (71.9%) used in the rebuilding analysis. Catch allocation used for the forecast reflects the average distribution of catches in 2007-2009 among fleets.

| Year | ACL (mt) [1] | Coast-wide Age 8+ biomass (mt) | Coast-wide Depletion | Spawning output (million eggs) Coast-wide | California | Oregon | Washington |
|---|---|---|---|---|---|---|---|
| 2011 | 17.0 | 2,193 | 21.3% | 228.9 | 78.5 | 108.3 | 32.5 |
| 2012 | 17.0 | 2,242 | 21.8% | 233.0 | 81.1 | 110.3 | 32.8 |
| 2013 | 21.0 | 2,254 | 22.3% | 228.9 | 83.5 | 112.3 | 33.1 |
| 2014 | 21.3 | 2,283 | 22.7% | 233.0 | 85.8 | 114.0 | 33.3 |
| 2015 | 21.6 | 2,312 | 23.1% | 236.9 | 87.9 | 115.6 | 33.4 |
| 2016 | 21.9 | 2,340 | 23.4% | 240.6 | 89.9 | 117.2 | 33.5 |
| 2017 | 22.1 | 2,368 | 23.8% | 244.2 | 91.9 | 118.7 | 33.6 |
| 2018 | 22.4 | 2,396 | 24.1% | 247.7 | 93.9 | 120.1 | 33.6 |
| 2019 | 22.6 | 2,424 | 24.4% | 251.0 | 95.8 | 121.6 | 33.7 |
| 2020 | 22.8 | 2,452 | 24.7% | 254.2 | 97.6 | 122.9 | 33.7 |
| 2021 | 23.0 | 2,479 | 25.0% | 257.4 | 99.4 | 124.3 | 33.7 |
| 2022 | 23.3 | 2,507 | 25.4% | 260.6 | 101.2 | 125.6 | 33.8 |

[1]ACL values were called OY prior to 2010.

Table 25. Decision table of 12-year projections for alternate states of nature (columns) and management options (rows) beginning in 2011. Relative probabilities are based on the joint distribution of alternate historical catch levels and steepness values.

| | | | **State of nature** | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 75% of catch < 2000 and steepness = 0.383 | | <u>Base case</u><br>100% of catch < 2000 and steepness = 0.441 | | 150% of catch < 2000 and steepness = 0.508 | |
| Relative probability | | | 0.0625 | | 0.25 | | 0.0625 | |
| **Management decision** | Year | Catch (mt) | Depletion | Spawning output (millions eggs) | Depletion | Spawning output (millions eggs) | Depletion | Spawning output (millions eggs) |
| Forecast catch calculated from rebuilding SPR (71.9%) applied to low alternative model. | 2013 | 14.4 | 19.5% | 150 | 22.2% | 229 | 25.3% | 391 |
| | 2014 | 14.7 | 19.8% | 152 | 22.7% | 234 | 26.0% | 401 |
| | 2015 | 14.9 | 20.0% | 154 | 23.2% | 237 | 26.6% | 411 |
| | 2016 | 15.0 | 20.3% | 156 | 23.6% | 242 | 27.2% | 421 |
| | 2017 | 15.1 | 20.5% | 158 | 24.0% | 247 | 27.8% | 430 |
| | 2018 | 15.2 | 20.8% | 160 | 24.5% | 251 | 28.4% | 440 |
| | 2019 | 15.2 | 21.0% | 167 | 24.9% | 255 | 29.0% | 449 |
| | 2020 | 15.3 | 21.2% | 163 | 25.2% | 259 | 29.7% | 458 |
| | 2021 | 15.4 | 21.4% | 165 | 25.6% | 263 | 30.2% | 467 |
| | 2022 | 15.6 | 21.6% | 166 | 26.0% | 267 | 30.8% | 476 |
| Forecast catch calculated from rebuilding SPR (71.9%) applied to base-case model. | 2013 | 21.8 | 19.5% | 150 | 22.3% | 229 | 25.3% | 391 |
| | 2014 | 22.1 | 19.7% | 151 | 22.7% | 233 | 25.9% | 400 |
| | 2015 | 22.4 | 19.8% | 153 | 23.0% | 237 | 26.5% | 409 |
| | 2016 | 22.8 | 20.0% | 154 | 23.4% | 240 | 27.1% | 418 |
| | 2017 | 23.0 | 20.1% | 155 | 23.7% | 244 | 27.6% | 427 |
| | 2018 | 23.3 | 20.2% | 156 | 24.1% | 247 | 28.2% | 436 |
| | 2019 | 23.6 | 20.4% | 158 | 24.4% | 250 | 28.7% | 444 |
| | 2020 | 23.9 | 20.5% | 157 | 24.7% | 254 | 29.3% | 452 |
| | 2021 | 24.1 | 20.5% | 158 | 24.0% | 257 | 29.8% | 460 |
| | 2022 | 24.4 | 20.6% | 159 | 25.3% | 260 | 30.3% | 469 |
| Forecast catch calculated from rebuilding SPR (71.9%) applied to high alternative model. | 2013 | 37.4 | 19.5% | 150 | 22.3% | 229 | 25.3% | 391 |
| | 2014 | 37.8 | 19.4% | 150 | 22.5% | 231 | 25.8% | 399 |
| | 2015 | 38.3 | 19.4% | 149 | 22.7% | 233 | 26.3% | 406 |
| | 2016 | 38.9 | 19.3% | 149 | 22.9% | 235 | 26.8% | 413 |
| | 2017 | 39.5 | 19.3% | 148 | 23.0% | 237 | 27.2% | 420 |
| | 2018 | 40.1 | 19.1% | 147 | 23.2% | 239 | 27.6% | 427 |
| | 2019 | 40.6 | 19.0% | 146 | 23.3% | 240 | 28.1% | 433 |
| | 2020 | 41.2 | 18.9% | 145 | 23.5% | 241 | 28.4% | 440 |
| | 2021 | 41.7 | 18.7% | 144 | 23.6% | 242 | 28.9% | 446 |
| | 2022 | 42.2 | 18.5% | 143 | 23.7% | 244 | 29.3% | 453 |

## 11. Figures

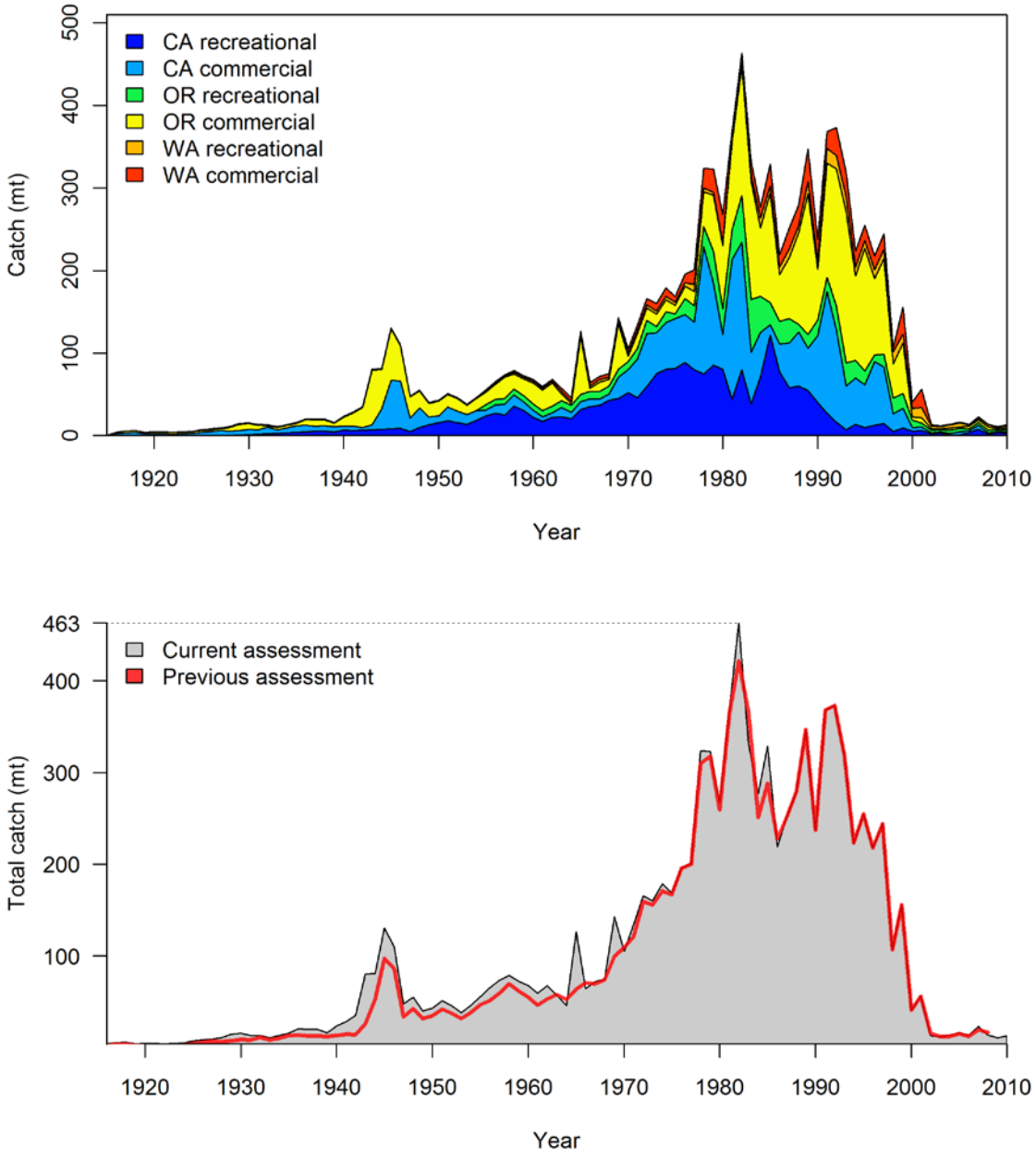



Figure 1. Yelloweye rockfish estimated catch history, 1916-2010 by sector (upper plot) and comparison with previous assessment showing the effect of the Oregon historical catch reconstruction for the years 1916-1986.

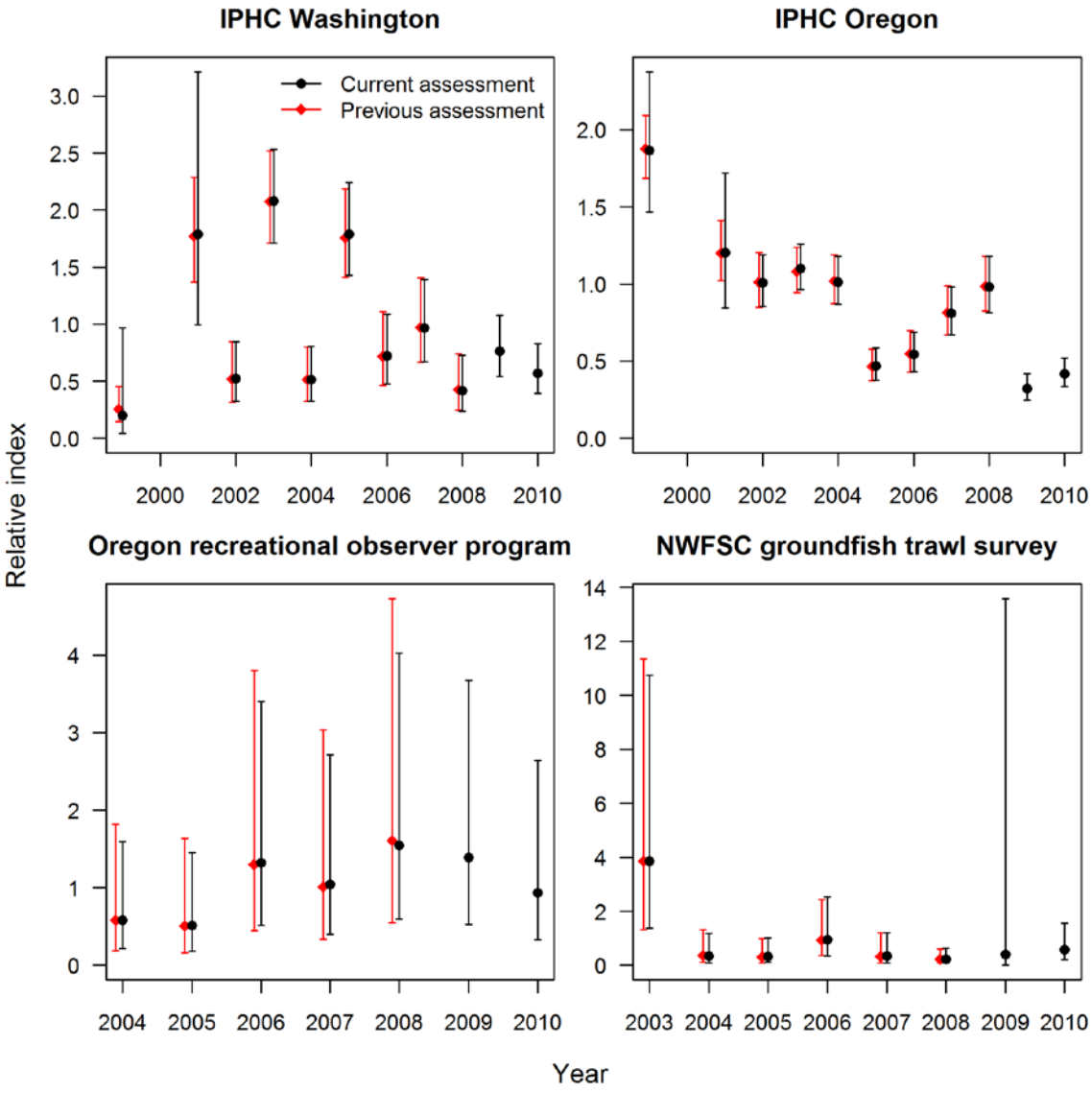



Figure 2. Comparison of indices of abundance that were extended with additional data (black) with those used in the 2009 assessment (red). For comparison, indices are standardized to have mean = 1 over the overlapping years. Increase in uncertainty of the 1999 and 2001 IPHC values is due to a new accounting for sampling only the first 20 out of every 100 hooks prior to 2002. Note that the years have been offset slightly to allow each point to be visible.

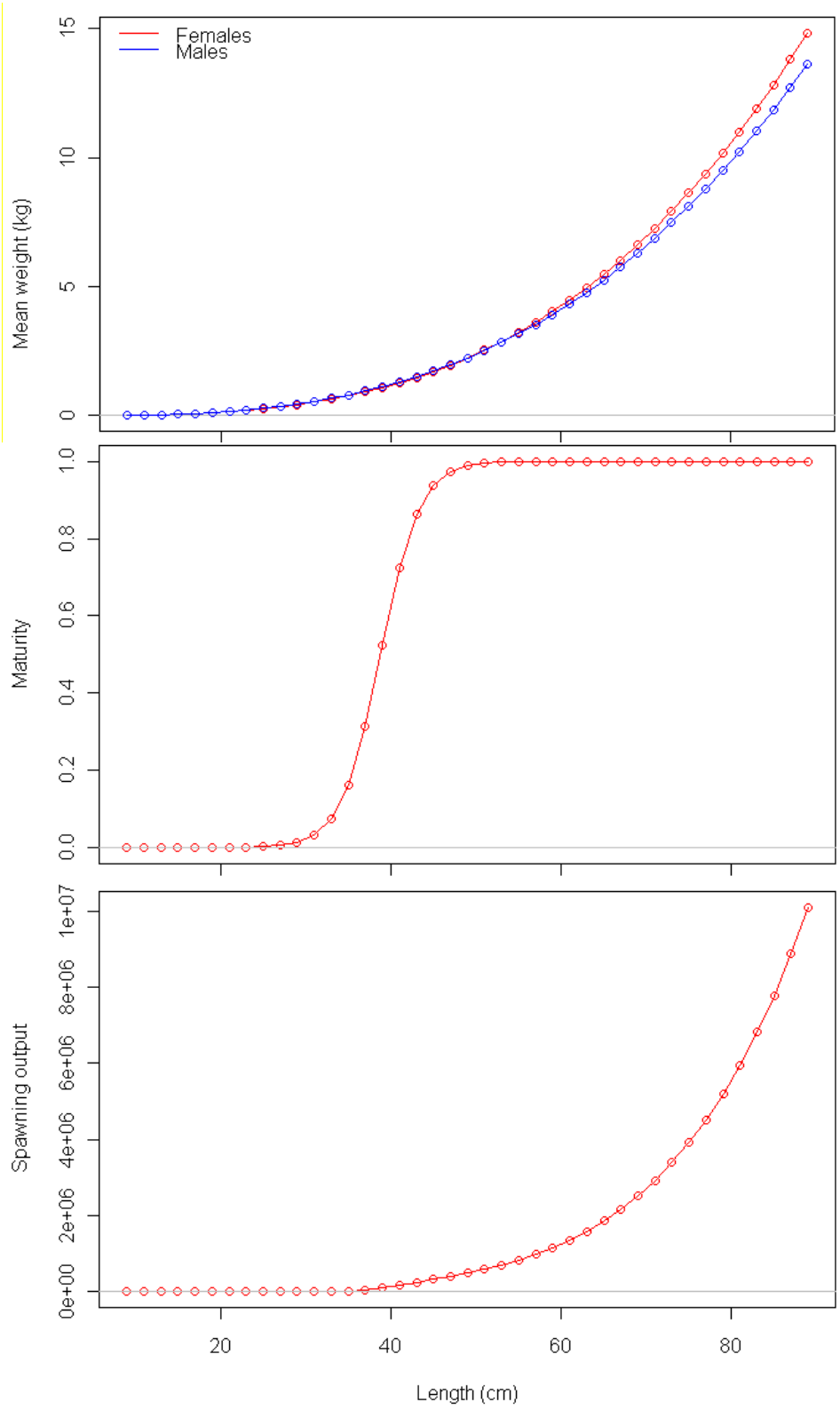

Females
Males
Mean weight (kg)
0
5
10
15
Maturity
0.0
0.2
0.4
0.6
0.8
1.0
Spawning output
0e+00
2e+06
4e+06
6e+06
8e+06
1e+07
20
40
60
80
Length (cm)

Figure 3. W-L relationship for male and female yelloweye (upper panel), female maturity curve (middle panel), and female spawning output at length (lower panel) illustrating the product of the female W-L, fecundity and maturity relationships.

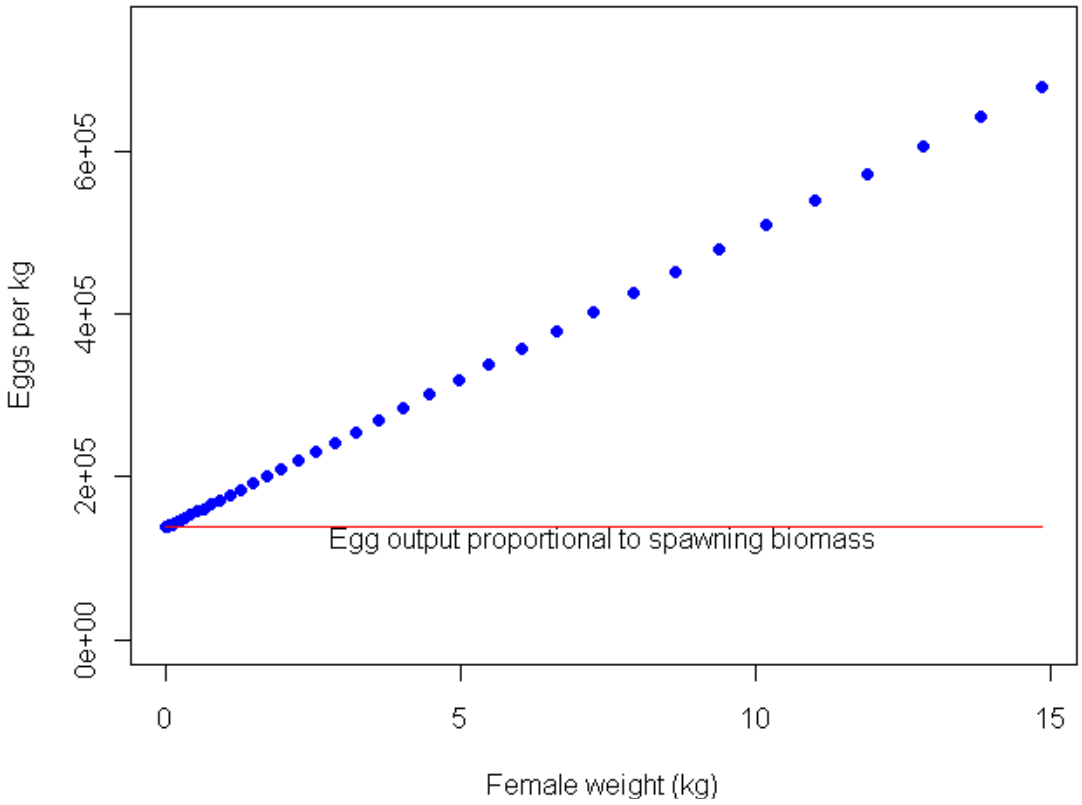



Figure 4. Female yelloweye fecundity relationship (Filled circles, From Dick, 2009). Horizontal line indicates no fecundity relationship (for comparison).

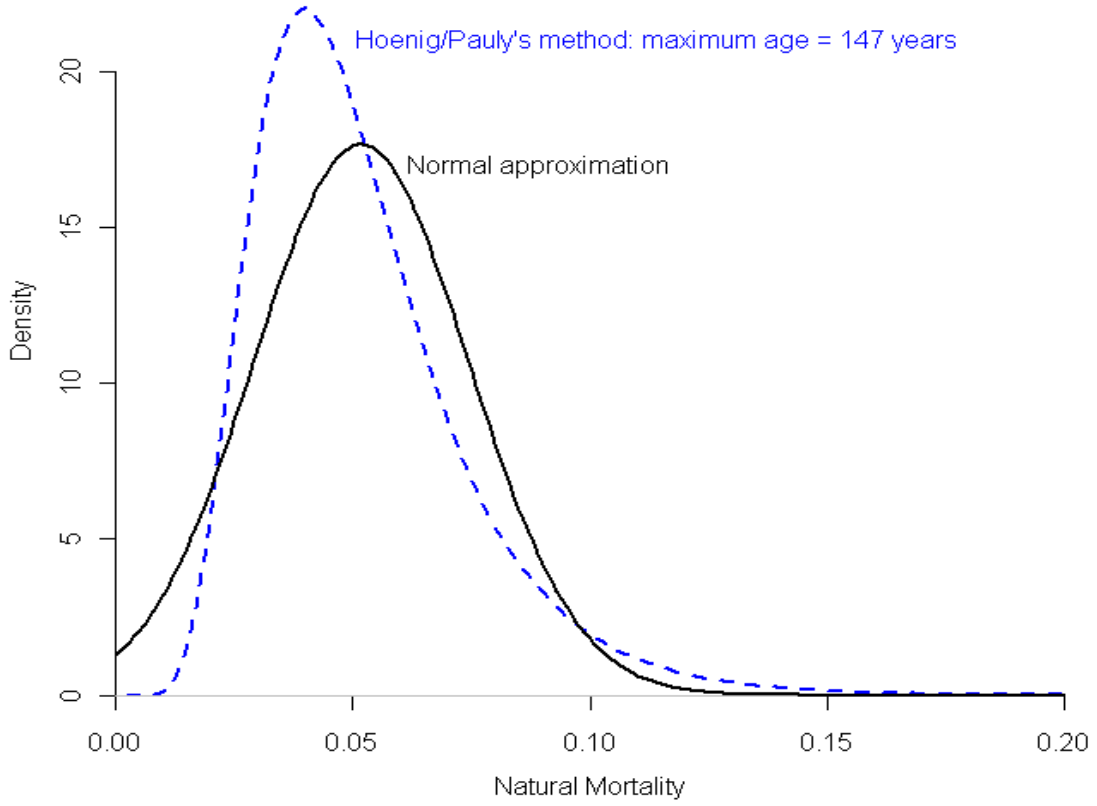



Figure 5**.** Prior for natural mortality (normal approximation) used in the base-case model, with original log-normal distribution for comparison.

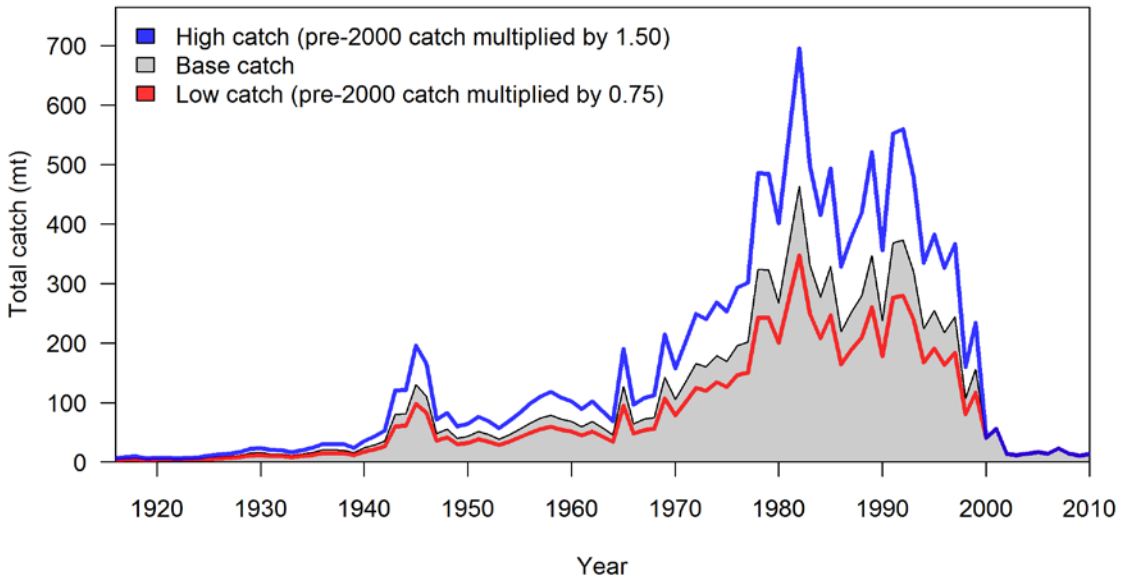



Figure 6. Catch series for the alternate states of nature.

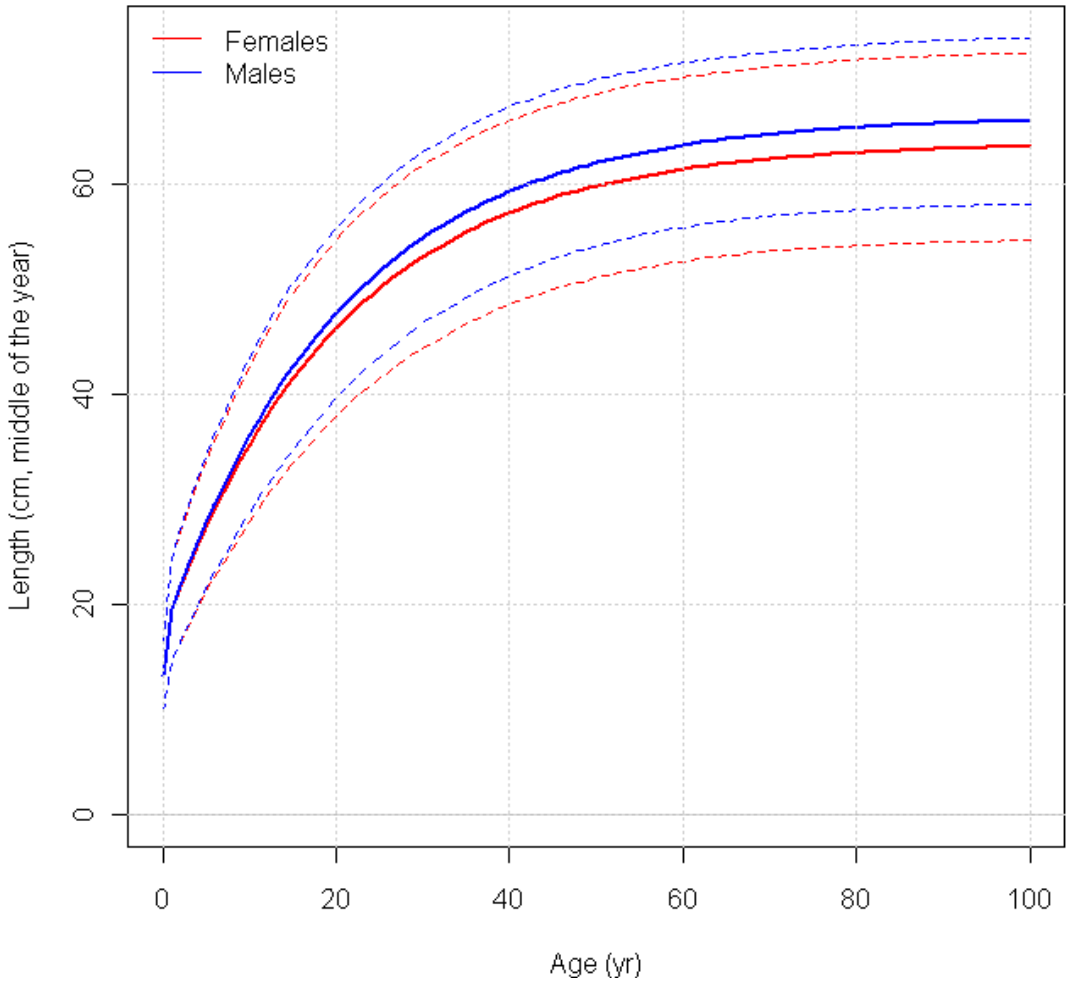



Figure 7. Growth curve for males (upper solid line) and females (lower solid line) with ~95% interval (dashed lines) indicating the expectation and individual variability of length-at-age for the base-case model.

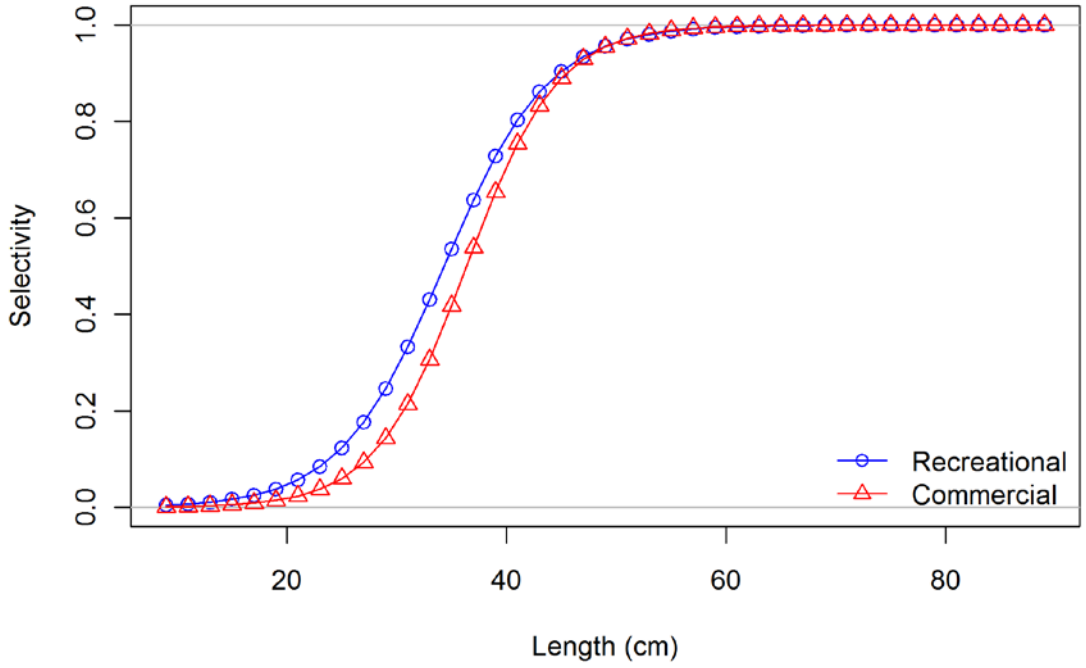



Figure 8. Estimated selectivity for the California fisheries.

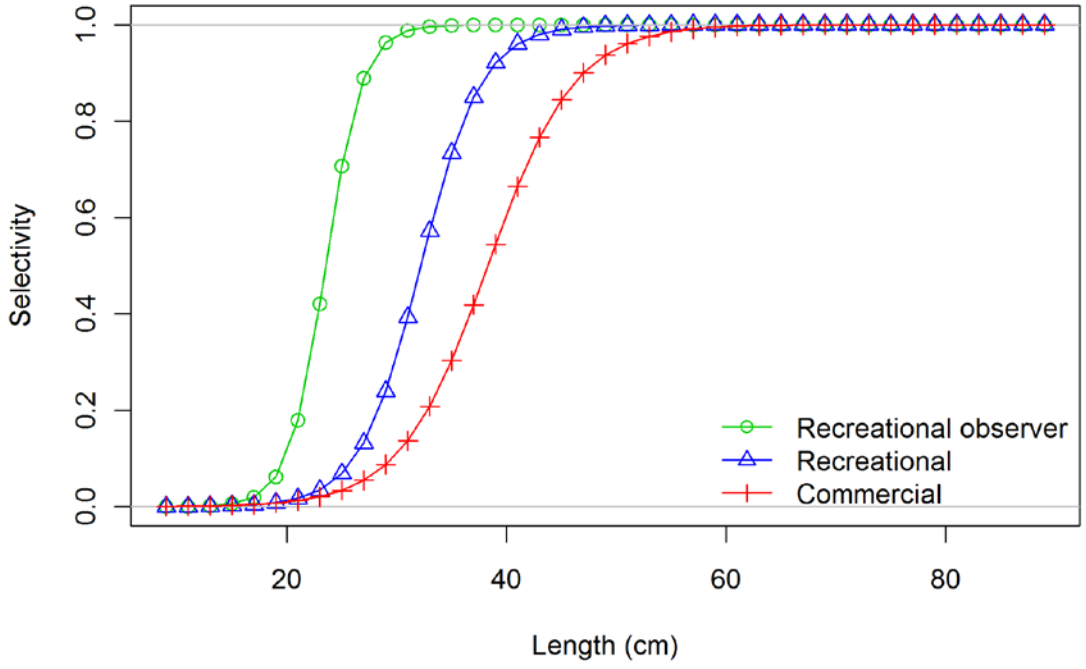



Figure 9. Estimated selectivity for Oregon fisheries.

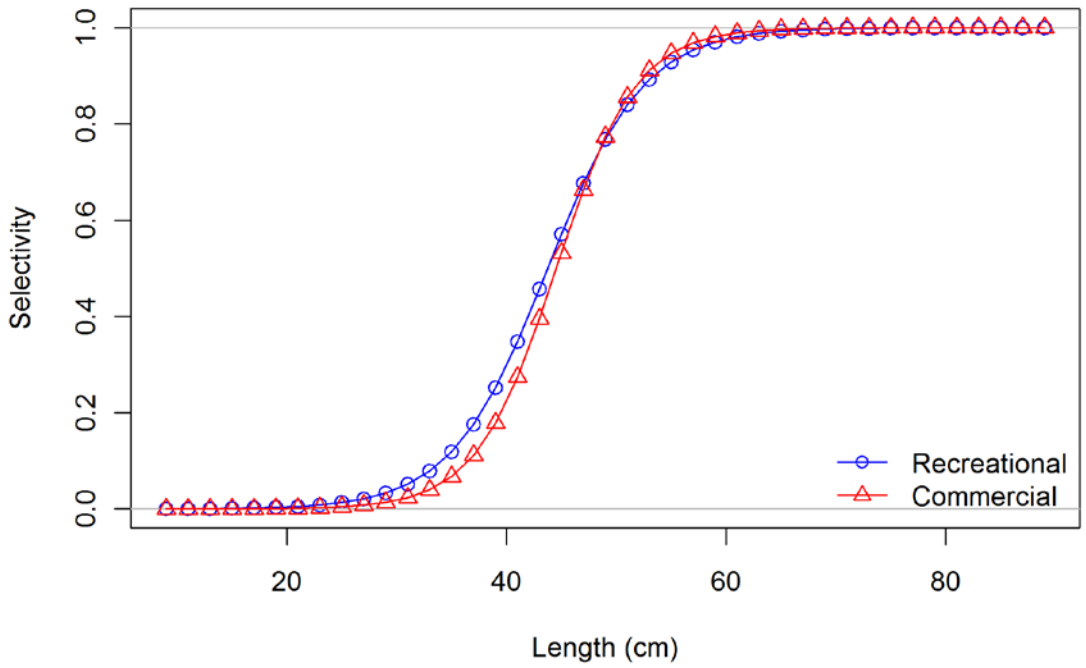



Figure 10. Estimated selectivity for Washington fisheries.

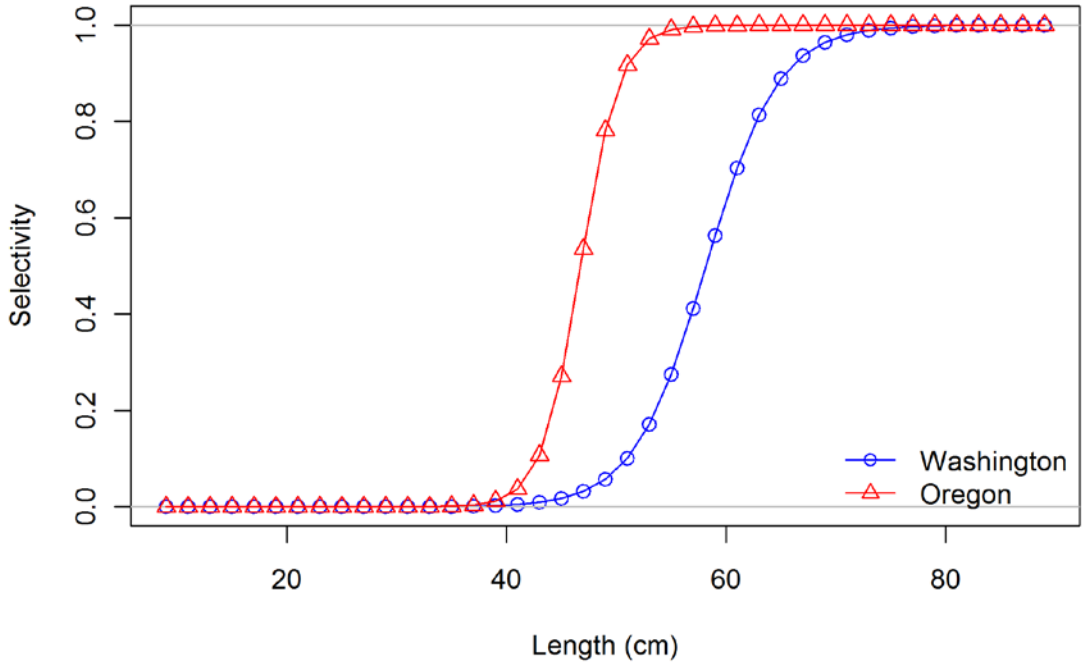



Figure 11. Estimated selectivity for IPHC surveys.

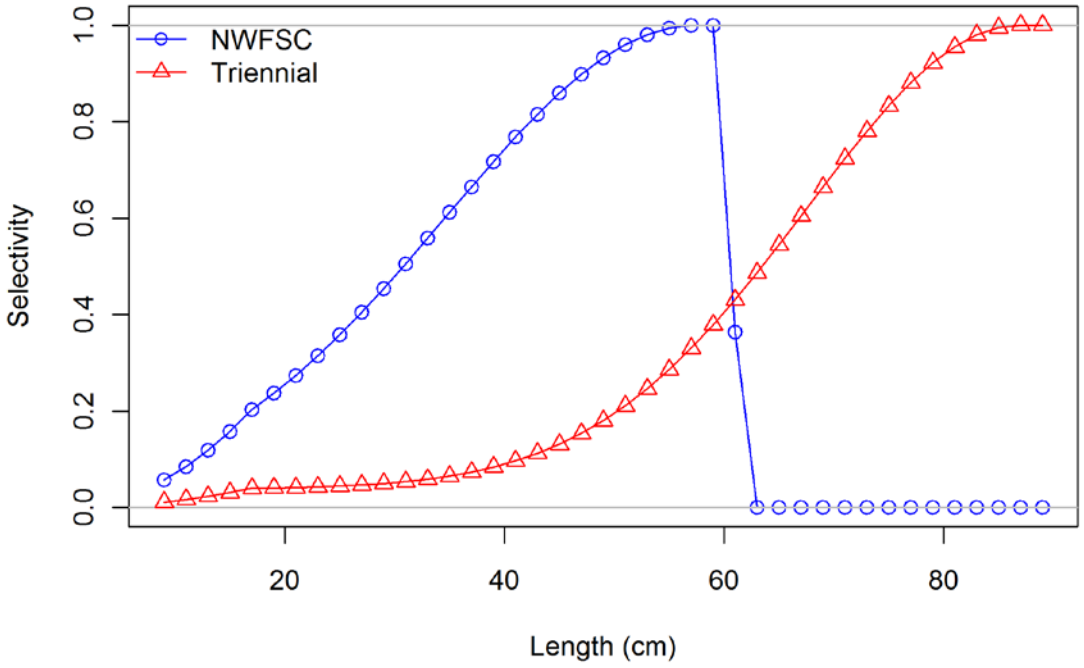



Figure 12. Estimated selectivity for trawl surveys.

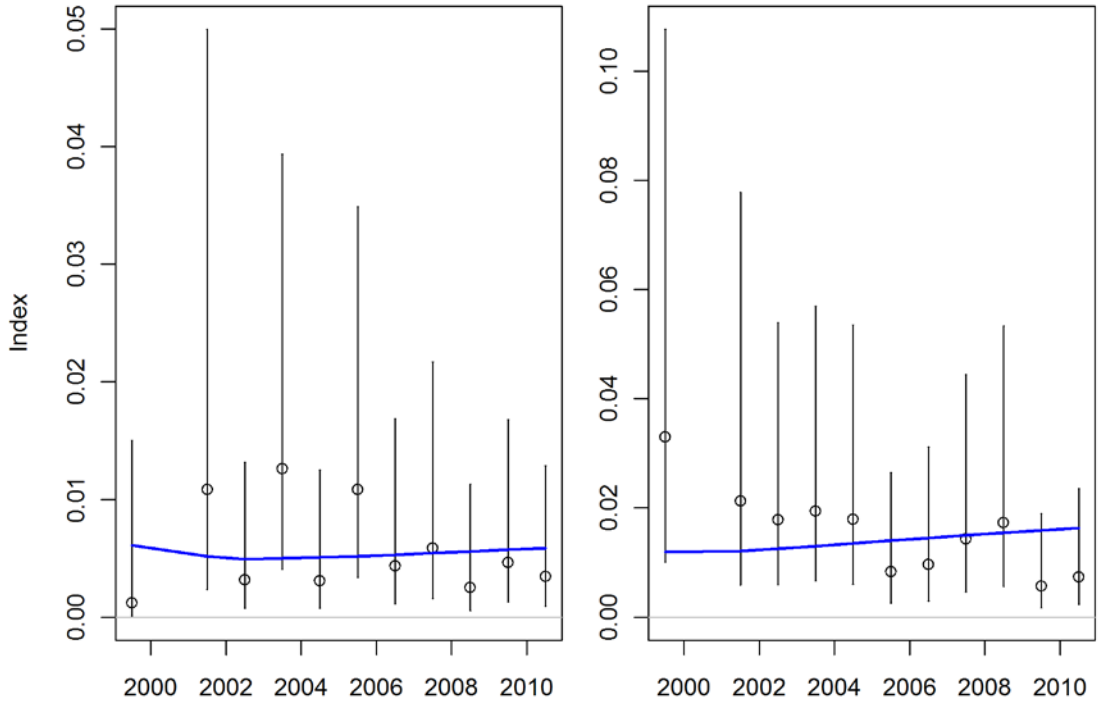



Figure 13. Fit to the IPHC survey index for Washington (left) and Oregon (right) in the base-case model.

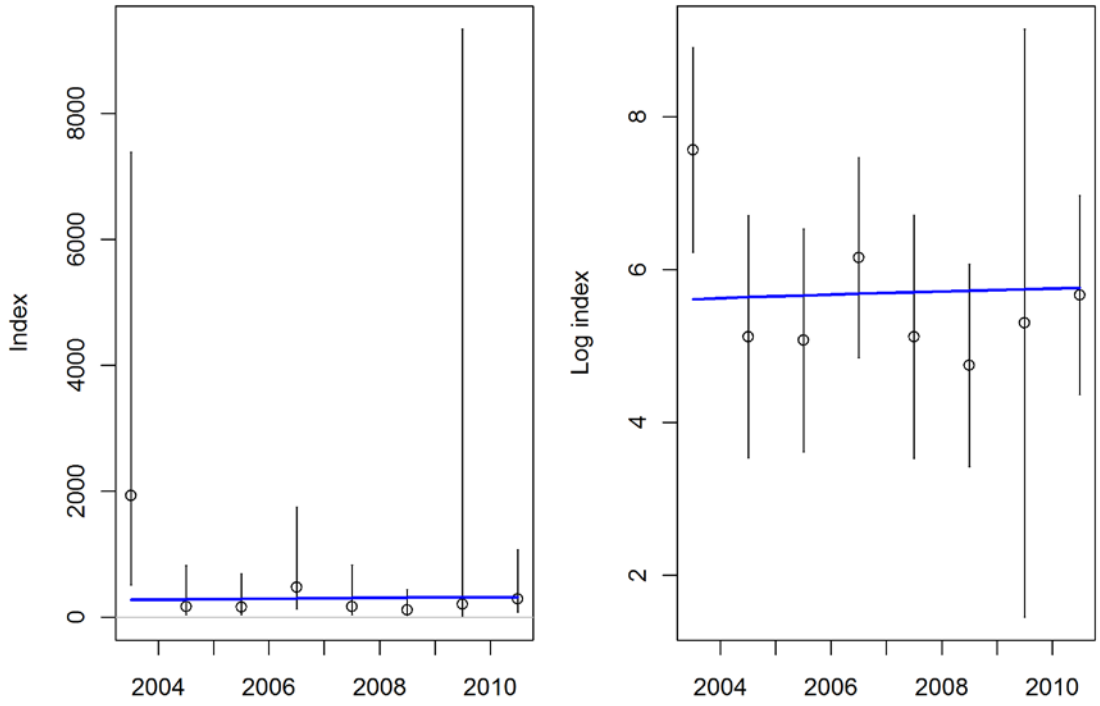



Figure 14. Fit to the NWFSC survey index for Oregon of relative biomass (left) and log(index) for easier evaluation (right) in the base-case model.

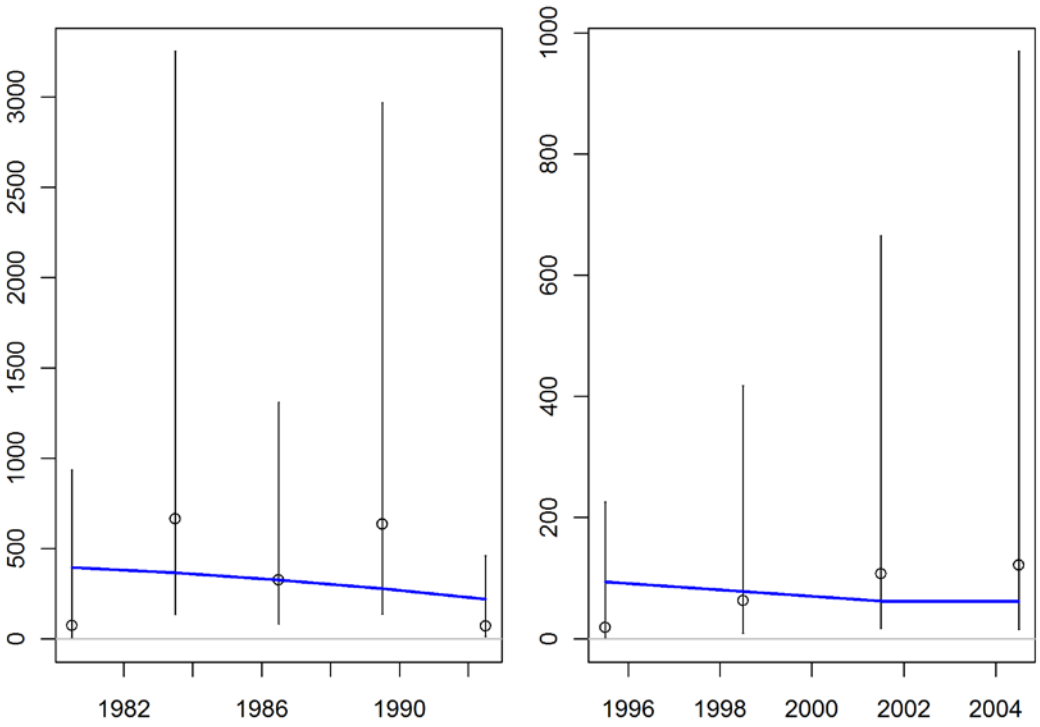



Figure 15. Fit to the early (left) and late (right) portions of the triennial survey index for Washington of relative biomass in the base-case model.

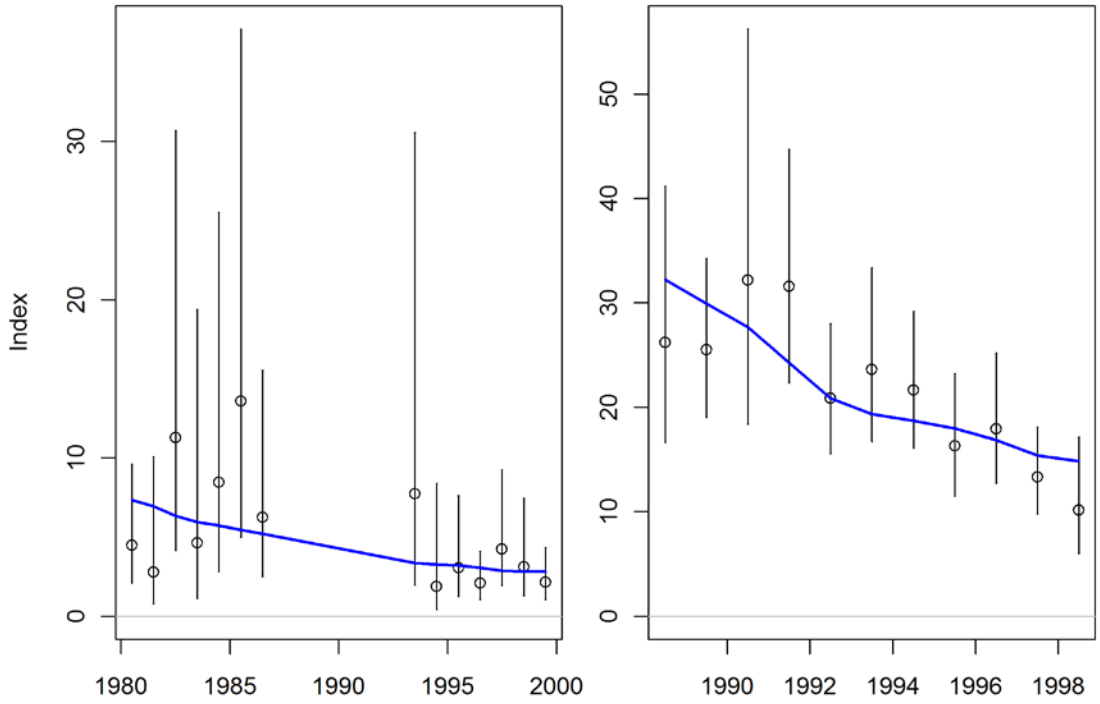



Figure 16. Fit to the California recreational CPUE index (left) and California recreational observer CPUE index (right) in the base-case model.

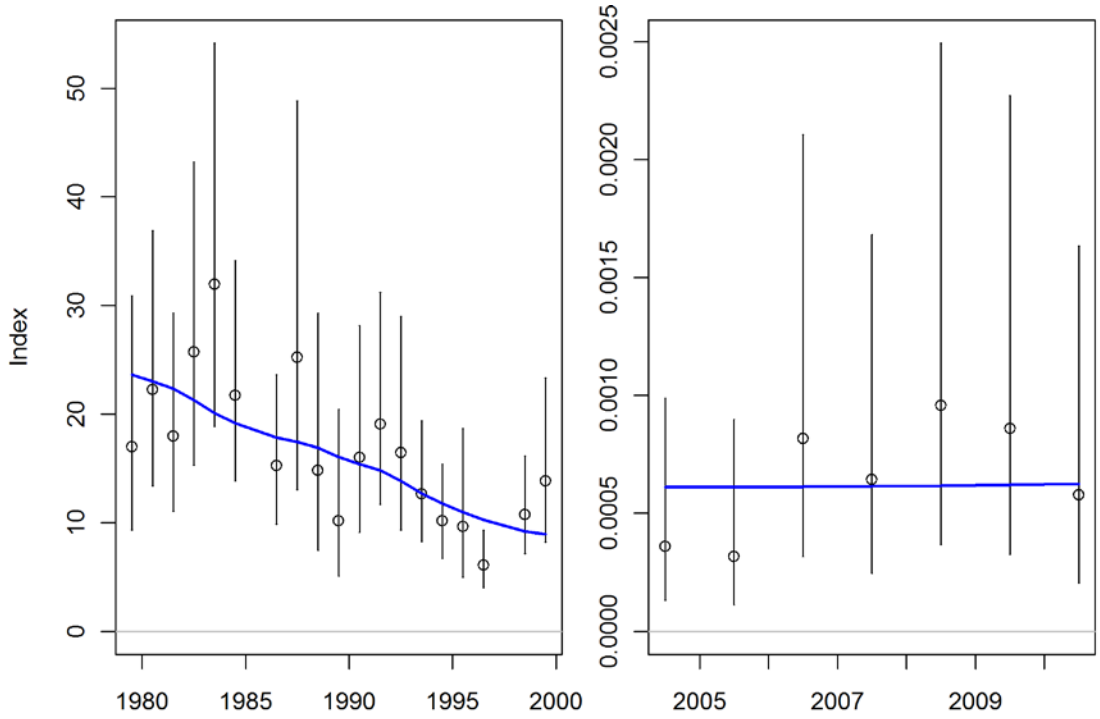



Figure 17. Fit to the Oregon recreational CPUE index (left) and Oregon recreational observer CPUE index (right) in the base-case model.

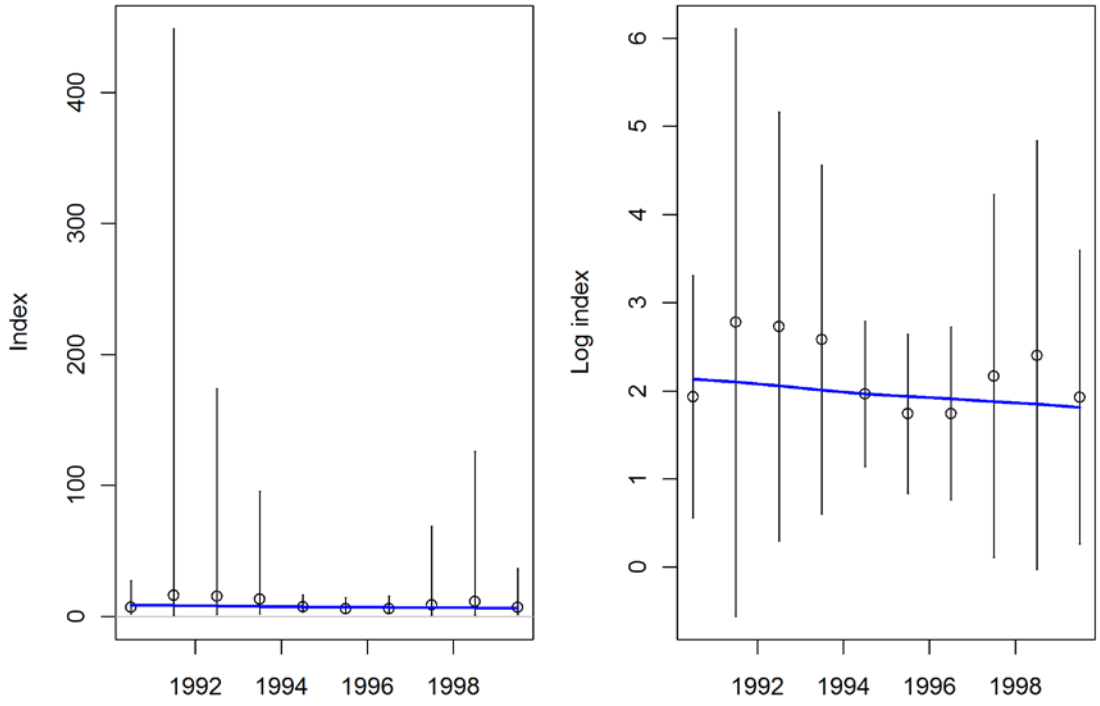



Figure 18. Fit to the Washington recreational CPUE index (left) and log(index) for easier evaluation (right) in the base-case model.

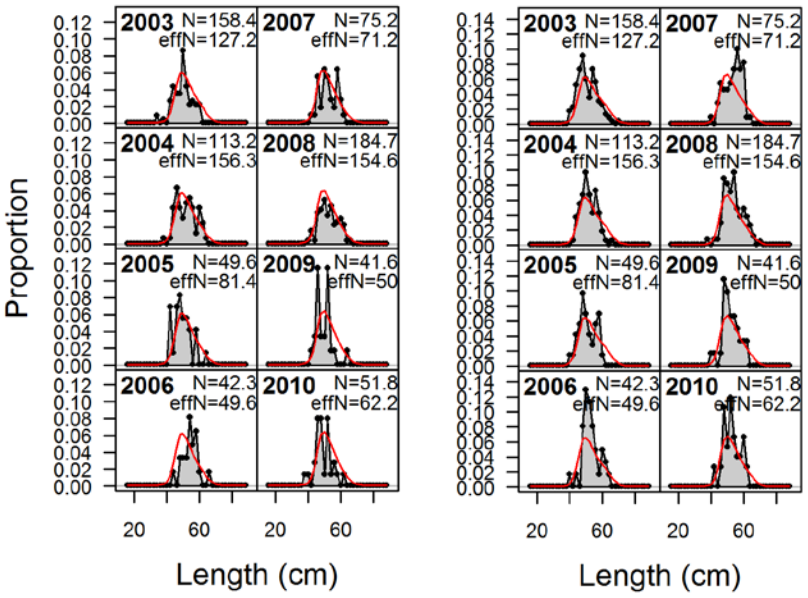



Figure 19. Fit to the Oregon IPHC female (left panels) and male (right panels) length frequencies.

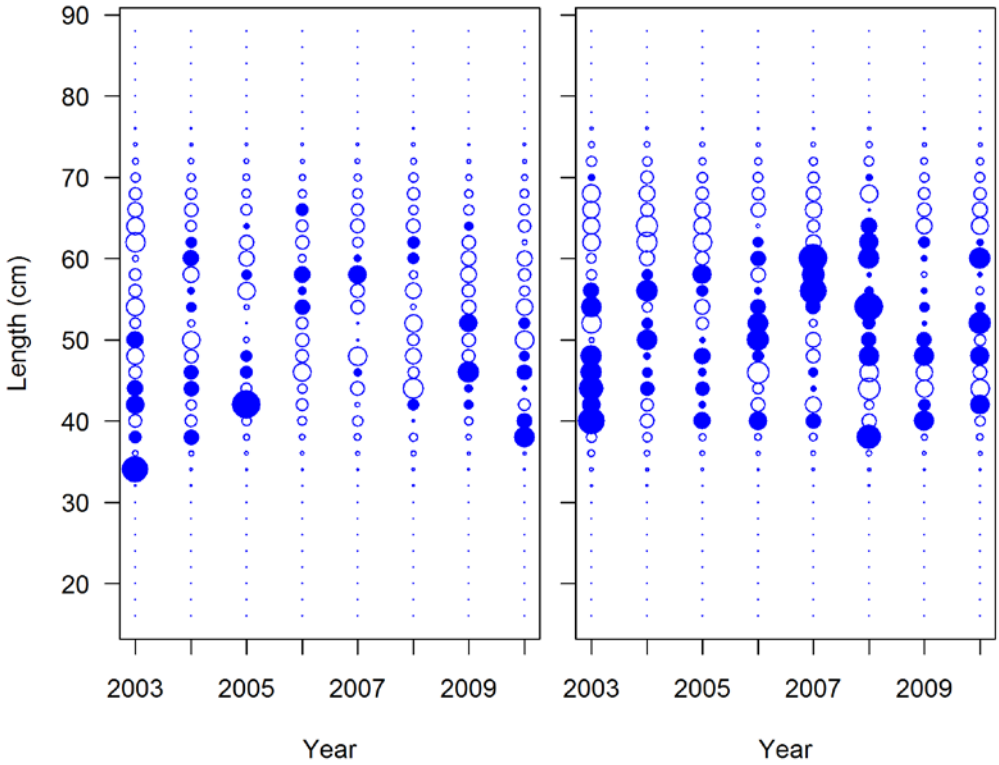



Figure 20. Pearson residuals for the fit to Oregon IPHC female (left, maximum = 3.75) and male (right, maximum = 2.69) length frequencies. Filled circles represent positive residuals (observed – expected).

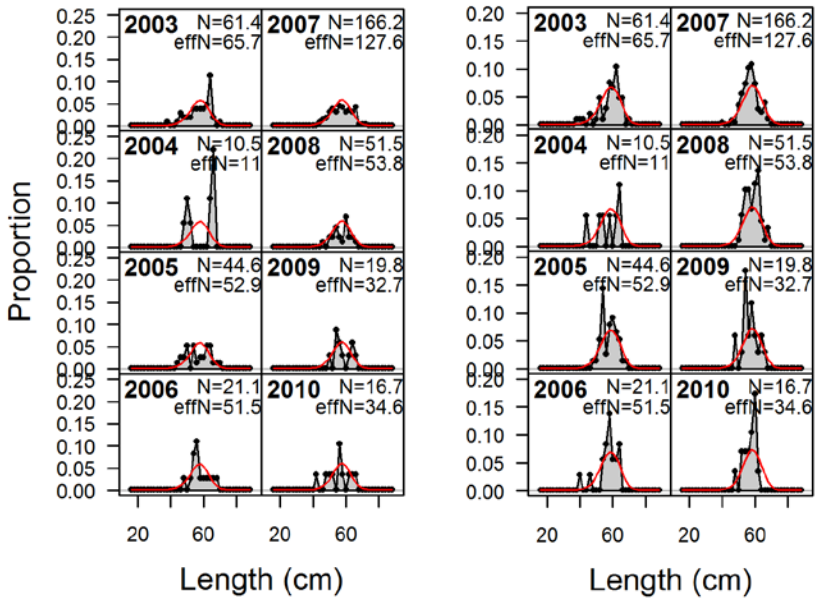



Figure 21. Fit to the Washington IPHC female (left panels) and male (right panels) length frequencies.

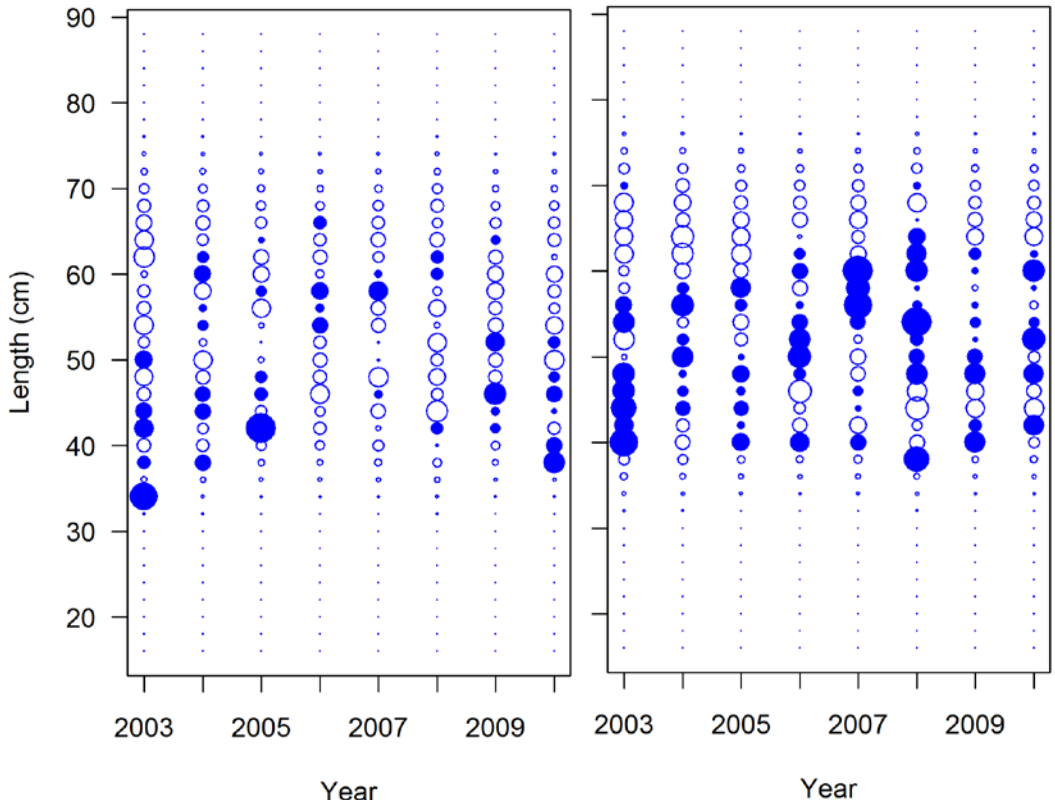



Figure 22. Pearson residuals for the fit to Washington IPHC female (left, maximum = 4.74) and male (right, maximum = 2.77) length frequencies. Filled circles represent positive residuals (observed – expected).

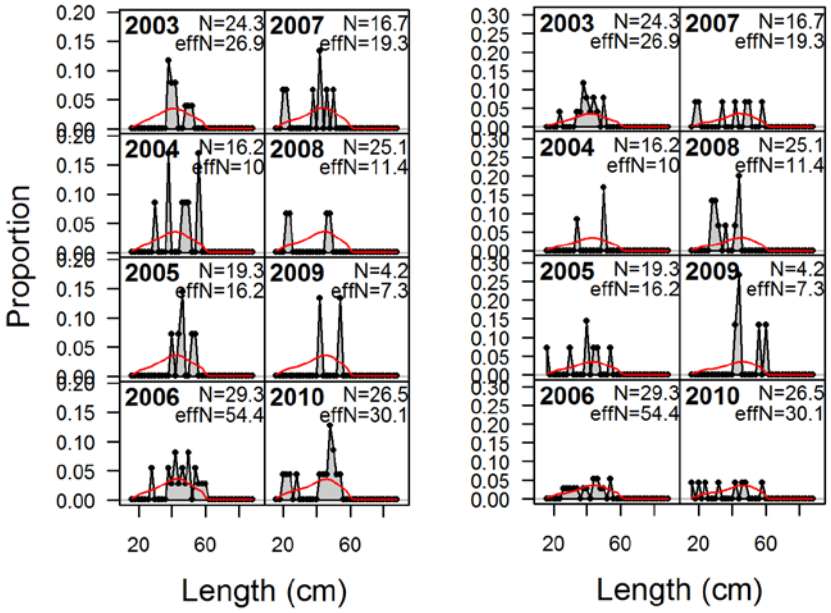
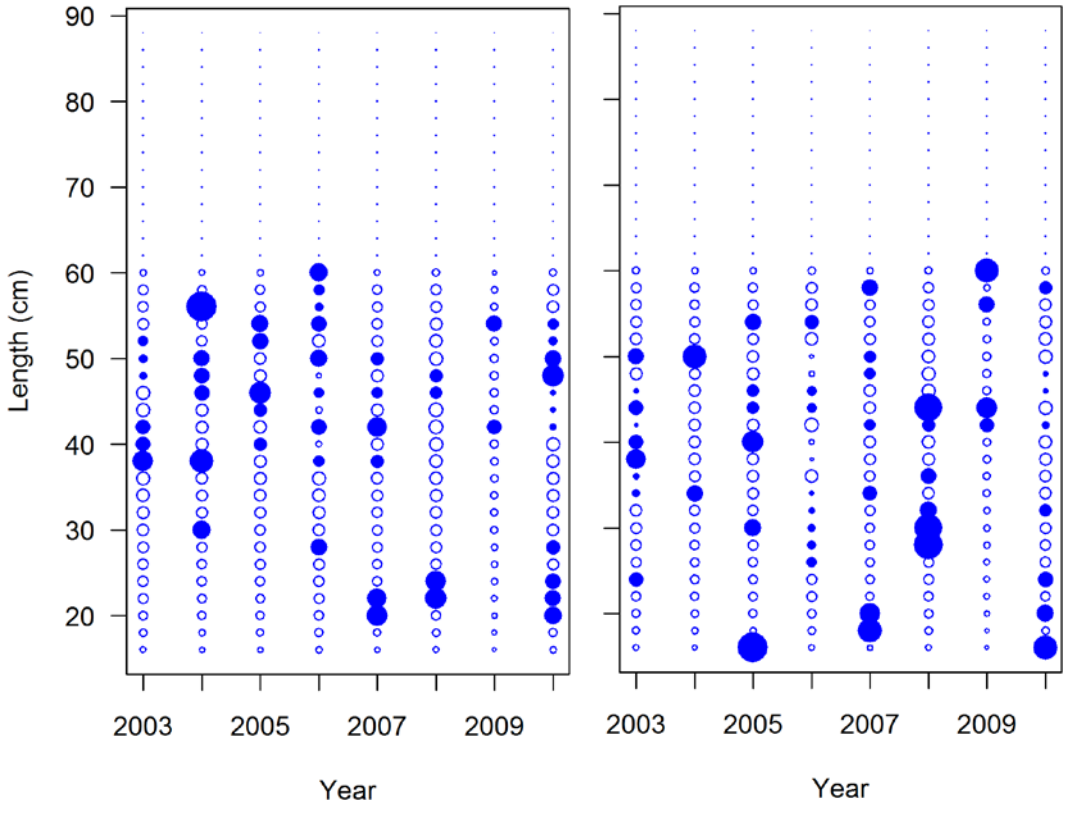



Figure 23. Fit to the Oregon NWFSC female (left panels) and male (right panels) length frequencies.




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Figure 24. Pearson residuals for the fit to Oregon NWFSC female (left, maximum = 4.89) and male (right, maximum = 5.24) length frequencies. Filled circles represent positive residuals (observed – expected).

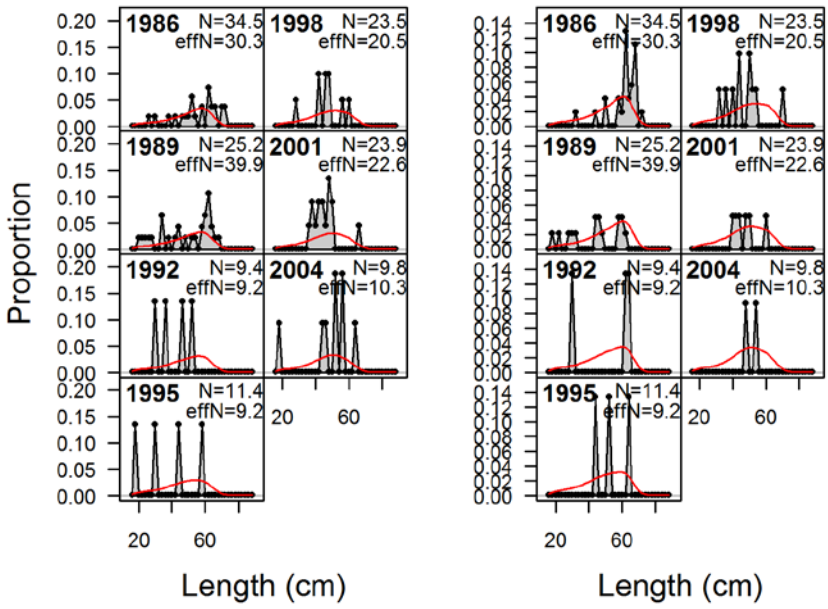



Figure 25. Fit to the Washington triennial female (left panels) and male (right panels) length frequencies.

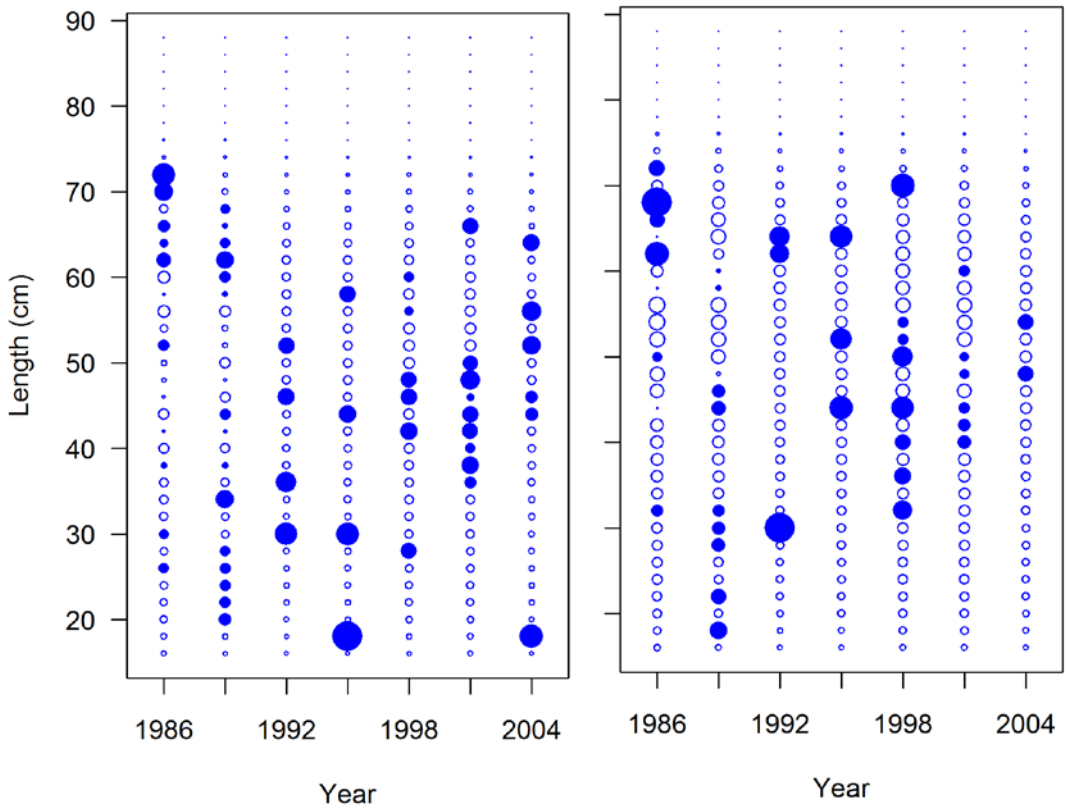



Figure 26. Pearson residuals for the fit to Washington triennial female (left, maximum = 6.65) and male (right, maximum = 4.06) length frequencies. Filled circles represent positive residuals (observed – expected).

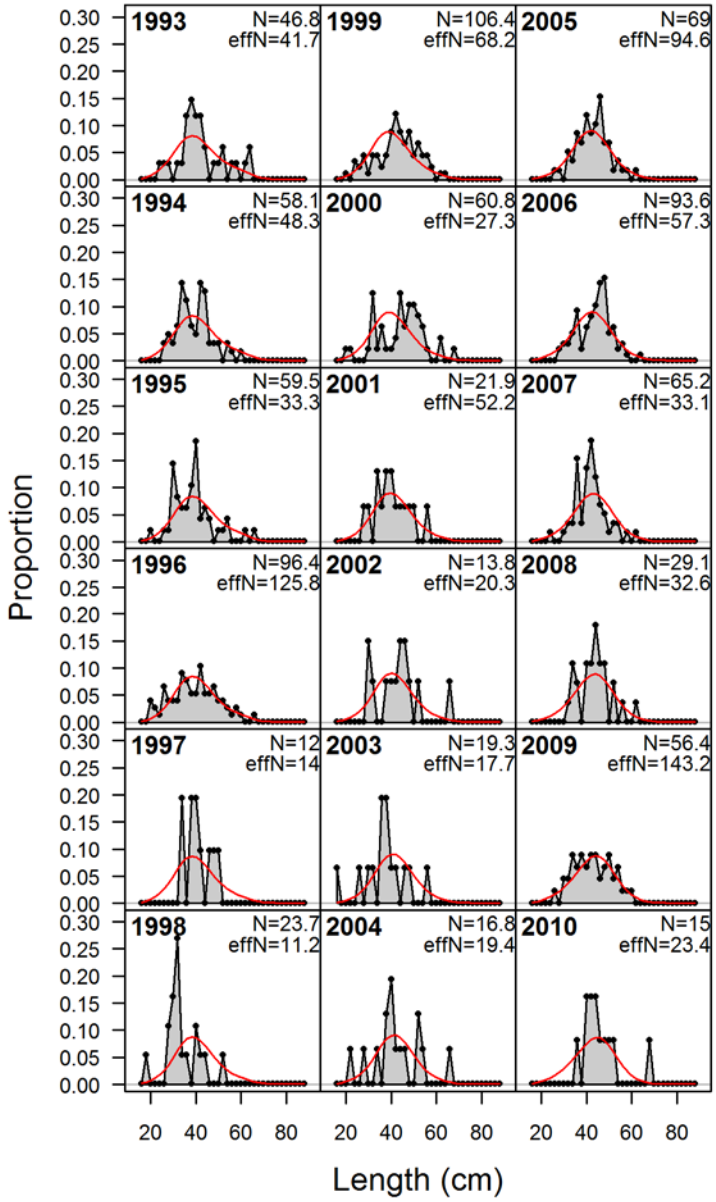



Figure 27. Fit to the California recreational sexes-combined length frequencies.

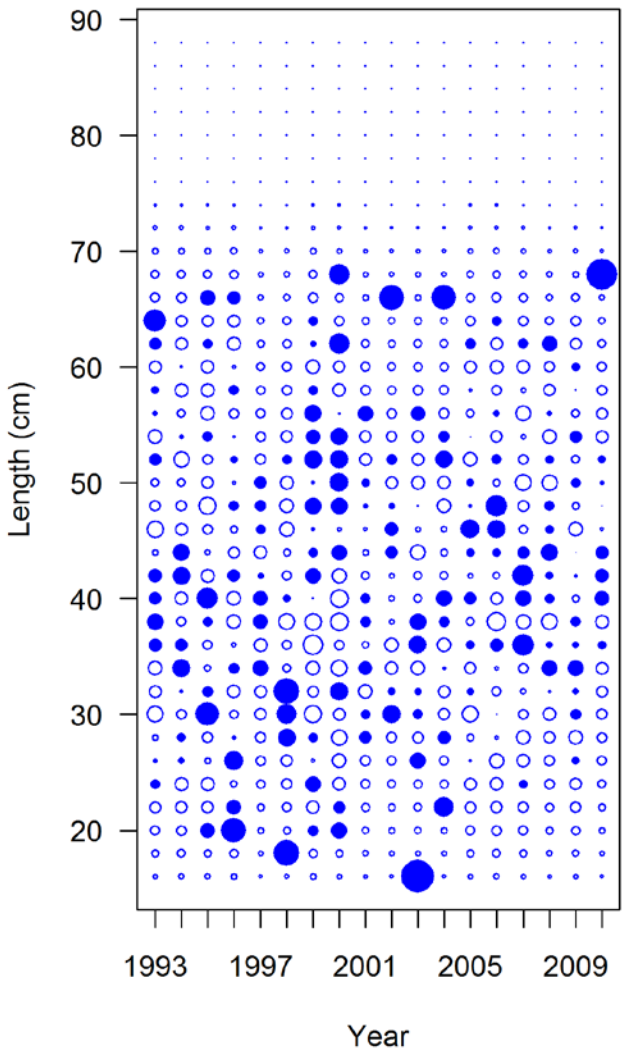



Figure 28. Pearson residuals for the fit to California recreational length frequencies (maximum = 6.66). Filled circles represent positive residuals (observed – expected).

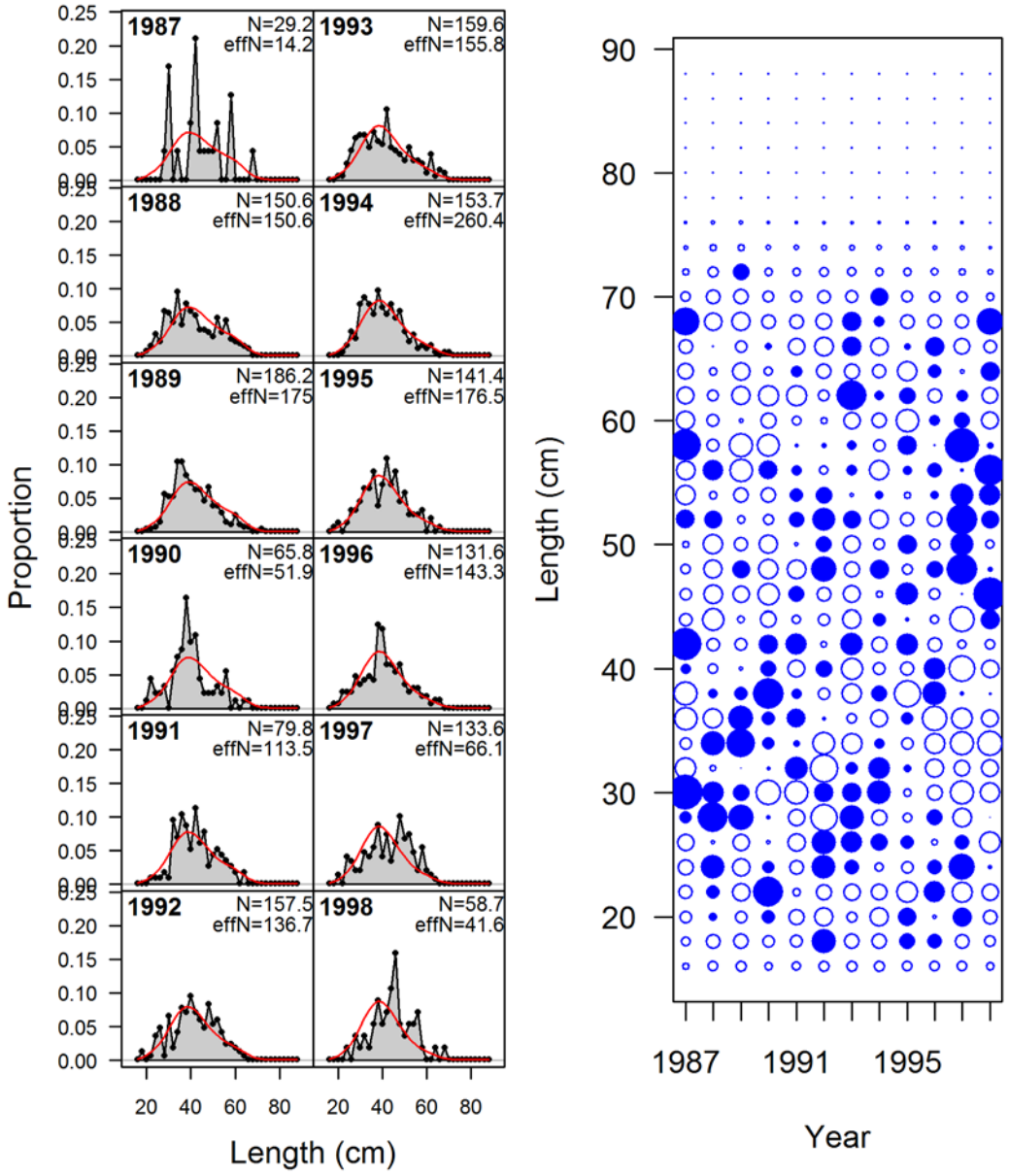



Figure 29. Fit to the California recreational charter vessel sexes-combined length frequencies (left panels) and pearson residuals for the fit to California recreational length frequencies (right panel, maximum = 3.54). Filled circles represent positive residuals (observed – expected).

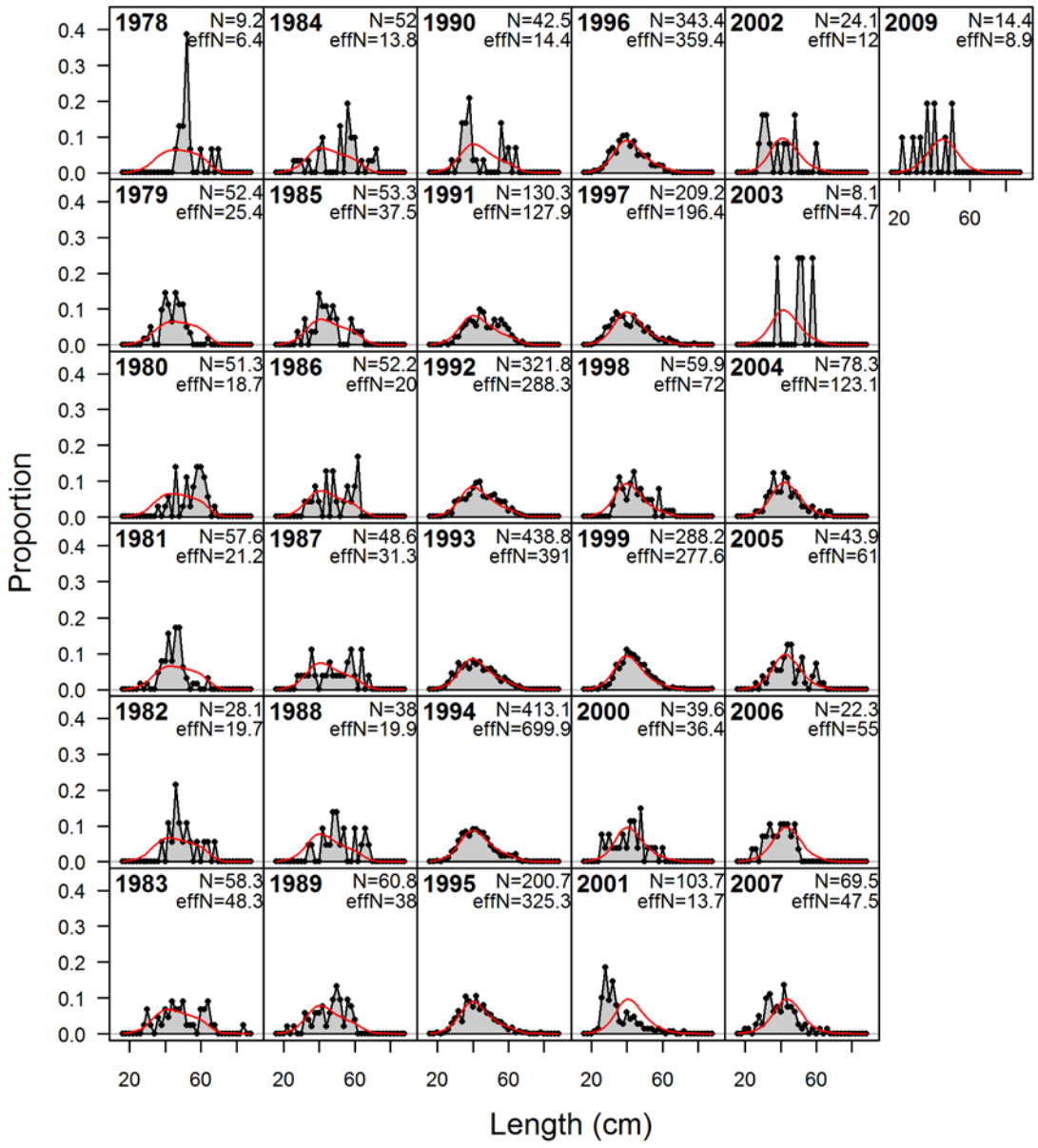



Figure 30. Fit to the California commercial sexes-combined length frequencies.

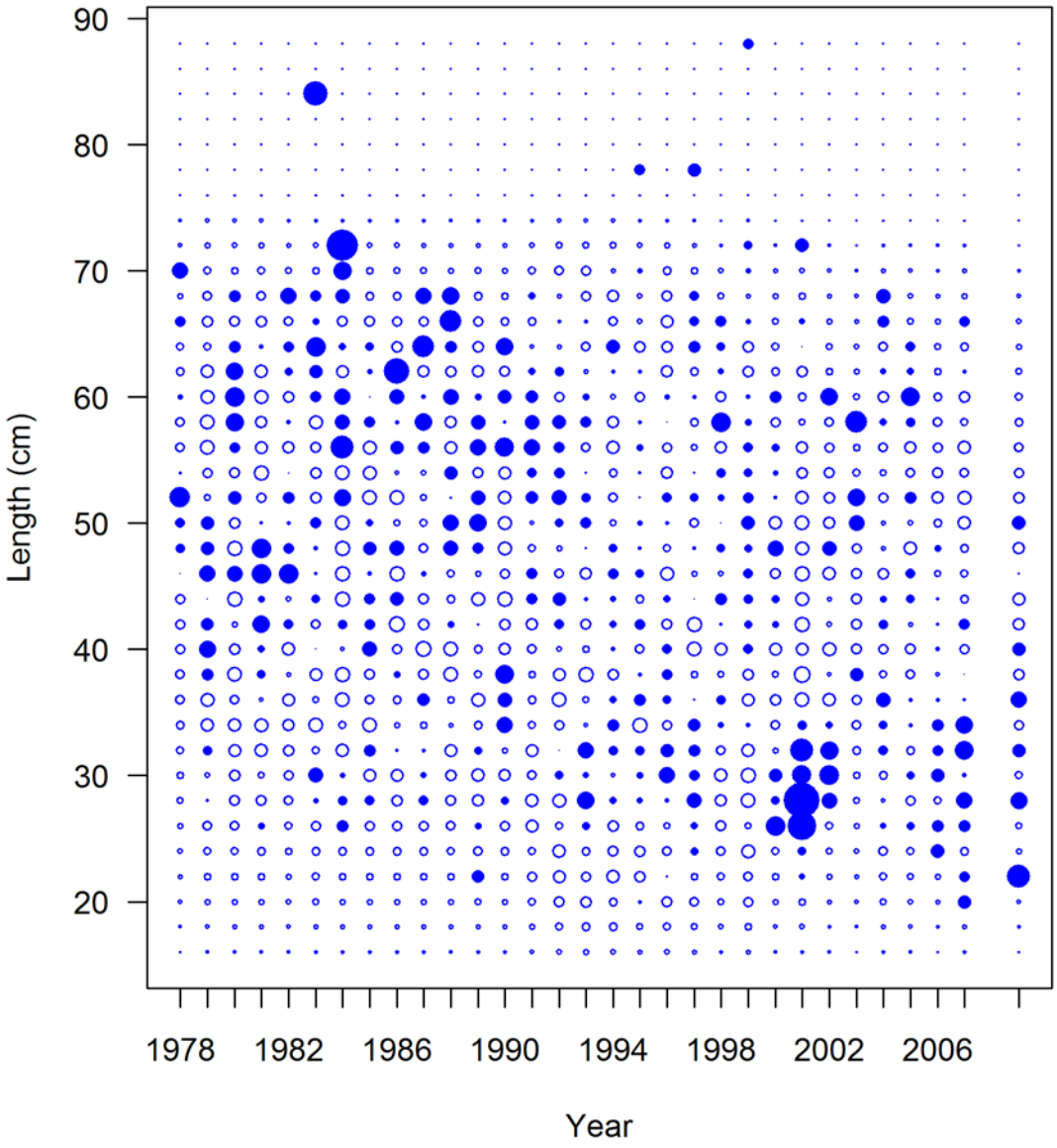



Figure 31. Pearson residuals for the fit to California commercial length frequencies (maximum = 11.95). Filled circles represent positive residuals (observed – expected).

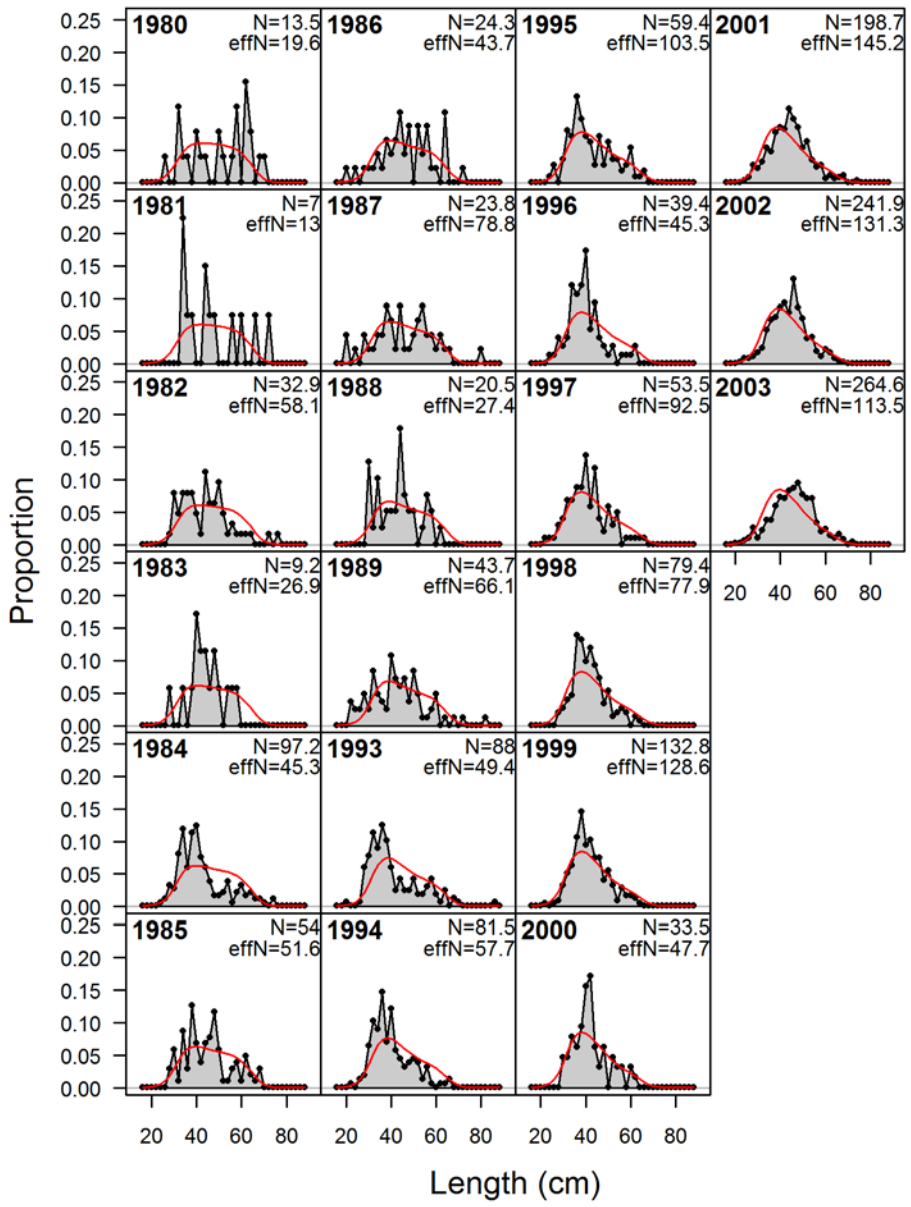



Figure 32. Fit to the Oregon recreational sexes-combined length frequencies.

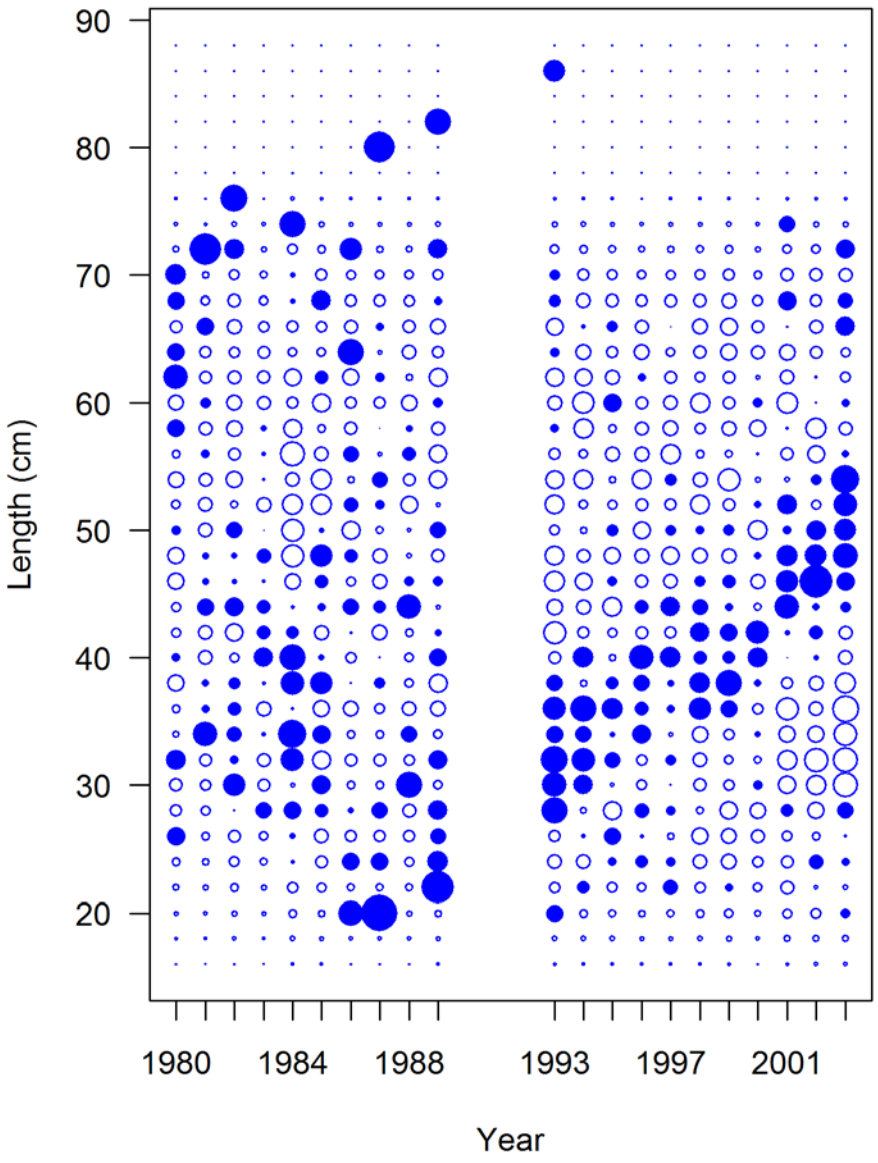



Figure 33. Pearson residuals for the fit to Oregon recreational length frequencies (maximum = 4.72). Filled circles represent positive residuals (observed – expected).

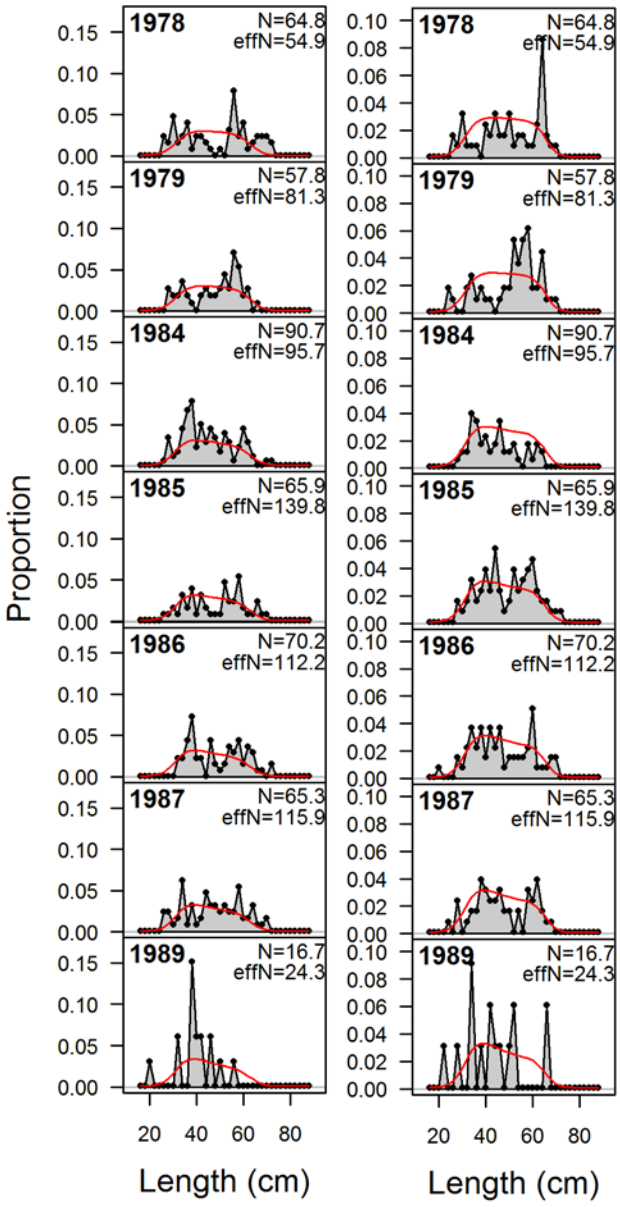



Figure 34. Fit to the Oregon recreational female (left panels) and male (right panels) length frequencies.

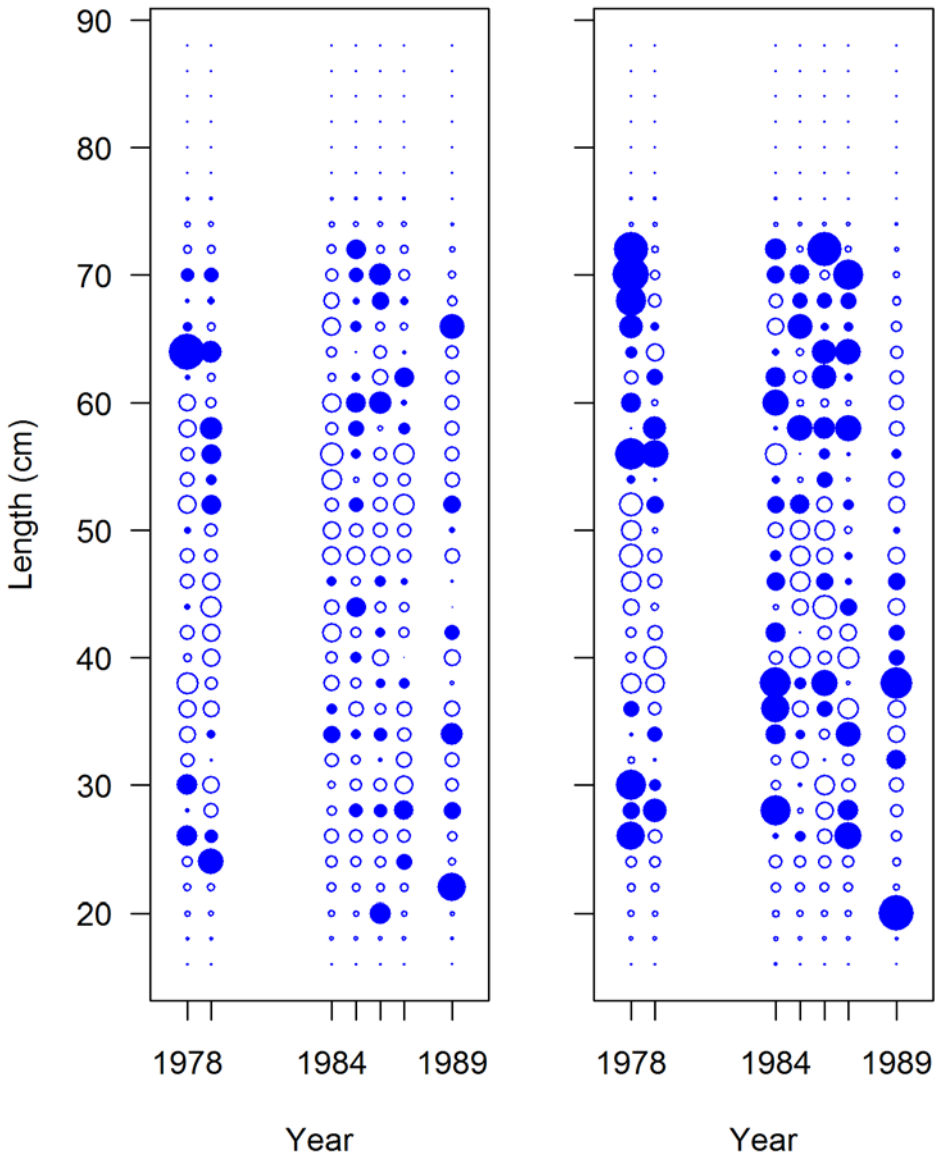



Figure 35. Pearson residuals for the fit to Oregon recreational female (left, maximum = 3.52) and male (right, maximum = 4.16) length frequencies. Filled circles represent positive residuals (observed – expected).

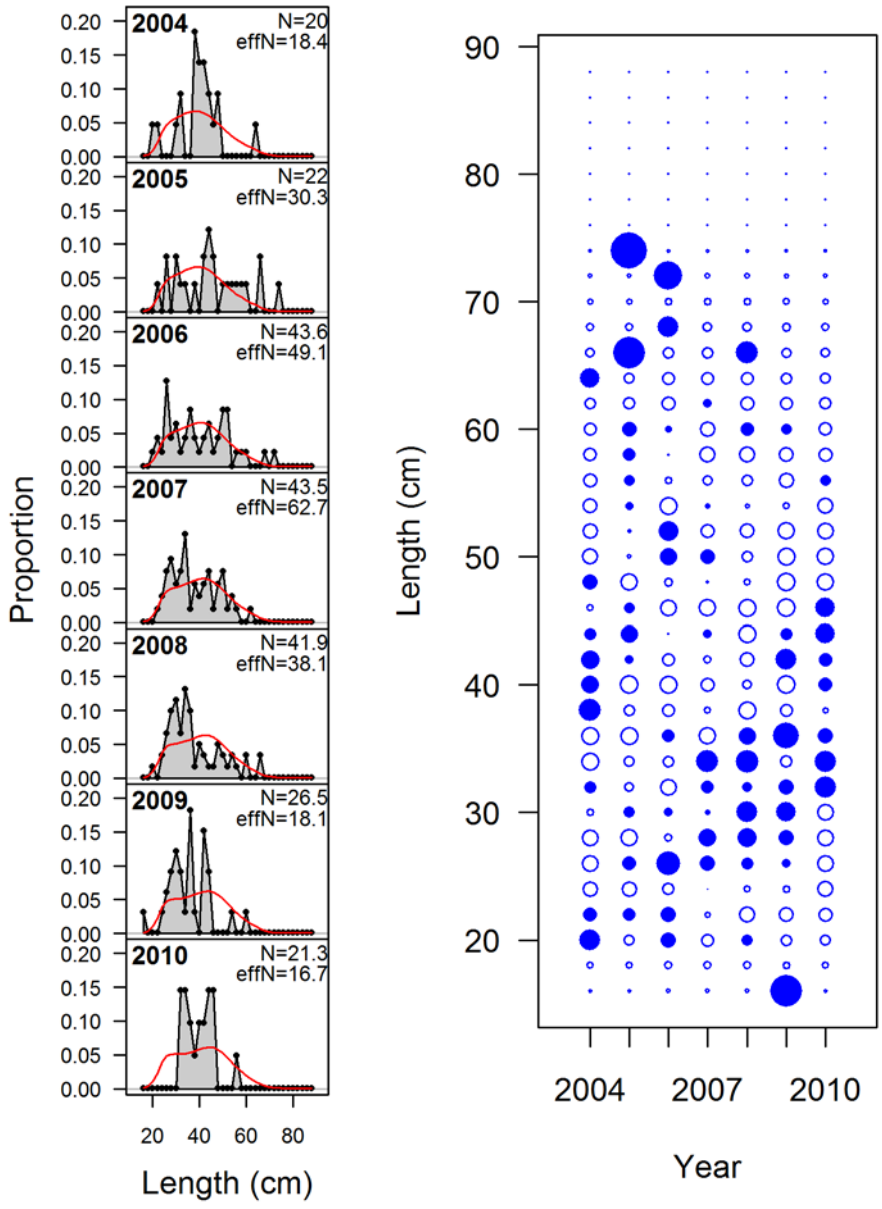



Figure 36. Fit to the Oregon recreational charter observer sexes-combined length frequencies and associated pearson residuals (maximum = 5.56). Filled circles represent positive residuals (observed – expected).

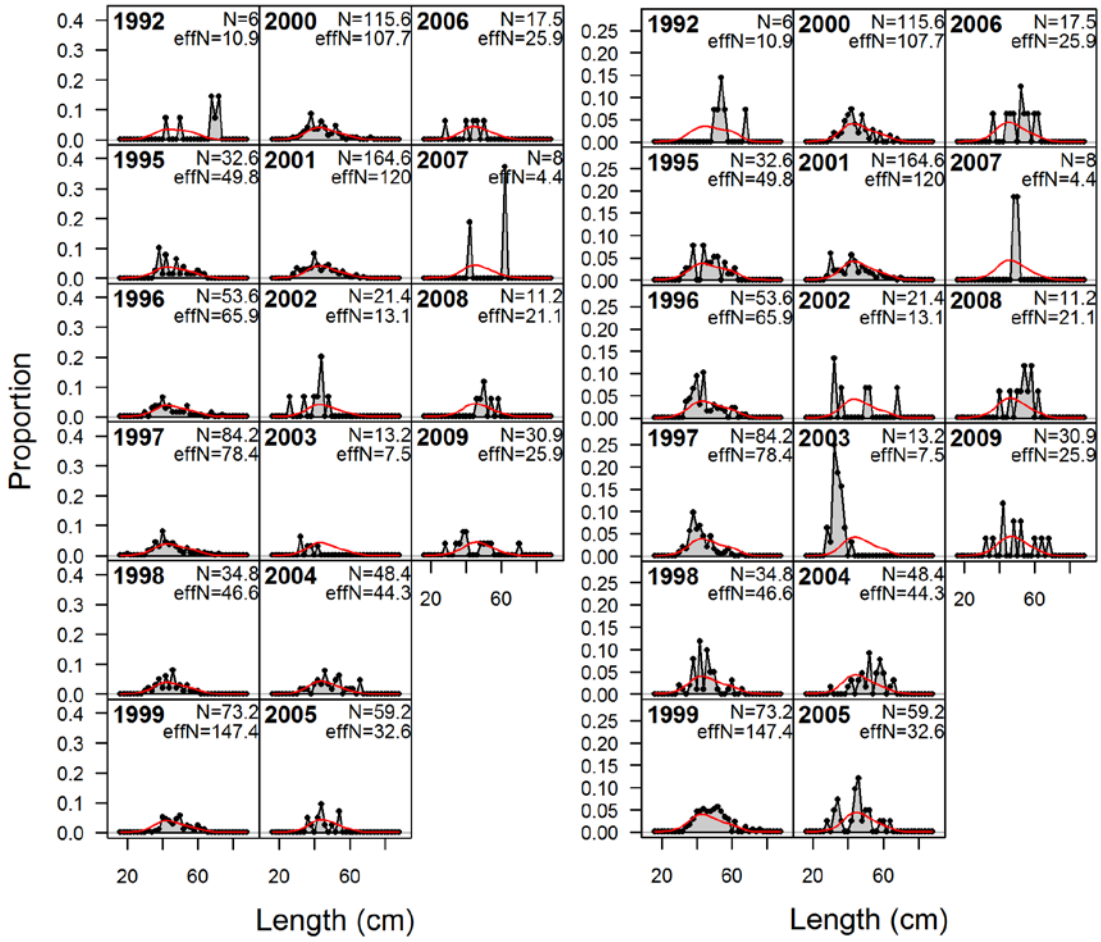



Figure 37. Fit to the Oregon commercial female (left panels) and male (right panels) length frequencies.

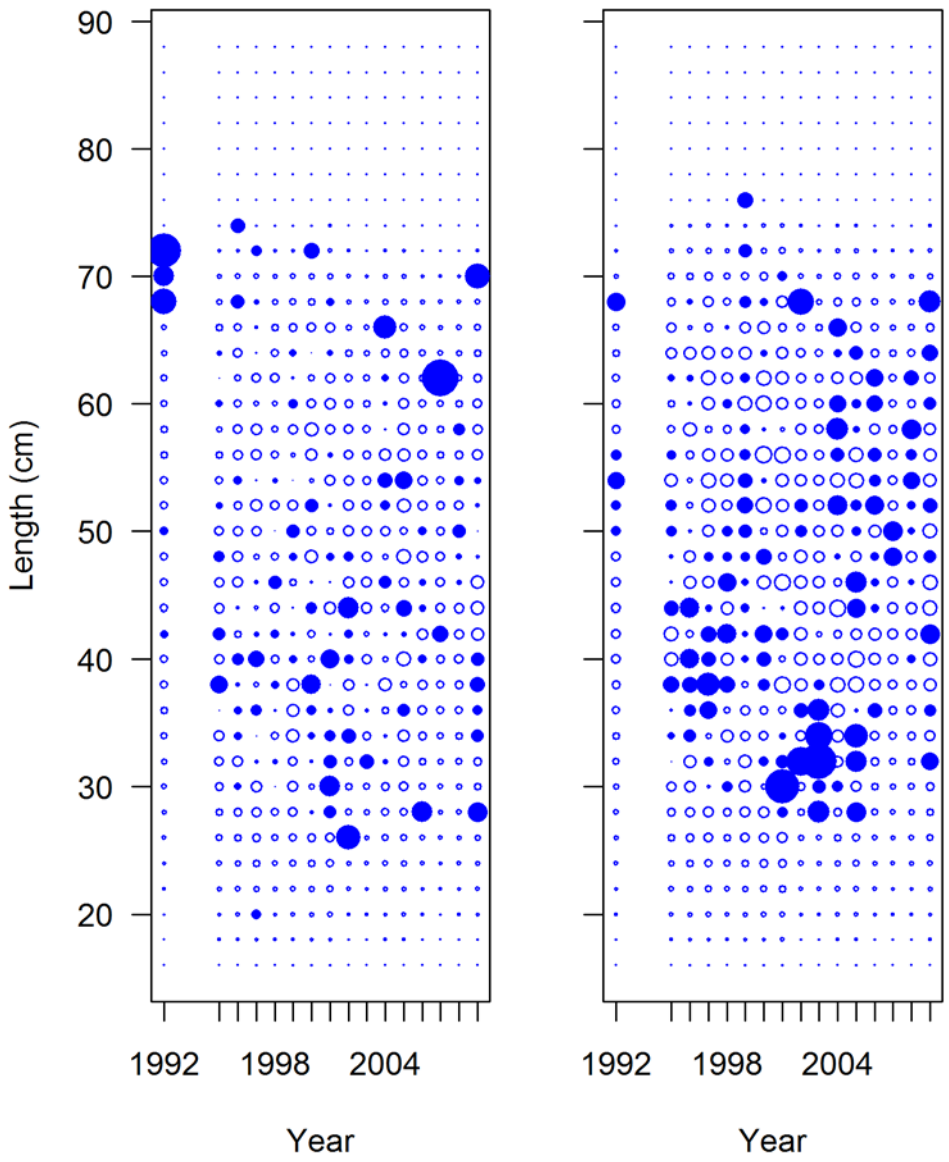



Figure 38. Pearson residuals for the fit to Oregon commercial female (left, maximum = 10.42) and male (right, maximum = 7.94) length frequencies. Filled circles represent positive residuals (observed – expected).

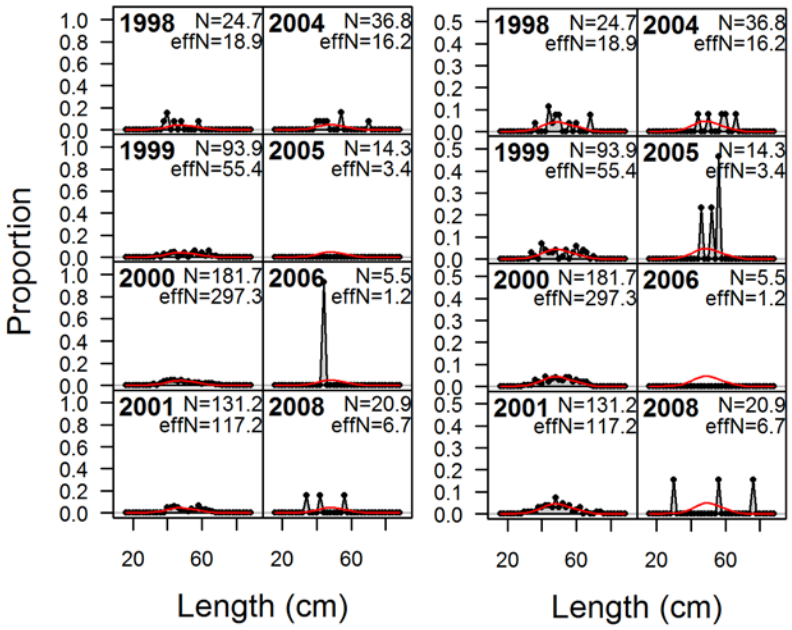



Figure 39. Fit to the Washington recreational female (left panels) and male (right panels) length frequencies.

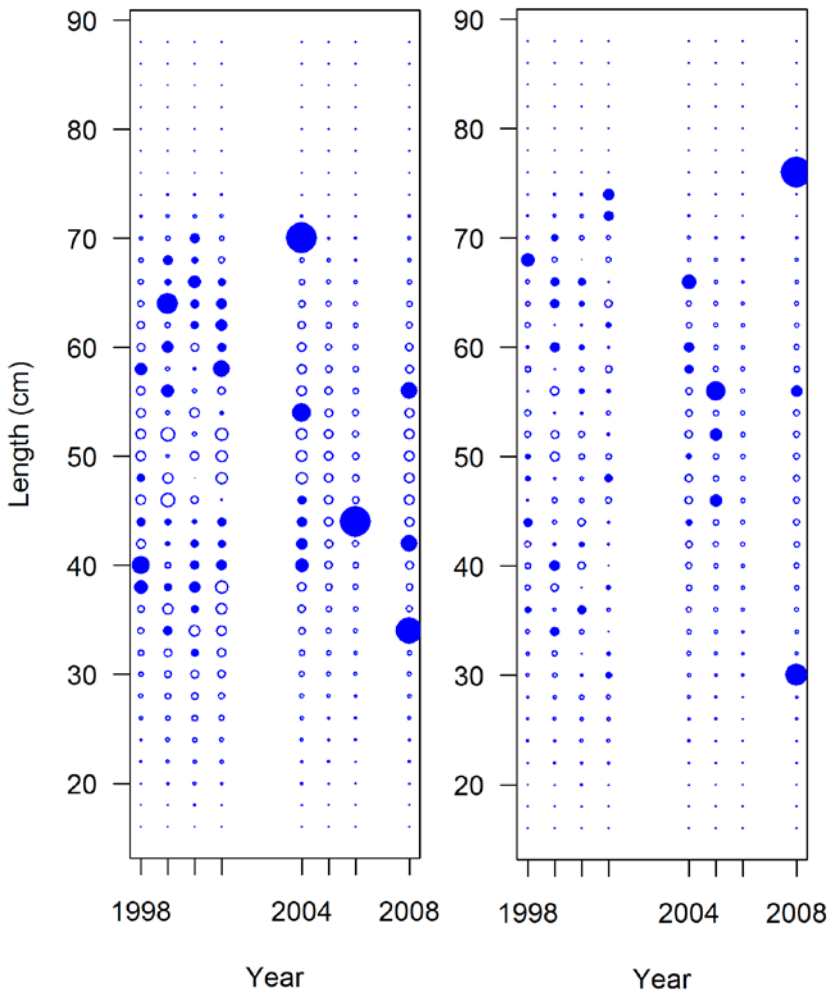



Figure 40. Pearson residuals for the fit to Washington recreational female (upper panel, maximum = 10.72) and male (lower panel, maximum = 22.6) length frequencies. Filled circles represent positive residuals (observed – expected).

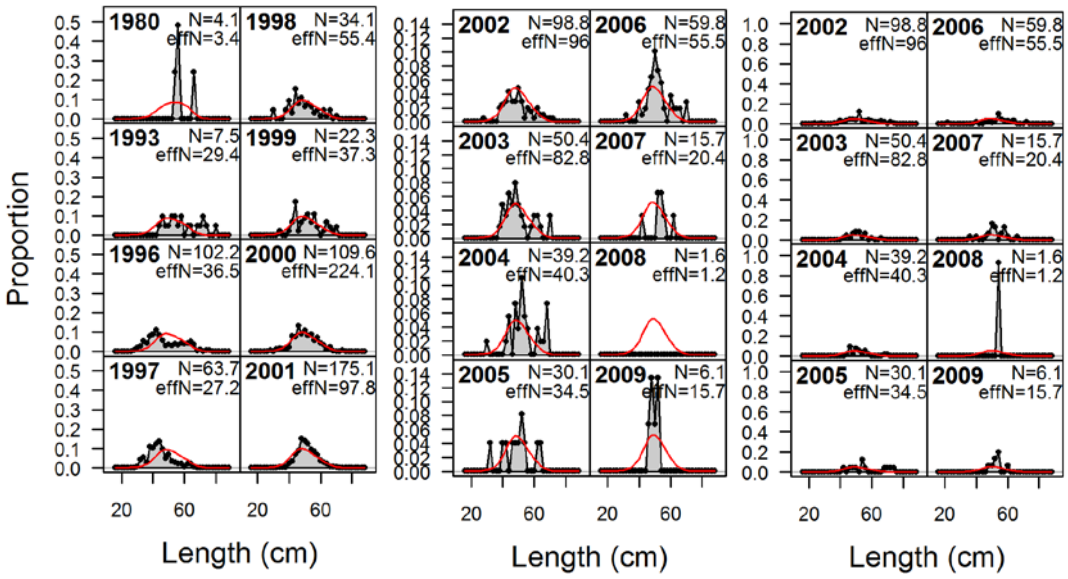



Figure 41. Fit to the Washington commercial sexes-combined (left), females (center) and males (right) length frequencies.

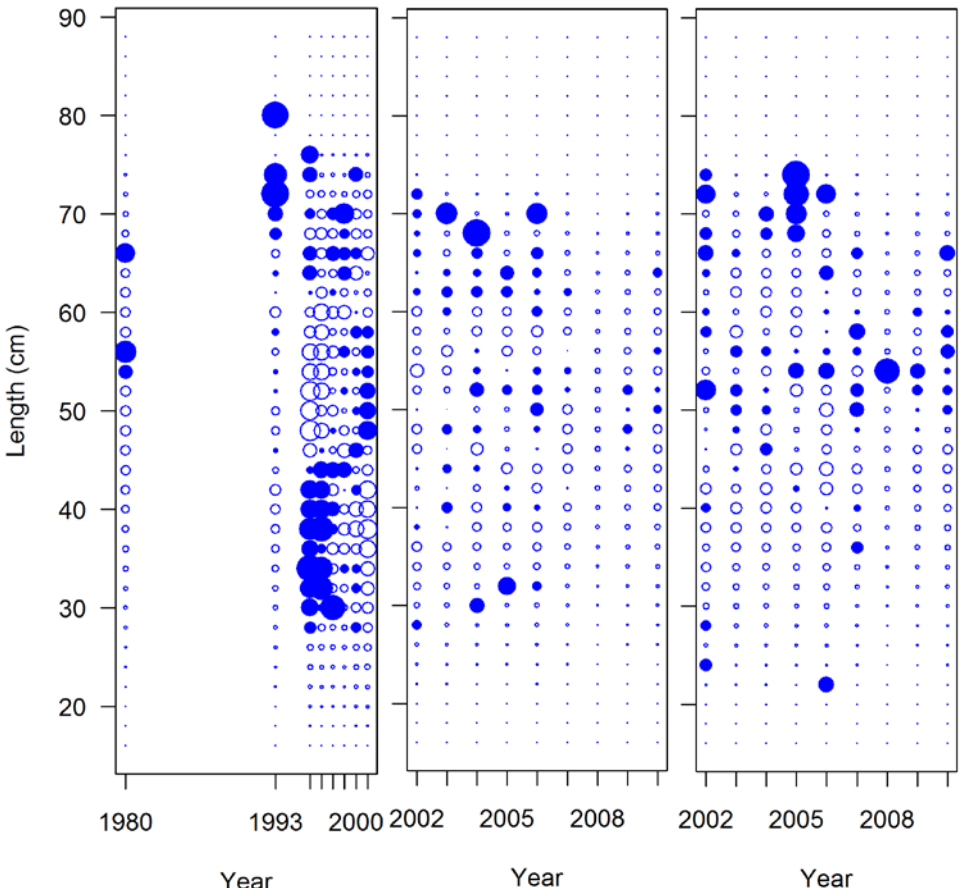



Figure 42. Pearson residuals for the fit to Washington commercial length frequencies for combined sex (left), females (center), and males (right), (maxima = 4.58, 7,79, and 6.46, respectively). Filled circles represent positive residuals (observed – expected).

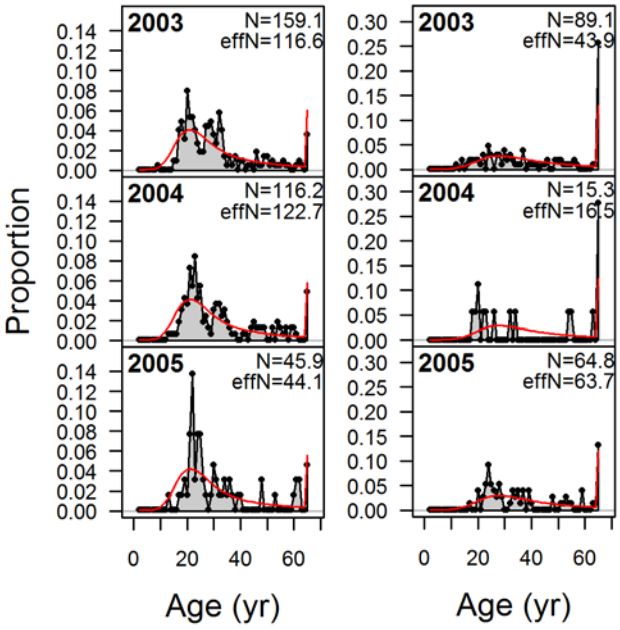



Figure 43. Fit to the Oregon (left panel) and Washington (right panel) IPHC sexes-combined age frequencies.

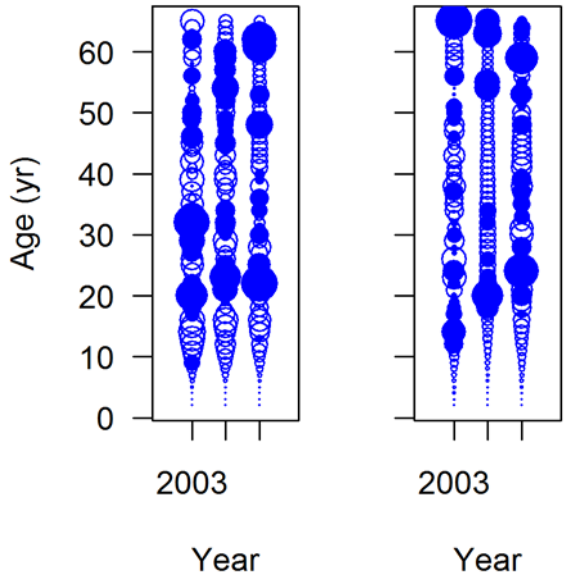



Figure 44. Pearson residuals for the fit to the Oregon (upper panel, maximum = 3.23) and Washington (lower panel, maximum = 3.6) IPHC sexes-combined age frequencies. Filled circles represent positive residuals (observed – expected).

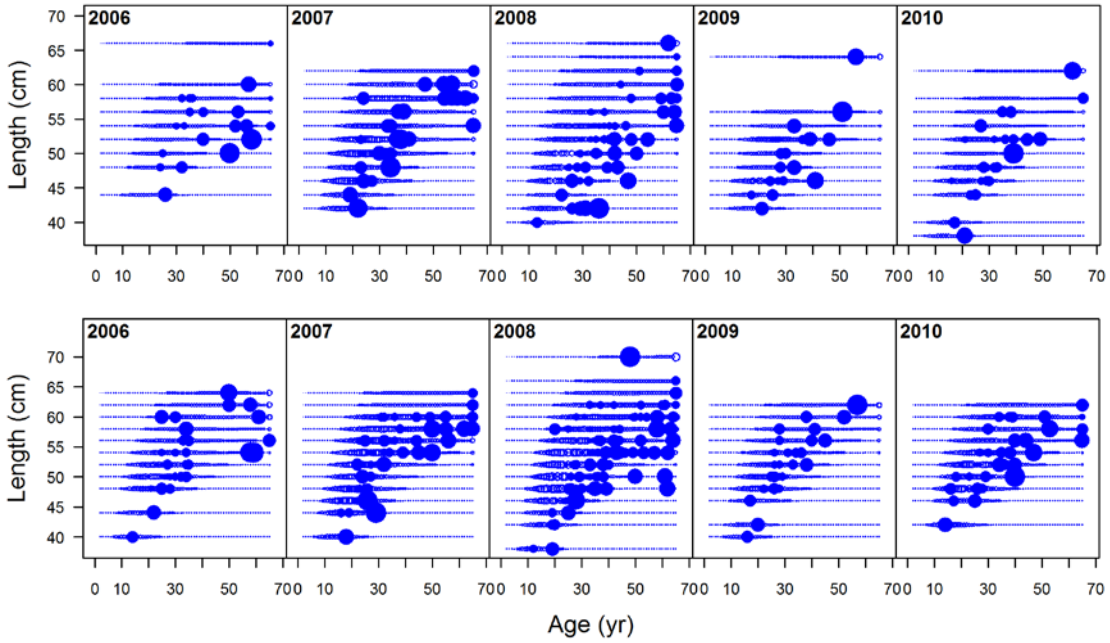



Figure 45. Pearson residuals for the fit to the Oregon female (upper panels, maximum = 12.41) and male (lower panels, maximum = 9.04) IPHC age frequencies. Filled circles

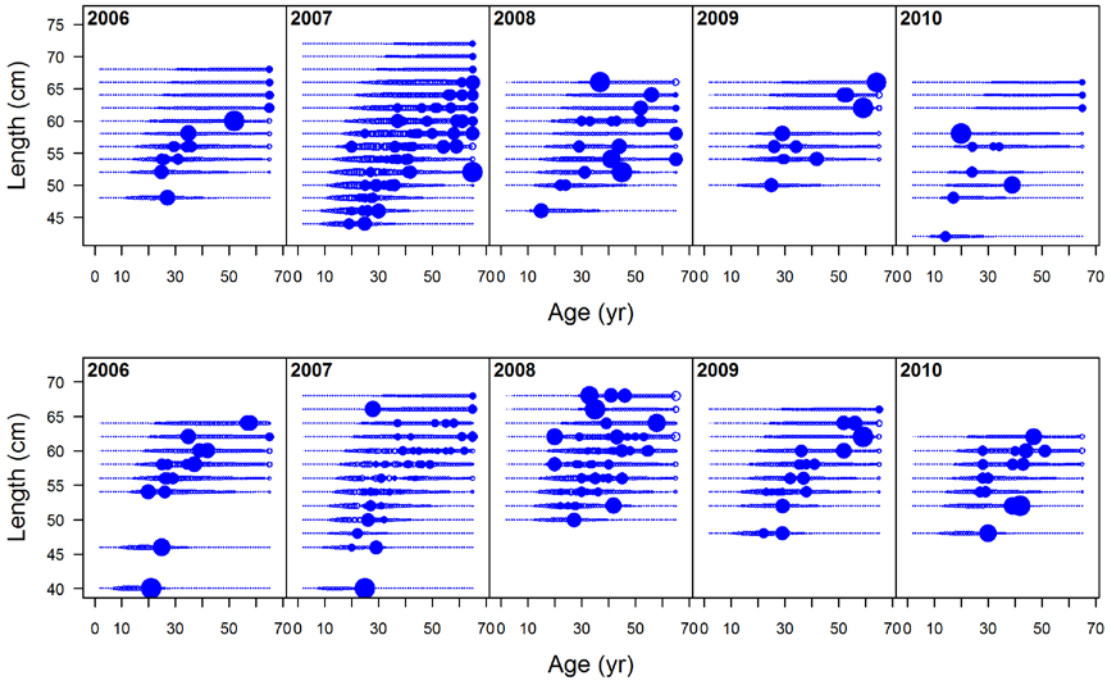



Figure 46. Pearson residuals for the fit to the Washington female (left panels, maximum = 12.99) and male (right panels, maximum = 12.98) IPHC age frequencies. Filled circles represent positive residuals (observed – expected).

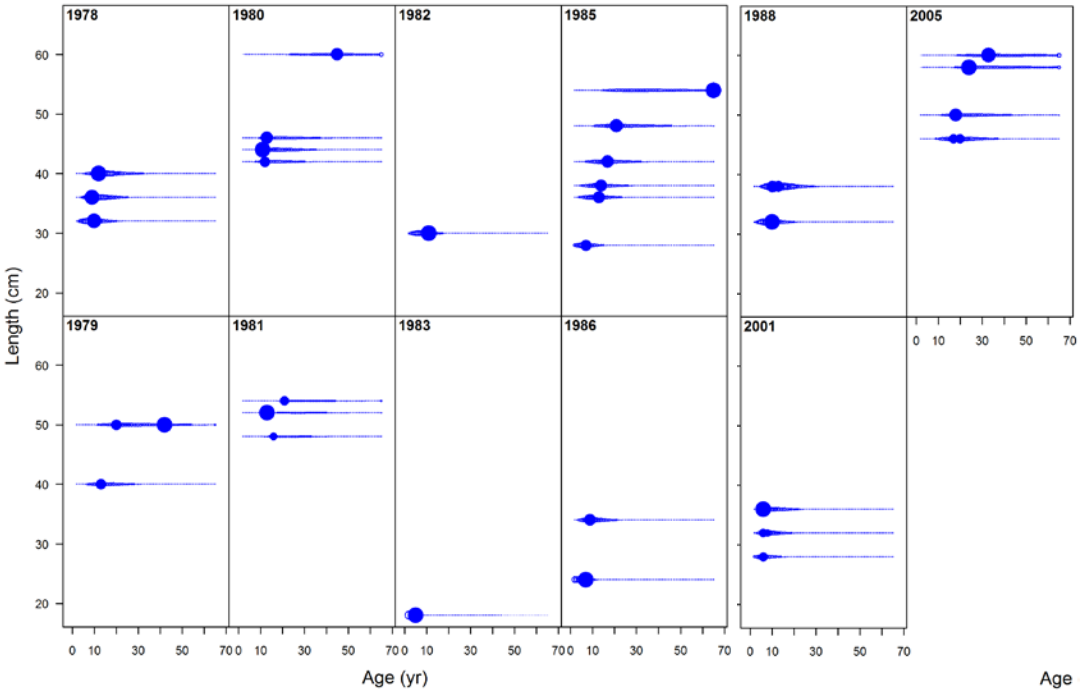



Figure 47. Pearson residuals for the fit to the California commercial female (maximum = 20.12) age frequencies. Filled circles represent positive residuals (observed – expected).

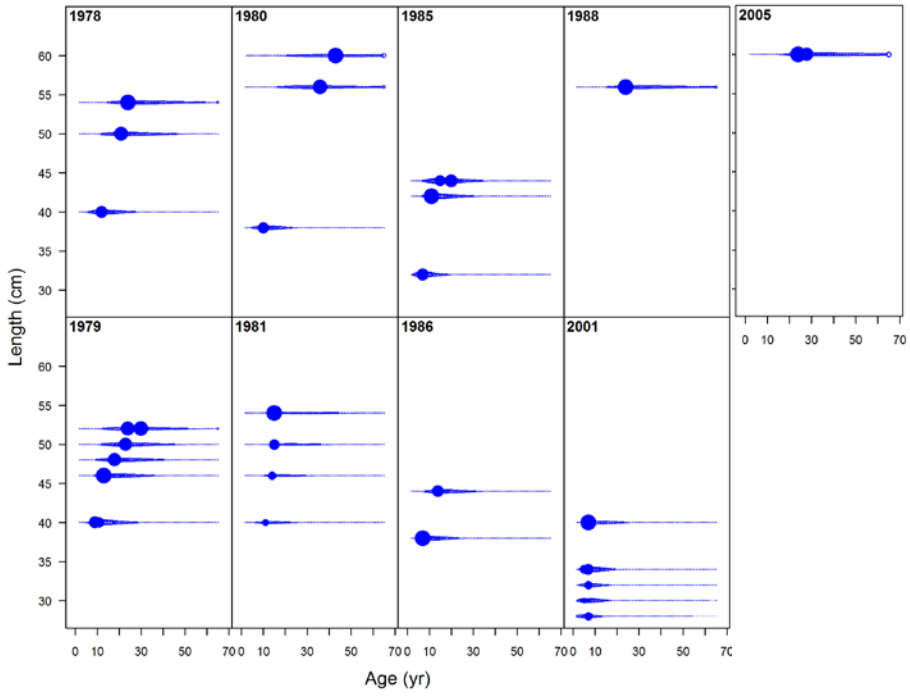



Figure 48. Pearson residuals for the fit to the California commercial male (maximum = 15.63) age frequencies. Filled circles represent positive residuals (observed – expected).

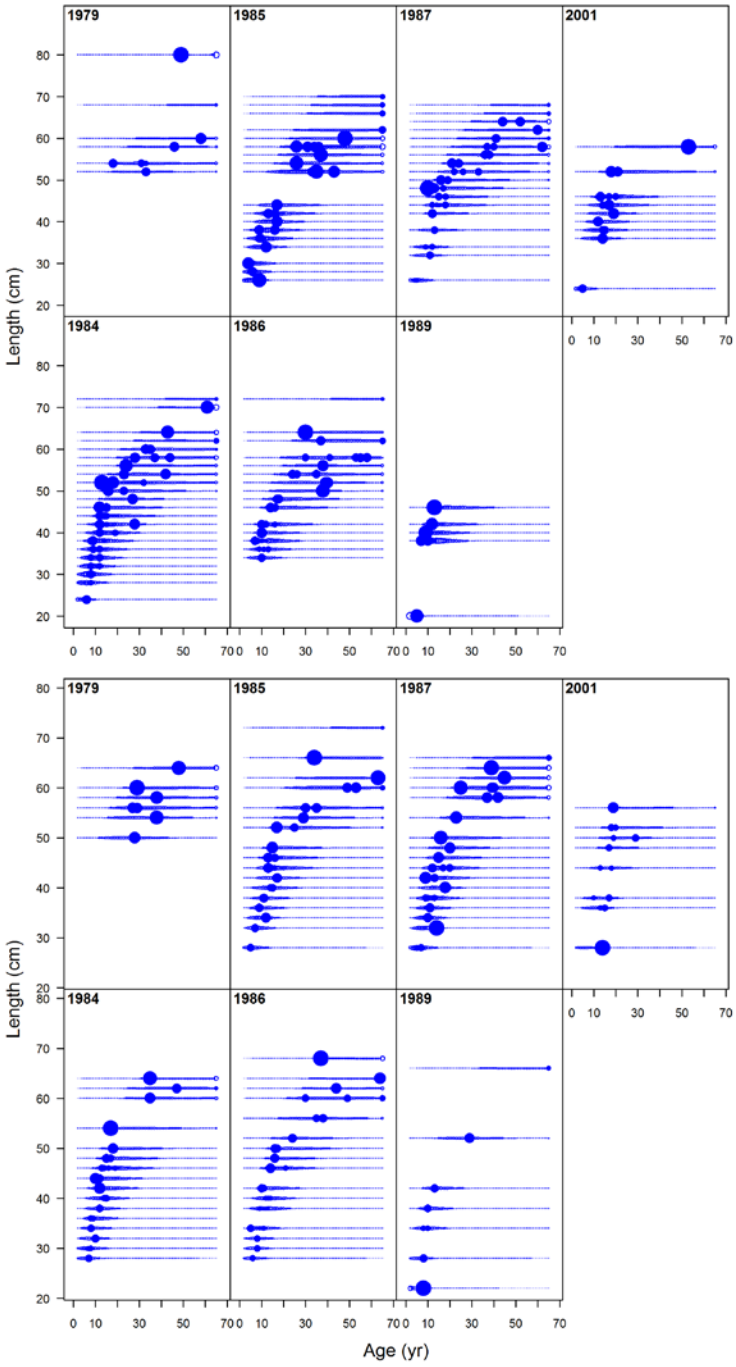



Figure 49. Pearson residuals for the fit to the Oregon recreational female (upper panels, maximum = 14.32) and male (lower panels, maximum = 16.7) age frequencies. Filled circles represent positive residuals (observed – expected).

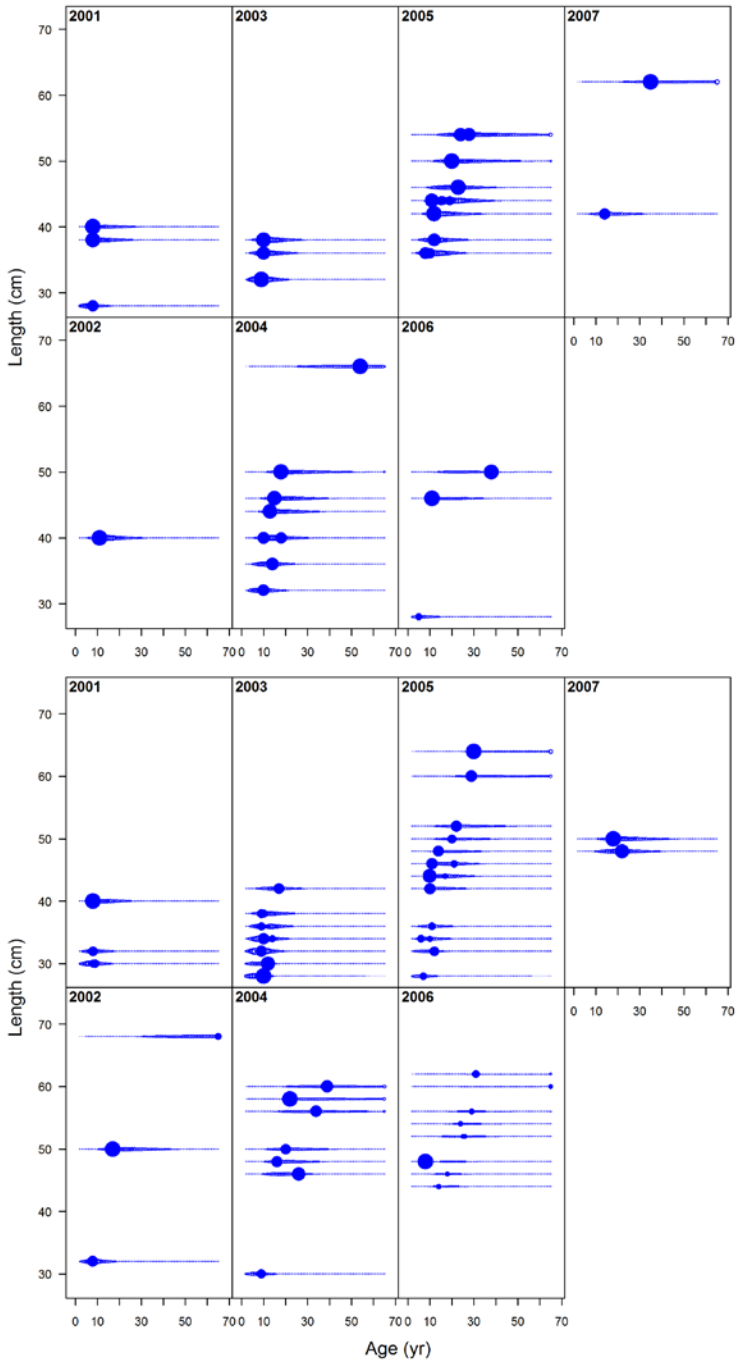



Figure 50. Pearson residuals for the fit to the Oregon commercial female (upper panels, maximum = 10.24) and male (lower panels, maximum = 28.72) age frequencies. Filled circles represent positive residuals (observed – expected).

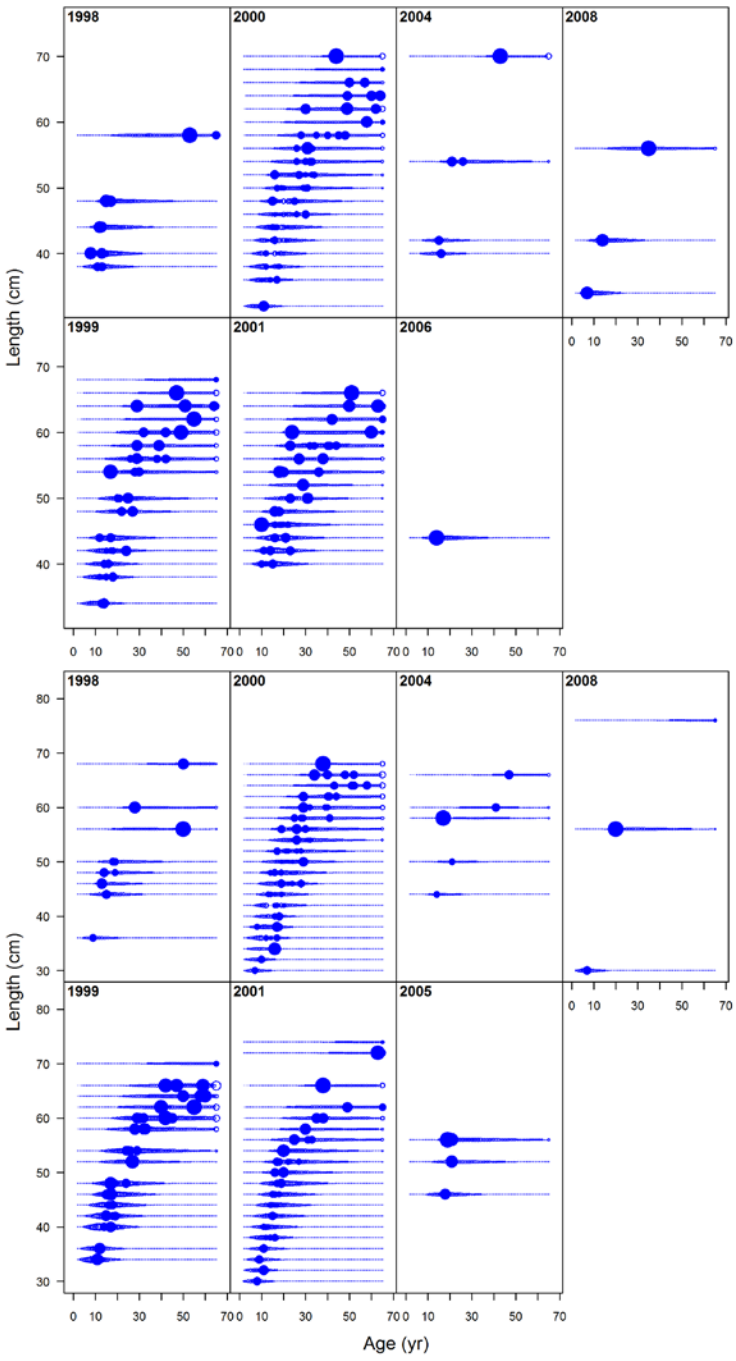



Figure 51. Pearson residuals for the fit to the Washington recreational female (upper panels, maximum = 9.38) and male (lower panels, maximum = 18.77) age frequencies. Filled circles represent positive residuals (observed – expected).

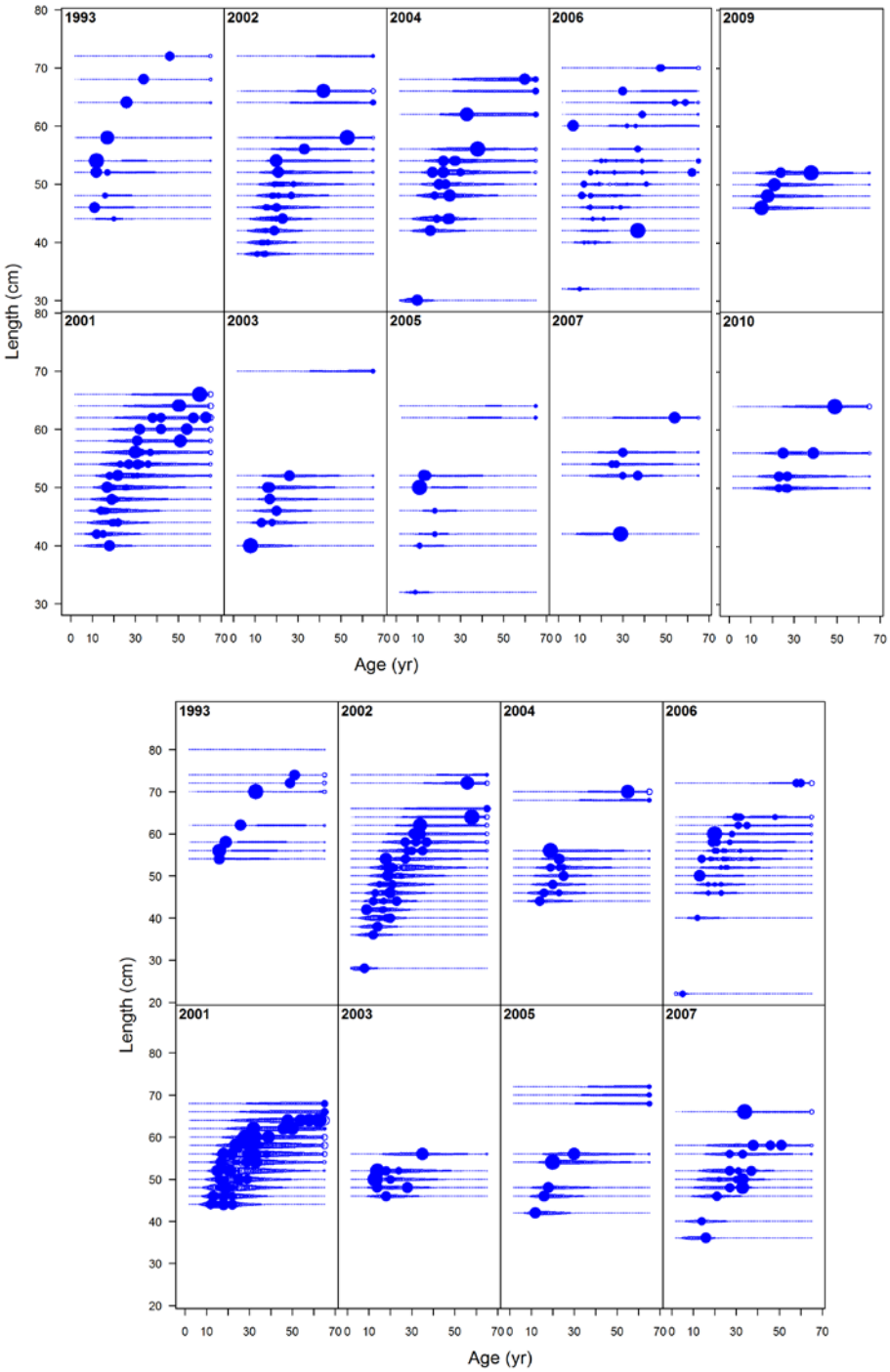



Figure 52. Pearson residuals for the fit to the Washington commercial female (upper panels, maximum =28.57) and male (lower panels, maximum = 20.77) age frequencies. Filled circles represent positive residuals (observed – expected).

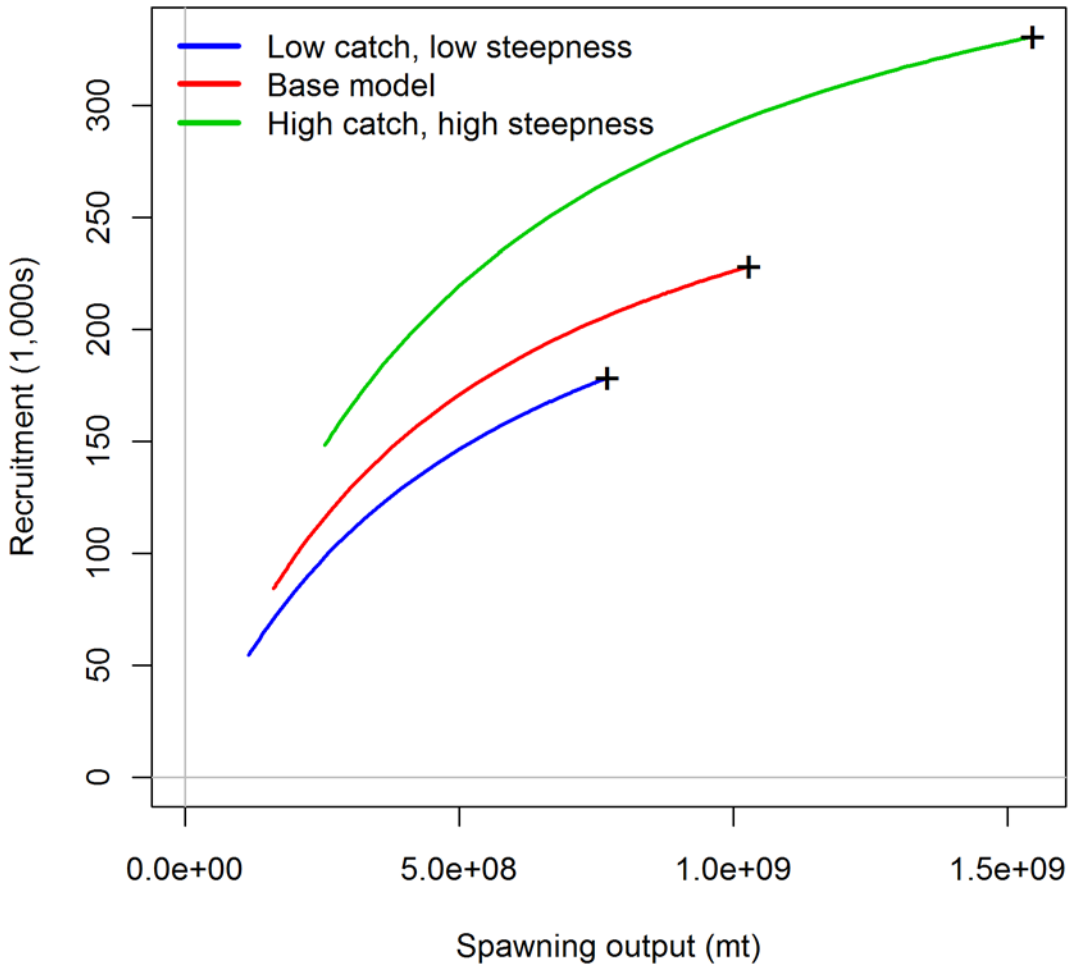



Figure 53. Estimated stock-recruit function for the base-case model, and alternate states of nature. Plus signs indicate estimate equilibrium values.

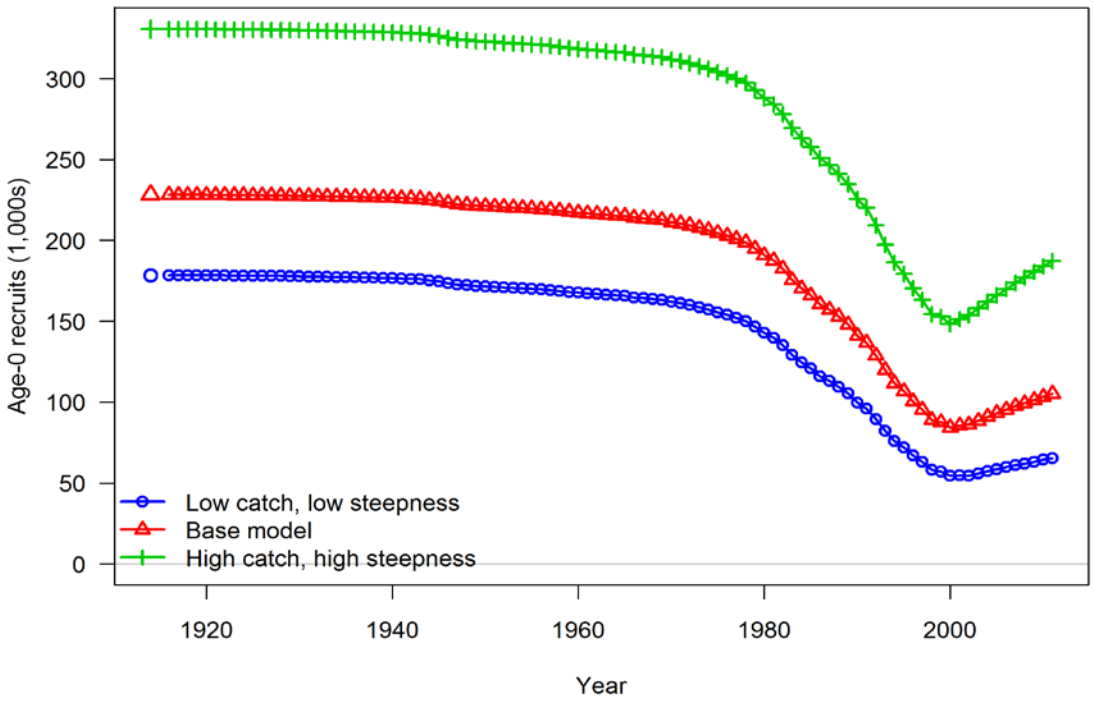



Figure 54. Time series of estimated yelloweye rockfish recruitments for the base-case model and alternate states of nature. Disconnected points at left indicate equilibrium.

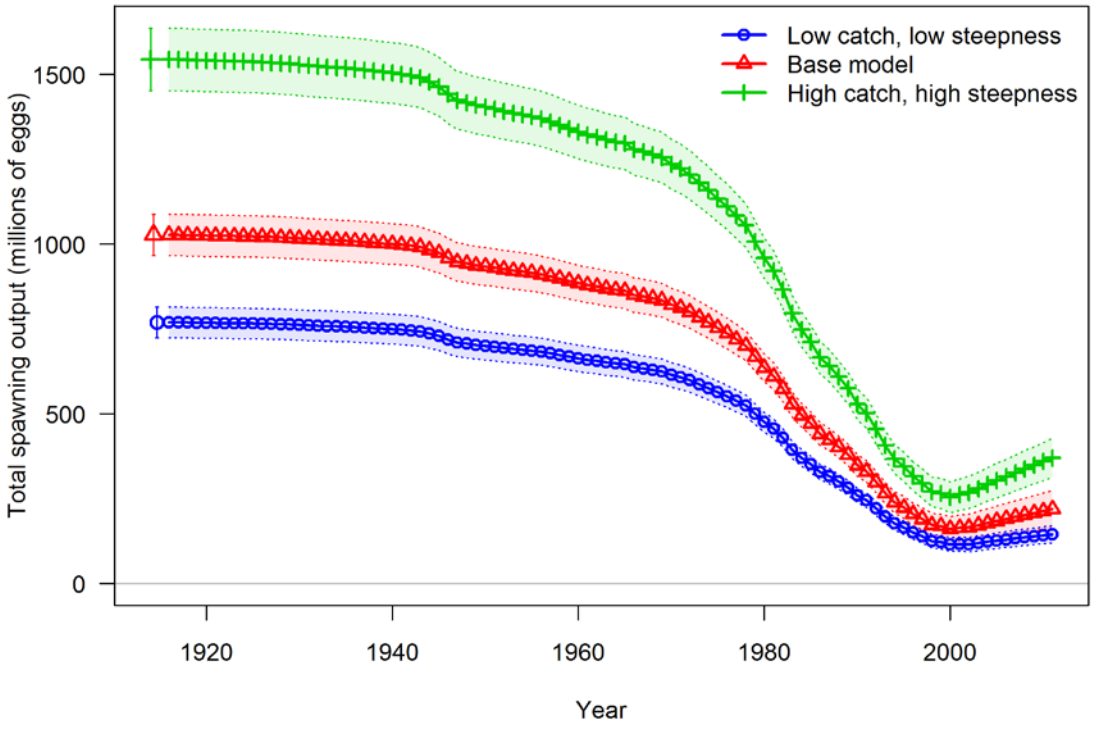



Figure 55. Estimated spawning output time-series (1916-2011) for the base-case model and alternate states of nature. Disconnected points at left indicate equilibrium.

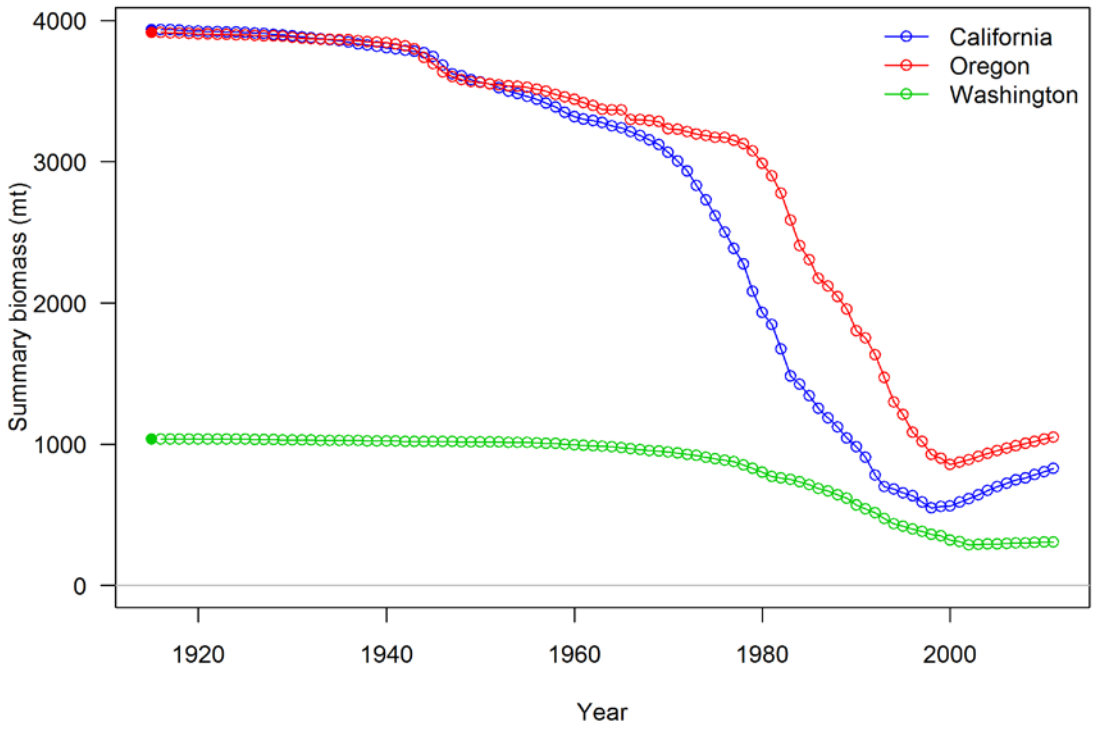



Figure 56. Estimated summary biomass (age-8+) time-series (1916-2011) by state for the base-case model.

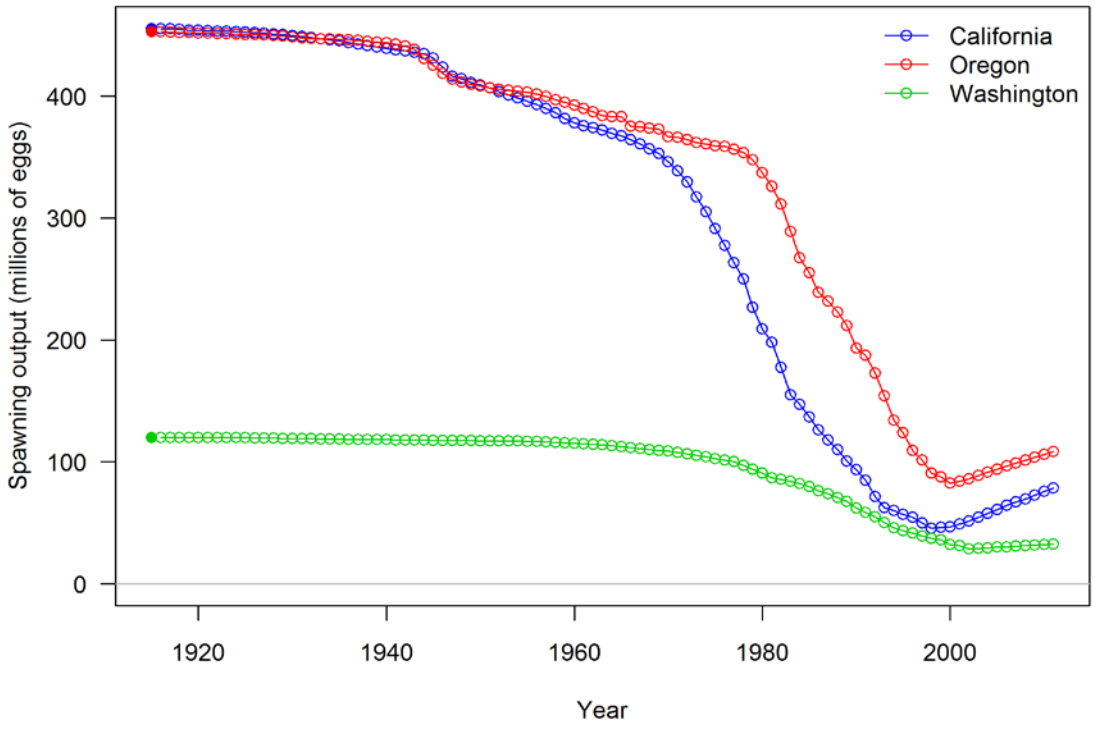



Figure 57. Estimated spawning output time-series (1916-2011) by state for the base-case model.

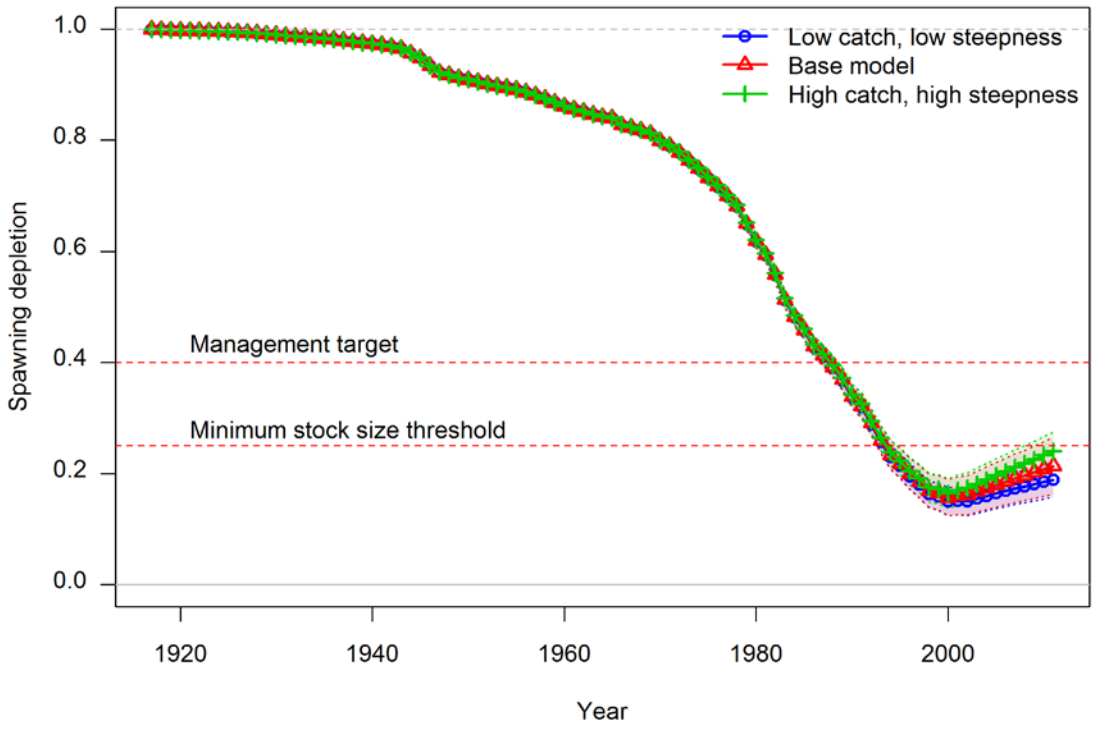



Figure 58. Time series of relative spawning depletion as estimated in the base-case model and alternate states of nature. Light shading around each line shows 95% intervals.

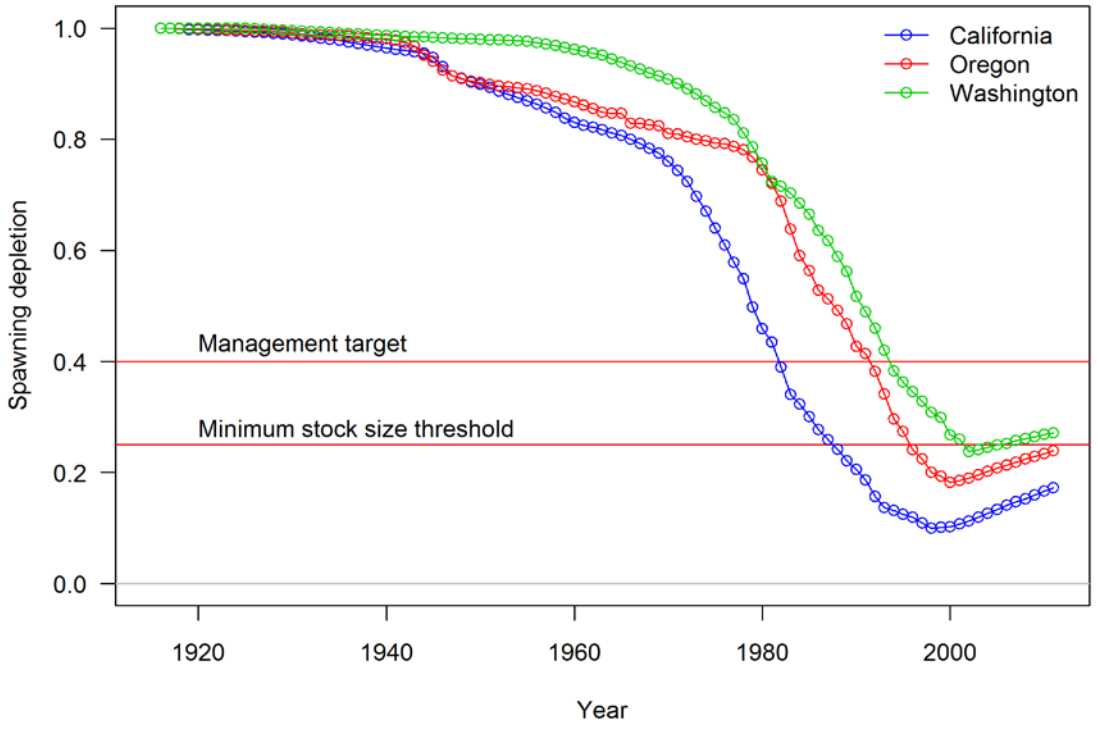



Figure 59. Time-series of relative spawning depletion by state for the base-case model.

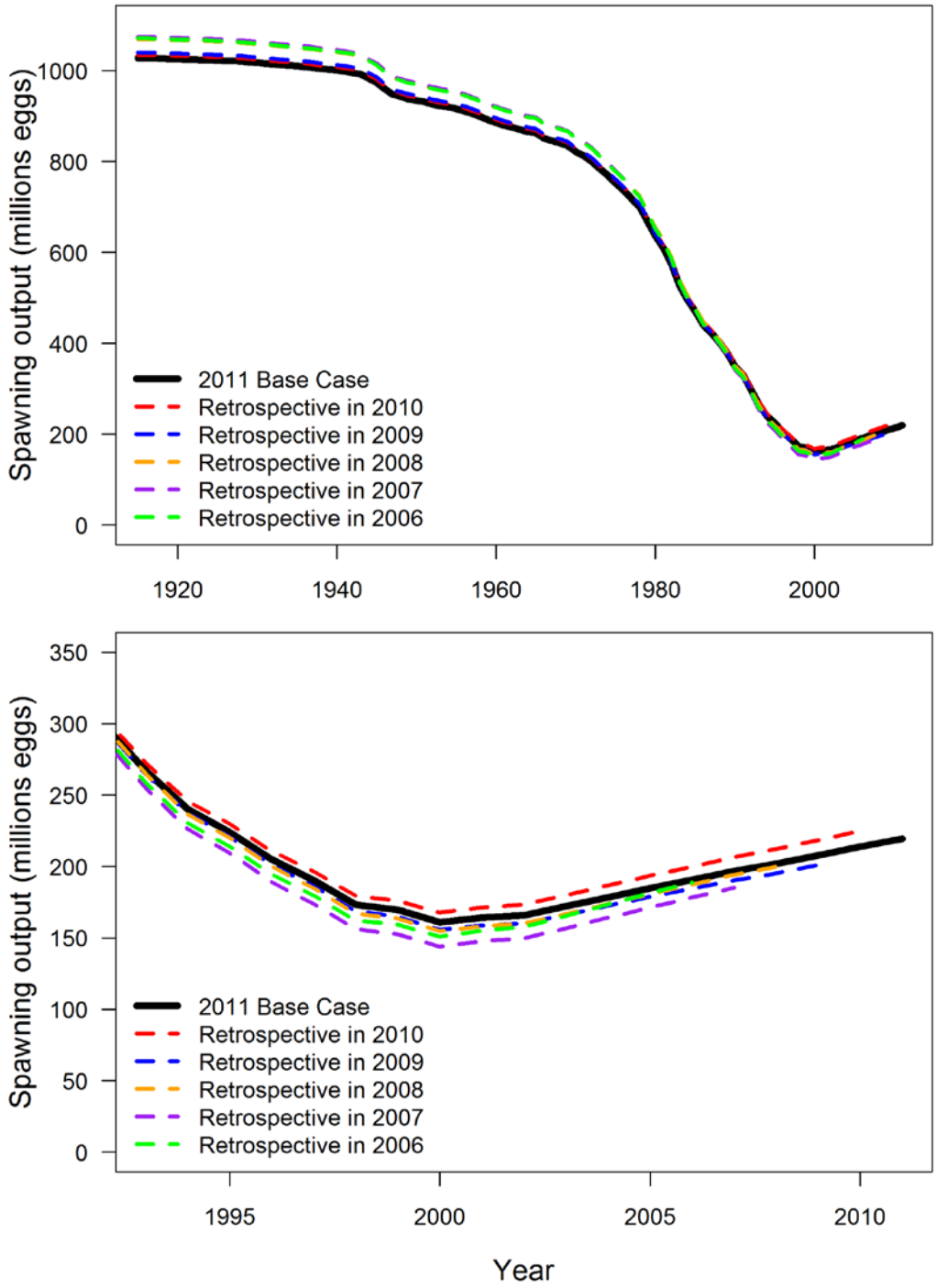



Figure 60. Results from a 5-year retrospective analysis. Each year of retrospective is performed as if the assessment were conducted in that year (i.e., retrospective in 2006 includes data through 2005). Upper panel represents the entire time-series of spawning output, lower panel only the most recent period for easier identification of effects on current status.

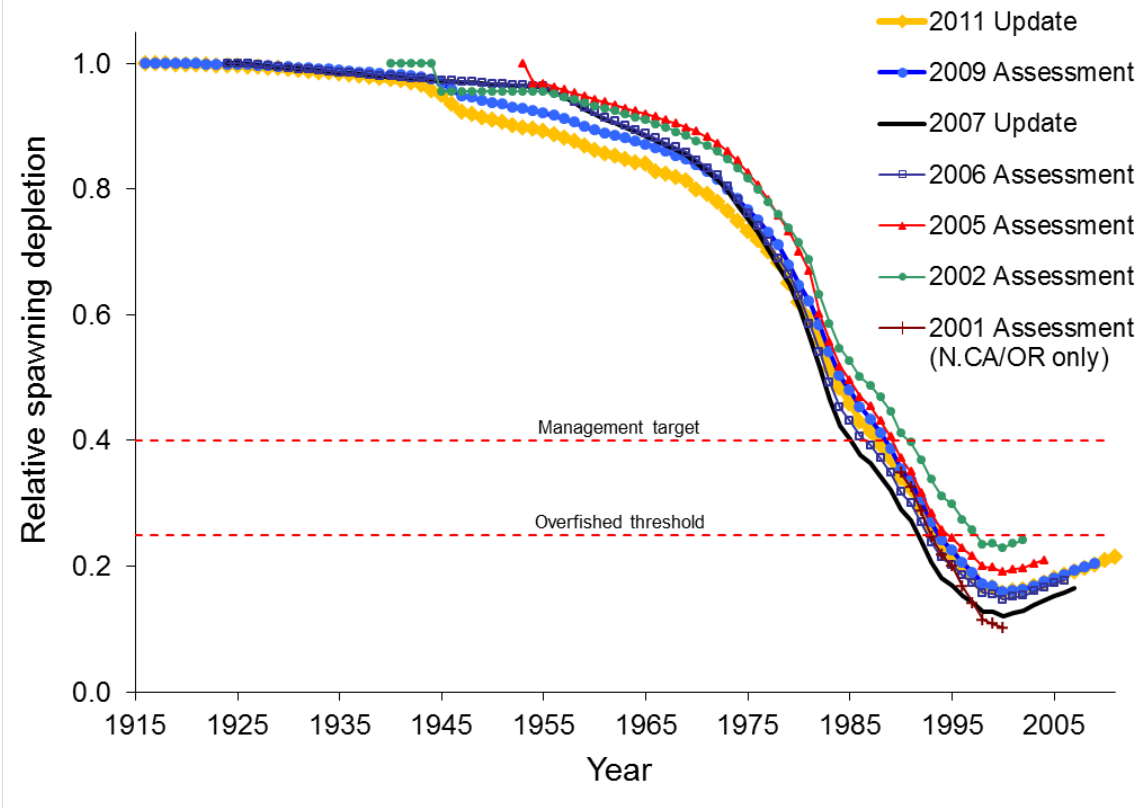



Figure 61. Retrospective pattern in relative depletion among yelloweye rockfish stock assessments.

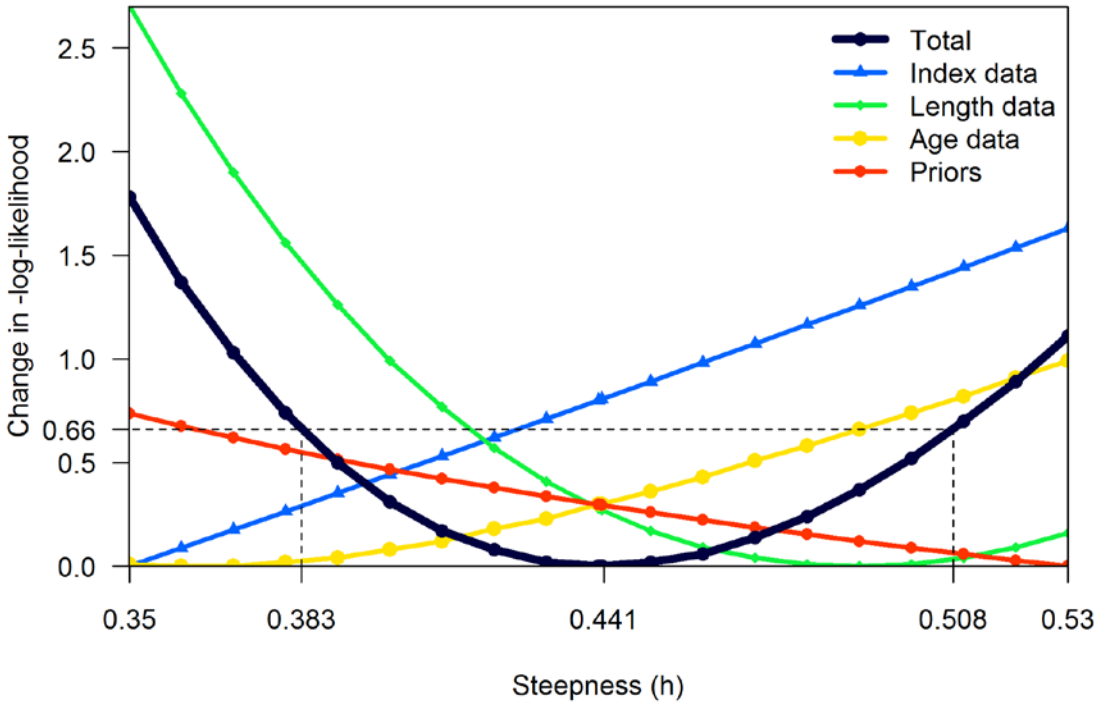



Figure 62. Results of a likelihood profile for steepness of the stock-recruit function, by data type. Dashed lines indicate interval used for low and high states of nature.

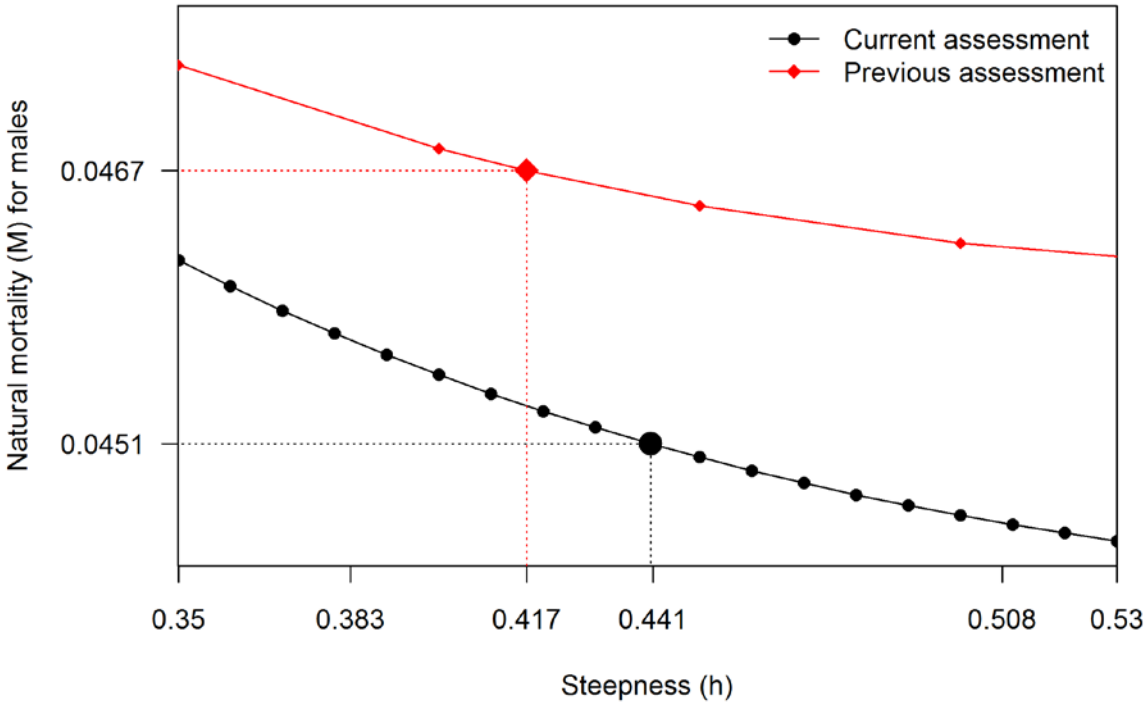



Figure 63. Relationship between steepness and estimated male natural mortality from the likelihood profile on steepness for the 2011 and 2009 assessments. Larger points and dashed lines indicate estimated values for each model.

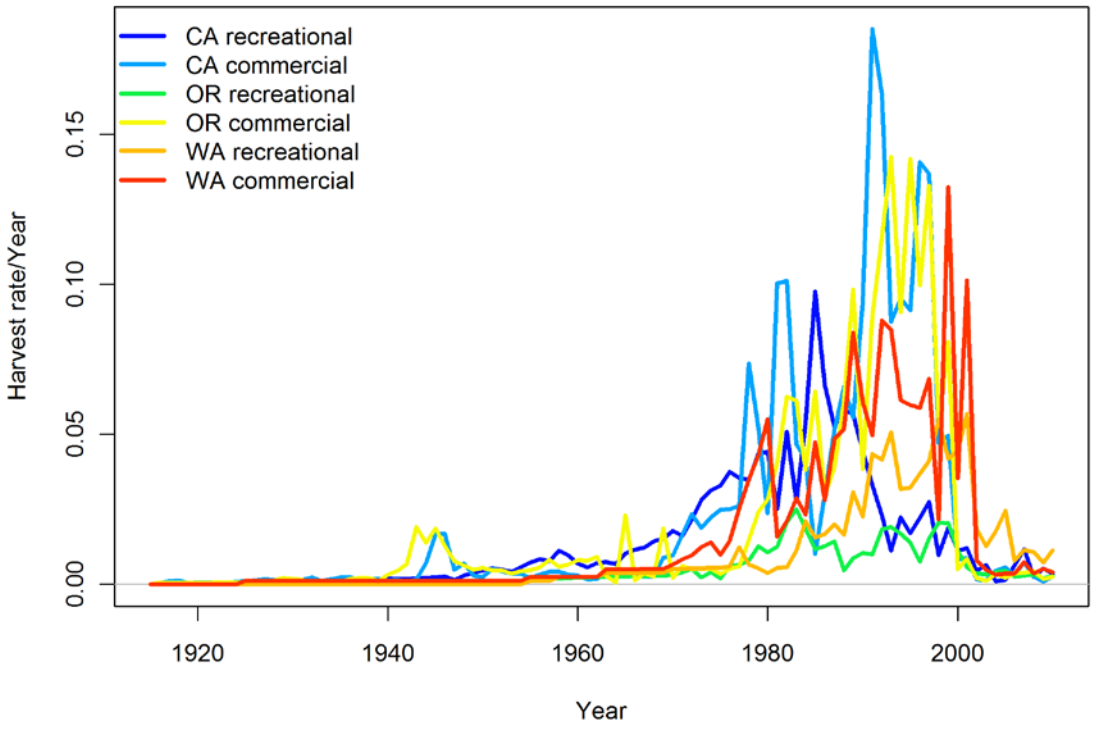



Figure 64. Time-series of harvest rate per year ($F$) for the fishing fleets in the base-case model.

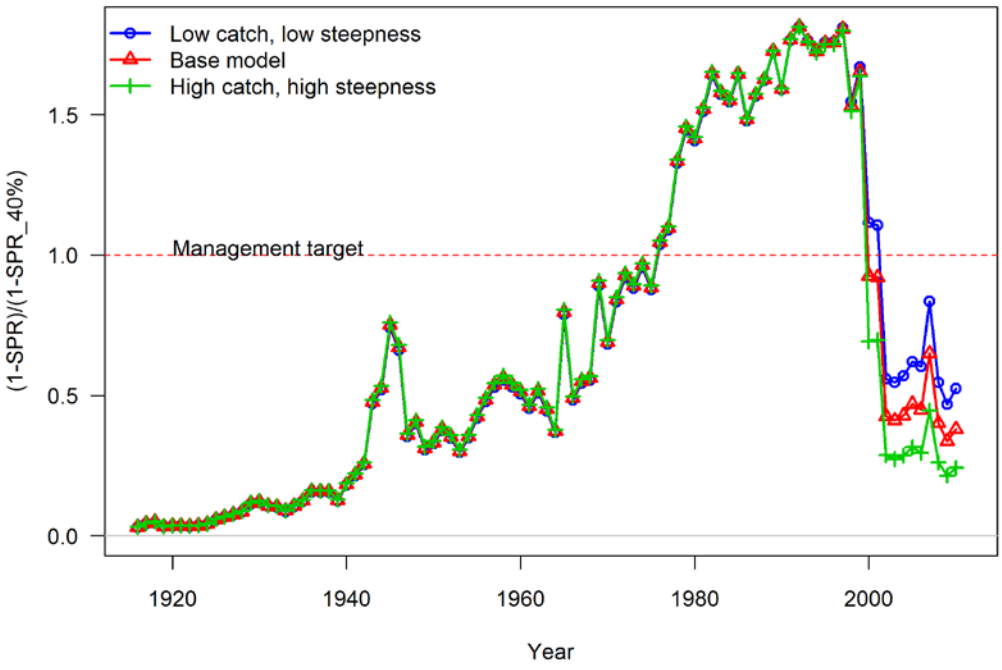



Figure 65. Time series of relative spawning potential ratio (1-SPR/1-$SPR_{Target=0.5}$) for the base-case model and alternate states of nature. Values of relative SPR above 100% reflect harvests in excess of the current overfishing proxy.

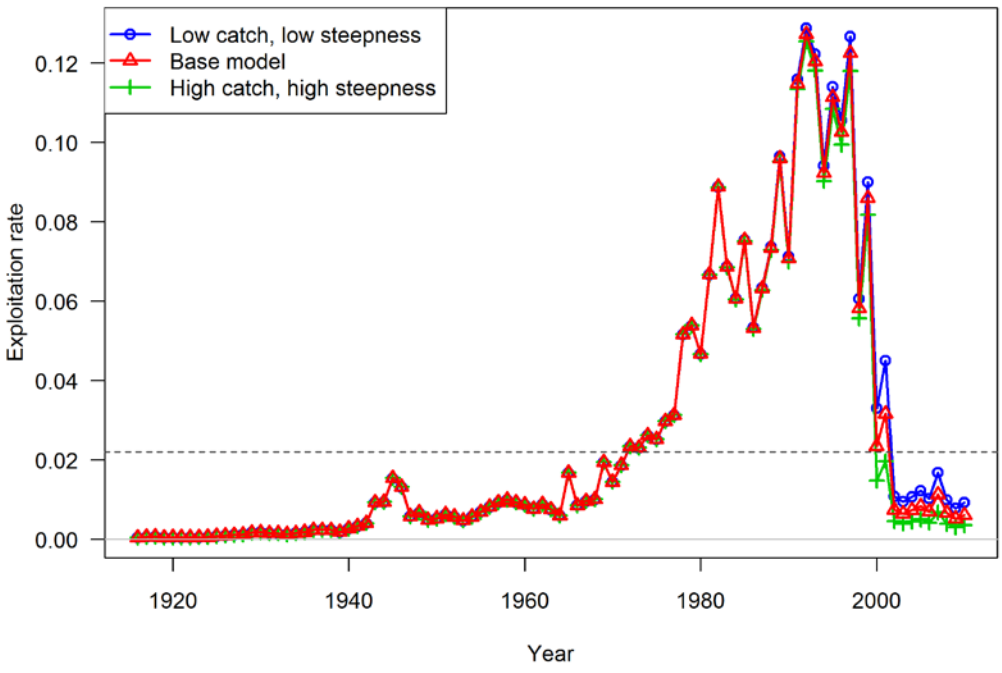



Figure 66. Time series of estimated exploitation rate (catch/age 8 and older biomass) for the base-case model and alternate states of nature. Horizontal line indicates the overfishing limit/target ($F_{50\%}$) from the base case.

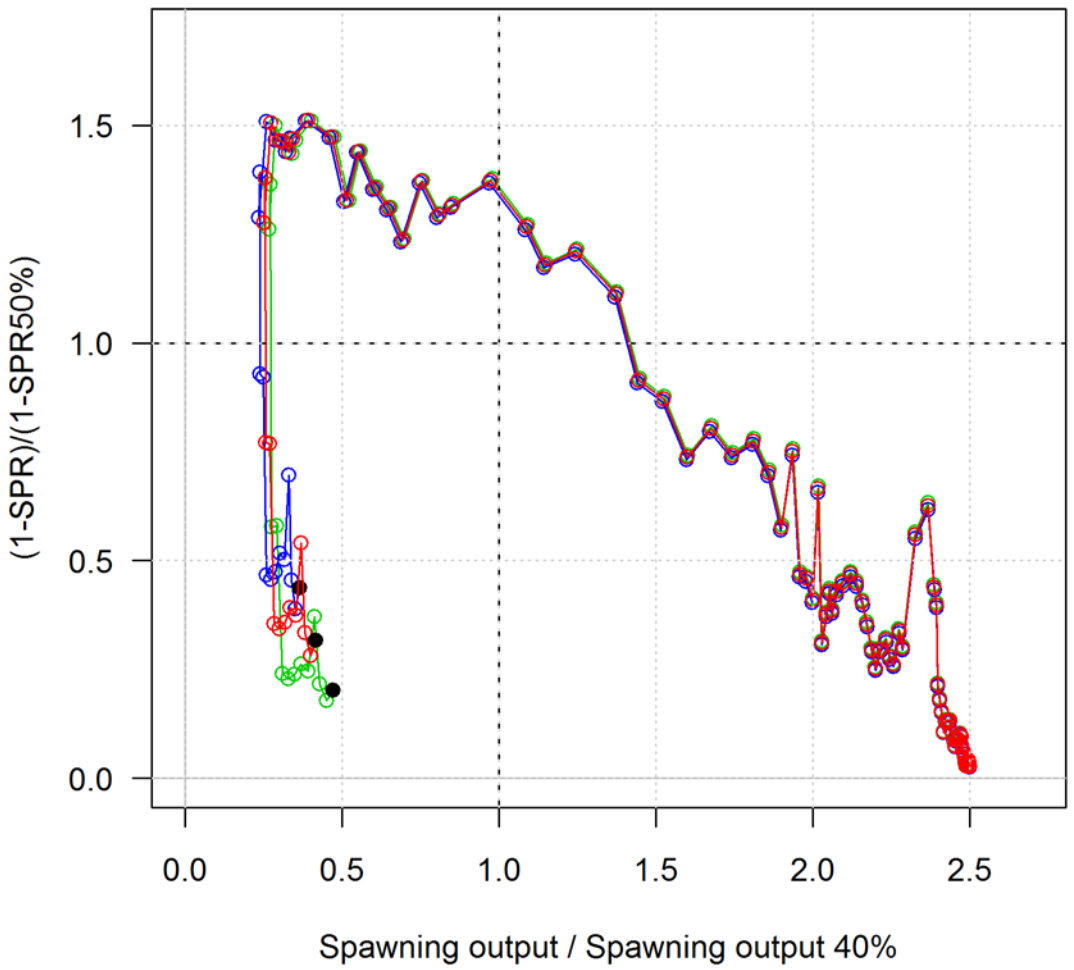



Figure 67. Estimated relative spawning potential ratio relative to the proxy target/limit of 50% vs. estimated spawning biomass relative to the proxy 40% level from the base-case model. Higher biomass occurs on the right side of the x-axis, higher exploitation rates occur on the upper side of the y-axis.

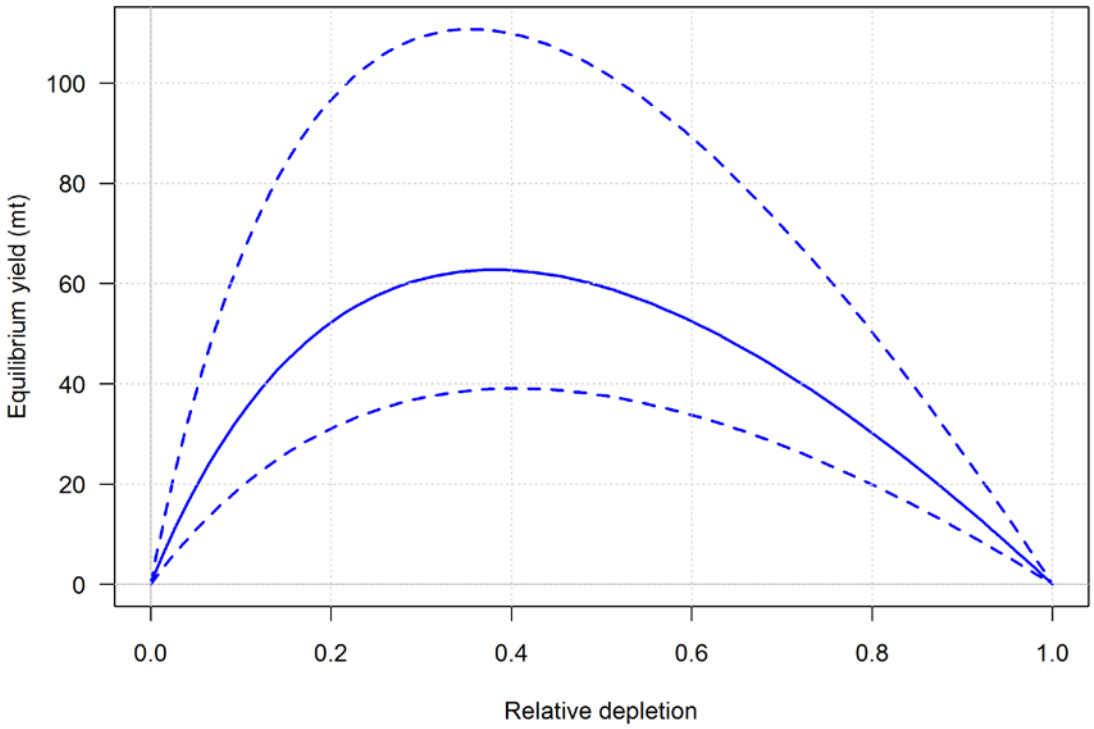



Figure 68. Equilibrium yield curve for the base-case model (solid line) and alternate states of nature (dashed lines).

12. Appendix A: Predicted numbers at age by sex and area

Table A.1. Female numbers at age in California (1000s) predicted by the base-case model.

| Age (Yr) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1916 | 49.8 | 47.6 | 45.4 | 43.4 | 41.4 | 39.5 | 37.8 | 36.1 | 34.4 | 32.9 | 257.5 | 162.5 | 102.5 | 64.7 | 40.8 | 25.7 | 16.2 | 10.2 | 17.5 |
| 1917 | 49.8 | 47.6 | 45.4 | 43.4 | 41.4 | 39.5 | 37.8 | 36.1 | 34.4 | 32.9 | 257.5 | 162.4 | 102.4 | 64.6 | 40.8 | 25.7 | 16.2 | 10.2 | 17.5 |
| 1918 | 49.8 | 47.5 | 45.4 | 43.4 | 41.4 | 39.5 | 37.8 | 36.1 | 34.4 | 32.9 | 257.3 | 162.2 | 102.3 | 64.6 | 40.7 | 25.7 | 16.2 | 10.2 | 17.5 |
| 1919 | 49.8 | 47.5 | 45.4 | 43.4 | 41.4 | 39.5 | 37.8 | 36.1 | 34.4 | 32.9 | 257.2 | 162.1 | 102.2 | 64.5 | 40.7 | 25.7 | 16.2 | 10.2 | 17.5 |
| 1920 | 49.8 | 47.5 | 45.4 | 43.4 | 41.4 | 39.5 | 37.8 | 36.1 | 34.4 | 32.9 | 257.1 | 162 | 102.2 | 64.4 | 40.7 | 25.6 | 16.2 | 10.2 | 17.4 |
| 1921 | 49.8 | 47.5 | 45.4 | 43.4 | 41.4 | 39.5 | 37.8 | 36.1 | 34.4 | 32.9 | 257.1 | 161.9 | 102.1 | 64.4 | 40.6 | 25.6 | 16.2 | 10.2 | 17.4 |
| 1922 | 49.7 | 47.5 | 45.4 | 43.3 | 41.4 | 39.5 | 37.8 | 36.1 | 34.4 | 32.9 | 257 | 161.8 | 102 | 64.4 | 40.6 | 25.6 | 16.2 | 10.2 | 17.4 |
| 1923 | 49.7 | 47.5 | 45.4 | 43.3 | 41.4 | 39.5 | 37.8 | 36.1 | 34.4 | 32.9 | 257 | 161.8 | 102 | 64.3 | 40.6 | 25.6 | 16.1 | 10.2 | 17.4 |
| 1924 | 49.7 | 47.5 | 45.4 | 43.3 | 41.4 | 39.5 | 37.7 | 36.1 | 34.4 | 32.9 | 257 | 161.7 | 101.9 | 64.3 | 40.6 | 25.6 | 16.1 | 10.2 | 17.4 |
| 1925 | 49.7 | 47.5 | 45.4 | 43.3 | 41.4 | 39.5 | 37.7 | 36 | 34.4 | 32.9 | 256.9 | 161.6 | 101.8 | 64.2 | 40.5 | 25.6 | 16.1 | 10.2 | 17.4 |
| 1926 | 49.7 | 47.5 | 45.4 | 43.3 | 41.4 | 39.5 | 37.7 | 36 | 34.4 | 32.9 | 256.9 | 161.5 | 101.7 | 64.2 | 40.5 | 25.5 | 16.1 | 10.2 | 17.4 |
| 1927 | 49.7 | 47.5 | 45.3 | 43.3 | 41.4 | 39.5 | 37.7 | 36 | 34.4 | 32.9 | 256.8 | 161.3 | 101.6 | 64.1 | 40.4 | 25.5 | 16.1 | 10.1 | 17.3 |
| 1928 | 49.7 | 47.5 | 45.3 | 43.3 | 41.4 | 39.5 | 37.7 | 36 | 34.4 | 32.8 | 256.6 | 161.1 | 101.5 | 64 | 40.4 | 25.5 | 16.1 | 10.1 | 17.3 |
| 1929 | 49.7 | 47.4 | 45.3 | 43.3 | 41.3 | 39.5 | 37.7 | 36 | 34.4 | 32.8 | 256.5 | 161 | 101.3 | 63.9 | 40.3 | 25.4 | 16 | 10.1 | 17.3 |
| 1930 | 49.6 | 47.4 | 45.3 | 43.3 | 41.3 | 39.5 | 37.7 | 36 | 34.4 | 32.8 | 256.3 | 160.8 | 101.2 | 63.8 | 40.2 | 25.4 | 16 | 10.1 | 17.3 |
| 1931 | 49.6 | 47.4 | 45.3 | 43.3 | 41.3 | 39.5 | 37.7 | 36 | 34.4 | 32.8 | 256.1 | 160.5 | 100.9 | 63.6 | 40.1 | 25.3 | 16 | 10.1 | 17.2 |
| 1932 | 49.6 | 47.4 | 45.3 | 43.2 | 41.3 | 39.5 | 37.7 | 36 | 34.4 | 32.8 | 256 | 160.3 | 100.8 | 63.5 | 40.1 | 25.3 | 15.9 | 10.1 | 17.2 |
| 1933 | 49.6 | 47.4 | 45.2 | 43.2 | 41.3 | 39.4 | 37.7 | 36 | 34.3 | 32.8 | 255.7 | 160 | 100.5 | 63.3 | 39.9 | 25.2 | 15.9 | 10 | 17.1 |
| 1934 | 49.5 | 47.3 | 45.2 | 43.2 | 41.3 | 39.4 | 37.6 | 35.9 | 34.3 | 32.8 | 255.5 | 159.8 | 100.3 | 63.2 | 39.9 | 25.1 | 15.9 | 10 | 17.1 |
| 1935 | 49.5 | 47.3 | 45.2 | 43.2 | 41.2 | 39.4 | 37.6 | 35.9 | 34.3 | 32.8 | 255.3 | 159.5 | 100.1 | 63 | 39.8 | 25.1 | 15.8 | 10 | 17.1 |
| 1936 | 49.5 | 47.3 | 45.2 | 43.2 | 41.2 | 39.4 | 37.6 | 35.9 | 34.3 | 32.7 | 255 | 159.2 | 99.8 | 62.8 | 39.6 | 25 | 15.8 | 9.9 | 17 |
| 1937 | 49.5 | 47.3 | 45.2 | 43.1 | 41.2 | 39.4 | 37.6 | 35.9 | 34.3 | 32.7 | 254.7 | 158.8 | 99.5 | 62.6 | 39.5 | 24.9 | 15.7 | 9.9 | 16.9 |
| 1938 | 49.4 | 47.2 | 45.1 | 43.1 | 41.2 | 39.3 | 37.6 | 35.9 | 34.2 | 32.7 | 254.5 | 158.5 | 99.2 | 62.4 | 39.4 | 24.8 | 15.7 | 9.9 | 16.9 |
| 1939 | 49.4 | 47.2 | 45.1 | 43.1 | 41.2 | 39.3 | 37.5 | 35.8 | 34.2 | 32.7 | 254.2 | 158.2 | 98.9 | 62.2 | 39.2 | 24.7 | 15.6 | 9.8 | 16.8 |
| 1940 | 49.4 | 47.2 | 45.1 | 43.1 | 41.1 | 39.3 | 37.5 | 35.8 | 34.2 | 32.6 | 254.1 | 157.9 | 98.7 | 62 | 39.1 | 24.7 | 15.6 | 9.8 | 16.8 |
| 1941 | 49.3 | 47.2 | 45 | 43 | 41.1 | 39.3 | 37.5 | 35.8 | 34.2 | 32.6 | 253.9 | 157.7 | 98.4 | 61.8 | 39 | 24.6 | 15.5 | 9.8 | 16.7 |
| 1942 | 49.3 | 47.1 | 45 | 43 | 41.1 | 39.3 | 37.5 | 35.8 | 34.2 | 32.6 | 253.7 | 157.4 | 98.2 | 61.7 | 38.9 | 24.5 | 15.5 | 9.8 | 16.7 |
| 1943 | 49.2 | 47.1 | 45 | 43 | 41.1 | 39.2 | 37.5 | 35.8 | 34.2 | 32.6 | 253.6 | 157.3 | 98 | 61.5 | 38.7 | 24.4 | 15.4 | 9.7 | 16.6 |
| 1944 | 49.1 | 47 | 44.9 | 43 | 41 | 39.2 | 37.4 | 35.7 | 34.1 | 32.6 | 253.3 | 157 | 97.7 | 61.3 | 38.6 | 24.3 | 15.4 | 9.7 | 16.6 |
| 1945 | 48.9 | 46.9 | 44.9 | 42.9 | 41 | 39.2 | 37.4 | 35.7 | 34.1 | 32.5 | 252.3 | 155.9 | 96.9 | 60.7 | 38.2 | 24.1 | 15.2 | 9.6 | 16.4 |
| 1946 | 48.7 | 46.7 | 44.7 | 42.8 | 40.9 | 39.1 | 37.3 | 35.6 | 33.9 | 32.3 | 249.8 | 153.5 | 95.2 | 59.6 | 37.5 | 23.7 | 14.9 | 9.4 | 16.1 |
| 1947 | 48.5 | 46.5 | 44.6 | 42.7 | 40.9 | 39 | 37.2 | 35.5 | 33.8 | 32.2 | 247.5 | 151.1 | 93.5 | 58.5 | 36.8 | 23.2 | 14.6 | 9.2 | 15.8 |
| 1948 | 48.4 | 46.3 | 44.4 | 42.6 | 40.8 | 39 | 37.2 | 35.5 | 33.8 | 32.2 | 247.5 | 150.6 | 93 | 58.1 | 36.6 | 23 | 14.5 | 9.2 | 15.7 |
| 1949 | 48.3 | 46.2 | 44.2 | 42.4 | 40.6 | 38.9 | 37.2 | 35.5 | 33.8 | 32.2 | 246.9 | 149.7 | 92.3 | 57.6 | 36.2 | 22.8 | 14.4 | 9.1 | 15.5 |
| 1950 | 48.3 | 46.1 | 44.1 | 42.2 | 40.4 | 38.8 | 37.1 | 35.5 | 33.8 | 32.2 | 246.9 | 149.2 | 91.8 | 57.2 | 36 | 22.7 | 14.3 | 9 | 15.4 |
| 1951 | 48.2 | 46.1 | 44 | 42.1 | 40.3 | 38.6 | 37 | 35.4 | 33.8 | 32.2 | 246.9 | 148.7 | 91.3 | 56.9 | 35.7 | 22.5 | 14.2 | 8.9 | 15.3 |
| 1952 | 48.1 | 46 | 44 | 42 | 40.2 | 38.4 | 36.8 | 35.2 | 33.7 | 32.2 | 246.3 | 147.8 | 90.5 | 56.3 | 35.3 | 22.3 | 14 | 8.9 | 15.1 |
| 1953 | 48 | 45.9 | 43.9 | 42 | 40.1 | 38.4 | 36.6 | 35.1 | 33.6 | 32.1 | 246.1 | 147.2 | 89.9 | 55.9 | 35 | 22.1 | 13.9 | 8.8 | 15 |
| 1954 | 48 | 45.9 | 43.9 | 41.9 | 40.1 | 38.3 | 36.6 | 34.9 | 33.4 | 32 | 245.9 | 146.8 | 89.4 | 55.5 | 34.8 | 21.9 | 13.8 | 8.7 | 14.9 |
| 1955 | 47.9 | 45.8 | 43.8 | 41.9 | 40 | 38.2 | 36.5 | 34.9 | 33.3 | 31.8 | 245.5 | 146.3 | 88.8 | 55 | 34.4 | 21.7 | 13.7 | 8.6 | 14.7 |
| 1956 | 47.8 | 45.8 | 43.7 | 41.8 | 39.9 | 38.2 | 36.4 | 34.8 | 33.2 | 31.7 | 244.9 | 145.8 | 88.2 | 54.6 | 34.1 | 21.5 | 13.5 | 8.5 | 14.6 |
| 1957 | 47.7 | 45.7 | 43.7 | 41.7 | 39.9 | 38.1 | 36.4 | 34.7 | 33.1 | 31.6 | 243.9 | 145 | 87.5 | 54 | 33.7 | 21.2 | 13.4 | 8.4 | 14.4 |

Table A.1. Continued. Female numbers at age in California (1000s) predicted by the base-case model.

| Age (Yr) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1958 | 47.6 | 45.6 | 43.6 | 41.7 | 39.8 | 38 | 36.3 | 34.6 | 33 | 31.5 | 242.9 | 144.3 | 86.7 | 53.4 | 33.4 | 21 | 13.2 | 8.3 | 14.2 |
| 1959 | 47.5 | 45.5 | 43.5 | 41.6 | 39.8 | 38 | 36.2 | 34.5 | 32.9 | 31.4 | 241.4 | 143.2 | 85.7 | 52.7 | 32.9 | 20.7 | 13 | 8.2 | 14 |
| 1960 | 47.4 | 45.3 | 43.4 | 41.5 | 39.7 | 37.9 | 36.2 | 34.5 | 32.9 | 31.3 | 240.3 | 142.4 | 84.9 | 52.1 | 32.5 | 20.4 | 12.8 | 8.1 | 13.8 |
| 1961 | 47.3 | 45.2 | 43.3 | 41.4 | 39.6 | 37.9 | 36.1 | 34.5 | 32.8 | 31.3 | 239.7 | 142.2 | 84.4 | 51.7 | 32.2 | 20.2 | 12.7 | 8 | 13.7 |
| 1962 | 47.2 | 45.1 | 43.2 | 41.3 | 39.5 | 37.8 | 36.1 | 34.4 | 32.8 | 31.3 | 239.6 | 142.2 | 84.2 | 51.4 | 32 | 20 | 12.6 | 8 | 13.6 |
| 1963 | 47.1 | 45 | 43.1 | 41.2 | 39.4 | 37.7 | 36 | 34.4 | 32.8 | 31.3 | 239.3 | 142.1 | 83.9 | 51.1 | 31.7 | 19.9 | 12.5 | 7.9 | 13.5 |
| 1964 | 47 | 44.9 | 43 | 41.1 | 39.3 | 37.6 | 35.9 | 34.3 | 32.7 | 31.2 | 238.6 | 141.7 | 83.4 | 50.6 | 31.4 | 19.7 | 12.4 | 7.8 | 13.3 |
| 1965 | 46.9 | 44.9 | 42.9 | 41 | 39.2 | 37.5 | 35.8 | 34.2 | 32.7 | 31.2 | 238.3 | 141.5 | 83.1 | 50.3 | 31.1 | 19.5 | 12.3 | 7.7 | 13.2 |
| 1966 | 46.7 | 44.8 | 42.8 | 40.9 | 39.1 | 37.4 | 35.7 | 34.1 | 32.6 | 31.1 | 237.4 | 140.8 | 82.5 | 49.8 | 30.7 | 19.2 | 12.1 | 7.6 | 13 |
| 1967 | 46.6 | 44.6 | 42.8 | 40.9 | 39 | 37.3 | 35.6 | 34 | 32.4 | 30.9 | 236.4 | 139.8 | 81.8 | 49.2 | 30.3 | 19 | 11.9 | 7.5 | 12.8 |
| 1968 | 46.5 | 44.5 | 42.6 | 40.8 | 39 | 37.2 | 35.5 | 33.9 | 32.3 | 30.8 | 235.4 | 138.8 | 81.2 | 48.6 | 29.9 | 18.7 | 11.7 | 7.4 | 12.6 |
| 1969 | 46.4 | 44.4 | 42.5 | 40.6 | 38.9 | 37.1 | 35.4 | 33.8 | 32.2 | 30.7 | 234 | 137.5 | 80.4 | 48 | 29.5 | 18.4 | 11.5 | 7.3 | 12.4 |
| 1970 | 46.1 | 44.3 | 42.4 | 40.5 | 38.7 | 37 | 35.3 | 33.6 | 32 | 30.5 | 231.7 | 135.4 | 79.1 | 47 | 28.8 | 17.9 | 11.3 | 7.1 | 12.1 |
| 1971 | 45.9 | 44 | 42.2 | 40.4 | 38.6 | 36.8 | 35.2 | 33.5 | 31.9 | 30.3 | 229.1 | 132.9 | 77.5 | 45.9 | 28.1 | 17.5 | 11 | 6.9 | 11.8 |
| 1972 | 45.6 | 43.8 | 42 | 40.3 | 38.5 | 36.7 | 35 | 33.4 | 31.7 | 30.1 | 225.9 | 129.9 | 75.6 | 44.6 | 27.2 | 16.9 | 10.6 | 6.7 | 11.4 |
| 1973 | 45.3 | 43.6 | 41.8 | 40 | 38.3 | 36.5 | 34.8 | 33.1 | 31.5 | 29.8 | 221.4 | 125.5 | 72.9 | 42.8 | 26 | 16.1 | 10.1 | 6.4 | 10.9 |
| 1974 | 45 | 43.3 | 41.6 | 39.8 | 38.1 | 36.4 | 34.6 | 32.9 | 31.2 | 29.6 | 217 | 121.2 | 70.1 | 41 | 24.8 | 15.4 | 9.6 | 6.1 | 10.4 |
| 1975 | 44.6 | 42.9 | 41.2 | 39.6 | 37.9 | 36.1 | 34.4 | 32.7 | 30.9 | 29.2 | 212.3 | 116.4 | 66.9 | 39 | 23.6 | 14.6 | 9.1 | 5.7 | 9.8 |
| 1976 | 44.2 | 42.6 | 40.9 | 39.3 | 37.6 | 35.9 | 34.2 | 32.5 | 30.7 | 28.9 | 207.5 | 111.4 | 63.6 | 37 | 22.3 | 13.7 | 8.6 | 5.4 | 9.2 |
| 1977 | 43.8 | 42.2 | 40.6 | 38.9 | 37.3 | 35.6 | 33.9 | 32.2 | 30.5 | 28.7 | 202.7 | 106.3 | 60.1 | 34.9 | 20.9 | 12.9 | 8 | 5.1 | 8.6 |
| 1978 | 43.3 | 41.8 | 40.2 | 38.6 | 37 | 35.3 | 33.7 | 32 | 30.2 | 28.5 | 198.8 | 101.7 | 57 | 32.9 | 19.7 | 12.1 | 7.5 | 4.7 | 8.1 |
| 1979 | 42.5 | 41.4 | 39.8 | 38.2 | 36.6 | 34.9 | 33.2 | 31.5 | 29.7 | 27.8 | 189.8 | 93 | 51.3 | 29.6 | 17.6 | 10.8 | 6.7 | 4.2 | 7.2 |
| 1980 | 41.6 | 40.6 | 39.4 | 37.8 | 36.2 | 34.6 | 32.9 | 31.1 | 29.3 | 27.4 | 183.5 | 86.4 | 46.9 | 26.9 | 15.9 | 9.8 | 6.1 | 3.8 | 6.5 |
| 1981 | 40.8 | 39.7 | 38.6 | 37.5 | 35.9 | 34.3 | 32.6 | 30.9 | 29.1 | 27.3 | 181.2 | 82.7 | 44.2 | 25.3 | 14.9 | 9.1 | 5.7 | 3.5 | 6.1 |
| 1982 | 39.7 | 39 | 37.8 | 36.7 | 35.5 | 33.9 | 32.2 | 30.4 | 28.6 | 26.7 | 173.2 | 74.9 | 39.1 | 22.3 | 13.1 | 8 | 4.9 | 3.1 | 5.3 |
| 1983 | 38.2 | 37.9 | 37.1 | 35.8 | 34.7 | 33.3 | 31.6 | 29.8 | 27.9 | 26 | 163.3 | 66.2 | 33.6 | 19 | 11.1 | 6.7 | 4.2 | 2.6 | 4.5 |
| 1984 | 37 | 36.5 | 36.2 | 35.3 | 34 | 32.8 | 31.5 | 29.7 | 27.9 | 26 | 163.1 | 63.7 | 31.5 | 17.8 | 10.3 | 6.2 | 3.9 | 2.4 | 4.1 |
| 1985 | 36.1 | 35.4 | 34.7 | 34.3 | 33.4 | 32.1 | 30.9 | 29.4 | 27.6 | 25.8 | 160.7 | 60.3 | 28.9 | 16.2 | 9.4 | 5.6 | 3.5 | 2.2 | 3.7 |
| 1986 | 34.9 | 34.5 | 33.6 | 32.9 | 32.4 | 31.4 | 30.1 | 28.7 | 27.1 | 25.3 | 156.8 | 56.5 | 26.3 | 14.6 | 8.4 | 5 | 3.1 | 1.9 | 3.3 |
| 1987 | 34.1 | 33.3 | 32.8 | 31.9 | 31.1 | 30.6 | 29.5 | 28.1 | 26.6 | 25 | 154.7 | 53.8 | 24.2 | 13.2 | 7.6 | 4.6 | 2.8 | 1.7 | 3 |
| 1988 | 33.2 | 32.6 | 31.7 | 31.1 | 30.2 | 29.4 | 28.7 | 27.5 | 26 | 24.5 | 152.3 | 51.2 | 22.1 | 12 | 6.9 | 4.1 | 2.5 | 1.6 | 2.7 |
| 1989 | 32.1 | 31.7 | 31 | 30.1 | 29.5 | 28.5 | 27.5 | 26.7 | 25.4 | 23.8 | 147.9 | 47.9 | 19.8 | 10.6 | 6 | 3.6 | 2.2 | 1.4 | 2.3 |
| 1990 | 30.6 | 30.7 | 30.2 | 29.4 | 28.5 | 27.8 | 26.7 | 25.6 | 24.7 | 23.3 | 144.7 | 45.6 | 18 | 9.4 | 5.4 | 3.2 | 1.9 | 1.2 | 2 |
| 1991 | 29.6 | 29.2 | 29.2 | 28.6 | 27.8 | 26.8 | 26 | 24.8 | 23.6 | 22.5 | 139.5 | 42.4 | 16 | 8.2 | 4.6 | 2.7 | 1.7 | 1 | 1.8 |
| 1992 | 27.8 | 28.3 | 27.7 | 27.6 | 27 | 26 | 24.8 | 23.8 | 22.4 | 21 | 127.6 | 36.2 | 12.8 | 6.4 | 3.6 | 2.1 | 1.3 | 0.8 | 1.4 |
| 1993 | 25.9 | 26.6 | 26.9 | 26.3 | 26 | 25.3 | 24.2 | 22.9 | 21.7 | 20.1 | 120 | 32.3 | 10.8 | 5.3 | 2.9 | 1.7 | 1 | 0.6 | 1.1 |
| 1994 | 24.1 | 24.7 | 25.3 | 25.6 | 24.9 | 24.6 | 23.8 | 22.7 | 21.3 | 20 | 120.1 | 31.9 | 10.1 | 4.8 | 2.7 | 1.5 | 0.9 | 0.6 | 1 |
| 1995 | 23 | 23 | 23.5 | 24.1 | 24.2 | 23.5 | 23.1 | 22.2 | 21 | 19.6 | 118.5 | 31 | 9.3 | 4.3 | 2.4 | 1.4 | 0.8 | 0.5 | 0.9 |
| 1996 | 21.6 | 21.9 | 21.9 | 22.4 | 22.8 | 22.9 | 22.1 | 21.6 | 20.7 | 19.4 | 117.4 | 30.5 | 8.7 | 3.9 | 2.1 | 1.2 | 0.7 | 0.4 | 0.8 |
| 1997 | 20.4 | 20.6 | 20.9 | 20.8 | 21.1 | 21.5 | 21.4 | 20.5 | 19.8 | 18.7 | 112.1 | 28.4 | 7.7 | 3.3 | 1.8 | 1 | 0.6 | 0.4 | 0.6 |
| 1998 | 19 | 19.5 | 19.6 | 19.8 | 19.6 | 19.9 | 20 | 19.8 | 18.7 | 17.9 | 107.1 | 26.5 | 6.8 | 2.8 | 1.5 | 0.8 | 0.5 | 0.3 | 0.5 |
| 1999 | 18.7 | 18.2 | 18.6 | 18.6 | 18.8 | 18.6 | 18.8 | 18.9 | 18.6 | 17.6 | 110 | 27.8 | 6.8 | 2.7 | 1.4 | 0.8 | 0.5 | 0.3 | 0.5 |

Table A.1. Continued. Female numbers at age in California (1000s) predicted by the base-case model.

| Age (Yr) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 18 | 17.9 | 17.3 | 17.7 | 17.7 | 17.8 | 17.6 | 17.7 | 17.7 | 17.4 | 111.1 | 28.9 | 6.8 | 2.5 | 1.3 | 0.7 | 0.4 | 0.3 | 0.4 |
| 2001 | 18.2 | 17.2 | 17.1 | 16.5 | 16.9 | 16.9 | 17 | 16.7 | 16.8 | 16.8 | 115.3 | 31.5 | 7.3 | 2.6 | 1.3 | 0.7 | 0.4 | 0.3 | 0.4 |
| 2002 | 18.4 | 17.4 | 16.4 | 16.3 | 15.7 | 16.1 | 16.1 | 16.1 | 15.9 | 15.9 | 118.2 | 34.4 | 7.7 | 2.6 | 1.3 | 0.7 | 0.4 | 0.3 | 0.4 |
| 2003 | 18.9 | 17.5 | 16.6 | 15.6 | 15.5 | 15 | 15.3 | 15.3 | 15.4 | 15.1 | 120.9 | 37.8 | 8.4 | 2.7 | 1.3 | 0.7 | 0.4 | 0.3 | 0.4 |
| 2004 | 19.4 | 18 | 16.8 | 15.9 | 14.9 | 14.8 | 14.3 | 14.6 | 14.6 | 14.6 | 121.9 | 41.4 | 9.2 | 2.8 | 1.3 | 0.7 | 0.4 | 0.3 | 0.4 |
| 2005 | 19.9 | 18.5 | 17.2 | 16 | 15.2 | 14.2 | 14.1 | 13.7 | 13.9 | 13.9 | 122.1 | 45.4 | 10.1 | 2.9 | 1.3 | 0.7 | 0.4 | 0.3 | 0.4 |
| 2006 | 20.4 | 19 | 17.7 | 16.4 | 15.3 | 14.5 | 13.6 | 13.5 | 13 | 13.3 | 121 | 49.3 | 11.1 | 3.1 | 1.3 | 0.7 | 0.4 | 0.3 | 0.4 |
| 2007 | 20.9 | 19.5 | 18.2 | 16.9 | 15.7 | 14.6 | 13.8 | 12.9 | 12.8 | 12.4 | 118.6 | 53.3 | 12.2 | 3.2 | 1.4 | 0.7 | 0.4 | 0.3 | 0.4 |
| 2008 | 21.3 | 19.9 | 18.6 | 17.3 | 16.1 | 15 | 13.9 | 13.1 | 12.3 | 12.2 | 114.2 | 56.6 | 13.3 | 3.4 | 1.4 | 0.7 | 0.4 | 0.2 | 0.4 |
| 2009 | 21.7 | 20.3 | 19 | 17.7 | 16.5 | 15.4 | 14.3 | 13.2 | 12.5 | 11.7 | 110.8 | 60.6 | 14.8 | 3.6 | 1.4 | 0.7 | 0.4 | 0.2 | 0.4 |
| 2010 | 22.1 | 20.7 | 19.4 | 18.2 | 16.9 | 15.8 | 14.7 | 13.6 | 12.6 | 11.9 | 107 | 64.1 | 16.3 | 3.9 | 1.4 | 0.7 | 0.4 | 0.2 | 0.4 |

Table A.2. Male numbers at age in California (1000s) predicted by the base-case model.

| Age (Yr) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1916 | 49.8 | 47.6 | 45.5 | 43.5 | 41.6 | 39.8 | 38 | 36.4 | 34.8 | 33.2 | 261.7 | 167 | 106.6 | 68 | 43.4 | 27.7 | 17.7 | 11.3 | 19.9 |
| 1917 | 49.8 | 47.6 | 45.5 | 43.5 | 41.6 | 39.8 | 38 | 36.4 | 34.8 | 33.2 | 261.6 | 166.9 | 106.5 | 68 | 43.4 | 27.7 | 17.7 | 11.3 | 19.9 |
| 1918 | 49.8 | 47.6 | 45.5 | 43.5 | 41.6 | 39.8 | 38 | 36.3 | 34.7 | 33.2 | 261.5 | 166.8 | 106.4 | 67.9 | 43.3 | 27.6 | 17.6 | 11.3 | 19.9 |
| 1919 | 49.8 | 47.6 | 45.5 | 43.5 | 41.6 | 39.8 | 38 | 36.3 | 34.7 | 33.2 | 261.3 | 166.6 | 106.3 | 67.8 | 43.3 | 27.6 | 17.6 | 11.2 | 19.8 |
| 1920 | 49.8 | 47.6 | 45.5 | 43.5 | 41.6 | 39.8 | 38 | 36.3 | 34.7 | 33.2 | 261.3 | 166.5 | 106.2 | 67.8 | 43.3 | 27.6 | 17.6 | 11.2 | 19.8 |
| 1921 | 49.8 | 47.6 | 45.5 | 43.5 | 41.6 | 39.8 | 38 | 36.3 | 34.7 | 33.2 | 261.2 | 166.4 | 106.2 | 67.7 | 43.2 | 27.6 | 17.6 | 11.2 | 19.8 |
| 1922 | 49.7 | 47.6 | 45.5 | 43.5 | 41.6 | 39.8 | 38 | 36.3 | 34.7 | 33.2 | 261.2 | 166.3 | 106.1 | 67.7 | 43.2 | 27.6 | 17.6 | 11.2 | 19.8 |
| 1923 | 49.7 | 47.6 | 45.5 | 43.5 | 41.6 | 39.8 | 38 | 36.3 | 34.7 | 33.2 | 261.1 | 166.3 | 106 | 67.7 | 43.2 | 27.5 | 17.6 | 11.2 | 19.8 |
| 1924 | 49.7 | 47.6 | 45.5 | 43.5 | 41.6 | 39.7 | 38 | 36.3 | 34.7 | 33.2 | 261.1 | 166.2 | 106 | 67.6 | 43.1 | 27.5 | 17.6 | 11.2 | 19.8 |
| 1925 | 49.7 | 47.5 | 45.5 | 43.5 | 41.6 | 39.7 | 38 | 36.3 | 34.7 | 33.2 | 261.1 | 166.1 | 105.9 | 67.6 | 43.1 | 27.5 | 17.6 | 11.2 | 19.8 |
| 1926 | 49.7 | 47.5 | 45.5 | 43.5 | 41.6 | 39.7 | 38 | 36.3 | 34.7 | 33.2 | 261 | 166 | 105.8 | 67.5 | 43.1 | 27.5 | 17.5 | 11.2 | 19.7 |
| 1927 | 49.7 | 47.5 | 45.4 | 43.5 | 41.6 | 39.7 | 38 | 36.3 | 34.7 | 33.2 | 260.9 | 165.8 | 105.7 | 67.4 | 43 | 27.4 | 17.5 | 11.2 | 19.7 |
| 1928 | 49.7 | 47.5 | 45.4 | 43.4 | 41.5 | 39.7 | 38 | 36.3 | 34.7 | 33.2 | 260.7 | 165.6 | 105.5 | 67.3 | 42.9 | 27.4 | 17.5 | 11.2 | 19.7 |
| 1929 | 49.7 | 47.5 | 45.4 | 43.4 | 41.5 | 39.7 | 38 | 36.3 | 34.7 | 33.2 | 260.6 | 165.4 | 105.3 | 67.2 | 42.9 | 27.4 | 17.5 | 11.1 | 19.6 |
| 1930 | 49.6 | 47.5 | 45.4 | 43.4 | 41.5 | 39.7 | 38 | 36.3 | 34.7 | 33.2 | 260.4 | 165.2 | 105.2 | 67.1 | 42.8 | 27.3 | 17.4 | 11.1 | 19.6 |
| 1931 | 49.6 | 47.5 | 45.4 | 43.4 | 41.5 | 39.7 | 37.9 | 36.3 | 34.7 | 33.1 | 260.2 | 164.9 | 104.9 | 66.9 | 42.7 | 27.2 | 17.4 | 11.1 | 19.6 |
| 1932 | 49.6 | 47.4 | 45.4 | 43.4 | 41.5 | 39.7 | 37.9 | 36.3 | 34.7 | 33.1 | 260 | 164.7 | 104.7 | 66.8 | 42.6 | 27.2 | 17.4 | 11.1 | 19.5 |
| 1933 | 49.6 | 47.4 | 45.3 | 43.4 | 41.5 | 39.7 | 37.9 | 36.2 | 34.6 | 33.1 | 259.7 | 164.3 | 104.5 | 66.6 | 42.5 | 27.1 | 17.3 | 11 | 19.5 |
| 1934 | 49.5 | 47.4 | 45.3 | 43.3 | 41.5 | 39.6 | 37.9 | 36.2 | 34.6 | 33.1 | 259.6 | 164.1 | 104.3 | 66.5 | 42.4 | 27.1 | 17.3 | 11 | 19.4 |
| 1935 | 49.5 | 47.4 | 45.3 | 43.3 | 41.4 | 39.6 | 37.9 | 36.2 | 34.6 | 33.1 | 259.3 | 163.9 | 104 | 66.3 | 42.3 | 27 | 17.2 | 11 | 19.4 |
| 1936 | 49.5 | 47.3 | 45.3 | 43.3 | 41.4 | 39.6 | 37.9 | 36.2 | 34.6 | 33.1 | 259 | 163.5 | 103.7 | 66.1 | 42.2 | 26.9 | 17.2 | 11 | 19.3 |
| 1937 | 49.5 | 47.3 | 45.3 | 43.3 | 41.4 | 39.6 | 37.8 | 36.2 | 34.6 | 33 | 258.7 | 163.1 | 103.4 | 65.8 | 42 | 26.8 | 17.1 | 10.9 | 19.2 |
| 1938 | 49.4 | 47.3 | 45.2 | 43.3 | 41.4 | 39.6 | 37.8 | 36.1 | 34.5 | 33 | 258.4 | 162.8 | 103.1 | 65.6 | 41.9 | 26.7 | 17 | 10.9 | 19.2 |
| 1939 | 49.4 | 47.3 | 45.2 | 43.2 | 41.4 | 39.5 | 37.8 | 36.1 | 34.5 | 33 | 258.2 | 162.4 | 102.8 | 65.4 | 41.7 | 26.6 | 17 | 10.8 | 19.1 |
| 1940 | 49.4 | 47.2 | 45.2 | 43.2 | 41.3 | 39.5 | 37.8 | 36.1 | 34.5 | 33 | 258 | 162.1 | 102.5 | 65.2 | 41.6 | 26.5 | 16.9 | 10.8 | 19.1 |
| 1941 | 49.3 | 47.2 | 45.1 | 43.2 | 41.3 | 39.5 | 37.8 | 36.1 | 34.5 | 33 | 257.8 | 161.9 | 102.3 | 65 | 41.5 | 26.5 | 16.9 | 10.8 | 19 |
| 1942 | 49.3 | 47.2 | 45.1 | 43.2 | 41.3 | 39.5 | 37.7 | 36.1 | 34.5 | 32.9 | 257.6 | 161.6 | 102 | 64.8 | 41.3 | 26.4 | 16.8 | 10.7 | 18.9 |
| 1943 | 49.2 | 47.1 | 45.1 | 43.1 | 41.3 | 39.4 | 37.7 | 36.1 | 34.5 | 32.9 | 257.5 | 161.4 | 101.8 | 64.6 | 41.2 | 26.3 | 16.8 | 10.7 | 18.9 |
| 1944 | 49.1 | 47.1 | 45 | 43.1 | 41.2 | 39.4 | 37.7 | 36 | 34.4 | 32.9 | 257.2 | 161.1 | 101.5 | 64.4 | 41.1 | 26.2 | 16.7 | 10.7 | 18.8 |
| 1945 | 48.9 | 46.9 | 45 | 43.1 | 41.2 | 39.4 | 37.6 | 36 | 34.4 | 32.8 | 256.1 | 160 | 100.6 | 63.8 | 40.7 | 26 | 16.6 | 10.6 | 18.6 |
| 1946 | 48.7 | 46.8 | 44.8 | 43 | 41.1 | 39.3 | 37.5 | 35.8 | 34.2 | 32.6 | 253.4 | 157.4 | 98.8 | 62.6 | 39.9 | 25.4 | 16.2 | 10.4 | 18.3 |
| 1947 | 48.5 | 46.6 | 44.7 | 42.8 | 41 | 39.2 | 37.5 | 35.8 | 34.1 | 32.5 | 250.9 | 154.8 | 97 | 61.4 | 39.1 | 25 | 15.9 | 10.2 | 17.9 |
| 1948 | 48.4 | 46.4 | 44.5 | 42.7 | 40.9 | 39.2 | 37.5 | 35.8 | 34.1 | 32.5 | 250.8 | 154.3 | 96.5 | 61.1 | 38.9 | 24.8 | 15.8 | 10.1 | 17.8 |
| 1949 | 48.3 | 46.3 | 44.3 | 42.5 | 40.8 | 39.1 | 37.4 | 35.7 | 34.1 | 32.5 | 250.2 | 153.3 | 95.7 | 60.5 | 38.5 | 24.5 | 15.7 | 10 | 17.6 |
| 1950 | 48.3 | 46.2 | 44.2 | 42.3 | 40.6 | 39 | 37.3 | 35.7 | 34.1 | 32.5 | 250.2 | 152.8 | 95.2 | 60.1 | 38.2 | 24.4 | 15.6 | 9.9 | 17.5 |
| 1951 | 48.2 | 46.1 | 44.2 | 42.3 | 40.5 | 38.8 | 37.2 | 35.6 | 34.1 | 32.5 | 250.2 | 152.3 | 94.7 | 59.7 | 38 | 24.2 | 15.4 | 9.9 | 17.4 |
| 1952 | 48.1 | 46.1 | 44.1 | 42.2 | 40.4 | 38.6 | 37 | 35.5 | 34 | 32.5 | 249.6 | 151.3 | 93.9 | 59.1 | 37.6 | 23.9 | 15.3 | 9.7 | 17.2 |
| 1953 | 48 | 46 | 44 | 42.1 | 40.3 | 38.6 | 36.9 | 35.3 | 33.9 | 32.4 | 249.3 | 150.6 | 93.2 | 58.6 | 37.2 | 23.7 | 15.1 | 9.7 | 17 |
| 1954 | 48 | 45.9 | 44 | 42.1 | 40.3 | 38.5 | 36.8 | 35.2 | 33.7 | 32.3 | 249.2 | 150.2 | 92.7 | 58.2 | 36.9 | 23.5 | 15 | 9.6 | 16.9 |
| 1955 | 47.9 | 45.9 | 43.9 | 42 | 40.2 | 38.4 | 36.7 | 35.1 | 33.5 | 32.1 | 248.8 | 149.6 | 92 | 57.7 | 36.6 | 23.3 | 14.9 | 9.5 | 16.7 |
| 1956 | 47.8 | 45.8 | 43.8 | 41.9 | 40.1 | 38.4 | 36.7 | 35 | 33.5 | 32 | 248.2 | 149.1 | 91.4 | 57.3 | 36.3 | 23.1 | 14.7 | 9.4 | 16.6 |
| 1957 | 47.7 | 45.7 | 43.8 | 41.9 | 40.1 | 38.3 | 36.6 | 35 | 33.4 | 31.9 | 247.2 | 148.3 | 90.6 | 56.7 | 35.9 | 22.8 | 14.6 | 9.3 | 16.4 |

Table A.2. Continued. Male numbers at age in California (1000s) predicted by the base-case model.

| Age (Yr) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1958 | 47.6 | 45.6 | 43.7 | 41.8 | 40 | 38.2 | 36.5 | 34.9 | 33.3 | 31.8 | 246.1 | 147.5 | 89.8 | 56.1 | 35.4 | 22.6 | 14.4 | 9.2 | 16.2 |
| 1959 | 47.5 | 45.5 | 43.6 | 41.7 | 39.9 | 38.2 | 36.5 | 34.8 | 33.2 | 31.7 | 244.5 | 146.3 | 88.7 | 55.3 | 34.9 | 22.2 | 14.2 | 9 | 15.9 |
| 1960 | 47.4 | 45.4 | 43.5 | 41.7 | 39.9 | 38.1 | 36.4 | 34.7 | 33.1 | 31.6 | 243.4 | 145.5 | 87.9 | 54.6 | 34.5 | 21.9 | 14 | 8.9 | 15.7 |
| 1961 | 47.3 | 45.3 | 43.4 | 41.6 | 39.8 | 38.1 | 36.4 | 34.7 | 33.1 | 31.6 | 242.8 | 145.2 | 87.3 | 54.2 | 34.2 | 21.7 | 13.8 | 8.8 | 15.6 |
| 1962 | 47.2 | 45.2 | 43.3 | 41.5 | 39.7 | 38 | 36.3 | 34.7 | 33.1 | 31.6 | 242.7 | 145.3 | 87.1 | 53.9 | 33.9 | 21.6 | 13.7 | 8.8 | 15.4 |
| 1963 | 47.1 | 45.1 | 43.2 | 41.4 | 39.6 | 37.9 | 36.3 | 34.7 | 33.1 | 31.5 | 242.4 | 145.2 | 86.7 | 53.5 | 33.7 | 21.4 | 13.6 | 8.7 | 15.3 |
| 1964 | 47 | 45 | 43.1 | 41.3 | 39.5 | 37.8 | 36.2 | 34.6 | 33 | 31.5 | 241.7 | 144.8 | 86.2 | 53 | 33.3 | 21.1 | 13.5 | 8.6 | 15.1 |
| 1965 | 46.9 | 44.9 | 43 | 41.2 | 39.4 | 37.7 | 36.1 | 34.5 | 33 | 31.5 | 241.4 | 144.6 | 85.8 | 52.7 | 33 | 20.9 | 13.3 | 8.5 | 15 |
| 1966 | 46.7 | 44.9 | 42.9 | 41.1 | 39.3 | 37.6 | 36 | 34.4 | 32.8 | 31.4 | 240.5 | 143.8 | 85.2 | 52.1 | 32.6 | 20.7 | 13.2 | 8.4 | 14.8 |
| 1967 | 46.6 | 44.6 | 42.9 | 41 | 39.2 | 37.5 | 35.9 | 34.3 | 32.7 | 31.2 | 239.4 | 142.7 | 84.5 | 51.5 | 32.2 | 20.4 | 13 | 8.3 | 14.6 |
| 1968 | 46.5 | 44.5 | 42.6 | 40.9 | 39.1 | 37.4 | 35.8 | 34.1 | 32.6 | 31.1 | 238.3 | 141.7 | 83.8 | 50.9 | 31.7 | 20.1 | 12.8 | 8.1 | 14.4 |
| 1969 | 46.4 | 44.4 | 42.6 | 40.7 | 39.1 | 37.3 | 35.7 | 34 | 32.5 | 30.9 | 236.9 | 140.4 | 83 | 50.2 | 31.3 | 19.7 | 12.6 | 8 | 14.1 |
| 1970 | 46.1 | 44.3 | 42.5 | 40.6 | 38.9 | 37.2 | 35.5 | 33.9 | 32.3 | 30.7 | 234.5 | 138.2 | 81.6 | 49.1 | 30.5 | 19.3 | 12.2 | 7.8 | 13.8 |
| 1971 | 45.9 | 44.1 | 42.3 | 40.5 | 38.8 | 37 | 35.4 | 33.7 | 32.1 | 30.6 | 231.6 | 135.6 | 80 | 48 | 29.7 | 18.7 | 11.9 | 7.6 | 13.4 |
| 1972 | 45.6 | 43.9 | 42.1 | 40.4 | 38.6 | 36.9 | 35.2 | 33.6 | 31.9 | 30.3 | 228.2 | 132.4 | 78 | 46.6 | 28.8 | 18.1 | 11.5 | 7.3 | 12.9 |
| 1973 | 45.3 | 43.6 | 41.9 | 40.1 | 38.5 | 36.7 | 35 | 33.3 | 31.7 | 30 | 223.4 | 127.8 | 75.1 | 44.7 | 27.6 | 17.3 | 11 | 7 | 12.3 |
| 1974 | 45 | 43.3 | 41.6 | 39.9 | 38.2 | 36.6 | 34.8 | 33.1 | 31.4 | 29.8 | 218.7 | 123.2 | 72.2 | 42.8 | 26.3 | 16.5 | 10.5 | 6.7 | 11.8 |
| 1975 | 44.6 | 43 | 41.3 | 39.7 | 38 | 36.3 | 34.6 | 32.9 | 31.1 | 29.4 | 213.6 | 118.2 | 68.9 | 40.7 | 24.9 | 15.6 | 9.9 | 6.3 | 11.1 |
| 1976 | 44.2 | 42.6 | 41 | 39.4 | 37.8 | 36.1 | 34.3 | 32.7 | 30.9 | 29.1 | 208.5 | 113 | 65.4 | 38.5 | 23.5 | 14.7 | 9.3 | 5.9 | 10.5 |
| 1977 | 43.8 | 42.3 | 40.7 | 39.1 | 37.4 | 35.8 | 34.1 | 32.3 | 30.6 | 28.8 | 203.3 | 107.6 | 61.8 | 36.3 | 22.1 | 13.8 | 8.7 | 5.6 | 9.8 |
| 1978 | 43.3 | 41.9 | 40.3 | 38.7 | 37.2 | 35.5 | 33.9 | 32.1 | 30.3 | 28.6 | 199.1 | 102.8 | 58.5 | 34.3 | 20.8 | 13 | 8.2 | 5.2 | 9.2 |
| 1979 | 42.5 | 41.4 | 39.9 | 38.4 | 36.7 | 35.1 | 33.4 | 31.6 | 29.8 | 27.9 | 189.5 | 93.6 | 52.6 | 30.8 | 18.6 | 11.6 | 7.3 | 4.6 | 8.2 |
| 1980 | 41.6 | 40.6 | 39.5 | 37.9 | 36.4 | 34.7 | 33 | 31.2 | 29.4 | 27.5 | 182.7 | 86.7 | 48 | 28 | 16.8 | 10.4 | 6.6 | 4.2 | 7.4 |
| 1981 | 40.8 | 39.8 | 38.7 | 37.6 | 36.1 | 34.5 | 32.8 | 31 | 29.2 | 27.3 | 180.3 | 82.8 | 45.2 | 26.3 | 15.7 | 9.7 | 6.1 | 3.9 | 6.9 |
| 1982 | 39.7 | 39.1 | 37.9 | 36.8 | 35.6 | 34 | 32.3 | 30.5 | 28.7 | 26.7 | 171.8 | 74.6 | 39.9 | 23.1 | 13.8 | 8.5 | 5.4 | 3.4 | 6 |
| 1983 | 38.2 | 38 | 37.2 | 36 | 34.8 | 33.5 | 31.7 | 29.9 | 27.9 | 25.9 | 161.2 | 65.6 | 34.1 | 19.7 | 11.7 | 7.2 | 4.5 | 2.9 | 5 |
| 1984 | 37 | 36.5 | 36.2 | 35.4 | 34.2 | 33 | 31.6 | 29.8 | 28 | 26 | 161 | 62.9 | 32 | 18.4 | 10.9 | 6.7 | 4.2 | 2.7 | 4.7 |
| 1985 | 36.1 | 35.4 | 34.8 | 34.5 | 33.6 | 32.3 | 31 | 29.5 | 27.7 | 25.8 | 158.5 | 59.3 | 29.3 | 16.8 | 9.8 | 6 | 3.8 | 2.4 | 4.2 |
| 1986 | 34.9 | 34.5 | 33.7 | 33 | 32.6 | 31.6 | 30.2 | 28.8 | 27.2 | 25.3 | 154.5 | 55.4 | 26.5 | 15 | 8.8 | 5.4 | 3.4 | 2.1 | 3.7 |
| 1987 | 34.1 | 33.3 | 32.9 | 32 | 31.3 | 30.7 | 29.6 | 28.1 | 26.6 | 25 | 152.5 | 52.6 | 24.4 | 13.7 | 8 | 4.9 | 3 | 1.9 | 3.4 |
| 1988 | 33.2 | 32.6 | 31.8 | 31.2 | 30.3 | 29.5 | 28.8 | 27.6 | 26.1 | 24.5 | 150 | 49.9 | 22.2 | 12.3 | 7.2 | 4.3 | 2.7 | 1.7 | 3 |
| 1989 | 32.1 | 31.7 | 31.1 | 30.2 | 29.6 | 28.6 | 27.6 | 26.8 | 25.4 | 23.8 | 145.4 | 46.5 | 19.8 | 10.9 | 6.3 | 3.8 | 2.4 | 1.5 | 2.6 |
| 1990 | 30.6 | 30.7 | 30.2 | 29.5 | 28.6 | 27.9 | 26.8 | 25.7 | 24.7 | 23.3 | 142.2 | 44.1 | 18 | 9.7 | 5.6 | 3.4 | 2.1 | 1.3 | 2.3 |
| 1991 | 29.6 | 29.2 | 29.2 | 28.7 | 27.9 | 26.9 | 26 | 24.8 | 23.6 | 22.4 | 136.8 | 40.9 | 15.9 | 8.4 | 4.9 | 2.9 | 1.8 | 1.1 | 2 |
| 1992 | 27.8 | 28.3 | 27.8 | 27.7 | 27 | 26.1 | 24.9 | 23.8 | 22.3 | 20.8 | 124.4 | 34.7 | 12.7 | 6.6 | 3.8 | 2.2 | 1.4 | 0.9 | 1.5 |
| 1993 | 25.9 | 26.6 | 26.9 | 26.4 | 26.1 | 25.4 | 24.3 | 22.9 | 21.6 | 20 | 116.4 | 30.7 | 10.6 | 5.4 | 3.1 | 1.8 | 1.1 | 0.7 | 1.2 |
| 1994 | 24.1 | 24.7 | 25.4 | 25.7 | 25 | 24.7 | 23.9 | 22.7 | 21.3 | 19.9 | 116.6 | 30.3 | 9.9 | 4.9 | 2.8 | 1.6 | 1 | 0.6 | 1.1 |
| 1995 | 23 | 23 | 23.6 | 24.1 | 24.3 | 23.6 | 23.2 | 22.3 | 21 | 19.5 | 115.1 | 29.3 | 9.1 | 4.3 | 2.5 | 1.4 | 0.9 | 0.6 | 1 |
| 1996 | 21.6 | 22 | 22 | 22.4 | 22.9 | 23 | 22.2 | 21.7 | 20.7 | 19.3 | 114.2 | 28.8 | 8.4 | 3.9 | 2.2 | 1.3 | 0.8 | 0.5 | 0.9 |
| 1997 | 20.4 | 20.6 | 20.9 | 20.8 | 21.2 | 21.5 | 21.4 | 20.5 | 19.8 | 18.6 | 108.9 | 26.7 | 7.4 | 3.3 | 1.8 | 1.1 | 0.6 | 0.4 | 0.7 |
| 1998 | 19 | 19.5 | 19.6 | 19.8 | 19.7 | 19.9 | 20.1 | 19.8 | 18.7 | 17.8 | 103.8 | 24.8 | 6.5 | 2.8 | 1.5 | 0.9 | 0.5 | 0.3 | 0.6 |
| 1999 | 18.7 | 18.2 | 18.6 | 18.7 | 18.9 | 18.7 | 18.9 | 19 | 18.6 | 17.5 | 107 | 26 | 6.5 | 2.7 | 1.4 | 0.8 | 0.5 | 0.3 | 0.5 |

Table A.2. Continued. Male numbers at age in California (1000s) predicted by the base-case model.

| Age (Yr) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 18 | 17.9 | 17.4 | 17.8 | 17.8 | 17.9 | 17.7 | 17.8 | 17.8 | 17.3 | 108.5 | 27.1 | 6.5 | 2.5 | 1.4 | 0.8 | 0.5 | 0.3 | 0.5 |
| 2001 | 18.2 | 17.2 | 17.1 | 16.6 | 17 | 17 | 17.1 | 16.8 | 16.9 | 16.8 | 113.2 | 29.6 | 6.9 | 2.6 | 1.3 | 0.8 | 0.5 | 0.3 | 0.5 |
| 2002 | 18.4 | 17.4 | 16.4 | 16.3 | 15.8 | 16.2 | 16.2 | 16.2 | 16 | 16 | 116.6 | 32.4 | 7.3 | 2.6 | 1.3 | 0.8 | 0.5 | 0.3 | 0.5 |
| 2003 | 18.9 | 17.6 | 16.7 | 15.7 | 15.6 | 15.1 | 15.4 | 15.4 | 15.5 | 15.2 | 119.8 | 35.8 | 8 | 2.7 | 1.3 | 0.8 | 0.5 | 0.3 | 0.5 |
| 2004 | 19.4 | 18.1 | 16.8 | 15.9 | 15 | 14.9 | 14.4 | 14.7 | 14.7 | 14.8 | 121.4 | 39.4 | 8.7 | 2.8 | 1.3 | 0.8 | 0.5 | 0.3 | 0.5 |
| 2005 | 19.9 | 18.6 | 17.3 | 16 | 15.2 | 14.3 | 14.2 | 13.8 | 14.1 | 14 | 122.1 | 43.3 | 9.5 | 2.9 | 1.4 | 0.8 | 0.5 | 0.3 | 0.5 |
| 2006 | 20.4 | 19.1 | 17.8 | 16.5 | 15.3 | 14.5 | 13.7 | 13.6 | 13.1 | 13.4 | 121.4 | 47.4 | 10.5 | 3 | 1.4 | 0.8 | 0.5 | 0.3 | 0.5 |
| 2007 | 20.9 | 19.5 | 18.2 | 17 | 15.8 | 14.6 | 13.9 | 13 | 12.9 | 12.5 | 119.3 | 51.5 | 11.5 | 3.1 | 1.4 | 0.8 | 0.5 | 0.3 | 0.5 |
| 2008 | 21.3 | 20 | 18.6 | 17.4 | 16.2 | 15 | 13.9 | 13.2 | 12.4 | 12.3 | 115.1 | 55.1 | 12.6 | 3.3 | 1.4 | 0.8 | 0.4 | 0.3 | 0.5 |
| 2009 | 21.7 | 20.3 | 19.1 | 17.8 | 16.6 | 15.5 | 14.4 | 13.3 | 12.6 | 11.8 | 111.9 | 59.3 | 13.9 | 3.5 | 1.4 | 0.8 | 0.4 | 0.3 | 0.5 |
| 2010 | 22.1 | 20.8 | 19.4 | 18.2 | 17 | 15.9 | 14.8 | 13.7 | 12.7 | 12 | 108.2 | 63.1 | 15.5 | 3.7 | 1.4 | 0.8 | 0.4 | 0.3 | 0.5 |

Table A.3. Female numbers at age in Oregon (1000s) predicted by the base-case model.

| Age (Yr) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1916 | 49.8 | 47.6 | 45.4 | 43.4 | 41.4 | 39.5 | 37.8 | 36.1 | 34.4 | 32.9 | 257.5 | 162.5 | 102.5 | 64.7 | 40.8 | 25.7 | 16.2 | 10.2 | 17.5 |
| 1917 | 49.8 | 47.6 | 45.4 | 43.4 | 41.4 | 39.5 | 37.8 | 36.1 | 34.4 | 32.9 | 257.5 | 162.4 | 102.4 | 64.6 | 40.8 | 25.7 | 16.2 | 10.2 | 17.5 |
| 1918 | 49.8 | 47.5 | 45.4 | 43.4 | 41.4 | 39.5 | 37.8 | 36.1 | 34.4 | 32.9 | 257.4 | 162.3 | 102.4 | 64.6 | 40.7 | 25.7 | 16.2 | 10.2 | 17.5 |
| 1919 | 49.8 | 47.5 | 45.4 | 43.4 | 41.4 | 39.5 | 37.8 | 36.1 | 34.4 | 32.9 | 257.4 | 162.3 | 102.3 | 64.6 | 40.7 | 25.7 | 16.2 | 10.2 | 17.5 |
| 1920 | 49.8 | 47.5 | 45.4 | 43.4 | 41.4 | 39.5 | 37.8 | 36.1 | 34.4 | 32.9 | 257.3 | 162.2 | 102.3 | 64.5 | 40.7 | 25.7 | 16.2 | 10.2 | 17.5 |
| 1921 | 49.8 | 47.5 | 45.4 | 43.4 | 41.4 | 39.5 | 37.8 | 36.1 | 34.4 | 32.9 | 257.3 | 162.1 | 102.2 | 64.5 | 40.7 | 25.7 | 16.2 | 10.2 | 17.5 |
| 1922 | 49.7 | 47.5 | 45.4 | 43.3 | 41.4 | 39.5 | 37.8 | 36.1 | 34.4 | 32.9 | 257.2 | 162.0 | 102.2 | 64.5 | 40.7 | 25.6 | 16.2 | 10.2 | 17.4 |
| 1923 | 49.7 | 47.5 | 45.4 | 43.3 | 41.4 | 39.5 | 37.8 | 36.1 | 34.4 | 32.9 | 257.2 | 162.0 | 102.1 | 64.4 | 40.6 | 25.6 | 16.2 | 10.2 | 17.4 |
| 1924 | 49.7 | 47.5 | 45.4 | 43.3 | 41.4 | 39.5 | 37.8 | 36.1 | 34.4 | 32.9 | 257.1 | 161.9 | 102.1 | 64.4 | 40.6 | 25.6 | 16.2 | 10.2 | 17.4 |
| 1925 | 49.7 | 47.5 | 45.4 | 43.3 | 41.4 | 39.5 | 37.7 | 36.0 | 34.4 | 32.9 | 257.1 | 161.8 | 102.0 | 64.3 | 40.6 | 25.6 | 16.1 | 10.2 | 17.4 |
| 1926 | 49.7 | 47.5 | 45.4 | 43.3 | 41.4 | 39.5 | 37.7 | 36.0 | 34.4 | 32.9 | 257.1 | 161.7 | 101.9 | 64.3 | 40.6 | 25.6 | 16.1 | 10.2 | 17.4 |
| 1927 | 49.7 | 47.5 | 45.3 | 43.3 | 41.4 | 39.5 | 37.7 | 36.0 | 34.4 | 32.9 | 257.1 | 161.7 | 101.9 | 64.2 | 40.5 | 25.6 | 16.1 | 10.2 | 17.4 |
| 1928 | 49.7 | 47.5 | 45.3 | 43.3 | 41.4 | 39.5 | 37.7 | 36.0 | 34.4 | 32.9 | 257.0 | 161.6 | 101.8 | 64.2 | 40.5 | 25.5 | 16.1 | 10.2 | 17.4 |
| 1929 | 49.7 | 47.4 | 45.3 | 43.3 | 41.3 | 39.5 | 37.7 | 36.0 | 34.4 | 32.9 | 256.9 | 161.5 | 101.7 | 64.1 | 40.4 | 25.5 | 16.1 | 10.2 | 17.3 |
| 1930 | 49.6 | 47.4 | 45.3 | 43.3 | 41.3 | 39.5 | 37.7 | 36.0 | 34.4 | 32.8 | 256.7 | 161.2 | 101.5 | 64.0 | 40.4 | 25.5 | 16.1 | 10.1 | 17.3 |
| 1931 | 49.6 | 47.4 | 45.3 | 43.3 | 41.3 | 39.5 | 37.7 | 36.0 | 34.4 | 32.8 | 256.6 | 161.0 | 101.3 | 63.9 | 40.3 | 25.4 | 16.0 | 10.1 | 17.3 |
| 1932 | 49.6 | 47.4 | 45.3 | 43.2 | 41.3 | 39.5 | 37.7 | 36.0 | 34.4 | 32.8 | 256.5 | 160.9 | 101.2 | 63.8 | 40.2 | 25.4 | 16.0 | 10.1 | 17.3 |
| 1933 | 49.6 | 47.4 | 45.2 | 43.2 | 41.3 | 39.5 | 37.7 | 36.0 | 34.4 | 32.8 | 256.5 | 160.9 | 101.1 | 63.7 | 40.2 | 25.4 | 16.0 | 10.1 | 17.2 |
| 1934 | 49.5 | 47.3 | 45.2 | 43.2 | 41.3 | 39.4 | 37.7 | 36.0 | 34.4 | 32.8 | 256.5 | 160.9 | 101.1 | 63.7 | 40.2 | 25.3 | 16.0 | 10.1 | 17.2 |
| 1935 | 49.5 | 47.3 | 45.2 | 43.2 | 41.3 | 39.4 | 37.7 | 36.0 | 34.4 | 32.8 | 256.5 | 160.8 | 101.0 | 63.6 | 40.1 | 25.3 | 16.0 | 10.1 | 17.2 |
| 1936 | 49.5 | 47.3 | 45.2 | 43.2 | 41.2 | 39.4 | 37.6 | 36.0 | 34.3 | 32.8 | 256.5 | 160.8 | 101.0 | 63.6 | 40.1 | 25.3 | 16.0 | 10.1 | 17.2 |
| 1937 | 49.5 | 47.3 | 45.2 | 43.1 | 41.2 | 39.4 | 37.6 | 35.9 | 34.3 | 32.8 | 256.3 | 160.7 | 100.8 | 63.5 | 40.0 | 25.3 | 15.9 | 10.0 | 17.2 |
| 1938 | 49.4 | 47.2 | 45.1 | 43.1 | 41.2 | 39.4 | 37.6 | 35.9 | 34.3 | 32.8 | 256.2 | 160.5 | 100.6 | 63.4 | 39.9 | 25.2 | 15.9 | 10.0 | 17.1 |
| 1939 | 49.4 | 47.2 | 45.1 | 43.1 | 41.2 | 39.3 | 37.6 | 35.9 | 34.3 | 32.7 | 256.0 | 160.3 | 100.5 | 63.2 | 39.9 | 25.1 | 15.9 | 10.0 | 17.1 |
| 1940 | 49.4 | 47.2 | 45.1 | 43.1 | 41.2 | 39.3 | 37.6 | 35.9 | 34.3 | 32.7 | 256.0 | 160.3 | 100.4 | 63.2 | 39.8 | 25.1 | 15.8 | 10.0 | 17.1 |
| 1941 | 49.3 | 47.2 | 45.0 | 43.0 | 41.1 | 39.3 | 37.5 | 35.9 | 34.2 | 32.7 | 255.6 | 160.0 | 100.2 | 63.0 | 39.7 | 25.0 | 15.8 | 10.0 | 17.0 |
| 1942 | 49.3 | 47.1 | 45.0 | 43.0 | 41.1 | 39.3 | 37.5 | 35.8 | 34.2 | 32.7 | 255.1 | 159.5 | 99.8 | 62.7 | 39.5 | 24.9 | 15.7 | 9.9 | 16.9 |
| 1943 | 49.2 | 47.1 | 45.0 | 43.0 | 41.1 | 39.2 | 37.5 | 35.8 | 34.2 | 32.6 | 254.4 | 158.6 | 99.2 | 62.3 | 39.3 | 24.8 | 15.6 | 9.9 | 16.8 |
| 1944 | 49.1 | 47.0 | 44.9 | 42.9 | 41.0 | 39.2 | 37.4 | 35.7 | 34.1 | 32.5 | 252.1 | 156.1 | 97.4 | 61.1 | 38.5 | 24.3 | 15.3 | 9.7 | 16.5 |
| 1945 | 48.9 | 46.9 | 44.9 | 42.9 | 41.0 | 39.2 | 37.4 | 35.7 | 34.0 | 32.5 | 250.8 | 154.5 | 96.2 | 60.3 | 38.0 | 24.0 | 15.1 | 9.5 | 16.3 |
| 1946 | 48.7 | 46.7 | 44.8 | 42.9 | 40.9 | 39.1 | 37.3 | 35.6 | 34.0 | 32.4 | 249.0 | 152.2 | 94.5 | 59.2 | 37.3 | 23.5 | 14.8 | 9.4 | 16.0 |
| 1947 | 48.5 | 46.5 | 44.6 | 42.7 | 40.9 | 39.1 | 37.3 | 35.6 | 33.9 | 32.4 | 248.2 | 150.8 | 93.5 | 58.5 | 36.8 | 23.2 | 14.6 | 9.2 | 15.8 |
| 1948 | 48.4 | 46.3 | 44.4 | 42.6 | 40.8 | 39.0 | 37.3 | 35.6 | 34.0 | 32.4 | 248.2 | 150.2 | 92.9 | 58.1 | 36.5 | 23.0 | 14.5 | 9.2 | 15.7 |
| 1949 | 48.3 | 46.2 | 44.2 | 42.4 | 40.7 | 38.9 | 37.3 | 35.6 | 34.0 | 32.4 | 248.5 | 149.8 | 92.4 | 57.7 | 36.3 | 22.9 | 14.4 | 9.1 | 15.6 |
| 1950 | 48.3 | 46.1 | 44.1 | 42.2 | 40.5 | 38.8 | 37.2 | 35.6 | 34.0 | 32.4 | 249.0 | 149.7 | 92.1 | 57.5 | 36.1 | 22.8 | 14.4 | 9.1 | 15.5 |
| 1951 | 48.2 | 46.1 | 44.1 | 42.2 | 40.3 | 38.6 | 37.1 | 35.5 | 33.9 | 32.4 | 249.3 | 149.6 | 91.8 | 57.2 | 35.9 | 22.6 | 14.3 | 9.0 | 15.4 |
| 1952 | 48.1 | 46.0 | 44.0 | 42.1 | 40.2 | 38.5 | 36.9 | 35.4 | 33.9 | 32.4 | 249.7 | 149.6 | 91.5 | 57.0 | 35.8 | 22.5 | 14.2 | 9.0 | 15.3 |
| 1953 | 48.0 | 45.9 | 43.9 | 42.0 | 40.2 | 38.4 | 36.7 | 35.2 | 33.8 | 32.3 | 250.1 | 149.7 | 91.3 | 56.8 | 35.6 | 22.4 | 14.2 | 8.9 | 15.3 |
| 1954 | 48.0 | 45.9 | 43.9 | 42.0 | 40.1 | 38.4 | 36.7 | 35.1 | 33.6 | 32.2 | 250.4 | 150.0 | 91.2 | 56.6 | 35.5 | 22.4 | 14.1 | 8.9 | 15.2 |
| 1955 | 47.9 | 45.8 | 43.8 | 41.9 | 40.1 | 38.3 | 36.6 | 35.0 | 33.5 | 32.1 | 250.5 | 150.3 | 91.0 | 56.5 | 35.4 | 22.3 | 14.0 | 8.9 | 15.1 |
| 1956 | 47.8 | 45.8 | 43.8 | 41.8 | 40.0 | 38.2 | 36.6 | 34.9 | 33.4 | 31.9 | 249.9 | 150.2 | 90.7 | 56.2 | 35.2 | 22.1 | 13.9 | 8.8 | 15.0 |
| 1957 | 47.7 | 45.7 | 43.7 | 41.8 | 39.9 | 38.2 | 36.5 | 34.9 | 33.3 | 31.8 | 249.1 | 150.1 | 90.3 | 55.8 | 34.9 | 22.0 | 13.8 | 8.7 | 14.9 |

Table A.3. Continued. Female numbers at age in Oregon (1000s) predicted by the base-case model.

| Age (Yr) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1958 | 47.6 | 45.6 | 43.6 | 41.7 | 39.9 | 38.1 | 36.4 | 34.8 | 33.2 | 31.7 | 247.9 | 149.6 | 89.7 | 55.3 | 34.6 | 21.7 | 13.7 | 8.6 | 14.8 |
| 1959 | 47.5 | 45.5 | 43.5 | 41.7 | 39.8 | 38.1 | 36.4 | 34.7 | 33.2 | 31.7 | 247.0 | 149.5 | 89.3 | 55.0 | 34.3 | 21.6 | 13.6 | 8.6 | 14.7 |
| 1960 | 47.4 | 45.3 | 43.4 | 41.6 | 39.8 | 38.0 | 36.3 | 34.7 | 33.1 | 31.6 | 246.0 | 149.3 | 88.9 | 54.6 | 34.0 | 21.4 | 13.5 | 8.5 | 14.5 |
| 1961 | 47.3 | 45.2 | 43.3 | 41.5 | 39.7 | 37.9 | 36.3 | 34.6 | 33.0 | 31.5 | 244.9 | 148.8 | 88.4 | 54.1 | 33.7 | 21.2 | 13.3 | 8.4 | 14.4 |
| 1962 | 47.2 | 45.1 | 43.2 | 41.3 | 39.6 | 37.9 | 36.2 | 34.6 | 33.0 | 31.5 | 243.8 | 148.3 | 87.9 | 53.7 | 33.4 | 21.0 | 13.2 | 8.3 | 14.2 |
| 1963 | 47.1 | 45.0 | 43.1 | 41.2 | 39.5 | 37.8 | 36.1 | 34.5 | 32.9 | 31.4 | 242.6 | 147.6 | 87.4 | 53.2 | 33.0 | 20.7 | 13.1 | 8.2 | 14.1 |
| 1964 | 47.0 | 44.9 | 43.0 | 41.1 | 39.4 | 37.7 | 36.0 | 34.5 | 32.9 | 31.4 | 242.4 | 147.7 | 87.4 | 53.0 | 32.9 | 20.6 | 13.0 | 8.2 | 14.0 |
| 1965 | 46.9 | 44.9 | 42.9 | 41.1 | 39.3 | 37.6 | 35.9 | 34.4 | 32.9 | 31.4 | 242.5 | 148.0 | 87.7 | 53.0 | 32.8 | 20.6 | 12.9 | 8.2 | 13.9 |
| 1966 | 46.7 | 44.8 | 42.8 | 41.0 | 39.2 | 37.5 | 35.8 | 34.2 | 32.7 | 31.2 | 239.7 | 145.2 | 86.0 | 51.8 | 32.0 | 20.1 | 12.6 | 8.0 | 13.6 |
| 1967 | 46.6 | 44.6 | 42.8 | 40.9 | 39.1 | 37.4 | 35.7 | 34.2 | 32.6 | 31.2 | 239.9 | 145.3 | 86.3 | 51.7 | 32.0 | 20.0 | 12.6 | 7.9 | 13.5 |
| 1968 | 46.5 | 44.5 | 42.6 | 40.9 | 39.0 | 37.3 | 35.7 | 34.1 | 32.6 | 31.1 | 239.8 | 145.0 | 86.3 | 51.6 | 31.8 | 19.9 | 12.5 | 7.9 | 13.4 |
| 1969 | 46.4 | 44.4 | 42.5 | 40.7 | 39.0 | 37.3 | 35.6 | 34.0 | 32.5 | 31.0 | 239.8 | 144.8 | 86.4 | 51.5 | 31.7 | 19.8 | 12.4 | 7.8 | 13.4 |
| 1970 | 46.1 | 44.3 | 42.4 | 40.6 | 38.8 | 37.2 | 35.5 | 33.9 | 32.4 | 30.9 | 237.6 | 142.6 | 85.2 | 50.6 | 31.0 | 19.3 | 12.2 | 7.7 | 13.1 |
| 1971 | 45.9 | 44.0 | 42.3 | 40.5 | 38.7 | 37.0 | 35.5 | 33.9 | 32.3 | 30.9 | 237.7 | 142.5 | 85.3 | 50.5 | 30.9 | 19.3 | 12.1 | 7.6 | 13.0 |
| 1972 | 45.6 | 43.8 | 42.0 | 40.4 | 38.6 | 36.9 | 35.3 | 33.8 | 32.3 | 30.8 | 237.1 | 141.8 | 85.0 | 50.3 | 30.7 | 19.1 | 12.0 | 7.5 | 12.9 |
| 1973 | 45.3 | 43.6 | 41.9 | 40.1 | 38.5 | 36.9 | 35.2 | 33.7 | 32.2 | 30.7 | 236.4 | 141.1 | 84.7 | 50.0 | 30.4 | 18.9 | 11.9 | 7.5 | 12.7 |
| 1974 | 45.0 | 43.3 | 41.6 | 40.0 | 38.3 | 36.8 | 35.2 | 33.6 | 32.1 | 30.7 | 236.2 | 140.9 | 84.6 | 49.9 | 30.2 | 18.8 | 11.8 | 7.4 | 12.7 |
| 1975 | 44.6 | 42.9 | 41.3 | 39.7 | 38.1 | 36.6 | 35.1 | 33.5 | 32.0 | 30.5 | 235.7 | 140.5 | 84.3 | 49.8 | 30.0 | 18.6 | 11.7 | 7.3 | 12.5 |
| 1976 | 44.2 | 42.6 | 41.0 | 39.4 | 37.9 | 36.4 | 34.9 | 33.5 | 32.0 | 30.5 | 235.7 | 140.7 | 84.3 | 49.8 | 30.0 | 18.5 | 11.6 | 7.3 | 12.5 |
| 1977 | 43.8 | 42.2 | 40.7 | 39.1 | 37.6 | 36.2 | 34.7 | 33.2 | 31.9 | 30.4 | 234.6 | 140.1 | 83.7 | 49.6 | 29.7 | 18.4 | 11.5 | 7.2 | 12.3 |
| 1978 | 43.3 | 41.8 | 40.3 | 38.8 | 37.4 | 35.9 | 34.5 | 33.1 | 31.6 | 30.3 | 233.4 | 139.4 | 83.1 | 49.3 | 29.4 | 18.2 | 11.3 | 7.1 | 12.2 |
| 1979 | 42.5 | 41.4 | 39.9 | 38.5 | 37.0 | 35.6 | 34.2 | 32.8 | 31.4 | 30.0 | 230.9 | 137.3 | 81.6 | 48.5 | 28.9 | 17.8 | 11.1 | 7.0 | 11.9 |
| 1980 | 41.6 | 40.6 | 39.5 | 38.1 | 36.7 | 35.3 | 33.9 | 32.4 | 31.1 | 29.6 | 226.5 | 133.5 | 79.0 | 47.1 | 27.9 | 17.1 | 10.7 | 6.7 | 11.5 |
| 1981 | 40.8 | 39.7 | 38.7 | 37.7 | 36.3 | 34.9 | 33.5 | 32.1 | 30.7 | 29.3 | 222.4 | 129.7 | 76.4 | 45.6 | 27.0 | 16.5 | 10.3 | 6.5 | 11.0 |
| 1982 | 39.7 | 39.0 | 37.9 | 36.9 | 35.9 | 34.6 | 33.2 | 31.8 | 30.3 | 28.9 | 216.8 | 124.4 | 72.8 | 43.5 | 25.7 | 15.7 | 9.7 | 6.1 | 10.4 |
| 1983 | 38.2 | 37.9 | 37.2 | 36.1 | 35.1 | 34.1 | 32.7 | 31.3 | 29.8 | 28.3 | 208.0 | 115.9 | 67.3 | 40.1 | 23.7 | 14.4 | 8.9 | 5.6 | 9.6 |
| 1984 | 37.0 | 36.5 | 36.2 | 35.5 | 34.4 | 33.4 | 32.2 | 30.8 | 29.3 | 27.7 | 199.6 | 107.8 | 62.0 | 36.9 | 21.8 | 13.2 | 8.2 | 5.1 | 8.7 |
| 1985 | 36.1 | 35.4 | 34.8 | 34.5 | 33.8 | 32.7 | 31.6 | 30.5 | 29.0 | 27.5 | 196.0 | 103.4 | 59.0 | 35.1 | 20.6 | 12.5 | 7.7 | 4.8 | 8.2 |
| 1986 | 34.9 | 34.5 | 33.7 | 33.2 | 32.9 | 32.1 | 31.0 | 29.9 | 28.7 | 27.1 | 191.2 | 97.6 | 55.0 | 32.6 | 19.2 | 11.5 | 7.1 | 4.5 | 7.6 |
| 1987 | 34.1 | 33.3 | 32.9 | 32.2 | 31.6 | 31.3 | 30.5 | 29.4 | 28.3 | 27.0 | 190.5 | 95.4 | 53.2 | 31.4 | 18.5 | 11.1 | 6.8 | 4.3 | 7.3 |
| 1988 | 33.2 | 32.6 | 31.8 | 31.4 | 30.7 | 30.1 | 29.7 | 28.9 | 27.7 | 26.6 | 188.7 | 92.3 | 50.9 | 29.9 | 17.7 | 10.5 | 6.5 | 4.1 | 6.9 |
| 1989 | 32.1 | 31.7 | 31.1 | 30.3 | 29.9 | 29.2 | 28.6 | 28.1 | 27.3 | 26.1 | 186.2 | 88.7 | 48.1 | 28.1 | 16.6 | 9.9 | 6.1 | 3.8 | 6.4 |
| 1990 | 30.6 | 30.7 | 30.2 | 29.6 | 28.8 | 28.4 | 27.6 | 26.9 | 26.4 | 25.4 | 179.4 | 82.1 | 43.6 | 25.2 | 15.0 | 8.9 | 5.4 | 3.4 | 5.7 |
| 1991 | 29.6 | 29.2 | 29.3 | 28.9 | 28.2 | 27.4 | 27.0 | 26.2 | 25.4 | 24.8 | 178.7 | 80.6 | 42.0 | 24.1 | 14.3 | 8.5 | 5.2 | 3.2 | 5.5 |
| 1992 | 27.8 | 28.3 | 27.8 | 27.9 | 27.5 | 26.8 | 26.0 | 25.4 | 24.5 | 23.7 | 172.8 | 75.7 | 38.4 | 21.9 | 13.0 | 7.7 | 4.7 | 2.9 | 4.9 |
| 1993 | 25.9 | 26.6 | 27.0 | 26.5 | 26.5 | 26.0 | 25.3 | 24.3 | 23.6 | 22.6 | 163.3 | 68.9 | 33.8 | 19.1 | 11.3 | 6.7 | 4.0 | 2.5 | 4.3 |
| 1994 | 24.1 | 24.7 | 25.3 | 25.7 | 25.2 | 25.1 | 24.5 | 23.6 | 22.5 | 21.7 | 152.3 | 61.2 | 28.9 | 16.2 | 9.6 | 5.6 | 3.4 | 2.1 | 3.6 |
| 1995 | 23.0 | 23.0 | 23.6 | 24.1 | 24.4 | 23.9 | 23.7 | 23.0 | 22.1 | 20.9 | 147.2 | 57.8 | 26.3 | 14.5 | 8.6 | 5.0 | 3.0 | 1.9 | 3.2 |
| 1996 | 21.6 | 21.9 | 21.9 | 22.4 | 22.9 | 23.1 | 22.5 | 22.2 | 21.3 | 20.3 | 138.5 | 52.2 | 22.7 | 12.4 | 7.3 | 4.3 | 2.6 | 1.6 | 2.7 |
| 1997 | 20.4 | 20.6 | 20.9 | 20.9 | 21.3 | 21.8 | 21.9 | 21.2 | 20.8 | 19.9 | 135.0 | 49.9 | 20.8 | 11.2 | 6.5 | 3.8 | 2.3 | 1.4 | 2.4 |
| 1998 | 19.0 | 19.5 | 19.6 | 19.9 | 19.8 | 20.2 | 20.5 | 20.5 | 19.7 | 19.1 | 128.3 | 45.8 | 18.2 | 9.6 | 5.6 | 3.3 | 2.0 | 1.2 | 2.0 |
| 1999 | 18.7 | 18.2 | 18.6 | 18.7 | 19.0 | 18.9 | 19.1 | 19.3 | 19.2 | 18.4 | 127.2 | 45.5 | 17.4 | 9.0 | 5.2 | 3.1 | 1.8 | 1.1 | 1.9 |

Table A.3. Continued. Female numbers at age in Oregon (1000s) predicted by the base-case model.

| Age (Yr) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 18.0 | 17.9 | 17.3 | 17.7 | 17.8 | 18.0 | 17.8 | 18.0 | 18.1 | 17.8 | 123.6 | 44.1 | 16.2 | 8.2 | 4.7 | 2.8 | 1.6 | 1.0 | 1.7 |
| 2001 | 18.2 | 17.2 | 17.1 | 16.5 | 16.9 | 17.0 | 17.1 | 16.9 | 17.1 | 17.1 | 126.0 | 46.5 | 16.5 | 8.2 | 4.6 | 2.7 | 1.6 | 1.0 | 1.7 |
| 2002 | 18.4 | 17.4 | 16.4 | 16.3 | 15.8 | 16.1 | 16.2 | 16.3 | 16.1 | 16.2 | 127.7 | 49.0 | 17.0 | 8.2 | 4.6 | 2.7 | 1.6 | 1.0 | 1.6 |
| 2003 | 18.9 | 17.5 | 16.6 | 15.6 | 15.5 | 15.1 | 15.4 | 15.4 | 15.6 | 15.4 | 128.8 | 52.0 | 17.7 | 8.3 | 4.6 | 2.7 | 1.6 | 1.0 | 1.6 |
| 2004 | 19.4 | 18.0 | 16.8 | 15.9 | 14.9 | 14.8 | 14.4 | 14.7 | 14.7 | 14.8 | 128.7 | 55.2 | 18.5 | 8.4 | 4.6 | 2.7 | 1.6 | 1.0 | 1.6 |
| 2005 | 19.9 | 18.5 | 17.2 | 16.0 | 15.2 | 14.3 | 14.2 | 13.7 | 14.0 | 14.0 | 127.4 | 58.3 | 19.3 | 8.5 | 4.6 | 2.7 | 1.6 | 1.0 | 1.6 |
| 2006 | 20.4 | 19.0 | 17.7 | 16.4 | 15.3 | 14.5 | 13.6 | 13.5 | 13.1 | 13.3 | 125.1 | 61.3 | 20.3 | 8.6 | 4.7 | 2.7 | 1.6 | 1.0 | 1.6 |
| 2007 | 20.9 | 19.5 | 18.2 | 16.9 | 15.7 | 14.6 | 13.8 | 13.0 | 12.9 | 12.4 | 122.0 | 64.5 | 21.5 | 8.8 | 4.7 | 2.7 | 1.6 | 1.0 | 1.6 |
| 2008 | 21.3 | 19.9 | 18.6 | 17.4 | 16.1 | 15.0 | 13.9 | 13.2 | 12.4 | 12.3 | 117.8 | 67.6 | 22.8 | 8.9 | 4.7 | 2.7 | 1.6 | 1.0 | 1.6 |
| 2009 | 21.7 | 20.3 | 19.0 | 17.8 | 16.6 | 15.4 | 14.3 | 13.3 | 12.5 | 11.8 | 113.5 | 70.3 | 24.1 | 9.1 | 4.7 | 2.7 | 1.6 | 1.0 | 1.6 |
| 2010 | 22.1 | 20.7 | 19.4 | 18.2 | 17.0 | 15.8 | 14.7 | 13.6 | 12.7 | 12.0 | 109.2 | 72.9 | 25.7 | 9.4 | 4.8 | 2.7 | 1.6 | 1.0 | 1.6 |

Table A.4. Male numbers at age in Oregon (1000s) predicted by the base-case model.

| Age (Yr) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1916 | 49.8 | 47.6 | 45.5 | 43.5 | 41.6 | 39.8 | 38.0 | 36.4 | 34.8 | 33.2 | 261.7 | 167.0 | 106.6 | 68.0 | 43.4 | 27.7 | 17.7 | 11.3 | 19.9 |
| 1917 | 49.8 | 47.6 | 45.5 | 43.5 | 41.6 | 39.8 | 38.0 | 36.4 | 34.8 | 33.2 | 261.7 | 167.0 | 106.5 | 68.0 | 43.4 | 27.7 | 17.7 | 11.3 | 19.9 |
| 1918 | 49.8 | 47.6 | 45.5 | 43.5 | 41.6 | 39.8 | 38.0 | 36.4 | 34.8 | 33.2 | 261.6 | 166.9 | 106.5 | 67.9 | 43.4 | 27.7 | 17.7 | 11.3 | 19.9 |
| 1919 | 49.8 | 47.6 | 45.5 | 43.5 | 41.6 | 39.8 | 38.0 | 36.4 | 34.8 | 33.2 | 261.5 | 166.8 | 106.4 | 67.9 | 43.3 | 27.7 | 17.6 | 11.3 | 19.9 |
| 1920 | 49.8 | 47.6 | 45.5 | 43.5 | 41.6 | 39.8 | 38.0 | 36.4 | 34.8 | 33.2 | 261.5 | 166.7 | 106.4 | 67.9 | 43.3 | 27.6 | 17.6 | 11.3 | 19.8 |
| 1921 | 49.8 | 47.6 | 45.5 | 43.5 | 41.6 | 39.8 | 38.0 | 36.4 | 34.8 | 33.2 | 261.4 | 166.6 | 106.3 | 67.8 | 43.3 | 27.6 | 17.6 | 11.2 | 19.8 |
| 1922 | 49.7 | 47.6 | 45.5 | 43.5 | 41.6 | 39.8 | 38.0 | 36.4 | 34.8 | 33.2 | 261.4 | 166.6 | 106.2 | 67.8 | 43.3 | 27.6 | 17.6 | 11.2 | 19.8 |
| 1923 | 49.7 | 47.6 | 45.5 | 43.5 | 41.6 | 39.8 | 38.0 | 36.4 | 34.8 | 33.2 | 261.3 | 166.5 | 106.2 | 67.8 | 43.2 | 27.6 | 17.6 | 11.2 | 19.8 |
| 1924 | 49.7 | 47.6 | 45.5 | 43.5 | 41.6 | 39.8 | 38.0 | 36.3 | 34.8 | 33.2 | 261.3 | 166.4 | 106.1 | 67.7 | 43.2 | 27.6 | 17.6 | 11.2 | 19.8 |
| 1925 | 49.7 | 47.5 | 45.5 | 43.5 | 41.6 | 39.7 | 38.0 | 36.3 | 34.7 | 33.2 | 261.3 | 166.3 | 106.0 | 67.7 | 43.2 | 27.5 | 17.6 | 11.2 | 19.8 |
| 1926 | 49.7 | 47.5 | 45.5 | 43.5 | 41.6 | 39.7 | 38.0 | 36.3 | 34.7 | 33.2 | 261.2 | 166.2 | 106.0 | 67.6 | 43.1 | 27.5 | 17.6 | 11.2 | 19.8 |
| 1927 | 49.7 | 47.5 | 45.4 | 43.5 | 41.6 | 39.7 | 38.0 | 36.3 | 34.7 | 33.2 | 261.2 | 166.2 | 105.9 | 67.6 | 43.1 | 27.5 | 17.6 | 11.2 | 19.8 |
| 1928 | 49.7 | 47.5 | 45.4 | 43.4 | 41.5 | 39.7 | 38.0 | 36.3 | 34.7 | 33.2 | 261.2 | 166.1 | 105.8 | 67.5 | 43.1 | 27.5 | 17.5 | 11.2 | 19.7 |
| 1929 | 49.7 | 47.5 | 45.4 | 43.4 | 41.5 | 39.7 | 38.0 | 36.3 | 34.7 | 33.2 | 261.1 | 165.9 | 105.7 | 67.4 | 43.0 | 27.5 | 17.5 | 11.2 | 19.7 |
| 1930 | 49.6 | 47.5 | 45.4 | 43.4 | 41.5 | 39.7 | 38.0 | 36.3 | 34.7 | 33.2 | 260.8 | 165.7 | 105.5 | 67.3 | 42.9 | 27.4 | 17.5 | 11.2 | 19.7 |
| 1931 | 49.6 | 47.5 | 45.4 | 43.4 | 41.5 | 39.7 | 38.0 | 36.3 | 34.7 | 33.2 | 260.6 | 165.4 | 105.3 | 67.2 | 42.9 | 27.3 | 17.4 | 11.1 | 19.6 |
| 1932 | 49.6 | 47.4 | 45.4 | 43.4 | 41.5 | 39.7 | 37.9 | 36.3 | 34.7 | 33.2 | 260.5 | 165.3 | 105.2 | 67.1 | 42.8 | 27.3 | 17.4 | 11.1 | 19.6 |
| 1933 | 49.6 | 47.4 | 45.3 | 43.4 | 41.5 | 39.7 | 37.9 | 36.3 | 34.7 | 33.2 | 260.6 | 165.3 | 105.1 | 67.0 | 42.8 | 27.3 | 17.4 | 11.1 | 19.6 |
| 1934 | 49.5 | 47.4 | 45.3 | 43.3 | 41.5 | 39.7 | 37.9 | 36.3 | 34.7 | 33.2 | 260.6 | 165.3 | 105.1 | 67.0 | 42.7 | 27.3 | 17.4 | 11.1 | 19.6 |
| 1935 | 49.5 | 47.4 | 45.3 | 43.3 | 41.4 | 39.6 | 37.9 | 36.3 | 34.7 | 33.2 | 260.6 | 165.2 | 105.0 | 66.9 | 42.7 | 27.2 | 17.4 | 11.1 | 19.6 |
| 1936 | 49.5 | 47.3 | 45.3 | 43.3 | 41.4 | 39.6 | 37.9 | 36.2 | 34.7 | 33.1 | 260.6 | 165.2 | 104.9 | 66.9 | 42.7 | 27.2 | 17.4 | 11.1 | 19.5 |
| 1937 | 49.5 | 47.3 | 45.3 | 43.3 | 41.4 | 39.6 | 37.9 | 36.2 | 34.6 | 33.1 | 260.4 | 165.1 | 104.8 | 66.8 | 42.6 | 27.2 | 17.3 | 11.1 | 19.5 |
| 1938 | 49.4 | 47.3 | 45.2 | 43.3 | 41.4 | 39.6 | 37.9 | 36.2 | 34.6 | 33.1 | 260.2 | 164.8 | 104.6 | 66.6 | 42.5 | 27.1 | 17.3 | 11.0 | 19.5 |
| 1939 | 49.4 | 47.3 | 45.2 | 43.3 | 41.4 | 39.6 | 37.8 | 36.2 | 34.6 | 33.1 | 260.0 | 164.7 | 104.4 | 66.5 | 42.4 | 27.1 | 17.3 | 11.0 | 19.4 |
| 1940 | 49.4 | 47.2 | 45.2 | 43.2 | 41.4 | 39.6 | 37.8 | 36.2 | 34.6 | 33.1 | 260.0 | 164.6 | 104.3 | 66.4 | 42.4 | 27.0 | 17.2 | 11.0 | 19.4 |
| 1941 | 49.3 | 47.2 | 45.2 | 43.2 | 41.3 | 39.5 | 37.8 | 36.1 | 34.6 | 33.0 | 259.7 | 164.3 | 104.1 | 66.2 | 42.2 | 26.9 | 17.2 | 11.0 | 19.3 |
| 1942 | 49.3 | 47.2 | 45.1 | 43.2 | 41.3 | 39.5 | 37.8 | 36.1 | 34.5 | 33.0 | 259.1 | 163.7 | 103.7 | 65.9 | 42.0 | 26.8 | 17.1 | 10.9 | 19.3 |
| 1943 | 49.2 | 47.1 | 45.1 | 43.1 | 41.3 | 39.5 | 37.7 | 36.1 | 34.5 | 33.0 | 258.3 | 162.9 | 103.0 | 65.5 | 41.8 | 26.6 | 17.0 | 10.8 | 19.1 |
| 1944 | 49.1 | 47.1 | 45.0 | 43.1 | 41.2 | 39.4 | 37.7 | 36.0 | 34.4 | 32.8 | 255.8 | 160.2 | 101.2 | 64.3 | 41.0 | 26.1 | 16.7 | 10.6 | 18.8 |
| 1945 | 48.9 | 46.9 | 45.0 | 43.1 | 41.2 | 39.4 | 37.6 | 35.9 | 34.3 | 32.8 | 254.3 | 158.4 | 99.9 | 63.4 | 40.4 | 25.8 | 16.4 | 10.5 | 18.5 |
| 1946 | 48.7 | 46.8 | 44.9 | 43.0 | 41.1 | 39.3 | 37.6 | 35.9 | 34.3 | 32.7 | 252.3 | 156.0 | 98.1 | 62.2 | 39.6 | 25.3 | 16.1 | 10.3 | 18.2 |
| 1947 | 48.5 | 46.6 | 44.7 | 42.9 | 41.1 | 39.3 | 37.6 | 35.9 | 34.2 | 32.7 | 251.5 | 154.5 | 97.0 | 61.5 | 39.1 | 25.0 | 15.9 | 10.2 | 17.9 |
| 1948 | 48.4 | 46.4 | 44.5 | 42.8 | 41.0 | 39.3 | 37.5 | 35.9 | 34.3 | 32.7 | 251.5 | 153.8 | 96.3 | 61.0 | 38.8 | 24.8 | 15.8 | 10.1 | 17.8 |
| 1949 | 48.3 | 46.3 | 44.3 | 42.5 | 40.9 | 39.2 | 37.5 | 35.9 | 34.3 | 32.7 | 251.7 | 153.4 | 95.9 | 60.6 | 38.6 | 24.6 | 15.7 | 10.0 | 17.7 |
| 1950 | 48.3 | 46.2 | 44.2 | 42.4 | 40.7 | 39.1 | 37.4 | 35.9 | 34.3 | 32.7 | 252.3 | 153.2 | 95.5 | 60.4 | 38.4 | 24.5 | 15.6 | 10.0 | 17.6 |
| 1951 | 48.2 | 46.1 | 44.2 | 42.3 | 40.5 | 38.9 | 37.3 | 35.8 | 34.2 | 32.7 | 252.7 | 153.0 | 95.1 | 60.1 | 38.2 | 24.4 | 15.5 | 9.9 | 17.5 |
| 1952 | 48.1 | 46.1 | 44.1 | 42.2 | 40.4 | 38.7 | 37.1 | 35.7 | 34.2 | 32.7 | 253.1 | 153.0 | 94.9 | 59.8 | 38.0 | 24.3 | 15.5 | 9.9 | 17.4 |
| 1953 | 48.0 | 46.0 | 44.0 | 42.2 | 40.4 | 38.6 | 37.0 | 35.5 | 34.1 | 32.6 | 253.5 | 153.1 | 94.6 | 59.6 | 37.9 | 24.1 | 15.4 | 9.8 | 17.3 |
| 1954 | 48.0 | 45.9 | 44.0 | 42.1 | 40.3 | 38.6 | 36.9 | 35.4 | 33.9 | 32.5 | 254.0 | 153.4 | 94.5 | 59.5 | 37.7 | 24.1 | 15.3 | 9.8 | 17.3 |
| 1955 | 47.9 | 45.9 | 43.9 | 42.0 | 40.3 | 38.5 | 36.9 | 35.3 | 33.8 | 32.4 | 254.1 | 153.6 | 94.2 | 59.2 | 37.6 | 24.0 | 15.3 | 9.7 | 17.2 |
| 1956 | 47.8 | 45.8 | 43.9 | 42.0 | 40.2 | 38.5 | 36.8 | 35.2 | 33.7 | 32.2 | 253.5 | 153.6 | 93.9 | 58.9 | 37.4 | 23.8 | 15.2 | 9.7 | 17.1 |
| 1957 | 47.7 | 45.7 | 43.8 | 41.9 | 40.1 | 38.4 | 36.7 | 35.1 | 33.6 | 32.1 | 252.7 | 153.4 | 93.4 | 58.5 | 37.1 | 23.6 | 15.1 | 9.6 | 16.9 |

Table A.4. Continued. Male numbers at age in Oregon (1000s) predicted by the base-case model.

| Age (Yr) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1958 | 47.6 | 45.6 | 43.7 | 41.9 | 40.1 | 38.3 | 36.7 | 35.1 | 33.5 | 32.0 | 251.4 | 153.0 | 92.8 | 58.0 | 36.7 | 23.4 | 14.9 | 9.5 | 16.8 |
| 1959 | 47.5 | 45.5 | 43.6 | 41.8 | 40.0 | 38.3 | 36.6 | 35.0 | 33.5 | 32.0 | 250.5 | 152.9 | 92.3 | 57.6 | 36.5 | 23.2 | 14.8 | 9.4 | 16.6 |
| 1960 | 47.4 | 45.4 | 43.5 | 41.7 | 39.9 | 38.2 | 36.6 | 34.9 | 33.4 | 31.9 | 249.5 | 152.6 | 91.9 | 57.2 | 36.2 | 23.0 | 14.7 | 9.4 | 16.5 |
| 1961 | 47.3 | 45.3 | 43.4 | 41.6 | 39.9 | 38.2 | 36.5 | 34.9 | 33.3 | 31.8 | 248.3 | 152.1 | 91.3 | 56.7 | 35.8 | 22.8 | 14.5 | 9.3 | 16.3 |
| 1962 | 47.2 | 45.2 | 43.3 | 41.5 | 39.8 | 38.1 | 36.4 | 34.8 | 33.3 | 31.8 | 247.1 | 151.7 | 90.8 | 56.2 | 35.5 | 22.5 | 14.4 | 9.2 | 16.2 |
| 1963 | 47.1 | 45.1 | 43.2 | 41.4 | 39.6 | 38.0 | 36.4 | 34.8 | 33.2 | 31.7 | 245.9 | 151.0 | 90.3 | 55.7 | 35.1 | 22.3 | 14.2 | 9.1 | 16.0 |
| 1964 | 47.0 | 45.0 | 43.1 | 41.3 | 39.5 | 37.9 | 36.3 | 34.7 | 33.2 | 31.7 | 245.7 | 151.1 | 90.3 | 55.5 | 34.9 | 22.2 | 14.1 | 9.0 | 15.9 |
| 1965 | 46.9 | 44.9 | 43.0 | 41.2 | 39.5 | 37.8 | 36.2 | 34.7 | 33.2 | 31.7 | 245.8 | 151.4 | 90.5 | 55.5 | 34.9 | 22.1 | 14.1 | 9.0 | 15.8 |
| 1966 | 46.7 | 44.9 | 42.9 | 41.1 | 39.4 | 37.7 | 36.0 | 34.5 | 33.0 | 31.5 | 242.8 | 148.5 | 88.8 | 54.2 | 34.0 | 21.5 | 13.7 | 8.8 | 15.4 |
| 1967 | 46.6 | 44.6 | 42.9 | 41.0 | 39.3 | 37.6 | 36.0 | 34.4 | 32.9 | 31.4 | 243.1 | 148.5 | 89.1 | 54.1 | 33.9 | 21.5 | 13.7 | 8.7 | 15.4 |
| 1968 | 46.5 | 44.5 | 42.7 | 41.0 | 39.2 | 37.5 | 35.9 | 34.4 | 32.8 | 31.4 | 243.0 | 148.2 | 89.1 | 53.9 | 33.7 | 21.3 | 13.6 | 8.7 | 15.3 |
| 1969 | 46.4 | 44.4 | 42.6 | 40.8 | 39.2 | 37.5 | 35.9 | 34.3 | 32.8 | 31.3 | 243.0 | 148.1 | 89.2 | 53.8 | 33.6 | 21.2 | 13.5 | 8.6 | 15.2 |
| 1970 | 46.1 | 44.3 | 42.5 | 40.7 | 39.0 | 37.4 | 35.8 | 34.2 | 32.6 | 31.2 | 240.7 | 145.7 | 88.0 | 52.8 | 32.9 | 20.8 | 13.2 | 8.4 | 14.9 |
| 1971 | 45.9 | 44.1 | 42.4 | 40.6 | 38.9 | 37.2 | 35.7 | 34.1 | 32.6 | 31.1 | 240.8 | 145.6 | 88.1 | 52.8 | 32.8 | 20.7 | 13.1 | 8.4 | 14.8 |
| 1972 | 45.6 | 43.9 | 42.1 | 40.5 | 38.8 | 37.2 | 35.5 | 34.1 | 32.5 | 31.1 | 240.2 | 144.9 | 87.8 | 52.5 | 32.5 | 20.5 | 13.0 | 8.3 | 14.6 |
| 1973 | 45.3 | 43.6 | 42.0 | 40.3 | 38.7 | 37.1 | 35.5 | 33.9 | 32.5 | 31.0 | 239.4 | 144.2 | 87.5 | 52.2 | 32.2 | 20.3 | 12.9 | 8.2 | 14.5 |
| 1974 | 45.0 | 43.3 | 41.7 | 40.1 | 38.5 | 37.0 | 35.4 | 33.9 | 32.4 | 31.0 | 239.3 | 144.0 | 87.4 | 52.1 | 32.0 | 20.2 | 12.8 | 8.2 | 14.4 |
| 1975 | 44.6 | 43.0 | 41.4 | 39.9 | 38.3 | 36.8 | 35.3 | 33.8 | 32.3 | 30.8 | 238.8 | 143.6 | 87.1 | 52.0 | 31.8 | 20.0 | 12.7 | 8.1 | 14.2 |
| 1976 | 44.2 | 42.6 | 41.1 | 39.6 | 38.1 | 36.6 | 35.1 | 33.7 | 32.2 | 30.8 | 238.8 | 143.8 | 87.1 | 52.0 | 31.7 | 19.9 | 12.6 | 8.0 | 14.2 |
| 1977 | 43.8 | 42.3 | 40.7 | 39.3 | 37.8 | 36.4 | 34.9 | 33.5 | 32.1 | 30.7 | 237.7 | 143.1 | 86.5 | 51.8 | 31.4 | 19.7 | 12.5 | 7.9 | 14.0 |
| 1978 | 43.3 | 41.9 | 40.4 | 38.9 | 37.5 | 36.1 | 34.7 | 33.3 | 31.9 | 30.6 | 236.5 | 142.4 | 85.8 | 51.5 | 31.1 | 19.5 | 12.3 | 7.8 | 13.8 |
| 1979 | 42.5 | 41.4 | 40.0 | 38.6 | 37.2 | 35.8 | 34.4 | 33.1 | 31.7 | 30.2 | 233.8 | 140.3 | 84.3 | 50.7 | 30.5 | 19.1 | 12.0 | 7.7 | 13.5 |
| 1980 | 41.6 | 40.6 | 39.6 | 38.2 | 36.9 | 35.4 | 34.1 | 32.7 | 31.3 | 29.9 | 229.1 | 136.3 | 81.6 | 49.2 | 29.5 | 18.4 | 11.6 | 7.4 | 13.0 |
| 1981 | 40.8 | 39.8 | 38.8 | 37.8 | 36.5 | 35.1 | 33.7 | 32.3 | 30.9 | 29.5 | 224.6 | 132.3 | 78.8 | 47.6 | 28.5 | 17.7 | 11.2 | 7.1 | 12.5 |
| 1982 | 39.7 | 39.1 | 38.0 | 37.1 | 36.1 | 34.7 | 33.4 | 31.9 | 30.5 | 29.1 | 218.6 | 126.7 | 75.1 | 45.4 | 27.1 | 16.8 | 10.6 | 6.7 | 11.8 |
| 1983 | 38.2 | 38.0 | 37.3 | 36.2 | 35.3 | 34.3 | 32.9 | 31.4 | 29.9 | 28.4 | 209.0 | 117.8 | 69.3 | 41.9 | 25.0 | 15.4 | 9.7 | 6.2 | 10.8 |
| 1984 | 37.0 | 36.5 | 36.3 | 35.6 | 34.5 | 33.5 | 32.4 | 30.9 | 29.4 | 27.8 | 200.0 | 109.2 | 63.8 | 38.5 | 22.9 | 14.1 | 8.9 | 5.6 | 9.9 |
| 1985 | 36.1 | 35.4 | 34.9 | 34.6 | 33.9 | 32.8 | 31.8 | 30.6 | 29.1 | 27.6 | 196.0 | 104.6 | 60.6 | 36.6 | 21.8 | 13.3 | 8.4 | 5.3 | 9.3 |
| 1986 | 34.9 | 34.5 | 33.8 | 33.3 | 33.0 | 32.3 | 31.1 | 30.0 | 28.8 | 27.2 | 190.9 | 98.4 | 56.5 | 34.0 | 20.2 | 12.3 | 7.7 | 4.9 | 8.6 |
| 1987 | 34.1 | 33.3 | 33.0 | 32.3 | 31.8 | 31.5 | 30.7 | 29.5 | 28.4 | 27.2 | 190.2 | 96.0 | 54.6 | 32.7 | 19.5 | 11.8 | 7.4 | 4.7 | 8.3 |
| 1988 | 33.2 | 32.6 | 31.9 | 31.5 | 30.8 | 30.2 | 29.9 | 29.1 | 27.9 | 26.7 | 188.3 | 92.7 | 52.2 | 31.1 | 18.6 | 11.2 | 7.0 | 4.4 | 7.8 |
| 1989 | 32.1 | 31.7 | 31.2 | 30.4 | 30.0 | 29.3 | 28.7 | 28.3 | 27.4 | 26.2 | 185.6 | 88.8 | 49.3 | 29.2 | 17.5 | 10.5 | 6.6 | 4.2 | 7.3 |
| 1990 | 30.6 | 30.7 | 30.3 | 29.7 | 29.0 | 28.5 | 27.8 | 27.0 | 26.5 | 25.5 | 178.4 | 81.8 | 44.5 | 26.2 | 15.7 | 9.4 | 5.9 | 3.7 | 6.5 |
| 1991 | 29.6 | 29.2 | 29.3 | 28.9 | 28.4 | 27.6 | 27.1 | 26.3 | 25.6 | 24.9 | 177.8 | 80.2 | 42.8 | 25.1 | 15.1 | 9.0 | 5.6 | 3.5 | 6.2 |
| 1992 | 27.8 | 28.3 | 27.9 | 28.0 | 27.6 | 27.0 | 26.1 | 25.5 | 24.7 | 23.8 | 171.6 | 75.0 | 39.0 | 22.7 | 13.7 | 8.2 | 5.0 | 3.2 | 5.6 |
| 1993 | 25.9 | 26.6 | 27.0 | 26.6 | 26.6 | 26.1 | 25.4 | 24.5 | 23.7 | 22.7 | 161.6 | 67.9 | 34.3 | 19.8 | 11.9 | 7.1 | 4.4 | 2.8 | 4.8 |
| 1994 | 24.1 | 24.7 | 25.4 | 25.7 | 25.3 | 25.2 | 24.6 | 23.7 | 22.6 | 21.7 | 150.0 | 59.9 | 29.2 | 16.7 | 10.0 | 6.0 | 3.7 | 2.3 | 4.0 |
| 1995 | 23.0 | 23.0 | 23.6 | 24.2 | 24.5 | 24.0 | 23.8 | 23.1 | 22.1 | 20.9 | 144.8 | 56.3 | 26.5 | 15.0 | 9.0 | 5.4 | 3.3 | 2.1 | 3.6 |
| 1996 | 21.6 | 22.0 | 22.0 | 22.5 | 23.0 | 23.2 | 22.6 | 22.2 | 21.4 | 20.3 | 135.8 | 50.6 | 22.8 | 12.8 | 7.6 | 4.5 | 2.8 | 1.7 | 3.0 |
| 1997 | 20.4 | 20.6 | 21.0 | 21.0 | 21.4 | 21.9 | 22.0 | 21.3 | 20.8 | 19.9 | 132.2 | 48.1 | 20.7 | 11.5 | 6.8 | 4.1 | 2.5 | 1.5 | 2.7 |
| 1998 | 19.0 | 19.5 | 19.7 | 20.0 | 19.9 | 20.3 | 20.6 | 20.5 | 19.7 | 19.1 | 125.4 | 44.0 | 18.1 | 9.9 | 5.8 | 3.5 | 2.1 | 1.3 | 2.3 |
| 1999 | 18.7 | 18.2 | 18.7 | 18.8 | 19.0 | 18.9 | 19.2 | 19.4 | 19.3 | 18.4 | 124.6 | 43.6 | 17.2 | 9.2 | 5.4 | 3.3 | 2.0 | 1.2 | 2.1 |

Table A.4. Continued. Male numbers at age in Oregon (1000s) predicted by the base-case model.

| Age (Yr) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 18.0 | 17.9 | 17.4 | 17.8 | 17.9 | 18.1 | 17.9 | 18.1 | 18.1 | 17.8 | 121.2 | 42.1 | 15.9 | 8.4 | 4.9 | 2.9 | 1.8 | 1.1 | 1.9 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2001 | 18.2 | 17.2 | 17.1 | 16.6 | 17.0 | 17.0 | 17.2 | 17.0 | 17.2 | 17.2 | 124.1 | 44.4 | 16.2 | 8.3 | 4.9 | 2.9 | 1.7 | 1.1 | 1.9 |
| 2002 | 18.4 | 17.4 | 16.4 | 16.3 | 15.9 | 16.2 | 16.3 | 16.4 | 16.2 | 16.3 | 126.3 | 47.0 | 16.6 | 8.3 | 4.8 | 2.9 | 1.7 | 1.1 | 1.8 |
| 2003 | 18.9 | 17.6 | 16.7 | 15.7 | 15.6 | 15.1 | 15.5 | 15.5 | 15.7 | 15.5 | 128.0 | 49.9 | 17.2 | 8.4 | 4.8 | 2.9 | 1.7 | 1.1 | 1.8 |
| 2004 | 19.4 | 18.1 | 16.8 | 15.9 | 15.0 | 14.9 | 14.5 | 14.8 | 14.8 | 14.9 | 128.4 | 53.1 | 18.0 | 8.5 | 4.8 | 2.9 | 1.7 | 1.1 | 1.8 |
| 2005 | 19.9 | 18.6 | 17.3 | 16.1 | 15.2 | 14.3 | 14.3 | 13.8 | 14.1 | 14.1 | 127.5 | 56.3 | 18.8 | 8.6 | 4.8 | 2.9 | 1.7 | 1.1 | 1.8 |
| 2006 | 20.4 | 19.1 | 17.8 | 16.5 | 15.3 | 14.6 | 13.7 | 13.6 | 13.2 | 13.5 | 125.6 | 59.5 | 19.7 | 8.7 | 4.9 | 2.9 | 1.7 | 1.0 | 1.8 |
| 2007 | 20.9 | 19.5 | 18.2 | 17.0 | 15.8 | 14.7 | 13.9 | 13.1 | 13.0 | 12.6 | 122.8 | 62.9 | 20.8 | 8.8 | 4.9 | 2.9 | 1.7 | 1.0 | 1.8 |
| 2008 | 21.3 | 20.0 | 18.6 | 17.4 | 16.2 | 15.1 | 14.0 | 13.3 | 12.5 | 12.4 | 118.9 | 66.1 | 22.0 | 9.0 | 4.9 | 2.9 | 1.7 | 1.0 | 1.8 |
| 2009 | 21.7 | 20.3 | 19.1 | 17.8 | 16.6 | 15.5 | 14.4 | 13.4 | 12.7 | 11.9 | 114.6 | 69.2 | 23.3 | 9.1 | 4.9 | 2.9 | 1.7 | 1.0 | 1.8 |
| 2010 | 22.1 | 20.8 | 19.4 | 18.2 | 17.0 | 15.9 | 14.8 | 13.8 | 12.8 | 12.1 | 110.5 | 72.1 | 24.8 | 9.4 | 4.9 | 2.9 | 1.7 | 1.0 | 1.8 |

Table A.5. Female numbers at age in Washington (1000s) predicted by the base-case model.

| Age (Yr) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1916 | 13.2 | 12.6 | 12.0 | 11.5 | 10.9 | 10.5 | 10.0 | 9.5 | 9.1 | 8.7 | 68.1 | 43.0 | 27.1 | 17.1 | 10.8 | 6.8 | 4.3 | 2.7 | 4.6 |
| 1917 | 13.2 | 12.6 | 12.0 | 11.5 | 10.9 | 10.5 | 10.0 | 9.5 | 9.1 | 8.7 | 68.1 | 43.0 | 27.1 | 17.1 | 10.8 | 6.8 | 4.3 | 2.7 | 4.6 |
| 1918 | 13.2 | 12.6 | 12.0 | 11.5 | 10.9 | 10.5 | 10.0 | 9.5 | 9.1 | 8.7 | 68.1 | 43.0 | 27.1 | 17.1 | 10.8 | 6.8 | 4.3 | 2.7 | 4.6 |
| 1919 | 13.2 | 12.6 | 12.0 | 11.5 | 10.9 | 10.5 | 10.0 | 9.5 | 9.1 | 8.7 | 68.1 | 43.0 | 27.1 | 17.1 | 10.8 | 6.8 | 4.3 | 2.7 | 4.6 |
| 1920 | 13.2 | 12.6 | 12.0 | 11.5 | 10.9 | 10.5 | 10.0 | 9.5 | 9.1 | 8.7 | 68.1 | 43.0 | 27.1 | 17.1 | 10.8 | 6.8 | 4.3 | 2.7 | 4.6 |
| 1921 | 13.2 | 12.6 | 12.0 | 11.5 | 10.9 | 10.5 | 10.0 | 9.5 | 9.1 | 8.7 | 68.1 | 43.0 | 27.1 | 17.1 | 10.8 | 6.8 | 4.3 | 2.7 | 4.6 |
| 1922 | 13.2 | 12.6 | 12.0 | 11.5 | 10.9 | 10.5 | 10.0 | 9.5 | 9.1 | 8.7 | 68.1 | 43.0 | 27.1 | 17.1 | 10.8 | 6.8 | 4.3 | 2.7 | 4.6 |
| 1923 | 13.1 | 12.6 | 12.0 | 11.5 | 10.9 | 10.5 | 10.0 | 9.5 | 9.1 | 8.7 | 68.1 | 43.0 | 27.1 | 17.1 | 10.8 | 6.8 | 4.3 | 2.7 | 4.6 |
| 1924 | 13.1 | 12.6 | 12.0 | 11.5 | 10.9 | 10.4 | 10.0 | 9.5 | 9.1 | 8.7 | 68.1 | 43.0 | 27.1 | 17.1 | 10.8 | 6.8 | 4.3 | 2.7 | 4.6 |
| 1925 | 13.1 | 12.6 | 12.0 | 11.5 | 10.9 | 10.4 | 10.0 | 9.5 | 9.1 | 8.7 | 68.1 | 43.0 | 27.1 | 17.1 | 10.8 | 6.8 | 4.3 | 2.7 | 4.6 |
| 1926 | 13.1 | 12.6 | 12.0 | 11.5 | 10.9 | 10.4 | 10.0 | 9.5 | 9.1 | 8.7 | 68.1 | 42.9 | 27.1 | 17.1 | 10.8 | 6.8 | 4.3 | 2.7 | 4.6 |
| 1927 | 13.1 | 12.5 | 12.0 | 11.4 | 10.9 | 10.4 | 10.0 | 9.5 | 9.1 | 8.7 | 68.1 | 42.9 | 27.0 | 17.1 | 10.8 | 6.8 | 4.3 | 2.7 | 4.6 |
| 1928 | 13.1 | 12.5 | 12.0 | 11.4 | 10.9 | 10.4 | 10.0 | 9.5 | 9.1 | 8.7 | 68.0 | 42.9 | 27.0 | 17.0 | 10.7 | 6.8 | 4.3 | 2.7 | 4.6 |
| 1929 | 13.1 | 12.5 | 12.0 | 11.4 | 10.9 | 10.4 | 10.0 | 9.5 | 9.1 | 8.7 | 68.0 | 42.8 | 27.0 | 17.0 | 10.7 | 6.8 | 4.3 | 2.7 | 4.6 |
| 1930 | 13.1 | 12.5 | 12.0 | 11.4 | 10.9 | 10.4 | 10.0 | 9.5 | 9.1 | 8.7 | 68.0 | 42.8 | 27.0 | 17.0 | 10.7 | 6.8 | 4.3 | 2.7 | 4.6 |
| 1931 | 13.1 | 12.5 | 12.0 | 11.4 | 10.9 | 10.4 | 10.0 | 9.5 | 9.1 | 8.7 | 68.0 | 42.8 | 26.9 | 17.0 | 10.7 | 6.8 | 4.3 | 2.7 | 4.6 |
| 1932 | 13.1 | 12.5 | 12.0 | 11.4 | 10.9 | 10.4 | 10.0 | 9.5 | 9.1 | 8.7 | 68.0 | 42.8 | 26.9 | 17.0 | 10.7 | 6.7 | 4.3 | 2.7 | 4.6 |
| 1933 | 13.1 | 12.5 | 12.0 | 11.4 | 10.9 | 10.4 | 10.0 | 9.5 | 9.1 | 8.7 | 68.0 | 42.7 | 26.9 | 16.9 | 10.7 | 6.7 | 4.3 | 2.7 | 4.6 |
| 1934 | 13.1 | 12.5 | 12.0 | 11.4 | 10.9 | 10.4 | 10.0 | 9.5 | 9.1 | 8.7 | 68.0 | 42.7 | 26.9 | 16.9 | 10.7 | 6.7 | 4.2 | 2.7 | 4.6 |
| 1935 | 13.1 | 12.5 | 11.9 | 11.4 | 10.9 | 10.4 | 10.0 | 9.5 | 9.1 | 8.7 | 67.9 | 42.7 | 26.8 | 16.9 | 10.7 | 6.7 | 4.2 | 2.7 | 4.6 |
| 1936 | 13.1 | 12.5 | 11.9 | 11.4 | 10.9 | 10.4 | 10.0 | 9.5 | 9.1 | 8.7 | 67.9 | 42.7 | 26.8 | 16.9 | 10.6 | 6.7 | 4.2 | 2.7 | 4.6 |
| 1937 | 13.1 | 12.5 | 11.9 | 11.4 | 10.9 | 10.4 | 9.9 | 9.5 | 9.1 | 8.7 | 67.9 | 42.7 | 26.8 | 16.9 | 10.6 | 6.7 | 4.2 | 2.7 | 4.6 |
| 1938 | 13.1 | 12.5 | 11.9 | 11.4 | 10.9 | 10.4 | 9.9 | 9.5 | 9.1 | 8.7 | 67.9 | 42.7 | 26.8 | 16.9 | 10.6 | 6.7 | 4.2 | 2.7 | 4.6 |
| 1939 | 13.1 | 12.5 | 11.9 | 11.4 | 10.9 | 10.4 | 9.9 | 9.5 | 9.1 | 8.7 | 67.9 | 42.7 | 26.8 | 16.8 | 10.6 | 6.7 | 4.2 | 2.7 | 4.6 |
| 1940 | 13.1 | 12.5 | 11.9 | 11.4 | 10.9 | 10.4 | 9.9 | 9.5 | 9.1 | 8.7 | 67.9 | 42.6 | 26.7 | 16.8 | 10.6 | 6.7 | 4.2 | 2.7 | 4.5 |
| 1941 | 13.0 | 12.5 | 11.9 | 11.4 | 10.9 | 10.4 | 9.9 | 9.5 | 9.1 | 8.7 | 67.9 | 42.6 | 26.7 | 16.8 | 10.6 | 6.7 | 4.2 | 2.7 | 4.5 |
| 1942 | 13.0 | 12.5 | 11.9 | 11.4 | 10.9 | 10.4 | 9.9 | 9.5 | 9.1 | 8.7 | 67.8 | 42.6 | 26.7 | 16.8 | 10.6 | 6.7 | 4.2 | 2.7 | 4.5 |
| 1943 | 13.0 | 12.4 | 11.9 | 11.4 | 10.9 | 10.4 | 9.9 | 9.5 | 9.1 | 8.7 | 67.8 | 42.6 | 26.7 | 16.8 | 10.6 | 6.7 | 4.2 | 2.7 | 4.5 |
| 1944 | 13.0 | 12.4 | 11.9 | 11.4 | 10.9 | 10.4 | 9.9 | 9.5 | 9.1 | 8.6 | 67.8 | 42.6 | 26.7 | 16.8 | 10.6 | 6.7 | 4.2 | 2.6 | 4.5 |
| 1945 | 12.9 | 12.4 | 11.9 | 11.3 | 10.8 | 10.4 | 9.9 | 9.5 | 9.0 | 8.6 | 67.8 | 42.6 | 26.7 | 16.7 | 10.5 | 6.6 | 4.2 | 2.6 | 4.5 |
| 1946 | 12.9 | 12.4 | 11.8 | 11.3 | 10.8 | 10.4 | 9.9 | 9.5 | 9.0 | 8.6 | 67.7 | 42.6 | 26.7 | 16.7 | 10.5 | 6.6 | 4.2 | 2.6 | 4.5 |
| 1947 | 12.8 | 12.3 | 11.8 | 11.3 | 10.8 | 10.3 | 9.9 | 9.5 | 9.0 | 8.6 | 67.7 | 42.6 | 26.7 | 16.7 | 10.5 | 6.6 | 4.2 | 2.6 | 4.5 |
| 1948 | 12.8 | 12.2 | 11.7 | 11.3 | 10.8 | 10.3 | 9.9 | 9.4 | 9.0 | 8.6 | 67.7 | 42.6 | 26.7 | 16.7 | 10.5 | 6.6 | 4.2 | 2.6 | 4.5 |
| 1949 | 12.8 | 12.2 | 11.7 | 11.2 | 10.8 | 10.3 | 9.9 | 9.4 | 9.0 | 8.6 | 67.6 | 42.6 | 26.6 | 16.7 | 10.5 | 6.6 | 4.2 | 2.6 | 4.5 |
| 1950 | 12.8 | 12.2 | 11.7 | 11.2 | 10.7 | 10.3 | 9.8 | 9.4 | 9.0 | 8.6 | 67.6 | 42.6 | 26.6 | 16.7 | 10.5 | 6.6 | 4.2 | 2.6 | 4.5 |
| 1951 | 12.7 | 12.2 | 11.6 | 11.1 | 10.7 | 10.2 | 9.8 | 9.4 | 9.0 | 8.6 | 67.5 | 42.5 | 26.6 | 16.7 | 10.5 | 6.6 | 4.2 | 2.6 | 4.5 |
| 1952 | 12.7 | 12.2 | 11.6 | 11.1 | 10.6 | 10.2 | 9.8 | 9.4 | 9.0 | 8.6 | 67.5 | 42.5 | 26.6 | 16.7 | 10.5 | 6.6 | 4.2 | 2.6 | 4.5 |
| 1953 | 12.7 | 12.1 | 11.6 | 11.1 | 10.6 | 10.2 | 9.7 | 9.3 | 8.9 | 8.6 | 67.5 | 42.5 | 26.6 | 16.7 | 10.5 | 6.6 | 4.2 | 2.6 | 4.5 |
| 1954 | 12.7 | 12.1 | 11.6 | 11.1 | 10.6 | 10.1 | 9.7 | 9.3 | 8.9 | 8.5 | 67.4 | 42.5 | 26.6 | 16.6 | 10.4 | 6.6 | 4.1 | 2.6 | 4.5 |
| 1955 | 12.7 | 12.1 | 11.6 | 11.1 | 10.6 | 10.1 | 9.7 | 9.3 | 8.9 | 8.5 | 67.3 | 42.5 | 26.6 | 16.6 | 10.4 | 6.6 | 4.1 | 2.6 | 4.5 |
| 1956 | 12.6 | 12.1 | 11.6 | 11.1 | 10.6 | 10.1 | 9.7 | 9.3 | 8.9 | 8.5 | 67.1 | 42.4 | 26.6 | 16.6 | 10.4 | 6.5 | 4.1 | 2.6 | 4.4 |
| 1957 | 12.6 | 12.1 | 11.6 | 11.0 | 10.6 | 10.1 | 9.7 | 9.2 | 8.8 | 8.5 | 67.0 | 42.3 | 26.5 | 16.6 | 10.4 | 6.5 | 4.1 | 2.6 | 4.4 |

Table A.5. Continued. Female numbers at age in Washington (1000s) predicted by the base-case model.

| Age | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| (Yr) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1958 | 12.6 | 12.1 | 11.5 | 11.0 | 10.6 | 10.1 | 9.6 | 9.2 | 8.8 | 8.4 | 66.8 | 42.2 | 26.4 | 16.5 | 10.3 | 6.5 | 4.1 | 2.6 | 4.4 |
| 1959 | 12.6 | 12.0 | 11.5 | 11.0 | 10.5 | 10.1 | 9.6 | 9.2 | 8.8 | 8.4 | 66.6 | 42.1 | 26.3 | 16.4 | 10.3 | 6.5 | 4.1 | 2.6 | 4.4 |
| 1960 | 12.5 | 12.0 | 11.5 | 11.0 | 10.5 | 10.1 | 9.6 | 9.2 | 8.8 | 8.4 | 66.4 | 42.0 | 26.2 | 16.4 | 10.3 | 6.4 | 4.1 | 2.6 | 4.4 |
| 1961 | 12.5 | 12.0 | 11.4 | 11.0 | 10.5 | 10.0 | 9.6 | 9.2 | 8.8 | 8.4 | 66.2 | 41.9 | 26.2 | 16.3 | 10.2 | 6.4 | 4.0 | 2.5 | 4.4 |
| 1962 | 12.5 | 11.9 | 11.4 | 10.9 | 10.5 | 10.0 | 9.6 | 9.2 | 8.8 | 8.4 | 66.0 | 41.8 | 26.1 | 16.3 | 10.2 | 6.4 | 4.0 | 2.5 | 4.3 |
| 1963 | 12.4 | 11.9 | 11.4 | 10.9 | 10.4 | 10.0 | 9.6 | 9.2 | 8.8 | 8.4 | 65.8 | 41.7 | 26.0 | 16.2 | 10.1 | 6.4 | 4.0 | 2.5 | 4.3 |
| 1964 | 12.4 | 11.9 | 11.4 | 10.9 | 10.4 | 10.0 | 9.5 | 9.1 | 8.7 | 8.4 | 65.6 | 41.5 | 25.8 | 16.1 | 10.0 | 6.3 | 4.0 | 2.5 | 4.3 |
| 1965 | 12.4 | 11.9 | 11.3 | 10.9 | 10.4 | 9.9 | 9.5 | 9.1 | 8.7 | 8.3 | 65.4 | 41.2 | 25.6 | 16.0 | 10.0 | 6.3 | 3.9 | 2.5 | 4.2 |
| 1966 | 12.3 | 11.8 | 11.3 | 10.8 | 10.4 | 9.9 | 9.5 | 9.1 | 8.7 | 8.3 | 65.3 | 41.0 | 25.5 | 15.9 | 9.9 | 6.2 | 3.9 | 2.5 | 4.2 |
| 1967 | 12.3 | 11.8 | 11.3 | 10.8 | 10.3 | 9.9 | 9.5 | 9.1 | 8.7 | 8.3 | 65.1 | 40.8 | 25.3 | 15.7 | 9.8 | 6.1 | 3.9 | 2.4 | 4.2 |
| 1968 | 12.3 | 11.8 | 11.3 | 10.8 | 10.3 | 9.9 | 9.5 | 9.0 | 8.7 | 8.3 | 65.0 | 40.6 | 25.1 | 15.6 | 9.7 | 6.1 | 3.8 | 2.4 | 4.1 |
| 1969 | 12.3 | 11.7 | 11.2 | 10.7 | 10.3 | 9.9 | 9.4 | 9.0 | 8.6 | 8.3 | 64.8 | 40.4 | 25.0 | 15.5 | 9.7 | 6.0 | 3.8 | 2.4 | 4.1 |
| 1970 | 12.2 | 11.7 | 11.2 | 10.7 | 10.3 | 9.9 | 9.4 | 9.0 | 8.6 | 8.2 | 64.7 | 40.2 | 24.8 | 15.4 | 9.6 | 6.0 | 3.8 | 2.4 | 4.1 |
| 1971 | 12.1 | 11.6 | 11.2 | 10.7 | 10.2 | 9.8 | 9.4 | 9.0 | 8.6 | 8.2 | 64.5 | 39.9 | 24.6 | 15.3 | 9.5 | 5.9 | 3.7 | 2.3 | 4.0 |
| 1972 | 12.1 | 11.6 | 11.1 | 10.7 | 10.2 | 9.8 | 9.4 | 9.0 | 8.6 | 8.2 | 64.3 | 39.6 | 24.4 | 15.1 | 9.4 | 5.9 | 3.7 | 2.3 | 4.0 |
| 1973 | 12.0 | 11.5 | 11.1 | 10.6 | 10.2 | 9.8 | 9.3 | 8.9 | 8.6 | 8.2 | 64.0 | 39.3 | 24.1 | 14.9 | 9.3 | 5.8 | 3.6 | 2.3 | 3.9 |
| 1974 | 11.9 | 11.4 | 11.0 | 10.6 | 10.1 | 9.7 | 9.3 | 8.9 | 8.5 | 8.2 | 63.8 | 39.0 | 23.8 | 14.7 | 9.1 | 5.7 | 3.6 | 2.2 | 3.8 |
| 1975 | 11.8 | 11.4 | 10.9 | 10.5 | 10.1 | 9.7 | 9.3 | 8.9 | 8.5 | 8.1 | 63.5 | 38.6 | 23.5 | 14.4 | 8.9 | 5.6 | 3.5 | 2.2 | 3.8 |
| 1976 | 11.7 | 11.3 | 10.8 | 10.4 | 10.0 | 9.6 | 9.2 | 8.9 | 8.5 | 8.1 | 63.4 | 38.4 | 23.2 | 14.2 | 8.8 | 5.5 | 3.4 | 2.2 | 3.7 |
| 1977 | 11.6 | 11.2 | 10.7 | 10.4 | 10.0 | 9.6 | 9.2 | 8.8 | 8.5 | 8.1 | 63.1 | 38.0 | 22.9 | 14.0 | 8.7 | 5.4 | 3.4 | 2.1 | 3.6 |
| 1978 | 11.5 | 11.1 | 10.7 | 10.3 | 9.9 | 9.5 | 9.1 | 8.8 | 8.4 | 8.1 | 62.6 | 37.3 | 22.2 | 13.5 | 8.4 | 5.2 | 3.3 | 2.0 | 3.5 |
| 1979 | 11.2 | 10.9 | 10.6 | 10.2 | 9.8 | 9.4 | 9.1 | 8.7 | 8.4 | 8.0 | 62.1 | 36.5 | 21.4 | 13.0 | 8.0 | 5.0 | 3.1 | 2.0 | 3.3 |
| 1980 | 11.0 | 10.7 | 10.4 | 10.1 | 9.7 | 9.4 | 9.0 | 8.7 | 8.3 | 8.0 | 61.6 | 35.6 | 20.6 | 12.5 | 7.7 | 4.8 | 3.0 | 1.9 | 3.2 |
| 1981 | 10.8 | 10.5 | 10.2 | 10.0 | 9.6 | 9.3 | 8.9 | 8.6 | 8.2 | 7.9 | 60.9 | 34.5 | 19.7 | 11.8 | 7.2 | 4.5 | 2.8 | 1.8 | 3.0 |
| 1982 | 10.5 | 10.3 | 10.0 | 9.8 | 9.5 | 9.2 | 8.9 | 8.5 | 8.2 | 7.9 | 60.9 | 34.4 | 19.4 | 11.6 | 7.1 | 4.4 | 2.7 | 1.7 | 2.9 |
| 1983 | 10.1 | 10.0 | 9.8 | 9.6 | 9.3 | 9.1 | 8.8 | 8.5 | 8.1 | 7.8 | 60.8 | 34.2 | 19.1 | 11.4 | 6.9 | 4.3 | 2.7 | 1.7 | 2.9 |
| 1984 | 9.8 | 9.6 | 9.6 | 9.4 | 9.1 | 8.9 | 8.7 | 8.4 | 8.1 | 7.7 | 60.4 | 33.8 | 18.6 | 11.0 | 6.7 | 4.1 | 2.6 | 1.6 | 2.7 |
| 1985 | 9.5 | 9.4 | 9.2 | 9.1 | 9.0 | 8.7 | 8.5 | 8.3 | 8.0 | 7.7 | 59.9 | 33.2 | 18.1 | 10.6 | 6.4 | 4.0 | 2.5 | 1.5 | 2.6 |
| 1986 | 9.2 | 9.1 | 8.9 | 8.8 | 8.7 | 8.6 | 8.3 | 8.1 | 7.9 | 7.6 | 59.1 | 32.4 | 17.2 | 10.0 | 6.0 | 3.7 | 2.3 | 1.4 | 2.5 |
| 1987 | 9.0 | 8.8 | 8.7 | 8.5 | 8.4 | 8.3 | 8.2 | 7.9 | 7.7 | 7.5 | 58.7 | 32.0 | 16.8 | 9.6 | 5.8 | 3.6 | 2.2 | 1.4 | 2.4 |
| 1988 | 8.8 | 8.6 | 8.4 | 8.3 | 8.1 | 8.0 | 7.9 | 7.8 | 7.6 | 7.3 | 57.9 | 31.1 | 16.0 | 9.0 | 5.4 | 3.3 | 2.1 | 1.3 | 2.2 |
| 1989 | 8.5 | 8.4 | 8.2 | 8.0 | 7.9 | 7.8 | 7.6 | 7.6 | 7.4 | 7.2 | 57.0 | 30.3 | 15.3 | 8.5 | 5.1 | 3.1 | 1.9 | 1.2 | 2.0 |
| 1990 | 8.1 | 8.1 | 8.0 | 7.9 | 7.7 | 7.6 | 7.4 | 7.3 | 7.2 | 7.0 | 55.5 | 28.6 | 14.0 | 7.6 | 4.5 | 2.8 | 1.7 | 1.1 | 1.8 |
| 1991 | 7.8 | 7.7 | 7.7 | 7.6 | 7.5 | 7.3 | 7.2 | 7.1 | 6.9 | 6.8 | 54.5 | 27.7 | 13.2 | 7.1 | 4.2 | 2.5 | 1.6 | 1.0 | 1.7 |
| 1992 | 7.4 | 7.5 | 7.4 | 7.4 | 7.3 | 7.1 | 7.0 | 6.9 | 6.7 | 6.6 | 53.3 | 26.8 | 12.4 | 6.5 | 3.8 | 2.3 | 1.4 | 0.9 | 1.5 |
| 1993 | 6.8 | 7.0 | 7.1 | 7.0 | 7.0 | 7.0 | 6.8 | 6.6 | 6.5 | 6.4 | 51.5 | 25.2 | 11.2 | 5.8 | 3.4 | 2.0 | 1.3 | 0.8 | 1.3 |
| 1994 | 6.4 | 6.5 | 6.7 | 6.8 | 6.7 | 6.7 | 6.6 | 6.5 | 6.3 | 6.2 | 49.8 | 23.7 | 10.2 | 5.1 | 2.9 | 1.8 | 1.1 | 0.7 | 1.1 |
| 1995 | 6.1 | 6.1 | 6.2 | 6.4 | 6.5 | 6.4 | 6.4 | 6.3 | 6.2 | 6.0 | 48.7 | 23.1 | 9.6 | 4.7 | 2.7 | 1.6 | 1.0 | 0.6 | 1.0 |
| 1996 | 5.7 | 5.8 | 5.8 | 6.0 | 6.1 | 6.2 | 6.1 | 6.1 | 6.0 | 5.9 | 47.5 | 22.6 | 9.2 | 4.4 | 2.5 | 1.5 | 0.9 | 0.6 | 0.9 |
| 1997 | 5.4 | 5.4 | 5.5 | 5.5 | 5.7 | 5.8 | 5.9 | 5.8 | 5.8 | 5.7 | 46.3 | 22.1 | 8.7 | 4.1 | 2.2 | 1.3 | 0.8 | 0.5 | 0.8 |
| 1998 | 5.0 | 5.2 | 5.2 | 5.3 | 5.3 | 5.4 | 5.6 | 5.6 | 5.5 | 5.5 | 44.9 | 21.4 | 8.2 | 3.7 | 2.0 | 1.2 | 0.7 | 0.5 | 0.8 |
| 1999 | 4.9 | 4.8 | 4.9 | 5.0 | 5.0 | 5.0 | 5.2 | 5.3 | 5.4 | 5.2 | 43.9 | 21.3 | 8.0 | 3.5 | 1.9 | 1.1 | 0.7 | 0.4 | 0.7 |

Table A.5. Continued. Female numbers at age in Washington (1000s) predicted by the base-case model.

| Age (Yr) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 4.8 | 4.7 | 4.6 | 4.7 | 4.7 | 4.8 | 4.8 | 4.9 | 5.0 | 5.1 | 41.7 | 19.7 | 7.1 | 3.0 | 1.6 | 0.9 | 0.6 | 0.3 | 0.6 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2001 | 4.8 | 4.5 | 4.5 | 4.4 | 4.5 | 4.5 | 4.6 | 4.6 | 4.7 | 4.8 | 40.7 | 19.6 | 6.9 | 2.9 | 1.5 | 0.9 | 0.5 | 0.3 | 0.5 |
| 2002 | 4.9 | 4.6 | 4.3 | 4.3 | 4.2 | 4.3 | 4.3 | 4.4 | 4.3 | 4.4 | 38.7 | 18.4 | 6.3 | 2.5 | 1.3 | 0.7 | 0.4 | 0.3 | 0.4 |
| 2003 | 5.0 | 4.6 | 4.4 | 4.1 | 4.1 | 4.0 | 4.1 | 4.1 | 4.2 | 4.1 | 38.0 | 19.0 | 6.5 | 2.5 | 1.2 | 0.7 | 0.4 | 0.3 | 0.4 |
| 2004 | 5.1 | 4.8 | 4.4 | 4.2 | 3.9 | 3.9 | 3.8 | 3.9 | 3.9 | 4.0 | 37.2 | 19.7 | 6.8 | 2.6 | 1.2 | 0.7 | 0.4 | 0.3 | 0.4 |
| 2005 | 5.3 | 4.9 | 4.6 | 4.2 | 4.0 | 3.8 | 3.7 | 3.6 | 3.7 | 3.7 | 36.2 | 20.3 | 7.1 | 2.6 | 1.2 | 0.7 | 0.4 | 0.3 | 0.4 |
| 2006 | 5.4 | 5.0 | 4.7 | 4.3 | 4.0 | 3.8 | 3.6 | 3.6 | 3.5 | 3.5 | 34.9 | 20.7 | 7.4 | 2.7 | 1.2 | 0.7 | 0.4 | 0.2 | 0.4 |
| 2007 | 5.5 | 5.2 | 4.8 | 4.5 | 4.2 | 3.9 | 3.7 | 3.4 | 3.4 | 3.3 | 33.6 | 21.3 | 7.8 | 2.8 | 1.2 | 0.7 | 0.4 | 0.2 | 0.4 |
| 2008 | 5.6 | 5.3 | 4.9 | 4.6 | 4.3 | 4.0 | 3.7 | 3.5 | 3.3 | 3.3 | 32.1 | 21.7 | 8.2 | 2.8 | 1.2 | 0.7 | 0.4 | 0.2 | 0.4 |
| 2009 | 5.7 | 5.4 | 5.0 | 4.7 | 4.4 | 4.1 | 3.8 | 3.5 | 3.3 | 3.1 | 30.7 | 22.0 | 8.6 | 2.9 | 1.3 | 0.7 | 0.4 | 0.2 | 0.4 |
| 2010 | 5.9 | 5.5 | 5.1 | 4.8 | 4.5 | 4.2 | 3.9 | 3.6 | 3.4 | 3.2 | 29.4 | 22.3 | 9.1 | 3.1 | 1.3 | 0.7 | 0.4 | 0.2 | 0.4 |

Table A.6. Male numbers at age in Washington (1000s) predicted by the base-case model.

| Age (yr) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1916 | 14.1 | 13.5 | 12.9 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.5 | 45.4 | 28.5 | 17.9 | 11.2 | 7.0 | 4.4 | 2.8 | 4.6 |
| 1917 | 14.1 | 13.5 | 12.9 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.5 | 45.4 | 28.5 | 17.9 | 11.2 | 7.0 | 4.4 | 2.8 | 4.6 |
| 1918 | 14.1 | 13.5 | 12.9 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.5 | 45.4 | 28.5 | 17.9 | 11.2 | 7.0 | 4.4 | 2.8 | 4.6 |
| 1919 | 14.1 | 13.5 | 12.9 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.5 | 45.4 | 28.5 | 17.9 | 11.2 | 7.0 | 4.4 | 2.8 | 4.6 |
| 1920 | 14.1 | 13.5 | 12.9 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.5 | 45.4 | 28.5 | 17.9 | 11.2 | 7.0 | 4.4 | 2.8 | 4.6 |
| 1921 | 14.1 | 13.5 | 12.9 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.5 | 45.4 | 28.5 | 17.9 | 11.2 | 7.0 | 4.4 | 2.8 | 4.6 |
| 1922 | 14.1 | 13.5 | 12.9 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.5 | 45.4 | 28.5 | 17.9 | 11.2 | 7.0 | 4.4 | 2.8 | 4.6 |
| 1923 | 14.1 | 13.5 | 12.9 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.5 | 45.4 | 28.5 | 17.9 | 11.2 | 7.0 | 4.4 | 2.8 | 4.6 |
| 1924 | 14.1 | 13.5 | 12.9 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.5 | 45.4 | 28.5 | 17.9 | 11.2 | 7.0 | 4.4 | 2.8 | 4.6 |
| 1925 | 14.1 | 13.5 | 12.9 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.5 | 45.4 | 28.5 | 17.9 | 11.2 | 7.0 | 4.4 | 2.8 | 4.6 |
| 1926 | 14.1 | 13.5 | 12.9 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.4 | 45.4 | 28.5 | 17.8 | 11.2 | 7.0 | 4.4 | 2.8 | 4.6 |
| 1927 | 14.1 | 13.5 | 12.9 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.4 | 45.4 | 28.4 | 17.8 | 11.2 | 7.0 | 4.4 | 2.8 | 4.6 |
| 1928 | 14.1 | 13.5 | 12.9 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.4 | 45.3 | 28.4 | 17.8 | 11.2 | 7.0 | 4.4 | 2.8 | 4.6 |
| 1929 | 14.1 | 13.5 | 12.9 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.4 | 45.3 | 28.4 | 17.8 | 11.2 | 7.0 | 4.4 | 2.8 | 4.6 |
| 1930 | 14.1 | 13.5 | 12.8 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.4 | 45.3 | 28.3 | 17.8 | 11.1 | 7.0 | 4.4 | 2.7 | 4.6 |
| 1931 | 14.1 | 13.5 | 12.8 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.3 | 45.2 | 28.3 | 17.7 | 11.1 | 7.0 | 4.4 | 2.7 | 4.6 |
| 1932 | 14.1 | 13.4 | 12.8 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.3 | 45.2 | 28.3 | 17.7 | 11.1 | 7.0 | 4.4 | 2.7 | 4.6 |
| 1933 | 14.1 | 13.4 | 12.8 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.3 | 45.2 | 28.3 | 17.7 | 11.1 | 7.0 | 4.4 | 2.7 | 4.6 |
| 1934 | 14.1 | 13.4 | 12.8 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.3 | 45.1 | 28.2 | 17.7 | 11.1 | 7.0 | 4.4 | 2.7 | 4.6 |
| 1935 | 14.1 | 13.4 | 12.8 | 12.2 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.3 | 45.1 | 28.2 | 17.7 | 11.1 | 6.9 | 4.4 | 2.7 | 4.6 |
| 1936 | 14.1 | 13.4 | 12.8 | 12.2 | 11.7 | 11.2 | 10.7 | 10.2 | 9.7 | 9.3 | 72.3 | 45.1 | 28.2 | 17.7 | 11.1 | 6.9 | 4.4 | 2.7 | 4.6 |
| 1937 | 14.1 | 13.4 | 12.8 | 12.2 | 11.7 | 11.2 | 10.6 | 10.2 | 9.7 | 9.3 | 72.3 | 45.1 | 28.2 | 17.6 | 11.1 | 6.9 | 4.3 | 2.7 | 4.6 |
| 1938 | 14.0 | 13.4 | 12.8 | 12.2 | 11.7 | 11.2 | 10.6 | 10.2 | 9.7 | 9.3 | 72.3 | 45.1 | 28.1 | 17.6 | 11.0 | 6.9 | 4.3 | 2.7 | 4.6 |
| 1939 | 14.0 | 13.4 | 12.8 | 12.2 | 11.7 | 11.1 | 10.6 | 10.2 | 9.7 | 9.3 | 72.3 | 45.1 | 28.1 | 17.6 | 11.0 | 6.9 | 4.3 | 2.7 | 4.6 |
| 1940 | 14.0 | 13.4 | 12.8 | 12.2 | 11.7 | 11.1 | 10.6 | 10.2 | 9.7 | 9.3 | 72.2 | 45.1 | 28.1 | 17.6 | 11.0 | 6.9 | 4.3 | 2.7 | 4.6 |
| 1941 | 14.0 | 13.4 | 12.8 | 12.2 | 11.7 | 11.1 | 10.6 | 10.2 | 9.7 | 9.3 | 72.2 | 45.1 | 28.1 | 17.6 | 11.0 | 6.9 | 4.3 | 2.7 | 4.6 |
| 1942 | 14.0 | 13.4 | 12.8 | 12.2 | 11.7 | 11.1 | 10.6 | 10.1 | 9.7 | 9.2 | 72.2 | 45.0 | 28.0 | 17.5 | 11.0 | 6.9 | 4.3 | 2.7 | 4.6 |
| 1943 | 14.0 | 13.4 | 12.8 | 12.2 | 11.7 | 11.1 | 10.6 | 10.1 | 9.7 | 9.2 | 72.2 | 45.0 | 28.0 | 17.5 | 11.0 | 6.9 | 4.3 | 2.7 | 4.6 |
| 1944 | 14.0 | 13.4 | 12.8 | 12.2 | 11.6 | 11.1 | 10.6 | 10.1 | 9.7 | 9.2 | 72.2 | 45.0 | 28.0 | 17.5 | 11.0 | 6.9 | 4.3 | 2.7 | 4.5 |
| 1945 | 14.0 | 13.4 | 12.8 | 12.2 | 11.6 | 11.1 | 10.6 | 10.1 | 9.7 | 9.2 | 72.2 | 45.0 | 28.0 | 17.5 | 11.0 | 6.9 | 4.3 | 2.7 | 4.5 |
| 1946 | 13.9 | 13.3 | 12.8 | 12.2 | 11.6 | 11.1 | 10.6 | 10.1 | 9.7 | 9.2 | 72.1 | 45.0 | 28.0 | 17.5 | 10.9 | 6.9 | 4.3 | 2.7 | 4.5 |
| 1947 | 13.9 | 13.3 | 12.7 | 12.2 | 11.6 | 11.1 | 10.6 | 10.1 | 9.7 | 9.2 | 72.1 | 45.0 | 28.0 | 17.5 | 10.9 | 6.9 | 4.3 | 2.7 | 4.5 |
| 1948 | 13.8 | 13.2 | 12.7 | 12.1 | 11.6 | 11.1 | 10.6 | 10.1 | 9.7 | 9.2 | 72.1 | 45.0 | 28.0 | 17.4 | 10.9 | 6.8 | 4.3 | 2.7 | 4.5 |
| 1949 | 13.8 | 13.2 | 12.6 | 12.1 | 11.6 | 11.1 | 10.6 | 10.1 | 9.7 | 9.2 | 72.0 | 45.0 | 28.0 | 17.4 | 10.9 | 6.8 | 4.3 | 2.7 | 4.5 |
| 1950 | 13.8 | 13.2 | 12.6 | 12.1 | 11.5 | 11.1 | 10.6 | 10.1 | 9.7 | 9.2 | 72.0 | 45.0 | 28.0 | 17.4 | 10.9 | 6.8 | 4.3 | 2.7 | 4.5 |
| 1951 | 13.8 | 13.2 | 12.6 | 12.0 | 11.5 | 11.0 | 10.6 | 10.1 | 9.6 | 9.2 | 72.0 | 45.0 | 28.0 | 17.4 | 10.9 | 6.8 | 4.3 | 2.7 | 4.5 |
| 1952 | 13.8 | 13.2 | 12.6 | 12.0 | 11.5 | 11.0 | 10.5 | 10.1 | 9.6 | 9.2 | 71.9 | 45.0 | 28.0 | 17.4 | 10.9 | 6.8 | 4.3 | 2.7 | 4.5 |
| 1953 | 13.7 | 13.1 | 12.6 | 12.0 | 11.5 | 11.0 | 10.5 | 10.0 | 9.6 | 9.2 | 71.9 | 45.0 | 27.9 | 17.4 | 10.9 | 6.8 | 4.3 | 2.7 | 4.5 |
| 1954 | 13.7 | 13.1 | 12.5 | 12.0 | 11.5 | 10.9 | 10.5 | 10.0 | 9.6 | 9.2 | 71.9 | 44.9 | 27.9 | 17.4 | 10.9 | 6.8 | 4.3 | 2.7 | 4.5 |
| 1955 | 13.7 | 13.1 | 12.5 | 12.0 | 11.4 | 10.9 | 10.4 | 10.0 | 9.5 | 9.1 | 71.8 | 44.9 | 27.9 | 17.4 | 10.8 | 6.8 | 4.3 | 2.7 | 4.5 |
| 1956 | 13.7 | 13.1 | 12.5 | 12.0 | 11.4 | 10.9 | 10.4 | 10.0 | 9.5 | 9.1 | 71.7 | 44.8 | 27.9 | 17.3 | 10.8 | 6.8 | 4.2 | 2.7 | 4.5 |
| 1957 | 13.7 | 13.1 | 12.5 | 11.9 | 11.4 | 10.9 | 10.4 | 10.0 | 9.5 | 9.1 | 71.5 | 44.7 | 27.8 | 17.3 | 10.8 | 6.7 | 4.2 | 2.7 | 4.5 |

Table A.6. Continued. Male numbers at age in Washington (1000s) predicted by the base-case model.

| Age | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| (yr) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1958 | 13.6 | 13.0 | 12.5 | 11.9 | 11.4 | 10.9 | 10.4 | 9.9 | 9.5 | 9.1 | 71.4 | 44.6 | 27.7 | 17.2 | 10.7 | 6.7 | 4.2 | 2.6 | 4.4 |
| 1959 | 13.6 | 13.0 | 12.4 | 11.9 | 11.4 | 10.9 | 10.4 | 9.9 | 9.5 | 9.1 | 71.2 | 44.5 | 27.7 | 17.2 | 10.7 | 6.7 | 4.2 | 2.6 | 4.4 |
| 1960 | 13.6 | 13.0 | 12.4 | 11.9 | 11.4 | 10.9 | 10.4 | 9.9 | 9.5 | 9.1 | 71.0 | 44.4 | 27.6 | 17.1 | 10.6 | 6.7 | 4.2 | 2.6 | 4.4 |
| 1961 | 13.5 | 12.9 | 12.4 | 11.9 | 11.3 | 10.8 | 10.4 | 9.9 | 9.5 | 9.0 | 70.8 | 44.2 | 27.5 | 17.0 | 10.6 | 6.6 | 4.2 | 2.6 | 4.4 |
| 1962 | 13.5 | 12.9 | 12.4 | 11.8 | 11.3 | 10.8 | 10.3 | 9.9 | 9.4 | 9.0 | 70.7 | 44.1 | 27.4 | 17.0 | 10.6 | 6.6 | 4.1 | 2.6 | 4.4 |
| 1963 | 13.5 | 12.9 | 12.3 | 11.8 | 11.3 | 10.8 | 10.3 | 9.9 | 9.4 | 9.0 | 70.5 | 44.0 | 27.3 | 16.9 | 10.5 | 6.6 | 4.1 | 2.6 | 4.3 |
| 1964 | 13.5 | 12.9 | 12.3 | 11.8 | 11.3 | 10.8 | 10.3 | 9.9 | 9.4 | 9.0 | 70.3 | 43.8 | 27.1 | 16.8 | 10.4 | 6.5 | 4.1 | 2.6 | 4.3 |
| 1965 | 13.4 | 12.8 | 12.3 | 11.7 | 11.2 | 10.7 | 10.3 | 9.8 | 9.4 | 9.0 | 70.0 | 43.6 | 26.9 | 16.7 | 10.4 | 6.5 | 4.0 | 2.5 | 4.3 |
| 1966 | 13.4 | 12.8 | 12.3 | 11.7 | 11.2 | 10.7 | 10.2 | 9.8 | 9.4 | 9.0 | 69.9 | 43.3 | 26.7 | 16.6 | 10.3 | 6.4 | 4.0 | 2.5 | 4.2 |
| 1967 | 13.4 | 12.8 | 12.2 | 11.7 | 11.2 | 10.7 | 10.2 | 9.8 | 9.3 | 8.9 | 69.7 | 43.1 | 26.5 | 16.4 | 10.2 | 6.4 | 4.0 | 2.5 | 4.2 |
| 1968 | 13.3 | 12.8 | 12.2 | 11.7 | 11.2 | 10.7 | 10.2 | 9.8 | 9.3 | 8.9 | 69.5 | 42.9 | 26.4 | 16.3 | 10.1 | 6.3 | 3.9 | 2.5 | 4.2 |
| 1969 | 13.3 | 12.7 | 12.2 | 11.6 | 11.1 | 10.7 | 10.2 | 9.7 | 9.3 | 8.9 | 69.4 | 42.6 | 26.2 | 16.2 | 10.0 | 6.3 | 3.9 | 2.5 | 4.1 |
| 1970 | 13.2 | 12.7 | 12.1 | 11.6 | 11.1 | 10.6 | 10.2 | 9.7 | 9.3 | 8.9 | 69.2 | 42.4 | 26.0 | 16.1 | 10.0 | 6.2 | 3.9 | 2.4 | 4.1 |
| 1971 | 13.2 | 12.6 | 12.1 | 11.6 | 11.1 | 10.6 | 10.1 | 9.7 | 9.3 | 8.9 | 69.0 | 42.2 | 25.8 | 15.9 | 9.9 | 6.1 | 3.8 | 2.4 | 4.0 |
| 1972 | 13.1 | 12.6 | 12.0 | 11.5 | 11.1 | 10.6 | 10.1 | 9.7 | 9.2 | 8.8 | 68.8 | 41.8 | 25.5 | 15.7 | 9.8 | 6.1 | 3.8 | 2.4 | 4.0 |
| 1973 | 13.0 | 12.5 | 12.0 | 11.5 | 11.0 | 10.5 | 10.1 | 9.7 | 9.2 | 8.8 | 68.5 | 41.5 | 25.2 | 15.5 | 9.6 | 6.0 | 3.7 | 2.3 | 3.9 |
| 1974 | 12.9 | 12.4 | 11.9 | 11.4 | 11.0 | 10.5 | 10.1 | 9.6 | 9.2 | 8.8 | 68.2 | 41.1 | 24.9 | 15.3 | 9.5 | 5.9 | 3.7 | 2.3 | 3.9 |
| 1975 | 12.8 | 12.3 | 11.8 | 11.4 | 10.9 | 10.5 | 10.0 | 9.6 | 9.2 | 8.8 | 67.9 | 40.7 | 24.5 | 15.1 | 9.3 | 5.8 | 3.6 | 2.3 | 3.8 |
| 1976 | 12.7 | 12.2 | 11.7 | 11.3 | 10.9 | 10.4 | 10.0 | 9.6 | 9.2 | 8.7 | 67.8 | 40.4 | 24.3 | 14.9 | 9.2 | 5.7 | 3.6 | 2.2 | 3.7 |
| 1977 | 12.5 | 12.1 | 11.6 | 11.2 | 10.8 | 10.4 | 9.9 | 9.5 | 9.1 | 8.7 | 67.5 | 40.0 | 23.9 | 14.6 | 9.0 | 5.6 | 3.5 | 2.2 | 3.7 |
| 1978 | 12.4 | 11.9 | 11.5 | 11.1 | 10.7 | 10.3 | 9.9 | 9.5 | 9.1 | 8.7 | 66.8 | 39.1 | 23.2 | 14.1 | 8.7 | 5.4 | 3.4 | 2.1 | 3.5 |
| 1979 | 12.1 | 11.8 | 11.4 | 11.0 | 10.6 | 10.2 | 9.8 | 9.4 | 9.0 | 8.6 | 66.2 | 38.2 | 22.4 | 13.6 | 8.4 | 5.2 | 3.2 | 2.0 | 3.4 |
| 1980 | 11.9 | 11.6 | 11.3 | 10.9 | 10.5 | 10.1 | 9.7 | 9.3 | 9.0 | 8.6 | 65.6 | 37.1 | 21.5 | 13.0 | 8.0 | 5.0 | 3.1 | 1.9 | 3.2 |
| 1981 | 11.6 | 11.3 | 11.0 | 10.8 | 10.4 | 10.0 | 9.6 | 9.3 | 8.9 | 8.5 | 64.8 | 35.9 | 20.5 | 12.3 | 7.6 | 4.7 | 2.9 | 1.8 | 3.1 |
| 1982 | 11.3 | 11.1 | 10.8 | 10.5 | 10.3 | 9.9 | 9.6 | 9.2 | 8.8 | 8.5 | 64.8 | 35.7 | 20.2 | 12.1 | 7.4 | 4.6 | 2.9 | 1.8 | 3.0 |
| 1983 | 10.9 | 10.8 | 10.6 | 10.3 | 10.1 | 9.8 | 9.4 | 9.1 | 8.8 | 8.4 | 64.7 | 35.5 | 19.9 | 11.9 | 7.3 | 4.5 | 2.8 | 1.7 | 2.9 |
| 1984 | 10.5 | 10.4 | 10.3 | 10.1 | 9.8 | 9.6 | 9.3 | 9.0 | 8.7 | 8.3 | 64.3 | 35.0 | 19.3 | 11.5 | 7.0 | 4.3 | 2.7 | 1.7 | 2.8 |
| 1985 | 10.2 | 10.0 | 9.9 | 9.8 | 9.6 | 9.4 | 9.1 | 8.9 | 8.6 | 8.2 | 63.7 | 34.4 | 18.7 | 11.0 | 6.7 | 4.2 | 2.6 | 1.6 | 2.7 |
| 1986 | 9.9 | 9.8 | 9.6 | 9.5 | 9.4 | 9.2 | 8.9 | 8.7 | 8.5 | 8.1 | 62.8 | 33.3 | 17.8 | 10.4 | 6.3 | 3.9 | 2.4 | 1.5 | 2.5 |
| 1987 | 9.7 | 9.5 | 9.3 | 9.1 | 9.0 | 8.9 | 8.8 | 8.5 | 8.3 | 8.1 | 62.3 | 32.9 | 17.3 | 10.1 | 6.1 | 3.8 | 2.3 | 1.5 | 2.4 |
| 1988 | 9.4 | 9.3 | 9.0 | 8.9 | 8.7 | 8.6 | 8.5 | 8.4 | 8.1 | 7.9 | 61.3 | 31.9 | 16.5 | 9.5 | 5.7 | 3.5 | 2.2 | 1.4 | 2.3 |
| 1989 | 9.1 | 9.0 | 8.8 | 8.6 | 8.5 | 8.3 | 8.2 | 8.1 | 7.9 | 7.7 | 60.3 | 31.0 | 15.7 | 8.9 | 5.4 | 3.3 | 2.0 | 1.3 | 2.1 |
| 1990 | 8.6 | 8.7 | 8.6 | 8.4 | 8.2 | 8.1 | 7.9 | 7.8 | 7.7 | 7.5 | 58.4 | 29.1 | 14.4 | 8.0 | 4.8 | 3.0 | 1.8 | 1.1 | 1.9 |
| 1991 | 8.3 | 8.2 | 8.3 | 8.2 | 8.0 | 7.8 | 7.7 | 7.5 | 7.4 | 7.3 | 57.3 | 28.2 | 13.5 | 7.5 | 4.5 | 2.7 | 1.7 | 1.1 | 1.8 |
| 1992 | 7.8 | 8.0 | 7.9 | 7.9 | 7.8 | 7.7 | 7.5 | 7.3 | 7.1 | 7.0 | 55.9 | 27.1 | 12.7 | 6.9 | 4.1 | 2.5 | 1.6 | 1.0 | 1.6 |
| 1993 | 7.3 | 7.5 | 7.6 | 7.5 | 7.5 | 7.4 | 7.3 | 7.1 | 7.0 | 6.7 | 53.8 | 25.3 | 11.5 | 6.2 | 3.6 | 2.2 | 1.4 | 0.8 | 1.4 |
| 1994 | 6.7 | 6.9 | 7.1 | 7.3 | 7.1 | 7.2 | 7.1 | 6.9 | 6.7 | 6.6 | 51.8 | 23.7 | 10.4 | 5.5 | 3.2 | 1.9 | 1.2 | 0.7 | 1.2 |
| 1995 | 6.4 | 6.4 | 6.6 | 6.8 | 6.9 | 6.8 | 6.8 | 6.7 | 6.6 | 6.4 | 50.6 | 23.1 | 9.9 | 5.1 | 2.9 | 1.8 | 1.1 | 0.7 | 1.1 |
| 1996 | 6.0 | 6.1 | 6.1 | 6.3 | 6.5 | 6.6 | 6.5 | 6.5 | 6.4 | 6.2 | 49.5 | 22.5 | 9.4 | 4.7 | 2.7 | 1.6 | 1.0 | 0.6 | 1.0 |
| 1997 | 5.7 | 5.7 | 5.8 | 5.8 | 6.0 | 6.2 | 6.3 | 6.2 | 6.2 | 6.1 | 48.2 | 22.0 | 8.9 | 4.4 | 2.5 | 1.5 | 0.9 | 0.6 | 1.0 |
| 1998 | 5.2 | 5.4 | 5.5 | 5.6 | 5.6 | 5.7 | 5.9 | 6.0 | 5.9 | 5.8 | 46.8 | 21.3 | 8.4 | 4.0 | 2.3 | 1.4 | 0.8 | 0.5 | 0.9 |
| 1999 | 5.2 | 5.0 | 5.2 | 5.2 | 5.3 | 5.3 | 5.5 | 5.6 | 5.7 | 5.6 | 45.7 | 21.2 | 8.1 | 3.8 | 2.1 | 1.3 | 0.8 | 0.5 | 0.8 |

Table A.6. Continued. Male numbers at age in Washington (1000s) predicted by the base-case model.

| Age (yr) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 4.9 | 4.9 | 4.8 | 4.9 | 5.0 | 5.1 | 5.1 | 5.2 | 5.3 | 5.4 | 43.3 | 19.5 | 7.2 | 3.3 | 1.8 | 1.1 | 0.7 | 0.4 | 0.7 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2001 | 5.0 | 4.7 | 4.7 | 4.6 | 4.7 | 4.7 | 4.8 | 4.8 | 4.9 | 5.0 | 42.2 | 19.4 | 7.1 | 3.1 | 1.7 | 1.0 | 0.6 | 0.4 | 0.6 |
| 2002 | 5.0 | 4.8 | 4.5 | 4.5 | 4.3 | 4.5 | 4.5 | 4.6 | 4.6 | 4.6 | 40.1 | 18.2 | 6.4 | 2.8 | 1.5 | 0.9 | 0.5 | 0.3 | 0.5 |
| 2003 | 5.2 | 4.8 | 4.6 | 4.3 | 4.3 | 4.1 | 4.3 | 4.3 | 4.4 | 4.3 | 39.4 | 18.7 | 6.6 | 2.8 | 1.4 | 0.8 | 0.5 | 0.3 | 0.5 |
| 2004 | 5.3 | 4.9 | 4.6 | 4.4 | 4.1 | 4.1 | 4.0 | 4.1 | 4.1 | 4.1 | 38.6 | 19.4 | 6.8 | 2.8 | 1.4 | 0.8 | 0.5 | 0.3 | 0.5 |
| 2005 | 5.5 | 5.1 | 4.7 | 4.4 | 4.2 | 3.9 | 3.9 | 3.8 | 3.9 | 3.9 | 37.6 | 20.0 | 7.1 | 2.8 | 1.4 | 0.8 | 0.5 | 0.3 | 0.5 |
| 2006 | 5.6 | 5.2 | 4.8 | 4.5 | 4.2 | 4.0 | 3.7 | 3.7 | 3.6 | 3.7 | 36.2 | 20.4 | 7.3 | 2.8 | 1.4 | 0.8 | 0.5 | 0.3 | 0.5 |
| 2007 | 5.7 | 5.3 | 5.0 | 4.6 | 4.3 | 4.0 | 3.8 | 3.6 | 3.5 | 3.4 | 34.9 | 21.1 | 7.7 | 2.9 | 1.4 | 0.8 | 0.5 | 0.3 | 0.5 |
| 2008 | 5.8 | 5.5 | 5.1 | 4.7 | 4.4 | 4.1 | 3.8 | 3.6 | 3.4 | 3.4 | 33.4 | 21.6 | 8.0 | 3.0 | 1.4 | 0.8 | 0.5 | 0.3 | 0.5 |
| 2009 | 5.9 | 5.6 | 5.2 | 4.9 | 4.5 | 4.2 | 3.9 | 3.6 | 3.4 | 3.2 | 31.7 | 21.8 | 8.3 | 3.0 | 1.4 | 0.8 | 0.5 | 0.3 | 0.5 |
| 2009 | 4.9 | 4.9 | 4.8 | 4.9 | 5.0 | 5.1 | 5.1 | 5.2 | 5.3 | 5.4 | 43.3 | 19.5 | 7.2 | 3.3 | 1.8 | 1.1 | 0.7 | 0.4 | 0.7 |

## 13. Appendix B: SS Data file

```
#C Data file for 2011 yelloweye assessment

#C updated from 2009 model by Ian Taylor
#C designed to run in SSv3.21d
#
### Global model specifications ###
#
1916  # Start year
2010  # End year
1 # Number of seasons/year
12  # Number of months/season (vector, by season)
1 # Spawning occurs at beginning of season
6 # Number of fishing fleets
6 # Number of surveys
3 # Number of areas
#
### Fleet Section ###
1_CARC%2_CACM%3_ORRC%4_ORCM%5_WARC%6_WACM%7_ORRCOB%8_CACPFV%9_IPHCWA%10_NWFSCOR
%11_IPHCOR%12_WATRI
0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 # Fleet timing (proportion of
season)
1 1 2 2 3 3 2 1 3 2 2 3 # Area of each fleet
1 1 1 1 1 1             # Units for catch by fishing fleet:
1=Biomass(mt),2=Numbers(1000s)
0.1 0.1 0.1 0.1 0.1 0.1             # SE of log(catch) by fishing fleet
#
### More global specs ###
2 # Number of genders (1=combined,2=females and males)
100 # Accumulator age (plus group for population dynamics)
#
### Catch section ###
# Initial equilibrium catch (landings + discard) by fishing fleet
0 0 0 0 0 0
#
95  # Number of lines catch data
# Catch (by fleet) Year Season
#CA rec CA comm OR rec  OR comm WA rec  WA comm Year  Season
0.00  2.20  0.00  1.70  0.00  0.00  1916  1
0.00  3.62  0.00  1.79  0.00  0.00  1917  1
0.00  4.25  0.00  1.88  0.00  0.00  1918  1
0.00  2.16  0.00  1.97  0.00  0.00  1919  1
0.00  2.38  0.00  2.05  0.00  0.00  1920  1
0.00  2.30  0.00  2.14  0.00  0.00  1921  1
0.00  2.06  0.00  2.23  0.00  0.00  1922  1
0.00  2.21  0.00  2.32  0.00  0.00  1923  1
0.00  2.82  0.00  2.40  0.00  0.00  1924  1
0.00  3.86  0.00  2.49  0.00  1.00  1925  1
0.00  4.87  0.00  2.58  0.00  1.00  1926  1
0.00  5.92  0.00  2.67  0.00  1.00  1927  1
0.00  5.52  0.00  4.45  0.00  1.00  1928  1
0.73  5.66  0.00  7.46  0.00  1.00  1929  1
1.18  6.76  0.00  6.65  0.00  1.00  1930  1
1.76  5.62  0.00  5.21  0.00  1.00  1931  1
2.35  8.13  0.00  1.79  0.00  1.00  1932  1
2.94  4.45  0.00  2.74  0.00  1.00  1933  1
3.53  5.78  0.00  3.11  0.00  1.00  1934  1
4.12  7.99  0.00  2.84  0.00  1.00  1935  1
4.70  8.08  0.00  6.64  0.00  1.00  1936  1
5.61  6.08  0.00  7.57  0.00  1.00  1937  1
5.50  6.36  0.00  7.30  0.00  1.00  1938  1
4.81  6.43  0.00  3.82  0.00  1.00  1939  1
```

```
6.85  4.57  0.00  11.15 0.00  1.00  1940  1
6.25  5.35  0.00  15.98 0.00  1.00  1941  1
6.78  3.37  0.00  23.85 0.00  1.00  1942  1
7.30  5.89  0.00  66.05 0.00  1.00  1943  1
7.83  24.88 0.00  46.97 0.00  1.00  1944  1
8.36  58.56 0.00  62.52 0.00  1.00  1945  1
8.88  57.74 0.00  42.38 0.00  1.00  1946  1
5.02  16.28 0.00  25.53 0.00  1.00  1947  1
10.12 23.30 0.00  20.73 0.00  1.00  1948  1
13.09 9.89  0.00  15.93 0.00  1.00  1949  1
15.95 8.03  0.00  17.79 0.00  1.00  1950  1
17.91 16.99 0.00  15.10 0.00  1.00  1951  1
15.95 14.15 0.00  14.88 0.00  1.00  1952  1
13.97 11.77 0.00  11.32 0.00  1.00  1953  1
18.74 11.78 0.00  14.23 0.00  1.00  1954  1
24.06 6.98  6.20  15.04 1.00  2.00  1955  1
27.15 10.40 6.50  18.06 1.00  2.00  1956  1
24.78 13.17 6.70  25.89 1.00  2.00  1957  1
35.91 13.41 7.00  18.30 2.00  2.00  1958  1
30.41 10.25 7.20  20.64 2.00  2.00  1959  1
22.05 8.88  7.50  25.32 2.00  2.00  1960  1
17.68 5.25  7.70  24.63 2.00  2.00  1961  1
22.08 5.43  8.00  28.28 2.00  2.00  1962  1
23.10 10.86 8.20  8.28  3.00  4.00  1963  1
20.82 7.52  8.50  1.94  3.00  4.00  1964  1
31.51 9.38  8.70  70.16 3.00  4.00  1965  1
35.34 8.97  9.00  3.86  3.00  4.00  1966  1
36.60 7.85  9.20  11.35 3.00  4.00  1967  1
42.79 7.66  9.50  7.93  3.00  4.00  1968  1
44.97 25.70 9.70  55.36 3.00  4.00  1969  1
51.89 27.70 10.00 6.31  4.00  5.10  1970  1
46.17 46.50 13.10 17.97 4.00  6.41  1971  1
59.61 63.66 16.30 14.82 4.00  7.31  1972  1
75.02 49.51 7.40  14.98 4.00  9.21  1973  1
80.47 56.38 12.80 14.86 4.00  10.31 1974  1
81.34 60.24 6.20  9.87  4.00  7.10  1975  1
88.56 57.96 19.40 14.86 4.30  10.30 1976  1
79.78 57.45 19.90 17.13 8.80  17.88 1977  1
74.46 154.20  24.50 41.91 4.50  23.90 1978  1
85.49 99.33 38.80 67.38 3.50  28.50 1979  1
80.19 42.07 31.50 76.22 2.40  35.06 1980  1
43.58 169.44  36.00 106.27  3.40  9.70  1981  1
79.60 154.33  56.90 156.56  3.40  12.60 1982  1
38.36 62.69 63.80 142.78  6.70  16.99 1983  1
71.26 53.66 43.70 82.56 12.20 13.42 1984  1
121.87  12.22 26.80 132.95  8.80  26.41 1985  1
77.31 33.51 27.40 56.89 9.00  14.94 1986  1
57.83 54.31 29.80 73.72 10.50 25.09 1987  1
60.07 65.44 9.40  110.73  8.30  25.56 1988  1
54.44 51.25 16.90 170.21  14.60 39.50 1989  1
40.06 81.32 18.70 61.12 9.90  26.27 1990  1
27.38 147.30  17.20 137.74  18.00 20.36 1991  1
16.41 111.10  29.40 165.88  16.20 33.85 1992  1
7.13  52.92 27.73 183.18  18.00 29.76 1993  1
13.78 56.02 21.57 102.19  10.30 19.58 1994  1
10.08 51.40 16.81 148.34  9.90  18.07 1995  1
12.74 76.54 8.17  92.52 10.80 16.89 1996  1
14.58 68.68 15.38 115.42  11.40 18.68 1997  1
4.84  21.89 18.78 41.47 14.40 5.57  1998  1
9.40  23.49 18.05 61.35 10.60 32.92 1999  1
5.71  4.02  9.52  3.64  10.10 7.86  2000  1
6.37  4.35  4.83  6.23  12.50 21.84 2001  1
2.49  0.89  3.14  1.56  3.70  1.55  2002  1
```

```
3.74  0.70  3.02  0.92  2.60  0.98  2003  1
0.60  2.61  3.69  2.67  3.70  0.66  2004  1
0.90  3.43  4.30  1.69  5.20  0.74  2005  1
4.10  1.86  2.49  2.92  1.70  0.76  2006  1
8.00  4.81  2.85  3.28  2.49  1.61  2007  1
1.69  1.72  3.25  3.88  2.40  0.78  2008  1
3.84  0.61  2.05  1.61  1.63  1.15  2009  1
2.70  1.84  2.80  2.25  2.60  0.91  2010  1
#1_CARC 2_CACM  3_ORRC  4_ORCM  5_WARC  6_WACM  Yr  Seas
#
### Abundance indices ###
100 # Total number of observations (all fleets) #_N_cpue
#_Units:  0=numbers; 1=biomass; 2=F
#_Errtype:  -1=normal; 0=lognormal; >0=T
#_Fleet Units Errtype
1 0 0 # 1_CARC
2 0 0 # 2_CACM
3 0 0 # 3_ORRC
4 0 0 # 4_ORCM
5 0 0 # 5_WARC
6 0 0 # 6_WACM
7 0 0 # 7_ORRCOB
8 0 0 # 8_CACPFV
9 0 0 # 9_IPHCWA
10  1 0 # 10_NWFSCOR
11  0 0 # 11_IPHCOR
12  1 0 # 12_WATRI
#
# Year  Seas    Type    Value   s(log space)
# 2009 CA Recreational CPUE from WDFW (unchanged for 2011; N=14)
1980  1 1 4.48  0.240
1981  1 1 2.78  0.506
1982  1 1 11.27 0.361
1983  1 1 4.64  0.579
1984  1 1 8.46  0.413
1985  1 1 13.57 0.363
1986  1 1 6.25  0.314
1993  1 1 7.72  0.552
1994  1 1 1.87  0.616
1995  1 1 3.06  0.314
1996  1 1 2.08  0.193
1997  1 1 4.23  0.249
1998  1 1 3.12  0.295
1999  1 1 2.14  0.211
# 2009 Oregon Recreational CPUE from WDFW (unchanged for 2011; N=19)
1979  1 3 16.99 0.225
1980  1 3 22.24 0.178
1981  1 3 17.98 0.169
1982  1 3 25.7  0.185
1983  1 3 31.95 0.189
1984  1 3 21.75 0.150
1986  1 3 15.27 0.143
1987  1 3 25.23 0.257
1988  1 3 14.81 0.268
1989  1 3 10.17 0.276
1990  1 3 16.02 0.208
1991  1 3 19.08 0.171
1992  1 3 16.46 0.209
1993  1 3 12.66 0.137
1994  1 3 10.17 0.132
1995  1 3 9.65  0.257
1996  1 3 6.1 0.134
1998  1 3 10.76 0.127
```

```
1999  1 3 13.84 0.186
# 2009 WA Recreational CPUE from WDFW (unchanged for 2011; N=10)
1990  1 5 6.9 0.700
1991  1 5 16.03 1.700
1992  1 5 15.29 1.240
1993  1 5 13.19 1.010
1994  1 5 7.15  0.420
1995  1 5 5.7 0.460
1996  1 5 5.72  0.500
1997  1 5 8.75  1.050
1998  1 5 11.06 1.240
1999  1 5 6.88  0.850
# 2011 Oregon Recreational Charter observer CPUE (logit MCMC run with 2
additional years; N=7)
2004  1 7 0.00036 0.515
2005  1 7 0.000317  0.532
2006  1 7 0.000817  0.483
2007  1 7 0.000644  0.490
2008  1 7 0.000958  0.488
2009  1 7 0.000861  0.495
2010  1 7 0.000578  0.530
# 2009 CA CPFV CPUE from WDFW (unchanged for 2011; N=11)
1988  1 8 26.19 0.211
1989  1 8 25.52 0.130
1990  1 8 32.16 0.265
1991  1 8 31.59 0.157
1992  1 8 20.88 0.130
1993  1 8 23.63 0.156
1994  1 8 21.67 0.132
1995  1 8 16.33 0.159
1996  1 8 17.9  0.154
1997  1 8 13.31 0.137
1998  1 8 10.13 0.248
# 2011 IPHC Washington-only (logit MCMC run with 2 additional years; N=11)
1999  1 9 0.001212  0.804
2001  1 9 0.010848  0.299
2002  1 9 0.003173  0.245
2003  1 9 0.012624  0.100
2004  1 9 0.003107  0.230
2005  1 9 0.010863  0.115
2006  1 9 0.004373  0.209
2007  1 9 0.005872  0.186
2008  1 9 0.002519  0.286
2009  1 9 0.004642  0.175
2010  1 9 0.003463  0.189
# 2009 NWFSC Trawl survey Oregon-only (updated for 2011 with 2 additional
years; N=8)
2003  1 10  1932.07 0.524
2004  1 10  167.55  0.648
2005  1 10  159.98  0.583
2006  1 10  472.51  0.506
2007  1 10  167.14  0.652
2008  1 10  115.32  0.515
2009  1 10  200.33  1.800
2010  1 10  289.57  0.505
# 2011 IPHC Oregon-only (logit MCMC run with 2 additional years; N=11)
1999  1 11  0.033 0.123
2001  1 11  0.021291  0.181
2002  1 11  0.017846  0.084
2003  1 11  0.019456  0.068
2004  1 11  0.017913  0.078
2005  1 11  0.008298  0.111
2006  1 11  0.009636  0.119
```

```
2007  1 11  0.014336  0.097
2008  1 11  0.017317  0.094
2009  1 11  0.005687  0.135
2010  1 11  0.007392  0.111
# 2009 Triennial Trawl survey Washington-only (updated for 2011 by running in
new GLMM software, separating between 92/95; N=9)
1980  1 12  72.24 0.896
1983  1 12  664.57  0.400
1986  1 12  327.13  0.298
1989  1 12  635.54  0.376
1992  1 12  71.47 0.538
1995  1 12  18.96 0.854
1998  1 12  63.08 0.554
2001  1 12  107.21  0.521
2004  1 12  121.86  0.648
#
### Discard observation section ###
0 #_N_fleets_with_discard
#_discard_units (1=same_as_catchunits(bio/num); 2=fraction; 3=numbers)
#_discard_errtype:  >0 for DF of T-dist(read CV below); 0 for normal with CV; -
1 for normal with se; -2 for lognormal
#_Fleet units errtype
# 1     2     30 # FISHERY1
0 # Number of discard observations all fleets and years # N_discard_obs
#
### Mean body weight observation section ###
0 # Number of mean body weight observations # N_meanbodywt_obs
1000  #_DF_meanwt
#
## Population size structure
3 # Length bin method: 1=Use data bins,2=generate from min/max/width read
below,3=Read count and vector below
41  # N population bins
# Lower edge of bins
8 10  12  14  16  18  20  22  24  26  28  30  32  34  36  38  40  42  44  46
48  50  52  54  56  58  60  62  64  66  68  70  72  74  76  78  80  82  84  86
88
#
-1  # Minimum proportion for compressing tails of observed compositional  data
0.001 # Constant added to expected frequencies
0 # Combine males and females at and below this bin number
#
37  # Number of data length bins
# Lower edge of data length bins by bin
16  18  20  22  24  26  28  30  32  34  36  38  40  42  44  46  48  50  52  54
56  58  60  62  64  66  68  70  72  74  76  78  80  82  84  86  88
#
168 # Total number of length observations all fleets and years
# Partition: 1=discarded catch, 2=retained catch, 0=whole catch (R+D)
# Gender: 0=sexes combined into length bins, 1=females only (0s male bins),
2=males only (0s for female bins), 3=both males and females, total should sum
to 1.0
# Year  Seas  Type  Gender  Partition Nsamp Data: females then  males
# Fleet 1: 2009 CA recreational (updated for 2011 with 2 additional years, and
recalculated sample sizes; N=18)
1993  1 1 0 0 36.6  0 0 0 0 1 1 1 0 1 1 4 5 4 4 2 0 1 1 2 0 1 1 0 1 2 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1994  1 1 0 0 45.4  0 0 0 0 0 2 3 2 4 9 7 4 3 9 8 2 2 2 0 2 1 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1995  1 1 0 0 46.5  0 0 1 0 0 1 1 7 4 3 3 5 9 2 3 2 0 1 1 2 0 0 0 1 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

0 0 0 0
1996 1 1 0 0 75.3 0 0 3 2 1 5 3 3 3 7 6 4 4 8 4 4 5 3 3 2 1 2 1 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1997 1 1 0 0 9.4 0 0 0 0 0 0 0 0 0 2 0 2 2 1 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1998 1 1 0 0 18.5 0 1 0 0 0 0 2 3 5 1 1 0 2 1 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1999 1 1 0 0 83.1 0 0 1 0 3 2 4 1 4 4 2 4 8 11 8 6 8 4 6 4 4 2 0 1 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2000 1 1 0 0 47.5 0 0 1 1 0 0 0 1 6 1 3 1 1 2 6 3 5 5 4 3 1 0 0 2 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2001 1 1 0 0 17.1 0 0 0 0 0 0 1 1 0 2 1 2 2 1 1 1 1 1 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2002 1 1 0 0 10.8 0 0 0 0 0 0 0 2 1 0 0 1 1 1 2 2 1 0 1 0 0 0 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2003 1 1 0 0 15.1 1 0 0 0 0 0 1 0 1 1 0 3 3 1 1 0 1 1 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2004 1 1 0 0 13.1 0 0 0 1 0 0 1 0 0 1 0 2 3 1 1 1 0 0 2 1 0 0 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2005 1 1 0 0 53.9 0 0 0 0 0 0 1 1 0 3 2 5 4 7 5 6 9 4 4 1 2 1 1 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2006 1 1 0 0 73.1 0 0 0 0 0 0 0 2 3 3 5 9 2 6 8 10 14 15 5 6 2 3 1 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
2007 1 1 0 0 50.9 0 0 0 0 1 0 0 1 2 2 9 2 8 11 7 4 3 1 2 2 0 1 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2008 1 1 0 0 22.7 0 0 0 0 0 0 0 0 1 3 2 0 3 3 5 3 3 0 2 0 1 0 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2009 1 1 0 0 44.1 0 0 0 0 0 0 1 0 2 2 4 3 4 3 4 4 2 3 4 2 3 1 1 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2010 1 1 0 0 11.7 0 0 0 0 0 0 0 0 0 0 1 0 2 2 2 1 1 1 1 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
# Fleet 2: 2009 CA commercial: Port and observer (updated for 2011 with
additional observations in 2009, but 0 samples from 2008 and 2010; N=31)
1978 1 2 0 0 4.1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 2 6 1 0 0 1 0 0 1 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1979 1 2 0 0 23.3 0 0 0 0 0 0 1 1 3 0 0 6 9 7 4 9 7 7 3 2 0 0 0 0 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1980 1 2 0 0 22.8 0 0 0 0 0 0 0 0 0 0 1 0 1 2 0 5 0 1 4 1 3 5 5 4 2 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1981 1 2 0 0 25.6 0 0 0 0 0 0 1 0 1 0 0 3 5 5 10 5 11 11 4 2 0 1 1 0 0 2 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
1982 1 2 0 0 12.5 0 0 0 0 0 0 0 0 0 0 0 1 0 2 1 4 2 1 2 1 0 1 0 1 1 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0

1983 1 2 0 0 25.9 0 0 0 0 0 0 1 3 1 0 2 1 3 2 4 3 3 4 1 1 1 0 3 3 4 1 1 0 0 0
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1984 1 2 0 0 23.1 0 0 0 0 0 1 1 1 0 1 0 0 2 3 0 0 0 0 4 0 6 3 3 0 1 0 1 1 2 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1985 1 2 0 0 23.7 0 0 0 0 0 0 1 0 2 0 1 1 4 3 3 2 3 2 0 0 0 2 1 1 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1986 1 2 0 0 23.2 0 0 0 0 0 0 0 0 1 1 1 2 1 0 3 0 3 1 0 1 2 1 2 4 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1987 1 2 0 0 21.6 0 0 0 0 0 0 1 1 1 1 3 1 0 1 1 2 1 1 1 1 2 3 1 0 3 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1988 1 2 0 0 16.9 0 0 0 0 0 0 0 0 0 1 1 0 0 2 1 1 3 3 1 2 0 0 2 0 1 2 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1989 1 2 0 0 27 0 0 0 1 0 1 0 0 3 2 1 3 3 4 1 3 5 7 5 1 5 4 2 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1990 1 2 0 0 18.9 0 0 0 0 0 0 1 0 1 4 4 6 1 1 0 1 0 0 0 0 4 1 2 0 2 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1991 1 2 0 0 57.9 0 0 0 0 1 0 1 5 5 11 13 16 15 12 23 21 11 11 16
12 16 13 10 6 3 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1992 1 2 0 0 143 0 0 0 0 1 6 5 21 24 26 25 32 41 48 50 29 27 29 32
23 21 21 8 12 6 4 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1993 1 2 0 0 195 0 0 0 2 5 14 33 28 54 45 52 43 59 52 57 39 42 43
35 25 17 24 17 11 6 6 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1994 1 2 0 0 183.6 0 0 1 0 4 7 21 26 44 60 63 54 69 69 62 61 49 33
25 21 12 11 13 12 15 3 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1995 1 2 0 0 89.2 0 0 1 0 1 4 11 16 24 13 40 35 29 41 26 31 22 20
15 13 12 8 4 6 1 2 1 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1996 1 2 0 0 152.6 0 0 0 3 3 7 14 32 37 30 48 56 57 40 47 26 28 25
26 11 10 11 10 3 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1997 1 2 0 0 93 0 0 0 1 4 6 14 15 21 27 24 24 17 15 24 19 17 11
14 9 6 4 5 2 5 3 2 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1998 1 2 0 0 26.6 0 0 0 0 0 0 0 0 2 5 7 5 3 6 8 4 5 3 3 3 0 5 0 1 1 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1999 1 2 0 0 128.1 0 0 0 1 0 6 4 7 16 36 31 39 58 53 50 45 36 36 26
19 16 11 8 2 1 3 1 1 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2000 1 2 0 0 17.6 0 0 0 0 0 2 1 2 1 1 1 2 1 3 3 1 4 0 1 1 1 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2001 1 2 0 0 46.1 0 0 0 1 2 15 28 14 22 12 5 4 9 6 7 4 4 2 2 2 1 2 1 0 1
1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
2002 1 2 0 0 10.7 0 0 0 0 0 0 1 2 2 1 0 1 0 1 1 0 2 0 0 0 0 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2003 1 2 0 0 3.6 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 1 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0

```
2004  1 2 0 0 34.8  0 0 0 0 0 1 1 1 4 5 9 5 5 9 8 4 5 4 2 2 1 2 0 1 0 1 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2005  1 2 0 0 19.5  0 0 0 0 0 1 0 2 1 3 4 3 3 5 7 7 1 3 5 1 0 2 4 1 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2006  1 2 0 0 9.9 0 0 0 0 1 1 0 2 2 3 2 2 3 3 3 2 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2007  1 2 0 0 30.9  0 0 1 1 0 2 4 2 8 9 5 6 5 11  6 6 5 2 1 2 0 1 0 1 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2009  1 2 0 0 6.4 0 0 0 1 0 0 1 0 1 0 2 0 2 0 0 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 # new for 2011
# Fleet 3: 2009 OR recreational lengths (no new data for 2011; N=28)
# Sexed
1978  1 3 3 0 120 0 0 0 0 0 3 2 6 2 3 5 1 3 3 2 1 0 1 0 4 10  3 5 1 2 3 3 3 2 0
0 0 0 0 0 0 0 0 0 0 0 2 1 4 1 1 1 0 3 2 4 2 2 4 1 2 2 1 1 3 11  2 1 1 0 0 0 0
0 0 0 0 0
1979  1 3 3 0 107 0 0 0 0 0 0 3 2 2 4 2 1 0 2 3 2 2 3 5 3 8 6 2 3 0 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 2 1 0 0 2 3 1 2 1 1 0 1 2 2 6 4 6 7 2 2 5 1 1 1 0 0 0 0 0
0 0 0
1984  1 3 3 0 168 0 0 0 0 0 1 6 2 3 8 12  14  4 9 5 8 6 3 7 5 1 4 8 5 2 0 0 1 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 2 7 6 3 4 2 3 6 2 2 3 1 0 3 1 3 2 0 0 0 0 0 0 0
0 0 0 0 0
1985  1 3 3 0 122 0 0 0 0 0 1 1 2 1 4 2 5 1 4 2 1 1 1 6 3 3 7 2 1 1 3 1 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 2 1 2 4 2 3 5 3 7 3 1 2 5 3 4 5 6 3 2 2 1 1 1 0 0 0 0 0
0 0 0
1986  1 3 3 0 130 0 0 0 0 0 0 0 0 0 3 3 6 10  3 3 0 6 2 1 2 5 4 6 2 5 4 1 1 0 2 0
0 0 0 0 0 0 0 0 0 1 0 0 0 2 1 3 5 3 5 2 5 3 5 1 2 2 2 2 3 7 1 1 1 2 2 0 0 0 0 0
0 0 0 0
1987  1 3 3 0 121 0 0 0 0 0 3 3 1 2 8 1 4 1 2 6 4 4 3 4 3 3 7 2 2 4 1 1 2 0 0 0
0 0 0 0 0 0 0 0 0 0 1 0 3 0 1 2 2 5 4 3 3 4 2 2 0 2 0 4 3 5 2 1 1 0 0 0 0 0 0 0
0 0 0
1989  1 3 3 0 31  0 0 1 0 0 0 0 0 2 0 0 5 2 2 0 2 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 3 0 1 0 2 1 1 0 1 2 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0
0 0 0
# Unsexed
1980  1 3 0 0 25  0 0 0 0 0 0 1 0 0 3 1 1 0 2 1 1 0 0 2 1 0 1 3 0 4 2 0 1 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1981  1 3 0 0 13  0 0 0 0 0 0 0 0 0 3 1 1 0 0 2 1 1 0 0 0 1 0 1 0 0 1 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1982  1 3 0 0 61  0 0 0 0 0 0 1 5 3 5 5 5 3 1 7 4 4 6 3 1 2 1 1 1 1 0 0 0 1 0 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1983  1 3 0 0 17  0 0 0 0 0 0 1 0 0 1 0 1 3 2 2 1 2 1 0 1 1 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1984  1 3 0 0 180 0 0 0 0 1 2 6 5 15  22  11  21  23  14  11  7 3 3 4 7 1 4 6 3
4 2 2 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
1985  1 3 0 0 100 0 0 0 0 0 0 3 6 1 9 3 13  7 4 7 8 12  6 1 1 3 4 1 5 2 1 3 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
1986  1 3 0 0 45  0 0 1 0 1 0 1 1 1 2 1 3 2 3 5 2 4 0 4 2 4 1 1 0 5 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1987  1 3 0 0 44  0 0 2 0 1 0 2 1 1 2 2 4 3 1 4 1 1 2 3 4 2 2 1 2 1 1 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
```

```
1988  1 3 0 0 38  0 0 0 0 0 0 0 5 1 4 1 2 2 2 7 3 2 2 0 1 3 2 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1989  1 3 0 0 81  0 0 0 3 2 2 4 2 7 4 3 2 9 6 5 6 3 7 4 1 1 2 4 0 1 0 1 0 1 0 0
0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1993  1 3 0 0 163 0 0 1 0 0 1 10  13  19  15  21  17  10  4 7 4 4 7 3 3 5 7 3 1
4 0 2 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0
1994  1 3 0 0 151 0 0 0 1 0 2 3 10  16  14  23  11  19  9 7 5 6 7 6 2 5 1 0 1 1
2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
1995  1 3 0 0 110 0 0 0 0 1 3 0 4 9 8 15  11  8 7 3 8 3 7 4 4 2 3 6 1 1 2 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
1996  1 3 0 0 73  0 0 0 0 1 1 3 2 3 9 8 9 13  4 7 3 2 1 2 0 1 1 1 2 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1997  1 3 0 0 99  0 0 0 1 1 1 3 4 7 7 9 9 14  6 12  4 2 6 3 5 0 1 1 1 1 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
1998  1 3 0 0 147 0 0 0 0 0 0 3 4 6 7 21  20  15  18  14  11  5 8 2 3 4 3 0 2 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1999  1 3 0 0 246 0 0 0 1 0 1 2 8 13  16  27  37  24  26  19  19  10  14  8 2 7
4 4 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0
2000  1 3 0 0 62  0 0 0 0 0 0 0 3 3 5 4 6 10  11  4 2 4 0 3 2 2 0 2 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2001  1 3 0 0 368 0 0 0 0 1 3 10  8 12  20  18  29  32  31  43  37  32  20  24
13  9 10  2 4 2 3 4 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2002  1 3 0 0 448 0 0 0 1 4 4 5 8 11  24  31  33  40  43  36  60  40  32  18
19  9 5 10  8 4 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2003  1 3 0 0 490 0 0 1 1 3 5 13  5 11  19  19  30  37  36  42  44  48  39  36
36  17  10  12  7 5 8 4 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
# Fleet 4: 2009 OR commercial (updated for 2011 with 2009 data, but no samples
in 2010; N=16)
1992  1 4 3 0 2.8 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 2 1 2 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 2 1 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0
1995  1 4 3 0 15.1  0 0 0 0 0 0 0 0 0 0 2 8 1 6 1 1 5 1 3 1 1 1 2 1 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 2 6 0 0 6 3 3 4 4 0 3 1 1 2 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1996  1 4 3 0 24.8  0 0 0 0 0 0 0 0 2 0 4 5 5 9 4 5 2 2 2 2 5 1 1 1 1 0 0 2 0 0 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 6 9 13  4 14  2 2 4 3 3 2 0 3 3 0 1 1 0 0 0 0
0 0 0 0 0 0 0
1997  1 4 3 0 39  0 0 1 0 0 0 0 0 4 5 11  7 20  11  9 10  7 4 2 6 2 1 3 1 2 1 1
0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 5 4 14  24  15  17  11  5 11  4 2 1 2 4 1 0
0 1 0 0 0 0 0 0 0 0 0 0 0 0
1998  1 4 3 0 16.1  0 0 0 0 0 0 0 0 1 2 1 3 5 2 6 2 8 2 3 1 3 1 1 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 0 2 8 1 12  1 10  5 5 1 0 0 1 3 0 0 1 0 0 0 0 0
0 0 0 0 0 0
1999  1 4 3 0 33.9  0 0 0 0 0 0 0 0 0 1 0 1 2 9 8 7 5 8 10  2 4 3 1 4 2 2 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 3 5 8 8 9 8 8 9 10  8 6 5 0 4 0 0 2 0 1 0 1
0 0 0 0 0 0 0
2000  1 4 3 0 53.5  0 0 0 0 0 0 0 1 1 2 4 6 13  5 5 9 6 2 3 7 3 1 0 1 1 1 0 0 0 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 2 3 7 9 11  6 3 9 4 1 4 0 3 0 0 2 0 1 0 0 0 0
0 0 0 0 0 0 0
2001  1 4 3 0 76.2  0 0 0 0 0 0 0 3 8 6 7 7 8 19  10  6 9 10  6 6 3 5 2 1 1 2 0 1
```

```
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 14  5 5 5 3 8 13  10  4 7 5 4 3 1 4 2 1 1 1 0
1 0 0 0 0 0 0 0 0 0 0
2002  1 4 3 0 9.9 0 0 0 0 0 1 0 0 0 1 0 0 1 1 3 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 1 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
0 0 0
2003  1 4 3 0 6.1 0 0 0 0 0 0 0 0 2 0 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 2 1 8 6 5 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2004  1 4 3 0 22.4  0 0 0 0 0 0 0 0 1 1 1 0 2 3 2 5 2 1 3 4 0 1 1 1 0 3 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 2 0 2 3 1 6 0 3 5 3 0 1 2 0 0 0 0 0 0 0
0 0 0 0
2005  1 4 3 0 27.4  0 0 0 0 0 0 0 0 0 0 2 1 0 2 4 1 0 1 0 3 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 2 3 1 0 0 1 4 5 1 2 2 0 0 1 1 0 1 0 0 0 0 0 0 0 0
0 0 0 0
2006  1 4 3 0 8.1 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 1 1 0 2 1 1 0 1 1 0 0 0 0 0 0 0 0 0
0 0 0
2007  1 4 3 0 3.7 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2008  1 4 3 0 5.2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 2 0 1 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 1 1 2 1 2 0 1 0 0 0 0 0 0 0 0 0 0
0 0 0
2009  1 4 3 0 14.3  0 0 0 0 0 0 1 0 0 1 1 2 2 0 0 0 1 1 1 1 0 0 0 0 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 3 0 0 2 0 2 0 0 0 1 0 1 0 1 0 0 0 0 0 0
0 0 0 0 # new for 2011
# Fleet 5: 2009 WA recreational (no new data for 2009 or 2010; N=8)
1998  1 5 3 0 4.5 0 0 0 0 0 0 0 0 0 0 0 2 4 0 2 0 2 0 0 0 0 2 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 3 1 2 2 0 0 1 0 1 0 0 0 2 0 0 0 0 0 0 0
0 0 0
1999  1 5 3 0 17.1  0 0 0 0 0 0 0 0 0 2 0 3 2 4 5 0 2 4 0 3 6 2 4 1 6 1 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 1 0 7 4 3 3 4 0 1 4 0 3 6 2 4 3 0 1 0 0 0 0 0
0 0 0 0
2000  1 5 3 0 33.1  0 0 0 0 0 0 0 0 2 0 4 7 8 9 9 7 9 6 7 4 5 5 2 4 3 3 1 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 6 4 2 9 4 7 8 6 5 8 8 4 6 4 4 4 1 0 0 0 0 0 0
0 0 0 0
2001  1 5 3 0 23.9  0 0 0 0 0 0 0 0 0 0 0 0 5 5 6 5 2 2 1 4 2 7 3 3 2 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 3 3 4 4 3 8 3 5 3 4 1 2 3 0 1 0 0 1 1 0 0 0
0 0 0 0
2004  1 5 3 0 6.7 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 0 0 0 2 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 1 1 0 0 1 0 0 0 0 0 0 0 0
0 0 0
2005  1 5 3 0 2.6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2006  1 5 3 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0
2008  1 5 3 0 3.8 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0
0 0 0
# Fleet 6: 2009 WA commercial (updated with 2009 and 2010 observations for
2011; N=17)
# unsexed
1980  1 6 0 0 2.6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 0 0 0 0 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1993  1 6 0 0 4.8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 1 1 2 2 1 2 0 1 1 0 1 1 2 1 0
0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
1996  1 6 0 0 65.1  0 0 0 0 0 0 2 5 8 17  13  24  27  34  26  18  9 11  9 12
10  13  12  13  16  11  1 3 0 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

```
1997  1 6 0 0 40.6  0 0 0 0 0 0 0 1 6 8 4 16  15  18  20  14  7 10  5 4 3 3 1 3
3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
1998  1 6 0 0 21.7  0 0 0 0 0 0 0 3 0 0 0 3 6 2 10  5 7 4 5 4 2 3 1 3 1 3 0 1 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
1999  1 6 0 0 14.2  0 0 0 0 0 0 0 0 0 1 0 0 1 3 8 1 3 4 5 3 5 2 0 1 3 2 1 2 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2000  1 6 0 0 69.8  0 0 0 0 0 0 2 0 4 6 4 3 8 29  28  50  34  40  30  32  21
27  16  12  3 9 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2001  1 6 0 0 111.5 0 0 0 0 0 0 0 0 0 1 1 2 13  20  42  52  91  83  74  56  50
40  21  17  13  3 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
# sexed
2002  1 6 3 0 62.9  0 0 0 0 0 0 1 0 0 0 0 4 5 6 9 6 6 10  6 1 4 3 1 4 2 2 1 1 1
0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 1 1 7 3 7 10  10  9 25  6 6 9 6 3 4 6 3 0 3
1 0 0 0 0 0 0 0 0
2003  1 6 3 0 32.1  0 0 0 0 0 0 0 0 0 0 0 1 3 2 4 3 5 3 2 1 0 1 2 2 1 0 0 2 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 1 4 5 5 2 4 0 1 0 0 1 0 0 0 0 0 0 0
0 0 0 0
2004  1 6 3 0 25  0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 3 0 4 2 6 3 2 0 0 2 1 1 4 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 5 1 4 3 1 3 1 0 0 0 0 1 1 0 0 0 0 0 0
0 0 0
2005  1 6 3 0 19.2  0 0 0 0 0 0 0 0 0 1 0 0 0 1 1 0 1 1 1 2 1 0 0 0 0 1 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 1 1 0 3 1 0 0 0 0 0 1 1 1 1 0 0 0
0 0 0 0
2006  1 6 3 0 38.1  0 0 0 0 0 0 0 0 0 1 0 0 0 3 1 2 5 7 11  8 6 2 0 4 2 2 2 0 3 0
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 2 0 0 3 3 1 3 11  5 3 3 2 4 0 0 0 2 0 0
0 0 0 0 0 0
2007  1 6 3 0 10  0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 2 2 1 0 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 1 2 5 4 0 2 4 1 0 0 1 0 0 0 0 0 0 0 0
0 0 0
2008  1 6 3 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
0 0
2009  1 6 3 0 3.9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 2 3 0 0 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 # new for 2011
2010  1 6 3 0 6.7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 2 0 2 0 0 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 3 2 4 3 1 0 0 2 0 0 0 0 0 0 0 0
0 0 0 # new for 2011
# Fleet 7: 2009 Oregon recreational observer (updated with 2009 and 2010
observations for 2011; N=7)
2004  1 7 0 0 13.9  0 0 1 1 0 0 0 1 2 0 0 4 3 3 2 1 2 0 0 0 0 0 0 0 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2005  1 7 0 0 15.3  0 0 0 1 0 2 0 2 1 1 0 1 0 2 3 2 0 1 1 1 1 1 1 0 0 2 0 0 0 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2006  1 7 0 0 30.3  0 0 1 2 1 6 2 3 1 2 4 2 1 2 3 1 2 4 4 0 1 1 1 0 0 0 1 0 1 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2007  1 7 0 0 30.2  0 0 0 1 2 4 5 3 4 7 1 3 2 3 4 1 3 4 1 2 1 0 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2008  1 7 0 0 29.1  0 0 1 0 2 4 6 7 4 8 6 1 3 2 1 1 3 2 1 2 1 0 2 0 0 2 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2009  1 7 0 0 18.4  1 0 0 0 1 2 3 4 3 1 6 1 0 5 3 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 # new for 2011
```

```
2010  1 7 0 0 14.8  0 0 0 0 0 0 0 0 3 3 2 1 2 2 3 3 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 # new for 2011
# Fleet 8: 2009 CA recreational CPFV (unchanged for 2011; N=12)
1987  1 8 0 0 19.2  0 0 0 0 0 0 1 4 0 1 0 0 2 5 1 1 1 1 2 0 0 3 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
1988  1 8 0 0 99.1  0 0 2 4 9 6 19  18  14  27  13  22  19  17  11  11  10  8
16  10  15  7 6 5 4 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1989  1 8 0 0 122.5 0 0 1 1 2 4 16  15  15  30  30  24  21  18  18  13  19  11
11  8 4 3 7 3 2 2 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1990  1 8 0 0 43.3  0 0 1 4 2 2 3 0 5 7 8 15  9 10  4 2 2 2 3 2 5 0 1 0 1 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0
1991  1 8 0 0 52.5  0 0 0 1 1 1 2 1 11  8 12  10  6 13  7 9 3 5 6 5 4 3 2 0 2 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
1992  1 8 0 0 103.6 0 2 0 1 6 8 1 11  3 7 13  12  16  12  10  8 14  9 10  7 4 4
3 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
1993  1 8 0 0 105 0 0 1 1 5 9 13  14  14  10  15  12  11  22  10  9 8 6 10  6 6
5 2 8 1 3 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0
1994  1 8 0 0 101.1 0 0 0 1 3 7 5 15  17  15  12  19  14  12  15  11  13  7 4 6
2 3 2 3 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0
1995  1 8 0 0 93  0 1 2 0 2 5 5 7 10  10  14  6 11  17  11  14  7 9 4 4 4 5 0 3
0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
1996  1 8 0 0 86.6  0 1 1 4 4 4 8 6 7 8 7 21  20  11  11  9 11  6 4 5 5 3 3 1 2
2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1997  1 8 0 0 87.9  0 0 2 0 6 5 3 3 7 6 8 13  6 11  5 9 15  10  11  7 3 8 3 2 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
1998  1 8 0 0 38.6  0 0 0 0 1 0 2 1 2 1 3 5 3 4 6 9 3 2 3 3 4 1 0 0 1 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
#Fleet 9: 2009 WA IPHC (updated with 2009 and 2010 observations for 2011; N=8)
2003  1 9 3 0 99  0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 3 2 2 2 4 4 4 4 5 12  2 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 0 2 0 1 5 1 3 8 7 11  5 5 0 1 0 0 0 0
0 0 0 0 0
2004  1 9 3 0 17  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 1 0 0 0 0 0 2 4 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 1 0 1 0 1 2 0 0 0 0 0 0 0 0
0 0 0
2005  1 9 3 0 72  0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 2 4 0 4 1 2 2 4 4 1 1 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 4 11  2 6 7 5 4 1 1 0 0 0 0 0 0
0 0 0 0
2006  1 9 3 0 34  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 3 4 1 1 1 1 1 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 2 3 5 2 2 3 0 0 0 0 0 0 0 0
0 0 0
2007  1 9 3 0 268 0 0 0 0 0 0 0 0 0 0 0 0 0 2 4 5 9 11  9 13  12  9 10  9 12
1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 2 1 10  16  21  29  31  21
8 6 11  3 0 0 0 0 0 0 0 0 0
2008  1 9 3 0 83  0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 2 2 4 2 1 6 2 2 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 5 9 9 6 10  12  4 1 3 0 0 0 0 0
0 0 0 0 0
2009  1 9 3 0 32  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3 2 1 0 1 2 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 1 6 2 4 2 1 2 1 0 0 0 0 0 0 0
0 0 0
2010  1 9 3 0 27  0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 1 1 0 3 1 0 1 1 1 0 0 0 0 0
```

```
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 2 2 2 3 5 1 0 0 0 0 0 0 0 0 0 0
0 0 0
#Fleet 10: 2009 NWFSC OR only (updated with 2009 and 2010 observations for
2011--early values unchanged by elimination of stations; N=8)
2003  1 10  3 0 8.7 0 0 0 0 0 0 0 0 0 0 0 3 2 2 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 1 3 2 1 2 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2004  1 10  3 0 5.8 0 0 0 0 0 0 0 1 0 0 0 2 0 0 0 1 1 1 0 0 2 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2005  1 10  3 0 6.9 0 0 0 0 0 0 0 0 0 0 0 1 0 1 2 0 0 1 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 2 0 1 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2006  1 10  3 0 10.5  0 0 0 0 0 0 2 0 0 0 0 2 1 3 1 2 1 3 0 2 1 1 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 0 1 1 0 2 2 1 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2007  1 10  3 0 6 0 0 1 1 0 0 0 0 0 0 0 1 0 2 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 1 0 0 0 1 0 0 1 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2008  1 10  3 0 9 0 0 0 1 1 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 2 2 1 0 1 0 0 1 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
2009  1 10  3 0 1.5 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0
2010  1 10  3 0 9.5 0 0 1 1 1 0 1 0 0 0 0 0 0 1 1 1 3 2 1 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 0 1 0 1 0 0 0 1 0 0 0 0 1 0 1 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
#Fleet 11: 2009 OR IPHC (updated with 2009 and 2010 observations for 2011; N=6)
2003  1 11  3 0 217 0 0 0 0 0 0 0 0 0 2 0 1 0 6 10  8 8 20  10  5 6 5 5 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 5 12  17  21  14  8 17  13  7 6 3
2 1 0 1 0 0 0 0 0 0 0 0
2004  1 11  3 0 155 0 0 0 0 0 0 0 0 0 0 0 1 0 1 7 11  7 5 8 9 7 2 7 4 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 9 11  16  11  7 12  7 3 1 0 1 0 0
0 0 0 0 0 0 0 0 0
2005  1 11  3 0 68  0 0 0 0 0 0 0 0 0 0 0 0 0 5 1 5 6 4 4 3 0 3 0 0 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 3 4 7 5 3 2 4 5 1 0 0 0 0 0 0 0 0 0
0 0 0 0
2006  1 11  3 0 58  0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 2 2 2 5 3 4 1 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 5 8 7 5 3 1 3 2 1 0 0 0 0 0 0 0 0
0 0 0 0
2007  1 11  3 0 103 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 6 2 7 6 3 2 7 3 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3 6 5 5 6 8 11  8 9 1 1 0 0 0 0 0 0 0
0 0 0 0 0
2008  1 11  3 0 253 0 0 0 0 0 0 0 0 0 0 0 0 1 4 1 10  11  14  9 12  6 7 8 6 1 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 2 2 8 24  22  19  26  13  10
13  10  7 3 0 1 0 0 0 0 0 0 0 0
2009  1 11  3 0 57  0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 7 2 2 7 1 1 0 0 0 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 1 7 6 4 4 3 2 2 2 0 0 0 0 0 0 0 0
0 0 0 0
2010  1 11  3 0 71  0 0 0 0 0 0 0 0 0 0 0 1 1 0 2 6 6 1 6 1 2 1 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 2 8 4 9 5 3 3 5 2 0 0 0 0 0 0 0 0 0
0 0 0 0
#Fleet 12: 2009 WA Triennial (unchanged for 2011; N=7)
1986  1 12  3 0 16.6  0 0 0 0 0 1 0 1 0 0 0 1 0 1 0 1 1 1 3 1 0 2 0 4 2 2 0 2 2
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 2 0 0 0 2 1 7 2 3 6 0 1 0 0 0
0 0 0 0 0
1989  1 12  3 0 12.1  0 0 1 1 1 1 1 0 0 3 0 1 0 1 2 0 1 0 1 1 0 2 3 5 2 1 1 0 0
0 0 0 0 0 0 0 0 0 1 0 1 0 0 1 1 1 0 0 0 0 0 0 2 2 1 0 0 0 0 2 2 1 0 0 0 0 0 0 0 0
0 0 0 0 0
1992  1 12  3 0 4.5 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0
0 0 0 0
```

```
1995  1 12  3 0 5.5 0 1 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0
1998  1 12  3 0 11.3  0 0 0 0 0 0 1 0 0 0 0 0 0 2 0 2 2 0 0 0 1 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 2 0 0 2 1 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0
0 0 0 0 0
2001  1 12  3 0 11.5  0 0 0 0 0 0 0 0 0 0 1 2 1 2 2 1 3 2 0 0 0 0 0 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 0 1 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2004  1 12  3 0 4.7 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 2 0 2 0 0 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0
#
64  # Number of age bins for data inputs
# Lower edge of age bins (first is a minus group, last is a plus group)
2 3 4 5 6 7 8 9 10  11  12  13  14  15  16  17  18  19  20  21  22  23  24  25
26  27  28  29  30  31  32  33  34  35  36  37  38  39  40  41  42  43  44  45
46  47  48  49  50  51  52  53  54  55  56  57  58  59  60  61  62  63  64  65
#
1 # Number of ageing error types
# Vectors of: Average age at true age (to accumulator age)
#             SD of ageing precision at true age
# Accumulator age = 100
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5  11.5  12.5  13.5  14.5  15.5
16.5  17.5  18.5  19.5  20.5  21.5  22.5  23.5  24.5  25.5  26.5  27.5  28.5
29.5  30.5  31.5  32.5  33.5  34.5  35.5  36.5  37.5  38.5  39.5  40.5  41.5
42.5  43.5  44.5  45.5  46.5  47.5  48.5  49.5  50.5  51.5  52.5  53.5  54.5
55.5  56.5  57.5  58.5  59.5  60.5  61.5  62.5  63.5  64.5  65.5  66.5  67.5
68.5  69.5  70.5  71.5  72.5  73.5  74.5  75.5  76.5  77.5  78.5  79.5  80.5
81.5  82.5  83.5  84.5  85.5  86.5  87.5  88.5  89.5  90.5  91.5  92.5  93.5
94.5  95.5  96.5  97.5  98.5  99.5  100.5
0.343 0.343 0.439 0.534 0.628 0.721 0.812 0.903 0.993 1.082 1.17  1.257 1.343
1.428 1.512 1.595 1.677 1.758 1.839 1.918 1.997 2.075 2.152 2.228 2.304 2.378
2.452 2.525 2.597 2.668 2.739 2.808 2.877 2.946 3.013 3.08  3.146 3.211 3.276
3.34  3.403 3.466 3.527 3.589 3.649 3.709 3.768 3.827 3.885 3.942 3.998 4.055
4.11  4.165 4.219 4.273 4.326 4.378 4.43  4.481 4.532 4.582 4.632 4.681 4.73
4.778 4.825 4.872 4.919 4.965 5.01  5.055 5.1 5.144 5.187 5.23  5.273 5.315
5.357 5.398 5.439 5.479 5.519 5.558 5.597 5.636 5.674 5.712 5.749 5.786 5.822
5.859 5.894 5.93  5.965 5.999 6.033 6.067 6.101 6.134 6.167
#
906 # Number of age comp observations
2 # Length bin refers to: 1=population length bin indices; 2=data length bin
indices; 3= actual lengths
0 #_combine males into females at or below this bin number
#
# Year  Season  Type    Gender  Partition  ageerr Lbin_lo Lbin_hi Nsamps Data:
females then males
# Fleet 1: 2009 CA recreational (no new data for 2011; N=4)
# Conditional
1983  1 1 1 0 1 10  10  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0
```

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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
# Fleet 2: 2009 CA commercial (no new data for 2011; N=70)
# Conditional
1978  1 2 1 0 1 9 9 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1978  1 2 1 0 1 11  11  1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1978  1 2 1 0 1 13  13  1 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1978  1 2 2 0 1 13  13  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1978  1 2 2 0 1 18  18  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1978  1 2 2 0 1 20  20  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 2 1 0 1 13  13  1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 2 2 0 1 13  13  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 2 2 0 1 16  16  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 2 2 0 1 17  17  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 2 1 0 1 18  18  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 2 2 0 1 18  18  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 2 2 0 1 19  19  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 2 2 0 1 19  19  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1980  1 2 2 0 1 12  12  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 1 0 0 0 0
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0 0 0 
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2001  1 2 1 0 1 7 7 1 0 0 0 0 1 0 0 0 0
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0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1981  1 2 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 0 0 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1982  1 2 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1983  1 2 3 0 1 1 37  -1  0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1985  1 2 3 0 1 1 37  -1  0 0 0 0 0 1 0 0 0 0 0 1 1 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 1 0 0 0 1 0 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1986  1 2 3 0 1 1 37  -1  0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1988  1 2 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 2 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2001  1 2 3 0 1 1 37  -1  0 0 0 0 3 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2 1 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2005  1 2 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 1 0 0 0 1 0 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
# Fleet 3: 2009 OR recreational (no new data for 2011; N=187)
# Conditional
1979  1 3 1 0 1 19  19  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 3 1 0 1 20  20  5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 2 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 3 1 0 1 22  22  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 3 1 0 1 23  23  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 3 1 0 1 27  27  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 3 1 0 1 33  33  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 3 2 0 1 18  18  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 3 2 0 1 20  20  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 3 2 0 1 21  21  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 3 2 0 1 22  22  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 3 2 0 1 23  23  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1979  1 3 2 0 1 25  25  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1984  1 3 1 0 1 5 5 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1984  1 3 1 0 1 7 7 3 0 0 0 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1984  1 3 1 0 1 8 8 5 0 0 0 0 0 2 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1984  1 3 1 0 1 9 9 4 0 0 0 0 0 0 2 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1984  1 3 1 0 1 10  10  5 0 0 0 0 0 0 0 2 0 0 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1984  1 3 1 0 1 11  11  5 0 0 0 0 0 0 0 0 2 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1984  1 3 1 0 1 12  12  4 0 0 0 0 0 0 1 2 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1984  1 3 1 0 1 13  13  4 0 0 0 0 0 0 0 0 0 0 2 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1984  1 3 1 0 1 14  14  4 0 0 0 0 0 0 0 0 0 0 0 2 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1984  1 3 1 0 1 15  15  3 0 0 0 0 0 0 0 0 0 0 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1984  1 3 1 0 1 16  16  2 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 
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0 0 0 
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1985  1 3 1 0 1 11  11  2 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1985  1 3 1 0 1 12  12  2 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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1987  1 3 1 0 1 9 9 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 1 0 1 10  10  2 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 1 0 1 12  12  1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 1 0 1 14  14  1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 1 0 1 15  15  5 0 0 0 0 0 0 0 0 0 0 1 0 1 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 1 0 1 16  16  2 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 1 0 1 17  17  3 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 1 0 1 18  18  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 1 0 1 19  19  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 1 0 1 20  20  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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1987  1 3 1 0 1 21  21  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 1 0 1 22  22  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 1 0 1 23  23  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 1 0 1 24  24  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 1 0 1 25  25  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 1 0 1 26  26  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 1 0 1 27  27  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 2 0 1 7 7 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 2 0 1 9 9 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 2 0 1 10  10  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 2 0 1 11  11  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 2 0 1 12  12  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 2 0 1 13  13  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 2 0 1 14  14  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 2 0 1 15  15  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 2 0 1 16  16  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 2 0 1 17  17  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 2 0 1 18  18  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 2 0 1 20  20  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 2 0 1 22  22  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 2 0 1 23  23  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1987  1 3 2 0 1 24  24  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 
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0 0 0 
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# Ghost marginals
1979  1 3 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0
0 0 2 1 2 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 2 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0
0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1984  1 3 3 0 1 1 37  -1  0 0 0 1 1 3 9 4 1 2 11  2 2 3 1 0 2 2 0 0 0 2 1 0 0 1
2 0 0 0 1 1 0 1 0 1 0 0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 3 0 0
0 0 0 2 3 1 2 0 5 1 2 2 1 2 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0
0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
1985  1 3 3 0 1 1 37  -1  0 0 1 0 1 0 0 3 1 0 1 1 0 0 2 2 0 0 0 0 0 0 0 0 2 0 0
0 0 1 0 1 1 2 1 1 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 0
1 0 1 0 1 0 1 1 3 1 3 2 2 0 0 0 0 0 0 0 0 1 0 0 0 1 1 0 0 0 1 1 0 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 3
1986  1 3 3 0 1 1 37  -1  0 0 0 0 0 0 1 1 1 4 2 2 1 1 0 2 1 1 0 0 0 0 0 1 0 1 0 0
0 2 0 0 0 0 1 0 1 2 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 1 0 0 0 0 0 0 6 0 0 0
1 1 0 2 2 1 3 2 2 3 0 2 1 0 0 0 1 0 0 1 0 0 0 0 0 1 0 0 0 0 1 0 1 1 0 0 0 0 0 1
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2
1987  1 3 3 0 1 1 37  -1  0 0 1 1 0 0 0 1 1 1 3 2 1 2 1 1 3 1 0 1 1 0 1 0 1 0 0
0 0 0 0 1 0 0 1 1 1 0 1 1 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 1 0 0 4 0 0 0
1 0 1 0 2 2 1 1 2 1 1 1 1 1 0 2 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 2 1 0 1 0 0
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
1989  1 3 3 0 1 1 37  -1  0 0 0 1 0 1 1 1 2 0 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 3 0 2 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
2001  1 3 3 0 1 1 37  -1  0 0 0 1 0 0 0 0 0 0 1 1 3 1 0 3 1 1 1 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 1 0 0 2 1 1 0 2 2 2 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
# Fleet 4: 2009 OR commercial (no new data for 2011; N=75)
# Conditional
2001  1 4 1 0 1 7 7 2 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2001  1 4 1 0 1 12  12  2 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2001  1 4 1 0 1 13  13  1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2001  1 4 2 0 1 8 8 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2001  1 4 2 0 1 9 9 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2001  1 4 2 0 1 13  13  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2002  1 4 1 0 1 13  13  1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2002  1 4 2 0 1 9 9 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2002  1 4 2 0 1 18  18  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2002  1 4 2 0 1 27  27  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
2003  1 4 1 0 1 9 9 2 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2003  1 4 1 0 1 11  11  1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
# Fleet 5: 2009 WA rec (no new data for 2009 or 2010; N=143)
# Conditional
1998  1 5 1 0 1 12  12  2 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 1 1 0 3 2 1 3 4 6 4 4 3 4 1 1 1 0 2 0 1 0 0 1 1 0 1 0 1 0 0 2 0 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3
2004  1 5 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 1 0 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
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2005  1 5 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2006  1 5 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2008  1 5 3 0 1 1 37  -1  0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
# Fleet 6: 2009 WA commercial (updated for 2011 with 21 new obs in 2009 and
2010  + 2 marginals; N=200)
# Conditional
1993  1 6 1 0 1 15  15  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
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1993  1 6 1 0 1 16  16  2 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2001  1 6 1 0 1 16  16  4 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2001  1 6 1 0 1 17  17  4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 0 1 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2001  1 6 1 0 1 18  18  6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 1 1 0 0 0 0 1 1 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2001  1 6 1 0 1 19  19  8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 3 1 0 0 0 0 0 0 0 0
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2001  1 6 1 0 1 20  20  7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 2 0 0 0
0 0 2 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
2001  1 6 2 0 1 25  25  5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 1 0 0 0 0 0 1 0 0 0 1 0 0 0 1 1 0 0
2001  1 6 2 0 1 26  26  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
2001  1 6 2 0 1 27  27  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2002  1 6 1 0 1 12  12  3 0 0 0 0 0 0 0 0 0 1 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2002  1 6 1 0 1 13  13  3 0 0 0 0 0 0 0 0 0 0 0 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2002  1 6 1 0 1 14  14  4 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 2 1 0 0 0 0 0 0 0 0 0 0 0
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2002  1 6 1 0 1 26  26  1 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 6 2 0 1 13  13  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2006  1 6 2 0 1 16  16  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 6 2 0 1 17  17  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2006  1 6 2 0 1 18  18  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 6 2 0 1 19  19  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 6 2 0 1 20  20  11  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 1 0 1 0 1 2 2 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 6 2 0 1 21  21  5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 6 2 0 1 22  22  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 6 2 0 1 23  23  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 6 2 0 1 24  24  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006 1 6 2 0 1 25 25 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006 1 6 2 0 1 29 29 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 6 1 0 1 14 14 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 6 1 0 1 19 19 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 6 1 0 1 20 20 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 6 1 0 1 21 21 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 6 1 0 1 24 24 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 6 2 0 1 11 11 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 6 2 0 1 13 13 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 6 2 0 1 16 16 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 6 2 0 1 17 17 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 6 2 0 1 18 18 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 6 2 0 1 19 19 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 6 2 0 1 21 21 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 6 2 0 1 22 22 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0
0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007 1 6 2 0 1 26 26 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

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0 0 0 
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2010  1 6 2 0 1 18  18  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 # new for 2025
2010  1 6 2 0 1 19  19  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 # new for 2026
2010  1 6 2 0 1 20  20  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 # new for 2027
2010  1 6 2 0 1 21  21  4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 # new for 2028
2010  1 6 2 0 1 22  22  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 # new for 2029
2010  1 6 2 0 1 23  23  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 # new for 2030
2010  1 6 2 0 1 26  26  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 # new for 2011
# Ghost marginals
1993  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 2 2 0 0 0 1 2 0 0 1 0 0 0 0 0 1 0 0
0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
2001  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 1 0 1 2 1 3 3 4 3 1 4 2 0 1 1 2 0
1 3 6 1 2 0 0 1 1 1 0 0 0 2 0 0 0 0 0 0 0 1 2 0 0 1 0 0 1 0 0 1 0 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 1 2 2 2 3 7 4 5 5 8 2 5 4 1 1 3 6 3 4 2 5 1 1 0 0 1 1 0 0 0 0 0
0 1 0 1 0 1 0 0 0 1 0 0 0 1 0 0 0 1 1 0 3
2002  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 1 0 1 2 3 2 0 3 4 7 4 1 3 0 0 0 1 1
0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0
0 0 0 1 1 0 0 2 1 1 2 1 5 5 7 9 6 4 2 0 3 0 2 1 0 1 1 1 0 2 1 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 4
2003  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 1 2 1 0 1 0 0 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 1 2 0 0 0 2 0 1 0 0 0 1 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2004  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 1 1 1 1 0 3 2 2 3 0 1 1
0 1 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 5 0 0 0
0 0 0 0 0 0 0 0 0 0 1 0 2 1 0 2 1 0 0 3 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1
2005  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 0 1 0 2 0 1 1 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0
0 0 0 0 0 0 0 0 1 0 0 0 1 0 1 0 2 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3
2006  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 1 0 0 1 1 2 0 2 5 1 2 1 2 1 3 2 2 0 4 4 2 0
1 1 0 2 0 0 0 0 1 2 0 3 0 1 0 0 0 0 0 0 1 1 0 0 0 0 0 0 1 0 0 0 0 1 0 0 1 0 0 3 0 0 0
1 0 0 0 0 0 0 0 1 1 1 0 0 2 1 2 4 3 0 4 3 4 1 1 1 0 2 2 2 0 0 1 0 1 0 0 0 0 0 0 0 0
0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0
2007  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0
1 2 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 1 1 0 0 0 0 4 0 0 1 2 0 4 1 0 0 1 2 0 0 0 0 0 0
0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2008  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 1 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 2 0 1 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 # new for 2011
2010  1 6 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 1 1 2 0
0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 2 1 0 2 0 0 2 0 1 0 0 1 0 1 0 0 1 0 1 1
1 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 # new for 2011
# Fleet 9: 2009 WA IPHC marginal age (updated for 2011 with 32 new observations
+ 2 ghost marginals; N=106)
# Marginal
2003  1 9 0 0 1 1 37  99  0 0 0 0 0 0 0 0 0 0 1 0 2 0 1 2 2 2 2 1 3 0 5 3 0 3 3
1 4 2 3 2 1 1 1 4 0 1 1 1 1 0 1 1 2 0 0 2 2 2 1 1 1 1 2 1 0 0 0 0 0 1 1 27  0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2004  1 9 0 0 1 1 37  17  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 2 0 1 1 0 0 1 0 0
0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 1 0 5 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2005  1 9 0 0 1 1 37  72  0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 3 0 2 4 7 4 3 2 4
2 0 0 1 3 2 3 1 3 0 3 1 0 0 0 0 0 0 0 2 0 0 1 1 2 1 1 0 0 0 3 0 0 0 1 1 10  0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
# Conditional
2006  1 9 1 0 1 17  17  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 9 1 0 1 19  19  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 9 1 0 1 20  20  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0
0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 9 1 0 1 21  21  4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2007  1 9 2 0 1 23  23  21  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 9 1 0 1 24  24  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 9 1 0 1 25  25  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 9 1 0 1 26  26  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 9 2 0 1 17  17  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 9 2 0 1 19  19  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 9 2 0 1 20  20  6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 1 1 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 9 2 0 1 21  21  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 9 2 0 1 22  22  4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 1 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 9 2 0 1 23  23  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 9 2 0 1 24  24  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0
2009  1 9 2 0 1 25  25  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0
2009  1 9 2 0 1 26  26  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
2010  1 9 1 0 1 14  14  1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2010  1 9 1 0 1 17  17  1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2010  1 9 1 0 1 18  18  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2010  1 9 1 0 1 19  19  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2010  1 9 1 0 1 21  21  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2010  1 9 1 0 1 22  22  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2010  1 9 1 0 1 24  24  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2010  1 9 1 0 1 25  25  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2010  1 9 1 0 1 26  26  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2010  1 9 2 0 1 17  17  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2010  1 9 2 0 1 19  19  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2010  1 9 2 0 1 20  20  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2010  1 9 2 0 1 21  21  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2010  1 9 2 0 1 22  22  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2010  1 9 2 0 1 23  23  5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 2
0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2010  1 9 2 0 1 24  24  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
# Ghost marginals
2006  1 9 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 2 1 0
1 2 1 2 1 1 3 2 0 0 0 2 0 0 0 0 0 0 0 0 0 0 1 0 2 1 0 0 1 1 1 0 0 0 0 0 0 7 0 0 0
0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 2 2 1 1 0 8 5 5 2 1 3 0 1 1 5 3 0 2 0 1 0 0 1 0 0
0 0 0 0 0 2 0 0 0 0 0 0 0 1 3 1 0 1 0 0 0 3
2007  1 9 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 0 1 5 6 7 3 5 2
3 4 4 3 2 5 3 4 7 3 3 2 4 3 2 1 1 1 1 1 0 1 1 1 0 3 0 1 4 1 3 0 3 1 0 0 38  0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 1 2 2 1 7 7 5 11  17  15  10  9 6 10  8 4 6 3 4 4 5
6 4 4 4 3 5 5 2 1 1 3 4 1 1 0 0 4 1 1 1 0 0 1 2 0 0 29
2008  1 9 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 1 0 1 2 1 2 3 7 3 2
6 2 5 1 4 2 3 3 1 3 1 3 3 5 2 2 1 1 1 2 0 1 1 2 0 1 0 1 0 0 1 1 0 1 1 1 27  0 0
0 0 0 0 0 0 0 0 1 0 0 0 0 0 2 3 5 1 3 1 7 10  11  11  14  7 7 3 4 13  5 6 8 3 6
6 4 5 7 6 4 4 2 1 2 2 3 0 3 2 2 1 0 2 6 1 1 2 2 1 2 19
2009  1 9 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0
2 1 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 1 0 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 1 0 1 1 3 0 0 1 0 0 1 2 1 2 0 0 1 0 0 0
0 0 0 0 0 0 0 2 0 0 0 1 0 0 1 0 0 0 0 0 1
2010  1 9 3 0 1 1 37  -1  0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 1 0 0 0 2 0 0 0 0 0
0 0 0 1 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 1 2 0 0 0 0 0 0 0 0 2 1 0 1 1 2
0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
# Fleet 11: 2009 OR IPHC (updated for 2011 with 41 new observations + 2 ghost
marginals; N=121)
```

```
# Marginal
2003  1 11  0 0 1 1 37  215 0 0 0 0 0 0 0 1 0 0 0 0 0 2 2 9 11  7 18  12  12  9
6 4 4 10  10  11  8 6 13  9 3 1 3 1 3 0 2 2 0 1 1 0 4 1 1 3 3 1 2 1 1 1 2 1 1 0
0 1 2 1 0 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2004  1 11  0 0 1 1 37  157 0 0 0 0 0 0 0 0 0 0 1 1 1 1 3 5 7 6 12  9 14  7 9
3 4 2 1 5 6 6 4 5 3 2 1 1 0 0 1 1 0 2 3 2 2 2 2 0 0 2 0 3 2 1 2 0 2 2 1 0 0 0 8
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2005  1 11  0 0 1 1 37  62  0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 1 2 1 5 9 2 5 5 2 1
0 1 3 2 1 1 2 1 2 1 0 1 1 0 0 0 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 0 1 2 2 0 0 3 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
# Conditional
2006  1 11  1 0 1 15  15  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 11  1 0 1 17  17  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 11  1 0 1 18  18  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 11  1 0 1 19  19  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 11  1 0 1 20  20  5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 11  1 0 1 21  21  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 11  1 0 1 22  22  4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 11  1 0 1 23  23  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 11  1 0 1 26  26  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 11  2 0 1 13  13  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 11  2 0 1 15  15  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 11  2 0 1 17  17  5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 2 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2006  1 11  2 0 1 18  18  8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 
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2007  1 11  1 0 1 22  22  7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 1 0 0 1 0 0 2 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007  1 11  1 0 1 23  23  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007  1 11  1 0 1 24  24  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2007  1 11  2 0 1 13  13  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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2007  1 11  2 0 1 15  15  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 11  1 0 1 25  25  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 11  2 0 1 13  13  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 11  2 0 1 14  14  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 11  2 0 1 16  16  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 11  2 0 1 17  17  7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 1 2 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 11  2 0 1 18  18  6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 11  2 0 1 19  19  4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 1 0 0 0 0 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 11  2 0 1 20  20  4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 1 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 11  2 0 1 21  21  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 11  2 0 1 22  22  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2009  1 11  2 0 1 23  23  2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

```
2009  1 11  2 0 1 24  24  2 0 0 0
```

```
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2010  1 11  2 0 1 19  19  9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0
```

## 14. Appendix C: SS Control file

```
#C Yelloweye 2011 control file
#C updated to run in SSv3.21d

# Morph setup
1 # Number of growth patterns
1 # N sub morphs within GPs

# Area setup
3 # Number of recruitment assignments
0 # Recruitment interaction flag
# For each recruitment assignment
# GP seas area
  1  1    1
  1  1    2
  1  1    3
0 # Number of movement parameters

# Time block setup
1       # Number of block designs
1       # N blocks in each design
1993 2009 # Blocks in design 1

# Mortality and growth specifications
0.5     # Fraction female at birth
1       # M setup: 0=single
Par,1=N_breakpoints,2=Lorenzen,3=agespecific;_4=agespec_withseasinterpolate
1       # Number of M breakpoints
4       # Ages at M breakpoints
1       # Growth model: 1=VB with L1 and L2, 2=VB with A0 and Linf, 3=Richards,
4=Read vector of L@A
1       # Age for growth Lmin
70      # Age for growth Lmax or 999 = Linf
0       # SD constant added to LAA (0.1 mimics v1.xx for compatibility only)
0       # Variability about growth: 0=CV~f(LAA) [mimic v1.xx], 1=CV~f(A),
2=SD~f(LAA), 3=SD~f(A)
1       # Maturity option: 1=length logistic, 2=age logistic, 3=read age-
maturity matrix by growth_pattern
2       # First age allowed to mature
1       # Fecundity option
0       # Hermaphroditic option
1       # mg parm offset option: 1=direct assignment, 2=each pat. x gender
offset from pat. 1 gender 1, 3=offsets as SS2 V1.xx with M old and CV old
offset from young values
1       # mg parm adjust method 1=do V1.23 approach, 2=use logistic transform
between bounds

# Mortality and growth parameters
# Lo    Hi      Init    Prior   Prior   Prior   Param   Env     Use     Dev
Dev     Dev     Block   block
# bnd   bnd     value   mean    type    SD      phase   var     dev     minyr
maxyr   SD      design  switch
0.01    0.15    0.044   0.0517  0       0.0226  6       0       0       0
0       0       0       0       #F_natM_young
10      35      23      30      -1      99      2       0       0       0
0       0       0       0       #F_Lmin
40      120     61      66      -1      99      2       0       0       0
0       0       0       0       #F_Lmax
0.01    0.2     0.05    0.05    -1      99      2       0       0       0
0       0       0       0       #F_VBK
0.05    0.2     0.13    0.19    -1      99      3       0       0       0
0       0       0       0       #F_CV-young
```

```
0.05    0.2     0.09    0.1     -1      99      3       0       0       0
0       0       0       0       #F_CV-old

0.01    0.15    0.056   0.0517  0       0.0226  6       0       0       0
0       0       0       0       #M_natM_young
-1      1       0       0       -1      99      -50     0       0       0
0       0       0       0       #M_Lmin
40      120     63      66      -1      99      2       0       0       0
0       0       0       0       #M_Lmax
0.01    0.2     0.05    0.05    -1      99      2       0       0       0
0       0       0       0       #M_VBK
0.05    0.2     0.11    0.14    -1      99      3       0       0       0
0       0       0       0       #M_CV-young
0.05    0.2     0.08    0.4     -1      99      3       0       0       0
0       0       0       0       #M_CV-old

# Lo    Hi      Init    Prior   Prior   Prior   Param   Env     Use     Dev
Dev     Dev     Block   block
# bnd   bnd     value   mean    type    SD      phase   var     dev     minyr
maxyr   SD      design  switch
# 2009 Female W-L
-3      3       0.0000097659 0.000020873 -1 99  -50     0       0       0
0       0       0       0       #Female wt-len-1
-3      4       3.17125028   2.96956    -1 99   -50     0       0       0
0       0       0       0       #Female wt-len-2
# 2009 Maturity
38      39      38.78   40      -1      99      -50     0       0       0
0       0       0       0       #Female mat-len-1
-3      3       -0.437  -0.4    -1      99      -50     0       0       0
0       0       0       0       #Female mat-len-2
# 2009 Fecundity
-3      300000  137900  137900  0       1.0     -6      0       0       0
0       0       0       0       #Female eggs/gm intercept
-3      39000   36500   36500   0       1.0     -6      0       0       0
0       0       0       0       #Female eggs/gm slope
# 2009 Male W-L
-3      3       0.0000170424 0.000020873 -1 99  -50     0       0       0
0       0       0       0       #male   wt-len-1
-3      4       3.02814697 2.96956      -1 99   -50     0       0       0
0       0       0       0       #male   wt-len-2


# Distribute recruitment (log scale fractions) among growth pattern x area x
season
# Lo    Hi      Init    Prior   Prior   Prior   Param   Env     Use     Dev
Dev     Dev     Block   block
# bnd   bnd     value   mean    type    SD      phase   var     dev     minyr
maxyr   SD      design  switch
  0     2       1       1       -1      99      -50     0       0       0
0       0       0       0 # RecrDist_GP_1

  -4    4       0       0       -1      99      -50     0       0       0
0       0       0       0 # RecrDist_Area_1
  -4    4       -0.1    0       -1      99      1       0       0       1916
2008    0.3     0       0 # RecrDist_Area_2
  -4    4       -0.4    0       -1      99      1       0       0       1916
2008    0.3     0       0 # RecrDist_Area_3

  0     2       1       1       -1      99      -50     0       0       0
0       0       0       0 # RecrDist_Seas_1

  0     2       1       1       -1      99      -50     0       0       0
0       0       0       0 # Cohort growth deviation parameter
```

```
# Cohort growth deviation
 0 0 0 0 0 0 0 0 0 0

#9 # Recruitment split annual deviation phase

# Spawner-recruit parameters
3       # S-R function: 1=B-H w/flat top, 2=Ricker, 3=standard B-H, 4=no
steepness or bias adjustment
# Lo    Hi      Init    Prior   Prior   Prior   Param
# bnd   bnd     value   mean    type    SD      phase
3       15      7       5       -1      99      1       # Ln(R0)
### Martins 2009 prior
0.2     1       0.55    0.73    2       0.189   7       # Steepness
###
0       5       0.001   1       -1      99      -50     # Sigma R
-5      5       0       0       -1      99      -50     # Environmental link
coefficient
-5      5       0       0       -1      99      -50     # Initial equilibrium
offset to virgin
-1      2       0       1       -1      99      -50     # Autocorrelation in
rec devs
0       # Index of environmental variable to be used for S-R parameter
0       # Env. target parameter: 0=none, 1=rec devs, 2=R0, 3=steepness

# Recruitment residuals
1 # Dev type: 0=none, 1=zero-sum, 2=simple deviations (no sum constraint)
1916    # Start year recruitment residuals
1916    # End year recruitment residuals
-8      # Phase
1       # Use advanced recruitment options: 0=no, 1=yes
0       # First year for early rec devs
-8      # Phase for early rec devs
-8      # Phase for forecast recruit deviations
1       # Lambda for forecast recr devs before endyr+1
-1965   # Last year with no bias correction in MPD
-1970   # First year with full bias correction (linear ramp from entry above)
-1990   # Last year for full bias correction in MPD
-1995   # First recent year with no bias correction in MPD
1.0     # max bias adjustment
0       # placeholder
-4      # Lower bound rec devs
4       # Upper bound rec devs
0       # Read N initial values for rec devs

# Fishing mortality setup
0.09    # F ballpark for tuning early phases
1999    # F ballpark year (neg value to disable)
1       # F method:  1=Pope's; 2=Instan. F; 3=Hybrid
0.9     # max F or harvest rate, depends on F_Method
#5      # F method=3: N iterations for tuning

# Initial F by fleet
# Lo    Hi      Init    Prior   P_type  SD      Phase
0       1       0.00    0.01    -1      99      -1
0       1       0.00    0.01    -1      99      -1
0       1       0.00    0.01    -1      99      -1
0       1       0.00    0.01    -1      99      -1
0       1       0.00    0.01    -1      99      -1
0       1       0.00    0.01    -1      99      -1

#_Q_setup
 # Q_type options:  <0=mirror, 0=median_float, 1=mean_float, 2=parameter, #
```

```
#Den-dep env-var extra_se Q_type
1       0       0       0       #       1_CARC
0       0       0       0       #       2_CACM
1       0       0       0       #       3_ORRC
0       0       0       0       #       4_ORCM
1       0       0       0       #       5_WARC
0       0       0       0       #       6_WACM
0       0       0       0       #       7_ORRCOB
1       0       0       0       #       8_CACPFV
0       0       0       0       #       9_IPHCWA
0       0       0       0       #       10_NWFSCOR
0       0       0       0       #       11_IPHCOR
0       0       0       4       #       12_WATRI

# Q parameters
1 # Par setup: 0=read one parm for each fleet with random q; 1=read a parm for
each year of index

# Lo    Hi      Init    Prior   Prior   Prior   Param
# bnd   bnd     value   mean    type    SD      phase
# Non-linear parameters
  -6    6       0       0       -1      99      1 #1_CARC
  -6    6       0       0       -1      99      1 #3_ORRC
  -6    6       0       0       -1      99      8 #5_WARC
  -6    6       0       0       -1      99      1 #8_CACPFV
# Early period
  -10   2       -0.0003 0       -1      99      1   # Triennial (log) base
parameter (1980)
  -4    4       0       0       -1      99      -50 # Triennial 1983 deviation
  -4    4       0       0       -1      99      -50 # Triennial 1986 deviation
  -4    4       0       0       -1      99      -50 # Triennial 1989 deviation
  -4    4       0       0       -1      99      -50 # Triennial 1992 deviation
# Late period
  -4    4       -0.6    0       -1      99      1   # Triennial 1995 deviation
  -4    4       0       0       -1      99      -50 # Triennial 1998 deviation
  -4    4       0       0       -1      99      -50 # Triennial 2001 deviation
  -4    4       0       0       -1      99      -50 # Triennial 2004 deviation

# Selectivity section
# Size-based setup
# A=Selex option: 1-24
# B=Do_retention: 0=no, 1=yes
# C=Male offset to female: 0=no, 1=yes
# D=Mirror selex (#)
# A  B C D
  1  0 0 0      #1_CARC
  1  0 0 0      #2_CACM
  1 0 0 0       #3_ORRC
  1  0 0 0      #4_ORCM
  1  0 0 0      #5_WARC
  1  0 0 0      #6_WACM
  1  0 0 0      #7_ORRCOB
  5  0 0 1      #8_CACPFV
  1  0 0 0      #9_IPHCWA
  24 0 0 0      #10_NWFSCOR
  1  0 0 0      #11_IPHCOR
  24  0 0 0     #12_WATRI
#_Age selex
  10 0 0 0      #1_CARC
  10 0 0 0      #2_CACM
  10 0 0 0      #3_ORRC
  10 0 0 0      #4_ORCM
  10 0 0 0      #5_WARC
```

```
  10 0 0 0      #6_WACM
  10 0 0 0      #7_ORRCOB
  10 0 0 0      #8_CACPFV
  10 0 0 0      #9_IPHCWA
  10 0 0 0      #10_NWFSCOR
  10 0 0 0      #11_IPHCOR
  10 0 0 0      #12_WATRI

# Selectivity and retention parameters
# Lo    Hi      Init    Prior   Prior   Prior   Param   Env     Use     Dev
Dev     Dev     Block   block
# bnd   bnd     value   mean    type    SD      phase   var     dev     minyr
maxyr   SD      design  switch
#1_CARC
  10    70      30      30      -1      99      4       0       0       0
0       0       0       0       #infl_for_logistic
  0.001 50      11      15      -1      99      5       0       0       0
0       0       0       0       #95%width_for_logistic
#2_CACM
  10    70      38      30      -1      99      4       0       0       0
0       0       0       0       #infl_for_logistic
  0.001 50      14      15      -1      99      5       0       0       0
0       0       0       0       #95%width_for_logistic
#3_ORRC
  10    70      36      30      -1      99      4       0       0       0
0       0       0       0       #infl_for_logistic
  0.001 50      11      15      -1      99      5       0       0       0
0       0       0       0       #95%width_for_logistic
#4_ORCM
  10    70      36      30      -1      99      4       0       0       0
0       0       0       0       #infl_for_logistic
  0.001 50      11      15      -1      99      5       0       0       0
0       0       0       0       #95%width_for_logistic
#5_WARC
  10    70      33      30      -1      99      4       0       0       0
0       0       0       0       #infl_for_logistic
  0.001 50      31      15      -1      99      5       0       0       0
0       0       0       0       #95%width_for_logistic
#6_WACM
  10    70      52      30      -1      99      4       0       0       0
0       0       0       0       #infl_for_logistic
  0.001 50      18      15      -1      99      5       0       0       0
0       0       0       0       #95%width_for_logistic
#7_ORRCOB
  10    70      22.1792 22.1792 -1      5       4       0       0       0
0       0       0       0       #infl_for_logistic
  0.001 50      3.6938  3.6938  -1      5       5       0       0       0
0       0       0       0       #95%width_for_logistic
#8_CACPFV
 -2     0       -1      5       -1      99      -50     0       0       0
0       0       0       0       #minsizeBinCaCPFV_8
 -2     0       -1      6       -1      99      -50     0       0       0
0       0       0       0       #maxsizeBinCaCPFV_8
#9_IPHCWA
  10    70      62      30      -1      99      4       0       0       0
0       0       0       0       #infl_for_logistic
  0.001 60      10      15      -1      99      5       0       0       0
0       0       0       0       #95%width_for_logistic
#10_NWFSCOR
  20    70      46      30      -1      99      4       0       0       0
0       0       0       0       #Peak
  -4    4       -4      0       -1      99      -50     0       0       0
0       0       0       0       #Top
```

```
  0     8       6       4       -1      99      4       0       0       0
0       0       0       0       #Asc width
  0     12      4.5     4       -1      99      5       0       0       0
0       0       0       0       #Desc width
  -1000 -998    -999    0       -1      99      -50     0       0       0
0       0       0       0       #Init
  -1000 -998    -999    0       -1      99      -50     0       0       0
0       0       0       0       #Final
#11_IPHCOR
  10    70      47      30      -1      99      4       0       0       0
0       0       0       0       #infl_for_logistic
  0.001 60      6       15      -1      99      5       0       0       0
0       0       0       0       #95%width_for_logistic
#12_WATRI
  20    87      87      30      -1      99      -4      0       0       0
0       0       0       0       #Peak
  -4    4       -4      0       -1      99      -50     0       0       0
0       0       0       0       #Top
  0     8       6       4       -1      99      4       0       0       0
0       0       0       0       #Asc width
  0     12      12      4       -1      99      -5      0       0       0
0       0       0       0       #Desc width
  -10   10      -2.88182        -2.88182        -1      2       4       0
0       0       0       0       0       0       #Init
  -10   10      10      0       -1      99      -50     0       0       0
0       0       0       0       #Final

#1 # selex block setup: 0=read one line for all, 1=read one line for each
# Time block parameters
#1 # Selex parameter adjustment method: 1=standard,2=logistic transform

0  # Tagging flag: 0=none,1=read parameters for tagging

### Likelihood related quantities ###
# variance/sample size adjustment by fleet
1 # Do variance adjustments
#1    2     3     4    5     6    7     8    9    10   11   12
 0.15 0 0.08 0 0.00 0 0.00 0.02 0.48 0.16 0.48 0.41  # constant added to survey
CV
 0    0     0     0    0     0    0     0    0    0    0    0    # constant
added to discard SD
 0    0     0     0    0     0    0     0    0    0    0    0    # constant
added to body weight SD
 1.28 2.25  0.54  2.16 5.49  1.57 1.44  1.52 0.62 2.79 0.73 2.08 #
multiplicative scalar for length comps
 1.0  1.0   1.0   1.0  1.0   1.0  1.0   1.0  0.90 1    0.74 1    #
multiplicative scalar for age comps
 1    1     1     1    1     1    1     1    1    1    1    1    #
multiplicative scalar for length at age obs

# removed for SSv3.20: 1000     # DF discard_like fraction data t-distribution
# removed for SSv3.20: 1000     # DF mean body weight data t-distribution
DF_for_meanbodywt_like
1       # Max N lambda phases: read this N values for each item below
1       # SD offset (CPUE, discard, mean body weight, recruitment devs): 0=omit
log(s) term, 1=include

0 # N changes to default Lambdas = 1.0
# Component codes:
#  1=survey
#  2=discard
#  3=mean body weight
#  4=length frequency
```

```
#  5=age frequency
#  6=Weight frequency
#  7=size at age
#  8=catch
#  9=initial equilibrium catch
#  10=rec devs
#  11=parameter priors
#  12=parameter deviations
#  13=Crash penalty
#  14=Morph composition
#  15=Tag composition
#  16=Tag return
# Component fleet/survey  phase  value  wtfreq_method


0 # extra SD reporting placeholder

999 # end of control file
```

## 15. Appendix D: SS Starter file

```
#C Yelloweye 2011 starter file

yelloweye_data.SS       # Data file
yelloweye_control.SS    # Control file

0       # Read initial values from .par file: 0=no,1=yes
1       # DOS display detail: 0,1,2
2       # Report file detail: 0,1,2
0       # Detailed checkup.sso file (0,1)
0       # Write parameter iteration trace file during minimization
0       # Write cumulative report: 0=skip,1=short,2=full
0       # Include prior likelihood for non-estimated parameters
0       # Use Soft Boundaries to aid convergence (0,1) (recommended)
1       # N bootstrap datafiles to create
25      # Last phase for estimation
1       # MCMC burn-in
1       # MCMC thinning interval
0       # Jitter initial parameter values by this fraction
-1      # Min year for spbio sd_report (-1 for styr, init, virgin)
-2      # Max year for spbio sd_report (-1 for endyr; -2 for
endyr+Nforecastyrs)
0       # N individual SD years
0.0001  # Ending convergence criteria
0       # Retrospective year relative to end year
8       # Min age for summary biomass
1       # Depletion basis: denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel
X*B_styr
1       # Fraction (X) for Depletion denominator (e.g. 0.4)
1       # (1-SPR)_reporting:  0=skip; 1=(1-SPR)/(1-SPR_tgt); 2=(1-SPR)/(1-
SPR_MSY); 3=(1-SPR)/(1-SPR_Btarget); 4=rawSPR
1       # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num);
3=sum(frates)
0       # F_report_basis: 0=raw; 1=F/Fspr; 2=F/Fmsy ; 3=F/Fbtgt

999 # end of file marker
```

## 16. Appendix E: SS Forecast file

```
#C V3.21d forecast for yelloweye 2011 update model
# 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)
0.5 # SPR target (e.g. 0.40)
0.4 # 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
1 #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
0.2 # 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 0 0
1 # Control rule method (1=catch=f(SSB) west coast; 2=F=f(SSB) )
0.4 # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40)
0.1 # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)
1 # Control rule target as fraction of Flimit (e.g. 0.75)
3 #_N forecast loops (1-3)
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)
0.0001 # 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)
2013 # 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 -1 -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       4.83
```

```
2011    1       2       2.55
2011    1       3       2.91
2011    1       4       3.13
2011    1       5       2.33
2011    1       6       1.26
2012    1       1       4.83
2012    1       2       2.55
2012    1       3       2.91
2012    1       4       3.13
2012    1       5       2.33
2012    1       6       1.26

999 # verify end of input
```

Agenda Item E.2.a
Attachment 6
June 2011

# Assessment Methods for Data-Poor Stocks
# Report of the Review Panel Meeting

National Marine Fisheries Service (NMFS)
Southwest Fisheries Science Center (SWFSC)
Santa Cruz, California
April 25-29, 2011



**Review Panel Members:**
Martin Dorn (Chair), NMFS, Alaska Fisheries Science Center, Scientific and Statistical Committee (SSC)
Jim Berkson, NFMS, Southeast Fisheries Science Center, RTR Unit at Virginia Tech
André Punt, University of Washington, SSC
Kevin Stokes, Center for Independent Experts (CIE)

**Pacific Fishery Management Council (Council) Advisors:**
John DeVore, Pacific Fishery Management Council Staff
John Budrick, California Department of Fish and Game (CDFG), PFMC Groundfish Management Team (GMT)
Gerry Richter, Pt. Conception Groundfishermen's Association, PFMC Groundfish Advisory Subpanel (GAP)

**Technical Team:**
Jason Cope, NMFS, Northwest Fisheries Science Center (NWFSC)
E.J. Dick, NMFS, Southwest Fisheries Science Center (SWFSC)
Daniel Hively, University of California at Santa Cruz (UCSC)
Alec MacCall, NMFS, SWFSC
Steve Ralston, NMFS, SWFSC
Chantel Wetzel, NWFSC, University of Washington
Maria DeYoreo, UCSC

**Others in Attendance:**
Linsey Arnold, Oregon State University
Ray Conser, NMFS, SWFSC, SSC
John Field, NMFS, SWFSC
Jim Hastie, NMFS, NWFSC
Susan Hilber, Oregon Department of Fish and Wildlife (ODFW)
Kristen Honey, Stanford University
Meisha Key, CDFG, SSC
Lynn Mattes, ODFW, GMT
Steve Munch, NMFS, SWFSC
Corey Niles, Washington Department of Fish and Wildlife (WDFW), GMT
Brad Pettinger, Oregon Trawl Commission
Steve Ralston, NMFS, SWFSC
Will Satterthwaite, UCSC
Andrew Shelton, UCSC
Rick Starr, California Sea Grant
Deb Wilson-Vandenberg, CDFG

## OVERVIEW

The requirement in the re-authorized Magnuson-Stevens Act of 2006 to set annual catch limits (ACLs) based on science recommendations implies some kind of basic assessment is required for all stocks in Fishery Management Plans (FMPs). This mandate has lead to an increased focus on assessing "data-poor" stocks. Many data-poor stocks are of minor economic importance and assessing all of them using size/age structured models would be difficult given data limitations and resources required. Simple assessment methods that use historical catches and available trend or size-composition information could potentially be applied to many data-poor stocks. These methods could be used to set ACLs, and to identify stocks which may be at risk of depletion that would be elevated to high priority for more detailed assessments.

With just a few exceptions, Overfishing Limits (OFLs) for all of the category 3 stocks in the Pacific Council's Groundfish FMP were developed for 2011-2012 biennial specifications process during January to June, 2010 using new assessment methods designed for data-poor stocks. These methods included Depletion-Corrected Average Catch (DCAC) and Depletion-Based Stock Reduction Analysis (DB-SRA). The methods were applied by Southwest Fisheries Science Center staff and reviewed by the Groundfish Subcommittee of the PFMC's Scientific and Statistical Committee (SSC), and endorsed by the full SSC. However the methods and their application did not receive the level of review afforded by a formal Stock Assessment Review (STAR) panel process, and in June, 2010, the PFMC requested a formal review of data-poor methodologies:

*"The Council also requested a formal review of methodologies for determining harvest specifications for data-poor stocks. Such methods include catch-based approaches as well as those that might be considered rudimentary assessments, and should include the methodology used in the current biennial specifications process as well as reasonable alternatives to that methodology."*
*Source: http://www.pcouncil.org/wp-content/uploads/0610decisions.pdf*

The Panel met during the week of April 25-29, 2011, in Santa Cruz, California. Based on the Council's request, the primary objective of the review meeting was to provide a list of endorsed methods for use with data-poor or data-limited stocks in the Groundfish FMP. DCAC and DB-SRA were reviewed during the meeting. In addition, the Panel reviewed a method based on the Stock Synthesis assessment platform that is comparable to DB-SRA. Several methods that utilize survey indices or time series of length composition data in simple assessments models were also reviewed. For each method reviewed, a set of key questions/issues were addressed by the Panel as follows:

1. What are the data requirements of the method?
2. What are the conditions under which the method is applicable?
3. What are the assumptions of the method?
4. Is the method correct from a technical perspective?
5. How robust are model results to departures from model assumptions and atypical data inputs?
6. Does the model provide estimates of uncertainty? How comprehensive are those estimates?
7. What level of review is appropriate for assessments conducted using the method?

Assessment methods presented to the Panel consisted of two broad categories, methods that utilize removal data and minimal life history information (catch-only methods), and methods that include catch, life history information and time series of either survey indices or length composition data (simple assessment methods). The methods that were reviewed by the Panel were (by acronyms):

**Catch-only Methods**
**DCAC**—Depletion-Corrected Average Catch.
**DB-SRA**—Depletion-Based Stock Reduction Analysis.
**SS-CO**—Simple implementation of the Stock Synthesis platform that uses only a time series of catches.

**Simple Assessment Methods**
**XDB-SRA**—Depletion-Based Stock Reduction Analysis extended using survey index data.
**SS-CL**—Simple implementation of the Stock Synthesis platform that uses catch and a time series of length composition data.
**SS-CI**—Simple implementation of the Stock Synthesis platform that uses catch and a time series of survey indices.

This report is organized as follows. For each assessment method, the report provides a short description of the method and the Panel's conclusions and recommendations pertaining to the method. Short responses are given to the list of seven key questions identified above. Each section concludes with a list of the requests made to the technical team and summarizes the responses. Several issues that extend across methods are discussed in separate sections. An Appendix includes a list of the primary background documents that were provided to the Panel in advance of the meeting via email and on an FTP site. Wireless access to the FTP site was intermittent during one day of the meeting, but for the most part functioned well.

The Panel endorses the use of DCAC, DB-SRA and SS-CO for determining OFLs for data-poor groundfish stocks, but makes several recommendations that could improve these methods in the future. Much progress has been made in developing and testing methods that use survey index or length composition data. However none of the methods reviewed by the Panel was found to be ready for implementation without further development and technical review. This report outlines the additional steps that will need to be taken to apply these methods to data-poor stocks for the 2015-2016 management cycle. Evaluation of DCAC, DB-SRA and other simple assessment models was greatly facilitated by a simulation testing analysis of these methods presented by Chantel Wetzel. Further work using this approach is strongly encouraged by the Panel.

The Panel thanks the SWFSC Santa Cruz Lab for hosting the meeting and the meeting participants for the enjoyable and constructive atmosphere during the review, the results of which should help inform the Council and its advisory bodies determine the best available science for the management of data-poor groundfish stocks.

## A. CATCH ONLY METHODS

### A.1 DCAC – Depletion-Corrected Average Catch

Alec MacCall presented the previously published Depletion-Corrected Average Catch (DCAC) method, which is an extension of the potential yield formula, and provides one-time estimates of sustainable yield (not to be mistaken for MSY which should always be greater than the DCAC estimate of sustainable yield) for data-poor fisheries. Over an extended period such as a decade or more, the catch is divided into a sustainable yield component and an unsustainable "windfall" component associated with a one-time reduction in stock biomass. The size of the windfall is expressed as being equivalent to a number of years of sustainable production, in the form of a "windfall ratio." The windfall ratio is given by $\Delta/\{(B_{MSY}/B_0)*(F_{MSY}/M)*M\}$, where $\Delta$ is the change in biomass relative to unfished biomass during the period over which removals occurred (i.e., $(B_{end}-B_{init})/B_0$), $B_{MSY}/B_0$ is the biomass producing MSY relative to the unfished biomass, and $F_{MSY}/M$ is the fishing rate that produces MSY relative to the natural mortality rate. Note that $\Delta$ is equivalent to one minus depletion when the period of removals covers the entire history of fishing. The DCAC is calculated as the sum of catches divided by the sum of the number of years in the catch series and this windfall ratio. The depletion correction is useful if $M$ is less than about 0.2 $y^{-1}$; otherwise it tends to be negligible. The input values are expected to be approximate. They are probability distributions rather than point estimates so that the uncertainty associated with these parameters can be accounted for using Monte Carlo methods.

The Panel endorses application of DCAC and highlights the following aspects.

- DCAC was not designed to estimate OFL, formally $F_{MSY} \times B_{current}$. There is, however, a relationship, albeit inexact, between DCAC and OFL. The use of DCAC as a method to estimate OFL should be regarded as a rough approximation, and considered an improvement over the previous approach of using uncorrected average catch.

- DCAC provides a biased value for OFL; the bias is negative (e.g., the estimated OFL is less than the true OFL) when the stock is actually larger than $B_{MSY}$.

- Simulations in which DCAC was based on the entire catch history demonstrated that if the prior for $\Delta$ is centered well below its true value (i.e., the stock is assumed to be much less depleted than it actually is), the median of the distribution of DCAC is higher than the true OFL.

- If the biomass of the population has declined after the period where data are available, the value of DCAC may no longer reflect a sustainable catch.

**Key Questions for DCAC**

1. **What are the data requirements of the method?** DCAC requires a time series of cumulative removals over a reasonably extended period. The period of time required should be related to generation time, and should generally be more than ten years. It is important to note that total removals should be used rather than just landings, highlighting the importance

of discard estimates. Prior distributions are also required for the parameters: $M$, $F_{MSY}/M$, $B_{MSY}/B_0$, and $\Delta$.

2. **What are the conditions under which the method is applicable?** This method should be used when $M < 0.2\ y^{-1}$. The method is still valid for stocks for which $M$ is larger than $0.2y^{-1}$, but provides no tangible benefit compared to assuming that the average catch represents a sustainable catch.
3. **What are the assumptions of the method?** The method assumes that a production function with compensation exists for the stock.
4. **Is the method correct from a technical perspective?** Yes.
5. **How robust are model results from departures from model assumptions and atypical data inputs?** The performance of DCAC is robust across a wide range of scenarios. Estimates are generally biased low in comparison to the true OFL, although estimates are sensitive to assumptions regarding $\Delta$. If the assumed value of $\Delta$ is lower than the true value (i.e., the stock is assumed to be less depleted than it actually is), the estimate of DCAC increases and can be greater than the "true" OFL.
6. **Does the model provide estimates of uncertainty? How comprehensive are those estimates?** DCAC does provide an estimate of uncertainty. Some components of the uncertainty estimate are based on supporting analyses while others are nominal estimates based on input involving expert judgment. The largest uncertainty that is ignored is the present status of the resource in comparison to the status during the period for which the removals took place. The uncertainty estimated is the uncertainty about a mean, the DCAC, not the uncertainty about an OFL for any given year.
7. **What level of review is appropriate for assessments conducted using the method?** Additional review of the method is not needed. Implementation of the method would require review of the basis for the prior distributions, at either a meeting of the SSC or at meeting of the SSC Groundfish Subcommittee. DCAC is not meant to be updated regularly. Rather, it provides a one-time estimate of a sustainable catch level for the stock. Historical catch data can be improved and analyses can be conducted to refine estimates of the input priors, which have the potential to further refine DCAC estimates. These updates would require some level of review.

**Analyses requested by the Panel for DCAC**

*a) Request:* How does the NMFS toolbox implement the distribution for the input parameters?
*Rationale*: The Panel was uncertain whether log-normal distributions were bias-corrected.
*Response*: The distributions generated by the toolbox program have means that agree with the input means, i.e., bias-correction is applied.

*b) Request:* What is the CV for DCAC if default values for the prior variances are used?
*Rationale*: The CV assumed when calculating ABCs from OFLs for category 3 stocks is 1.44 and the Panel was interested to know how this assumed CV compares with that produced by DCAC.
*Response*: The CV for the widow rockfish case is around 0.343, which is slightly lower than suggested by the SSC meta-analysis of among-assessment variation in biomass estimates for data-rich stocks in category 1 (Ralston et al., 2011).

c) *Request:* What would it take to get uncertainty as large as the CV = 1.44 currently being recommended for data-poor stocks?
*Rationale*: The CV assumed when calculating ABCs from OFLs for category 3 stocks is 1.44 and the Panel was interested to know how the assumed CV compares with that produced by DCAC.
*Response*: It doesn't appear to be possible for the CV of DCAC to be 1.44, even when uncertainty in catches is admitted. The CV is less than 1.0 even for some very extreme assumptions regarding the CVs for the prior distributions.

### A.2 DB-SRA (Depletion-Based Stock Reduction Analysis)

E.J. Dick and Alec MacCall presented an overview of the Depletion-Based Stock Reduction Analysis (DB-SRA) method. DB-SRA combines components of DCAC and stochastic stock reduction analysis. The production function used in DB-SRA is novel and is designed to allow the maximum net productivity level to be at any biomass between zero and $B_0$. The productivity function used combines the Pella-Tomlinson function above a join point and the Schaefer function below that point. The data used by DB-SRA are the age at maturity and the annual removals, which are assumed to be taken by a single fishery with a selectivity pattern equal to the maturity pattern. Prior distributions for the parameters used in DCAC ($B_{MSY}/B_0$, $F_{MSY}/M$, $M$, and $\Delta$) are used to construct posterior distributions. DB-SRA outputs posterior distributions for $B_0$, the OFL, *MSY* and $B_{\mathrm{MSY}}$. DB-SRA is available as a standalone program. Note that in DCAC the $\Delta$ parameter can span any two points in time. In DB-SRA, however, it refers to a given end point relative to unfished biomass. It is important to note that the year in which $\Delta$ is specified can affect OFL estimates.

The Panel agreed that the theoretical basis for, and the implementation of, DB-SRA is sound. Concerns about the effect of the novel, hybrid production function were addressed. It was noted that the Pella-Tomlinson function is sufficiently productive at low biomass that it is fairly difficult to overexploit a stock. Use of the hybrid function is intended to overcome this issue. The novel function seems reasonable, but the Panel noted that further exploration of alternative functional forms could be valuable. This is particularly important, potentially, for stocks that might be highly depleted and are sensitive to model dynamics at low abundances.

**Key Questions for DB-SRA**

1. **What are the data requirements of the method?** Time series of annual removals, age-at-maturity, and prior distributions for $M$, $F_{MSY}/M$, $B_{MSY}/B_0$ and current depletion (1- $\Delta$ ).
2. **What are conditions under which the method is applicable?** The method is applicable to any stock for which a time-series of removals is available and for which the population is reasonably expected to be influenced primarily by the production function rather than recruitment variability.
3. **What are the assumptions of the method?** The method assumes a production function that could in principle take many forms. The specific form used is a hybrid of the Pella-Tomlinson and Schaefer functions. Production is assumed to be lagged by the age at maturity (recruitment/maturity are assumed to be knife-edged functions of age). Standard assumptions underlying typical category 1 assessments apply, but also that recruitment is deterministic,

growth (and hence age-at-maturity and the production lag) is time-invariant, and selectivity is asymptotic and stationary.

4. **Is the method correct from a technical perspective?** Yes, but note that the year to which the depletion prior relates needs to be carefully considered in applications.
5. **How robust are model results from departures from model assumptions and atypical data inputs?** Generally, DB-SRA performs well and has properties similar to DCAC. Performance in terms of OFL estimation (the primary function of DB-SRA) is robust across a wide range of scenarios in simulation studies, and comparisons with category 1 assessments suggests that DB-SRA-estimated OFLs are generally less than "true" values. The main sensitivity is to the assumed value for $\Delta$; if $\Delta$ is assumed low (i.e., that depletion is not as great as the true value), then OFL estimates can be higher than the true values. In application, in order to make DB-SRA OFL estimates risk neutral, the DB-SRA OFL estimates should be bias-corrected. This has so far been achieved by comparison across a wide range of category 1 assessment estimates of OFL compared to DB-SRA estimates for the same stocks. However, there are alternative approaches that should be explored further. During the workshop, use of PSA (Productivity and Susceptibility Assessment; Patrick et al. 2010) was briefly examined as a way of deriving depletion priors for stocks or stock categories (as opposed to application for all stocks of a common depletion prior). This approach seems to have merit and the Panel recommends that it be explored further.
6. **Does the model provide estimates of uncertainty? How comprehensive are those estimates?** DB-SRA provides estimates of the uncertainty associated with the OFL in the form of a posterior distribution. Uncertainty in estimates of OFL arises from the priors for the parameters, which are informed by expert judgment, but also by model misspecification, which is not accounted for. DB-SRA also accounts for the uncertainty associated with the bias-correction factor as currently implemented.
7. **What level of review is appropriate for assessments conducted using the method?** Additional review of DB-SRA is not needed, but further consideration of bias correction (see question 5) is encouraged. Implementation of DB-SRA would require review of the basis for the priors used, at either a meeting of the SSC or of the SSC Groundfish Subcommittee. Unlike DCAC, for which regular updates would not be expected, there is the potential to apply DB-SRA each assessment cycle. If this is done, care is needed (see question 1) to ensure that the year to which the $\Delta$ prior relates is not changed unless this change is appropriately reviewed. As for DCAC, but even more so given the use of annual removals, DB-SRA relies heavily on information contained in removals data. It is important, therefore, to ensure the best possible removals time series are used and that there is confidence in those series.

**Analyses requested by the Panel for DB-SRA**

*a) Request:* Plot equilibrium yield versus depletion for the production function underlying DB-SRA (the hybrid method) and that underlying the Pella-Tomlinson model for a variety of choices for $B_{MSY}/B_0$. The value for MSY should be the same for all calculations to enhance comparability.

*Rationale*: The Panel wished to see how the hybrid production function differed from the standard Pella-Tomlinson function and, in particular, how production at low biomass differed.

*Response:* The effect of using the hybrid function compared to the Pella-Tomlinson function is insubstantial except when the biomass is less than about $0.2B_0$. It is unclear whether using a Pella-Tomlinson production function would change the estimated OFL appreciably.

*b) Request:* Conduct a set of sensitivity tests for DB-SRA analogous to retrospective analyses (leave out 2 years of data at a time). Show the resulting time trajectories of OFL. Show this for a range of representative species.
*Rationale*: DB-SRA has been applied for a range of stocks already to estimate OFL. DB-SRA selects $B_0$ to "hit" pre-specified values for $\Delta$ (i.e., 1-depletion) in a given year. If that year is changed then the resulting OFL estimates are likely to change. The Panel wished to examine the extent to which "retrospective" patterns in OFL estimates could arise under various circumstances (catch trends, values of *M*, etc.) in order to advise on practical use of DB-SRA in informing OFL decisions.
*Response:* A retrospective analysis was provided for five species. Whether the retrospective pattern shows an increasing or decreasing trend in OFL depends on a number of factors. Stocks with a higher *M* have larger retrospective patterns and the time lag, and catch history trends also impact the retrospective patterns. The Panel suggested that the year to which the prior on $\Delta$ relates should not change over time unless there is evidence to support changing it. The analyses shown during the workshop provided an initial demonstration of effects, but it is possible that other more subtle effects could occur. The Panel therefore recommends further exploration of this issue.

*c) Request:* Check Table 4 of the Draft Report by Dick et al.; specifically, check why the percentage change values are so variable.
*Rationale*: The percentage change values shown in Table 4 of the "Draft Report on Determining Annual Catch Limits for Data-Poor Stocks…" appear high and unexpectedly variable. The expectation is for the values to fall into well-defined blocks depending on stock groupings, with little if any difference within the blocks.
*Response:* The technical team identified the source of variation in the percentage change figures. The intent of using a bias-correction distribution, as opposed to a scalar, was to correctly reflect the uncertainty associated with the bias-correction factor. However, the three productivity-based bias-correction distributions differ in terms of skewness (Figure 1 in the Draft Report by Dick et al.). Monte Carlo error associated with sampling from these distributions introduced the variation observed in Table 4 of the Draft Report. The Panel noted the explanation.

### A.3. SS-CO-1 and SS-CO-2 (Stock Synthesis-Catch Only Variants)

Jason Cope presented a "simple" approach to stock assessment for data-poor species based on the Stock Synthesis platform. Two variants of this assessment approach were presented:

- SS-CO-1. This assessment method is based on applying SS3 in which a prior is imposed on depletion in the form of a pseudo survey with variability matching the assumed distribution of $\Delta$ in DB-SRA, but otherwise no data except catches (assumed to be taken by a single fishery with a selectivity pattern equal to the maturity pattern) are used. Parameters with priors ($M$, $h$, $R_0$) are sampled using MCMC. Forty-five species of non-assessed groundfish species in the PFMC Groundfish FMP were considered. Several output quantities (OFL,

$F_{MSY}/M$, and $B_{MSY}/B_0$) were compared to DB-SRA, while the posteriors for *M*, *h*, and depletion were compared to their priors as model diagnostics. The Panel indentified technical concerns with this method as described below in the response to question 4. Given these concerns, the Panel did not endorse the use of SS-CO-1, and recommends that further development of the approach focus on SS-CO-2.

- SS-CO-2. This assessment method, which was developed during the workshop at the request of the Panel, is similar to SS-CO-1, but instead of sampling parameter vectors from priors specified within SS, the values for *M*, *h*, and depletion are generated from priors external to SS3, and SS3 is used only to solve for the value for $R_0$ such that the depletion is equal to the generated value for depletion.

The Panel noted that SS-CO (note that the Panel supports only the SS-CO-2 version) provides a consistent approach to assessment of data-poor and data-rich stocks so that the same modelling platform could be used for all assessments, but that data-rich stocks would include fishery and survey data in addition to priors. Furthermore, the Panel noted that SS-CO might provide a more appropriate way to develop and conduct category 3 assessments than DB-SRA for species with "complicated" life history (e.g., sex specific life histories) because, unlike DB-SRA, SS3 can allow for such life histories. The Panel noted that SS-CO, unlike DB-SRA, is based on the Beverton-Holt stock-recruitment relationship so it is not possible to simultaneously place independent priors on $F_{MSY}/M$ and $B_{MSY}/B_0$. This latter problem could be rectified if a more general stock-recruitment relationship were to be included in SS3. In contrast to DB-SRA, SS-CO can be used to place prior distributions on other life history parameters such as those that define the growth curve. Overall, the Panel was satisfied that SS-CO could be used to conduct category 3 stock assessments following, as for DB-SRA, development and implementation of an approach for bias-correction.

**Key Questions for SS-CO**

1. **What are the data requirements of the method?** Time series of annual removals, life-history parameters, and prior distributions for *M*, *h* and current depletion. The year to which the current depletion relates also needs to be specified.
2. **What are conditions under which the method is applicable?** Any stock for which a time-series of removals is available and for which the population is reasonably expected to be influenced primarily by the production function rather than recruitment variability.
3. **What are the assumptions of the method?** The method is based on all of the standard assumptions underlying a typical category 1 SS3 assessment, but also assumes that recruitment is deterministic, growth is time-invariant, and selectivity is asymptotic and stationary.
4. **Is the method correct from a technical perspective?** The approach used to implement the prior on $B_{current}/B_0$ in SS-CO-1 involves including an "artificial" survey index (with either normal or lognormal error) in the assessment, and using MCMC to generate samples from the posterior. However, this leads to two priors on one parameter ($R_0$) because, when applied in MCMC mode, SS-CO-1 assumes a uniform prior on $R_0$ and because the prior for $B_{current}/B_0$ is effectively also a prior for $R_0$. This is an example of 'Borel's paradox' (Wolpert, 1995; Schweder and Hjort, 1995), and may be one reason why the posterior distributions for

$B_{current}/B_0$ from SS-CO-1 do not always match the associated priors. There are no technical concerns with SS-CO-2.

5. **How robust are model results from departures from model assumptions and atypical data inputs?** This is yet to be evaluated; however, the results of the simulations for DB-SRA can be used to infer the likely performance of SS-CO-2.
6. **Does the model provide estimates of uncertainty? How comprehensive are those estimates?** SS-CO-2 provides estimates of the uncertainty associated with the OFL in the form of a posterior distribution. Uncertainty in estimates of OFL arises from the priors for the parameters (which are informed by expert judgment), but also by model misspecification, which is not accounted for. Unlike DB-SRA, no bias-correction factors have been developed for SS-CO, but this could easily be implemented.
7. **What level of review is appropriate for assessments conducted using the method?** Limited additional review of SS-CO-2 assessments would be required (e.g., review of the time-series of removals and basis for the priors used). These review requirements are identical to those for DB-SRA. However, a review of the basis for any bias-correction factor would be needed before implementing the method for the first time.

**Analyses requested by the Panel for SS-CO**

*a) Request*: Apply SS-CO-1, but instead of using MCMC to sample from the parameter distribution, generate parameter samples external to SS3, and use SS3 to solve for $B_{current}/B_0$.
*Rationale*: The approach used to implement the prior on $B_{current}/B_0$ in SS-CO-1 results in placing two priors on one parameter ($R_0$) because, when applied in MCMC mode, SS-CO-1 assumes a uniform prior on $R_0$ and the prior for $B_{current}/B_0$ is effectively also a prior for $R_0$. The requested change is a way to deal with this problem.
*Response*: Results were presented for SS-CO-2. The posteriors for depletion and *h* matched the priors almost exactly, and did not show the updating (usually minor) that occurred with SS-CO-1.

*b) Request*: Evaluate SS-CO-1 using simulation to determine the practical impact of the identified issues.
*Rationale*: Although the concerns identified by the Panel have been shown in other cases to impact performance, this may not be particularly severe compared to other sources of uncertainty.
*Response*: Some results of initial simulations were presented which showed that SS-CO-1 was either as good as, or better than, DB-SRA at estimating OFLs, and that the estimates of *M*, *h* and $R_0$ from SS-CO-1 were centered close to the values used to generate the data sets. It was, however, noted that both SS-CO-1 and the operating model are age structured models with a Beverton-Holt stock-recruit relationship, which may, in part, account for the good performance.

**A.4 Issues Common to All Catch-Only Methods**

*A.4.1 Improving historical catch estimates*

Catch-only methods rely on the availability of historical catches, and development of OFLs is nearly impossible without this information. It is fortunate for management of Pacific coast groundfish that state resource management agencies recognized early the importance of keeping

records of fisheries landings. As an off-year science activity, a major effort was initiated in 2008 to recover historical records and compile the best estimates of landings early in the development of Pacific coast groundfish fisheries. Up to now this effort has produced published estimates for California fisheries (Ralston, et al. 2010), and more recently estimates for Oregon fisheries (Karnowski, et al. In Press), but this effort will not achieve its maximum benefit without Washington information. The Panel recommends that this be given a high priority because landings from Washington are needed for assessments of data-poor stocks and groundfish stocks in general, though it is recognized that there are unique difficulties in separating Washington landings into Canadian and U.S. components.

The Panel recommends that these historical catch estimates be reviewed outside of the normal stock assessment review process. The review of landings data cannot occur effectively during a STAR panel for an individual stock or even a group of stocks (focus is naturally on the details of modelling and other data inputs). Furthermore, outside experts and most SSC members do not have the expertise to review this information. It would be better to review reconstructions of all removals comprehensively, perhaps when the Washington information is available in draft form. There is expertise, but most is contained within state agencies and retirees from those agencies, so this review would need to be structured differently than a STAR panel. It is also important to recognize that reconstructing historical removals should be regarded as an ongoing activity, as new discoveries of historical data occur regularly.

Historical records are records of landings, not total removal, and the data-poor methods require total removals. Several data sets from studies in the 1980s and 1990s are used to infer discards, but this information is not treated in a standard manner across stock assessments. Modelling approaches that take into account changes in target fisheries may improve discard estimates. This might also be reviewed at the recommended review panel meeting described above. Another potential topic is the apportionment of harvest specifications north and south of 40°10' N latitude.

*A.4.2 Using meta-analytic approaches for deriving appropriate input parameters*

DCAC and DB-SRA have generally used default choices for the prior distributions for $M$, $F_{MSY}/M$, and $B_{MSY}/B_0$. That is, these distributions were set to those in MacCall (2009). It may be possible to refine some of these distributions using stock assessments conducted in the same area as the stock of interest. Distributions for $F_{MSY}/M$ and $B_{MSY}/B_0$ should be routinely compiled for all quantitative assessments in an area. If there are consistent differences geographically or between groups of species, stratification by these factors may be warranted. The mean and the distribution of the parameters for assessed species could then be used in DCAC or DB-SRA for unassessed species in the same stratum. This may reduce the need to adjust the OFL post-hoc to correct for the bias in the distributions.

*A.4.3 Using PSA to inform $\Delta$*

A productivity and susceptibility assessment (PSA) has been conducted for all groundfish FMP species. The relationships between depletion and PSA scores for assessed stocks were explored to approximate a distribution for $\Delta$ which could be used when applying catch-only methods and simple assessment models (e.g., DB-SRA, SS-CO). The PSA scores of relative productivity, susceptibility, and vulnerability to overfishing were plotted against estimated depletion to

understand these potential relationships (Figure 1). Depletion estimates were taken from the most recent relatively data-rich assessments conducted since 2005. PSA scores were developed under the current management perspective for the non-overfished stocks and the management perspective of the 1999 fishery for six of the currently overfished rockfish stocks. The Panel agreed that these relationships could potentially be used to develop informative priors for depletion (and hence $\Delta$) for DB-SRA and SS-CO, with the recommended refinement that susceptibility be re-scored from the perspective of the fishery prior to 2000 when rebuilding plans and RCA restrictions were first implemented. Further, these susceptibility scores should be refined with the depletion and the fishing mortality attribute weighted to zero as this information would not be available for data-poor stocks. The predictive distributions (not confidence intervals) for depletion based on relationships such as those in Figure 1 should be used when developing priors for $\Delta$.

## B. SIMPLE ASSESSMENT METHODS

The following sections outline three 'simple' assessment methods. These methods extend the 'catch-only' methods of the previous section and hence could form the basis for category 2 assessments. The Panel discussed what information from a category 2 assessment for a data-moderate species could be used to provide management advice. The Panel agreed that OFL values from such assessments would clearly be used in preference to OFL values from a category 3 assessment. However, the Panel also agreed that estimates of depletion from such assessments should be treated with care. Specifically, the Panel recommended that the estimates of depletion from a category 2 data-moderate assessment should be used for status determination as follows: (1) if the estimated depletion value exceeds a pre-specified threshold value the stock should not be considered overfished, and (2) if the estimated depletion is less than the threshold value, the stock should be flagged as a conservation concern, and a full assessment should be conducted in the next cycle. The Panel did not identify a specific threshold but agreed that the threshold should be greater than the overfished threshold of 0.25 (e.g., 0.3) and recommended that this issue be addressed by the SSC.

### B.1 SS-CL (Stock Synthesis-Catch and Length)

Steve Ralston outlined how a standard age-structured stock assessment method (applied using SS3 in this instance) could be used to conduct assessments for data-poor species and illustrated the method using data for aurora rockfish.

The Panel encourages further development of this approach to providing management advice. However, the Panel was concerned whether length data alone were sufficient to enable reliable estimates of quantities of management interest (e.g., depletion and OFL) to be obtained. In particular, it was noted that past experience suggests that length-data-only methods can perform poorly when their assumptions are violated. In this respect, the Panel was concerned that it appeared that a few length samples could provide considerable information (100 units of log-likelihood) on $M$ and noted that this apparent certainty was likely due to model mis-specification (e.g., incorrect assumptions regarding selectivity), sampling issues, and because only a few parameters (and in particular no recruitment deviations) were estimated. However, without additional information, it was not possible to identify which of these factors (if any) was the actual reason (or whether the method is indeed able to estimate $M$ with high precision).

The Panel agreed that this method could not be used at present for assessment purposes and encouraged further evaluation of the approach. In particular, the Panel recommended that simulation studies be undertaken to evaluate the performance of length-data-only methods. Daniel Hively outlined an operating model that he is developing which could be used for this purpose. The Panel recommended considering simulations in which growth, recruitment, natural mortality, and selectivity vary over time so that the performance of a length-data-only method is definitely unacceptable and then examining the conditions under which this type of method does perform adequately. Simulations presented by Chantel Wetzel suggest that length-data-only methods can perform well if the assumptions of the method are not violated.

**Key Questions for SS-CL**

1. **What are the data requirements of the method?** Removals, life history parameters such as natural mortality, growth parameters and fecundity-at-age, and length composition data.
2. **What are conditions under which the method is applicable?** The method can be applied when the required data are available. In particular, it is necessary to have data on length-composition which are representative of the catches.
3. **What are the assumptions of the method?** The method is based on all of the standard assumptions underlying a typical category 1 SS3 assessment, but it also assumes that recruitment is deterministic, growth is time-invariant, and selectivity is asymptotic and stationary.
4. **Is the method correct from a technical perspective?** Yes.
5. **How robust are model results from departures from model assumptions and atypical data inputs?** This is yet to be evaluated. Simulations should be conducted to determine the circumstances under which assumption violations will lead to poor performance.
6. **Does the model provide estimates of uncertainty? How comprehensive are those estimates?** Measures of precision based on MCMC sampling were provided for the specific example, but the Panel did not evaluate these. In principle, the extent of uncertainty could also be examined using sensitivity tests, similar to the way uncertainty is typically assessed for full assessments.
7. **What level of review is appropriate for assessments conducted using the method?** Review of SS-CL assessments could be conducted during a STAR panel review process, which would focus on whether the length-composition data satisfy the criteria identified during simulation testing to enable reliable estimates to be obtained. It would be possible to evaluate a set of SS-CL stock assessments in a single review panel if all stocks had similar fishery and monitoring characteristics (e.g., slope species). Once a SS-CL assessment has been reviewed, updates could be conducted using a variant of the standard update process for PFMC stock assessments.

### B.2 XDB-SRA

E.J. Dick outlined extended DB-SRA. The method involves updating the joint prior distribution on which DB-SRA is based, taking indices of abundance (either relative or absolute) into account. The current implementation of XDB-SRA is based on finding the maximum likelihood estimate for $q$ for relative abundance indices, calculating the joint likelihood for the data, and setting the weights assigned to each draw from the prior based on the relative likelihood. The variances associated with each data point are based on a jackknife and allowance is made for additional observation error when the jackknife variances appear to under-estimate the true

observation error uncertainty. The method was illustrated for cowcod, bocaccio and darkblotched rockfish. It was noted that the method could be extended to allow for uncertainty in historical catches by imposing priors on the catches. Also, use of trajectories of fishing mortality rates from data-rich assessments could be used as effort series in a XDB-SRA assessment similar to the 'Robin Hood' approach (Punt et al., 2011).

The Panel noted that XDB-SRA was similar to stock assessments based on the SIR algorithm and had the following guidance for future development of the method:

- Use the maximum likelihood estimate for $q$ (which is an analytic calculation for a normal or log-normal likelihood) when computing the likelihood. This is equivalent to placing a uniform prior on log-catchability (an assumption which can be shown to be 'non informative').

- The likelihood used when assigning weights should be the integral of the likelihood over the additional variance ("process error"). The additional variance parameters can either be generated from priors in common with the other parameters, or integrated out numerically (e.g., using Simpson's rule) because these are "nuisance" parameters given the aim of estimating a distribution for the OFL.

- The weighting scheme should be replaced by the SIR algorithm. This algorithm leads to a set of independent draws from the posterior which makes inference easier.

- Diagnostics (e.g., the proportion of replicate parameter vectors in the posterior sample; smooth posteriors; use of posterior predictive distributions) should be used to assess whether the number of samples from the prior is adequate to obtain a reliable posterior distribution.

Maria DeYoreo presented initial results for cowcod based on the first two suggestions. The initial results showed promise, but a larger number of draws from the prior (or a more efficient sampling technique) is needed.

It was also noted that the use of SIR or a SIR-like algorithm is often computationally infeasible if age or length data are fitted because ideally this involves estimating recruitment deviations. The Panel agreed that XDB-SRA was not yet sufficiently well developed for use during the current assessment round. However, in common with SS-CI, development of the XDB-SRA is progressing well and these methods could be recommended for use in category 2 assessments following: (1) further development, (2) application to some species for which full assessments have already been conducted, and (3) testing using simulated data sets.

Since this approach is still under development, the Panel did not consider it appropriate to develop responses to the key questions.

### B.3 SS-CI (Stock Synthesis-Catch and Index)

Jason Cope presented an extended version of the SS-CO-1 method (SS-CI) which includes abundance indices to help inform OFLs while qualifying species as category 2. Both SS-CO-1 and SS-CI were applied to three category 1 species with Council-approved assessments (lingcod,

canary rockfish and greenstriped rockfish). Application of SS-CI to these stocks produced OFL estimates similar to category 1 assessments. However, in models where a pseudo survey is used to implement a prior on depletion, this method shares with SS-CO-1 the technical issues with parameter prior specification discussed in section A.3.

The Panel recommended that SS-CI should be implemented using SIR, given problems with convergence of the MCMC algorithm when applying SS-CI as well as the technical problems associated with imposing two priors on the parameter which scales the population. It was noted that this is relatively straightforward.

Implementing SIR in the Stock Synthesis platform requires running SS3 many times with different parameter draws. It was noted that the calculations could be made more efficient by implementing a routine in SS3 (e.g., in the preliminary_calcs_section of the SS3 ADMB code) to calculate $R_0$ so that a specific depletion is "hit".

Since this method is still under development, the Panel did not consider it appropriate to develop responses to the key questions.

**Analyses requested by the Panel for SS-CI**

*a) Request*: Repeat the analyses for a prior mean depletion of 60% when the indices are (1) ignored and (2) taken into account using a grid search method.
*Rationale*: The Panel was concerned by some aspects of the results presented. In particular, the priors for depletion were not updated very substantially when the indices were added except when the depletion prior was essentially ignored. In addition, the method led to many cases in which the posterior for $R_0$ included a large proportion of unrealistically high values (the author rejected cases in which depletion was '1').
*Response*: The results of the grid search highlighted the non-linear relationship between $R_0$ and depletion. This emphasized the importance of selecting the parameter (on which to place a prior) which scales the population. Selecting a uniform prior on log-$R_0$ can imply an informative prior on depletion (and *vice versa*).

*b) Request*: Plot the objective function against cycle number for the analyses for a prior mean depletion of 60% when the indices are (1) ignored and (2) taken into account.
*Rationale*: The Panel was concerned that the MCMC algorithm may not have converged.
*Response*: The trace for SS-CO-1 showed high correlation among samples but no pathological behaviour. In contrast, the trace for SS-CI exhibited some "jumps" suggesting that convergence had not occurred.

**B.4 Simulation study of assessment methods**

Chantel Wetzel presented results from a simulation study that 1) evaluated the performance of DCAC and DB-SRA under different catch and depletion scenarios, and 2) evaluated the performance of simple statistical catch-at-age model using the Stock Synthesis platform when only sparse data sets of various kinds are available. In all, 11 scenarios for data availability were considered, including scenarios with survey indices only (scenarios 1 and 2), scenarios with survey indices and varying quantities of length or age composition data

from either the survey or the fishery (scenarios 3-10), and a scenario with length composition data only (scenario 11). The results of this research are referred to in the sections of this report that pertain to the different assessment methods, but the Panel also reviewed the simulation study itself, and made a number of requests to the technical team.

One general concern of the Panel was relatively poor performance of simple models implemented with Stock Synthesis that used only survey indices, which is a likely model configuration for data-poor stocks. In the simulation tests, the survey index-only models estimated parameters for age-at-50% selectivity and recruitment deviations, parameters for which a survey index would not likely be informative. Although the Panel attempted to explore this issue further in requests to the technical team, it was not possible to obtain robust results for stocks with flatfish life history considering the survey data typically available for Pacific coast groundfish stocks. Nevertheless the Panel recommends further evaluation of index-only assessment methods that implement the changes recommended this report, such as using Bayesian approaches rather than unconstrained model fitting.

**Analyses Requested by the Panel for the Simulation Study**

*a) Request:* Make the following assumptions for the index-only model: turn off recruit deviations, fix selectivity to true selectivity in the operating model, take out 40-10 adjustment. Compare distribution of OFLs to the operating models distributions of OFL. Plot resulting estimated OFLs/true OFLs for this set of assumptions compared to the same statistic for the original model setup.
*Rationale:* The Panel wanted to understand the reasons for the poor performance of the model that used only survey index information.
*Response:* The plots showing the estimated OFLs/true OFLs were not as informative as the Panel had hoped, but they did not suggest a substantial difference in OFL/true OFL ratios for the different model setups. Removing the 40-10 rule, which is the correct approach for evaluating OFL estimates, improved performance but did not change the overall conclusions.

*b) Request:* Show the distribution of estimated depletion for a selected subset of the scenarios 1-11, including 1 and 11, and a few in between.
*Rationale:* The paper provided only the probability that the stock was below the overfished threshold, and the Panel wanted to see the full distribution of this statistic.
*Response:* There were no pathologies evident in the full distribution of depletion.

*c) Request:* Show the relationship between estimated depletion and *M* for a selected subset of the scenarios 1-11, including 1 and 11, and a few in between.
*Rationale:* The Panel expected that this relationship could be strong in some cases, and that it would be helpful to understand this relationship when applying simple assessment models.
*Response:* There was a clear relationship between the value of the random draw of *M* and the estimated depletion for the simulations that used length-composition data, with lower values of *M* resulting in estimates of depletion that were lower than the true depletion and vice versa for higher values of *M*. An incorrect value of *M* is likely to result in a biased estimate of stock depletion.

*d) Request:* For the simulation-estimation evaluation of the simple model using Stock Synthesis use the following setup a) use data scenario 2 (20 yrs every third year), b) set up operating model for Case 1 (true 40% depletion, M = true M), c) shut off recruit deviations, and d) fix selectivity to true values. Compare estimated depletion (marginal distribution) for about 15 runs to depletion for the setup in the original paper (marginal), and operating model depletion (marginal) for the flatfish life history.
*Rationale:* The Panel wanted to further explore the performance of simple assessment models with survey index data. In this model, the only free parameter is $R_0$.
*Response:* Results were provided for a full simulation of 100 runs. Estimates of depletion showed a bimodal pattern: either the stock was estimated to be more depleted than true depletion, or the stock was estimated to be close to unfished abundance. Even under this model setup, performance of the survey index-only model was poor, likely because recruitment variability can give rise to patterns in the survey time series that are inconsistent with model assumptions.

## B.5 Issues common to all simple assessment methods

### *B.5.1 Tradeoffs to consider in modelling platforms*

There was considerable discussion on the advantages and disadvantages of using a common platform for stock assessments (specifically Stock Synthesis 3). It was recognized that using a common platform has the advantage of easy communication when discussing inputs and model specification within expert groups (used to using those platforms), of standardised diagnostic outputs and confidence in program validation. There are advantages to using standalone implementations for simple applications; these include ease of modifying code, more general transparency of method application, ease of communicating to non-experts, simplified (and possibly less error-prone) inputs of data and assumptions, and the ability to work outside of the constraints necessarily imposed by a given platform. For simple method implementation, validation of standalone programs is relatively straightforward (though not necessarily carried out). In contrast, validation is much more difficult for complex methods. Overall, the Panel was of the opinion that forcing all assessments to use a given platform would be unduly constraining, especially for methods in development (e.g., extended versions of DB-SRA) and which use non-standard approaches. At the same time, the Panel recognized the high value of using a common platform if it is suitable and if it can be readily updated to accommodate developments. Validation, maintenance, documentation and updating of all software used for assessments are important. Use of a common platform can be advantageous to achieve these aspects, especially if good project management systems are in place allowing for expert involvement and continuity.

### *B.5.2 Simulation testing*

The Panel wished to emphasize the importance of testing candidate methods using simulations. Although it is sometimes possible to determine the direction of bias associated with violation of assumptions for simple methods, and applications to real situations can be illustrative when a category 1 assessment has been conducted, the “truth” is known for simulations, allowing for powerful testing of methods. While the simulation studies presented to the Panel clearly helped in its deliberations, the Panel was concerned that the simulated data sets were generally not sufficiently “nasty” (or diabolical) as test data sets. In particular, assuming that selectivity is stationary and growth is time-invariant are unlikely to be correct in reality even though many assessment methods will be forced to make these assumptions. The Panel therefore encouraged

further development of methods to generate data sets that include uncertainties more typical of real data sets, but noted that it may never be possible to generate data sets that fully capture all of the issues related to actual data sets. One test of whether simulated data sets are sufficiently "nasty" is whether it is possible to visually identify real data sets from simulated data sets.

*B.5.3 Alternative Approaches*

The Panel noted that all of the methods considered during the workshop are essentially "watered down" versions of more complicated methods and aim to produce management quantities which mimic those produced by current category 1 methods (OFLs, ABCs, etc.). An alternative approach is to identify management procedures which may not include OFLs and ABCs, but nevertheless achieve the management objectives by predicting ACLs directly so as to achieve, with high probability, objectives associated with use of OFL and ABC. Management procedures which set catch limits based on trends in commercial CPUE or survey indices, or changes in catch at age or length compositions, have been found to lead to adequate performance in terms of achieving management objectives in other regions (e.g., Australia, New Zealand, and South Africa). Whether such control rules will perform adequately for west coast groundfish would need to be investigated using Management Strategy Evaluation.

Another approach to assessing data-poor stocks that merits further consideration is to conduct joint assessments of a number of stocks simultaneously using the 'Robin Hood' approach (Punt et al., 2011). Ideally, the jointly-assessed stocks would include one or more data-rich stocks whose exploitation history and abundance patterns are likely to be informative for data-poor stocks. This approach seems especially suited for stock complexes that are likely to experience similar trends in fishing mortality and environmental forcing.

*B.5.4 The Future of Category 3 Stocks*

Category 3 stocks are difficult to fit into the National Standard 1 framework and, as such, there is a great desire to see each move to a higher tier. This will be possible for a number of category 3 stocks where sufficient data exist, but assessments have not been completed. It may also be possible for some in the future if additional surveys or monitoring are implemented. Many stocks, however, will remain as category 3. These stocks may have such low abundance that they are observed too infrequently or may not be vulnerable to observation in fisheries or surveys. Because of this, we will not escape the need for data-poor methods. Tremendous progress has been made in the development and testing of methods such as DCAC and DB-SRA over the past several years and continued development and improvements are expected. Despite this, the ability to develop OFLs for these stocks will remain a challenge.

## C. AREAS OF DISAGREEMENT REGARDING PANEL RECOMMENDATIONS

There were no major areas of disagreement among the Panel members or between the Panel and the Technical Team and Advisors.

## D. UNRESOLVED PROBLEMS AND MAJOR UNCERTAINTIES

These were dealt with in the sections for each method.

## E. MANAGEMENT, DATA OR FISHERY ISSUES RAISED BY THE PUBLIC AND GMT AND GAP ADVISORS

Public comment indicated an interest in a process for soliciting local expert knowledge from recreational and commercial fishermen on qualitative abundance trends. Information gathered in this way could potentially inform the prior on $\Delta$, a critical parameter in data-poor assessments (recognizing that this parameter is defined differently in DCAC and DB-SRA). The logistics of such a process would need to be considered carefully to ensure maximum participation and appropriate geographic scale. One way to improve participation would be to schedule workshops immediately before or after a Council meeting.

The GMT advisor emphasized the need for formal data review for data-poor assessments. Review is needed for all of the data inputs for data-poor assessments (just as for data-rich assessments), not just historical catches.

## F. RECOMMENDATIONS FOR FUTURE RESEARCH AND DATA COLLECTIONS

The PFMC has been a leader in implementing methods for assessing data-poor stocks in the US. Methods first developed and applied by PFMC are being considered by other Regional Councils. To continue the progress that has been made, the Panel recommends that a similar off-year STAR Panel review be scheduled to further develop and finalize methods and to review example applications. The Panel suggests a few common data sets be used across all candidate methods. The meeting would involve participants from at least the NWFSC, the SWFSC, and various academic institutions. Methods should be sufficiently developed by the 2015-16 groundfish management cycle that it would be reasonable to bring forward a number of candidate category 2 stock assessments using simple assessment models for review at a STAR Panel in 2013. The number of assessments considered during such a review would depend on whether removal and survey data only were used or if CPUE and compositional data were incorporated.

*Immediate recommendations (prior to the September briefing book)*

Several relatively minor errors were discovered in the implementation of DCAC and DB-SRA to set OFLs for category 3 stocks in the 2011-12 management cycle. The Panel recommends that these errors be corrected for the 2013-14 management cycle and that all DCAC and DB-SRA-derived OFL estimates be updated using the best estimates of historical removals (to 2009).

*Short term recommendations (prior to the 2015-16 management cycle)*

- XDB-SRA and SS-CI should be implemented using SIR (Sample-Importance-Resample) algorithm.

- Continue to test and evaluate simple assessment methods using simulation. Priority should be given to testing methods such as XDB-SRA and SS-CI that employ "hitter" algorithms for depletion implemented using the SIR algorithm.

- Evaluation of simple length-based methods such as SS-CL using simulation testing should also continue. Tests should include simulations in which growth, recruitment, natural mortality, and selectivity vary over time so that the performance of a length-based method is definitely unacceptable and then examining the conditions under which this type of method does perform adequately.

- Evaluate alternative functional forms for the production function in DB-SRA. Is the particular functional form assumed by DB-SRA influential in the estimates of OFL?

- Evaluate effects on DB-SRA of the choice of year to which the prior on $\Delta$ applies. An understanding of potential retrospective patterns is needed to apply the method appropriately, particularly when updating previous analyses.

- For catch-only methods, obtain regionally-based estimates of the distribution for $F_{MSY}/M$ and $B_{MSY}/B_0$ using results from full assessments of Pacific coast groundfish stocks.

- For DB-SRA and SS-CO (and perhaps for DCAC), develop informative priors for depletion using PSA (Productivity and Susceptibility Assessment).

- Add a more general stock-recruitment relationship option in SS3 that decouples $F_{MSY}$ and $B_{MSY}/K$.

- Implement a routine in SS3 (e.g., in the preliminary_calcs_section of the SS3 ADMB code) to calculate $R_0$ so that a specific depletion is "hit."

- Complete the Pacific coast historical catch reconstruction effort by reconstructing historical Washington landings.

- Conduct a review of the coast-wide historical catch reconstructions. This review should occur outside of the normal stock assessment review process, and should involve reviewers with knowledge of historical records such as state agency personnel.

- Develop modelling approaches that take into account changes in target fisheries to estimate historical discards. Catch-only methods require estimates of total removals not just landings. Standard approaches should be developed that can be used across stock assessments.

- Alternative approaches to apportioning of harvest specifications such OFLs north and south of 40°10' N latitude should be evaluated.

- The SSC should provide guidance on the use of results from data-moderate assessments (category 2) for status determination.

*Long term research recommendations*

More comprehensive evaluation of uncertainty is needed for assessments of data-poor stocks. Conceptually, it seems preferable to obtain uncertainty estimates (σ) based on analysis of assessment approaches used for category 1 and 2 stocks, rather than scaling up the uncertainty for data-rich stocks.

Evaluate alternative approaches to assessing and managing data-poor stocks that have been applied elsewhere such as:

- Management procedures which set catch limits based on trends in commercial CPUE or survey indices, or changes in catch at age or length compositions.

- Conducting joint assessments of a number of stocks simultaneously using the 'Robin Hood' approach (Punt et al., 2011).

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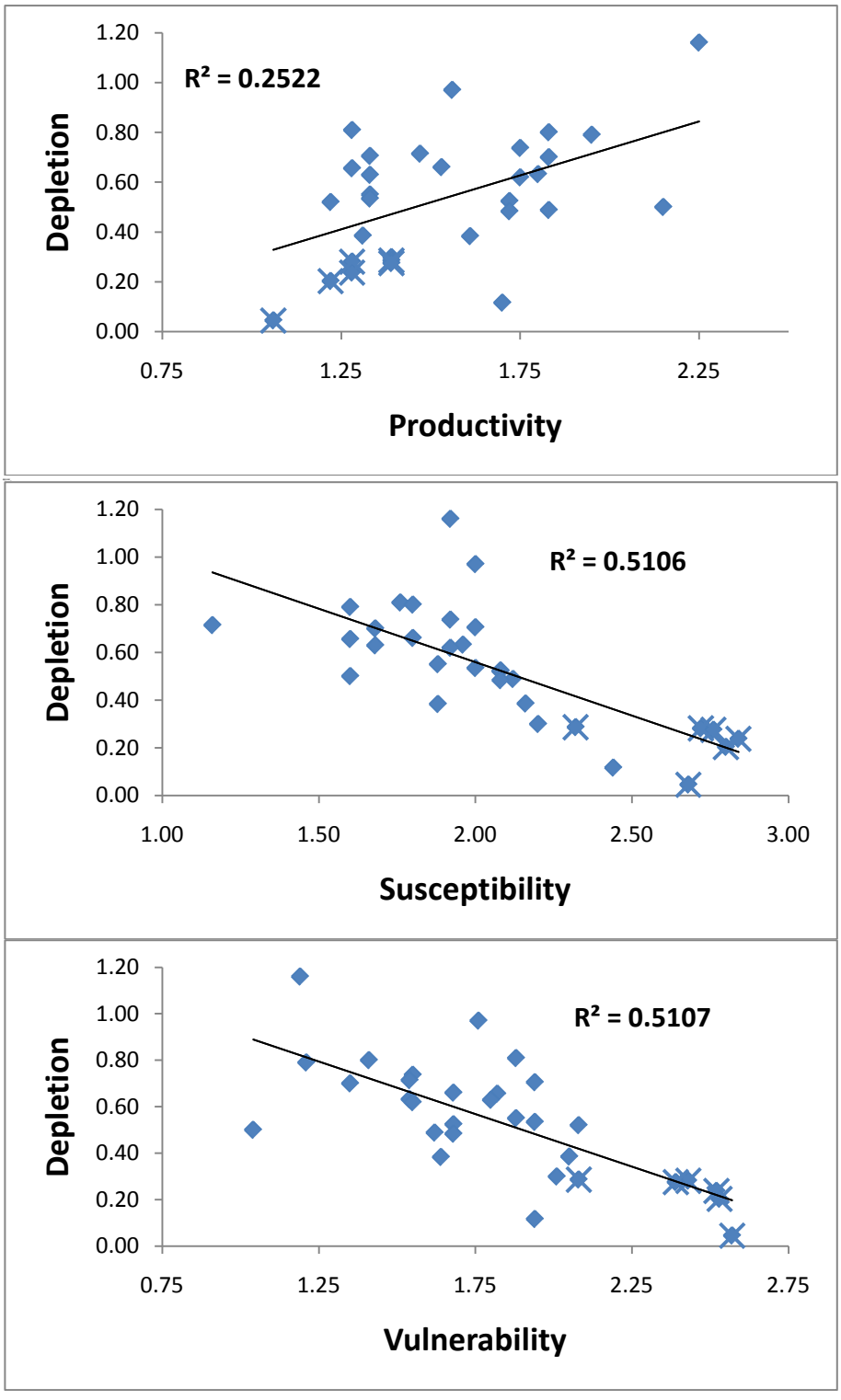



Figure 1. Relationship between relative productivity, susceptibility, and vulnerability to overfishing and estimated depletion for assessed west coast groundfish stocks. Symbols with an "X" through the marker indicate stocks that are currently considered overfished and scored for susceptibility given the west coast fishery circa 1999.

**Appendix: Primary Documents Reviewed**
**(Available at ftp://ftp.pcouncil.org/pub/Data-Limited_Review_April_2011/)**

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Wetzel, C. R. and A. E. Punt. In Press. Performance of a fisheries catch-at-age model (Stock Synthesis) in data-limited situations. Marine and Freshwater Research.

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# GROUNDFISH ADVISORY SUBPANEL REPORT ON STOCK ASSESSMENTS FOR 2013-2014 GROUNDFISH FISHERIES

The Groundfish Advisory Subpanel (GAP) reviewed the stock assessment updates provided in the advance briefing book. In general, the GAP supports the Scientific and Statistical Committee (SSC) recommendations regarding the yelloweye, cowcod, and canary assessment updates, taking into account corrections made to the canary rockfish assessment update during the SSC meeting. We also support the SSC's recommendation to send the bocaccio assessment update to the mop-up stock assessment review (STAR) Panel given the need to further explore use of the Northwest Fisheries Science Center (NWFSC) bottom trawl survey and impingement recruitment indices and their influence on the assessment results. The SSC has previously identified concerns about the ability of the NWFSC bottom trawl survey to sample rockfish because of the difficulty of using bottom trawl gear in rocky habitat inhabited by many rockfish species (see Agenda Item E.6.c, Supplemental SSC Report, June 2009).

The GAP notes the NWFSC bottom trawl survey was also identified as the primary driver affecting the darkblotched rockfish assessment update results. The GAP is concerned about the apparent disparity in how two stock assessment updates were dramatically impacted by use of the NWFSC bottom trawl survey data – the appearance of numerous young bocaccio appeared to produce a much larger than expected stock size, whereas the appearance of numerous young darkblotched rockfish appeared to produce a much smaller than expected stock size. This effect confuses the GAP. In line with the SSC's recommendation to send bocaccio to the mop-up STAR Panel and their previous statements about the NWFSC bottom trawl survey (e.g., "adult darkblotched rockfish association with rock ledges may affect the ability of the survey to monitor this component of the population." [Agenda Item E.6.c, Supplemental SSC Report, June 2009]), the GAP recommends the darkblotched rockfish assessment update also go to the mop-up Panel to further explore what is driving assessment results. The GAP notes that similar effects are evident in the draft Pacific ocean perch stock assessment, which adds to the importance of understanding the effects of the NWFSC bottom trawl survey on rockfish stock assessments.

The GAP is also concerned by use of the reconstructed historical catch estimates. We understand that these reconstructions were undertaken to provide a more standardized set of historical catch estimates. However, given the influence of these reconstructed catch estimates on the stock assessment results, they should be formally reviewed to ensure they provide the best available information.

The GAP also agrees with the SSC's recommendations on which data-limited methods should be used for estimating overfishing limits for unassessed stocks. The potential use of "enhanced" data-limited methods that incorporate data other than catch to assess these stocks is problematic in that it increases uncertainty and produces highly variable results that cannot be addressed in an expedited review process. If there is data that could be used in an "enhanced" data-limited assessment, it would be better to provide a full assessment where the data and methods are fully vetted in a STAR Panel.

Summary of GAP recommendations:

1. Send bocaccio and darkblotched rockfish assessment updates to the mop-up STAR Panel;
2. Consider scheduling a formal review of the reconstructed historical catch estimates.

PFMC
06/09/11

# GROUNDFISH MANAGEMENT TEAM REPORT ON STOCK ASSESSMENTS FOR 2013-2014 GROUNDFISH FISHERIES

The overfished species stock assessment update reviews and data poor Stock Assessment Review (STAR) Panel has been completed for the 2013-14 management cycle. All concerns expressed by the Groundfish Management Team (GMT) representatives to the update STAR Panel were addressed. The STAR Panel approved three catch-based methods including Depletion-Corrected Average Catch (DCAC), Depletion-Based Stock Reduction Analysis (DB-SRA), and Catch Only Stock Synthesis (SS-CO). These methods are considered an improvement over the average historical catch method of Restrepo (1998). DB-SRA and SS-CO implement population dynamics models in the overfishing level (OFL) calculation, but differ in the production parameters. Based on the results of the data poor STAR Panel meeting and report, a list of the next steps were recommended by the STAR Panel (Attachment 6) to further refine these methods and improve stock assessments and management of data poor species are provided below. The GMT is highlighting these issues due to their management implications.

1. *Develop Adjustment to Δ (1-depletion) Value to Reflect Likely Stock Condition*. For healthy stocks, DCAC and DB-SRA methods provide OFL estimates that are biased low relative to stock assessments for non-overfished species. If the degree to which abundance is assumed to be reduced from unfished biomass (Δ) is underestimated, the resulting sustainable yield (DCAC) or MSY (DB-SRA) will be overestimated. Therefore, they should not be used on potentially overfished species unless the assumed Δ prior of 60% (corresponding to 40% depletion $B_{MSY}$) has been adjusted downward. **To improve catch only methods, the GMT recommends that the Council request further development of the correlation between vulnerability or susceptibility and depletion for assessed stocks, so the vulnerability of data poor stocks can be used to inform an appropriate Δ applied in DCAC and DB-SRA.** The GMT could draft a preliminary analysis for review by the Scientific and Statistical Committee (SSC) in the next off year for application in the 2015-16 biennium. The relationship between vulnerability from the Productivity and Susceptibility Analysis (PSA) and depletion for Category 1 assessed stocks was presented at the STAR Panel and shown to be worth pursuing. The resulting approximation of an appropriate Δ for each data poor stock can then be used in DCAC and DB-SRA analyses to provide less biased estimates of OFLs. This adjustment may be derived using the relationship.

2. *Off year review of data poor stock assessment methods to evaluate historical catch and priors used in DCAC and DB-SRA.* **Data review workshops should be held before or immediately after Council meetings in the off year, prior to updating the application of the methods, to garner input from fishermen regarding refinements to historical catch data used in data poor assessments. In addition, the priors used in the assessments could also be the subject of review by the SSC or these review panels.** This could be added to the list off year science review tasks for further prioritization. The DCAC OFL estimates are not sensitive to recent catch and provide a long term approximation of sustainable yield, while the DB-SRA or SS-CO estimates of OFL should be updated each biennium since recent catch has implications for the resulting OFL. In the event that major

revisions are made to the catch history or to priors on $F_{MSY}/M$, $B_{MSY}/B_0$, M and $\Delta$, or steepness (*h*), the OFL estimates should be updated for all methods.

3. *Integrating Abundance Indices into Catch-Based Stock Assessments to Move Species with these Category 3 Assessments to Category 2.* Category 2 assessment methods incorporate abundance index trend information. The SS-CO method and DB-SRA can be extended (SS-CI and XDB-SRA, respectively) by adding indices of abundance to raise assessments conducted using this method from Category 3 (catch-based only) to Category 2 in the groundfish Fishery Management Plan tier system. Unfortunately, the SS-CI and XDB-SRA methods incorporating indices of abundance are still in development and in need of further analysis. As a result, these extended methods were not endorsed by the STAR Panel, though they may be revisited once adequate analysis has been conducted. **High priority should be placed on development of methods for integrating indices of abundance into catch only methods DB-SRA and Stock Synthesis (with catch only data) to bring as many Category 3 assessments to Category 2 status as possible.** STAR Panel reviews of data poor stock assessment methods including review of category 2 stock assessments incorporating indices of abundance should be carried out during off years.

4. *Scientific Uncertainty and Appropriate Sigma for Category 3 Assessed Stocks.* The Star Panel discussion of the uncertainty associated with catch-only methods indicate that the sigma of 1.44 for Category 3 stocks is far in excess of the error associated with these methods and a lower sigma should be considered by the SSC for application to these stocks (sigma ~ 1.0). **We recommend the Council ask the SSC to discuss revising the TOR to use estimates of coefficient of variation (CV) derived using catch only methods to determine an appropriate value of sigma for Category 3 stocks (sigma < 1).** This would better reflect the actual uncertainty rather than the CV for Category 1 stocks multiplied by four as used at present (Sigma = 1.44).

5. *Allocation of Rockfish Complex OFLs North and South of 40° 10' N. Lat.*
The current allocation of the OFL/annual catch limits (ACL) of complexes north and south of 40°10' N. latitude is based on historical catch. **We recommend that the Council prioritize development of alternative apportionment methods by the GMT as part of the off year science research in preparation for the 2015-16 management cycle.** This was part of the original impetus for the STAR Panel meeting. Habitat area multiplied by catch per unit of effort (CPUE) indices from the trawl survey could be used to allocate slope and shelf complexes, while habitat area multiplied by appropriately stratified recreational CPUE indices could be used to allocate nearshore complexes. In the interim, we recommend that historical catch continue to be used to apportion the OFL/ACL of rockfish complexes until other methods can be developed.

PFMC
06/09/11

# SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON STOCK ASSESSMENTS FOR 2013-2014 GROUNDFISH FISHERIES

The Groundfish Subcommittee of the Scientific and Statistical Committee (SSC) met on June 6, 2011 in Spokane, Washington, to review assessment updates for bocaccio, darkblotched, yelloweye and canary rockfish, and data report for cowcod. The reports for these assessment updates were then discussed by the full SSC.

In assessment updates developed within the current and the last assessment cycles, several changes were made to the data used in the previous assessments. These changes included the use of reconstructed historical catch series and an updated approach to estimate survey abundance indices. In addition, the updated version of the modeling software was used for updates. Although these changes likely represent improvements, they have not been formally reviewed. The SSC recommends that the terms of reference (TOR) for assessment updates should be strengthened to clarify criteria for the assessment updates. The TOR should also specify a procedure to follow when an assessment does not meet the criteria for an update.

The SSC recommends that recently reconstructed historical catch time series should be reviewed outside of the normal stock assessment review process. A major effort to reconstruct historical landings was initiated in 2008 in response to the Council's call to compile the best estimates of catch history early in the development of Pacific coast groundfish fisheries. Currently, this effort has produced published estimates for California fisheries, and more recently, estimates for Oregon fisheries, but landings are still being compiled for Washington. The SSC recommends conducting an off-year science workshop to review reconstructions of all landings comprehensively, ideally when the Washington information is available. This review would need to be structured differently than a Stock Assessment Review (STAR) Panel, since the most expertise is to be found among current and former employees of state agencies. The SSC recommends that the uncertainty of the historical catch estimates also be reviewed.

**Bocaccio rockfish**

Dr. John Field of the Southwest Fisheries Science Center (SWFSC) presented the assessment update for bocaccio, which underwent a full assessment in 2009.

New information available for the update included:

- 2009 and 2010 abundance data from the CalCOFI larval survey, the Southern California Bight hook and line survey, the Northwest Fisheries Science Center (NWFSC) combined trawl survey, the SWFSC juvenile rockfish survey, and the recreational pier juvenile index.
- 2009 and 2010 length data from the NWFSC combined trawl survey and the recreational fishery.
- The power plant impingement index of recruitment (which was not used in the previous full assessment).

The Stock Assessment Teams (STATs) proposed base model, which includes the use of the power plant impingement data and removal of the 2010 NWFSC survey length data, does not fall within the rules of update assessments.

Length composition data from the NWFSC combined survey in 2010 showed an exceptionally strong peak in the 16-20 cm range, which represents young-of-the-year bocaccio. When these data are included in the assessment, the estimate of 2010 year class is the largest in over 50 years. A year class of this magnitude has a large influence on bocaccio stock dynamics, and would result in the stock reaching the rebuilding target in 2013, when this year class would become mature. Other survey information also suggests that the 2010 year class may be above average, but the magnitude of the 2010 year class will remain highly uncertain until additional information becomes available.

In a full assessment, alternative approaches would typically be evaluated to deal with sensitivity to exceptional data, but this is not possible with an update assessment where no changes in the model or data sets used in the assessment are allowed. Therefore the SSC recommends that bocaccio assessment be revisited at the mop-up panel to consider a narrow set of modeling and data issues related to the estimated strength of the 2010 year class.

It should be noted that if this recommendation is followed, this year's bocaccio assessment could be considered neither an update nor a full assessment according to strict compliance with the groundfish terms of reference for stock assessments. The SSC discussed the alternative of basing management advice on the 2009 bocaccio assessment, but this could have detrimental repercussions. A very strong bocaccio year class would be unavoidable by the California fishery as soon as 2011 and 2012, and the SSC considers it important for any future management measures to take this into account.

Specifically, the SSC requests the following analyses be done for review at the mop-up panel:

1) Evaluate
    a. models with time-varying selectivity for the NWFSC trawl survey and/or
    b. models where the selectivity of the NWFSC trawl survey for young-of-the-year bocaccio is decoupled from that for the older fish;
2) Evaluate models in which the abundance of young-of-the-year bocaccio is modeled as a separate recruitment index with an estimated catchability coefficient;
3) Evaluate models where the newly updated power plant impingement data set is included as a recruitment index (as the STAT proposed within the current update);
4) Consider other time series (e.g. sport fishery length data) that may be informative about bocaccio recruitment strength.

Any model changes or sensitivity analyses should start from a base model that conforms to the requirements of an update assessment (Alt State 2 in the current update document). The SSC anticipates that these model evaluations would not require substantial additional effort by the STAT team, and expects that the review would require no more than half a day during the mop-up panel meeting.

**Darkblotched rockfish**

Dr. Andi Stephens of the Northwest Fisheries Science Center (NWFSC) presented the update assessment for darkblotched rockfish. The last full assessment for this species was conducted in 2007, and it was subsequently updated in 2009.

The current update was conducted using the updated version (v3.21d) of the Stock Synthesis (SS) platform. New data used in the update included:

- Updated Oregon catch history (1892-1986);
- Updated (recently re-analyzed) discard data from the West Coast Groundfish Observer Program;
- Fishery data (landings, length and age compositions) from the most recent years (2009 and 2010);
- NWFSC shelf and slope survey data (abundance, length and age compositions) from the most recent years (2009 and 2010);
- Updated time series of survey abundance for the NWFSC shelf and slope surveys, estimated with an updated generalized linear mixed model (GLMM) package assuming gamma error distribution (instead of lognormal as in the 2009 update).

The recent landings of the darkblotched remain below 200 mt. The 2009 depletion level estimated by the current update (15.1 percent) is lower than the depletion reported by the 2009 update (27.5 percent). The magnitude of the change in perceived stock status is greater than would normally be expected in an update. However, unlike the boccacio update, the darkblotched update assessment followed the TORs for updates, and there is no obvious technical issue with respect to the modeling assumptions or the data that would justify rejecting this as an update.

The analysis explored which new or altered data or methods might have caused the change in depletion, but the responsibility for the change could not be attributed to any of the modifications in the assessment model or previously used data sources, including the new SS version, the newly reconstructed Oregon catch series, a change in the starting year of the model, and new GLMM abundance indices (which are estimated using a different error distribution than the previous assessment). The model output appeared to be driven primarily by the length composition data from the two most recent years (2009, 2010) of the NWFSC slope survey. The indication is that the strength of the 1999 and 2000 year classes were previously over-estimated.

The SSC recommends that the darkblotched update be accepted as a valid assessment update and be used as the basis for management decisions in the 2013-2014 groundfish management cycle as it represents the best available science. The SSC notes that in the Decision Table the labels for catch and landings should be reversed. The SSC also recommends conducting a full assessment for darkblotched rockfish in the next assessment cycle because of the large change in estimated depletion level.

**Yelloweye rockfish**
Dr. Ian Taylor of NWFSC presented the updated yelloweye rockfish stock assessment. Yelloweye is an overfished stock that has been under a Council rebuilding plan since 2004. The last full stock assessment (2009) indicated that the stock was rebuilding, albeit slowly.

The current update was conducted using the updated version (v3.21d) of the Stock Synthesis platform. New data used in the update included:

- Updated Oregon catch history (1892-1986);
- Updated (recently re-analyzed) discard data from the West Coast Groundfish Observer Program;
- Revised 2008 recreational catch estimate;
- Fishery data (landings, length and age compositions) from the most recent years (2009 and 2010);
- NWFSC trawl survey data (abundance, length and age compositions) and IPHC survey data (abundance) from the most recent years (2009 and 2010);
- Updated time series of survey abundance for the NWFSC trawl survey, estimated with an updated GLMM package assuming gamma error distribution (instead of lognormal as in the 2009 assessment).

The SSC recommends that the yelloweye update be accepted as a valid assessment update.

Comparison of the assessment update results with those from the 2009 full assessment indicated minor changes in spawning stock biomass (SSB) estimates in the early years due to revised Oregon landings estimates, small changes in SSB estimates in recent years, no appreciable differences in stock biomass trends or SSB trends, little change in spawning depletion estimates through 2008, and modest stock rebuilding. 2009 depletion level estimated by the current update (20.2 percent) is comparable to the depletion reported by the 2009 update (20.3 percent).

The yelloweye rockfish assessment update represents the best available science and should be used as the basis for management decisions in the 2013-2014 groundfish management cycle. Finally, the SSC suggests that another assessment update should be sufficient for the 2015-2016 management cycle.

**Canary rockfish**
Mr. John Wallace of the NWFSC presented the update assessment for canary rockfish. The last full assessment for this species was conducted in 2007, and it was subsequently updated in 2009. The SSC notes that the briefing book version of this update was not the version reviewed by the SSC. Rather, a corrected version of the executive summary and key tables was provided by the STAT as supplemental material.

This updated assessment used the updated version (v3.21d) of the Stock Synthesis platform. Model structure and data sources remained the same as in 2009 assessment. New information used in this update includes:

- Reconstructed Oregon historical landings for (1892-1986);

- Landings and discards for 2009 and 2010 added. It is to be noted that catches are below optimum yield (OY) in 2009 and 2010 for the first time since 2000.
- Length and age composition data from the fisheries and survey for 2009 and 2010 added;
- Updated estimates of discard rates, total mortality and discard mortality (recreational only) for 2002-2010;
- Updated time series of survey abundance for the NWFSC trawl survey, estimated with an updated GLMM package assuming gamma error distribution (instead of lognormal as in the 2009 update).

Comparison of the assessment update results with those in 2009 assessment update indicates lower spawning biomass during 1950s-1980s, and slightly lower spawning biomass in recent years. Spawning depletion at the beginning of 2009 was lower in this update (21 percent) than that in the 2009 update (24 percent). Despite the lower depletion estimate for 2009, the stock is rebuilding slowly. Spawning biomass and depletion at the beginning of 2011 are estimated to be 6,416 mt and 23 percent, respectively.

The assessment update represents the best available science and should be used as the basis for management decision in the 2013-2014 groundfish management cycle. The SSC recommends that a full assessment be conducted for canary rockfish for the next cycle.

**Cowcod**

A cowcod status report was provided by Dr. E.J. Dick of the SWFSC.

The 2007 catch of cowcod was reported in the document to be 5 mt, which is 1 mt higher than the OY of 4 mt. However, upon investigation of the basis for this number, it was discovered that some catch data had been double-counted, and the updated total estimated 2007 catch is well under 4 mt. Given this new information, it is confirmed that catch of cowcod has been below the OY in all recent years (2002-2009).

The SSC recommends that until further data on stock trends become available or significant overages in catch are observed, there is no need for an updated cowcod assessment. The rebuilding analyses could be undertaken every other assessment cycle as there is no information that would change the rebuilding trajectory, except for catch, which is too small to have an impact over just two years. The SSC found the results of the stock structure investigations presented in the appendix informative.

**Assessment Methods for Data-Poor Stocks**

The SSC reviewed the report of the April review panel meeting which considered assessment methods for data-poor stocks. Dr. Martin Dorn, the chair of the review panel, presented the report to the SSC. For each data-poor method, the review panel considered whether it could be endorsed for general use without extensive review of individual applications. Two categories of methods were reviewed:

1) Catch-Only methods (appropriate for category 3 assessments) that use catch history and some limited information about life history such as natural mortality or maturity. These include

Depletion-Corrected Average Catch (DCAC), Depletion–based Stock Reduction Analysis (DB-SRA) and Stock Synthesis – Catch Only (SS-CO); and

2) Simple Assessment methods (appropriate for category 2 assessments) that use some additional data, either length composition data or indices of abundance. These include Stock Synthesis – Catch and Length (SS-CL), extended DB-SRA (XDB-SRA) and Stock Synthesis – Catch and Indices (SS-CI).

A noted advantage of all of the methods considered is that the assumptions and priors are clearly laid out.

DCAC improves upon a simple average catch method by accounting for the fishing down of the population by including a "windfall" ratio. This is helpful for species with low natural mortality rates (<0.2), but otherwise provides little to no benefit over simple average catch. DCAC is dependent on priors on important parameters and provides an estimate of sustainable catch rather than OFL. This sustainable catch level can be biased high (and possibly not sustainable) if the stock is more depleted than assumed.

DB-SRA is somewhat more complicated than DCAC in that it includes a production function and requires an estimate of age at maturity, with the assumption that only mature fish are exploited by the fishery. This method was deemed appropriate if more life-history information is available. As with DCAC, the sustainable catch level can be biased high if the stock is actually more depleted than assumed.

The SS-CO (version 2, developed during the panel) uses Stock Synthesis to estimate unfished recruitment given estimates of other parameters. This was considered a better method in cases of complex life-histories (such as sex-specific growth and/or natural mortality).

These Catch-Only methods are not assessments and cannot define stock status, but none-the-less represent an improvement over the status quo in terms of choosing harvest levels. The SSC endorses these catch-only methods for use in setting harvest levels for category 3 stocks, as was done in the 2011-2012 harvest specification process.

The Simple Assessment methods for category 2 stocks were not considered by the panel to be ready for use in the Council process. The panel identified an alternative estimation procedure that should be evaluated for use with these methods. These methods could then be reviewed again once those algorithms are implemented.

The review panel recommended an off-year STAR Panel review to further refine and modify the methods and test their application to both assessed and simulated stocks. There remains a need for simple assessment tools that are well understood and that can be applied routinely and rapidly to multiple stocks. The SSC supports the recommendation for a review panel to further evaluate these simple assessment methods once the identified improvements have been made. Given positive results from this off-year review panel, the SSC supports having a STAR Panel dedicated to reviewing the application of these methods to a number of stocks in the next assessment cycle.

All of the methods reviewed are dependent upon accurate historical catch estimates, including discards. The further investigation of these to obtain the best possible estimates is a high priority, and uncertainty in the catch history should be included in evaluating and implementing these data-poor methods.

PFMC
06/09/11

# GROUNDFISH AMENDMENT 16-5 AND 2012 HARVEST SPECIFICATIONS AND MANAGEMENT MEASURES

Groundfish Fishery Management Plan (FMP) Amendment 16-5 concerns modifications to existing rebuilding plans for seven overfished rockfish species, a new rebuilding plan for petrale sole, and new reference points for managing assessed flatfish species. The Council adopted a final preferred alternative for Amendment 16-5, including 2011-2012 harvest specifications for overfished species in June 2010. National Marine Fisheries Service (NMFS) announced their decision to disapprove the Council's Amendment 16-5 decision in December 2010 (Attachment 1). In March 2011, the Council considered the NMFS decision, together with new information on the socioeconomic impacts associated with yelloweye rockfish and cowcod rebuilding constraints, and reaffirmed the original Council-preferred alternative for Amendment 16-5. The Council directed Council staff to transmit their Amendment 16-5 recommendations to NMFS with accompanying rationale for their decision (Attachment 2). On April 29, NMFS announced their final decision on 2011 groundfish harvest specifications and management measures (Attachment 3). This action implemented the NMFS-preferred alternative (Attachment 4) for 2011 that was described in the final environmental impact statement (FEIS) prepared by NMFS (FEIS available online at http://www.pcouncil.org/groundfish/fishery-management-plan/fmp-amendment-16-5/#16-5) and was done using the Secretary of Commerce's authority under the Magnuson-Stevens Act to promulgate emergency regulations for the rebuilding plans and new reference points for managing assessed flatfish species. However, the associated emergency regulations implementing Amendment 16-5 are due to expire at the end of 2011.

Under MSA section 304(a), when an FMP amendment is disapproved, the Council may resubmit a revised amendment (Attachment 5). Under this agenda item, the Council is tasked with reconsidering Amendment 16-5 and the affected 2012 groundfish harvest specifications and management measures.

FMP amendment disapprovals are rare in the Council process, and the potential actions taken can affect the timing of implementing 2012 regulations. The first decision the Council needs to consider is whether the final decision on revised Amendment 16-5 should be one taken by the Council or the Secretary. If the Council takes action, it could necessitate a process delay that might delay implementation of 2012 harvest specifications and management measures. If the Council elects to take no action at this meeting, then the Secretary has the authority to develop a Secretarial amendment under MSA section 304(c) and make final decisions on Amendment 16-5 and 2012 harvest specifications and management measures. In this case, it is likely that the Secretarial process could be done more expeditiously and the amendment approved with regulations implemented by January 1, 2012 (Attachment 6). Further, the workload impacts on NMFS staff and Council staff would be less than the Council conducting a two-meeting process to decide and submit a revised Amendment 16-5.

There are different options for action at this meeting, but all have a strong likelihood to cause a delay in implementing Amendment 16-5 and 2012 regulations. The potential actions and the likelihood for an implementation delay are as follows:

1) The Council takes action to reaffirm their June 2010 preferred alternative in a resubmitted amendment. This action may require another Council meeting, yet would likely be disapproved by NMFS given their original disapproval and a lack of any new analysis or information. This process would likely delay implementation of 2012 regulations.

2) The Council takes action to adopt the NMFS-preferred alternative and submit the revised amendment and implementing regulations under MSA section 304(a). This action may also require another Council meeting, followed by submission to the agency under section 304(a) and notice and comment rulemaking that would likely delay implementation of 2012 regulations.

3) The Council takes action to adopt in a revised amendment a different alternative that was analyzed in the EIS but was not one of the alternatives preferred by either the Council or NMFS. This action would require another Council meeting, followed by submission of the revised amendment and implementing regulations under MSA section 304(a), and notice and comment rulemaking that would likely delay implementation of 2012 regulations.

4) The Council takes action to adopt in a revised amendment an alternative that was not analyzed in the EIS. This action would require new analysis and at least one more, if not two more Council meetings, prior to submission of the revised amendment and implementing regulations under MSA section 304(a), and notice and comment rulemaking. This action would delay implementation of 2012 regulations.

The Council should carefully consider these issues and tradeoffs, as well as the recommendations of NMFS staff, NOAA General Counsel, advisory bodies, and the public before deciding a preferred process and action for implementing Amendment 16-5 and 2012 groundfish harvest specifications and management measures.

**Council Action:**

**Determine necessary process and actions to implement Amendment 16-5 and 2012 groundfish harvest specifications and management measures.**

Reference Materials:

1. Agenda Item E.3.a, Attachment 1: December 27, 2010 letter from Mr. William Stelle to Chairman Mark Cedergreen concerning the NMFS decision to disapprove Amendment 16-5.
2. Agenda Item E.3.a, Attachment 2: April 5, 2011 letter from Dr. Donald McIsaac to Mr. William Stelle concerning Pacific Council recommendations on the National Marine Fisheries Service final decision on the 2011-12 groundfish fishery specifications and management measures.
3. Agenda Item E.3.a, Attachment 3: April 29, 2011 letter from Mr. Frank Lockhart to Chairman Mark Cedergreen concerning the NMFS final decision on 2011 groundfish harvest specifications and management measures.
4. Agenda Item E.3.a, Attachment 4: Comparison of the target year and harvest control rule for overfished species under the current regulations, the Council Preferred Alternative, and the NMFS Preferred Alternative.
5. Agenda Item E.3.a, Attachment 5: May 19, 2011 letter from Mr. Frank Lockhart to Chairman Mark Cedergreen concerning the Secretarial amendment process.

6. Agenda Item E.3.a, Attachment 6: Draft schedule for 2012 specifications and revised FMP amendment under a Secretarial amendment process.

Agenda Order:

a. Agenda Item Overview — John DeVore
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Determine Necessary Process and Actions to Implement Amendment 16-5 and 2012 Groundfish Harvest Specifications and Management Measures

PFMC
05/20/11

**UNITED STATES DEPARTMENT OF COMMERCE**
**National Oceanic and Atmospheric Administration**
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

December 27, 2010

Mr. Mark Cedergreen, Chair
Pacific Fishery Management Council
7700 NE Ambassador Place
Portland, Oregon 97220

Dear Mr. Cedergreen:

By this letter, I am partially approving Amendment 23 and disapproving Amendment 16-5 to the Pacific Coast Groundfish Fishery Management Plan (FMP). Amendment 23 revises relevant sections of the Groundfish FMP to ensure they are consistent with the Magnuson-Stevens Fishery Conservation and Management Act of 2006 (MSA) and National Standard 1 Guidelines. The guidelines describe fishery management approaches to meet the objectives of MSA National Standard 1 (MSA Section 301). Amendment 16-5 revises rebuilding plans for the following species: Bocaccio south of 40°10′ north latitude; canary rockfish; cowcod south of 40°10′ north latitude; darkblotched rockfish, Pacific Ocean Perch, widow rockfish, and yelloweye rockfish. This amendment also created a rebuilding plan for petrale sole, which was declared overfished on February 9, 2010. In addition, Amendment 16–5 modifies status determination criteria for flatfish and establishes a new precautionary harvest control rule for flatfish.

The National Marine Fisheries Service (NMFS) strongly supports the Council's efforts with these amendments to increase the accounting for scientific and management uncertainty, prevent overfishing, and rebuild overfished species.

NMFS has determined that, except for the removal of dusky and dwarf-red rockfish from the FMP, Amendment 23 is consistent with the national standards and other provisions of the MSA and other applicable laws. A further discussion of the basis for NMFS' disapproval of the removal of the two species from the FMP is provided in the Issues Attachment 1 below.

As you are aware, on April 29, 2010, the District Court for the Northern District of California ruled in part against NMFS in a case on the 2009-2010 harvest specifications (*Natural Resources Defense Council v. Locke)*. Specifically, the court found that NMFS violated:

- National Standard 2 of the MSA by failing to use the best scientific information available on the economic status of fishing communities;

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- Section 304(e)(4)(A)(i) of the MSA by establishing rebuilding plans for darkblotched rockfish, cowcod and yelloweye rockfish that do not rebuild those species in time periods that are "as short as possible."

As thoroughly discussed at the November meeting, NMFS concluded that we would not be able to make necessary analytical refinements to the Draft Environmental Impact Statement (EIS) for Amendment 16-5 in time for NMFS to make a final decision by the deadlines imposed in Section 304(a) of the Magnuson-Stevens Act. Therefore, Amendment 16-5 is being disapproved. Because of the disapproval, NMFS' implementation of the 2011 specifications and management measures will be accomplished, in part, under the emergency authority of the MSA. NMFS requests that the Council revise as appropriate and resubmit Amendment 16-5 for implementation of the 2012 specifications and management measures. NMFS understands that the Council has already preliminarily scheduled time in the spring/summer 2011 meeting agendas to accomplish this task.

**Items for Disapproval**

Amendment 16-5 is being disapproved because there is not currently an adequate EIS to support decision-making. The Magnuson-Stevens Act (16 U.S.C. 1854(a)(3)) requires that before approving an FMP or amendment, NMFS must review the FMP for consistency with the measures of the MSA itself, as well as other applicable law. One of the primary tools that NMFS uses to accomplish this review is an adequate Final EIS, drafted in a manner consistent with the guidance contained within NAO 216-6 (Environmental Review Procedures For Implementing The National Environmental Policy Act). At this time, there is not any Final EIS, let alone an adequate Final EIS, to serve as a basis for either approving or disapproving Amendment 16-5 to the FMP. The Region will continue to work with Council staff to reorganize and refine the Draft EIS analyses to publish a Final EIS in time to support a final decision by the court-ordered April 29, 2011 deadline.

Amendment 23 as recommended by the Council also removes dusky and dwarf-red rockfish from the list of species in the FMP, and from the minor rockfish complex as a management group. The FMP currently specifies that it covers "rockfish," which includes all genera and species of the family Scopaenidae[1], *even if not listed*, that occur in the Washington, Oregon, and California area." NMFS believes that removing any species of "rockfish" from the FMP at this time is a fundamental change to one of the foundations of groundfish management, and as such, should be accompanied by a thorough analysis to support such a change. As described below, a thorough analysis was not provided. Therefore, NMFS is partially approving Amendment 23, which would leave these species in the FMP.

---

[1] *Scorpaenidae* genera (*Sebastes, Scorpaena,* Scorpaenodes, and Sebastolobus)

The rationale given by the Council for removing dusky and dwarf red rockfish was that there are very few historical landings of these species. However, these two species are not the only species with little or no landing history that are currently in the FMP. Further, when NMFS looked at Pacific whiting data from the NORPAC database, which includes observer sampling information, there were historical catches of dusky rockfish in most years, including over 2 metric tons in 2003. Although the catches were relatively small in most years, they show that this species is regularly subject to mortality in this fishery. In addition, there are other rockfish species currently in the FMP that have very small landings; our review revealed at least 15 species with less than 1,000 pounds of landings in 2009

Although the FMP includes all rockfish species, individual management of all species of rockfish is not feasible because some species are rarely caught in fisheries, and in many cases there is insufficient information on certain species on which to base management decisions. In response to this circumstance of rare catches and limited scientific information, many species in the FMP are managed within a stock complex. This is the case for both dusky and dwarf-red rockfish, which are members of the minor shelf rockfish complex. Stock complexes are an important management tool for managing many rockfish species on the West Coast.

Removal of a species from the FMP would reflect a determination that conservation and management measures are not necessary. NMFS is not prepared to make that determination at this time without a more comprehensive discussion and review of how the Council and NMFS manage rockfish genera and species within the family of scorpaenidae. NMFS understands that the Council is planning to refine the existing stock complexes for the 2013-14 specifications and management measures. NMFS believes it is prudent, from a management perspective, to take a comprehensive look at all species and complexes in the FMP before deciding to remove or add any. The option to designate species as ecosystem component species is also another option that may be explored through the Council process.

As discussed above, NMFS is approving the remainder of Amendment 23. However, we note that public comments highlighted a lack of clarity in the amendment with respect to the connection between Annual Catch Limits (ACLs) and Accountability Measures (AMs). While NMFS does not believe this is a basis on which to disapprove the amendment, we agree that this lack of clarity needs to be addressed through the development and submission of an additional amendment to the FMP. The National Standard 1 Guidelines require that the FMP describe AMs to prevent ACLs from being exceeded, and to correct or mitigate overages of the ACLs if they occur. Amendment 23 contains an extensive suite of inseason and other management measures, some of which are referred to as accountability measures, but the amendment does not clearly articulate the connection between ACLs and AMs, and it is not entirely clear which management

measures constitute AMs. NMFS requests that the Council address this issue in conjunction with its resubmission of Amendment 16-5, and we are committed to working with Council staff to develop the appropriate language.

Amendments 23 and 16-5 were developed over several Council meetings and required significant efforts by the Council, its advisory bodies, and its staff. NMFS will continue to work with the Council to make the changes necessary to Amendment 16-5 for approval for implementation for 2012, as well as the refinements to ACL provisions discussed above. The deliberations by the Council and its advisory bodies, and the work of members of the public at Council meetings and in their home ports, demonstrate an impressive commitment to the principles of the Magnuson-Stevens Conservation and Management Act. Thank you for your time and effort.

Sincerely,



For William W. Stelle, Jr.
Regional Administrator

Issues Attachment
Rationale for partial disapproval of Amendment 23

The Pacific Coast Groundfish Fishery Management Plan was established to manage all "rockfish" genera and species within the family of scorpaenidae, even if not listed individually in the FMP, that occur in Washington, Oregon and California. Although the FMP includes all rockfish species, individual management of all species of rockfish is not feasible because some species are rarely caught in fisheries, and in many cases there is insufficient information to manage a species specifically. In response to this circumstance of rare catches and limited scientific information, many species in the FMP are managed within a stock complex. This is the case for both dusky and dwarf-red rockfish, which are members of the minor shelf rockfish complex.

Stock complexes are an important management tool for managing many rockfish species on the West Coast. NMFS believes it is prudent, from a management perspective, to take a comprehensive look at all species and complexes in the FMP before deciding to remove or add any. The option to designate species as ecosystem component species is also another option NMFS will explore through the Council process.

The rationale given by the Council for removing dusky and dwarf red rockfish was that there are very few historical landings of these species. However, these two species are not the only species with little or no landing history that are currently in the FMP. Further, when NMFS looked at data from the NORPAC database, observer sub-sampling data in the Pacific whiting fishery indicated that incidental catch of dusky rockfish has historically been reported (Table 1). Although the landings were relatively small, they show that this species has been landed. There are other rockfish species currently in the FMP that have very small landings (Table 2). Removal of a species from the FMP would reflect a determination that conservation and management measures are not necessary. NMFS is not prepared to make that determination at this time, without a more comprehensive discussion and review of how the Council and NMFS manage "rockfish" genera and species within the family of scorpaenidae.

The Northwest Fisheries Science Center indicated that dusky and dwarf-red rockfish most likely do not occur in Washington, Oregon or California in numbers sufficient enough to determine abundance or conduct a stock assessment. However, this does not lead NMFS to conclude that these species should be removed from the FMP at this time. NMFS believes that as the stock complexes are further refined, it may be appropriate to remove species from the FMP. However, this discussion and related policy decisions should be addressed in a comprehensive, as opposed to piecemeal fashion. Finally, with the implementation of the trawl rationalization program and full catch accounting of both catch and discards, more information will be available to inform any decisions on removal of species from the FMP.

# Landings of dusky rockfish
# NORPAC Database

Table 1. Landings of dusky rockfish in individulal hauls from the NORPAC database.

| Haul Date | Metric Tons |
|---|---|
| 12/12/1990 | 0.212 |
| 7/23/1991 | 0.001 |
| 9/10/1992 | 0.036 |
| 9/12/1992 | 0.233 |
| 9/12/1992 | 0.524 |
| 9/12/1992 | 1.220 |
| 10/6/1992 | 0.015 |
| 10/6/1992 | 0.074 |
| 4/15/1994 | 0.817 |
| 4/16/1994 | 0.132 |
| 4/16/1994 | 0.273 |
| 5/2/1995 | 0.027 |
| 5/15/1996 | 0.009 |
| 5/18/1998 | 0.016 |
| 5/19/1998 | 0.005 |
| 5/16/1999 | 0.067 |
| 5/23/1999 | 0.005 |
| 5/15/2000 | 0.014 |
| 5/15/2000 | 0.017 |
| 7/17/2000 | 0.013 |
| 7/17/2000 | 0.017 |
| 7/17/2000 | 0.071 |
| 7/17/2000 | 0.079 |
| 7/17/2000 | 0.093 |
| 7/17/2000 | 0.164 |
| 7/22/2000 | 0.083 |
| 7/22/2000 | 0.479 |
| 7/23/2000 | 0.086 |
| 7/23/2000 | 0.137 |
| 7/23/2000 | 0.250 |
| 7/23/2000 | 2.074 |
| 7/24/2000 | 0.041 |
| 9/4/2000 | 0.002 |
| 10/14/2001 | 0.003 |
| 10/24/2001 | 0.010 |
| 10/24/2001 | 0.018 |
| 5/17/2002 | 0.003 |
| 5/15/2003 | 0.005 |

Table 2. Landings (in pounds) of rockfish species in the FMP in 2009
PACFIN Database

| Table 2. Landings (in pounds) of rockfish species in the FMP in 2009 | |
|---|---|
| **Species** | **Pounds** |
| UNSPECIFIED SHELF ROCKFISH | 7 |
| FLAG ROCKFISH | 20 |
| CALIFORNIA SCORPIONFISH | 24 |
| QUILLBACK | 27 |
| OLIVE | 50 |
| VERMILION | 63 |
| SHORTBELLY | 102 |
| BROWN | 115 |
| STRIPETAIL | 144 |
| UNSPECIFIED ROCKFISH | 148 |
| UNSPECIFIED SMALL REDS ROCKFISH | 172 |
| YELLOWEYE | 189 |
| ROSETHORN | 228 |
| NORTH UNSPECIFIED NEAR-SHORE ROCKFISH | 304 |
| UNSPECIFIED REDS ROCKFISH | 309 |
| BLACKSPOTTED | 360 |
| GREENSPOTTED | 539 |
| BLACK | 593 |
| SILVERGREY | 690 |
| GREENBLOTCHED | 797 |

Pacific Fishery Management Council

7700 NE Ambassador Place, Suite 101, Portland, OR 97220-1384
Phone 503-820-2280 | Toll free 866-806-7204 | Fax 503-820-2299 | www.pcouncil.org
Mark Cedergreen, Chairman Donald O. McIsaac, Executive Director

April 5, 2011

Mr. William Stelle, Regional Administrator
National Marine Fisheries Service, Northwest Region
7600 Sand Point Way NE, BIN C15700
Seattle, WA 98115-0070

Re: Pacific Council Recommendations on the National Marine Fisheries Service Final Decision on the 2011-12 Groundfish Fishery Specifications and Management Measures

Dear Mr. Stelle: Will

At its March 5-10, 2011 meeting in Vancouver, Washington, the Pacific Fishery Management Council (Pacific Council) considered issues relevant to your upcoming decision on the 2011-12 fishery specifications and management measures for the West Coast groundfish fishery, including rebuilding plans associated with Fishery Management Plan Amendment 16-5. After considering all available recent information, the perspectives of federal, state, and tribal fishery management agencies, written and oral statements of Pacific Council advisory bodies and public testimony, the Pacific Council voted 12-0 with one abstention and the Chair not voting to reaffirm its prior recommendations, including in particular their recommended annual catch limits for yelloweye rockfish and cowcod. The unanimity of this vote was unusual in that it was contrary to a National Marine Fisheries Service (NMFS) preferred alternative (PA) for lower catch limits for these two stocks, identified just before the Council meeting. The purpose of this letter is to provide rationale for this decision and to urge you to adopt the Pacific Council recommendations as a final rule.

It is very unusual for the Pacific Council to vote unanimously in rejection of a NMFS PA. However, the NMFS PA was considered in a positive manner with all due respect to the agency for its ultimate regulatory responsibility and extensive efforts considering this complex matter. The Pacific Council vote represents the full regional position as envisioned by the Magnuson-Stevens Act (MSA), subsequent to a comprehensive public process spanning seven Council meetings, thousands of pages of written material and thousands of hours of personal participation by concerned individuals. We hope the following and appended rationale summary, not found explicitly in the Final Environmental Impact Statement (FEIS) currently subject to a 30-day comment period, will be helpful to you in arriving at a balanced decision in full accordance of the provisions of the MSA.

The Pacific Council PA includes a yelloweye rockfish annual catch limit (ACL) of 20 metric ton (mt) and an annual catch target (ACT) of 17 mt, and an ACL of 4 mt for cowcod. The NMFS PA included ACLs of 17 mt for yelloweye rockfish and 3 mt for cowcod, with no ACTs. While the difference between the Pacific Council PA and the NMFS PA may seem small at first glance, the differences are extremely significant given that these stocks are constraining bottleneck stocks in multi-species groundfish fisheries and are also the subject of ongoing litigation regarding the allowable amount of catch. While there is a substantial volume of material that we believe supports the Pacific Council PA, in this letter we highlight the following reasons at this late stage in the decision-making process.

- The NFMS PA ACL levels do not adequately take into account the needs of fishing communities.
- The Pacific Council PA complies with the April 2010 U.S. District Court of Northern California Summary Judgment and Order.

- The NMFS PA is insufficient in accounting for management uncertainty for yelloweye rockfish and cowcod.
- "The fishery has been catching smaller amounts recently than the Pacific Council PA" is faulty reasoning in support of the NMFS PA, including insufficient attention to complexities of tribal trust responsibilities.
- The Pacific Council PA produces more yield to the nation in the long term than rebuilding in a shorter time period, with no jeopardy to the sustainable health of fish stocks.
- The Pacific Council PA more adequately provides for research needed for improved yelloweye rockfish stock assessments and Pacific halibut surveys scheduled by the International Pacific Halibut Commission (IPHC).

Succinct rationale statements that further explain these highlighted reasons are provided below. The attached appendix provides detailed information, analysis, references, and further rationale in support of the above topical conclusions.

**The NFMS PA ACL levels do not adequately take into account the needs of fishing communities.**

The MSA intentionally does not provide an exact prescription for the balancing of rebuilding speed with ill effects to fishing communities[1]. However, it is clear that ignoring the needs of the communities, such as would occur when a complete fishery closure occurs, would not be appropriate. A recent Ninth Circuit Court of Appeals decision has indicated that properly taking into account the needs of fishing communities would be "...avoid disastrous short-term consequences..." We maintain that the NMFS PA does not avoid disastrous short term consequences, as described below.

In response to a request from NMFS at the November 2010 Pacific Council meeting for further information about impacts to fishing communities on the small catch levels for yelloweye rockfish and cowcod, much has been entered into the NMFS and Pacific Council record. This information demonstrates the recent low catches of these stocks have had disastrous consequences in terms of federal definition. Under restrictive catch regimes of recent years, inflation adjusted ex-vessel economic revenue in commercial groundfish fisheries has declined 21 percent from the level designated to be a federal economic disaster in 2000, with fishing port infrastructure now in or nearing a state of collapse (see appendix for details of the Port of Neah Bay, Washington as an example). Some traditional fisheries, such as the nearshore trawl fishery north of Cape Alava, Washington, have been completely closed. Recreational groundfish fisheries are in a similarly disastrous condition. When one looks at allowable commercial and recreational fisheries under the NMFS PA, they are not at a level that avoids disastrous impacts to the needs of fishing communities.

**The Pacific Council PA complies with the April 2010 U.S. District Court of Northern California Summary Judgment and Order.**

In April 2010, Judge James Larson ordered NMFS to establish rebuilding times that are "as short as possible" within the full context of MSA Section 304(e)(4)(A)(i), citing a U.S. Court of Appeals for the Ninth Circuit interpretation of this section of the MSA to mean "the rebuilding period be 'as short as possible' while giving consideration to 'the status and biology of the overfished species and the needs of the fishing communities' as Congress' way of ensuring that overfished species would be rebuilt as quickly as possible while 'leaving some leeway to avoid disastrous short-term consequences for fishing

[1] MSA Section 304(e)(4)(A)(i) specifies a rebuilding period shall "be as short as possible, **taking into account ... the needs of fishing communities** ..." (emphasis added)

communities'." As noted above and described in more detail in the appendix of this letter, the fishing limits in the Pacific Council PA are needed to lessen short-term disastrous economic consequences to fishing communities. The Pacific Council PA also complies with the balance of the modifiers to rebuilding in as short a time as otherwise possible. The rebuilding schedules in the Pacific Council PA are responsibly short considering the biological characteristics of the fish stocks, with a performance status that is on schedule to rebuild, contrary to comments from litigants that performance is behind schedule. The recent scientific update assessing stock status confirms that since designated in the overfished condition, yelloweye rockfish have increased 25 percent and cowcod 91 percent, in accordance with current rebuilding plans. Also, the Pacific Council PA adequately accounts for research needs, including recommendations of the IPHC as required by MSA Section 304(e)(4)(A)(i) [2]and the Judge Larson order (see separate section below). Lastly, by scheduling fishing impacts on yelloweye and cowcod that are only incidental and carry with them the optimum level of ancillary healthy catch, the Pacific Council PA comports with Judge Larson's order to comply with the section of the key MSA provision to take into account the interaction of yelloweye rockfish and cowcod in the mixed stock fishery[3].

**The NMFS PA is insufficient in accounting for management uncertainty for yelloweye rockfish and cowcod.**

The NMFS PA includes a yelloweye rockfish ACL of 17 mt, the same as the Pacific Council ACT, and provides for the same management measures as the Pacific Council PA, but does not provide for a buffer for management uncertainty as does the Pacific Council PA. There is considerable uncertainty in the actual catch of yelloweye rockfish and cowcod, for commercial, tribal and recreational fisheries and research efforts since they are only caught incidentally while targeting other species. For example, management measures in place in 2007 were similar to the NMFS-PA ACLs for 2011-12, yet the total mortality of cowcod and yelloweye rockfish in 2007 (3.3 mt and 19.6 mt, respectively) was greater than the NMFS PA level (i.e., 3 mt and 17 mt for cowcod and yelloweye rockfish, respectively). A higher than expected bycatch of cowcod in the limited entry trawl fishery and a higher than expected bycatch of yelloweye rockfish in the California recreational fishery led to these high catches. Should a yelloweye rockfish ACL of 17 mt stand, the fishery may need to be managed in-season for a smaller, more disastrous, catch level so as to not exceed 17 mt by year's end.

**"The fishery has been catching smaller amounts recently than the Pacific Council PA" is faulty reasoning in support of the the NMFS PA, including insufficient attention to complexities of tribal trust responsibilities**

While it is true total mortality impacts have been less than the Pacific Council ACT levels in some recent years of record, it has also been greater. However, a significant reason for the lower catch amounts in relevant years has been the tribal fisheries impact being less than planned pre-season (for example, the recent planned take of 2.1 mt compared to the actual take of 0.1 mt). It would be faulty to presume tribal trust responsibilities would be protected by planning on an actual catch level falling far short of the planned level. It is also faulty to presume research catches will be less than expected, particularly when biomass is increasing with rebuilding. For example, research catches of canary rockfish, another overfished species that is a key constraint in the mixed stock fishery, have spiked higher than pre-season expectations simply due to the incidental catch dynamics of reasonably rare events. To presume the

[2] MSA Section 304(e)(4)(A)(i) specifies a rebuilding period shall "be as short as possible, **taking into account recommendations by international organizations in which the United States participates** ..." (emphasis added)
[3] MSA Section 304(e)(4)(A)(i) specifies a rebuilding period shall "be as short as possible, **taking into account the interaction of the overfished stock in the marine ecosystem**..." (emphasis added)

non-tribal fisheries can be further reduced in-season if tribal catches and research actually achieve the expected catches, would only aggravate the disastrous impacts of the NMFS PA. To presume the non-tribal fisheries "have been living with lower catches," is not correct, as they have benefited from "leftover" quantities from tribal fisheries and other set-aside allocations; again, the ultimate effect of this incorrect presumption is to further aggravate disastrous short-term consequences to non-tribal commercial and recreational fisheries and the communities that depend on them.

**The Pacific Council PA produces more yield to the nation in the long term than rebuilding in a shorter time period, with no jeopardy to the sustainable health of the fish stocks**

There may be an exaggerated impression of the long term benefits of rebuilding as soon as possible, in comparison to the long term yield provided by the Pacific Council PA. Estimated MSY for healthy, rebuilt populations of cowcod and yelloweye rockfish are relatively low (54 mt and 49 mt, respectively) compared to MSY values estimated for other rockfish species and far lower than historic catches (155 mt in 1999). Thus, an urgency to rebuild more quickly so as to gain the benefit of large yields at that point is somewhat misguided. Given the weakest stock link of these stocks in a mixed stock fishery, each fish taken incidentally carries a huge economic benefit in terms of the catch of healthy stocks in commercial fisheries and fishing opportunity in recreational fisheries. The use of just a few more fish during a reasonable rebuilding time frame provides more yield to the nation in the long term. It is also important to note that rebuilding under the Pacific Council PA does not jeopardize the sustainable health of fish stocks, as an overfished designation does not entail the extinction risks of an Endangered Species Act listing.

**The Pacific Council PA more adequately provides for research needed for improved yelloweye rockfish stock assessments and Pacific halibut surveys scheduled by the International Pacific Halibut Commission (IPHC).**

Research needs comprise 18 percent of the ACL for yelloweye rockfish, including a portion needed for IPHC research plans. Accommodating these impacts for scheduled research is important in evaluating rebuilding progress and providing hope for better ways to protect the stock and provide for fisheries above the disastrous level. We are encouraged that the NMFS PA provides for the same level of planned research take as the Pacific Council PA, noting the disappointing situation in 2010 when two thirds of the scheduled research was cancelled so as to keep the total catch from exceeding a 14 mt level. However, the Council PA provides coverage for current research plans and a reasonable buffer should the catches exceed plans, something that is a reasonable possibility as the stock biomass increases. An additional new uncertainty for higher research catches of yelloweye rockfish was brought to light at the March 2011 Council meeting when the IPHC Executive Director confirmed expanded research plans for Pacific halibut, and expectation for additional yelloweye rockfish bycatch. The NMFS PA contains no uncertainty buffer for larger than expected research catches

In closing, we would like to emphasize the precautionary nature of Pacific Council recommendations for yelloweye rockfish and cowcod in general. As scientific information about these stocks changed and a conservation challenge became apparent, action by the Council was appropriately responsive. Catches were reduced by over 90 percent between 1999 and early 2000 to 2003; massive area closures were instigated covering most of the preferred habitat; tight management measures were adopted to reduce take of these fish to accidental bycatch only; fishery impacts were monitored closely and enforced by in-season management so as to not exceed target catch levels; and evaluatory science efforts were

scheduled. The Pacific Council PA for the 2011-12 groundfish fishery cycle maintains this same type of precautionary management attitude.

Thank you for considering the Pacific Council recommendations on this important matter. Should you have any questions, please do not hesitate to contact me.

Sincerely,

Donald O. McIsaac, PhD
Executive Director

Enclosure: Appendix

cc:
Council Members
Sam Rauch
Lois Shiffer
John Coon
Don Hansen
Kit Dahl
Kelly Ames
John DeVore
Kevin Duffy
Becky Renko
Sheila Lynch
Mariam Mcall

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# Appendix to April 5, 2011 Pacific Council Letter: Comments Relative to National Marine Fisheries Service's Final Decision on 2011-12 Groundfish Harvest Specifications and Management Measures

## Introduction

In April 2010, while the Council was in the midst of establishing harvest specifications and management measures for the groundfish fisheries in 2011 and 2012, Judge James Larson of the U.S District Court of Northern California issued a Summary Judgment and Order in a long-running case about rebuilding seven overfished groundfish species. Judge Larson remanded the 2009-10 harvest specifications ("OYs") and vacated them for darkblotched rockfish, cowcod, and yelloweye rockfish. For the remainder of 2010, he ordered that the OYs in place in 2008 be substituted for those he vacated, and specifically, for yelloweye rockfish, an OY of 14 metric tons (mt). In June 2010 the Council took final action on their groundfish harvest specifications recommendation. They chose an annual catch limit (ACL) for yelloweye of 20 mt and an accompanying annual catch target (ACT) of 17 mt.[1] NMFS published a draft environmental impact statement (EIS) evaluating this recommendation (the Council's "Final Preferred Alternative") in August 2010. However, they chose not to publish a final EIS (FEIS) and implement the recommendation by the end of 2010. In March 2011 NMFS published the FEIS and included a new alternative, the "NMFS Preferred Alternative," that differs from the Council recommendation by establishing a 17 mt ACL for yelloweye and a 3 mt ACL for cowcod (versus the Council's recommended 4 mt ACL). Judge Larson had ordered the Agency, within one year, to establish new specifications for the seven overfished species consistent with his order of remedy. The FEIS published in March 2011 is intended to support the agency's response.

**In March 2011 the Council reaffirmed their original June 2010 recommendation for groundfish harvest specifications and management measures, including those for cowcod. In doing so the Council argues that their recommendation is in fact consistent with Judge Larson's Judgment and Order, and more broadly, with the National Standards set forth in the Magnuson Stevens Fishery Conservation and Management Act (MSA).** The reasons why we believe the Council's recommendation is consistent with the law and should be implemented instead of the NMFS Preferred Alternative (or any other alternative with ACLs lower than those the Council recommended) are set forth below.

## Judge Larson's April 2010 Summary Judgment and Order on Remedy

In April 2010 Judge Larson ordered the Agency, within one year, to establish new specifications for the overfished species that result in rebuilding times that are "as short as possible" within the meaning of MSA Section 304(e)(4)(A)(i). He cited the U.S. Court of Appeals for the Ninth Circuit's interpretation of this section of the MSA to mean "the rebuilding period be 'as short as possible' while giving consideration to 'the status and biology of the overfished species and the needs of the fishing communities' as Congress' way of ensuring that overfished species would be rebuilt as quickly as possible while 'leaving some leeway to avoid disastrous short-term consequences for fishing communities' (emphasis added). While the judgment and remand applied to the Council's 2009-10 specifications, this ruling bears on the harvest specifications for 2011 and 2012.

[1] ACL is a new term introduced in National Standard 1 Guidelines practically equivalent to what were termed OYs. An annual catch target is a new concept meant to more effectively keep harvest below the ACL in the face of various sources of management uncertainty.

This reading of the MSA takes a rather narrow view of the tradeoff between the benefits of "faster rebuilding" and the attendant short-term costs of conservation measures embedded in the MSA. For example, while National Standard 1 privileges conservation, National Standard 8 emphasizes "sustained participation" by and minimized adverse impacts to fishing communities. Nonetheless, we believe we can demonstrate that the Council's recommendation is consistent with Judge Larson's intent.

## The Rationale for the Council's Overfished Species ACL Recommendations

The Council's recommended 2011-12 yelloweye and cowcod ACLS are consistent with current rebuilding plans

The *de minimus* fishing mortality management strategy in the yelloweye and cowcod rebuilding plans focuses on restricting catch to unavoidable bycatch while allowing enough fishing opportunity to forestall disastrous short-term consequences for fishing communities. Retention is largely prohibited and the prime areas where these species reside are closed to fishing activities that have the potential to catch these two species.

The Council chose to maintain this existing strategy and the objectives of the rebuilding plans including the target years they adopted in Amendment 16-4. For yelloweye this is 2084. Based on the most recent stock assessment and rebuilding analysis for yelloweye rockfish this corresponds to an ACL of 20 mt in 2011 and 2012. Similarly, based on the best available science, the estimated target year associated with a 4 mt cowcod ACL in 2011 and 2012 is 2071, 1 year earlier than the target year established in Amendment 16-4.

Litigants contesting west coast groundfish rebuilding plans have continually claimed that cowcod and yelloweye rebuilding is behind schedule (Agenda Item H.1.e, Supplemental Public Comment, March 2011).These claims are simply not true. The 2009 assessments and rebuilding analyses used to develop 2011 and 2012 harvest specifications and modifications to rebuilding plans show positive rebuilding for both species. The best understanding of rebuilding progress is provided by evaluating the time series of annual spawning biomass estimates in the 2009 assessments. Cowcod rebuilding progress is best measured by comparing the estimated spawning biomass in 2000 (51.1 mt), the year the stock was declared overfished, with the spawning biomass estimated in 2009 (97.6 mt); a 91 percent increase in the 10 years the stock has been managed under a rebuilding plan. Likewise, there has been steady yelloweye rebuilding progress since the stock was declared overfished in 2002 with spawning output increasing 25 percent from 2002 (162 million eggs) to 2009 (202 million eggs). In claiming that rebuilding is currently behind schedule, it appears litigants may be confusing selected old, now obsolete scientific projections with the currently best available scientific projections.

The Council must balance a range of fishing-related concerns when ACLs are very constraining.

Although the Council's preferred alternative sets the yelloweye ACL to 20 mt, management is structured around the 17 mt ACT. Before allocating potential harvest among different fisheries the Council must consider a variety of activities resulting in yelloweye mortality that they have limited or no ability to control. These "off-the top" amounts accommodate 1) treaty-tribal fishery rights in their usual and accustomed areas, 2) expected research activities, 3) incidental mortality of groundfish in non-groundfish fisheries, and 4) exempted fishing permits (EFPs), the only one of these activities the Council can directly influence. Once deductions are made for these activities the resulting fishery harvest guideline forms the basis for the trawl and non-trawl allocations. There is considerable uncertainty about the actual level of harvest that these activities will incur, in part because they are not directly managed. For this reason, the Council may use larger, more precautionary estimates of harvest to account for potential variability in actual annual catches.

The Council is required to meet the tribal obligations outlined in Groundfish FMP Section 6.2.5 and 50 CFR 660.324. Tribal set asides are an amount necessary to accommodate treaty-tribal fishery rights in the usual and accustomed areas located off of northern Washington, an area of high yelloweye rockfish density (see Figure 4-13 in the FEIS). The coastal tribes participate in longline fisheries for Pacific halibut and sablefish and the 2011-12 estimates of yelloweye impacts (2.3 mt) are based on the past performance and expectations for the next 2 years (see FEIS, Appendix B, Section B.1.1.2). The tribal set aside also accommodates any risk associated with the developing Quileute mid-water fishery for Pacific whiting, which could have yelloweye rockfish impacts. Since the tribal set aside is a fixed amount, as the ACL is reduced it accounts for an ever-larger proportion of expected total fishing mortality. For example, in 2010-11 the tribal set aside is 2.3 mt, or 14 percent of a 17 mt ACL but 18 percent under the 13 mt ACL in Alternative 1.

Precautionary set asides are also required for research activities, because the Council and NMFS do not have direct management control over the activities. For the 2011-12 period the Council set aside a total of 3.3 mt for research, or 19 percent of the 17 mt yelloweye ACT. The research set aside accommodates enhanced rockfish surveys, the International Pacific Halibut Commission (IPHC) stock assessment survey, and other projects. The enhanced rockfish surveys have been recommended by several Stock Assessment Review Panels (Agenda Item E.2.a, Attachment 13, September 2009), participants at a Council-sponsored yelloweye rockfish workshop (Agenda Item E.2.a, Supplemental Attachment 3, March 2010), and are also part of the Council's research priorities, given the paucity of fishery independent data that informs the yelloweye rockfish assessment. Research activities conducted by the IPHC are vital to the Pacific halibut stock assessment, a species that is very important to commercial and recreational fisheries and the associated communities. Further, MSA Section 304(e)(4)(A)(i) requires that rebuilding plans take into account recommendations by international organizations in which the United States participates. The IPHC has adopted recent changes to the 2011 survey design that may result in additional yelloweye rockfish impacts. The 3 mt difference between the ACT and ACL is one way to account for the uncertainty in research impacts, while meeting the MSA requirements for coordination.

IPHC survey data are also the primary fishery independent source of data informing the yelloweye rockfish assessment (Agenda Item E.2.a, Attachment 12, September 2009). Thus, any voluntary decision by the Commission to curtail its research activities to reduce yelloweye impacts would not only adversely impact halibut management but also further reduce the amount of scientific information available to accurately assess the status of the yelloweye stock.

Catch of yelloweye in incidental open access fisheries (those not targeting groundfish but catching some amount) are highly variable, the Council and NMFS do not have direct management control over these fisheries, and observer coverage is limited or nonexistent in many of these fisheries. Again, this calls for a precautionary set aside, estimated at 0.2 mt for the 2011-12 biennial period.

Finally, the Council considers the EFP set asides. While the amounts are taken "off the top" of the ACT, because the Council does not have control over the other activities contributing to the off the top amount, EFP amounts are only considered after those deductions have been made. As a result, consideration of EFPs is squeezed from both sides: on one side off the top amounts for other activities, and on the other a fishery harvest guideline large enough to cover unavoidable bycatch. As a result, a miniscule 100 kilos, or approximately 23 individual yelloweye rockfish, would be reserved for EFP activities that may increase utilization, expand opportunities in the west coast groundfish fishery, and increase harvest efficiency; objectives that are consistent with the MSA and the management goals of the FMP. As a result, it will be much more difficult to test innovative gears and strategies that have the potential of providing some additional fishing opportunities with a minimal yelloweye impact, which offer hope for the fishery to emerge from its current disastrous condition.

Once the fishery harvest guideline is determined, net of the deductions, the Council explicitly or implicitly allocates harvest opportunity to different groundfish fisheries, or sectors. Under a 17 mt ACT and ACL, the amount available for commercial and recreational harvest is only 11.1 mt. In their 2011-12 recommendation the Council fully allocated the 17 mt ACT, reserving the remaining 3 mt difference between it and the ACL as a buffer for uncertainty. For example, it is one way to account for the uncertainty in research impacts, while meeting the MSA requirements that rebuilding plans account for the recommendations of international organizations (in this case the IPHC). The rationale for maintaining this buffer is described below.

A 20 mt yelloweye ACL and associated 17 mt ACT and 4 mt cowcod ACL are necessary to avoid disastrous short-term impacts due to management uncertainty.

Revised National Standard 1 guidelines introduce a new tool, the ACT, which is a management target to control the actual catch at or below the ACL. In evaluating past yelloweye catches the Council determined that it may be possible to keep catches below 17 mt and chose an ACT accordingly (and if fisheries can be managed over the long-term consistent with the ACT, the stock is projected to rebuild by 2074). While actual catch in recent years shows it is possible to manage fisheries below 17 mt, the 20 mt ACL provides some leeway if catch is higher than anticipated and disastrous short-term consequences due to further restrictions on the fishery are to be avoided. Figure 1 shows the variability in these recent catches even though management measures that affect these two species have been relatively consistent in the last six years. Yelloweye rockfish fishing mortality is hard to monitor, because since 2001 regulations have prohibited fixed gear commercial or recreational retention and landing of this species. As a result, there is a higher risk of exceeding the management target. Between 2002 and 2008, estimated yelloweye catch has varied between 12.13 and 19.6 mt. But the catch in 2002 was 15.8 mt, exceeding the 13.5 mt OY in place in that year. This shows that it is possible to manage for catches in the range below 17 mt (albeit with severe socioeconomic impacts) but the variability in catches introduces a risk of exceeding the catch limit.

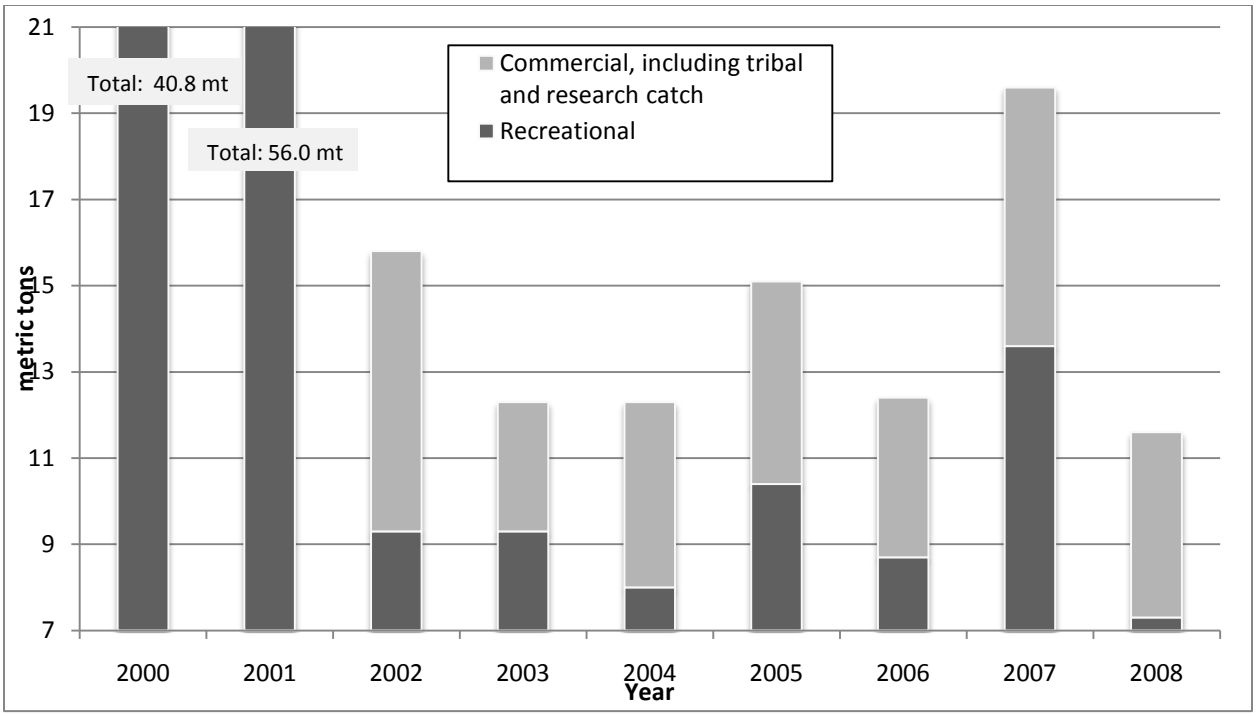



**Figure 1. Estimated yelloweye catches in groundfish commercial and recreational fisheries, 2000-2008. (Sources: 2001-2004 catches from Dick and MacCall 2010; 2005-2008 catches from Dick et al. 2009.)**

Similarly, Figure 2 shows cowcod catches. A higher than expected bycatch of cowcod in the limited entry trawl fishery and a higher than expected bycatch of yelloweye in the California recreational fishery led to high catches in 2007. Thus despite the ongoing adverse impacts resulting to managing to OYs that since 2002 have been consistent with the rebuilding plan, there continues to be uncertainty in estimating or projecting actual catches.

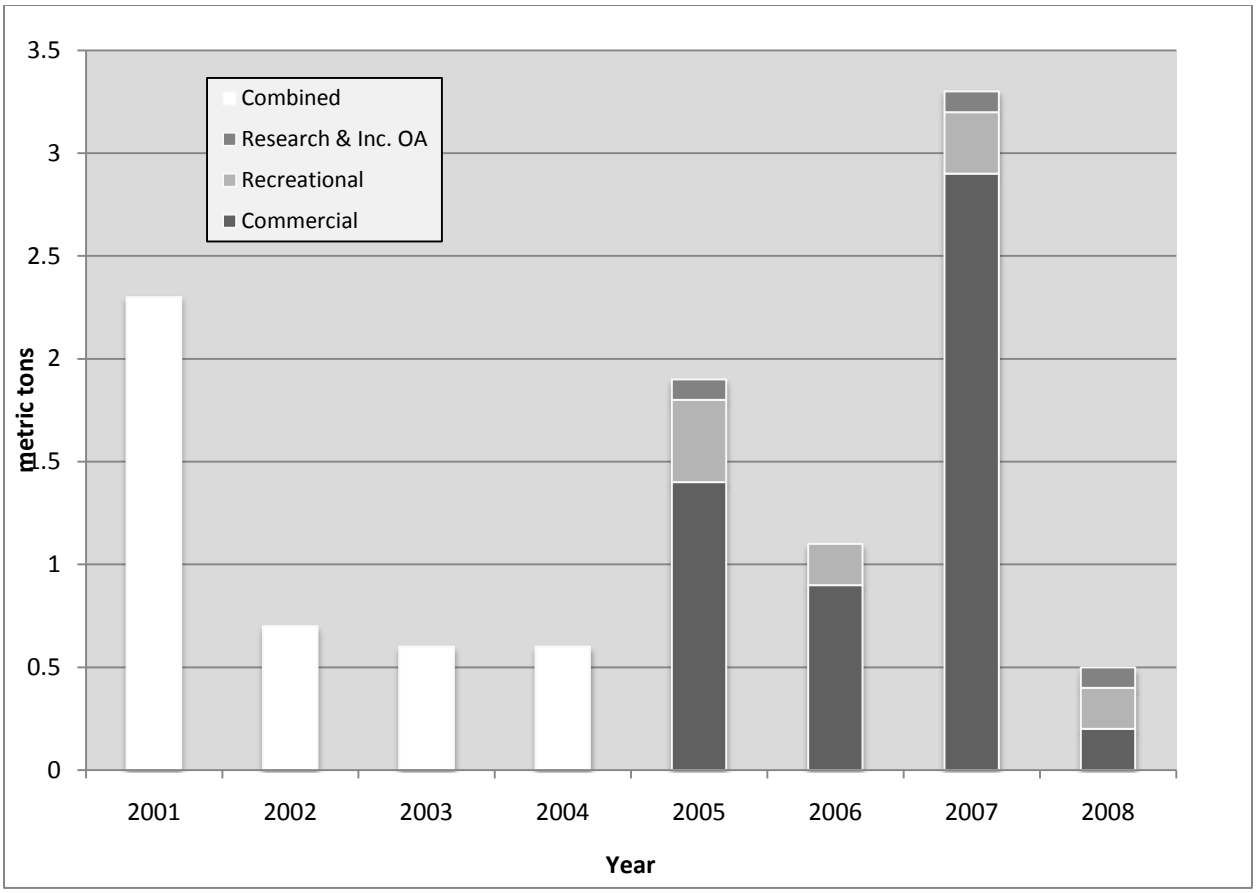



**Figure 2. Estimated total catches (mt) of cowcod south of 40$^{0}$10' N lat., 2001-2008. (Sources: 2001-2004 catches from Dick and MacCall 2010; 2005-2008 catches from Dick et al. 2009.)**

This uncertainty is understood when the Council uses different fishery-specific models to project catch when developing allocations for groundfish fisheries as described below by fishery sector.

*Nonwhiting limited entry trawl*

Although the trawl model projected this fishery to catch 0.3 mt of yelloweye rockfish (see FEIS Table 4-20), the Council established a 0.6 mt allocation to capture the variability in the trawl model estimates, which in recent years has been as high as 0.6 mt (Agenda Item E.5.b, Supplemental GMT Report, March 2010). With trawl rationalization observer coverage has been increased to 100 percent in the shoreside trawl fishery (from 20 percent). Yelloweye catches are a rare event because of existing management controls that prohibit access to the rocky areas that yelloweye rockfish inhabit. For example, gears that may be used in rocky habitat where yelloweye reside have been prohibited and rockfish conservation areas have been implemented since 2005. This increases the margin of error when expanding sample data to total fishing mortality estimates. In response to full observer coverage, estimates of yelloweye catch in the trawl fishery for 2011 were doubled to account for the possibility that complete enumeration of catches will fall on the high side of this margin of error. The 17 mt ACT and 20 mt ACL is a risk-averse strategy in anticipation of uncertainty about what the actual yelloweye catch will be in 2011-12.

*Fixed gear sablefish ("non-nearshore") fishery*

The non-nearshore fixed gear sector is composed of limited entry and open access vessels that primarily target sablefish, shortspine thorneyhead, and slope rockfish species. The non-nearshore model is updated with the latest bycatch rates once each year (or twice during a biennial management period); however, the bycatch rate data used in the model are 2 years old, because of the processing and quality control requirements to convert raw observer data to a usable form. Updating the yelloweye rockfish bycatch rate, which reflects management uncertainty, influences catch estimates measured against the ACL. The Council took this into account when setting the non-nearshore allocation of yelloweye; while projected catch was 0.8 mt, the Council allocated 1.1 mt to this sector. It is also possible that the actual 2011-12 yelloweye bycatch rate could be greater than that used in the catch projection model. This would result in the non-nearshore fishery exceeding its allocation, and potentially the groundfish fishery as a whole exceeding the 17 mt ACT. Managers wouldn't even know this happened until 2 years hence, because of the time lag between data collection and its availability for management. Added to this, a significant bias in the observer coverage for the non-nearshore fleet was recently uncovered, which calls into question the accuracy of the existing bycatch rates used in the model. While some may argue that the non-nearshore fishery "can live with" an allocation of 0.8 mt, based on the catch projection, we believe this view is inconsistent with the National Standard 1 guidelines, which require management uncertainty be taken into account. This translates into the ability of managers to accurately estimate catch and adjust management measures so as not to exceed the ACL. In sum, given the lack of real-time reporting of yelloweye rockfish bycatch rates it is important the allocation scheme take into account this management uncertainty, bolstered by basing allocations an ACT 3 mt below the ACL.

Beyond these allocation decisions at the outset of the biennial period, changes in the bycatch rate used in the non-nearshore model to make inseason adjustments can have immediate consequences even though the outputs must rely on fishery conditions from 2 years prior. For example, if the new input yelloweye bycatch rate is higher, it may prompt changing the current 100 fm seaward RCA boundary to 125 fm or even 150 fm, causing adverse impacts to fishing communities on the Oregon coast. If rates are high enough, the seaward boundary of the RCA in Washington north of Point Chehalis would also be moved to 125 fm or 150 fm, effectively prohibiting the dogfish fishery. This shows how west coast communities, particularly in Washington and Oregon, depend on fixed gear sablefish revenues and would pay a heavy price if yelloweye rockfish catch projections are incorrectly estimated too high.

*Nearshore fishery*

The nearshore model, used to project catches in fixed gear fisheries mainly targeting black and blue rockfish, cabezon, greeling, lingcod, and other nearshore rockfish, is similarly updated annually with 2-year old bycatch rates. As with non-nearshore management, if the yelloweye bycatch rate estimate increases, managers may need to reduce trip limits inseason, reducing target species catch dramatically. This would adversely impact fishing communities in the Oregon and California. A more dire management response would be needed if yelloweye bycatch rates used for inseason catch projections are high enough, such as closing large swaths of ocean to fishing. This would be devastating to the nearshore dependent and vulnerable communities mentioned above.

*Tribal fisheries*

Tribal catches of yelloweye rockfish have been as low as 0.1 mt and as high as 2.9 mt (See FEIS, Table B-6). The tribal set aside of 2.3 mt is intended to accommodate all expected fishing activities including the longline fishery for Pacific halibut and sablefish as well as the newly developing Quileute tribal fishery for Pacific whiting. In recent years, tribal catches have been substantially lower than the set aside, which has contributed to the overall harvest of yelloweye remaining below the OY. However, the tribal

set aside is an amount that cannot be reallocated to other fisheries if tribal catches do not reach the set aside amount. As such, if non-treaty fishery yelloweye projections are higher than anticipated during the biennial cycle management action must be taken to constrain catch even if the tribal set-aside is not completely used. Catch could be higher than anticipated if, for example, the Quileute whiting fishery expands faster than anticipated or if bycatch in the Pacific halibut fishery is higher.

Managing for yelloweye harvests below 17 mt and cowcod harvest below 4 mt is likely to result in disastrous short-term consequences.

The FEIS shows the Council considered revising the yelloweye rebuilding plan to adopt an earlier target year of 2065 (18 years longer than the fastest rebuilding schedule where no yelloweye catch occurs) in addition to maintaining the current Amendment 16-4 target year. They also considered revising the target year for cowcod to 2064 (4 years longer than the fastest rebuilding schedule). This was analyzed in the EIS as Alternative 1, which would implement a yelloweye ACL of 13 mt and a cowcod ACL of 2 mt in 2011-12. Alternative 1 is projected to result in a 34 to 24 percent decline in community income, depending on the types of management measures used to keep total fishing mortality within the ACLs. Looking at individual fishing communities, reductions in personal income were projected to be as high as 53 percent. This can be compared to the disaster declaration from 2000. Non-whiting groundfish ex-vessel revenue fell by 31 percent in inflation adjusted dollars between 1997 and 1998 when restrictions were placed on the fishery to address overfishing. Revenue has fallen a further 10 percent through 2009 (FEIS, Appendix F). It can be seen the year-on-year reductions in personal income projected for Alternative 1 (the 13 mt ACL) are comparable to the revenue declines associated with the formal disaster declaration of the late 1990s. This makes a strong case that this constitutes the kind of disastrous short-term consequences the Court said could justify delaying rebuilding from the shortest time period possible.

We believe that the Council's commitment to rebuilding the seven currently overfished groundfish stocks has resulted in substantial severe, consequences. The impacts of current management need to rebuild stocks, along with information in the FEIS about the distress west coast communities are experiencing supports our contention that implementing ACLs for yelloweye and cowcod lower than those proposed by the Council would result in disastrous short-term consequences. Below, we present evidence from fisheries and related communities to support this assertion.

*Nowhiting groundfish trawl, especially in northern Oregon and Washington*

Although trawl impacts to yelloweye rockfish have been significantly reduced from a high of 2.1 mt to a recent low of 0.1 mt (Figure 3), this decline has come at a cost to fisheries in Washington. Reducing yelloweye bycatch has necessitated rockfish conservation area closures and gear restrictions to prevent fishing in rocky habitat to reduce yelloweye rockfish bycatch. In recent years, this has included complete area closures off of Washington north of Cape Alava (46°16' N latitude) to reduce yelloweye and canary rockfish bycatch.

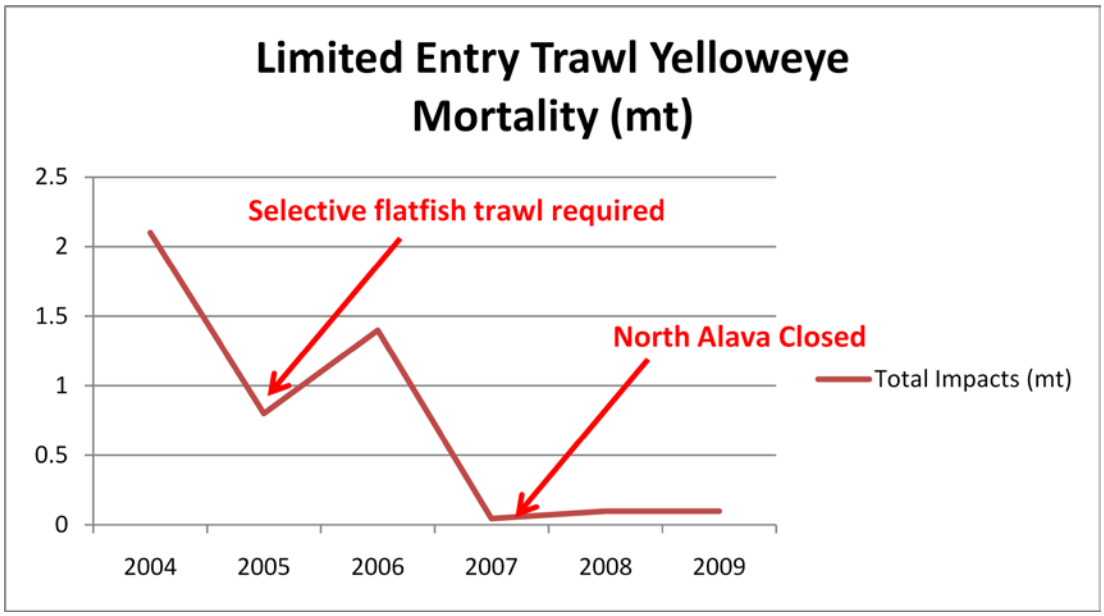



**Figure 3. entry trawl total mortality (landings plus discard) from 2004 to 2009.**

As stated in the FEIS (Section 3.2.2.2.6) and during public comment, the Cape of Alava closure resulted in significant impacts to Neah Bay and continues to threaten the existing infrastructure. The Makah tribe's trawl fleet reduced from 10 vessels to 5 active (8 eligible) vessels due in part to reduced markets as a result of fewer non-tribal landings. Similarly, between 2000 and 2009 the number of non-tribal commercial vessels landing groundfish in Neah Bay declined from 63 to 14 according to PacFIN records. Furthermore, buyers in Neah Bay have reduced the number of trucks taking fish to processors. Although not rated vulnerable in the most recent vulnerability analysis (FEIS Appendix E), both Neah Bay and Clallam County were rated as vulnerable in the 2006 analysis. (The updated analysis ranked the region medium for engagement, dependence, and resiliency.) The 2006-2008 poverty rate was 14 percent, ranking it ninth among the port group areas. Ironically, the change in this port group's vulnerability status may be in part due to reduced participation in groundifsh fisheries while the region remains economically distressed.

**In 2010 the Council made re-opening the area north of Cape Alava a priority once the trawl fishery became rationalized and demonstrated they could successfully avoid catching yelloweye.** Under the Council's final preferred alternative of a 17 mt ACT and 20 ACL, the Council could provide the rationalized trawl fishery the opportunity to explore opportunities in this area with very little risk of exceeding the ACL. Re-opening the area would increase vessel efficiency, increase landings into the communities in northern Washington, and help secure port infrastructure. Conversely, under a 17 or 14 mt ACL there is very limited opportunity to open the area due to risk of exceeding the ACL.

All three port groups classified as most vulnerable in the 2010 vulnerability analysis (Newport, Crescent City, and Fort Bragg) depend on groundfish trawl landings (see FEIS Tables 3-25 and 4-49). And three other trawl port groups (Eureka, Coos Bay, and Brookings) are considered vulnerable. These port groups encompass much of the coastal region from central Oregon to northern California. Although not rated vulnerable, the Astoria, San Francisco, Bodega Bay, Puget Sound and Monterey port groups also depend on trawl revenues. A yelloweye rockfish ACL lower than the Council's recommendation (e.g., 14 mt) would in turn cut the Council's preferred trawl allocation, which could jeopardize the success of the rationalized trawl fishery, resulting in disastrous socioeconomic impacts to these associated communities.

Recent trawl catches of cowcod in the limited entry non-whiting trawl fishery have ranged from 0.2 to 3.0 mt (Table 1). Even though trawl fishery management measures were similar to those implemented in other years, estimated mortality reached 3.0 mt in 2007. This extreme variability in catch makes it difficult to predict how much cowcod may be caught under the management measures proposed 2011-12. Further, beginning in 2011, the limited entry non-whiting trawl fishery is managed with individual fishing quota (IFQ). Since this is an entirely new approach to management for this fishery, past bycatch rates may not be a reliable predictor of overfished species bycatch. Recognizing this problem the FEIS analysis modeled catch based on trip limit management used in the past. This assumes the fishery will perform no worse than under trip limit management. Under the Council's final preferred alternative for 2011, the trawl model projections for cowcod rockfish were 0.3 mt (FEIS, Table 4-10) out of a 1.8 mt allocation. Since cowcod bycatch is rare a large confidence interval should be attached to bycatch rates derived from WCGOP data. Catch projections based on models using these data are highly uncertain. As with yelloweye rockfish, the Council recommended a trawl allocation higher than the projected catch to take into account management uncertainty, especially with respect to model accuracy.

**Table 1. Limited entry trawl total mortality estimates of cowcod in metric tons from 2004-2009.**

| Year | Non-Whiting Trawl Mortality (mt) | OY (mt) |
|---|---|---|
| 2009 | 0.5 | 4 |
| 2008 | 0.2 | 4 |
| 2007 | 3.0 | 4 |
| 2006 | 0.9 | 4.2 |
| 2005 | 1.5 | 4.2 |
| 2004 | 0.9 | 4.8 |

Starting in 2011 all trawl trips will be observed, a requirement of IFQ management, making catch estimates much more reliable. If trawl catches of cowcod remain very low as estimated in recent years (other than 2007), this may compel a future reduction in the harvest rate and a re-setting of the target year. However, the Council did not want to lower the harvest rate in the rebuilding plan until the rationalized trawl fishery is evaluated.

Trawl port groups south of Cape Mendocino (40°10 N. latitude), where cowcod bycatch is a concern, include Fort Bragg, Bodega Bay, San Francisco, Monterey, Morro Bay, Santa Barbara, Los Angeles, and San Diego. Of these port groups, the county in Fort Bragg is considered most vulnerable to changes in groundfish revenue.

*Non-nearshore Fixed Gear Fishery*

Beginning in 2009 (and described in the FEIS No Action alternative), the seaward boundary of the non-trawl RCA was moved from 100 to 125 fm between the California-Oregon border (43° N. latitude) and the central Oregon coast (Cascade Head) to reduce yelloweye rockfish bycatch. Fixed gear fishermen stressed that much of their productive fishing grounds are between 100 and 125 fm, and that moving the line to 125 fm created negative impacts for the fishery (Agenda Item B.3.b, ODFW Report, June 2010). The Council's Groundfish Advisory Subpanel (GAP) reported that in the fall waters shallower than 125 fm during typically yield larger and more valuable sablefish, along with increased catches of lingcod (Agenda Item, B.3.b, Supplemental GAP Report, June 2010). In addition, the GAP noted that fishing shallower would benefit smaller vessels (because they lack the space for the additional gear required to

fish in deeper water) and enhance at-sea safety (Agenda Item, B.3.b, Supplemental GAP Report, June 2010). Finally, in some areas (particularly off Washington), the industry pointed out that RCA restrictions that push the fleet further off the coast result in more intense fishing pressure on increasingly less productive fishing grounds in smaller areas (also decreasing catch rates and increasing gear conflicts over time) (Agenda Item B.7.b, Supplemental GAP Report, June 2010). Decreasing the ACL below the Council's recommended 20 mt, taking into account the need to manage fisheries in the face of uncertainty about catches, will necessitate still more restrictive area management, magnifying the types of effects described here.

Expanding closed areas off the Oregon coast is likely to intensify impacts to coastal communities that depend on sablefish revenue. Operating expenses have increased while the sablefish ACL has shrunk by 23 percent. The State of Oregon believes these trends, when combined with restrictive management needed under a yelloweye ACL below 20 could be devastating to coastal communities (Agenda Item H.2.c, ODFW letter, March 2011). In five Oregon port groups (Astoria, Tillamook, Newport, Coos Bay, and Brookings) that depend on sablefish revenue from the fixed gear fishery, four counties are listed as vulnerable in the 2010 analysis and Newport is listed as most vulnerable. Within the Brookings port group, Port Orford and Gold Beach are particularly reliant upon fixed gear landings since fish buyers have relatively few other options for year round groundfish product (because there are no trawl landings). Tillamook, Newport, and Brookings port groups had three of the highest poverty rankings.

The area in Washington north of Point Chehalis faces a similar situation. The seaward boundary of the non-trawl RCA could be moved to 125 or 150 fm, if the yelloweye catch has to be managed below 17 mt while taking into account catch estimation uncertainty. Specifically, this would effectively close the dogfish fishery in this area. The South Central Washington Coast and the North Washington Coast port groups would be hurt by these restrictions. Within the South Central Washington port group, two of the three counties are vulnerable. Poverty rates in both port groups are 14-16 percent, with unemployment as high as 12 percent.

*Nearshore fixed gear fishery*

Management restrictions associated with the Council's *de minimus* catch strategy for overfished species, and yelloweye and cowcod in particular, affect fishing communities that participate in the nearshore fishery coastwide.

In the Washington, the non-trawl RCA extends from shore to 100 fm, because of the abundance of yelloweye rockfish in these waters. This effectively prohibits the nearshore commercial fishery.

Beginning in 2009 (and described in the FEIS No Action alternative), the shoreward boundary of the non-trawl RCA was moved from 30 fm to 20 fm from Cape Mendocino, California (40°10 N. latitude) and southern Oregon (43° N. latitude) to reduce impacts to yelloweye rockfish. Public comment at Council meetings revealed the impact of this closure on coastal communities (Agenda Item B.3c, Public Comment, June 2010). In Oregon, nearshore fisheries occur in most ports, with the largest percentage occurring in the Brookings port group in southern Oregon, the area hit hardest by the RCA modification, and also rated vulnerable (FEIS Appendix E). The Tillamook port group receives the next largest share of the nearshore landings in Oregon and it is also considered vulnerable to changes in revenue. Together, the Brookings and Tillamook port groups have no or limited trawl landings and thus rely on fixed gear landings to sustain year round fishing. The Crescent City and Eureka port groups are directly impacted by the RCA expansion. Humboldt County, California (Eureka port group) is rated vulnerable, while Del Norte County, California (Crescent City port group) is rated most vulnerable. Public comment at several Council meetings further elaborate the extreme hardship Crescent City fishermen have faced (Agenda Item G.4.c, Supplemental Public Comment 2, November 2009). In 2006 and most recently in March

2011, the port was declared a disaster as a result of powerful tsunamis, which destroyed several vessels and docks necessary for offloading fish and sustaining the community. Clearly, minimizing groundfish related revenue declines in this community is essential.

Under a 14 mt ACL the area between Cape Mendocino, California (40°10 N. latitude) and the California-Oregon border (42° N. latitude) would likely be closed to fishing in order to minimize yelloweye rockfish bycatch. As a result, state nearshore permit holders, the only people allowed to harvest nearshore species in this area, would be prohibited from redirecting their fishing effort to another area and would thus be out of work (see Agenda Item H.2.c, CDFG Letter, March 2011).

These examples suggest the kinds of severe restrictions already in place to minimize yelloweye rockfish bycatch in nearshore fisheries and show that managing for harvests below 17 mt, while taking into account management uncertainty, would likely result in disastrous socioeconomic effects for many west coast fishing communities.

*Recreational fisheries*

In contrast to commercial fisheries, data on recreational fisheries catch is provided with only a 2-month time lag, which makes inseason adjustments of state and Federal regulations much easier. Nonetheless, it has been very difficult for managers to effectively minimize yelloweye rockfish catch, especially in the California recreational fisheries.

Washington

Management measures in the Washington recreational fishery include season and depth restrictions to limit impacts to yelloweye rockfish. As stated in the WDFW public comment letter (Agenda Item H.2.c, WDFW Letter, March 2011), one of the most significant measures has been a bottomfish fishing closure extending seaward of the 20 fm isobath off the north coast (marine areas 3 and 4) from mid-May through the end of September and a year-round offshore closure (FEIS Figure 2-7, C-shaped closure). This same closure is included in the Council's final preferred alternative. If the yelloweye ACL is reduced to 13 mt, the 20 fm depth restriction in marine areas 3 and 4 would need to be extended (FEIS Section 2.4.3.1).

Under the Council's final preferred alternative two year-round yelloweye rockfish conservation area closures are implemented near Westport, Washington thereby curtailing targeted trips for healthy species such as lingcod and yellowtail rockfish in these areas. This closure affects counties in the South and Central Washington port group, which includes Westport and Ilwaco-Chinook. Two out of three counties in this port group are vulnerable. Under the final preferred alternative, there is a slight projected increase in angler trips (0.8 percent).

Oregon

Depth management and season restrictions are also used in Oregon recreational fisheries to limit yelloweye rockfish impacts. The direct impact of these management measures is reduced groundfish angler trips and associated negative socio-economic impacts to Oregon's coastal communities. The relative impact of the depth closures by port is directly related to the amount of fishable area by depth by port. For example, a reduction in the coastwide ACL from 17 mt to 13 mt is projected to decrease groundfish angler trips by 6.2 percent (FEIS, Table 4-41). Percent reductions in angler trips of a 13 mt ACL compared to No Action are substantial in the Tillamook (16.2 percent), Coos Bay (10.3 percent), Brookings (6.0 percent), and Newport (1.3 percent) port groups. In the 2010 analysis (FEIS Appendix E), Newport was rated as most vulnerable. Under the Council's final preferred alternative, Oregon coastal communities maintain opportunities similar to No Action.

The ODFW public comment letter notes that the EIS analysis may underestimate the percent decrease in angler trips in the Tillamook port group, which includes Garibaldi, by 20-35 percent (Agenda Item H.2.c, ODFW letter, March 2011). This is particularly important since the Tillamook port group and county is ranked vulnerable in the 2011-12 analysis.

California

**Managing yelloweye rockfish impacts in the California recreational fisheries has been extremely challenging; over a five year period catches exceeded the recreational fishery harvest guideline 60 percent of the time (**Table 2**). Management uncertainty in California recreational fishery was one of the main reasons the Council recommended managing with a 3 mt buffer between the 20 mt yelloweye rockfish ACL and the 17 mt ACT.** As discussed above, management uncertainty comes from two sources: the effectiveness of management measures to constrain catch sufficiently and uncertainty in estimating catch. Both these sources apply in California recreational management and underscore the appropriateness of the Council's yelloweye ACL recommendation to avoid disastrous short-term consequences.

**Table 2. California Recreational Historical Catch, Harvest Guidelines, and OYs for Yelloweye Rockfish.**

| Year | Catch (mt) | HG (mt) | Catch as % of HG |
|---|---|---|---|
| 2009 | 3.8 | 2.8 | 136% |
| 2008 | 1.7 | 2.1 | 81% |
| 2007 | 8.0 | 2.1 | 381% |
| 2006 | 4.1 | 3.7 | 111% |
| 2005 | 0.9 | 3.7 | 24% |

The area north of Point Arena in central California (northern and north-central, north of point arena management areas) is most affected by yelloweye rockfish bycatch and the associated management measures. This are includes the Eureka and Crescent City port groups both of which are rated vulnerable with Crescent City being most vulnerable. Under the Council's final preferred alternative, the California recreational fishery receives a slightly higher harvest guideline than under No Action, which increases the season length by 1.5 months and could potentially provide for an increase in angler trips in Crescent City and Eureka of up to 13.5 percent (FEIS Table 4-51).

Cowcod are also caught infrequently in California recreational fisheries. Estimating discard mortality in that fishery is more uncertain than in commercial fisheries. Recreational observer data are available from charter vessels, but little information is available from private vessels. Further, a portion of recreational rockfish catch has been classified as "unidentified" (Agenda Item E.8.b, CDFG Report, September 2009). A retrospective analysis indicated that the California harvest guideline for cowcod might have been exceeded in 2008 if some of the unidentified rockfish were indeed cowcod.

Under the Council's final preferred alternative, a 0.9 mt non-trawl allocation (includes commercial fixed gear and recreational) was recommended. The allocation was set sufficiently high enough to accommodate the management uncertainty surrounding the projected impacts in the California recreational fishery (0.2 mt) and fixed gear fisheries (trace).

Recreational port groups south of 40°10 N. Latitude include Fort Bragg, Bodega Bay, San Francisco, Monterey, Morro Bay, Santa Barbara, Los Angeles, and San Diego. Of these port groups, the county in Fort Bragg is considered most vulnerable to changes in angler trips. As noted in the CDFG public comment letter and the FEIS, the communities south of Point Conception, California (34°27 N latitude),

where cowcod populations and management measures are greatest, are highly engaged in fishing activities (Agenda Item H.2.c, CDFG Letter, March 2011).

**For some overfished species the socioeconomic benefits of stock rebuilding shouldn't be overstated.**

The most recent assessments of cowcod and yelloweye indicate the maximum sustainable yield (MSY) for healthy, rebuilt populations of both species are relatively low compared to MSY values estimated for other rockfish species. Estimated MSY values using the proxy MSY harvest rate of F50% are 54 mt for cowcod and 49 mt for yelloweye rockfish. The Council's science advisors think that even these relatively modest estimates of MSY may be too high.

Low estimated MSY values for both species will probably require significant area fishing restrictions on the continental shelf in the prime habitats where these species reside. The high relief areas in the CCAs where cowcod predominate in the southern California Bight will likely remain closed as well as many of the reefs off northern California, Oregon and Washington where yelloweye are found in the greatest densities. Clearly, the same relatively unconstrained access to shelf areas where commercial and recreational groundfish fisheries concentrated efforts in the 1980s and 1990s cannot be sustained with these low predicted MSY amounts. For perspective, the average annual catches of cowcod and yelloweye during the period from 1980 to 1999 were 104 mt and 278 mt, respectively or 193 percent and 567 percent of each species' respective MSY. In fact, the lowest annual yelloweye catch during that period was 107 mt or 218 percent of the estimated MSY. While this comparison underscores the reason these species became so depleted, it also provides the perspective that a return to wide open fishing on the shelf is unrealistic.

It is important to understand this reality, because one of the arguments underlying the strong preference to rebuild overfished stocks "in as short a time as possible" is that short-term sacrifice will be compensated by larger future returns measured by increased fishing opportunity and associated socioeconomic benefits. However, given that cowcod and yelloweye ACLs are likely to be small even when these stocks are rebuilt may mean that foregone benefits (due to the restrictive ACLs needed to rebuild these stocks a few years earlier) may not be outweighed by the future benefits of a rebuilt stock. While the FEIS acknowledges there may be a variety of nonmonetary benefits derived from a rebuilt stock (Section 4.2.2.6) these cannot be practicably measured and are unlikely to outweigh the benefits derived from direct use of the resource.

**Disastrous short-term impacts are also a function of cumulative impacts over several years.**

Disastrous short-term socioeconomic effects cannot only be assessed in the context of a single year or 2-year management period. Cumulative impacts (discussed in FEIS Section 4.3) intensify the effects of management measures during any 2-year period. Groundfish landings declined dramatically in the late 1990s as new information revealed that several stocks had become depleted and rebuilding plans were first developed, leading to much tighter restrictions on groundfish fisheries. As a result, in 2000 the west coast groundfish fishery was declared a Federal economic disaster. The ensuing period, during which the economic outlook has become increasingly bleak for west coast fishing communities dependent on the groundfish fishery, should be viewed in entirety when assessing the kinds of effects that overfished species ACLs will have, as described above.

Historic commercial fishery landings data presented in the 2011-12 groundfish harvest specifications FEIS (see Appendix F) indicate that the total ex-vessel revenue (adjusted for inflation) attributed to commercial groundfish landings has declined about 21 percent from 2000 to 2009. A closer look at this trend indicates that there has been about a 45 percent decline in revenues during that period in the target

fishery for Pacific whiting driven largely by a decline in annual limits (which were driven by trends in abundance of Pacific whiting) and about an 11 percent decline in revenue attributed to landings of non-whiting groundfish. More west coast fishing communities are affected by landings of non-whiting groundfish species and the socioeconomic impacts associated with these landings are somewhat masked by a rising value of sablefish during this period. If sablefish landings and revenue are removed from the trend, revenues have declined by about 40 percent (Figure 4). Further constraints to the fishery attributed to lower cowcod and yelloweye ACLs would exacerbate these socioeconomic trends.

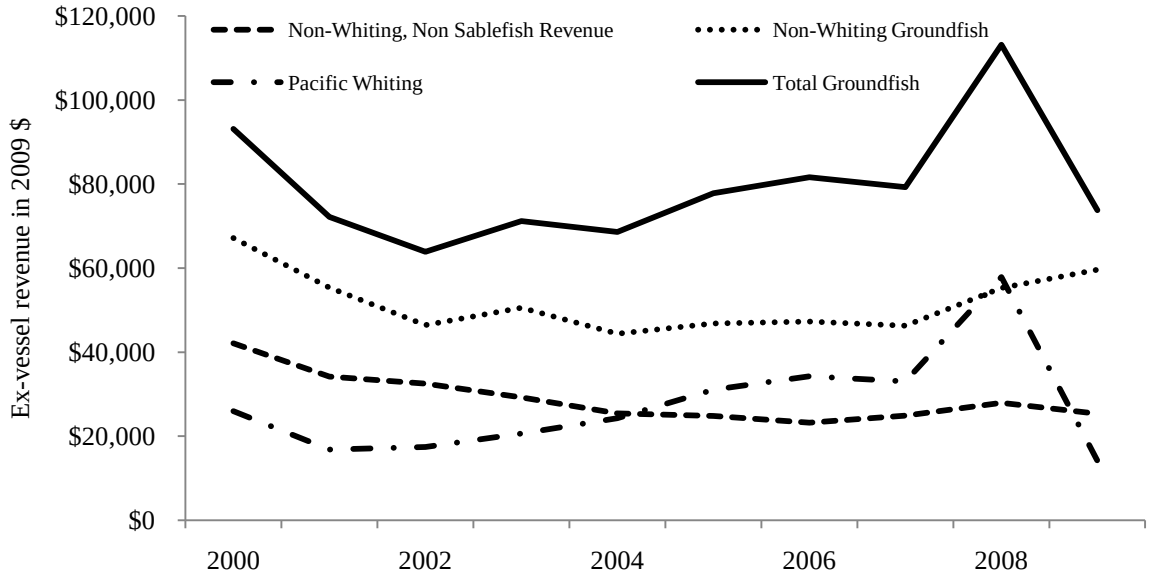



**Figure 4. Ex-vessel revenue trends (in 2009 dollars) attributed to commercial west coast groundfish landings since the 2000 economic disaster declaration.**

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Sustainable Fisheries Division F/NWR2
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115-0070

APR 29 2011

Mr. Mark Cedergreen, Chair
Pacific Fishery Management Council
7700 NE Ambassador Place
Portland, Oregon 97220

Dear Mr.Cedergreen:

The National Marine Fisheries Service (NMFS) has made its final decision on the groundfish harvest specifications and management measures for 2011. The final rule was submitted to the Office of the Federal Register on April 28, 2011, and on April 29, 2011, we notified the court in NRDC v Locke that the agency has complied with the court's Remedy Order. We will notify you of the publication date of the final rule as soon that information is available.

As a consequence of our disapproval of Amendment 16-5 on December 27, 2010, NMFS has adopted all the rebuilding plans, revisions to flatfish proxies, Annual Catch Limits (ACLs) for overfished species, and specifications for flatfish pursuant to section 305(c) of the Magnuson Stevens Act (MSA), which provides the Secretary of Commerce the authority to promulgate emergency regulations that are treated as an amendment to an Fishery Management Plan (FMP) for the period the regulations are in effect. These provisions will be effective only temporarily, and additional action will be required in the coming months to extend their effectiveness through the end of the 2011-2012 biennium.

*NMFS' Decision*

The final rule implements NMFS' preferred alternative as described in the Final Environmental Impact Statement (FEIS). The provisions that are implemented in the final rule are divided into two distinct sets of actions. The first is the 2011–2012 harvest specifications for most of the species in the groundfish fishery and management measures for the entire fishery. The second establishes or revises rebuilding plans, sets catch limits for eight overfished species, revises flatfish proxies and precautionary control rule, and sets temporary harvest specifications for flatfish.

Harvest Specifications for Most Species and Fishery Management Measures

NMFS' final decision regarding the 2011-2012 harvest specifications for most of the species in the groundfish fishery and final 2011-2012 management measures was made under the standard process for Secretarial adoption of regulations recommended by the Council, and are implemented for the biennium and beyond. Specifically, NMFS has concluded that the

overfishing limits (OFLs) and acceptable biological catches adopted by the Council and described in the FEIS are consistent with the recommendations of the scientific and statistical committee (SSC), the MSA, and the revised guidelines for implementing National Standard 1 of the MSA (74 FR 3178, 50 CFR 600.310). Likewise, the ACLs for non-overfished species described in both the Council's final preferred alternative and the NMFS preferred alternative are consistent with the guidelines and the MSA, as are the management measures for the fishery.

NMFS has concluded that most of the management measures that the Council recommended in June 2010 are adequate for preventing overfishing and ensuring that rebuilding continues for overfished species. The Council has a strong track record of setting appropriate management measures designed to maintain harvest within established limits and also has effective procedures that allow the Council to adjust fishing levels inseason if monitoring reveals a chance of exceeding harvest limits. However, as discussed below, NMFS is not implementing the Council-recommended changes to the Cowcod Conservation Areas (CCA).

The Council recommended changes to the CCA that would allow recreational fishing in areas shoreward of the boundary line approximating the 30 fathom depth contour and would also allow retention of shelf rockfish in depths open to recreational groundfish fishing within the CCA. NMFS is not implementing these changes to the CCA management measures because the Council's analyses do not allow us to conclude that the changes will not result in increased mortality on cowcod. The impacts on juveniles are particularly uncertain, and increased impacts on juveniles could potentially delay rebuilding. In addition, because the cowcod biomass is extremely low, the Region believes that any measures that potentially increase cowcod mortality require better information to support such a change. NMFS intends to work with the state of California and the affected industry to design a sampling regime that would provide more information while maintaining protections for cowcod.

In addition, while NMFS is implementing the specifications related to the stock complexes in the fishery, we note, as the Council's advisory committees observed, that the existing complexes may not be ideally organized to prevent overfishing on the component species. We understand that that the Council plans to make progress during the 2013-2014 specification cycle toward reconsidering management of the complexes. We support the Council's commitment to make progress and will work with the Council to that end.

Overfished Species and Flatfish

NMFS is implementing, under emergency authority, the measures included in Amendment 16-5 with modifications to make those measures consistent with the court's decision and statutory requirements. NMFS is implementing the NMFS' preferred alternative, as described in the FEIS, which includes an ACL of 3 mt for cowcod and an ACL of 17 mt for yelloweye. This deviates from the Council's final preferred alternative (FPA), which included an ACL of 4 for cowcod and an ACL of 20 mt and annual catch target (ACT) of 17 mt for yelloweye. After careful consideration of the analysis in the FEIS, public comments, the Council's April 4, 2011 letter, and other information in the record, NMFS concluded that its preferred alternative would rebuild the overfished species in the shortest time possible, taking into account the statutory factors, and is the most consistent with the court's order in NRDC v. Locke. Although the

difference between the NMFS preferred alternative and the Council's final preferred alternative is only a total of 4 mt between yelloweye rockfish and cowcod, these small differences result in noticeable reductions in rebuilding times with minimal additional impacts to communities.

NMFS agrees with the Council that the needs of fishing communities cannot be assessed solely in the context of a single year or 2-year management period. As public and state comments have shown, many communities have lost important infrastructure such as ice houses, fuel docks, and processing facilities during the last decade. Continued low levels of revenue will likely result in further losses of infrastructure. Although it is difficult to predict, at some point the losses of infrastructure and fishing opportunity result in a "tipping point" in which a community shifts from a fishing community to a non-fishing community. In addition, with decreased revenues, fishermen are not making needed repairs or improvements to fishing gear, resulting in potential safety issues and potentially reducing innovation in the fleet to reduce bycatch or impacts to habitat. Accordingly, NMFS preferred alternative allows for small increases in projected revenues (although revenues for many sectors individually are projected to decline), similar to that of the Council's FPA.

*Action Required to Finalize PCGFMP Amendment 16-5*

As described above, the measures adopted under emergency authority, which include all the rebuilding plans, revisions to flatfish proxies, ACLs for overfished species, and specifications for assessed flatfish, are temporary in duration. Further action is necessary to extend these measures through 2012. As you are aware, the Council has scheduled a June agenda item for the reconsideration of Amendment 16-5. NMFS will provide detailed information to the Council for incorporation into the briefing book; this information will include statutory language about Secretarial amendments and further guidance on what NMFS believes is appropriate action for the Council to consider.

*Conclusions*

Amendment 23, Amendment 16-5 and the 2011-2012 groundfish harvest specifications and management measures were developed over several Council meetings and required a significant amount of work by the Council, its advisory bodies, and Council staff. NMFS recognizes and appreciates the hard work by the Council family and we are committed to working with you in the coming months to conclude action on Amendment 16-5, and to initiate work on the upcoming biennial harvest specifications and management measures.

Sincerely,

Frank D. Lockhart
Assistant Regional Administrator

**Comparison of the target year and harvest control rule for overfished species under the current regulations, the Council Preferred Alternative, and the NMFS Preferred Alternative.**

| Species | Current Values | | | Council's Preferred | | | NMFS' Preferred | | |
|---|---|---|---|---|---|---|---|---|---|
| | $T_{TARGET}$ | SPR Harvest Rate | 2010 OY | $T_{TARGET}$ | SPR Harvest Rate | ACL (ACT) 2011/2012 | $T_{TARGET}$ | SPR Harvest Rate | ACL (ACT) 2011/2012 |
| **Bocaccio** | 2026 | F77.7% | 288 | 2022 | No change | 263/274 | 2022 | No change | 263/274 |
| **Canary** | 2021 | F88.7% | 105 | 2027 | No change | 102/107 | 2027 | No change | 102/107 |
| **Cowcod** | 2072 | F79.0% | 4 | 2071 | No change | 4/4 | 2068 | F82.7% | 3/3 |
| **Darkblotched** | 2028 | F62.1% | 330 | 2025 | F64.9% | 298/296 | 2025 | F64.9% | 298/296 |
| **Petrale** | -- | -- | 1,200 | 2016 | F31%/ F32.4% | 976/1160 | 2016 | F31%/ F32.4% | 976/1160 |
| **POP** | 2017 | F86.4% | 200 | 2020 | No change | 180 (157)/ 183 (157) | 2020 | No change | 180 (157)/ 183 (157) |
| **Widow** | 2015 | F95.0% | 509 | 2010 | F91.7% F91.3% | 600/600 | 2010 | F91.7% F91.3% | 600/600 |
| **Yelloweye** | 2084 | F71.9% [a/] | 14 | 2084 | F72.8% | 20 (17)/ 20 (17) | 2074 | F76% | 17/ 17 |

a/ The yelloweye SPR harvest rate of F71.9% is the constant harvest rate in the current rebuilding plan that would be specified starting in 2011 after the harvest rate ramp-down strategy is completed in 2010.

**UNITED STATES DEPARTMENT OF COMMERCE**
**National Oceanic and Atmospheric Administration**
NATIONAL MARINE FISHERIES SERVICE
Sustainable Fisheries Division F/NWR2
7600 Sand Point Way N E , Bldg. 1
Seattle, WA 98115-0070

May 19, 2011

Mr. Mark Cedergreen, Chair
Pacific Fishery Management Council
7700 Ambassador Place
Portland, Oregon 97220

Dear Mr. Cedergreen:

The National Marine Fisheries Service (NMFS) notified you, via letter dated April 29, 2011, of its final decision on the groundfish harvest specifications and management measures. On April 29, 2011, we also notified the court in NRDC V Locke that the agency had complied with the court's Remedy Order.

On December 27, 2010, NMFS disapproved Amendment 16-5 to the Pacific Coast Groundfish Fishery Management Plan (FMP). Because of Magnuson-Stevens Act (MSA) requirements, anything disapproved by NMFS in Amendment 16-5 can only be implemented temporarily. Therefore, pursuant to section 305(c) of the MSA, the final rule and decision made on April 28, 2011 implemented all groundfish rebuilding plans, revisions to flatfish proxies, Annual Catch Limits (ACLs) for overfished species, and specifications for flatfish, but these measures will only be effective through 2011. Therefore, for the harvest specifications and management measures to be in effect for the entire 2011-2012 biennium, it is necessary for either the Pacific Fishery Management Council (Council) or NMFS to prepare a revised Amendment 16-5 in the next several months in order for measures to be ready for implementation on January 1, 2012.

This issue is scheduled to be addressed at the June 8-13 Council meeting in Spokane, Washington. In the event that the Council, for workload or other reasons, does not take on the task of revising and resubmitting Amendment 16-5 for applicability in 2012, NMFS is prepared to take on this task. We have developed a schedule for the preparation of a Secretarial amendment under section 304(c) of the MSA. (See attached schedule).

Although the MSA specifies the steps that must be taken in more detail, the basic steps are as follows:

1) NMFS would propose a revised Amendment with the rebuilding plans, flatfish proxies, ACLs and specifications for flatfish consistent with the measures adopted by the agency in the final rule;
2) The revised amendment would be noticed in the Federal Register in August and provided to the Council for consideration at its September meeting.
3) NMFS would conduct a public hearing during one evening of the September 2011 Council meeting.

4) NMFS anticipates that the comment period on the revised Amendment and the proposed rule would be from late August through late October 2011.
5) Final agency action would occur in late November.

In addition to the schedule for preparation of a Secretarial amendment, the applicable Sections of MSA regarding Secretarial amendments is attached for reference.

NMFS looks forward to Council discussion of these issues at the June 2011 meeting.

Sincerely,

Frank D. Lockhart
Assistant Regional Administrator

MSA sections regarding Secretarial amendments and procedures for FMP approval/disapproval
Section 304
(a) REVIEW OF PLANS.—

(1) Upon transmittal by the Council to the Secretary of a fishery management plan or plan amendment, the Secretary shall—

(A) immediately commence a review of the plan or amendment to determine whether it is consistent with the national standards, the other provisions of this Act, and any other applicable law; and

(B) immediately publish in the Federal Register a notice stating that the plan or amendment is available and that written information, views, or comments of interested persons on the plan or amendment may be submitted to the Secretary during the 60-day period beginning on the date the notice is published.

(2) In undertaking the review required under paragraph (1), the Secretary shall—

(A) take into account the information, views, and comments received from interested persons;

(B) consult with the Secretary of State with respect to foreign fishing; and

(C) consult with the Secretary of the department in which the Coast Guard is operating with respect to enforcement at sea and to fishery access adjustments referred to in section 303(a)(6).

(3) The Secretary shall approve, disapprove, or partially approve a plan or amendment within 30 days of the end of the comment period under paragraph (1) by written notice to the Council. A notice of disapproval or partial approval shall specify—

(A) the applicable law with which the plan or amendment is inconsistent;

(B) the nature of such inconsistencies; and

(C) recommendations concerning the actions that could be taken by the Council to conform such plan or amendment to the requirements of applicable law. If the Secretary does not notify a Council within 30 days of the end of the comment period of the approval, disapproval, or partial approval of a plan or amendment, then such plan or amendment shall take effect as if approved.

**(4) If the Secretary disapproves or partially approves a plan or amendment, the Council may submit a revised plan or amendment to the Secretary for review under this subsection.**

(5) For purposes of this subsection and subsection (b), the term "immediately" means on or before the 5th day after the day on which a Council transmits to the Secretary a fishery management plan, plan amendment, or proposed regulation that the Council characterizes as final.

(c) PREPARATION AND REVIEW OF SECRETARIAL PLANS.—

**(1) The Secretary may prepare a fishery management plan, with respect to any fishery, or any amendment to any such plan, in accordance with the national standards, the other provisions of this Act, and any other applicable law, if—**

(A) the appropriate Council fails to develop and submit to the Secretary, after a reasonable period of time, a fishery management plan for such fishery, or any necessary amendment to such a plan, if such fishery requires conservation and management;

**(B) the Secretary disapproves or partially disapproves any such plan or amendment, or disapproves a revised plan or amendment, and the Council involved fails to submit a revised or further revised plan or amendment;** or

(C) the Secretary is given authority to prepare such plan or amendment under this section.

In preparing any such plan or amendment, the Secretary shall consult with the Secretary of State with respect to foreign fishing and with the Secretary of the department in which the Coast Guard is operating with respect to enforcement at sea. The Secretary shall also

prepare such proposed regulations as he deems necessary or appropriate to carry out each plan or amendment prepared by him under this paragraph.

**(2) In preparing any plan or amendment under this subsection, the Secretary shall—**

**(A) conduct public hearings, at appropriate times and locations in the geographical areas concerned, so as to allow interested persons an opportunity to be heard in the preparation and amendment of the plan and any regulations implementing the plan; and (B) consult with the Secretary of State with respect to foreign fishing and with the Secretary of the department in which the Coast Guard is operating with respect to enforcement at sea.**

(3) Notwithstanding paragraph (1) for a fishery under the authority of a Council, the Secretary may not include in any fishery management plan, or any amendment to any such plan, prepared by him, a provision establishing a limited access system, including any limited access privilege program unless such system is first approved by a majority of the voting members, present and voting, of each appropriate Council.

**(4) Whenever the Secretary prepares a fishery management plan or plan amendment under this section, the Secretary shall immediately—**

**(A) for a plan or amendment for a fishery under the authority of a Council, submit such plan or amendment to the appropriate Council for consideration and comment; and**

**(B) publish in the Federal Register a notice stating that the plan or amendment is available and that written information, views, or comments of interested persons on the plan or amendment may be submitted to the Secretary during the 60-day period beginning on the date the notice is published.**

**(5) Whenever a plan or amendment is submitted under paragraph (4)(A), the appropriate Council must submit its comments and recommendations, if any, regarding the plan or amendment to the Secretary before the close of the 60-day period referred to in paragraph (4)(B). After the close of such 60-day period, the Secretary, after taking into account any such comments and recommendations, as well as any views, information, or comments submitted under paragraph (4)(B), may adopt such plan or amendment.**

**(6) The Secretary may propose regulations in the Federal Register to implement any plan or amendment prepared by the Secretary. In the case of a plan or amendment to which paragraph (4)(A) applies, such regulations shall be submitted to the Council with such plan or amendment. The comment period on proposed regulations shall be 60 days, except that the Secretary may shorten the comment period on minor revisions to existing regulations.**

**(7) The Secretary shall promulgate final regulations within 30 days after the end of the comment period under paragraph (6). The Secretary must publish in the Federal Register an explanation of any substantive differences between the proposed and final rules. All final regulations must be consistent with the fishery management plan, with the national standards and other provisions of this Act, and with any other applicable law.**

Draft schedule for 2012 specifications and revised FMP amendment under a Secretarial amendment process.

| Projected Date | SPEX MSA and RULEMAKING |
|---|---|
| August 30, 2011 | Proposed rule and NOA for FMP Amendment - publish each with 60 day comment period. Revised FMP submitted to Council for review and comment. Last day NOA and proposed rule can publish with 60 day required comment periods and make a December 30, 2011 implementation date. |
| September 14, 2011 | Public hearing hosted by NMFS sometime during September PFMC meeting |
| September 15, 2011 | |
| September 16, 2011 | |
| September 17, 2011 | |
| September 18, 2011 | |
| September 19, 2011 | |
| October 31, 2011 | Proposed rule and FMP Amendment comment period closes |
| November 30, 2011 | Final rule publishes with 30 day cooling off period |
| December 30, 2011 | Final rule effective |

# GROUNDFISH ADVISORY SUBPANEL REPORT ON GROUNDFISH AMENDMENT 16-5 AND 2012 HARVEST SPECIFICATIONS AND MANAGEMENT MEASURES

The Groundfish Advisory Subpanel (GAP) received a presentation from Mr. John DeVore on Groundfish Amendment 16-5 and 2012 harvest specifications and management measures. The GAP understands the risk of delaying implementation of Amendment 16-5 and 2012 regulations under any scenario where the Council takes action under this agenda item. The GAP maintains the original Council-preferred alternative for Amendment 16-5 better meets the needs of west coast fishing communities for all the reasons that have been provided in the past and elaborated in the April 5 Council staff letter to National Marine Fisheries Service (NMFS) (attachment 2) and therefore, prefers that alternative. However, since NMFS has already disapproved that alternative and will not likely approve it now, the GAP recommends the Council take No Action on Amendment 16-5 and that a Secretarial amendment process be followed to adopt the amendment to increase the likelihood of January 1 start date.

PFMC
06/09/11

Agenda Item E.4
Situation Summary
June 2011

# FINAL SCHEDULE FOR COMPLETING THE 2013-14 SPECIFICATIONS AND MANAGEMENT MEASURES AND CONSIDERATIONS FOR SOLVING BIENNIAL CYCLE PROCESS ISSUES

In November 2010, in response to serious, chronic problems with achieving a January 1 start to the fishery as described in the groundfish Fishery Management Plan (FMP), the Council initiated a process to 1) generate recommendations for a workable detailed process and schedule for the 2013-14 cycle and 2) investigate solutions for biennial cycle process issues, including whether an FMP amendment should be pursued. Background information on the problems and process to develop solutions can be found in the April 2011 briefing book, Agenda Item I.2. In April 2011, the Council adopted a very detailed front-loaded schedule for Council decision-making and the National Marine Fisheries Service (NMFS) review and implementation process for the 2013-14 harvest specifications and management measures, as a preliminary preferred alternative (PPA) for public review and further analysis (Attachment 1).

The primary Council action under this agenda item is to adopt a final process and schedule for developing the 2013-14 groundfish fishery specifications and management measures. In accomplishing this action, the Council will need to make a final decision on the proposal to amend Council Operating Procedure (COP) 19 from annual consideration of exempted fishing permit (EFP) applications to consideration every 2 years, aligned with the biennial decision-making process (Attachment 2). In response to a Council request from April 2011, the Groundfish Management Team provided clarification on their recommendation for a Scientific and Statistical Committee review of the conservation performance of the Council's rebuilding plans (GMT Report). The Council is also scheduled to receive a briefing on efforts to analyze the existing stock complexes (Supplemental Attachment 3), although this may not necessarily alter the PPA schedule and process, which calls for a decision on stock complex definition at the September Council meeting. In adopting a final detailed process and schedule, the intent would be that the Council and all responsible parties feel reasonably assured of its achievability.

A secondary Council action under this agenda item is to consider longer term solutions to make the biennial process more easily and reliably achievable. At its April 2011 meeting, the Council requested further analysis of a programmatic approach for completing harvest specifications, which may or may not require amending the FMP. Attachment 4 provides background on the need and potential design of a programmatic approach. The Council also recommended the advisory bodies comment on a proposed schedule to amend the FMP, if necessary. Attachment 5 shows potential schedules that begin with the November 2011 Council meeting.

**Council Action:**

1. **Consider modifying COP 19 for groundfish EFPs to align with biennial decision-making.**
2. **Adopt a final process and schedule for developing the 2013-14 groundfish harvest specifications and management measures.**
3. **Consider solutions to biennial cycle process issues, including a programmatic approach which may involve an FMP amendment.**

Reference Materials:

1. Agenda Items E.4.a, Attachment 1: Preliminary Preferred Schedule for Developing 2013-14 Groundfish Harvest Specifications and Management Measures.
2. Agenda Item E.4.a, Attachment 2: Draft Proposed Changes to Council Operating Procedure 19 for Groundfish Exempted Fishing Permits.
3. Agenda Item E.4.a, Supplemental Attachment 3: Analytical Update Regarding the Potential Reconstruction of Stock Complexes.
4. Agenda Item E.4.a, Attachment 4: Programmatic Approaches to the Groundfish Harvest Specifications National Environmental Policy Act Process.
5. Agenda Item E.4.a, Attachment 5: Possible Schedules for Groundfish Fishery Management Plan Amendment Considerations.
6. Agenda Item E.4.b, GMT Report: Groundfish Management Team Clarification on a Suggested Review of the Conservation Performance of the Council's Rebuilding Plans.

Agenda Order:

a. Agenda Item Overview — Kelly Ames
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action**: Adopt a Final Process and Schedule; Adopt Modifications to Council Operating Procedure 19 for Groundfish EFPs; Provide Further Guidance on Solutions for Biennial Cycle Management

PFMC
05/20/11

# PRELIMINARY PREFERRED SCHEDULE FOR DEVELOPING 2013-14 GROUNDFISH HARVEST SPECIFICATIONS AND MANAGEMENT MEASURES[1]

Non-italicized font in the table below represents activities associated with the Council process. Italicized font represents activities associated with the National Marine Fisheries Service (NMFS) review and implementation process, including procedures and public comment periods required by the National Environmental Policy Act (NEPA) and the Administrative Procedures Act (APA). Bold font dates represent Council meeting dates.

This schedule is premised on the preparation of an environmental impact statement (EIS), which has statutorily defined minimum time periods for public comment. If NMFS determines that an environmental assessment (EA) can be prepared, a substantially different and less constrained schedule for the NEPA process could be contemplated. Under regulations, a public comment period is not required on an EA except in certain circumstances.[2]

| Start Date | End Date | Task |
|---|---|---|
| **April 9, 2011** | **April 14, 2011** | The Council meets and adopts:<br>1. A preliminary schedule, process, and work plan for developing 2013-2014 groundfish harvest specifications and management measures for public review. Schedule includes detailed timelines for such things as Scientific and Statistical Subcommittee (SSC) meetings, Groundfish Management Team (GMT) meetings, and the NMFS Secretarial review and implementation process.<br>2. A decision whether to initiate analysis necessary to restructure the stock complexes and bring new fish into the groundfish fishery management plan (FMP) for the 2013-2014 cycle.[3]<br>3. Recommendations for long-term solutions, including whether an amendment to the groundfish FMP should be pursued.<br>4. A process to modify Council Operating Procedure 19 for exempted fishing permits (EFPs), with the goal of issuing two-year EFPs that coincide with the harvest specifications and management measures process. |

[1] As recommended by the Council in April 2011.

[2] The EA would need to be finalized so that a Finding of No Significant Impact (FONSI) can be signed before the Final Rule is published in December 2012. The NMFS determination process of whether to prepare an EA or EIS ends in this schedule on September 28, 2011. If an EIS is to be prepared, a Notice of Intent (NOI) must be published in the Federal Register.

[3] Existing stock complexes include Other Fish, Other Flatfish, and Minor Nearshore, Shelf, and Slope rockfish north and south of 40°10 N. latitude. The task of restructuring the complexes could include 1) regrouping the existing complexes based on productivity and susceptibility scores, and 2) examining existing data sources and determining whether new species should be brought into the groundfish FMP. Analysis of the Other Fish complex is anticipated since spiny dogfish, a component of the Other Fish complex, is scheduled for an assessment in the 2013-2014 cycle.

| Start Date | End Date | Task |
|---|---|---|
| April 15, 2011 | August 25, 2011 | Council staff, NMFS Northwest Region (NWR), General Counsel, NMFS NEPA Coordinator, and GMT chair develop draft framework for Magnuson-Stevens Act (MSA) and the NEPA analysis necessary to support Council decision-making.[4] Work products include guidance for the advisory bodies and a detailed outline of the anticipated EIS, and criteria for when a range of alternatives is needed for the NEPA process and Council decision-making. |
| April 25, 2011 | April 29, 2011 | Data Poor Methodologies Workshop: Review methodologies for estimating yield for unassessed species including the depletion-corrected average catch and depletion-based stock reduction analysis used for the 2011-2012 cycle (see Agenda Item B.3.a Attachment 7, June 2010), associated productivity and susceptibility assessments, and alternative methods for identifying overfishing levels (OFLs) for tier 2 and tier 3 stocks for use in the 2013-2014 cycle.[5] Three GMT members, one from each state, will attend. One Groundfish Advisory Subpanel (GAP) representative to attend. |
| June 7, 2011 | June 9, 2011 | SSC meets[6] to reach recommendations on:<br>1. Updated assessments.<br>2. Data report for cowcod.<br>3. Data poor methodologies for use in the 2013-2014 cycle. |
| **June 8, 2011** | **June 13, 2011** | The Council meets and adopts:<br>1. A final schedule, process, and work plan for developing 2013-2014 groundfish harvest specifications and management measures.<br>2. Stock assessment updates for four species: boccacio, canary rockfish, darkblotched rockfish, and yelloweye rockfish.<br>3. Data report for one species: cowcod.<br>4. Methodologies for setting harvest specifications for data poor stocks to be used in the 2013-2014 cycle.<br>5. Council briefed on EIS development process and staffing. |
| June 20, 2011 | June 24, 2011 | Stock Assessment Review (STAR) Panel (Seattle, WA): Pacific ocean perch and petrale sole. One GMT and GAP representative to attend. |
| July 11, 2011 | July 15, 2011 | STAR Panel (Seattle, WA): Widow rockfish and spiny dogfish. One GMT and GAP representative to attend. |

[4] Meetings involving Council advisory bodies will be noticed by PFMC and announced in the Federal Register.
[5] If certain criteria are met, a stock may be re-classified from tier 3 to tier 2.
[6] Dates for the SSC meetings are estimated based on past meeting schedules.

| Start Date | End Date | Task |
|---|---|---|
| | *July 15, 2011* | *To achieve the necessary frontloading, all necessary approvals will be secured to allow NMFS NWR staff, the NMFS Regional NEPA Coordinator and NOAA General Counsel (GC) to perform concurrent or expedited reviews proposed in the schedule for harvest specifications NEPA/rulemaking to be adopted by the Council.*[7] |
| | July 18, 2011 | GMT teleconference/webinar to discuss emerging issues. |
| July 25, 2011 | July 29, 2011 | STAR Panel (Newport, OR): Sablefish and Dover sole. One GMT and GAP representative to attend. |
| August 8, 2011 | August 12, 2011 | STAR Panel (Santa Cruz, CA): Greenspotted rockfish and blackgill rockfish. One GMT and GAP representative to attend. |
| September 13, 2011 | September 15, 2011 | SSC meets[8] to reach recommendations on:<br>1. OFL values.<br>2. Stock categories (i.e., tiers 1, 2, and 3).<br>3. Sigma values.<br>4. Considerations for the P* decision.<br>5. Revised or new impact assessment models.<br>6. Eight full assessments, if all are recommended by the STAR panels.<br>7. Restructured complexes, if applicable. |

[7] Current procedures now in place for necessary sequential review and written regulatory processing approvals, in combination with other regulatory processes, would not allow for the fishery to begin on January 1 of a given cycle if taken sequentially after final Council action at a June Council meeting.

[8] Dates for the SSC meetings are estimated based on past meeting schedules.

| Start Date | End Date | Task |
|---|---|---|
| **September 14, 2011** | **September 19, 2011** | The Council meets and adopts:<br>1. Stock assessments for the eight species subject to summer STAR panels.[9]<br>2. If Council chooses to restructure the stock complexes, adopt the preliminary preferred alternatives (PPA) for restructured complexes, except the Other Fish complex.[10]<br>3. Final preferred alternatives (FPA) for OFLs, as recommended by the SSC, including OFLs derived from data poor methodologies.<br>4. FPA sigma values, as recommended by the SSC.<br>5. A range of P* alternatives, including PPA P* values.<br>6. A range of acceptable biological catch (ABC) alternatives, including PPA ABC levels.<br>7. Prioritized range of new management measures for preliminary analysis.[11] |
| September 26, 2011 | September 30, 2011 | The SSC Groundfish Subcommittee meets to review rebuilding analyses prepared for overfished species as well as any stock assessments approved for further review by the Council. One GMT and GAP representative to attend. |
| | September 28, 2011 | NWR, NOAA GC, NEPA coordinator, Council staff, and GMT Chair meet to discuss the determination of the NEPA document category (EA or EIS).[12] NMFS decides on NEPA document category.[13] |
| October 3, 2011 | October 7, 2011 | The GMT meets in Seattle, Washington to approve impact projection models, review new stock assessments and rebuilding analyses. The GMT, NMFS NWR, NOAA GC, and NMFS NEPA coordinator draft a recommended integrated range of 2013-2014 harvest specifications and preliminary management measures for analysis. |
| | *October 14, 2011* | *Notice of intent to prepare an EIS filed for Federal Register publication by this date.* |

[9] Council action could be postponed from September to November for any stock assessments recommended for further review by a 2011 STAR panel and/or the SSC. I.e., those assessments the Council authorizes to be sent to the September 26-30 mop-up panel.
[10] If the spiny dogfish assessment is adopted by the Council at the September meeting, the Other Fish complex analysis will need to take the assessment results into consideration. While this could be done by simple subtraction, it is possible the Other Fish complex PPA might need to be moved to November.
[11] New management measures are those management measures that have not been analyzed or implemented in a previous cycle.
[12] Meetings involving Council advisory bodies will be noticed by PFMC and announced in the Federal Register.
[13] The balance of this schedule assumes a decision for an EIS.

| Start Date | End Date | Task |
|---|---|---|
| November 1, 2011 | November 3, 2011 | SSC meets[14] to reach recommendations on:<br>1. Rebuilding analyses.<br>2. Any stock assessments relegated to "mop-up" reconsiderations completed at the September 26-30 SSC Groundfish Subcommittee meeting. |
| **November 2, 2011** | **November 7, 2011** | The Council meets and adopts:<br>1. Rebuilding analyses and any assessments sent to the mop-up panel.<br>2. FPA for P* values.<br>3. FPA for ABC levels.<br>4. If Council chose to restructure the stock complexes, adopt FPAs for restructured complexes, including the Other Fish complex.<br>5. PPA for non-overfished species ACLs.<br>6. A range of overfished species ACLs and PPA ACLs.<br>7. A tentative range of allocation alternatives.[15]<br>8. A final set of new management measures for detailed analysis. |
| November 8, 2011 | January 31, 2012[16] | The GMT, Council staff, and analytical team develop and analyze the integrated alternatives, which are a combination of the harvest specifications and management measures. |
| November 8, 2011 | March 31, 2012 | Convene the Ad-Hoc Groundfish Allocation Committee (GAC) for a two day meeting prior to the March Council meeting some time in this interval. The GAC will consider the results of the integrated alternatives analysis and generate recommendations for Council consideration. |
| | *Late Winter – Dates to be determined* | *Draft DEIS submitted to NMFS for review from interdisciplinary project team.* |

[14] Dates for the SSC meetings are estimated based on past meeting schedules.
[15] Allocations to be reviewed for tentative adoption include both the trawl and non-trawl allocations as well as the within non-trawl apportionments and accountability measures (e.g., recreational harvest guidelines). Specifically, this includes two-year allocation alternatives for species not allocated under Amendment 21: bocaccio, canary, cowcod, and yelloweye and non-overfished species allocations (e.g., black rockfish in Oregon and California).
[16] February 17, 2012 is the estimated briefing book deadline for the March Council meeting in 2012.

| Start Date | End Date | Task |
|---|---|---|
| *Late winter – Dates to be determined* | *Early spring – Dates to be determined* | • *Concurrent Sustainable Fisheries Division and Regional NEPA Coordinator review of draft DEIS*<br>• *EIS project team addresses comments*<br>• *GC review of DEIS*<br>• *EIS project team addresses comments* |
| **March 2, 2012** | **March 12, 2012** | At the March Council meeting, the Council and advisory bodies receive an informational briefing on the selected results of the integrated alternatives. |
| November 8, 2011 | March 31, 2012 | Opportunity for state and tribal agencies to hold constituent meetings to obtain input on final harvest specifications and preliminary management measures. |
| | March 23, 2012[17] | Preliminary DEIS submitted for the April Council meeting advance briefing book. |
| **April 1, 2012** | **April 6, 2012** | The Council meets and adopts:<br>1. FPA non-overfished species ACLs.<br>2. FPA overfished species ACLs.<br>3. PPA management measures from the range adopted at the November Council meeting.[18]<br>4. PPA allocations. |
| April 7, 2012 | May 31, 2012[19] | Council staff, GMT, and analytical team validate and refine analysis, consequent to the April Council meeting actions, as necessary. |
| *April 24, 2012* | *May 4, 2012* | • *NOAA Office of Planning and Policy Integration (PPI) review of draft DEIS*<br>• *EIS project Team addresses comments and prepares DEIS for public release*<br>• *NWR Clearance of DEIS*<br>• *PPI Clearance of DEIS* |
| *May 7, 2012* | *May 11, 2012* | • *Prepare DEIS package*<br>• *File DEIS with Environmental Protection Agency* |
| | *May 18, 2012* | *EPA publishes Notice of Availability starting 45-day public comment period on DEIS[20].* |

[17] March 23, 2012 is the estimated briefing book deadline for the April Council meeting in 2012.
[18] Additional management measures that require limited analysis could be added, if necessary. Complex management measures considered only under emergency situations. Complex management measures could be added in April; however, the January 1 fishery start date may be compromised.
[19] Estimated briefing book deadline for March 2012.
[20] If an EA is prepared, this comment period is not required.

| Start Date | End Date | Task |
|---|---|---|
| **June 20, 2012** | **June 25, 2012** | The Council meets and adopts:<br>1. Corrections to the FPA harvest specifications, if needed.<br>2. FPA allocations.<br>3. FPA management measures. |
| July 9, 2012 | July 13, 2012 | The GMT meets to finalize analysis of the Council's FPA for the FEIS. |
| *July 9, 2012* | *August 5, 2012* | • *NWR initiates iterative process by sending draft regulations to Council staff and GMT for review.*<br>• *Council and NMFS staffs reach consensus on draft regulation language. Council staff & GMT send draft regulations comments to NWR.*<br>• *NWR provides Council staff with near complete regulations text for deeming.* |
| | *July 2, 2012* | *45-day NEPA public comment period on DEIS ends.* |
| *August 5, 2012* | *August 26, 2012* | • *NWR sends draft proposed rule package to GC, Issues Advisory to headquarters (HQ)*<br>• *NWR sends draft proposed rule to Edits Unit for review*<br>• *NWR makes Edits Unit changes and sends draft proposed rule package to HQ (excluding the FMP Amendment)* |
| | *August 24, 2012* | • *Council staff provides draft FMP language to NWR, if necessary*<br>• *GC & Sustainable Fisheries Division simultaneous review of FMP language*<br>• *Draft FMP language is sent to HQ*<br>• *NWR & Council staff reach consensus on rule and FMP language* |
| | *August 30, 2012* | *Council Executive Director transmits final FMP recommendation (if necessary) and final regulations deemed necessary and appropriate for 2013-14 groundfish fisheries.* |
| *July 3, 2012* | *August 24, 2012* | *Prepare FEIS:*<br>• *EIS project team organizes public comments and revises DEIS based on public comments and final action by the Council, and prepares draft FEIS*<br>• *NWR SFD staff, Regional NEPA Coordinator, and GC conduct concurrent and expedited reviews of draft FEIS*<br>• *EIS project team addresses comments*<br>• *PPI review of draft FEIS*[21]<br>• *EIS project team addresses comments and prepares draft FEIS for public release*<br>• *NWR clearance of draft FEIS*<br>• *PPI clearance of draft* |

[21] NMFS will have needed to secure expedited review and clearance processes agreement with PPI well in advance.

| Start Date | End Date | Task |
|---|---|---|
| *August 27, 2012* | *August 31, 2012* | • *Prepare and send FEIS package to EPA (will need to overnight FEIS or request HQ to hand deliver FEIS)*<br>• *File FEIS with EPA* |
| | *September 7, 2012* | *EPA publishes FEIS NOA.* |
| *August 31, 2012* | *September 30, 2012* | *Proposed rule publishes, 30-day proposed rule public comment period required by APA ends.* |
| *October 1, 2012* | *November 13, 2012* | *Preparation of Final Rule under APA:*<br>• *SFD drafts final rule and sends package to GC for review*<br>• *GC completes review and sends to SFD*<br>• *SFD completes revisions and sends to Edits Unit*<br>• *SFD completes Edits Unit changes and sends package to HQ* |
| | *October 8, 2012* | *30 day NEPA cooling off period for FEIS.* |
| *October 8, 2012* | *November 13, 2012* | *NMFS prepares Record of Decision:*<br>• *Review any comments received during 30 day cooling off period and prepare draft record of decision (ROD).*<br>• *Finalize draft ROD*<br>• *NWR SFD staff, Regional NEPA Coordinator, and GC conduct concurrent and expedited reviews of draft ROD*<br>• *Project team addresses comments*<br>• *NWR clearance of draft ROD*<br>• *Draft ROD submitted to HQ for review*<br>• *HQ signs ROD (must be submitted with final rule package)* |
| | *December 2, 2012* | *Final Rule Publishes under the APA.* |
| | *January 1, 2013* | *30-day cooling off period required by APA ends; FMP amendment and regulations effective and groundfish fishery begins under new regulations.* |

19

# COUNCIL OPERATING PROCEDURE

**Protocol for Consideration of Exempted Fishing Permits for Groundfish Fisheries**

Approved by Council: ~~09/10/03~~MM/DD/YY
Reviewed: ~~03/11/05~~MM/DD/YY

## DEFINITION

An exempted fishing permit (EFP) is a federal permit, issued by the National Marine Fisheries Service, which authorizes a vessel to engage in an activity that is otherwise prohibited by the Magnuson-Stevens Fishery Conservation and Management Act or other fishery regulations for the purpose of collecting limited experimental data. EFPs can be issued to federal or state agencies, marine fish commissions, or other entities, including individuals. An EFP applicant need not be the owner or operator of the vessel(s) for which the EFP is requested.

## PURPOSE

The specific objectives of a proposed exempted fishery may vary. The Pacific Fishery Management Council's (Council) fishery management plan (FMP) for West Coast groundfish stocks provides for EFPs to promote increased utilization of underutilized species, realize the expansion potential of the domestic groundfish fishery, and increase the harvest efficiency of the fishery consistent with the Magnuson-Stevens Act and the management goals of the FMP. However, EFPs are commonly used to explore ways to reduce effort on depressed stocks, encourage innovation and efficiency in the fisheries, provide access to constrained stocks while directly measuring the bycatch associated with those fishing strategies, and to evaluate current and proposed management measures.

The Council process for considering and recommending groundfish EFP proposals is a biennial one that is synchronized with the decision-making process for considering new biennial groundfish harvest specifications and management measures. Approved EFP activities may continue for one or both years of the biennial management cycle. The Council's EFP process begins at the November meeting in odd-numbered years when alternatives for biennial harvest specifications and management measures are decided for detailed analysis. The Council also decides preliminary preferred yield set-asides for overfished and non-overfished species at this November meeting, including the yields necessary to conduct EFPs. Therefore, EFP applications for the following two-year management cycle are first considered at this November meeting. Any EFP proposals recommended for further consideration are given final consideration at the June meeting in even-numbered years, when final harvest specifications and management measures are decided. The Council may task the Scientific and Statistical Committee (SSC) or other advisors to do a more thorough review of refined EFP proposals that

are recommended in November, prior to the June Council meeting, when EFPs are given final consideration. Those EFPs recommended at the June Council meeting are forwarded to NMFS for implementation in the next biennial management cycle.

PROTOCOL

A, Submission

1. The Pacific Fishery Management Council and its advisory bodies [Groundfish Management Team (GMT), Groundfish Advisory Subpanel (GAP), and ~~Scientific and Statistical Committee (~~SSC~~)~~] should review EFP proposals prior to issuance; the advisory bodies may provide comments on methodology and relevance to management data needs, and make recommendations to the Council accordingly. The public may also comment on EFP proposals.

2. Completed applications for EFPs from individuals or non-government agencies, for Council consideration, must be received by the Council for review, at least two weeks prior to the ~~June~~ November Council meeting in odd-numbered years.

3. Applications for EFPs from federal or state agencies must meet the briefing book deadline for the ~~June~~ November Council meeting in odd-numbered years.

B. Proposal Contents

1. EFP proposals must contain sufficient information for the Council to determine:

   a. There is adequate justification for an exemption to the regulations.

   b. The potential impacts of the exempted activity have been adequately identified.

   c. The exempted activity would be expected to provide information useful to management and use of groundfish fishery resources.

2. Applicants must submit a completed application in writing that includes, but is not limited to, the following information:

   a. Date of application.

   b. Applicant's names, mailing addresses, and telephone numbers.

   c. A statement of the purpose and goals of the experiment for which an EFP is needed, including a general description of the arrangements for the disposition of all species harvested under the EFP.

   d. Valid justification explaining why issuance of an EFP is warranted.

e. A statement of whether the proposed experimental fishing has broader significance than the applicant's individual goals.

f. An expected total duration of the EFP (i.e., number of years proposed to conduct exempted fishing activities). Note that EFPs are considered every other year for the following two-year management cycle. However, the EFP can be developed to cover only one year of the two-year cycle.

g. Number of vessels covered under the EFP.

h. A description of the species (target and incidental) to be harvested under the EFP and the amount(s) of such harvest necessary to conduct the experiment; this description should include harvest estimates of overfished species.

i. A description of a mechanism, such as at-sea fishery monitoring, to ensure that the harvest limits for targeted and incidental species are not exceeded and are accurately accounted.

j. A description of the proposed data collection and analysis methodology.

k. A description of how vessels will be chosen to participate in the EFP.

l. For each vessel covered by the EFP, the approximate time(s) and place(s) fishing will take place, and the type, size, and amount of gear to be used.

m. The signature of the applicant.

n. The GMT, GAP, SSC, and/or Council may request additional information necessary for their consideration.

C. Review and Approval

1. The GMT and SSC will review EFP proposals in ~~June~~ November of odd-numbered years and make recommendations to the Council for action; the Council will consider those proposals for preliminary action. Final action on EFPs will occur at the ~~November~~ June Council meeting in even-numbered years. Only those EFP applications that were considered in ~~June~~ November may be considered ~~in November~~the following June; EFP applications received after the ~~June~~ November Council meeting for the following ~~calendar year~~two-year management cycle will not be considered.

2. EFP proposals must contain a mechanism, such as at-sea fishery monitoring, to ensure that the harvest limits for targeted and incidental species are not exceeded and are accurately accounted. Also, EFP proposals must include a description of the proposed data collection and analysis methodology used to measure whether the EFP objectives will be met.

3. The Council will give priority consideration to those EFP applications that:

    a. Emphasize resource conservation and management with a focus on bycatch reduction (highest priority).

    b. Encourage full retention of fishery mortalities.

    c. Involve data collection on fisheries stocks and/or habitat.

    d. Encourage innovative gear modifications and fishing strategies to reduce bycatch.

    e. Encourage the development of new market opportunities.

    f. Explore the use of higher trip limits or other incentives to increase utilization of underutilized species while reducing bycatch of non-target species.

4. The GMT review will consider the following questions:

    a. Is the application complete?

    b. Is the EFP proposal consistent with the goals and objectives of the West Coast Groundfish FMP?

    c. Does the EFP account for fishery mortalities, by species?

    d. Are the harvest estimates of overfished species within the amounts set aside for EFP activities?

    e. Does the EFP meet one or more of the Council's priorities listed above?

    f. Is the EFP proposal compatible with the federal observer program effort?

    g. What infrastructure is in place to monitor, process data, and administer the EFP?

    h. How will achievement of the EFP objectives be measured?

    i. Is the data ready to be applied? If so, should it be used, or rejected? If not, when will sufficient data be collected to determine whether the data can be applied?

    j. What are the benefits to the fisheries management process to continue an EFP that began during the previous ~~year~~management cycle?

k. If the EFP proposes to integrate~~ing~~ the data into management, what is the appropriate process?

l. What is the funding source for at-sea monitoring?

m. Has there been coordination with appropriate state and federal enforcement, management, and science staff?

5. SSC Review:

a. All EFP applications should first be evaluated by the GMT for consistency with the goals and objectives of the groundfish FMP and the Council's strategic plan for groundfish.

b. When a proposal is submitted to the GMT that includes a significant scientific component that would benefit from SSC review, the GMT can refer the application to the SSC groundfish subcommittee for comment. Those EFPs recommended at the November meeting that are also recommended for an SSC review, can be reviewed at the March, April, and/or June SSC meetings during even-numbered years prior to a final Council decision on the EFP in June of even-numbered years.

c. In such instances, the groundfish subcommittee will evaluate the scientific merits of the application and will specifically evaluate the application's:~~;~~ a) problem statement, b) data collection methodology, c) proposed analytical and statistical treatment of the data, and d) the generality of the inferences that could be drawn from the study. The SSC groundfish subcommittee's evaluation shall be presented to the full SSC for review and comment.

d. EFP proposals can be deferred to allow adequate time for SSC review.

D. Other considerations:

1. EFP candidates or participants may be denied future EFP permits under the following circumstances:

a. If the applicant/participant (fisher/processor) has violated past EFP provisions; or has been convicted of a crime related to commercial fishing regulations punishable by a maximum penalty range exceeding $1,000 within the last three years; or within the last three years assessed a civil penalty related to violations of commercial fishing regulations in an amount greater than $5,000; or, has been convicted of any violation involving the falsification of fish receiving tickets including, but not limited to, mis-reporting or under-reporting of groundfish. Documented fish receiving tickets indicating mis-reporting or under-reporting of groundfish will not qualify for

consideration when fish reporting documents are used as part of the qualifying criteria for EFPs.

E. Report Contents

1. The EFP applicant must present a preliminary report on the results of the EFP and the data collected (including catch data) to the GMT at the ~~April~~ November Council meeting of the odd-numbered year during the management cycle in which the EFP activity was conducted. The report should provide the EFP catch of species made to date and announce the sponsor's intent to continue the EFP activity in the second year of the management cycle (assuming the approved EFP activity was scheduled for a two-year duration). If the EFP was scheduled for two years and the EFP sponsors announce their intent to terminate the EFP early, the Council can recommend a release of EFP yield set-asides for other uses.

2. A final written report on the results of the EFP and the data collected must be presented to the GMT, SSC, and the Council at the September Council meeting of the year following the management cycle in which the EFP activity was conducted.

3. The final report should include:

    a. A summary of the work completed.

    b. An analysis of the data collected.

    c. Conclusions and/or recommendations.

4. Timely presentation of results is required to determine whether future EFPs will be recommended.

# PROGRAMMATIC APPROACHES TO THE GROUNDFISH HARVEST SPECIFICATIONS NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) PROCESS

A PFMC Staff White Paper

## Introduction

In their report (Agenda Item I.2.b, PIC Report, April 2011) the Groundfish Process Improvement Committee (PIC) recommended that the Council consider a "NEPA tiered" approach for future groundfish harvest specifications cycles as a way to address current problems frustrating timely implementation of regulations. The concept of "tiering" is usually linked to preparation of a programmatic environmental impact statement (EIS). The PIC Report briefly describes how such a tiered approach could be applied to the harvest specifications process:

> A Tier 1 ("programmatic") EIS would evaluate management policies applicable for multiple (2 or 3) biennial cycles plus harvest specifications for the first of these cycles. This policy evaluation would include a long-term strategic view of rebuilding plans. For the subsequent cycles (either one or two), a more streamlined Tier 2 Environmental Assessment or EIS could be prepared that evaluates adjustments to harvest specifications consistent with the policy framework evaluated in the Tier 1 document. Under this approach the Council would periodically adjust management measures "inseason" consistent with policies adopted in the Tier 1 document.

The PIC presented this recommendation is in the context of developing a fishery management plan (FMP) amendment as part of a long-term solution to process problems.

The PIC Report did not, however, get into the specifics, in part because there are various conceptions of what the problem is and how it may be addressed. This paper tries to succinctly state the root causes of the current process problems in relation to a programmatic EIS, tiering subsequent NEPA documents, and how this might relate to preparation of an FMP amendment.

## Why the Current Process Doesn't Work

The groundfish harvest specifications process invokes at least two, and usually three, statutorily mandated timelines found in NEPA, the Administrative Procedures Act (for promulgating regulations), and the Magnuson-Stevens Act (MSA) if an FMP amendment is required. The PIC explored at length the intricacies in the timing of these three processes and they won't be detailed here. Briefly, NEPA is the umbrella process, in part because the agency must make its finding under NEPA before it can conclude any of the other statutory processes.[1] Although CEQ regulations identify a minimum time period for the EIS process of 90 days between when the notice for the draft EIS (DEIS) is published and the record of decision is signed (40 CFR

[1] In the case of an EIS the finding is called a record of decision, or ROD, and in the case of an environmental assessment it is called a finding of no significant impact, or FONSI.

1506.10(b)), in practice the process takes considerably longer, first, because of the time needed to scope and prepare the DEIS, and second, because of the time needed by the agency to review and ensure the legal sufficiency of the document before filing it with the Environmental Protection Agency. To get an idea of how much time is actually needed one need look no further than the proposed process and schedule under consideration by the Council for the 2013-14 harvest specifications (Agenda Item E.4.a, Attachment 1, June 2011). The process can be generalized as follows:

| Task | Days | Percent of Total |
|---|---|---|
| Scoping and preparatory work on EIS analyses, etc. (August - November 2011) | 89 | 18% |
| Initial writing of the DEIS (November 2011 - January 2012) | 85 | 17% |
| Internal review and revision of the DEIS document for adequacy and legal sufficiency, clearance and filing (January - May 2012) | 101 | 20% |
| Public comment period on the DEIS (May - June 2012) | 45 | 9% |
| Organizing and responding to comments, preparing the FEIS (July - August 2012) | 28 | 6% |
| Internal review of the FEIS for adequacy and legal sufficiency, clearance and filing (August - September 2012) | 32 | 6% |
| Cooling off period, writing and signing the record of decision (September - November 2012) | 82 | 16% |
| Interval from ROD signing to effective date of regulations (November – January 1, 2013)* | 41 | 8% |
| Total | 503 | 100% |

*Not part of the NEPA process but reflects final stage in harvest specifications implementation.

These figures reflect the higher standard of internal review that NMFS has decided necessary when preparing an EIS. Overall, the process takes about 17 months. Of course this presents a problem, because Council decision-making, as described in the FMP, culminates in June of the year preceding implementation. It is therefore impossible to circulate the DEIS after Council action is concluded since there are only 190 days between the end of the June 2012 Council meeting and the date upon which regulations need to be in place. Even if the scoping and some of the EIS preparation were to occur before the June Council meeting (which has been the practice in past cycles) the amount of time available after the June Council meeting is less than half that required.

For the 2013-14 biennial cycle the solution is to release the DEIS before the June 2012 meeting without identifying a preferred alternative (i.e., a description of the Council's final action or recommendation for the purpose of the EIS analysis). At this point it is unclear how much this approach may constrain the Council's choice of a preferred alternative that differs from those alternatives evaluated in the DEIS. By the same token, earlier release requires the Council to make a lot of decisions at their September and November 2011 meetings so that an adequate range of alternatives can be identified for the DEIS analysis. Even with this "frontloading" the amount of time to do the analysis and prepare a substantially completed DEIS (the interval between November 2011 and January 2012) is pretty limited. For all these reasons, it is not assured that the approach for this next harvest specifications cycle is a durable one.

## Preparing an Environmental Assessment Could Shorten the Process

Many of these problems with the process would go away if an environmental assessment (EA) was prepared instated of an EIS. In terms of process, no public comment period on an EA is required nor must the comments be responded to in the way described at 40 CFR 1503 (although an agency may establish a comment period and take comments into consideration when preparing an EA if desired). This means that the EA only needs to be finalized so that a FONSI may be signed before the agency takes action (which in the case of harvest specifications is marked by the publication of the final rule). Considering the time periods for an EIS described above, signing the FONSI would correspond to the date on which the ROD would be signed in a process involving an EIS. Assuming that a FONSI would need to be signed in mid-November, this allows about 150 days from the end of the June Council meeting to prepare an EA. Of course, little is gained if the time needed for preparation and review of the document is no less than that required for an EIS. (Based on the time intervals outlined above, even without the public comment period and the need to prepare both a draft and final document, more than 150 days is required for preparation and internal review.) However, in addition to the less onerous procedural requirements, an EA is typically considered a briefer, simpler analysis than an EIS.[2] One would expect that the agency's internal review expectations would be similarly shortened.

The fact that an EA is usually shorter than an EIS and presents fewer process constraints raises the question *Why not prepare an EA for the harvest specifications?* The likelihood of "significant impacts" is a key test in NEPA and distinguishes an EA from an EIS. If an EA is prepared the agency must either make a finding of no significant impact or go on to prepare an EIS. (In practice, agencies typically make this decision *a priori* based on prior experience with actions similar to the one under review.) So what is it about the harvest specifications decision that has required six EISs to be prepared since 2003—six EISs that have evaluated very similar actions and impacts? There isn't a straightforward answer to this question. Controversy is sometimes mentioned, particularly since harvest specifications have been subject to litigation.[3] Proceeding directly to an EIS removes one potential avenue for complaint (that there will be significant impacts even though the agency found there would be none). But this assumes that the agency cannot support a FONSI and does not address the underlying question of whether harvest specifications generate significant impacts. An underlying problem is that the EISs prepared to date do not clearly articulate what would constitute a significant impact (overfishing? a change in ex-vessel revenue of some defined magnitude? harm to protected species sufficient to trigger a section 7 consultation?) or how the impacts of the action exceed a threshold that makes them significant. To be clear, this does not necessarily mean that the harvest specifications have not, or will not, engender significant impacts, only that the documentation thus far does not make it easy to elucidate this fundamental NEPA question.

Going forward, then, there needs to be a more substantive and specific identification of what constitutes a significant impact. While there is a natural tendency to avoid the conclusion that an

[2] CEQ regulations say an EA should "Briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact" (40 CFR 1508).

[3] Controversy is a factor in assessing significant impacts, 40 CFR 1508.27(b)(4), although by itself controversy may not be a reason to conclude that an action will have significant impacts. Also, in this context controversy refers specifically to matters of scientific methods and related policy, not to controversy that arises because members of the public simply oppose the action.

action is likely to cause significant impacts, by not defining them it is not possible to determine when an action may *not* result in significant impacts. And it is only by such a demonstration that a FONSI can be reached and an EA prepared.

**Why Use a "Tiered" Process?**

The introduction, above, references the PIC recommendation to examine "NEPA tiering" as a long-term solution. The terminology and methods for tiering environmental documents are founded on CEQ NEPA regulations, which state:

> "Tiering" refers to the coverage of general matters in broader environmental impact statements (such as national program or policy statements) with subsequent narrower statements or environmental analyses (such as regional or basinwide program statements or ultimately site-specific statements) incorporating by reference the general discussions and concentrating solely on the issues specific to the statement subsequently prepared. Tiering is appropriate when the sequence of statements or analyses is:
>
> (a) From a program, plan, or policy environmental impact statement to a program, plan, or policy statement or analysis of lesser scope or to a site- specific statement or analysis.
>
> (b) From an environmental impact statement on a specific action at an early stage (such as need and site selection) to a supplement (which is preferred) or a subsequent statement or analysis at a later stage (such as environmental mitigation). Tiering in such cases is appropriate when it helps the lead agency to focus on the issues which are ripe for decision and exclude from consideration issues already decided or not yet ripe.
>
> (40 CFR 1508.28)

A fishery management plan (FMP) is a "plan" that articulates a policy framework and related decision processes that are then periodically implemented through regulations, which is a "program." Given that 'program or policy statements' developed by fishery management councils are a central tenet in the Magnuson-Stevens Act, it seems natural to consider how tiering could be used in the fishery management process.

With respect to harvest specifications tiering could serve several purposes. First, as suggested in the PIC recommendation, it could establish a framework to evaluate whether subsequent actions are likely to cause significant impacts. In this way it can help decision-makers avoid proposing actions with significant impacts or include sufficient mitigation measures in the proposal to reduce the intensity of impacts below the significance threshold. Second, a Tier 1 (programmatic) document that considers actions over a long time period could more effectively assess impacts, particularly cumulative impacts.[4] Finally, to the degree that the Tier 1 document

[4] An "…overview or area-wide EIS would serve as a valuable and necessary analysis of the affected environment and the potential cumulative impacts of the reasonably foreseeable actions under that program or within that geographical area" (*Forty Most Asked Questions Concerning CEQ's Regulations*, Question, 24b, EPA).

adequately covers the description of the affected environment and evaluation of impacts it reduces the length and complexity of subsequent Tier 2 documents.[5]

All of these purposes ultimately need to facilitate a shortened process for several harvest specifications cycles. Ideally, by defining the "sideboards" of actions resulting in significant impacts it would allow the preparation of EAs as long as subsequent decisions avoid actions with significant impacts. Alternatively, a supplemental EIS only evaluating the current action (within the context of the range of alternatives in the Tier 1 EIS) could be prepared (as recommended at 40 CFR 1508.28(b), above). Even if the Tier 2 document must be an EIS it could be narrower in scope, length, and complexity. Of course, in addition to the document itself, tiering would need to address the internal review requirement imposed by the agency. A shorter document could be accompanied by shorter review time; in addition, the agency could consider adjusting the review of subsequent environmental analyses based on whether the effects of the proposed action fall within previously established sideboards.

## Implementing a Tiered Process for the Groundfish Harvest Specifications

The guidance in CEQ regulations, quoted above, suggests two approaches that could be used for groundfish harvest specifications. One option is to combine an FMP amendment with a programmatic EIS, which would evaluate (and more clearly articulate) the policy framework under which harvest specifications are developed, especially with regard to rebuilding overfished species (per paragraph (a) above). A second option is to use the harvest specifications EIS for an initial biennial period as the Tier 1 document with Tier 2 environmental analyses prepared for two or more subsequent biennial cycles (per paragraph (b) above). Both of these approaches have advantages and related disadvantages:

| Tier 1 Document and FMP Amendment | Tier 1 Harvest Specifications Document |
|---|---|
| Allows consideration of general effects and policy framework separately from actually setting harvest specifications, separating policy from action-specific considerations. | Reduces the number of documents prepared and related processes. Could be more time efficient. |
| FMP amendment is the best vehicle for establishing a policy framework and, potentially, relating it to an assessment of what constitutes significant impacts in the NEPA context. | Allows greater flexibility in subsequent decisions because any policy framework could be changed without an FMP amendment. |

Given that harvest specifications must be established every 2 years and the current process takes about 17 months it will be a challenge to "step back" and employ a tiered approach under either scenario. An FMP amendment will require sustained and careful attention on the part of the Council; it may be difficult to even begin fully focusing on an amendment until the upcoming harvest specifications decision-making is complete in June 2012. In addition, work on the

[5] "Tiering is a procedure which allows an agency to avoid duplication of paperwork through the incorporation by reference of the general discussion and relevant specific discussions from an environmental impact statement of broader scope into one of lesser scope or vice versa" (*Forty Questions*, 24c).

amendment would need to be completed 12-16 months before the decision-making for the first tiered harvest specifications cycle begins so that the NEPA and FMP processes could be completed through to implementation. More concretely, if the Council finished action on an FMP amendment in June 2013, for example, the amendment might not be implemented until June 2014 when the Council would be slated to take final action on 2015-16 harvest specifications. Thus it may not be until the 2017-18 cycle that such an approach could be fully operational.

Using a future harvest specifications EIS as a Tier 1 document would "reduce the amount of paperwork" because a NEPA process separate from harvest specifications would be unnecessary. However, in terms of the timing of effective implementation (when a Tier 2 harvest specifications document could be prepared) the effect might be much the same. At this stage it seems unlikely that the 2013-14 harvest specifications EIS could be developed as a Tier 1 "programmatic" document, because there already appears to be insufficient time to consider broader questions of policy as part of this process. Thus, it would be the 2015-16 harvest specifications that would have to be set up as the Tier 1 document with the first Tier 2 document prepared for the 2017-18 cycle, as with the FMP amendment approach.

# POSSIBLE SCHEDULES FOR GROUNFISH FISHERY MANAGEMENT PLAN AMENDMENT CONSIDERATIONS

This report outlines potential development schedules if the Council decides that an amendment to the groundfish fishery management plan (FMP) is needed to address process issues for the groundfish harvest specifications. Council Operating Procedures 11 outlines a minimum of three Council meetings to adopt an FMP amendment. Depending on the level of National Environmental Policy Act analysis required (environmental impact statement or assessment), between 6 and 12 months is needed after Council final action for the amendment and any associated regulations to become effective. The schedule below outlines potential timelines for such an amendment. Option 1 outlines the potential for a four-meeting process, assuming a more complex amendment consideration, while Option 2 outlines a three-meeting process. The objective is to have the amendment implemented in time to be used for the 2015-16 harvest specifications decision-making process, which could begin as early as the September 2013 Council meeting.

| **Council Meeting** | **Option 1** | **Option 2** |
|---|---|---|
| November 2011 | 1st Council meeting | |
| March 2012 | 2nd Council meeting | 1st Council meeting |
| April 2012 | | |
| June 2012 | 3rd Council meeting | 2nd Council meeting |
| September 2012 | Possible 4th Council meeting | 3rd Council meeting |
| November 2012 | | |
| March 2013 | | |
| April 2013 | | |
| June 2013 | | |
| September 2013 | Amendment implemented | Amendment implemented |

PFMC
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# COUNCIL STAFF AND NATIONAL MARINE FISHERIES SERVICE PROJECT TEAM REPORT ON THE SCHEDULE FOR 2013-14 HARVEST SPECIFICATIONS AND MANAGEMENT MEASURES

Members of the project team primarily responsible for producing and compiling the National Environmental Policy Act (NEPA) analysis and implementing regulations for the 2013-14 harvest specifications and management measures met in Seattle May 23-25. The project team includes staff from the Council, National Marine Fisheries Service (NMFS) Northwest Region (NWR), National Oceanic and Atmospheric Administration (NOAA) General Counsel, and the NMFS NWR NEPA Coordinator. The team provides the following comments regarding the Council's preliminary preferred schedule in Agenda Item E.4.a, Attachment 1.

1. Attachment 1 assumes development of an Environmental Impact Statement (EIS) for the 2013-14 harvest specifications and management measures, given the history of previous biennial actions. If NMFS determines that an Environmental Assessment can be prepared, a shorter schedule may be possible. The determination of the appropriate NEPA document is scheduled to occur by September 28, 2011, in time for discussions at the November 2011 Council meeting.

   If it is determined that an EIS is required, there is a very significant risk (likely greater than 50 percent) that the new harvest specifications and management measures would not be effective by January 1, 2013. The likelihood of meeting January 1, 2013 under an EA scenario is also uncertain, though more likely than under an EIS schedule.

   In April 2011, the groundfish Process Improvement Committee highlighted challenges of previous biennial cycles and noted that the NMFS and NOAA internal review period has been significantly lengthened since the implementation of biennial management under Amendment 17. Final action is scheduled in June (even years) with a fishery start date of January 1; however, NMFS staff indicated 7 to 14 months is a more realistic time frame for preparation, internal review, and implementation of an EIS. While the proposed 2013-14 schedule promotes front-loading for success, the need for a longer NMFS and NOAA review period cannot be fully realized given the existing framework.

   The proposed 2013-14 schedule relies on front-loading of necessary Council decisions, analysis and preparation of the draft EIS, and NMFS review and implementation. The project team identified further potential complications in each of these overarching steps that make the January 1 fishery start date highly unlikely.
   a. Complexities arising from the stock assessments and rebuilding analyses could delay Council decision-making for harvest specifications and management measures that are currently scheduled for action in September and November 2011. Council action during these meetings is essential for conducting meaningful analysis over winter to support publishing a draft EIS in May 2012.

b. The Council's final preferred alternatives for harvest specifications and management measures selected in June 2012 must be within the range analyzed in the draft EIS published in May 2012. Significant changes would require the draft EIS to be re-released or supplemented, further lengthening the schedule and threatening the January 1 fishery start date.
c. There is limited time for Groundfish Management Team (GMT) analysis of the integrated alternatives and Northwest Fisheries Science Center economic analysis, two processes that must be done sequentially. Further, there is a compressed timeline for GMT analysis of new management measures.
d. Given the expected length and complexity of the EIS, the proposed schedule for the NMFS NEPA, NWR, and General Counsel sequential review is likely insufficient.
e. The schedule assumes expedited review and clearance at the NOAA NEPA level (office) which can be requested, but not assured.
f. The required review periods, response to comments, and time necessary for cooling off periods (time between availability and decision dates) is likely inadequate.
g. The proposed schedule is longer and assigns more internal review time than any previous biennial management schedule; its success also depends on nothing happening that might delay any of the sequential deadlines.

2. The project team recommends adopting the Council process displayed in Attachment 1 (non-italicized font) and postponing the adoption of the schedule for NMFS review and implementation (italicized font) until the November 2011 Council meeting, when the type of NEPA document has been decided by NMFS (EIS or EA), and the project team has a sense of what progress has been made completing the work associated with the harvest specifications and management measures.

3. The Council may want to consider reducing the scope and number of management considerations for 2013-14 to reduce complexity and increase the likelihood of on-time implementation. The scope of action would be best determined at the November 2011 meeting, when the Council adopts the harvest specifications and new management measures for analysis.

4. Under current regulations, a delay in implementing the 2013-14 harvest specifications would impact the annual issuance of quota pounds for the rationalized shorebased fishery and, depending on the length of the delay, the mothership and catcher-processor allocations. Under Agenda Item E.6, the Council will consider a process for providing interim allocations under the shorebased IFQ program in the event future harvest specifications are delayed (see Agenda Item E.6.b, Supplemental NMFS Report, page 14). The framework is proposed for the Program Improvements and Enhancement Rule, which is scheduled for implementation by January 1, 2012.

Finally, the project team fully supports continued exploration for long term solutions to biennial cycle challenges.

# REPORT ON THE INTENDED ANALYSIS IN CONSIDERATION FOR RESTRUCTURING GROUNDFISH STOCK COMPLEXES

This report was prepared by a working group of Groundfish Management Team (GMT) members and Council staff charged with providing an analysis in consideration for restructuring groundfish stock complexes. The conceptual approach for doing this analysis is provided below. In April, the Council requested that as much of the analysis be brought forward as possible to help plan the 2013-14 schedule. The team is planning a thorough examination of all the groundfish stock complexes under the revised National Standard 1 guidelines as soon as necessary for implementation in the 2013-14 management cycle.[1] This working group made progress but was not able to complete a preliminary analysis in time for this meeting. As discussed in the GMT report, the working group expects to produce the analysis for publication in the September Briefing Book and full comment and consideration by the Science and Statistical Committee, the Groundfish Advisory Subpanel, and the Council.

The working group notes the analyses provided in past GMT statements and the Final 2011-12 Specifications Environmental Impact Statement (EIS) as setting out the basic methodological approach that will be produced for the September meeting. These analyses have focused on the risks inherent with managing stocks within a complex and methods for evaluating the extent to which the risks might exist in the Groundfish Fishery Management Plan (FMP). Stock complex management works if stocks are caught in proportion to their component harvest specifications (overfishing limits [OFLs] and acceptable biological catch [ABC]). If stocks are not caught in such proportions, then it is possible that the catch of certain component species could exceed their respective OFL/ABCs, even when catch is kept within the aggregate stock complex annual catch limit as highlighted by the GMT during the last harvest specifications setting cycle (Agenda Item I.2.b, Supplemental GMT Report, April 2010). This is more likely to occur with the more vulnerable stocks that only contribute a small proportion of the overall OFL.

The GMT has so far used two major attributes to determine alternative stock complex structures: ecological co-occurrence and common vulnerabilities to overfishing. Ecological co-occurrence includes depth and latitudinal affinities, as well as consideration of seasonal movements. The intent of this classification is to find species that would likely be caught together in a fishery. As a first attempt to determine ecological co-occurrence, we used core latitudinal and depth ranges to define species assemblages via cluster analysis (Agenda Item E.2.b, GMT Report, March 2010). Further information on species co-occurrence can be obtained from considering historical catches by fishery sector as well as fishery-independent survey catches. All these sources of information will be considered when defining species assemblages for the 2013-2014

[1] The NS1 guidelines recommend that managing multiple species with a complex requires (a) that species within the complex demonstrate similar life history traits (e.g., age/growth, longevity, (b) species within the complex exhibit similar vulnerabilities to fishing mortality (i.e., selectivity to fishing gears) and (c) species within the complex can withstand similar levels of harvest.

consideration of stock complex structuring. Secondly, we then grouped species by common vulnerabilities to overfishing. Vulnerability is determined by using the Productivity-Susceptibility Analysis (PSA) that uses scorings of species productivity and susceptibility to fisheries as a composite measure of vulnerability. Additionally, the probability of recent removals exceeding the OFL as calculated by the Depletion-based Stock Reduction Analysis (DB-SRA) was used to evaluate vulnerability. Both the PSA and probability of overfishing calculated by DB-SRA show high correlation in identifying vulnerable species (Table 1). Both of these analyses were provided in the 2011-2012 harvest specifications EIS. These analyses will also be revisited for the 2013-2014 consideration of stock complex structuring.
Our initial analysis indicated the most vulnerable rockfish species were found in the slope and nearshore rockfish complexes. Specifically, the shortraker and rougheye rockfishes, currently managed in the slope complexes, and China, copper, and quillback rockfishes, managed in the nearshore complexes, were most vulnerable to overfishing. This information could be used to consider restructuring these complexes to reduce the risk of overfishing the most vulnerable species.

There are also notable issues with the Other Fish complex. The species that are currently managed in the Other Fish complex are a mixed assemblage of species from disparate taxa, co-occurrence in the fishery, and vulnerabilities to overfishing. Further, there is no scientific basis for the current harvest specifications for the Other Fish complex since catch histories are unknown for many of the species preventing a DCAC or DB-SRA approach to determining OFLs. For example, only a portion of the endemic skates are in the Other Fish complex, yet skates have been landed in a general skate market category. This is the reason the GMT recommended consideration for bringing new species into the FMP so that catch-based methods can be employed for determining OFLs (Agenda Item E.2.b, Supplemental GMT Report, March 2010). Additionally, many of these species have similar vulnerabilities and are caught in approximately the same magnitude in groundfish fisheries as those currently managed in the Other Fish complex. The GMT therefore intends to identify and score the vulnerabilities of candidate FMP species.

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Agenda Item E.4.b
GMT Report
June 2011

# GROUNDFISH MANAGEMENT TEAM CLARIFICATION ON A SUGGESTED REVIEW OF THE CONSERVATION PERFORMANCE OF THE COUNCIL'S REBUILDING PLANS


Purpose of this Report ..... 1
1. Introduction to the Discussion Paper ..... 4
2. Issues and Questions for SSC Review ..... 5
A. Evaluating changes in status and biology between stock assessment cycles ..... 5
B. Comparing alternatives using the rebuilding projections. ..... 6
i) Population viability and the "Needs of the Species" ..... 8
ii) Ecological Function and Other "Needs of a Species" ..... 10
iii) Long-term economic return and Sustainable Yield ..... 10
3. Interpreting Scientific Uncertainty ..... 13
4. Clarifying the Constant Harvest Rate Rationale, Considering Rebuilding Revision Rules ..... 14
5. Conclusion ..... 15
References ..... 15
Appendix ..... 17


## Purpose of this Report

This report intends to clarify a suggestion from the Groundfish Management Team (GMT) made in April that the Council request advice and review from the Science and Statistical Committee (SSC) on certain interpretations and questions arising from the rebuilding analyses. In April, the team suggested that this review take place in time to inform the Council's consideration of the 2013-14 harvest specifications.[1]

In April, the SSC presented the Council with a list of analyses and models that the committee members thought should be reviewed during the 2013-14 process.[2] The review discussed here was not on that list. The SSC identified the models as priorities for review because the models had not been reviewed before (or for some time) and because they provide projections of catch and effort that serve as key input data for the economic impact models used to evaluate the economic impact of harvest alternatives each biennial management cycle.

The proposed review discussed in this report would focus on the broader tradeoffs involved with the Council's rebuilding plans and on what the rebuilding analyses can and cannot tell us about those tradeoffs. To be clear, this review and the reviews highlighted by the SSC are mutually exclusive only to the extent that limitations on time and resources make them so. In substance, they involve connected and fundamental questions that speak to the choices inherent in the

[1] PFMC April 2011 Briefing Book, Agenda Item I.2.c, Supplemental GMT Report.
[2] PFMC April 2011 Briefing Book, Agenda Item I.2.c, Supplemental SSC Report.

decision of how to best rebuild an overfished stock. A comprehensive review of the Council's framework for evaluating rebuilding plans would cover both.

As the Council is considering under this agenda item, time for analysis and review is already limited for the 2013-14 process. To the extent that a choice must made, multiple team members would recommend that the broader review take precedence over the review of the analyses and projection models identified by the SSC. Other team members may disagree or have not had time to properly weigh the choice.

Those team members expressing a preference for the broader review do so because the questions involved have not been directly examined in recent cycles. This has left the Council and reviewers of Council decisions with little more than lightly examined assumptions with which to consider the long-term biological and economic tradeoffs involved with rebuilding.

Throughout the 2011-12 process, the GMT and others suggested that some of those assumptions, although commonly held, are unlikely to be true for the rebuilding groundfish. Likewise, the team also identified possible misunderstandings of the complex science involved with rebuilding and suggested a specific approach for better gauging how estimates of stock status and biology have changed from previous assessment cycles.

The discussion paper below goes into the issues and questions raised during the 2011-12 process in some detail. If the review were to take place this summer or fall, the GMT would expect to further discuss and refine the substance and form of the materials produced for the review based on the input of the SSC and the Council. At this time we would highlight the following questions and issues as being part of the review:

- Is the GMT's approach (described below) an appropriate and helpful method for describing changes in estimates of stock status and biology and separating the "noise" created by scientific uncertainty from meaningful and consequential changes in estimates of stock status and biology?
- To what extent does the constant harvest rate revision rule address the policy aspects of rebuilding plans?
- What level of confidence do the rebuilding projections and the science underlying the harvest control rules give the Council and public that the abundance of the rebuilding stocks are stable and expected to increase in abundance (i.e., that the risk of population decline and extinction/extirpation is minimal)?
- Can the best available science compare rebuilding alternatives based on their expected ecological impact?
- It is commonly assumed that slower rebuilding comes at a cost to long-term economic return: should this be assumed given the new economic and biological analyses in the literature and the specific circumstances presented by the groundfish fisheries?

- On the face of the rebuilding projections it appears more likely than not that the Council's policies favor higher success of rebuilding over either short-term economic interests or long-term economic return. At the same time, these estimates are uncertain. What can and cannot be said and assumed about the balance between short-term economic benefits and long-term economic return in the context of the Council's rebuilding plans?
- The rebuilding analyses output includes estimates for the probability that a stock has rebuilt by year: how fully do these probabilities capture the risks and uncertainties of rebuilding?

Some of these questions and issues would seem to fit quite naturally into the SSC's routine biennial review of rebuilding analyses. Others might present a more broad and general review role than typical for the SSC. We therefore expect further discussion between the GMT and SSC and the SSC and the Council at the June meeting on the SSC's role and the potential form the review might take if the Council were to request it.

To reiterate, we are making this clarification at the request of the Council for the purpose of providing the more context and background to the SSC on the origins and general shape of the review. We expect the Council to give guidance under this agenda item to the SSC on the priority of this review relative to the list considered in April. To do so, we expect that the Council will be looking for guidance from the SSC on the extent to which the questions and issues could be addressed in time for the 2013-2014 process. The following discussion paper is intended to aid the SSC, the Council, and the public in weighing and providing input on the need for the review and its priority relative to other potential SSC and Council tasks.

## 1. Introduction to the Discussion Paper

The overview above describes how the Council and SSC are facing a potential choice of what reviews can and should be included as part of the 2013-14 harvest specifications and management measures process.

In general, analysis of alternative options is meant to inform decision-makers by comparing and contrasting different approaches for achieving a set of management/policy objectives. This comparison helps to orient decision-makers and the public to policy choices and tradeoffs among those objectives. The set of alternatives that the Council has used to compare rebuilding alternatives over the last few biennial cycles has left out explicit discussion of the long-term tradeoffs that might be at play. Instead, rebuilding alternatives have compared based on the evaluation of economic impacts for the biennial period being analyzed and the $T_{Target}$ estimates attached to a particular rebuilding alternative, with the metric of difference being "years". The long-term biological and economic significance of that difference in "years" has not been examined in detail. Some on the GMT believe that this omission has led to some fundamental misconceptions about the Council's rebuilding policies.

The law requires the Council rebuild overfished stocks in a time period that is as short as possible with some leeway to take into account the needs of fishing communities and other factors.[3] The amount of leeway is ambiguous and has been subject to litigation and interpretation by the courts. The most recent court order on the matter was issued last year between the April and June Council meetings. The court summarized that decision in a subsequent order awarding attorney fees to the plaintiffs:

> In its April 23, 2010 summary judgment order, this Court ruled that Defendants have continued to give undue weight to short-term economic concerns in establishing rebuilding periods and harvest levels for several critically depleted Pacific Coast groundfish species, in contravention of the Magnuson-Stevens Act and binding Ninth Circuit precedent. When Defendants approved the 2009-2010 harvest specifications and management measures for Pacific Coast groundfish, the latest available stock assessments for cowcod, darkblotched rockfish, and yelloweye rockfish indicated that these species were considerably less abundant and recovering more slowly than Defendants had assumed in approving their 2007-2008 Specifications for these species. Defendants responded to these less favorable stock assessments by maintaining or increasing allowable harvest levels and extending the projected time for each species to rebuild.[4]

In our review of that April 2010 court order, the GMT recognized certain findings and assumptions—e.g., "undue weight to short-term economic concerns," "critically depleted," "less favorable stock assessments," "considerably less abundant and recovering more slowly," etc.—as involving questions that can be examined with the standard analytical techniques of fisheries science and management. As we reported to the Council in June 2010, our knowledge of those

[3] The relevant factors are listed at Section 304(e)(4) of the Magnuson-Stevens Act (16 U.S.C. § 1854(e)(4)).
[4] NRDC v. Locke, No. C 01-0421 JL. Order Awarding Attorney Fees And Expenses (Granting Docket # 349) February 14, 2011.

techniques and concepts suggested that some of the court's findings were not likely to hold true for the Council's rebuilding plans.[5]

We said "not likely" instead of something more definitive because our conclusions were drawn from the rebuilding projections, which are uncertain and might be over optimistic. These projections also tend to change considerably from stock assessment to stock assessment. At the same time, we recognized that the rebuilding analyses were designed to take uncertainty into account, with the probability of recovery (i.e., of having reached $B_{MSY}$) by year being one of the analyses' main outputs. Based on the median (i.e., the 50th percentile) estimates of catch and abundance, we did not see much support for the claim that the Council is giving undue weight to short-term economic concerns.

The SSC is the Council's primary advisor on the best available science and on the uncertainty in that science. The SSC's advice—on the degree to which certain claims can be evaluated based on the rebuilding projections, on what can and cannot be inferred with respect to long-term tradeoffs, etc.—would therefore be informative. Many of the questions relating to rebuilding cannot be answered definitively or precisely quantified. The GMT came up with the beginnings of a qualitative approach for weighing long-term tradeoffs.

Before discussing specific questions and issues, we note that evaluation of the rebuilding plans involves issues of law, policy, and science. The divisions between these issues are often unclear. To be clear, we are not asking the SSC to weigh in on what the law means. The GMT is not meaning to weigh in on what the law means either. Our focus is on analyzing certain questions and arguments that have their provenance in biology and economics. Irrespective of what the law is, analysts should explore its impact on the fishery and the marine environment based on the best available science.

## 2. Issues and Questions for SSC Review

We divide the issues and questions for the SSC review into two categories. The first concerns the interpretation of rebuilding projections and estimates of stock status as they change from stock assessment to stock assessment.

The second category outlines an approach for evaluating rebuilding options based on long-term conservation objectives. Both relate to what the best available scientific information can tell the public and policymakers about the fundamental policy tradeoffs involved with the Council's rebuilding plans.

### *A. Evaluating changes in status and biology between stock assessment cycles*

The scientific uncertainty involved with rebuilding means that estimates will change from cycle to cycle. As Punt and Ralston (2007) phrased it, we should expect that "the results of rebuilding analyses in the future will not conform exactly with the expectations based on the original rebuilding analysis."

[5] PFMC Briefing Book June 2010, Agenda Item B.3.b, Supplemental GMT Report 2.

When such changes do occur, questions arise: How does the change affect the policy decision that was made last time? Can the same policy course be maintained or must it be revisited? Is the stock making rebuilding progress? And so on. The complexity of the science can make it difficult to understand, evaluate, and communicate the import of the changes.

In past cycles and in informal communication we have often simplified changes in rebuilding estimates using statements like "worse off"/"better off", "more pessimistic/more optimistic," "behind schedule"/"ahead of schedule," etc. Such simplifications fail to communicate the full depth of the science. In June 2010 we focused on three major aspects in which stock assessments and rebuilding projections change:

1. **Status**: the estimate of current abundance relative to the estimate of unfished biomass ($B_0$);
2. **Scale**: the estimated absolute abundance of the population; to which the harvest rate is applied; and,
3. **Productivity**: how quickly we expect the stock to increase, which we explored by calculating the expected growth per year to $T_{Target}$ for each rebuilding alternative.

Estimates of stock status and biology can change in all three aspects from cycle to cycle. Our understanding is that the most recent stock assessment and rebuilding analysis provide the best available scientific information on the stock. And it is from this best available look at the stock that the Council and the public should sort out errors and scientific uncertainty from true progress and setbacks in rebuilding. As part of the review, we would request the SSC's advice and input on how well the three attributes identified above can help separate "the signal from the noise." That is, on how well they help differentiate real changes in stock abundance from changes more reflective of what is unknown about stock status and biology.

***B. Comparing alternatives using the rebuilding projections.***

The Council's policy for addressing changes in estimates of stock status and biology has been to maintain a constant harvest rate throughout rebuilding to the extent possible. Yet to say that the Council's policy is to use a constant harvest rate begs the question of why the constant harvest rate was chosen in the first place. The major policy choice with rebuilding is made by choosing one $T_{Target}$ over another. The key policy question explored each biennial cycle is why one $T_{Target}$ is preferable over others.

In fisheries management, it is commonly presumed that rebuilding a stock as fast as possible more conservation oriented. Under this presumption one expects a compelling reason to deviate from the fastest possible rebuilding trajectory, one compelling enough to justify the costs imposed by delay on conservation. The same logic applies to the comparison of any set of alternatives: a preference for a slower rebuilding alternative would have to be based on a benefit that offsets the consequences of the delay from faster rebuilding alternatives.

It is in this basic light that the recent court findings of "undue weight" being given to the cowcod, yelloweye, and darkblotched rebuilding plans might be interpreted. In other words, the court may have not seen reasons compelling enough to overcome the perceived costs to long-term conservation.

The key point is that the "costs" of delay are perceived and assumed. They have not been directly examined in biennial analyses.

In March of last year, Hilborn and Stokes (2010) articulated how these "costs" derive from the overfishing and overfished concepts and are prone to misperceptions. They also offered a basic approach for evaluating rebuilding, which in essences suggests evaluating rebuilding alternatives against the conservation objectives for which harvest policies were established to achieve. The courts have used similar reasoning to interpret the congressional intent behind the MSA rebuilding provisions and have drawn a connection between rebuilding and the MSA's long-term conservation goals.[6]

The problem is that conservation—like sustainability and many other words used to describe natural resource policy goals—is not a precise term. For analysts to evaluate relative conservation performance, terms like conservation must defined in ways that can be measured and tracked. We would classify the conservation objectives into three categories: (1) long-term economic return from sustainable yield, (2) ecological or ecosystem considerations, and (3) population viability.[7] An omniscient analyst would evaluate options for rebuilding based on the full suite of costs and benefits in each of these three categories over an appropriate timeframe.

Short of an optimal rebuilding path, long-term economic return, population viability, and ecological function are all functions of a stock's abundance and can be explored, to some extent, using the rebuilding projections. The figures and tables shown in the Appendix identify the output we have looked at when approaching such evaluations.

We chose to show the rebuilding projections for petrale sole and yelloweye rockfish because of the considerable differences in status and biology between these two stocks combined and then the striking similarities they share as to conservation tradeoffs.

The three components of that rebuilding analysis output that we used to make the comparisons include: (1) the median catch, representing the best, risk-neutral estimate of the annual catch limit (ACL) by year; (2) the estimate of status, biomass, or spawning output by year; and, (3) the probability of recovery in each year. The other piece of information needed was the annual yield expected for each stock at $B_{MSY}$ from the stock assessment. We replaced the estimate of median catch with this estimate of catch at $B_{MSY}$ for each rebuilding alternative, starting the year after the probability of recovery crossed the 50 percentile mark and then assumed that a stock would behave the same in terms of yield once $B_{MSY}$ was reached.

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[6] *See* NRDC v. NMFS, 421 F. 3d 872, 879 (9th Cir. 2005)(internal case citation omitted):

> The purpose of the Act is clearly to give conservation of fisheries priority over short-term economic interests. . . . ("[U]nder the [Act], the [Agency] must give priority to conservation measures."). The Act sets this priority in part because the longer-term economic interests of fishing communities are aligned with the conservation goals set forth in the Act. Without immediate efforts at rebuilding depleted fisheries, the very long-term survival of those fishing communities is in doubt.

[7] The courts have pointed to "long-term economic return" and the "marine environment" as two components of conservation that are affected by delays in rebuilding. We saw the term "marine environment" as also imprecise, covering multiple concerns. When referring to conservation, the courts have also juxtaposed the "needs of the species" against the "needs of fishing communities" (the short-term needs at least; as the quote in the preceding footnote states, the courts have observed that the long-term needs of communities are "aligned with the conservation goals" of the MSA).

The following sections describe the general that inferences we made from these rebuilding projections. Again, our interest is in furthering this approach for helping the Council and public compare rebuilding alternatives based on three primary measures of conservation.

*i) Population viability and the "Needs of the Species"*

The precedent setting Ninth Circuit decision on rebuilding faulted the Council's 2002 alteration to the darkblotched rebuilding plan for having "altered dramatically the balance between the needs of a species and of fishing communities."[8] The "needs of a species" could refer to many things. Population viability is what comes to mind first for us.

Conservation biology is concerned primarily with the status of populations and the risk of extinction or extirpation that results from low population size. The overfished designation also indicates that a stock is at lower abundance than desired. With all that is going on in the world of conservation, it is understandable why the courts have tended to use the adjective "dire" to describe the condition of overfished stocks. Yet the overfished designation is a different concept from designations like threatened or endangered under the Endangered Species Act.

Hilborn and Stokes (2010) trace the origin of the overfishing and overfished concepts to the policy objective of maximum sustainable yield (MSY) and describe how fisheries science conceived of overfished status—i.e., minimum stock size threshold—as part of the precautionary approach to fisheries primarily to indicate that stocks were at lower abundances than desired for producing yield. Low stock size can raise concerns about extinction risk, yet at the same time, Hilborn (2010) describes how certain stocks can produce sustainable yield even at low abundance, a result he recognizes as potentially "shocking" even to many fisheries management professionals. Hilborn and Stokes (2010) recommend that fisheries agencies "carefully differentiate" concerns about MSY and recruitment overfishing from concerns about population viability and other reasons for caring about population abundance (e.g., maximum economic yield). We echo this recommendation and see the SSC as the most appropriate advisory body to communicate the degree to which population viability is at risk in rebuilding.

Our understanding of the science suggests that extinction/extirpation risk is not a significant factor at play in the Council's rebuilding decisions. We say this for two reasons. First, harvest is the main anthropogenic pressure affecting the abundance of the rebuilding stocks that we are aware of, and because the Council has reduced harvest rates substantially based on scientific advice. Such reductions in harvest (a.k.a. exploitation) rates are viewed as the key management response for recovering marine fisheries and ecosystems (Worm et al. 2009). The rebuilding analyses reflect these reductions and project that all rebuilding stocks will increase in abundance, even at rates considerably higher than those typically considered by the Council.[9]

Second, the body of science used to derive the harvest rates employed in the Groundfish FMP suggests that the Council's default $F_{MSY}$ harvest rates should be safely away from what is referred to as $F_{crash}$ or $F_{extinction}$; i.e. the rate of harvest that would jeopardize a stock's continued existence.[10] Given that the Council has typically used harvest rates well below $F_{MSY}$ to rebuild

[8] NRDC v. NMFS, 421 F. 3d at 880.
[9] This is not true for petrale sole, which the Council chose to rebuild at rates set between $F_{MSY}$ and the 40:10 harvest control rule for 2010 and 2011.
[10] *E.g.*, Punt and Smith (2001); Mace (2001).

rockfish—in 2009 the $F/F_{MSY}$ ratios ranged from a low of 0.07 for widow rockfish to a high of 0.59 for darkblotched—the Council's rebuilding harvest rates would seem to be highly unlikely to cause such jeopardy. These harvest rates are chosen to rebuild abundance within the timeframes thought allowable by law. Again, the science projects that stocks could be rebuilt using higher rates of harvest, just over longer timeframes.

At the same time, we would not say that population viability is of zero concern because scientific uncertainty always poses risk. The $F_{MSY}$ harvest rate if known or reasonably approximated has to be applied to an estimate of current stock abundance. If current stock abundance is overestimated, then the effective rate of harvest will be higher than intended. In addition, rebuilding analyses are built on assumptions about future recruitment and the marine ecosystem remaining similar to past conditions. Climate change, ocean acidification, and our limited knowledge of ecological and oceanographic dynamics give reason to worry that the marine ecosystem will change significantly.

Another key uncertainty is that stock assessments and rebuilding analysis are based on certain assumptions about the strength of compensatory density dependence in each stock (Hilborn 2010). Longhurst (2011) takes less confidence from the Myers meta-analysis of stock-recruitment relationships than do Hilborn and Stokes (2010) and warns about undue optimism toward the risk of depensatory dynamics with marine fish stocks.[11] In addition, others disagree with the general view that marine fish are not as susceptible to extinction risk as other vertebrates and have advocated for evaluating marine fish using standard extinction/extirpation criteria.[12]

Whether population viability risk is of major concern or not, the Council's rebuilding and harvest policies are based on the expectation that harvest rates will be adjusted using feedback about their effectiveness (i.e., feedback decision or revision rules, adaptive management, etc.). Our ability to do has been limited by the restrictions imposed by rebuilding are so limiting for stocks like cowcod and yelloweye—closed areas and limits on harvest have shut off the fishery-dependent and fishery-independent information needed to properly monitor effectiveness. At the same time, the rockfish conservation areas and other closed areas should be recognized as mitigating some of the risk posed by harvest by closing off significant areas of habitat.

Lastly, we would include here other considerations that might be lumped into the label of "needs of the fish." Fishing has altered more than just the abundance of fish populations: harvest can affect the age and size structure of a population as well as its gene pool, spatial structure, and even behavior (NRC 2006). The reasons for caring about these qualities of populations are the same as for caring about abundance: sustainable yield, population viability, ecosystem impacts, etc. Nonetheless, many recommendations like that of Francis et al.'s (2007)—e.g., "maintain old-growth age structure in fish populations"—suggest that rebuilding plans should restore more than just stock abundance. It may be unclear to many whether or how the Council's rebuilding plans might address such concerns. Some have argued there is an important distinction between

[11] Longhurst suggests "that there is an abundance of evidence for the existence of a wide range of ecological mechanisms and processes that may be evoked in explanation of what appear to be depensation effects in depleted populations." Yet he appears more concerned about the chances of successful recovery from depletion rather than the risk of extinction, as suggested by the following excerpt: "This case history [of the barndoor skate (*Raja laevis*)] suggests that the evocative term 'extinction' . . . has been used too freely by those advocating stricter controls on fishing: exaggeration does not improve their already excellent case."

[12] E.g., Reynolds et al. 2005; Dulvy et al. 2003.

rebuilding abundance and addressing other population characteristics.[13] At a minimum, it may be helpful for the SSC and GMT to clarify what population characteristics the Council's rebuilding plans do and do not currently address.

*ii) Ecological Function and Other "Needs of a Species"*

As just discussed, concerns about population viability focus on scientific expectations about future trends in stock abundance. They do not speak to the policy reasons why society might care about the abundance of a particular stock of fish.

The main reason fisheries science has focused on population abundance is that abundance, together with productivity, determines the "surplus production" that can be sustainably harvested from a stock. The ecosystem approaches to fisheries being advanced in recent years are bringing more attention to the ecological opportunity cost of harvesting this surplus production. As Walters and Martell (2005) explain single species management typically treats the surplus production from a stock as either "having no economic or social value" or assumes "that there is ample supply" of other species to compensate for the biomass removed from the ecosystem.

Worm et al. (2009) are improving our ability to measure the effect of alternative harvest scenarios on ecological communities. For now, it does not seem the science is able to compare or detect ecological differences between alternatives that differ in how they are expected to rebuild a stock by just a few years. Even for a stock like yelloweye where $T_{Target}$ estimates differ ~10 years between alternatives, the differences in expected abundance between alternatives are too minor to register any ecological impact. The SSC may be able to help interpret the trophic models that have been run on the California Current and give the Council some qualitative, descriptions of the ecological costs involved.

Even if we are correct that ecological differences in rebuilding alternatives will remain unquantifiable for the foreseeable future, there are still reasons why some people may prefer faster rebuilding on ecological grounds. Hilborn (2010) articulates multiple reasons why it may be socially preferable to hold stocks at higher levels of abundance than necessary to produce MSY. At the most basic level, rebuilding stocks faster would provide society with the option of doing sooner.

*iii) Long-term economic return and Sustainable Yield*

An analysis of economic return from rebuilding would consider fishing communities as "sole owners" that seek to maximize the value of fish stocks over time. Walters and Martell (2004) identify this same sole owner approach as a "hidden assumption" in the optimization methods used by fisheries scientists to evaluate the key tradeoff between current and future harvest from a

[13] Hammer (2010) reports on a keynote address made by Steve Murawski at an ICES/PICES symposium on rebuilding in 2009 where Dr. Murawski emphasized that:

> a distinction should be made between "recovery" and "rebuilding"; the former referring to a straightforward increase in stock biomass, whereas the latter implies fulfilling a suite of additional criteria, including the restoration of age structure, evolutionary mechanisms, and behavioural traits. Murawski's message, echoed by subsequent presenters, clarified that "rebuilding" has a much longer time horizon than "recovery."

stock. The focus of the approach is on yield from a stock and the economic return from that yield can be maximized.[14]

As we noted above, with rebuilding the commonly held assumption seems to be that delays come at a cost to long-term economic return with the best economic option being the fastest rebuilding time possible. It follows from this assumption that delays in rebuilding would favor current fishing communities over future fishing communities. This assumption recognizes that rebuilding exacts short-term costs from current fishery participants, yet these costs are thought to be offset by the long-term benefits of rebuilding.[15]

Holland (2010) points to the "bang-bang" or "most rapid approach" harvest strategy, described in Clark (1990) and elsewhere in the bioeconomics literature, as the origin of the commonly held assumptions about the economics of rebuilding. He then uses a simple model to identify circumstances where this bang-bang approach to rebuilding is not the economically superior option. Larkin et al. (2006) perform a similar analysis of alternative rebuilding paths and also identifies circumstances where more gradual paths to rebuilding are economically preferable. Clark (2010) revisits the assumptions, including an important assumption about opportunity costs, that make the bang-bang strategy look economically preferable.[16]

The essence of our argument that we would put to the SSC is that we do not think it appropriate to presume that the Council's rebuilding plans are overemphasizing short-term economic needs at the expense of long-term economic return. The true economic performance of a particular rebuilding path will depend on specific biological and economic characteristics of each stock, which we think can be analyzed using the rebuilding analyses, even if only generally.

More fundamentally, we see the tradeoff involved with rebuilding as more appropriately described as a tradeoff between successful rebuilding and the yield objectives for which the harvest policies were established. In other words, more risk aversion in rebuilding is going to be accompanied by a higher probability of forgoing yield that could have been harvested while rebuilding. This is the same basic dynamic involved with the Council's setting of OFLs and ABCs to prevent overfishing. It is a tradeoff better characterized in terms of risk instead of in black-and-white certainty about short-term and long-term economic interests.

Our look at the rebuilding projections suggested that the Council's rebuilding plans are more weighted toward successful rebuilding than to economic concerns. The key observation we made last cycle was that the median catch projections from the rebuilding analysis show that the Council's rebuilding plans appear to be producing less overall yield from the stock during rebuilding than would more gradual approaches to rebuilding. This observation went counter to

[14] Hilborn and Stokes (2010) phrase the approach using two key questions: "(1) What is the value of rebuilding to higher stock abundances given we are at lower abundance, and (2) How quickly should this rebuilding take place?"

[15] E.g., Hammer (2010):

> The short-term socio-economic effects associated with rebuilding fish stocks are considerable, but should be offset by increased benefits over the longer term. These downside losses and upside benefits have to be communicated to the fishing industry and to the public in a clear and transparent way.

[16] The relevant discussion can be found on p. 48 of Clark (2010).

the expectation that delays from the shortest time possible would come at a cost to overall yield.[17] Here is the basic economic picture as we see it:

- A fish stock's economic value derives from the annual yield it produces and the commercial and recreational fisheries that yield supports.[18] For a target stock like petrale sole, the primary value of yield comes from direct harvest. For bycatch stocks like the rockfish, the primary value is indirect and derives from the set of target stocks/opportunities to which they limit access.
- The rebuilding analyses projections of yield by year for each stock allow alternatives to be compared on the expected cumulative yield and the timing of that yield over rebuilding.
- Forgoing yield during rebuilding (i.e., less cumulative yield) imposes short-term costs on fishing communities. This cost, or economic impact, is largely what we focus on in current analysis but just for the two-year period under consideration. The yield projections can be used to examine whether these costs can be expected to be offset by the benefits rebuilding.
- In general, the rebuilding projections show that the expected cumulative yield tends to be greater for more gradual rebuilding alternatives. These projections suggest that the benefits of reaching $B_{MSY}$ faster will not outweigh the yield that is forgone when rebuilding using harvest rates that are well below $F_{MSY}$.
- With cumulative yield higher for more gradual rebuilding alternatives, the typically thorny issue of the discount rate and net present value becomes off less significance: it would take a negative discount rate to make the net present value of alternatives that produce less yields comparable to those that produce higher yields.[19] Policy debates often differ on which discount rate to use in long-term analyses, yet the rates debated are positive.[20]
- There is evidence of "pretty good yield" (Hilborn 2010) in the rebuilding projections. For example, the $F_{MSY}$ harvest proxy or 40-10 control rule alternatives are not projected to rebuild yelloweye. They are, however, projected to produce higher cumulative yield than those alternatives that are projected to rebuild the stock. For some stocks, "pretty good yield" means that the marginal change in annual yield will increase more slowly than abundance.
- Bioeconomic models assume that stocks become less costly to harvest as they increase in abundance, largely because of expected increases in CPUE (i.e, higher abundance equates to higher density). As seen with petrale, CPUE can remain high even when the stock is overfished. With bycatch stocks, the situation is the opposite

[17] We had expected that a slower rebuilding alternative would delay achievement of MSY and thus come at a cost in overall yield compared to a faster rebuilding alternative. We thought that the cost of this lost yield could then be evaluated based on the size of the discount rate needed to equalize the net present values of the alternatives. To our surprise, the situation was reversed.

[18] We also recognize that a stock can also support fisheries indirectly through the food web. The Council's policy for krill is an example of this.

[19] Appendix G in the Final EIS shows that slower rebuilding alternatives for canary and yelloweye rebuilding perform better for faster rebuilding alternatives even with the discount rate set at 0 percent. http://www.pcouncil.org/wp-content/uploads/1112GF_Spex_ApdxG_NPV_-Analysis_1008061.pdf.

[20] Larkin et al. (2006) also show how the relative performance of rebuilding alternatives on certain criteria is insensitive to the choice of a discount rates of 4% or 24%.

with higher CPUE being more costly. Our standard assumption is that stocks will become harder to avoid as they rebuild.

- Bioeconomic models also consider how price, and hence the market value of a stock, changes as stock abundance changes. The ex-vessel price of the most economically important groundfish respond more to market conditions (demand) than to stock abundance (supply).
- The marginal (i.e., incremental) economic value of yield from a stock can show an increasing, diminishing, or linear relationship. We would expect a stock like petrale to show a linear relationship. The rebuilding rockfish, in contrast, are likely to show diminishing marginal value: for a given rate of bycatch, the rockfish become less constraining as their allowable harvest level is increased and so likely approach their maximum economic value at yields less than yield at $B_{MSY}$.[21] We would conclude from this that a stock like yelloweye that is currently able to produce ~80 percent of yield it would at $B_{MSY}$ is probably also capable of producing substantially more than 80 percent of its maximum economic value.

These observations and assumptions are what we see as the major topics for SSC review. We did not have occasion last cycle to bring them to the SSC's attention. They involve questions about the reliability of the yield projections and the basic economic assumptions that we made in interpreting those projections.

Lastly, we would note than an analysis of long-term economic return cannot ignore the mixed stock nature of the groundfish fisheries. Much of fisheries science and economics is focused on single stock management. It has long been recognized that mixed stock fisheries pose different challenges to policy makers and scientists than single species models might suggest (e.g., Larkin 1984). Recent ecosystem modeling efforts are confirming the basic view that yield cannot be maximized from every stock in the fishery, and as a consequence, that the goal of achieving optimum yield from a fishery as whole would involve harvesting some stocks at higher rates than would be used to achieve MSY (e.g., Mackinson 2009). This general observation is recognized and incorporated into the National Standard 1 guidelines' mixed stock exception.[22]

**3. Interpreting Scientific Uncertainty**

As just mentioned, we see the central tradeoff in rebuilding being between risk-aversion and lost yield. Risk is the key question involved with rebuilding. In the section on population viability, we highlighted some of the reasons why rebuilding might not proceed as successfully as the best available science predicts. The conclusions we have drawn about population viability and long-term economic return are based on the risk-neutral, median estimates from the rebuilding analysis. We see a need for the SSC to provide further guidance on how the Council should think about risk with the rebuilding projections. The following illustrates some of the issues questions about risk and uncertainty that we might raise to the SSC.

The projections are based on the probability of recovery by year. These estimates are not given much prominence in the evaluation of rebuilding alternatives. The $T_{Target}$ estimates used to compare alternatives are typically based on the year in which the probability of recover exceeds

[21] As mentioned above we do expect the bycatch rates to increase as the rockfish increase in abundance.
[22] 50 C.F.R. § 600.310(m).

50 percent. We wonder if alternatives might be also, or more appropriately, characterized and contrasted using the full probability distribution from the rebuilding analyses.

We also questioned whether differences between rebuilding alternatives are exaggerated given the degree of scientific uncertainty involved. For example, the $F_{MSY}$ and 40:10 alternatives for petrale sole look quite similar based on the rebuilding projections. The projections for other stocks (e.g., canary and widow) show a similar pattern. In advising the Council last cycle, we thought that the appropriate inference to make was that the science could not really differentiate between these alternatives, but that in general less catch corresponds to more risk aversion.

As another example, the petrale sole rebuilding analyses showed a relatively high probability of rebuilding the stock with 10 years even if fished with no precautionary adjustment to the $F_{MSY}$ harvest proxy. In team discussion, this presented the question of whether employing a P-star adjusted ABC control rule was necessary or whether that probability of rebuilding sufficiently characterized scientific uncertainty that the sigma is meant to cover.

We recognize that uncertainty in rebuilding would be most fully considered through a management strategy evaluation (MSE) approach. We expect that an MSE is likely to be the SSC's long-term recommendation for answering many of the questions raised here. We assume that an MSE is not possible in time for 2013-14 process but are curious about what can be said with respect to uncertainty short of conducting an MSE.

**4. Clarifying the Constant Harvest Rate Rationale, Considering Rebuilding Revision Rules**

We have noted confusion within and outside the GMT on what we refer to as the constant harvest rate policy for rebuilding. We see the need for further clarification on the science and policy issues involved with the constant harvest rate approach and other rebuilding revision rules like those described in Punt and Ralston (2007).

Revision rules are intended to guide the adjustment of rebuilding plans when rebuilding estimates of stock status and biology change. The change that has received the most attention is when the stock looks "worse off" and the Council does not chose to lower the allowable catch as a result. As we stated above, "worse off" is most often an oversimplification. There are 26 combinations of changed understandings in stock status and biology that can result from the three attributes we identified above either increasing, decreasing, or remaining unchanged across cycles. The magnitude and policy significance of these changes varies.

Under the Magnuson-Stevens Act, rebuilding revision rules need to address both policy and science. Again, the basic policy calculus involves taking into account stock status and biology, the shortest rebuilding time possible, the needs of fishing communities, and other factors named in section 304(e) of the statute. Revisions to the Council's rebuilding plans need to consider all of these factors. The constant harvest rate policy doesn't seem to accomplish this on its own.

Our understanding is the constant harvest rate is best at maintaining a $T_{Target}$ across changes in estimates of stock scale. Scale can change quite substantially while the $T_{Target}$ remains relatively unchanged. The catch corresponding to the constant harvest rate is a different story. The changes seen in 2009 for yelloweye provide an example. The $T_{Target}$ year for yelloweye from the previous cycle could have been preserved with only a minor adjustment to the SPR harvest rate. Yet the

catch corresponding to that rate was 20 mt instead of 14 mt (there were changes in the estimates of stock status and productivity as well).

The SSC's clarification on whether this view of the constant harvest rate comports with the science would be helpful. We would also suggest GMT-SSC discussion on how to best connect changes in estimates of status and biology to changes in policy issues involved with rebuilding.

**5. Conclusion**

We have covered in some detail the questions and issues we have for the SSC and the reasons why they may be important to the Council's consideration of rebuilding plans.

The SSC's review of these issues could take many forms. We have laid out the main structure of our analysis here and do not have much additional information to share. The materials offered for review might be as simple as the rebuilding analyses output together with a list of specific questions and general issues for the SSC to consider. Alternatively, we could provide more detail and analysis of the economic, ecological, and population viability issues discussed above.

Finally, as there are issues of science and policy involved, we would suggest an opportunity for iteration or dialogue between the SSC and the GMT. We would of course expect that the SSC's advice to the Council would remain separate and independent from that of the team. Given the legal issues involved, we would suggest that NOAA General Counsel also participate if possible.

We expect to have the opportunity to discuss the form and need for review with the SSC at the June meeting.

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## Appendix

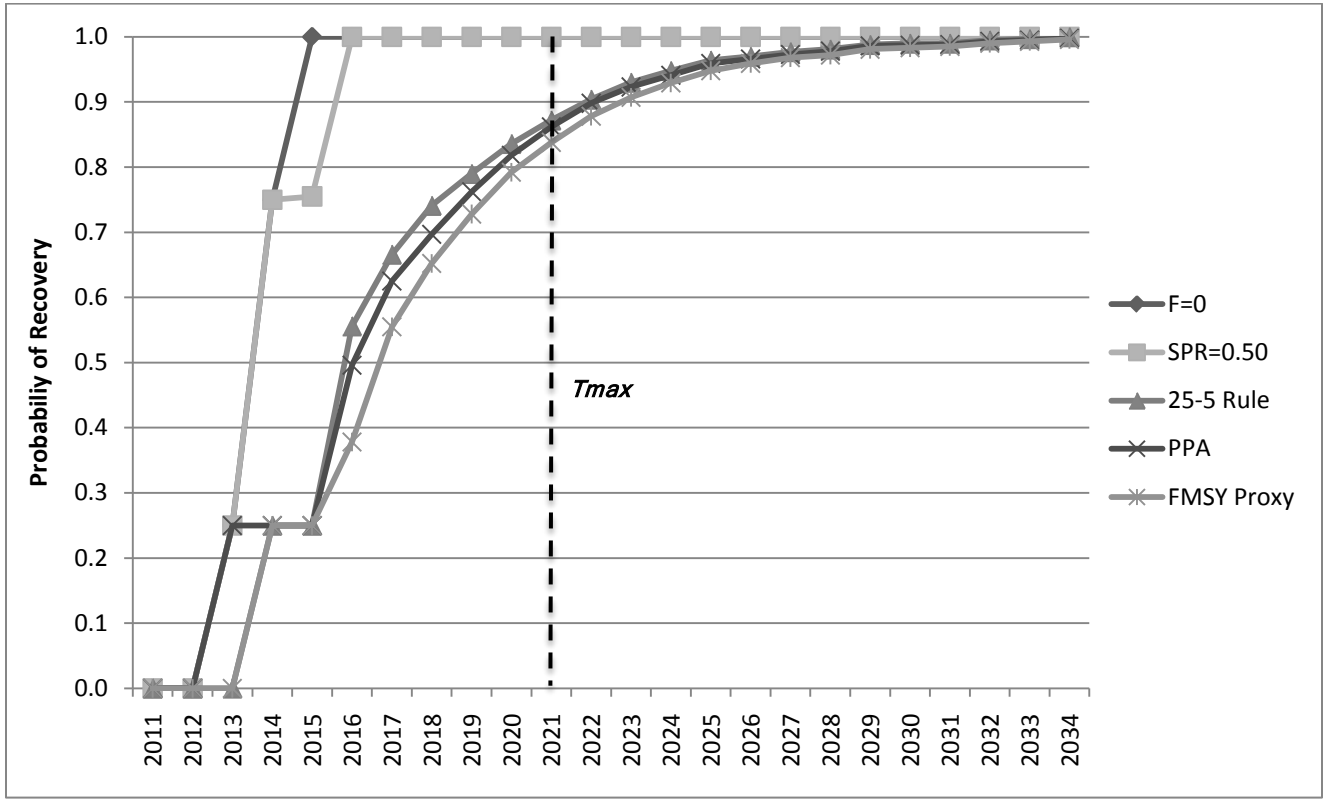



Figure 1. Probability of having reached the B25% rebuilding target ("probability of recovery") by year for the five alternative rebuilding strategies considered by the Council for petrale sole in the setting of 2009-2010 harvest specifications.

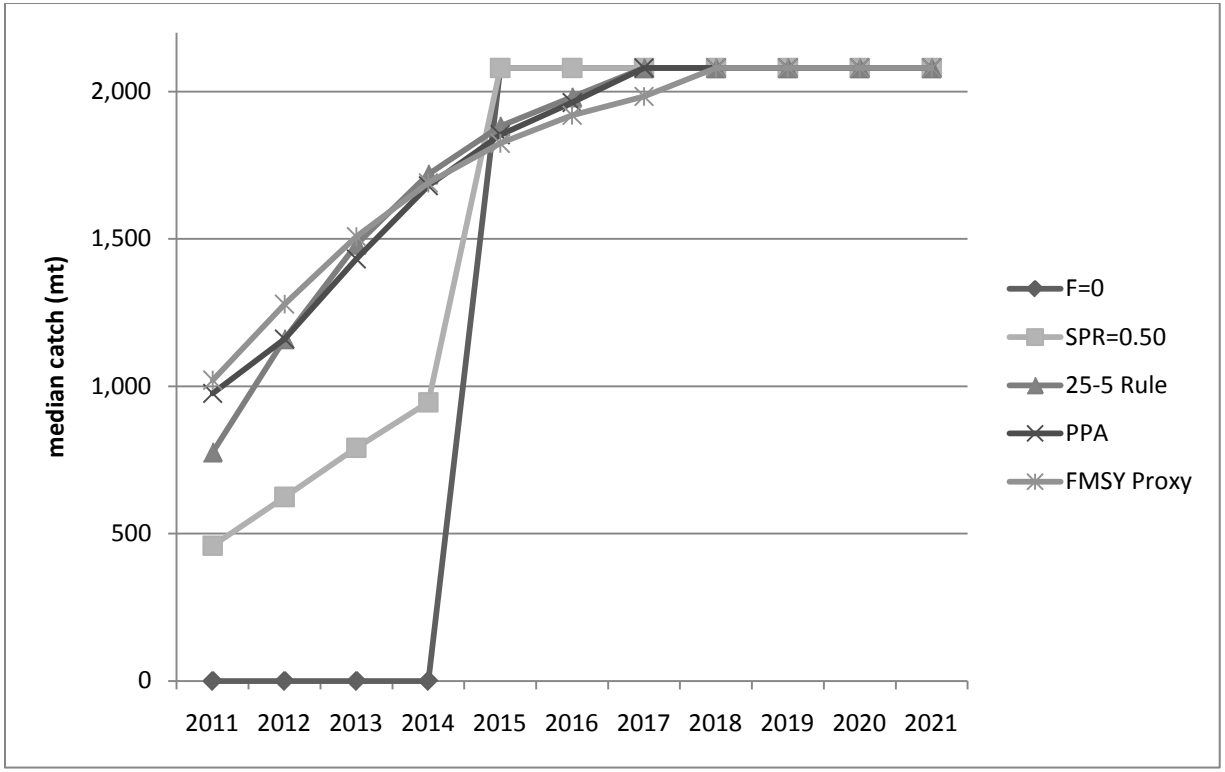



Figure 2. Median catch estimates (mt) by year for the five alternative rebuilding strategies considered by the Council for petrale sole in the setting of 2009-2010 harvest specifications. In the year after the probability of recovery reached 50 percent, we replaced the median catch estimate with the estimate of the $SPR_{MSY\text{-}proxy}$ yield at $SB_{SPR}$ from Haltuch and Hicks (2009).

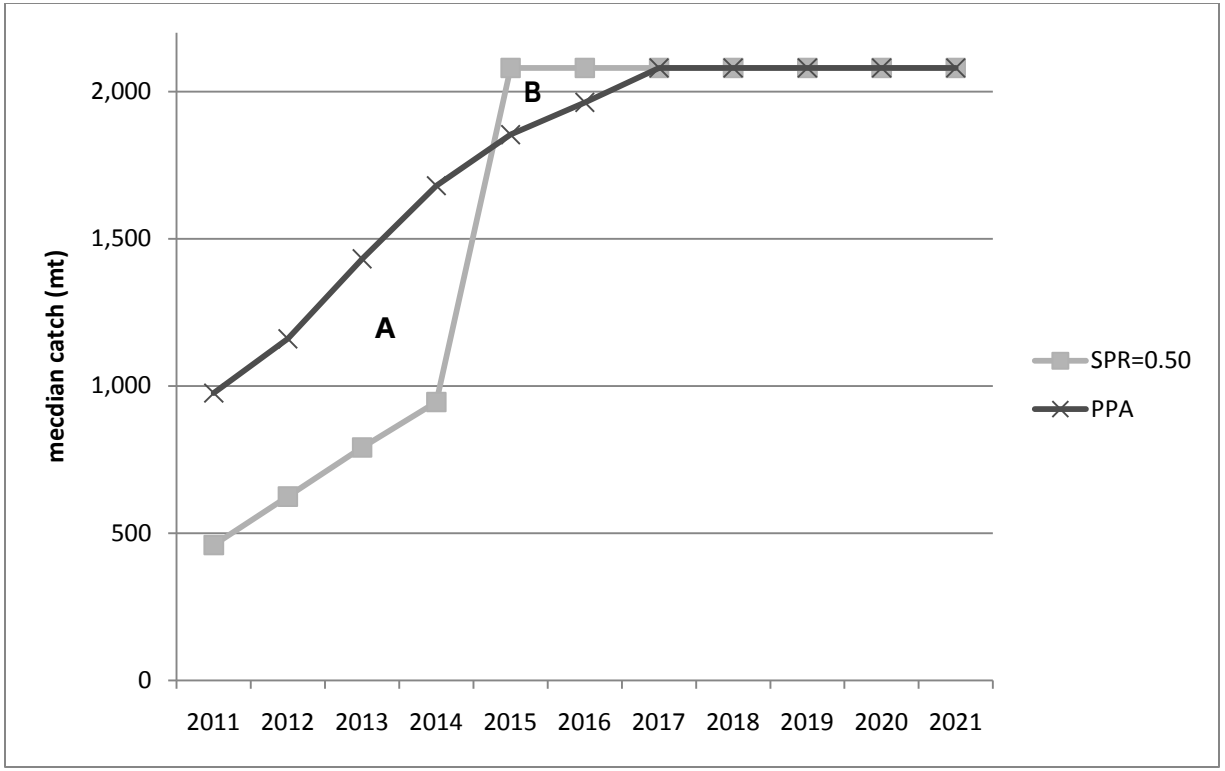



Figure 3. The same median catch estimates (mt) as shown in Figure 2, for just the SPR=0.050 constant harvest rate and the Council's preliminary preferred alternative (PPA) (this alternative is basically a transition from the ABC harvest control rule in 2011 to the 25-5 harvest control rule in 2013). The relative economic performance of the two alternatives can be examined by comparing the difference in height between the two curves. The area where annual catches are higher for the Council's PPA ("A") is clearly larger than the area where the SPR=0.50 alternative produces larger annual catches ("B"). This latter area would of course shrink in economic importance if a discount rate were applied to the yield. On the other hand, the SPR=0.50 harvest alternative shows a superior probability of rebuilding by 2021, as shown in Figure 1.

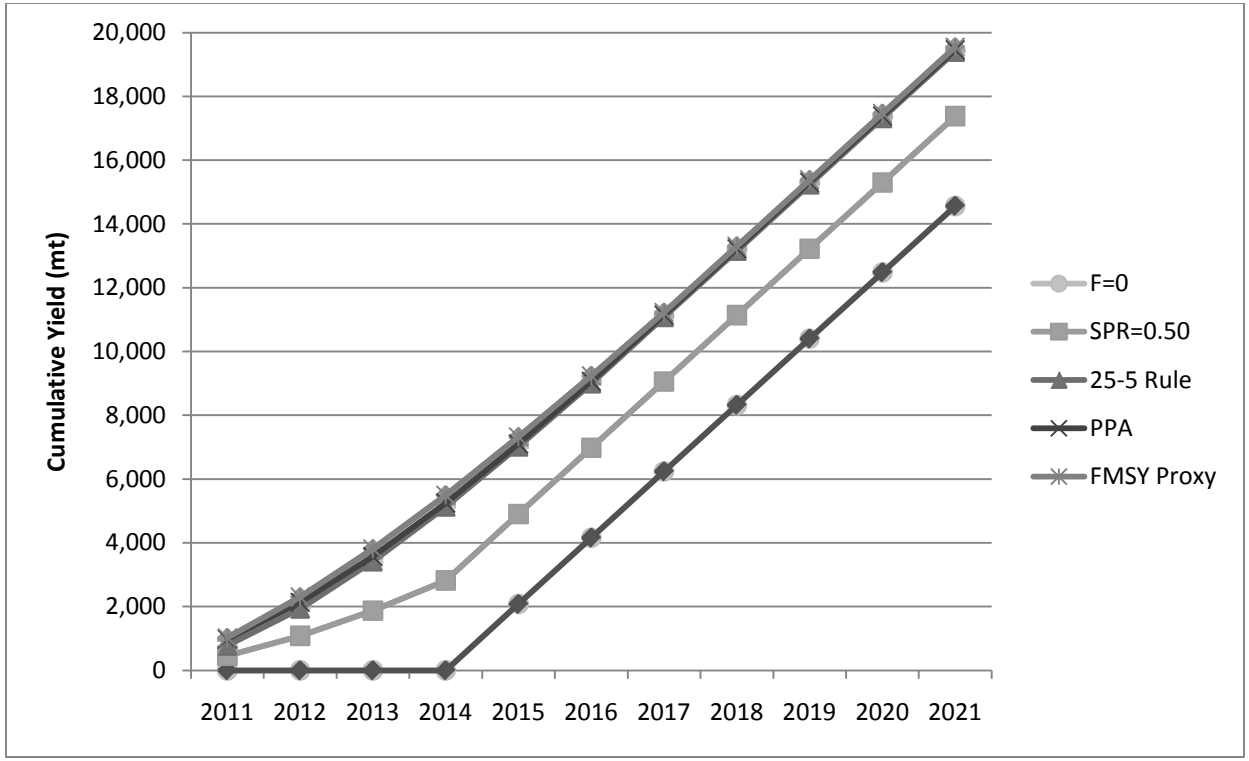



Figure 4. The cumulative median catch (mt) for each of the five alternative rebuilding strategies considered by the Council for petrale sole in the setting of 2009-2010 harvest specifications (i.e., the summed median catch estimates for each alternative shown in Figure 2 over the years 2011-2021).

Table 1. Median catch estimates and cumulative expected yield for the five petrale rebuilding alternatives considered during the setting of the 2009-2010 harvest specifications. This is the same information in table form presented in the figures above.

| F=0 ("complete closure") | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ACL (median catch) | 0 | 0 | 0 | 0 | 2,080 | 2,080 | 2,080 | 2,080 | 2,080 | 2,080 | 2,080 | 14,560 |
| Cumulative yield | 0 | 0 | 0 | 0 | 2,080 | 4,160 | 6,240 | 8,320 | 10,400 | 12,480 | 14,560 | -- |
| | | | | | | | | | | | | |
| **SPR = 0.50** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | Total |
| ACL (median catch) | 459 | 624 | 791 | 945 | 2,080 | 2,080 | 2,080 | 2,080 | 2,080 | 2,080 | 2,080 | 17,380 |
| Cumulative yield | 459 | 1,083 | 1,874 | 2,820 | 4,900 | 6,980 | 9,060 | 11,140 | 13,220 | 15,300 | 17,380 | -- |
| | | | | | | | | | | | | |
| **25-5 control rule** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | Total |
| ACL (median catch) | 776 | 1,160 | 1,481 | 1,720 | 1,883 | 1,981 | 2,080 | 2,080 | 2,080 | 2,080 | 2,080 | 19,401 |
| Cumulative yield | 776 | 1,937 | 3,418 | 5,137 | 7,020 | 9,001 | 11,081 | 13,161 | 15,241 | 17,321 | 19,401 | -- |
| | | | | | | | | | | | | |
| **Alternative 3 - PPA** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | Total |
| ACL (median catch) | 976 | 1,160 | 1,432 | 1,680 | 1,853 | 1,963 | 2,080 | 2,080 | 2,080 | 2,080 | 2,080 | 19,464 |
| Cumulative yield | 976 | 2,136 | 3,568 | 5,248 | 7,101 | 9,064 | 11,144 | 13,224 | 15,304 | 17,384 | 19,464 | -- |
| | | | | | | | | | | | | |
| **OFL/Fmsy Proxy** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | Total |
| ACL (median catch) | 1,021 | 1,279 | 1,507 | 1,690 | 1,824 | 1,919 | 1,984 | 2,080 | 2,080 | 2,080 | 2,080 | 19,544 |
| Cumulative yield | 1,021 | 2,299 | 3,807 | 5,497 | 7,321 | 9,240 | 11,224 | 13,304 | 15,384 | 17,464 | 19,544 | -- |

Table 2. Same comparison between the Council's PPA rebuilding alternatives for petrale sole and the SPR=0.50 alternative made in Figure 3 based on the median estimate of catch by year during rebuilding (ACL) (mt).

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SPR = 0.50 ACL | 459 | 624 | 791 | 945 | 2,080 | 2,080 | 2,080 | 2,080 | 2,080 | 2,080 | 2,080 |
| PPA ACL | 976 | 1,160 | 1,432 | 1,680 | 1,853 | 1,963 | 2,080 | 2,080 | 2,080 | 2,080 | 2,080 |
| PPA ACL - SPR=0.50 ACL | 517 | 536 | 641 | 735 | -227 | -117 | 0 | 0 | 0 | 0 | 0 |
| Cumulative Difference | 517 | 1,053 | 1,693 | 2,428 | 2,202 | 2,085 | 2,085 | 2,085 | 2,085 | 2,085 | 2,085 |

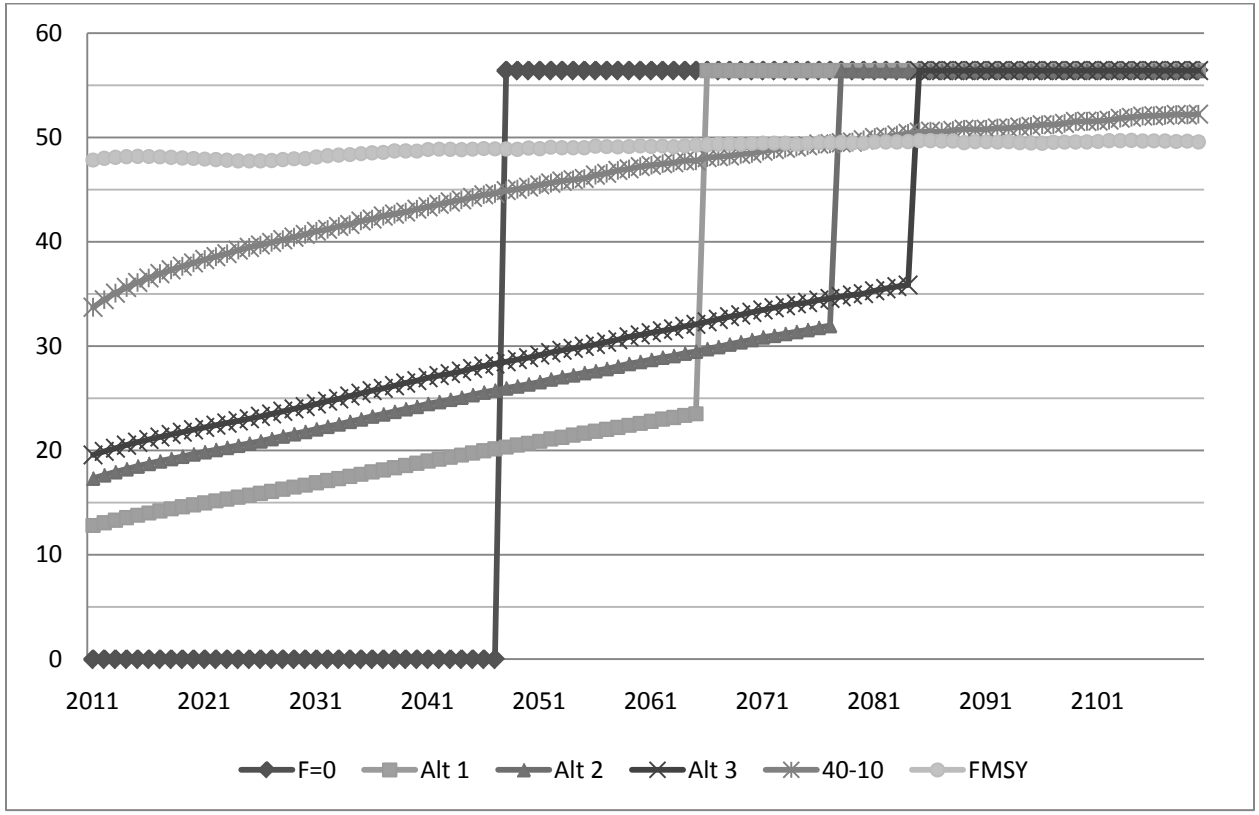



Figure 5. Median catch estimates (mt) by year for the alternative rebuilding strategies considered by the Council for yelloweye rockfish in the setting of 2009-2010 harvest specifications, plus the 40-10 and $F_{MSY}$ control rules. In the year after the probability of recovery reached 50 percent, we replaced the median catch estimate with the estimate yield at $B_{MSY}$ from Stewart et al., 2009.

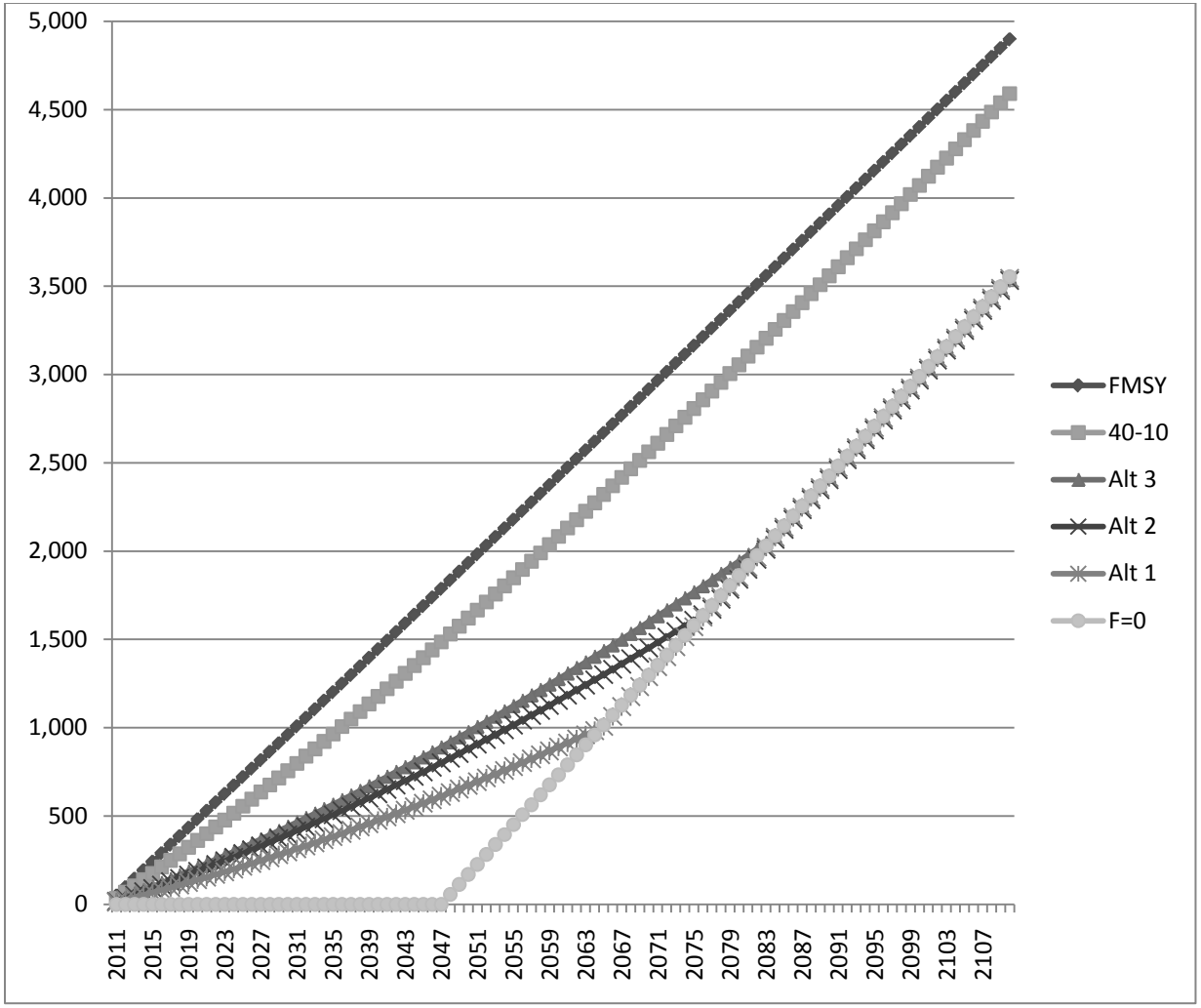



Figure 6. The cumulative median catch (mt) for the alternative rebuilding strategies considered by the Council for yelloweye rockfish in the setting of 2009-2010 harvest specifications, plus the 40-10 and $F_{MSY}$ control rule alternatives.

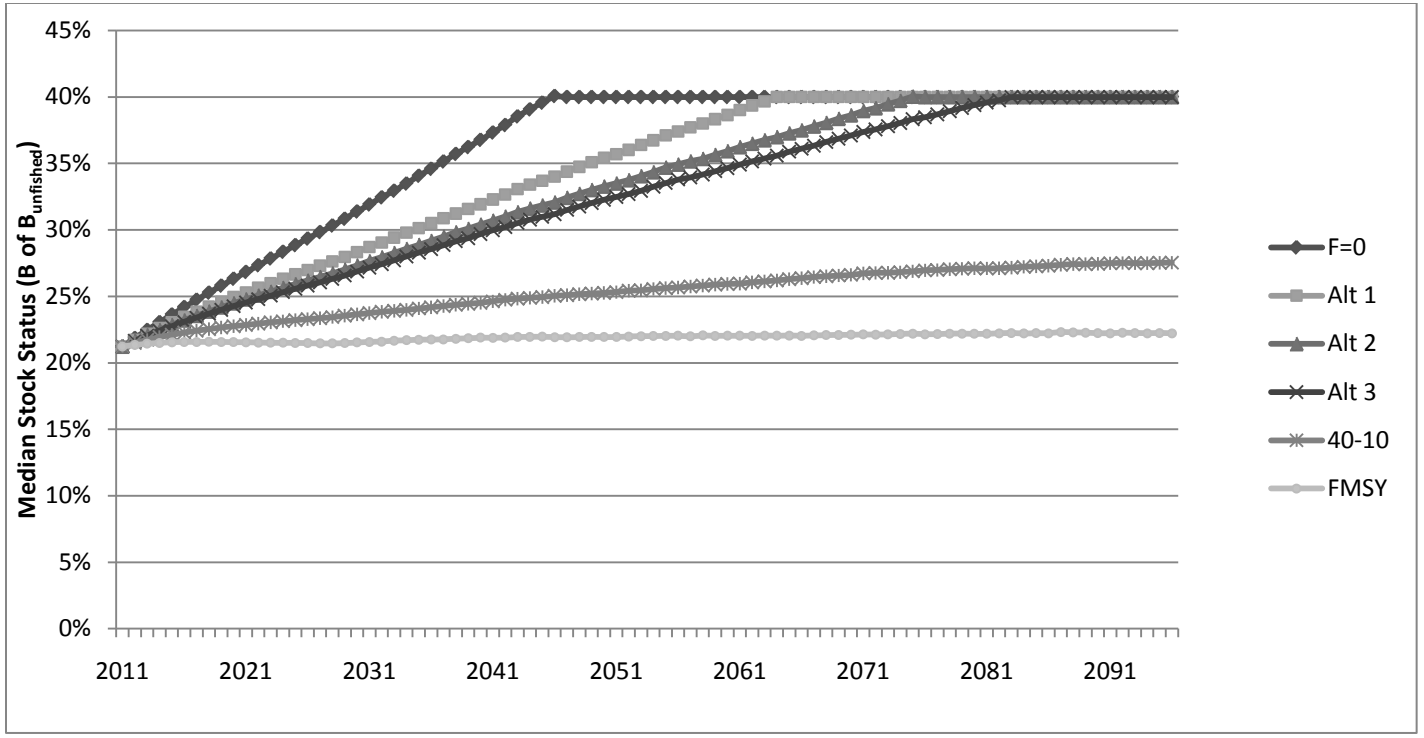



Figure 7. Projections of median stock status (% of $B_{unfished}$) by year for the 2009-10 yelloweye rockfish rebuilding alternatives and the 40-10 and $F_{MSY}$ control rule alternatives.

# FINAL SCHEDULE FOR COMPLETING THE 2013-14 SPECIFICATIONS AND MANAGEMENT MEASURES AND CONSIDERATIONS FOR SOLVING BIENNIAL CYCLE PROCESS ISSUES

The Groundfish Advisory Subpanel (GAP) considered the presentation by Ms. Kelly Ames and Mr. John DeVore on revising the Council Operating Procedure 19 for exempted fishing permits, revising the final schedule for completing the 2013-2014 specifications and management measures, and considerations for solving biennial cycle process issues.

## COP 19 – exempted fishing permits

The GAP generally approves of the proposed revision, noting that aligning Exempted Fishing Permits (EFPs) to the two-year specifications schedule is a reasonable idea. Two issues came up during our discussion:

1) EFPs that don't require set-asides: The GAP generally supports the two-year EFP process but we would like the flexibility to introduce EFPs annually for concepts that do not require any set-asides of fish, such as gear modifications in the trawl individual quota (TIQ) program. Modifications of regulatory artifacts from prior management in the trawl fishery are anticipated, but may require an EFP. Requiring a two-year process for those EFPs would likely impair flexibility and the opportunity to accelerate management improvement.

2) We note that in Attachment 2 under this agenda item, the proposed revisions to COP 19, the GAP is listed as one of the advisory bodies assigned to review the submission (Section A) of EFPs, along with the GMT and SSC. However, in Section C, Review and Approval, as well as later sections, the GAP is not included in the list of subcommittees reviewing or receiving reports pertaining to the EFP. The GAP believes we have valuable and pertinent expertise relating to the development and approval of EFPs and should be included in all stages of review.

## Schedule for completing 2013-14 specifications and biennial process issues

While the complexity of some of the issues prevents the GAP from spending a lot of time discussing them, we are certain several objectives must be considered when making any changes to the schedule. Furthermore, since some of our comments apply to both the 2013-14 process and later biennial processes, we have combined our discussions here.

Generally, the GAP is satisfied with any process that allows more time to assimilate new science and data for use to make better informed decisions.

At the same time, the GAP understands that NMFS' streamlining process is projected to require more time for NEPA considerations, a 14-month timeframe in some instances. This simply is unacceptable. The Council, council staff, and advisory bodies have spent much time trying to

revise the biennial cycle to make it more efficient, yet NMFS procedures now could commandeer much of that time in NEPA analysis.

The GAP discussed changing the fishing year to 14 months or 16 months or even starting the fishing year on April 1 or May 1 to work with this change. A three-year spex process also was suggested. In the end, both of these ideas were eliminated as unworkable. Aligning the spex process with annual fishing years simply makes sense and a three-year cycle could eliminate the inclusion of new science or assessments that could have profound effects on management decisions.

We further discussed the use of a programmatic Environmental Impact Statement (EIS) – a comprehensive EIS with a tiered approach that uses separate Environmental Assessments (EAs) – as a solution to the biennial spex problem. We thought this might be a good solution but we do not want to sacrifice the flexibility of in-season adjustments nor do we want development of this "super EIS" to sacrifice traditional, carefully considered input by the Council and its advisory bodies for the 2013-14 cycle.

The GAP also recommends the council request a schedule on how an EA would be developed for the 2013-14 harvest spex cycle. Furthermore, looking at how other Councils incorporate NEPA reviews while developing regulations that consistently get implemented on time may provide insight for Pacific Council and NMFS staff on ways to streamline the process so that it is workable for everyone.

To that end, GAP members have identified key issues that are important to the industry and request these be taken into consideration when looking at future spex schedules.

1. Maintaining a January 1 start date. The fishing industry needs some assurance fishermen will be able to fish and processors will have product at the beginning of the year. This maintains continuity of supply to the market. While there are assurances the shore-based trawl sector would start on time, it is important that the limited-entry fixed-gear and open access fleets are assured of being able to fish January 1.

   In particular, since some of the management responsibility for whiting will be handled by an international commission, it is important that regulations developed by the Council and approved by NMFS match that commission's schedule. It also is important that the allocation of non-whiting bycatch to the whiting fleet be completed on time so the fleet can plan its fishing operations for the year.

   The fixed-gear tiered blackcod fishery, which starts in April, will need to have regulations in place to prosecute the fishery.

   While the general belief is that it would be unlikely regulations would be delayed for three or four months, it's not out of the realm of possibility.

   At the very least, a phased-in approach, such as was done this year, could be used. In the long-term, however, this is not a good plan.

Maintaining in-season flexibility. Currently, the Trawl Individual Quota program should remove the necessity of most of the in-season actions for the shoreside limited entry groundfish trawl sector, with the exception of some items such as changes in the Rockfish Conservation Area (RCA) line or for non-TIQ trawl fisheries. The other sectors – recreation, limted entry fixed-gear, open access, etc. – do need the flexibility to make in-season changes, as the current process affords.

PFMC
06/10/11

# GROUNDFISH MANAGEMENT TEAM REPORT ON THE FINAL SCHEDULE FOR COMPLETING THE 2013-14 SPECIFICATIONS AND MANAGEMENT MEASURES AND CONSIDERATIONS FOR SOLVING BIENNIAL CYCLE PROCESS ISSUES

The Groundfish Management Team (GMT) reviewed materials submitted under this agenda item and offers the following comments for consideration. We have structured this statement around the three Council actions identified in the Situation Summary, taking them in order:

## *I. Consider modifying Council Operating Procedure (COP) 19 for groundfish exempted fishing permits (EFPs) to align with biennial decision making*

The GMT reviewed the draft proposed schedule for the 2013-14 harvest specifications and management measures (Attachment 1), draft COP 19 for EFPs (Attachment 2) and the April 2011 GMT statement (Agenda Item I.2.c, Supplemental GMT Report), and provides the following comments, relative to modifying the EFP approval process and timeline.

**The GMT supports the schedule proposed in the revised draft for COP 19** (Attachment 2), in place of the Process Improvement Committee recommended schedule (preliminary approval in April of even years, final approval in June of even years) because it more closely aligns with the Council's preliminary and final decisions on annual catch limits (ACLs) and set-aside amounts for non-overfished and overfished species. With the adoption of Amendment 21, there is less flexibility to adjust set-asides during the cycle, and we see this alignment potentially helping with this aspect. In addition, a schedule that accepts EFPs in November (odd year) would provide more time for Scientific and Statistical Committee (SSC) review and modification of the EFP, if necessary, prior to the Council taking final action in June (even year). The longer time-frame between initial consideration of EFPs and final action also provides the Council with some flexibility to adjust the schedule, if necessary. **The GMT supports the recommendation to include a mid-cycle evaluation of EFP performance by the Council in November of the odd year to determine whether sufficient set-aside is available for the following year and to make other adjustments that might be necessary.**

The GMT would like to reiterate some of the pros and cons of aligning the EFP approval process with the biennial harvest specifications and management measures process that we presented in the April 2011 GMT statement. Alignment with the groundfish biennial cycle might free up Council and advisory body agenda time mid-cycle, which the Council and advisory bodies might use to consider additional management measures. A biennial process may also increase the likelihood of timely permitting (meaning the permits may get issued by January 1 instead of later in the year). Additionally, a two-year EFP might be able to provide more data than a one-year EFP. The GMT does have some concerns with taking on EFPs during development of the biennial harvest specifications and management measures. Consideration of EFP applications will add to the GMT's workload, as well as the National Marine Fisheries Service (NMFS) Northwest Region's (NWR) workload, during an already busy and complicated time in the process, with EFPs potentially competing with other Council and NMFS NWR priorities.

II. *Adopt a final process and schedule for developing the 2013-14 groundfish harvest specifications and management measures.*

During the discussion of this agenda item, the GMT was presented with the NMFS and Council staff report on this schedule (Supplemental Attachment 6) which states that a January 1, 2013 start date is highly unlikely, even with the proposed front-loaded schedule. The majority of the team's discussions proceeded based on the proposed schedule in Attachment 1, and a January 1 start date. If the schedule is changed and/or the start date is delayed, it may require adjustment of the timing of tasks by the GMT, which we can update in September.

Throughout this process, the Council and GMT have assumed that development of an Environmental Impact Statement (EIS) for the 2013-14 harvest specifications and management measures will be required, given the history of previous biennial actions. If NMFS determines that an Environmental Assessment (EA) can be prepared instead, a shorter schedule may be possible. The NMFS determination of the appropriate National Environmental Policy Act (NEPA) document is scheduled to occur by September 28, 2011, in time for discussions at the November 2011 Council meeting. The GMT recommends that an EA schedule be prepared, including the number of days proposed for a public comment period (if desired by the agency), for the September Council meeting. Additionally, the GMT recommends that the Council task the appropriate staff with developing a white paper that describes how other Councils and Regions develop and implement harvest specifications and management measures, while meeting NEPA requirements and still have those regulations going into effect on time.

*a. Stock Complex Analysis*

In reviewing Attachment 1 (p. 4-5) we noted one difference between the preliminary preferred schedule and the Council's guidance, as some understood it, from April 2011. The difference has to do with the schedule for completing the National Standard 1 Guidelines recommended review of the Fishery Management Plan's (FMP) classification of stocks (i.e., stocks "in the fishery") and the evaluation of stock complexes. Figure 1 reproduces the basic steps involved with analysis and decision making that we outlined in our April statement (Agenda Item I.2.c, Supplemental GMT Report, April 2011).

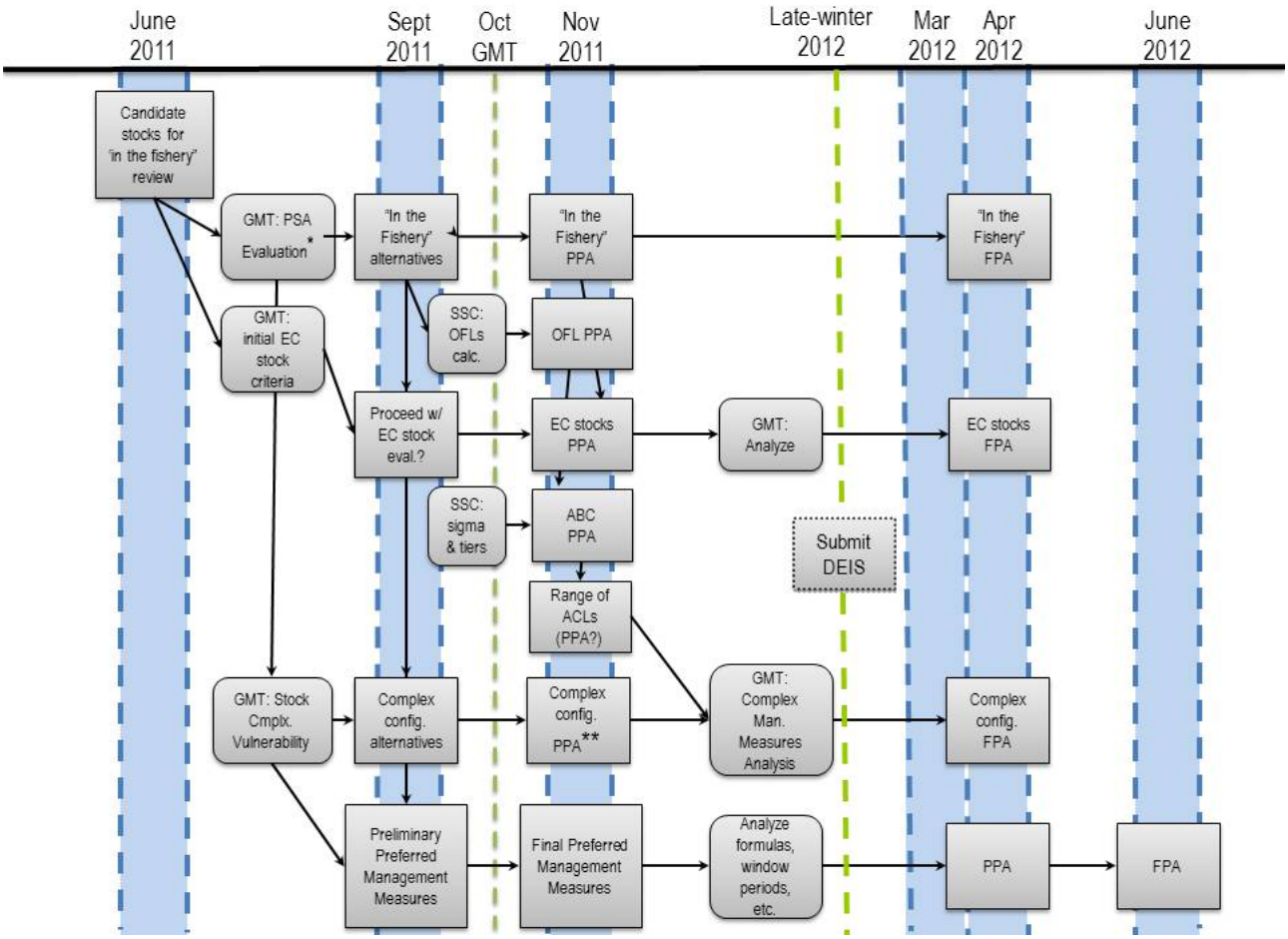



**Figure 1. Diagram of steps required to align the stocks within the FMP and the configuration of the complexes with National Standard 1 and develop management measures for the coming biennial cycle.**

Potential reconfiguration of stock complexes raised the most logistical concerns with the 2013-14 schedule. From the analytical and decision making perspective, when structuring the alternatives for the evaluation for stock complexes we have to keep in mind two purposes: (1) to compare and contrast options for structuring the complexes in a way that best informs the Council's decision on the appropriate management measures, including reconfiguring the stock complexes, and if so, how; and then, (2) to inform and assimilate with the integrated alternatives used to inform the setting of ACLs for rebuilding stocks.

Some on the team do not think the analysis can serve the first purpose until the Council addresses the rebuilding ACLs in November 2011. The management measures and fishing opportunity associated with alternative stock complex configurations—i.e., in how effective they are at controlling the risk of overfishing and in how they might adversely impact fishing communities—are key factors informing the Council's final recommendation. Given that rebuilding ACLs drive management measures in the groundfish fisheries, some on the team do

not think these factors can be addressed thoroughly until after the Council makes recommendations on the range of rebuilding ACLs in November.

On the other hand, others worry that the Council's decision on stock complex configurations could affect management measures so much that the analysis of integrated alternatives would potentially have to be redone depending on what the Council chooses as final stock complexes. All on the team agree that there is some possibility of this happening and that significant attention will have to be given to how the stock complex evaluation alternatives are structured. Some don't think the possibility is severe enough to require that the Council make a preliminary preferred decision in September or a final preferred alternative in November.

All on the team also agree that we'll have a better sense of these questions in September. The plan is to continue the work started by Council staff and a subgroup of the GMT over the summer. A big part of this work will involve consideration of how to best structure the alternatives and then bring alternatives to the September meeting for input by the full GMT, the SSC, the Groundfish Advisory Subpanel (GAP) and initial Council consideration. At this point, we will all have a better sense of the analytical steps that remain, the factors that the Council needs and wants to inform its decision, and the logistical issues integrated alternatives.

*b. Integrated Alternatives*

The GMT discussed the data limitations that arise from front-loaded schedules. Commercial models rely on landings data from PacFIN and West Coast Observer Program (WCGOP) bycatch rate data. PacFIN landings data are typically available on a two to three-month time lag, for the majority of hard data. Bycatch rate data from WCGOP are on a two-year lag (e.g., 2008 bycatch rates were available in 2010). Updated commercial models are typically provided in January, although in some years updated models have been provided as late as March. Recreational models rely on RecFIN data which is on a two-month time lag (e.g., December data is available in early February).

Table 1 outlines the data that will be available for use in the 2013-14 analysis based on two time periods: analysis starting in mid-November and early February. These two time periods were chosen as based on the availability of updated WCGOP bycatch rates. For example, an analysis conducted in mid-November 2011 would rely on 2009 bycatch rate data, while an analysis started in February 2012 could incorporate 2010 bycatch rate data. The GMT has not yet had the opportunity to ask WCGOP whether commercial models updated with 2010 bycatch data could be provided in November 2011, we will do so and report back at the September Council meeting.

**Table 1. Data available for use in the 2013-14 biennial projection models, based on the data delivery date to meet the NEPA review schedules. Data used in the 2011-12 spex analysis is included for reference.**

| Fishery | Model | 15-Nov-2011 | 15-Feb-2012 | 11-12 spex |
|---|---|---|---|---|
| Rec | Washington | thru Sep 2011 | thru 2011 | thru Sep 2010 |
| | Oregon | thru 2010 | thru 2011 | thru 2009 |
| | California | thru August 2011 | thru 2011 | thru 2009 |
| Trawl | Shorebased | Framework/model at conceptual stage, data availability unknown | data availability unknown | N/A |
| | At-Sea | | | N/A |
| Fixed Gear (FG) Impact Models | Neashore-OR | thru 2009 | thru 2010 | 2007-2009 |
| | Nearshore-CA | thru 2009 | thru 2010 | 2006-2008 |
| | Non-nearshore | thru 2009 | thru 2010 | thru 2008 (2009 data received for March 2010 meeting) |
| FG Trip Limit Models 1/ | FG N of 36°N LE | thru 2010 | thru 2011 | thru 2010 |
| | FG N of 36°N OA | thru 2010 | thru 2011 | thru 2010 |
| | FG S of 36°N LE | thru 2010 | thru 2011 | thru 2010 |
| | FG S of 36°N OA | thru 2010 | thru 2011 | thru 2010 |
| Tribal | Whiting | thru 2010 2/ | thru 2011 | thru 2009 |

1/ Uses PacFin landings data on a two month lag.

2/ 2011 bycatch rates may be available if the tribal whiting fishery is finished prior to November.

Additionally, it is our understanding that the Project Team had difficulty resolving the analysis and documentation schedule for the draft EIS. As such, the 2013-14 schedule in Attachment 1 lists the delivery date of the draft EIS for internal review as "late winter." The GMT was asked to weigh in on the amount of time necessary to analyze the integrated alternatives and management measures. During the 2011-12 cycle, it took 27 business days for the GMT to conduct this analysis. To provide sufficient time for analysis the GMT recommends 40 business days for this step. Assuming the analysis can begin immediately after the November 2011 Council meeting, the GMT analysis would be completed in early January (if using the 2009 bycatch rates) or early April (using the 2010 bycatch rates, assuming a February 2012 delivery).

After adding in all of the other process steps (e.g., socio-economic analysis by the Northwest Fishery Science Center, write up, etc.), the delivery of the draft EIS for internal review could occur in late March (2009 bycatch rates) or late May (2010 bycatch rates), significantly later than the "late winter" deadline proposed in Attachment 1.

*c. Summer Workload Considerations*

The preliminary preferred schedule for 2013-14 has the GMT doing a lot of preparation for the 2013-14 analysis during the summer (time between June and September Council meetings). This includes attending Stock Assessment Review (STAR) panels, updating data and models, developing management measures, working on the stock complexes and probability of overfishing (P*) considerations, as well as other GMT and non-GMT duties (Figure 2). At first glance, this may seem like a sufficient amount of time, but the GMT would like to highlight the fact that they will not be able to dedicate 100 percent of their time solely to 2013-14 issues during this time.

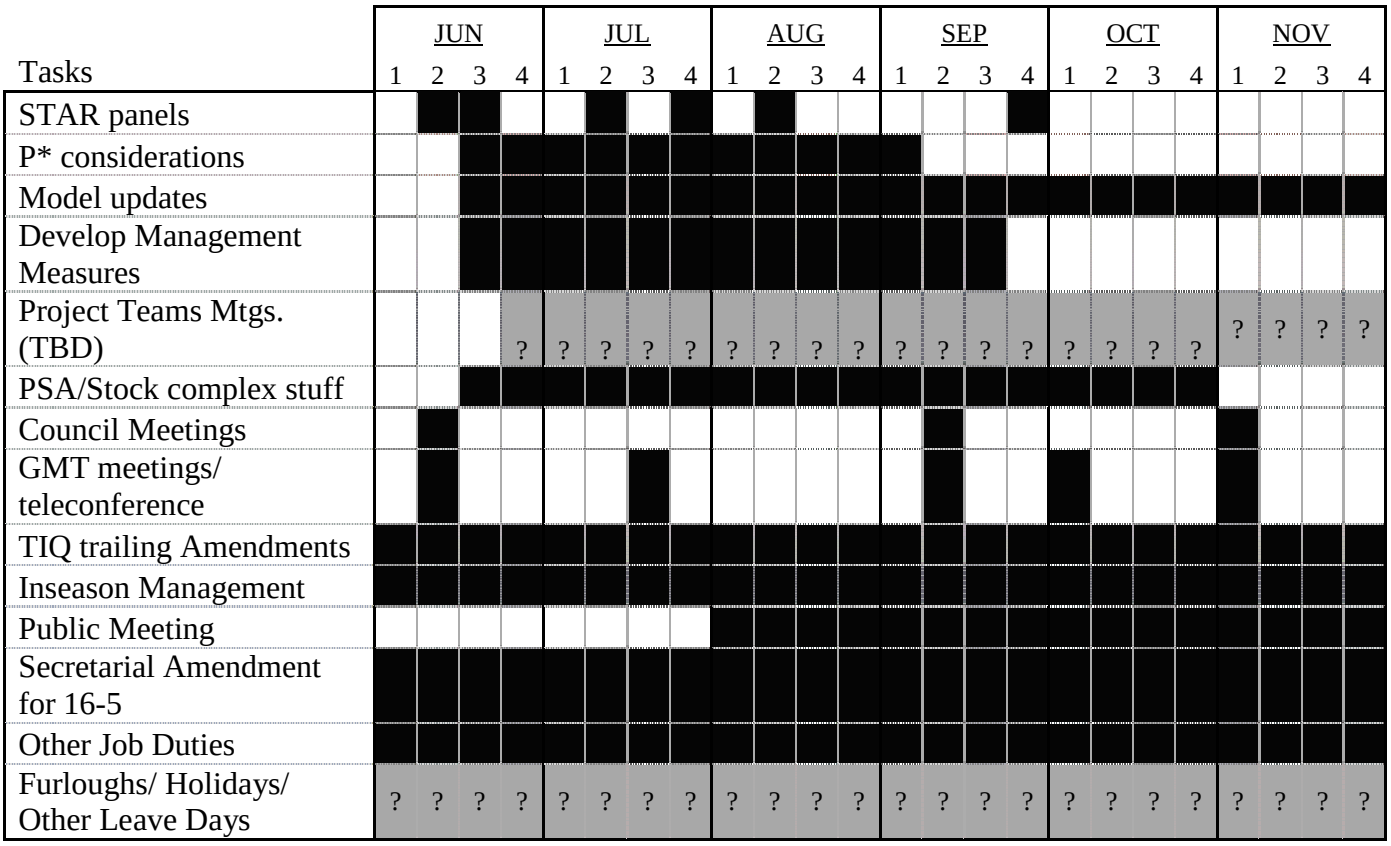



**Figure 2. GMT tasks co-occurring between the June, September and November Council meetings.**

*d. Clarification of Rebuilding Analyses*

In April 2011 the GMT put forward a suggestion that the Council request advice and guidance from the SSC on interpreting rebuilding analyses. To help the SSC and the Council better understand our request and the type of questions we have, the GMT outlined the general issues in

Agenda Item E.4 b, GMT Report. The GMT report is meant as an overview of the general ideas that the GMT would like to have clarified. We have been making some assumptions about what the rebuilding analyses are telling us and the GMT feels that feedback from the SSC on whether or not we are on track with these assumptions is critical to inform future decisions.

Feedback from the SSC on the issues/questions outlined in the report would help the GMT describe and the Council consider policy issues such as long-term versus short-term trade-offs associated with making harvest specification decisions based on rebuilding analyses. This may lead to broader understanding of rebuilding analysis and Council decisions on rebuilding among the public, as well. Clarification from the SSC on these rebuilding assumptions should also help inform the NEPA project team as they develop alternatives covering a reasonable range of possibilities, potentially including rebuilding scenarios that have not been considered before.

Ideally we would like to have some feedback from the SSC in time for the analyses that will go into the harvest specification decisions for the 2013-14 management cycle starting in November. If the Council supports moving forward with this discussion, the GMT is prepared to formulate specific questions that we would like the SSC to consider. We understand that there may not be time for the SSC to fully respond to all of our questions in time for the 2013-14 management cycle but think that some information would improve the decision-making process while the conversation continues over the long term.

III. *Consider solutions to biennial cycle process issues, including a programmatic approach which may involve an FMP amendment*

We continue to support the idea of exploring long-term solutions for the issues causing the challenges of meeting a January 1 implementation date for the biennial setting and adjustment of harvest specifications and management measures. We are concerned, however, with the feasibility of the two options for a three meeting process described in Attachment 5. Both options would involve taking on this important discussion while also in the middle of the 2013-14 process. The GMT's ability to engage in the discussion would therefore be limited under either option. We assume the same would be true for everyone, from the Council to the public.

**We therefore offer a third option for consideration (**Table 2**).** This option would begin in September 2012, the next meeting after the Council will have completed its business on 2013-14. The second meeting could then be in March or April 2013, with June 2013 serving as the final meeting. If this three meeting process resulted in a Council recommendation to amend the FMP, then the option we propose would involve some overlap between the start of the new process and NOAA's review and implementation of the amendment. The overlap would not be the same as with Amendment 23 and the 2011-12 cycle where the two efforts were largely concurrent. The option we propose would have the Council finish its recommended changes to the process before then following those recommendations (assuming that the new process started no earlier than September 2013).

Attachment 5 also mentions that the length of the NOAA review process for the potential FMP amendment would depend in part on the level of NEPA analysis required. The circumstances here may be somewhat unusual because part of the purpose and need for the FMP Amendment would be to better integrate NEPA procedures and analytical requirements with the fishery

management process for adjusting harvest specifications and management measures based on the most recent information possible. How problematic the potential overlap in implementation and taking action(s) under new FMP provisions is uncertain at this time.

**Table 2. GMT proposed option for a potential development schedule for considering an FMP amendment to modify the process for adjusting setting harvest specifications and management measures.**

| Council Meeting | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| November 2011 | 1st Council meeting | | |
| March 2012 | 2nd Council meeting | 1st Council meeting | |
| April 2012 | | | |
| June 2012 | 3rd Council meeting | 2nd Council meeting | |
| September 2012 | Possible 4th Council meeting | 3rd Council meeting | 1st Council meeting |
| November 2012 | | | |
| March 2013 | | | 2nd Council meeting |
| April 2013 | | | 3rd Council meeting |
| June 2013 | | | |
| September 2013 | Amendment implemented | Amendment implemented | Start of new process |
| March 2014 | | | |
| April 2014 | | | |
| June 2014 | | | |
| September 2014 | | | Amendment implemented |

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# SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON FINAL SCHEDULE FOR COMPLETING THE 2013-2014 SPECIFICATIONS AND MANAGEMENT MEASURES, AND CONSIDERATIONS FOR SOLVING BIENNIAL CYCLE PROCESS ISSUES

Ms. Kelly Ames briefed the Scientific and Statistical Committee (SSC) on this Agenda Item. The SSC discussion focused on two issues: 1) a review of the economic models used in the groundfish harvest specification process, and 2) the GMT Report on a review of a proposed economic analysis of the Council's rebuilding plans (Agenda Item E.4.b).

The SSC has previously emphasized the importance of review of the data and methodologies used in the harvest specification process to evaluate economic effects of management alternatives. At the April 2011 meeting, the SSC compiled a list of economic analyses and groundfish harvest forecast models that could potentially be reviewed:

- California Recreational Model;
- Oregon Recreational Model;
- Washington Recreational Model;
- Non-nearshore Fixed Gear Model;
- Limited Entry Fixed Gear Sablefish Daily-Trip-Limit Model north of 36 N. latitude;
- Limited Entry Fixed Gear Sablefish Daily-Trip-Limit Model south of 36 N. latitude;
- Open Access Daily Trip Limit Model Sablefish north and south of 36 N. latitude;
- Commercial Nearshore Fixed Gear Model;
- Commercial harvest projections to port regions;
- Trawl rationalization model (to be developed this year by the GMT).

The SSC Economics Subcommittee has developed a draft Terms of Reference (TOR) for a review process for economic analyses. Given workload considerations, the SSC now recommends that a one-day meeting of the Economics Subcommittee be scheduled prior to the Council meeting in September, and proposes that the commercial harvest projection model be reviewed at this meeting. This model (developed by Mr. Ed Waters) allocates catch and ex-vessel value to port groups. The review of this model could have immediate benefit, since recommended changes would likely be implemented in time for the 2013-2014 harvest specifications analyses.

Review of the remaining economic projection models continues to be a priority, but the SSC recommends this be done as an off-year science activity. One possibility to ensure routine review of economic and forecast models is to establish an annual or biannual review process, similar to the salmon methodology review process.

Mr. Corey Niles also presented a Groundfish Management Team (GMT) request for SSC review of a proposed economic analysis of alternative rebuilding plans for overfished groundfish species. The SSC is willing to discuss and review analytical tools developed by the GMT to evaluate alternative rebuilding strategies.

PFMC
06/10/11

Agenda Item E.5
Situation Summary
June 2011

# CONSIDERATION OF INSEASON ADJUSTMENTS – PART I

Management measures for the groundfish seasons are set by the Council with the general understanding these measures will likely need to be adjusted within the biennium to attain, but not exceed, the total catch limits. This agenda item will consider inseason adjustments to ongoing 2011 fisheries. Potential inseason adjustments include adjustments to rockfish conservation area boundaries and adjustments to commercial and recreational fishery catch limits. Adjustments are, in part, based on catch estimate updates and the latest information from the West Coast Groundfish Observer Program.

The Groundfish Management Team and the Groundfish Advisory Subpanel will meet prior to this agenda item to discuss and recommend inseason adjustments to 2011 groundfish fisheries. The Council will consider this agenda item on Saturday, June 11, 2011, and make recommendations as necessary. If further consideration of inseason adjustments is warranted, Agenda Item E.8, Consideration of Inseason Adjustments – Part II, is scheduled for Monday, June 13, 2011.

**Council Action:**

1. **Consider information on the status of 2011 fisheries and adopt preliminary or final (if possible) inseason adjustments as necessary.**

Reference Materials:

None.

Agenda Order:

a. Agenda Item Overview — Kelly Ames
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Adopt Preliminary or Final Recommendations for Adjustments to 2011 Groundfish Fisheries (Part II on Monday, if necessary)

PFMC
05/16/11

# ENFORCEMENT CONSULTANTS REPORT ON CONSIDERATION OF INSEASION ADJUSTMENTS

**TRat Implementation Update:**

Approximately 120 Vessel Accounts established, with approximately half of these accounts active with at least one delivery.

43 First Receiver Licenses issued.

**Accounts Management**

Software glitz's
Deficits:
- Failure to successfully initiate quota pound transfer
- Multi vessel management / Risk Pools covering deficits after landings
- Quota share (QS)/quota pound (QP) owners holding all of their QP in QS accounts and covering landings after delivery.

Observer data:
- Hit the system in mid May:
- Eight vessels went into deficit, three per halibut, five per target species
- Office of Law Enforcement (OLE) contacted the owners of the accounts, courtesy call
- Accounts cleared shortly thereafter.

Data entry errors
- Split deliveries

**Compliance Issues**

Fishing while in Deficit (most problematic issue to date, verbal and written warnings)
Observer Harassment
Deviation from Catch Monitoring Plans by FRs (verbal warning)
Overall, compliance to data is tracking at a high rate.

**AFTER ACTION REPORT:** *OPERATION CATCH SHARES COMPLIANCE*
**Area:** US / Canada Border to Morro Bay, CA

**Dates:** May 9-20, 2011

**Participants:** OLE Agents, Washington Department of Fish and Wildlife Officers, Oregon State Police Troopers, California Department of Fish and Game (CDFG) Wardens, United States Coast Guard

**Action Plan Emphasis:** Shoreside IFQ Trawl, Northern CA Shoreside IFQ Whiting

**Objective: To Assist Industry in Complying with NOAA Regulations:**

- Achieve local familiarization of TRat Program operations
- Analyze Industry understanding of the TRat Program requirements
- Inspect local offload sites for Federal and state regulation compliance
- Clarify/correct Industry confusion/ misunderstandings of TRat Program requirements
- Make contact with and support Observers and Catch Monitors
- Respond to detected violations as appropriate

**Southwest Division:**

Southwest region utilized seven Agents, one Enforcement Officer and four CDFG Wardens to contact and inspect groundfish first receivers and limited entry groundfish trawl vessels located in ports from Brookings, Oregon to Morro Bay, California.

There were approximately seventeen active limited entry trawlers (declared trawl) in California during the two week period of which nine fished and delivered in California. Brookings has two first receivers and California has twenty. Brookings received trawl fish at two first receivers and California received groundfish at seven first receivers during the operation period. Enforcement personnel inspected nine first receivers and monitored five limited entry trawl deliveries and two fixed gear deliveries by vessel with trawl permits. Some of the limited entry trawlers were not trawling during the two week period, because they remained focused on other fisheries.

No significant violations were detected at first receivers or on vessels during this period. Five trawlers were boarded and fully inspected. Two trawl vessel operators had unintentional violations because of difficulties transferring quota pounds into their vessel accounts. One first receiver site had a weigh scale visibility problem. The site utilized a second scale out of view of the main scale and the vessel offload. The second scale received the sorted sablefish, and a different process should be added to get gross weight of the sablefish before it is taken out of view of the observer.

A joint CDFG and National Oceanic and Atmospheric Administration (NOAA) two day at sea patrol was conducted by PB Blue Fin on May 17 and 18 near Morro Bay. One fixed gear vessel was located but weather prevented a boarding.

**Northwest Division:**

NOAA-OLE agents, their Joint Enforcement Agreement (JEA) partners, and a USCG boarding officer interviewed 48 people, inspected 15 fishing vessels (F/V), and inspected 8 first receivers associated with TRat. One written and one verbal warning were issued throughout the operation. Both warnings were issued by NOAA-OLE special agents. The written warning was issued for fishing in deficit and the verbal warning was issued for an issue related to the Groundfish Conservation Areas.

Throughout the operation mangers, owners, and operators expressed the view that the TRat Program was working more smoothly then they expected. As the operation progressed it was noted with appreciation that enforcement was attempting to resolve misconceptions before they became violations.

**Common Themes Expressed throughout the Operation:**

- Operators, catch monitors, and observers all generally agreed that the regulatory requirement for observers to remain aboard F/V after getting to shore and before offload should be removed. Most considered the requirement unnecessary as the most vital fish species would already be accounted for and some thought it was unsafe to live aboard the F/V while moored at certain docks.

- To varying degrees, operators, observers, and first receiver managers thought the rules concerning halibut accounting should be changed. One observer found the accounting process stressful and asked that one mortality percentage number be used for all halibut harvested. Many others agreed that dead halibut should be landed and donated.

- Many of the operators and owners are concerned about the future costs of observers. There is an impression that the program will not be subsidized for long and the costs will go up after the Federal government is no longer negotiating the contracts.

- A concern shared by managers at two first receivers is that the entire fishery could be closed by the negligent fishing of a few F/V.

- At the time of the operation, observer data was not available to quota share owners. This was universally identified as a problem for managing the fishery.

- There were varied objections to the principle behind quota sharing. The primary concern was the perceived control of the majority of the fishery by only a few people.

**Opportunities for Improvement on the Enforcement Model**

Enforcement personnel should improve their communication with the observer providers.
The TRat groundfish technicians in Seattle and enforcement personnel in the field need to continue coordination efforts.

**Conclusion:**

This operation again demonstrated that the JEA supported OLE/State Partnership is a vital and necessary component in ensuring compliance in the highly regulated environment of trawl rationalization.

This was an unprecedented joint compliance assistance operation that reinforced the positive working relationship between the fisheries enforcement partners and the fishing industry. In

general, there appeared to be an acceptance that the TRat Program was working well with some exceptions and noted reservations.

PFMC
06/11/11

# GROUNDFISH ADVISORY SUBPANEL REPORT ON CONSIDERATION OF INSEASON ADJUSTMENTS – PART I

The Groundfish Advisory Subpanel (GAP) and the Groundfish Management Team (GMT) discussed potential inseason actions for 2011. Following this initial inseason discussion, the GAP wishes to recommend the following:

Open access, shelf rockfish, south of 34° 27' N. Lat: Increase shelf rockfish trip limits from 750 lbs./2 months to 1,000 lbs./2 months.

Industry has reported encountering large amounts of speckled rockfish while targeting deeper nearshore rockfish and vermillion rockfish. This has created some discarding issues and this request is to turn discards into landed catch.

The GAP notes that this same issue was brought to the Council's attention in 2008. The Council adopted this same trip limit increase late in 2008. There was no effort shift of open access fishermen seen from this prior limit increase. The GAP therefore supports this increase of open access shelf rockfish from 750 lbs./2 months to 1,000 lbs./2 months for fishermen south of 34° 27' N. Latitude.

Limited entry and open access between 42° and 40° 10' N. Lat: Industry has requested an increase in nearshore black rockfish trip limits from the current "7,000 lbs./2 months, no more than 1,200 lbs. of which may be species other than black rockfish," up to 8,000 to 9,000 lbs./2 months, with no change to the black rockfish sublimit.

This fishery is tracking very low due to the combination of poor weather and the March 11 tsunami that devastated the port at Crescent City, the main port in this area, and damage done to neighboring ports and vessels as well. Current catch projections show this fishery will harvest only 50 percent of the commercial black rockfish allocation for California this year.

The GAP supports an increase from the current 7,000 lbs./2 months up to the following: 8,500 lbs./2 months, no more than 1,200 lbs. of which may be species other than black rockfish. Furthermore, GMT analysis shows little or no impacts to or increases of other species (GMT option 2, Table 6).

Limited entry and open access south of 40° 10' N. Lat: Deeper nearshore rockfish.

Industry has requested an increase for deeper nearshore rockfish to allow a higher take of black and blue rockfish. This fishery is also tracking quite low most likely due to poor weather conditions this winter and spring. The GAP supports an increase from 800 lbs/2 months up to 900 lbs./2 months, effective July 1 (GMT option 1, Table 8).

Limited entry fixed-gear sablefish north of 36° N. Lat: Daily trip limit (DTL) fishery.

The GMT has made necessary corrections to the Pacific Fishery Information Network algorithm and has updated current landing estimates. Projections show this fishery will grossly exceed the limited entry (LE) share north of 36° N. Lat without trip limit corrections.

The GAP supports the GMT option to reduce the current trip limit of 2,000 weekly/6,500 bimonthly down to 2,000 weekly/3,500 bimonthly to stay within the harvest guideline.

Limited entry fixed-gear sablefish south of 36° N. Lat:

The GAP notes this fishery is tracking behind schedule as of June 4 Quota Species Managemetn (QSM) Best Estimate Report. The GAP also notes the open access DTL fishery is tracking behind schedule. While the Council did adopt a harvest guideline of 55 percent for LE and 45 percent to open access for 2011, the GAP points out that this was not a hard allocation between the two sectors. The GAP suggests taking no action at this time and re-evaluating the situation in September.

Trawl fishery: Change the seaward Rockfish Conservation Area (RCA) line.

The GAP requests a change in the seaward RCA line north of 45° 46' N. Lat from 200 fathoms to 150 fathoms during periods 5 and 6 (effectively the remainder of the year).

We have commented on this before. The trawl fleet is operating under an individual, fully accountable rationalized system, so the responsibility of dealing with any bycatch is solely the fisherman's responsibility. As one trawler on the GAP said, "If people don't have [bycatch quota], they're not going to fish there."

The argument has been put forth that there is no proven track record to show one fisherman won't incur too much bycatch which could, in turn, close the whole trawl fishery.

The GAP argues that, on the contrary, there is no track record to show that it *would* happen. In fact, there has been only one or two times in the past that excessive bycatch has closed a fishery – and that was under traditional management. Under that system, we had no real incentive to avoid bycatch; under the Trawl Individual Quota program, now we do. That is the difference.

Another concern was the potential bycatch of darkblotched rockfish. Again, this argument is irrelevant. According to the latest National Marine Fisheries Service (NMFS) Trawl Individual Fishing Quota report[1], only 11 percent of the darkblotched rockfish quota has been caught – and we're nearly six months into the first year of the Trawl Individual Quota (TIQ) program.

For comparison, the GAP looked at the QSM Best Estimate Reports from 2010.

[1] Generated from NOAA West Coast Groundfish IFQ Application on 06/10/2011 11:20 AM; https://www.webapps.nwfsc.noaa.gov/ifq/

**2010-2011 harvest guidelines and year-to-date darkblotched rockfish catches, in pounds**

| | As of 6/12/10[2] | As of 12/31/10[3] | As of 6/10/11[1] |
|---|---|---|---|
| Harvest guideline/sector quota pounds | 634,931 | 634,931 | 552,997 |
| Landings | 304,237 | 403,446 | 61,254 |
| Percent harvested | 50% | 64% | 11% |

Clearly, the above table shows that:

- The trawl fleet darkblotched landings are down by nearly 80 percent over the same time last year
- Last year, the landings of darkblotched rockfish were below this year's trawl sector allocation by more than 100,000 pounds
- The trawl fleet could quintuple its darkblotched landings during the whiting season and *still* have enough quota remaining for the rest of the year

Given the change to independent accountability via the TIQ program, it's likely the darkblotched rockfish bycatch will be much lower this year – and it's already evident that bycatch has indeed decreased.

This change also would provide the Council with more data. At some point, the trawl fleet must be allowed the flexibility to test of the new system. The GAP is not advocating doing completely away with the RCA lines – other changes to the traditional management system will be considered by the Trawl Rationalization Regulatory Evaluation Committee – but this proposed change is not an unreasonable request.

Under this new management regime, many vessels have large darkblotched quotas that enable them to access other target species within this area. It's not solely for the purpose of targeting darkblotched.

Pacific whiting tribal reallocation: In light of the recent letter from the Quileute Tribe, that states they don't plan to fish for whiting in 2011, the GAP urges the Council request NMFS move expeditiously to ensure that any surplus whiting resulting from the tribe's announcement be made available to other sectors this year.

PFMC
06/10/11

[2] Extracted June 10, 2011, from:
http://pacfin.psmfc.org/pacfin_pub/data_rpts_pub/qsm_rpts_pub/ber_tf_100612.txt.

[3] Extracted June 10, 2011, from:
http://pacfin.psmfc.org/pacfin_pub/data_rpts_pub/qsm_rpts_pub/ber_tf_101231.txt

# GROUNDFISH ADVISORY SUBPANEL REPORT ON CONSIDERATION OF INSEASON ADJUSTMENTS – PART I

The Groundfish Advisory Subpanel (GAP) would like to add the following to its first in-season statement:

Open access fixed-gear sablefish north of 36° N. Latitude: The current model projection for the open access sablefish fishery north of 36° N. Latitude is tracking slightly high and the GAP supports the reduced trip limits proposed by the Groundfish Management Team (GMT). The limit should be reduced from the current 300 lbs. daily/1,200 lbs. weekly/2,250 lbs. bimonthly down to a new limit of 300 lbs. daily/1,050 lbs weekly/2,100 lbs bimonthly.

PFMC
06/11/11

Agenda Item E.5.b
Supplemental GMT Report
June 2011

# THE GROUNDFISH MANAGEMENT TEAM REPORT ON CONSIDERATION OF INSEASON ADJUSTMENTS

The Groundfish Management Team (GMT) considered the most recent information on the status of ongoing fisheries, research, and requests from industry and provides the following recommendations for 2011 inseason adjustments.

The GMT also received guidance from National Marine Fisheries Service (NMFS) Northwest Region (NWR) regarding timing of implementation of inseason recommendations from this meeting. NMFS anticipates implementing routine inseason adjustments to fishery management measures by July 1, 2011; however, adjustments that are not directly related to preventing exceeding 2011 annual catch limits (ACLs) may need to be separated for implementation after July 1, 2011 due to timing and workload considerations at NMFS.

## SCORECARD UPDATES

*Limited Entry Fixed Gear and Open Access Nearshore Fishery*

The GMT examined landing inputs to the nearshore model and discovered that it included lingcod that were actually taken in other non-nearshore fisheries. As a result, the nearshore model was overestimating overfished species impacts. The nearshore model was updated with the corrected lingcod data and the nearshore fishery row in the scorecard has been revised to reflect the update to overfished species impacts (Attachment 1).

## RESEARCH

Summer research projects are just beginning and the GMT has no updates on catch in research activities at this time. As updates become available, the GMT will present them, likely beginning in September. The GMT was notified by Washington Department of Fish and Wildlife (WDFW) staff that the state may do some sampling at rockfish stations off the Washington coast, but that would likely not begin until fall.

## RECREATIONAL FISHERIES

*Washington, Oregon and California*

Recreational fisheries in all three states are tracking within anticipated levels and no inseason adjustments to fishery management measures are recommended at this time. The scorecard (Attachment 1) has been updated with the correct harvest guidelines from the final 2011 harvest

specifications and management measure regulations, as well as the most current projected impacts.

## COMMERCIAL FISHERIES

### *Individual Fishing Quota (IFQ) Fishery*

#### Inseason Update

Table 1 lists the current IFQ catch by weight, attainment, and retention rates by species category, as of June 6, 2011. The current estimate of catch-weighted average retention rate for the fishery is 95%.

Since the start of the fishery on January 11, 2011, 162,816 mt has been debited to accounts overall, on 484 trips, on 118 landing days, at 17 ports, by 60 vessels, to 13 dealers, in all three states, using both trawl and fixed gear.

Sablefish north of 36° N. lat. shows the greatest percentage attainment, at 29.5%, followed by petrale sole with 28.8%, and longspine thornyheads, north of 34° 27’ N. lat. with 21.8%. Table 2 shows catch distributed by state and port. Overall, 67.8% of the total catch was in Oregon, Washington had 16.9%, and 15.3% of catch has been in California.

There have been 135 landings in California, 291 in Oregon, and 58 in Washington. The average weight debited per trip has been 18,240 pounds in California, 37,392 pounds in Oregon, and 46,780 pounds in Washington (Figure 1). Washington has the highest average pounds per trip, as well as the highest variance.

Dover sole has dominated catch by weight in Washington (36%), Oregon (53%) and California (58%). In Washington, Dover sole was followed by arrowtooth flounder (30%) and sablefish (11%) by weight. In Oregon, Dover sole was followed by arrowtooth flounder (20%) and sablefish (9%). Ranking behind Dover sole in California, sablefish north of 36° N. lat. comprised 14% of California catch by weight, and so did longspine thornyheads (14%), north of 34° 27’ N. lat.

Table 1. Current IFQ catch (total debited) and retention rates by species category, as of June 6, 2011.

| IFQ species category | Quota (mt) | Catch to date | mt remaining | % caught | % remaining | % retention |
|---|---|---|---|---|---|---|
| Arrowtooth flounder | 12,431 | 1,363 | 11,068 | 11.0% | 89.0% | 85% |
| BOCACCIO ROCKFISH, south of 40°10' N. | 60.0 | 0.8 | 59.2 | 1.3% | 98.7% | 100% |
| CANARY ROCKFISH | 25.9 | 0.2 | 25.7 | 0.8% | 99.2% | 99% |
| Chilipepper rockfish, south of 40°10' N. | 1,475 | 2 | 1,473 | 0.1% | 99.9% | 98% |
| COWCOD, south of 40°10' N. | 1.80 | 0.00 | 1.80 | 0.2% | 99.8% | 100% |
| DARKBLOTCHED ROCKFISH | 250.8 | 27.3 | 223.5 | 10.9% | 89.1% | 99% |
| Dover sole | 22,235 | 3,698 | 18,537 | 16.6% | 83.4% | 98% |
| English sole | 18,673 | 25 | 18,648 | 0.1% | 99.9% | 90% |
| Lingcod | 1,863 | 90 | 1,774 | 4.8% | 95.2% | 100% |
| Longspine thornyheads, north of 34°27' N. | 1,966 | 429 | 1,537 | 21.8% | 78.2% | 95% |
| Minor shelf rockfish, north of 40°10' N. | 522 | 2 | 520 | 0.3% | 99.7% | 60% |
| Minor shelf rockfish, south of 40°10' N. | 86 | 0 | 86 | 0.2% | 99.8% | 4% |
| Minor slope rockfish, north of 40°10' N. | 830 | 53 | 776 | 6.4% | 93.6% | 98% |
| Minor slope rockfish, south of 40°10' N. | 377 | 4 | 373 | 1.2% | 98.8% | 99% |
| Other flatfish | 4,197 | 155 | 4,042 | 3.7% | 96.3% | 95% |
| Pacific cod | 1,135 | 40 | 1,095 | 3.5% | 96.5% | 100% |
| Pacific halibut (IBQ), north of 40°10' N. | 117 | 9 | 108 | 7.7% | 92.3% | 0% |
| PACIFIC OCEAN PERCH, north of 40°10' N. | 119.4 | 14.6 | 104.7 | 12.3% | 87.7% | 100% |
| Pacific whiting | 92,818 | 40 | 92,778 | 0.0% | 100.0% | 26% |
| PETRALE SOLE | 871.0 | 256.6 | 614.4 | 29.5% | 70.5% | 100% |
| Sablefish, north of 36° N. | 2,546 | 733 | 1,814 | 28.8% | 71.2% | 100% |
| Sablefish, south of 36° N. | 531 | 13 | 518 | 2.4% | 97.6% | 99% |
| Shortspine thornyheads, north of 34°27' N. | 1,432 | 301 | 1,130 | 21.0% | 79.0% | 99% |
| Shortspine thornyheads, south of 34°27' N. | 50 | 0 | 50 | 0.0% | 100.0% | NA |
| Splitnose rockfish, south of 40°10' N. | 1,381 | 2 | 1,379 | 0.2% | 99.8% | 39% |
| Starry flounder | 668 | 4 | 664 | 0.6% | 99.4% | 98% |
| WIDOW ROCKFISH | 342.6 | 1.1 | 341.6 | 0.3% | 99.7% | 100% |
| YELLOWEYE ROCKFISH | 0.60 | 0.02 | 0.58 | 3.2% | 96.8% | 100% |
| Yellowtail rockfish, north of 40°10' N. | 3,094 | 20 | 3,074 | 0.6% | 99.4% | 100% |
| | | Catch-weighted average retention | | | | 95% |

Table 2. Current IFQ catch, in mt and percent of total, by state and port. Some data omitted due to few vessels contributing.

| | mt | % total |
|---|---|---|
| California | 1116.9 | 15.3% |
| Eureka | | |
| Eureka Area | | |
| Fort Bragg | | |
| Moss Landing | | |
| Crescent City | | |
| Monterey | | |
| Morro Bay | | |
| Princeton/Half Moon Bay | | |
| San Francisco | | |
| Not recorded | | |
| Sum combined | 1116.9 | 15.3% |
| | | |
| Oregon | 4935.6 | 67.8% |
| Astoria | 3010.8 | 41.3% |
| Brookings | 527.5 | 7.2% |
| Charleston (Coos Bay) | 785.1 | 10.8% |
| Newport | 612.2 | 8.4% |
| | | |
| Washington | 1230.7 | 16.9% |
| Bellingham Bay | 530.9 | 7.3% |
| | | |
| Ilwaco | | |
| Westport | | |
| Not recorded | | |
| Sum combined | 699.8 | 9.60% |

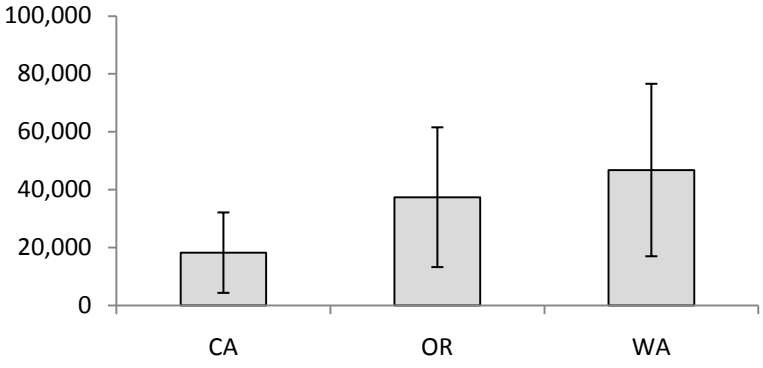



Figure 1. Average number of pounds debited per trip, by state, and standard deviation. There have been 135 landings in California, 291 in Oregon, and 58 in Washington.

Modifications to the Seaward Boundary of the Trawl Rockfish Conservation Area (RCA)

The GMT received a request from the Groundfish Advisory Subpanel (GAP) to move the seaward boundary line of the trawl Rockfish Conservation Area (RCA) from the 200 fm line to the 150 fm line (Table 3) for the area 45°46' N. lat. (Cape Falcon) to 48°10' N. lat. (Cape Alava) starting September 1 through the end of the year (i.e., Periods 5 and 6). There are three major considerations at play with requests for changes to the trawl RCA boundaries: (1) potential impacts to co-occurring overfished and individual bycatch quota (IBQ) species that may be protected by the current RCA structure (e.g., darkblotched rockfish and Pacific halibut), (2) a strong desire for industry to exercise their benefits of individual accountability to access fishing areas that are, and have been, closed by the RCA, and (3) the amount of area of the coastline included in the request. The GMT notes that the decision for changes to the boundaries of the RCA is largely a risk call and therefore the GMT is presenting the available data that the Council may want to consider when weighing this decision.

Table 3. Current limited entry trawl rockfish conservation areas north of 40°10' N. Lat. (Federal Register, Vol. 76, No. 91, p. 27548) with the requested modification (strikeout/underline)

<table>
<tr><td></td><td>JAN-FEB</td><td>MAR-APR</td><td>MAY-JUN</td><td>JUL-AUG</td><td>SEP-OCT</td><td>NOV-DEC</td></tr>
<tr><td>North of 48°10' N. lat.</td><td>shore - modified 200 fm line</td><td>shore - 200 fm line</td><td colspan="2">shore - 150 fm line</td><td>shore - 200 fm line</td><td>shore - modified 200 fm line</td></tr>
<tr><td>48°10' N. lat. - 45°46' N. lat.</td><td rowspan="2">75 fm line - modified 200 fm line</td><td rowspan="2">75 fm line - 200 fm line</td><td>75 fm line - 150 fm line</td><td>100 fm line - 150 fm line</td><td>75 fm line - ~~200 fm line~~ 150 fm line</td><td>75 fm line - ~~modified 200 fm line~~ 150 fm line</td></tr>
<tr><td>45°46' N. lat. - 40°10' N. lat.</td><td>75 fm line - 200 fm line</td><td>100 fm line - 200 fm line</td><td>75 fm line - 200 fm line</td><td>75 fm line - modified 200 fm line</td></tr>
</table>

This request was analyzed to evaluate the impacts to darkblotched rockfish using three data sources: (a) 2011 IFQ catch data through June 6, 2011 (i.e., NMFS VA database), (b) average 2006-2010 bycatch rate by depth data obtained from the West Coast Groundfish Observer Program (WCGOP), and (c) 2009-2010 west coast trawl logbook data acquired from PacFIN. The only data available for the GMT to evaluate potential impacts of this RCA change to Pacific halibut was provided in a WCGOP report to Council staff. The GMT points out that the bycatch data sets represent pre-IFQ conditions (i.e., data were collected during trip-limit management of the trawl fishery). Use of pre-IFQ data (e.g., bycatch rates) for evaluating potential impacts to overfished and IBQ species under IFQ management may be debatable. There was no individual penalty for exceeding trip limits or catching IBQ species prior to IFQ, as long as any excess was discarded and not delivered. On the other hand, the individual penalty may be severe for exceeding quota pounds (QP) under the IFQ program, where all fish caught, even if discarded, are accounted for. If a vessel exceeds their QP under the IFQ program, they must acquire additional QP, presumably at a high price, before being allowed to

continue fishing. The Council may wish to consider this difference between the pre- and post-IFQ fishery when evaluating the potential effects of bycatch rates by depth (i.e., Figure 2 and Figure 3 below). The GMT acknowledges that bycatch data we present may not be optimal, but these are the only data available to provide some insight on relative abundance of darkblotched rockfish and Pacific halibut between depth strata or geographic area.

*Darkblotched rockfish catch to date:* As of June 6, 2011, only 27.3 mt of darkblotched rockfish were harvested (landings plus discard) by the west coast IFQ fishery, which represents 11% of the 2011 darkblotched rockfish IFQ allocation (Table 1). Landings of darkblotched rockfish are currently much lower under the IFQ program than observed during the same period during previous years (pre-IFQ). For example, during period 1, the 2011 IFQ landings of darkblotched rockfish were 26% of the average 2006-2010 pre-IFQ landings (PFMC, Agenda Item I.5.b, Supplemental GMT Report, April, 2011). Reasons for the lower landings of darkblotched, through the first half of 2011, may be a combination of fewer trips relative to previous years (PFMC, Agenda Item I.5.b., Supplemental GMT Report, April 2011) and individual accountability affecting fishing behavior (see above; e.g., where and when to fish). The GMT notes that catch and catch rates can increase quickly, so the low catch of darkblotched rockfish during the first half of 2011 cannot be used to predict catch during the second half of 2011. These data is presented only to provide the Council with a reference point of the current fishery.

*Historical RCA Structure:* Since 2004, the trawl RCA north of 40°10' N. lat. has been 200 fm or deeper for periods 5 and 6, with the following exceptions:

- The RCA was 150 fm during September and October 2008 between 46°16' and 48°10' N. lat.; and
- The RCA was 150 fm during September 2004 north of 40°10'.

Hence, very little fishing has occurred between the 150 fm and 200 fm RCA boundaries during this time of year in recent years. It is therefore difficult to accurately predict the catch within this area during periods 5 and 6.

*Darkblotched bycatch rates prior to IFQ*: Prior to implementation of the IFQ program, bycatch rates provided by WCGOP were evaluated when making decisions regarding RCAs (PFMC and NMFS, 2011). These bycatch rates were also included in the trawl model used to predict the catch of overfished species (PFMC and NMFS, 2011). WCGOP bycatch rates for darkblotched rockfish north of 40°10' N. lat are provided for depths 150-200 fm and depths 200-250 fm (weighted averages for 2006-2010) to illustrate the potential likelihood of encountering darkblotched rockfish with bottom trawl between the two depth strata (Figure 2). These data suggest that darkblotched rockfish are more likely to be encountered at depths greater than 150 fm than at depths greater than 200 fm. Differences are largest for periods 1 and 6. Note that the area encompassed for the bycatch rates shown in **Error! Reference source not found.** are for the entire area north of 40°10' N. lat., which is much larger than the area of the requested RCA modification (Table 3).

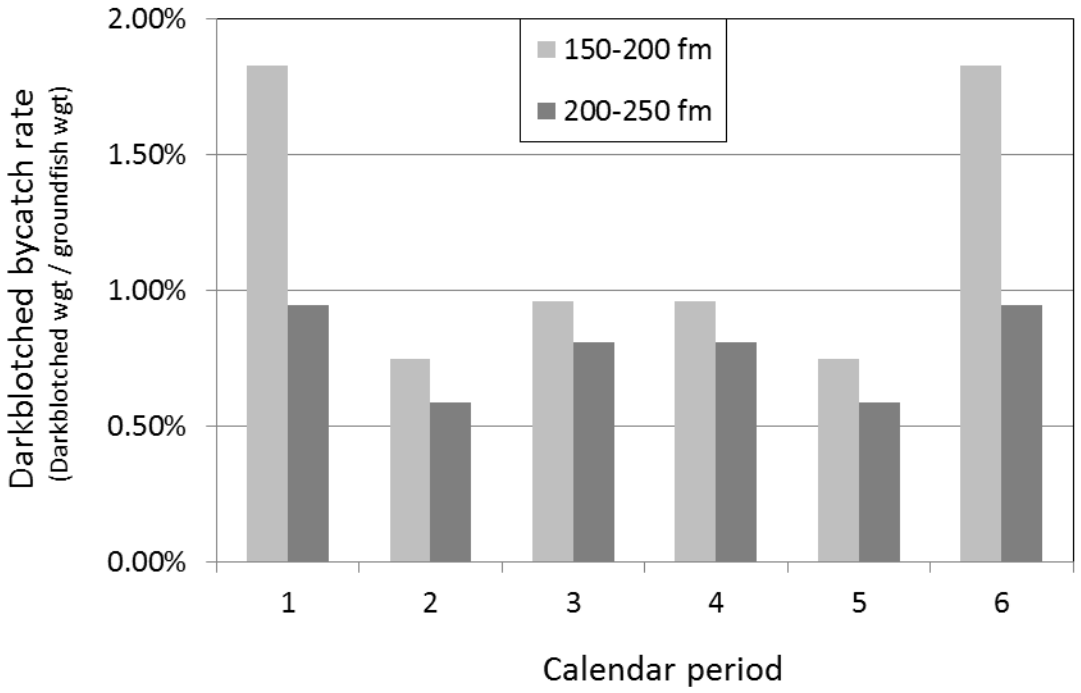



Figure 2. 2006-2010 average darkblotched rockfish bycatch rates (darkblotched lbs./ groundfish lbs. north of 40° 10' N. latitude for depths 150-200 fm and depths 200-250 fm by calendar period. These data were provided by the West Coast Groundfish Observer Program. Note that the seaward RCA was 200 fm during periods 1, 2, 5, and 6, and 150 fathoms during periods 4 and 5. See PFMC and NMFS for more detail.

*Darkblotched rockfish and Dover sole catch per trawling hour (CPUE) prior to IFQ*: This comparison was made to provide some idea of the potential cost and benefit for moving the RCA from 200 fm to 150 fm in this area. Note that for this analysis, only data for periods 3 and 4 were included (when seaward RCAs were 150 fm). RCAs were 200 fm in this area during periods 1, 2, 5, and 6 in 2009 and 2010. Catch per trawling hour (CPUE) was evaluated for darkblotched rockfish and Dover sole (Figure 3) between 48°10' - 45°46' N. lat. for two depth strata (150-200 fm and 200-250 fm), and only for those hauls in which they were encountered (hauls with no catch were excluded). This analysis was conducted for 2009 and 2010 (pre-IFQ fishery). Darkblotched rockfish CPUE, when encountered, is highest within the shallowest depth strata (Figure 3), which corroborates results shown in Figure 2. Dover sole CPUE, one of the primary target species at these depths, was highest (or similar) at 200-250 fm relative to 150-200 fm. (Figure 3).

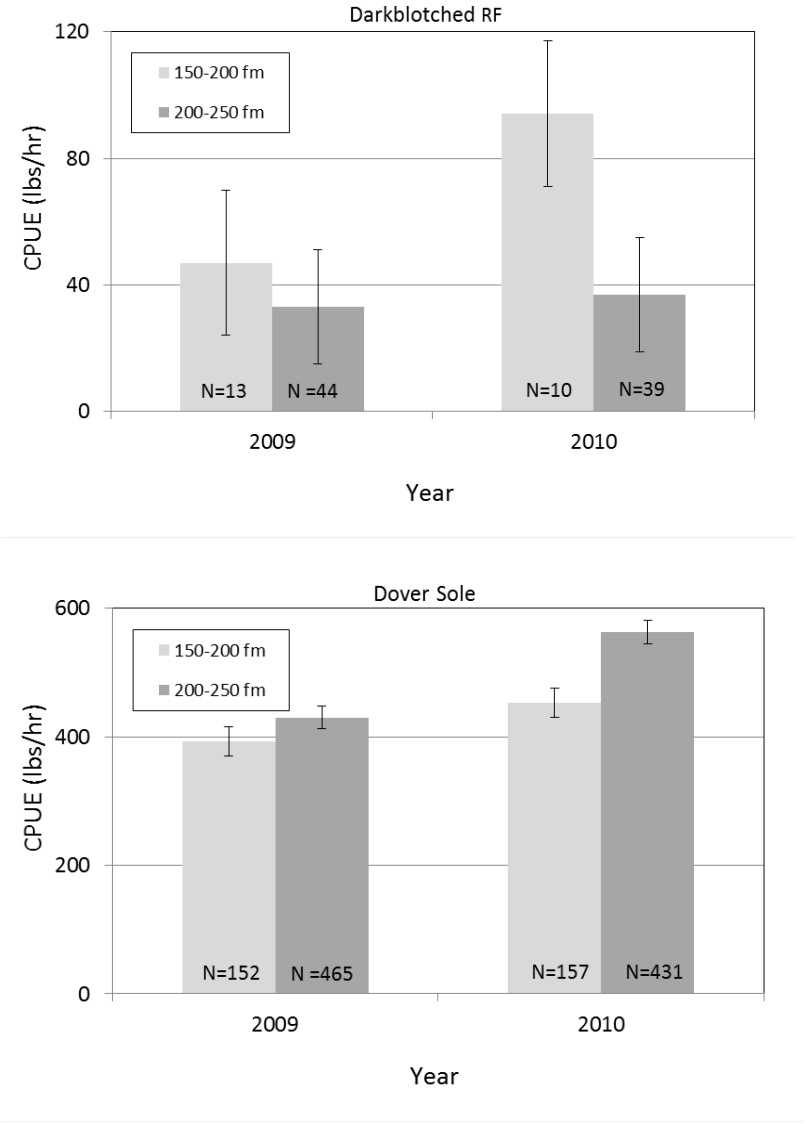



Figure 3. Bottom trawl catch per unit effort (CPUE; lbs/trawling hour) between 48°10' - 45°46' N. latitude at depths of 150-200 fm and 200-250 fm for (A) darkblotched rockfish, only when encountered and (B) Dover sole, only when encountered (hauls with no catch were excluded). West coast logbook data were acquired from the PacFIN data base for 2009 and 2010. Bars represent one standard error.

*Pacific halibut bycatch rates:* The only data available for the GMT to assess potential impacts of RCA changes for Pacific halibut was provided by the WCGOP (Figure 4) or taken from the International Pacific Halibut Commission (IPHC) website. Geographically, bycatch rates for Pacific halibut were highest north of 47°30' N. lat. Pacific halibut also exhibit seasonal migration patterns, moving to deeper waters (98 – 246 fm) during winter (IPHC).

**Figure 4.** Pacific halibut bycatch rates computed using 3 different denominators for the combined years of 2003-2006 (period used in initial issuance rule) and 2002-2009 in the limited entry bottom trawl groundfish fishery stratified according to area (north of 47° 30' N. lat and 40° 10' to 47° 30' N. lat) and depth (0-115 fm, >115 fm). We use PHLB as an abbreviation for Pacific halibut, ARTH for arrowtooth flounder, PTRL for petrale sole, ALLFLT for all FMP flatfish, and POSCOR for species whose retained catch has been found to be correlated with Pacific halibut bycatch (Heery et al. 2010).

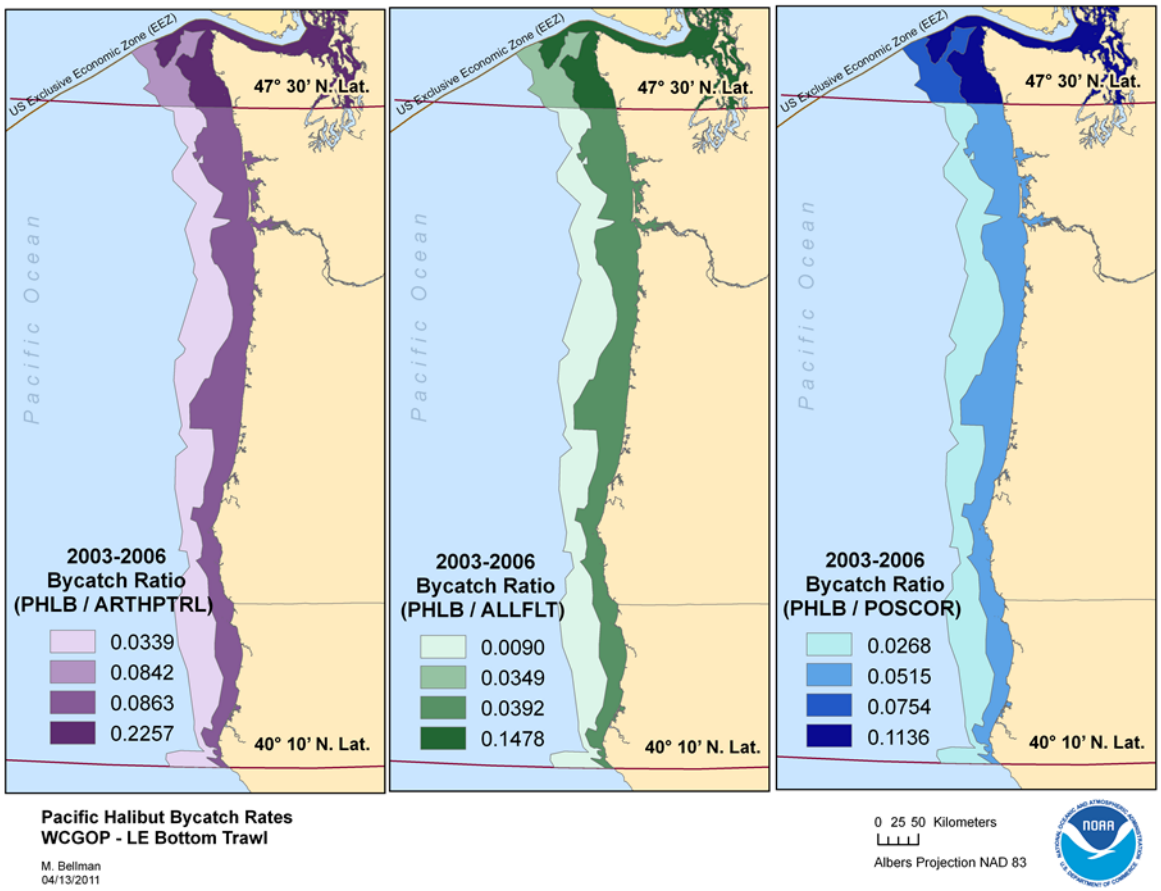
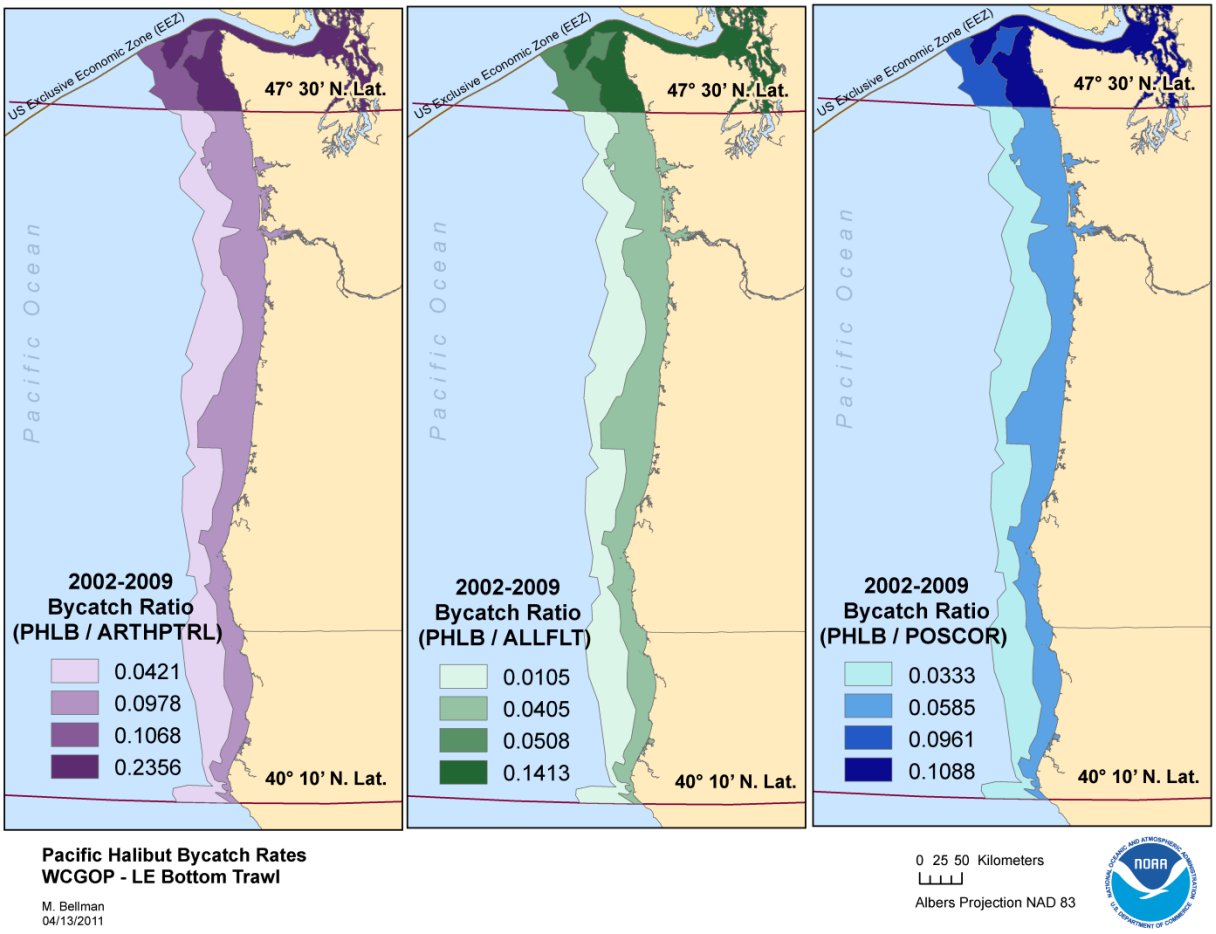


**Figure 4 (continued).**



*Summary*: Although most of the data analyzed herein was collected during pre-IFQ time periods, results indicate that if the seaward RCA were moved from 200 fm to 150 fm during periods 5 and 6 of 2011, that the probability of encountering darkblotched rockfish will likely be higher than if the 200 fm line were maintained. In addition, the probability of encountering Pacific halibut may be highest north of 47°30' N. lat and their vulnerability to trawl may increase during winter months by moving the RCA from 200 fm to 150 fm. However, as pointed out above, this fishery is now managed under IFQ – fishing behavior, and therefore bycatch rates, may be much different than observed during pre-IFQ. We also note that the request was made for a relatively small area of the coast (48°10' - 45°46' N. lat.). The Council should consider the potential impact of individual accountability when making this decision.

**The Council should consider the available data when considering changes to the trawl RCA from the 200 fm line to the 150 fm line (Table 3) for the area 45°46' N. lat.(Cape Falcon) to 48°10' N. lat. (Cape Alava) during September – December.**

*Sablefish in the Limited Entry Fixed Gear (LEFG) and Open Access (OA) Daily Trip Limit (DTL) Fisheries*

Introduction

With regards to trip limit changes for the LEFG and OA sablefish DTL fisheries, any Council-recommended reductions would need to be effective by July 1, 2011 to avoid the potential need of much more restrictive trip limits or even fishery closures later in the year.

At the March, 2011 meeting, the GMT recommended precautionary adjustments to sablefish trip limits in response to discovery of a long-standing error (since 2004) in the algorithm that estimates DTL landings in the PacFIN database. The new, corrected algorithm in PacFIN produced higher DTL landings estimates than the old algorithm. The DTL landings estimates from the new algorithm have been thoroughly reviewed by NWR, PacFIN and Oregon Department of Fish and Wildlife (ODFW) staff and as such, the GMT believes that estimates are based on the best available data.

Based on the projections summarized in **Error! Reference source not found.**, the GMT offers the following considerations and recommendations for changes to trip limits in the LEFG and OA sablefish DTL fisheries.

LEFG Sablefish DTL North of 36° N. lat.

The projected catches for 2011 under the current trip limits in the LEFG DTL north of 36° N. lat. are 160% (439 mt) of the harvest guideline (HG). When combined with impacts from other fisheries that interact with sablefish, this is projected to potentially exceed the 2011 LE FG share by 4%. Trip limit reductions from July 1 through December 31, from 6,500 to 3,500 pounds per

two months, would be necessary to keep projected catches within the HG and would result in 97% (266 mt) attainment.

**Therefore, the GMT recommends a reduction in bi-monthly trip limits for the LEFG sablefish DTL fishery north of 36° N. lat. from "2,000 lb per week, not to exceed 6,500 lb per 2 months" to "2,000 lb. per week, not to exceed 3,500 lb per 2 months," beginning on July 1 through the end of the year.**

OA Sablefish DTL North of 36° N. lat.

The current model projection for the open access sablefish fishery, north of 36° N. lat. is for 101% (436mt) of its HG. Minor reductions in trip limits from "1,200 lb/week, 2,250 lb/2 months" to "1,050 lb/week, 2,100 lb/2 months" would be necessary to bring the projections to 94% of the HG. Corrected landings data had no effect on these projections. The recommended trip limit reductions are due to allowance for discard mortality and current data. Industry had requested a trip limit increase to 2,400 lb/2 months, but this would result in a further overage (447mt, or 103% of the HG).

**Therefore, the GMT recommends a reduction in trip limits for the OA sablefish DTL fishery north of 36° N. lat. from "300 lb per day, or one landing per week up to 1,200 lb, not to exceed 2,250 lb per 2 months" to "300 lb per day, or one landing per week of up to 1,050 lb, not to exceed 2,100 lb per 2 months," beginning on July 1 through the end of the year.**

LEFG Sablefish DTL Fishery South of 36° N. lat.

The projected impacts for 2011 under the current trip limits in the limited entry, fixed gear sablefish fishery, south of 36° N. lat. are 436 mt, or 110% of the ad-hoc catch sharing recommended for the 2011-12 cycle (55 percent to LE, 45 percent to OA). The reason for this difference between the projection and ad-hoc catch sharing is due to the correction of the PacFIN error and accounting for discard mortality. The error in the PacFIN estimation of DTL landings misattributed some of the LE FG sablefish catch south of 36° N. lat. to the primary fishery north of 36° N. lat., even though there is no primary fishery south of 36° N. lat.

The GMT notes that the open access fishery south of 36° N. lat. is currently projected to attain 85% of the ad-hoc catch sharing. **Although no action is recommended for this fishery at this time, the GMT highlights this issue due to the implications on limited entry trip limits.** Since both limited entry and open access share the non-trawl allocation in this area, and the landings from both sectors combined are not expected to exceed the southern non-trawl allocation, the Council may to take this into consideration when recommending whether to make adjustments to this fishery.

The GMT notes that the considerable reductions in sablefish bi-monthly limits in the LEFG sablefish DTL fishery north of 36° N. lat. may provide enough of an incentive for fishers to move south to fish sablefish, where the LEFG trip limit would be either 2,100 (status quo) or 1,900 pounds per week (alternative) with no bi-monthly limit. The Council may want to consider the implications of effort shifts when making a decision relative to the LE FG south of 36° N. lat.

If the Council chooses to reduce trip limits for the LE FG South fishery, the GMT analyzed a trip limit of 1,900 lb./ week, which will keep the fishery within 94% of the ad-hoc catch sharing.

**The Council could consider the progress of the LEFG fishery south of 36° N. lat. If reductions are desired than reduce the weekly limit for the LEFG sablefish DTL fishery south of 36° N. lat. from "2,100 lb. per week", to "1,900 lb. per week", beginning on July 1 through the end of the year.**

Table 4. Projected landings and trip limits for the (non-IFQ) fixed gear sablefish "DTL" fisheries, including LE and OA north of 36 N. lat., and LE and OA south of 36 N. lat. in 2011. Recommended trip limit changes are in bold, italic font.

| Options | Data | Projected Landings | % HG | Trip Limits (lbs.) |
|---|---|---|---|---|
| **LEFG Sablefish DTL Fishery North of 36° N. lat.** | | | | |
| Status Quo | Uncorrected Algorithm | 271mt | 79% | 2,000 weekly/ 6,500 bi-monthly |
| | Corrected Algorithm | 439mt | 160% | |
| ***GMT-Recommended*** | Corrected Algorithm | 266mt | 97% | ***2,000 weekly/ 3,500 bi-monthly*** |
| **OA Sablefish DTL Fishery North of 36° N. lat.** | | | | |
| Status Quo | Uncorrected Algorithm | 436mt | 101% | 300 daily/ 1,200weekly/ 2,250 bimonthly |
| | Corrected Algorithm | | | |
| ***GMT-Recommended*** | Corrected Algorithm | 407mt | 94% | ***300 daily/ 1,050 weekly/ 2,100 bimonthly*** |
| **LEFG Sablefish DTL Fishery South of 36° N. lat.** | | | | |
| Status Quo | Uncorrected Algorithm | 351mt | 89% | 2,100 weekly |
| | Corrected Algorithm | 436mt | 110% | |
| ***Alternative*** | Corrected Algorithm | 371mt | 94% | ***1,900 weekly*** |
| **OA Sablefish DTL Fishery South of 36° N. lat.** | | | | |
| Status Quo | Uncorrected Algorithm | 270mt | 85% | 300 daily /1,200 weekly/ 2,400 bimonthly |
| | Corrected Algorithm | | | |
| ***GMT-Recommended*** | Corrected Algorithm | 270mt | 85% | ***No change*** |

Table 5. Sablefish trip limits that were in place in 2011 through June 30, and GMT-recommended changes to trip limits for July 1 through the end of the year (BOLD, *Italic*).

| Area | Fishery | Jan-Feb | Mar-Apr | May-June | July-Aug | Sept-Oct | Nov-Dec |
|---|---|---|---|---|---|---|---|
| North of 36° N. lat. (U.S./Canada Border to 36° N. lat.) | LEFG | 1,750 lb. per week, not to exceed 7,000 lb. per 2 mo. | 2,000 lb. per week, not to exceed 7,000 lb. per 2 mo. | | ~~2,000 lb. per week, not to exceed 6,500 lb. per 2 mo.~~ ***2,000 lb. per week, not to exceed 3,500 lb. per 2 mo.*** | | |
| | OA | 300 lb. per day, or 1 landing per week of up to 800 lb., not to exceed 2,400 lb. per 2 mo. | 300 lb. per day, or 1 landing per week of up to 950 lb., not to exceed 1,900 lb. per 2 mo. | | ~~300 lb. per day, or 1 landing per week of up to 1,200 lb., not to exceed 2,250 lb. per 2 mo.~~ ***300 lb. per day, or 1 landing per week of up to 1,050 lb., not to exceed 2,100 lb. per 2 mo.*** | | |
| South of 36° N. lat. | LEFG | 400 lb. per week, not to exceed 1,500 lb. per 2 mo. | 2,100 lb. per week | | | | |
| | OA. | 400 lb. per day, or 1 landing per week of up to 1,500 lb., not to exceed 8,000 lb. per 2 mo. | 300 lb. per day, or 1 landing per week of up to 1,200 lb., not to exceed 2,400 lb. per 2 mo. | | | | |

*PacFIN sablefish DTL error and its correction*

The following is a summary of the problems with the old PacFIN sablefish DTL algorithm; which have been corrected. These errors created estimates of primary landings on the Best Estimate Report that were too high (often higher than the sum of all the primary tier limits), and DTL numbers in the report and the tables feeding GMT models that were too low.

1) The old algorithm did not apply sablefish tier limits for 2004-2010. All LE FG sablefish landings during the primary season by vessels with tier endorsed permits were counted as primary catch, even if they had landed more than their tier limits.
2) A bug in the old algorithm misallocated some of the LE South catch to primary rather than DTL, even though there is no primary fishery in the South.
3) The old algorithm did not take into account any permit transfers among vessels, resulting in incorrect primary vessel limits. The new algorithm calculates a daily limit for each day the vessel makes a landing, comparing cumulative catch to the permits on each vessel, each day.
4) The old algorithm inflated vessel aggregate tier limits, due to duplicate permit records, which lead to primary landings estimates that were too high, and DTL landings estimates that were too low.
5) Vessels were allowed to go over their tier limits before switching from primary to DTL. The new algorithm stops primary landings "within one DTL" of their primary

vessel limit (as in regulation) to model when a vessel has reached its limit and switches from primary catch to DTL catch during the season.

In addition to the new algorithm, adjustments were made to reduce sablefish harvest levels to account for discard mortality (a need which precipitated during a correction to the 2011 tier limits). Also, more recent data have been added to the GMT FG trip limit models since the March Council meeting, including final data through 2010. Data from early 2011 were not used because PacFIN was still working to ensure a complete separation of IFQ fixed gear landings (under gear switching provisions) from non-IFQ fixed gear landings. Additionally, early DTL landings estimates in 2011 may change after the current tier limits are corrected in regulation, due to the function of the PacFIN DTL estimation algorithm, which splits primary and DTL landings.

If current efforts to record sablefish landings on state fish tickets against each groundfish permit number, and marking them as primary or DTL catch are successful (rather than the current method of recording landings against the list of permits "stacked" on the vessel), there will be no need for *estimation* of DTL and primary catch. It will be a simple matter of addition; and the estimated landings data will slowly fade from inclusion in the GMT projection models, which will increase their accuracy.

**Therefore, the GMT recommends that state fish tickets (landing receipts) attribute landings separately to each groundfish permit number as well as include designation of whether fixed gear sablefish landings are either primary or DTL. This will enable direct accounting of sablefish primary and DTL landings rather than the current estimation method.**

*Updated Quota Species Monitoring (QSM) is clean of IFQ fixed gear landings*

The PacFIN QSM Best Estimate Reporting on the web is now current, including reports previously held back. The reason for the delay was to insure that the Best Estimate Report does not include any LE sablefish IFQ landings where fixed gear was used, under gear switching provisions. Landings are now checked against IFQ declarations data from NMFS Office of Law Enforcement (OLE), allowing identification of when a permitted vessel is landing against their IFQ quota pounds. QSM still does not report IFQ landings. Those data can be accessed from the NMFS website: https://www.webapps.nwfsc.noaa.gov/ifq/ .

*Open Access Fishery, Shelf Rockfish Trip Limits South of 34° 27' N. lat.*

The GMT received a request to increase shelf rockfish trip limits in the open access fishery south of 34° 27' N. lat. from "750 lb/2 months" to "1,000 lb/2 months" on July 1, or as soon as possible, through the end of the year to reduce discarding of speckled rockfish while targeting deeper nearshore and vermilion rockfish, and to turn discards into landed catch. A similar request was made in June 2010, but could not be accommodated by the GMT due to workload.

The shelf rockfish complex south of 40°10' N. lat. has been under-harvested in recent years (Table 6). Starting in 2011 under Amendment 21 (intersector allocation), the minor shelf rockfish complex annual catch limit (ACL) of 701 mt is divided between the non-trawl (87.8%; 615 mt) and trawl (12.2%; 86 mt) sectors. If the newly implemented 2011 trawl/non-trawl allocation had been in place from 2006-2009, only 29%-52% of the non-trawl allocation would have been taken (

Table 7). On average, recreational catches comprise 94% of estimated mortality of shelf rockfish complex species from the non-trawl fishery.

Table 6. Estimates of total mortality (TM) in the OA fishery south of 34° 27' N. lat. from WCGOP reports compared to Optimum Yield (OYs) (2006-2009).

| | TM (mt) | OY (mt) | %OY |
|---|---|---|---|
| 2006 | 334 | 714 | 46.8% |
| 2007 | 365 | 714 | 51.1% |
| 2008 | 212 | 714 | 29.7% |
| 2009 | 273 | 714 | 38.2% |

Table 7. Estimated total mortality by sector (2006-2009) compared to 2011 non-trawl allocation south of 34° 27' N. lat.

| | trawl (mt) | non-trawl (mt) | non-trawl allocation (mt) | % non-trawl allocation |
|---|---|---|---|---|
| 2006 | 22 | 310 | 615 | 50.4% |
| 2007 | 3 | 319 | 615 | 51.8% |
| 2008 | 24 | 180 | 615 | 29.2% |
| 2009 | 15 | 254 | 615 | 41.3% |

Although there is no formal bycatch projection model for the non-nearshore fishery south of 34°27' N. lat., WGCOP data indicate very few encounters with overfished species, including bocaccio (2011-2012 FEIS, Appendix A). Although the current trip limit for bocaccio is "100 lb./2 months," state fish ticket data indicate that very few fishers actually attained the full trip limit between 2008 and 2010, with average fleet landings of approximately 50 lb/ 2 months. Based on those data, the GMT does not anticipate any increases to overfished species impacts as a result of this industry request. Additionally, the GMT does not anticipate that this modest increase in trip limits will result in an overharvest of any species' contribution to the complex as a result of this request.

**Therefore the GMT recommends increasing the open access shelf rockfish trip limit south of 34° 27' N. lat. from "750 lb/2 months" to "1,000 lb/2 months" on July 1, or as soon as possible thereafter**.

*Limited Entry Fixed Gear and Open Access nearshore black rockfish (between 42° and 40°10' N. lat.)*

The GMT received a request to increase the black rockfish trip limits from "7,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black rockfish" to "8,000 or 9,000 lb/2 months, no more than 1,200 lb of which may be species other than black rockfish" with no change to the 1,200 lb per 2 month sub-limit for minor nearshore rockfish.

State fish ticket data (through June 6, 2011) indicate that landings have been lower than normal compared to previous years, due in part to poor weather and impacts from the tsunami (e.g., infrastructure and damaged vessels). Some vessels have not been able to resume full time operations since the tsunami and other vessels which sustained damage are taking longer to resume operations than previously thought. As a result, without any modifications to trip limits, this fishery is expected to under harvest the black rockfish currently accounted for within the nearshore model.

Three trip limit alternatives were analyzed by California Department of Fish and Game (CDFG) staff, ranging from 8,000 lb/2 months to 9,000 lb/2 months with no change to the 1,200 lb/2 month sub-limit for minor nearshore rockfish (Table 8). The trip limit analyses are precautionary and contain a 20% buffer and assume that 2011 activities will be at a similar level as activity from 2007-2009 (but may be lower due to the loss of buyers, physical harbor infrastructure damage, and increasing fuel costs).

Table 8. Comparison of various trip limit alternatives and projected impacts as compared to the target within the nearshore model.

| Alternative | Projected impacts (mt) | % of target (82 mt) |
|---|---|---|
| Status quo – 7,000 | 67.6 | 82.5% |
| **8,000 lb**/ 2 months, no more than 1,200 lb of which may be species other than black rockfish | 74.2 | 90.5% |
| **8,500 lb**/ 2 months, no more than 1,200 lb of which may be species other than black rockfish | 77.6 | 94.6% |
| **9,000 lb**/ 2 months, no more than 1,200 lb of which may be species other than black rockfish | 80.9 | 98.6% |

Catch under any trip limit alternative presented in Table 8 would not raise projected catch of black rockfish higher than 82 mt, the target catch level in the nearshore model. Since these levels of harvest of black rockfish are already being accounted for within the nearshore model, there will be no additional increased impacts to this stock beyond those anticipated in the 2011-2012 biennial harvest specifications and management measures. We have no data to inform the level of risk to co-occurring stocks and potential risk from increased discarding. Landings of the co-occurring stocks continue to be limited by lower sub-trip limits, and bycatch is not expected

to increase because black rockfish are targeted at different depths within the water column than the co-occurring stocks.

The GMT discussed potential effort shifts that may arise as a result of this increase since the deeper nearshore permit is a coastwide permit within California and not constrained to a particular area, unlike the shallow nearshore permits. Differential trip limits (between north and south of 40°10' N. lat.) have been in place for quite some time without experiencing effort shifts. Additionally industry indicates that many deeper nearshore permit holders who also possess shallow nearshore permits, which are restricted to specific areas, will not shift north to target the higher black rockfish trip limits and will remain within their shallow permit areas to prosecute more valuable shallow species such as cabezon.

Since the overfished species impacts are not expected to increase under any of the alternatives, the Council may consider increasing the black rockfish component without modifying the 1,200 lb./2 months minor nearshore species sub-limit. Any increases to trip limits would be effective July 1, or as soon as possible thereafter.

**The Council could consider changes to the limited entry and open access trip limits for black rockfish between 42° and 40°10' N. lat., beginning July 1, or as soon as possible thereafter.**

*Limited Entry Fixed Gear and Open Access Deeper Nearshore Rockfish, South of 40°10' N. lat.*

The GMT received a request to increase deeper nearshore rockfish trip limits south of 40°10' N. lat. from "700 lb/ 2 months" between 40°10' N. lat. and 34°27' N. lat. and "600 lb/2 months" south of 34°27' N. lat. to "1,000 lb/2 months" for the entire area south of 40°10' N. lat. to allow for higher take of black and blue rockfish. Under current regulations, trip limits will automatically increase for the entire area south of 40°10' N. lat. to "800 lb/2 months" on September 1, 2011 through the end of the year. This request would increase those trip limits and make them effective earlier. State fish ticket data (through June 6, 2011) indicate that landings have been lower than normal compared to previous years.

The GMT provides the following alternatives for Council consideration (Table 9). There was a slight increase in yelloweye rockfish impacts, but it did not change the overall model results because the results rounded to 0.1 mt. As a result, model results indicate that either trip limit could be accommodated without further increasing yelloweye rockfish impacts.

Table 9. Comparison of overfished species impacts under proposed trip limit increases.

| Alternative | 700/600 lb/2mo until Aug. 30; 800 lb/ 2 mo. from Sept. 1 through end of year. | 900 lb/2 mo | 1,000 lb/2 mo |
|---|---|---|---|
| Bocaccio | 0.5 | 0.5 | 0.5 |
| Canary | 3.1 | **3.2** | **3.2** |
| Cowcod | 0.0 | 0.0 | 0.0 |
| Darkblotched | 0.2 | 0.2 | 0.2 |
| Widow | 0.2 | 0.2 | 0.2 |
| Yelloweye | 1.0 | 1.0 | 1.0 |

It is the GMT's understanding that approximately 5% of the deeper nearshore permitees south of 40°10' N. lat. took greater than 75% of the maximum allowable landings during 2009 and 2010 and occurred in central California based on state fish ticket data. The proposed trip limit options (and impacts) assume similar fleet behavior under the higher trip limits. If fleet behavior changes such that the landings of deeper nearshore rockfish exceed those currently accounted for within the nearshore model, there could be an increase in overfished species impacts.

The Council may consider increasing the deeper nearshore trip limits to for the entire area south of 40°10' N. lat. Any increases to trip limits would be effective July 1, or as soon as possible thereafter.

**The Council could consider increasing the deeper nearshore trip limits to south of 40°10' N. lat. Any increases to trip limits would be effective July 1, or as soon as possible thereafter.**

**GMT RECOMMENDATIONS AND COUNCIL CONSIDERATIONS**

1. **Consider changing the trawl RCA from 200 fm to 150 fm (Table 3) for the area 45°46' N. lat.(Cape Falcon) to 48°10' N. lat. (Cape Alava) starting September 1 though the end of the year (Periods 5 and 6).**
2. **Reduce the bi-monthly trip limits for the LEFG sablefish DTL fishery north of 36° N. lat. from "2,000 lb. per week, not to exceed 6,500 lb. per 2 months" to "2,000 lb. per week, not to exceed 3,500 lb. per 2 months," beginning on July 1 through the end of the year.**
3. **Reduce the trip limits for the OA sablefish DTL fishery north of 36° N. lat. from "300 lb. per day, or one landing per week up to 1,200 lb., not to exceed 2,250 lb. per 2 months" to "300 lb. per day, or one landing per week of up to 1,050 lb., not to exceed 2,100 lb. per 2 months," beginning on July 1 through the end of the year.**

4. **Consider reducing the weekly limits for the LEFG sablefish DTL fishery south of 36° N. lat. from "2,100 lb. per week", to "1,900 lb. per week", beginning on July 1 through the end of the year. Any reductions to trip limits would be effective July 1, or as soon as possible thereafter.**
5. **Increase the open access shelf rockfish trip limit south of 34° 27' N. lat. from "750 lb./2 months" to "1,000 lb./2 months" on July 1, or as soon as possible thereafter**.
6. **Consider changes to the limited entry and open access trip limits for black rockfish between 42° and 40°10' N. lat. Any increases to trip limits would be effective July 1, or as soon as possible thereafter.**
7. **Consider increasing the deeper nearshore trip limits south of 40°10' N. lat. Any increases to trip limits would be effective July 1, or as soon as possible thereafter.**
8. **Recommend that state fish tickets (landing receipts) attribute landings separately to each groundfish permit number as well as include designation of whether fixed gear sablefish landings are either primary or DTL. This will enable direct accounting of sablefish primary and DTL landings rather than the current estimation method.**

## REFERENCES

PFMC (Pacific Fishery Management Council) and NMFS (National Marine Fisheries Service). 2011. Proposed Harvest Specifications and Management Measures for the 2011-2012 Pacific Coast Groundfish Fishery and Amendment 16-5 to the Pacific Coast Groundfish Fishery Management Plan to Update Existing Rebuilding Plans and Adopt a Rebuilding Plan for Petrale Sole; Final Environmental Impact Statement. Pacific Fishery Management Council, Portland, OR. February 2011.

Attachment 1. June 2011 Scorecard (updated with the current model projections). Allocations[a] and projected mortality impacts (mt) of overfished groundfish species for 2011.

| Fishery | Bocaccio b/ | | Canary | | Cowcod b/ | | Dkbl | | Petrale | | POP | | Widow | | Yelloweye | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Date*: 11 June, 2011** | Allocation a/ | Projected Impacts | Allocation a/ | Projected Impacts | Allocation a/ | Projected Impacts | Allocation a/ | Projected Impacts | Allocation a/ | Projected Impacts | Allocation a/ | Projected Impacts | Allocation a/ | Projected Impacts | Allocation a/ | Projected Impacts |
| **Off the Top Deductions** | 13.4 | 13.4 | 20.0 | 20.0 | 0.3 | 0.3 | 18.7 | 18.7 | 65.4 | 64.5 | 12.8 | 12.9 | 61.0 | 60.9 | 5.9 | 5.9 |
| EFPc/ | 11.0 | 11.0 | 1.3 | 1.3 | 0.2 | 0.2 | 1.5 | 1.5 | 2.0 | 2.0 | 0.1 | 0.1 | 11.0 | 11.0 | 0.1 | 0.1 |
| Research d/ | 1.7 | 1.7 | 7.2 | 7.2 | 0.1 | 0.1 | 2.1 | 2.1 | 17.0 | 17.0 | 1.8 | 1.8 | 1.6 | 1.6 | 3.3 | 3.3 |
| Incidental OA e/ | 0.7 | 0.7 | 2.0 | 2.0 | -- | -- | 15.0 | 15.0 | 1.0 | 0.1 | 0.0 | 0.1 | 3.3 | 3.3 | 0.2 | 0.2 |
| Tribal f/ | | | 9.5 | 9.5 | | | 0.1 | 0.1 | 45.4 | 45.4 | 10.9 | 10.9 | 45.0 | 45.0 | 2.3 | 2.3 |
| **Trawl Allocations** | 60.0 | 60.0 | 34.1 | 34.1 | 1.8 | 1.8 | 265.0 | 265.0 | 876.0 | 876.0 | 137.0 | 137.0 | 491.0 | 491.0 | 0.6 | 0.6 |
| **---SB Trawl** | 60.0 | 60.0 | 25.9 | 25.9 | 1.8 | 1.8 | 250.5 | 250.5 | 871.0 | 871.0 | 119.6 | 119.6 | 342.1 | 342.1 | 0.6 | 0.6 |
| **---At-Sea Trawl** | | | 8.2 | 8.2 | | | 14.5 | 14.5 | 5.0 | 5.0 | 17.4 | 17.4 | 147.9 | 147.9 | | |
| **a) At-sea whiting MS** | | | 3.4 | 3.4 | | | 6.0 | 6.0 | | | 7.2 | 7.2 | 61.2 | 61.2 | | |
| **b) At-sea whiting CP** | | | 4.8 | 4.8 | | | 8.5 | 8.5 | | | 10.2 | 10.2 | 86.7 | 86.7 | | |
| **Non-Trawl Allocation** | 189.6 | 55.9 | 29.8 | 17.1 | 0.9 | 0.2 | 14.0 | 5.8 | 35.0 | 0.0 | 7.0 | 0.4 | 49.0 | 10.0 | 10.5 | 9.6 |
| Non-Nearshore | 57.9 | | 2.3 | | | | | | | | | | | | | |
| LE FG | | | | 1.4 | | | | 4.8 | | | | 0.3 | | 0.1 | 0.8 | 0.8 |
| OA FG | | | | 0.2 | | | | 0.8 | | | | 0.1 | | 0.0 | 0.1 | 0.1 |
| Directed OA: Nearshore | 0.7 | 0.5 | 4.0 | **3.1** | | 0.0 | | 0.2 | | | | | | 0.2 | 1.1 | **1.0** |
| Recreational Groundfish | | | | | | | | | | | | | | | | |
| WA | | | 2.0 | 0.7 | | | | -- | | -- | | -- | | -- | 2.6 | 2.5 |
| OR | | | 7.0 | 2.4 | | | | -- | | -- | | -- | | 1.0 | 2.4 | 2.1 |
| CA | 131.0 | 55.4 | 14.5 | 9.3 | | 0.2 | | -- | | -- | | -- | | 8.7 | 3.1 | 3.1 |
| **TOTAL** | 263.0 | 129.3 | 83.9 | 71.2 | 3.0 | 2.3 | 297.7 | 289.5 | 976.4 | 940.5 | 156.8 | 150.3 | 601.0 | 561.9 | 17.0 | 16.1 |
| **2011 Harvest Specification g/** | **263** | **263** | **102** | **102** | **3.0** | **3.0** | **298** | **298** | **976** | **976** | **157** | **157** | **600** | **600** | **17** | **17** |
| **Difference** | 0.0 | 133.7 | 18.1 | 30.8 | 0.0 | 0.7 | 0.3 | 8.5 | -0.4 | 35.5 | 0.2 | 6.7 | -1.0 | 38.1 | 0.0 | 0.9 |
| **Percent of OY** | 100.0% | 49.2% | 82.3% | 69.8% | 100.0% | 76.7% | 99.9% | 97.1% | 100.0% | 96.4% | 99.9% | 95.7% | 100.2% | 93.7% | 100.0% | 94.7% |
| Key | | | = not applicable | | | | | | | | | | | | | |
| | -- | | = trace, less than 0.1 mt | | | | | | | | | | | | | |
| | | | = Fixed Values | | | | | | | | | | | | | |
| | | | = off the top deductions | | | | | | | | | | | | | |

a/ Formal allocations are represented in the black shaded cells and are specified in regulation in Tables 1b and 1e. The other values in the allocation columns are 1) off the top deductions, 2) set asides from the trawl allocation (at-sea petrale only) 3) ad-hoc allocations recommended in the 2011-12 EIS process, 4) HG for the recreational fisheries for canary and YE.

b/ South of 40°10' N. lat.

c/ EFPs are amounts set aside to accommodate anticipated applications. Values in this table represent the estimates from the 11-12 biennial cycle, which are currently specified in regulation.

d/ Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs.

e/ The GMT's best estimate of impacts as analyzed in the 2011-2012 Environmental Impact Statement (Appendix B), which are currently specified in regulation.

f/ Tribal values in the allocation column represent the the values in regulation. Projected impacts are the tribes best estimate of catch.

# OREGON DEPARTMENT OF FISH AND WILDLIFE REPORT ON THE RATIONALIZED TRAWL FISHERY OFF OREGON

The Oregon Department of Fish and Wildlife (ODFW) examined components of the trawl fishery in Oregon during the first quarter of 2011. Fishing behavioral changes are expected as the west coast groundfish fishery makes the transition from bimonthly trip limits to an individual fishing quota (IFQ) fishery. Potential behavioral changes include: geographic consolidation of fleets, landings and infrastructure, as well as effort shifts to other fisheries and fishing locations. The purpose of this report is to compare the IFQ fishery during the first quarter of 2011 with first quarter fishery statistics during 2006 to 2010 (i.e., pre-IFQ). Note that the 2011 IFQ fishery began January 11th. This report is intended to supplement IFQ updates that have recently been provided by the Groundfish Management Team. Only data associated with Oregon landings are presented herein.

## Comparison with Historical Data

### Vessels and Landings

Twenty-two fewer limited entry non-whiting, groundfish trawl vessels participated in the fishery during the first quarter of 2011 relative to the same time period of 2006 to 2010 (average=50 vessels; Table 1). Additionally, there were approximately half the number of landings in early 2011 than the previous five year average (132 versus 268), and there were there fewer dealers receiving landings in Oregon (5 versus 8). In contrast, the average landing size per vessel increased from 28,939 pounds in 2006-2010 to 39,316 pounds in 2011. Vessels were making fewer landings in early 2011, but each landing is, on average, larger than historical landings (Figure 1).

Table 1. Landings statistics for limited entry non-whiting trawl during the first quarter (January 1st to March 31st) 2006 through 2010 as compared to the first quarter (January 11th to March 31st) of 2011. Average is abbreviated as "Avg" and groundfish as "GF."

| Year | Vessels (No.) | GF Landings (No.) | Avg Landing Size (Lbs.) | Dealers (No.) | Avg Total Vessel Revenue |
|---|---|---|---|---|---|
| 2006 | 29 | 168 | 24,729 | 7 | $84,544 |
| 2007 | 50 | 219 | 30,313 | 7 | $68,487 |
| 2008 | 56 | 290 | 30,315 | 9 | $86,144 |
| 2009 | 59 | 377 | 27,582 | 8 | $88,651 |
| 2010 | 58 | 285 | 31,759 | 7 | $73,985 |
| 2011 | 28 | 132 | 39,316 | 5 | $108,340 |

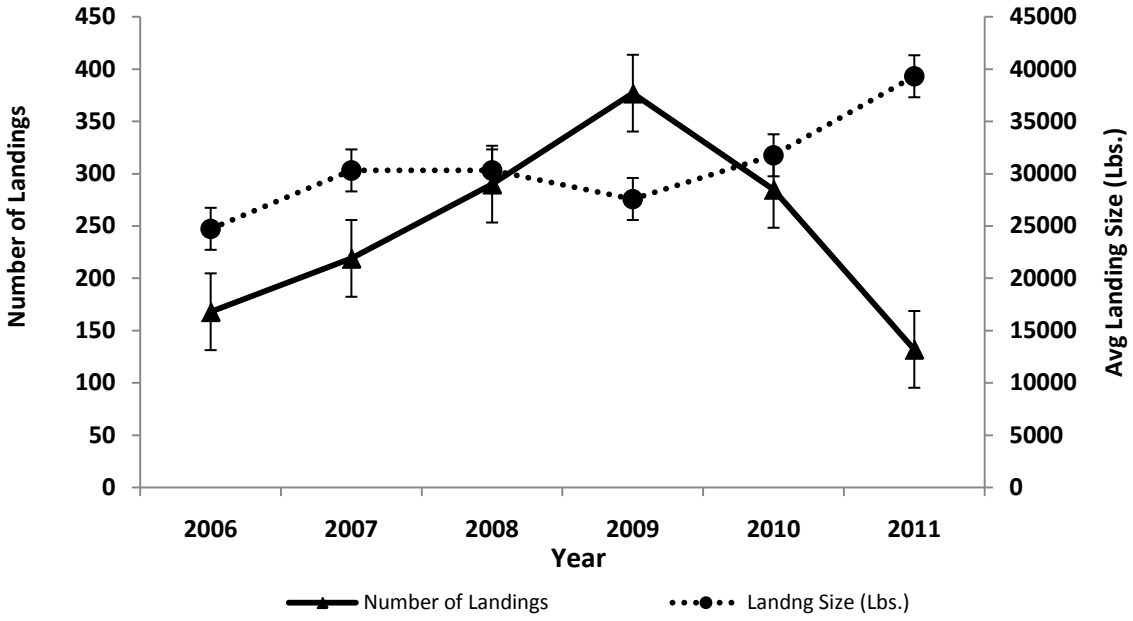



Figure 1. Total number and average weight (lbs) of groundfish landings for limited entry, non-whiting trawl vessels during the first quarter of 2006 to 2011.

**Vessel Revenue**

Even though there was a decline in the number of vessels, landings and dealers receiving landings in Oregon during early 2011 compared with the previous five years (Table 1), there was an overall increase in total revenue per vessel (Figure 2). During the first quarter of 2011, the

median total revenue per vessel was $103,122 (average = $108,340) versus $65,874 to $88,879 (average = $80,716) during the first quarter of 2006 through 2010.

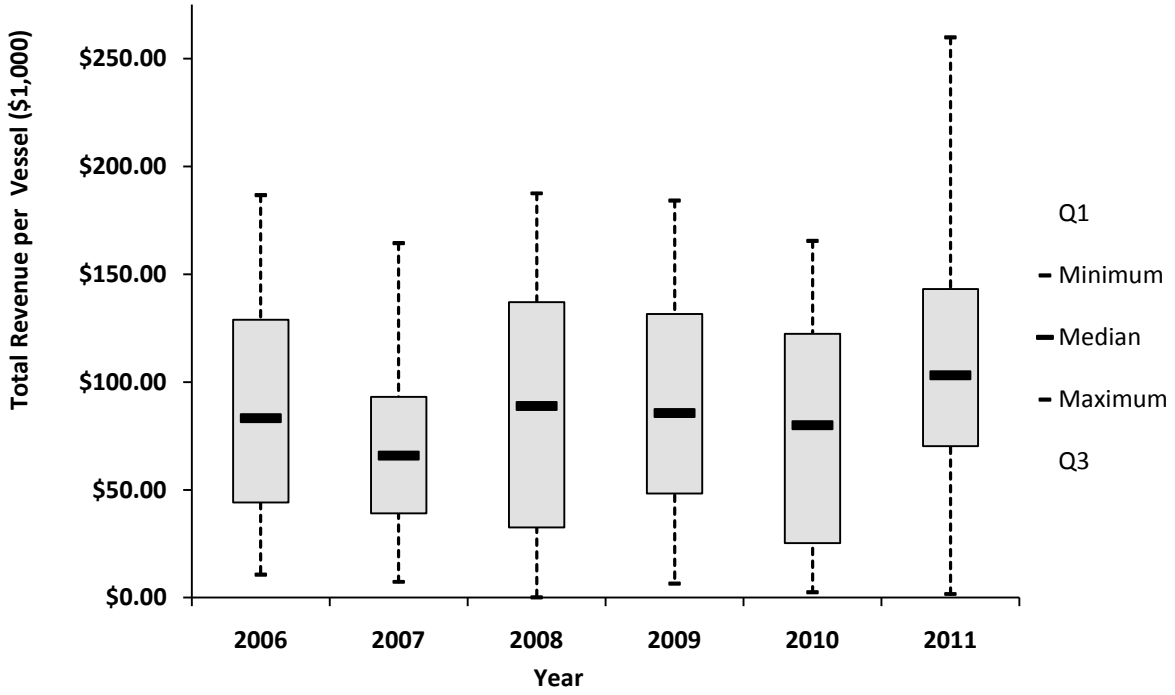



Figure 2. Total revenue per vessel, by year, during the first quarter (January 1st to March 31st) of the limited entry non-whiting trawl fishery (2006-2011) and the non-whiting IFQ fishery (2011). Median, upper and lower quartiles (Q1 and Q3), and maximum and minimum values are shown.

**Species**

There were 57 species or species groups landed by trawl vessels in Oregon during early 2011, which is higher than the historical average (27 species). In other words, fishermen are delivering more of their catch and discarding less at-sea during this early phase of the IFQ program. The DTS complex species (Dover sole, thornyheads and sablefish) were the primary species landed during the first part of 2011 (69 percent of total pounds landed), followed by arrowtooth flounder (13 percent) and petrale sole (6 percent). Price per pound varied by species and during the first quarter of 2011, the highest price per pound increase relative to the 2006 to 2010 average was observed for petrale sole (41 percent increase) and sablefish (18 percent increase; Figure 3). Negligible changes were observed for Dover sole (4 percent increase), shortspine thornyhead (6 percent increase), slope rockfish species complex (5 percent decrease) and longspine thornyhead (7 percent decrease).

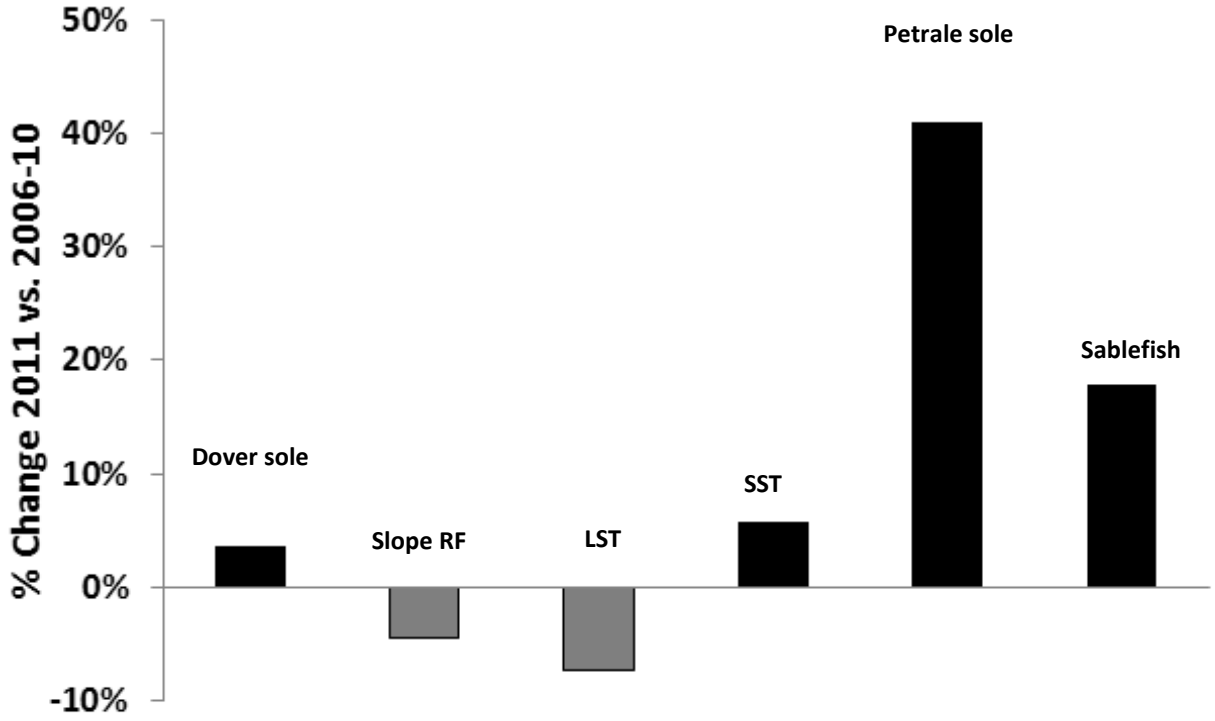



Figure 3. Comparison of percent change in trawl caught price per pound, by species, for 2011 compared with the 2006 to 2010 average. Shortspine thornyhead is abbreviated as "SST," longspine thornyhead as "LST" and rockfish as "RF."

**Port Groups**

All four Oregon port groups (Astoria, Newport, Coos Bay and Brookings) received landings in early 2011. Between 2010 (pre-IFQ) and 2011 (IFQ), all port groups had a reduction in the number of participating vessels with the greatest reduction occurring in Newport (66.7 percent) followed by Brookings (62.5 percent), Coos Bay (50 percent) and Astoria (38.1 percent). The total pounds landed in Oregon decreased by 33 percent (2.6 million pounds), with every port showing a lower volume of fish landed, relative to the previous five years (Figure 4). The largest decrease in total pounds landed occurred in Newport (54 percent), followed by Coos Bay (43 percent), Astoria (25 percent) and Brookings (4 percent). In early 2011, the majority of the total pounds were landed in Astoria (53.1 percent) followed by Coos Bay (25.1 percent), Newport (11.5 percent) and Brookings (10.2 percent). Fewer first quarter 2011 landings combined with a decreased total landing volume translates to a lower total statewide groundfish revenue, with Newport having the largest revenue decline (50 percent) relative to the previous five years (Table 2). Only Brookings showed an increase in total revenue during the first quarter of 2011, relative to the five year average. In 2011, total statewide revenue decreased (Figure 5).

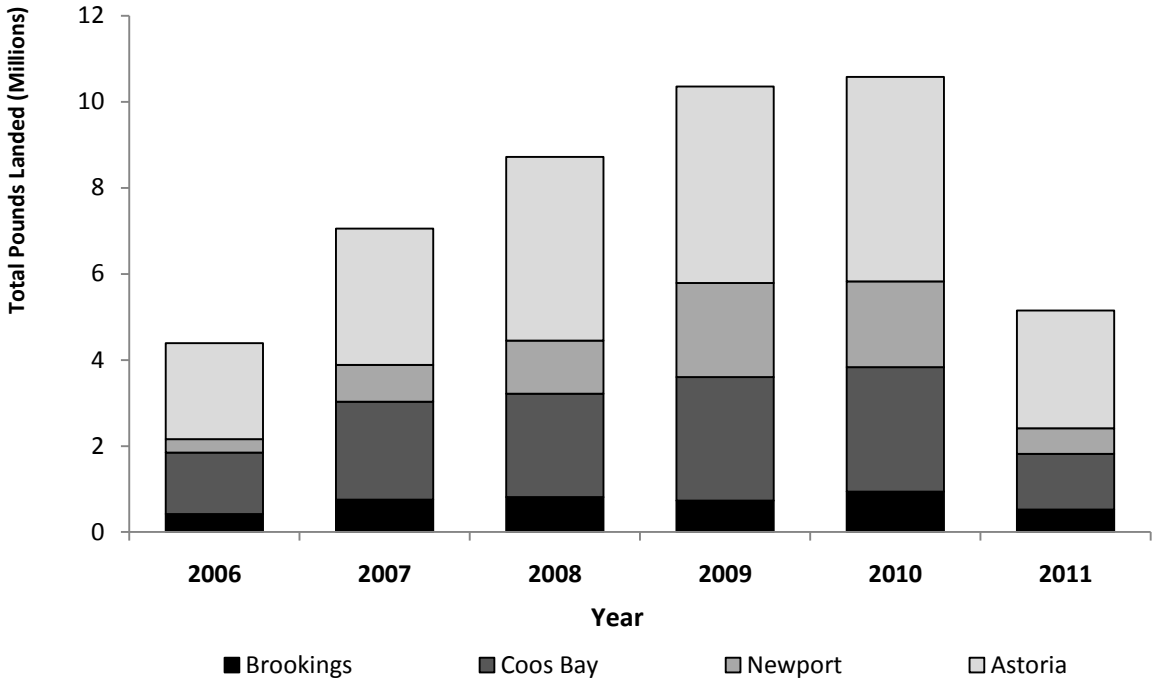



Figure 4. Total groundfish landings (millions of pounds), by year and by port, during the first quarter (January 1st to March 31st) of the limited entry non-whiting trawl fishery (2006-2010) and the non-whiting IFQ fishery (2011).

Table 2. Comparison of total revenue (2011) and average total revenue (2006-2010), by port, during the first quarter (January 1st to March 31st) of limited entry, non-whiting groundfish trawl fishery (2006-2010) and non-whiting IFQ fishery (2011).

| Port | Avg 2006-2010 | 2011 | % change |
|---|---|---|---|
| **Astoria** | $1,797,865 | $1,494,135 | -17% |
| **Newport** | $723,016 | $363,158 | -50% |
| **Coos Bay** | $1,147,322 | $745,773 | -35% |
| **Brookings** | $376,139 | $430,466 | 14% |

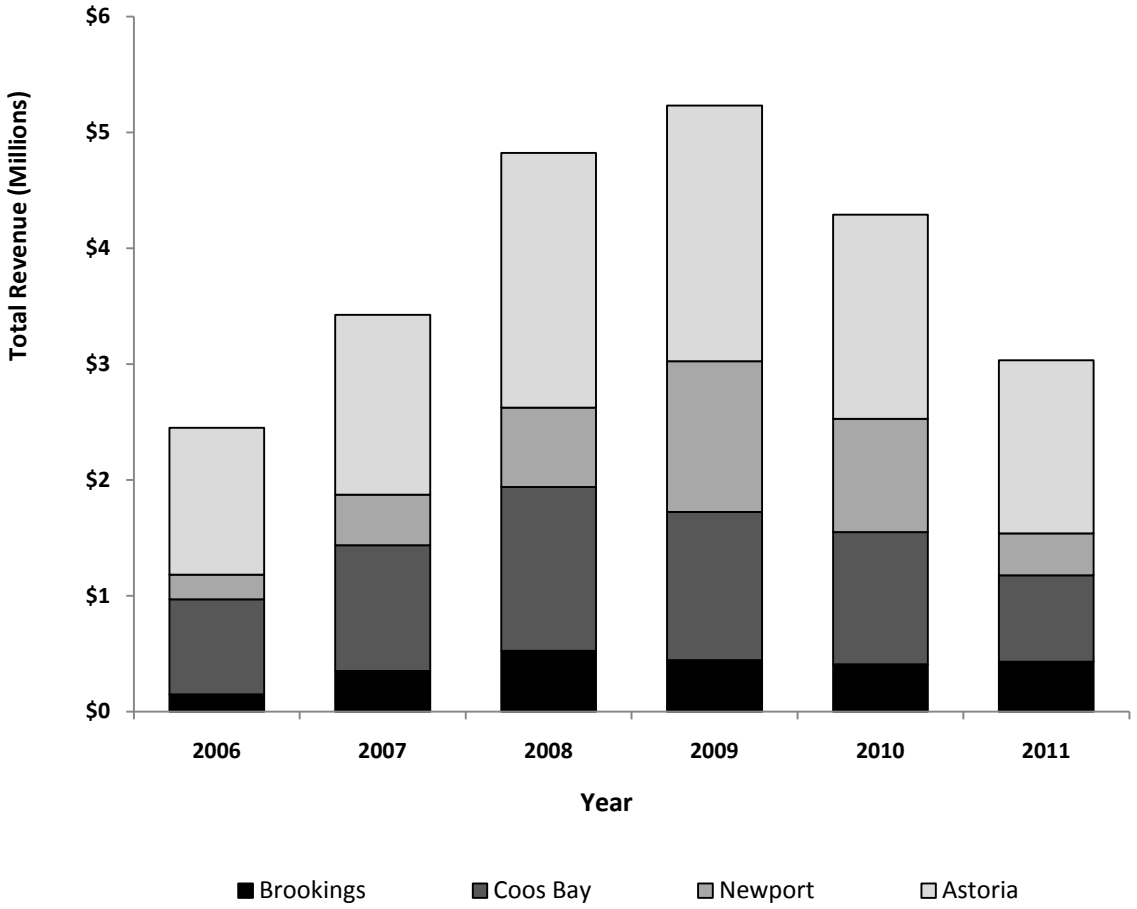



Figure 5. Total revenue (millions of dollars), by year and by port, during the first quarter (January 1st to March 31st) of the limited entry non-whiting trawl fishery (2006-2010) and the non-whiting IFQ fishery (2011).

## Behavioral Changes with IFQ: Fishing Depth and Location and Effort Shift into other Fisheries

The amount of overfished species each IFQ permit is allocated plays a central role in determining fishing behavior and, as a result, could change fishing patterns and ultimately how the fishery is managed. Potential behavioral changes include fishing deeper or in different locations in 2011, compared with pre-IFQ fishing patterns. An additional concern is the management implications associated with potential effort shift, or spillover, of vessels holding limited entry trawl permits moving into state managed fisheries such as the pink shrimp and Dungeness crab fisheries.

### Fishing Depth and Location

During early 2011, industry indicated that vessels were trawling deeper to avoid overfished species. To examine this issue Oregon commercial logbook data were analyzed to determine the

location (latitude and longitude) and depth (fathoms; fm) of bottom trawl sets seaward and shoreward of the Rockfish Conservation Area (RCA; 100 fm < RCA < 150 fm). Proportions of total sets were determined by depth (shoreward and seaward of the RCA) and by year (Table 3). There was no apparent difference in fishing depth and location during the first quarter of 2011, compared with the 2006 to 2010 average (Table 3). This suggests that during the first quarter of 2011, vessels generally fished in similar depths and locations as they were during the previous five years.

Table 3. Number and percentage of bottom trawl sets made shoreward of the RCA for landings made during January, February, and March. Depths < 100 fm were considered shoreward of the RCA, whereas depths > 150 fm were considered seaward of the RCA.

| | **Shoreward sets** | | **Seaward sets** | | |
|---|---|---|---|---|---|
| **Year** | **Number** | **Percent** | **Number** | **Percent** | **Total** |
| 2006 | 68 | 7.0% | 907 | 93.0% | 975 |
| 2007 | 34 | 2.3% | 1,465 | 97.7% | 1,499 |
| 2008 | 26 | 1.3% | 1,999 | 98.7% | 2,025 |
| 2009 | 45 | 1.7% | 2,612 | 98.3% | 2,657 |
| 2010 | 63 | 3.1% | 2,001 | 96.9% | 2,064 |
| 2011 | 56 | 5.0% | 1,057 | 95.0% | 1,113 |

**Effort Shift into State Managed Fisheries**

At the April 2011 Council meeting, the GMT addressed the potential for effort shift into state managed, non-groundfish fisheries (e.g. pink shrimp and Dungeness crab) and suggested participation is limited by state issued permits (Agenda Item 1.7.b, Supplemental GMT Report, April 2011). However, based on an analysis of non-whiting, limited entry groundfish trawl vessels with additional shrimp or Dungeness crab permits, there was an increase in the number of crab and shrimp landings during 2011 versus the historical average (2006 to 2010), combined with below average 2011 groundfish landings (Figure 6.A.). The IFQ program did not begin until January 11$^{th}$, 2011 and there was an increase in the number of crab landings by vessels who also held limited entry, non-whiting groundfish trawl permits (Figure 6.B.). Additionally, the pink shrimp fishery opened on April 1, 2011 and there was an increased number of shrimp landings by limited entry trawl vessels (Figure 6.C.).

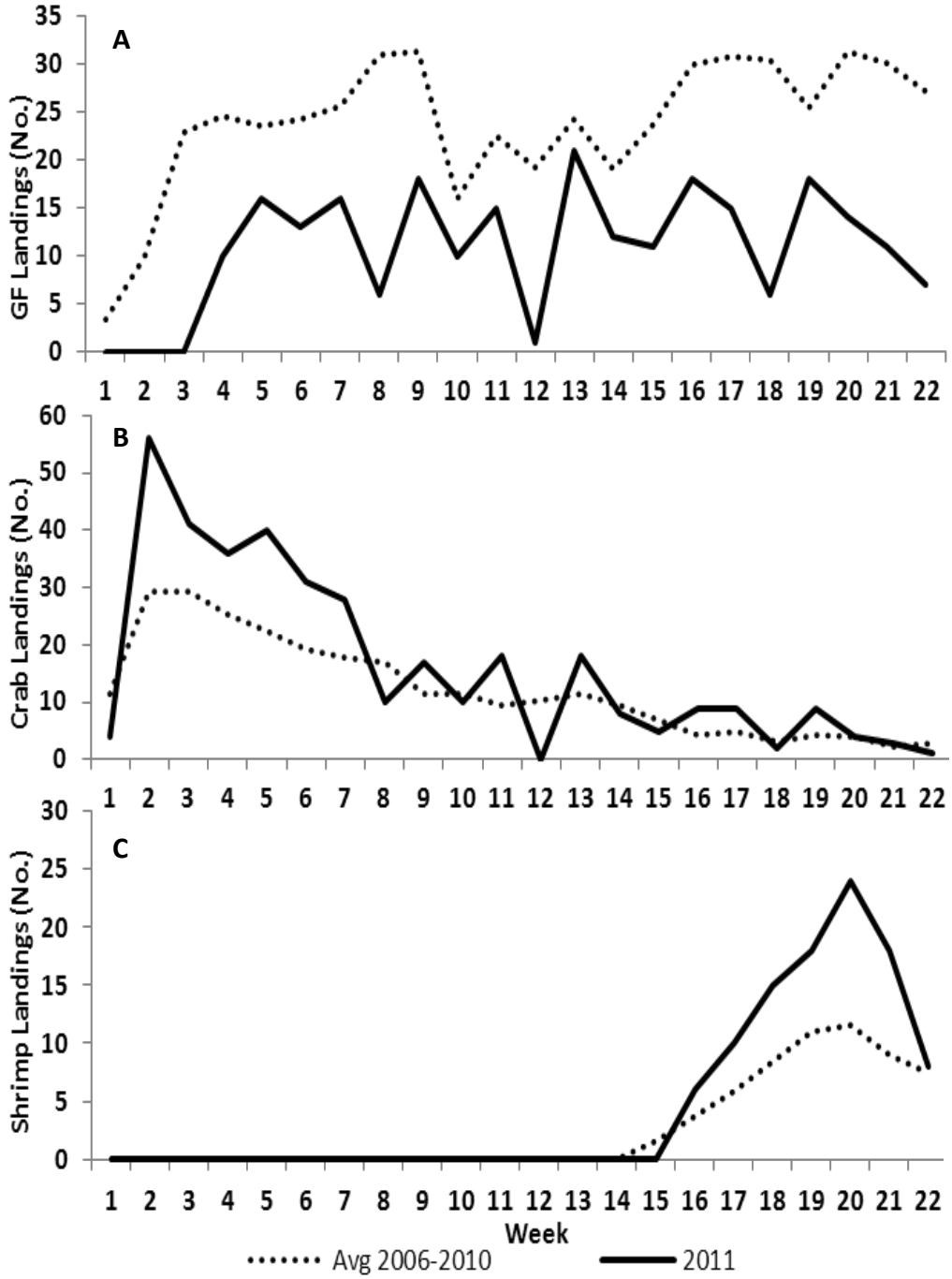



Figure 6. Number of groundfish (A), Dungeness crab (B) and pink shrimp (C) landings by limited entry, non-whiting trawl vessels during the first eighteen weeks of the Dungeness crab and groundfish fishery in 2011 (IFQ) as compared to the 2006-2010 (pre-IFQ) average; and the first five weeks of the pink shrimp fishery in 2011 compared with the 2006-2010 average. Note that the 2011 IFQ program began on January 11th, 2011 and the pink shrimp fishery opens annually in April.

## Conclusions

During the first quarter of 2011, there was a decrease in the number of participating vessels, groundfish landings and total statewide revenue, but an increase in average landing size and in average vessel revenue when compared with historical data (2006 to 2010). On a regional scale, Newport had the largest decline of total pounds landed and total revenue while Brookings actually saw an increase in total groundfish revenue during early 2011. Additionally, fishing behavior has not changed in regards to fishing depth and location, relative to the previous five years. However, there was increased effort during the early part of the Dungeness crab fishery and the pink shrimp fishery.

# TRAWL RATIONALIZATION AND ASSOCIATED GENERAL GROUNDFISH FISHERY ISSUES SLATED FOR FINAL ACTION, INCLUDING THOSE IN THE PROGRAM IMPROVEMENTS AND ENHANCEMENT (PIE) RULE

The Council has been working on trailing actions (Agenda Item E.6.a, Attachment 1) for the trawl rationalization (Amendment 20) and intersector allocation (Amendment 21) programs and is scheduled to take final action on the following trailing action issues at this Council meeting under this agenda item.

- Amendment 21 trawl/nontrawl allocation percentages supersedance of Amendment 6 limited entry /open access allocation percentages (Agenda Item E.6.a, Attachment 2). (This action clarifies that for species/species groups for which trawl/nontrawl allocations were created under Amendment 21, existing guidance on limited entry/open access allocations is superseded and needed limited entry/open access allocations will be established through the biennial specification process.)
- Set-aside rollover flexibility (Agenda Item E.6.a, Attachment 3). (This action provides inseason flexibility with regard to shifting exempted fishing permits (EFPs), research and incidental open access set-asides and tribal whiting reapportionment.)
- Pacific halibut allocation for trawl bycatch mortality (Agenda Item E.6.a, Attachment 4).
- Severability of mothership sector catch history/ endorsements from limited entry catcher vessel permits (Agenda Item E.6.a, Attachment 5).
- Extension of adaptive management program (AMP) quota pound pass-through (Agenda Item E.6.a, Attachment 6).
- Program improvement and enhancement (PIE) issues identified National Marine Fisheries Service (NMFS) (Agenda Item E.6.b, NMFS Report 1 and Supplemental NMFS Report 2).
- PIE issues identified by the Council: grandfathering of existing at-sea processing of shoreside allocations (Agenda Item E.6.b, ODFW Letter Excerpts).

The NMFS draft rulemaking plan is provided as NMFS Report 3. After the April Council meeting, NMFS provided its preliminary determinations on the National Environmental Policy Act (NEPA) analyses required for most of these actions and those trailing actions on which the Council is not taking final action at this meeting (Agenda Item E.6.b, NMFS Report 4). NMFS has determined that certain issues qualify for categorical exclusions and/or are within the scope of previous NEPA analyses. For issues for which a categorical exclusion applies, appropriate decision documents are provided to the Council, rather than formal environmental assessment (EA) documents. Included among these determinations was the need for an EA on the issue of grandfathering in existing at-sea processing of the shoreside trawl allocation. Background information on this issue was provided in an Oregon Department of Fish and Wildlife (ODFW) letter submitted to the Council in March 2011 (Agenda Item E.6.b, ODFW Letter (excerpts)). No resources have been identified at this time for the production of the EA needed on this issue.

Trailing actions on which the Council is not slated to take final action at this meeting will be addressed under Agenda Item E.7. Also in September, the Council is scheduled to make a determination on priorities for the next round of trailing actions.

**Council Action:**

**1.** Final Action
   a. Amendment 21 vs. Amendment 6.
   b. Inseason flexibility for set-aside adjustments.
   c. Pacific halibut bycatch mortality allocation for the trawl sector.
   d. Severability of mothership sector catch history/endorsements.
   e. Extension of the AMP pass-through.
   f. PIE Rule – NMFS-proposed elements.
   g. PIE Rule – Grandfathering of existing at-sea processing of shoreside allocations.

**2.** Other guidance, as necessary.

Reference Materials:

1. Agenda Item E.6.a, Attachment 1: Trailing Action Calendar and Status.
2. Agenda Item E.6.a, Attachment 2: Intersector Allocation Issue: Recommended FMP and Regulatory Amendatory Language That Complies with the Council's Intent Regarding Superseding Amendment 6 Allocations with Amendment 21 Allocations.
3. Agenda Item E.6.a, Attachment 3: Intersector Allocation Issue: Recommended FMP and Regulatory Amendatory Language That Complies with the Council's Intent Regarding Annual Management of Fishery Set-Asides.
4. Agenda Item E.6.a, Attachment 4: Intersector Allocation Issue: Groundfish Trawl Pacific Halibut Bycatch Mortality Allocation, Council Decision Document.
5. Agenda Item E.6.a, Attachment 5: Trawl Rationalization Issue: Severability of Whiting Mothership Catcher Vessel Endorsements/Catch History.
6. Agenda Item E.6.a, Attachment 6: Trawl Rationalization Issue: Adaptive Management Program Quota Pound Pass-Through, Council Decision Document.
7. Agenda Item E.6.b, NMFS Report 1: PIE Rule - Part 1, NMFS Items Unchanged from April
8. Agenda Item E.6.b, Supplemental NMFS Report 2: PIE Rule - Part 2, New or Changed NMFS items from April.
9. Agenda Item E.6.b, NMFS Report 3: Draft Rulemaking Plan.
10. Agenda Item E.6.b, NMFS Report 4: NMFS' Preliminary Determinations on the Appropriate Level of NEPA for Trailing Actions.
11. Agenda Item E.6.b, ODFW Letter (excerpt).

Agenda Order:

a. Agenda Item Overview — Jim Seger
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action**: Final Action or Further Guidance

PFMC
05/23/11

# TRAILING ACTION CALENDAR AND STATUS

Table 1: Calendar for trailing actions.

| | Trailing Action | 2011 | | | | | 2012 | | | | | | 2013 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Issue | Mar | Apr | Jun | Sep | Nv | Jan 1 | Mar | Apr | Jun | Sep | Nv | Jan 1 |
| 1a | A-21 Superseding A-6 | PPA | | FPA | | | Impl | | | | | | |
| 1b | Set-aside Rollover Flex | PPA | Y | FPA | | | | | | Impl | | | |
| 2 | Halibut Allocation | PPA | | FPA | | | Impl | | | | | | |
| 3 | Cost Recovery | | Y | PPA* | FPA | | | | Impl† | | | | |
| 4a | CFAs - QS Control Rule Safe Harbor | | Y | PPA | FPA | | | | | Impl | | | |
| 4b | Risk Pools - QS Control Rule Safe Harbor | | Y | PPA | FPA | | | | | Impl | | | |
| 4c | Lenders - QS Control Rule Safe Harbor and Ancillary Lender Issues | | | | PPA | FPA | | | | ? | | | |
| 5 | Severability of Mothership Sector Catch History/ Endorsement From Catcher Vessel Permit | PPA | | FPA | | | Impl | | | | | | |
| 6 | AMP Pass Thru | | Y | FPA | | | | | | Impl | | | |
| 7 | Program Improvements and Enhancement (PIE) Rule Including IFQ Processing At-sea | | Y | FPA | | | Impl†† | | | | | | |

**PPA** = Council selects preliminary preferred alternative.
**FPA** = Council selects final preferred alternaive. **Impl** = Target implementation date.
**Y** = Council activity.
* = PPA may not be needed since this action will qualify for a categorical exclusion under NEPA.
† = While cost recovery may not be implemented until mid year, NMFS has indicated that it is their intent to recover costs incurred as of January 1, 2012.
†† = Grandfathering in of at-sea processing of IFQ would not be implemented until mid-year due to time required to issue permit endorsements.

Table 2: Status of trailing actions.

| | Issue | Recent Council Direction | Urgency (Implementation by) |
|---|---|---|---|
| 1a | A-21 Superseding A-6 | Nov 2010: Move ahead. March 2011: Preliminary Preferred Alternative (PPA) Selected | "Highest Priority" 2013 (needed for/with biennial spex) |
| 1b | Set-aside Rollover Flex | Nov 2010: Move ahead. April 2011: PPA selected. Continue but do not allow any complexities delay the June action on A-21 superseding A-6 | Not specified. Useful for 2012 fishery (mid-year). |
| 2 | Halibut Allocation | Nov 2010: Move ahead. March 2011: PPA selected | 2012 (emergency rule expires at end of 2011) |
| 3 | Cost Recovery | Nov 2010: Move ahead with NMFS lead. Requested transparency of cost information used to determine fees. Cost assessments should be sector specific. April 2011: Request for more specificity and description. Consider using buyback fee collection system. | 2012 (stated Council objective) |
| 4a | CFAs - QS/QP Control Rule Safe Harbor | Nov 2010: Move ahead. General guidance on alternatives & analysis provided. Apr 2011: Additional guidance provided. | QS trading starts in 2013 |
| 4b | Risk Pools - QS/QP Control Rule Safe Harbor | Nov 2010: Move ahead with alternatives provided in staff document. Apr 2011: Request for guidance on relation between duration of risk pool and violation of control limits. Additional guidance provided. | Not specified |
| 4c | Lenders - QS/QP Control Rule Safe Harbor and Ancillary Lender Issues | Nov 2010: Move ahead. Included in 4b (verbal clarification of motion). Apr 2011: Added issues relating to third party verification of QS ownership, a lien registry, and QS unique identifiers. | Not specified. Next action delayed until Sept 2011. |
| 5 | Severability of Mothership Sector Catch History/ Endorsement From Catcher Vessel Permit | Nov 2010: Move ahead. March 2011: PPA selected. | 2012 (stated Council objective) |
| 6 | Adaptive Management Program Quota Pound Pass Thru | Nov 2010: Move ahead. A range of alternatives provided. April 2011: take final action in June and include in PIE rulemaking. | 2013 (needed in lieu of other direction for using AMP pounds) |
| 7 | PIE Rule Including IFQ Processing at-sea | April 2011: Proceed, taking into account comments of Council advisory bodies and adding in the issue of grandfathering in processing at-sea for nonwhiting species taken in the IFQ program. | 2012 |

**Intersector Allocation Issue: Recommended FMP and Regulatory Amendatory Language That Complies with the Council's Intent Regarding Superseding Amendment 6 Allocations with Amendment 21 Allocations**

The Council adopted Amendment 21 in April 2009, which specified formal allocations of select groundfish species to trawl and non-trawl sectors of the west coast groundfish fishery. The Secretary of Commerce partially approved Amendment 21 in 2010, which was implemented in January 2011. Based on a procedural concern and ambiguities in the record, NMFS disapproved the provisions in Amendment 21 that addressed Amendment 21's effect on limited entry and open access allocations established in the FMP. NMFS guidance on Amendment 21 superseding Amendment 6 for Amendment 21 species has been to clarify the record and move forward with a technical and conforming FMP amendment in an open and timely manner.

The Council revisited this issue at its March 2011 meeting and affirmed its intent under Amendment 21 was to have allocations for Amendment 21 species supersede Amendment 6 allocations (preliminary preferred alternative or PPA). Under this agenda item the Council task is to select a final preferred alternative (FPA), including review of the revised FMP and regulatory language implementing Amendment 21 explicitly stating that, for Amendment 21 species, formal trawl/nontrawl allocations percentages decided under Amendment 21 supersede formal limited entry/open access allocations decided under Amendment 6. For species for which there is a need for limited entry/open access allocations, such allocations would be decided in the biennial specifications process.

A more detailed description of the action with recommended FMP and regulatory amendments that comply with the Council's intent follow.

**Superseding Amendment 6 Allocations with Amendment 21 Allocations**

Because of NMFS' partial disapproval, the FMP and current regulations implementing Amendment 21 trawl/non-trawl allocations do not state that they supersede the limited entry/open access allocations originally decided under Amendment 6 for those species subject to Amendment 21. While it was generally understood through the Amendment 21 process that Amendment 6 allocations were part of the No Action Alternative, which was rejected in favor of the preferred Amendment 21 allocations, there were multiple interpretations from the action alternatives in the EIS and FMP language (as drafted through April 2010) on how Amendment 21 related to the limited entry/open access allocations. As NMFS was drafting allocation regulations for deeming, NMFS brought interpretations on this issue to the Council at its March and April 2010 meetings (see issue #2 in Agenda Item E.6.b, Supplemental REVISED NMFS Report 1, March 2010; and issue #1 in Agenda Item I.1.b, Supplemental NMFS Report 3, April

2010). At the Council's April 2010 meeting, the Council made a motion to clarify that Amendment 21 allocations supersede the limited entry/open access allocations for Amendment 21 species and that, if the draft EIS is ambiguous, Council staff were directed to clear it up. In the Council's transmittal of Amendment 21 to the FMP, new language that had not previously been adequately available for public inspection or Council consideration appeared in the FMP language and clarified that Amendment 21 supersedes the limited entry/open access allocations for Amendment 21 species.

In NMFS' partial disapproval letter, dated August 9, 2010, NMFS explained there were ambiguities in the record associated with the relationship of Amendment 21 to the limited entry/open access allocations, generating a procedural issue. Thus, NMFS concluded that it was necessary and prudent to partially disapprove Amendment 21 so the ambiguity could be addressed in an open and timely manner through a technical and conforming amendment. NMFS disapproved of the process but noted that there was no apparent disagreement amongst the members of the Council on the intent of the Council in its design of Amendment 21. The procedural issue relates most directly to the question of the adequacy of the notice to the public of the intended effect of Amendment 21 on these underlying allocations and the adequacy of the opportunity for meaningful public review and comment. **Therefore, under this agenda item, the Council is provided an opportunity to make a clear record of its intent that Amendment 21 allocations supersede the limited entry/open access allocations for Amendment 21 species and providing numerical examples of the implications of alternative interpretations.**

NMFS and Council staffs both have concerns with the interpretation that Amendment 6 allocations could be applied in addition to the Amendment 21 allocations. The option of specifying both Amendment 21 and Amendment 6 allocations for Amendment 21 species could result in an over-allocation of a stock's OY or ACL or the inability to fully allocate a sector's share of the harvestable surplus. This result could be realized in cases where a stock's ACL is fully accessible. Table 1 depicts a theoretical example of allocating chilipepper rockfish using both Amendment 21 and Amendment 6 allocations. In this example there is a 1,000 mt fishery harvest guideline that can be allocated to directed groundfish sectors. The limited entry (LE) trawl sector allocation is first determined by applying the Amendment 21 allocation of 75% to trawl sectors and 25% to non-trawl sectors. The next step is deducting the estimated recreational sector mortality of chilipepper (3 mt) from the non-trawl share. The 247 mt left over for non-trawl commercial sectors (i.e., directed open access (OA) and limited entry fixed gear (LEFG)) is further divided by applying the open access allocation to the commercial harvest guideline (fishery HG minus recreational amount) (997 * 0.443 in this example). Because 247 is less than the amount that would be allocated to the open access sector (directed and incidental) under the Amendment 6 structure, all 247 mt would go to the directed open access fishery, leaving zero for LEFG. In fact, the disadvantaged sectors in this example depend on the order of operations in applying these disparate allocation schemes. If the Amendment 6 allocation was first applied to

the 1,000 mt fishery HG, then 557 mt would be allocated to LE sectors and 443 mt would be allocated to the directed OA sector (in this example the incidental OA sector does not have a set aside). This order would leave the LE trawl sectors short of their Amendment 21 allocation. Regardless, it is clear that there are species, like chilipepper rockfish in this example, where it doesn't make sense to apply both allocation schemes.

Table 1. An example using chilipepper rockfish of the negative consequences of applying both Amendment 21 and Amendment 6 allocations.

<table>
<tr><td colspan="2">Amendment 21 Allocation</td><td colspan="2">Amendment 6 Allocation</td></tr>
<tr><td>Trawl</td><td>Non-Trawl</td><td>LE</td><td>OA</td></tr>
<tr><td>75.0%</td><td>25.0%</td><td>55.7%</td><td>44.3%</td></tr>
<tr><td colspan="4">Sector Allocations Assuming a 1,000 mt Fishery HG for Chilipepper<br>Apply the Am 21 allocation:</td></tr>
<tr><td colspan="2">LE Trawl</td><td colspan="2">Non-Trawl</td></tr>
<tr><td colspan="2">750</td><td colspan="2">250</td></tr>
<tr><td colspan="4">Deduct the recreational amount from non-trawl using the 2011 amount:</td></tr>
<tr><td>LE Trawl</td><td>Rec.</td><td colspan="2">Comm. Non-Trawl</td></tr>
<tr><td>750</td><td>3</td><td colspan="2">247</td></tr>
<tr><td colspan="4">Apply the Am 6 allocation to the Commercial HG to calculate amount available to OA, leftover amount to LEFG:</td></tr>
<tr><td>LE Trawl</td><td>Rec.</td><td>OA</td><td>LEFG</td></tr>
<tr><td>750</td><td>3</td><td>247</td><td>0</td></tr>
</table>

Table 2 uses the same chilipepper example with Amendment 21 allocations superseding the limited entry/open access allocations.

Table 2. An example using chilipepper rockfish and applying only Amendment 21 allocations.

<table>
<tr><td colspan="2">Amendment 21 Allocation<br>Trawl | Non-Trawl<br>75.0% | 25.0%</td><td></td></tr>
<tr><td colspan="3">Sector Allocations Assuming a 1,000 mt Fishery HG for Chilipepper<br>Apply the Am 21 allocation:</td></tr>
<tr><td colspan="2">LE Trawl<br>750</td><td>Non-Trawl<br>250</td></tr>
<tr><td colspan="3">Deduct the recreational amount from non-trawl using the 2011 amount:</td></tr>
<tr><td>LE Trawl<br>750</td><td>Rec.<br>3</td><td>Comm. Non-Trawl (shared dir. OA & LEFG)<br>247</td></tr>
</table>

*Suggested Revisions to the FMP and the Regulations*

The Pacific Coast Groundfish FMP and federal regulations will need to be modified to implement the Council PPA. Excerpted portions of the FMP and the Code of Federal Regulations (CFR) that apply to Amendment 21 and Amendment 6 allocations are provided below followed by recommended changes to these excerpted parts to comply with the Council's PPA.

The recommended FMP language that complies with the Council's stated intent under its PPA and is identical to what was transmitted to NMFS in April 2010 makes it explicit in section 6.3.2.3 and 11.2.2 that Amendment 21 allocations supersede Amendment 6 allocations as follows with new language underscored.

> "6.3.2.3 Limited Entry Trawl Allocations for Amendment 21 Species
>
> "... The remainder of the OYs/ACLs are then allocated according to the percentages in Table 6-1 [Table 6-1 provides the schedule of allocations adopted by the Council under Amendment 21]. The trawl percentage is for the non-treaty trawl fishery managed under Amendment 21. The non-treaty, non-trawl percentage is for the limited entry fixed gear fishery, the open access fishery, and the recreational fishery. <u>Amendment 6 limited entry and open access allocations are superseded by these allocation percentages.</u> Allocations to the directed non-trawl sectors (i.e., limited entry fixed gear, directed open access, and recreational) for the species allocated Table 6-1 are decided, if needed, in the biennial harvest specifications and management measures process."
>
> "11.2.2 Allocations Between the Limited and Open Access Fisheries and Management of the Open Access Fishery
>
> 1. The division of the fleet into limited and open access participants will require that separate allocations be established for each group where

management measures are required to prevent harvest in excess of annual catch limits. For those species, species groups and areas covered by the trawl/-non-trawl allocations provided in Table 6- 1 and for which the Council determines an allocation is necessary, ad hoc allocations to the directed open access sector will be established as needed through the biennial specifications process.

2. For those species for which trawl/non-trawl allocations are not established in Table 6- 1, allocations for the open access fishery will be based on historical catch levels for the period July 11, 1984 to August 1, 1988 by exempted, longline and fishpot gears used by vessels which did not receive an endorsement for the gear…."

Federal regulations governing formal allocations are found at 50 CFR 660.55 and are described as follows with possible changes underscored.

"660.55 Allocations. {revised at 75 FR 78344, 12/15/2010; revised at 75 FR 82296, 12/30/2010}

(a) General. An allocation is the apportionment of a harvest privilege for a specific purpose, to a particular person, group of persons, or fishery sector. The opportunity to harvest Pacific Coast groundfish is allocated among participants in the fishery when the OYs for a given year are established in the biennial harvest specifications. For any stock that has been declared overfished, any formal allocation may be temporarily revised for the duration of the rebuilding period. For certain species, primarily trawl-dominant species, beginning with the 2011–2012 biennial specifications process, separate allocations for the trawl fishery and non-trawl fishery (which for this purpose includes limited entry fixed gear, open access, and recreational fisheries) will be established biennially or annually using the standards and procedures described in Chapter 6 of the PCGFMP. Chapter 6 of the PCGFMP provides the allocation structure and percentages for species allocated between the trawl and non-trawl fisheries. Also, separate allocations for the limited entry and open access fisheries may be established for those species not subject to the trawl/non-trawl allocations specified under Amendment 21 (see the table in paragraph c, subsection (1) of this section for the list of Amendment 21 species) using the procedures described in Chapters 6 and 11 of the PCGFMP and this subpart. Allocation of sablefish north of 36° N. lat. is described in paragraph (h) of this section and in the PCGFMP. Allocation of Pacific whiting is described in paragraph (i) of this section and in the PCGFMP. Allocation of black rockfish is described in paragraph (l) of this section. Allocation of Pacific halibut bycatch is described in paragraph (m) of this section. Allocations not specified in the PCGFMP are established in regulation through the biennial harvest

specifications and are listed in Tables 1 a through d and Tables 2 a through d of this subpart."

A further amendment of the regulations at 660.55(e)(2) should also be considered to clarify the Council's intent under Amendment 21. The following is an excerpt of the current regulatory language with the possible amended regulatory language underscored.

"(2) Species with LE/OA allocations. For species with LE/OA allocations that are not subject to Amendment 21 allocations, the allocation between the limited entry (both trawl and fixed gear) and the open access fisheries is determined by applying the percentage for those species with a LE/OA allocation to the commercial harvest guideline plus the amount set-aside for the non-groundfish fisheries."

**Intersector Allocation Issue: Recommended FMP and Regulatory Amendatory Language That Complies with the Council's Intent Regarding Annual Management of Fishery Set-Asides**

The term "set-asides" has been used to refer to the amounts of fish deducted "off the top" from the ACL (previously termed OY) and, for the whiting fishery, off the trawl sector. There has been some question about the flexibility that set-asides do or don't provide. A GMT statement from the Council's June 2010 meeting clarified some of the flexibility related to set-asides as follows (Agenda Item B.7.b, Supplemental GMT Report, June 2010):

> *The sum of these [off-the-top] amounts (tribal, research, incidental open access, EFP) should be specified in regulation through the biennial specifications and management measures process so that it is clear how the fishery harvest guideline has been determined. Similarly, in cases where a commercial harvest guideline is specified, the recreational estimates should be documented so that it is clear how the commercial harvest guideline has been determined. However, these amounts that are deducted from the ACL to come up with the fishery harvest guideline are somewhat flexible as long as the summed amount that is deducted from the ACL is not exceeded. For example, if research catch is higher than originally estimated, but incidental open access amounts are lower than expected and the sum of all amounts deducted from the ACL is not exceeded, no action needs to be taken.*
>
> *The amount of fish deducted from the ACL to determine the fishery harvest guideline is not available to be allocated to other sectors (trawl or non-trawl). However, if either of those sectors (trawl or non-trawl) exceeds their allocation, or conversely, the amount of fish that comes "off the top" is exceeded, no sector is held harmless from that overage as stated in the Am 21 DEIS. … If either the trawl or non-trawl exceeds their allocation or an estimate or set-aside amount is exceeded, there is no harm as long as the ACL for that species is not exceeded.*

The regulations implementing the above interpretations of Amendment 21 were deemed through the Council during the trawl rationalization deeming process. The current regulations are a change in the way the Council and NMFS manage set-aside amounts or yields that are deducted to cover non-directed fishing activities before allocations to directed groundfish fisheries are applied. The change is that these "off-the-top" amounts are no longer available to be changed inseason or re-allocated to the trawl or non-trawl sectors. This effectively strands resources that could otherwise be utilized in directed fisheries if there are cases where it is not needed to cover the proposed activity. For instance, if there is a set-aside for EFPs during the biennial

specifications process but EFPs are not approved or are conducted and completed without using the entire yield set aside to cover EFPs, this resource cannot be used for directed fisheries.

The Council could reconsider its intent under Amendment 21 that the amounts of yield set aside to cover these sources of fishing-related mortality can be routinely changed downward, as appropriate, by the Council and NMFS in an inseason action. In such cases, the set-aside yield could be re-allocated to directed groundfish fisheries. The Council and NMFS would need to consider in their deliberations regarding an inseason adjustment of a set-aside whether there is an increased risk of exceeding an ACL by re-allocating yield to directed fisheries that was originally set aside to accommodate expected bycatch or catch in research and EFP activities. For example, in cases where yield is set aside to cover expected bycatch in a fishery (e.g., a tribal fishery), it is unlikely that an inseason action can be considered to decrease the set aside if the fishery is ongoing and there is still a chance that the bycatch could occur. This is because the timing of bycatch events is inherently unpredictable.

The Council revisited this issue at its March 2011 meeting and affirmed its intent to maintain more flexible management of set aside amounts as part of its preliminary preferred alternative (PPA). The Council's PPA covered inseason adjustments to "off-the-top" yields set aside for research catches, exempted fishing permit activities, catches in tribal fisheries, and groundfish bycatch in non-groundfish fisheries (i.e., incidental open access fisheries). The elements of the Council PPA are reflected in the regulatory language provided below. NMFS has now determined that an environmental assessment will need to be produced to support the NMFS decision process. However, this determination does not require a delay in the Council decision on its final preferred alternative (FPA).

The following excerpted regulatory language from CFR 660.55(j) describing fishery set-asides provides the amended regulatory language in strikeout and underscoring that clarifies the Council's intent under Amendment 21 based on the Council PPA. Note that the use of the term "tribal fishing activities" and how those set-asides are managed will need to be discussed in further detail with the treaty tribes.

> "Fishery set-asides. Annual set-asides are not formal allocations but they are amounts which are not available to the other fisheries ~~during~~ at the start of the fishing year. For the catcher/processor and mothership sectors of the at-sea Pacific whiting fishery, set-asides will be deducted from the limited entry trawl fishery allocation. Set-aside amounts will be specified in Tables 1a through 2d of this subpart and may be adjusted through the biennial harvest specifications and management measures process. In the case of set-asides to accommodate planned research activities, fishing activities authorized under approved exempted fishing permits, tribal fishing activities, or projected bycatch in non-groundfish fisheries, set-aside amounts may be adjusted downward inseason and, if practicable, can be re-allocated to directed groundfish fisheries. In the case of inseason adjustments

to set-asides to accommodate tribal fishing activities, the process involves NMFS-tribal coordination and agreement from the tribes to reapportion the set-aside to be made available for other uses."

# INTERSECTOR ALLOCATION

# ISSUE: GROUNDFISH TRAWL PACIFIC HALIBUT BYCATCH MORTALITY ALLOCATION

## Council Decision Document

**PREPARED BY**
**THE PACIFIC FISHERY MANAGEMENT COUNCIL**
**7700 NE AMBASSADOR PLACE, SUITE 101**
**PORTLAND, OR 97220**
**503-820-2280**
**WWW.PCOUNCIL.ORG**

**MAY 2011**

## Table of Contents

CHAPTER 1 Purpose and Need for the Proposed Action ..... 4
**1.1 Introduction ..... 4**
**1.2 Description of the Proposed Action ..... 4**
*1.2.1* Issue: Halibut Bycatch Mortality Allocations ..... 4
**1.3 Purpose and Need for the Proposed Action ..... 4**
*1.3.1* Issue: Halibut Bycatch Mortality Allocations ..... 4
CHAPTER 2 Description of the Alternatives ..... 6
CHAPTER 3 Affected Environment ..... 9
CHAPTER 4 Impacts ..... 11
**4.1 Issue: Halibut Bycatch Mortality Allocations ..... 11**
*4.1.1* Direct and Indirect Impacts to the Physical Environment, Including Habitat and Ecosystem ..... 13
*4.1.2* Direct and Indirect Impacts to the Biological Environment ..... 13
*4.1.3* Direct and Indirect Impacts to the Socioeconomic Environment ..... 14

# List of Tables

Table 2-1. A 2004-2010 hindcast of the total pounds available to the West Coast trawl fishery to cover mortality of legal and sublegal sized Pacific halibut (round weight) under each alternative. t ..... 8
Table 4-1 Halibut allocations under the alternatives in comparison to best estimates of bycatch mortality for each year. ..... 16
Table 4-2. Pacific halibut bycatch rates used for initial allocation (rates per pound of arrowtooth and Petrale sole, 2003 through 2006). (WORK UNDERWAY WITH THE NWFSC TO DEVELOP SOME OTHER RATES FOR CONSIDERATION IN THIS ANALYSIS.) ..... **Error! Bookmark not defined.**
Table 4-3. Pacific halibut TCEYs, retention fishery quotas, actual preseason estimates, and trawl bycach mortality allocations under each alternative for a 2004-2010 hindcast (all values are pounds of legal sized halibut (O32) net weight; allocations under the alternatives have not been expanded.). ..... 21
Table 4-4. Proportions by which retention fishery quotas might increase with a decrease in the amount of halibut allocated for the trawl bycatch mortality (based on hypothetical preseason estimates that might have been used based on the new bycatch estimation methodology). ..... 22
Table 4-5. Summary of the flexibility provided under each Alternative during the biennial specifications process. ..... 26

# List of Figures

Figure 3-1. Estimates of actual trawl halibut (legal+sublegal size, net weight) bycatch mortality and preseason estimates for 2004-2010 (estimate from two years prior generally forms the basis for the preseason estimate for each year). ..... 9
Figure 3-2. Annual bycatch (mt) of Pacific halibut by the at-sea whiting sectors, 1995-2008. ..... 10
Figure 4-1. Halibut TCEYs, halibut quotas for retention fisheries, and actual preseason projections of trawl bycatch mortality, 2004 through 2010. ..... 23

Figure 4-2. Halibut TCEYs, halibut quotas for retention fisheries, and trawl halibut bycatch mortality set asides based on the No Action Alternative, 2004 through 2010. ..... 23
Figure 4-3. Halibut TCEYs, halibut quotas for retention fisheries, and trawl halibut bycatch mortality set asides based on the Alternative 1 with a 130,000 pound upper limit, 2004 through 2010. ..... 24
Figure 4-4. Halibut TCEYs, halibut quotas for retention fisheries, and trawl halibut bycatch mortality set asides based on the Alternative 1 with a 100,000 pound upper limit, 2004 through 2010. ..... 24

# CHAPTER 1 PURPOSE AND NEED FOR THE PROPOSED ACTION

## 1.1 Introduction

This document provides background information about, and analyses for, the set aside of Pacific halibut to cover bycatch mortality in the limited entry groundfish trawl fishery. The proposed action would require an amendment to the Pacific Coast Groundfish Fishery Management Plan (FMP), which contains the policies and framework for allocating the harvestable surplus of groundfish and provides for the allocation of Pacific halibut bycatch mortality for the trawl fishery. The proposed action must conform to the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the principal legal basis for fishery management within the Exclusive Economic Zone (EEZ), which extends from the outer boundary of the territorial sea to a distance of 200 nautical miles from shore.

## 1.2 Description of the Proposed Action

### *1.2.1* Issue: Halibut Bycatch Mortality Allocations

The proposed action is to amend the groundfish FMP sections to change provisions related to the amount of halibut bycatch mortality for which the trawl fishery will be managed.

## 1.3 Purpose and Need for the Proposed Action

### *1.3.1* Issue: Halibut Bycatch Mortality Allocations

Limits on halibut bycatch mortality for the limited entry groundfish trawl fishery were first established by Amendment 21 and the measures used to manage them (catch shares) were established under Amendment 20. Both of these amendments were approved by NMFS in the summer of 2010. As stated in Amendment 21, the purpose of the limit on trawl halibut bycatch mortality is as follows:

> To limit the bycatch of Pacific halibut in future LE trawl fisheries. A total catch limit of Pacific halibut, with the intent of further minimization of Pacific halibut bycatch in Area 2A trawl fisheries, is consistent with the Magnuson-Stevens Fishery Conservation and Management Act (MSA) mandate to minimize bycatch and will provide increased benefits to Area 2A fishers targeting Pacific halibut.

Amendment 21 set a limit on trawl halibut bycatch mortality that was expected to force a mortality reduction of about 50%. However, a few months after Amendment 21 approval, new information on the Pacific halibut bycatch mortality revealed that the groundfish trawl sector was taking more halibut than had previously been believed. This implied that the reductions imposed by Amendment 21 would have been more severe than intended. On that basis, following a Council recommendation NMFS implemented an emergency rule for 2011 limiting trawlers to an amount of halibut expected to attain the

original target of a 50% reduction in trawl mortality. Emergency rules are effective only for 180 days and may be renewed only one time, to cover another 186 day period.[1] Absent further action by the Council and NMFS, the limits and consequent reduction in bycatch mortality originally approved in Amendment 21 will become effective at the beginning of 2012. It is believed that such a reduction would prevent trawlers from accessing healthy groundfish target species with which Pacific halibut is taken as bycatch and thereby have substantial adverse impact for the fishing industry and fishing dependent communities. The purpose of this proposed action, to modify the trawl halibut bycatch mortality limits, is to avoid this negative outcome while still reducing trawl bycatch mortality.

Action may also be needed to evaluate and potentially modify other aspects of the process and formula by which the trawl bycatch mortality limits are set. For example, as currently specified, determining the amount of the limit involves a calculation using the halibut total constant exploitation yield (TCEY). A final value for TCEY is not available until after the start of each year while the calculation of the amount of halibut available to the trawl fishery must be made before the start of the year, in order to issue halibut individual bycatch quota (IBQ) pounds to the trawl fishery before fishing starts. The purpose of additional modifications to the allocation process would be to ensure that the process for determining the trawl bycatch mortality limits can be effectively and efficiently implemented.

[1] Renewal of the emergency action, for the second period, is subject to MSA (c)(3)(B): " . . .provided the public has had an opportunity to comment on the emergency regulation or interim measure, and, in the case of a Council recommendation for emergency regulations or interim measures, the Council is actively preparing a fishery management plan, plan amendment, or proposed regulations to address the emergency or overfishing on a permanent basis"

# CHAPTER 2 DESCRIPTION OF THE ALTERNATIVES

### 2.1.1.1 Issue: Halibut Bycatch Mortality Allocations

Pacific halibut is a prohibited species in the west coast LE trawl fishery. Under Amendment 20, Pacific halibut bycatch in the shoreside trawl fishery north of $40^0$10' N latitude is managed using a system of individual bycatch quotas (IBQs). A total mortality limits on trawl bycatch induced Pacific halibut mortality will be calculated as follows.

**No Action Alternative --** Status quo. *Specific plan amendment language:*

> The trawl mortality limit for legal and sublegal Pacific halibut be set at 15% of the Area 2A (i.e., waters off California, Oregon, and Washington) constant exploitation yield for legal size halibut, not to exceed 130,000 pounds for the first four years of trawl rationalization and not to exceed 100,000 pounds starting in the fifth year [2015]. This total bycatch limit may be adjusted downward or upward through the biennial specifications and management measures process. Part of the overall total catch limit is a set-aside of 10 mt of Pacific halibut to accommodate bycatch in the at-sea whiting fishery and bottom trawl bycatch south of 40°10' N latitude. The set-aside amount of Pacific halibut to accommodate the incidental catch in the trawl fishery south of $40^0$10' N latitude and in the at-sea whiting fishery may be adjusted in the biennial specifications and management measures process in future years as better information becomes available.
>
> *Note: based on the Amendment 21 analysis, status quo has been interpreted to include and expansion of the allocation from net to round weight.*

**Alternative 1 (Preliminary Preferred Alternative) –** Specify the allocation as net weight legal-sized fish and make necessary expansions. Modify the No Action Alternative (Status Quo) to clearly specify that the amounts resulting from the calculations would be a total net weight of legal sized halibut which would then be expanded, converting to total round weight of legal and sublegal sized halibut. *Specific plan amendment language would be as follows.*

> For 2012 through 2014, 15% of the Area 2A total constant exploitation yield (TCEY) for legal sized halibut (net weight), not to exceed 130,000 lbs will be subtracted from the TCEY to account for expected trawl bycatch mortality of legal sized halibut (net weight). Beginning in 2015, the amount to be subtracted will be capped at 100,000 lbs. The TCEY used for these

calculations will be the best estimate of the TCEY available from the IPHC at the time of the calculation (most likely the preliminary TCEY). The bycatch allocation percent can be adjusted downward or upward (above or below 15%) through the biennial specifications and management measures process but the upper bound on the maximum allocations can only be changed though an FMP amendment.

The shoreside trawl rationalization program keeps the trawl sector within expectations by requiring that trawlers account for their total mortality of all halibut in round weight (legal and sublegal sized). Therefore, to determine a trawl bycatch mortality limit the amount of halibut pounds available to the trawl fleet will be determined by expanding the expected legal sized halibut mortality (net weight) into a round weight legal+sublegal sized amount. To achieve this, the following conversions will be applied.

i. Net weight to round weight conversion: multiply by the IPHC net weight to round weight conversion factor in use at the time of the calculation (for 2011 the ratio was 1/0.75=1.33).
ii. Legal to legal+sublegal sized conversion factor: multiply by the IPHC legal+sublegal to legal ratio in use at the time of the calculation (for 2011 the ratio was 1/0.62=1.61).

After these conversions, 10 mt will be subtracted to cover bycatch mortality in the at-sea whiting fishery and trawl fishery south of $40^{o}$ 10' N. lat, and the remainder will be issued as IBQ, to be used to cover Pacific halibut mortality by vessels operating in the shoreside trawl IFQ program. The amount of Pacific halibut set aside to accommodate incidental catch in the trawl fishery south of $40^{0}$10' N latitude and in the at-sea whiting fishery can be adjusted in the biennial specifications and management measures process in future years as better information becomes available.

**Alternative 2** – Set allocations biennially. Same as Alternative 1 but during the biennial specifications process set a specific amount of halibut to be subtracted from the TCEY (rather than a percentage) up to a maximum, and use the calculation described above for expanding the trawl allocation and determining the amount of IBQ quota pounds to be issued. Maximum limits to be analyzed would be 100,000 lbs and 130,000 lbs, both expressed in legal-sized, net weight. *Specific plan amendment language would be as follows.*

*The same plan amendment language as Alternative 1 except replace the first paragraph of Alternative 1 with the following:*

During each biennial specifications and management measures process, the Council will determine a trawl halibut bycatch mortality limit for legal sized halibut, net weight.[2] The maximum to which that limit can be set is

Suboption 3a: 100,000 pounds legal-sized, net weight
Suboption 3b: 130,000 pounds legal-sized, net weight

NOTE: **If the Council continues with Alternative 2 it will need to be augmented with an explicit allocation decision for the 2012 fishery, since the fishery will occur after the current emergency rule runs out and before the Council's the next biennial management process.**

[2] The Council November 2010 motion stated that both Alternatives 1 and 2 should "provide for adjustment of the trawl halibut bycatch mortality limit through the biennial management process." However, for Alternative 2, since the allocation amounts would already be determined through that process, the only other aspect of the provisions that could be modified through the biennial management process would be the upper bounds. If the upper bounds could be modified through the same process and at the same time as the allocation amounts, the upper bounds would have no effect. For this reason, for Alternative 2 the specification that additional adjustments could be made through that biennial process has not been included in this Council review draft.

Alternative 1 and 2 were developed by the Council at its November 2010 meeting. No other alternatives were developed but eliminated from consideration.

The alternative Pacific halibut total catch limits analyzed in this document have been applied retrospectively to the 2004 through 2010 fisheries (a hindcast) and the results are provided in Table 2-1. For each year, each total catch limit alternative was applied to the Area 2A TCEY, decided annually by the IPHC; for the no Action Alternative, the result was expended from dressed to round; and for Alternative 1 and 2 the result was expanded using the round/dressed and (legal+sublegal)/legal ratios. Under the No Action Alternative, even though there is not an expansion in the allocation from legal to legal+sublegal, the trawl sector would need to use the number of pounds allocated to it (unexpanded) to cover the mortality of all legal+sublegal fish caught.

**Table 2-1.** A 2004-2010 hindcast of the total pounds available to the West Coast trawl fishery to cover mortality of legal and sublegal sized Pacific halibut (round weight) under each alternative. ŧ

| | | Baseline Actual Mortality ŧŧ | **No Action Alternative** (Set by Formula, No Conversion) | **Alternative 1** (Set by Formula and Convert to Round Wt Legal + Sublegal) | | **Alternative 2** (Determine Biennially and Convert to Round Wt Legal + Sublegal) Cap values are provided here – converted to legal + sublegal round weight Actual allocations may be lower. | |
|---|---|---|---|---|---|---|---|
| Year | TCEY (lb., legal sized net weight) | Legal and Sublegal Sized Round Wt | | 15% Capped at 130,000 through 2014 | 15 % Capped at 100,000 starting in 2015 | Alternative 2a (max of 100,000 pounds legal sized net wet) | Alternative 2b (max of 130,000 pounds legal sized net wet) |
| 2004 | 2,110,000 | 293,214 | 173,333 | 279,570 | 215,054 | 215,054 | 279,570 |
| 2005 | 1,560,000 | 632,726 | 173,333 | 279,570 | 215,054 | 215,054 | 279,570 |
| 2006 | 1,710,000 | 533,518 | 173,333 | 279,570 | 215,054 | 215,054 | 279,570 |
| 2007 | 1,580,000 | 460,766 | 173,333 | 279,570 | 215,054 | 215,054 | 279,570 |
| 2008 | 940,000 | 458,561 | 173,333 | 279,570 | 215,054 | 215,054 | 279,570 |
| 2009 | 640,000 | 553,360 | 128,000 | 206,452 | 206,452 | 215,054 | 279,570 |
| 2010 | 820,000 | not/available | 164,000 | 264,516 | 215,054 | 215,054 | 279,570 |

ŧ Under each alternative, to determine the amount available to the shoreside trawl IFQ fishery subtract 10 mt (22,046 pounds) from the estimated allocations.

ŧŧ Heery et. al. 2010.

* Legal sized Pacifica halibut are 32" and larger, and sublegal sized are under 32".

# CHAPTER 3 AFFECTED ENVIRONMENT

TO BE AUGMENTED WITH ADDITIONAL BASELINE INFORMATION.
**Pacific Halibut: Retention and Nonretention Fisheries**

**Halibut Bycatch Mortality in the Trawl Fishery**

Prior to Amendment 21 allocations and the Amendment 20 catch share plan, the amount of Pacific halibut set aside for the trawl fishery each year was based on the estimated trawl Pacific halibut bycatch mortality from two years previous (the most recent data available at the time the set asides were determined). Trawl Pacific halibut bycatch mortality estimates are provided in Figure 3-1. Two bycatch estimates are provided. The first estimates (the "old method") were the estimates actually used for management during the years covered by the figure. The second estimates (the "new method") were developed and presented to the Council in the fall of 2010 (Heery, et. al., 2010). The trawl mortality amounts were determined through observer program sampling on trawl trips (generally about 20% of the trips were observed) and there were no regulations in place established specifically to reduce the amount of trawl halibut bycatch. The actual mortality and the planned mortality often varied widely from one another from one year to the next (Figure 3-1) due in part to the two year lag between the most recent estimate of trawl bycatch mortality and the year in which that estimate was used and in part because of the absence of management measures to control trawl bycatch. The Amendment 20 catch share program should increase the accuracy of the mortality estimates (due to a 100% observer coverage requirement) and reduce the differences between planned trawl mortality and the actual trawl mortality (due to the individual vessel accountability imposed through Pacific halibut individual bycatch quota included as part of the Amendment 20 catch share program).

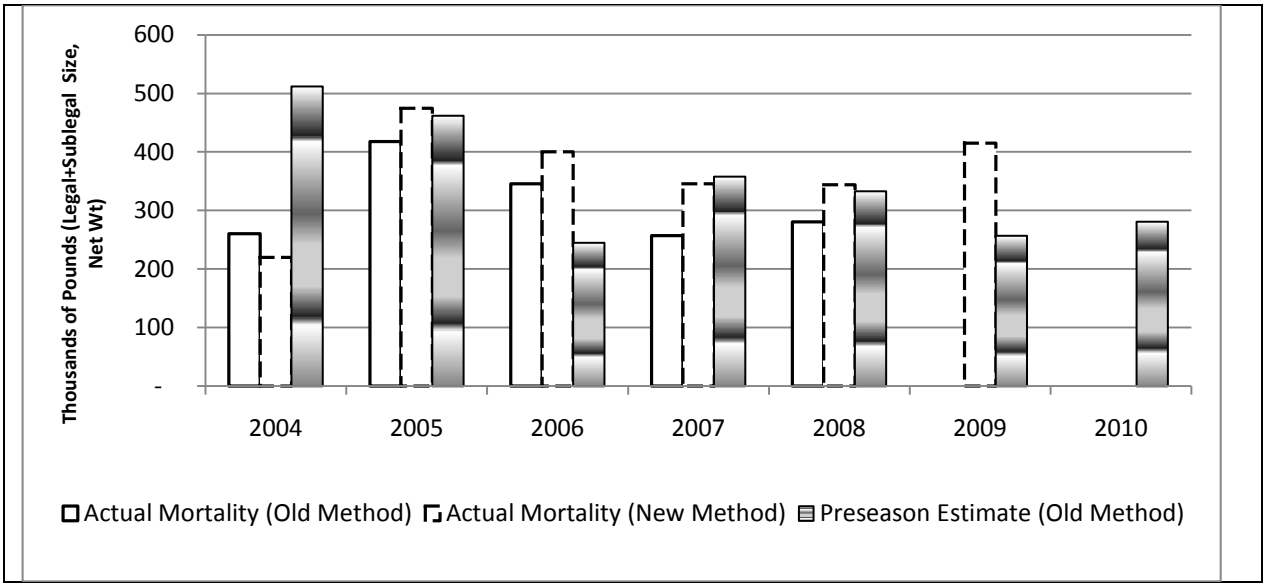



Figure 3-1. Estimates of actual trawl halibut (legal+sublegal size, net weight) bycatch mortality and preseason estimates for 2004-2010 (estimate from two years prior generally forms the basis for the preseason estimate for each year).

**At-Sea Trawl Sector and Southern Fishery Bycatch Amounts**

Under Amendment 21 10 mt was set aside for the southern and at-sea trawl fisheries, an amount expected to minimize the likelihood of constraining the at-sea whiting fisheries. No modifications to this aspect of the allocation formula have been proposed in the current alternatives.

Trawl sector set-asides for Pacific halibut include set-asides to account for catch in the shoreside trawl sector in areas south of 40°10' N latitude, as well as incidental catch in the at-sea sectors. Available information from the West Coast Groundfish Observer Program indicates that approximately 0.24 percent of the observed halibut has been taken in that area south of 40°10' N latitude from the 2003 to 2006 period. Over that period, the trawl bycatch estimate for areas north of 40°10' N latitude has ranged from 923,693 to 666,782 pounds, with estimated bycatch mortality equaling approximately 50 percent. This means that the observed halibut bycatch mortality estimate in areas to the south of 40°10' N latitude is estimated to be approximately 3.7 to 5.1 mt. When combined with the at-sea trawl sector take of Pacific halibut over the 1995 to 2008 period, an appropriate set-aside may be on the order of 10 mt for at-sea and shoreside trawl south of 40°10' N latitude combined (Figure 3-2).

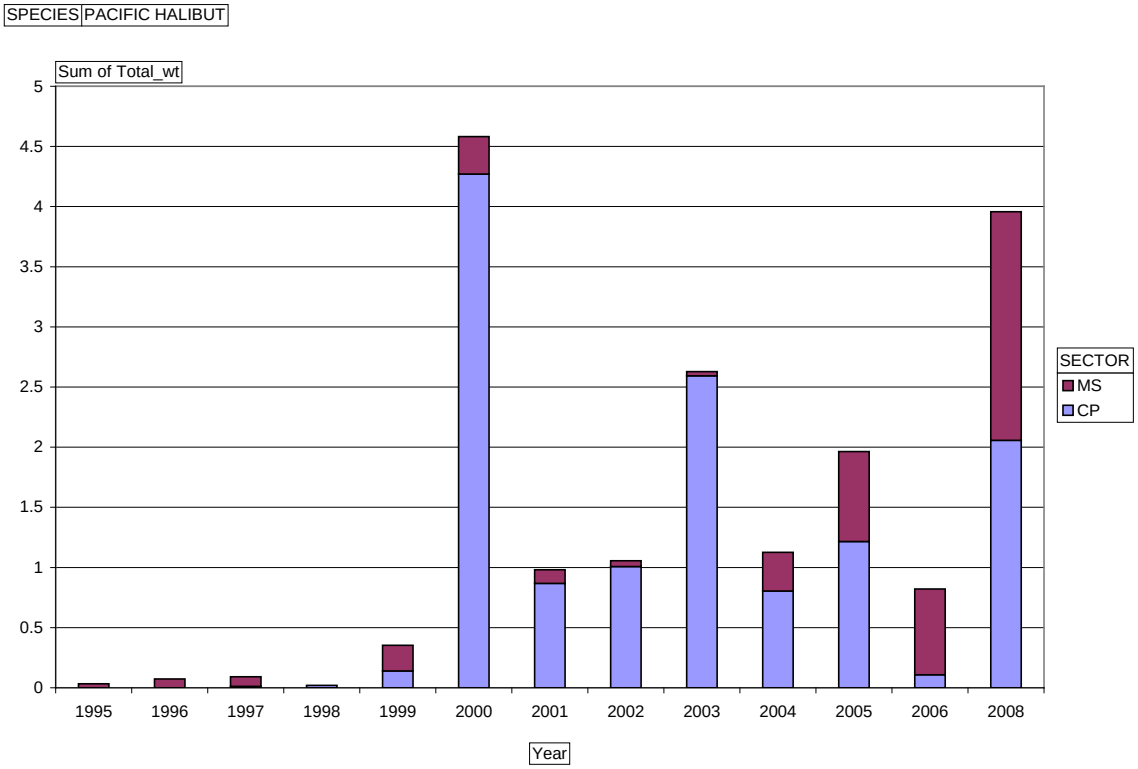



Figure 3-2. Annual bycatch (mt) of Pacific halibut by the at-sea whiting sectors, 1995-2008.

# CHAPTER 4 IMPACTS

## 4.1 Issue: Halibut Bycatch Mortality Allocations

Through 2010, trawl halibut bycatch was managed though a process under which an expected trawl bycatch was estimated and deducted from the Pacific halibut TCEY. There were no management measures designed to specifically limit the amount of trawl fishery bycatch mortality. For 2011, bycatch control measures in the form of individual bycatch quota were established as part of the Amendment 20 catch share program and a bycatch mortality limit was established through Amendment 21. However, the bycatch mortality limit specified by Amendment 21 was not implemented for 2011; a different limit was implemented through emergency action. The main action analyzed by this document is the modification of the Pacific halibut bycatch mortality allocation formula that was developed under Amendment 21 but never implemented.

The quantitative portion of the analysis will largely rely on a hindcast of the Amendment 20 and 21 actions. The allocation implemented in lieu of the Amendment 21 allocation was implemented for this year (2011) and data on this year's fishery will not be available until after this action is complete. For these two reasons (that Amendment 21 limits were not implemented for 2011 and the unavailability of 2011 data) there is no information available to assess impacts of the fishery under status quo. The baseline used for the hindcast is 2004 through 2009, the six most recent years for which data is available[3]. The idea behind the hindcast method is to use conditions from past years to illustrate the range of conditions that might be encountered in the future and how each alternative would perform under such conditions.

The starting point for each year of the hindcast period will be the TCEYs and the amounts of quota allocated to each of the Pacific halibut retention fisheries. From there, we will examine the change in the amount of the trawl halibut bycatch mortality that would be expected given implementation of each of the alternatives. The amount of change will depend on the baseline assumptions regarding the amount of trawl halibut bycatch mortality that would have been expected in each year. There are two assumptions that may be made regarding the trawl halibut bycatch mortality used for the baseline.

1. **Actual Preseason Estimates Based on Old Method:** The amount of trawl bycatch mortality that would have been expected is the preseason estimate used by the IPHC when the season was planned. In general, the amount of trawl bycatch mortality expected for a coming year was based

[3] This baseline includes both an unusually low year of trawl bycatch (2004) and an unusually high year (2005). Extending the range back to 2003 would have picked up a second unusually low year and starting the range in 2006 would have resulted in a comparable average without picking up the range of variability in fleet performance. There is only a 3% difference between the 2004-2009 average and the 2006-2009 average.

on the most recent post season estimate available at the time the fishery was planned. For example, the post season estimate for the 2008 fishery provides the basis for planning the 2010 fishery.

2. **Hypothetical Preseason Estimates Based on New Method:** In the fall of 2010 a new estimation procedure resulted in revisions to the post season estimates going back through 2002 (Heery, et. al., 2010). For most years the estimates of legal and sublegal sized trawl caught halibut bycatch mortality resulting from this new method were higher than those based on the old method. As mentioned, the purpose of the hindcast is to use past fishery conditions to indicate the range of management situations that might be encountered under the alternatives as we move into the future. Since this new method would be used in the future and provides the best estimate of actual trawl bycatch and bycatch needs during the baseline period, it seems appropriate to use the new estimates in modeling a hindcast of the impacts of the proposed management measures.[4] However, use of the new method to develop hypothetical preseason estimates has its challenges. While IPHC based its preseason estimates on the most recent post season estimate available, in some cases the IPHC found it appropriate make modifications. It is impossible to determine how the IPHC might have modified the hypothetical preseason estimates based on the new estimates, which is why they have been termed here as "hypothetical." Additionally, if the new bycatch information had been available this would have resulted in changes in the estimated stock biomass and amounts of TCEY made available.

Each of these methods for estimating the baseline trawl bycatch mortality has its merits and in some cases both may be used to further illustrate the range of possible outcomes.

The quantitative analysis will be based on a comparison of the following.

**Hindcast Baseline –** retention fishery quotas and 2004-2009 trawl Pacific halibut bycatch mortality levels. (For comparisons where complete data is available for the 2010 fishery, 2010 is included in the baseline).

**No Action Alternative** – Status quo, Amendment 21 trawl Pacific halibut bycatch mortality allocations, including application of expansion factor to convert from net to round weight.

**Alternative 1 –**Amendment 21 trawl Pacific halibut bycatch mortality allocation, with an additional expansion factor to convert from legals to legals+sublegal.

**Alternative 2** – Set trawl Pacific halibut bycatch mortality allocations biennially and use same expansion factors as for Alternative 1.

Under each alternative, the hindcast assumes that the Amendment 20 catch share program would be in place to ensure that the trawl halibut bycatch mortality limits are not exceeded

There are some general impact mechanisms and impacts which form the basis of the analyses more fully developed in each subsection. These are as follows.

1. **Trade-Offs:** In general, the level of allocation of Pacific halibut bycatch mortality to the trawl fishery will not directly affect total Pacific halibut mortality since any reduction in trawl bycatch will likely result in increased quota in retention fisheries. However, on some occasions, particularly when the halibut TCEY is going through a rapid decline, the IPHC has provided for an adjustment period by allocating quota in excess of the TCEY (or in amounts that result in mortalities in excess of the TCEY when nonretention fishery discard mortality is taken into account). In such years, a reduction in the Pacific halibut needed to cover trawl mortality could go toward reducing the overall mortality and better achieving the TCEY rather than increasing the quota for retention fisheries. Assuming that quota and bycatch mortality limits are set to meet the TCEY the following are the general effects.

[4] At the same time, it should be recognized that if the IPHC had the new estimates at the time it planned the fisheries used for the hindcast, it would have made different preseason estimates and likely would have established a different set of quotas.

- **Effect of a Trawl Bycatch Mortality Allocation In Excess of Trawl Bycatch Needs.** Any halibut allocated for trawl fishery bycatch in excess of the needs of the trawl fishery would likely represent foregone halibut opportunity for retention fisheries and total halibut mortality levels below the TCEY. The retention fishery fishing industry (including commercial harvesting, recreational charter, and processing businesses and workers), fishing communities, tribes, recreational fishers, and fish consumers would experience a reduction in benefits resulting from reduced Pacific halibut harvest. The habitat and ecosystem impacts of the retention fishery would be lower than if enough quota had been allocated to fully utilize the TCEY.
- **Effect of a Trawl Bycatch Mortality Allocation Less than Trawl Bycatch Needs.** If the trawl fishery does not receive enough halibut to fully harvest the amount of groundfish harvest allowed by its allocations the fishing industry, fishing communities, and fish consumers would experience a reduction in benefits resulting from reduced groundish harvest; and impacts to habitat, the ecosystem, and the groundfish resource would be reduced below levels anticipated to result from the regulations analyzed and approved through the biennial specifications process.

2. **Effect on Management and Agency Resources.** The procedures established for setting the trawl allocation levels will have impacts on the management system's flexibility to respond to changing conditions and the amount of administrative effort required to make changes in the future.

### *4.1.1* Direct and Indirect Impacts to the Physical Environment, Including Habitat and Ecosystem

The direct and indirect impacts of the trawl fishery to groundfish essential fish habitat (EFH) and the California current ecosystem are analyzed as part of the biennial specifications process, usually in an EIS (PFMC, 2010). The halibut allocated to cover trawl halibut bycatch mortality will not affect the total amount of trawl activity (and hence physical impacts), except to the extent that bycatch mortality limits are not sufficient to accommodate full harvest of the amount of groundfish allocated to the trawl fishery, in which case trawl activity and impacts may be reduced below levels anticipated in the biennial specifications process.

Under normal circumstances, a reduction in the amount of halibut made available for the trawl fishery bycatch would likely increase the amount of quota available for tribal, sport, and non-trawl commercial halibut retention fisheries, increasing the impacts of those fisheries. The proportions by which the retention fishery activity might increase are described in the section on impacts to the fishery. An increase in activity in retention fisheries might not occur if the additional quota is instead used to better achieve conservation goals, as described in the first assumption/premise listed in Section 4.1.

The proposed action to modify the amount of Pacific halibut allocated as bycatch mortality for the trawl fishery, as well as the No Action Alternative to maintain the existing bycatch mortality allocation for the trawl fishery, do not alter the management measures by which each sector is kept within its allowable harvests. Such direct and indirect impacts are the concern of the groundfish biennial specification process and the Pacific halibut catch sharing plan, and are analyzed in separate environmental analyses that are part of those processes.

### *4.1.2* Direct and Indirect Impacts to the Biological Environment

**Pacific Halibut**

The total mortality of Pacific halibut is not expected to be directly altered by any of the action alternatives. The main effect of the alternatives is to change the amount of trawl sector halibut mortality and hence the amount left over for harvest by other sectors. The allocations for other sectors may be increased as a result of the reduction in trawl sector bycatch mortality. However, because in some recent years the IPHC has set quota levels in excess of the TCEY (Figure 4-2), it is possible that rather than increasing the harvest of other sectors,

in some years the reduction in the trawl sector bycatch mortality might be used to more closely achieve the TCEY.

**Groundfish, Including Overfished Species**

The amount of halibut allocated to the trawl sector under the action alternatives will not increase the total mortality of groundfish to levels above those anticipated and analyzed in the impact assessments produced during the biennial specifications process. Total mortality expected mortality and amount of catch allocated to the trawl sector is determined through that biennial process. Catch accounting and 100% observer coverage in the trawl fishery assure adequate control over total mortality. A shortage of IBQ-pounds for Pacific halibut could constrain trawl harvest and prevent the sector from attaining the allocations anticipated during the biennial specifications process.

**ESA Listed Salmon**

No change in impacts expected. This section to be elaborated.

**Other Protected Species.**

No change in impacts expected. This section to be elaborated.

**Other Fish Resources**

No change in impacts expected. This section to be elaborated.

## *4.1.3* Direct and Indirect Impacts to the Socioeconomic Environment

### 4.1.3.1 Fishery Impacts

**Approach to Analysis**

Since the actions contemplated in this document concern allocation of a set-aside to cover groundfish trawl bycatch mortality of halibut, without directly altering the total halibut mortality, the anticipated effects are largely socioeconomic. The resulting modifications of the amounts allocated to cover trawl bycatch mortality will affect the amount of halibut available for halibut retention fisheries and therefore the total tribal harvest, commercial revenue, recreational trips and associated community impacts from those fisheries. Each retention fishery will be affected differently depending on how the available halibut is split among the retention fisheries and on the management measures used to keep each sector within its allocation. These allocations and the management measures are developed annually by the Council through the catch sharing plan and recommended to the IPHC for adoption. The impacts of those specific decisions are considered through that process. Rather than speculating on the various mixes of allocations among retention fisheries, management measures, and impacts that might result, the quantitative portion of this analysis provides a baseline for the various sectors and focuses on the proportional changes in opportunities expected under each alternative. The ability to project impacts for the groundfish trawl fishery is limited by the shift of this fishery to a catch share program in 2011. The catch share program is expected to have a major impact on how this fishery is prosecuted. Key to understanding the impacts on the trawl fishery will be the halibut bycatch encounter and mortality rates. At this time, there is a great deal of uncertainty about what these rates will be under catch share management. This uncertainty will limit the quantification of the economic impacts on the groundfish trawl fishery.

**Impact on the Groundfish Trawl Fishery**

Since Pacific halibut bycatch retention by the trawl fishery is not allowed the halibut allocation will not directly affect total revenue. The primary issue for the trawl fishery is whether the amount allocated is sufficient to

allow the sector to access its target catch and if not, the amount by which the target catch might be reduced through a halibut bycatch constraint.

There are two ways to display the trawl bycatch allocations for the purpose of assessing its impacts. One way is to show the allocations in terms of the legal sized halibut, net weight. Displays of the allocations in these units are useful first because they are the units in which most of the alternatives are denominated (e.g. upper limits of Alternatives 1 and 2 are specified in terms of legal sized net pounds); and second, because the retention fishery quotas (and consequently the changes in those quotas that might be affected by changes in the trawl allocations) are in terms of legal sized net pounds. On the other hand, the trawl sector is held accountable for the amount of halibut mortality it causes in round weight of both legal and sublegal fish. In terms of understanding the amount of quota available to the trawl fishery and the meaning of the constraints, display of the impacts on the trawl halibut in terms of legal+sublegal round weight is most useful.

One indication of the potential constraint that the Pacifica halibut allocation alternatives may impose on the groundfish trawl fishery is the amount available to cover the fishery's round weight of legal and sublegal sized halibut bycatch in comparison to the best estimate of the trawl induced actual mortality each year. On average the No Action Alternative would have been expected to reduce trawl induced mortality by 66% compared to actual observed mortality (Table 4-1). The individual accountability provided under the trawl program is expected to provide fishermen with a number of incentives and opportunities to reduce their bycatch mortality. Total bycatch may be reduced through gear modifications, changing areas of catch, and reducing tow length to allow vessels to detect whether or not they are in a high encounter rate area. Shorter tow lengths may also reduce mortality rates because the halibut are likely to be in better condition when discarded. Further fishermen will have opportunity to reduce mortality rates through more careful and rapid discard of halibut taken as bycatch. Through all of these means and others it may be possible to achieve a substantial reduction in the total halibut mortality associated with targeted trawl catch. However, if the trawlers are not able to reduce their bycatch mortality rates to the degree required, the amount of halibut IBQ-pounds available to the fishery will not be sufficient, and directed groundfish catch will be forgone resulting in a reduction in the total trawl exvessel revenue and the attendant revenues and benefits for crew members, shoreside processors, communities, and the fish consuming public.

Table 4-1 Halibut allocations under the alternatives in comparison to best estimates of bycatch mortality for each year.

| Year | Postseason Bottom Trawl Halibut Bycatch Mortality Estimate ŧ Legal and Sublegal Sized (O32 + U32) (Round Wt) | Pounds Allocated to Cover Groundfish Trawl Bycatch Mortality Of Legal (O32) and Sublegal (U32) Sized Pacific Halibut (Round Wt) ŧŧ | | | Percent Change from Post Season Estimate | | |
|---|---|---|---|---|---|---|---|
| | | No Action Alternative (130,000 lb upper bound on O32 + U32 net wt) | Alternative 1 (130,000 lb upper bound on O32 net wet) | Alternative 1 (100,000 lb upper bound on O32 allocated net wt) | No Action Alternative | Alternative 1 (130,000 lb upper bound) | Alternative 1 (100,000 lb upper bound) |
| 2004 | 293,214 | 173,333 | 279,570 | 215,054 | -41% | -5% | -27% |
| 2005 | 632,726 | 173,333 | 279,570 | 215,054 | -73% | -56% | -66% |
| 2006 | 533,518 | 173,333 | 279,570 | 215,054 | -68% | -48% | -60% |
| 2007 | 460,766 | 173,333 | 279,570 | 215,054 | -62% | -39% | -53% |
| 2008 | 458,561 | 173,333 | 279,570 | 215,054 | -62% | -39% | -53% |
| 2009 | 553,360 | 128,000 | 206,452 | 206,452 | -77% | -63% | -63% |
| 2010 | n/a | 164,000 | 264,516 | 215,054 | | | |
| 2004-2009 Avg | 488,691 | 165,778 | 267,384 | 213,620 | -66% | -45% | -56% |

Notes: Since no trawl caught fish are "legal" the IPHC preferred terminology is over 32" (O32) for legal sized halibut and under 32" (U32) for sublegal sized halibut. To assist in the transition to this new terminology, the expressions are maintained side-by-side in this table.

ŧ Heery et. al. 2010 (Table 5).

ŧŧ No Action Alternative: allocation expanded from net to round weight. Alternative 1: allocation expanded from net to round weight and from O32 to O32+U32.

Alternative 1 provides 15% of the legal sized halibut TCEY to the groundfish trawl fishery, capped at 130,000 pounds for 2012 through 2014 and at 100,000 pounds starting in 2015. If Alternative 1 with the 130,000 pound cap is applied over the 2004-2009 time period, the reduction compared to actual mortalities would have been 45%. If Alternative 1 with the 130,000 pound cap is applied over the 2004-2009 time period, the reduction compared to actual mortalities would have been 56%. Because the Alternative 1 limits are greater than under the No Action Alternative, relative to the No Action Alternative there would be a lower risk that socio-economic benefits might be forgone because of the amount of halibut was insufficient to allow complete access to the trawl sectors groundfish allocation.

Under Alternative 2, every two years the Council would determine the amount of trawl halibut allocation for the coming two years. In Alternative 2, there are suboptions on the amount the trawl fishery would be allocated: Alternative 2a: 100,000 pounds and Alternative 2b, 130,000 pounds. Because the amounts under Alternative 2 are subject to biennial determinations, no estimates can be provided for the amounts the Council would allocate. These amounts would be determined and impacts analyzed during the groundfish biennial specifications process. In general, Alternative 2a might be expected to perform similarly to when Alternative 1 is operating on the 100,000 pound cap (2105 and beyond) and Alternative 2b might be expected to perform similarly to when Alternative 1 is operating on the 130,000 pound cap (2012-2014).

Some indication of the potential impacts of the Pacific halibut allocation on the shoreside trawl fishery target species retention may be derived through an examination of trawl fishery bycatch rates. These rates can be used to indicated the amount of target species forgone per pound of halibut, assuming that halibut constrains target harvest. In

Pacific halibut bycatch rates are provided using a number of different denominators: arrowtooth flounder and petrale sole retained catch, all FMP flatfish retained catch, groundfish retained catch (except Pacific hake), and the retained catch of a group of species that were shown to have a positive correlation with Pacific halibut bycatch in the LE trawl sector (arrowtooth flounder, petrale sole, Pacific cod, unspecified skates, lingcod, yellowtail rockfish, and Pacific Ocean Perch) (Heery, et al. 2010). The rates are in terms of all halibut caught by the fleet in proportion to the indicated denominators for the areas and depths indicated. The lower the bycatch rates the greater the value of each pound of halibut for the trawl fishery, i.e. the greater the amount of target species can be harvested along with the attendant revenue and other benefits.

**Table 4-2.** Pacific halibut bycatch rates for the combined years of 2003-2006 (period used in initial issuance rule) and 2002-2009 in the limited entry bottom trawl groundfish fishery stratified according to area and depth.

| | **Shoreward of Trawl RCA (0-115 fm)** | | | | **Seaward of Trawl RCA (>115 fm)** | | | |
|---|---|---|---|---|---|---|---|---|
| | **Pacific Halibut Bycatch Rates** | | | | **Pacific Halibut Bycatch Rates** | | | |
| | Arrowtooth flounder +Petrale sole Retained | All FMP Flatfish Retained | FMP Groundfish Retained | Positive Correlation Species Retained | Arrowtooth flounder +Petrale sole Retained | All FMP Flatfish Retained | FMP Groundfish Retained | Positive Correlation Species Retained |
| **North of 47° 30' N. lat.** | | | | | | | | |
| 2003-2006 | 0.2257 | 0.1478 | 0.0782 | 0.1136 | 0.0842 | 0.0349 | 0.0268 | 0.0754 |
| 2002-2009 | 0.2356 | 0.1413 | 0.0712 | 0.1088 | 0.1068 | 0.0508 | 0.0394 | 0.0961 |
| **40° 10' to 47° 30' N. lat.** | | | | | | | | |
| 2003-2006 | 0.0863 | 0.0392 | 0.0245 | 0.0515 | 0.0339 | 0.0090 | 0.0057 | 0.0268 |
| 2002-2009 | 0.0978 | 0.0405 | 0.0255 | 0.0585 | 0.0421 | 0.0105 | 0.0067 | 0.0333 |
| **South of 40° 10' N. lat.** | | | | | | | | |
| 2002-2009 | 0.0146 | 0.0114 | 0.0059 | 0.0132 | 0.0057 | 0.0005 | 0.0003 | 0.0049 |

Note: Data summaries provided by the NWFSC, April 27, 2011.

This information is presented graphically in Figure 4-1.

**Figure 4-1 Pacific halibut bycatch rates computed using 3 different denominators for the combined years of 2003-2006 (period used in initial issuance rule) and 2002-2009 in the limited entry bottom trawl groundfish fishery stratified according to area (north of 47° 30' N. lat and 40° 10' to 47° 30' N. lat) and depth (0-115 fm, >115 fm). We use PHLB as an abbreviation for Pacific halibut, ARTH for arrowtooth flounder, PTRL for petrale sole, ALLFLT for all FMP flatfish, and POSCOR for species whose retained catch has been found to be correlated with Pacific halibut bycatch (Heery et al. 2010).**

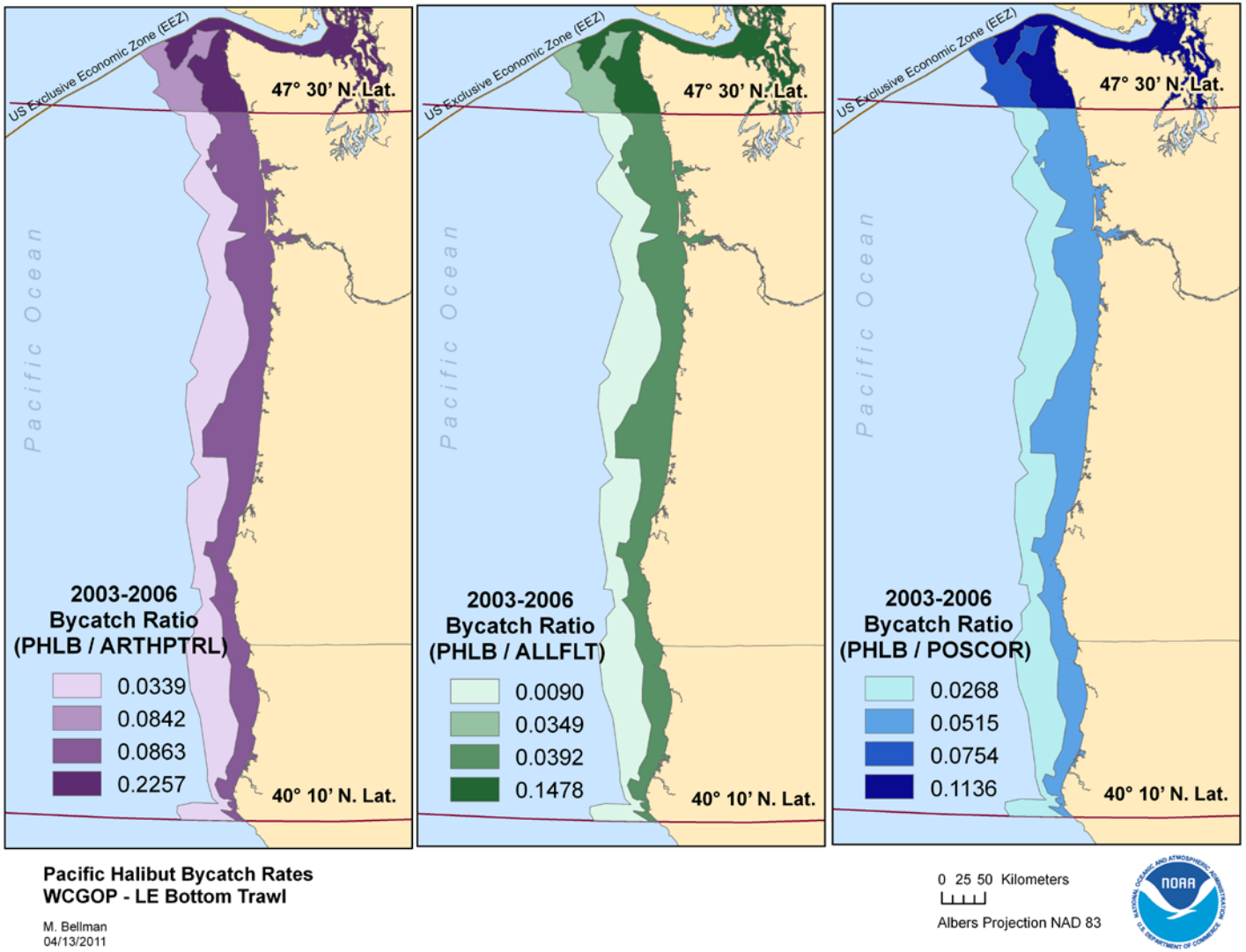
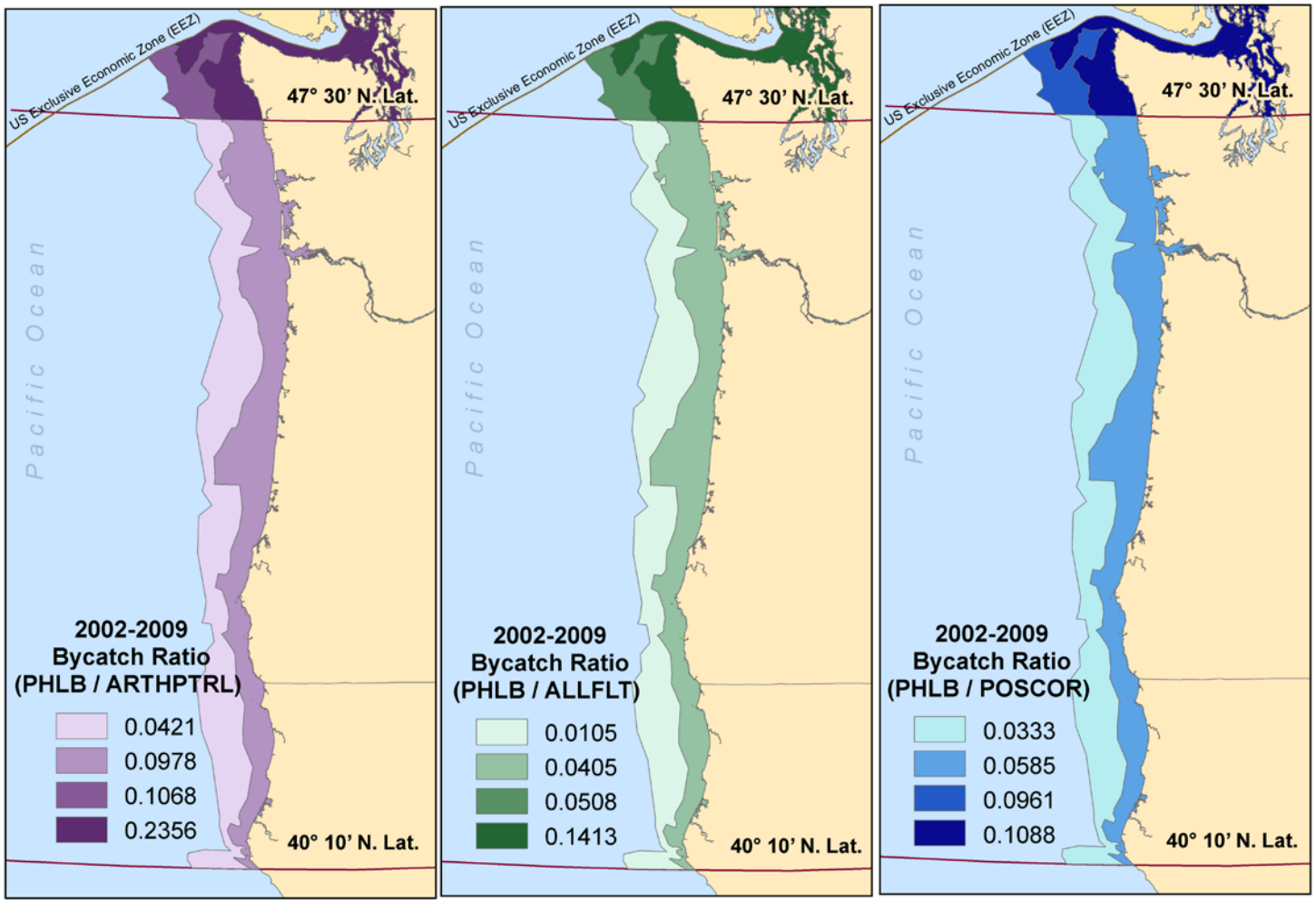



**Figure 1 (continued).**




**Pacific Halibut Bycatch Rates**
**WCGOP - LE Bottom Trawl**

M. Bellman
04/13/2011

0 25 50 Kilometers

Albers Projection NAD 83

Since the trawl fleet is allocated bycatch mortality rather than total bycatch to the degree that discarded halibut survive, the amount of target species a trawler can take per pound of IBQ is greater. Data from the NWFSC indicates that from 2004 through 2009, on average about 29 pounds of halibut mortality was incurred for every 100 pounds discarded. This conclusion is based on the data provided in Table 4-3.

Table 4-3. Summary of Pacific halibut viability data and annual discard mortality rates in the LE bottom trawl groundfish fishery. The condition of observer sampled Pacific halibut was identified as Excellent, Poor, or Dead based on the injury key presented in Appendix L of the WCGOP training manual (NWFSC 2010), which is consistent with International Pacific Halibut Commission (IPHC) protocols. The percentage of individuals in each viability category was weighted based on the length-weight relationship as described in the Methods section of Heery et al. 2010. Discard mortality rates for each viability category-year were obtained by multiplying the % of individuals in each viability category by a category specific mortality rate: $m_{excellent}$ = 0.20, $m_{poor}$ = 0.55, $m_{dead}$ = 0.90 based on Clark et al. 1992 (see also: Heery et al. 2010).

| | % of individuals in each viability category (weighted average) | | | Discard Mortality Rate for each viability category | | |
|---|---|---|---|---|---|---|
| **Year** | **Excellent** | **Poor** | **Dead** | **Excellent** | **Poor** | **Dead** |
| 2004 | 32% | 22% | 46% | 0.0643 | 0.1185 | 0.4166 |
| 2005 | 28% | 23% | 49% | 0.0568 | 0.1266 | 0.4374 |
| 2006 | 36% | 16% | 48% | 0.0718 | 0.0899 | 0.4296 |
| 2007 | 22% | 11% | 67% | 0.0437 | 0.0627 | 0.6009 |
| 2008 | 23% | 17% | 60% | 0.0460 | 0.0910 | 0.5440 |
| 2009 | 29% | 16% | 54% | 0.0589 | 0.0891 | 0.4890 |
| **All Years Combined** | 28% | 18% | 54% | 0.0566 | 0.0993 | 0.4828 |

Note: Methods used to estimate these values can be found on pages 13-14 of Heery et al. 2010; http://www.nwfsc.noaa.gov/research/divisions/fram/observer/datareport/docs/pacifichalibut_totalmortality_2010.pdf

With respect to opportunities for the at-sea whiting trawl fishery and the groundfish trawl fishery south of 40° N. latitude, there is no difference between the alternatives. For all alternatives, including the No Action Alternative, 10 mt of legal and sublegal sized round weight halibut are allocated to cover bycatch.

**Impact on Retention Fisheries**

For the retention fisheries, of interest is the impact of the alternatives on the amounts of legal sized halibut available, net weight. For that reason, tables and figures in this section portray the allocations and effects in those units. Table **4-4** provides TCEYs, retention fishery allocations, and trawl bycatch estimates and allocations in terms of the pounds of legal sized halibut represented by each.

Table 4-4. Pacific halibut TCEYs, retention fishery quotas, actual preseason estimates, and trawl bycach mortality allocations under each alternative for a 2004-2010 hindcast (all values are pounds of legal sized halibut (O32) net weight; allocations under the alternatives have not been expanded.).

| Year | TCEY | Sum of Retention Fishery Quotas | Trawl Bycach Mortality Actual Preseason Estimates (Based on Old Method)* | No Action Alternative (130,000 lb upper bound on O32 + U32 net wt)*** | Alternative 1 (130,000 lb upper bound on O32 net wet) | Alternative 1 (100,000 lb upper bound on O32 net wt) |
|---|---|---|---|---|---|---|
| | Legal sized(O32) halibut (pounds net wt) | | | | | |
| 2004 | 2,100,000 | 1,480,000 | 344,690 | 77,623 | 130,000 | 100,000 |
| 2005 | 1,560,000 | 1,330,001 | 367,000 | 79,677 | 130,000 | 100,000 |
| 2006 | 1,710,000 | 1,380,000 | 172,000 | 86,015 | 130,000 | 100,000 |
| 2007 | 1,580,000 | 1,340,000 | 228,000 | 67,944 | 130,000 | 100,000 |
| 2008 | 940,000 | 1,220,000 | 252,000 | 70,909 | 130,000 | 100,000 |
| 2009 | 640,000 | 950,000 | 128,000 | 53,742 | 96,000 | 96,000 |
| 2010 | 820,000 | 810,000 | 183,000 | 73,918 | 123,000 | 100,000 |

*The 2004 preseason estimate of the legal sized trawl halibut bycatch mortality was derived by applying the average 2005-2009 legal to legal+sublegal ratio to the preseason estimate of legal+sublegal trawl halibut bycatch mortality. All other preseason estimates in this column were provided directly by IPHC.

**Since no trawl caught fish are "legal" the IPHC preferred terminology is over 32" (O32) for legal sized halibut and under 32" (U32) for sublegal sized halibut. To assist in the transition to this new terminology, the expressions are maintained side-by-side in this table.

*** Pounds of legal sized fish derived using legal to legal+sublegal ratios from the new halibut bycatch mortality estimation method (lagged two years to account for the information that would have been available during each year's planning process had the new methodology been in place).

As discussed, the halibut bycatch mortality allocated for the trawl fishery affects the amount of the TCEY left for allocation among the retention fisheries. In (Table **4-5**), the potential reduction in the amounts allocated for the trawl fishery are displayed as a percent of the total quotas for all retention fishery over the course of a 2004-2010 base period, i.e. the proportion by which retention fishery quotas might be increased given the reduction in trawl bycatch mortality that might be imposed under each alternative. The degree of change in opportunity depends on what would have been assumed about the expected trawl bycatch mortality in the absence of a limit, which in turn depends on the model used for estimation of bycatch (the "old method" or "new method" as described earlier), and how the IPHC would have used the estimates. For the purposes of this hindcast approach, the actual quotas for each year and hypothetical preseason trawl allocation are based on the new bycatch estimates. Assuming that all of the additional legal sized halibut made available through reductions in the trawl bycatch mortality levels are used to increase the quota for the directed fisheries, the increases would have averaged 11.7% under the No Action Alternative, 7.4% under Alternative 1 with a 130,000 pound cap, and 8.4% under Alternative 1 with a 100,000 pound cap. *Note: still under discussion for the next draft of this document is whether the best baseline to use would be the actual preseason estimates available when the IPHC planned its fishery or hypothetical estimates based on the new bycatch mortality estimation methodology.* ***Figure 4-2*** *shows graphically the actual preseason bycatch estimates use by the IPHC.*

Table 4-5. Proportions by which retention fishery quotas might increase with a decrease in the amount of halibut allocated for the trawl bycatch mortality (based on hypothetical preseason estimates that might have been used based on the new bycatch estimation methodology).

| | Legal Sized Halibut (pounds (O32) net weight) | | | Potential Change in Total Halibut Quota Available for Retention Fishery in Moving from Baseline to Trawl Bycatch Allocation Alternative (as a percent of retention fishery quotas) | | |
|---|---|---|---|---|---|---|
| | TCEY | Sum of Retention Fishery Quotas | Trawl Baseline (New Hypothetical Preseason Estimates Trawl Bycatch Mortality)* | No Action Alternative (Status Quo) | Alternative 1 130,000 lb upper bound | Alternative 1 100,000 lb upper bound |
| 2004 | 2,100,000 | 1,480,000 | 340,614 | 17.8% | 14.2% | 16.3% |
| 2005 | 1,560,000 | 1,330,001 | 125,663 | 3.5% | -0.3% | 1.9% |
| 2006 | 1,710,000 | 1,380,000 | 145,505 | 4.3% | 1.1% | 3.3% |
| 2007 | 1,580,000 | 1,340,000 | 248,020 | 13.4% | 8.8% | 11.0% |
| 2008 | 940,000 | 1,220,000 | 218,257 | 12.1% | 7.2% | 9.7% |
| 2009 | 640,000 | 950,000 | 193,455 | 14.7% | 10.3% | 10.3% |
| 2010 | 820,000 | 810,000 | 206,683 | 16.4% | 10.3% | 6.0% |
| '04-'10 average | | | | 11.7% | 7.4% | 8.4% |

Note: Hypothetical preseason estimates derived from the most recent post season trawl bycatch mortality estimate that would have been available at the time the fishery was planned if the new estimation method was in place. For example, planning for the 2010 fishery occurred in 2009 at which time the most recent post season estimate available was for 2008.

While these tables indicate the amounts of halibut the alternatives might have freed up for the halibut retention fisheries, actual amounts may have varied for a variety of reasons. One of these is that the new bycatch estimation methodologies may have affected the TCEY. Another is that for some years, due to changing circumstances, the IPHC found it appropriate to set quotas in excess of the TCEY. To illustrate, Figure 4-2 shows that with the declining TCEY, starting in 2008 the IPHC allocated more quota to directed fisheries than was available under the TCEY. Under these conditions, it may be that savings from reduced halibut mortality might have gone to stock conservation rather than increases in quota for the directed fishery.

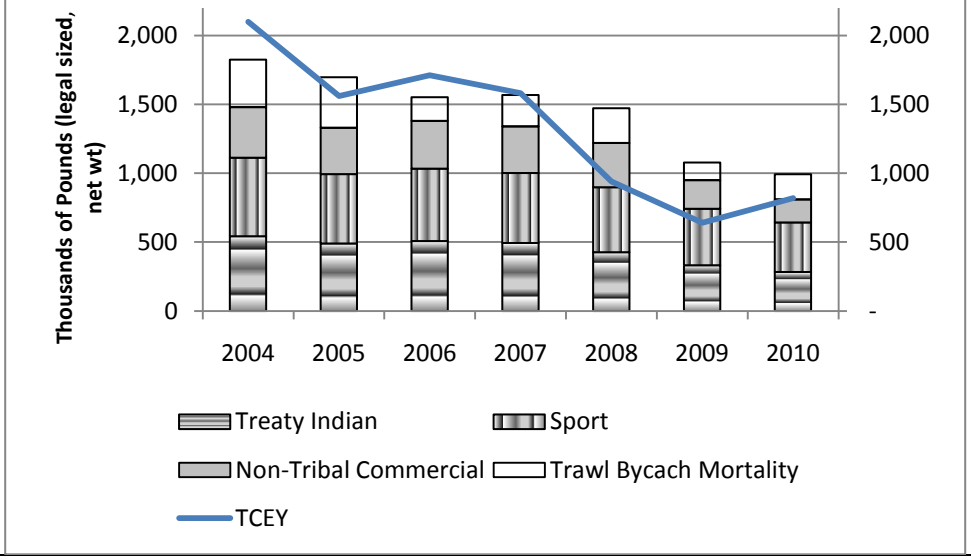



Figure 4-2. Halibut TCEYs, halibut quotas for retention fisheries, and actual preseason projections of trawl bycatch mortality, 2004 through 2010.

Additional figures provide a visual sense of the additional fishing or conservation opportunity that might have been provided under the No Action Alternative (Figure 4-3), Alternative 1 with a 130,000 pound upper limits (Figure 4-4), and Alternative 1 with a 100,000 pound upper bound (Figure 4-5). Alternative 2a also has a 100,000 pound upper bound, and Alternative 2b a 130,000 pound upper bound but the actual allocation levels are indeterminate because there is no default allocation formula (allocation would be determined entirely through the biennial specifications process).

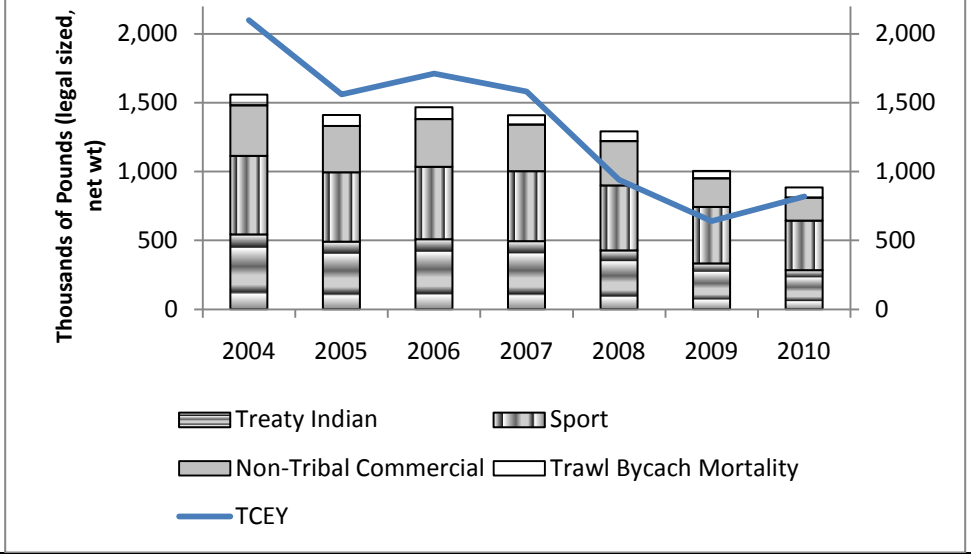



Figure 4-3. Halibut TCEYs, halibut quotas for retention fisheries, and trawl halibut bycatch mortality allocated based on the No Action Alternative, 2004 through 2010.

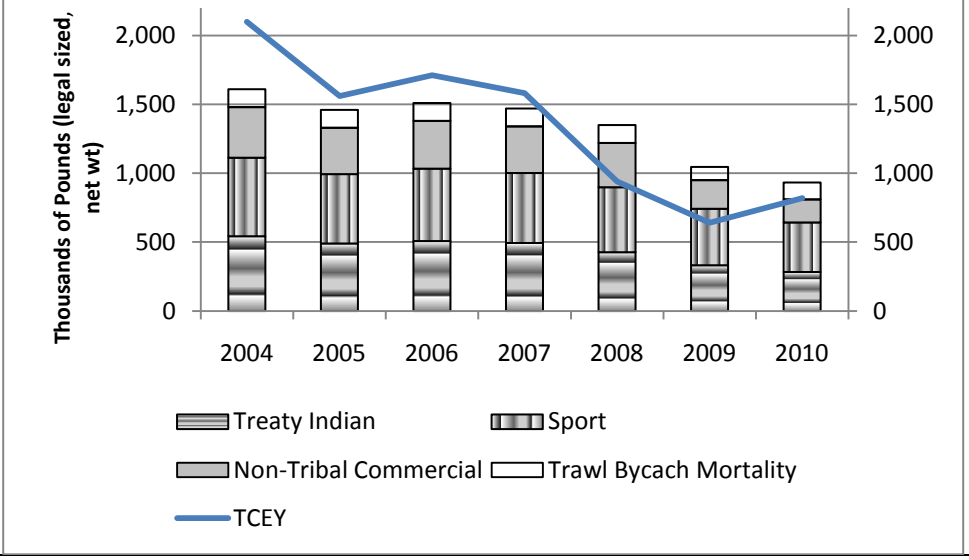



Figure 4-4. Halibut TCEYs, halibut quotas for retention fisheries, and trawl halibut bycatch mortality allocated based on the Alternative 1 with a 130,000 pound upper limit, 2004 through 2010.

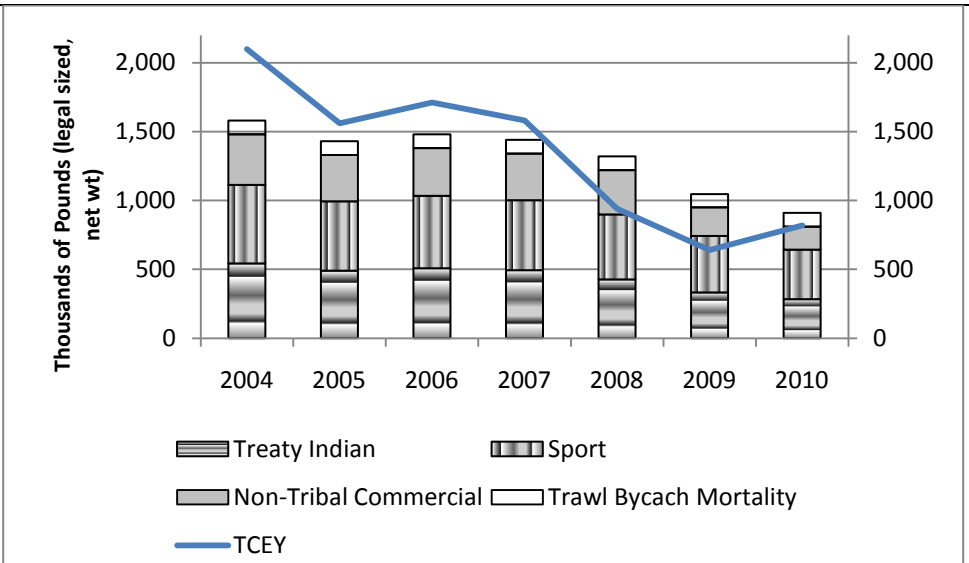



Figure 4-5. Halibut TCEYs, halibut quotas for retention fisheries, and trawl halibut bycatch mortality allocated based on the Alternative 1 with a 100,000 pound upper limit, 2004 through 2010.

**Impact on Both Trawl Bycatch and Retention Fisheries**

The Council's November 2010 motion language indicated that under Alternative 2, the trawl bycatch mortality allocations would be specified as "a specific amount . . . rather than a percentage…." If this language is followed strictly, the absence of flexibility to use a ratio could result in some potential negative effects for all the fisheries (bycatch and retention). Under Alternative 2, the Council would be setting allocations before the TCEY is available for the first year of the upcoming biennial period and over a year before more certain information on the TCEY for the second year is available. For example, in the spring of 2010 the Council would have been setting the trawl bycatch allocation for the 2011 and 2012 fisheries. To the extent that stock assessment documents accurately forecast the TCEYs for future

years this might not be a problem. However, if those forecasts are not always accurate a problem could occur if the fishery, without sufficient advance warning, ran into a series of TCEYs such as occurred from 2007 to 2009, when the TCEY dropped by nearly 50%. If the trawl bycatch amounts had been set based on 2007 levels, the directed fisheries might have been more constrained than would otherwise have been desirable. The effect could also run in the opposite direction, with an unexpected increase resulting in a situation where the trawl fishery is more constrained than necessary. Under Alternative 2, this potentiality might be handled during the biennial process if rather than a specific amount the allocations can be set using a percent or a schedule, tied to the TCEY, for determining the amount of trawl halibut bycatch mortality for the second year of the biennial period.

#### 4.1.3.2 Impacts on Communities

The decision on halibut bycatch allocations is more likely to affect communities along the northern coast where halibut bycatch rates are higher and communities which are involved in the directed halibut fisheries. On the one hand, inadequate amount of halibut IBQ for the trawl fishery could lead to a shift of substantial portions of the groundfish trawl fishery landings into more southern areas were bycatch rates are lower, assuming there are not also constraining species in those areas. On the other hand, to the degree that bycatch amounts allocations for the trawl fishery are minimized (without constraining trawl groundfish harvest), there will be more halibut available for retention fisheries, which also benefit coastal communities. The communities involved with halibut retention fisheries also tend to be more northerly distributed.

#### 4.1.3.3 Impacts on Agencies and Public Decision Processes

Each of the alternative provides for making adjustments to the trawl bycatch allocations in a somewhat different manner. Under the No Action Alternative the limit and the adjustment opportunities are stated as follows.

> The trawl mortality limit for legal and sublegal Pacific halibut be set at 15% of the Area 2A (i.e., waters off California, Oregon, and Washington) constant exploitation yield for legal size halibut, not to exceed 130,000 pounds for the first four years of trawl rationalization and not to exceed 100,000 pounds starting in the fifth year [2015]. This total bycatch limit may be adjusted downward or upward through the biennial specifications and management measures process

For this analysis, the interpretation of this provision for the no action alternative is that the 15% value can be modified or the 130,000 pound (100,000 pound) value can be modified. This interpretation is based on the fact that the "limit" is derived as the combined effect of applying both of these parameters and that what is subject to modification, as described in the second sentence, is the limit. Further, when the Council discussed this issue at its June 2009 Council meeting, there was considerable concern that the limit would not be sufficient to meet the needs of the trawl fishery and that an opportunity should be provided to move that limit up or down (as compared to the initial proposal that the limit just be downwardly modifiable). As indicated by the hindcast analysis provided in Table 2-1, for most years modifying the 15% would not result in an upward increase in the amount of halibut available to the trawl sector (due to the effect of the upper bound constraint). The upper bound would have had to have been modified to effect a change.

Under Alternative 1, the Council motion with respect to adjustment of the trawl allocations through the biennial management process has been interpreted as follows.

The bycatch allocation ratio percent can be adjusted downward or upward (above or below 15%) through the biennial specifications and management measures process but the upper bound on the maximum allocations can only be changed though an FMP amendment.

This language makes explicit the intent behind the motion that only the percent applied to the TCEY could be modifiable through the biennial specifications process but that the value used as the upper pounds could not.

Under Alternative 2, there would be a biennial determination of the amount of Pacific halibut provided to the trawl fishery and that amount would be capped (an upper bound of 100,000 pounds or 130,000 pounds for Alternatives 2a and 2b respectively). There would not be a default allocation rate (e.g. 15% up to an upper limit). Therefore, the Council would have to make an allocation decision during each biennial management process. In order for the upper bound to be a constraint on the biennial process, it cannot be adjusted through that process. Therefore, for this alternative it has been assumed that the upper bounds could be adjusted only through the FMP amendment process.

Setting the issue of the level of the upper bound aside, for any particular biennial process the same allocational result could be achieved under either Alternative 1 or 2. The only difference is that under Alternative 2 the Council would have to deliberate over the trawl halibut bycatch amount during every biennial process and under Alternative 1, while the Council would have the option to deliberate the issue during every process a default allocation formula would be in place (15%). Thus Alternative 1 and 2 have similar flexibility with respect to outcome but Alternative 1 has more flexibility with respect to process (the option to go with the default allocation and not take up the trawl halibut allocation during a particular biennial process). While the allocation formula under the no Action Alternative differs from those of Alternatives 1 and 2, the No Action Alternative has greater flexibility than under Alternative 1 or 2 because it also includes the opportunity modify the upper bounds through the biennial process (as well as the opportunity to modify the percentage or go with the default allocation). A comparison of the flexibility differences among the alternatives is provided in Table **4-6**

Table 4-6. Summary of the flexibility provided under each Alternative during the biennial specifications process.

| | No Action Alternative | Alternative 1 | Alternative 2 |
|---|---|---|---|
| During the biennial specifications process | | | |
| Would there be a default allocation? | Yes | Yes | No |
| Could the percent of TCEY used to calculate the trawl bycatch mortality allocation be modified? | Yes | Yes | Not Applicable |
| Could the upper bound of the allocation be modified? | Yes | No | No |

Note: a more flexible approach to Alternative 2 is described below.

In terms of impact on agency resources, including those of the Council, the flexibility provided by the No Action Alternative (combined with the presence of a default allocation formula) would be the least burdensome. On the surface, Alternative 2 could be the most burdensome, requiring Council deliberation on the trawl bycatch mortality allocations during every biennial management process and requiring a plan amendment to modify the upper bounds of the allocation. However, if under Alternative 2 it is specified that a percent could be adopted rather than a specific amount, the Council would have the flexibility to select an amount or establish a default allocation formula that would run for several management cycles (or be a default formula, in place until changed). The advantage of this approach to Alternative 2 would be that by the spring of 2012 there will be substantially more information available indicating the amount of halibut mortality that may be required to reasonably

prosecute the trawl fishery. At that time it might be easier for the Council to set a default allocation through the biennial specifications process or it could continue to set an allocation every two years if it so desired.[5] However, **if the Alternative 2 is selected, it will need to be augmented with an explicit allocation decision for the 2012 fishery, since the fishery will occur before the Council the next biennial management process.**

During the Council discussions about increasing the amount of halibut allocated for trawl bycatch mortality, concern was expressed that such an action would have far reaching effects on halibut retention fisheries, to which halibut are allocated through the catch sharing plan. It was held by some that a change to the allocation would require a substantial analysis as well as the explicit inclusion in the process of Council advisors representing all affected groups. The degree to which such an extensive analysis and involvement is required during the biennial specifications process might be contingent on the degree to which the proposed allocations vary from the range considered in the alternatives. For example, Alternatives 1 and 2 might be considered to provide a framework under which, during the biennial specifications process, any allocation level might be selected with minimal additional analysis and advisory body involvement, as long as the allocation was below the upper bounds (100,000 pounds or 130,000 pounds). An allocation above the upper bound would require an FMP amendment and the level of rigor required for the modification process would likely increase. Under the No Action Alternative the upper bound may be increased through the biennial process. The level of analysis and advisory body involvement required for such a modification during the biennial process is left open. If modification of the upper bound had also been frameworked and analyzed (e.g. the allocation is 15% not to exceed 100,000 pounds, modifiable through the biennial specifications process but in no case to exceed 200,000 pounds without an FMP amendment) then there might be less uncertainty about the rigor of analysis and process required for such a modification.

**References**

Heery, E., Bellman, M.A., and J. Majewski. 2010. Pacific halibut bycatch in the U.S. west coast groundfish fishery from 2002 through 2009. West Coast Groundfish Observer Program. Northwest Fisheries Science Center, 2725 Montlake Blvd E., Seattle, WA 98112.

[5] See end of Section 4.1.3.1 (Fishery Impacts) for a discussion of the potential challenges in setting a bycatch mortality level for the second year of a biennial management period if such a level cannot be set using a percentage.

# TRAWL RATIONALIZATION

# ISSUE: SEVERABILITY OF WHITING MOTHERSHIP CATCHER VESSEL ENDORSEMENTS/CATCH HISTORY

## Council Decision Document

**PREPARED BY**
**THE PACIFIC FISHERY MANAGEMENT COUNCIL**
**7700 NE AMBASSADOR PLACE, SUITE 101**
**PORTLAND, OR 97220**
**503-820-2280**
**WWW.PCOUNCIL.ORG**

**MAY 2011**

## Table of Contents

CHAPTER 1 Purpose and Need for the Proposed Action ..... 3

**1.1 Introduction ..... 3**

**1.2 Description of the Proposed Action ..... 3**

*1.2.1* Issue: Severability of Whiting Mothership Catcher Vessel Endorsements/Catch History. 3

**1.3 Purpose and Need for the Proposed Action ..... 3**

*1.3.1* Issue: Severability of Whiting Mothership Catcher Vessel Endorsements/Catch History. 3

CHAPTER 2 Description of the Alternatives ..... 5

CHAPTER 3 Impacts ..... 6

**3.1 Issue: Severability of Whiting Mothership Catcher Vessel Endorsements/Catch History 6**

*3.1.1* Direct and Indirect Impacts to the Physical Environment, Including Habitat and Ecosystem, and Biological Environment ..... 6

*3.1.2* Direct and Indirect Impacts to the Socioeconomic Environment ..... 6

# List of Tables

Table 3-1. Mothership catcher vessel endorsement and associated whiting catch history assignments. .. 7

# List of Figures

**NO TABLE OF FIGURES ENTRIES FOUND.**

# CHAPTER 1 PURPOSE AND NEED FOR THE PROPOSED ACTION

## 1.1 Introduction

This document provides background information about, and analyses for, a provision that would allow the mothership catcher vessel (MS/CV) endorsement and/or associated catch history to be separated from the limited entry permit to which it was issued and transferred to a different limited entry trawl permit. The proposed action would require an amendment to the regulations implementing the Pacific Coast Groundfish Fishery Management Plan (FMP). If the regulatory amendment is implemented, the description of the trawl rationalization program contained in Appendix E to the groundfish FMP would automatically be revised to reflect the regulatory modification. The proposed action must conform to the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the principal legal basis for fishery management within the Exclusive Economic Zone (EEZ), which extends from the outer boundary of the territorial sea to a distance of 200 nautical miles from shore.

## 1.2 Description of the Proposed Action

### *1.2.1* Issue: Severability of Whiting Mothership Catcher Vessel Endorsements/Catch History

The proposed action is to amend the regulations implementing the groundfish FMP to change provisions related to the transferability of MS/CV endorsements and/or catch history.

## 1.3 Purpose and Need for the Proposed Action

### *1.3.1* Issue: Severability of Whiting Mothership Catcher Vessel Endorsements/Catch History

Under Amendment 20 trawl rationalization (the catch shares program), MS/CV endorsements were issued for limited entry trawl permits that met required minimums for participation in the mothership sector of the whiting fishery. These endorsements included a catch history assignment based on the catch history of the individual permits during the allocation period. There are some permits that during the allocation period participated primarily in the shoreside fishery but had some relatively minor amounts of MS/CV catch history. These permits received MS/CV endorsements with some very small allocations of whiting catch history. In order to use the catch history associated with an MS/CV endorsement, the endorsed permit must join a co-op. Once a permit has joined the co-op the annual allocation associated with that permit's catch history is assigned to the co-op and any vessel in or fishing for the co-op, may harvest it. For any permit that does not join the co-op, the annual allocation associated with that permit's catch history is assigned to the non-co-op fishery. In the non-co-op fishery, any vessel with an MS/CV endorsement which has not joined the co-op competes with other

such vessels to harvest the non-co-op fishery allocation. If a number of vessels fishing for different motherships participate, the non-co-op fishery could likely encounter many of the problems associated with the traditional derby style fisheries. However, under the trawl rationalization program it is believed that not many (if any) vessels will choose to participate in the non-co-op fishery.

For the small amounts of mothership whiting catch history that some permits received, the burden (transaction costs) of joining a co-op may not be worth the benefits from that permit's allocation. Maintaining membership in the co-op and conducting the annual transfers would entail annual transaction costs for both the co-op and the permits receiving the small allocation. Alternatively, these permit holders could sell their permits to mothership whiting fishery participants; however, they might not want to because they need the permits for use in the shoreside fishery.

Given this situation, there are a number of concerns.

1. If permit holders with very small amounts of quota join co-ops each year, there will be transaction costs that may largely offset the benefits of the small allocation, reducing the overall efficiency and benefits from the trawl rationalization program.
2. If permits with very small amounts do not join a co-op, their allocations will automatically go to the non-co-op fishery where
    a. it may go unharvested, if all other MS/CV endorsed permits have joined co-ops and the owners of the permits with small allocations do not have interest in gearing up for the mothership whiting fishery;
    b. it may contribute toward an incentive for MS/CV endorsed permits to enter the non-co-op fishery instead of joining a co-op, decreasing the effectiveness of the trawl rationalization program.

In addressing these concerns, the purpose of this action is to reduce transaction costs, increase the probability that the fishery and communities are able to fully benefit from the allowable levels of whiting harvest, and reduce the chances that incentives will develop for vessels to enter into a non-co-op derby style fishery.

# CHAPTER 2 DESCRIPTION OF THE ALTERNATIVES

### 2.1.1.1 Severability of Whiting Mothership Catcher Vessel Endorsements/Catch History

**No Action Alternative --** Status quo. *The language on severability contained in Appendix E to the groundfish FMP (reflecting the regulatory language) would remain unchanged.*

> Appendix E, Section B-2.1.1.b: The [MS/CV] whiting endorsement (together with the associated catch history) ***may not be*** severed from the groundfish LE trawl permit. Catch history associated with the whiting endorsement may not be subdivided.

**Alternative 1 (Preliminary Preferred Alternative) –**MS/CV Endorsement Severability. *Modify the regulations to achieve the following.*

a. The MS/CV whiting endorsement (together with the associated catch history) ***may be*** severed from the groundfish LE trawl permit (the endorsement and catch history stay together).
b. Catch history associated with the whiting endorsement may not be subdivided.
c. The severed endorsement and catch history may be transferred together to any limited entry trawl permit (if the permit to which the MS/CV endorsement is transferred already has an MS/CV endorsement, multiple MS/CV endorsements would be stacked on the single permit).
d. The endorsement and catch history would be maintained separately on the limited entry permit (i.e., stacked, but not merged or combined with any other endorsement or catch history on the permit). Such endorsements together with the catch history could later be transferred away from the permit.

Alternative 1 was developed by the Council at its November 2010 meeting. An alternative considered but not developed would have allowed the catch history to be transferred separate from the MS/CV endorsement. A trawl permit with an MS/CV endorsement alone, but without catch history, would confer little relative to a trawl permit that does not have an MS/CV endorsement. Vessels with MS/CV endorsed permits and those without MS/CV endorsed permits are allowed to fish for co-ops. A permit without an MS/CV endorsement permit is not allowed to formally join the co-op, while a permit with an MS/CV endorsement permit is. However, co-op membership of an MS/CV endorsed permit without any catch history would not provide an advantage to the co-op, except possibly by helping the co-op meet the minimum requirement for number members (B-2.2.3.b "A minimum of 20 percent of the CV(MS) permit holders are required to form a co-op").

# CHAPTER 3 IMPACTS

## 3.1 Issue: Severability of Whiting Mothership Catcher Vessel Endorsements/Catch History

Modification of the trawl rationalization program to allow the severance of MS/CV endorsements from limited entry trawl permits will not substantially impact the physical or biological environment. Its primary effects will be to on the distribution of benefits from the trawl rationalization program and socio-economic performance of the program.

### *3.1.1* Direct and Indirect Impacts to the Physical Environment, Including Habitat and Ecosystem, and Biological Environment

Under the alternative to status quo, potential impacts on the physical and biological would likely be minor. The means by which harvest is taken (trawl gear) would not be changed but there could be a minor effect on the level of harvest. In a separate process, regulations for the level of harvest in the whiting fishery are developed based on the assumption that all authorized harvest will be fully taken. As identified in the purpose and need statement (Section 1.3.1), under status quo permits with small amounts of catch history might not join co-ops, in which case their allocations will go to the non-co-op fishery. If no MS/CV endorsed vessels enter the non-co-op fishery, the allocations to the non-co-op fishery would go unharvested. Under the Alternative 1, it would become somewhat more likely that the authorized harvests would be fully taken.

### *3.1.2* Direct and Indirect Impacts to the Socioeconomic Environment

#### 3.1.2.1 Fishery Impacts

Allowing MS/CV endorsement severability (moving catch history and MS/CV sector endorsements together as a unit from one LE trawl permit to another) and stacking multiple MS/CV endorsements on a single vessel will introduce additional flexibility into the management system. This flexibility will apply not only to the permits with small catch history allocations (as discussed in the purpose and need section) but to all permits with MS/CV endorsements.

The following permit data were provided by the National Marine Fisheries Service Limited Entry Permit Office. The table shows for various amounts of initial catch history allocations (classes), the number of mothership catcher vessel (MS/CV) permits receiving that amount, the average percent allocated per permit, the total percent for all permits in the row, and the cumulative total for that class and all classes receiving smaller amounts. The final column (added by Council staff) provides an estimate of the poundage equivalent of the average permit for each class, assuming a 25,000 mt allocation of whiting to the mothership at-sea sector.

Table 3-1. Mothership catcher vessel endorsement and associated whiting catch history assignments.

| Class (by amount of total catch history) | Number of MS/CV Endorsed Permits | Percent of Total History Allocated | | | Pounds Assuming a 25,000 mt Allocation |
|---|---|---|---|---|---|
| | | Average Per Permit | Total for Class | Cumulative Total | Average Per Permit |
| Permits with | | | | | |
| Under 0.5% | 5 | 0.2 | 1.0 | 1.0 | 105,912 |
| 0.5 to 1.0 % | 5 | 0.7 | 3.5 | 4.5 | 390,979 |
| 1.0% to 2.0% | 7 | 1.5 | 10.2 | 14.7 | 804,678 |
| 2.0% to 3.0% | 3 | 2.3 | 6.9 | 21.6 | 1,268,916 |
| 3.0% to 4.0% | 6 | 3.4 | 20.5 | 42.1 | 1,883,568 |
| 4.0% to 5.0% | 7 | 4.6 | 32.3 | 74.4 | 2,542,876 |
| 5% or greater | 4 | 6.4 | 25.6 | 100.0 | 3,522,501 |
| Total | 37 | | | | |

The flexibility provided by MS/CV endorsement transferability would allow individuals to stack MS/CV endorsements onto limited entry trawl permits and release unneeded limited entry trawl permits for use in the shoreside trawl fishery (which is managed under an IFQ program). Under its IFQ program, the shoreside trawl fleet is expected to consolidate. With substantially fewer trawl vessels operating a surplus of permits is expected to result. The surplus of permits from trawl vessels may be transferred to nontrawl vessels. Any vessels with a trawl permit (including nontrawl vessels) may use nontrawl gear to fish under the IFQ program. This is the result of the gear switching opportunities provided by the program. Allowing the severance of MS/CV endorsements from their limited entry permits would contribute to the pool of permits available for use by non-trawl vessels in the shoreside fishery (or by shoreside trawl vessels).

While increased program flexibility and the opportunity to sell off unneeded permits could make a marginal contribution to the likelihood that MS/CV catch history will be aggregated, accumulation limits in place for the MS/CV co-op program will continue to restrict the degree of consolidation.

#### 3.1.2.2 **Impacts on Communities**

To the degree the flexibility provided by Alternative 1 reduces the number of events in which whiting is allocated to the MS/CV non-co-op fishery only to go unharvested, there will be more whiting caught to the benefit of communities reliant on the mothership whiting fishery.

#### 3.1.2.3 **Impacts on Agencies**

Allowing the transfer of MS/CV endorsements may require some adjustments to the data systems in place to track transfers under the catch share program. Additionally, the flexibility provided by MS/CV endorsement transferability separate from the permit could increase the number of transactions which need to be processed by the NMSF Limited Entry Office, particularly when the regulations are first changed. Overtime, as endorsements are stacked the number of MS/CV endorsement holders would be expected to decline, potentially reducing paperwork, depending on the amount of transferring of stacked endorsements among permits.

# TRAWL RATIONALIZATION: ADAPTIVE MANAGEMENT PROGRAM QUOTA POUND PASS-THROUGH, COUNCIL DECISION DOCUMENT

NMFS has determined that this action is eligible for a categorical exclusion under NEPA and therefore neither an environmental assessment nor an environmental impact statement is required.

The Council's trawl catch share program includes a set aside of 10 percent of the nonwhiting quota shares (QS) for an adaptive management program (AMP). For the first two years of the program, the annually issued quota pounds (QP) derived from this set-aside will be passed through to the QS holders in proportion to their holdings of QS. The catch share program specifies that the Council will develop alternative criteria for distribution the adaptive management QP beginning in year 3 of the program. There is concern that such alternative criteria may not be ready by 2013 in which case there is no procedure in place for distribution of the AMP QP. At its November 2010 meeting, the Council provided guidance for the development of a range of options. Based on that guidance, the following options are presented for Council consideration. Absent additional guidance from the Council, these options and an accompanying analysis will be presented at the Council's June 2011 meeting. At that time, the Council is expected to adopt a preliminary preferred alternative for this issue.

**No Action Alternative (status quo):** Beginning in 2013, the QP associated with the QS set-aside for AMP purposes will be distributed in accordance with procedures developed under the AMP provisions. If such procedures are not developed, there is no guidance on how these QP will be distributed.

**Alternative 1:** Same as No Action, except that if AMP procedures are not fully implemented for 2013, the pass-through procedures used in 2011 and 2012 will be continued for 2013.

**Alternative 2:** Same as No Action, except that if AMP procedures are not fully implemented for 2013, the pass-through procedures used in 2011 and 2012 will be continued until procedures are developed under the AMP.

Note: implementation includes sufficient time for any application processes that may be required.

**Primary Impacts**

**Physical and Biological Environment:** Under the No Action Alternative, there may be a reduction of trawl sector impacts starting in 2013, if no alternative means is developed for distribution of the AMP QP is developed and assuming that resolution of the situation would not qualify for emergency action. Under Alternatives 1 and 2 there would be no impacts relative to a 2011-2012 baseline and the trawl allocation authorized under the 2013-2014 groundfish specifications.

**Socioeconomic Impacts:** The main impact of the no action alternative is the possibility of a 10 percent reduction in the shoreside nonwhiting trawl harvest starting in 2013 and the attendant adverse social and economic impacts. Continuation of the automatic pass-through beyond 2012 may introduce some uncertainty and variability in QS pricing. Transaction prices are likely to vary depending on whether traders anticipate a long-term continuation of the pass-through. If a long-term continuation of the pass-through is built into QS prices, this would likely generate resistance to future proposals for alternative distributions.

# PIE Rule – Part 1

## NMFS Items Unchanged From April 2011

NMFS has several items to be addressed through a future rulemaking (i.e., PIE rule(s)) for the Pacific Coast groundfish fishery. NMFS intends to implement many of these through a rulemaking with a target effective date of January 1, 2012. These items fall in to the following three categories:

1) Further revisions that are beyond simple corrections but are still within Council intent for Amendments 20 and 21.
2) Errors or old regulatory language that needs to be corrected or revised.
3) New areas the Council could address in response to implementation issues, including measures to make the fishery more flexible or efficient.

NMFS' report to the Council for the PIE rule is divided in to 2 parts. Part 1, the subject of this NMFS Report 1, includes the items previously presented by NMFS at the April Council meeting (Agenda Item I.7.b, Supplemental NMFS Report 2, April 2011) that remain unchanged and are repeated here. Part 2, Supplemental NMFS Report 2 for June 2011, includes additional information for some of the NMFS items reported in April and also includes new items. As noted below, the following items have been pulled from this report, Part 1, and will be included in Part 2 with additional information:

1) Consider revisions to requirement for observer coverage until offload complete.
2) Moving between limited entry and open access fisheries.
3) Clarify the open access language for non-groundfish trawl fisheries.
4) Review and, as necessary, revise catch accounting regulations.
7) Clarify first receiver has to complete and submit an electronic fish ticket before the fish leaves the offload site.
8) Mandatory requirement to fill out ex-vessel value on electronic fish ticket.
9) Review and, as appropriate, clarify what ownership changes must be reported to NMFS.

NEW Items may include:

- Revised definition of who is required to have a first receiver site license.
- Revised designation of quota share account and vessel account managers.

Items NMFS may address in a future rulemaking are listed below. These items are still in development and additional items may be added as the rulemaking progresses. Where preliminary regulatory language has been drafted, it is provided below.

## Further Implementation of Council Intent

1) Consider revisions to requirement for observer coverage until offload complete.

   - See Supplemental NMFS Report 2

2) Moving between limited entry and open access fisheries.

   - See Supplemental NMFS Report 2

3) Clarify the open access language for non-groundfish trawl fisheries.

   - See Supplemental NMFS Report 2

4) Review and, as necessary, revise catch accounting regulations.

   - See Supplemental NMFS Report 2

5) Review and, if necessary, revise crossover provisions.

   Council consideration: Further implementation of Council intent.

   Background:
   In the regulations, crossover provisions apply to two activities: 1) operating on different sides of a management line, or 2) moving between limited entry and open access fisheries during a 2-month cumulative limit period. The crossover provisions were structured for trip limit fisheries. In some places, the current regulations are no longer applicable or do not accurately reflect the new catch share program. For example, under the IFQ program, there are multiple management areas rather than just a north-south management area and vessels may not fish in more than one management area during a single trip. The crossover provisions need to be reviewed and revised appropriately.

   Recommended change:
   Regulations on crossover provisions for the groundfish fishery overall, as well as the limited entry trawl fishery and perhaps the limited entry fixed gear and open access fisheries, need to be reviewed and revised. The emergency rule (75 FR 82296, 12/30/2010) made some modifications to the crossover provisions and should be reviewed to determine what changes should be made more permanent through a full

rulemaking. In reviewing the crossover provisions, NMFS will consider any implications for dual-endorsed limited entry permits.

Regulatory sections affected: 660.12(a)(6)?, 660.60(h)(7), 660.120, 660.220, 660.320

Sectors affected: All commercial

6) Consider a process to allow end of the year resolution of accounts.

Council consideration: Policy decision

Background:
NMFS is developing the process for end of the year account resolution, especially with regard to the carrying over a surplus. This is a database and accounting issue. It is envisioned that any surplus carryover in a vessel account can be transferred to a different vessel account.

Recommended change:
The following are some potential options:

Option 1: Prohibit fishing from 12/15-12/31 to resolve accounts and calculate the carryover.

Option 2 (*NMFS preferred*): Do not prohibit fishing for end of the year account resolution. Populate accounts with the next year's available quota pounds on or near January 1 (including any deductions for using the carryover provision to cover a deficit in the previous year). NMFS could then calculate any surplus carryover from the previous year and add that amount later in the year once available (e.g., end of January). This option was brought forward by the GAP at the Council's March 2011 meeting (Agenda Item H.5.b, Supplemental GAP Report, March 2011, p.5).

Regulatory sections affected: 660.112 (maybe), 660.140(e)

Sectors affected: IFQ

7) Clarify first receiver has to complete and submit an electronic fish ticket before the fish leaves the offload site.

- See Supplemental NMFS Report 2

8) Mandatory requirement to fill out ex-vessel value on electronic fish ticket.

- See Supplemental NMFS Report 2

9) Review and, as appropriate, clarify what ownership changes must be reported to NMFS.

- See Supplemental NMFS Report 2

10) Add "first receiver" to list in conflict of interest regulations for catch monitors and catch monitor providers.

Council consideration: Implementation issue

Background:
In the conflict of interest regulations for catch monitors and catch monitor providers, add "first receiver" to the list of businesses. The current conflict of interest regulations apply to any interest in a business involving vessels and shorebased or floating stationary processor facility. These regulations should have also included "first receivers." This was an inadvertent omission and NMFS will revise the regulations accordingly.

Recommended change:
The regulations for both catch monitors and catch monitor providers will be revised to read as follows:

*(i) Any ownership, mortgage holder, or other secured interest in a vessel, <u>first receiver,</u> shorebased or floating stationary processor facility involved in the catching, taking, harvesting or processing of fish,*

*(ii) Any business involved with selling supplies or services to any vessel, <u>first receiver,</u> shorebased or floating stationary processing facility; or*

*(iii) Any business involved with purchasing raw or processed products from any vessel, <u>first receiver,</u> shorebased or floating stationary processing facilities.*

Regulatory sections affected: 660.18(c)(1) & (d)

Sectors affected: IFQ

## Corrections/Consistency

11) Correct erroneous cross references.

CORRECTION RULE

Background:
Some redesignated sections from initial issuance final rule had the wrong cross references and need fixed.

Regulatory sections affected: 660.70-.79

Sectors affected: Commercial and recreational

12) Correct duplicate entry in regulation.

CORRECTION RULE

Background:
The electronic Code of Federal Regulations (eCFR) has 2 entries for a specific regulation. The one marked [Reserved] is a mistake.

Regulatory sections affected: 660.150(f)(2)

Sectors affected: Mothership

13) Delete use of term "bycatch limits" for whiting

CORRECTION RULE

Background:
The new trawl rationalization program regulations do not use the term "bycatch limits" for the whiting fisheries. The term should be removed from regulation and replaced with "non-whiting groundfish species with an allocation."

Regulatory sections affected: 660.131(c)(4)

Sectors affected: Trawl

14) Update electronic fish ticket hardware and software requirements.

Background:
Update regulations with current hardware/software requirements for electronic fish ticket. If requiring higher standards, the Council may need to address this. NMFS will double check if any updates are needed for the following other software requirements: QS account (660.140(d)(2)), vessel account (660.140(e)(2)), or obs (660.140(h)(2)(iii), 660.150(j)(2)(iii), 660.160(g)(2)(iii)).

Regulatory sections affected: 660.15(d)

Sectors affected: IFQ

15) Review and, if necessary, revise sorting requirements and electronic fish ticket requirements.

Background:
For sorting requirements, review harvest specifications final rule to see if it updated the

sorting requirements to match the additional species levels for new OFLs, etc. Check if electronic fish ticket requirements need updated to require species reporting to the levels required under sorting requirements. Revise 660.130(d)(2)(i) for first receiver sorting to state, "must be sorted to the species groups specified in paragraph (d)(1) of this section."

Regulatory sections affected: 660.113(b)(4), 660.130(d)

Sectors affected: All commercial

16) Make it clear who is responsible for daily testing of at-sea scales.

Background:
There has been some confusion over who is responsible for the daily testing of at-sea scales. NMFS will review and revise the regulations to make this more clear.

Regulatory sections affected: 660.15(b)

Sectors affected: Mothership and catcher/processor

17) Clarify regulatory title.

Background:
Consider separating this paragraph in to two, one for “size limits” and one for “weight limits” or change the title to “Weight and size conversions.”

Regulatory sections affected: 660.60(h)(5)

Sectors affected: Commercial and recreational

18) Streamline first receiver site license application process.

Background:
Fix the first receiver site license application process so that it doesn’t require a separate written request for a site inspection. Could change form to add a line stating that the form serves as the written request to schedule a site inspection.

Regulatory sections affected: 660.140(f)(3)(iii)(B)

Sectors affected: IFQ

19) Move paragraph on training and certification to catch monitor responsibility rather than catch monitor provider responsibility.

Background:
The regulations at 660.17(e)(14) list items and responsibilities of the catch monitor, but

are listed under the catch monitor provider section of the regulations. This paragraph should be moved to the appropriate place, likely within paragraph (b).

Regulatory sections affected: 660.17(e)(14)

Sectors affected: IFQ

20) Repeat AMP allocation language in the IFQ allocation paragraphs so all IFQ allocation steps are in one place.

Background:
Add "10 percent of non-whiting QS will be reserved for the AMP during years one and two of the Shorebased IFQ Program, but the resulting AMP QP will be issued to all QS permit owners in proportion to their non-whiting QS during years one and two" to the IFQ fishery paragraphs on allocation. Language would be copied from 660.140(l) on the adaptive management program and duplicated in the allocation section to have all allocation steps in one place.

Regulatory sections affected: 660.140(d)(1)(ii)(A)

Sectors affected: IFQ

21) Further clarify that halibut under the size limit still count against IBQ.

Background:
Clarify that all halibut caught N of 40° 10' count against IBQ regardless of the size (</> 32"). Right now interpret 660.140(d)(1)(ii)(C) to mean that but could be more clear.

Regulatory sections affected: 660.140(d)(1)(ii)(C)

Sectors affected: IFQ

22) Revise fishery declaration regulations to make consistent with the declaration worksheet.

Background:
Add the following declarations to regulations to match what is included on the declaration worksheet. In regulation, "open access net gear" would be replaced by (1) Open access CPS net gear; (2) Open access CA gillnet complex gear. Also consider adding "open access" before non-groundfish trawl entries in regulations and in the declaration worksheet to make it more clear what sector those fisheries are associated with.

Regulatory sections affected: 660.13(d)(5)(iv)(A)

Sectors affected: Open access

23) Consider revisions to make applicable RCAs more clear.

Background:
Rethink how RCA boundaries displayed for trawl fishery (Table 1 north and south). While it is clear in the regulatory text that the RCAs apply for any fishing done in the Shorebased IFQ Program, there was some confusion based on language in the trip limit tables (Table 1 north and south). The trip limit table language is being revised through the final rule for the harvest specifications.

Regulatory sections affected: Table 1 (North and south) & 660.130(e)

Sectors affected: All trawl

24) Review use of "transfer" in relation to permits and change to "change in vessel registration."

Background:
Review use of "transfer" in relation to permits and change to "change in vessel registration" where appropriate to be more specific.

Regulatory sections affected: 660.25

Sectors affected: All limited entry permits

25) Delete old effective date language from regulations.

Background:
Delete sentence under "General" paragraph that refers to beginning January 1, 2011. This sentence is no longer needed because the program is already implemented.

Regulatory sections affected: 660.140(a), 660.150(a), 660.160(a)

Sectors affected: IFQ, mothership, catcher/processor

26) Clarify regulations for sorting/weighing requirements for non-whiting IFQ species.

Background:
The regulations are inconsistent with regards to the sorting and weighing requirements for non-whiting IFQ species.

The prohibitions at 660.112(b)(2)(ii) state that it is unlawful to: *"(ii) Fail to sort fish received from a IFQ landing prior to first weighing after offloading as specified at §660.130(d)(2) for the Shorebased IFQ Program, except the vessels declared in to the limited entry midwater trawl, Pacific whiting shorebased IFQ at §660.13(d)(5)(iv)(A), subpart C may weigh catch on a bulk scale before sorting as described at §660.140(j)(2).*"

While the regulations at 660.140(j)(2)(viii) and (ix) on catch weighing requirements state:

> *(viii) Pacific whiting.* …(exemption mentioned above)
>
> *(ix) For all other IFQ landings the following weighing standards apply:*
>
> *(A) A belt or automatic hopper scale may be used to weigh all of the catch prior to sorting. All but a predominant species must then be reweighed.*
>
> [paragraphs (B) and (C) are not inconsistent with the above prohibition at 660.112]

The prohibition at 660.112(b)(2)(ii) restricts what 660.140(j)(2)(ix)(A) allows for non-whiting groundfish. The activity listed in 660.140(j)(2) has occurred in the past in Washington and may still be occurring. The state laws on this have differed, so 660.140(j)(2) was to allow groundfish to be weighed in a hopper scale, then sorted by species, and each species (or group) weighed back and deducted from original total weight, IF it was allowed by state law. This activity has also been previously allowed under an EFP for both whiting and non-whiting groundfish.

Regulatory sections affected: 660.112

Sectors affected: IFQ

27) Revise to consistently use the term “deficit”

Background:
Change the word "overage" to "deficit" for consistency with rest of section.

Regulatory sections affected: 660.112(b)(1)(iv)

Sectors affected: IFQ

## Potential Future Council Actions

28) Develop a process to certify new observer providers.

Background:
Develop regulations for observer provider certification for new providers. To start the trawl rationalization program, NMFS grandfathered observer providers who were permitted to provide observer services in the North Pacific. Now that the trawl rationalization program is underway, the Council and NMFS need to create a certification process specific to the Pacific Coast groundfish fishery to 'approve' observer providers in

future years. To the extent practicable, this program should be developed to parallel the catch monitor provider certification.

Regulatory sections affected: 660.140, 660.150, 660.160

Sectors affected: IFQ, mothership, catcher/processor

29) Consider increasing flexibility to allow change in vessel registration 2 times per year or to allow permit stacking.

Background:
Current regulations restrict the number of times a limited entry permit may be registered to a different vessel to one time per calendar year (except for MS permits, and limited entry trawl permits with an MS/CV or C/P endorsement which are restricted to two times per calendar year). This restricts the flexibility of the IFQ participants and limited entry fixed gear fisheries more than the at-sea whiting fisheries. It also complicates the regulations.

This restriction, in tandem with the regulatory restriction that limits the stacking of fixed gear and trawl endorsed LE permits on the same vessel, limits the participation of limited entry fixed gear and limited entry trawl permit owners from moving between the trawl and limited entry fixed gear fisheries (except dual-endorsed permits).

Example 1: A vessel may start the year registered to a limited entry trawl permit and fish in the IFQ fishery. It may then remove the trawl permit from the vessel and declare in to the open access non-groundfish trawl fishery for California halibut in late January. It may only want to fish for 2 weeks in the California halibut fishery. The limited entry trawl permit could again be registered to the vessel to fish in the IFQ fishery, but would not be effective until March 1. The vessel would have another opportunity to remove its limited entry trawl permit to fish in an open access fishery, but that permit could no longer be used to fish in the limited entry trawl fisheries for the remainder of the calendar year.

Example 2: A vessel may start the year registered to a limited entry trawl permit and fish in the IFQ fishery. It may then remove the trawl permit and register a limited entry fixed gear sablefish-endorsed permit to the vessel to fish its sablefish tier beginning in May. It may only take 2 weeks to fish the sablefish permit tier amount. That vessel may remove the sablefish permit and register with the trawl permit. The limited entry fixed gear permit would have used its limit on vessel registrations and could not be used to fish for the remainder of the calendar year.

Allowing 2 changes in vessel registration per year would increase flexibility for both limited entry trawl and limited entry fixed gear permits. However, increasing the

flexibility of vessels to move between limited entry and open access fisheries may also create more "double dipping" opportunities between a capacity controlled fishery and one that is not capacity controlled, potentially exacerbating management problems.

Another option the Council could explore is allowing limited entry trawl and limited entry fixed gear permits to be registered to a vessel at the same time (i.e. stacked). Either approach may require additional analysis.

Regulatory sections affected: 660.25(b)(4)(vi)

Sectors affected: IFQ and limited entry fixed gear

30) Consider revisions to weight conversion factors based on any new information.

Background:
Are any species missing that should have a conversion? Are there species landed dressed/head-on that need a conversion factor?

31) Clarify distinction between "cease fishing reports" for whiting vs. one for observer program

32) Develop the adaptive management program and a process for allocating quota pounds.

# Draft Rulemaking Plan

NMFS implemented the trawl rationalization program (program) in January 2011 under extremely tight regulatory timelines. As mentioned by NMFS during the trawl rationalization program regulatory deeming process over 2010, there would be follow-up rulemakings to further implement regulations for the program as needed. NMFS may implement these items through one or more rulemakings over 2011. In addition, NMFS may include other Council trailing actions in these rulemakings, as appropriate. NMFS has termed these post-implementation rulemakings the "Program Improvement and Enhancement (PIE)" rule and envisions multiple PIE rules over the next couple of years, as needed. Below is a tentative schedule of rulemakings related to trawl rationalization for 2011, a summary of what might be included in those rules, and the affected sectors.

- **Correction**
  1. Timing: Final rule & effective – June
  2. Includes: Items needing more immediate correction, such as
     - Erroneous cross references
     - Duplicate entry of a regulatory paragraph
     - Remove reference to term whiting "bycatch limits"
  3. Sectors affected:
     limited entry trawl (IFQ/MS/C/P), limited entry fixed gear, open access

- **PIE 1**
  1. Timing: Proposed rule – August
     Final rule – November
     Effective – January 1, 2012
  2. Includes: Any items ready for rulemaking with a target implementation of January 1, 2012, including any trailing actions such as Amendment 21 v. 6, halibut allocations, items to further implement Council intent, etc. Also see Agenda Item E.6.b, NMFS Report 1 and Supplemental NMFS Report 2, June 2011.
  3. Sectors affected:
     limited entry trawl (IFQ/MS/C/P), limited entry fixed gear, open access, and possibly recreational

- **Cost Recovery** - (details being discussed under Agenda Item E.7.b)
  1. Timing: Proposed rule – November
     Final rule – February 2012
     Effective – March 2012
  2. Includes: See Agenda Item E.7.b, NMFS Report 1, June 2011.
  3. Sectors affected: limited entry trawl (IFQ/MS/C/P)

# NMFS' Preliminary Determinations on the Appropriate Level of NEPA for Trailing Actions

| No. | Trailing Action | New draft analysis prepared so far | Related analyses | Preliminary determination on level of NEPA |
|---|---|---|---|---|
| 1 | A-21 supersede A-6 | Alternatives (Mar 2011) | Am 21 EIS | *No further NEPA* |
| 2 | Inseason flexibility for set-asides, including off-the-top set-asides, tribal reapportionment, and at-sea whiting set-asides | Alternatives (Mar 2011), but do not include at-sea whiting set-asides | Am 21 EIS & App B of Am 20 EIS | *EA* |
| 3 | Halibut allocation | Draft EA (Mar 2011) | Am21 EIS & Emer. Rule EA | *Undetermined* |
| 4 | Cost Recovery | | Am 20 EIS | *CE* |
| 5 | NMFS items for PIE rule | | Am 20 EIS & Am 21 EIS | *No further NEPA* |
| 6 | Severability of catch history & MS/CV end. from LE permit | Draft EA (Mar 2011) | Am 20 EIS, App B | *No further NEPA* |
| 7 | CFAs (QS/QP control rule safe harbor) | Draft EA (Apr 2011) | Am 20 EIS | *EA (one EA for 7 & 8)* |
| 8 | Risk Pools (QS/QP control rule safe harbor) | | Am 20 EIS, App A | *EA (one EA for 7 & 8)* |
| 9 | AMP pass through | | Am 20 EIS | *CE* |
| 10 | Processing at-sea in IFQ fishery | | Am 20 EIS | *EA* |

Oregon
Theodore R. Kulongoski, Governor

Department of Fish and Wildlife
Marine Resources Program
2040 SE Marine Science Drive
Newport, OR 97365
(541) 867-4741
Fax: (541) 867-0311
www.dfw.state.or.us

TO: William Stelle, Administrator
Northwest Region, National Marine Fisheries Service

ATTN: Sarah Williams
Northwest Region, National Marine Fisheries Service
sarah.williams@noaa.gov

CC: Frank Lockhart, Assistant Regional Administrator
Northwest Region, National Marine Fisheries Service

FROM: Stephen Williams, Deputy Administrator
Fish Division, Oregon Department of Fish and Wildlife

RE: RIN No. 0648-BA01

Date: January 4, 2011

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This comment is in response to a recent Proposed Rule concerning 2011-2012 Biennial Specifications and Management Measures (50 CFR Part 660: Federal Register /Vol. 75, No. 212 /Wednesday, November 3, 2010 / Proposed Rules, pages 67810 – 67896). Please refer to RIN No. 0648-BA01. The purpose of this comment is to propose amending the preamble and sections 50 CFR 660.112(b)(1)(xii) and 50 CFR 660.60(h)(5) of the Federal Pacific Coast Groundfish Regulations and recommend increasing amount of yellowtail rockfish set-aside for exempted fishing permits (EFP).

**Processing At-Sea**

Current federal regulations (50 CFR Part 660, Subpart G, Federal Pacific Coast Groundfish Regulations for Commercial and Recreational Fishing 3-200 Nautical Miles off Washington, Oregon, and California, October 1, 2010) do not prohibit processing fish at sea onboard non-whiting limited entry trawl vessels. Processing is defined to include

freezing (glazing) but does not mean heading and gutting unless additional preparation is done.

New Federal Pacific Coast Groundfish Regulations, that may become effective on January 11, 2011, will prohibit vessels from landing frozen product. This action was first proposed to be prohibited under 50 CFR Part 660 in the Federal Register on August 31, 2010 (Federal Register /Vol. 75, No. 168 / Tuesday August 31, 2010 /Proposed Rules, see page 53414) and became final on October 1, 2010 (see Federal Register /Vol. 75, No. 190 / Friday, October 1, 2010 / Rules and Regulations, Pages 60868 – 60999). The language in the referenced proposed rule is: "**§ 660.112 Trawl fishery—prohibitions, (b) Shorebased IFQ program,** (xii) *Process groundfish at-sea* (''at-sea processing'') by vessels in the Shorebased IFQ Program regardless of the type of gear used, with the following exceptions: (A) A vessel that is 75-ft (23-m) or less LOA that harvests whiting and, in addition to heading and gutting, cuts the tail off and freezes the whiting, is not considered to be a catcher/processor nor is it considered to be processing fish, and (B) A vessel that has a sablefish at-sea processing exemption, defined at § 660.25(b)(3)(iv)(D), subpart C may process sablefish at-sea."

At the time these regulations were finalized, the Council was unaware that the activity had been planned for in 2008/2009 and occurred in 2010, when processing groundfish onboard non-whiting trawl vessels was permitted by regulation. Public comment received at the November 2010 meeting revealed that one individual had legally installed and operated the necessary equipment to process groundfish onboard his non-whiting trawl vessel under the guidance of the current regulations. There is great expense associated with the infrastructure required to perform this activity. This individual began delivering groundfish as a frozen product in 2010 with the purpose of providing the public with a product of highest quality and maximizing the value. This vessel has since made a number of landings of frozen groundfish in Oregon. The State of Oregon adopted a process for converting landed weight of glazed fish into round weight for fish ticket accounting. This process may be implemented in federal rule for use in quota pound tracking. Language for this process is provided below.

It is important to note that similar considerations have been made in the past. During the process of approving Amendment 14 to the Groundfish Fishery Management Plan (Permit Stacking, Season Extension, and Other Modifications to the Limited Entry Fixed Gear Sablefish Fishery; http://www.pcouncil.org/groundfish/fishery-management-plan/fmp-amendment-14/), at-sea processing of sablefish caught in the limited entry primary season was prohibited. A vessel was identified as active in glazing sablefish at sea. A permit was developed to allow this activity to continue for those who had demonstrated to do so already. This is a similar situation. We therefore respectfully propose amending 50 CFR Part 660 to allow an exception for this vessel to continue delivering frozen product.

We are aware that other procedures may be available to make this regulation change; however, we feel this is the most appropriate and timely venue. There are no trailing amendments that are appropriate for the inclusion of this requested change. The only

other mechanism available is to make the regulation change through the 2013-2014 Harvest Specifications and Management Measures. These vessels invested substantial resources to conduct this process legally, and making them wait for two years before resuming their operations is unreasonable. We therefore ask that this regulation change be made via this public comment to the Proposed Rule concerning the 2011-2012 Biennial Specifications and Management Measures.

**Proposed Changes**

We offer potential language for our proposed changes under sections 50 CFR 660.112(b)(1)(xii) and 50 CFR 660.60(h)(5) that are shown in the Proposed Rule for 2011-2012 Biennial Specifications and Management Measures (see Federal Register / Vol. 75, No. 212 /Wednesday, November 3, 2010 / Proposed Rules / pages 67810 – 67896). These proposed changes are:

(1) Amend 50 CFR 660.112(b)(1)(xii) by adding a new clause (C) as follows: **"(C) A trawl vessel that has legally processed Pacific groundfish (other than Pacific whiting) at sea prior to July 20, 2010 and that is operating under the Shorebased IFQ Program regardless of the type of gear used."** This exception would pertain only to the single vessel that has been carrying out this activity. Exceptions for at-sea processing are already in regulations for a shoreside whiting vessel (A) and for a limited entry fixed gear vessel delivering sablefish (B).

(2) Amend 50 CFR 660.60(h)(5) by adding a new clause (xii) as follows: **"(xii) The following conversion applies to vessels landing sorted catch that is frozen (glazed) in the Shorebased IFQ Program. A conversion factor of 0.95 must be applied when there are fewer than 60 individuals of any species or species group in a single landing. Conversion factors must be calculated for each landing for each species or species group when there are 60 or greater individuals of a category (=species or species group) in a single landing as follows: Weigh a sample of at least 20 glazed fish to obtain the glazed weight; Completely remove glaze from individual fish making up the sample; Re-weigh the sample to obtain the non-glazed weight; Divide the non-glazed weight by the glazed weight to obtain the conversion factor; A separate conversion factor may be calculated for each size grade of a species, but may only be applied to landings of that size grade; Documentation of this calculation must be retained with the dock receiving ticket. "**

**Preamble Errors**

In reviewing the above referenced document, Oregon Department of Fish and Wildlife (ODFW) staff noticed discrepancies in the sector specific harvest guidelines listed in the preamble portion of the document for bocaccio, canary rockfish, and yelloweye rockfish. The regulatory text beginning on page 67849 contains sector specific harvest guidelines recommended by the Pacific Fisheries Management Council at their June 2010 meeting.

# ENFORCEMENT CONSULTANTS REPORT ON TRAWL RATIONALIZATION AND ASSOCIATED GENERAL GROUNDFISH FISHERY ISSUES SLATED FOR FINAL ACTION, INCLUDING THOSE IN THE PROGRAM IMPROVEMENTS AND ENHANCEMENT (PIE) RULE

The Enforcement Consultants (EC) has reviewed Agenda Item E.6.b, NMFS Reports 1 and 2, and has the following comments:

Throughout this statement, unless otherwise stated, the EC has no comment.

**For Pie Rule Part 1**

The EC recommends adoption of Item 5, Option 2 for Item 6, and Item 10.

For Corrections/Consistency, the EC recommends the adoption of all Corrections/Consistency issues, Items 11 through 27.

Under Potential Council Actions, Items 28 through 32, the EC recommends adoption of Items 28 and 30, 31, and 32.

Item 29, consider increasing flexibility to allow change in vessel registration two times per year or allow permit stacking.

The EC recommends allowing limited entry trawl and fixed gear permits to be registered to a vessel at the same time. Additional issues of permit stacking, transfer and removal requirements should be vetted by the Trawl Rationalization Regulatory Evaluation Committee in a comprehensive review of all required permit transfer and removal issues currently under consideration.

**For Pie Rule Part 2,** the EC recommends the following:

Item 1, Consider revisions to requirements for observer coverage until offload complete.

Recommend adoption of elements 1, 2 and 5. The EC does not believe elements 3 and 4 are necessary. Should tampering of the load and removal of target species become a problem in the future, consideration of approaches like evidence tape and vessel posting may need to be revisited.

Item 2, Moving between limited entry and open access fisheries.

The EC recommends portions of Item 2 be adopted so that all non groundfish exempt trawl (pink shrimp, sea cucumbers, California halibut, and ridgeback prawn) be allowed to participate in their respective fisheries without requiring removal of the registered Limited Entry Permit. A Vessel Monitoring System (VMS) declaration change should be the only requirement when moving from individual fishing quota (IFQ) to exempt trawl.

Considered changes on the effects of switching to other legal groundfish fisheries and gear, i.e. fixed gear and open access should be deferred for further vetting by the Ad Hoc Trawl Rationalization Regulatory Evaluation Committee.

Item 3, Clarify the open access language for non-groundfish trawl fisheries.

Adoption of our recommendation for non groundfish exempt trawl under Item 2 will necessitate moving forward on Item 3.

Item 7, Clarify first receiver electronic fishticket submittal requirements.

As stated by the GAP, this issue has been discussed at length during previous meetings and conference calls. We support adoption of Item 7 as presented.

Item 8, Mandatory requirement to fill out exvessel value on electronic fishtickets.

This is a current requirement under State law and Federal executive order. We support adoption of Item 8 as written.

Item 9, Review and, as appropriate, clarify what ownership changes must be reported to NMFS.

The EC recommends adoption of Item 9. Accuracy of the ownership data base is vital to effective enforcement of the ownership and control caps.

Item 10, Add first receiver to list in conflict of interest regulations for catch monitors and catch monitor providers.

We recommend adoption of Item 10. Undue persuasion and collusion are a continuing concern. Failure to adequately address this issue can seriously erode the compliance role fulfilled by the catch monitors and their providers.

**New Items**

Item 33, Revise who is required to have a first receiver site license.

Members of the EC have witnessed firsthand the unanticipated outcomes and confusion of not linking First Receivers and State Fish Buyers License in e ticket delivery transactions and submittals. The EC concurs with the Gap and recommends the linkage of a buyer with a First Receiver license.

**Newly Emerging Issues**

It has recently come to the attention of the EC that several vessels have requested to test non-fishing trawl gear or store and recover non-fishing IFQ pot gear in the ocean. Current regulations have interpreted this activity to be fishing, which requires a proper VMS Declaration report and observer coverage. The EC recommends further vetting of these issues, as outlined below, by the Trawl Rationalization Regulatory Evaluation Committee.

Transiting

If a vessel is strictly transiting between ports with gear stowed, the current regulatory interpretation is that the trip is not considered a fishing trip and observer coverage is not required. Currently, it is recommended that the vessel file the VMS Declaration report "other" and report transiting prior to departing port. The development of a VMS Declaration code for "transiting" would provide more accurate reporting and monitoring.

Transiting and setting or retrieving non-fishing pot gear

A vessel while transiting from one port to another port, which deploys non-fishing pots (panels open, no bait) for storage or retrieves non-fishing pots and has no catch onboard is currently interpreted as fishing under the MSFCMA definition. While the intent of this activity is to support the movement or storage of gear in preparation for fishing, it remains possible to take marine resources (fish, marine mammal entanglements). The current guidance is that vessels must declare into the applicable fishery and gear type and obtain observer coverage. Industry has requested more flexibility to engage in this activity and to reduce costs by avoiding the requirement to carry an observer. If this flexibility is supported by the committees and the Council, this would require regulatory language to exempt this activity from "fishing" or observer coverage and the development of a proper VMS Declaration code. This could result in cost savings to industry.

Testing of trawl gear

Trawl vessels have inquired into the requirements for testing trawl gear or adjusting the trawl net at-sea, with and without trawl doors deployed and without a cod end attached. Currently, it is recommended that the vessel declare into the IFQ fishery and obtain observer coverage. Industry has requested more flexibility to engage in this activity and to reduce costs by avoiding the requirement to carry an observer. If this flexibility is supported by the committee and the Council, this would require regulatory language to exempt this activity from "fishing" or observer coverage and the development of a proper VMS Declaration for "gear testing". This could result in cost savings to industry.

PFMC
06/12/11

# GROUNDFISH MANAGEMENT TEAM REPORT ON TRAWL RATIONALIZATION AND ASSOCIATED GENERAL GROUNDFISH FISHERY ISSUES SLATED FOR FINAL ACTION, INCLUDING THOSE IN THE PROGRAM IMPROVEMENTS AND ENHANCEMENT RULE (PIE)

The Groundfish Management Team (GMT) reviewed the reports under this agenda item, received a briefing from Ms. Jamie Goen, and provides the following comments for Council consideration.

*Amendment 21 versus Amendment 6*

Relative to this action, the GMT would like to point out that the limited entry and open access allocations previously established under Amendment 6 would be abolished for Amendment 21 species. The open access fishery was previously allocated a percentage of fish from the commercial (trawl and non-trawl) fisheries, which would no longer exist. If the Council wanted to maintain the flavor of Amendment 6 by providing the open access sector with a fixed share of harvest, a new one would need to be calculated for the 2013-14 specifications and management measures.

The GMT discussed whether there was need to re-calculate new non-trawl limited entry and open access allocations given the fact that many of the species that would require new allocations (e.g. chilipepper and minor shelf rockfish) are not fully utilized. These Amendment 21 species either have no directed open access fisheries or full utilization is limited due to overfished species interactions.

At this time the GMT does not see a need to calculate new allocations for the 2013-14 specifications and management measures. As stated previously, many of these species are not fully utilized and the GMT does not feel there are any risks to exceeding an annual catch limit (ACL) and the non-trawl fishery harvest guideline could be shared by both sectors. At such time that a stock does become more fully utilized non-IQ limited entry and open access allocations could be considered.

*Set-Asides*

The GMT understands that there may be multiple interpretations on the actions that would be necessary to allow inseason flexibility in modifying set-asides for exempted fishing permits, research catches, and incidental open access (and potentially tribal set-asides if the tribes want to change those inseason). One interpretation is that the set-asides would be formally changed in the regulations (requiring notice and comment rulemaking) and the second is that the regulations would remain unchanged and unused set-aside amounts could be considered in determining risk of exceeding ACLs or other hard fishery targets in managing non-individual quota (non-IQ) directed fisheries. Simply put, the second approach would be akin to how the Council has balanced the scorecard in the past by accounting for all projected impacts inseason.

For the IQ fishery, it may be more difficult to distribute new quota pounds (QP) compared to the non-IQ fishery. The amount of set-aside redistributed to the IQ fishery would have to be large enough that the newly distributed QP equaled at least one pound per account (for those with quota shares [QS]) since National Marine Fisheries Service (NMFS) cannot issue QP in increments of less than that amount. There is also an associated staff time cost with re-distributing QP to the IQ fishery for both the NMFS Northwest Region and Fisheries Science Center that may come at a cost to other Council priorities. This redistribution would require a regulatory change.

Since set-asides cannot be released until a fishery has closed or research completed, any set-aside will most likely be released later in the year, if at all, and the extent that it could be utilized by the fisheries are unknown at this time. The GMT supports an approach to allowing inseason flexibility in modifying set-asides that does not require regulations to be modified inseason. We would also suggest that the Council may want to get clarification on the necessary process steps for redistributing set-aside fish from NMFS.

PIE Rule – Old items

*Moving between limited entry and open access fisheries*

The GMT does not see any accounting issues relative to this issue, nor will it have an impact on any GMT models.

*Review and, as necessary, revise catch accounting regulations*

Relative to revising catch accounting regulations, the GMT would like to highlight that the sablefish trip limit models rely on the current accounting methods where "*Any groundfish caught by a vessel with a limited entry permit will be counted against the limited entry allocation while the limited entry fishery for that vessel's limited entry gear is open."* Deviating from the current catch accounting regulations could affect trip limit models.

PIE Rule – New items

*Add process under the Shorebased IFQ Program in case harvest specifications and management measures are delayed.*

Relative to the Pacific halibut individual bycatch quota pounds annual allocation, the Council may want to consider revising the regulations on the conversion rate from *legal sized to legal and non-legal sized halibut* such that the regulations reference the ratio calculation from the most current observer data instead of having a fixed value of *0.62*.

Additionally, the GMT notes that the Pacific halibut total constant exploitation yield (CEY) is usually not known by January 1. As such, the Council may consider recommending NMFS issue QP in two parts. The first part could be issued based on some portion of the International Pacific Halibut Commission (IPHC) staff recommended total CEY from their interim meeting. The second part could be issued based on the final total CEY that results from the IPHC annual meeting in late January.

PFMC
06/11/11

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# INTERNATIONAL PACIFIC HALIBUT COMMISSION

ESTABLISHED BY A CONVENTION BETWEEN CANADA

AND THE UNITED STATES OF AMERICA

DIRECTOR
BRUCE M. LEAMAN

2320 W. COMMODORE WY, STE 300
SEATTLE, WA 98199-1287

TELEPHONE
(206) 634-1838

FAX:
(206) 632-2983

June 7, 2011

Mr. Mark Cedergreen, Chair
Pacific Fishery Management Council
7700 NE Ambassador Place
Portland, Oregon 97220

**Re: June 2011 Agenda Item E.6.b – Supplemental NMFS Report 2: PIE Rule, part 2**
VIA Email

Dear Mark:

The staff of the International Pacific Halibut Commission (IPHC) has become aware of changes being proposed as part of the Trawl IQ Program Improvement and Enhancement (PIE) rule, which seeks to revise the manner in which the pounds of halibut bycatch are calculated for quota share holders.

The IPHC staff concurs with the general steps being proposed by the Council but notes that a fixed value is proposed to convert legal-sized pounds to pounds of all sizes of halibut, i.e., legal-sized plus sublegal-sized. We suggest a more appropriate approach would be to specify the use of the fraction which would be reported in the most recent NMFS analysis of trawl fishery bycatch. The fraction of legal-sized, or O32, halibut in the trawl bycatch varies annually for several reasons, including halibut stock dynamics and the manner in which the trawl fishery is conducted. For example, a strong recruit class will influence the overall average size as it moves through the stock and fishery. Using a fixed conversion value can substantially misrepresent the total halibut bycatch amount relative to using a current legal fraction. Our suggestion is therefore to make the conversion based on the latest results, to better reflect the current status of the trawl fishery and halibut stock characteristics.

We would be pleased to elaborate on this issue, if required. Gregg Williams of our staff is the contact person for the issue.

Sincerely,



Bruce M. Leaman, Ph.D.
Executive Director

cc: Commissioners

**NMFS Questions on Severability of Mothership Catcher Vessel (MS/CV) Endorsement and Catch History Assignment from the Limited Entry Trawl Permit**

NMFS has several questions and observations for the Council regarding severability. Depending on the Council's answers to these questions, the action may be narrow or more expansive. NMFS' understanding is that Council's intent with this action is narrow (If so, NMFS will try to implement the action for 2012 through the upcoming PIE rule). If the Council's decision is more expansive, NMFS may need to reconsider its internal scoping under NEPA, further analysis may be required, and implementation may occur on a longer timeline. Even under a narrow scope of action, severability may not be available for the 2012 whiting season depending on the application window (i.e., If the initial transfer application window for severability is September-December 2012 (during permit renewal), the change would be effective January 2013).

NMFS has the following questions:

1. When would the Mother Ship (MS)/Catcher Vessel (CV) endorsement (END) and catch history assignment (CHA) be severable from the limited entry (LE) trawl permit and when would it be effective?
    a. Option 1: END/CHA freely transferable during the whiting season and the change in permit ownership for the END/CHA would be effective upon approval by NMFS (restrictions on change of vessel registration discussed under "observations" below). This option would be more expansive, would increase complexity, and may require further NEPA analysis. For instance, if option 1 is chosen, and END/CHA were severed from an LE trawl permit that belonged to a coop during the year, would the old LE trawl permit owner (now without an END) or the new LE trawl permit owner with multiple ENDs, be the coop member? How would membership in a coop, or multiple coops (if there were more than one), and participation in the non-coop fishery be addressed if transfers of ownership occurred during the year?
    b. Option 2: END/CHA only transferable during LE permit renewal period (September 1 to December 31) and effective the following year. This is the more narrow option.

2. Does the END provide coop membership or the LE trawl permit?
    a. This becomes an issue if option 1 (unrestricted transferability) under #1 above is chosen. If the permit is transferred during the during the coop application process or during the whiting season, option 1 raises the question over which LE trawl permit is the coop member - the owner of the original permit or the owner of the permit to which the END is transferred (transferee)?
        i. If option 1 (unrestricted transferability) under #1 above is selected and coop membership remains based on MS/CV-endorsed LE trawl permits only, it could result in changed coop membership throughout the year. Making the coop membership based on the endorsements would prevent that from occurring.
        ii. If option 2 (transfers only during permit renewal) under #1 above is selected, no problem keeping coop membership based on the LE trawl permit.

3. Could a LE trawl permit owner with 2 END/CHAs on their permit join 2 coops?
    a. Current regulations at 660.150(b)(3)(i)(B) state that MS coops "be composed of MS/CV-endorsed limited entry permit owners"
    b. What happens if multiple END/CHAs are registered to a single LE trawl permit? This becomes an issue if option 1 (unrestricted transferability) under #1 above is chosen.
        i. As discussed above - who is the coop member if transfers occur mid-year?
        ii. What happens if a transferee that is already a member of coop obtains an END/CHA from a permit that is registered to the non-coop fishery? If option 1 (unrestricted transferability) under #1 above is selected, potentially there could be an MS/CV-endorsed permit that is in both the coop fishery and non-coop fishery.
        iii. If option 2 (transfers only during permit renewal) under #1 above is selected, no problem keeping coop membership based on the LE trawl permit.
    c. Does this change the provision at 660.150(b)(3)(i)(F), which states, in part, that the MS coop must include at least 20% of all MS/CV-endorsed permits as members? In other words, does the Council intend that coop membership requires 20% membership of all permits (including those with multiple endorsements) or 20% of all individual MS/CV endorsements?

4. Does the Council intend to maintain the permit combination provision as specified at 660.150(g)(2)(iv) which allows for combining multiple END/CHA in to one END/CHA and increases the size endorsement on a LE permit? And the provision in the same paragraph which allows combination with C/P endorsed LE trawl permits, resulting in loss of the MS/CV END/CHA?
    a. 660.150(g)(2)(iv) states: *(iv) <u>Combination</u>. An MS/CV-endorsed permit may be combined with one or more other limited entry trawl permits; the resulting permit will be a single permit with an increased size endorsement. If the MS/CV-endorsed permit is combined with another limited entry trawl-endorsed permit other than a C/P-endorsed permit, the resulting permit will be MS/CV-endorsed. If an MS/CV-endorsed permit is combined with a C/P-endorsed permit, the resulting permit will be exclusively a C/P-endorsed permit, and will not have an MS/CV endorsement. If an MS/CV-endorsed permit is combined with another MS/CV-endorsed permit, the combined catch history assignment of the permit(s) will be added to the active permit (the permit remaining after combination) and the other permit will be retired. NMFS will not approve a permit combination if it results in a person exceeding the accumulation limits specified at paragraph (g)(3) of this section. Any request to combine permits is subject to the provision provided at § 660.25(b), including the combination formula for resulting size endorsements.*

5. Does the Council intend to provide a window of time for folks that have already combined permits (i.e., can they undo it to maximize their flexibility)?
    a. NMFS recently combined two MS/CV-endorsed LE trawl permits into one MS/CV endorsed LE trawl permit with an increased CHA and size endorsement. On the resultant permit, NMFS did not maintain the two unique MS/CV endorsements and CHA amounts. This resulted in 36 MS/CV endorsed LE trawl permits, instead of the original 37 that qualified.

6. Can the ownership of the END/CHA and the LE trawl permit to which it's registered be different?
    a. Can the END/CHA be leased separate from the LE trawl permit?
    b. If ownership can be different, would increase complexity in tracking ownership.
    c.

**Observations:** NMFS would like to make the following observations.

**Achievement of Stated Objective.** The Council stated objective is to address the situation of those permits with small amounts of CHA. However, as noted in the analysis, the proposed options apply to END/CHA of all sizes and apply indefinitely. On the one hand, the rationale for options addressing all amounts of CHA might be justified based on simplicity and that the additional flexibility also meets other objectives of the trawl rationalization program. On the other hand, a more narrowly constructed option, applying only to endorsements with smaller amounts of CHA and applying only for a few years might achieve the stated objective for this action with lower long-term administrative costs (although also with less long term flexibility). *The Council may want to consider an option that applies only to endorsements with smaller CHA and that allows transfers only for a specific period of time.*

**Benefits of Maintaining Separate END/CHA.** The analysis identifies that the system with transferable endorsements that can be stacked separately will have greater flexibility than the current system. However, there may also be program advantages (increased stability) and administrative cost savings that would occur if the END/CHA were permanently combined (reducing the total number of END/CHA endorsements and number of possible MS/CV-endorsed permits). *The analysis contained in the Council decision document (Agenda Item E.6.a, Attachment 5, June 2011) should discuss these trade-offs and the Council may wish to provide further rationale for indefinitely maintaining separate END/CHA on a single permit.*

**Number of Changes in Vessel Registration per Year.** The option does not indicate there would be any change in the number of times per year a permit could be transferred from one vessel to another. Under current regulations at 660.25(b)(4)(vi), LE permits without an MS/CV endorsement can only change their vessel registration once per calendar year while MS/CV-endorsed LE permits may change their vessel registration up to two times per calendar year. Also under current regulations, a change in vessel registration would be effective at the start of the next 2-month cumulative limit period, except for the second change in vessel registration for an MS/CV-endorsed permit which would be effective upon approval by NMFS (see at 660.25(b)(4)(v)(C)).

a) This is not an issue if option 2 (transfers only during permit renewal) under #1 above is chosen.

b) This becomes an issue if option 1 (unrestricted transferability) under #1 above is chosen. This could have implications for permits moving between MS and IFQ fisheries because of restrictions on number of changes in vessel registration per year and different standards for MS/CV-endorsed LE trawl permits and non-endorsed LE trawl permits.

**Use of Term "Stacking".** The term "stacking" as used in the Council decision document is not the same as "stacking" in the LEFG sablefish program. *NMFS recommends that for clarity this action could be termed "registering multiple END/CHA on a LE trawl permit" or "endorsement stacking"*.

PFMC
06/09/11

Agenda Item E.6.b
Supplemental NMFS Report 2
June 2011

# PIE Rule – Part 2

### New or changed NMFS items from April 2011

This document builds off the PIE Rule - Part 1 document (see Agenda Item E.6.b, NMFS Report 1, June 2011) and includes new items or additional information for some of the NMFS items reported at the April Council meeting (Agenda Item I.7.b, Supplemental NMFS Report 2, April 2011). This document includes additional information for the following items:

1) Consider revisions to requirement for observer coverage until offload complete.
2) Moving between limited entry and open access fisheries.
3) Clarify the open access language for non-groundfish trawl fisheries.
4) Review and, as necessary, revise catch accounting regulations.
7) Clarify first receiver ~~has to complete and submit an~~ electronic fish ticket submittal requirements ~~before the fish leaves the offload site~~.
8) Mandatory requirement to fill out ex-vessel value on electronic fish ticket.
9) Review and, as appropriate, clarify what ownership changes must be reported to NMFS.

NEW items include:

- Revise who is required to have a first receiver site license.
- Revise designation of quota share account and vessel account managers.
- Add process under the Shorebased IFQ Program in case harvest specifications and management measures are delayed.
- Add threshold rules for annual issuance of allocation for Shorebased IFQ and Mothership Coop Programs.

These items are still in development and additional items may be added as the rulemaking progresses. Where preliminary regulatory language has been drafted, it is provided below.

## Further Implementation of Council Intent (additional information from April 2011)

1) Consider revisions to requirement for observer coverage until offload complete.

Council consideration: Policy decision

Background:
Because Amendment 20 to the Pacific Coast Groundfish Fishery Management Plan (FMP) required 100% observer coverage, NMFS implemented a requirement for the

observer to remain onboard the vessel until all IFQ species were offloaded, as specified at 660.112(b)(1)(xiii) and 660.140(h)(1)(i). NMFS and the Council have received feedback from the industry that this requirement is overly restrictive, a burden on the industry, and a concern for the observer providers.

Recommended change:
In response to the Council's discussion on allowing the observer to depart the vessel upon return to port and for the catch monitor to conduct the hold inspection at the end of the offload, the following option is being considered to allow this action while ensuring catch accountability. This option has been further developed and revised since the April 2011 Council meeting where a number of options were provided. The goal of this option is to ease the burden on industry, observers and observer providers, while still ensuring accurate catch accounting and limiting incentives/opportunities for IFQ species to be altered prior to landing (especially overfished species or species near deficit).

1. For bocaccio, yelloweye, canary, cowcod, and other species, as deemed necessary by the Council, the observer will document the weight and number of these species on a form. A copy of the form will be retained by the observer, the vessel operator, and the catch monitor.
    a. if there is a discrepancy between the haul level observer number and the vessel operator's, the discrepancy will be noted and highlighted on the form.
    b. the Observer Program will develop protocols for dealing with discrepancy, i.e. if discrepancy due to species id disagreement, observer will be required to take pictures.
2. If upon offload, the number of species recorded on the form, (i.e. bocaccio, yelloweye, canary, cowcod) observed by the catch monitor is less than recorded by the observer, the catch monitor will use the number and weight of the overfished species recorded by the observer in the catch monitor's offload report submitted for catch accounting. *(This would be the only time that this information is used in catch accounting)*
3. If offload is delayed, prior to departing the vessel, the observer will post a notice on the super structure of the vessel. Vessel posting placard to be developed and supplied by NMFS OLE, (i.e. a cardboard placard with distinct color and specific verbiage)
4. Upon offload of a posted vessel, the catch monitor will remove the posting from the vessel and record the removal of the posting, along with any other relevant observations, with the filing of the corresponding catch monitor report.
5. Regulations currently require observer coverage until final offload of the catch. Regulations would be revised to allow an exemption of this requirement as long as the observer and vessel operator meet the requirements, as determined by the Council and published in Federal regulations. Additionally, the term "catch

monitor" would be included in applicable regulations, to allow catch monitors to complete functions such as removing the posting on the vessel, hold inspections, and any other applicable duties.

Regulatory sections affected: 660.112(b)(1)(xiii) & 660.140(h)

Sectors affected: IFQ

2) Moving between limited entry and open access fisheries.

Council consideration: Further implementation of Council intent.

Background:
Since implementation of the trawl catch share program, there has been interest in the rules and restrictions around moving between limited entry and open access fisheries or even between sectors within the limited entry trawl fishery. NMFS developed a matrix to guide participants on the requirements (see a public notice dated 1/19/2011 and in the small entity compliance guide revised 2/25/2011). In general, current groundfish regulations are interpreted to allow all limited entry fishermen (trawl and fixed gear) to move between limited entry and open access fisheries with no permit action and simply changing their fishery declaration between fishing trips, with 3 exceptions (non-groundfish trawl gear for California halibut, ridgeback prawn, or sea cucumber). Under this interpretation moving between the IFQ fishery and open access fishery is distinct from "gear switching" under the IFQ program. Under gear switching all catch is covered by quota pounds regardless of the legal groundfish gear used. In moving between the IFQ fishery and open access fishery, quota pounds cover catch in the IFQ fishery and trip limits cover catch in the open access fishery. NMFS concern with the interpretation in our matrix is how freely vessels can move between the limited entry and open access fisheries and which allocations catch is being counted against.

The final environmental impact statement for Amendment 20 addressed concerns over "double-dipping," taking from 2 allocations of fish (limited entry and open access) (Appendix A, p.A-14), and structured the fishery to require quota pounds to cover catch by most gears if the vessel has a limited entry trawl permit registered to, with some exceptions. The Amendment 20 FMP language in Appendix E, section A-1.1 states the following:

> *For trips delivered shoreside, QP will be required to cover catch of all groundfish (including all discards) by limited entry (LE) trawl vessels with certain gear and species exceptions.*
>
> > *Gear Exception: Vessels with an LE trawl permit using the following gears would not be required to cover their groundfish catch with QP:*

*exempted trawl [a], gear types defined in the coastal pelagic species FMP, gear types defined in the highly migratory species FMP, salmon troll, crab pot, and LE fixed gear when the vessel also has a LE permit endorsed for fixed-gear (longline or fishpot) AND has declared that they are fishing in the LE fixed-gear fishery.*

*[a] California halibut gear of 7.5" or greater used in state waters is exempted.*

In discussing this issue with Council staff, the current groundfish regulations may only partially match the Council's action from Amendment 20.

Recommended change:
This provision should be more thoroughly reviewed to ensure that it matches Council action from Amendment 20 and tracks with catch accounting procedures.

One of the regulatory changes needed is to clarify the IFQ regulations on gear exceptions at 660.140(e)(1)(i) to make it clear that these exceptions are still subject to the open access requirements and limits when declared in to an open access fishery. Therefore, 660.140(e)(1)(i) should be revised to read:

*(i) Gear exception. Vessels with a limited entry trawl permit using the following gears would not be required to cover groundfish catch with QP or Pacific halibut catch with IBQ pounds: Non-groundfish trawl, gear types defined in the coastal pelagic species FMP, gear types defined in the highly migratory species FMP, salmon troll, crab pot, and limited entry fixed gear when the vessel also has a limited entry permit endorsed for fixed gear and has declared that they are fishing in the limited entry fixed gear fishery. These gear exceptions are subject to the open access fishery restrictions and limits when declared in to an open access fishery.*

To more accurately reflect the intent of Amendment 20, all catch of IFQ species by a vessel registered to a limited entry trawl permit (not participating in the at-sea whiting fisheries) must be debited from a vessel account instead of being subject to trip limits, unless the limited entry trawl permit is removed from the vessel, with some exceptions (listed in 660.140(e)(1)(i) cited above). For these exceptions, the vessel does not have to remove the limited entry trawl permit from the vessel to participate in the open access fishery and be subject to trip limits; they only need to change their fishery declaration from an IFQ fishery to an open access fishery. When declared in to an open access fishery, the catch of groundfish would be deducted from the open access allocation.[1] That being said, all limited entry vessels (trawl and fixed gear) could move to the open

[1] NMFS is still reviewing the FMP regarding this interpretation.

access fishery by removing the limited entry permit from the vessel and declaring in to the open access fishery.

Other regulatory sections will need to be reviewed and, as necessary, revised to reflect this interpretation.

Regulatory sections affected:
660.11 (def. of open access fishery and non-groundfish trawl), 660.55(f) catch accounting, 660.60(h)(7) crossover provisions, 660.140(e)(1)(i) may need interpreted in other sections of the regulations, 660.140(k) on gear switching should be reviewed, 660.232 limited entry fixed gear before primary season, Subpart F open access fisheries

Sectors affected: All commercial

3) Clarify the open access language for non-groundfish trawl fisheries.

Council consideration: Further implementation of Council intent (related to previous item).

Background:
This issue is an outcome of the previous item on moving between limited entry and open access fisheries and of historic language in the regulations. Since 2004, regulations have stated that a vessels participating in the ridgeback prawn, sea cucumber, or California halibut trawl fishery must <u>not</u> have a Federal limited entry groundfish permit registered to the vessel. Amendment 20 added a gear exception that included the non-groundfish trawl fleet and provided them more flexibility. The result is that a vessel registered to a limited entry trawl permit may participate in the IFQ fishery or the non-groundfish trawl fishery by simply changing their vessel declaration.

In addition, to clarify that ridgeback prawn, California halibut, and sea cucumber are open access fisheries, NMFS intends to add the words "open access, non-groundfish trawl" to those regulations. This would distinguish the open access, non-groundfish trawl gear used for those fisheries from other gear that may be used for those fisheries.

Recommended change:
Change language at 660.333 under paragraphs (b)(1), (c)(1), and (d)(1) to read:

> *"A trawl vessel will be considered participating in the <u>open access, non-groundfish trawl</u> (insert ridgeback prawn, California halibut, sea cucumber) fishery if:*
>
> *(1) It is <u>declared "non-groundfish trawl gear for (insert ridgeback prawn, California halibut, sea cucumber)" under §660.13(d)(5)(iv), regardless of whether it is registered to a Federal limited entry trawl-endorsed permit</u> ~~not~~*

~~*registered to a valid Federal limited entry groundfish permit issued under §660.25(b) for trawl gear;"*~~

Need to review the non-groundfish trawl language for pink shrimp at 660.333(e) and revise, as necessary, to reflect IFQ program and how crossover provisions apply between open access trip limits and quota pounds for IFQ species.

Regulatory sections affected: 660.333(b), (c), (d), and (e)

Sectors affected: open access

4) Review and, as necessary, revise catch accounting regulations.

Council consideration: Further implementation of Council intent

Background:
Due to the tight timeline to implement regulations for the trawl rationalization program, some regulations should be reviewed to make sure they are still accurate. The catch accounting regulations at 660.55 should be reviewed and revised, as appropriate, for both the trawl/nontrawl fisheries and the limited entry/open access fisheries. The catch accounting between regulations should be reviewed for accuracy also in light of decisions under the item above on switching between fisheries. The current limited entry/open access regulations are old regulatory language from before Amendment 21 was implemented and may no longer be accurate or only accurate for non-Amendment 21 species.

Current regulatory language at 660.55(f) reads as follows:

*(f) Catch accounting. Catch accounting refers to how the catch in a fishery is monitored against the allocations described in this section. For species with trawl/nontrawl allocations, catch of those species are counted against the trawl/nontrawl allocations as explained in paragraph (f)(1) of this section. For species with limited entry/open access allocations in a given biennial cycle, catch of those species are counted against the limited entry/open access allocations as explained in paragraph (f)(2) of this section.*

*(1) <u>Between the trawl and nontrawl fisheries</u> —*

*(i) <u>Catch accounting for the trawl allocation</u>. Any groundfish caught by a vessel registered to a limited entry trawl-endorsed permit will be counted against the trawl allocation while they are declared in to a groundfish limited entry trawl fishery and while the applicable trawl fishery listed in subpart D of this part for that vessel's limited entry permit is open.*

*(ii) Catch accounting for the nontrawl allocation. All groundfish caught by a vessel not registered to a limited entry permit and not fishing in the non-groundfish fishery will be counted against the nontrawl allocation. All groundfish caught by a vessel registered to a limited entry permit when the fishery for a vessel's limited entry permit has closed or they are not declared in to a limited entry fishery, will be counted against the nontrawl allocation, unless they are declared in to a non-groundfish fishery. Catch by vessels fishing in the non-groundfish fishery, as defined at §660.11, will be accounted for in the estimated mortality in the non-groundfish fishery that is deducted from the ACL or ACT when specified.*

*(2) Between the limited entry and open access fisheries. Any groundfish caught by a vessel with a limited entry permit will be counted against the limited entry allocation while the limited entry fishery for that vessel's limited entry gear is open. When the fishery for a vessel's limited entry gear has closed, groundfish caught by that vessel with open access gear will be counted against the open access allocation. All groundfish caught by vessels without limited entry permits will be counted against the open access allocation.*

Some concerns over the current catch accounting regulations, specifically the trawl/nontrawl regulations in relation to Amendment 21, include:

- The draft regulation seems to indicate that catch by vessels using non-groundfish trawl gear without a limited entry permit would count against the nontrawl quota. Amendment 21 eliminated the fixed allocations between limited entry and open access gears for Amendment 21 species but it did not change the Amendment 6 accounting rules. This means that the groundfish catch by a vessel with a limited entry permit still counts against the limited entry allocation but the limited entry allocation is determined during each biennial management cycle rather than through an allocation fixed across years.
- Under the current regulations, darkblotched rockfish in the pink shrimp fishery would come off the top before formal allocations.

In a separate, but related issue, NMFS has received questions from industry on the catch accounting for discards in the IFQ fishery between IFQ species versus non-IFQ species (e.g., trip limit species). To clarify, the IFQ fishery is a "total catch" fishery where, for IFQ species, both landings and discards count against the quota pounds in a vessel account. For the non-IFQ species subject to trip limits, only landings are counted toward the vessel's trip limit. Discards of non-IFQ species are estimated by the observer and accounted for in the annual total mortality report. This data is used in calculating the biennial harvest specifications. The current regulations account for the discards of both IFQ and non-IFQ species, albeit differently, and no regulatory change is needed.

Recommended change:
Regulations at 660.55(f) on catch accounting should be reviewed and, as necessary, revised.

Regulatory sections affected: 660.55(f)

Sectors affected: All commercial

5) Review and, if necessary, revise crossover provisions.

- See NMFS Report 1

6) Consider a process to allow end of the year resolution of accounts.

- See NMFS Report 1

7) Clarify first receiver ~~has to complete and submit an~~ electronic fish ticket submittal requirements ~~before the fish leaves the offload site~~.

Council consideration: Implementation issue

Background:
Through discussions with industry, the states, Pacific State Marine Fisheries Commission (PSMFC), and the Council, this issue has changed substantially since the April 2011 Council meeting.

To further facilitate state adoption of the PSFMC electronic fish ticket (e-ticket) format, while supporting implementation of the trawl rationalization program, NMFS is considering additional required fields for e-tickets, additional requirements for catch monitoring plans to outline the e-ticket submittal, and additional process requirements for first receivers and catch monitors.

The additional e-ticket field to document whether the fish were caught in state waters, Federal waters, or both will aid enforcement. Federal jurisdiction over the West Coast groundfish fishery under the Magnuson Act applies only to fishing in the EEZ, beyond three miles from shore, and to some extent also on the high seas beyond the EEZ. So, generally speaking, in a Magnuson groundfish enforcement case, part of the burden is to prove the illegal fish were caught in federal waters, i.e., beyond three miles. The existing WDFW fish ticket form includes three boxes to check, including "Fish caught outside 3 miles". The burden of proof can also be met in other ways, such as logbook entries or statements by the skipper, but a check box would make the burden of proof clearer for both state and Federal enforcement cases.

The states of WA, OR, and CA retain the option to address areas of Federal regulations with more specific and restrictive state regulations.

Recommended change:

Creation of Additional E-Ticket Fields:

1. A field to type the name of the vessel operator.
2. A signature block for the vessel operator's written signature for printed documents.
3. A signature block for first receiver's written signature for printed documents.
4. A drop down box titled "Inside/Outside State Waters", containing the following: caught outside 3 miles, caught inside 3 miles, or both.

Additional Requirements for First Receiver Catch Monitoring Plans:

As part of the first receiver site license application, the catch monitoring plan requirements will be revised to add an additional requirement detailing how the e-ticket submittal requirements will be met. As with other aspects of the catch monitoring plans, e-ticket submittal proposals will be evaluated and accepted or rejected.

Additional Process Requirements for First Receivers and Catch Monitors:

All existing e-ticket recording and submittal regulations remain in place with these modifications:

FOR OFFLOADING AT A FIRST RECEIVER WHERE THE FISH WILL BE PROCESSED ON-SITE:

1. The first receiver (FR) will communicate the e-ticket number to the catch monitor (CM).
2. After completing the offload, the e-ticket information will be recorded immediately.
3. Prior to submittal of the e-ticket, the e-ticket will be reviewed by the CM and the vessel operator (Captain) who delivered the fish.
4. After review, the FR and the vessel operator will sign a printed hard copy of the e-ticket.
5. Three copies of the signed e-ticket will then be produced by the FR with the following distribution: one copy retained by the vessel operator, one copy retained by the FR, and one copy sent to the state of origin if required by state regulations.
6. After review and signature, the e-ticket will be submitted within 24 hours of the completion of the offload.

FOR OFFLOADING AT A FIRST RECEIVER WHERE THE FISH WILL BE TRANSPORTED FOR PROCESSING AT A DIFFERENT SITE:

1. The FR will communicate the e-ticket number to the CM at the beginning of the offload.
2. The vessel name and the e-ticket number will be recorded on the all dock tickets related to that delivery. For the purposes of this section, the term *dock ticket* means a form generally accepted by the state to record the landing, receipt, purchase, or transfer of fish.
3. Upon completion of the dock ticket, but prior to transfer of the off load to another location, the dock ticket information that will be used to complete the e-ticket will be reviewed by the CM and the vessel operator (Captain) who delivered the fish.
4. After review, the FR and the vessel operator will sign the original copy of each dock ticket related to that delivery.
5. Three copies of the signed dock ticket will then be produced by the FR with the following distribution: one copy retained by the vessel operator, one copy retained by the FR, and one copy sent to the state of origin if required by state regulations.
6. Based on the information contained in the dock ticket, the e-ticket will be completed and submitted within 24 hours of the completion of the offload.
7. To facilitate monitoring and catch tracking, original dock tickets must be retained by the FR submitting the e-ticket as required by state and Federal regulations.
8. Upon submittal of the e-ticket, three copies of the e-ticket will be produced by the FR with the following distribution: one copy retained by the vessel operator, one copy retained by the FR, and one copy sent to the state of origin if required by state regulations.

Regulatory sections affected: 660.112(b)(2)(iv), others

Sectors affected: IFQ

8) Mandatory requirement to fill out ex-vessel value on electronic fish ticket.

Council consideration: Implementation issue

Background:
Regulations require first receivers to complete certain fields on an electronic fish ticket (e-ticket). Since the program was implemented in January, NMFS has had mixed reporting of the ex-vessel value on the e-ticket because it is not currently listed in the "required information" section of the regulations. The regulations have a clause that the Regional Administrator may deem other information as required to be completed by the IFQ first receiver on the e-ticket. In a memo dated April 4, 2011, NMFS's Northwest Regional Administrator determined that the ex-vessel value of the landing is a mandatory field that must be completed by the IFQ first receiver. Therefore, NMFS has added the

ex-vessel value of the landing as a mandatory field to be completed on the e-ticket and will update the regulations accordingly.

NMFS has determined that the ex-vessel value of the landing is a mandatory reporting requirement for several reasons. In order for the states to have the option of adopting the Federal e-ticket to cover their state reporting requirements, the e-ticket must include the items required to be reported on the state fish tickets. The ex-vessel prices are a state reporting requirement for the state to be able to collect excise taxes and fees. The ex-vessel value will be also used in the cost recovery program that is currently being developed by the Council and NMFS. The ex-vessel value is not collected through the economic data collection program forms and is necessary information for that program to measure the economic changes in the fishery for the 5-year review of the program and beyond. In other words, if the information is not collected on the electronic fish ticket, the EDC forms may need to be revised to collect the information. The ex-vessel value may also be used by NMFS in required regulatory flexibility analyses for rulemakings.

> Additional information:
> At the Council's April 2011 meeting, there was discussion of adding a timeframe to make any edits to the ex-vessel value on a fish ticket, or to any of the required information for a fish ticket as listed at §660.113(b)(4)(i) (excerpted below). Because ex-vessel value as reported on the e-ticket may change after sorting or marketing, the first receiver or processor must either edit the e-ticket or submit a revised e-ticket according to state requirements. Similarly, other information on an e-ticket, such as the species and weight in an offload, may change after the original fish ticket has been submitted due to new information from cutting and processing the offload. However, the gross weight of the sorted offload, as observed by the catch monitor should not change, except for the rare occurrence of a data entry error not found upon review prior to e-ticket submittal.
>
> State requirements for editing and revising fish tickets vary (e.g. up to 6 years for Oregon versus California which doesn't allow edits). In addition, the state regulations can be more conservative than Federal regulation. Because state requirements vary and state regulation can be more conservative, NMFS decided a timeframe for editing or revising e-tickets would be more appropriate in state regulation and is not necessary in Federal regulation.
>
> As requested at the April 2011 meeting, NMFS will explain in the preamble to the rule and/or in a public notice what is expected of first receivers regarding reporting ex-vessel value.

Recommended change:
The regulations will be revised to read as follows:

*(i) Required information. All IFQ first receivers must provide the following types of information: Date of landing, vessel that made the delivery, vessel account number, gear type used, catch area, first receiver, actual weights of species landed listed by species or species group including species with no value, condition landed, number of salmon by species, number of Pacific halibut, ex-vessel value of the landing by species and any other information deemed necessary by the Regional Administrator as specified on the appropriate electronic fish ticket form.*

Regulatory sections affected: 660.113(b)(4)(i)

Sectors affected: IFQ

9) Review and, as appropriate, clarify what ownership changes must be reported to NMFS.

Council consideration: Implementation issue

Background:
NMFS intends to review and, as appropriate, clarify the regulations for all limited entry permits and IFQ vessel accounts regarding what constitutes a change in ownership, how owners report a change, and how that affects the accounting/ownership interest process.

Recommended change:
Quota Share (QS) Permits and Accounts

No change may be made to the legal name registered to a QS permit (and QS account owner) including adding or removing a member to the registered QS permit owner name. During the first 2 years of the trawl rationalization program, there may be exceptions on the transfer of QS if directed by a court order. After year two of the program, any new ownership group must apply for a new QS permit. QS could then be transferred in to the new QS account. An ownership interest form is required of the new owner.

To close the old QS account once all QS has been transferred to the new QS account, the permit owner must submit a written request to close their QS account. Similarly, if they fail to renew their QS permit, the account may be inactivated for the following year. The QS permit and account may be renewed during the renewal period in the following year and the account reinstated to active status.

Vessel Accounts

No change may be made to the legal name registered (vessel owner) to a vessel account including adding or removing a member of the vessel owner registered to the account. If the registered owner(s) of a vessel (as given on USCG or state

vessel registration document) changes, the new vessel owner must apply for a new vessel account and that account will start with a zero balance of QPs. The new vessel owner must transfer QPs into the vessel account for use by the vessel. An ownership interest form is required of the new owner. To close the old vessel account once QPs have been transferred to the new vessel account, the vessel owner must submit a written request to close their QS account. Similarly, if the vessel owner fails to renew their vessel account, the account may be inactivated at the beginning of the following year. A vessel account may be renewed after the start of the following year and reinstated to an active status.

NMFS also intends to add a prohibition against fraudulently using a vessel account.

Regulatory sections affected: 660.25(b)(4)(iv), 660.112, 660.140(e)

Sectors affected: IFQ

10) Add "first receiver" to list in conflict of interest regulations for catch monitors and catch monitor providers.

- See NMFS Report 1

## New Items (numbering builds off previous NMFS reports from April and June 2011 on this issue)

33) Revise who is required to have a first receiver site license.

Background:
NMFS intends to revise who is required to have a first receiver site license. There has been some confusion over the buyer as reported on the e-ticket and the associated first receiver site license which is not designated on the e-ticket. In some cases to date, the buyer has not been the first receiver. For example, a first receiver with a site license has been contracted by the buyer to receive, sort, account for the IFQ groundfish and fill out a fish ticket in the name of the buyer.

NMFS intends to revise the regulation to require every buyer of groundfish to have a first receiver site license for each physical location that they receive, purchase, or take custody, control, or possession of an IFQ landing. Thus, the buyer as represented on the e-ticket would also be the first receiver in all cases. This would help align the state paper fish ticket system with the e-ticket system. It would continue to allow the state buyer to be reported on the ticket for revenue and tax purposes as required by the states. The Federal requirement would associate a buyer on a specific e-ticket as the buyer registered to a specific first receiver site license.

NMFS acknowledges that this will require some additional buyers to apply for a first receiver site license(s) (possibly for multiple locations) and pay the application fee(s). NMFS does not expect this to increase community impacts because many buyers already have their first receiver site licenses and the application fee is $50. In addition, for buyers sharing a physical location, the catch monitoring plan can be shared among applicants.

Recommended change:
Each physical location and state buyer's license pair must have a first receiver site license.

Regulatory sections affected: 660.140(f)

Sectors affected: IFQ

34) Revise designation of quota share account and vessel account managers.

Background:
In an effort to reduce the paperwork and regulatory burden, NMFS intends to remove the optional requirement for business entities to designate an account manager with NMFS. Beginning in 2012, users will have the capability to designate individuals to have certain roles and associated privileges (an individual can have the privilege to initiate or accept/reject transfers, others can only view account balances) within their online account under an "account information" tab.

Recommended change:
NMFS will remove references to designating an account manager from the regulations for QS and vessel accounts.

Regulatory sections affected: 660.140(d) and (e)

Sectors affected: IFQ

35) Add process under the Shorebased IFQ Program in case harvest specifications and management measures are delayed.

Background:
NMFS is aware of the management possibility of having to provide quota pounds for the Shorebased IFQ Program prior to harvest specifications becoming final. Should this event occur in the future, NMFS is recommending a framework approach to provide NMFS implementation authority to issue interim allocations. This approach is consistent with similar measures used for the Pacific whiting allocation at 660.140(d)(1)(ii)(B) and provides a parallel process should the situation occur for non-whiting groundfish or Pacific halibut.

Recommended change:
NMFS recommends new sub-paragraphs (1) and (2) below for 660.140(d)(1)(ii)(A) on nonwhiting groundfish and (C) on Pacific halibut:

*(A) Nonwhiting QP annual sub-allocations. NMFS will issue QP for IFQ species other than Pacific whiting and Pacific halibut annually by multiplying the QS permit owner's QS for each such IFQ species by that year's shorebased trawl allocation for that IFQ species. Deposits to QS accounts for IFQ species other than Pacific whiting and Pacific halibut will be made on or about January 1 each year.*

*(1) In years where the groundfish harvest specifications are known by January 1, deposits to QS accounts for IFQ species will be made on or about January 1.*

*(2) In years where the groundfish harvest specifications are not known by January 1, NMFS will issue QP in two parts. On or about January 1, NMFS will deposit QP based on the shorebased trawl allocation multiplied by the lower end of the range of potential harvest specifications for that year. After the final harvest specifications are established later in the year, NMFS will deposit additional QP to the QS account.*

…

*(C) Pacific halibut IBQ pounds annual allocation. NMFS will issue IBQ pounds for Pacific halibut annually by multiplying the QS permit owner's IBQ percent by the Shorebased IFQ Program component of the trawl mortality limit for that year (expressed in net weight), dividing by 0.75 to convert to round weight pounds, and dividing by 0.62 to convert from legal sized to legal and non-legal sized halibut. Consistent with §660.55(m), the Shorebased IFQ Program component of the trawl mortality limit will be 130,000 pounds of legal size halibut, net weight in the first four years of the Shorebased IFQ Program and not to exceed 100,000 pounds starting in the fifth year of the Shorebased IFQ Program, less the set-aside amount of Pacific halibut to accommodate the incidental catch in the trawl fishery south of 40°10' N. lat. and in the at-sea whiting fishery. Deposits to QS accounts for Pacific halibut IBQ pounds will be made on or about January 1 each year.*

*(1) In years where the Pacific halibut total CEY is known by January 1, deposits to QS accounts will be made on or about January 1.*

*(2) In years where the Pacific halibut total CEY is not known by January 1, NMFS will issue QP in two parts. On or about January 1, NMFS will deposit QP based on the shorebased trawl allocation multiplied by the*

*lower end of the range of potential harvest specifications for that year. After the final Pacific halibut total CEY is established later in the year, NMFS will deposit additional QP to the QS account.*

Regulatory sections affected: 660.140(d)(1)(ii)

Sectors affected: IFQ

36) Add threshold rules for annual issuance of allocation for Shorebased IFQ and Mothership Coop Programs.

Background:
During the annual issuance of allocations to individual QS permits for the Shorebased IFQ Program, or in the case of the mothership fishery to the coop or non-coop fishery, NMFS ensures that the allocations add back up to 100% of the sector's or coop's allocation. Because of rounding rules, calculations may not add up to 100%. For example, if several QS permits have similar percentages, the rounding rules may cause the calculation to never quite reach or to exceed 100. NMFS will make its best attempts to completely allocate QP. However, after making best attempts, NMFS may determine that QP allocations to individual permits that are within 99.99% are complete. A similar calculation is done among the MS/CV endorsed permits to determine the allocations to the coop(s) or non-coop fishery.

Recommended change:
NMFS intends to set a threshold above which it does not need to continue to run iterations redistributing the allocation. The regulations would be revised to state that NMFS' annual allocations to individuals (or the coop) must be equal to or greater than 99.99%.

Regulatory sections affected: 660.140, 660.150

Sectors affected: IFQ, mothership

# GROUNDFISH ADVISORY SUBPANEL REPORT ON TRAWL RATIONALIZATION AND ASSOCIATED GENERAL GROUNDFISH FISHERY ISSUES SLATED FOR FINAL ACTION, INCLUDING THOSE IN THE PROGRAM IMPROVEMENTS AND ENHANCEMENT (PIE) RULE

The Groundfish Advisory Subpanel (GAP) listened to several presentations by Council and National Marine Fisheries Service (NMFS) staff and recommends the following, in order of the action items listed in this agenda item's situation summary:

1. **Amendment 21 vs. Amendment 6**

   As the GAP noted in March and April of this year, it has been the Council's intent that Amendment 21 supersede Amendment 6 and the GAP agrees.

2. **Inseason flexibility for set-aside adjustments**

   The GAP would like to reiterate the importance of this issue and repeat what we said in our April statement:

   > "… we urge the Council and NMFS to remedy the inadvertent removal of regulatory authority to re-apportion tribal whiting set-aside amounts to the non-tribal whiting fishery sectors. Without this fix, there is a high likelihood that whiting harvest will be foregone, causing harm to the non-tribal whiting fishery sectors and contravening National Standard 1."

   A clear example of the need for this is the timing of the circumstances this year, as the Quileute Tribe has declared it won't fish for whiting in 2011. This situation demonstrates the strong need for this issue that needs to be remedied as soon as possible.

   Additionally, in March and April, the GAP requested the Council retain some flexibility in redistributing set-asides – such as those for exempted fishing permits (EFPs), research, etc. -- through inseason management:

   > "The GAP recommends the Council adopt a more flexible strategy where … yield can be re-allocated if the set-aside is no longer needed for its intended use. This is how set-asides and buffers in the scorecard were used prior to the adoption of Amendment 21 and how the GAP believes management of set-asides should continue."

**3. Pacific halibut bycatch mortality allocation for the trawl sector**

The GAP feels halibut bycatch should be flexible. The 1.6 conversion factor may vary based on observer data at the time and the 15 percent of the total catch exploitation yield (TCEY) can be adjusted through the biennial spex process.

We recommended this in March and we recommend again now that the trawl allocation be 15 percent without a cap. To reiterate our March statement:

> "The new GAP alternative would set the trawl allocation of Pacific halibut to 15 percent of the Area 2A total catch exploitation yield (TCEY) without a poundage cap. In situations when trawl opportunities on the northern shelf are severely constrained (e.g., an important shelf target species like Dover sole is declared overfished), a ratio of less than 15 percent of the TCEY can be specified as the sector limit. These cases could be analyzed and considered in the biennial specifications process. This alternative would scale the trawl halibut bycatch limit to the abundance of halibut on the West Coast while taking into consideration the availability of trawl target species on the shelf. The objective of this alternative would be to reduce halibut bycatch by 50 percent. Since the GAP alternative is based on a percentage of the Area 2A TCEY, this is fair to the non-trawl sectors since non-trawl sector allocation increases with increased abundance of halibut. The conversion to address the legal/sublegal issues contained in alternatives 1 and 2 and the proposed GAP alternative is necessary. Modifying the trawl halibut limit should be fast-tracked, even though the trawl industry realizes this will not bring any bycatch relief in 2011."

As the TCEY of halibut increases, the occurrence of halibut bycatch increases accordingly and we need to account for that.

**4. Severability of mothership sector catch history/endorsements**

The GAP referred to Agenda Item E.6.b, Supplemental NMFS Report 5, "NMFS Questions on Severability of MS/CV Endorsement …" on this issue. We have followed that document's structure in order to make it clear on which options the GAP is providing comment.

In general, however, the GAP agrees with National Marine Fisheries Service's (NMFS) understanding of a narrow intent by the Council regarding severability, if at all possible, and that this action should be implemented in 2012.

The GAP recommends Option (b) under question No.1 (that is, Option 2, the endorsement/catch history is transferrable only during the limited entry (LE) permit renewal period [Sept. 1-Dec. 31] and effective the following year).

This option is the simplest approach to accomplish a narrow objective. It is easy to understand, predictable and minimizes the NMFS administrative burden.

Regarding the subsequent questions in that document:

2) Does the MS/CV endorsement (END) provide coop membership or the LE trawl permit? This question is not pertinent based on the choice in question No. 1.

3) Could a LE trawl permit owner with 2 MS/CV endorsements (ENDs)/Catch History Assignments (CHAs) on their permit join 2 coops? Yes, which comports with status quo, option 3(a), and renders 3(b) moot. Regarding the question under 3(c), the GAP recommends maintaining the provision that a coop must include at least 20 percent of all MS/CV-endorsed permits as members.

This is the simplest approach and maintains status quo, which would require no change to regulations and minimizes NMFS administrative burden.

4) Does the Council intend to maintain the permit combination provision as specified at 660.150(g)(2)(iv) which allows for combining multiple MS/CV endorsements (ENDs)/Catch History Assignments (CHAs) into one END/CHA and increases the size endorsement on a LE permit? The permit combination provision should be modified. The GAP believes providing the option to combine LE permits while maintaining separate endorsements/catch history assignments gives greater flexibility to fishery participants and, therefore, recommends clarifying this in regulation. That is, combining LE trawl permits would not require combining endorsements associated with those permits.

5) Does the Council intend to provide a window of time for folks that have already combined permits … ? Yes.

6) Can the ownership of the MS/CV endorsements (ENDs)/Catch History Assignments (CHAs) and the LE trawl permit to which it's registered be different? No. The GAP recommends dropping this issue, as it would create unnecessary complexity and increase NMFS administrative burden.

NMFS also made four observations, on which the GAP would like to comment:

- Achievement of stated objective: The GAP agrees that this process should be as simple as possible. Applying this to all mothership (MS)/catcher-vessel (CV) permits and keeping it open ended follows Council intent, as noted by NMFS, and is the simplest and most flexible approach.

- Benefits of Maintaining Separate MS/CV endorsements (ENDs)/ Catch History Assignments (CHAs): The GAP believes maintaining separate MS/CV endorsements (ENDs)/Catch History Assignments (CHAs) on a single permit should reduce consolidation by maintaining a larger number of eligible permits. It also provides the greatest flexibility for fishery participants.

- Number of Changes in Vessel Registration per Year: As identified in NMFS Supplemental Report 5, because the GAP recommends Option (b) under question No.1 (that is, Option 2, the endorsement/catch history is transferrable only during the LE permit renewal period [Sept. 1-Dec. 31] and effective the following year), there is no need to consider this issue.

- Use of Term "Stacking": The GAP agrees that, for clarity, this term should be changed so it won't be confused with the limited entry/fixed-gear (LEFG) sablefish permit stacking program.

**5. Extension of the Adaptive Management Program quota pounds pass-through**

The GAP agreed, as it has in the past two meetings, that this should continue for the time being. From our April statement:

> "This would allow for continued pass-through of QP through 2013 if no other procedures for AMP QP are developed. The GAP felt 2011 and 2012 would be "learning years" and provide the opportunity to develop programs to use those pounds in subsequent years if a need is evident. There is no current need demonstrated for which the council or GAP should spend their time on development of a program when more urgent trailing actions should be considered to ensure the TIQ program works effectively."

**6. PIE Rule: NMFS-proposed elements**

For this agenda item, the GAP referred to Agenda Item E.6.b - Supplemental NMFS Report 2, "PIE rule – Part 2; New or changed NMFS items from April 2011," and followed that document's structure.

(Note: We also reviewed Agenda Item E.6.b – Supplemental NMFS Report 1, "PIE rule – Part 1" and agreed to all issues contained therein. Comments for those issues are the same as we made in April.)

1) Consider revisions to requirement for observer coverage until offload complete. The GAP agrees with the recommended change as described in Agenda Item E.6.b - Supplemental NMFS Report 2, "PIE rule – Part 2; New or changed NMFS items from April 2011."

2) Moving between limited entry and open access fisheries. The GAP discussed this at length. There was much confusion between whether this would affect switching gear or switching a fishery and whether it would detrimentally affect current limited entry fixed-gear and open access fishermen. The GAP agrees that the provision does need to be more thoroughly reviewed to better reflect the council's intent and to provide flexibility to the trawl fleet while preventing harm to non-trawl fisheries.

3) Clarify the open access language for non-groundfish trawl fisheries. The GAP agrees and that clarification is needed that it is indeed unnecessary to remove the trawl permit from the vessel in order to participate in the non-groundfish trawl fisheries for California halibut, ridgeback prawn and sea cucumber fisheries. A declaration is all that would be needed.

4) Review and, as necessary, revise catch accounting regulations. The GAP agrees that this should be reviewed and revised as appropriate.

5) N/A – covered under a separate agenda item (NMFS Report 1: PIE Rule – Part 1).

6) N/A – covered under a separate agenda item (NMFS Report 1: PIE Rule – Part 1).

7) Clarify first receiver electronic fish ticket submittal requirements. This was an issue the GAP members discussed at length with enforcement during prior meetings and conference calls. The GAP believes the recommended changes – creation of additional E-ticket fields, additional requirements and additional process requirements – capture the necessary elements while not making the process overly cumbersome.

8) Mandatory requirement to fill out ex-vessel value on electronic fish ticket. The GAP agrees with the recommended change and to defer to the states' timeframes for revising etickets.

9) Review and, as appropriate, clarify what ownership changes must be reported to NMFS. The GAP agrees with this clarification.

10) N/A – covered under a separate agenda item (NMFS Report 1: PIE Rule – Part 1).

**NEW ITEMS**

33) **Revise who is required to have a first receiver site license**.

The GAP understands this issue arose during discussions about splitting deliveries. The GAP agrees to this change. As listed in the NMFS report: "The federal requirement would associate a buyer on a specific e-ticket as the buyer registered to a specific first receiver site license." The GAP agrees with the recommended change that each physical location and each state buyer's license must have a first receiver site license.

34) **Revise designation of quota share account and vessel account managers**.

The GAP agrees that removing references to designation of an account manager from the regulations for QS and vessel accounts is a good decision.

35) **Add process under the Shorebased IFQ Program in case harvest specifications and management measures are delayed**.

The GAP agrees with this and further recommends exploration of similar measures for the at-sea whiting sectors.

36) **Add threshold rules for annual issuance of allocation for Shorebased IFQ and Mothership Coop Programs**.

The GAP agreed this seemed clear and straightforward.

## 7. Grandfathering of existing at-sea processing of shoreside allocations

The GAP recognizes that implementation of the Trawl Individual Quota program was not meant to put one trawl fisherman, who carefully restructured and built up his unique business, out of work. Enforcement worked with this particular fisherman in 2010 and the State of Oregon supports his plan. While an Environmental Assessment (EA) likely would need to be done, the GAP feels it is important for the Council to approve this action at this meeting, work on the EA as time permits and bring closure to this issue.

PFMC
06/11/11

# PRIORITY TRAILING ACTIONS UNDER TRAWL RATIONALIZATION SLATED FOR PRELIMINARY ACTION

The Pacific Fishery Management Council (Council) is slated to identify preliminary preferred alternatives (PPA) for (1) quota share (QS) control rule safe harbors for Community Fishing Association (CFA) and risk pools and (2) cost recovery. The only priority trailing action item on which the Council is not slated to take action at this meeting is control rule safe harbors for lenders. At its April meeting, the Council delayed final action on the lender issue and expanded the scope to include third party verification of quota share ownership (i.e. National Marine Fisheries Service [NMFS] informing a third party as to the ownership of particular QS), a lien registry, and unique identifiers for QS to facilitate financial transactions. While the Council is not scheduled to identify preliminary preferred alternatives on these lender issues, it may provide additional direction and guidance as it deems appropriate.

With respect to control rule safe harbors for CFAs and risk pools, the Council requested the rationale and decisional history on the existing control rules. The CFA and risk pool issues have been combined into a single environmental assessment (EA) (Agenda Item E.7.a, Attachment 1) and that information has provided in Section 1.4.2.2 of the draft EA. The Council also expressed interest in seeing a discussion of the reasons that CFAs and risk pools might or might not have needs that warrant special consideration relative to other types of entities that might also benefit from an exception to control limits. Discussion on this topic has been provided in Section 1.4.4.

At its April meeting, to help assess the need for safe harbors for CFAs, the Council was presented with historical information on the total historic landings received by each trawl port in comparison to the amount of landings which could be controlled under existing QS control limits. The purpose of this information was to illustrate the degree to which a single entity might meet the needs of any particular port with control limits set at their current levels. The Council was also interested in knowing what minimum amounts of QS might be needed to maintain a trawl port. While adequate economic information was not available to respond to this question, the analysis showed that a number of trawl ports appeared to have maintained long-term viability with harvest levels that could be accommodated under existing control limits. Still at issue is the degree to which the Council believes that port stability necessarily requires that the historic landings of any particular port be accommodated by QS held by a single entity. The analysis provided in April has now been augmented by providing historic (1996-1998) information on a yearly basis rather than average, an assessment of county dependencies and vulnerabilities based on non-whiting trawl metrics, inclusion of landings from the Morro Bay/Port San Luis experimental fishing permits, and the use of a Conception area sablefish trawl allocation lower than the 2011 level to evaluate the degree to which the control limits accommodate sablefish landings in southern ports. This information is provided in Appendices A and C of the EA as part of the analysis of the level of the exception that might be provided to CFAs. Appendix B of the EA covers all provisions of the CFA alternative. Subsections in Appendix B correspond to each section of the CFA alternative and identify outstanding options and questions for Council

decision. These issues should be addressed as part of selection a preliminary preferred alternative.

With respect to risk pools, one of the major points of deliberation at the April Council meeting was how the duration of agreements obligating quota pounds (QP) affect assessment of the control of underlying QS. To help address this issue, the Council added for consideration an option that would specify that any agreement on the transfer of QP of a duration of 14 months or less would not constitute control of underlying QS. Additional discussion on the issue of duration of agreements in conjunction with other features of risk pool agreements has been provided by Council staff in Section 1.4.3.

With respect to cost recovery, NMFS will provide a report on its efforts to develop a methodology for Council consideration (Agenda Item E.7.b, NMFS Report). Because the cost recovery method will be implemented under a National Environmental Policy Act categorical exclusion, for which an EA/Environmental Impact Statement is not required, final action in September does not necessarily require that the Council adopt a PPA for cost recovery at this meeting. The Council has previously expressed a number of preference on this issue, including preferences for (1) an option that would divide and assess costs by each of the three trawl sectors, (2) the identification of specific tasks required to implement the trawl rationalization program, (3) the application and explanation of general budget estimation methods to model an allocation of agency resources between the new trawl rationalization necessities and other fishery management activities, (4) the collecting cost recovery fees through the same method used for the buyback program, and (5) consideration of reimbursing states for their relevant new management costs. A letter from the Washington Department of Fish and Wildlife (WDFW) discussing relevant state costs is provided as Agenda Item E.7.b, WDFW Letter.

**Council Action:**

1. **Adopt PPA for QS control rule safe harbors:**
   a. **for CFAs**
   b. **for risk pools**
2. **Adopt PPA or provide guidance, as appropriate, for cost recovery methodologies.**
3. **Other guidance on trailing actions and trawl rationalization as needed.**

Reference Materials:

1. Agenda Item E.7.a, Attachment 1: Trawl Rationalization Regulatory Amendments: Control Limit Safe Harbors for Community Fishing Associations and Risk Pools, Draft Environmental Assessment, May 2011.
2. Agenda Item E.7.b, NMFS Report 1: Cost Recovery Program Options.
3. Agenda Item E.7.b, WDFW Letter: April 27, 2011 Letter to Mr. Frank Lockhart From Mr. Phil Anderson.
4. Agenda Item E.7.c, Public Comment.

Agenda Order:

a. Agenda Item Overview — Jim Seger and LB Boydstun
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action**: Adopt Preliminary Preferred Alternatives for Issues Concerning Safe Harbors from the Control Rule and Cost Recover or Guidance as Necessary

PFMC
05/24/11

# TRAWL RATIONALIZATION REGULATORY AMENDMENTS

# CONTROL LIMIT SAFE HARBORS FOR COMMUNITY FISHING ASSOCIATIONS AND RISK POOLS

## Draft Environmental Assessment

PREPARED BY
THE PACIFIC FISHERY MANAGEMENT COUNCIL
7700 NE AMBASSADOR PLACE, SUITE 101
PORTLAND, OR 97220
503-820-2280
WWW.PCOUNCIL.ORG

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# Table of Contents


CHAPTER 1 **PURPOSE AND NEED FOR THE PROPOSED ACTION ..... 4**

**1.1 Introduction ..... 4**

**1.2 Description of the Proposed Action ..... 4**
*1.2.1* Issue: QS Control Limit Safe Harbor for Community Fishing Associations ..... 4
*1.2.2* Issue: QS Control Limit Safe Harbor for Risk Pools ..... 5

**1.3 Purpose and Need for the Proposed Action ..... 5**
*1.3.1* Issue: QS Control Limit Safe Harbor for Community Fishing Associations ..... 5
*1.3.2* Issue: QS Control Limit Safe Harbor for Risk Pools ..... 6

**1.4 Goals and Objectives ..... 7**

**1.5 Background ..... 11**
*1.5.1* The West Coast Groundfish Fishery ..... 11
*1.5.2* Design and Implementation of the Trawl Rationalization Program ..... 11
1.5.2.1 General ..... 11
1.5.2.2 Accumulation Limits (QS Control and Vessel Use) ..... 11
National Policy Guidance on Accumulation Limits ..... 11
History of Council Deliberation on Accumulation Limits ..... 13
Council Objectives and Rationale for Accumulation Limits ..... 15
QS Control Limits ..... 15
Vessel QP Usage Limits ..... 17
Percentages Chosen for Limits ..... 17
*1.5.3* Accommodating Co-operation and Community Participation Under Control Limits ..... 18
*1.5.4* Special Types of Participants in the IFQ Program ..... 24
1.5.4.1 CFAs ..... 24
1.5.4.2 Risk Pools ..... 25

CHAPTER 2 **DESCRIPTION OF THE ALTERNATIVES ..... 26**

**2.1 Issue: Safe Harbor for Community Fishing Associations ..... 26**
*2.1.1* Council Decisional Authority and Community Stability Plan Requirements ..... 26
*2.1.2* Alternatives: QS Control Limit Safe Harbors for CFAs ..... 28

**2.2 Issue: QS Control Limit Safe Harbor for Risk Pools ..... 38**
*2.2.1* Duration of Agreements Committing QP ..... 38
*2.2.2* Alternatives: QS Control Limit Safe Harbors for Risk Pools ..... 38

**2.3 CFA/Risk Pool Differences and Interactions ..... 42**
*2.3.1* Differences Between CFAs and Risk Pools ..... 42
*2.3.2* Dual participation in CFAs and Risk Pools ..... 42

CHAPTER 3 **AFFECTED ENVIRONMENT** ..... **43**

CHAPTER 4 **IMPACTS ON THE AFFECTED ENVIRONMENT** ..... **43**

**4.1 Issue: Safe Harbor for Community Fishing Associations** ..... **43**
*4.1.1* Direct and Indirect Impacts to the Physical Environment, Including Habitat and Ecosystem ..... 43
*4.1.2* Direct and Indirect Impacts to the Biological Environment ..... 43
*4.1.3* Direct and Indirect Impacts to the Socioeconomic Environment ..... 43
4.1.3.1 Fishery Impacts ..... 44
4.1.3.2 Impacts on Communities ..... 44
4.1.3.3 Impacts on Agencies and Public Decision Processes ..... 44

**4.2 Issue: Control Rule Safe Harbor for Risk Pools** ..... **44**
*4.2.1* Direct and Indirect Impacts to the Physical Environment, Including Habitat and Ecosystem ..... 44
*4.2.2* Direct and Indirect Impacts to the Biological Environment ..... 44
*4.2.3* Direct and Indirect Impacts to the Socioeconomic Environment ..... 44
4.2.3.1 Fishery Impacts ..... 44
4.2.3.2 Impacts on Communities ..... 44
4.2.3.3 Impacts on Agencies and Public Decision Processes ..... 44

APPENDICES

Appendix A: CFA Alternative 1: Special Privilege Exception Analysis A-1

Appendix B: CFA Alternative 1: Section by Section Analysis of Provision B-1

Appendix C: CFA Alternative 1: Special Privilege Exception Analysis—Sablefish in the Conception Management Area C-1

## LIST OF TABLES

Table 1-1. Policy guidance from MSA, Groundfish FMP, and Amendment 20 (A-20) goals and objectives. ..... 9
Table 2-1: Aggregate control and vessel use limits under the trawl rationalization program (expressed as a proportion of species-specific trawl sector allocations). ..... 33
Table 2-2. Elements and options for CFA safe harbor control limits. ..... 34
Table 2-3. Differences between CFAs and risk pools. ..... 42

# CHAPTER 1 PURPOSE AND NEED FOR THE PROPOSED ACTION

## 1.1 Introduction

The Council is considering a number of trailing actions for the Amendment 20 trawl rationalization program.

This document provides background information about, and analyses for, the creation of safe harbor exceptions from the shoreside limited entry trawl IFQ program quota share control limits. The specific exceptions would apply to

- community fishing associations (CFAs),and
- risk pools.

The safe harbor exceptions, if adopted, would provide CFAs and risk pools with the opportunity to control QS in excess of existing QS control limits. For CFAs a higher control limit will be proposed as part of the action. There may or may not be a higher limit to which risk pools are held.

The proposed action would require an amendment to the regulations implementing the Pacific Coast Groundfish Fishery Management Plan (FMP). If the regulatory amendment is implemented, the description of the trawl rationalization program contained in Appendix E to the groundfish FMP would automatically be revised to reflect the regulatory modification. The proposed action must conform to the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the principal legal basis for fishery management within the Exclusive Economic Zone (EEZ), which extends from the outer boundary of the territorial sea to a distance of 200 nautical miles from shore.

In addition to addressing MSA mandates, this document is an environmental assessment (EA), pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended. This document is organized so that it contains the analyses required under NEPA.

## 1.2 Description of the Proposed Action

### *1.2.1* Issue: QS Control Limit Safe Harbor for Community Fishing Associations

The action considered under this issue would amend the shoreside trawl rationalization regulations to create exceptions from control limits (control limit safe harbors) for recognized/designated *community fishing associations (CFAs)*. The proposed action is limited in scope to the *non-whiting portion* of the IFQ program under which the shoreside groundfish trawl fishery is managed.

### *1.2.2* Issue: QS Control Limit Safe Harbor for Risk Pools

The action considered under this issue would amend the shoreside trawl rationalization regulations to create special provisions for recognized *risk pools*. The proposed action is limited in scope to the IFQ program under which the shoreside groundfish trawl fishery is managed.

## **1.3** Purpose and Need for the Proposed Action

During the Council's decisions establishing the rules of the IFQ program, several matters were addressed. One of these matters concerns the limits on accumulation of QS that an entity could control and what it means to exert "control" over QS. Control limits and definitions were developed in response to MSA provisions which states that a Council or the Secretary shall "ensure that limited access privilege holders do not acquire an excessive share of the total limited access privileges…" as well as other guidance in the MSA, groundfish FMP, and the goals and objectives for the IFQ program. The control limits developed by the Council were set at a level which would roughly allow for an entity to control enough QS to operate two full time trawl vessels. The definition the Council adopted to define "control" is very broad and can be interpreted to apply to certain marketing, financing, delivery, or ownership arrangements which exert control over the utilization or disposition of QS.

More information is provided on the establishment of the accumulations limits and implications for the fishermen working together co-operatively in Section 1.5.2.2 and Section 1.5.3, respectively. In this section we discuss the purpose and need for considering CFA and risk pool exceptions to the QS control limits.

### *1.3.1* Issue: QS Control Limit Safe Harbor for Community Fishing Associations

One major concern for the trawl rationalization program is the potential for consolidation and geographic redistribution of landings. Individuals selling trawl QS are likely to base such sales on the best price offered, not taking into account the effect on communities and all the local entities in the production chain that rely on the landings. Communities may also rely on the trawl fishery to provide threshold amounts of activity needed to maintain buyers, processing and other infrastructure that supports nontrawl fisheries.

The MSA includes a number of provisions related to communities including National Standard 8 which requires that the Council take into account the importance of fishery resources to fishing communities by utilizing economic and social data….to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse impacts on such communities. Section 303A(c)(5)(C) of the MSA requires the Council to "include measures to assist, when necessary and appropriate, entry-level and small vessel owner-operators, captains, crew, and fishing communities in the purchase of limited access privileges.". At the same time, 303A requires that the Council prevent excessive concentration of QS.

The potential for geographic redistribution and its impacts was identified in the FEIS which analyzed the Amendment 20 trawl rationalization program. While the EIS identified a number of reasons that certain communities might be advantaged while others were disadvantaged, the information available was not sufficient to predict exactly how landings might be redistributed under the program. However, there were a number of provisions in the program that were expected to provide some opportunities for communities to adjust and respond to the significant changes in the fishery that were expected to result from trawl rationalization. One of these provisions allows acquisition of QS/QP by any entity eligible to own a US documented fishing vessel, including any legally organized associations and government entities that may wish to acquire QS/QP to benefit local communities, so long as they would be eligible to own a US documented fishing vessel.

The amount of QS that any one entity may acquire is limited by control limits. The amount of QS required to meet all of the QS needs of the vessels operating under the trawl IFQ program in a particular community may exceed those control limits. If a single organization is to be allowed to acquire sufficient QS to meet the all of the needs of the vessels operating in a particular community, for some port areas an exception to the QS limits would be required.

The proposed action would permit organizations officially designated "Community Fishing Associations" to acquire and control trawl fishery quota shares in excess of QS control limits that apply to all other QS holders.

### *1.3.2* Issue: QS Control Limit Safe Harbor for Risk Pools

A major challenge faced by the Pacific coast groundfish IFQ fishery concerns the successful prosecution of healthy fishery resources given the low amounts of quota available for overfished species. The presence of overfished stocks in the multi-species IFQ fishery constrains access to healthy target species. This is due to the fact that overfished species are caught in combination with other, healthier stocks. Typically the allowable catch level for these overfished stocks is reached prior to the allowable catch level of healthy stocks. Under this situation fishing ceases prior to attainment of allowable catch levels for target species, meaning that overfished species constrain access to healthy target stocks.

Other challenges exist in addition to these constraining factors. For several overfished species, the prospect that a well functioning quota market will develop is in question due to the severely limited quantity of quota available to the fishery. These limited quantities will tend to spur "thin market" conditions where trades are infrequent and price signals unclear. In extreme instances, the price of trades made in a thin market may be based more upon personal negotiation skill and relationships. Furthermore, there may not be quota available for purchase. In other words, trades of quota for certain species are likely to be erratic over time and variable in quantity and price. Regardless of the degree to which trades do occur, the quota prices for these limiting species is likely to be high. Quota prices for overfished species should – at some level – reflect the value of access to target species these stocks allow plus a premium for the risk posed by the chance of inadvertent encounters with these constraining species.

In addition to high cost of quota and uncertainty over quota availability on the marketplace, substantial degrees of uncertainty appear to exist regarding the possibility and degree of encountering these species – and in what volume – when a fisherman deploys gear. Available information indicates that catch events of several types of overfished species are erratic and unpredictable with catch volumes varying widely. The combination of these factors – quota availability, quota cost, and catch uncertainty – creates "risky" conditions for harvesters.

During the development of Amendment 20, perceptions of the risks associated with constraining species catch events in an IFQ fishery first led to the consideration of insurance-like pooling arrangements. At that time, the concept of "risk pools" was discussed where fishermen would enter in to voluntary arrangements to pool quota and develop terms for covering inadvertent catch events, should they occur. It was envisioned that these arrangements would effectively spread the risk of inadvertent catch events of high risk constraining species across a collective group of harvesters, thereby reducing the risk to individuals.

There is concern that the scope of activities which constitute "control" as specified in the regulations implementing the Council policy, may be so broad as to inhibit the formation of such pools either because of a direct conflict with the rules or as a result of extreme precaution due to uncertainty as to how the control rules might apply to risk pools. The policy and rationale behind the IFQ program control rules are provided in Section 1.5.2.2, and a discussion of how these rules may constrain risk pools and other types of co-operation is provided in Section 1.5.3. It has been proposed that provisions be added to create a clearly delineated safe harbor from control rules for those who may desire to form risk pools.

The purpose of pursuing this amendment process is to make adjustments that may be needed to enable the development of well functioning, voluntary quota pooling arrangements among participants in the IFQ fishery while simultaneously maintaining the Council's original intent when establishing the control limit structure and IFQ program. Such pooling arrangements have been considered one of the primary tools needed by industry to manage the very limited amount of quota available for overfished species and other highly constraining species such as Pacific halibut. The Council's goals for the IFQ program, including economic, social, and biological goals, depend on the industry's ability to successfully manage quota for these species. If the industry's ability to do so is inhibited by control limits, achievement of those goals may be compromised.

The need to consider an amendment process stems from the limitations imposed upon IFQ holders through regulations which implement the control limits. These regulations create conditions that appear to be detrimental to the function and development of voluntary risk pooling arrangements.

## 1.4 Goals and Objectives

At this time, specific goals and objectives for each of these issues have not been developed beyond what is reflected in the purpose and needs statements. The policy guidance from the MSA and existing goals and objectives of the FMP and Amendment 20 would guide deliberations on this action. The Amendment 20 goals and objectives are as follows

Goal

*Create and implement a capacity rationalization plan that increases net economic benefits, creates individual economic stability, provides for full utilization of the trawl sector allocation, considers environmental impacts, and achieves individual accountability of catch and bycatch.*

Objectives

The above goal is supported by the following objectives:

1. Provide a mechanism for total catch accounting.
2. Provide for a viable, profitable, and efficient groundfish fishery.
3. Promote practices that reduce bycatch and discard mortality and minimize ecological impacts.
4. Increase operational flexibility.
5. Minimize adverse effects from an IFQprogram on fishing communities and other fisheries to the extent practical.
6. Promote measurable economic and employment benefits through the seafood catching, processing, distribution elements, and support sectors of the industry.
7. Provide quality product for the consumer.
8. Increase safety in the fishery.

Constraints and Guiding Principles

The above goals and objectives should be achieved while the following occurs:

1. Take into account the biological structure of the stocks including, but not limited to, populations and genetics.
2. Take into account the need to ensure that the total OYs and allowable biological catch (ABC) are not exceeded.
3. Minimize negative impacts resulting from localized concentrations of fishing effort.
4. Account for total groundfish mortality.
5. Avoid provisions where the primary intent is a change in marketing power balance between harvesting and processing sectors.
6. Avoid excessive quota concentration.
7. Provide efficient and effective monitoring and enforcement.
8. Design a responsive mechanism for program review, evaluation, and modification.
9. Take into account the management and administrative costs of implementing and oversee the IFQ or co-op program and complementary catch monitoring programs, as well as the limited state and Federal resources available.

Table 1-1 summarizes guidelines, objectives, and goals identified for Amendment 20 , the groundfish FMP (Chapter 2.0 in the FMP), and the MSA (including Section 301(a), National Standards for fishery conservation and management, and Section 303A, LAPPs). The guidance is organized into 11 topic areas: conservation; net benefits and efficiency; disruption; excessive shares; fairness and equity, sector health; labor (captains, crew, and processing plant workers); communities; small vessels, small entities, and new entrants; auctions and cost recovery; and program performance monitoring and modification. This guidance was used to develop the alternatives and to evaluate the effects of the alternatives of the trawl rationalization program.

**Table 1-1.** Policy guidance from MSA, Groundfish FMP, and Amendment 20 (A-20) goals and objectives.

| Guidance | Reference |
|---|---|
| **Conservation** | |
| Allocations Reasonably Calculated to **Promote Conservation** | MSA - National Standard 4(b) |
| LAPPs shall **assist in rebuilding** overfished species | MSA - 303A(c)(1)(A) |
| LAPPs shall **promote fishery conservation** and management | MSA - 303A(c)(1)(C)(ii) |
| Maintain an **information flow** on the status of the fishery… as the fishery occurs | GF FMP Objective 1 |
| Reduce **nongroundfish mortality** | GF FMP Objective 4 |
| Minimize adverse impacts on **EFH** | GF FMP - Objective 5 |
| Total catch accounting; Reduce bycatch, discard mortality, and ecological impacts | A-20 Objective 1 and 3 |
| Consider biological stock structure, not exceeding the OYABC, minimizing localized concentrations of fishing effort, and accounting for total mortality | A-20 Constraints 1, 2, 3, and 4 |
| **Net Benefits and Efficiency** | |
| Consider Efficiency | MSA - National Standard 5 |
| Contribute to **reducing capacity** | MSA - 303A(c)(1)(B) |
| Attempt to achieve the greatest net economic **benefit to the nation** | GF FMP Objective 6 |
| **Maximize the value** of the groundfish resource as a whole | GF FMP Goal 2 |
| Provide for a[n] … efficient groundfish fishery | A-20 Objective 2 |
| Promote measurable economic benefits | A-20 Objective 6 |
| **Disruption** | |
| **Accomplish change with the least disruption** of current domestic fishing practices, marketing procedures, and the environment | GF FMP Objective 14 |
| **Excessive Shares** | |
| No particular individual, corporation, or other entity [shall] acquire an **excessive share** of privileges | MSA - National Standard 4(c) |
| Address concerns over **excessive geographic or other consolidation** in the harvesting or processing sectors of the fishery | MSA - 303A(c)(5)(B)(ii) |
| Ensure that LAPP holders do not acquire an excessive share by<br>(i) establishing a **maximum share** to hold, acquire or use, and<br>(ii) establishing other measures to prevent inequitable concentration | MSA - 303A(c)(5)(D) |
| **Avoid excessive quota concentration** | A-20 Constraint 6 |
| Establish a review process to determine whether any illegal antitrust acts have occurred. | MSA - 303A(c)(1)(J) |
| **Fairness and Equity**<br>The excessive share objectives also relate to fairness and equity considerations. | |
| Allocation shall be fair and equitable to all such fishermen | MSA - National Standard 4(a) |
| Establish procedures to ensure **fair and equitable** initial allocations, including consideration of<br>(i) **current and historical** harvests;<br>(ii) **employment** in the harvesting and processing sectors;<br>(iii) **investments** in, and dependence upon, the fishery; and<br>(iv) the **current and historical participation** of fishing communities | MSA - 303A(c)(5)(A) |
| Issue privileges to persons who **substantially participate** in the fishery (as specified by the Council) | MSA - 303A(c)(5)(E) |
| Provide an administrative **appeals process** regarding initial allocation decisions | MSA - 303A(c)(1)(I) |
| Environmental Justice **Identify and address**, as appropriate, **disproportionately high and adverse** human health and environmental effects of its programs...**on minority populations and low income populations.** | EO 12898 |
| **Avoid** provisions where the primary intent is a **change in marketing power balance** between harvesting and processing sectors | A-20 Constraint 5 |
| **Sector Health** | |
| Provide for a **viable, profitable** . . . groundfish fishery | A-20 Objective 2 |
| Promote **measurable economic . . . benefits** through the seafood catching, processing, distribution elements, and support sectors of the industry | A-20 Objective 6 |
| **Maximize the value of the groundfish resource** as a whole | GF FMP Goal 2 |
| Promote **year-round marketing opportunities** and extend those opportunities as long as practicable during the fishing year | GF FMP Objective 7 |
| Avoid unnecessary **adverse impacts on small entities** | GF FMP Objective 15 |

| Guidance | Reference |
|---|---|
| **Labor: Captains, Crew, and Processing Plant Workers** | |
| Include measures to **assist… entry-level and small vessel owner-operators, captains, crew… through set-asides** of allocations… or economic assistance in the purchase of quota | MSA - 303A(c)(5)(C) |
| Promote measurable… **employment benefits** through the seafood catching, processing, distribution elements, and support sectors of the industry | A-20 Objective 6 |
| Promote the **safety of human life at sea** | MSA - National Standard 10<br>GF FMP - Objective 17 |
| **Communities** | |
| Consider importance of fishing to communities in order to provide sustained participation and to **minimize adverse impacts** | MSA - National Standard 8<br>GF FMP Objective 16<br>A-20 Objective 5 |
| Consider basic cultural and social framework of the fishery through<br>(i) the development of **policies to promote sustained participation** of… fishing communities that depend on the fisheries, including regional or port-specific landing and delivery requirement;<br>(ii) procedures to **address concerns over excessive geographic** or other **consolidation** in the harvesting or processing sectors of the fishery | MSA - 303A(c)(5)(B) |
| Include measures to **assist**, when necessary and appropriate… fishing communities through **set-asides of harvesting allocations**… or economic assistance in the purchase of quota | MSA - 303A(c)(5)(C) |
| If a program is created in which fishing communities are given a special standing (e.g., a direct allocation to qualified fishing communities), the Council is required to consider the following criteria:<br>(i) Traditional fishing or processing practices in, and dependency on, the fishery;<br>(ii) The cultural and social framework relevant to the fishery;<br>(iii) Economic barriers to access the fishery;<br>(iv) Existence and severity of projected economic and social impacts associated with implementation…;<br>(v) Expected effectiveness, transparency and equitability; and<br>(vi) Potential for improving economic conditions in remote coastal communities | MSA - 303A(c)(3)(B) |
| **Minimize** negative impacts resulting from **localized concentrations** of fishing effort (this constraint is also listed under "Conservation") | A-20 Constraint 3 |
| **Small Vessels, Small Entities, and New Entrants** | |
| Promote sustained participation of small owner-operated fishing vessels | MSA - 303A(c)(5)(B)(i) |
| Include measures to **assist**, when necessary and appropriate, entry level and small vessel owner-operators . . . through **set-asides of harvesting allocations**… or economic assistance in the purchase of quota [1] | MSA - 303A(c)(5)(C) |
| **Avoid** unnecessary **adverse impacts** on small entities | GF FMP Objective 15 |
| **Auctions and Cost Recovery** | |
| Auctions, or other **systems to collect royalties**, shall be considered for initial or any subsequent allocation | MSA - 303A(d) |
| Assess and provide a program of **fees paid by the quota holders** that will cover the costs of management, data collection and analysis, and enforcement activities | MSA - 303A(e) |
| **Program Performance Monitoring and Modification** | |
| Take into account the **management and administrative costs** of implementing and overseeing the IFQ or co-op program and complementary catch monitoring programs, and the limited state and federal resources available. | A-20 Constraint 9 |
| Regular **review and monitoring of the program** for progress in meeting the goals, 5 year formal review | MSA - 303A(c)(1)(G) |
| **Privileges may be revoked**, limited or modified at anytime. Provide for revocation | MSA - 303A(b)(2)<br>MSA - 303A(c)(1)(K) |

[1] An Assisted Purchase Program may be developed to aid in financing quota purchase by small vessel fishermen and first time purchase by entry-level fishermen (MSA - 303A(g)(1)).

## 1.5 Background

### *1.5.1* The West Coast Groundfish Fishery

Insert brief general description of the fishery and the trawl sector within.

### *1.5.2* Design and Implementation of the Trawl Rationalization Program

#### 1.5.2.1 General

A management system intended to rationalize the groundish trawl fishery was implemented in 2011. This management system uses a different catch share program for each each sector of the groundfish trawl fishery:

Shoreside Trawl Sector (non-whiting groundfish species and whiting):
- Manage with IFQs.
- Provide 90% of the initial allocation of non-whiting IFQ to holders of vessel permits; and
  - set aside 10% of the initial allocation for an adaptive management program (AMP) that may used in the future to benefit processors and communities, among others.
- Provide 80% of the initial allocation of whiting IFQ to holders of vessel permits; and
- provide 20% of the initial allocation of whiting to processors (no AMP set aside).

Mothership Trawl Sector (whiting and groundfish bycatch species):
- Manage with a harvester co-op system.
- Require that vessels declare preseason the mothership processor for which they will fish in a coming year.

Catcher Processor Sector (whiting and groundfish bycatch species):
- Create a permit endorsement to prevent expansion of the number of participants.
- License the current voluntary co-op.
- Allocate whiting and bycatch to participants in the existing voluntary co-op program.
- Provide an IFQ program if the voluntary co-op program fails (initially allocate IFQ equally among all permit holders).

This set of proposed regulatory amendments deals with the IFQ program set up for the shoreside fishery. An important part of that program was the control limits

#### 1.5.2.2 Accumulation Limits (QS Control and Vessel Use)

**National Policy Guidance on Accumulation Limits**

Excessive accumulation of the control of IFQ can result in changes in the structure of the fishing industry and communities and, in the extreme, possibly reduce net economic benefits (in the unlikely event that those accumulating QS alter total production). While some IFQ programs rely solely on antitrust law to prevent excessive concentration of shares, experience has shown this not sufficient to prevent problems resulting from excessive concentration of IFQ (NRC 1999) (pg. 209). The NRC also notes that concentration limits may not be very effective if ways can be found to circumvent them.

The following provisions of the MSA relate to the need to consider accumulation limits:

National Standard 4 of the MSA has always required the consideration of excessive shares:

> (4) Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen;
>
> (B) reasonably calculated to promote conservation; and (C) *carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privilege.* [Emphasis added]

Additionally, the reauthorized MSA requires that accumulation limits be established within a limited-access privilege program.

> (5) ALLOCATION. — In developing a LAPP to harvest fish the Council or secretary shall—
>
> (D) ensure that LAP holders do not acquire an excessive share of the total LAPs in the program by—
>
> (i) establishing a maximum share, expressed as a percentage of the total LAPs, that a LAP holder is permitted to hold, acquire, or use; and
>
> (ii) establishing any other limitations or measures necessary to prevent an inequitable concentration of LAPs.

In 2007, NMFS published guidance on the LAPP provisions of the MSA. A portion of that guidance relevant to excessive shares is reproduced here (Anderson and Holliday, 2007).

*F. Excessive Shares*

While transferability of harvesting privileges offers many potential advantages, a concentration of ownership can lead to at least two different types of problems. One is market power including monopoly (a single seller) or monopsony (a single buyer). These problems are possible in other sections of the economy as well; it is not a problem unique to LAPs. A second problem is it can lead to undesired changes in the structure of the fishing community broadly defined.

There are different types of market power problems that can follow from concentration of privileges. First, an operator may obtain a significant amount of QS that result in monopoly power in the sale of fish products to the general consumer. The search for monopoly profits will lead to an artificial reduction in output and increase in prices to the consumer. In most instances the threat of this actually occurring is quite small because the product from any one LAP program must compete with similar products from other domestic and international fisheries, including aquaculture-supplied products. Only when the LAP is for a unique fishery with a separate market niche is this likely to become a problem.

Similarly, a participant may obtain a significant amount of QS and operate as a monopsonist or monopolist in the market for quota. Such market power can reduce the actual transferability of quota and hence prevent an ownership pattern which allows for the most efficient operation of the fleet. This type of market power is more likely to occur than market power in the sale of the final product.

The second type of problem that can result from concentration of ownership has to do with the life style of fishing households and fishing communities. There can be significant philosophical support for the maintenance of a fishery composed of many diverse individuals. According to this view, even if concentration will not produce market power problems, it is something to be avoided for its own sake. This trade-off in economic returns from the fishery resource to maintain a social or community structure is a policy and prioritization question the Councils must sort through.

While there are valid reasons for considering limits on ownership, such limits have their weaknesses as well. A main purpose of using LAPs is to allow individuals to have the flexibility to obtain more quota so as to be able to use more efficient vessels, either on their own account, or in combinations with others.

Caps on ownership, or even limiting the ability to use more than a certain amount of quota on one boat (even if the shares are owned by different individuals) can be a direct barrier to such efficiencies and this can result in significant economic losses.

An important reference point for discussions of "excessive shares" is National Standard 4 (Section 301(a)(4)) [provided above]….

Excessive share is referenced again in Section 303A(c)(5)(D) that grants Councils the authority to create LAP programs. )) [provided above]….

The requirements to consider the allocation of shares to different entities, loan programs, and ways to address different types of consolidation are examples of possible management objectives that may affect what constitutes an excessive share. More to the point, there are specific instructions to develop procedures to address excessive geographic or other types of consolidation. But Councils still must determine what "excessive" means.

It is clear that market power is one thing that needs to be considered in determining what constitutes an excessive share. However, Councils are also given considerable latitude to determine the management objectives for any FMP and to choose the subsequent management measures to achieve those objectives subject to the restrictions and obligations of all 10 National Standards and other MSA requirements. National Standard 8 (Section 301(a)(8)) is of particular relevance to this discussion.

> (8) Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities by utilizing economic and social data that meet the requirements of paragraph (2), in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

Depending on the particular management objectives chosen and the ways in which the Councils decide to address the National Standards, it will be necessary to look at things other than simple market power to determine what constitutes an excessive share. However, it is useful to make a clear distinction between them because they address completely different issues, and are, for the most part, independent of each other. For purposes of discussion, this distinction will be maintained by referring to market power share and management objective share limits. An excessive share will exist if either limit is exceeded.

**History of Council Deliberation on Accumulation Limits**

Summary: The Council's deliberation on accumulation limits evolved from a policy of control limits covering both QS and QP, to one that provided separate QS control limits and QP vessel limits, and then back toward one in which QP were explicitly identified as implicating the QS control limits. This path evolved as follows. Initially control limits applied to QS and QP and limits were established for vessel usage of Q). Vessel limits were set higher than control limits to provide room under the vessel limits for QS owners (including crew members) to work together on the same vessel. This created a conflict between the control limits and the vessel limit such that a vessel could not achieve the higher vessel limit without the vessel owner violating the control limit. To resolve this, the Council decided the control limit would not apply to QS (with a general caveat that QP usage could be an indicator of QS control, depending on specific circumstance). This created separate QS control and vessel QP limits. Despite this separation the Council remained concern that the control limit policy could interfere with the industry formation of risk pools to manage overfished species and adopted a policy statement of its intent that such pools be allowed to form. Then, during the deeming process, the Council decided to specifically identify the ability to direct QP usage as an indicator of control of the underlying QS. This adjustment may have reduced the flexibility for

> fishermen to work together in a variety of ways including through the formation of risk pools. While there are no statements in the rule regarding the duration of any QP agreement that would constitute QS control, concern has now been expressed that any QP agreement lasting more than a year might imply control over the underlying QS.

Initially there were limits on the amount of QS/QP an entity could control and limits on the amount of QP that could be used on a vessel. Then the principle was established that the limits on the amounts used on a vessel would be set higher than the control limits. The purpose was to take advantage of the efficiencies that could be gained by harvesting greater amounts of QP on a single vessel while continuing to provide for greater dispersal of the benefits of QS ownership, including ensuring that there was room under vessel limits for crew members and others to use their QS/QP. For ease of tracking and to reduce administrative costs it was determined that there would be a single account on each vessel to which all QP to be used on the vessel would be transferred (as opposed to allowing a separate account for each individual fishing on a particular vessel). Thus all QP to be used on a vessel comes under control of the vessel owner. Applying control limits to QS and QP while at the same time allowing higher QP limits for vessels would establish a paradoxical situation in which a vessel could not achieve higher vessel limits without the vessel owner violating the control limits. This situation was resolved by specifying that control limits would apply to QS and vessel limits would apply to QP. It was also indicated that while QP would not necessarily count against control limits, patterns in the use of QP could be an indicator of defacto control of the underlying QS. For example, the repeated sale of the QP of one individual to another might be considered an indicator that the QP seller's QS were actually under control of the QP buyer. However, a determination of whether QS control limits were being violated would depend on the specific circumstances of the situation.

As it finalized Amendment 20, the Council was aware that it might be possible that the control limits would constrain the ability for fishermen of form risk pools to manage overfished species (see Section 1.3.2 for more information on risk pools and their potential benefits). Because of this possibility, the Council adopted the following policy statement (Table E-1, Section A-2.2.3.e, footnote aa, Appendix E of the FMP):

> It is the Council intent that control limits should not constrain the formation of risk pools to help the fishermen deal with overfished species constraints, so long as the pools do not undermine the effectiveness of the accumulation limits. A risk pool is one in which two or more people enter into an agreement whereby if one person does not have the QP the others would agree to provide the QP, if they have them. Whether these kinds of agreements are informal or formal, as other considerations and conditions are added to the agreements they may begin to constitute control. It is the Council intent to allow for these pooling agreements, so long as they do not become control.

The first draft of regulations provided during the deeming process maintained this bifurcation of individual QS control limits and vessel QP limits and covered the intent that multiyear transfers of QP might be an indicator that the underlying QS control limits with general language of what became Section 660.140(d)(4)(iii)(H): "The person has the ability through any means whatsoever to control or have a controlling influence over the entity to which QS or IBQ is registered." However, during the deeming process it was again identified that ability to direct the use of QP could be a back door way of controlling QS and the regulations on QS control were expanded in a number of locations to explicitly cover QP (see the underlined text of Section 660.140(d)(4)(iii)).

660.140(d)(4)

*Accumulation limits*—(i) *QS and IBQ control limits.* QS and IBQ control limits are accumulation limits and are the amount of QS and IBQ that a person, individually or collectively, may own or control. QS and IBQ control limits are expressed as a percentage of the Shorebased IFQ Program's allocation.
(A) *Control limits for individual species.* No person may own or control, or have a controlling influence over, by any means whatsoever an amount of QS or IBQ for any individual species that exceeds the Shorebased IFQ Program accumulation limits.
(B) *Control limit for aggregate . . .*
(C) The Shorebased IFQ Program accumulation limits are as follows: [see Table of QS Control Limits]
(ii) Ownership—individual and collective *rule.* The QS or IBQ that counts toward a person's accumulation limit will include:
(A) The QS or IBQ owned by that person, and
(B) That portion of the QS or IBQ owned by an entity in which that person has an economic or financial interest, where the person's share of interest in that entity will determine the portion of that entity's QS or IBQ that counts toward the person's limit
(iii) *Control.* Control means, but is not limited to, the following:
(A) The person has the right to direct, or does direct, in whole or in part, the business of the entity to which the QS or IBQ are registered;
(B) The person has the right to limit the actions of or replace, or does limit the actions of or replace, the chief executive officer, a majority of the board of directors, any general partner, or any person serving in a management capacity of the entity to which the QS or IBQ are registered;
(C) The person has the right to direct, or does direct, and/or the right to prevent or delay, or does prevent or delay, the transfer of QS or IBQ, or the resulting QP or IBQ pounds;
(D) The person, through loan covenants or any other means, has the right to restrict, or does restrict, and/or has a controlling influence over the day to day business activities or management policies of the entity to which the QS or IBQ are registered;
(E) The person, excluding banks and other financial institutions that rely on QS or IBQ as collateral for loans, through loan covenants or any other means, has the right to restrict, or does restrict, any activity related to QS or IBQ or QP or IBQ pounds, including, but not limited to, use of QS or IBQ, or the resulting QP or IBQ pounds, or disposition of fish harvested under the resulting QP or IBQ pounds;
(F) The person, excluding banks and other financial institutions that rely on QS or IBQ as collateral for loans, has the right to control, or does control, the management of, or to be a controlling factor in, the entity to which the QS or IBQ, or the resulting QP or IBQ pounds, are registered;
(G) The person, excluding banks and other financial institutions that rely on QS or IBQ as collateral for loans, has the right to cause or prevent, or does cause or prevent, the sale, lease or other disposition of QS or IBQ, or the resulting QP or IBQ pounds; and
(H) The person has the ability through any means whatsoever to control or have a controlling influence over the entity to which QS or IBQ is registered.

This modification to the regulations was viewed as providing less flexibility for interpretation of the specific situational circumstances in which QP commitments imply control of the underlying QS. However, this tightening of the control rule has left less room for flexibility with respect to accommodating fishermen working together to form risk pools or other cooperative arrangements. Strictly read, the regulations appear to imply that any ability to restrict the use of QP implies control of the underlying QS. This interpretation could potentially implicate any QP transfer agreement under the control limit, however, this has not been a proposed interpretation. Another interpretation might be that an agreement for the transfer of QP is considered to restrict QS only if the need to keep that agreement limits the QS holder's ability to divest itself of its QS. This interpretation might also be phrased as "any agreement committing QP for more than a single year implies control of the underlying QS." Any interpretation will be specific to the particular situational circumstances and various scenarios for multiyear and single year agreements and how those agreements might be interpreted under the control rule are provided in Section 1.5.3.

**Council Objectives and Rationale for Accumulation Limits**

The following sections, excerpted from the Amendment 20 FEIS, provide the general objectives and rationale for control limits, vessel limits, and the specific percentages chosen by the Council for these limits.

**QS Control Limits**

From Appendix A to the Amendment 20 FEIS (pages A-288 through A-289):

A limit on the amount of QS an entity would be allowed to control is proposed to address requirements of the MSA and a number of goals and objectives. Control limits could achieve the following:

- Contribute to efficiency if the control limits are set at a level that prevents the exertion of market power without constraining operation sizes to below the most efficient levels (MSA – National Standard 5, Groundfish FMP Goal 2 and Objective 7, Amendment 20 Objective 2 and 6)
- Prevent the accumulation of excessive shares (MSA – National Standard 5, 303(c)(5)(B)(ii), 303(A)(c)(5)(D), Amendment 20 Constraint 6)
- Contribute to sector health (Amendment 20, Objectives 2 and 6)
- Help to geographically disperse harvest and landings to the benefit of communities (MSA – National Standard 8, 202A(c)(5)(B); Groundfish FMP Objective 16; Amendment 20 Objective 5 and Constraint 3)
- Contribute to fairness and equity (MSA – National Standard 4(a), 3030(c)(5)(A); Amendment 20 constraint 5);

. . . .Consideration was given to relying solely on antitrust laws to address concerns about excessive shares; however, the level of aggregation required to establish the anticompetitive behaviors that are of antitrust concern may be substantially greater than the levels of aggregation that trigger concerns about fairness and equity, geographic distribution, communities, or sector health. . . .

Another question to be addressed with respect to the QS control limit is whether there should be different types of control limits for different types of entities (e.g., control limits for harvesters that are different than control limits for crewmembers, processors, or communities). In particular, processors have argued that they should have greater control limits because they handle larger volumes of product. It has also been argued the communities should have larger control limits to address the needs of their entire fleet and that harvester cooperatives should have greater limits to form risk management pools and take advantage of other benefits that may flow from the formation of harvester cooperatives.

When discussed by the TIQC, there were two reasons that setting up different control limit for different groups was rejected. First, the differential limits could be circumvented if an entity would be able to make some simple adjustments and qualify as the type of entity that has the highest accumulation limit. For example, if processor limits would be substantially higher than harvester limits, then harvesting companies might make adjustments that allow them to qualify as a processor (e.g., acquire a processing license and process a small amount of fish or take on a minority processor interest). The second reason for not having different control limit levels for different types of entities was that control limits are less of a direct impediment to operations of other entities, as compared to harvesters. Thus, there did not appear to be a need to provide higher control limits for other groups. However, the Council has expressed its intent to consider a special higher limit for CFAs to facilitate groups of QS holders working together. This would occur as part of a trailing amendment. The rationale would be that these higher limits are needed to allow certain types of group activities that advance Council goals and objectives for the fishery and which would not be possible or as effectively carried out without the higher limits.

## Vessel QP Usage Limits

From Appendix A to the Amendment 20 FEIS (page A-287):

> The vessel limit applies at the level of the production unit (as compared to the control limit, which does not directly restrict the amount of fish used on a vessel). The vessel limit would be intended to achieve the following:
>
> - Ensure that there is at least some minimum number of fishing vessels in the fleet to support more job positions and the purchase of more equipment, supplies, and support from fishing communities
> - Increase the likelihood that harvest would be geographically dispersed
> - Serve as a back up to the control limit (control limits may be difficult to monitor and enforce)
>
> The Council is balancing the need to address these objectives with the risk that restrictive vessel limits may decrease potential efficiency gains from consolidation.

## Percentages Chosen for Limits

From Appendix A to the FEIS (pages A-301 through A-302):

> . . . . the task of arriving at these preferred limits [required] a balancing the social objectives behind control and vessel limits against the economic objectives at the center of the rationalization program. In particular, the Council attempted to identify percentage limits that would be low enough to prevent excessive control and use of QS/QP, while at the same time, high enough not to interfere with the objectives of providing for improved operational flexibility for the fleet and a viable, profitable, and efficient groundfish fishery. . . .
>
> . . . . there are no analytical methods for pinpointing precise thresholds above which limits become excessive or inequitable. Rather, the process of arriving at percentage limits involved an imprecise balancing of management objectives that left much to the policy discretion of the Council.
>
> To help delineate the upper boundaries above which control and use become excessive and the lower boundaries below which limits constrained operational flexibility and efficiency, the Council and its advisory bodies considered several criteria that included the following:
>
> - The initial allocations of QS at the permit and entity level to establish the expected range of starting points in the fishery
> - Recent and past levels of vessel performance as an indication of what level of harvest vessels may need to achieve profitability
> - The minimum fleet size possible or minimum number of vessels needed to harvest the full trawl allocation for a given species of limits[2]

[2] The minimum number is calculated by dividing the percentage limit into 100 and then adding one vessel or owner for any remainder. For example, the minimum number of vessels needed to harvest a species that was subject to a vessel limit of 3 percent would be 34 (100 ÷ 3 = 33 1/3). Of course, this minimum would be achieved only if participants acquired QS/QP up to the limit. As discussed more below, the more likely result will involve a distribution of QS/QP ownership and usage where only a limited percentage of participants hold QS/QP at the highest level allowed by the accumulation limits.

- The minimum number of entities that could control all the harvest in the fishery in comparison to the number of entities that may need some quota to cover catch, including incidental catch
- The maximum amount of revenue a single entity or vessel might receive under a given set of vessel limits

From Appendix A to the Amendment 20 FEIS (pages A-310 through A-311)

> For its recommendations for non-overfished species QS control and vessel accumulation limits, the Council relied principally on the GAP recommendations for the suite of limits it used in the preferred alternative. . . . Based on the GMT analysis, the GAP recommended an aggregate nonwhiting control limit of 2.7 percent. This would accommodate a fairly high level of consolidation (down to as few as about 38 entities controlling QS) and would allow entities to control QS representing up to well over a million dollars of annual ex-vessel revenue . . . .
>
> In general, in developing its recommendations for control limits the GAP used as a starting point the maximum initial QS share allocation to permits and checked that level to ensure that in most cases the resulting control limit or vessel limit would accommodate the maximum recent share of landings taken by any single vessel in recent years . . . For many species, the GAP recommended allowing for some growth above the maximum initial allocations to facilitate the desired improvements in harvesting efficiency and in some cases to accommodate recent levels of harvest levels. However, they also went lower than the general approach in situations where a catch of a species was widely distributed along the coast and important to a number of different trawl strategies, as recommended by the GMT with respect to Petrale and sablefish. They did not want to take a chance on one entity developing excess concentration that could potentially affect the entire coast. Occasionally, in the opposite situation, they went somewhat higher when the fishery was very limited geographically. This was also in line with the GMT approach. In these situations, the effect of the concentration would be limited to a smaller geographic area, and they did not believe there was any possibility for expansion of the local fishery to other areas along the coast . . . . the Council did not adopt the GAP recommendations on overfished species [there is a separate detailed species specific rational for the limits adopted for overfished species, available in Appendix A of the final Amendment 20 EIS].

### *1.5.3* Accommodating Co-operation and Community Participation Under Control Limits

During its deliberations on the IFQ program, the Council expressed its desire to allow

- Fishermen to pool their individual QS and work together on a single vessel
- Fishermen to form risk pools to deal with overfished species constraints
- Communities to hold QS and use it for community purposes

The following are some more specific examples of each of the above categories of co-operative activities.

- Two fishermen agree that they will invest together in a vessel and commit the QP from both their QS accounts to the vessel account for a number of years.

- Fishermen join a risk pool and obligate the QP from their overfished species QS to the risk pool for a number of years (agreeing that they will not sell that QS for the duration of the agreement).
- Communities hold QS for a particular species and enter into multiyear agreements with fishermen who commit to deliver both the QP from the community-held QS and a certain amount of QP from their own holdings.

It has been suggested that in some cases the QS control limits may be too restrictive to allow these co-operative activities to occur at levels that are optimal or even effective. A conclusion that the control limits are too restrictive would result from the combined effect of the levels set for the control limits and the rules for defining what constitutes control. With respect to what constitutes control, of particular concern is whether agreements to transfer QP that do not result in the transfer of QS might still be construed as exerting control over the underlying QS. This section explores scenarios for a number of types of agreements that may be more or less likely to imply the control of QS. Regardless of general interpretations provided here, determining how control rules apply in any particular situation would be unique to the situational circumstances.

The QP transfer agreement scenarios discussed here vary based on the following parameters

- Duration of agreement
  - Single year agreement
  - Muliyear agreements
  - 1+ year agreements (more than one less than two, e.g. 14 month agreements)
- Direct QS obligation.
  - QS holdings required (parties to the agreement are required to maintain control over the QS needed to provide the QP they have obligated under the agreement).
  - QS holdings not required (there is no requirement that the parties must maintain QS, i.e., parties may acquire the QP to meet their agreement obligations from any source, including inseason purchases on the market)
- Timing of agreement
  - Future year agreement (all multiyear agreements imply future year, single year agreements may or may not involve a future year).
  - Current year agreement (instantaneous QP transfer)
- Contingency provisions
  - Obligated transfer
  - Obligated transfer contingent on circumstances

Based on these parameters, the following scenarios are constructed to illustrate some of the possible ways control rules might be implicated.

1. Single current year (QS holdings <u>not</u> required)
2. Single future year (QS holdings required)
3. Multiyear (QS holdings required, obligated transfer)
4. Multiyear (QS holdings required, contingency obligation)
5. Multiyear (QS holdings <u>not</u> required, contingency obligation)

6. 14 month (QS holdings required, obligation of QP for two QP issuance cycles)
7. 14 month (QS holdings required, obligated transfer 1st year, contingency transfer 2nd year)
8. 14 month (QS holdings <u>not</u> required, obligated transfer 1st year, contingency transfer 2nd year)

1. Single current year (QS holdings not required)

Contracts for QP transfers involving QP already issued clearly do not bind or otherwise constrain the seller's ability to dispose of the QS which gave rise to the QP sold.

If all of the following scenarios are determined to implicate the control rule, then the only way to form a risk pool would be through single year agreements executed after QP for the year are issued. Single year agreements might create some unfortunate incentives while simultaneously requiring a devotion of more time and resources toward annual negotiations over risk pooling terms than would be necessary with multiyear agreements. Such incentives may become detrimental to a risk pool arrangement, as illustrated by the following example.

> *One identified incentive concerns the prospect of a fisherman incurring an inadvertent catch event of constraining species toward the end of the year which exceeds the amount of quota left available in the pool for that year. Under this situation that fishermen is required to "tie up" until that deficit is covered and assume the consequences imposed upon vessels in a deficit condition that are specified in NOAA regulations and enforced by the NOAA Office of Law Enforcement. This occurs in spite of the fact that this vessel may have been operating under compliance with terms specified by a risk pool agreement. If that risk pool agreement is required to expire at the end of the calendar year, that vessel would independently carry that deficit through to the next year. In that subsequent year, that vessel is a liability to any risk pooling effort due to its deficit condition, making it unlikely that the vessel will be accepted within any pooling arrangement. Instead, the vessel is forced to the open market to compete individually for quota in order to clear its deficit, negating the reasons for entering a pool in the first place. This prospect begins to set up "Olympic fishing conditions" within the risk pool as members have an incentive to fish before the quota available to the pool becomes exhausted. Alternatively, if a risk pooling arrangement can span more than one year, the reissuance of QP to pool members in the following year can be used to cover the deficit incurred by that vessel in the prior year, thus upholding the arrangement pool members have constructed, and retaining the incentives for forming such an arrangement.*

In addition to the incentives created in the above example, the prospect of negotiating risk pool terms each year means devoting time and resources toward annual negotiations rather than devoting time and resources toward refining, improving, and building upon an established agreement.

2. Single future year (QS holdings required)

   This scenario covers contracts for the transfer of QP for a single year entered into before the QP for a year has been issued and when the contract requires the seller to hold the underlying QS necessary to provide the contracted QP. This is a single year scenario which prevents the transfer of QS until QP are issued, effectively giving the QP buyer some authority over the QS. If such a contract implies control of QS, the agreement terms pertaining to the associated QS would strongly influence the control determination, separate from the issue of the duration of the issuance cycles covered by the QP contract. Even though this scenario does not implicate the control rule, it would still not resolve the problem for risk pools identified in the first scenario.

3. Mulityear (QS holdings required, obligated transfer)

   In this situation, parties to an agreement would be obligated to transfer QP each year to other parties to that agreement andto maintain the QS needed to meet that obligation. Examples of this type of agreement might be:

   - A CFA agrees to provide QP to a particular entity for a number of years in return for that entity's multiyear commitment to remain in the community.
   - A risk pool requires that all participants transfer their overfished species QP to a central account.

   Even though no central entity takes control of the QS because transfer of the QS is restricted over a multiyear period, this type of agreement would appear likely to implicate QS control (i.e., the community's QS might be considered to be controlled by the entity receiving the QP, and the central risk pool account might be considered to control all the QS of the risk pool members).

   Related to this example might be an agreement in which a vessel makes a multiyear commitment to land in a port using a specific amount of its own QP in return for matching QP provided by the CFA. This agreement would not involve the direct transfer of QP to the CFA, but the control over delivery location provided to the CFA might be considered to be control of the QS under 660.140(d)(4)(E). In this case, the vessels' QS might be counted against the CFA control limit.

4. Mulityear (QS holdings required, contingent transfer)

   This agreement might be a form that some risk pools might take. The difference between this and the previous scenario is the contingent nature of the transfer. For example,

- A number of QS holders agree to cover one another's shortfalls of overfished species QP, but maintain ownership of those QP until needed for their own landings of that of others.

Under this scenario, the QP are not transferred to a central entity which might then be construed to control the underlying QS. Nor is it certain that in any particular year the QP will be transferred outside the control of a QS/QP owner. However, the restriction on transfer of the QS and the terms under which the QP may be transferred appear to implicate the control limits under Section 660.140(d)(4)(C).

There might be less of a chance that this agreement (or the example described in the third scenario) would be considered control if there were some form of an escape clause, allowing the parties to terminate their participation in the agreement and retain control of their own QS, depending on the severity and nature of penalties involved with exercise of the escape clause, among other factors.

Also, the total duration of the multi-year agreement might affect whether or not it is perceived as exerting control over the QS. For example, an agreement obligating QS for two years might be viewed as less of a threat to the original objectives for establishing control limits than an agreement obligating QS for five or ten years.

Agreements that prohibit parties from selling or trading the QS used to provide QP obligated under the agreement might be desirable and contribute to the success and efficiency of such agreements. An agreement's prohibition against QS transfers provides more certainty that the parties will be able to meet their QP obligations than if the agreement allowed parties to sell their QS and rely on purchasing QP each year to meet their obligations (as will be discussed in the fifth scenario).

5. Multiyear (QS holdings not required, obligation)

This scenario is distinguished from the third scenario in that the source of the QP used to meet the obligation is not specified. Under such an agreement, parties to the agreement would be free to divest themselves of their QS and meet QP obligations by acquiring QP on the market after the QP for the year have been issued.

- A risk pool might form obligating each member to provide a certain amount of QP without regard to the QS source for those QP.
- A CFA might enter into agreements to provide QP to those making multiyear commitments of matching QP without regard to the QS source for those QP.
- Two fishermen might enter into an agreement to each provide QP for the operation of a single vessel without regard to the QS source for those QP.

On the one hand, this might be viewed as not involving the control of particular QS and so not implicate the control rule. On the other hand, depending on circumstances such an agreement might still extend the amount of QS a particular party effectively controls.

For example, suppose a QS holder obligates 10 years of QP; the and the QS holder's financial conditions, QP market conditions, and/or the contractual penalties for non-performance are such that sale of the obligor's QS was not a reasonable option; then the entity to which the QP is obligated might more likely be considered to control the obligor's QS.

Those involved in developing risk pool agreements have been talking about the need to obligate QP for at least one subsequent year (i.e. two year agreements). As discussed above, not requiring parties to the agreement to hold the requisite QS has its risks. However, if it were determined that the control rule is not necessarily implicated when agreements do not require the obligators to maintain QS, then the need for an exception for risk pool agreements might be reduced.

6. 14 month (QS holdings required, obligation of QP for two QP issuance cycles)

   A 14 month agreement requiring that QS be held and obligated to the agreement for two issuance cycles would not differ substantially from a multiyear agreement covering two years. In either case after the second year QP are issued, the QS holders would likely be able to transfer their QS without violating the agreement.

7. 14 month (QS holdings required, obligated transfer 1st year, contingency transfer 2nd year)

   If the QP issued for the second year is only obligated to meet uncovered deficits incurred by parties to the agreement in the previous year, and no more than that, then the degree of implied control over QS might be considered less than would be the case in the fourth scenario. For example, assume that a 14 month risk pool agreement covers from January 1, 2011 through Feb 29, 2012, and that in December of 2011 one party to the agreement incurs a deficit which the other parties to the agreement are unable to cover because all of the 2011 QP obligated under the agreement have already been used. If the agreement requires all parties to make their QP issued for 2012 available to cover any remaining deficits carried by members from the 2011 fishery, and beyond that does not in any other way obligate the parties' use of their 2012 QP or constrain their transfer of QS in 2012, then it might be considered that there is a lesser degree of control of the QS than would occur under a two-year agreement in which all the QP from both years are fully obligated under the agreement.

8. 14 month (QS holdings not required, obligated transfer 1st year, contingency transfer 2nd year)

   This scenario is similar to the previous one except that the party to the contract is never required to hold the QS needed to meet its obligations under the contract. As discussed above, not requiring parties to the agreement to hold the requisite QS has risks for all parties to the agreement. Because the parties are free to transfer the QS and because in the second year QP are obligated to cover needs of the parties based on activities during the first year of the agreement, this approach might generate the lowest likelihood of

implicating control limits (other than the first scenario) while still providing risk pools the ability to bridge their agreements across multiple years.

### *1.5.4* Special Types of Participants in the IFQ Program

In this action, special exceptions to control limits are being considered for CFAs and risk pools. One of the concerns expressed by Council members has been that many groups might have special needs that warrant consideration of an exception from some aspect of the program and that there be consideration of why certain types of need might warrant an exception more than others. This section provides information on how CFAs and risk pools may differ from a typical IFQ program participant (e.g. vessel owners operating using their own QS) but does not attempt to speculate on the cases that other types of entities might make for special exceptions. At this time, no other entities have approached the Council for such special consideration. For both CFAs and risk pools the need for an exception is based on the special type of service provided by the entity and a stated need to control amounts of QS in excess of control limits in order to effectively meet that need.

#### 1.5.4.1 CFAs

CFAs are community based organization that would hold QS for the purpose of maintaining fishing activities in a local community. CFAs could potentially counteract the tendency for individuals owning QS to sell based primarily on their own benefit, i.e., to the highest bidder even if that bidder is outside the local community. In making their decision to sell, QS sellers are not likely to take into account the many other benefits that landings bring to a particular community. For example, QS may flow to a low cost/high revenue port even if the fish landed in that port are immediately trucked out of the community to a centralized processing facility elsewhere. Such movement of QS would generate lower benefits than one in which more of the resulting economic activity stayed in the local fishing community. Thus CFAs are different from other types of entities in that they would be required to take into account the broader interests of the community.

The QS control limits were designed to support two trawl vessels operating full time in the groundfish fishery. CFAs may need access to more QS than other entities because of their need to support activities within the community in aggregate, rather than those activities of individual entities within the community. The degree of their need for greater amounts of QS depends on their effectiveness in using the QS they acquire to leverage commitments of greater amounts of QS in the community. Processors/buyers are another entity that might desire to have security over amounts of QS in excess of the QS control limits.

An exception for communities may be found in line with MSA National Standard, which requires the Council to take into account the importance of fisheries in providing for sustained participation by communities and to minimize adverse impacts.

#### 1.5.4.2 Risk Pools

Risk pools are a type of overfished species management arrangement developed by the fishing industry. The purpose of these voluntary arrangements is to collectively manage the catch of overfished species so as to maximize the economic potential of the fishery. In this context, "maximum economic potential" addresses the points of allowing for the maximum amount of target species harvest given the allowable catch levels, while minimizing the risks individuals face to their business operations when engaging in fishing strategies that may encounter overfished species. Certain types of arrangements being contemplated would specify terms and conditions spanning multiple years

Several forms of policy guidance are relevant to the concept of risk pools. These include FMP goals established by the PFMC, statutes contained within the Magnuson-Stevens FCMA, and the National Standard Guidelines developed by NOAA. Several aspects of policy guidance speak to relevant concepts which include:

- Achieving optimum yield on a continuing basis (National Standard Guideline (NSG) 1 of the MSA, AM 20 goals and objectives),
- Preventing overfishing (NSG1 and MSA),
- Promoting individual economic stability (AM 20 Goal)
- Achieving full utilization of the trawl sector allocation (AM 20 Goal)
- Ensuring that LAPP holders do not acquire an excessive share (MSA)

Each of these pieces of policy guidance is relevant to the concept of risk pools. The risk pooling structure being contemplated within this amendment process would enable certain types of voluntary fishery management activities intended to reduce the probability of encountering overfished species and react to those encounters should they occur. If an overfished species catch event did occur, the implications – and cost – would be spread among members of the pool, thereby reducing the risks to individuals.

# CHAPTER 2 DESCRIPTION OF THE ALTERNATIVES

## 2.1 Issue: Safe Harbor for Community Fishing Associations

### *2.1.1* Council Decisional Authority and Community Stability Plan Requirements

The Council requested analysis of the pros and cons of including a community stability plan in the CFA provisions. At this time, a community stability plan requirement, labeled as such, has not been included. The Council has a choice as to whether to designate CFAs under

(a) the general authority provided by the MSA (as described in the NMFS limited access privilege program guidelines, or
(b) the Fishing Community provisions of the MSA (Section 303A(c)(3).

The availability of this choice is identified in the NMFS LAP guidelines:

> In summary, the revised MSA sets up procedures which allows Councils to create FCs [fishing communities] or RFAs [regional fishing associations] using a specific set of eligibility criteria and a second set of considerations for developing participation criteria. Once formed, both can hold LAPs if they meet the legally recognized criteria, however only FCs can receive LAPs in an initial allocation**. Apparently, Councils can also develop LAP programs whereby LAPs can be held by or allocated to any other legally recognized entity, which do not necessarily have to be specified as RFAs or FCs.** The program would have to comply with the general LAP mandates contained in the revised MSA. If community-based entities are used, **Councils have the option of requiring operation plans to ensure stated criteria are met. (NMFS, 2007, p. 42)**

If the Council chooses to designate fishing communities under the provisions of Section 303A(c)(3), then a community stability plan would be required. At this time NMFS has not provided specific guidance on the requirements such plans would have to meet. Additionally, if

submitted under 303A(c)(3), other parts of that section would apply, such as a requirement that "The Secretary shall deny or revoke limited access privileges granted under this section for any person who fails to comply with the requirements of the community sustainability plan."

> **MSA 303A(c)(3)** FISHING COMMUNITIES.—
> (A) IN GENERAL.—
> (i) ELIGIBILITY.—To be eligible to participate in a limited access privilege program to harvest fish, a fishing community shall—
> (I) be located within the management area of the relevant Council;
> (II) meet criteria developed by the relevant Council, approved by the Secretary, and published in the Federal Register;
> (III) consist of residents who conduct commercial or recreational fishing, processing, or fishery-dependent support businesses within the Council's management area; and
> (IV) develop and submit a community sustainability plan to the Council and the Secretary that demonstrates how the plan will address the social and economic development needs of coastal communities, including those that have not historically had the resources to participate in the fishery, for approval based on criteria developed by the Council that have been approved by the Secretary and published in the Federal Register.
> (ii) FAILURE TO COMPLY WITH PLAN.—The Secretary shall deny or revoke limited access privileges granted under this section for any person who fails to comply with the requirements of the community sustainability plan. Any limited access privileges denied or revoked under this section may be reallocated to other eligible members of the fishing community.
>
> (B) PARTICIPATION CRITERIA.—In developing participation criteria for eligible communities under this paragraph, a Council shall consider—
> (i) traditional fishing or processing practices in, and dependence on, the fishery;
> (ii) the cultural and social framework relevant to the fishery;
> (iii) economic barriers to access to fishery;
> (iv) the existence and severity of projected economic and social impacts associated with implementation of limited access privilege programs on harvesters, captains, crew, processors, and other businesses substantially dependent upon the fishery in the region or subregion;
> (v) the expected effectiveness, operational transparency, and equitability of the community sustainability plan; and
> (vi) the potential for improving economic conditions in remote coastal communities lacking resources to participate in harvesting or processing activities in the fishery.

If the Council chooses not to submit the CFA provisions for approval under 303A(c) (3) then it has a choice of whether or not to require a community stability plan. Rather than considering whether to require such a plan, the Council may wish to simply determine what documents and reports a CFA should be required to submit in order to meet the Council's intent for CFAs and the general standards and criteria of the MSA, and then decide what label to apply to those requirements (Section 2.0 of the CFA alternative). Section 2.0 of the CFA Alternative 1 mentions that a CFA would have to submit charter agreements and harvesting agreements that have certain required provisions related to goals and objectives for the CFA. If these provisions are adopted, the Council might want to determine whether or not these provisions constitute a community stability plan.

At present there are few specific requirements for the community stability plan and there appear to be no particular benefits for setting up the CFA under the MSA provisions related to Fishing Communities (303A(c)(3)). If the Council chooses not to establish a CFA under 303A(c)(3) and in the future Congress creates advantages for CFAs established under 303A(c)(3), the Council's FMP might have to be amended in order to allow west coast CFAs to take advantage of the new benefits.

### *2.1.2* Alternatives: QS Control Limit Safe Harbors for CFAs

Entities are able to form community fishing associations (CFAs) for a variety of purposes without Council action. Prior to its finalization of Amendment 20, the Council scoped the possibility of creating special provisions for such associations. The main issues were

(1) what, if any, special privileges should be provided to CFAs, and
(2) what criteria would CFA have to meet in order to be designated as a CFA that qualifies for such privileges?

The special privilege that is under consideration for this action is a safe harbor exception from quota share (QS) control limits. In general, the CFAs of concern in this issue are associations that acquire QS/QP and distribute QP for delivery within the geographic community that the CFA represents. If the Council recommends a safe harbor exception for CFAs, there could be two types of CFAs participating in the trawl shoreside IFQ program:

General CFAs: community based organizations that participate in common with other program participants (i.e. receive no special privileges). Since they receive no special privileges there is no need to develop definitions and criteria to identify general CFAs as distinct from any other participant in the program.

Designated CFAs: A designated CFA would be defined by virtue of its having met certain criteria and therefore qualifying for a special privilege (a safe harbor exception from control limits). The special privileges may also come with special responsibilities.

While qualifying for an exception, it is likely that the exception provided designated CFAs would not be a complete exception, i.e. designated-CFAs would still be held to control limits, but some or all of those control limits would be higher than those which apply to other program participants. Thus the CFA safe harbor options entail consideration of two issues corresponding to the main questions the Council considered when it first took up this issue:

(1) the level of the control limit that will apply to designated CFAs, and
(2) the criteria an organization must meet to qualify as a designated CFA.

A key decision in developing the options is the authority under which the CFA provisions will be created.

**No Action Alternative (Status Quo)** – General CFAs. General CFAs would operate within the regulatory parameters common to all other participants. Such CFAs would need to meet the same criteria for owning QS as all other participants and be subject to the same control limits.

**Status Quo FMP Appendix E Language**

The Council policy language on eligibility to own, from Appendix E of the FMP, Table D-1, Section A-2.2.3-a, is as follows.

No person can acquire quota shares or quota pounds other than 1) a United States citizen, 2) a permanent resident alien, or 3) a corporation, partnership, or other entity established under the laws of the United States or any State, that is eligible to own and control a U.S. fishing vessel with a fishery endorsement pursuant to 46 USC 12113 (general fishery endorsement requirements and 75 percent citizenship requirement for entities).

The Council policy language on control rules, from Appendix E of the FMP, Table D-1, Section A-2.2.3-e, is as follows.

> **QS Control Limit:** A person, individually or collectively, may not control QS in excess of the specified limit (because there is no the grandfather clause). QS controlled by a person shall include those registered to that person, plus those controlled by other entities in which the person has a direct or indirect ownership interest, as well as shares that the person controls through other means. [aa/] The calculation of QS controlled by a person will follow the "individual and collective" rule.
>
> > Individual and Collective Rule: The QS that counts toward a person's accumulation limit will include 1) the QS or QP owned by them, and 2) a portion of the QS owned by any entity in which that person has an interest. The person's share of interest in that entity will determine the portion of that entity's QS that counts toward the person's limit. [bb/]
> >
> > aa/ It is the Council intent that control limits should not constrain the formation of **risk pools** to help the fishermen deal with overfished species constraints, so long as the pools do not undermine the effectiveness of the accumulation limits. A risk pool is one in which two or more people enter into an agreement whereby if one person does not have the QP the others would agree to provide the QP, if they have them. Whether these kinds of agreements are informal or formal, as other considerations and conditions are added to the agreements they may begin to constitute control. It is the Council intent to allow for these pooling agreements, so long as they do not become control.
> >
> > bb/ For example, if a person has a 50 percent ownership interest in that entity, then 50 percent of the QS owned by that entity will count against the individual's accumulation limit unless it is otherwise determined that have effective control of a greater or lesser amount.

**Status Quo control rule implementing regulations.**

> **660.140(d)(2)** ***Eligibility and registration —***
> (i) *Eligibility*. Only the following persons are eligible to own QS permits:
> (A) A United States citizen, that is eligible to own and control a U.S. fishing vessel with a fishery endorsement pursuant to 46 U.S.C. 12113 (general fishery endorsement requirements and 75 percent citizenship requirement for entities);

(B) A permanent resident alien, that is eligible to own and control a U.S. fishing vessel with a fishery endorsement pursuant to 46 U.S.C. 12113 (general fishery endorsement requirements and 75 percent citizenship requirement for entities); or

(C) A corporation, partnership, or other entity established under the laws of the United States or any State, that is eligible to own and control a U.S. fishing vessel with a fishery endorsement pursuant to 46 U.S.C. 12113 (general fishery endorsement requirements and 75 percent citizenship requirement for entities). However, there is an exception for any entity that owns a mothership that participated in the west coast groundfish fishery during the allocation period and is eligible to own or control that U.S. fishing vessel with a fishery endorsement pursuant to sections 203(g) and 213(g) of the AFA.

**660.140(d)(4)** ***Accumulation limits—***

(i) *QS and IBQ control limits.* QS and IBQ control limits are accumulation limits and are the amount of QS and IBQ that a person, individually or collectively, may own or control. QS and IBQ control limits are expressed as a percentage of the Shorebased IFQ Program's allocation.

(A) *Control limits for individual species.* No person may own or control, or have a controlling influence over, by any means whatsoever an amount of QS or IBQ for any individual species that exceeds the Shorebased IFQ Program accumulation limits.

(B) *Control limit for aggregate . .* [description of calculation of aggregate nonwhiting QS control limit].

(C) The Shorebased IFQ Program accumulation limits are as follows: [see table of QS Control Limits (**Table 2-1**)]

(ii) Ownership—individual and collective *rule.* The QS or IBQ that counts toward a person's accumulation limit will include:

(A) The QS or IBQ owned by that person, and

(B) That portion of the QS or IBQ owned by an entity in which that person has an economic or financial interest, where the person's share of interest in that entity will determine the portion of that entity's QS or IBQ that counts toward the person's limit.

(iii) *Control.* Control means, but is not limited to, the following:

(A) The person has the right to direct, or does direct, in whole or in part, the business of the entity to which the QS or IBQ are registered;

(B) The person has the right to limit the actions of or replace, or does limit the actions of or replace, the chief executive officer, a majority of the board of directors, any general partner, or any person serving in a management capacity of the entity to which the QS or IBQ are registered;

(C) The person has the right to direct, or does direct, and/or the right to prevent or delay, or does prevent or delay, the transfer of QS or IBQ, or the resulting QP or IBQ pounds;

(D) The person, through loan covenants or any other means, has the right to restrict, or does restrict, and/or has a controlling influence over the day to

day business activities or management policies of the entity to which the QS or IBQ are registered;

(E) The person, excluding banks and other financial institutions that rely on QS or IBQ as collateral for loans, through loan covenants or any other means, has the right to restrict, or does restrict, any activity related to QS or IBQ or QP or IBQ pounds, including, but not limited to, use of QS or IBQ, or the resulting QP or IBQ pounds, or disposition of fish harvested under the resulting QP or IBQ pounds;

(F) The person, excluding banks and other financial institutions that rely on QS or IBQ as collateral for loans, has the right to control, or does control, the management of, or to be a controlling factor in, the entity to which the QS or IBQ, or the resulting QP or IBQ pounds, are registered;

(G) The person, excluding banks and other financial institutions that rely on QS or IBQ as collateral for loans, has the right to cause or prevent, or does cause or prevent, the sale, lease or other disposition of QS or IBQ, or the resulting QP or IBQ pounds; and

(H) The person has the ability through any means whatsoever to control or have a controlling influence over the entity to which QS or IBQ is registered.

**Alternative 1**: CFAs applying for and meeting specific criteria (Designated CFAs) would be recognized for special privileges. Designated CFAs would operate under the rules that apply to all other participants, but would be eligible for higher QS control limits. This alternative is outlined as follows and fully described in Table 2-1.

**Special Privilege.** Section 1.0 describes the special privileges to be granted to designated CFAs. The following are the options within this section.

**1.0 CFA Special Privileges**

**Option a:** For designated CFAs quota share control limits for some or all QS species categories are 1.5 times the current accumulation limits.

**Option b:** For designated CFAs quota share control limits for some or all QS species categories are 2.0 times the current accumulation limits

**Option c:** 1.5 times the current accumulation for all regions and species except as follows: 60% for sablefish south of 36° 0'N Latitude, and shortspine thornyheads south of 34°27' N Latitude. (In April, the Council requested a geographically specific alternative. This option is based on one from the public record from the spring of 2009 and fall of 2010).

**Designated CFA Qualifying Criteria and Other Elements.** Sections 2.0 through 4.0 collectively describe what an organization must do to qualify as a designated CFA and maintain that qualification. The following is a general outline of these sections. Specific options are provided in each section (or to be developed).

**2.0 CFA Agreements and Activities**

2.1 Organizational Agreements (CFA Charter Agreement)

2.1.1 Local Government Approval

2.1.2 CFA Geographic Affiliations

2.1.3 CFA Organization

2.1.4 Control of CFA

2.2 Harvest and Harvest Agreements

**3.0 CFA Reporting Requirements**

**4.0 CFA Approval and Renewal**

**Additional Possible Provisions:** Based on April 2009 deliberation, the Council may want to consider adding some of the following to the provisions and options on CFAs

- Consider limiting CFAs eligibility to organizations in primary groundfish communities which are vulnerable or become vulnerable through the trawl rationalization program.
- Consider providing CFAs an exception to the transfer moratorium
  - **Option a:** CFAs are entitled to acquire QS from any entity with QS in excess of control limits during the QS trading moratorium.
  - **Option b:** No exception to the moratorium would be provided for CFAs.
- Expand goals. Currently the CFA alternative requires that CFAs only address one of the goals listed Section 2.1.1. The following was included for consideration as a community stability plan requirement in the April 2009 briefing materials:

  Description of how the CFA will contribute to the social, economic development, and conservation and monitoring needs of the fishery locally, including the needs of entry-level and small vessel owner-operators, captains, and crew. The description shall include anticipated efforts to address the following as necessary to maintain the characteristic of the community or support its economic development:
  - sustaining effort by trawl and other groundfish fisheries;
  - maintaining crew, processing and seasonal employment opportunities;
  - maintaining local processing activity;
  - meeting local community and municipality needs;
  - investing in local infrastructure; and
  - addressing potential adverse impacts on the nontrawl sector.
- Explicitly identify that the "new entry" goal of Section 2.1.1 may apply to processors/receivers as well as entry-level and small owner-operators, captains and crew.
- Identify types of entities that must, may, and may not be included among CFA members. For example,
  - exclude/don't exclude membership by those who will directly benefit from the distribution of CFA QS/QP either their direct involvement in harvesting or fish buying and processing entities.
- Consider provisions for CFA beneficiaries (those receiving QP)
  - Limited to CFA members (also see previous bullet)
  - May include non-members
  - Must allow non-members an opportunity to receive and deliver QP on the same terms as members.
- Require that CFAs provide
  - a management structure organization chart and operating procedures including roles and responsibilities of members of the association, staff, and contractor and dispute resolution processes.
  - A list of members and their involvement/interest in the fishery.

- § Consider requiring a provision in the articles of incorporation and/or bylaws specifying rules for the removal of officers and conditions under which the CFA can be dissolved.
- § Require that CFAs provide statements explaining how
  - · QS will be held and procedures and criteria that will be used to distribute QP each year.
  - · QS will be sold or held if the CFA is dissolved or has new officers.
  - · Disputes will be resolved.
- § Require that CFAs or their members maintain and disclose information necessary to determine compliance with control limits.
- § Limit the amount of control any single member would exert
  - ¨ How might control of the CFA be determined?

Table 2-1: Aggregate control and vessel use limits under the trawl rationalization program (expressed as a proportion of species-specific trawl sector allocations).

| Species Category | Vessel Limit (Applies to all QP in a Vessel Account, Used and Unused) | Vessel Unused QP Limit** | QS Control Lim |
|---|---|---|---|
| Non-whiting Groundfish Species | 3.20% | | 2.70% |
| Lingcod - coastwide | 3.80% | | 2.50% |
| Pacific Cod | 20.00% | | 12.00% |
| Pacific whiting (shoreside) | 15.00% | | 10.00% |
| Pacific whiting (mothership) | 30.00% | | 20.00% |
| Sablefish | | | |
| N. of 36° (Monterey north)e | 4.50% | | 3.00% |
| S. of 36° (Conception area) | 15.00% | | 10.00% |
| PACIFIC OCEAN PERCH | 6.00% | 4.00% | 4.00% |
| WIDOW ROCKFISH * | 8.50% | 5.10% | 5.10% |
| CANARY ROCKFISH | 10.00% | 4.40% | 4.40% |
| Chilipepper Rockfish | 15.00% | | 10.00% |
| BOCACCIO | 15.40% | 13.20% | 13.20% |
| Splitnose Rockfish | 15.00% | | 10.00% |
| Yellowtail Rockfish | 7.50% | | 5.00% |
| Shortspine Thornyhead | | | |
| N. of 34°27' | 9.00% | | 6.00% |
| S. of 34°27' | 9.00% | | 6.00% |
| Longspine Thornyhead | | | |
| N. of 34°27' | 9.00% | | 6.00% |
| COWCOD | 17.70% | 17.70% | 17.70% |
| DARKBLOTCHED | 6.80% | 4.50% | 4.50% |
| YELLOWEYE | 11.40% | 5.70% | 5.70% |
| Minor Rockfish North | | | |
| Shelf Species | 7.50% | | 5.00% |
| Slope Species | 7.50% | | 5.00% |
| Minor Rockfish South | | | |
| Shelf Species | 13.50% | | 9.00% |
| Slope Species | 9.00% | | 6.00% |
| Dover sole | 3.90% | | 2.60% |
| English Sole | 7.50% | | 5.00% |
| Petrale Sole | 4.50% | | 3.00% |
| Arrowtooth Flounder | 20.00% | | 10.00% |
| Starry Flounder | 20.00% | | 10.00% |
| Other Flatfish | 15.00% | | 10.00% |
| Pacific Halibut | 14.40% | 5.40% | 5.4% |

* If widow rockfish is rebuilt before initial allocation of QS, the vessel limit will be set at 1.5 times the control limit.

** A limit on the amount of unused QP that may be in a vessel account at any one time.

Table 2-2. Elements and options for CFA safe harbor control limits.

| | | *Options from November 2010* |
|---|---|---|
| 1.0 CFA Special Privileges | | |
| | Exception to control limit. | **Option a:** For designated CFAs quota share control limits for some or all QS species categories are 1.5 times the current accumulation limits.<br>**Option b:** For designated CFAs quota share control limits for some or all QS species categories are 2.0 times the current accumulation limits<br>**Option c:** 1.5 times the current accumulation for all regions and species except as follows: 60% for sablefish south of 36° 0'N Latitude, and shortspine thornyheads south of 34°27' N Latitude. (In April, the Council requested a geographically specific alternative. This option is based on one from the public record from the spring of 2009 and fall of 2010).<br>**Considered but rejected:** increase the control caps only for overfished species. |
| 2.0 CFA Agreements and Activities | CFAs will be required to have organizational (charter) agreements and harvesting agreements that meet certain standards. If the Council decides to recognize CFAs under the MSA fishing community provisions, these agreements could form the basis of the "Sustainability Plans" required under Section 303A(c)(3) | |
| 2.1 Organizational Agreements (CFA Charter Agreement): | | |
| 2.1.1 - Goals and Objectives | Include a goal of furthering the groundfish FMP and include enforceable performance standards. | *Possible Objectives:*<br>a. Community stability<br>b. Facilitate new entry.<br>c. Stabilize business environment (e.g. require landings be made locally).<br>d. Enhance value (e.g. require particular fishing and delivery methods)<br>e. Harvest Sustainability.<br>*i.* Minimize bycatch<br>*ii.* Participate in activities intended to successfully manage bycatch on a fishery-wide scale (research, risk pool participation, etc).<br>*iii.* Minimize adverse fishing gear impacts on habitat<br>*iv.* Enhance stock productivity (e.g. area management or measures to protect age structure). |

| | | | *Options from November 2010* |
|---|---|---|---|
| 2.1.2 - CFA Geographic Affiliations | Organizational agreements should include a description of the CFA boundaries.. | | Consider whether a confidentiality waiver might be possible and warranted to reduce reporting and monitoring challenges for small geographic areas. |
| | Local government approval | | Local government letter designates the CFA eligible to apply for that area (Which governments are authorized for a particular area? Should a local government be allowed to endorse more than one entity? Should a CFA be required to receive an endorsement from every jurisdiction it proposes to cover?) |
| | CFA Boundaries | | |
| | | Geographic exclusiveness | Overlaps Allowed (i.e. more than one CFA in an area)<br>No Overlap Allowed |
| | | Minimum geographic area. | |
| | | Maximum geographic area. | Can one CFA cover many ports? If multiple ports are allowed: Is ther ea limit on the number? Do they have to be contiguous? Should there be a limit on the distance covered by a single CFA? |
| 2.1.3 - CFA Organization | | | |
| Type of Legal Organization | CFAs might be organized as corporations, trusts, etc. | | Options<br>a. Require that local government serves as the CFA entity.<br>b. Require organization as a non-profit corporation, 501(c)(4) social welfare organization.<br>c. Allow CFAs to be organized as another type of entity, Suboptions<br>i. controlled only by fishermen<br>ii. controlled by fishermen or others. |
| Control of CFA | Board of directors | | The local municipality must (options):<br>a. Appoint the board<br>b. Endorse an independently formed board via the endorsement of the CFA. |
| | | A minimum number of board members. | At least 5 |
| | | Limit vessel owner and processor participation on board. | *Some Options Suggested in Public Comment*<br>Not mutually exclusive.<br>a. No more than 20% vessel owners or their representatives.<br>b. Alternatively, ensure that fishermen have the lead in CFAs.<br>c. No more than 20% processors or their reps. |
| | | Other | Must be community members (residents?). |

| | | *Options from November 2010* |
|---|---|---|
| 2.2 Harvest and Harvest Agreements | Conditions which must be in the agreements between the CFA and those harvesting CFA QP. | Each of the following may be adopted (not mutually exclusive)<br>a. Prohibit/allow CFAs from harvesting their own QP (does this mean individual members of the CFA or the CFA entity itself?).<br>b. Require that CFAs contract with co-operatives organized under the Fishermen's Collective Marketing Act.<br>c. Require that individual entities comprising the FCMA coop not receive QP from the CFA that is in excess of the vessel QP accumulation limit.<br>d. Include measures (performance standards) needed for CFAs to meet charter objectives and meet reporting requirements (examples: fishing methods, area and gear restrictions, fishing handling practices, local landing requirements).<br>e. Require participation in fishery-wide efforts for successfully managing overfished species catch |
| 3.0 CFA Reporting Requirements | | |
| | Timing and content. | Require biennial reports to document compliance, progress on goals, and facilitate fishery policy evaluation.[a]<br><br>Self-certified compliance: Require annual or biennial affidavit of compliance. |
| 4.0 CFA Approval and Renewal | | |
| Initial Application | Required elements of the Initial Application: | a. The CFA agreement and bylaws.<br>b. Proposed Harvesting Agreements<br>c. Endorsement letters from local municipalities (if required).<br>d. A statement<br>i. Describing the CFA area including infrastructure and the community sectors that would benefit.<br>ii. Explaining how agreements meet criteria.<br>iii. Demonstrating the need for the exception, including supporting data and/pr reports. |
| | Initial approval | NMFS would review and approve applications and CFA agreements. Review and approval standard; i.e., insure required documents are submitted, and that required elements are reflected in the documents, but NMFS does not undertake substantive review for adequacy of elements relative to Council goal compliance. |
| Ongoing Monitoring | | NMFS and PFMC receive required reports and reviews for goal compliance. PFMC initiates program modifications as necessary to insure PFMC goals are met |

| | | *Options from November 2010* |
|---|---|---|
| Renewal | Periodic renewal. | For CFAs for which an application for renewal has been submitted, the CFA will remain in place until action is taken to approve or deny<br>CFA agreements must be resubmitted for approval every.<br>Option 1. Two years.<br>Option 2. Five years (coinciding with program review cycle). |
| | Renewal on modification | Resubmit for approval with modification of agreement or change in board of director membership. |

[a] Items required for the biennial report might include

- Total amount of quota share and quota poundage, by species, held or harvested on behalf of the CFA by year.
- Economic impacts of CFA activities on the community including ex-vessel revenue, location of processing, and distribution of economic activity generated as a result of CFA regulations and harvester/processor activities.
- Social impacts on the community, such as documentation of new entry, creation of local fishermen's cooperatives, or other non-market social effects attributed or related to CFA existence.
- Harvest volume including bycatch and discard quantities by year and month.
- Spatial footprint of fishing effort, including documentation of particular habitat areas that are of interest and measures taken in response to the identification of those areas.
- Other measures taken to enhance sustainability or modify the activities of the harvesting cooperative.

## 2.2 Issue: QS Control Limit Safe Harbor for Risk Pools

### *2.2.1* Duration of Agreements Committing QP

Section 1.5.3 provides a number of scenarios for different types of single and multiyear agreements for the transfer of QP and discusses how these agreements might or might not implicate QS control rules.

At its April 2010 meeting, the Council asked for exploration of an alternative that would explicitly allow risk pool agreements that extended for a period of time more than a year but less than two years. In response two new types of alternatives are provided. One (Alternative 2) that would exempt risk pools from any interpretation of the regulations which would bind them from entering into agreements obligating QS for more than one year (as evidenced by QP commitments). The second (Alternative 3) would provide such an exception to all participants, eliminating the need for criteria to designate risk pools. A number of suboptions are provided in Alternative 3, the first of these is intended to address a problem which may or may not exist under current regulations:

> A strict interpretation of the current regulatory language might be read to imply that any obligation to transfer QP from specific QS to a buyer prior to the issuance of that QP places a constraint on the transfer of the QS. Such agreements might therefore be viewed as indicating that the QP buyer has some short term control over the QP seller's QS, implicating the control rule. Given that NMFS is not likely to issue QP many days prior to the start of a particular fishing year, if this interpretation is reasonable, the current regulations might be read to potentially implicate the QS control rule in all QP agreement made prior to the start of a particular fishing year.

### *2.2.2* Alternatives: QS Control Limit Safe Harbors for Risk Pools

**No Action Alternative (Status Quo):** While the QS control rule is intended to restrict control over QS, and not control of QP, the regulations implementing the QS control rule reference the control of QP as a possible indicator of control of the underlying QS. See the no action alternative for CFAs for a complete description of the policy and regulations pertaining to control rules. Reproduced here is the specific section of the Council FMP Appendix E pertaining to risk pools (Table D-1, Section A-2.2.3-e, footnote aa/).

> It is the Council intent that control limits should not constrain the formation of **risk pools** to help the fishermen deal with overfished species constraints, so long as the pools do not undermine the effectiveness of the accumulation limits. A risk pool is one in which two or more people enter into an agreement whereby if one person does not have the QP the others would agree to provide the QP, if they have them. Whether these kinds of agreements are informal or formal, as other considerations and conditions are added to the agreements they may begin to constitute control. It is the Council intent to allow for these pooling agreements, so long as they do not become control.

**Alternative 1: Risk Pool Exception (no limit on control or duration of risk pool agreement)**

| Exception, Element, or Criteria | Description |
|---|---|
| Risk Pool Definition | · A risk pool is an entity developed to manage "risk pool species" which are limited to . . .<br>**Option A:** Overfished species and Pacific halibut QS<br>**Option B:** Overfished species<br>for a group of QS owners and limited entry trawl vessels. To be a risk pool for the purposes of qualifying for a safe harbor from control limits, the risk pool must meet all the terms and conditions of all of the criteria contained in this option.<br>· The below references to risk pools pertain to only those risk pools that wish to be provided an exception from QS control limits. |
| Accumulation Limits | · Risk pool agreements which govern use of quota by members are not held to an ~~accumulation limit~~ QS control limit.<br>· Each of the individuals making up the risk pool structure, or operating under the risk pool structure, are held to ~~accumulation limits~~ QS control limits individually |
| Eligible members | · Risk pools are composed of limited entry trawl licensed vessel owners and quota share owners, or their representatives (such as an association). Risk pool members may include (but are not limited to) independent harvesters, processors which own vessels, or quota share holders which neither process nor harvest.<br>· Entities which do not own trawl permitted vessels or quota share may not participate in risk pool activities, including negotiations over governance structures, unless they are acting on behalf of a vessel owner(s) or quota share holder(s). |
| Agents | · Risk pools may hire agents to enact and enforce the provisions of the risk pooling arrangement. These arrangements may include: monitoring vessel performance and enforcing the terms of any agreed-upon reward/penalty structure, or dictating harvesting activity with the intention of reducing bycatch.<br>· Risk pools may also form an entity which self-monitors and self-enforces the agreement rather than using a third party.<br>· **Option:** Risk pools will be entitled to designate an agent for whom NMFS will provide a QP account to which QP governed by the risk pool agreement may be transferred. |
| Duration of arrangement | · Risk pools may forge agreements dictating the use and transferability requirement of quota pounds held by members which extend beyond a single year. The duration of those arrangements is not limited by regulation, but is the subject of private negotiation. |

| Exception, Element, or Criteria | Description |
|---|---|
| Application, Oversight, Enforcement, and Monitoring | · **Option A:** Risk pools are able to form and function without direct acceptance of their formation agreement by NMFS and without a requirement that they submit performance reports to an oversight body such as the Council or NMFS. However, risk pool contracts must be made available to NMFS or state agencies upon request.<br>· **Option B:** Risk pools are able to function only after review and acceptance of their formation agreement and related contracts by NMFS. Annual performance reports must be submitted to NMFS and provided to the Council. As a condition for receiving the privilege of forming a risk pool, the risk pool and its members agree to make public the identities of those entities participating in the risk pool and all information pertaining to the amounts of QS and QP controlled and harvested under the terms of the risk pool agreement (but not the exvessel value of such product), regardless of confidentiality protections that might otherwise restrict the release of such information.<br>· All options: Contractual terms which violate standards subject all participants in the risk pool to the possibility of an enforcement action due to joint and several liability which applies to any such agreement. |
| Limited Scope of Agreement | · Risk pools which exceed specified ~~accumulation limits~~ QS control limits may only be set up to manage risk of risk pool species catch events. This includes active and reactive risk management terms such as: Risk pool species quota pound sharing rules, harvest activity management (which may include provisions such as tie up provisions, area closures, or gear restrictions), and financial rewards and penalties over bycatch performance.<br>**Option A:** Risk pools may not include provisions which dictate delivery terms for harvested groundfish.<br>**Option B:** Do not include language of Option A. |
| Risk Pool Agreement | · Any risk pool contract must include standards and requirements consistent with the elements, exceptions, and criteria above. Such agreements must be signed by risk pool members and those members (names of any person or corporation) must be clearly identifiable next to the signature. |

**Alternative 2: Modified Duration for Risk Pools.** For any entity qualifying as a risk pool, any risk pool agreement of less than the duration (see suboptions) will not be held to a QS control limit by virtue of the duration of the agreement alone.

**Suboption A:** 14 months
**Suboption B:** 24 months

The provisions for qualifying as a risk pool would be the same as Alternative 1.

**Alternative 3: Blanket Modified Duration** Blanket Control Rule Specification. Make an explicit modification of the control rule regulatory language applying to all entities:

Allow contracts for QP commitments prior to the time of QP issuance and tied to specific QS (i.e. contracts under which the QP seller is required to maintain under its control the QS

necessary to meet the QP obligated in the contract) but limit the duration of such commitments as per one of the below suboptions.

*Blanket modifications could potentially eliminate the need for and costs associated with developing criteria and an application/registration process for risk pools. Below each suboption in is discussed primarily in terms of the needs of risk pools however, it should be noted that* ***these suboptions would apply to all entities.***

**Suboption A:** QP commitments may not be made more than 12 months in advance of QP issuance.

*This option would explicitly allow a practice that may already be occurring (QP transfer commitments made prior to the issuance of the QP). It would also facilitate pre-season negotiations and commitments of QP to risk pool and other types of arrangements. It would not take care of the concern that a risk pool member could be stranded at the end of the year if it incurs a deficit and the risk pool QP for the year is exhausted. It would also not facilitate multiyear risk pool agreements (it has been pointed out that insurance pools tend to operate more effectively over a longer duration).*

**Suboption B:** QP commitments may not be made more than 14 months in advance of QP issuance.

*This option would explicitly allow the commitment of QP for two QP issuance cycles and might meet the needs of those advocating for additional flexibility for risk pools: It would allow risk pools to cover a member's deficit from the first year of an agreement with QP from a following year (such use of QP from a following year is already allowed under the IFQ program); and it might allow agreements that covered two years (QP for the second year of the agreement would have to be transferred to an entity that holds the QP for the risk pool* ***and it would have to be determined that such a disposition of the QP does not constitute a continuation of control****). For risk pools there is a chance that it would be determined that the agreement does in fact extend control over the QP for a full second year and therefore implicate the control rule. However, for non-risk pool agreements this might not be the case (e.g. the case of a clean transfer, one in which all terms of a contract are completed with the QP transfer and the QP recipient does not have then have an ongoing reciprocal obligation to the entity providing the QP).*

**Suboption C:** Same as Suboption B but also require that all QP obligated under such an agreement may only be used to cover landings for a single fishing year.

*This option is more restrictive than Suboption B but may still meet some of the needs identified by risk pool organizers. It would allow agreements to be structured to cover an individual who has an overage at a time when the risk pools QP has already been exhausted. However, the QP covered by the agreement could not used by a QP recipient to cover fishing occurring in the following year. Therefore, this option would likely be only used to cover deficit contingencies.*

**Suboption D:** Same as Suboption C but extend the commitment duration to 26 months.

*This would allow the risk pool to extend for two years and would allow agreements to be structured to avoid stranding a member that incurs a deficit at the end of the second year.*

## 2.3 CFA/Risk Pool Differences and Interactions

### *2.3.1* Differences Between CFAs and Risk Pools

The following graphic provides a comparison proposed control limit exceptions for CFA and risk pools.

**Table 2-3.** Differences between CFAs and risk pools.

| CFAs | Risk Pools |
|---|---|
| Exception for all species | Exception for overfished species & halibut |
| A control limit would still apply | Proposal is for no control limit |
| A central entity (CFA) would hold the QS (hence the need for an exception) | No central entity would hold the QS. Multiyear agreement committing the annually issued QP from particular QS triggers concern about need for an exception. |

### *2.3.2* Dual participation in CFAs and Risk Pools

CFAs are likely to specify some specific delivery terms in the agreements by which they provide QP to vessels (e.g. the port to which the delivery must be made. Under the risk pool exception there is an option which would prohibit a risk pool from dictating the terms of delivery. If CFAs provide target species QP, CFAs may well want to require that the vessels to which they provide that QP join risk pools. The question is, would this then create a conflict between the CFA and risk pool provisions?

If a CFA provides only target species QP and required the QP recipients to join an overfished species risk pool, the CFA QP recipient's target species QP would not be covered by the risk pool agreement and there would not be an explicit conflict. The CFA might also provide both overfished and target species QP to a vessel but not restrict the landing area for the overfished species QP. Because its target species would be restricted the vessel would still make its landings in the port, but the overfished species QP would be in the risk pool. While giving up the geographic commitment of the overfished species QP, the CFA would still potentially benefit from its de facto participation in the risk pool via the vessel which is committed to land locally (i.e. to the degree that a vessel committed to a CFA benefits from its participation in the risk pool the CFA would benefit from the risk pool without being a risk pool participant or constraining the use of any overfished species QP it might provide).

# CHAPTER 3 AFFECTED ENVIRONMENT

TO BE AUGMENTED WITH BASELINE INFORMATION.

# CHAPTER 4 IMPACTS ON THE AFFECTED ENVIRONMENT

In this section the direct and indirect of the actions being considered under each issue will be addressed separately. Within the section on each issue, there will also be a discussion of cumulative impacts. Although CEQ regulations reference the need for a cumulative impact analysis to consider "past, present, and reasonably foreseeable future actions," from an analytical standpoint what is of interest is the net effect on baseline conditions prior to the action proposed under each issue and any ongoing effects of these actions because they continue to exist programmatically.

## **4.1** Issue: Safe Harbor for Community Fishing Associations

### ***4.1.1*** Direct and Indirect Impacts to the Physical Environment, Including Habitat and Ecosystem

No change in impacts expected. This section to be elaborated.

### ***4.1.2*** Direct and Indirect Impacts to the Biological Environment

**Groundfish, Including Overfished Species**
No change in impacts expected. This section to be elaborated.

**ESA Listed Salmon**
No change in impacts expected. This section to be elaborated.

**Other Protected Species**
No change in impacts expected. This section to be elaborated.

**Other Fish Resources**
No change in impacts expected. This section to be elaborated.

### ***4.1.3*** Direct and Indirect Impacts to the Socioeconomic Environment

#### 4.1.3.1 Fishery Impacts

To be developed further based on analysis in Appendix A, B and C.

#### 4.1.3.2 Impacts on Communities

To be developed further based on analysis in Appendix A, B and C.

#### 4.1.3.3 Impacts on Agencies and Public Decision Processes

Main issue is likely to be the degree of burden imposed on agencies and the Council process to designate and monitor CFAs. Section 1.0 Option c (individualized exceptions to CFA control limits is likely to be most burdensome and will require the development of criteria to guide evaluation of individual applications).

To be developed further based on analysis in Appendix A, B and C.

### **4.2** Issue: Control Rule Safe Harbor for Risk Pools

### ***4.2.1*** Direct and Indirect Impacts to the Physical Environment, Including Habitat and Ecosystem

No change in impacts expected. This section to be elaborated.

### ***4.2.2*** Direct and Indirect Impacts to the Biological Environment

**Groundfish, Including Overfished Species**
No change in impacts expected. This section to be elaborated.

**ESA Listed Salmon**
No change in impacts expected. This section to be elaborated.

**Other Protected Species**
No change in impacts expected. This section to be elaborated.

**Other Fish Resources**
No change in impacts expected. This section to be elaborated.

### ***4.2.3*** Direct and Indirect Impacts to the Socioeconomic Environment

#### 4.2.3.1 Fishery Impacts

#### 4.2.3.2 Impacts on Communities

#### 4.2.3.3 Impacts on Agencies and Public Decision Processes

Main issue is likely to be the degree of burden imposed on agencies and the Council process to designate and monitor risk pools.

# Appendix A. CFA ALTERNATIVE 1, SPECIAL PRIVILEGE EXCEPTION

NOTE: Text that has changed since the previous version of this document (April 2011 Council meeting) is highlighted with shading. The titles for tables and figures with changes are similarly highlighted. Numbers highlighted within tables have not changed (unless the table title is also highlighted). The values are highlighted to allow the reader to rapidly locate the most relevant numbers.

# Table of Contents

**A.1 Executive Summary ..... 4**
*A.1.1* Introduction ..... 4
*A.1.2* Methods ..... 4
*A.1.3* Finding and Conclusions ..... 5
*A.1.4* Specific Questions asked by the Council Regarding the Level of the Exception for CFAs. 7
**A.2 Introduction ..... 9**
**A.3 Methods for Analysis of Special Privileges (Level of Exception) ..... 10**
**A.4 Results ..... 16**
*A.4.1* Analysis of Vessel Distribution and Revenues. ..... 16
*A.4.2* Analysis of Special Privilege Options (Level of Exception) ..... 20
**A.5 Findings and Conclusions ..... 37**
*A.5.1* General ..... 37
*A.5.2* Specific Questions asked by the Council Regarding the Level of the Exception for CFAs. 38
**A.6 Literature Cited ..... 39**
**A.7 Attachments ..... 40**

## Appendix A, Executive Summary

Table ES- 1. Ratios of landings to control limits, by port and target species based on average and maximum landings during 1996-1998. ..... 6
Table ES- 2. Ratios of landings to control limits, by port and target species based on average and maximum landings during 2004-2010. ..... 6

## Appendix A, Main Text

Table A- 1 Non-whiting trawl control limit caps in mts and lbs for 2011.[a/] ..... 10
Table A- 2. Abbreviations for landing port names used and not used in the analysis, including annual average non-whiting groundfish pounds landed by limited entry trawl vessels, 2004-2010 a/ ..... 12
Table A- 3. Observed bycatch ratios of overfished groundfish during 2003-2006 by management area, depth category and species. All values are expressed in terms of mt of overfished species per 100 mt of target groundfish species. ..... 15
Table A- 4 Number of vessels landing in 1, 2, 3, 4, 5 or 6 ports during 2008 by vessels' primary port of landing. a/ ..... 16
Table A- 5. Number of vessels landing in 1, 2, 3, 4, 5 or 6 ports during 2009 by vessels' primary port of landing. a/ ..... 17
Table A- 6. Number of vessels landing in 1, 2, 3, 4, 5 or 6 ports during 2010 by vessels' primary port of landing. a/ ..... 17
Table A- 7. Average non-whiting groundfish revenues per trawler by primary port and year, 2008-2010 1/ ..... 19

Table A- 8. Number of control limits landed by port and target species based on average and maximum landings during 1996-1998 including species landing indices. ..... 20
Table A- 9 Number of control limits landed by port and target species based on average and maximum landings during 2004-2010 including species landing indices. ..... 21
Table A- 10. Distribution of hypothetical account pounds by port and species or species group that would meet the non-whiting groundfish control limit and stay within species limits. Based on 2004-2010 port landing proportions and 2011 species limits. Highlighted values show species limits that were met or exceeded. ..... 26
Table A- 11. Non-whiting trawl groundfish dependence metrics and county ratings: 2008 data ..... 28
Table A- 12. Summary of fishery engagement, groundfish fishery dependence, economic resiliency rating, groundfish vulnerability rating, and non-whiting trawl fishery rationalization advantage score by county for 2008. ..... 31
Table A- 13. Comparative advantage of non-whiting trawl communities under trawl rationalization (Source: PFMC 2010). ..... 34
Table A- 14 Maximum potential groundfish target species landings in mt by management area, depth fished based on overfished species bycatch ratios (Table A- 3). ..... 35

**Appendix A, Attachment**

Table AT- 1. Number of control limit-equivalent landings for BLL by period and species. ..... 40
Table AT- 2. Number of control limit-equivalent landings for NEA by period and species. ..... 40
Table AT- 3. Number of control limit-equivalent landings for WPT by period and species. ..... 41
Table AT- 4. Number of control limit-equivalent landings for AST by period and species. ..... 41
Table AT- 5. Number of control limit-equivalent landings for NEW by period and species. ..... 42
Table AT- 6. Number of control limit-equivalent landings for COS by period and species. ..... 42
Table AT- 7. Number of control limit-equivalent landings for BRK by period and species. ..... 43
Table AT- 8. Number of control limit-equivalent landings for CRS by period and species. ..... 43
Table AT- 9. Number of control limit-equivalent landings for ERK by period and species. ..... 44
Table AT- 10. Number of control limit-equivalent landings for BRG by period and species. ..... 44
Table AT- 11. Number of control limit-equivalent landings for BDG by period and species. ..... 45
Table AT- 12. Number of control limit-equivalent landings for SF by period and species. ..... 45
Table AT- 13. Number of control limit-equivalent landings for PRN by period and species. ..... 46
Table AT- 14. Number of control limit-equivalent landings for MOS by period and species. ..... 46
Table AT- 15. Number of control limit-equivalent landings for MNT by period and species. ..... 47
Table AT- 16. Number of control limit-equivalent landings for MRO by period and species. ..... 47

**List of Figures**

Figure A- 1. Number of non-whiting groundfish trawlers by primary landing port, 2008-2010 ..... 18
Figure A- 2. Average annual revenues of non-whiting groundfish LE trawl vessels by primary port and year. Ports with less than 3 vessels show $0. ..... 19
Figure A- 3. Average and maximum landings in terms of QS control limit equivalents by port and target species, 1996-1998. ..... 22
Figure A- 4. Average and maximum landings in terms of QS control limit equivalents by port and target species, 2004-2010. ..... 23
Figure A- 5. Distribution of hypothetical account pounds by port and species or species group that would meet the non-whiting groundfish control limit and stay within species limits. ..... 27
Figure A- 6. Maximum potential groundfish target species landings based on overfished groundfish species bycatch ratios (Table A-3) by management area and depth fished (SeaW=>115 fm; ShoreW=<115fm). ..... 36

# Appendix A – CFA Components Analysis: Special Privilege Exception

## A.1 Executive Summary

### *A.1.1* Introduction

**NOTE: Text that has changed since the previous version of this document (April 2011 Council meeting) is highlighted with shading. The titles for figures and tables with changes are similarly highlighted. Numbers highlighted within tables have not changed (unless the table title is also highlighted). The values are highlighted to allow the reader to rapidly locate the most relevant numbers.**

The limited entry shoreside non-whiting groundfish trawl fishery (the fishery) is expected to consolidate to about half the number of vessels (40-50) currently active in the fishery (100-120), assuming that after consolidation all vessels remaining operate in the fishery on a full time basis. Some ports are expected to gain landings and some ports will lose landings in response to this process. The Council is considering an exception to current control limits for Designated Community Fishery Associations (CFAs), ones that meet specified qualification criteria, which are addressed in Appendix B. The analysis here is limited to the two control cap special privilege options contained in Alternative 1: (a) 1.5 times increase in control limits, and (b) 2.0 times increase in control. Fishery background information is presented on (1) primary trawl landing ports (ports in which at least one trawl vessel made a majority of its trawl landings) and revenues for fishery vessels in study years, and (2) the amount of control rule exception that ports would need in order to accommodate past fishery landings. Data are presented on the dependence of coastal counties on the non-whiting trawl fishery and the economic vulnerability of counties that are dependent on ocean fishing and/or the non-whiting trawl fishery. Overfished species bycatch ratios are used to estimate maximum potential groundfish species landings by management area and depth fished. Responses to Council questions regarding CFA special privilege exception from its November 2010 meeting are included as the last report section.

### *A.1.2* Methods

The PacFIN data base was the source of data used in the report. The target species in the analysis included the DTS complex (sablefish, Dover sole and both thornyhead species), English sole and other flatfish. The years used in the analysis were 1996-98 (pre-Rockfish Conservation Area, RCA, years) and 2004-2010 (Post RCA years). The ports used in the analysis were those that had at least one trawler using that port as its primary landing port (where most pounds were delivered) in any year during 2008-2010. The 13 ports not included in the analysis, but that had some level of non-whiting trawl groundfish landings, generally had landings during 2004-2010 that averaged less the 100,000 pounds of non-whiting groundfish.

Vessel landings data during 2008-2010 were compiled to show primary landing port for single vessels, frequency of vessels landing at multiple ports, and average fishery revenues by primary landing port.

Port-specific fishery landings data for the study years were expressed as QS control limit equivalents (control limits) to show the number of control limits that a Designated CFA would need to acquire to accommodate past fishery landings. The species and species group allocations that were expected to be

implemented for the 2011 season (not the ones that were actually used to start the year) were used to convert control limits from QS to QP in order to make comparisons with historic landings in each port for the study years.

A hypothetical QS account was constructed for each port based on past fishery landings for that port but constrained by species and species group control limits with the aim of exactly meeting the aggregate groundfish QS limit of 2.7%, excluding overfished rockfish species but including petrale sole.

Landings data for 2008 were analyzed to derive metrics of the dependence of coastal counties on the non-whiting trawl fishery. Those metrics included: 1) proportion of all commercial fishing vessels that made landings in the area that were non-whiting trawl fishery vessels, 2) proportion of commercial fishing vessel revenues received in the area accrued to the non-whiting trawl fishery, 3) number of non-whiting trawl fishery buyers in the area and 4) each county's proportion of total coatwide non-whiting trawl fishery revenues. Fishery dependency and county resiliency assessments were used to assess the vulnerability of coastal counties to disruption in general fishery and non-whiting trawl fishery activities.

Overfished species bycatch ratio data were analyzed to estimate the theoretical maximum target species landings that could be achieved in each management area. A range of maximum potential target species landings was estimated for each management area using the overfished species bycatch rates that would allow the greatest and least target species landings potential in the area (constraining species).

### *A.1.3* Finding and Conclusions

- Port of landings data showed that between 105 and 120 vessels were active in the fishery during 2008-2010, and that 79% to 80% of deliveries for single vessels were made to their primary landing ports. The primary ports for the majority of vessels (54% to 57% depending on year) were the Oregon ports of Astoria, Newport and Coos Bay (18-28 vessels per port per year). There was a secondary center of activity at the port of Eureka, CA (10 or 11 vessels). The other ports supported between one and seven vessels each except for 2010 when two ports had no vessels using that port as their primary landing port (Neah Bay, WA and Morro Bay, CA).
- Coastwide vessel revenues ranged from an average of about $223 thousand to an average of about $259 thousand per year during 2008-2010. The highest average annual vessel revenues were for the ports of Fort Bragg and Eureka ($318,565 and $337,706, respectively); Princeton (Half Moon Bay) had the lowest average ($42,682).
- In 5 ports which served as a primary port for a least one trawl vessel (Neah Bay, Bodega Bay, Princeton, Moss Landing, and Monterey) the single year maximum landings for no target species exceeded 1.0 control limits during either study period (1996-1998 or 2004-2010) (Table ES- 1 and Table ES- 2).
- The other 11 ports (Bellingham, Westport, Astoria, Newport, Coos Bay, Brookings, Crescent City, Eureka, Fort Bragg, San Francisco and Morro Bay) all had at least one year (the port's maximum year) in which landings for a given target species were >1.25 control limits (Table ES- 1 and Table ES- 2). Most of these same ports exceeded two control limits for at least one target species.
- Using average data rather than maximums of the single year landings data showed fewer ports with landings exceeding 1.25 control limits at some time. Period averages were lower than maximums by about 22% and 37% for 1996-1998 and 2004-2010 data, respectively.

**Table ES- 1. Ratios of landings to control limits, by port and target species based on average and maximum landings during 1996-1998.**

| | Sablefish | | Dover sole | | Shortspine TH | | Longspine TH | | English sole | | Other flatfish | | Aggregate gf | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max |
| BLL | 0.84 | 1.02 | 0.38 | 0.45 | 0.26 | 0.29 | 0.40 | 0.54 | 0.02 | 0.03 | 0.02 | 0.03 | 0.84 | 0.91 |
| NEA | 0.70 | 0.97 | 0.20 | 0.26 | 0.16 | 0.21 | 0.12 | 0.22 | 0.11 | 0.17 | 0.06 | 0.12 | 0.52 | 0.68 |
| WPT | 1.64 | 2.28 | 0.54 | 0.79 | 0.56 | 0.85 | 0.86 | 1.54 | 0.10 | 0.15 | 0.08 | 0.12 | 1.08 | 1.57 |
| AST | 7.54 | 9.71 | 2.94 | 3.62 | 2.38 | 2.93 | 4.84 | 6.35 | 0.21 | 0.26 | 0.37 | 0.44 | 4.04 | 4.76 |
| NEW | 5.22 | 6.21 | 1.06 | 1.16 | 1.38 | 1.44 | 1.97 | 2.75 | 0.09 | 0.11 | 0.16 | 0.22 | 2.23 | 2.81 |
| COS | 6.56 | 8.27 | 2.33 | 2.47 | 2.32 | 2.70 | 4.90 | 6.18 | 0.16 | 0.19 | 0.58 | 0.69 | 2.43 | 2.61 |
| BRK | 2.13 | 2.49 | 0.62 | 0.64 | 0.69 | 0.77 | 1.62 | 2.31 | 0.03 | 0.07 | 0.06 | 0.08 | 0.60 | 0.67 |
| CRS | 4.01 | 4.86 | 0.94 | 1.13 | 1.19 | 1.30 | 2.90 | 3.47 | 0.10 | 0.15 | 0.29 | 0.36 | 1.04 | 1.09 |
| ERK | 2.91 | 4.05 | 1.03 | 1.26 | 0.94 | 1.04 | 2.27 | 3.45 | 0.04 | 0.05 | 0.17 | 0.28 | 0.96 | 1.26 |
| BRG | 3.36 | 4.17 | 1.57 | 1.94 | 1.32 | 1.46 | 2.63 | 3.46 | 0.09 | 0.12 | 0.21 | 0.29 | 1.47 | 1.85 |
| BDG | 0.76 | 0.79 | 0.63 | 0.94 | 0.36 | 0.49 | 0.69 | 0.86 | 0.04 | 0.06 | 0.05 | 0.06 | 0.51 | 0.60 |
| SF | 0.92 | 1.34 | 0.62 | 0.92 | 0.44 | 0.59 | 0.86 | 1.42 | 0.10 | 0.14 | 0.21 | 0.31 | 0.83 | 1.19 |
| PRN | 0.58 | 0.75 | 0.30 | 0.47 | 0.13 | 0.18 | 0.19 | 0.25 | 0.05 | 0.07 | 0.68 | 0.97 | 0.41 | 0.51 |
| MOS | 0.45 | 0.55 | 0.40 | 0.56 | 0.33 | 0.40 | 0.66 | 0.71 | 0.01 | 0.01 | 0.11 | 0.15 | 0.31 | 0.38 |
| MNT | 0.54 | 0.75 | 0.33 | 0.50 | 0.24 | 0.30 | 0.51 | 0.68 | 0.07 | 0.08 | 0.35 | 0.53 | 0.60 | 0.81 |
| MRO | 2.10 | 2.60 | 1.19 | 1.60 | 0.96 | 1.13 | 1.44 | 1.79 | 0.00 | 0.01 | 0.13 | 0.18 | 0.71 | 0.90 |
| IDX | 2.52 | | 0.94 | | 0.85 | | 1.68 | | 0.08 | | 0.22 | | 1.16 | |

**Table ES- 2. Ratios of landings to control limits, by port and target species based on average and maximum landings during 2004-2010.**

| | Sablefish | | Dover sole | | Shortspine TH | | Longspine TH | | English sole | | Other flatfish | | Aggregate gf | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max |
| BLL | 1.11 | 1.51 | 0.60 | 0.85 | 0.21 | 0.31 | 0.03 | 0.06 | 0.03 | 0.09 | 0.02 | 0.03 | 0.53 | 0.73 |
| NEA | 0.17 | 0.53 | 0.03 | 0.08 | 0.01 | 0.03 | 0.00 | 0.01 | 0.04 | 0.10 | 0.03 | 0.08 | 0.09 | 0.27 |
| WPT | 0.63 | 1.63 | 0.44 | 0.87 | 0.16 | 0.53 | 0.08 | 0.32 | 0.02 | 0.03 | 0.04 | 0.06 | 0.35 | 0.68 |
| AST | 8.33 | 10.47 | 4.33 | 5.77 | 2.82 | 5.03 | 0.94 | 2.13 | 0.21 | 0.37 | 0.77 | 1.28 | 3.12 | 3.92 |
| NEW | 6.62 | 8.24 | 1.74 | 2.81 | 2.12 | 3.63 | 0.64 | 1.49 | 0.03 | 0.06 | 0.10 | 0.14 | 1.12 | 1.70 |
| COS | 5.10 | 5.71 | 2.41 | 3.19 | 1.31 | 1.79 | 1.36 | 2.11 | 0.07 | 0.12 | 0.34 | 0.43 | 1.36 | 1.64 |
| BRK | 2.10 | 2.73 | 0.95 | 1.41 | 0.45 | 0.66 | 0.52 | 0.90 | 0.01 | 0.02 | 0.10 | 0.14 | 0.46 | 0.62 |
| CRS | 1.01 | 1.66 | 0.53 | 1.02 | 0.24 | 0.64 | 0.30 | 0.74 | 0.02 | 0.05 | 0.15 | 0.31 | 0.30 | 0.47 |
| ERK | 3.85 | 4.46 | 2.00 | 2.74 | 1.07 | 1.40 | 1.76 | 2.44 | 0.10 | 0.20 | 0.21 | 0.29 | 1.09 | 1.37 |
| BRG | 2.92 | 3.86 | 1.05 | 1.25 | 0.88 | 1.34 | 1.29 | 1.86 | 0.01 | 0.03 | 0.07 | 0.13 | 0.67 | 0.80 |
| BDG | 0.03 | 0.12 | 0.01 | 0.03 | 0.01 | 0.02 | 0.01 | 0.02 | 0.00 | 0.01 | 0.00 | 0.01 | 0.02 | 0.05 |
| SF | 1.00 | 1.47 | 0.43 | 0.59 | 0.27 | 0.38 | 0.39 | 0.81 | 0.01 | 0.01 | 0.07 | 0.13 | 0.28 | 0.39 |
| PRN | 0.03 | 0.06 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.02 | 0.03 | 0.18 | 0.37 | 0.09 | 0.14 |
| MOS | 0.55 | 0.99 | 0.15 | 0.40 | 0.27 | 0.40 | 0.34 | 0.48 | 0.00 | 0.01 | 0.04 | 0.10 | 0.13 | 0.25 |
| MNT | 0.10 | 0.17 | 0.03 | 0.14 | 0.02 | 0.05 | 0.03 | 0.07 | 0.01 | 0.02 | 0.04 | 0.12 | 0.06 | 0.08 |
| MRO | 0.38 | 1.06 | 0.07 | 0.22 | 0.12 | 0.32 | 0.12 | 0.47 | 0.01 | 0.03 | 0.02 | 0.07 | 0.08 | 0.21 |
| IDX | 2.12 | | 0.92 | | 0.62 | | 0.49 | | 0.04 | | 0.14 | | 0.61 | |

- Landings declined for all target species except Dover sole (2% difference) between the two study periods (based on landing indices) (Table ES- 1 and Table ES- 2). The amount of decline ranged from 16% (sablefish) to 81% (longspine thornyhead). This trend resulted in fewer ports (9 in 1996-1998 versus 6 in 2004-2010) with landings of a target species ≥2.0 control limits. The same number of ports (10) had landings target species ≥1.5 the control limits in both periods, but the list of ports was different.
- The aggregate groundfish control limit analysis showed that it would be possible for each hypothetical QS holder to accrue about 4.5 million pounds of fish based on 2011 trawl allocations depending on the mix of species they desire to have in their account
- The dependency analysis showed that 15 coastal counties of WA, OR and CA received non-whiting trawl fishery revenues totalling $31.8 million, which represented 12% of all commercial fishery revenues for coastal counties. The analysis used 2008 data to comport with US Census Bureau

economic data used in the vulnerability analysis. The major non-whiting trawl fishery counties included Clatsop County, OR (27.7%), Lincoln County, OR (14.7%), Coos County, OR (14.6%) and Humboldt County, CA (12.5%). These same counties were given a High non-whiting trawl fishery dependency rating.

- The vulnerability analysis listed the following counties as vulnerable or most vulnerable based on assessments of general fishery dependency, non-whiting trawl fishery dependency and county resiliency: Grays Harbor County, WA; Tillamook County, OR; Lincoln County, OR; Coos County, OR; Del Norte County, CA, Humboldt County, CA; and Mendocino County, CA. They were rated vulnerable because of high fishery dependency and low resiliency to economic disruption.
- Data for primary non-whiting trawl fishery ports showed that none of the counties listed as vulnerable in the vulnerability assessment are among those assessed as likely to be negatively affected by the trawl rationalization program.
- If the Council determines it desirable for a CFA to control all of the QS needed to accommodate historic landings in a particular port, for some ports species combinations an exception to the control limits would be needed. The ports with very high landings included Astoria, Newport, Coos Bay, Eureka and Fort Bragg. For some other ports no exception to the limits may be necessary such as Neah Bay, Bodega Bay, Princeton, Moss Landing, and Monterey. The remaining ports (Bellingham, Westport, Brookings, Crescent City, San Francisco and Morro Bay) were somewhere in between in terms of having levels of historic landings higher than recent control limits, depending on the species or species group and years used in the analysis.
- If a CFA is provided a higher limit for target species then landing that limit will require that the CFA or vessels acquire the overfished species QP needed to with that target species, potentially increasing the amount of overfished species QS demanded for the area of the coast in which the CFA operates. Overfished species bycatch ratios (from 2003-2006 WCGOP at sea observations) were used to calculate theoretical maximum target species landings by PFMC area for fishing constrained to waters >115 fm ("seaward") and <115 fm ("shoreward"). The estimates for seaward fishing ranged from 6,014 mt in the US/Vancouver area (based on Pacific Ocean perch bycatch ratios) to 26,728 mt in the Conception and Monterey areas (based on cowcod). For shoreward fishing the estimates ranged from 896 mt in the US/Vancouver area (based on yelloweye rockfish) to 3,574 in the Columbia area (based on yelloweye rockfish).

### *A.1.4* Specific Questions asked by the Council Regarding the Level of the Exception for CFAs.

At its November 2010 meeting the Council asked that analysts look at a number of specific issues as follows:

- **Historic Participation and Dependence.** Historical participation (past landings) is assessed in the tables and figures of Appendix A which are expressed in terms of QS control limits. County dependence (and vulnerability) assessments are also provided in Appendix A.
- **Ability to Support to Full Time Captain and Crew.** The control limits were designed to allow one individual to control sufficient QS to support two vessels working full time. For the typical vessel, this would include a captain and crew of two individuals. Several ports analyzed did not have total landings for any of the species or species groups or for aggregate groundfish in any year or period that exceeded one control limit. These ports included Neah Bay, Bodega Bay, Princeton, Moss Landing and Monterey. The other ports (Bellingham, Westport, Astoria, Newport, Coos Bay, Brookings, Crescent City, Eureka, Fort Bragg, San Francisco, and Morro Bay) had landings that exceeded one control limit depending on the species or species group. Sablefish landings at these other ports generally exceeded 1.5 control limits, and ranging up to 10.5 control limits.

- **Ability to Support Necessary Infrastructure.** A precise answer to the question regarding ability to support necessary infrastructure would depend on several factors including local port conditions and other fisheries operating out of any particular port. The analysis shows that of all the west coast ports there are several that would appear to need higher control limits (about 1.5 times) in order to cover all their landings with CFA controlled QS. These ports include Bellingham (sablefish), Westport (sablefish), Astoria (six species or species groups), Newport (five species or species groups), Coos Bay (5 species or species groups), Brookings (3 species), Crescent City (2 species), Eureka (5 species or species groups), Fort Bragg (4 species or species groups), San Francisco (sablefish) and Morro Bay (2 species). If the other ports on the coast (Neah Bay, Bodega Bay, Princeton, Moss Landing and Monterey) are considered to have long-term viability at their recent harvest levels then it appears that the current control limits may be sufficient to support the necessary infrastructure for these latter ports.
- **Potential to Lose or Gain QS Based on Market Forces.** Certain ports have been identified as being more likely to lose QS than other ports. Table 4-69 from the Amendment 20 EIS shows that most of the ports that might potentially benefit from a higher CFA control limit tend to be those that are expected to have a comparative advantage in the trawl rationalization program. These ports include Astoria, Newport, Coos Bay, Brookings, Eureka and Fort Bragg. The ports at a disadvantage include Neah Bay, Princeton, Moss Landing, and Morro Bay.
- **Ability to Use Community Based Quota to Attract Quota Landings.** Under current control limits, a smaller port could offer to cover all the landings in that port with CFA controlled QS, while a CFA for a larger port would be constrained to covering only a portion of those landings. Raising the control limits would allow larger ports to cover a greater portion of the landings with CFA controlled QS and allow smaller ports to expand operations covered by CFA controlled QS. The ability of larger and smaller ports to acquire QS up to the higher limits would presumably depend on the tax base or other funding sources available to support CFA acquisition of QS.

## A.2 Introduction

The components analysis for special privilege exception is divided into three sections:

- Methods
- Results
- Findings and Conclusions

The expectation is that under trawl rationalization the non-whiting groundfish trawl fleet (the fishery) will consolidate. If all vessels in the fishery operate on a full-time basis, the fleet is expected to decline from about 100 to 120 active vessels to less than half (40-50) that number, with the less efficient vessels leaving the fishery. The 100% observer coverage requirement will contribute to the consolidation process by increasing each vessel's the overhead cost, which will disproportionately affect the less efficient or low volume harvesters. The consolidated fleet is expected to gross an average of about $700,000 per vessel-year compared to the current average of about $200,000 per vessel-year. Each full time vessel in the consolidated fleet is expected to support one vessel captain and a two-person crew that will be able to fish and generate income on a year-round basis. Geographic redistribution of the catch is a likely outcome of the rationalization process due to market forces related to such things as port costs, distance to fishing grounds, overfished species bycatch rates on grounds near port, shifts in processing and distribution channels, etc (PFMC 2010a).

The trawl rationalization environmental impact statement (EIS) (PFMC 2010b) describes the groundfish trawl fishery, associated fisheries, the processor sector, and general port infrastructure in a geographic context circa 2004-2006. The information was used, in part, to project the degree to which ports were dependent on the trawl groundfish fishery and the resilience of ports to change in fishery landings. Here the analysis is limited to the two control cap options of Alternative 1.

**Option a:** For designated CFAs quota share control limits for some or all QS species categories are 1.5 times the current accumulation limits.

**Option b:** For designated CFAs quota share control limits for some or all QS species categories are 2.0 times the current accumulation limits

Fishery background information is presented, for recent years showing the distribution of non-whiting limited entry trawl groundfish vessels by primary landing port (where most pounds were landed), the degree of fidelity of vessels to their primary landing ports, and average annual revenues for vessels by primary landing port. Data and analyses are presented on "historical" (1996-1998 average) and "recent" (2004-2010, individual years) fishery landings for selected species and species groups at selected ports. Landings are expressed in terms of the number of QS control limit caps they represent based on trawl sector allocations expected to be implemented for the 2011 season. These data are intended to show the degree to which port communities could guarantee their recent or historical harvest levels by acquiring QS under the existing control rules and the magnitude of the QS control rule adjustments or exceptions that Designated Community Fishing Associations (CFAs) would need in order to be able to directly control enough QS to cover all recent or historical non-whiting trawl fishery landings at a particular port. Non-whiting trawl fishery dependency data are analyzed to show the degree to which coastal counties are dependent on the non-whiting trawl fishery. Those data are then analyzed to assess county vulnerability to fishery economic disruption. Overfished groundfish species bycatch ratios available from 2003-2006 observations are used to estimate maximum potential target species landings by management area and depth fished, which may be important information for the CFA approval process.

## A.3 Methods for Analysis of Special Privileges (Level of Exception)

**Vessel Distribution and Revenues Analysis**. Vessel landings and revenue data by port of delivery were compiled for 2008-2010 to show the primary landing port (where most fish were delivered) for single vessels, frequency of vessels landing in multiple ports in the same year (vessel fidelity analysis), and average non-whiting revenues for vessels by primary landing port. The vessel distribution data correlate with, in part, the skewed distribution in landings by species and species group (expressed as number of control limits) that has occurred between ports during the years used for this analysis.

**Conversion of QS to QP**. Individual entities (potentially including CFAs) that acquire QS under the trawl groundfish shoreside IFQ program beginning in 2013 will be able to use their own vessel(s) or contract out to other vessels to potentially harvest all of the quota pounds in their account except as constrained by control and use limits for individual species, and the overall control and use limits for aggregate non-whiting groundfish. Expressed in QP, control limits projected to be in place for the 2011 season varied widely between species (Table A- 1). The maximum control limits projected (expressed in pounds) for the 2011 season ranged from about 7,000 lbs for shortspine thornyhead in the Conception area to about 2.7 million pounds for arrowtooth flounder. The aggregate groundfish poundage limit, explained below, was about 4.5 million pounds (Table A- 1).

**Table A- 1 Non-whiting trawl control limit caps in mts and lbs for 2011.**[a/]

| Species/Species Group/Area | mt | control limit | cap in mt and pounds | |
|---|---|---|---|---|
| | | | mts | lbs |
| Lingcod | 1,858 | 0.025 | 46 | 102,426 |
| Pacific Cod | 1,134 | 0.12 | 136 | 300,002 |
| Sablefish N of 36 N lat. | 2,501 | 0.03 | 75 | 165,411 |
| Sablefish S of 36º N lat. | 531 | 0.1 | 53 | 117,064 |
| Dover sole | 22,235 | 0.026 | 578 | 1,274,501 |
| English sole | 18,654 | 0.05 | 933 | 2,056,230 |
| PETRALE SOLE | 871 | 0.03 | 26 | 57,606 |
| Arrowtooth flounder | 12,431 | 0.1 | 1,243 | 2,740,538 |
| Starry Flounder | 668 | 0.1 | 67 | 147,267 |
| Other flatfish | 4,193 | 0.1 | 419 | 924,389 |
| PACIFIC OCEAN PERCH | 107 | 0.04 | 4 | 9,436 |
| WIDOW | 235 | 0.051 | 12 | 26,422 |
| Chilipepper S of 40°10' N lat. | 1,475 | 0.1 | 148 | 325,179 |
| Splitnose S of 40°10' N lat. | 1,381 | 0.1 | 138 | 304,455 |
| Yellowtail N of 40°10' N lat. | 2,801 | 0.05 | 140 | 308,754 |
| Shortspine thornyhead N of 34 27' N lat. | 1,431 | 0.06 | 86 | 189,287 |
| Shortspine Thornyhead S of 34 27' N lat. | 50 | 0.06 | 3 | 6,614 |
| Longspine thornyhead N of 34 27' N lat. | 1,966 | 0.06 | 118 | 260,055 |
| DARKBLOTCHED | 240 | 0.045 | 11 | 23,810 |
| Minor Shelf Rockfish N of 40°10' N lat. | 431.2 | 0.05 | 22 | 47,531 |
| Minor Shelf Rockfish S of 40°10' N lat. | 86 | 0.09 | 8 | 17,064 |
| Minor Slope Rockfish N of 40°10' N lat. | 818 | 0.05 | 41 | 90,168 |
| Minor Slope Rockfish S of 40°10' N lat. | 377 | 0.06 | 23 | 49,868 |
| Non-whiting Groundfish Species (w/o overfished rockfish and POP) | 75,893 | 0.027 | 2,049 | 4,517,446 |

a/ A set of interim trawl fishery allocations were in place for the start of the 2011 fishing season because the final rule was not yet implemented. The allocations used in this report were based on the trawl fishery allocations shown in the proposed rule for the West Coast Groundfish Fishery for the 2011-2012 season (75 Federal Register 67864) (http://www.nwr.noaa.gov/Publications/FR-Notices/2010/loader.cfm?csModule=security/getfile&pageid=48404) and adjusted to show the non-whiting trawl groundfish allocations based on the non-whiting/whiting fishery proportions contained in the Trawl Allocation FEIS (PFMC 2010c, page 96). In addition, the minor shelf rockfish splits for the non-whiting trawl fishery in the northern and southern areas were set at 82.6% and 100%, respectively.

**Ports Covered in the Analysis**. The 2011 control limits were compared to past port-specific non-whiting groundfish landings for selected species in order to evaluate the need for the special privilege options. The ports used for analysis were those that had at least one vessel using that port as its primary landing port (where most pounds were landed) during 2008-2010 (Table A- 2). This approach focused the analysis on the primary ports of trawl fishery activity during recent years, and omitted 13 ports that had non-whiting trawl fishery landings, but were not primary landing ports for any vessels. Most of the excluded ports had relatively small landings (<100,000 pounds) on average during 2004-2010. Three of the excluded ports (Blaine WA, Port Angeles WA, and Avila CA) had higher average trawl landings during 2004-2010 than some of the ports included in the analysis; but all of the vessels that used the excluded ports during 2008-2010 delivered most of their fish to a different port

This port-based analysis was done to show the number of control limits that would have been needed at the respective ports in past years to achieve those same levels of non-whiting groundfish landings. This issue is of concern to a number of communities stemming from changes under the trawl rationalization program. A detailed discussion of the potential negative impacts of trawl rationalization on communities can be found in Chapter 4 to the FEIS (PFMC, 2010b).

**QS vs QP Control as a Limiting Factor for CFAs**. Vessel use limits were not addressed in this analysis because the proposed Designated CFA safe harbor provision addresses the amount of quota share (QS) that a CFA would be allowed to control, as opposed to the amount of QP it might acquire during the year. CFAs are expected to contract out for harvest of their quota; vessel owners are permitted to use QP in their vessel accounts up to the vessel use limits. If CFAs were to control their own vessels and permits, they would be able to acquire additional QP up to the corresponding number of vessel limits for each non-whiting groundfish species. Alternatively, an adequately funded CFA could buy additional QP to transfer directly to vessels with which it had contracts, in amounts up to each vessel's limit. There does not appear to be a limit on any organization's ability to arrange for the financing and transfer of QP to any particular vessel or any number of vessels, whether it would be a Designated CFA or any other type of CFA. Consequently, this analysis only addresses the potential for CFAs to own QS for fish to be harvested and landed in the local area.

The PacFIN database was the source of data used in the report. The years selected for analysis were 2004-2010 (the "recent" period following the trawl buyback program when Rockfish Conservation Areas [RCAs] were in place) and 1996-98 ("historical" pre-RCA years). The data used for analysis were for non-whiting groundfish landed shoreside by vessels on trawl groundfish trips while fishing under LE trawl permits. The ports included in the analysis were those that had one or more vessels that used the port as its primary landing port for non-whiting groundfish in any year during 2008-10 (Table A- 2). By this approach 13 ports that supported some level of non-whiting trawl fleet activity were not included. Some of the omitted ports historically had much higher trawl landings than shown in recent years. Aggregation of port-level data to the port group level is possible but was not used because the expectation is (based on public input) that CFA proposals will focus at the individual port level.

**Species Breakouts Used for the Analysis.** The species or species groups selected to focus the analysis included the DTS complex (sablefish [north of Conception area], longspine thornyhead, shortspine thornyhead and Dover sole), English sole, and other flatfish. These are the primary target species of the non-whiting trawl fishery. The overall aggregate groundfish control limit was also evaluated. Other trawl species or species groups not included in the analysis have regulations that substantially impede trawl access to them. These included all shelf and slope rockfish species, because of association with overfished rockfish species (boccaccio, canary rockfish, cowcod, darkblotched rockfish, Pacific ocean perch, widow rockfish, and yelloweye rockfish); petrale sole because of spawning stock constraints; and Pacific cod and arrowtooth flounder because of limited geographic distributions. However, all non-whiting species, excluding overfished species other than petrale sole, were included in calculations related to the non-whiting control limits. Additionally, data on all species by port are provided in the attachment to this appendix.

**Table A- 2. Abbreviations for landing port names used and not used in the analysis, including annual average non-whiting groundfish pounds landed by limited entry trawl vessels, 2004-2010 a/**

| Abbreviation | Name | AVG lbs 2004-2010 (millions) |
|---|---|---|
| Ports Used in Analysis | | |
| BLL | Bellingham, WA | 2.4 |
| NEA | Neah Bay, WA | 0.5 |
| WPT | Westport, WA | 1.6 |
| AST | Astoria, OR | 14.1 |
| NEW | Newport, OR | 5.1 |
| COS | Coos Bay, OR | 6.1 |
| BRK | Brookings, OR | 2.1 |
| CRS | Crescent City, CA | 1.4 |
| ERK | Eureka, CA | 4.9 |
| BRG | Fort Bragg, CA | 3.0 |
| BDG | Bodega Bay, CA | 0.1 |
| SF | San Francisco, CA | 1.3 |
| PRN | Princeton/Half Moon Bay, CA | 0.4 |
| MOS | Moss Landing, CA | 0.6 |
| MNT | Monterey, CA | 0.3 |
| MRO | Morro Bay, CA | 0.5 |
| Ports Not Used in Analysis | | |
| BLN | Blaine, WA | 1.3 |
| PAG | Port Angeles, WA | 0.4 |
| LAP | La Push, WA | <0.1 |
| LWC | Lower Columbia R, WA | <0.1 |
| TLL | Tillamook, OR | <0.1 |
| FLR | Florence, OR | <0.1 |
| WIN | Winchester, OR | <0.1 |
| OSM | Other Sonoma, Mendocino Co. ports | <0.1 |
| TML | Tomales Bay, CA | <0.1 |
| OAK | Oakland, CA | <0.1 |
| CRZ | Santa Cruz, CA | <0.1 |
| AVL | Avila/Port San Luis, CA | 0.6 |
| SB | Santa Barbara, CA | <0.1 |
| Total All Ports | | 46.8 |

a/ Pounds are inclusive of all non-whiting groundfish caught and landed shoreside by vessels on directed trawl non-whiting groundfish trips while fishing under LE trawl permits.

**Evaluation of Historic Landings Against Control Limits.** Control limits define the maximum annual harvest level of each groundfish species that a quota share holder (including a CFA) is able to control long term. Landings in each port during the 1996-1998 and 2004-2010 study periods were used to illustrate the degree to which control limits would have constrained each port from controlling enough QS to cover its harvest over these periods. For each species and year (or multiyear period) each port's annual landings were converted to QS control limit equivalents by dividing the port's landings (pounds) by the pounds derived from applying the QS control limit to the 2011 shoreside trawl allocations. Specifically, landings were converted to QS control limit equivalent (c) by species or species group *i*, port *j* and period *k*, by dividing pounds landed (b) of species or species group *i* at port *j* in period *k* by the corresponding control limit (B) for species or species group *i* from Table 2-1, which can be expressed as follows:

$$c_{ijk} = b_{ijk} / B_i$$

It is important to note that the control limits in Table 2-1 are inclusive of landed catch and associated discard mortality, while the data used for analysis were landed catch only, excluding discard mortality. Switching to the total catch accounting system required under trawl rationalization was projected to increase fishery revenues due to retention of target species that formerly would have been discarded. This was estimated to increase annual ex-vessel revenues between 5% and 9% (PFMC 2010b, page 323). This was for all species in combination and would vary by species. Thus the analysis presented here using landed catch probably fairly closely illustrates what the impacts on past fishery practices may have been had they been subject to total catch accounting and the 2011 QS control limits.

**Construction of Hypothetical QS Accounts and Calculation of Aggregate Groundfish QS**. Annual landings of each quota share species category during 2004-2010 were used as the basis for constructing a hypothetical quota share account for each port. Each port's hypothetical quota share account was constructed by proportionally adjusting landings of each species category until no individual species control limits were exceeded, and the aggregate non-whiting groundfish control limit (2.7%) was exactly met. So the mix and quantity of species in each port's hypothetical quota share account reflects its recent average landings history subject to the QS control limits. The species mix also affects (to a very small degree) the amount of fish that can be held in each account because of the species and species group weighting factors. The formula used for the adjustment algorithm is shown below.

Each port's aggregate non-whiting groundfish quota share ($QS_{aggregate}$) was calculated as the weighted average of quota share for each individual quota species in the port's hypothetical account; where quota share for each species ($p_i$) was calculated as the lesser of each port's annual average 2004-2010 landings and the corresponding species control limit; and the weights ($l_i/L$) were calculated as each species' proportionate contribution ($l_i$) to the non-whiting trawl sector's aggregate allocation of non-whiting groundfish species in 2011 (L).

Or:

$$QS_{aggregate} = \sum_{i=1}^{n} p_i * l_i / L$$

Where:

$QS_{aggregate}$= Aggregate non-whiting groundfish species quota share in each port's hypothetical account,

$l_i$ = Total 2011 allocation (weight) to the non-whiting trawl sector for species *i*,

L (= $\sum_{i=1}^{n} l_i$ ) = Total 2011 allocation (weight) to the non-whiting trawl sector for all non-whiting groundfish quota species combined,

$p_i$ = Proportion of 2011 allocation to the non-whiting trawl sector for species *i* held in each port's hypothetical account.

**Dependency of Coastal Communities on the Non-Whiting Trawl Fishery.** The non-whiting trawl fishery dependency analysis followed the methodology used for the groundfish fishery dependency analysis included as part of the 2008-2010 groundfish specifications and management measures FEIS (PFMC 2010) except this analysis was confined to commercial fishery parameters. The metrics for those parameters, which were based on 2008 commercial fishery landings, included

1) proportion of all commercial fishing vessels that made landings in the area that were non-whiting trawl fishery vessels,
2) proportion of commercial fishing vessel revenues received in the area accrued to the non-whiting trawl fishery,
3) number of non-whiting trawl fishery buyers in the area and
4) each county's proportion of total coastwide non-whiting trawl fishery revenues.

The metrics for each area and parameter were ranked from high to low and assigned a numeric score as follows:

- top 1/3 ranked areas, 3 points each,
- middle 1/3 ranked areas, 2 points each, and
- bottom, 1/3 ranked areas, 1 point each.

The values for each area were summed across all 4 parameters and assigned a dependency rating based on total score as follows: highest 1/3 of area scores, High, middle 1/3 of area scores, Medium, and bottom 1/3 of area scores, Low. The geographic area of resolution for was at the county level in order to comport with US Census Bureau data that was available for community resiliency assessment (used in the vulnerability analysis). The data outputs for the dependency assessment listed the non-whiting trawl fishery ports included in each county, which spanned the entire PFMC management area (Cape Flattery, WA to the US/Mexico border). Many coastal counties did not have a non-whiting trawl fishery landing in 2008 and were thus listed as non-dependent counties.

**Vulnerability of Coastal Counties Based on Fishery Dependence Assessment.** The vulnerability of coastal counties to economic disruption stemming from fishery dependence was assessed as part of the 2008-2010 groundfish specifications and management measures FEIS process (PFMC 2010). The fishery dependency assessment, which was based on 2008 information, took into consideration by county

1) level of general fishery engagement and
2) level of groundfish fishery dependency.

Each county received a dependency rating, based on specific 2008 fishery metrics, of high, medium, or low for each fishery dependency category. These ratings were then compared to US Census Bureau resiliency ratings by county to determine county fishery vulnerability rating as follows: vulnerable, most vulnerable, or not rated (blank). Any county that had at least one high fishery dependency rating and a low resiliency rating was ranked as vulnerable. Any county that had a high dependency rating for both fishery categories and a low resiliency rating was ranked as most vulnerable. For this report, the previous county vulnerability assessment (included as part of the specifications report) was expanded to include non-whiting trawl fishery dependency assessments (methodology explained above) and using those assessments in the expanded analysis in place of the previous general groundfish fishery assessments. This approach provides a fishery vulnerability assessment for the non-whiting trawl fishery separate from the analysis based on groundfish fisheries overall.

**Impact of Trawl Fishery Rationalization on Primary Landing Ports**. Certain ports have been identified as being more likely to lose QS than other ports stemming from the trawl rationalization program. Those results are shown in Table 4-69 of the Amendment 20 EIS (Table A- 13 of this document). Those assessments are used in the county vulnerability assessment to identify which counties may be affected by the trawl fishery rationalization program.

**Potential Impacts of Overfished Groundfish Species on Regional Fisheries and Locations of Designated CFAs**. The overfished groundfish species bycatch ratios used to allocate those species to QS holders were used to project the theoretical maximum amount of target species that could be expected to be landed in a management area in 2011 based on overfished species OYs (Table A- 3). The bycatch ratios (lbs of overfished species per lb of target species landed) were based on 2003-2006 WCGOP at-sea observations, and were calculated separately for fishing in depths ≤ 115 fm and > 115 fm. Estimated landings by area were computed as a range for each overfished species because the ratios varied substantially by species and between the two depth strata. Since several overfished species appear in each management area, there are several theoretical maximum landing estimates for each area. The estimates are considered as theoretical maximum ranges because the bycatch rates may change (decline) with the implementation of the trawl rationalization program along with the distribution of fishing effort relative to the 2003-2006 period. Constraining overfished species will have a major influence on where fishermen fish in 2011, and could be an important consideration in the Designated CFA approval process. Placement of Designated CFAs in management areas that have relatively low maximum landings potential (low target species to overfished species ratios) could negatively affect fisheries in other areas if CFA vessels are required to fish and land only in the local area.

**Table A- 3. Observed bycatch ratios of overfished groundfish during 2003-2006 by management area, depth category and species. All values are expressed in terms of mt of overfished species per 100 mt of target groundfish species.**

| | 2011 OY (mt) | San Diego to Morro Bay | | Monterey to Fort Bragg | | Eureka to Brookings | | Coos Bay to Westport | | Neah Bay to Bellingham | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SeaW | ShoreW | SeaW | ShoreW | SeaW | ShoreW | SeaW | ShoreW | SeaW | ShoreW |
| bocaccio | **60** | 0.179 | 1.901 | 0.179 | 1.901 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| canary | **25.9** | 0.001 | 0.158 | 0.001 | 0.158 | 0.002 | 0.872 | 0.014 | 0.308 | 0.003 | 0.804 |
| cowcod | **1.35** | 0.005 | 0.129 | 0.005 | 0.129 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| darkblotched | **250.84** | 0.478 | 0.001 | 0.478 | 0.001 | 1.503 | 0.218 | 1.884 | 0.224 | 0.995 | 0.156 |
| Pacific ocean perch | **119.36** | 0.000 | 0.000 | 0.000 | 0.000 | 0.137 | 0.015 | 1.583 | 0.011 | 1.985 | 0.107 |
| widow | **282.55** | 0.068 | 0.105 | 0.068 | 0.105 | 0.001 | 0.018 | 0.076 | 0.039 | 0.007 | 0.013 |
| yelloweye | **0.3** | 0.000 | 0.009 | 0.000 | 0.009 | 0.001 | 0.013 | 0.001 | 0.008 | 0.001 | 0.033 |

1/ SeaW means ≤ 115 fm; ShoreW means >115 fm

## A.4 Results

### *A.4.1* Analysis of Vessel Distribution and Revenues

Totals of 120, 117 and 105 trawlers made non-whiting groundfish landings (from directed non-whiting groundfish trips while fishing under LE trawl permits) in the PFMC area during 2008, 2009 and 2010, respectively (Table A- 4, Table A- 5, and Table A- 6). These tables show for each port the total number of vessels with that port as their principle port and the number of other ports to which those vessels also delivered. For example, in 2008 a total of 28 trawl vessels had Astoria as their principle port and of these 23 delivered only to Astoria and 5 delivered to one other port. The vessels made landings at ports between Bellingham WA in the north and Morro Bay CA in the south. Based on primary port of landing (port where most fish were landed) the center of fishery activity was at the Oregon ports of Astoria, Newport and Coos Bay (18-28 vessels per port per year; **Figure A- 1**). There was a secondary center of activity at the port of Eureka CA (10 or 11 vessels). The aforementioned Oregon group accounted for 54%, 56% and 57% of the total fleet in the respective years. The Eureka proportion represented between 9% and 10% of the fleet in those same years. The other coastal ports supported between one and seven vessels each, except for 2010 when two ports had no trawl vessels using them as their primary port for trawl caught fish (Neah Bay WA and Morro Bay CA). Five ports had zero, one, or two vessels in each of the three years (Neah Bay WA, Bodega Bay CA, Moss Landing CA, Monterey CA, and Morro Bay CA).

Table A- 4 Number of vessels landing in 1, 2, 3, 4, 5 or 6 ports during 2008 by vessels' primary port of landing. a/

| | Number of ports of delivery | | | | | | Total vessels to port |
|---|---|---|---|---|---|---|---|
| Port | 1 | 2 | 3 | 4 | 5 | 6 | |
| | Number of vessels delivering to the indicated number of ports | | | | | | |
| BLL | 3 | 0 | 1 | 0 | 0 | 0 | 4 |
| NEA | 2 | 0 | 0 | 0 | 0 | 0 | 2 |
| WPT | 5 | 1 | 0 | 0 | 0 | 0 | 6 |
| AST | 23 | 5 | 0 | 0 | 0 | 0 | 28 |
| NEW | 17 | 1 | 0 | 1 | 0 | 0 | 19 |
| COS | 17 | 0 | 0 | 0 | 1 | 0 | 18 |
| BRK | 2 | 4 | 0 | 0 | 0 | 0 | 6 |
| CRS | 3 | 1 | 1 | 1 | 0 | 0 | 6 |
| ERK | 7 | 3 | 0 | 0 | 0 | 1 | 11 |
| BRG | 6 | 1 | 0 | 0 | 0 | 0 | 7 |
| BDG | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| PRN | 5 | 0 | 0 | 0 | 0 | 0 | 5 |
| SF | 3 | 0 | 0 | 0 | 0 | 0 | 3 |
| MOS | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| MNT | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| MRO | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| Total | 96 | 17 | 3 | 2 | 1 | 1 | 120 |
| % | 80.0 | 14.2 | 2.5 | 1.7 | 0.8 | 0.8 | 100.0 |

a/ primary port is where the vessel landed the most non-whiting groundfish.

Table A- 5. Number of vessels landing in 1, 2, 3, 4, 5 or 6 ports during 2009 by vessels' primary port of landing. a/

| | Number of ports of delivery | | | | | | Total vessels to port |
|---|---|---|---|---|---|---|---|
| Port | 1 | 2 | 3 | 4 | 5 | 6 | |
| | Number of vessels delivering to the indicated number of ports | | | | | | |
| BLL | 1 | 3 | 0 | 0 | 0 | 0 | 4 |
| NEA | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| WPT | 2 | 2 | 1 | 0 | 0 | 0 | 5 |
| AST | 23 | 3 | 0 | 0 | 0 | 0 | 26 |
| NEW | 19 | 3 | 0 | 0 | 0 | 0 | 22 |
| COS | 16 | 1 | 1 | 0 | 0 | 0 | 18 |
| BRK | 3 | 3 | 0 | 0 | 0 | 0 | 6 |
| CRS | 5 | 1 | 1 | 0 | 0 | 0 | 7 |
| ERK | 8 | 1 | 0 | 1 | 0 | 0 | 10 |
| BRG | 6 | 1 | 0 | 0 | 0 | 0 | 7 |
| BDG | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| PRN | 3 | 0 | 0 | 0 | 0 | 0 | 3 |
| SF | 3 | 1 | 0 | 0 | 0 | 0 | 4 |
| MOS | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| MNT | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| MRO | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Total | 92 | 21 | 3 | 1 | 0 | 0 | 117 |
| % | 78.6 | 17.9 | 2.6 | 0.9 | 0.0 | 0.0 | 100.0 |

a/ primary port is where the vessel landed the most non-whiting groundfish.

Table A- 6. Number of vessels landing in 1, 2, 3, 4, 5 or 6 ports during 2010 by vessels' primary port of landing. a/

| | Number of ports of delivery | | | | | |
|---|---|---|---|---|---|---|
| Port | 1 | 2 | 3 | 4 | 5 | 6 |
| | Number of vessels delivering to the indicated number of ports | | | | | |
| BLL | 2 | 2 | 0 | 0 | 0 | 0 |
| NEA | 0 | 0 | 0 | 0 | 0 | 0 |
| WPT | 3 | 1 | 0 | 0 | 0 | 0 |
| AST | 18 | 5 | 0 | 0 | 0 | 0 |
| NEW | 13 | 5 | 0 | 0 | 0 | 0 |
| COS | 16 | 1 | 2 | 0 | 0 | 0 |
| BRK | 5 | 1 | 0 | 0 | 0 | 0 |
| CRS | 2 | 1 | 0 | 0 | 0 | 0 |
| ERK | 8 | 0 | 2 | 1 | 0 | 0 |
| BRG | 7 | 0 | 0 | 0 | 0 | 0 |
| BDG | 0 | 1 | 0 | 0 | 0 | 0 |
| PRN | 3 | 0 | 0 | 0 | 0 | 0 |
| SF | 4 | 0 | 0 | 0 | 0 | 0 |
| MOS | 1 | 0 | 0 | 0 | 0 | 0 |
| MNT | 1 | 0 | 0 | 0 | 0 | 0 |
| MRO | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 83 | 17 | 4 | 1 | 0 | 0 |
| % | 79.0 | 16.2 | 3.8 | 1.0 | 0.0 | 0.0 |

a/ primary port is where the vessel landed the most non-whiting groundfish.

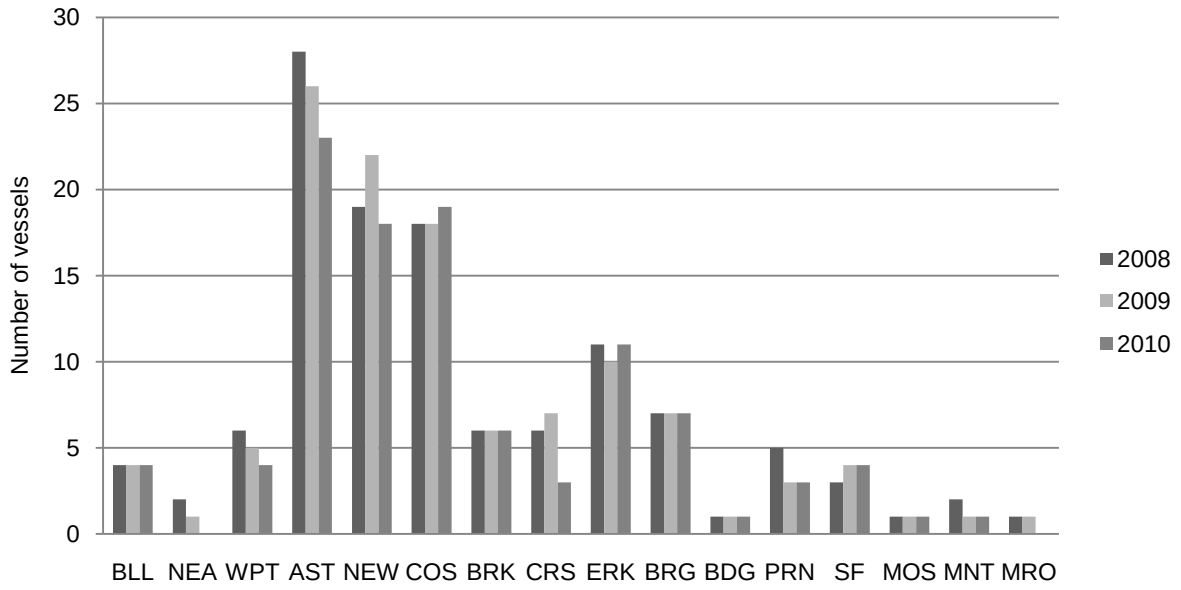



Figure A- 1. Number of non-whiting groundfish trawlers by primary landing port, 2008-2010

A large majority of trawl vessels (79%-80%) made all landings at a single port, with a lesser proportion (14%-18%), making landings at two ports (Table A- 4, Table A- 5, and Table A- 6). Some vessels made landings at three or more ports, but these represented a relatively small proportion (3%-6%) of the fleet.

Coastwide average non-whiting groundfish revenues per vessel during 2008-2010 ranged from an average of about $223 thousand to about $259 thousand per vessel per year (Table A- 7; Figure A- 2). Some ports had fewer than 3 vessels and so have been omitted from the following port-based analysis for confidentiality reasons. Eureka and Fort Bragg vessels had the highest average annual revenues ($337,706 and $318,565, respectively) while Princeton had the lowest average ($42,682). Other ports with vessel averages that were substantially below the coastwide three-year average of $246,433 were Westport ($167,490), and Crescent City ($166,206).

Table A- 7. Average non-whiting groundfish revenues per trawler by primary port and year, 2008-2010 1/

| | 2008 | 2009 | 2010 | 2008-10 AVG |
|---|---|---|---|---|
| BLL | $275,359 | $311,676 | $165,087 | $250,707 |
| NEA | $0 | $0 | $0 | $0 |
| WPT | $132,829 | $233,424 | $136,218 | $167,490 |
| AST | $305,572 | $296,972 | $287,295 | $296,613 |
| NEW | $232,522 | $235,536 | $201,753 | $223,270 |
| COS | $244,862 | $221,352 | $209,766 | $225,327 |
| BRK | $300,661 | $262,243 | $244,288 | $269,064 |
| CRS | $174,921 | $211,063 | $78,563 | $154,849 |
| ERK | $361,258 | $351,670 | $300,190 | $337,706 |
| BRG | $327,632 | $377,173 | $250,890 | $318,565 |
| BDG | $0 | $0 | $0 | $0 |
| PRN | $47,530 | $52,990 | $27,524 | $42,682 |
| SF | $342,489 | $179,289 | $164,916 | $228,898 |
| MOS | $0 | $0 | $0 | $0 |
| MNT | $0 | $0 | $0 | $0 |
| MRO | $0 | $0 | $0 | $0 |
| Coastwide | $257,166 | $258,811 | $223,322 | $246,433 |

1/ $$ inclusive of all port landings; fewer than 3 vessels show $0; coastwide avgs inclusive of all vessels

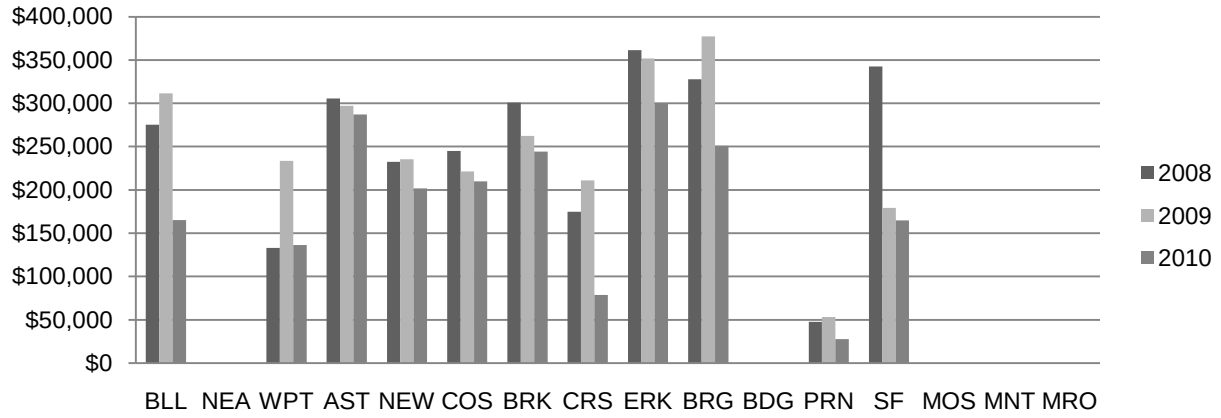



Figure A- 2. Average annual revenues of non-whiting groundfish LE trawl vessels by primary port and year. Ports with less than 3 vessels show $0.

The expectation is that under rationalization, if only full time vessels participate, the fleet will reduce to 40-50 vessels, each with the potential to harvest $700,000 of non-whiting groundfish on average per year (given current prices and trawl sector allocations). Under trawl rationalization, some ports are expected to gain landings and revenues and others are expected to lose. The pattern and direction in which consolidation and redistribution takes place will depend on many factors such as distribution of target stocks, constraints caused by overfished species and Pacific halibut, incidental catch concerns, price competition for fish by buyers and processors, alternative fishing opportunities for QS holders, and factors affecting vessel operating efficiency and overhead costs.

## *A.4.2* Analysis of Special Privilege Options (Level of Exception)

The analysis of the level of the exception that would be required as a special privilege for CFAs focused on past fishery landings by port and year using the control limits translated to QP and assuming the allocations that were expected to be in place for 2011. CFAs developed for ports that received annual landing amounts less than one control limit during the study periods (1996-98 and 2004-2010) have the ability under existing regulations to maintain fishery landings via direct control of quota share. CFAs for ports that had landings amounting in excess of one control limit would not be able to directly control all the QS necessary to ensure that they do not lose landings due to control limit constraints. However, they could potentially arrange for the acquisition and transfer of QP each year to vessels willing to deliver to their port.

Past data are analyzed in the context of control limit equivalent landings by port and study period for selected target species: the DTS complex (sablefish, Dover sole, shortspine thornyhead and longspine thornyhead), English sole, other flatfish and aggregate groundfish. Control limit equivalent landings by port and year for target and non-target species are shown in Attachment tables AT-1 through AT-16. The analysis used average and/or maximum annual control limit landings by target species and study period to characterize past fishery landings on an individual port bases. Indices of species landings were computed for each study period based on means of port averages.

### A.4.2.1 Ports within Control Limit Caps

The landings data showed five ports with average and maximum annual control limit landings of ≤1.0 (rounded) for all target species during both study periods as follows: Neah Bay, Bodega Bay, Princeton, Moss Landing and Monterey (Table A- 8 and Table A- 9; Figure A- 3 and Figure A- 4).

**Table A- 8. Number of control limits landed by port and target species based on average and maximum landings during 1996-1998 including species landing indices.**

| | Sablefish | | Dover sole | | Shortspine TH | | Longspine TH | | English sole | | Other flatfish | | Aggregate gf | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max |
| BLL | 0.84 | 1.02 | 0.38 | 0.45 | 0.26 | 0.29 | 0.40 | 0.54 | 0.02 | 0.03 | 0.02 | 0.03 | 0.84 | 0.91 |
| NEA | 0.70 | 0.97 | 0.20 | 0.26 | 0.16 | 0.21 | 0.12 | 0.22 | 0.11 | 0.17 | 0.06 | 0.12 | 0.52 | 0.68 |
| WPT | 1.64 | 2.28 | 0.54 | 0.79 | 0.56 | 0.85 | 0.86 | 1.54 | 0.10 | 0.15 | 0.08 | 0.12 | 1.08 | 1.57 |
| AST | 7.54 | 9.71 | 2.94 | 3.62 | 2.38 | 2.93 | 4.84 | 6.35 | 0.21 | 0.26 | 0.37 | 0.44 | 4.04 | 4.76 |
| NEW | 5.22 | 6.21 | 1.06 | 1.16 | 1.38 | 1.44 | 1.97 | 2.75 | 0.09 | 0.11 | 0.16 | 0.22 | 2.23 | 2.81 |
| COS | 6.56 | 8.27 | 2.33 | 2.47 | 2.32 | 2.70 | 4.90 | 6.18 | 0.16 | 0.19 | 0.58 | 0.69 | 2.43 | 2.61 |
| BRK | 2.13 | 2.49 | 0.62 | 0.64 | 0.69 | 0.77 | 1.62 | 2.31 | 0.03 | 0.07 | 0.06 | 0.08 | 0.60 | 0.67 |
| CRS | 4.01 | 4.86 | 0.94 | 1.13 | 1.19 | 1.30 | 2.90 | 3.47 | 0.10 | 0.15 | 0.29 | 0.36 | 1.04 | 1.09 |
| ERK | 2.91 | 4.05 | 1.03 | 1.26 | 0.94 | 1.04 | 2.27 | 3.45 | 0.04 | 0.05 | 0.17 | 0.28 | 0.96 | 1.26 |
| BRG | 3.36 | 4.17 | 1.57 | 1.94 | 1.32 | 1.46 | 2.63 | 3.46 | 0.09 | 0.12 | 0.21 | 0.29 | 1.47 | 1.85 |
| BDG | 0.76 | 0.79 | 0.63 | 0.94 | 0.36 | 0.49 | 0.69 | 0.86 | 0.04 | 0.06 | 0.05 | 0.06 | 0.51 | 0.60 |
| SF | 0.92 | 1.34 | 0.62 | 0.92 | 0.44 | 0.59 | 0.86 | 1.42 | 0.10 | 0.14 | 0.21 | 0.31 | 0.83 | 1.19 |
| PRN | 0.58 | 0.75 | 0.30 | 0.47 | 0.13 | 0.18 | 0.19 | 0.25 | 0.05 | 0.07 | 0.68 | 0.97 | 0.41 | 0.51 |
| MOS | 0.45 | 0.55 | 0.40 | 0.56 | 0.33 | 0.40 | 0.66 | 0.71 | 0.01 | 0.01 | 0.11 | 0.15 | 0.31 | 0.38 |
| MNT | 0.54 | 0.75 | 0.33 | 0.50 | 0.24 | 0.30 | 0.51 | 0.68 | 0.07 | 0.08 | 0.35 | 0.53 | 0.60 | 0.81 |
| MRO | 2.10 | 2.60 | 1.19 | 1.60 | 0.96 | 1.13 | 1.44 | 1.79 | 0.00 | 0.01 | 0.13 | 0.18 | 0.71 | 0.90 |
| IDX | 2.52 | | 0.94 | | 0.85 | | 1.68 | | 0.08 | | 0.22 | | 1.16 | |

**Table A- 9 Number of control limits landed by port and target species based on average and maximum landings during 2004-2010 including species landing indices.**

| | Sablefish | | Dover sole | | Shortspine TH | | Longspine TH | | English sole | | Other flatfish | | Aggregate gf | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max |
| BLL | 1.11 | 1.51 | 0.60 | 0.85 | 0.21 | 0.31 | 0.03 | 0.06 | 0.03 | 0.09 | 0.02 | 0.03 | 0.53 | 0.73 |
| NEA | 0.17 | 0.53 | 0.03 | 0.08 | 0.01 | 0.03 | 0.00 | 0.01 | 0.04 | 0.10 | 0.03 | 0.08 | 0.09 | 0.27 |
| WPT | 0.63 | 1.63 | 0.44 | 0.87 | 0.16 | 0.53 | 0.08 | 0.32 | 0.02 | 0.03 | 0.04 | 0.06 | 0.35 | 0.68 |
| AST | 8.33 | 10.47 | 4.33 | 5.77 | 2.82 | 5.03 | 0.94 | 2.13 | 0.21 | 0.37 | 0.77 | 1.28 | 3.12 | 3.92 |
| NEW | 6.62 | 8.24 | 1.74 | 2.81 | 2.12 | 3.63 | 0.64 | 1.49 | 0.03 | 0.06 | 0.10 | 0.14 | 1.12 | 1.70 |
| COS | 5.10 | 5.71 | 2.41 | 3.19 | 1.31 | 1.79 | 1.36 | 2.11 | 0.07 | 0.12 | 0.34 | 0.43 | 1.36 | 1.64 |
| BRK | 2.10 | 2.73 | 0.95 | 1.41 | 0.45 | 0.66 | 0.52 | 0.90 | 0.01 | 0.02 | 0.10 | 0.14 | 0.46 | 0.62 |
| CRS | 1.01 | 1.66 | 0.53 | 1.02 | 0.24 | 0.64 | 0.30 | 0.74 | 0.02 | 0.05 | 0.15 | 0.31 | 0.30 | 0.47 |
| ERK | 3.85 | 4.46 | 2.00 | 2.74 | 1.07 | 1.40 | 1.76 | 2.44 | 0.10 | 0.20 | 0.21 | 0.29 | 1.09 | 1.37 |
| BRG | 2.92 | 3.86 | 1.05 | 1.25 | 0.88 | 1.34 | 1.29 | 1.86 | 0.01 | 0.03 | 0.07 | 0.13 | 0.67 | 0.80 |
| BDG | 0.03 | 0.12 | 0.01 | 0.03 | 0.01 | 0.02 | 0.01 | 0.02 | 0.00 | 0.01 | 0.00 | 0.01 | 0.02 | 0.05 |
| SF | 1.00 | 1.47 | 0.43 | 0.59 | 0.27 | 0.38 | 0.39 | 0.81 | 0.01 | 0.01 | 0.07 | 0.13 | 0.28 | 0.39 |
| PRN | 0.03 | 0.06 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.02 | 0.03 | 0.18 | 0.37 | 0.09 | 0.14 |
| MOS | 0.55 | 0.99 | 0.15 | 0.40 | 0.27 | 0.40 | 0.34 | 0.48 | 0.00 | 0.01 | 0.04 | 0.10 | 0.13 | 0.25 |
| MNT | 0.10 | 0.17 | 0.03 | 0.14 | 0.02 | 0.05 | 0.03 | 0.07 | 0.01 | 0.02 | 0.04 | 0.12 | 0.06 | 0.08 |
| MRO | 0.38 | 1.06 | 0.07 | 0.22 | 0.12 | 0.32 | 0.12 | 0.47 | 0.01 | 0.03 | 0.02 | 0.07 | 0.08 | 0.21 |
| IDX | 2.12 | | 0.92 | | 0.62 | | 0.49 | | 0.04 | | 0.14 | | 0.61 | |

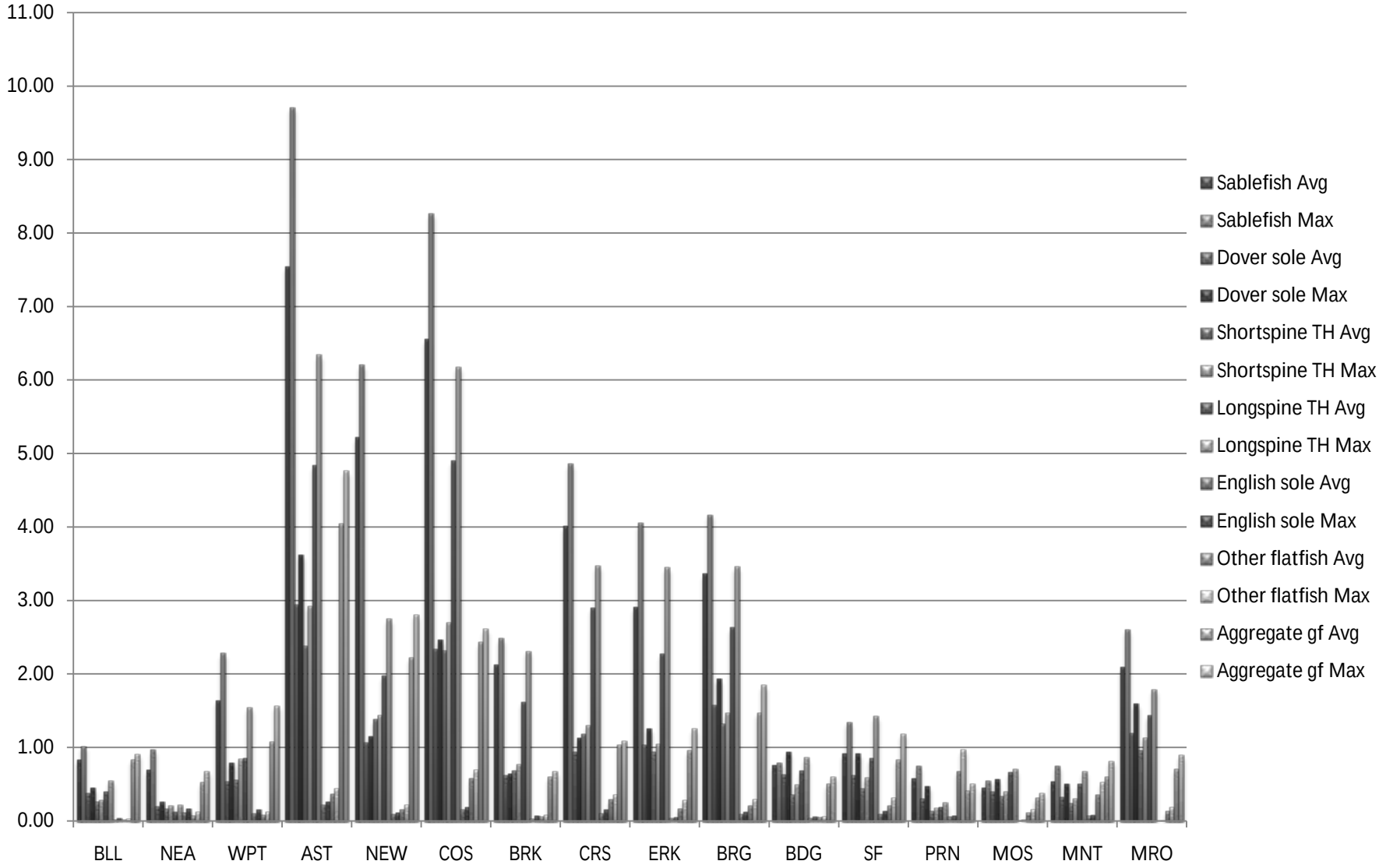



**Figure A- 3. Average and maximum landings in terms of QS control limit equivalents by port and target species, 1996-1998.**

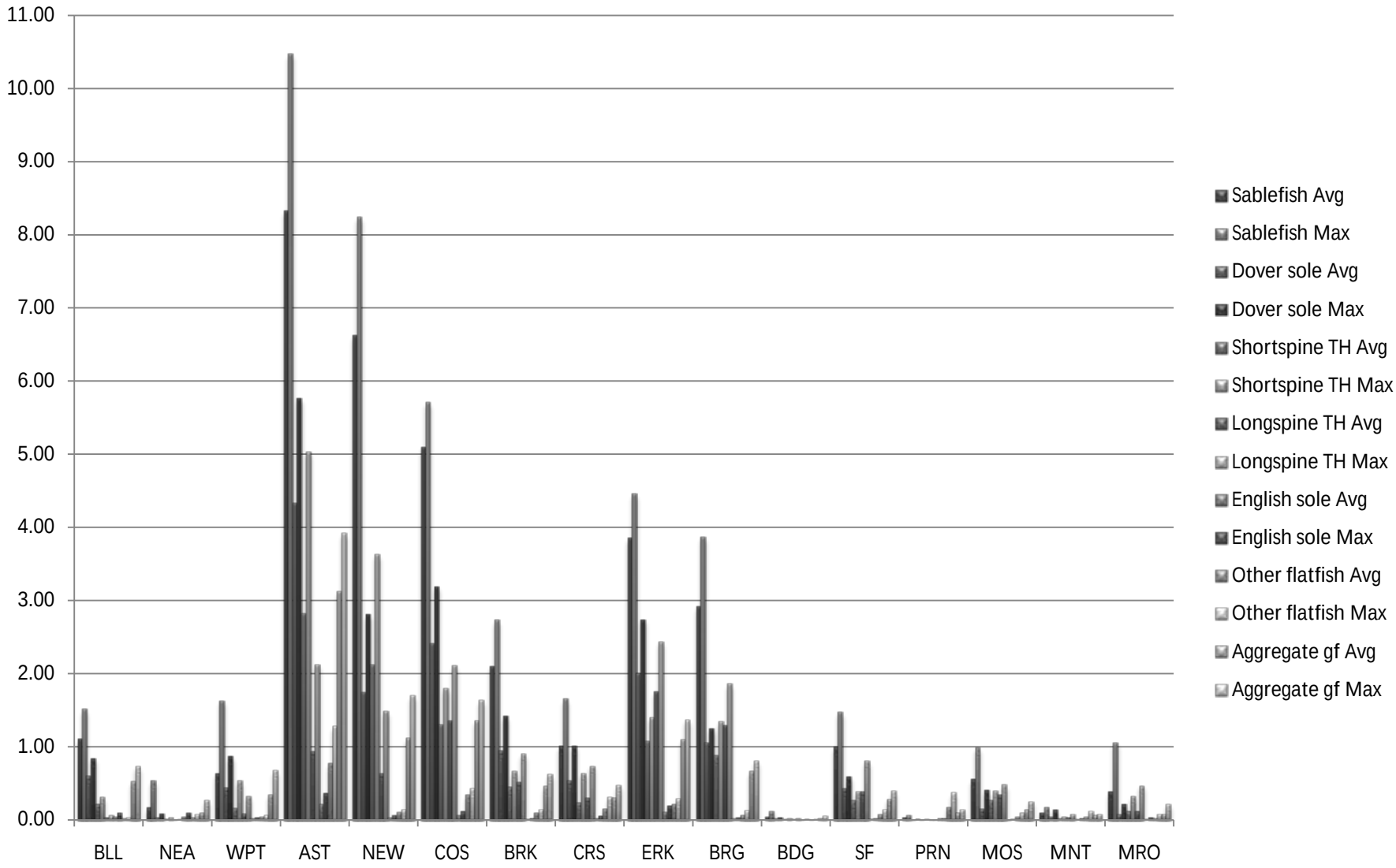



**Figure A- 4. Average and maximum landings in terms of QS control limit equivalents by port and target species, 2004-2010.**

### A.4.2.2 Ports Meeting or Exceeding Control Limit Caps

Landings data for 11 ports showed at least one entry (maximum or average landing statistic) during either study period (1996-1998 or 2004-2010) with landings of a target species that approached or exceeding 1.5 times the control limit (greater than 1.25 control limits). (Table A- 8 and Table A- 9; Figure A- 3 and Figure A- 4). These same ports had at least one entry of over 1.75 limits except Bellingham and San Francisco. Compared to average landings data, using maximum landing data to qualify ports for exception to control limit caps will generally show more ports exceeding a particular landings threshold. There were 36 port-species comparisons in the1996-1998 data in which the maximum landing statistic approached or exceeded 1.5 control limits (was greater than 1.25 control limits). In these 36 comparisons, 8 (22%) had average landings for the period of less than1.25 control limits (did not come close to the 1.5 control limit level). A comparable analysis using 2004-2010 data included 30 comparisons with 11 (37%) not coming close to the 1.5 control limit level (less than 1.25 control limits) based on average landings data.

Species landing index data showed landing declines for all species except Dover sole (within 2%) between the two study periods. The decline ranged from 16% for sablefish to 81% for longspine thornyhead. The reduced landings during 2004-2010 resulted in fewer ports (from 9 to 6) with average or maximum landings approaching or greater than 2.0 control limits (greater than 1.75 limits). The same number of ports (10) had landings approaching or greater than the 1.5 control limit level (greater than 1.25 limits) in both periods, but the lists of ports were different (San Francisco and Morro Bay dropped out and Bellingham and Westport were added).

### A.4.2.3 Hypothetical Aggregate Non-whiting Groundfish Account

The purpose of this analysis was to show the pounds and species mix of fish that an entity (such as a CFA) could accrue in a hypothetical port account using expected 2011 control limits for LE trawl-caught non-whiting groundfish. The analysis used recent port-specific landings data to reflect the likely mix of fish in each account, which varied widely for some species from north to south. As described in the methods section, ports that would need amounts of fish in excess of the control limits in order to cover their historic harvests were capped at the aggregate non-whiting accumulation limits.

The non-whiting groundfish control limit analysis placed 4,517,446 aggregate non-whiting groundfish pounds in each account (**Table A- 10**; Figure A- 5). Certain species had greater impact on the accounts than others because of their respective control limits and geographic distributions. The species or species groups that were common to most accounts included lingcod, sablefish, Dover sole, thornyheads, petrale sole, shelf rockfish, slope rockfish, and other flatfish. The ones of limited distribution include Pacific cod, arrowtooth flounder, chilipepper and splitnose rockfish, and starry flounder. Whether the account holder would actually be able to acquire and harvest these fish (because of availability of fish or of vessels to harvest the fish, facilities to land and process the fish, or other market forces) are separate issues that are not addressed here.

Below is a summary of findings by port for key species or species group:

- The sablefish and petrale sole poundage caps were met at all ports.
- The lingcod poundage cap was met at Brookings and all ports between Fort Bragg and Morro Bay.
- The Pacific cod poundage cap was met at only two ports: Bellingham and Neah Bay.
- The chilipepper rockfish poundage cap was met at all ports between Fort Bragg and Monterey.

- The splitnose rockfish limit was met at all ports between Fort Bragg and Morro Bay except Bodega Bay and Princeton.
- The yellowtail rockfish poundage cap was met only at Westport.
- The shortspine thornyhead limit was met at all ports between Astoria and Morro Bay except Princeton.
- The longspine thornyhead poundage cap was met at all ports between Newport and Moss Landing except Princeton.
- The northern shelf rockfish poundage cap was not reached at any port while the southern shelf rockfish poundage cap was met at all ports between Fort Bragg and Morro Bay except Bodega Bay.
- The slope rockfish limits, both north and south, were met at all ports except Neah Bay.
- The Dover sole poundage cap was met at all ports except Neah Bay and Princeton.
- The English sole and starry flounder poundage limits were met at only one port, Princeton, while the arrowtooth flounder poundage cap was not met at any port.
- The other flatfish poundage cap was reached at every port between Brookings and Moss Landing except Eureka and Bodega Bay.

Table A- 10. Distribution of hypothetical account pounds by port and species or species group that would meet the non-whiting groundfish control limit and stay within species limits. Based on 2004-2010 port landing proportions and 2011 species limits. Highlighted values show species limits that were met or exceeded.

| Species | BLL | NEA | WPT | AST | NEW | COS | BRK | CRS | ERK | BRG | BDG | SF | PRN | MOS | MNT | MRO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lingcod | 29,619 | 101,359 | 59,393 | 41,168 | 60,987 | 73,495 | 102,404 | 80,804 | 67,958 | 102,404 | 102,404 | 102,404 | 102,404 | 102,404 | 102,404 | 102,404 |
| P cod | 300,002 | 300,002 | 91,334 | 188,133 | 19,281 | 4,988 | 535 | 0 | 98 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N Sablefish | 165,411 | 165,411 | 165,411 | 165,411 | 165,411 | 165,411 | 165,411 | 165,411 | 165,411 | 165,411 | 165,411 | 165,411 | 165,411 | 165,411 | 165,411 | 0 |
| S Sablefish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 117,064 |
| Chilipepper | 0 | 0 | 0 | 31 | 1,784 | 99 | 42 | 194,270 | 92,934 | 325,179 | 325,179 | 325,179 | 325,179 | 325,179 | 325,179 | 105,336 |
| Splitnose | 1,099 | 684 | 1,523 | 4,427 | 35,126 | 5,296 | 30,108 | 97,740 | 38,984 | 304,455 | 286,043 | 304,455 | 162,797 | 304,455 | 304,455 | 304,455 |
| Yellowtail | 8,269 | 81,591 | 308,754 | 64,035 | 68,370 | 11,275 | 380 | 4,362 | 7,936 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Shortspine th | 108,083 | 27,617 | 147,264 | 189,155 | 189,155 | 189,155 | 189,155 | 189,155 | 189,155 | 189,155 | 189,155 | 189,155 | 45,793 | 189,155 | 189,155 | 189,155 |
| Longspine th | 20,299 | 3,626 | 105,951 | 132,427 | 260,055 | 260,055 | 260,055 | 260,055 | 260,055 | 260,055 | 260,055 | 260,055 | 18,294 | 260,055 | 260,055 | 260,055 |
| N Shelf RF | 5,989 | 16,163 | 13,032 | 6,027 | 14,112 | 10,957 | 6,456 | 17,322 | 6,646 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S Shelf RF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17,064 | 12,655 | 17,064 | 17,064 | 17,064 | 17,064 | 17,064 |
| N Slope RF | 90,168 | 9,738 | 90,168 | 90,168 | 90,168 | 90,168 | 90,168 | 90,168 | 90,168 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S Slope RF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 49,868 | 49,868 | 49,868 | 49,868 | 49,868 | 49,868 | 49,868 |
| Dover sole | 1,274,501 | 669,053 | 1,274,501 | 1,274,501 | 1,274,501 | 1,274,501 | 1,274,501 | 1,274,501 | 1,274,501 | 1,274,501 | 1,274,501 | 1,274,501 | 445,143 | 1,274,501 | 1,274,501 | 1,274,501 |
| English sole | 183,599 | 1,304,161 | 167,947 | 235,176 | 227,956 | 379,896 | 733,854 | 782,540 | 1,001,871 | 766,490 | 1,202,478 | 755,214 | 2,056,230 | 835,410 | 828,673 | 1,115,550 |
| Petrale sole | 57,606 | 57,606 | 57,606 | 57,606 | 57,606 | 57,606 | 57,606 | 57,606 | 57,606 | 57,606 | 57,606 | 57,606 | 57,606 | 57,606 | 57,606 | 57,606 |
| Arrowtooth fl | 2,235,531 | 1,289,898 | 1,854,949 | 1,655,769 | 1,676,706 | 1,106,939 | 681,357 | 379,123 | 361,486 | 80,869 | 15,393 | 372 | 0 | 0 | 0 | 0 |
| Starry fl | 42 | 2,619 | 10,116 | 25,646 | 5,422 | 777 | 1,026 | 0 | 11,071 | 0 | 79,771 | 91,772 | 147,267 | 11,949 | 18,686 | 0 |
| Other flatfish | 37,229 | 487,916 | 169,498 | 387,766 | 370,805 | 886,828 | 924,389 | 924,389 | 891,565 | 924,389 | 496,926 | 924,389 | 924,389 | 924,389 | 924,389 | 924,389 |
| Total | 4,517,446 | 4,517,446 | 4,517,446 | 4,517,446 | 4,517,446 | 4,517,446 | 4,517,446 | 4,517,446 | 4,517,446 | 4,517,446 | 4,517,446 | 4,517,446 | 4,517,446 | 4,517,446 | 4,517,446 | 4,517,446 |

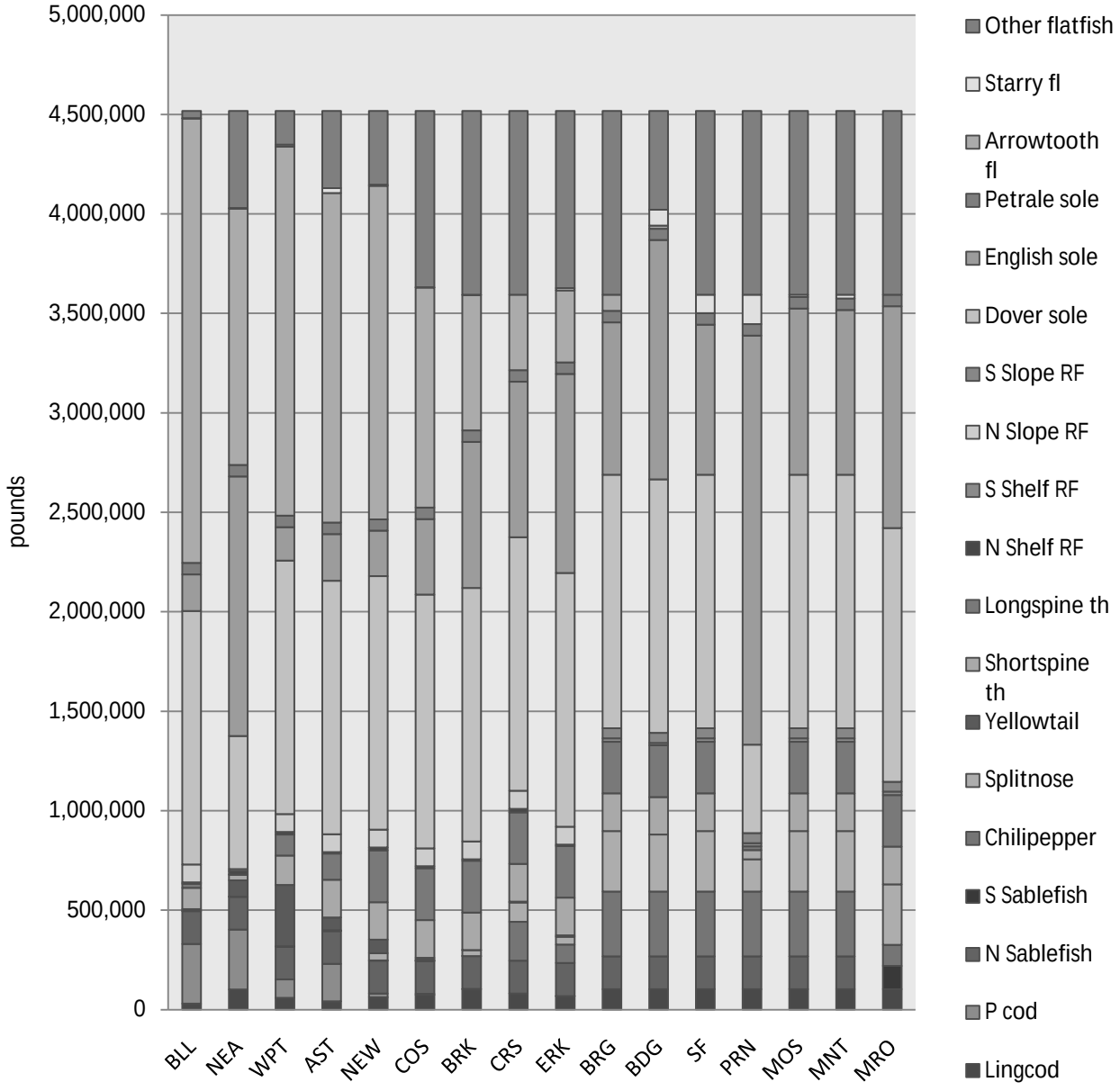



Figure A- 5. Distribution of hypothetical account pounds by port and species or species group that would meet the non-whiting groundfish control limit and stay within species limits.

**Dependence of Coastal Communities on Non-Whiting Trawl Fishery.** The non-whiting trawl fishery dependency analysis showed that 17 of 35 (49%) coastal counties between Washington and California had at least one LE non-whiting trawl landing in 2008 (Table A- 11). The proportion of total commercial vessels that made at least one landing in a dependent county that was a non-whiting trawl fishery vessel ranged from less than 1% (1 vessel) of the local commercial fleet in Santa Barbara County, CA to 12% of the commercial fleet in Clatsop County, OR, which included the primary port of Astoria and also held the largest fleet of non-whiting trawl vessels using a single county (31 vessels). Total non-whiting groundfish revenues that accrued to the trawl non-whiting fleet were about $31.8 million, which represented about 12% of all commercial fishery revenues (about $272 million) accruing to all commercial fisheries in the PFMC area in 2008. The number of non-whiting trawl fishery buyers ranged from one in Santa Barbara to 10 in Mendocino County. Clatsop County, OR had the largest share of coastwide non-whiting trawl fishery revenues at 27.7% ($8.8 million) followed by Lincoln County, OR at 14.7% ($4.7 million), Coos County, OR at 14.6% ($4.6 million), and Humboldt County, CA at 12.5% ($4.0 million).

**Table A- 11. Non-whiting trawl groundfish dependence metrics and county ratings: 2008 data**

| | | Vessels | | | Revenue | | | Buyers | | Revenue, All Ports | | Dependence |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| County | Port(s) 1/ | No. | P 2/ | Rank | Value | P 2/ | Rank | No. | Rank | Share | Rank | Rating |
| Whatcom, WA | **Bellingham**, Blaine | 4 | 0.08 | 13 | $1,001,006 | 0.23 | 12 | 2 | 2 | 0.03 | 10 | Medium |
| Skagit, WA | Anacortes | 0 | 0.00 | 0 | $0 | 0.00 | 0 | 0 | 0 | 0.00 | 0 | Not dependent |
| Snohomish, WA | Everett | 0 | 0.00 | 0 | $0 | 0.00 | 0 | 0 | 0 | 0.00 | 0 | Not dependent |
| King, WA | Seattle | 0 | 0.00 | 0 | $0 | 0.00 | 0 | 0 | 0 | 0.00 | 0 | Not dependent |
| Pierce, WA | Tacoma | 0 | 0.00 | 0 | $0 | 0.00 | 0 | 0 | 0 | 0.00 | 0 | Not dependent |
| Thurston, WA | Olympia | 0 | 0.00 | 0 | $0 | 0.00 | 0 | 0 | 0 | 0.00 | 0 | Not dependent |
| Jefferson, WA | Port Townsend | 0 | 0.00 | 0 | $0 | 0.00 | 0 | 0 | 0 | 0.00 | 0 | Not dependent |
| Clallam, WA | **Neah Bay**, Port Angeles, La Push | 3 | 0.04 | 7 | $47,219 | 0.02 | 4 | 2 | 2 | 0.00 | 3 | Low |
| Grays Harbor, WA | **Westport**, Grays Harbor, Copalis Beach | 7 | 0.03 | 5 | $837,062 | 0.02 | 3 | 3 | 8 | 0.03 | 8 | Low |
| Pacific, WA | **Ilwaco, Wilapa Bay** | **0** | 0.00 | 0 | $0 | 0.00 | 0 | 0 | 0 | 0.00 | 0 | Not dependent |
| Klickitat, WA | OCR | 0 | 0.00 | 0 | $0 | 0.00 | 0 | 0 | 0 | 0.00 | 0 | Not dependent |
| Clatsop, OR | **Astoria**, Gearhart-Seaside, Cannon Beach | 31 | 0.12 | 17 | $8,789,749 | 0.28 | 15 | 4 | 11 | 0.28 | 17 | High |
| Tillamook, OR | Tillamook | 2 | 0.02 | 3 | $12,612 | 0.00 | 2 | 2 | 2 | 0.00 | 2 | Low |
| Lincoln, OR | **Newport**, Salmon River, Siletz Bay, Depoe Bay, Waldport, Yachats | 24 | 0.08 | 12 | $4,651,153 | 0.14 | 10 | 2 | 2 | 0.15 | 16 | Medium |
| Lane, OR | Florence | 0 | 0.00 | 0 | $0 | 0.00 | 0 | 0 | 0 | 0.00 | 0 | Not dependent |
| Douglas, OR | Winchester Bay | 0 | 0.00 | 0 | $0 | 0.00 | 0 | 0 | 0 | 0.00 | 0 | Not dependent |
| Coos, OR | **Coos Bay**, Bandon | 21 | 0.10 | 16 | $4,645,000 | 0.23 | 13 | 7 | 16 | 0.15 | 15 | High |
| Curry, OR | **Brookings**, Port Orford, Gold | 9 | 0.06 | 9 | $1,876,613 | 0.26 | 14 | 2 | 2 | 0.06 | 12 | Medium |

| County | Port(s) 1/ | Vessels | | | Revenue | | | Buyers | | Revenue, All Ports | | Dependence |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. | P 2/ | Rank | Value | P 2/ | Rank | No. | Rank | Share | Rank | Rating |
| | Beach | | | | | | | | | | | |
| Del Norte, CA | **Crescent City** | **10** | 0.08 | 11 | $977,094 | 0.11 | 7 | 3 | 8 | 0.03 | 9 | Medium |
| Humboldt, CA | **Eureka**, Fields Landing, Trinidad, others | 14 | 0.10 | 15 | $3,950,725 | 0.35 | 17 | 3 | 8 | 0.12 | 14 | High |
| Mendocino, CA | **Fort Bragg**, Albion, Pt. Arena, Others | 7 | 0.06 | 10 | $2,287,865 | 0.32 | 16 | 10 | 17 | 0.07 | 13 | High |
| Sonoma, CA | **Bodega Bay** | **1** | 0.01 | 2 | $221,431 | 0.06 | 5 | 2 | 2 | 0.01 | 4 | Low |
| Marin, CA | Tomales Bay | 0 | 0.00 | 0 | $0 | 0.00 | 0 | 0 | 0 | 0.00 | 0 | Not dependent |
| Alameda, CA | Oakland, Alameda | 0 | 0.00 | 0 | $0 | 0.00 | 0 | 0 | 0 | 0.00 | 0 | Not dependent |
| Contra Costa, CA | Richmond | 0 | 0.00 | 0 | $0 | 0.00 | 0 | 0 | 0 | 0.00 | 0 | Not dependent |
| San Francisco, CA | **San Francisco** | **9** | 0.05 | 8 | $1,221,135 | 0.18 | 11 | 6 | 14 | 0.04 | 11 | Medium |
| San Mateo, CA | **Princeton** | **8** | 0.09 | 14 | $341,615 | 0.11 | 8 | 6 | 14 | 0.01 | 5 | Medium |
| Santa Cruz, CA | Santa Cruz | 0 | 0.00 | 0 | $0 | 0.00 | 0 | 0 | 0 | 0.00 | 0 | Not dependent |
| Monterey, CA | **Moss Landing, Monterey**, others | 3 | 0.03 | 4 | $509,799 | 0.07 | 6 | 4 | 11 | 0.02 | 7 | Medium |
| San Luis Obispo, CA | **Morro Bay**, Avila | 4 | 0.03 | 6 | $353,230 | 0.13 | 9 | 4 | 11 | 0.01 | 6 | Medium |
| Santa Barbara, CA | Santa Barbara | 1 | 0.01 | 1 | $1,386 | 0.00 | 1 | 1 | 1 | 0.00 | 1 | Low |
| Ventura, CA | Ventura, Oxnard, Others | 0 | 0.00 | 0 | $0 | 0.00 | 0 | 0 | 0 | 0.00 | 0 | Not dependent |
| Los Angeles, CA | Terminal Island, San Pedro, Long Beach, Others | 0 | 0.00 | 0 | $0 | 0.00 | 0 | 0 | 0 | 0.00 | 0 | Not dependent |
| Orange, CA | Newport Beach, Dana Point, Others | 0 | 0.00 | 0 | $0 | 0.00 | 0 | 0 | 0 | 0.00 | 0 | Not dependent |
| San Diego, CA | San Diego | 0 | 0.00 | 0 | $0 | 0.00 | 0 | 0 | 0 | 0.00 | 0 | Not dependent |
| Totals | All | | | | $31,724,693 | | | | | 1.00 | | |

1/ Primary non-whiting trawl fishery ports shown in bold letters.
2/ Proportion (P) is based on commercial fishing statistics for the county.

The counties that received a High non-whiting trawl fishery dependence rating did so because of their relatively high rankings relative to the four fishery metrics used in the analysis. These counties included Clatsop and Coos counties in OR and Humboldt and Mendocino counties in CA (Table A- 11). The counties that received a Low non-whiting trawl fishery dependence rating included Neah Bay and Grays Harbor in WA; Tillamook county in OR, and Sonoma and Santa Barbara counties in CA. The other counties were ranked as having Medium dependence on the non-whiting trawl fishery.

**County Vulnerability Assessment.** The vulnerability analysis combined economic dependency assessments from the 2008-2010 specifications document and the non-whiting trawl fishery dependency assessments presented above (Table A- 11). These inputs were used to produce vulnerability assessments by county based on general fishery dependence together with non-whiting trawl fishery dependence. The specifications assessments included county-based fishery engagement, groundfish dependence, and socioeconomic resiliency assessments, all three of which drew upon and used a variety of economic metrics as described in the Methods

section. There were 35 coastal counties included in the vulnerability analysis including 29 that supported some form of commercial and/or recreational groundfish fishing (Table A- 12). The non-whiting trawl assessment showed 18 counties that had at least one non-whiting trawl groundfish landing in 2008. The vulnerability analysis based on non-whiting groundfish fishery metrics identified the following counties as vulnerable: Grays Harbor, WA; Tillamook, Lincoln and Coos counties in OR; and Del Norte and Humboldt counties in CA (Table A- 12). These assessments were based on a low resiliency rating and high dependence either on ocean fishing overall or groundfish fishing by itself. Mendocino County CA was rated as most vulnerable because of high dependence on both general ocean fishing and non-whiting groundfish fishing in addition to low resilience. The vulnerability ratings constructed using general groundfish fishing metrics and non-whiting fishery metrics showed the same or similar results for seven counties, but disagreement in one (Grays Harbor, WA).

One port received a disadvantaged rating in the trawl rationalization assessment: Neah Bay (Table A- 12 and. Table A- 13). This was because of low rankings relative to four non-whiting trawl fishery parameters: fleet efficiency, bycatch concerns, shore-based infrastructure, and initial allocation of groundfish. The county of this port, Clallam County WA, was ranked as vulnerable because of low resiliency rating. Thus, trawl rationalization may pose an economic threat to this particular county. Several other ports had negative assessments in one or two categories but had positive assessment in the remaining categories, thus no score was given to those ports, meaning that the impact of trawl rationalization could not be projected. The ports with positive scores in the rationalization assessment included Astoria, Coos Bay and Eureka. The counties of two of these ports, Coos (Coos Bay) and Humboldt (Eureka), were identified as vulnerable because of high fishery dependency and low county resiliency. These counties may be vulnerable, but trawl rationalization does not appear to be a threat to each county's economic situation based on the trawl fishery rationalization assessment for the ports of Coos Bay and Eureka. Astoria is located in Clatsop County, OR, and received a medium County resiliency rating and was not rated as vulnerable, but even if it were, there would be very low economic threat to the county stemming from trawl fishery rationalization.

Table A- 12. Summary of fishery engagement, groundfish fishery dependence, economic resiliency rating, groundfish vulnerability rating, and non-whiting trawl fishery rationalization advantage score by county for 2008.

| County | Port(s) | Fishery Engagement Rating 1/ | Groundfish Dependence Rating 2/ | Non-W Trawl Dependency Rating 3/ | County Resiliency Rating 4/ | GF Vulnerability Rating 5/ | Non-W Trawl Vulnerability Rating 6/ | 2006 Vulnerability Rating 7/ | Trawl Rationalization Advantage Score 8/ |
|---|---|---|---|---|---|---|---|---|---|
| Whatcom, WA | **Bellingham**, Blaine | Low | Medium | Medium | Medium | | | | Positive except for bycatch concern |
| Skagit, WA | Anacortes | Low | Not Dependent | Not Dependent | Medium | | | | |
| Snohomish, WA | Everett | Low | Not Dependent | Not Dependent | Medium | | | | |
| King, WA | Seattle | Low | Not dependent | Not Dependent | High | | | | |
| Pierce, WA | Tacoma | Low | Not Dependent | Not Dependent | High | | | | |
| Thurston, WA | Olympia | Low | Not Dependent | Not Dependent | High | | | | |
| Jefferson, WA | Port Townsend | Low | Not Dependent | Not Dependent | Medium | | | | |
| Clallam, WA | **Neah Bay**, Port Angeles and La Push | Medium | Medium | Low | Medium | | | Vulnerable | Negative |
| Grays Harbor, WA | **Westport**, Grays Harbor, Copalis Beach | High | Medium | Low | Low | Vulnerable | Vulnerable | Most Vulnerable | |
| Pacific, WA | **Ilwaco, Wilapa Bay** | High | Low | Not Dependent | Low | Vulnerable | | Vulnerable | |
| Klickitat, WA | OCR | Not rated but some groundfish | Not rated but some groundfish | Not Dependent | | | | | |
| Clatsop, OR | **Astoria**, Gearhart-Seaside, Cannon Beach | High | Medium | High | Medium | | | Vulnerable | Positive |
| Tillamook, OR | Tillamook | High | Medium | Low | Low | Vulnerable | Vulnerable | | |
| Lincoln, OR | **Newport**, Salmon River, Siletz Bay, Depoe Bay, Waldport, Yachats | High | High | Medium | Low | **Most Vulnerable** | Vulnerable | **Most Vulnerable** | Positive except for bycatch concern |
| Lane, OR | Florence | High | Low | Not Dependent | Medium | | | | |
| Douglas, OR | Winchester Bay | Low | Low | Not Dependent | Low | | | | |
| Coos, OR | **Coos Bay**, | Medium | High | High | Low | Vulnerable | Vulnerable | **Most** | Positive |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Bandon | | | | | | | **Vulnerable** | |
| Curry, OR | **Brookings**, Port Orford, Gold Beach | Medium | High | Medim | Low | Vulnerable | | Vulnerable | Positive except for infrastructure concern |
| Del Norte, CA | **Crescent City** | High | High | Medium | Low | **Most Vulnerable** | Vulnerable | Vulnerable | |
| Humboldt, CA | **Eureka**, Fields Landing, Trinidad and others | Medium | High | High | Low | Vulnerable | Vulnerable | **Most Vulnerable** | Positive |
| Mendocino, CA | **Fort Bragg**, Albion, Pt. Arena, Others | High | High | High | Low | **Most Vulnerable** | **Most Vulnerable** | **Most Vulnerable** | Positive except for fleet efficiency concern |
| Sonoma, CA | **Bodega Bay** | Medium | Medium | Low | High | | | | |
| Marin, CA | Tomales Bay | Medium | Low | Not Dependent | High | | | | |
| Alameda, CA | Oakland, Alameda | High | Low | Not Dependent | High | | | | |
| Contra Costa, CA | Richmond | Low | Low | Not Dependent | High | | | | |
| San Francisco, CA | **San Francisco** | Medium | Medium | Medium | High | | | | |
| San Mateo, CA | **Princeton** | Medium | Medium | Medium | High | | | | |
| Santa Cruz, CA | Santa Cruz | Medium | Medium | Not Dependent | Medium | | | | |
| Monterey, CA | **Moss Landing, Monterey**, others | High | High | Medium | Medium | | | Vulnerable | |
| San Luis Obispo, CA | **Morro Bay**, Avila | High | High | Medium | Medium | | | | |
| Santa Barbara, CA | Santa Barbara | High | Medium | Low | High | | | | |
| Ventura, CA | Ventura, Oxnard, Others | High | Medium | Not Dependent | High | | | | |
| Los Angeles, CA | Terminal Island, San Pedro, Long Beach, Others | High | Medium | Not Dependent | Medium | | | Vulnerable | |
| Orange, CA | Newport Beach, Dana Point, Others | High | Medium | Not Dependent | High | | | | |
| San Diego, CA | San Diego | High | Medium | Not Dependent | High | | | | |

1/ Based on county ranking relative to total commercial fishery revenues, number of commercial vessels, number of commercial buyers, total recreational trips, and number of recreational charter vessels (Source PFMC 2010d)

2/ Based on county ranking relative to proportion of total commercial vessels that were groundfish vessels, proportion of total commercial revenues that were groundfish revenues, number of groundfish buyers, proportion of recreational trips that were groundfish trips, and proportion of total groundfish trips for all ports (Source PFMC 2010d)
3/Based on county ranking relative to proportion of total commercial vessels that were non-whiting trawl vessels, proportion of total commercial revenues that were non-whiting trawl revenues, number of non-whiting trawl buyers and proportion of total non-whiting trawl revenues for all ports (Source: This Report)
4/ Based on county ranking relative to population density, industry diversity index, poverty rate, and unemployment rate (Source: PFMC 2010d)
5/ Based on county ranking relative to fishery engagement rating, groundfish fishery dependency rating, and county resiliency rating (Source PFMC 2010d). To achieve a vulnerable rating the county has to have a low resiliency rate and either a high fishery engagement rating or a high groundfish dependency rating. To achieve a highly vulnerable rating the county has to have a low resiliency rating and both a high fishery engagement rating and a high groundfish fishery dependency rating.
6/ Same as 5/ but for non-whiting trawl fishery dependency ranking (Source: This Report)
7/ 2006-2007 groundfish specifications (Source: PFMC 2010d)
8/ Assessment is for primary ports and is based on fleet efficiency score, bycatch dependency score, shore-based infrastructure assessment, and initial groundfish allocations (Source PFMC 2010d).

**Table A- 13. Comparative advantage of non-whiting trawl communities under trawl rationalization (Source: PFMC 2010).**

| Port | Fleet Efficiency Score | Bycatch Dependent Area Score | Shore-based Infrastructure | Initial Allocation of Groundfish | Score |
|---|---|---|---|---|---|
| Bellingham | ? | – – | + + | + | |
| Neah Bay | – | – – | – – | – | – |
| Westport | – | + | + | – | |
| Astoria | + | + | + + | + + | + |
| Newport | + | – | + + | + | |
| Charleston (Coos Bay) | + | + | + + | + | + |
| Brookings | + | + | – | + | |
| Crescent City | – | + | + | – | |
| Eureka | + | + | + | + | + |
| Fort Bragg | – | + | + | + | |
| San Francisco | – | – | + + | + | |
| Moss Landing | – | – – | + | + | |
| Princeton/Half Moon Bay | – | – – | + | + | |
| Morro Bay | ? | + | – | – | |

**Theoretical Maximum Target Species Landing Estimates by Management Area Based on Overfished Species Bycatch Ratios.** In the following, seaward waters means waters >115 fm in depth and shoreward waters means waters ≤115 fm in depth. This analysis showed that maximum target species landings in each management area could occur if all fishing took place in seaward waters because of the relatively low abundance of overfished species there compared to shoreward waters (Table A- 3). The analysis showed that cowcod was the most constraining species in the Conception and Monterey areas (San Diego to Morro Bay and from Monterey to Fort Bragg) with a maximum potential landing of target species in each area (if all vessels fished in seaward waters) of 26,728 mt (Table A- 14; Figure A- 6). In the Eureka area (Eureka to Brookings) the most constraining species was darkblotched rockfish with a theoretical maximum potential target species landing of 16,694 mt. The most constraining species in the Columbia area (Coos Bay to Westport) in seaward waters was Pacific Ocean perch, with 7,539 mt of theoretical maximum potential target species landings. In the US/Vancouver area (Neah Bay to Bellingham), the most constraining species in seaward waters was Pacific ocean perch with a maximum potential target species landing of 6,014 mt.

In the Columbia area, shoreward fishing would allow target species landings of only 3,574 mt based on yelloweye rockfish bycatch ratios. Shoreward fishing in the other management areas showed maximum target species landings in the range of only 896 mt in the US/Vancouver area to 2,327 mt in the Eureka area, in both cases due to yelloweye bycatch constraints.

**Table A- 14 Maximum potential groundfish target species landings in mt by management area, depth fished based on overfished species bycatch ratios (Table A- 3).**

| | Conception | | Monterey | | Eureka | | Columbia | | US/Vancouver | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SeaW | ShoreW | SeaW | ShoreW | SeaW | ShoreW | SeaW | ShoreW | SeaW | ShoreW |
| bocaccio | 33,441 | 3,156 | 33,441 | 3,156 | n/a | n/a | n/a | n/a | n/a | n/a |
| canary | 2,836,323 | 16,380 | 2,836,323 | 16,380 | 1,208,533 | 2,971 | 182,220 | 8,404 | 848,564 | 3,221 |
| cowcod | 26,728 | 1,051 | 26,728 | 1,051 | n/a | n/a | n/a | n/a | n/a | n/a |
| darkblotched | 52,433 | 36,088,331 | 52,433 | 36,088,331 | 16,694 | 114,812 | 13,317 | 112,079 | 25,209 | 160,747 |
| Pacific ocean perch | n/a | n/a | n/a | n/a | 87,274 | 802,608 | 7,539 | 1,077,240 | 6,014 | 111,556 |
| widow | 417,462 | 269,227 | 417,462 | 269,227 | 34,807,246 | 1,613,389 | 374,158 | 729,452 | 4,327,558 | 2,135,165 |
| yelloweye | 0 | 3,191 | 0 | 3,191 | 47,617 | 2,327 | 27,322 | 3,574 | 47,146 | 896 |

1/ SeaW means >115 fm and ShoreW means fishing in waters ≤ 115 fm

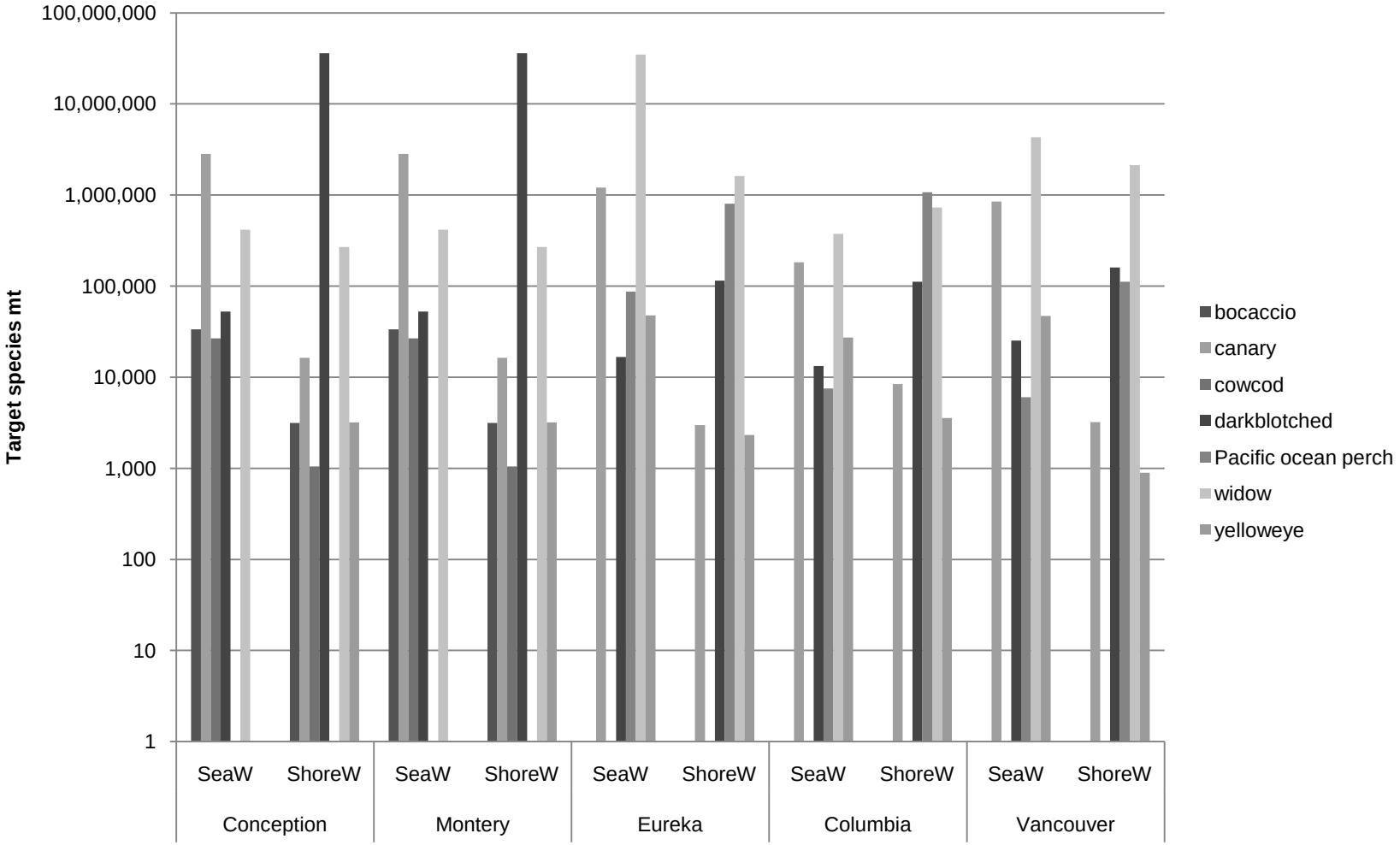



**Figure A- 6. Maximum potential groundfish target species landings based on overfished groundfish species bycatch ratios (Table A-3) by management area and depth fished (SeaW=>115 fm; ShoreW=<115fm).**

## A.5 Findings and Conclusions

### *A.5.1* General

- There were two centers of non-whiting trawl fishery activity during 2008-2010: the central/northern Oregon area (Coos Bay, Newport and Astoria) and the Eureka area (Tables A-4, A-5 and A-6; **Figure A- 1**). Average revenues per vessel varied widely between ports and years with highest average revenues calculated for Fort Bragg and Eureka vessels (over $300 thousand on average, and in all years except one) and lowest for Neah Bay and Princeton vessels ($30-40 thousand range on average) (Table A-6; Figure A-2). The years 2008-2009 had similar coastwide averages ($257 thousand and $259 thousand, respectively), but 2010 dropped about 16% (to $223,000) compared to the previous year (Table A-6).
- In 5 ports which served as a primary port for a least one trawl vessel (Neah Bay, Bodega Bay, Princeton, Moss Landing, and Monterey) the single year maximum landings for no target species exceeded 1.0 control limits during either study period (1996-1998 or 2004-2010) (Table ES- 1 and Table ES- 2).
- The other 11 ports (Bellingham, Westport, Astoria, Newport, Coos Bay, Brookings, Crescent City, Eureka, Fort Bragg, San Francisco and Morro Bay) all had at least one year (the port's maximum year) in which landings for a given target species were >1.25 control limits (Table ES- 1 and Table ES- 2). Most of these same ports exceeded two control limits for at least one target species.
- Using average data rather than maximums of the single year landings data showed fewer ports with landings exceeding 1.25 control limits at some time. Period averages were lower than maximums by about 22% and 37% for 1996-1998 and 2004-2010 data, respectively.
- Landings declined for all target species except Dover sole (2% difference) between the two study periods (based on landing indices) (Table ES- 1 and Table ES- 2). The amount of decline ranged from 16% (sablefish) to 81% (longspine thornyhead). This trend resulted in fewer ports (9 in 1996-1998 versus 6 in 2004-2010) with landings of a target species ≥2.0 control limits. The same number of ports (10) had landings target species ≥1.5 the control limits in both periods, but the list of ports was different.
- The aggregate groundfish control limit analysis showed that it would be possible for each hypothetical QS holder to accrue about 4.5 million pounds of fish based on 2011 trawl allocations depending on the mix of species they desire to have in their account.
- A total of 13 ports were omitted from the analysis because they were not primary landing ports during 2008-2010. Some of these ports historically had much higher landings than in recent years. Avila (Port San Luis) for example averaged 1.7 million pounds per year during 1996-98, which was higher than Moss Landing, a port included in the expanded analysis, on average, during the same period (1.5 million pounds). The Council may wish to consider ports that were not included in the analysis for Designated CFA status based on their historical landings.
- The dependency analysis showed that 15 coastal counties of WA, OR and CA received non-whiting trawl fishery revenues totalling $31.8 million, which represented 12% of all commercial fishery revenues for coastal counties. The analysis used 2008 data to comport with US Census Bureau economic data used in the vulnerability analysis. The major non-whiting trawl fishery counties included Clatsop County, OR (27.7%), Lincoln County, OR (14.7%), Coos County, OR (14.6%) and Humboldt County, CA (12.5%). These same counties were given a High non-whiting trawl fishery dependency rating.
- The vulnerability analysis listed the following counties as vulnerable or most vulnerable based on assessments of general fishery dependency, non-whiting trawl fishery dependency and county resiliency: Grays Harbor County, WA; Tillamook County, OR; Lincoln County, OR; Coos County, OR; Del Norte County, CA, Humboldt County, CA; and Mendocino County, CA. They were rated vulnerable because of high fishery dependency and low resiliency to economic disruption.
- If a CFA is provided a higher limit for target species then landing that limit will require that the CFA or vessels acquire the overfished species QP needed to with that target species, potentially increasing the

amount of overfished species QS demanded for the area of the coast in which the CFA operates. Overfished species bycatch ratios (from 2003-2006 WCGOP at sea observations) were used to calculate theoretical maximum target species landings by PFMC area for fishing constrained to waters >115 fm ("seaward") and <115 fm ("shoreward"). The estimates for seaward fishing ranged from 6,014 mt in the US/Vancouver area (based on Pacific Ocean perch bycatch ratios) to 26,728 mt in the Conception and Monterey areas (based on cowcod). For shoreward fishing the estimates ranged from 896 mt in the US/Vancouver area (based on yelloweye rockfish) to 3,574 in the Columbia area (based on yelloweye rockfish)..

## *A.5.2* Specific Questions asked by the Council Regarding the Level of the Exception for CFAs.

At its November 2010 meeting the Council asked that analysts look at a number of specific issues regarding the effects of higher accumulation limits. The following reviews those issues and provides relevant information.

Historical participation and dependence.

Historical participation (past landings) is assessed in the preceding tables and figures expressed in terms of QS control limits. Dependency and vulnerability assessments are presented in tables 11 and 12.

Ability to support a full time captain and crew.

The control limits were designed to allow one individual to control sufficient QS to support two vessels working full time. For the typical vessel, this would include a captain and crew of two individuals. Many of the ports analyzed did not have total landings for any of the species or species groups or for aggregate groundfish in any year or period that exceeded one control limit. These ports included Neah Bay, Bodega Bay, Princeton, Moss Landing and Monterey. The other ports (Bellingham, Westport, Astoria, Newport, Coos Bay, Brookings, Crescent City, Eureka, Fort Bragg, San Francisco, and Morro Bay) had landings that exceeded one control limit depending on the species or species group. Sablefish landings at these other ports generally exceeded 1.5 control limits up to as high as 10.5 control limits.

Ability to support necessary infrastructure, such as processing capacity, port facilities etc.

A precise answer to this question would depend on several factors including local port conditions and other fisheries operating out of any particular port. The analysis shows that of all the west coast ports there are several that would appear to need higher control limits ( at least about 1.5 times) in order to cover all their landings with CFA controlled QS. These ports include Bellingham, Westport, Astoria, Newport, Coos Bay, Brookings, Crescent City, Eureka, Fort Bragg, San Francisco and Morro Bay. If the other ports on the coast (Neah Bay, Bodega Bay, Princeton, Moss Landing and Monterey) are considered to have long-term viability at their recent harvest levels then it appears that the current control limits may be sufficient to support the necessary infrastructure for smaller ports.

The potential to lose or gain quota share based on market forces.

Certain ports have been identified as being more likely to lose QS than other ports. Table 4-69 from the Amendment 20 EIS appears as Table A-13 in this document. This table shows that most of the ports that might potentially benefit from a CFA higher control limit tend to be those that are expected to have a comparative advantage in the trawl rationalization program. These ports include Astoria, Coos Bay and Eureka. The one port rated as disadvantaged was Neah Bay. No scores were provided for the other ports because of mixed scores for the various fishery or fishery related parameters used in the analyis.

The ability to use community-based quota to attract quota landings.

> Under current control limits, a smaller port could offer to cover all the landings in that port with CFA controlled QS, while a CFA for a larger port would be constrained to covering only a portion of those landings. Raising the control limits would allow larger ports to cover a greater portion of the landings with CFA controlled QS and allow smaller ports to expand operations covered by CFA controlled QS. The ability of larger and smaller ports to acquire QS up to the higher limits would likely depend on the tax base or other funding sources available to support CFA acquisition of QS.

## A.6 Literature Cited

Pacific Fishery Management Council (PFMC). 2010a. Analysis of components, elements, and options for the individual fishing quota alternative trawl individual quota components: Appendix A to the rationalization of the Pacific coast groundfish limited entry trawl fishery final environmental impact statement. PFMC, Portland OR 97220.

_____. 2010b. Rationalization of the Pacific coast groundfish limited entry trawl fishery: Final environmental impact statement including regulatory impact review and initial regulatory flexibility analysis. PFMC, Portland OR 97220.

_____.2010c. Groundfish Fishery Management Plan Amendment 21 (Intersector Allocation): Final environmental impact statement. PFMC, Portland OR 97220.

_____ 2010d. Proposed Harvest Specifications and Management Measures for the 2011-2012 Pacific Coast Groundfish Fishery and Amendment 16-5 to the Pacific Coast Groundfish Fishery Management Plan to Adopt a Rebuilding Plan for Petrale Sole: Update of the 2006 community vulnerability analysis. PFMC, Portland OR 97220

## A.7 Attachments

Table AT- 1. Number of control limit-equivalent landings for BLL by period and species.

| | 1996 | 1997 | 1998 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lingcod | 1.80 | 1.46 | 0.17 | 0.05 | 0.08 | 0.15 | 0.09 | 0.06 | 0.20 | 0.12 |
| P cod | 0.17 | 0.48 | 0.41 | 1.36 | 1.30 | 0.22 | 0.12 | 0.00 | 0.14 | 0.25 |
| N Sablefish | 0.80 | 1.02 | 0.70 | 1.04 | 1.31 | 1.51 | 1.09 | 1.20 | 1.02 | 0.58 |
| S Sablefish | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chilipepper | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Splitnose | 0.02 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Yellowtail | 1.63 | 0.67 | 0.67 | 0.04 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Shortspine th | 0.29 | 0.25 | 0.24 | 0.13 | 0.13 | 0.17 | 0.21 | 0.27 | 0.31 | 0.29 |
| Longspine th | 0.54 | 0.49 | 0.17 | 0.05 | 0.00 | 0.01 | 0.06 | 0.04 | 0.02 | 0.03 |
| N Shelf RF | 6.98 | 6.54 | 6.75 | 0.26 | 0.06 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| S Shelf RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Slope RF | 7.48 | 8.66 | 4.68 | 0.65 | 0.29 | 0.56 | 0.57 | 0.33 | 0.48 | 0.45 |
| S Slope RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Dover sole | 0.45 | 0.28 | 0.40 | 0.34 | 0.59 | 0.48 | 0.57 | 0.61 | 0.85 | 0.80 |
| English sole | 0.01 | 0.03 | 0.03 | 0.07 | 0.09 | 0.02 | 0.04 | 0.00 | 0.01 | 0.00 |
| Petrale sole | 1.17 | 2.44 | 3.61 | 6.08 | 9.42 | 5.59 | 2.90 | 2.15 | 2.96 | 0.99 |
| Arrowtooth fl | 0.31 | 0.42 | 0.73 | 0.60 | 0.31 | 0.14 | 0.15 | 0.20 | 0.40 | 0.34 |
| Starry fl | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other flatfish | 0.01 | 0.01 | 0.03 | 0.00 | 0.02 | 0.01 | 0.01 | 0.01 | 0.03 | 0.02 |
| Aggregate gf | 0.79 | 0.81 | 0.91 | 0.73 | 0.67 | 0.40 | 0.38 | 0.39 | 0.60 | 0.51 |

Table AT- 2. Number of control limit-equivalent landings for NEA by period and species.

| | 1996 | 1997 | 1998 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lingcod | 0.65 | 1.11 | 0.18 | 0.07 | 0.13 | 0.11 | 0.06 | 0.01 | 0.02 | 0.00 |
| P cod | 0.39 | 2.28 | 1.60 | 0.81 | 1.00 | 0.69 | 0.05 | 0.02 | 0.16 | 0.04 |
| N Sablefish | 0.45 | 0.97 | 0.67 | 0.33 | 0.53 | 0.22 | 0.00 | 0.07 | 0.02 | 0.00 |
| S Sablefish | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chilipepper | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Splitnose | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Yellowtail | 1.13 | 0.56 | 0.90 | 0.04 | 0.04 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| Shortspine th | 0.09 | 0.21 | 0.19 | 0.00 | 0.03 | 0.01 | 0.00 | 0.02 | 0.00 | 0.00 |
| Longspine th | 0.15 | 0.22 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Shelf RF | 3.54 | 3.84 | 4.40 | 0.04 | 0.05 | 0.03 | 0.01 | 0.01 | 0.00 | 0.00 |
| S Shelf RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Slope RF | 5.32 | 5.89 | 2.64 | 0.00 | 0.02 | 0.02 | 0.00 | 0.01 | 0.00 | 0.00 |
| S Slope RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Dover sole | 0.15 | 0.26 | 0.17 | 0.03 | 0.08 | 0.08 | 0.01 | 0.01 | 0.01 | 0.00 |
| English sole | 0.02 | 0.17 | 0.15 | 0.06 | 0.10 | 0.07 | 0.02 | 0.01 | 0.01 | 0.00 |
| Petrale sole | 1.46 | 3.20 | 3.54 | 1.01 | 1.31 | 0.70 | 0.30 | 0.07 | 0.36 | 0.04 |
| Arrowtooth fl | 0.00 | 0.07 | 0.06 | 0.01 | 0.12 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Starry fl | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other flatfish | 0.01 | 0.07 | 0.12 | 0.04 | 0.08 | 0.06 | 0.03 | 0.00 | 0.01 | 0.00 |
| Aggregate gf | 0.36 | 0.68 | 0.53 | 0.13 | 0.27 | 0.17 | 0.03 | 0.01 | 0.02 | 0.00 |

Table AT- 3. Number of control limit-equivalent landings for WPT by period and species.

| | 1996 | 1997 | 1998 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lingcod | 2.72 | 2.17 | 0.18 | 0.07 | 0.11 | 0.14 | 0.16 | 0.16 | 0.15 | 0.04 |
| P cod | 0.94 | 0.52 | 1.60 | 0.26 | 0.14 | 0.02 | 0.00 | 0.01 | 0.00 | 0.00 |
| N Sablefish | 2.28 | 1.96 | 0.67 | 0.32 | 0.23 | 0.18 | 0.64 | 0.79 | 1.63 | 0.63 |
| S Sablefish | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chilipepper | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Splitnose | 0.01 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Yellowtail | 3.80 | 1.23 | 0.90 | 0.56 | 0.50 | 0.55 | 0.99 | 0.27 | 0.33 | 0.66 |
| Shortspine th | 0.85 | 0.64 | 0.19 | 0.03 | 0.01 | 0.00 | 0.11 | 0.16 | 0.53 | 0.27 |
| Longspine th | 1.54 | 1.03 | 0.00 | 0.01 | 0.00 | 0.00 | 0.02 | 0.07 | 0.32 | 0.17 |
| N Shelf RF | 6.32 | 3.87 | 4.40 | 0.03 | 0.02 | 0.04 | 0.06 | 0.04 | 0.04 | 0.17 |
| S Shelf RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Slope RF | 12.83 | 12.98 | 2.64 | 0.26 | 0.27 | 0.19 | 1.43 | 0.78 | 1.95 | 0.61 |
| S Slope RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Dover sole | 0.79 | 0.65 | 0.17 | 0.24 | 0.20 | 0.14 | 0.52 | 0.62 | 0.87 | 0.52 |
| English sole | 0.10 | 0.06 | 0.15 | 0.02 | 0.02 | 0.01 | 0.03 | 0.03 | 0.01 | 0.00 |
| Petrale sole | 7.42 | 5.24 | 3.54 | 2.80 | 2.72 | 1.91 | 2.00 | 2.85 | 2.62 | 0.73 |
| Arrowtooth fl | 0.45 | 0.36 | 0.06 | 0.01 | 0.00 | 0.00 | 0.12 | 0.15 | 0.36 | 0.31 |
| Starry fl | 0.05 | 0.01 | 0.00 | 0.02 | 0.03 | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 |
| Other flatfish | 0.07 | 0.04 | 0.12 | 0.06 | 0.06 | 0.02 | 0.02 | 0.04 | 0.05 | 0.01 |
| Aggregate gf | 1.57 | 1.14 | 0.53 | 0.21 | 0.17 | 0.13 | 0.39 | 0.41 | 0.68 | 0.45 |

Table AT- 4. Number of control limit-equivalent landings for AST by period and species.

| | 1996 | 1997 | 1998 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lingcod | 5.17 | 3.62 | 0.88 | 0.47 | 0.55 | 1.03 | 0.90 | 0.86 | 0.78 | 0.60 |
| P cod | 0.53 | 0.34 | 0.54 | 3.79 | 2.06 | 1.31 | 0.15 | 0.05 | 0.37 | 0.38 |
| N Sablefish | 9.71 | 8.23 | 4.69 | 6.64 | 7.55 | 7.95 | 7.22 | 10.47 | 10.17 | 8.29 |
| S Sablefish | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chilipepper | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Splitnose | 0.11 | 0.14 | 0.05 | 0.05 | 0.05 | 0.02 | 0.03 | 0.02 | 0.01 | 0.01 |
| Yellowtail | 12.78 | 5.19 | 7.22 | 0.63 | 0.47 | 0.39 | 0.34 | 0.07 | 0.20 | 0.57 |
| Shortspine th | 2.93 | 2.40 | 1.81 | 1.08 | 1.10 | 1.21 | 2.73 | 5.03 | 4.79 | 3.83 |
| Longspine th | 6.35 | 5.19 | 2.99 | 0.37 | 0.14 | 0.26 | 0.80 | 1.72 | 1.17 | 2.13 |
| N Shelf RF | 21.65 | 18.37 | 29.00 | 0.20 | 0.25 | 0.54 | 0.11 | 0.10 | 0.17 | 0.27 |
| S Shelf RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Slope RF | 44.95 | 44.58 | 36.32 | 4.69 | 2.71 | 2.51 | 4.48 | 2.95 | 3.50 | 4.05 |
| S Slope RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Dover sole | 3.62 | 2.77 | 2.44 | 3.12 | 3.56 | 3.01 | 4.38 | 5.77 | 5.64 | 4.86 |
| English sole | 0.20 | 0.26 | 0.18 | 0.27 | 0.22 | 0.37 | 0.30 | 0.12 | 0.10 | 0.09 |
| Petrale sole | 8.72 | 8.79 | 8.60 | 22.99 | 34.12 | 33.20 | 22.67 | 18.13 | 15.23 | 8.17 |
| Arrowtooth fl | 0.72 | 0.67 | 1.04 | 0.56 | 0.76 | 0.82 | 1.03 | 1.38 | 1.89 | 1.39 |
| Starry fl | 0.28 | 0.57 | 0.63 | 0.96 | 0.21 | 0.72 | 0.11 | 0.04 | 0.06 | 0.14 |
| Other flatfish | 0.44 | 0.39 | 0.28 | 0.77 | 0.82 | 1.28 | 0.65 | 0.47 | 0.84 | 0.60 |
| Aggregate gf | 4.76 | 3.77 | 3.59 | 2.54 | 2.75 | 2.77 | 2.99 | 3.63 | 3.92 | 3.24 |

Table AT- 5. Number of control limit-equivalent landings for NEW by period and species.

| | 1996 | 1997 | 1998 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lingcod | 5.03 | 6.45 | 0.58 | 0.12 | 0.24 | 0.19 | 0.12 | 0.12 | 0.20 | 0.07 |
| P cod | 0.05 | 0.03 | 0.03 | 0.09 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| N Sablefish | 6.21 | 6.19 | 3.27 | 7.70 | 5.08 | 5.43 | 6.44 | 7.67 | 8.24 | 5.81 |
| S Sablefish | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chilipepper | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 |
| Splitnose | 0.08 | 0.13 | 0.16 | 0.01 | 0.02 | 0.00 | 0.01 | 0.01 | 0.02 | 0.13 |
| Yellowtail | 7.34 | 1.33 | 1.98 | 0.01 | 0.18 | 0.11 | 0.03 | 0.01 | 0.01 | 0.03 |
| Shortspine th | 1.44 | 1.31 | 1.41 | 1.40 | 0.89 | 1.02 | 2.20 | 3.07 | 3.63 | 2.66 |
| Longspine th | 2.75 | 2.34 | 0.83 | 0.30 | 0.12 | 0.22 | 0.33 | 0.74 | 1.25 | 1.49 |
| N Shelf RF | 21.81 | 13.47 | 11.25 | 0.06 | 0.11 | 0.16 | 0.03 | 0.05 | 0.09 | 0.03 |
| S Shelf RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Slope RF | 53.81 | 48.47 | 27.29 | 2.65 | 2.12 | 1.16 | 1.59 | 1.90 | 2.32 | 2.66 |
| S Slope RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Dover sole | 1.04 | 1.16 | 0.99 | 1.19 | 0.91 | 0.84 | 1.81 | 2.55 | 2.81 | 2.08 |
| English sole | 0.09 | 0.11 | 0.07 | 0.03 | 0.06 | 0.03 | 0.01 | 0.01 | 0.04 | 0.02 |
| Petrale sole | 3.21 | 5.29 | 5.52 | 4.49 | 8.55 | 7.02 | 4.26 | 5.60 | 9.78 | 4.07 |
| Arrowtooth fl | 0.05 | 0.13 | 0.10 | 0.10 | 0.16 | 0.13 | 0.11 | 0.18 | 0.25 | 0.15 |
| Starry fl | 0.04 | 0.05 | 0.03 | 0.02 | 0.04 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 |
| Other flatfish | 0.14 | 0.22 | 0.12 | 0.11 | 0.09 | 0.06 | 0.08 | 0.11 | 0.14 | 0.13 |
| Aggregate gf | 2.81 | 2.34 | 1.52 | 0.91 | 0.81 | 0.72 | 1.04 | 1.42 | 1.70 | 1.24 |

Table AT- 6. Number of control limit-equivalent landings for COS by period and species.

| | 1996 | 1997 | 1998 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lingcod | 2.19 | 2.23 | 0.69 | 0.11 | 0.15 | 0.32 | 0.34 | 0.36 | 0.27 | 0.22 |
| P cod | 0.01 | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Sablefish | 8.27 | 6.99 | 4.41 | 4.53 | 4.38 | 5.32 | 5.06 | 5.63 | 5.71 | 5.08 |
| S Sablefish | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chilipepper | 0.06 | 0.06 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Splitnose | 0.10 | 0.30 | 0.21 | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| Yellowtail | 2.74 | 0.80 | 0.99 | 0.01 | 0.03 | 0.03 | 0.00 | 0.00 | 0.01 | 0.00 |
| Shortspine th | 2.70 | 2.13 | 2.11 | 0.96 | 0.86 | 0.98 | 1.18 | 1.75 | 1.79 | 1.62 |
| Longspine th | 6.18 | 5.19 | 3.34 | 1.13 | 0.73 | 0.88 | 1.05 | 1.65 | 1.96 | 2.11 |
| N Shelf RF | 15.98 | 14.11 | 13.11 | 0.06 | 0.11 | 0.08 | 0.05 | 0.12 | 0.10 | 0.05 |
| S Shelf RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Slope RF | 19.16 | 28.99 | 16.16 | 1.45 | 1.08 | 0.82 | 0.94 | 0.67 | 0.74 | 1.27 |
| S Slope RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Dover sole | 2.47 | 2.11 | 2.42 | 1.75 | 1.74 | 1.66 | 2.43 | 3.00 | 3.19 | 3.10 |
| English sole | 0.09 | 0.18 | 0.19 | 0.10 | 0.12 | 0.08 | 0.07 | 0.03 | 0.04 | 0.02 |
| Petrale sole | 12.79 | 12.39 | 10.40 | 8.12 | 10.82 | 16.55 | 13.13 | 13.46 | 10.64 | 5.17 |
| Arrowtooth fl | 0.10 | 0.10 | 0.12 | 0.11 | 0.12 | 0.12 | 0.17 | 0.17 | 0.13 | 0.19 |
| Starry fl | 0.04 | 0.14 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other flatfish | 0.38 | 0.69 | 0.69 | 0.37 | 0.28 | 0.26 | 0.32 | 0.30 | 0.41 | 0.43 |
| Aggregate gf | 2.61 | 2.55 | 2.13 | 1.09 | 1.08 | 1.15 | 1.37 | 1.60 | 1.64 | 1.56 |

Table AT- 7. Number of control limit-equivalent landings for BRK by period and species.

| | 1996 | 1997 | 1998 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lingcod | 0.39 | 0.85 | 0.24 | 0.01 | 0.02 | 0.09 | 0.09 | 0.08 | 0.06 | 0.02 |
| P cod | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Sablefish | 2.49 | 2.44 | 1.47 | 1.13 | 1.76 | 1.98 | 2.07 | 2.43 | 2.62 | 2.73 |
| S Sablefish | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chilipepper | 0.00 | 0.01 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Splitnose | 0.01 | 0.05 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Yellowtail | 0.11 | 0.22 | 0.48 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Shortspine th | 0.77 | 0.71 | 0.58 | 0.17 | 0.28 | 0.31 | 0.46 | 0.62 | 0.63 | 0.66 |
| Longspine th | 2.31 | 1.73 | 0.83 | 0.19 | 0.21 | 0.49 | 0.58 | 0.67 | 0.58 | 0.90 |
| N Shelf RF | 1.74 | 2.19 | 4.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 |
| S Shelf RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Slope RF | 2.89 | 7.60 | 5.70 | 0.06 | 0.06 | 0.12 | 0.23 | 0.24 | 0.15 | 0.35 |
| S Slope RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Dover sole | 0.62 | 0.60 | 0.64 | 0.51 | 0.66 | 0.58 | 0.98 | 1.24 | 1.24 | 1.41 |
| English sole | 0.00 | 0.01 | 0.07 | 0.00 | 0.01 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 |
| Petrale sole | 1.49 | 2.87 | 1.23 | 0.47 | 1.36 | 2.63 | 3.92 | 5.54 | 2.96 | 1.26 |
| Arrowtooth fl | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.00 |
| Starry fl | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other flatfish | 0.05 | 0.08 | 0.06 | 0.08 | 0.11 | 0.09 | 0.14 | 0.12 | 0.09 | 0.09 |
| Aggregate gf | 0.56 | 0.67 | 0.57 | 0.23 | 0.33 | 0.35 | 0.50 | 0.61 | 0.57 | 0.62 |

Table AT- 8. Number of control limit-equivalent landings for CRS by period and species.

| | 1996 | 1997 | 1998 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lingcod | 0.59 | 0.99 | 0.43 | 0.04 | 0.07 | 0.09 | 0.07 | 0.02 | 0.04 | 0.01 |
| P cod | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Sablefish | 4.53 | 4.86 | 2.64 | 0.59 | 1.07 | 0.84 | 1.17 | 1.21 | 1.66 | 0.54 |
| S Sablefish | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chilipepper | 0.05 | 0.02 | 0.17 | 0.03 | 0.01 | 0.03 | 0.01 | 0.02 | 0.02 | 0.14 |
| Splitnose | 0.06 | 0.02 | 0.29 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.10 |
| Yellowtail | 0.59 | 0.15 | 0.41 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 |
| Shortspine th | 1.30 | 1.16 | 1.11 | 0.12 | 0.14 | 0.07 | 0.27 | 0.30 | 0.64 | 0.12 |
| Longspine th | 3.31 | 3.47 | 1.93 | 0.00 | 0.20 | 0.09 | 0.17 | 0.74 | 0.72 | 0.15 |
| N Shelf RF | 1.97 | 1.65 | 3.69 | 0.05 | 0.00 | 0.09 | 0.00 | 0.02 | 0.00 | 0.00 |
| S Shelf RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Slope RF | 10.25 | 6.62 | 7.38 | 0.17 | 0.07 | 0.04 | 0.21 | 0.57 | 0.15 | 0.24 |
| S Slope RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Dover sole | 0.89 | 0.81 | 1.13 | 0.30 | 0.42 | 0.34 | 0.68 | 0.80 | 1.02 | 0.19 |
| English sole | 0.06 | 0.09 | 0.15 | 0.05 | 0.04 | 0.05 | 0.02 | 0.00 | 0.01 | 0.00 |
| Petrale sole | 3.61 | 3.80 | 3.60 | 0.97 | 3.17 | 3.27 | 2.31 | 1.39 | 1.76 | 0.39 |
| Arrowtooth fl | 0.02 | 0.03 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 |
| Starry fl | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other flatfish | 0.28 | 0.36 | 0.23 | 0.31 | 0.29 | 0.13 | 0.13 | 0.08 | 0.12 | 0.02 |
| Aggregate gf | 1.09 | 1.02 | 1.00 | 0.23 | 0.30 | 0.24 | 0.33 | 0.38 | 0.47 | 0.12 |

Table AT- 9. Number of control limit-equivalent landings for ERK by period and species.

| | 1996 | 1997 | 1998 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lingcod | 0.94 | 0.78 | 0.30 | 0.08 | 0.10 | 0.25 | 0.21 | 0.21 | 0.12 | 0.03 |
| P cod | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Sablefish | 4.05 | 2.63 | 2.05 | 2.82 | 2.90 | 3.89 | 4.46 | 4.31 | 4.37 | 4.23 |
| S Sablefish | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chilipepper | 0.44 | 0.13 | 0.15 | 0.12 | 0.18 | 0.07 | 0.04 | 0.02 | 0.01 | 0.00 |
| Splitnose | 0.07 | 0.13 | 0.27 | 0.03 | 0.00 | 0.03 | 0.12 | 0.00 | 0.01 | 0.00 |
| Yellowtail | 0.20 | 0.18 | 0.16 | 0.02 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 |
| Shortspine th | 0.99 | 0.80 | 1.04 | 0.65 | 0.64 | 0.96 | 1.17 | 1.32 | 1.35 | 1.40 |
| Longspine th | 3.45 | 1.70 | 1.67 | 0.97 | 0.96 | 1.81 | 2.15 | 2.44 | 1.99 | 1.98 |
| N Shelf RF | 3.15 | 2.13 | 2.06 | 0.09 | 0.06 | 0.04 | 0.00 | 0.00 | 0.01 | 0.00 |
| S Shelf RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Slope RF | 11.71 | 5.82 | 8.09 | 1.14 | 0.39 | 0.41 | 0.53 | 0.63 | 0.43 | 0.23 |
| S Slope RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Dover sole | 1.26 | 0.74 | 1.09 | 1.14 | 1.37 | 1.28 | 2.62 | 2.58 | 2.74 | 2.31 |
| English sole | 0.05 | 0.05 | 0.04 | 0.17 | 0.16 | 0.20 | 0.10 | 0.07 | 0.03 | 0.00 |
| Petrale sole | 7.36 | 5.94 | 3.35 | 7.59 | 11.73 | 11.33 | 10.41 | 12.95 | 5.89 | 1.85 |
| Arrowtooth fl | 0.01 | 0.00 | 0.01 | 0.01 | 0.02 | 0.02 | 0.04 | 0.03 | 0.03 | 0.04 |
| Starry fl | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.02 | 0.01 | 0.02 | 0.01 | 0.00 |
| Other flatfish | 0.28 | 0.22 | 0.13 | 0.20 | 0.26 | 0.22 | 0.29 | 0.27 | 0.14 | 0.07 |
| Aggregate gf | 1.26 | 0.77 | 0.84 | 0.77 | 0.89 | 0.96 | 1.36 | 1.37 | 1.25 | 1.05 |

Table AT- 10. Number of control limit-equivalent landings for BRG by period and species.

| | 1996 | 1997 | 1998 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lingcod | 0.94 | 1.90 | 0.37 | 0.03 | 0.13 | 0.07 | 0.38 | 0.30 | 0.43 | 0.28 |
| P cod | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Sablefish | 4.17 | 3.88 | 2.05 | 2.51 | 3.52 | 3.04 | 2.28 | 2.70 | 3.86 | 2.53 |
| S Sablefish | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chilipepper | 2.32 | 2.86 | 1.68 | 0.11 | 0.11 | 0.03 | 0.08 | 0.29 | 0.80 | 0.97 |
| Splitnose | 0.25 | 0.33 | 1.82 | 0.51 | 0.24 | 0.09 | 0.15 | 0.12 | 0.16 | 0.10 |
| Yellowtail | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Shortspine th | 1.41 | 1.46 | 1.07 | 1.34 | 0.78 | 0.79 | 0.65 | 0.70 | 1.00 | 0.91 |
| Longspine th | 3.46 | 2.93 | 1.51 | 0.80 | 1.86 | 1.79 | 0.89 | 1.46 | 0.98 | 1.27 |
| N Shelf RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| S Shelf RF | 10.01 | 31.89 | 15.60 | 0.03 | 0.69 | 0.12 | 0.12 | 0.19 | 0.45 | 0.20 |
| N Slope RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| S Slope RF | 14.16 | 32.96 | 20.50 | 4.92 | 2.16 | 1.99 | 3.54 | 2.98 | 3.67 | 2.60 |
| Dover sole | 1.94 | 1.89 | 0.89 | 1.09 | 1.25 | 0.86 | 0.89 | 1.12 | 1.22 | 0.90 |
| English sole | 0.09 | 0.12 | 0.07 | 0.01 | 0.02 | 0.01 | 0.02 | 0.03 | 0.01 | 0.00 |
| Petrale sole | 2.88 | 5.75 | 3.12 | 0.23 | 2.45 | 2.82 | 8.06 | 7.82 | 6.12 | 1.62 |
| Arrowtooth fl | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Starry fl | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other flatfish | 0.20 | 0.29 | 0.13 | 0.10 | 0.13 | 0.07 | 0.06 | 0.05 | 0.04 | 0.01 |
| Aggregate gf | 1.47 | 1.85 | 1.09 | 0.63 | 0.74 | 0.58 | 0.60 | 0.72 | 0.80 | 0.59 |

Table AT- 11. Number of control limit-equivalent landings for BDG by period and species.

| | 1996 | 1997 | 1998 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lingcod | 0.30 | 0.44 | 0.10 | 0.00 | 0.00 | 0.00 | 0.04 | 0.06 | 0.02 | 0.01 |
| P cod | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Sablefish | 1.03 | 0.79 | 0.46 | 0.04 | 0.00 | 0.12 | 0.03 | 0.02 | 0.03 | 0.00 |
| S Sablefish | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chilipepper | 0.66 | 1.03 | 0.56 | 0.00 | 0.00 | 0.01 | 0.01 | 0.05 | 0.04 | 0.08 |
| Splitnose | 0.03 | 0.07 | 0.26 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.00 |
| Yellowtail | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Shortspine th | 0.49 | 0.37 | 0.22 | 0.01 | 0.00 | 0.02 | 0.00 | 0.00 | 0.01 | 0.00 |
| Longspine th | 0.86 | 0.81 | 0.39 | 0.01 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Shelf RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| S Shelf RF | 6.62 | 10.95 | 13.46 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 |
| N Slope RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| S Slope RF | 9.22 | 9.92 | 6.27 | 0.04 | 0.00 | 0.12 | 0.06 | 0.08 | 0.24 | 0.04 |
| Dover sole | 0.94 | 0.70 | 0.25 | 0.03 | 0.00 | 0.03 | 0.01 | 0.01 | 0.01 | 0.00 |
| English sole | 0.05 | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 |
| Petrale sole | 0.91 | 1.30 | 0.93 | 0.00 | 0.00 | 0.27 | 2.05 | 2.86 | 0.88 | 0.50 |
| Arrowtooth fl | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Starry fl | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 |
| Other flatfish | 0.06 | 0.06 | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Aggregate gf | 0.60 | 0.58 | 0.33 | 0.01 | 0.00 | 0.02 | 0.04 | 0.05 | 0.02 | 0.01 |

Table AT- 12. Number of control limit-equivalent landings for SF by period and species.

| | 1996 | 1997 | 1998 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lingcod | 2.03 | 1.60 | 0.11 | 0.05 | 0.03 | 0.08 | 0.07 | 0.06 | 0.03 | 0.03 |
| P cod | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Sablefish | 1.34 | 1.09 | 0.32 | 1.47 | 0.92 | 0.94 | 1.35 | 1.11 | 0.73 | 0.46 |
| S Sablefish | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chilipepper | 2.14 | 2.21 | 1.57 | 0.07 | 0.05 | 0.04 | 0.09 | 0.09 | 0.25 | 0.51 |
| Splitnose | 0.50 | 0.75 | 0.76 | 0.18 | 0.05 | 0.10 | 0.17 | 0.12 | 0.07 | 0.09 |
| Yellowtail | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Shortspine th | 0.59 | 0.48 | 0.24 | 0.38 | 0.30 | 0.15 | 0.33 | 0.32 | 0.25 | 0.18 |
| Longspine th | 1.42 | 0.93 | 0.21 | 0.81 | 0.31 | 0.14 | 0.40 | 0.54 | 0.35 | 0.15 |
| N Shelf RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| S Shelf RF | 33.85 | 14.02 | 4.03 | 0.53 | 0.43 | 0.17 | 0.60 | 0.22 | 0.07 | 0.03 |
| N Slope RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| S Slope RF | 22.58 | 15.50 | 2.03 | 2.83 | 1.08 | 0.73 | 0.45 | 0.90 | 0.26 | 0.25 |
| Dover sole | 0.92 | 0.74 | 0.20 | 0.59 | 0.26 | 0.16 | 0.53 | 0.57 | 0.42 | 0.46 |
| English sole | 0.14 | 0.13 | 0.03 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 |
| Petrale sole | 4.23 | 3.31 | 0.99 | 2.02 | 1.72 | 3.93 | 5.64 | 4.54 | 2.04 | 1.65 |
| Arrowtooth fl | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Starry fl | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.03 | 0.04 | 0.01 | 0.01 |
| Other flatfish | 0.23 | 0.31 | 0.08 | 0.13 | 0.07 | 0.07 | 0.07 | 0.06 | 0.04 | 0.06 |
| Aggregate gf | 1.19 | 0.96 | 0.34 | 0.39 | 0.20 | 0.18 | 0.36 | 0.35 | 0.24 | 0.24 |

Table AT- 13. Number of control limit-equivalent landings for PRN by period and species.

| | 1996 | 1997 | 1998 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lingcod | 0.05 | 0.04 | 0.03 | 0.01 | 0.01 | 0.03 | 0.08 | 0.04 | 0.02 | 0.02 |
| P cod | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Sablefish | 0.77 | 0.75 | 0.24 | 0.02 | 0.04 | 0.06 | 0.04 | 0.03 | 0.01 | 0.01 |
| S Sablefish | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chilipepper | 0.20 | 0.42 | 0.75 | 0.01 | 0.00 | 0.01 | 0.03 | 0.09 | 0.24 | 0.23 |
| Splitnose | 0.15 | 0.27 | 1.19 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 |
| Yellowtail | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Shortspine th | 0.13 | 0.18 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 |
| Longspine th | 0.25 | 0.24 | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Shelf RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| S Shelf RF | 3.67 | 1.96 | 5.23 | 0.02 | 0.06 | 0.00 | 2.41 | 0.06 | 0.04 | 0.01 |
| N Slope RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| S Slope RF | 1.73 | 2.84 | 0.81 | 0.00 | 0.01 | 0.09 | 0.26 | 0.30 | 0.01 | 0.01 |
| Dover sole | 0.47 | 0.31 | 0.11 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 |
| English sole | 0.07 | 0.05 | 0.04 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 | 0.01 | 0.00 |
| Petrale sole | 2.76 | 1.29 | 1.05 | 1.60 | 2.84 | 3.77 | 4.24 | 3.10 | 1.48 | 0.34 |
| Arrowtooth fl | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Starry fl | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.04 | 0.04 | 0.02 | 0.02 | 0.07 |
| Other flatfish | 0.97 | 0.36 | 0.71 | 0.37 | 0.10 | 0.14 | 0.25 | 0.20 | 0.14 | 0.04 |
| Aggregate gf | 0.51 | 0.33 | 0.39 | 0.11 | 0.07 | 0.10 | 0.14 | 0.11 | 0.07 | 0.03 |

Table AT- 14. Number of control limit-equivalent landings for MOS by period and species.

| | 1996 | 1997 | 1998 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lingcod | 0.06 | 0.04 | 0.04 | 0.03 | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| P cod | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Sablefish | 0.55 | 0.32 | 0.48 | 0.78 | 0.81 | 0.99 | 0.31 | 0.34 | 0.36 | 0.29 |
| S Sablefish | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chilipepper | 0.28 | 0.24 | 0.36 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.13 | 0.07 |
| Splitnose | 0.25 | 0.35 | 1.79 | 0.28 | 0.23 | 0.54 | 0.07 | 0.06 | 0.02 | 0.07 |
| Yellowtail | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Shortspine th | 0.36 | 0.25 | 0.40 | 0.35 | 0.30 | 0.40 | 0.14 | 0.22 | 0.24 | 0.21 |
| Longspine th | 0.66 | 0.62 | 0.71 | 0.31 | 0.36 | 0.48 | 0.23 | 0.38 | 0.37 | 0.28 |
| N Shelf RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| S Shelf RF | 2.55 | 3.59 | 1.21 | 0.10 | 0.02 | 0.43 | 0.07 | 0.01 | 0.02 | 0.04 |
| N Slope RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| S Slope RF | 1.50 | 0.70 | 1.69 | 0.50 | 0.38 | 1.28 | 0.28 | 0.04 | 0.63 | 0.08 |
| Dover sole | 0.56 | 0.27 | 0.35 | 0.40 | 0.30 | 0.31 | 0.04 | 0.00 | 0.00 | 0.00 |
| English sole | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 |
| Petrale sole | 0.33 | 0.79 | 0.38 | 0.78 | 2.42 | 1.61 | 0.05 | 0.01 | 0.34 | 0.35 |
| Arrowtooth fl | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Starry fl | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other flatfish | 0.04 | 0.15 | 0.12 | 0.10 | 0.10 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 |
| Aggregate gf | 0.31 | 0.24 | 0.38 | 0.24 | 0.22 | 0.25 | 0.05 | 0.05 | 0.07 | 0.06 |

Table AT- 15. Number of control limit-equivalent landings for MNT by period and species.

| | 1996 | 1997 | 1998 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lingcod | 0.83 | 0.43 | 0.04 | 0.05 | 0.02 | 0.02 | 0.07 | 0.05 | 0.02 | 0.02 |
| P cod | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Sablefish | 0.75 | 0.52 | 0.35 | 0.08 | 0.09 | 0.09 | 0.17 | 0.09 | 0.05 | 0.14 |
| S Sablefish | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chilipepper | 3.03 | 2.36 | 0.79 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.14 | 0.13 |
| Splitnose | 1.17 | 0.58 | 1.92 | 0.12 | 0.10 | 0.12 | 0.04 | 0.24 | 0.07 | 0.06 |
| Yellowtail | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Shortspine th | 0.30 | 0.24 | 0.19 | 0.03 | 0.00 | 0.00 | 0.01 | 0.04 | 0.00 | 0.05 |
| Longspine th | 0.68 | 0.46 | 0.37 | 0.03 | 0.00 | 0.01 | 0.03 | 0.07 | 0.00 | 0.06 |
| N Shelf RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| S Shelf RF | 12.66 | 5.53 | 1.63 | 0.33 | 0.17 | 0.07 | 0.12 | 0.07 | 0.08 | 0.04 |
| N Slope RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| S Slope RF | 6.97 | 3.10 | 1.99 | 0.19 | 0.22 | 0.36 | 0.19 | 1.32 | 1.13 | 0.58 |
| Dover sole | 0.50 | 0.29 | 0.18 | 0.04 | 0.00 | 0.01 | 0.00 | 0.04 | 0.02 | 0.14 |
| English sole | 0.08 | 0.07 | 0.05 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Petrale sole | 3.36 | 2.73 | 1.97 | 1.28 | 1.85 | 1.61 | 2.01 | 1.07 | 0.96 | 0.28 |
| Arrowtooth fl | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Starry fl | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other flatfish | 0.36 | 0.17 | 0.53 | 0.12 | 0.08 | 0.01 | 0.01 | 0.02 | 0.03 | 0.02 |
| Aggregate gf | 0.81 | 0.51 | 0.46 | 0.08 | 0.06 | 0.05 | 0.05 | 0.08 | 0.05 | 0.08 |

Table AT- 16. Number of control limit-equivalent landings for MRO by period and species.

| | 1996 | 1997 | 1998 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lingcod | 0.06 | 0.12 | 0.05 | 0.05 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P cod | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N Sablefish | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| S Sablefish | 2.60 | 2.52 | 1.17 | 0.57 | 1.06 | 0.22 | 0.14 | 0.33 | 0.37 | 0.00 |
| Chilipepper | 0.42 | 0.53 | 0.52 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 |
| Splitnose | 0.31 | 0.48 | 0.34 | 0.03 | 0.01 | 0.00 | 0.01 | 0.03 | 0.02 | 0.00 |
| Yellowtail | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Shortspine th | 0.95 | 1.13 | 0.80 | 0.20 | 0.32 | 0.06 | 0.02 | 0.12 | 0.09 | 0.00 |
| Longspine th | 1.79 | 1.76 | 0.77 | 0.30 | 0.47 | 0.03 | 0.00 | 0.02 | 0.01 | 0.00 |
| N Shelf RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| S Shelf RF | 3.21 | 6.09 | 1.36 | 0.03 | 0.08 | 0.06 | 0.00 | 0.04 | 0.06 | 0.00 |
| N Slope RF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| S Slope RF | 6.85 | 7.94 | 4.96 | 0.75 | 1.61 | 0.29 | 0.19 | 1.97 | 0.97 | 0.00 |
| Dover sole | 1.37 | 1.60 | 0.62 | 0.16 | 0.22 | 0.02 | 0.00 | 0.06 | 0.03 | 0.00 |
| English sole | 0.00 | 0.01 | 0.00 | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Petrale sole | 1.61 | 1.50 | 0.68 | 3.92 | 2.77 | 0.03 | 0.31 | 1.61 | 0.72 | 0.00 |
| Arrowtooth fl | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Starry fl | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other flatfish | 0.18 | 0.13 | 0.06 | 0.02 | 0.07 | 0.00 | 0.00 | 0.02 | 0.02 | 0.00 |
| Aggregate gf | 0.80 | 0.90 | 0.43 | 0.16 | 0.21 | 0.02 | 0.01 | 0.08 | 0.05 | 0.00 |

# Appendix B. CFA ALTERNATIVE 1: SECTION BY SECTION ANALYSIS OF PROVISION

# Appendix B. TABLE OF CONTENTS


**APPENDIX B. CFA ALTERNATIVE 1: SECTION BY SECTION ANALYSIS OF PROVISION.....B-1**

**APPENDIX B. TABLE OF CONTENTS .....B-2**

**B.0 Introduction and Method .....B-4**
Overview ..... B-4
Method ..... B-4
Terminology ..... B-4

**B.1 Special Exception Options for Designated CFAs .....B-5**
Provisions and Questions ..... B-5
Rationale and Discussion of Options (NOTE: This section will be provided in the Council supplemental materials.)B-5
Impacts (NOTE: This section will be provided in the Council supplemental materials.) ..... B-5

**B.2 CFA Agreements and Activities (Including Consideration of Community Stability Plan) .....B-6**
*B.2.1* Organizational Agreements (CFA Charter Agreement) ..... B-6
Provisions and Outstanding Questions ..... B-6
Rationale and Discussion of Options ..... B-6
Impacts ..... B-6
B.2.1.1 Goals and Objectives ..... B-7
Provisions and Outstanding Questions ..... B-7
Rationale and Discussion of Options ..... B-7
Impacts ..... B-7
B.2.1.2 Geographic Affiliations ..... B-8
Provisions and Outstanding Questions ..... B-8
Rationale and Discussion of Options for Confidentiality Waiver ..... B-8
Impacts of Confidentiality Waiver ..... B-8
Rationale and Discussion of Options for Local Government Approval ..... B-8
Impacts of Local Government Approval Provision ..... B-9
Rationale and Discussion of Options for Geographic Boundaries, Exclusiveness, Minimum, and Maximum AreasB-9
Impacts of Geographic Boundaries, Exclusiveness, Minimum, and Maximum Areas ..... B-9
B.2.1.3 CFA Organization ..... B-11
Provisions and Outstanding Questions ..... B-11
Rationale and Discussion of Options for Type of Legal Organization ..... B-11
Impacts for Type of Legal Organization ..... B-11
Rationale and Discussion of Options for CFA Board of Directors ..... B-12
Impacts for CFA Board of Director Provisions ..... B-12
*B.2.2* Harvest and Harvest Agreements ..... B-13
Provisions and Outstanding Questions ..... B-13
Rationale and Discussion of Options for Harvest and Harvesting Agreement Provisions ..... B-13
Impacts of Harvest and Harvesting Agreement Provisions ..... B-13

**B.3 CFA Reporting Requirements .....B-14**
Provisions and Outstanding Questions ..... B-14
Rationale and Discussion of Options for CFA Reporting Requirements ..... B-14
Impacts of CFA Reporting Requirements ..... B-14

**B.4 CFA Approval and Renewal (additional options possible)..... B-15**
Provisions and Outstanding Questions..... B-15
Rationale and Discussion of Options on CFA Approval and Renewal..... B-15
Impacts of CFA Approval and Renewal Provisions..... B-17

## B.0 Introduction and Method

### Overview

The Council is considering whether or not to create special provisions for CFAs (a safe harbor exception from the quota share (QS) control limits for designated CFAs). The purpose need, alternatives and general impacts are described in the main text. An analysis of the level of exception to be provided is described in Appendix A. This appendix provides an analysis of the provisions and options related to CFA Alternative 1. These provisions are described in full in Table 2-2 of the main text and at the start of each of the below section. The section numbers of this appendix correspond to the section numbers of Table 2.2 (e.g. Section B.2.1.2 of this appendix corresponds to Section 2.1.2 of Table 2-2).

### Method

For each element of the alternative covered in this appendix, the rationale for the element is provided along with the expected impacts of the provision. Where there options have been specified, a comparison among the options is provided. For some elements there are outstanding questions that need to be considered to fully develop the element. In those cases, the questions are provided along with a discussion of some of the options and associated pros and cons.

### Terminology

For clarification, the term CFA is used in the context of "Designated CFA" as opposed to "General CFA" (which does not require a QS exception), as explained in Chapter 2. The term "fishery" is used to mean the non-whiting groundfish trawl fishery.

## B.1 Special Exception Options for Designated CFAs

**Provisions and Questions**

| *Section* | *Element* | |
|---|---|---|
| 1.0 CFA Special Privileges | | |
| | Current Scoping Priority (for March 2011 Council meeting): | **Option a:** For designated CFAs quota share control limits for some or all QS species categories are 1.5 times the current accumulation limits.<br>**Option b:** For designated CFAs quota share control limits for some or all QS species categories are 2.0 times the current accumulation limits<br>**Option c:** 1.5 times the current accumulation for all regions and species except as follows: 60% for sablefish south of 36° 0'N Latitude, and shortspine thornyheads south of 34°27' N Latitude. (In April, the Council requested a geographically specific alternative. This option is based on one from the public record from the spring of 2009 and fall of 2010).<br>**Considered but rejected:** increase the control caps only for overfished species. |

**Outstanding questions:** Select option from list above (option a, b, or c).

**Rationale and Discussion of Options (NOTE: This section will be provided in the Council supplemental materials.)**

Discussion requested by the Council regarding the need CFAs may have for an exception to control limits, as compared to other entities is provided in Section 1.5.4 of the main document.

**Impacts (NOTE: This section will be provided in the Council supplemental materials.)**

To help the Council determine the need and level for exceptions to the accumulation limits extensive analysis and data are provided in Appendices A and C.

## B.2 CFA Agreements and Activities (Including Consideration of Community Stability Plan)

## *B.2.1* Organizational Agreements (CFA Charter Agreement)

**Provisions and Outstanding Questions**

| *Section* | *Element* |
|---|---|
| 2.0 CFA Agreements and Activities | CFAs will be required to have organizational (charter) agreements and harvesting agreements that meet certain standards. If the Council decides to recognize CFAs under the MSA fishing community provisions, these agreements could form the basis of the "Sustainability Plans" required under Section 303A(c)(3) |
| 2.1 Organizational Agreements (CFA Charter Agreement): | |

**Outstanding questions**

Inclusion of a Community Stability Plan

If the Council wants to organize CFAs under the 303A(c)(3) fishing community provisions (see Section 2.1.1 for discussion of these provisions) then provisions for community stability plans must be included. The current options specify that CFAs would be required to have organization agreements and harvesting agreements that meet certain standards. If it were so desired, it might be possible to specify that these agreements constitute that community stability plan.

**Rationale and Discussion of Options**

The issue of whether or not to require formally designated CFA agreements is covered in Section 2.1.1. The specifics elements of the organizational agreement are discussed in subsections below. These agreements would be intended to ensure that the CFA exceptions are used for the purposes intended by the Council.

The charter agreements would include, but not be limited to:

a. a statement of goals and objectives for the fishery and associated community;
b. a description of the proposed CFA including geographic limits and local government endorsements; and
c. organization bylaws specifying the type of legal organization and its control.

Documents which would need to be provided are specified in Section 4.0 of Risk Pool Alternative 2.

**Impacts**

Pro: A charter agreement and attachments as described provide clarity of intent of the applicant for CFA designation and explains how all qualifying criteria have been met. The statement of need for special privilege exception, with supporting data or reports, may be needed to provide a basis for action relative to CFA approval criteria.
Con: Preparation of such a document may be burdensome and require professional technical assistance, at a cost, for data analysis and document preparation. This would be one of the negative impacts to be included in the cost-benefit analysis.

## B.2.1.1 Goals and Objectives

### Provisions and Outstanding Questions

| *Section* | *Element* | *Options from November 2010* |
|---|---|---|
| 2.1.1 - Goals and Objectives | Include a goal of furthering the groundfish FMP and include enforceable performance standards. | *Possible Objectives:*<br>a. Community stability<br>b. Facilitate new entry.<br>c. Stabilize business environment (e.g. require landings be made locally).<br>d. Enhance value (e.g. require particular fishing and delivery methods)<br>e. Harvest Sustainability.<br>*i.* Minimize bycatch<br>*ii.* Participate in activities intended to successfully manage bycatch on a fishery-wide scale (research, risk pool participation, etc).<br>*iii.* Minimize adverse fishing gear impacts on habitat<br>*iv.* Enhance stock productivity (e.g. area management or measures to protect age structure). |

#### Outstanding questions

Is this the entire list of objectives the Council would like to require that CFAs address?
Should a CFA be required to address at least one of these goals, more than one, or all of these objectives?

### Rationale and Discussion of Options

### Impacts

## B.2.1.2 Geographic Affiliations

**Provisions and Outstanding Questions**

| *Section* | *Element* | *Options from November 2010* |
|---|---|---|
| 2.1.2 - CFA Geographic Affiliations | Organizational agreements should include a description of the CFA boundaries.. | Consider whether a confidentiality waiver might be possible and warranted to reduce reporting and monitoring challenges for small geographic areas. |
| | Local government approval | Local government letter designates the CFA eligible to apply for that area (Which governments are authorized for a particular area? Should a local government be allowed to endorse more than one entity? Should a CFA be required to receive an endorsement from every jurisdiction it proposes to cover?) |
| | CFA Boundaries | |
| | Geographic exclusiveness | Overlaps Allowed (i.e. more than one CFA in an area)<br>No Overlap Allowed |
| | Minimum geographic area. | |
| | Maximum geographic area. | Can one CFA cover many ports? If multiple ports are allowed: Is there a limit on the number? Do they have to be contiguous? Should there be a limit on the distance covered by a single CFA? |

**Outstanding questions:** As detailed in the above provisions, there are a number of outstanding questions to be addressed relating to:

Confidentiality.
Local government Endorsements.
Geographic Boundaries

**Rationale and Discussion of Options for Confidentiality Waiver**

A major consideration in the approval process is the availability of data to show need for CFA designation. The lowest level of fishery landings resolution in the PacFIN database subject to public disclosure is at the area port level, which in some areas may include several landing facilities or sub-areas/ports within the port area. Any request for CFA designation for sub areas within ports (e.g., certain docks) would be more difficult to evaluate and to monitor because of confidentiality restrictions. The Council may want to discuss the possibility that confidentiality waivers might be required as a condition of establishing the CFA.

**Impacts of Confidentiality Waiver**

Uncertain legality under MSA.

**Rationale and Discussion of Options for Local Government Approval**

**Require endorsement from local municipality in support of CFA application.** The appropriate municipality for documentation of support would be the one that has principal governance over the CFA area and might be the city council. If it is desired that there be only one CFA in any area, the local government endorsement requirement (with a provision that any local governing entity could only endorse one CFA) would reduce the chance of multiple applications for the same area (see Section 2.1.2 Geographic Boundaries, Exclusiveness, Minimum, and Maximum Areas). To eliminate the chances of multiple CFA applications for similar areas, the type of municipalities whose endorsements would be recognized might need to be restricted. For example, recognizing designations by counties, cities, and port districts could result in competing applications for the same area. Alternatively, a hierarchy might be established to determine which local governing authority would take precedence.

**Impacts of Local Government Approval Provision**

Pro: Such a provision will aid the process by reducing the opportunity for more than one group to obtain CFA designation for the same area, unless the decision is made to allow for overlapping CFAs (see Section 2.1.2 –Geographic Boundaries). Engaging a local government in the application process, could lead to that government offering to provide the CFA with other benefits, such as offers of facilities or staff to aid the CFA in its application process. A requirement for a local governing district endorsement of the CFA introduces an element of local accountability, which may reduce the chances for abuse of the CFA provisions. For example, if a local government has endorsed a CFA but the CFA and the safe harbor provision were being abused for private gain to the detriment of others in the community, the situation might become an issue resolved through local political processes. Hence, requiring local government involvement introduces another level of accountability into the system.

Con: The process of asking for and obtaining city approval could politicize the process; e.g., the city could influence who sits on the board and/or terms and conditions for contracts to harvest CFA pounds. The act of requesting local government approval is a work load in itself and could be burdensome if it involves a city council of a large metropolitan area with many high (or higher) priority issues. The requirement is additionally burdensome if the request spans multiple jurisdictions and an endorsement would be required from each jurisdiction, as might be the case if CFAs are allowed to include two or more ports (see Section 2.1.2 – Geographic Boundaries).

**Rationale and Discussion of Options for Geographic Boundaries, Exclusiveness, Minimum, and Maximum Areas**

Establish physical boundaries for CFAs. The minimum and maximum physical boundaries for CFAs may be important decision points. Consideration might also be given to limiting the number and distribution of ports for included in CFA applications. If multiple ports are acceptable for consideration and local government endorsements are required, it is presumed that the CFA applicant would have to have an endorsement from each jurisdiction that it covers. Another requirement might be that the ports be contiguous with one another, or within a certain distance, in order to minimize potential enforcement and monitoring costs. Another decision point under this option is whether to allow for overlapping CFAs (e.g., whether a port could be included in more than one CFA) and the degree of overlap that should be allowed.

**Impacts of Geographic Boundaries, Exclusiveness, Minimum, and Maximum Areas**

Pro: This requirement will focus applicants on the database that can/will be used to evaluate individual proposals, establish boundaries for areas that will be considered for CFA designation, and clarify the rules that apply to overlapping boundaries.

a. Covering Multiple Ports: Allowing one designated-CFA to represent multiple ports could introduce cost savings.[1]
b. Overlapping CFAs - Multiple CFAs Covering the Same Port. If there are competing business interests in a single port it might be beneficial to encourage that competition by allowing the formation of separate CFAs to benefit the same port. If overlapping CFAs are to be allowed, there would be less need for requiring that the local government endorse the CFA. It should be noted that overlapping non-designated (general) CFAs is allowed under status quo, and that even if overlapping of designated CFAs is not allowed, a single designated CFA may overlap with one or more non-designated CFAs.

[1] If the reason for considering larger designated-CFAs is to reduce administrative burden, such burden might also be reduced if a single organization provides administrative services for a number of smaller independent CFAs.

Con: The data limitations identified here might preclude CFA designation for sub-areas within ports. This could hinder the city council approval process if there are multiple jurisdictions in a port.

a. Covering Multiple Ports: Allowing a single designated-CFA to cover multiple ports, combined with a provision that does not allow overlapping designated-CFAs, would reduce the number of designated-CFAs available for a vessel to work with.
b. Overlapping CFAs - Multiple CFAs Covering the Same Port: Multiple designated-CFAs in the same port would allow interests in a single port to control more of the QS than might have been intended by the safe harbor provision. Given the opportunity for local governments to endorse multiple CFAs such endorsements could become pro forma and not cultivate the desired local scrutiny of CFA proposals and CFA management.

## B.2.1.3 CFA Organization

**Provisions and Outstanding Questions**

| *Section* | *Element* | *Options from November 2010* |
|---|---|---|
| 2.1.3 - CFA Organization | | |
| Type of Legal Organization | CFAs might be organized as corporations, trusts, etc. | Options<br>a. Local government serves as the CFA entity.<br>b. Require organization as a non-profit corporation, 501(c)(4) social welfare organization.<br>c. Allow CFAs to be organized as another type of entity<br>Suboptions<br>i. controlled only by fishermen<br>ii. controlled by fishermen or others. |
| Control of CFA | Board of directors | The local municipality must (options)<br>a. Appoint the board<br>b. Endorse an independently formed board via the endorsement of the CFA. |
| | A minimum number of board members. | At least 5 |
| | Limit vessel owner and processor participation on board. | *Some Options Suggested in Public Comment*<br>Not mutually exclusive.<br>a. No more than 20% vessel owners or their representatives.<br>b. Alternatively, ensure that fishermen have the lead in CFAs.<br>c. No more than 20% processors or their reps. |
| | Other | Must be community members (residents?). |

**Outstanding questions:** As detailed in the above provisions, there are a number of outstanding questions to be addressed relating to:

CFA Legal Organization
Board of Director Appointment
Board of Director Composition
Board of Director Residency Requirement

**Rationale and Discussion of Options for Type of Legal Organization**

Require each CFA board to obtain legal status. Under status quo, a CFA would be required to have some type of federally or state recognized legal status in order to acquire QS. This would continue, unless an exception to that requirement is made for designated-CFAs. Such an exception would probably not be needed since CFAs will likely have to contract out for permitted vessels to harvest their CFA pounds. This may require that the board obtain legal status as a responsible entity. Several possibilities for legal status exist including: (1) non-profit corporation (501(c) (4) social welfare organization), (2) partnership, (3) corporation or (4) trust. The type of entity selected or required for legal status designation could have major impact on how the board conducts its business and whether board members, including individuals closely associated with board members, can participate in the harvest or processing of CFA pounds.

**Impacts for Type of Legal Organization**

Pros: Legal status designation for the CFA commits the board to responsible management of CFA pounds as it makes them legally responsible for their actions such as the issuance and monitoring of harvest contracts. It also meets the legal requirement for opening and holding a QS account.

Cons: Obtaining legal status comes at a price in terms of time and expense. Professional assistance would likely be required to complete and file the necessary documents. The type of legal status adopted could

affect the ability of board members to participate in the harvest of CFA pounds. A fish processor board member, for example, might not be eligible to process fish landed under a harvest contract approved by the board if the board has legal status as a non-profit organization. The same might be true for a board member that is a vessel owner: they might not be eligible to harvest fish approved by the board to harvest CFA pounds. These kinds of situations could lead to disincentive for board member participation. It could also lead to conflict of interest in board decisions if the legal status designation allows board members to participate in the harvest or processing of CFA pounds (unless precluded under some other provision for CFA designation). A preferred alternative to the board obtaining legal status might be for the local municipality to assume responsibility as an established legal entity for all business activities and to use the board in an advisory capacity. The local entity could then charge overhead in CFA contracts to cover their administrative costs, such as contracting out for use of quota pounds. However, extensive governmental involvement in the CFA process has political implications and may not be possible because of staffing limitations and concerns about potential legal repercussions. With or without CFA board input, cities will be eligible to acquire and manage quota shares under existing rules for future quota share acquisition.

**Rationale and Discussion of Options for CFA Board of Directors**

Require CFA board be composed of representatives of specific interest meeting certain other criteria. A board of directors will likely be needed to conduct CFA business activities. Board composition may be an important consideration to provide community balance in board decisions. The principal interest groups are commercial fishermen and groundfish buyers and processors. However, other groups are potentially affected by or may have an interest in board decisions. These include fishery crew, support industry representatives, environmental groups, and the public at large. One proposal would have each board composed of at least five members representing the following interest groups: harvest sector (with controlling interest $\leq$ 20%), processor sector (with controlling interest $\leq$ 20%), and public at large (one member). The residency requirement is intended to influence decisions in favor of local area interests. Local area might mean the same county as the CFA. Under this option the board would appoint and organize itself and seek a local governmental endorsement. Another option would place the local municipality in charge of board appointments.

**Impacts for CFA Board of Director Provisions**

Pros: Having diverse board representation gives credibility to the CFA decision process and reduces the chances that the CFA will be "captured" and used primarily for private purposes. Having multiple individuals involved in the process results in a shared and, presumably, more informed decision process. The local area residency requirement may add credibility to the board selection and decision making process.

Cons: It may not always be possible to find enough qualified people willing to commit time and resources to the process if a large number of seats are required to constitute the board. The task is even more difficult if a fixed number of seats are reserved for particular interest groups. Interest in the process is likely to wane over time if a large group is required to constitute a forum and, in particular, if they receive no direct benefit from the process. An executive director may be required at a cost to the CFA to facilitate meetings, maintain business records, ensure reports are prepared, and keep the board on track. Flexibility in number of board seats and interest group composition may be preferred to a fixed formula. A requirement that board members must be appointed by the local municipality may be very onerous for a large community where fishery issues may be overshadowed by other more pressing issues. It may get even more difficult if multiple jurisdictions (i.e., multiple ports) are covered by the CFA proposal and the program required the endorsement of each port or municipality covered within the geographic area of the CFA.

## *B.2.2* Harvest and Harvest Agreements

**Provisions and Outstanding Questions**

| *Section* | *Element* | *Options from November 2010* |
|---|---|---|
| 2.2 Harvest and Harvest Agreements | Conditions which must be in the agreements between the CFA and those harvesting CFA QP. | Each of the following may be adopted (not mutually exclusive)<br>a. Prohibit/allow CFAs from harvesting their own QP (does this mean individual members of the CFA or the CFA entity itself?).<br>b. Require that CFAs contract with co-operatives organized under the Fishermen's Collective Marketing Act.<br>c. Require that individual entities comprising the FCMA coop not receive QP from the CFA that is in excess of the vessel QP accumulation limit.<br>d. Include measures (performance standards) needed for CFAs to meet charter objectives and meet reporting requirements (examples: fishing methods, area and gear restrictions, fishing handling practices, local landing requirements).<br>e. Require participation in fishery-wide efforts for successfully managing overfished species catch |

**Outstanding questions**: Which of the 5 listed options should be included in the CFA provision.

**Rationale and Discussion of Options for Harvest and Harvesting Agreement Provisions**

Specify conditions for harvest of CFA pounds. Harvest agreements (contracts) are likely to be the primary tool for harvest of quota pounds. However, depending on the provision the Council includes, CFAs may be able to acquire vessels and permits to harvest their own pounds. In either case there are several terms and conditions that could be required for harvest of CFA pounds.

**Impacts of Harvest and Harvesting Agreement Provisions**

Pro: Prohibiting (or limiting) the amount of CFA pounds that may be harvested or processed by board members may reduce the potential for conflict of interest in issuing harvest contracts. To the degree that processors are prohibited from participating in fishermen's co-ops, requiring that CFAs only contract with fisherman coops will limit processor participation in harvesting operations.. Inclusion of measures in the harvesting agreement that further the goals and objectives of the CFA charter is an explicit (and logical) approach to ensuring that that the program goals and objectives will be met. Requiring the utilization of a co-op for the harvest of CFA quota my help make optimal use of limited amounts of overfished species and Pacific halibut quota via real time information exchange and the application of methods and procedures to avoid or minimize contact with overfished species. Information exchange is important to ensure full utilization of CFA quota pounds. The local area landing area requirement would be intended to bolster the local economy, including support industries, as opposed to a neighboring or distant community. A provision for contract preference to new or recent fishery entrants would be aimed at helping those that cannot afford to buy quota on the open market, by providing them the opportunity to harvest contract fish.

Con: Board members may lose interest in board membership or refuse board participation if they are not allowed or are limited in the amount of CFA pounds they are allowed to access. This could substantially reduce the pool of qualified representatives for the available board seats. Under the provision for contracting only with fishery coops, independent fishermen and processing sector vessel owners would be precluded from bidding on quota pounds. This reduces competition in the bidding process and has the potential to reduce revenues for contract fish. Requiring vessels to land their catch or a large portion of their catch in the local area could depress ex-vessel price, due to limited bidding competition for fish. Giving contract preference to new fishery entrants could result in reduced harvest efficiency and reduced ex-vessel value of fish due to the inexperience and/or inefficiency of new or recent fishery entrants.

## B.3 CFA Reporting Requirements

### Provisions and Outstanding Questions

| *Section* | *Element* | *Options from November 2010* |
|---|---|---|
| 3.0 CFA Reporting Requirements | | |
| | Timing and content. | Require biennial reports to document compliance, progress on goals, and facilitate fishery policy evaluation.[i]<br><br>Self-certified compliance: Require annual or biennial affidavit of compliance. |

**Outstanding questions:** Self certified compliance provision interacts with Section 4.0 of this alternative, on application approval. If there is a more thorough review of applications, the self reporting requirement may not be necessary.

### Rationale and Discussion of Options for CFA Reporting Requirements

Biennial report requirement and content: The CFA would be required under this provision to submit a report every two years. Report content would address progress in meeting charter goals and objectives and might include, but not be limited, to:

a. total amount of quota share and quota poundage, by species, held or harvested on behalf of the CFA by year,
b. economic impacts of CFA activities on the community including ex-vessel revenue, location of processing, and distribution of economic activity generated as a result of CFA regulations and harvesting/processing activities,
c. social impacts on the community, such as documentation of new entry, creation of local fishermen's cooperatives, or other non-market social effects attributed or related to CFA existence
d. harvest volume including bycatch and discarded quantities by year and month,
e. spatial footprint of fishing effort, including documentation of fishing in particular habitat areas that are of interest and measures taken in response to the identification of those areas,
f. other measures taken to enhance sustainability or modify the activities of the harvesting cooperative.

An alternative to a detailed report every two years would be to require the CFA to submit an affidavit of compliance with the goals and objectives of the charter and CFA approval criteria.

### Impacts of CFA Reporting Requirements

Pro: The biennial report requirement as described provides a basis for continuation or modification of CFA agreements.

Con: The report data and writing requirement could be burdensome to the CFA and would likely require assistance with data analysis and technical report writing, at a cost.

## B.4 CFA Approval and Renewal (additional options possible)

### Provisions and Outstanding Questions

| *Section* | *Element* | *Options from November 2010* |
|---|---|---|
| 4.0 CFA Approval and Renewal | | |
| Initial Application | Required elements of the Initial Application: | a. The CFA agreement and bylaws.<br>b. Proposed Harvesting Agreements<br>c. Endorsement letters from local municipalities (if required).<br>d. A statement<br>i. Describing the CFA area including infrastructure and the community sectors that would benefit.<br>ii. Explaining how agreements meet criteria.<br>iii. Demonstrating the need for the exception, including supporting data and/pr reports. |
| | Initial approval | NMFS would review and approve applications and CFA agreements. Review and approval standard; i.e., insure required documents are submitted, and that required elements are reflected in the documents, but NMFS does not undertake substantive review for adequacy of elements relative to Council goal compliance. |
| Ongoing Monitoring | | NMFS and PFMC receive required reports and reviews for goal compliance. PFMC initiates program modifications as necessary to insure PFMC goals are met |
| Renewal | Periodic renewal. | For CFAs for which an application for renewal has been submitted, the CFA will remain in place until action is taken to approve or deny<br>CFA agreements must be resubmitted for approval every.<br>Option 1. Two years.<br>Option 2. Five years (coinciding with program review cycle). |
| | Renewal on modification | Resubmit for approval with modification of agreement or change in board of director membership. |

**Outstanding Questions.**

**Goals and Objectives for Ongoing Monitoring:** For the "ongoing monitoring" provision, what goals and objectives will be used to evaluate whether the CFA safe harbor is achieving the desired end? Should some or all of the objectives listed in Section 2.1.1.[2] be designated as those against which the performance of this provision would be evaluated (in addition to those of Amendment 20 and the groundfish FMP, MSA, etc)?

**Options:** Select option under periodic renewal.

### Rationale and Discussion of Options on CFA Approval and Renewal

**Rationale for an Application Requirement**: A process is needed to make a determination as to whether a particular entity is entitled to an exemption from QS control limits. This could be achieved by participant self monitoring and after-the-fact enforcement investigations. However, a formal application and permit approval

[2] The possible objectives listed in section 2.1.1 are as follows:
a. Community stability
b. Facilitate new entry.
c. Stabilize business environment (e.g. require landings be made locally).
d. Enhance value (e.g. require particular fishing and delivery methods)
e. Harvest Sustainability.
*i.* Minimize bycatch
*ii.* Participate in activities intended to successfully manage bycatch on a fishery-wide scale (research, risk pool participation, etc).
*iii.* Minimize adverse fishing gear impacts on habitat
*iv.* Enhance stock productivity (e.g. area management or measures to protect age structure).

process provides greater certainty to the applicant about their status under the program, increases the assurance to the public and all participants that the program is being complied with (contributing to overall levels of voluntary compliance), and assures orderly and lower cost access to the information NMFS needs to ensure compliance.

**Rationale for the Required Elements of an Application**: The provision specifies a number of documents that must be submitted as part of the initial application. These documents could be expected to provide a substantial portion of the basis for determining whether the provisions of Elements 2.0 and 3.0 of the CFA safe harbor exception is being met. During the regulatory development and implementation process, NMFS may determine that additional submissions are required for effective implementation of the CFA safe harbor exception.

**Rationale for Initial Approval Provisions**: While it would be required that an application be submitted with certain information and documentation, the proposed approval criteria would make only limited use of the documents, i.e. there would not be a substantial evaluation of whether the intent of the CFA provisions, as reflected in the provisions of Elements 2.0 and 3.0, is adequately addressed by the applicant. Such a substantial evaluation would likely require that NMFS (or the Council) make discretionary determinations requiring more effort in order to nonarbitrarily evaluate and document each decision. Approval would instead be based on an evaluation of whether the application is completely filled out with all the requisite submissions. The main value in the content of the application package would be for use in the ongoing monitoring of the performance of CFA safe harbor provision.

**Rationale for Ongoing Monitoring Provisions:** Quality assurance for the CFA safe harbor provisions would be achieved by monitoring the overall performance of the CFA safe harbor provisions to determine whether they were contributing to achievement of the desired ends. If a determination were made that desirable outcomes were not being achieved, or that the policy was leading to undesirable outcomes, the program might be revised. One example of such a possible response to inadequate performance would be revision of the application approval process to require evaluation of the individual proposals with respect to objectives for the CFA safe harbor provisions.

If the Council is to conduct a future review to determine whether or not the CFA safe harbor provision is performing adequately, is there a need for a set of objectives specific to this provision or can the Council rely on an evaluation of the provision in the context of the goals and objectives of the trawl rationalization program, FMP, MSA, etc.?

**Rationale for Renewal Provisions (Periodic):** Renewal requirements provide an opportunity to government to ensure that records are up to date, ensure that original conditions for issuance continue to be met, and encourage permit holders' ongoing attention to the responsibilities attendant with receiving a special privilege. Renewal also reinforce that a particular privilege is not granted in perpetuity. The Council is considering two options for renewal requirements. One option would require renewal every two years and the other every five years. An important aspect of evaluating the effect of these different time frames is the criteria that will be used in the evaluation of permit renewals. As with the original application, the permit renewals will not include an evaluation of the quality of the application but only its completeness with respect to the requirements of the program; therefore, the choice between two-year and five-year option will not affect monitoring of CFA achievement of the goals of the CFA safe harbor provisions.

| Comparison of two year and five year renewal options. | |
|---|---|
| **Two Year** | **Five Year** |
| Coincides with biennial cycle. | Coincides with five year program review. |
| Relative to the 5 year option:<br>· Acts as a more frequent cross check for compliance with the requirement that whenever there is a modification to the CFA agreement or board of directors the CFA designation would have to be renewed.<br>· Provides a greater frequency of local government accountability | *Inverse of result for two year option* |
| *Inverse of result for five year option.* | Relative to the 2 year option:<br>Provides a longer planning horizon for those with CFA safe harbor exceptions (unless the CFA safe harbor exception is changed in the interim, for example, if it is not performing as expected). |
| Higher frequency means higher industry and administrative costs. | *Inverse of result for two year option.* |

**Rationale for Renewal Provisions (On Modification):** This provision is intended to ensure that when certain key aspects of the CFAs change that NMFS is notified of the change. While NMFS would not conduct a formal evaluation of the individual CFA applications, the information in CFA applications may be used to inform investigations regarding other abuses of control limits and overall performance of the CFA safe harbor provisions. For these reasons information on membership on the board of directors and the content of the CFA agreements should be kept up to date. So long as the only criteria for reissuance of the CFA exemption is completeness of the application, the renewal process should be relatively low cost from an administrative standpoint.

**Impacts of CFA Approval and Renewal Provisions**

The primary impacts of these provisions are on participant compliance, industry compliance costs and administrative and enforcement costs

**Participant Compliance**

Two aspects of participant compliance are discussed here, the first is related to compliance by those who form a CFA and the second is compliance by others in the program.

With respect to CFA participant compliance in pursing the goals and objectives for which the safe harbor was granted, a relatively low threshold of compliance is required for each individual CFA (initial approval and renewal requires only that forms be properly completed). If the safe harbor provisions are abused to the point that goals for the provisions are not achieved the program would be modified. Thus, CFAs would collectively bear the penalty of individual CFA's failures to faithfully pursue the objectives of the CFA safe harbor provisions. This approach to program enforcement would set up a situation similar to the collective cost vs.

individual benefit typical in fisheries. The benefit of the approach would be the lower costs discussed in the following section.

To the degree that some individuals are able to game and take advantage of a system, there may be a reduction in the rate of compliance by other participants in the program. This might be expected for the IFQ program if CFA safe harbor provisions are abused.

**Industry Compliance, Program Administrative, and Enforcement Costs**

The primary direct costs of these provisions would be those incurred by the CFA in preparing and submitting application, governmental costs of reviewing applications and issuing a permit or some form of designation indicating that a particular CFA is entitled to an exemption to the QS control limits, and related enforcement costs.

Proposed in these provisions are a low standard of application review and reliance on quality assurance through monitoring of the overall performance of the safe harbor provisions. Over time, adjustments to the program could be made as needed to ensure achievement of objectives. This approach is expected to result in lower administrative costs over the short term, and if successful, over the long term as well. If the CFA safe harbor provisions perform adequately using this approach, then costs would be lower than if a more rigorous application review process is imposed from the start. If the provisions do not perform adequately, and the cause is traced back to the standards used in the application review process, then continuation of the program may rely on creating higher standard review process at some time in the future (a higher administrative cost program). The potential downside of starting the program with a low standard of application review would be the interim damages associated with excessive concentration of QS by those for whom such a privilege was not intended, lost opportunity to promote the specified objectives, and a possible reduction in the compliance rates of others in the program.

[i] Items required for the biennial report might include

- Total amount of quota share and quota poundage, by species, held or harvested on behalf of the CFA by year.
- Economic impacts of CFA activities on the community including ex-vessel revenue, location of processing, and distribution of economic activity generated as a result of CFA regulations and harvester/processor activities.
- Social impacts on the community, such as documentation of new entry, creation of local fishermen's cooperatives, or other non-market social effects attributed or related to CFA existence.
- Harvest volume including bycatch and discard quantities by year and month.
- Spatial footprint of fishing effort, including documentation of particular habitat areas that are of interest and measures taken in response to the identification of those areas.
- Other measures taken to enhance sustainability or modify the activities of the harvesting cooperative.

# Appendix C. CFA Alternative 1: Special Privilege Exception Analysis—Sablefish in the Conception Management Area

# Table of Contents

Appendix C. CFA Alternative 1: Special Privilege Exception Analysis—Sablefish in the Conception Management Area ..... C-1

C.1 Introduction ..... C-3

C.2 Fishery Management ..... C-3

C.3 Geographic Distribution and Trends in Trawl Fishery Landings ..... C-5

C.4 Control Limit Analysis Based on Historical OYs ..... C-8

C.5 Conclusions ..... C-9

# List of Tables

Table C-1. Conception area sablefish landings by sector including OYs and proportions of OYs (share) landed by sector, 1995-2005 ..... C-4

Table C-2. Limited entry trawl sablefish landings (mt) in Conception area by port during 1995-2010 ... C-6

Table C-3. Limited entry trawl sablefish landings in Conception area by port during 1995-2010 in terms of number of 2011 control limits. ..... C-7

Table C-4. Limited entry trawl and EFP sablefish landings (mt) in Conception area by port during 1995-2010 ..... C-8

Table C-5. Limited entry trawl and EFP sablefish control limit landings in Conception area by port during 1995-2010 ..... C-8

Table C-6. Control limits required to accommodate specified sablefish landing levels (mt) in the Conception area based on historical OYs. ..... C-9

# List of Figures

Figure C-1. Conception area sablefish landings by sector including OYs, 1995-2005 (excluding EFP Landings) ..... C-4

Figure C-2. Conception area sablefish landings by sector including OYs, 1995-2005 (including EFP landings) ..... C-5

Figure C-3. LE trawl fishery mt landed by port and year, 1995-2010: CONCEPTION AREA SABLEFISH (excluding EFP landings). ..... C-6

Figure C-4. LE trawl fishery mt landed by port and year, 1995-2010: CONCEPTION AREA SABLEFISH (including EFP landings). ..... C-7

# APPENDIX C: Additional Considerations for Sablefish Special Exception in the Conception Management Area

## C.1 Introduction

Conception area sablefish are managed separately from sablefish fisheries to the north. A substantial trawl fishery existed in the area based in the ports of Morro Bay and Avila until the mid 2000s when an environmental organization (The Nature Conservancy) acquired some local trawl permits and vessels. For three years (2008-2010) the permits and vessels were used to target sablefish using fixed fishing gear under experimental fishing permits. The Conception area sablefish optimum yield specification (OY) was at a relatively low during 1995-2008, and then substantially increased beginning in 2009. Interest has been expressed in creating a Designated CFA in the Conception area (Morro Bay), and some feel that special consideration should be given to that request. Some reasons for special consideration include 1) the 2011 sablefish control limit will fall short of accommodating control of historical landings for the port by a single entity, 2) the Conception area sablefish OY was not met in a large majority of years, and 3) the trawl fishery has been allocated a large proportion of the area sablefish OY under Amendment 21 (intersector allocation). While the control limit cap would accommodate historic landings at the elevated OY of recent years (e.g. 2011), concern has been raised that control limit cap for Conception area sablefish may not be accommodate historic landing levels (as measured by weight) in future years if the OY declines to pre 2009 levels. The following report provides a summary of past sablefish fishery management, a review of distribution and trends in trawl sablefish landings including experimental fishery landings, and an evaluation of alternative sablefish control limit caps based on pre-2009 OYs.

## C.2 Fishery Management

Conception area sablefish have been managed based on optimum yield (OY) specifications since before 1995. The annual OYs since 1995 have averaged 453 mt with a range of 210 mt to 1,371 mt (Table C-1; Fig. C-1). The Conception area sablefish OY has averaged about 6% of the coastwide sablefish OY (PFMC 2010).

Under Amendment 21, the Conception area trawl fishery is allocated 42% of the Conception area OY (PFMC 2010). Prior to the 2011 season, there was no trawl allocation of Conception area sablefish; the LE trawl fishery was managed under the same regulations as the trawl fishery to the north while the Conception area LE and OA fixed gear sablefish fisheries were managed under the same regulations including the same daily and weekly trip limits (FR notices). Very minor amounts of Conception area sablefish were taken in exempted trawl and recreational fisheries (PFMC 2010). During 1995-2010, the combined directed fisheries harvested an average of 67% of annual Conception area OYs (ranging from 25% to 103%) broken down as follows: 20% of the OY was harvested in the LE trawl fishery, 26% in the LE fixed gear fishery and 21% in OA fixed gear fishery, including the experimental fishery. During its three years, experimental fishery landings averaged 8% of the OY, ranging from 1% to 16% (Table C-1; Figure C-2). All of these fish were landed in Morro Bay.

Table C-1. Conception area sablefish landings by sector including OYs and proportions of OYs (share) landed by sector, 1995-2005

| | | Landings (mt) | | | | | Landings as share of OY | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | OY | LE Trawl | LE FG | OA | X [a/] | All | LE Trawl | LE FG | OA | X [a/] | All |
| 1995 | 425 | 209.1 | 43.2 | 78.2 | | 330.5 | 0.49 | 0.10 | 0.18 | | 0.75 |
| 1996 | 425 | 213.5 | 85.6 | 41.8 | | 340.9 | 0.50 | 0.20 | 0.10 | | 0.79 |
| 1997 | 425 | 175.8 | 108.4 | 4.8 | | 289.1 | 0.41 | 0.26 | 0.01 | | 0.68 |
| 1998 | 425 | 118.6 | 96.0 | 4.0 | | 218.6 | 0.28 | 0.23 | 0.01 | | 0.51 |
| 1999 | 472 | 84.0 | 86.1 | 13.1 | | 183.2 | 0.18 | 0.18 | 0.03 | | 0.39 |
| 2000 | 472 | 35.8 | 68.9 | 17.7 | | 122.4 | 0.08 | 0.15 | 0.04 | | 0.25 |
| 2001 | 212 | 28.1 | 98.7 | 15.3 | | 142.1 | 0.13 | 0.47 | 0.07 | | 0.66 |
| 2002 | 229 | 49.0 | 110.6 | 30.1 | | 189.8 | 0.21 | 0.48 | 0.13 | | 0.81 |
| 2003 | 294 | 77.7 | 107.2 | 33.9 | | 218.8 | 0.26 | 0.36 | 0.12 | | 0.72 |
| 2004 | 276 | 78.9 | 76.7 | 26.5 | | 182.1 | 0.29 | 0.28 | 0.10 | | 0.65 |
| 2005 | 275 | 56.2 | 72.7 | 17.0 | | 146.0 | 0.20 | 0.26 | 0.06 | | 0.53 |
| 2006 | 271 | 11.6 | 62.7 | 116.9 | | 191.2 | 0.04 | 0.23 | 0.43 | | 0.70 |
| 2007 | 210 | 7.6 | 63.1 | 122.3 | | 193.0 | 0.04 | 0.30 | 0.58 | | 0.91 |
| 2008 | 210 | 17.6 | 76.3 | 122.1 | 2.8 | 218.8 | 0.08 | 0.36 | 0.58 | 0.01 | 1.03 |
| 2009 | 1,371 | 19.5 | 211.0 | 434.6 | 92.5 | 757.6 | 0.01 | 0.15 | 0.32 | 0.07 | 0.55 |
| 2010 | 1,258 | 0.0 | 191.5 | 545.9 | 197.8 | 935.1 | 0.00 | 0.15 | 0.43 | 0.16 | 0.74 |

[a/] X means landings under the experimental permit fishery. All were landed in Morro Bay.

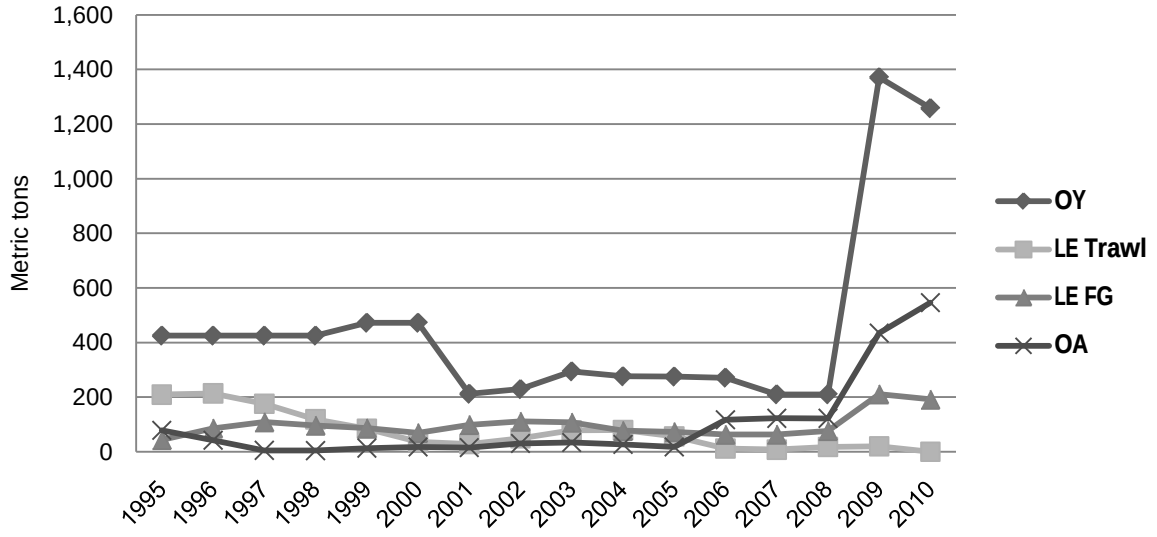



Figure C-1. Conception area sablefish landings by sector including OYs, 1995-2005 (excluding EFP Landings)

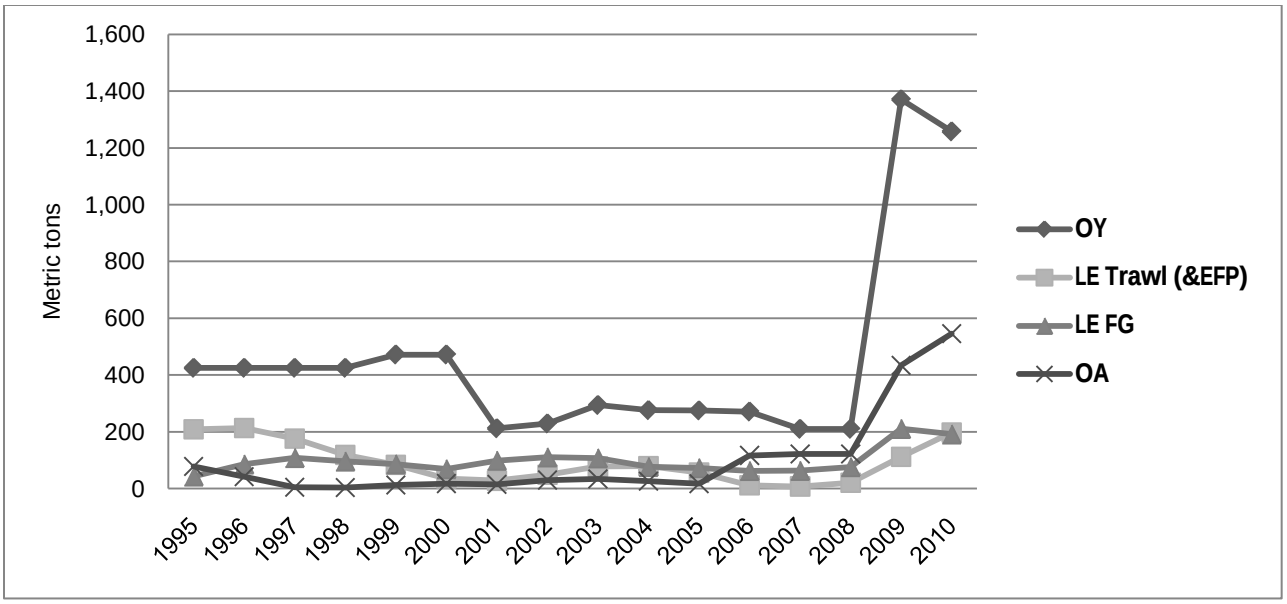



Figure C-2. Conception area sablefish landings by sector including OYs, 1995-2005 (including EFP landings)

## C.3 Geographic Distribution and Trends in Trawl Fishery Landings

LE trawl sablefish were primarily landed at the Conception area ports of Morro Bay and Avila during 1995-2010 except no LE trawl sablefish were landed in the Conception area in 2010 (Table C-2; Figure C-2). Morro Bay was the major landing port (58%) followed by Avila (42%). A very minor amount was landed in the Santa Barbara and Ventura areas. Trawl landings for the years examined average 74 mt (163 thousand pounds). The data for all ports and overall showed a strong downward trend in landings from a high of about 214 mt (472 thousand pounds) in 1996 to no trawl landings in 2010. Expressed in terms of 2011 Conception area sablefish control limit equivalents (one control limit= 53.1 mt [117,064 lbs]) trawl landings over the years 1995-2010 averaged 1.39 limits with a range of from 4.02 limits in 1996 to zero limits in 2010 (Table C-3). The Morro Bay average for 1995-2010 was 0.81 control limits, ranging from 2.62 control limits to zero.

The analysis in Appendix A primarily focused on the QS control limits that would be required for a CFA for a port to control enough QS to accommodate the poundage landed historically. With only two ports landing trawl caught sablefish in this area, if the desire is to allow a single entity to control the historic proportion of landings for a particular port, a 60% limit might be appropriate. Since Avila has gone to zero landings in recent years, this would still require 40% of the QS to be held outside of a CFA. This result does not account for fish that may be caught in this area but landed to the north.

Inclusion of the EFP landings of recent years alters the Morro Bay landings for 2008 through 2010. For Morro Bay the average with the EFP landings increase from 42,86 mt to 61.89 mt (Table C-2 and Table C-4) and the number of control limits required to cover the average landings increased from 0.81 to 1.15 (Table C-3 and Table C-5)

Table C-2. Limited entry trawl sablefish landings (mt) in Conception area by port during 1995-2010

| | MRO | AVL | SB | VEN | South | Total |
|---|---|---|---|---|---|---|
| 1995 | 138.89 | 70.23 | 0.00 | 0.00 | 0.00 | 209.12 |
| 1996 | 138.13 | 75.41 | 0.00 | 0.00 | 0.00 | 213.54 |
| 1997 | 133.76 | 42.06 | 0.00 | 0.00 | 0.00 | 175.82 |
| 1998 | 61.90 | 56.73 | 0.00 | 0.00 | 0.00 | 118.62 |
| 1999 | 44.79 | 39.17 | 0.00 | 0.00 | 0.00 | 83.96 |
| 2000 | 8.68 | 27.01 | 0.00 | 0.11 | 0.00 | 35.80 |
| 2001 | 2.12 | 25.94 | 0.00 | 0.00 | 0.00 | 28.06 |
| 2002 | 5.44 | 43.49 | 0.00 | 0.00 | 0.00 | 48.92 |
| 2003 | 9.71 | 68.02 | 0.00 | 0.00 | 0.00 | 77.72 |
| 2004 | 30.10 | 48.68 | 0.12 | 0.00 | 0.00 | 78.89 |
| 2005 | 56.22 | 0.00 | 0.00 | 0.00 | 0.00 | 56.22 |
| 2006 | 11.57 | 0.00 | 0.00 | 0.00 | 0.00 | 11.57 |
| 2007 | 7.43 | 0.12 | 0.00 | 0.00 | 0.00 | 7.55 |
| 2008 | 17.56 | 0.00 | 0.00 | 0.00 | 0.00 | 17.56 |
| 2009 | 19.55 | 0.00 | 0.00 | 0.00 | 0.00 | 19.55 |
| 2010 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Avg | 42.86 | 31.05 | 0.01 | 0.01 | 0.00 | 73.93 |
| Share | 0.58 | 0.42 | 0.00 | 0.00 | 0.00 | 1.00 |

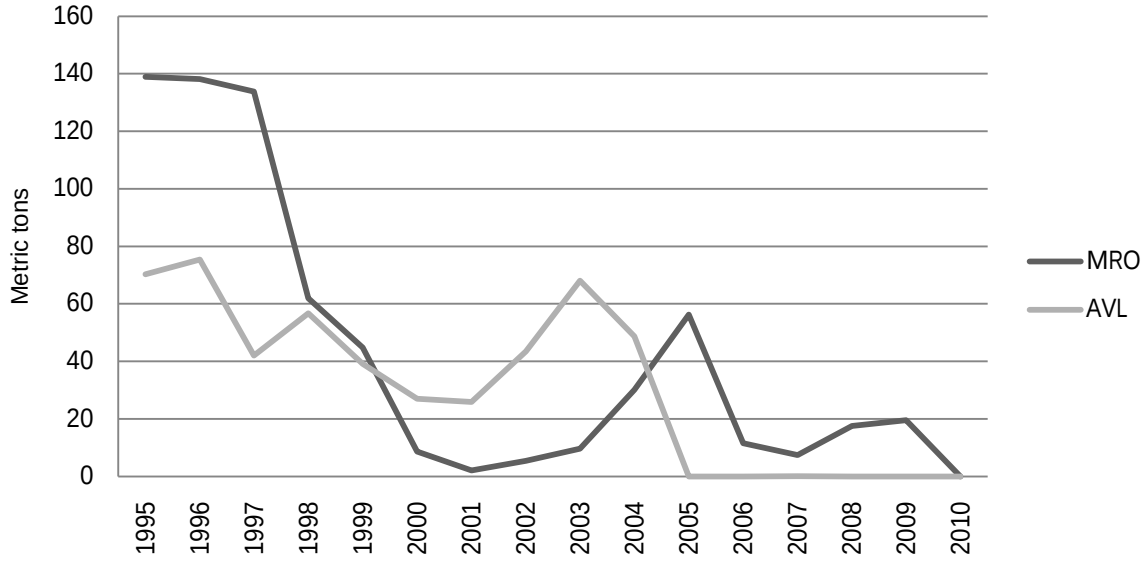



Figure C-3. LE trawl fishery mt landed by port and year, 1995-2010: CONCEPTION AREA SABLEFISH (excluding EFP landings).

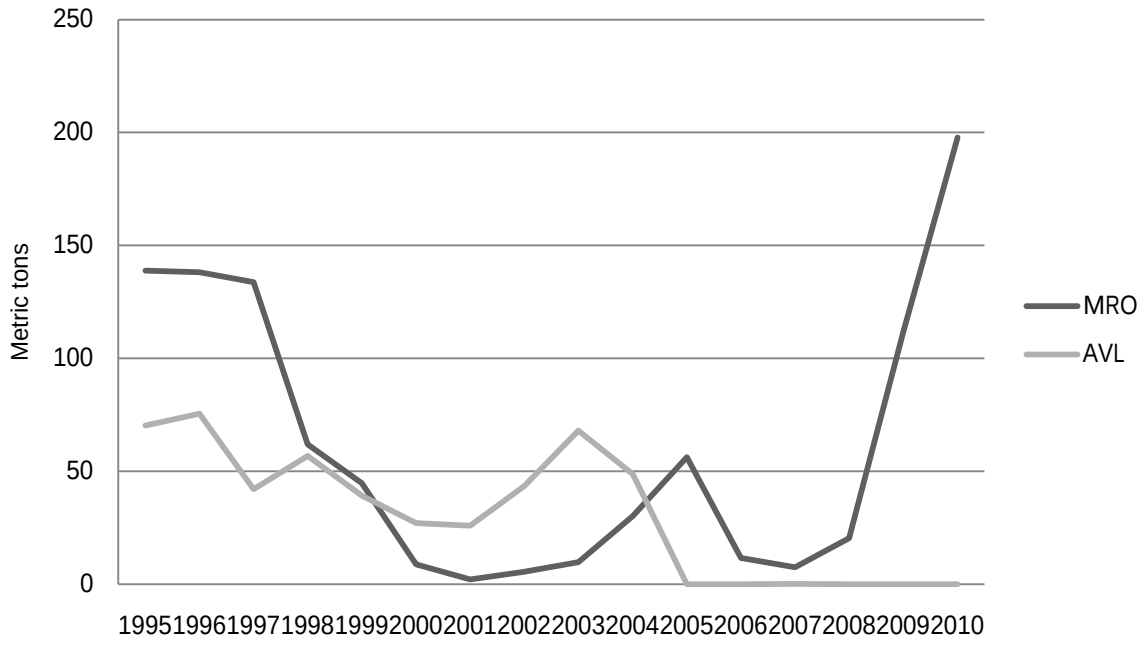



Figure C-4. LE trawl fishery mt landed by port and year, 1995-2010: CONCEPTION AREA SABLEFISH (including EFP landings).

Table C-3. Limited entry trawl sablefish landings in Conception area by port during 1995-2010 in terms of number of 2011 control limits.

| | MRO | AVL | SB | VEN | South | Total |
|---|---|---|---|---|---|---|
| 1995 | 2.62 | 1.32 | 0.00 | 0.00 | 0.00 | 3.94 |
| 1996 | 2.60 | 1.42 | 0.00 | 0.00 | 0.00 | 4.02 |
| 1997 | 2.52 | 0.79 | 0.00 | 0.00 | 0.00 | 3.31 |
| 1998 | 1.17 | 1.07 | 0.00 | 0.00 | 0.00 | 2.23 |
| 1999 | 0.84 | 0.74 | 0.00 | 0.00 | 0.00 | 1.58 |
| 2000 | 0.16 | 0.51 | 0.00 | 0.00 | 0.00 | 0.67 |
| 2001 | 0.04 | 0.49 | 0.00 | 0.00 | 0.00 | 0.53 |
| 2002 | 0.10 | 0.82 | 0.00 | 0.00 | 0.00 | 0.92 |
| 2003 | 0.18 | 1.28 | 0.00 | 0.00 | 0.00 | 1.46 |
| 2004 | 0.57 | 0.92 | 0.00 | 0.00 | 0.00 | 1.49 |
| 2005 | 1.06 | 0.00 | 0.00 | 0.00 | 0.00 | 1.06 |
| 2006 | 0.22 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 |
| 2007 | 0.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.14 |
| 2008 | 0.33 | 0.00 | 0.00 | 0.00 | 0.00 | 0.33 |
| 2009 | 0.37 | 0.00 | 0.00 | 0.00 | 0.00 | 0.37 |
| 2010 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Avg | 0.81 | 0.58 | 0.00 | 0.00 | 0.00 | 1.39 |
| Share | 0.58 | 0.42 | 0.00 | 0.00 | 0.00 | 1.00 |

Table C-4. Limited entry trawl and EFP sablefish landings (mt) in Conception area by port during 1995-2010

| | MRO | AVL | SB | VEN | South | Total |
|---|---|---|---|---|---|---|
| 1995 | 138.89 | 70.23 | 0.00 | 0.00 | 0.00 | 209.12 |
| 1996 | 138.13 | 75.41 | 0.00 | 0.00 | 0.00 | 213.54 |
| 1997 | 133.76 | 42.06 | 0.00 | 0.00 | 0.00 | 175.82 |
| 1998 | 61.90 | 56.73 | 0.00 | 0.00 | 0.00 | 118.62 |
| 1999 | 44.79 | 39.17 | 0.00 | 0.00 | 0.00 | 83.96 |
| 2000 | 8.68 | 27.01 | 0.00 | 0.11 | 0.00 | 35.80 |
| 2001 | 2.12 | 25.94 | 0.00 | 0.00 | 0.00 | 28.06 |
| 2002 | 5.44 | 43.49 | 0.00 | 0.00 | 0.00 | 48.92 |
| 2003 | 9.71 | 68.02 | 0.00 | 0.00 | 0.00 | 77.72 |
| 2004 | 30.10 | 48.68 | 0.12 | 0.00 | 0.00 | 78.89 |
| 2005 | 56.22 | 0.00 | 0.00 | 0.00 | 0.00 | 56.22 |
| 2006 | 11.57 | 0.00 | 0.00 | 0.00 | 0.00 | 11.57 |
| 2007 | 7.43 | 0.12 | 0.00 | 0.00 | 0.00 | 7.55 |
| 2008 | 20.36 | 0.00 | 0.00 | 0.00 | 0.00 | 20.36 |
| 2009 | 112.05 | 0.00 | 0.00 | 0.00 | 0.00 | 112.05 |
| 2010 | 197.80 | 0.00 | 0.00 | 0.00 | 0.00 | 197.80 |
| Avg | 61.18 | 31.05 | 0.01 | 0.01 | 0.00 | 92.25 |
| Share | 0.66 | 0.34 | 0.00 | 0.00 | 0.00 | 1.00 |

Table C-5. Limited entry trawl and EFP sablefish control limit landings in Conception area by port during 1995-2010

| | MRO | AVL | SB | VEN | South | Total |
|---|---|---|---|---|---|---|
| 1995 | 2.62 | 1.32 | 0.00 | 0.00 | 0.00 | 3.94 |
| 1996 | 2.60 | 1.42 | 0.00 | 0.00 | 0.00 | 4.02 |
| 1997 | 2.52 | 0.79 | 0.00 | 0.00 | 0.00 | 3.31 |
| 1998 | 1.17 | 1.07 | 0.00 | 0.00 | 0.00 | 2.23 |
| 1999 | 0.84 | 0.74 | 0.00 | 0.00 | 0.00 | 1.58 |
| 2000 | 0.16 | 0.51 | 0.00 | 0.00 | 0.00 | 0.67 |
| 2001 | 0.04 | 0.49 | 0.00 | 0.00 | 0.00 | 0.53 |
| 2002 | 0.10 | 0.82 | 0.00 | 0.00 | 0.00 | 0.92 |
| 2003 | 0.18 | 1.28 | 0.00 | 0.00 | 0.00 | 1.46 |
| 2004 | 0.57 | 0.92 | 0.00 | 0.00 | 0.00 | 1.49 |
| 2005 | 1.06 | 0.00 | 0.00 | 0.00 | 0.00 | 1.06 |
| 2006 | 0.22 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 |
| 2007 | 0.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.14 |
| 2008 | 0.38 | 0.00 | 0.00 | 0.00 | 0.00 | 0.38 |
| 2009 | 2.11 | 0.00 | 0.00 | 0.00 | 0.00 | 2.11 |
| 2010 | 3.73 | 0.00 | 0.00 | 0.00 | 0.00 | 3.73 |
| Avg | 1.15 | 0.58 | 0.00 | 0.00 | 0.00 | 1.74 |
| Share | 0.66 | 0.34 | 0.00 | 0.00 | 0.00 | 1.00 |

## C.4 Control Limit Analysis Based on Historical OYs

The following analysis of special exception accommodation for Conception area CFAs was based on four historical OYs, which covered the OY range during 1995-2010: 212 mt, 294 mt, 425 mt and 1,264 mt (Table C-1). Control limit caps for each of these OYs were computed based on the area trawl fishery allocation (42%) and the fishery control limit cap (10%). The computed control limit caps ranged from 8.9 mt to 53.1 mt (Table C-6). Two landing level objectives were used to examine the appropriate level of control limit accommodation: 130 mt (excluding 2010), approximate maximum annual for Morro Bay since 1995, and 65 mt, half of that amount.

Table C-6. Control limits required to accommodate specified sablefish landing levels (mt) in the Conception area based on historical OYs.

| | | OY (mt) | | | |
|---|---|---|---|---|---|
| | Proportion | 212.0 | 294.0 | 425.0 | 1,264.3 |
| Trawl fishery allocation | 42% | 89.0 | 123.5 | 178.5 | 531.0 |
| Control limit cap | 10% | 8.9 | 12.3 | 17.9 | 53.1 |
| Cap in lbs | | 19,629.9 | 27,222.6 | 39,352.5 | 117,063.9 |
| | | Number of Control limits Required to Meet Objective | | | |
| Landing objective in mt | 130 | 14.60 | 10.53 | 7.28 | 2.45 |
| | 65 | 7.30 | 5.26 | 3.64 | 1.22 |
| | | Proportion (objective/trawl allocation) | | | |
| Landing objective in mt | 130 | 1.46 | 1.05 | 0.73 | 0.24 |
| | 65 | 0.73 | 0.53 | 0.36 | 0.12 |

The number of control limits required to meet the 130 mt landing objective ranged from 14.60 to 2.45 depending on OY. Likewise the number of control limits required to meet the 65 mt objective ranged from 7.30 to 1.22. However, it was not possible to meet the 130 mt objective at the two low OY levels (212 and 294 mt) because the amount of fish required exceeded the fishery allocation. For the remaining combinations of OY and fishery landing objectives, the proportion of the allocation required ranged from 12% (1,264.3 mt OY with a 65 mt objective) to 73% (425 mt OY with a 130 mt objective; and 212 mt OY with a 65 mt objective).

In 2010 there were no trawl sablefish landings in Morro Bay but 197.8 mt of EFP landings by trawl vessels using nontrawl gear. This was the maximum amount of landings by trawl vessels in Morrow Bay in any one year from 1995 through 2010. Table C-6 can be used to make a quick estimate of the situation if the 2010 trawl vessel landing level were selected as an objective for the QS a CFA should be allowed to control in terms of the metric tons that QS would represent given a variety of OYs. This can be done by summing the results for the 130 mt and 65 mt rows. The summed objective for these two rows is 195 mt which closely approximates the 2010 EFP landings (99% of the 2010 value which was also the 1995-2010 maximum) can be evaluated by summing the control limit and allocation proportion metrics for the 130 mt and 65 mt landing objectives discussed above and shown in Table C-6. For example, the number of control limits required to meet a landing objective of 195 mt at the 425 mt OY level would be 10.92 control limits, which would not be permitted because such a control limit exception would represent 109% of the Conception area trawl fishery allocation (178.5 mt).

## C.5 Conclusions

- The Conception area trawl sablefish fishery has substantially decline since 1995 with no landings recorded for the fishery in 2010.
- The trawl fishery allocation of 42% of the OY is much higher (13 to 42 percentage points) than the actual harvest shares for the fishery since 1998.
- Using OY data prior to 2009 to calculate trawl fishery control limit caps resulted in much lower caps compared to calculations on the 2011 OY. The number of control limits required to accommodate a

particular landing level based on the earlier OY levels was much higher than the number required based on the 2011 OY.

- A very high level of control limit (>70%) would be required in a medium level OY year (e.g., 425 mt) to accommodate (or nearly accommodate) a maximum historical landing level of 130 mt. A high level of accommodation (e.g., 130 mt) would not possible in a low OY year (e.g., 212 mt) because the trawl fishery is capped at 42% of the area OY.

The analysis did not examine the potential need for CFAs to acquire QS for target groundfish species and overfished groundfish species that associate with sablefish. CFAs may need to acquire QS for associated species if the vessels used to harvest their fish do not have sufficient QP for the associated species. Otherwise CFA sablefish will be under harvested or will need to be transferred to other entities that can access them. These are issues that CFAs will need to address as part of their harvest planning and contracting processes.

# INSERTS FOR CONTROL LIMIT SAFE HARBOR ENVIRONMENTAL ASSESSMENT

This document contains a number of inserts for the control rule safe harbor EA (Agenda Item E.7.a, Attachment 1):

Chapter 2 Insert (CFA Safe Harbor: Overview of Rationale and Impacts for Action Alternative) Page 2

Appendix B Insert (Special Exception Options for Designated CFAs) Page 8

Coastal/Marine County Municipalities And Port Districts Page 15

# CHAPTER 2 INSERT

## Section 2.4. CFA Safe Harbor: Overview of Rationale and Impacts for Action Alternative

The Council ensured that communities would be able to directly acquire QS in order to provide communities with an opportunity to mitigate the IFQ programs tendency to cause a geographic redistribution of landings.

Communities might use QS to maintain landings within the community in a number of ways, including:

1. Complete QP Production Subsidy (Annual): Provide the QP to vessels willing to commit to the delivery of that QP within the community.
2. Partial QP Production Subsidy (Annual): Provide the QP to vessels willing to match each QP provided with a QP some of their own (a 1:1 or some other ratio).
3. Partial Complementary QP Production Subsidy (Annual): Provide the QP for certain co-occurring species to vessels willing to provide their own QP for other species.
4. Long-term Subsidy: Provide a long term commitment of the QP (or lease the QS) to a new processor or vessel operation willing to locate into the community and commit to certain production levels.

The amount of QS that any one entity (including communities) may acquire is limited by control limits. Based on the data from Appendix A, if a CFA follows the first of these example approaches and acquires sufficient QS to cover all of the landings of the vessels operating in a particular community, for some port areas an exception to the QS control limits would be required. The action alternative would permit organizations officially designated "Community Fishing Associations" to acquire and control trawl fishery quota shares in excess of QS control limits that apply to all other QS holders.

**Initial Decision Point**

The first decision point for the Council is whether or not to proceed with developing a control rule safe harbor for CFAs. If the action alternative is selected then there are a number of design decisions needed. These design decisions are detailed in Appendix B. The impacts of each alternative are compared in Chapter 4. The following is a qualitative summary of the pros and cons of the action alternative.

**Pros and Cons**

In the following list of positive and negative potential impacts, there are a number of impacts the size of which will depend on

- ❖ the degree to which CFAs exercise the additional control allowed under the safe harbor provision, and
- ❖ whether or not the CFA activities expand the landings and QS within the port.

- With respect to the exercise of the safe harbor provisions,
  - ♦ CFAs can be formed under current rules but are subject to control limits. Therefore, many of the potential positive and negative impacts of CFAs that are identified below may already occur under the current program. Of concern here is whether the degree of those impacts may increase if a single CFA entity has the flexibility to operate at a larger scale than under the status quo.
  - ♦ At present (and with the action alternative) multiple general CFAs can operate in a single port. **Therefore, what is at issue is not so much whether CFAs in a single port could meet all or a certain percentage of the needs of a port but rather the number of CFAs that would need to be formed to achieve that end.** Requiring more CFAs to achieve the same end means greater costs for the entities in the ports and a greater number of independent interests that would be willing to form CFAs in a particular port (if the control of CFAs were linked then control limits might be violated even if single CFAs did not hold QS in excess of limits).
- With respect to whether or not the CFA activities expand the QS and landings within the port,
  - ♦ If the CFA is simply maintaining a port's existing QS and activity level, there will be minimal net effect elsewhere (CFA acquired QS/QP will simply be substituted for locally controlled QS/QP).
    - ➢ For this result to occur either
      - the CFA must acquire its QS locally, or
      - the quota holders in the port that receive the CFA-provided QP release their QS or QP[1] to other areas of the coast (Figure 2- 1).
    - In either of these cases, the net effect is simply a shift of control from local QS holders to the CFA.
  - ♦ If the CFA causes and expansion of activity in a port, either as an intentional strategy or because the recipients of the CFA-QP decide to maintain the QS/QP they already had access to.
    - some of the negative impacts identified in the following list are more likely.

[1] Note: If local QS holders release their QP then some of the benefits of QS ownership (rents) will flow back to the community with the CFA.

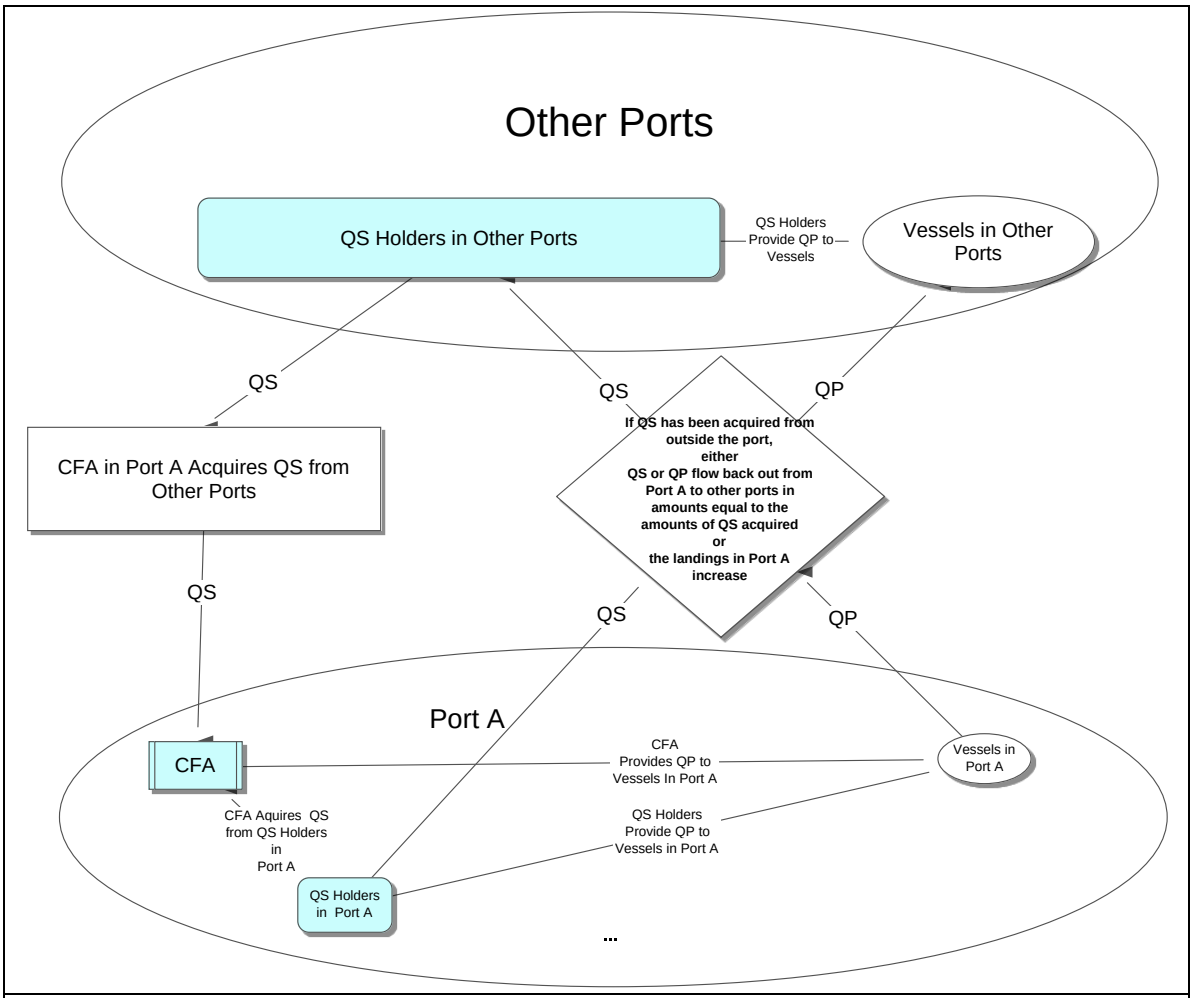



**Figure 2- 1. Effect of CFA acquisition on the flow of QS/QP and the amount of landings occurring in a port (see diamond).**

***Please note in the following list, the number of potential positive impacts are fewer than the number of potential negative impacts. The number of potential impact mechanisms in either direction is not necessarily an indicator of the overall positive or negative net effect of the alternative.***

**Pros:** Potential Benefits/Positive Impacts of the Action Alternative:

- **Increased community stability.** An organization representing port interests (designated CFA) would be able to stabilize fishery landings at a higher level. That level may be below, equal to, or greater than recent landing levels, depending on the magnitude of recent landings for the port, the level of special exception that is afforded designated CFAs, and the degree to which designated CFAs exercise this option. There are a number of social and economic benefits that may accompany the additional community stability.
- **Increased potential for enhancing fishery value and sustainable harvest practices.** A CFA may use its QP to influence fishing and fish handling operations. Designated CFAs could do this on a larger scale.

**Cons:** Potential Costs/Negative Impacts of the Action Alternative:

- **Increased IFQ program administrative costs.**
- **Potential for CFAs to be "captured" and used for purposes not intended by the CFA policy.**
- **CFAs safe harbors may work in at least partial opposition to some trawl rationalization program objectives.** The existence of CFAs implies an alteration of the distribution and use of QS as compared to what would be expected solely based on market forces. To the degree that CFAs acquire QS in excess of control limits, the performance of the program may be reduced with respect to some objectives that are dependent on the free flow of QS in response to market incentives (e.g. efficiency and avoidance of high bycatch areas).
    - **Total catch of target species could be adversely affected.** If a CFA attracts effort into areas that geographic distribution based on markets would avoid, e.g. areas with lower profit margins because of higher overfished species bycatch rates, this would increase average coastwide bycatch rates and hence decrease coastwide total catch of target species.[2]
- **CFAs safe harbors are likely to cause some increase in the price of QS/QP.**
    - In the absence of CFAs, QS/QP would likely flow to entities that are able to make most efficient use of it. If the CFA does not alter the market distribution there would be little need for the CFAs. Any QS/QP diverted to CFAs may cause the most efficient participants to bid up the price for the QS remaining available to the market (i.e. the amount of QS/QP potentially made available in response to market prices would be reduced[3]).
        - CFA provided QP may act as a subsidy, increasing the price recipients of CFA provided QP are willing to pay for other QS/QP.
- **A higher price for QS may increase the redistribution of QS, possibly having an adverse effect on some areas.** To the degree that the price of QS escalates, more QS held by entities with lower profit margins will be sold (or the QP held by those entities will be leased to others). If the entities with lower profit margins tend to reside in a particular port, or sell to a particular buyer, then those ports/buyers will be more adversely affected. If ports of a certain type (e.g. smaller ports) tend to have higher costs, offer lower exvessel prices, or have harvesters that work with lower volumes of fish (have higher average per pound costs[4]), then those ports may be more affected than other ports.
- **Existence of CFAs in some ports may induce other ports to form CFAs.** If the accumulation of additional QS by CFAs in one port has a substantial effect on the QS available in other ports, entities in those ports may respond defensively by creating their

[2] Assuming the CFA or its beneficiaries attain the bycatch species QP necessary to access its target species

[3] In general, a CFA is unlikely to make its QS available to the market in response to price fluctuations of QS that are within a normal range. However, at a high enough price the CFA might find that the capital generated by selling the QS could do more for the community than could be achieved by holding the QS.

[4] Volume of product may be important in offsetting fixed seasonal or per trip (e.g. observer) costs in participating in the IFQ program.

own CFAs. This may increase impacts associated with CFA operations (both positive and negative).

- **Potential for control of large amounts of QS by CFAs in aggregate.** A few CFAs (see Appendix B, Table B-1) could potentially control the majority of QS/QP for species with high (>10%) control limits (Conception sablefish and other flatfish).
    - Large amounts of aggregate control could occur cumulatively across a number of CFAs using the safe harbor provisions in different ports.
    - Large amounts of aggregate control could occur in one port through the activities of a single designated CFAs and other general CFA(s) operating within the control limits (such other CFAs would have to be independently controlled).

Another impact of the higher control limits is their effect on the relative advantage between larger ports and smaller ports. Under current control limits, a CFA for a smaller port might meet that port's needs by providing a 100% QP subsidy (i.e. provide all QP) to vessels delivering to that smaller port. A CFA for a larger port could not provide a 100% QP subsidy for all the landings to the larger port. This differential provides opportunity for a smaller port to make an inroad in maintaining or growing its landings. With a higher QS control limit, a CFA at a larger port would be able to subsidize a larger percentage of the port's landings, decreasing the differential between the QP subsidy a large port and small port can offer.

The Conception area sablefish and shortspine thornyhead CFA situations are somewhat different from the northern area management situation for these species because a single port, Morro Bay, has supported the entire trawl fleet and its landings for many years (see Appendix C). It has been suggested that, other ports could potentially be impacted if a special exception to the control limit is provided for this area and QP for other species (e.g. overfished species such as cowcode or bocaccio) are needed to match the sablefish and shortspine thornyhead QP in the area. However, given that all of the QP is already being landed in one port and that the purpose of the control limit exception may be more to provide the CFA with influence over other types of fishing related behaviors (e.g. gear usage and fishing areas) this may be less of a concern.

**Port Needs**

The Council previously asked about the amount of QS a port might need to maintain basic infrastructure. An attempt is made to address this question in Appendix A. While sufficient information is not available for a direct answer, it may be possible to begin to infer an answer from historic information about past levels of landings in ports.

In Appendix A, to determine the amount of QP a single entity could control QS control limits were converted to QP. These amounts were then compared to the past amounts of trawl landings in each primary trawl port. Historic landings were then displayed in terms of the number of control limit equivalents. For example, the northern sablefish control limit of 3% converts to 165,411 pounds. If a port had historic landings of 165,000 pounds, its landings would be *1.0* in terms of control limit equivalents, as was the case for Bellingham's maximum sablefish landings for 1996-1998 (Figures A-3). Figures A-3 and A-4 show results for key target species and primary trawl ports. Results for all species are provided in the tables which are attached to Appendix A. As shown in these figures and the rest of Appendix A, landings data for 11 of 16

primary ports analyzed showed maximum landings of 1.25 control limits or greater for one or more target groundfish species in one or more year during 1996-1998 or 2004-2010.

The data in Appendix A might be interpreted to show, that a number of ports were able to operate over a long period at landing levels lower than control limits (i.e. CFAs would not need an exception in order to maintain infrastructure). Whether such conclusions based on this historic data transfers to a conclusion that a single control limit is sufficient to maintain a minimum amount of infrastructure in other ports,[5] depends on the degree of port dependence on groundfish trawl fishery, changing conditions in other fisheries, and changing prices.

### Amount of Control Required by the CFA in Order to Accommodate Harvest Levels

One question for Council consideration is whether in order to maintain a given level of activity in a port a designated CFA should be able to control all the QS in a port or whether it can use QP from its QS to influence more QP than it directly controls. The Council Alternative 1 control limit exception Options a, b, and c would accommodate under a single designated CFA most historic landings in most ports.

### CFA Accommodation of Past Harvest Levels

If the intent of this initiative is to allow a designated CFA to control the QS needed to accommodate past landings at primary landing ports, and not to provide for an increased fishing opportunity above recent or historical landing levels, then control limit exception levels of 1.5 times the control limits (Alternative 1, Option a and c) and 2.0 times the control limit options (Alternative 1, Option b) will closely accommodate historical landings for several ports for one or more of the following species or species groups based on maximum landing in one or more study years: sablefish, Dover sole, shortspine thornyhead, longspine thornyhead and aggregate groundfish (see summary analysis in Appendix B). For the remaining ports with historically very high landings of one or more of these species in one or more study years, neither option will allow individual designated CFAs to control enough fish to accommodate past landings. However, if multiple CFAs establish in the same port they could collectively control enough limits to cover past landings for each species.[6]

### CFA Accommodation of Harvest Expansion

If the intent of the initiative is to allow a designated CFA to control the QS needed to provide enhanced landing opportunity compared to historical landings then several primary ports (Neah Bay, Bodega Bay, Princeton, Moss Landing and Monterey) and several secondary ports (shown

[5] Or even in these same ports under current conditions.

[6] Note: At present, there is no limit on the number of general CFAs that can establish in a particular port. Establishing such a limit would require development of a new set of criteria that would categorize entities as to whether or not they are general CFAs. These criteria would be different from those used to identify designated CFAs. To be effective, these criteria would have to be used to screen every entity that holds QS to determine whether or it fell into the general CFA category. If only a certain number of general CFAs were to be allowed, then criteria would have to be established to determine which general CFAs were to be prohibited. If QS control by general CFAs were to be prohibited, then the eligible to own criteria would need to be modified.

in Appendix A, Table A-2) could benefit from Alternative 1, control limit exception Options a, b or c.

Other ports which currently have no groundfish trawl landings or do not serve as the primary port for any trawl vessel might also take advantage of elevated designated CFA control limits.

# APPENDIX B INSERT

**B.1 Special Exception Options for Designated CFAs**

**Provisions and Questions**

| 1.0 CFA Special Privileges | |
|---|---|
| Current Scoping Priority (for June 2011 Council meeting): | **Option a:** For designated CFAs quota share control limits for some or all QS species categories are 1.5 times the current accumulation limits.<br>**Option b:** For designated CFAs quota share control limits for some or all QS species categories are 2.0 times the current accumulation limits<br>**Option c (new):** 1.5 times the current accumulation for all regions and species except as follows: 60% for sablefish south of 36° 0'N Latitude, and shortspine thornyheads south of 34°27' N Latitude. (In April 2011, the Council requested a geographically specific alternative. This option is based on one from the public record from the spring of 2009 and fall of 2010).<br>**Considered but rejected:** increase the control caps only for overfished species. |

**Outstanding Questions:**

- Does Option C respond to Council request? (Option C was developed based on Council guidance).
- Which option should be selected for the preliminary preferred alternative?

**Rationale and Discussion of Options**

The Council is considering providing CFAs with an exception to the QS control limits for reasons discussed in Chapters 1 and 2 of this document. This section assesses the options for the level of the exception that might be provided to designated CFAs. The No Action Alternative, which would provide no exceptions for CFAs, is described in Chapter 2 and analyzed in comparison to the action alternative (Alternative 2) in Chapter 4. The purpose of this section is primarily to compare the options within the action alternative to one another. Options a and b were developed through the public scoping process. Option c was developed based on Council direction at the April Council meeting and using public input from spring of 2009 and fall of 2010. The 60% exception for the Conception area was based on previous Council action and public comment but roughly corresponds to the average share of the trawl landings of Conception area sablefish delivered to Morro Bay (the primary trawl port in the area) from 1995 through 2010 (Tables C-3 and C-5 of Appendix C).

## Impacts

**Summary of Control Limit Analysis.** As shown in Appendix A (Tables A-8 and A-9), nine of 16 primary landing ports had landings of one or more target species ≥2.0 control limits, depending on study period (1996-1998 and 2004-2010) (Table B-1; Fig. B-1). The same number of ports (10) had landings of one or more target species ≥1.5 the control limits in both study periods, but the list of ports was different. Sablefish was the most common species among ports with landings ≥1.5 and ≥2.0 control limits during both study periods (Table B-1; Fig. B-1). Depending on the degree to which a port must subsidize a vessel's QP (provide the QP) to keep the landings in the port, those ports might benefit from special privilege exception to better ensure high level of fishery landings in the local area in future years. Also shown in Appendix A (Tables A-8 and A9), five ports had annual landings of target species in all study years of 1.0 control limits or less, thus would not appear to be in need of a special exception to accommodate historical landings. However, ports with historically low landings (and others not included in the analysis) might seek a special exception to the control limits in order to create expanded business opportunities.

> NOTE: For this analysis, it makes a difference what years to use in defining what constitutes historical landings: landings were higher for all target species in pre-RCA years compared to post RCA implementation years except Dover sole (see Appendix A). The statistic to use in defining historical landings is also important: The maximum landing at any port in any year during either study period (1996-1998 and 2004-2010) was always higher than the corresponding average annual landing during either study period (see Appendix A).

Table B-1: Number of ports with target species landings meeting or exceeding control limits of 1.25 and 1.75 by study period (Early is 1996-1998; Recent is 2004-2010).1/

| | Sablefish | Dover sole | Shortspine th | Longspine th | Aggregate gf |
|---|---|---|---|---|---|
| Early: 1.25 | 10 | 5 | 5 | 10 | 6 |
| Early: 1.75 | 9 | 3 | 2 | 8 | 2 |
| Recent: 1.25 | 10 | 4 | 5 | 5 | 4 |
| Recent: 1.75 | 7 | 3 | 3 | 4 | 1 |

1/ English sole and other flatfish are not included because no port exceeded 1.0 control limit for these species except Astoria in one year.

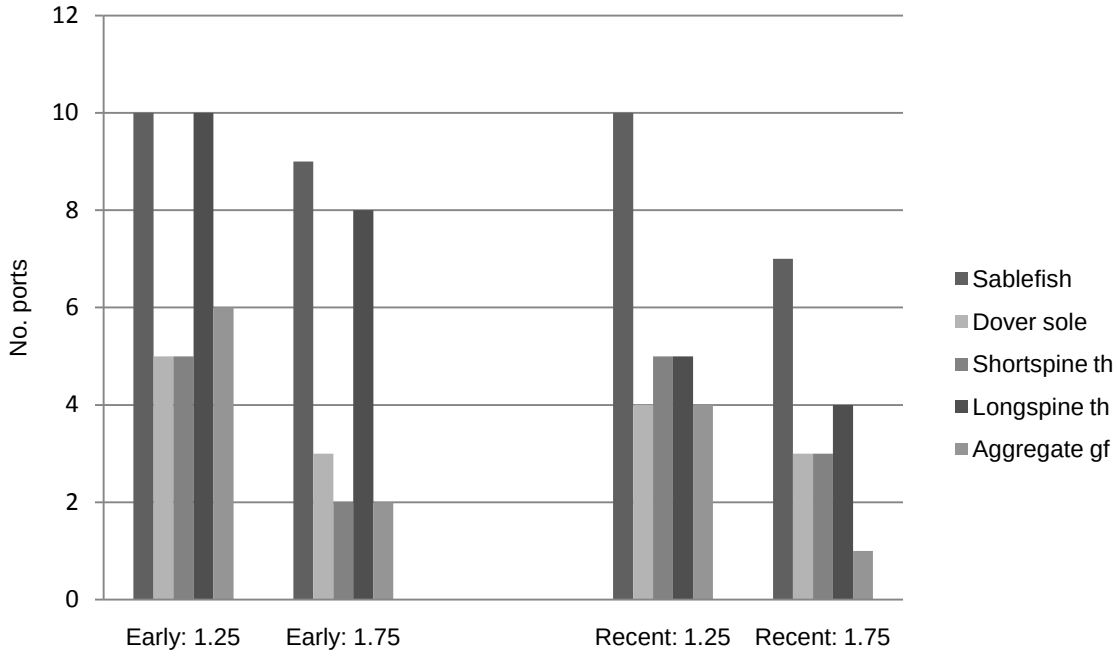



Fig. B-1: Number of ports with target species landings meeting or exceeding control limits of 1.25 and 1.75 by study period. Early is 1996-1998; Recent is 2004-2010.

**CFA Affect on QS Market.** As discussed in Section 2.4, the QS held by CFAs would not generally be viewed as being available on the market. The amount of QS available on the market (QS not held by CFAs) will depend on the amount of QS that is allowed to be acquired, and is acquired, by all CFAs collectively.

- Under Option a (150% exception) and with one CFA controlling the maximum allowed, the level of trawl fishery allocation controlled by the CFA would be in the range of 4% to 15% depending on target species (Table B-2: Fig B-2). With 4 CFAs controlling the maximum allowed, the trawl allocation controlled by CFAs would be in the range of 16% to 60% depending on species. With 8 CFAs controlling the maximum allowed the level of trawl allocation controlled by CFAs would be in the range of 31% to 100% depending on species.
- Under Option b (200% special exception) and one CFA, the trawl fishery allocation control level would range from 5% to 20% depending on species (Table B-2; Fig. B-3). The comparative control range with 4 CFAs would be 21% to 80%. With 8 CFAs the control range increases to from 42% to 100% depending on species.
- Option c has an element specific to the Conception area; it would cap the control limit for CFAs in the area to 60% each of the sablefish and shortspine thornyhead trawl fishery allocations. Under Option c the impacts are the same as Option a, except Conception area sablefish and shortspine thornyhead control ranges would be from 60% with 1 CFA to 100% with 4 CFAs (Table B-2; Fig. B-4).

Table B-2: Potential impacts of Designated CFAs on market shares of target species measured as proportions of trawl fishery allocations.

| Species | limit cap | Option a (150% special exception) | | | Option b (200% special exception) | | | Option c (same as a except for sablefish S and shortspine th S) 1/ | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 CFA | 4 CFA | 8 CFA | 1 CFA | 4 CFA | 8 CFA | 1 CFA | 4 CFA | 8 CFA |
| Sablefish N of 36 N lat. | 0.030 | 0.05 | 0.18 | 0.36 | 0.06 | 0.24 | 0.48 | 0.05 | 0.18 | 0.36 |
| Sablefish S of 36º N lat. | 0.100 | 0.15 | 0.60 | 1.20 | 0.20 | 0.80 | 1.60 | 0.60 | 1.20 | 1.80 |
| Dover sole | 0.026 | 0.04 | 0.16 | 0.31 | 0.05 | 0.21 | 0.42 | 0.04 | 0.16 | 0.31 |
| English sole | 0.050 | 0.08 | 0.30 | 0.60 | 0.10 | 0.40 | 0.80 | 0.08 | 0.30 | 0.60 |
| Other flatfish | 0.100 | 0.15 | 0.60 | 1.20 | 0.20 | 0.80 | 1.60 | 0.15 | 0.60 | 1.20 |
| Shortspine thornyhead N of 34 27' N lat. | 0.060 | 0.09 | 0.36 | 0.72 | 0.12 | 0.48 | 0.96 | 0.09 | 0.36 | 0.72 |
| Shortspine Thornyhead S of 34 27' N lat. 2/ | 0.060 | 0.09 | 0.36 | 0.72 | 0.12 | 0.48 | 0.96 | 0.60 | 1.20 | 1.80 |
| Longspine thornyhead N of 34 27' N lat. | 0.060 | 0.09 | 0.36 | 0.72 | 0.12 | 0.48 | 0.96 | 0.09 | 0.36 | 0.72 |

1/ Under this option each CFA in the Conception area would be eligible for a special exception limit for sablefish of 60% of the trawl allocation; and each CFA south of Point Conception would be eligible for a special exception limit of 60% of the trawl allocation for the area of shortspine thornyhead.

2/ The annual trawl allocation for this species is 50mt.

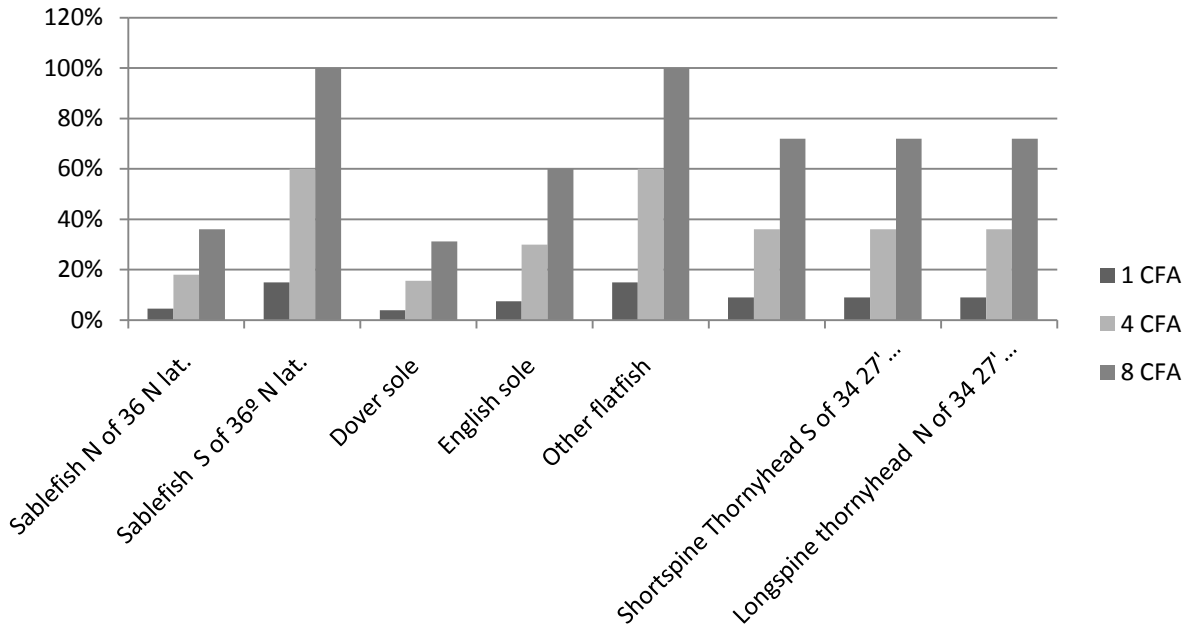



Fig. B-2. Potential impacts of Designated CFAs on market shares of target species measured as proportions of trawl fishery allocations: Option 1a (150% special exception).

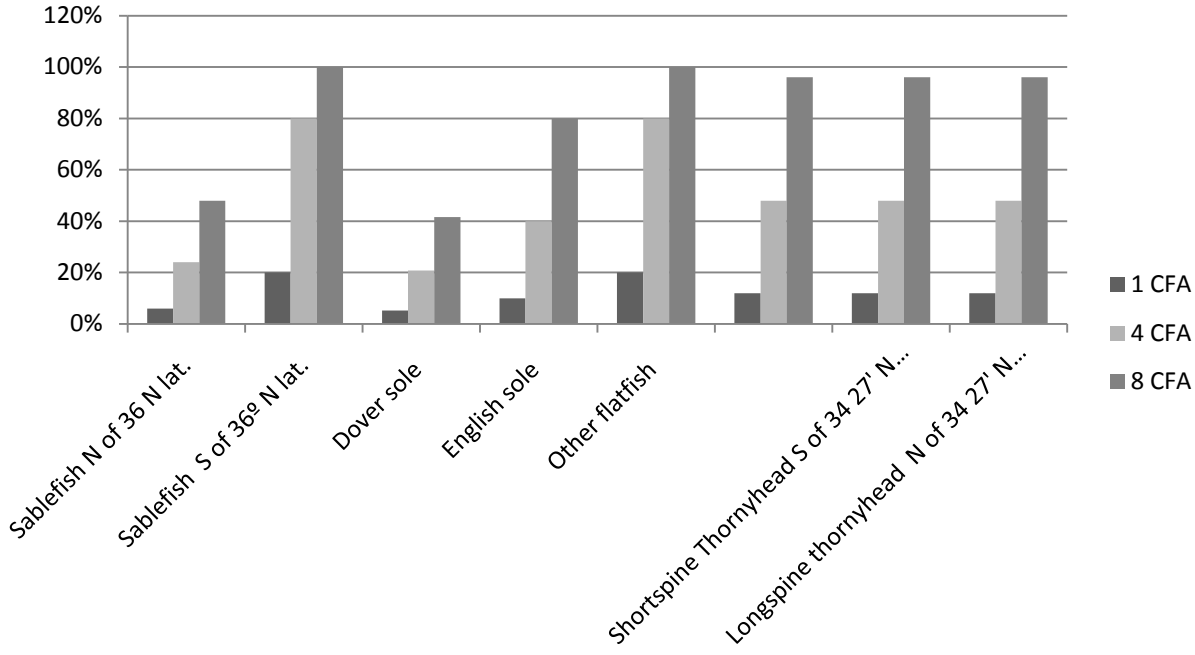



Fig. B-3. Potential impacts of Designated CFAs on market shares of target species measured as proportions of trawl fishery allocations: Option 1b (200% special exception).

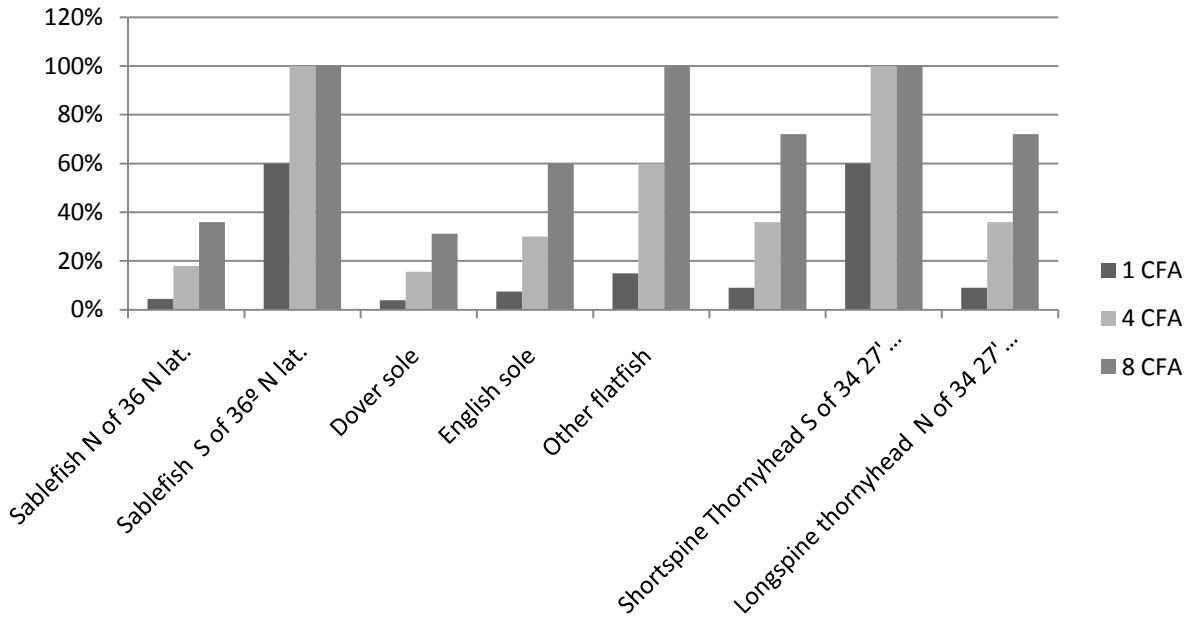



Fig. B-4. Potential impacts of Designated CFAs on market shares of target species measured as proportions of trawl fishery allocations: Option 1c (same as 1a except for sablefish S and shortspine thornyhead S).

# Coastal/Marine County Municipalities And Port Districts

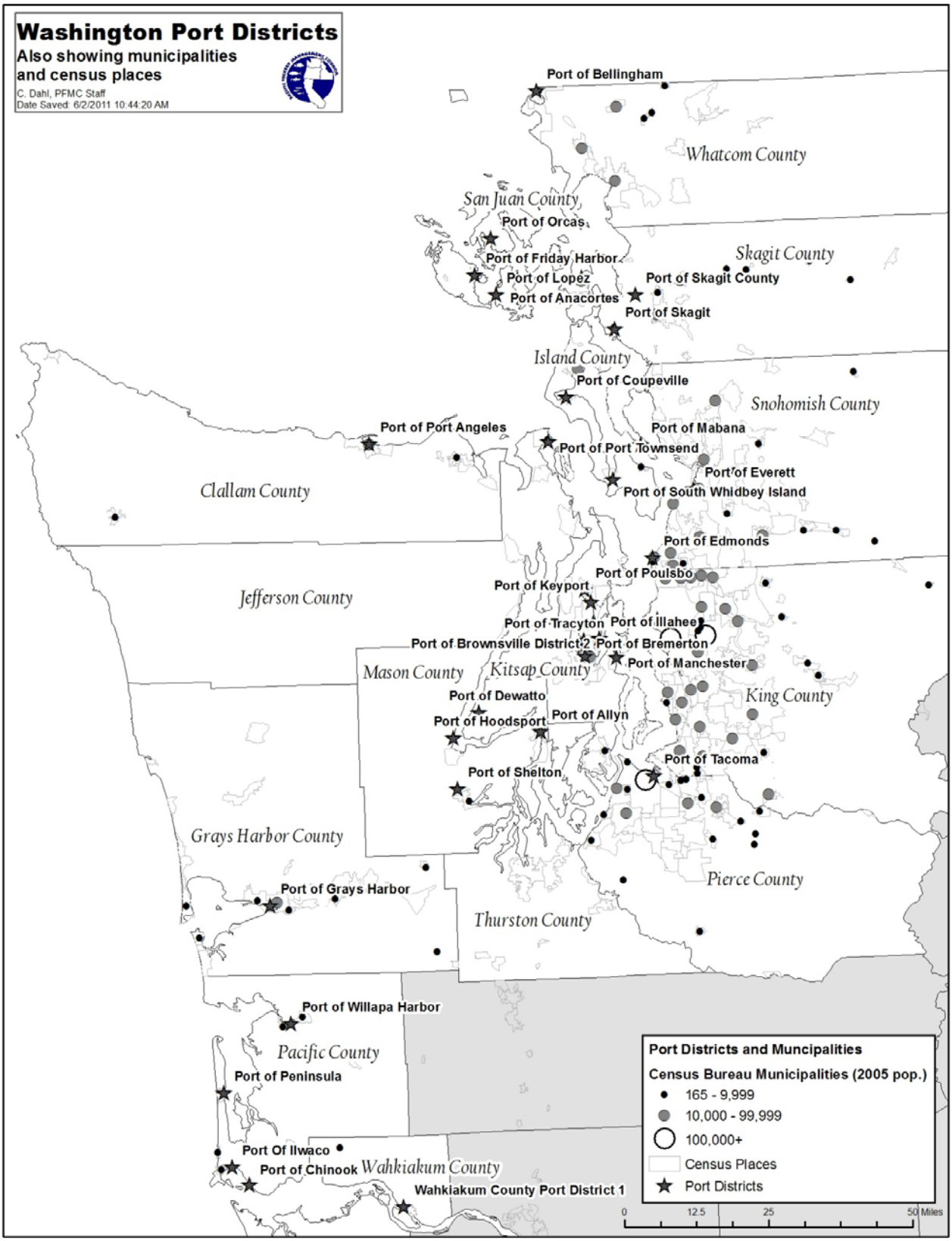
Some questions about community fishing associations are whether there will be limitations on the number of CFAs in a particular geographic area and whether endorsements from a local governing entity will be required. The attached figures have been produced to inform the discussion on these issues.

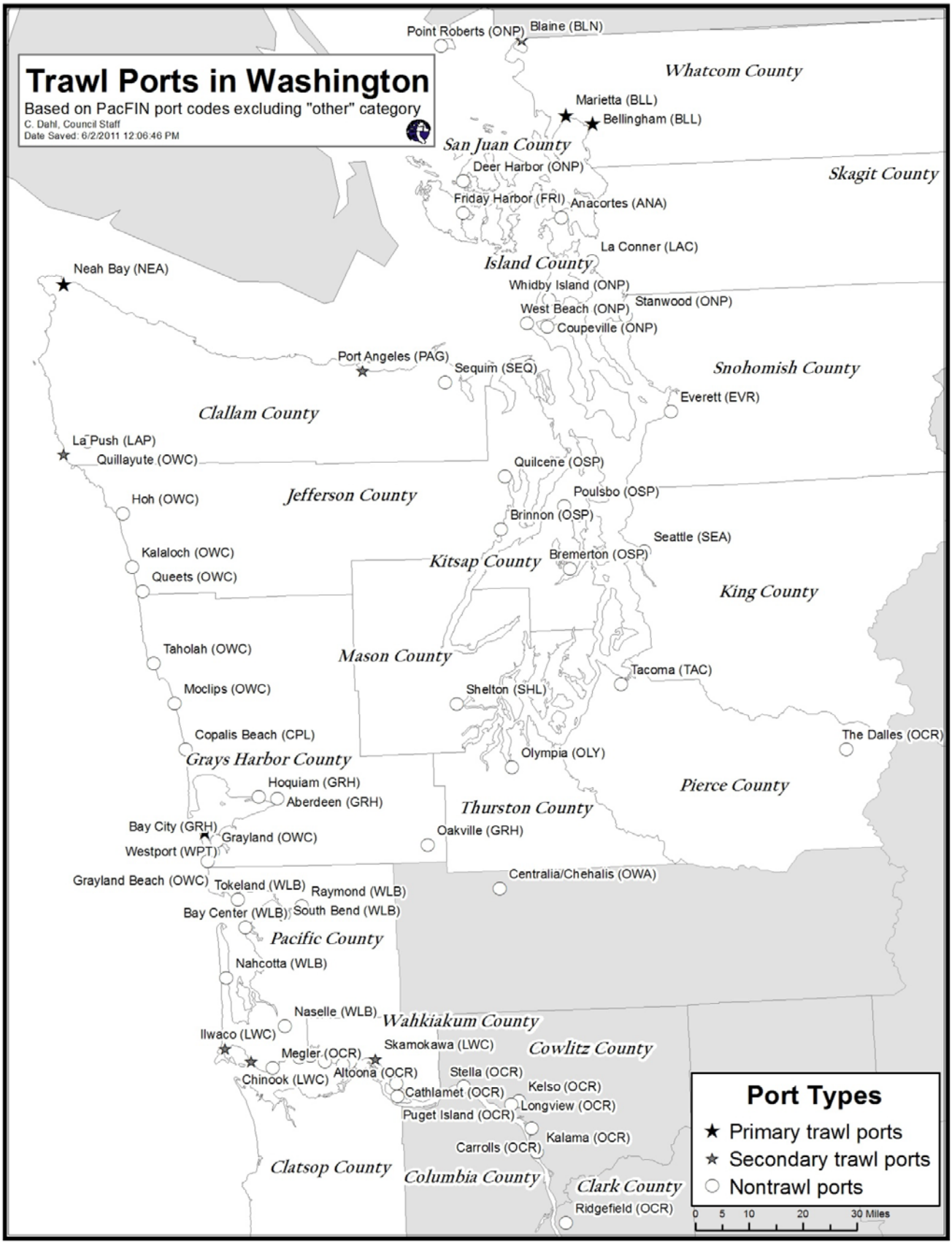
The attached figure provides a

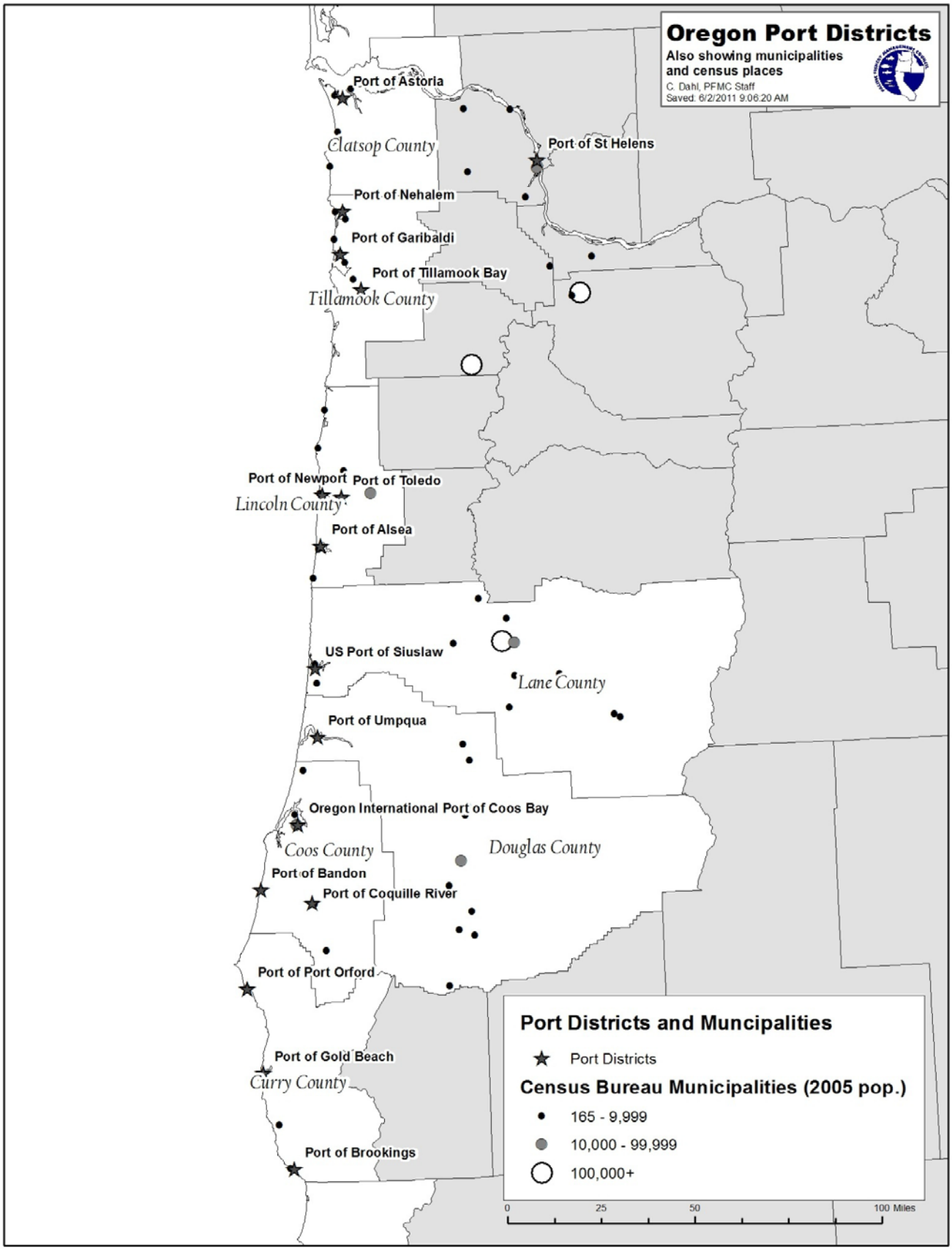
- ports with PacFIN port identifiers, ports with at least one vessel for which the port is the primary port of delivery, and other ports receiving trawl groundfish landings.
- all municipal governments in coastal and estuarine counties on the west coast and all special governing districts associated with ports (port or harbor districts) as identified in the U.S. Census data website (the ports with special districts needs further review and validation).

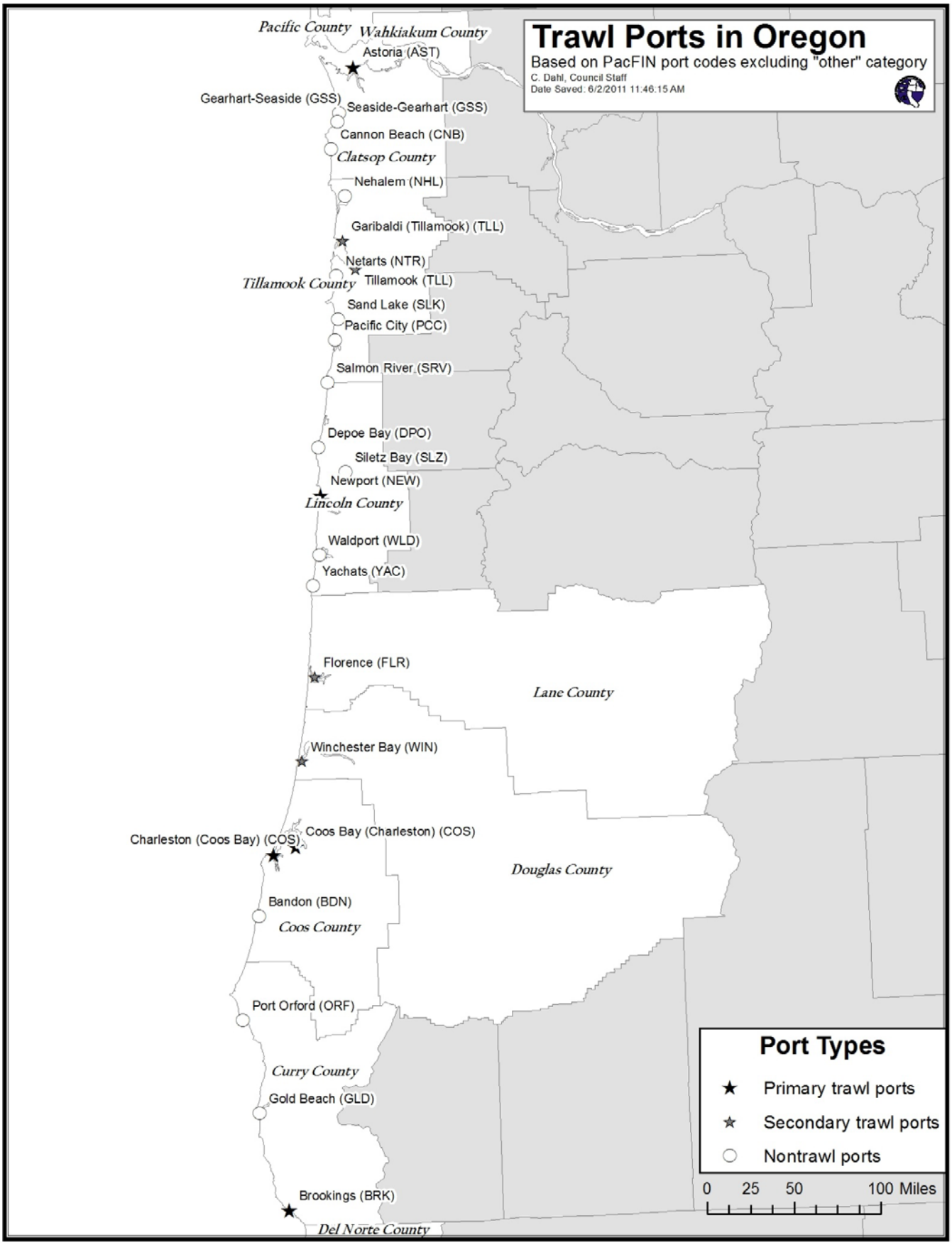
Some things to note:

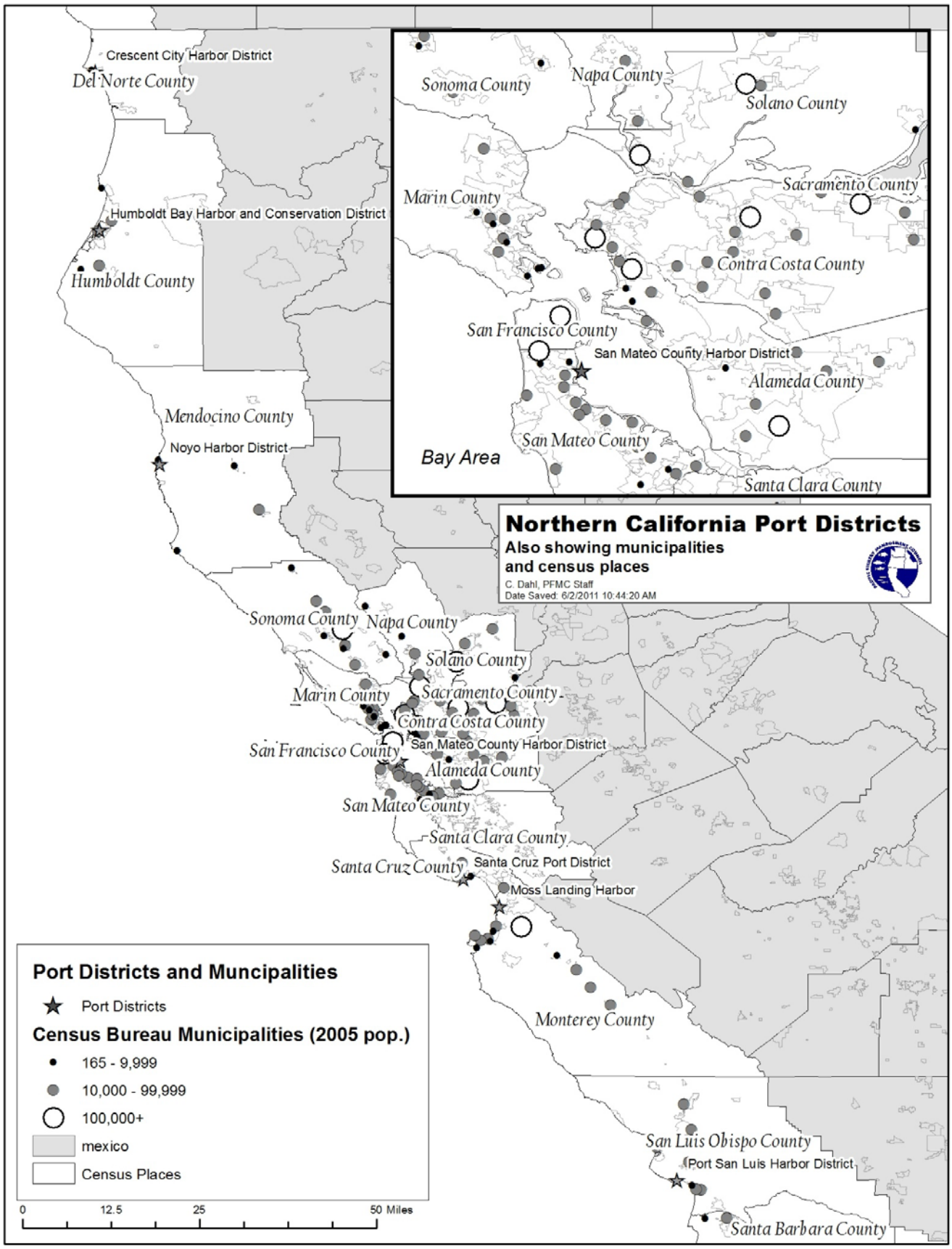
1. There are some port districts for which there are no municipalities (e.g. East Sound WA, Moss Landing CA).
2. There are some known ports which do not have special port districts (e.g. San Francisco). In these cases, the port activities are generally handled by the local municipal governments.
3. There are some location(s) which are PacFIN port codes (e.g. Neah Bay) which have associated with them neither recognized municipalities (town or city governments) nor port districts (likely because of tribal jurisdiction?). These ports do show up as census districts.
4. There are some PacFIN port areas for where there are subdivisions when codes are examined at the state level (e.g. Coos Bay/Charleston and Princeton/Half Moon Bay).

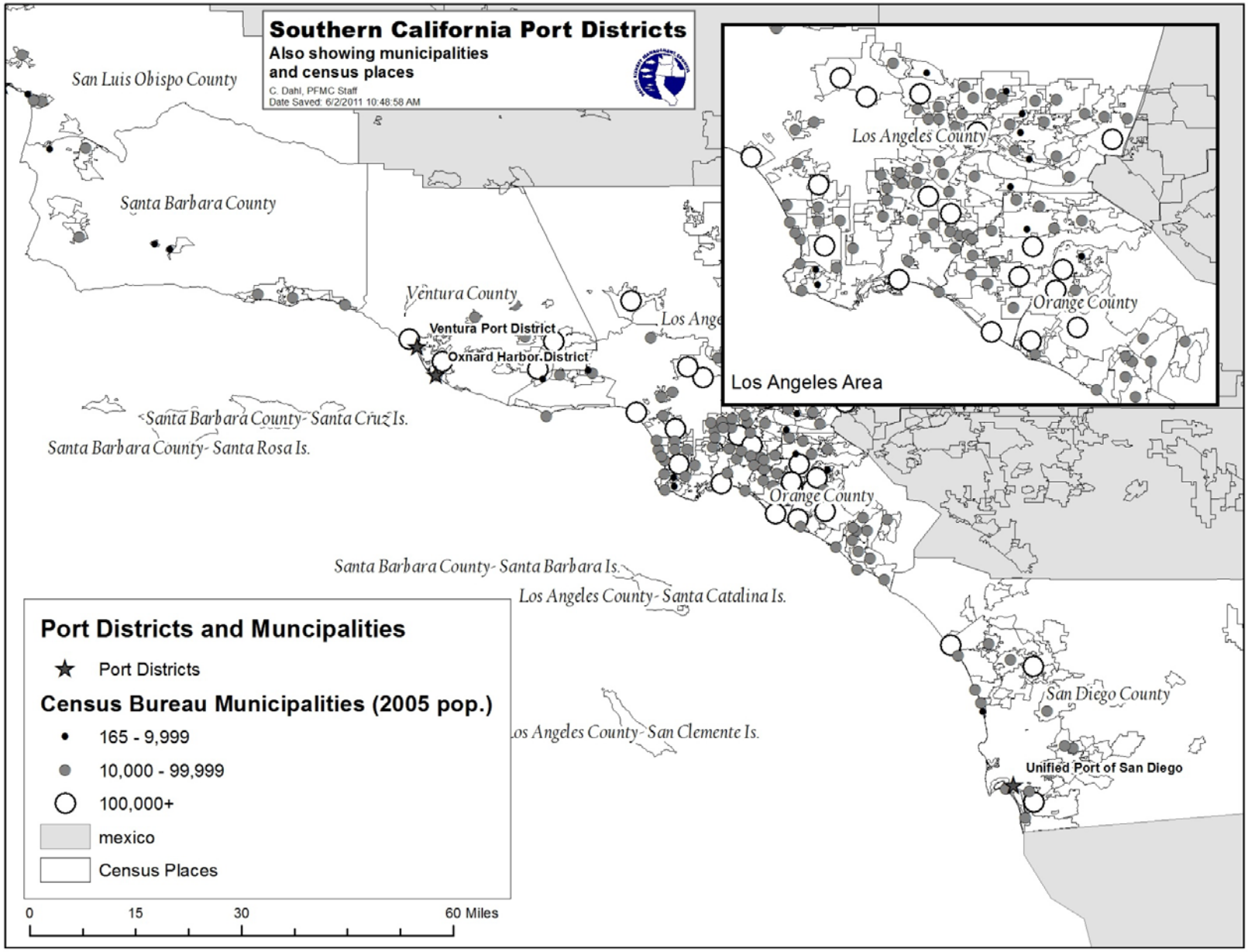

Washington Port Districts
Also showing municipalities
and census places
C. Dahl, PFMC Staff
Date Saved: 6/2/2011 10:44:20 AM
Port of Bellingham
Whatcom County
San Juan County
Port of Orcas
Port of Friday Harbor
Port of Lopez
Port of Anacortes
Skagit County
Port of Skagit County
Port of Skagit
Island County
Port of Coupeville
Snohomish County
Port of Port Angeles
Port of Mabana
Port of Port Townsend
Port of Everett
Port of South Whidbey Island
Clallam County
Port of Edmonds
Port of Poulsbo
Port of Keyport
Jefferson County
Port of Tracyton
Port of Illahee
Port of Brownsville District 2
Port of Bremerton
Port of Manchester
Mason County
Kitsap County
King County
Port of Dewatto
Port of Hoodsport
Port of Allyn
Port of Tacoma
Port of Shelton
Grays Harbor County
Pierce County
Port of Grays Harbor
Thurston County
Port of Willapa Harbor
Pacific County
Port of Peninsula
Port Of Ilwaco
Port of Chinook
Wahkiakum County
Wahkiakum County Port District 1
Port Districts and Muncipalities
Census Bureau Municipalities (2005 pop.)
165 - 9,999
10,000 - 99,999
100,000+
Census Places
Port Districts
0
12.5
25
50 Miles

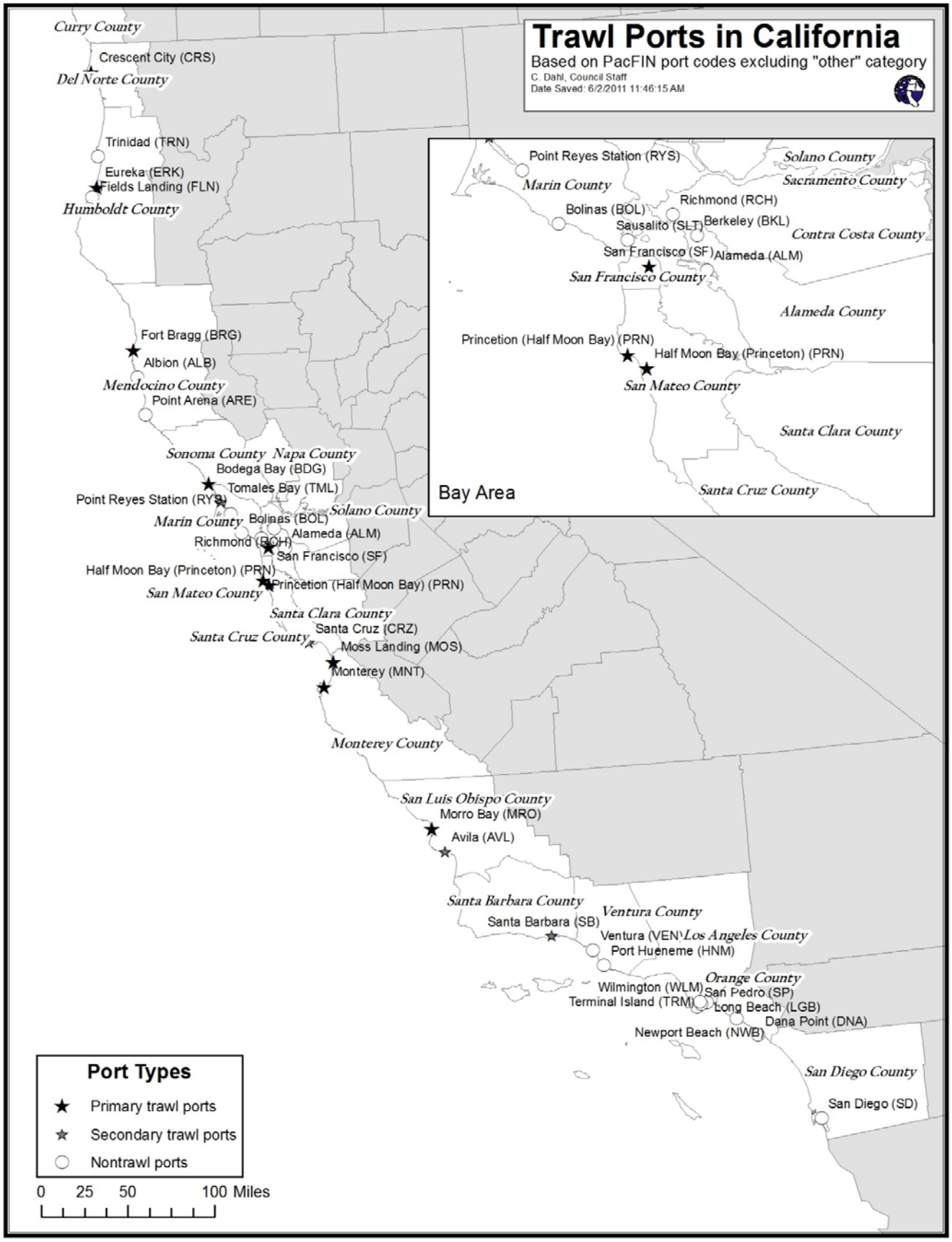

Trawl Ports in Washington
Based on PacFIN port codes excluding "other" category
C. Dahl, Council Staff
Date Saved: 6/2/2011 12:06:46 PM
Point Roberts (ONP)
Blaine (BLN)
Whatcom County
Marietta (BLL)
Bellingham (BLL)
San Juan County
Deer Harbor (ONP)
Skagit County
Friday Harbor (FRI)
Anacortes (ANA)
La Conner (LAC)
Island County
Neah Bay (NEA)
Whidby Island (ONP)
Stanwood (ONP)
West Beach (ONP)
Coupeville (ONP)
Port Angeles (PAG)
Sequim (SEQ)
Snohomish County
Everett (EVR)
Clallam County
La Push (LAP)
Quillayute (OWC)
Quilcene (OSP)
Hoh (OWC)
Jefferson County
Poulsbo (OSP)
Brinnon (OSP)
Seattle (SEA)
Kalaloch (OWC)
Kitsap County
Bremerton (OSP)
Queets (OWC)
King County
Taholah (OWC)
Mason County
Tacoma (TAC)
Moclips (OWC)
Shelton (SHL)
Copalis Beach (CPL)
The Dalles (OCR)
Olympia (OLY)
Grays Harbor County
Hoquiam (GRH)
Pierce County
Aberdeen (GRH)
Thurston County
Bay City (GRH)
Oakville (GRH)
Grayland (OWC)
Westport (WPT)
Centralia/Chehalis (OWA)
Grayland Beach (OWC)
Tokeland (WLB)
Raymond (WLB)
Bay Center (WLB)
South Bend (WLB)
Pacific County
Nahcotta (WLB)
Naselle (WLB)
Wahkiakum County
Ilwaco (LWC)
Skamokawa (LWC)
Cowlitz County
Megler (OCR)
Stella (OCR)
Altoona (OCR)
Chinook (LWC)
Kelso (OCR)
Cathlamet (OCR)
Longview (OCR)
Puget Island (OCR)
Kalama (OCR)
Carrolls (OCR)
Clatsop County
Columbia County
Clark County
Ridgefield (OCR)
Port Types
Primary trawl ports
Secondary trawl ports
Nontrawl ports
0 5 10 20 30 Miles


Oregon Port Districts
Also showing municipalities and census places
C. Dahl, PFMC Staff
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Port of Astoria
Clatsop County
Port of St Helens
Port of Nehalem
Port of Garibaldi
Port of Tillamook Bay
Tillamook County
Port of Newport
Port of Toledo
Lincoln County
Port of Alsea
US Port of Siuslaw
Lane County
Port of Umpqua
Oregon International Port of Coos Bay
Coos County
Douglas County
Port of Bandon
Port of Coquille River
Port of Port Orford
Port of Gold Beach
Curry County
Port of Brookings
Port Districts and Muncipalities
Port Districts
Census Bureau Municipalities (2005 pop.)
165 - 9,999
10,000 - 99,999
100,000+
0
25
50
100 Miles


Trawl Ports in Oregon
Based on PacFIN port codes excluding "other" category
C. Dahl, Council Staff
Date Saved: 6/2/2011 11:46:15 AM
Pacific County
Wahkiakum County
Astoria (AST)
Gearhart-Seaside (GSS)
Seaside-Gearhart (GSS)
Cannon Beach (CNB)
Clatsop County
Nehalem (NHL)
Garibaldi (Tillamook) (TLL)
Netarts (NTR)
Tillamook County
Tillamook (TLL)
Sand Lake (SLK)
Pacific City (PCC)
Salmon River (SRV)
Depoe Bay (DPO)
Siletz Bay (SLZ)
Newport (NEW)
Lincoln County
Waldport (WLD)
Yachats (YAC)
Florence (FLR)
Lane County
Winchester Bay (WIN)
Charleston (Coos Bay) (COS)
Coos Bay (Charleston) (COS)
Douglas County
Bandon (BDN)
Coos County
Port Orford (ORF)
Curry County
Gold Beach (GLD)
Brookings (BRK)
Del Norte County
Port Types
Primary trawl ports
Secondary trawl ports
Nontrawl ports
0 25 50 100 Miles


Crescent City Harbor District
Del Norte County
Humboldt Bay Harbor and Conservation District
Humboldt County
Mendocino County
Noyo Harbor District
Sonoma County
Napa County
Solano County
Marin County
Sacramento County
Contra Costa County
San Francisco County
San Mateo County Harbor District
Alameda County
San Mateo County
Santa Clara County
Bay Area
Northern California Port Districts
Also showing municipalities and census places
C. Dahl, PFMC Staff
Date Saved: 6/2/2011 10:44:20 AM
Santa Cruz County
Santa Cruz Port District
Moss Landing Harbor
Monterey County
San Luis Obispo County
Port San Luis Harbor District
Santa Barbara County
Port Districts and Muncipalities
Port Districts
Census Bureau Municipalities (2005 pop.)
165 - 9,999
10,000 - 99,999
100,000+
mexico
Census Places
0
12.5
25
50 Miles


Southern California Port Districts
Also showing municipalities
and census places
C. Dahl, PFMC Staff
Date Saved: 6/2/2011 10:48:58 AM
San Luis Obispo County
Santa Barbara County
Ventura County
Ventura Port District
Oxnard Harbor District
Santa Barbara County- Santa Cruz Is.
Santa Barbara County- Santa Rosa Is.
Orange County
Santa Barbara County- Santa Barbara Is.
Los Angeles County- Santa Catalina Is.
Los Angeles County- San Clemente Is.
San Diego County
Unified Port of San Diego
Los Angeles County
Orange County
Los Angeles Area
Port Districts and Muncipalities
Port Districts
Census Bureau Municipalities (2005 pop.)
165 - 9,999
10,000 - 99,999
100,000+
mexico
Census Places
0
15
30
60 Miles


Trawl Ports in California
Based on PacFIN port codes excluding "other" category
C. Dahl, Council Staff
Date Saved: 6/2/2011 11:46:15 AM
Curry County
Crescent City (CRS)
Del Norte County
Trinidad (TRN)
Eureka (ERK)
Fields Landing (FLN)
Humboldt County
Fort Bragg (BRG)
Albion (ALB)
Mendocino County
Point Arena (ARE)
Sonoma County
Napa County
Bodega Bay (BDG)
Tomales Bay (TML)
Point Reyes Station (RYS)
Marin County
Bolinas (BOL)
Solano County
Alameda (ALM)
Richmond (RCH)
San Francisco (SF)
Half Moon Bay (Princeton) (PRN)
Princetion (Half Moon Bay) (PRN)
San Mateo County
Santa Clara County
Santa Cruz (CRZ)
Santa Cruz County
Moss Landing (MOS)
Monterey (MNT)
Monterey County
San Luis Obispo County
Morro Bay (MRO)
Avila (AVL)
Santa Barbara County
Santa Barbara (SB)
Ventura County
Ventura (VEN)
Los Angeles County
Port Hueneme (HNM)
Orange County
Wilmington (WLM)
San Pedro (SP)
Terminal Island (TRM)
Long Beach (LGB)
Dana Point (DNA)
Newport Beach (NWB)
San Diego County
San Diego (SD)
Bay Area
Point Reyes Station (RYS)
Marin County
Solano County
Sacramento County
Richmond (RCH)
Bolinas (BOL)
Berkeley (BKL)
Sausalito (SLT)
Contra Costa County
San Francisco (SF)
Alameda (ALM)
San Francisco County
Alameda County
Princetion (Half Moon Bay) (PRN)
Half Moon Bay (Princeton) (PRN)
San Mateo County
Santa Clara County
Santa Cruz County
Port Types
Primary trawl ports
Secondary trawl ports
Nontrawl ports
0 25 50 100 Miles

# Decision Tree for Use by Council at June 2011 Meeting Re: Preliminary Preferred Alternative for Designated CFAs

The following decision tree is offered to facilitate the Council decision process regarding the adoption of a preliminary preferred alternative for safe harbor exemption for community fishing associations (CFAs) to the quota share (QS) control limits (contained in trawl rationalization program regulations). There are five (5) suggested decision points that relate to:

1. adequacy of the options,
2. species to consider (or not consider) for special exception consideration,
3. the preliminary preferred action,
4. authority to use in the final action, and
5. program design elements and options.

This document is offered to facilitate the decision process. It is not intended to preclude consideration of additional decision points/issues that the Council might wish to address as part of this action.

## Definitions (from draft EA):

General CFAs: community based organizations that participate in common with other program participants (i.e. receive no special privileges). Since they receive no special privilege there is no need to develop definitions and criteria to identify general CFAs as distinct from any other participant in the program.

Designated CFAs: A designated CFA would be defined by virtue of its having met certain criteria and therefore qualifying for a special privilege (a safe harbor exception from control limits). The special privileges may also come with special responsibilities.

Control Limits and Vessel Limits: See Table 2-1 of draft EA

## The Options (Section 2.1 of draft EA):

Status quo (only general CFAs allowed with no special exception to the control limits).

Designated CFA action item options:

1a: 150% control limit exception for all or some target species
1b: 200% control limit exception for all or some target species
1c (new): 150% control limits exception for all or some target species except 600% control limit exception for Conception area sablefish and 600% control limit exception for shortspine thornyhead south of Point Conception.

**Decision 1:**

Are there changes needed in one or more of the three action options, and if so what are they? (In particular, does option 1c adequately respond to the Council's April 2011 request for a geographically based option?)

**Decision 2:**

What are the target species, if any, included (or excluded) in each or all of the action item options? (for a species summary, see Tables B-1 and B-2 and accompanying graphs of Appendix B to the draft EA, which is Attachment 2 to this agenda item).

**Decision 3:**

The preliminary preferred action is:

a) Proceed with status quo option *and* one action item option (the preliminary preferred alternative).
b) Proceed with status quo option, but do not adopt a preferred action item option at this time.
c) Other.

**Decision 4:**

Does the Council wish to specify, at this time, the authority (preliminary) to use in the potential adoption of designated CFA provisions? For details see Section 2.1.1 of the draft EA.

The options are:

a) MSA community fishing provision (which includes Sustainability Plan and associated requirements),
b) General LAP authority (which may require plan amendment if/when directed to do so).

**Decision 5:**

Design of Designated CFA Program:

The design elements and options for a Designated CFA program are contained in Sections B-2 through B-4 of Appendix B to the Draft EA. Additional possible elements and options are shown in Section 2.1.2. The suite of potential design elements and options are reproduced below.

The pros and cons and projected fishery impacts of the program elements and options contained in Sections B.2 through B.4 are presented in the respective sections. The

"additional possible elements and options" shown in Section 2.1.2 have not been analyzed.

*The Council has the option of adopting the full suite of potential program elements and options as its preliminary alternative, or narrowing it down to a set of preliminary preferred program elements and options.*

The design elements and options contained in Sections B.2 through B.4 follow:

*2.0 CFA Agreements and Activities*

CFAs will be required to have organizational (charter) agreements and harvesting agreements that meet certain standards. If the Council decides to recognize CFAs under the MSA fishing community provisions, these agreements could form the basis of the "Sustainability Plans" required under Section 303A(c)(3). The charter agreements would include, but not be limited to:

a. a statement of goals and objectives for the fishery and associated community;
b. a description of the proposed CFA including geographic limits and local government endorsements; and
c. organization bylaws specifying the type of legal organization and its control.

*2.1.1 - Goals and Objectives*

Include a goal of furthering the groundfish FMP and include enforceable performance standards.

*Possible Objectives:*
a. Community stability
b. Facilitate new entry.
c. Stabilize business environment (e.g. require landings be made locally).
d. Enhance value (e.g. require particular fishing and delivery methods)
e. Harvest Sustainability.
*i.* Minimize bycatch
*ii.* Participate in activities intended to successfully manage bycatch on a fishery-wide scale (research, risk pool participation, etc).
*iii.* Minimize adverse fishing gear impacts on habitat
*iv.* Enhance stock productivity (e.g. area management or measures to protect age structure).

2.1.2 – CFA Geographic Affiliations

Organizational agreements should include a description of the CFA boundaries. Consider whether a confidentiality waiver might be possible and warranted to reduce reporting and monitoring challenges for small geographic areas.

Local government approval: Local government letter designates the CFA eligible to apply for that area (which governments are authorized for a particular area? Should a local government be allowed to endorse more than one entity? Should a CFA be required to receive an endorsement from every jurisdiction it proposes to cover?)

CFA Boundaries

Geographic exclusiveness
Overlaps Allowed (i.e. more than one CFA in an area)
No Overlap Allowed

Minimum geographic area. (e.g., PacFIN port level)

Maximum geographic area.
Can one CFA cover many ports?

If multiple ports are allowed: Is there a limit on the number?
Do they have to be contiguous?
Should there be a limit on the distance covered by a single CFA?

2.1.3 - CFA Organization

Type of Legal Organization: CFAs might be organized as corporations, trusts, etc.

Options

a. Local government serves as the CFA entity.
b. Require organization as a non-profit corporation, 501(c)(4) social welfare organization.
c. Allow CFAs to be organized as another type of entity

Suboptions

i. controlled only by fishermen
ii. controlled by fishermen or others.

Control of CFA

Board of directors

The local municipality must (options):

a. Appoint the board
b. Endorse an independently formed board via the endorsement of the CFA.

A minimum number of board members.

At least 5

Limit vessel owner and processor participation on board.
*Some Options Suggested in Public Comment*
(Not mutually exclusive).

a. No more than 20% vessel owners or their representatives.
b. Alternatively, ensure that fishermen have the lead in CFAs.
c. No more than 20% processors or their reps.
d. Other: Must be community members (residents?).

2.2 Harvest and Harvest Agreements

Conditions that must be present in the agreements between the CFA and those harvesting CFA QP. Each of the following may be adopted (not mutually exclusive):

a. Prohibit/allow CFAs from harvesting their own QP (does this mean individual members of the CFA or the CFA entity itself?).
b. Require that CFAs contract with co-operatives organized under the Fishermen's Collective Marketing Act.
c. Require that individual entities comprising the FCMA coop not receive QP from the CFA that is in excess of the vessel QP accumulation limit.
d. Include measures (performance standards) needed for CFAs to meet charter objectives and meet reporting requirements (examples: fishing methods, area and gear restrictions, fishing handling practices, local landing requirements).
e. Require participation in fishery-wide efforts for successfully managing overfished species catch.

3.0 CFA Reporting Requirements

Timing and content.

Require biennial reports to document compliance, progress on goals, and facilitate fishery policy evaluation, or

Self-certified compliance: Require annual or biennial affidavit of compliance.

4.0 CFA Approval and Renewal

Initial Application

Required elements of the Initial Application:

a. The CFA agreement and bylaws.
b. Proposed Harvesting Agreements
c. Endorsement letters from local municipalities (if required).
d. A statement
    i. Describing the CFA area including infrastructure and the community sectors that would benefit.
    ii. Explaining how agreements meet criteria.
    iii. Demonstrating the need for the exception, including supporting data and/or reports.

Initial Approval

NMFS would review and approve applications and CFA agreements. Review and approval standard; i.e., insure required documents are submitted, and that required elements are reflected in the documents, but NMFS does not undertake substantive review for adequacy of elements relative to Council goal compliance.

Ongoing Monitoring

NMFS and PFMC receive required reports and reviews for goal compliance. PFMC initiates program modifications as necessary to insure PFMC goals are met

Renewal Periodic renewal.

For CFAs for which an application for renewal has been submitted, the CFA will remain in place until action is taken to approve or deny. CFA agreements must be resubmitted for approval every.
    Option 1. Two years.
    Option 2. Five years (coinciding with program review cycle).

Renewal on modification.

Resubmit for approval with modification of agreement or change in board of director membership.

**Additional Possible Provisions:**

Based on April 2009 deliberation, the Council may want to consider adding some of the following to the provisions and options on CFAs:

Consider limiting CFAs eligibility to organizations in primary groundfish communities which are vulnerable or become vulnerable through the trawl rationalization program.

Consider providing CFAs an exception to the transfer moratorium
- **Option a:** CFAs are entitled to acquire QS from any entity with QS in excess of control limits during the QS trading moratorium.
- **Option b:** No exception to the moratorium would be provided for CFAs.

Expand goals. Currently the CFA alternative requires that CFAs only address one of the goals listed Section 2.1.1. The following was included for consideration as a community stability plan requirement in the April 2009 briefing materials:

> Description of how the CFA will contribute to the social, economic development, and conservation and monitoring needs of the fishery locally, including the needs of entry level and small vessel owner-operators, captains, and crew. The description shall include anticipated efforts to address the following as necessary to maintain the characteristic of the community or support its economic development:
>
> ¨ sustaining effort by trawl and other groundfish fisheries;
> ¨ maintaining crew, processing and seasonal employment opportunities;
> ¨ maintaining local processing activity;
> ¨ meeting local community and municipality needs;
> ¨ investing in local infrastructure; and
> ¨ addressing potential adverse impacts on the nontrawl sector.

Explicitly identify that the "new entry" goal of Section 2.1.1 may apply to processors/receivers as well as entry-level and small owner-operators, captains and crew.

Identify types of entities that must, may, and may not be included among CFA members. For example,

· exclude/don't exclude membership by those who will directly benefit from the distribution of CFA QS/QP either their direct involvement in harvesting or fish buying and processing entities.

Consider provisions for CFA beneficiaries (those receiving QP)

· Limited to CFA members (also see previous bullet)
· May include non-members
· Must allow non-members an opportunity to receive and deliver QP on the same terms as members.

Require that CFAs provide

· a management structure organization chart and operating procedures including roles and responsibilities of members of the association, staff, and contractor and dispute resolution processes.

· A list of members and their involvement/interest in the fishery.

Consider requiring a provision in the articles of incorporation and/or bylaws specifying rules for the removal of officers and conditions under which the CFA can be dissolved.

Require that CFAs provide statements explaining how

· QS will be held and procedures and criteria that will be used to distribute QP each year.
· QS will be sold or held if the CFA is dissolved or has new officers.
· Disputes will be resolved.

Require that CFAs or their members maintain and disclose information necessary to determine compliance with control limits.

Limit the amount of control any single member would exert

¨ How might control of the CFA be determined?

PFMC
06/12/11

# Cost Recovery Program Options

**Discussion of relevant issues:**

**Legal and Policy Guidelines**

**There are three primary sources guiding NMFS and Council action on cost recovery for Limited Access Privilege Programs, such as the trawl catch share program in Amendments 20 and 21.**

**The Magnuson-Stevens Fishery Conservation and Management Act (MSA)**

SEC. 303A. LIMITED ACCESS PRIVILEGE PROGRAMS.

(e) COST RECOVERY.—In establishing a limited access privilege program, a Council shall—
(1) develop a methodology and the means to identify and assess the management, data collection and analysis, and enforcement programs that are directly related to and in support of the program; and
(2) provide, under section 304(d)(2), for a program of fees paid by limited access privilege holders that will cover the costs of management, data collection and analysis, and enforcement activities.

SEC. 304. ACTION BY THE SECRETARY
(d) ESTABLISHMENT OF FEES.—
(1) The Secretary shall by regulation establish the level of any fees which are authorized to be charged pursuant to section 303(b)(1). The Secretary may enter into a cooperative agreement with the States concerned under which the States administer the permit system and the agreement may provide that all or part of the fees collected under the system shall accrue to the States. The level of fees charged under this subsection shall not exceed the administrative costs incurred in issuing the permits.

(2)(A) Notwithstanding paragraph (1), the Secretary is authorized and shall collect a fee to recover the actual costs directly related to the management, data collection, and enforcement of any— (i) limited access privilege program;

(B) Such fee shall not exceed 3 percent of the ex-vessel value of fish harvested under any such program, and shall be collected at either the time of the landing, filing of landing report, or sale of such fish during a fishing season or in the last quarter of the calendar year in which the fish is harvested.

(C)(i) Fees collected under this paragraph shall be in addition to any other fees charged under this Act and shall be deposited in the Limited Access System Administration Fund established under section 305(h)(5)(B).

SEC. 305. OTHER REQUIREMENTS AND AUTHORITY

(h) CENTRAL REGISTRY SYSTEM FOR LIMITED ACCESS SYSTEM PERMITS.—
(B) There is established in the Treasury a Limited Access System Administration Fund. The Fund shall be available, without appropriation or fiscal year limitation, only to the Secretary for the purposes of—
(i) administering the central registry system; and
(ii) administering and implementing this Act in the fishery in which the fees were collected.

**"The Design and Use of Limited Access Privilege Programs"** (Lee G. Anderson and Mark C. Holliday)
(http://spo.nwr.noaa.gov/tm/tm86.pdf)

[text quoted directly, starting from bottom of page 90]

The object of the fee program is to cover at least part of the costs of management (recall the 3-percent cap on cost recovery imposed by the MSA). The Councils are given the task of developing the methodology and means to assess the costs that are directly related to and in support of the program. But what exactly does that mean? While specific guidelines may be developed in a future cost-recovery rulemaking, some general principles can be described right now.

Incremental Costs

The relevant costs to recover are the incremental costs, i.e., those costs that would not have been incurred but for the IFQ program (NMFS, 2003). Conceptually, measuring these costs involves a "with and without" comparison, i.e., What is the cost of running the management program for the specified fishery under the status quo regime, and what is the cost of running the management program under the LAP program? The difference is the incremental costs attributable to implementing the LAP program. The two justifications for limiting recoverable costs to incremental costs are:
(1) Since the issue is to find the funds to cover the costs of adding LAP programs, then the real problem is to cover incremental costs.
(2) To minimize the disincentives for Councils and their constituents as they consider replacing non-LAP programs with LAPs, it makes sense to have participants in LAP programs only pay for the costs that are added because of the LAP program itself. For example, stock assessment costs will be required no matter what type of program is used. Given the current law, it is not possible to have participants in non-LAP programs pay for stock assessments. Therefore, having participants in LAP programs pay for stock assessment while non-LAP participants don't pay would be unfair and prejudice the Council's and industry's preference of LAPs as a management option.

The incremental cost issue was examined in a recent GAO study on cost recovery. (GAO, 2005). GAO pointed out that "actual costs" could alternatively be interpreted as the full costs of managing the fishery under consideration: every dollar that is spent on managing the fishery should be counted. In its response NOAA indicated that the current methodology of defining recoverable costs as those that are directly attributable to the implementation of an IFQ program

was the correct interpretation of the MSA. The GAO did not go so far as to suggest that full costs should be recovered. Rather, they said that if Congress wanted full costs to be recovered, it should clarify the cost recovery fee provision of the Act to call for full costs to be recovered. The MSA reauthorization passed by Congress in December 2006 made no such change.

Interestingly, the Administration's MSA reauthorization bill provided additional cost recovery provisions for Congress to consider. The bill included a proposal for cost recovery in non-LAP fisheries, added science activities as a recoverable cost, and raised the potential cost recovery rate to 15 percent. Congress did not adopt any of these provisions, providing additional evidence that the existing cost recovery authorities and practices were sufficient.

The reason for a with-without comparison rather than a before-after comparison is to keep all other factors equal. This becomes tricky for any currently unmanaged fisheries. Here the baseline to use as a reference for the cost comparison is the estimated cost of basic data collection and analysis, management and enforcement under a traditional non-LAP method for that fishery. This means that if the status quo management system is incomplete or insufficient to meet current objectives and just happens to be adjusted concurrent with the introduction of the LAP program, the costs of satisfying the insufficiency should not be attributable to the LAP program. For example, a newly managed fishery would need some form of a stock assessment regardless of whether the management strategy was a LAP or non-LAP approach. The stock assessment cost would not be a recoverable cost in this case. Another example is the general recognition that observers are necessary in a multi-species fishery managed with a non-LAP program. However, consider the case where observers were not part of the initial management program and a decision was subsequently made to require observers. Even though the decision to introduce observer might coincide with the start of a LAP program, the observer costs would not necessarily be eligible for cost recovery unless they were directly related to and in support of the LAP program. The determinations of what costs are recoverable will be extremely important to the industry and the agency, and regulatory guidance may be necessary to promote consistency and equity."

**NOAA Catch Share Policy**, published November 2010.
(http://www.nmfs.noaa.gov/sfa/domes_fish/catchshare/docs/noaa_cs_policy.pdf)
[Inserted text from page 16-17]

Cost Recovery: It is NOAA policy to compute and recover from participants only the incremental operating costs associated with LAPPs. Cost recovery aims to recover a variety of government costs attributable to the private sector use of a public resource. Section 303A(e) of the MSA requires cost recovery of the management, data collection and analysis and enforcement programs that are directly related to and in support of LAP programs. The relevant costs to recover are the incremental costs, i.e., those costs that would not have been incurred but for the LAP program, since cost recovery is not authorized for non-LAP fisheries. Conceptually, measuring these costs involves a "with and without" comparison of the cost of running the management program for the specified fishery under the status quo non-LAP regime, relative to the cost of running the management program under the LAP program. The difference is the incremental costs attributable to implementing the LAP program. It is possible that the incremental costs could be negative (i.e., that costs for management, etc., go down under a catch share program) and therefore no cost recovery fee needs to be levied.

This approach requires the identification of the incremental costs of adding LAP programs relative to the entire cost of compliance monitoring, data collection, stock assessment and catch specification. However, it excludes the costs of managing a resource for the benefit of the public, such as costs for species preservation or biodiversity protection.

Costs for catch share programs include the same operational categories associated with other management strategies but may incur some additional design, operational and monitoring costs due to changes in scale. However, fixing inadequacies in the quality, frequency or coverage of existing monitoring or enforcement programs should not be attributed as catch share costs when these needs pre-existed the catch share program. While cost recovery will reimburse the public for some of the costs of management, data collection and enforcement, actual costs can exceed the 3-percent MSA cap, particularly in the early years of a catch share program and in cases of currently overfished stocks. Design costs (i.e., prior to implementation of a LAP) are also not subject to cost recovery.

Adequate cost recovery can be especially problematic in economically depressed fisheries or for low-valued species. The subject of who pays for these costs may become an impediment to catch share support in the short term. Therefore, government support may be needed for some fisheries to address start-up and transition costs. Such investments are justifiable for catch share programs where the benefits of rebuilt fisheries can outweigh these costs in a relatively short period of time for most fisheries.

Under any structure, NOAA and Councils will need to design the most efficient catch share programs possible to meet their needs and minimize costs to the participants and the public. This includes consideration of common infrastructure capabilities that support multiple catch share programs and spread the costs across multiple fisheries."

**Council Guidance on Cost Recovery**

Motion #32 from the November 2010 Meeting of the Pacific Fishery Management Council (courtesy of Council Staff Member, Jim Seger)

"Ms. Culver moved to amend (Motion 32 amendment #1) that the assessment of the recovery of the costs would be done on a sector specific basis and that the costs identified would be sector specific. Mr. Myer seconded the motion.

Mr. Lockhart, for clarification, sectors can mean multiple things. Ms. Culver said the 3 trawl sectors w/in the fleet.
Motion 32 was:

Ms. Vojkovich moved and Mr. Crabbe seconded a motion (Motion 32) that whenever NMFS takes up the issue of cost recovery for the Trawl Rationalization Program that a great degree of transparency is employed. That transparency should include relevant information on the Federal and State costs of current management in as much detail as possible (i.e. sectors, observers, rulemaking, enforcement, etc) as well as expected costs and cost savings as this program comes

on line. Cost recovery should explore efficiencies, technologies, new approaches and minimal government involvement wherever appropriate."

PFMC
05/24/11

State of California -The Natural Resources Agency
DEPARTMENT OF FISH AND GAME
1933 Cliff Dr., Suite 9
Santa Barbara, CA 93101
805.568.1246
http://www.dfg.ca.gov

*EDMUND G. BROWN, Jr. Governor*
*JOHN McCAMMAN, Director*

June 10, 2011

Mr. Frank Lockhart, Division Manager
National Marine Fisheries Service,
Northwest Region
7600 Sand Point Way, N.E., BIN C15700
Seattle, WA 98115-0070

Subject: California Department of Fish and Game Trawl Rationalization Program Costs

Dear Mr. Lockhart:

The California Department of Fish and Game (CDFG) has reviewed current operations and assumed responsibilities for full implementation of the Pacific Fishery Management Council's (PFMC) Trawl Rationalization Program (TIQ) in the State. While California's trawl groundfish fishery has been slow to start, CDFG has been able to review earlier cost estimates and current costs to prepare this report. It is a fact that Oregon has the largest number of groundfish trawl permits among the three States, however, California has a much larger coastline and number of fishing ports. These two features result in substantial enforcement and monitoring costs that may appear out of line with the size of the fleet. In reality it is very difficult to have an enforcement officer or a sampler travel between Crescent City and San Francisco, a distance of over 350 miles, to conduct their TIQ responsibilities. These may be unique characteristics that need to be considered in any potential funding available to defray State costs in implementing the TIQ on the west coast.

**ENFORCEMENT and MONITORING:**

Enforcement - CDFG wardens are essential to ensuring compliance and understanding of the new ITQ regulations and the groundfish fishery in general. Wardens are enforcing and monitoring offshore activity such as license requirements, gear restrictions, closed areas, and all of the at-sea regulations associated with the trawl fishery. Wardens are monitoring and ensuring compliance at the dock by monitoring offloads and confirming appropriate documentation of catch for both the State and Federal accounting systems. Complex investigations requiring additional time and significant expertise in the new fishery will require specific training and a dedicated cadre of experienced officers. The wardens work closely with their Federal counterparts to investigate

and monitor the fishery, provide assistance to field staff and serve as the point of contact for the program.

Adequate dockside catch monitoring – Beyond onboard observers and in-plant catch monitors, there is a need for routine dockside checks of catch to ensure that catch information to the species level is fully reported. The goals of dockside sampling are twofold – both biological and for purposes of enforcement. Because some groundfish species (i.e., longspine thornyheads south of 34°27', minor nearshore rockfish (north and south), black rockfish, California scorpionfish, cabezon, kelp greenling, shortbelly rockfish, and especially the "Other Fish" category of groundish) are exempt from TIQ quota share requirements, there is a heightened need to ensure that species composition is properly accounted for. Since gear switching is allowed, tracking issues will be increasingly complex, and will likely involve heightened needs for catch tracking of both the limited entry fixed gear sector and open access sectors of the groundfish fishery. The Pacific States Marine Fisheries Commission currently manages the California dockside commercial groundfish catch monitoring. The funding for that program has been severely eroded over the years and there have been no augmentations. There are increased needs for monitoring the TIQ catch at the dock and additional funds are needed to hire samplers specifically for the program in California.

**MANAGEMENT:**

Commercial Database Interface – Staff are needed to handle long-term landings and logbook data integration needs. Although the federal catch recording program is electronic, the CDFG does not have an electronic landing receipt system. This person is responsible for coordination and resolution of data discrepancies especially for state managed species and will be assisting enforcement officers with their data needs as they make compliance cases.

Adaptive Management Pounds Program - Once the TIQ automatic pass through program is concluded, a staff (AMP) person will be needed to service the California AMP processes and needs, as well as to address "fallout" from changes resulting from TIQ as shares are transferred and vessels/individuals enter other state-managed fisheries in response (i.e., it is likely that displaced groundfish trawl fishermen/vessels will look to try to move into the California halibut trawl fishery). Additionally, if groundfish resources off California become more abundant as a result of reductions in trawl fishing off the California coast, it is reasonable to expect an increase in requests for Exempted Fishing Permits to the PFMC, or Experimental Gear Permits to the Fish and Game Commission. California cannot absorb these impacts without additional staff support.

PFMC Support for State Staff – The state will continue to be involved in the PFMC Team and Groundfish Allocation Committee meetings, trailing amendments to the TIQ program, meeting preparation and conference calls, responding to members

of the Legislature, responding to inquiries by the Governor's office, etc. As the PFMC budget declines, it is anticipated that the budgetary support for the States will be reduced accordingly. However, the TIQ specific activities within the PFMC process will continue for several years post implementation.

**Summary:**

I am providing a summary estimate below for all of the typical CDFG staff costs including basic salaries, benefits, general operating, travel, specialized equipment and CDFG overhead. If a more line by line breakdown of costs is necessary, please contact me at the above number.

**Enforcement** – CDFG Wardens - (2 FTEs) ($340,000/Year ongoing)
**Commercial Database Interface** – A Systems Information Programmer/Analyst – (1 FTE) ($120,000/Year ongoing)
**Adequate dockside catch monitoring** - (3 FTEs (Biologists/Fishery Technicians) ($50,000/FTE/year ongoing; total $150,000/year ongoing).
**Adaptive Management Pounds Program** - Associate Biologist (1 FTE full time) ($100,000/year ongoing)
**PFMC Support for State Staff** – ($60,000/year ongoing)

**Total Estimated (ongoing)** - $770,000

Thank you for providing the CDFG an opportunity to share important funding needs with the NMFS for successful implementation of the west coast Trawl Rationalization Program.

Sincerely,

Marija Vojkovich
Marine Regional Manager
California Department of Fish and Game

cc: Deputy Director Sonke Mastrup, CDFG - Sacramento
Asst. Chief Tony Warrington, CDFG - Sacramento

ENFORCEMENT CONSULTANTS REPORT ON PRIORITY TRAILING ACTIONS UNDER TRAWL RATIONALIZATIONSLATED FOR PRELIMINARY ACTION

# Enforcement Division Costs Associated with TIQ

As the Trawl Individual Quota (TIQ) program evolved from planning to implementation, the related law enforcement jurisdictions were asked by NOAA and the Council to assess their funding needs. The initial requests for information were based on uncooked concepts. Now that the program has been implemented, we are better able to assess our capabilities based on the present day situation. The enforcement consultants are aware that there are questions concerning proposed cost recovery for law enforcement services. While some discussion with members of the Groundfish Advisory Subpanel (GAP) has occurred, the Enforcement Consultants (EC) felt compelled to offer formal justification so that everyone affected has an understanding of our position, funding requests, and capacity to effectively undertake these new duties related to TIQ.

**Staffing Issues:**

It's important to understand how the West Coast law enforcement resources (Federal and state) have declined over time. NOAA OLE in NW and SW regions experienced a 45% reduction in Special Agent resources since TIQ development in 2009. The original OLE request of zero investigators was based on an assumption that staffing levels would continue to exist at the historic level, and that the states would fulfill most of the patrol function. That staffing outlook has obviously changed. The current funding replaces only 4 out of 12 lost positions, far from restoring OLE to previous levels.

For the West Coast States, the view of presence and our capacity for effective enforcement requires a different lens. While some of the costing and tables that have been developed were predicated on not having adequate state patrol resources to monitor groundfish fisheries in the first place, this is not the entire picture. When groundfish were managed by cumulative trip limits, a small portion of the landings were monitored by all entities combined. While the West Coast States have been involved in groundfish enforcement for decades, they have a multi-faceted resource protection and public safety mission. NOAA Agents also have more responsibilities than just groundfish. One important example is ESA protection, an area of priority for all jurisdictions. Those other duties and staffing issues continue to exist. Without additional funding, we are being asked to increase our level of participation, re-structure our priorities and make this new program successful. Lack of enforcement is often cited as a contributing factor in the demise of fish populations.

**TIQ as a priority:**

TIQ has been a priority for this Council, and as such, driven many other fisheries management activities lower on the Council's priority list. The same will be true for law enforcement. Remaining at status quo staffing levels will be at the expense of adequate enforcement relative to other Council managed species, including ESA listed species.

Ensuring law enforcement can continue to provide adequate enforcement in Council interest areas outside TIQ will be important if there is an industry effort shift from trawl fishing. Early analysis has shown that effort shifting to non-groundfish fisheries and gear types is occurring. Using existing resources under this scenario to now focus on TIQ may have an adverse effect on compliance and our gains made in other areas.

## Enforcement

State law enforcement, NOAA OLE and the USCG have historically collaborated on commercial groundfish enforcement. As management strategies add additional layers of complexity, burdens on existing and historically inadequate staff increase. Even though TIQ will supplant some regulations with others and some level of observer and electronic monitoring systems will be employed to provide some oversight, LE believes that additional resources are required to ensure high compliance. The level of complexity in this program is beyond what has been tried in the past. No program is without flaws and there will be an increased need for a level of enforcement that is sophisticated enough to overcome any exploitation that may occur. The monitoring of quota shares and the associated investigations comes with additional costs to match the increased complexity and need for better compliance. The higher the compliance required or desired, the higher the costs for LE.

### Dockside Inspections / Investigations:

LE must continue to monitor offloads of the vessels engaged in the TIQ fishery and continue to assure that the shoreside observer program is capturing total catch accounting.

It is anticipated that state and Federal LE will be investigating a number of potential violations at off-load facilities, however, market inspections and intelligence garnered from sources outside the observer program may result in the discovery of violations away from landing sites.

### Offshore Resources:

It is assumed that many rockfish conservation areas (RCA) will still be in place. Our understanding is that the role of on-board observers will not be concerned with area enforcement. While vessel monitoring system (VMS) is a valuable enforcement tool, in most cases, LE resources are forced to investigate incursions after the fact instead of designing an adequate on the ground response, providing a clearer understanding of intent.

### Observers:

There is a distinction between an on-board observer or shore-side catch monitor, and law enforcement. The roles and responsibilities are quite different even under the TIQ program.
Assuming that the role of a law enforcement officer will somehow be completely supplanted by catch monitors or observers is flawed, especially when the system is being designed to promote 100% compliance with catch accounting.

**Effort Shift**

We have already seen changes in the way the fishery is prosecuted. Some ports are taking deliveries where there have not been any for some years. Other ports are standing idle. These shifts in infrastructure needs, fishing strategies, and economic incentives will continue and will require changing needs in enforcement of the fishery and positioning of field staff as well. Some of these changes may cause an initial increase in cost.

**Conclusions**

The success of the TIQ program is reliant on identification of enforcement concerns early in implementation. This can only be accomplished with an increased presence. Compliance and activity should be tracked and reported in order to evaluate whether the level of law enforcement activity is adequate. Results and analysis of a comprehensive program review could be used to justify reducing or increasing the level of LE needed.

The EC engaged in a productive discussion with the GAP and appreciated their candor on the topic of cost recovery. We recognize that each of the jurisdictions may need to provide additional justification for funds from industry for enforcement. In addition, law enforcement may need to identify or clarify what portion of the total enforcement need is actually incremental. The EC is interested in participating in any process the Council deems necessary to facilitate that.

It seems to us that shifting priorities to accommodate this program with existing staff would compromise our efforts and gains in other areas of enforcement responsibility. It is difficult to accept a policy where only incremental costs can be considered when our presence in Federal fisheries protection, to include trawl, has been inadequate to begin with. It is our hope that the council can look for ways to support funding for adequate presence beyond what may be considered incremental.

Whether the costs of enforcement comes from an appropriation, alternate funding sources, or out of the trawl program; the overall effort must be considered to ensure the success of the program.

PFMC
06/12/11

# GROUNDFISH ADVISORY SUBPANEL REPORT ON PRIORITY TRAILING ACTIONS UNDER TRAWL RATIONALIZATION SLATED FOR PRELIMINARY ACTION

The Groundfish Advisory Subpanel (GAP) received a report from Mr. Seger and Mr. Boydstun on agenda item E.7. The GAP appreciates their excellent work on the development of the Draft Environmental Assessment (EA) on Control Limit Safe Harbors for Community Fishing Associations (CFAs) and Risk Pools.

Risk Pools

The GAP had a wide-ranging discussion on risk pools, and ultimately **recommends a limited modification to the control rule to facilitate functioning of risk pools (see GAP Alternative described in detail below).**

Essentially, the modification would clarify that it is not "control" of quota share for participants in qualifying risk pools to obligate quota pounds (QP) from the following year to the pool, if the purpose is solely to provide coverage to a risk pool participant who had incurred a deficit which could not be covered by the pool in the current year. We believe this satisfies concerns of risk pool proponents (i.e. negative incentives created if there is no guarantee the pool will be able to cover an overage in a given year), while carefully limiting the modification to prevent program abuse. Industry, risk pool proponents, and other GAP members were involved in collaboratively developing the GAP alternative.

Some members of the GAP feel that the action should be limited to dealing with the issue of allowing a risk pool to cure their deficit in the following year. Those members feel the need to develop risk pool regulations has not been demonstrated and adds to agency workload and administration.

## GAP Alternative

**The GAP supports a "limited modification" to the control rule language specifying that it does not constitute quota share (QS) control for "qualifying risk pools" to insure against catch events for specified "risk pool species" under certain circumstances, even where such agreement might otherwise exceed the QS control caps.**

***Limited modification –***

The modification to the control language would state that it is not control of QS for participants in qualifying risk pools to obligate QP from the following year to the pool, where such obligation is only for the purposes of providing coverage to a risk pool participant who had incurred a deficit which could not be covered by the pool in the current year. Each of the individuals making up the risk pool structure, or operating under the risk pool structure, would be held to QS control limits individually.

**Option A**: Qualifying risk pool contracts would expire at the end of every calendar year, with the stipulation that QP from the following year could be obligated to the pool solely to cover overages that could not be covered by the risk pool in the year in which they were incurred. Uncoverable overages incurred in the current year would have to be covered within 30 days of quota being issued for the following year.

**Option B**: Qualifying risk pool contracts would run indefinitely, but any signatory to the risk pool agreement could opt out at the end of each calendar year subject only to satisfying its obligation.

***Qualifying risk pools –***

A qualifying risk pool is an entity developed solely to manage specified "risk pool species" (see below). This includes active and reactive risk management terms such as: Risk pool species quota pound sharing rules, harvest activity management (which may include provisions such as tie up provisions, area closures, or gear restrictions), and financial rewards and penalties over bycatch performance. Qualifying risk pools may not specify delivery terms or take any other action deemed to constitute control of QS outside of the limited modification to the control language described above.

***Risk pool species –***

Risk pool species means non-target overfished species as designated in the harvest specifications process and halibut. Currently, risk pool species are yelloweye, canary, widow, darkblotched, Pacific ocean perch, bocaccio, cowcod, and halibut.

***Eligible members –***

Qualifying risk pools are composed of limited entry trawl licensed vessel owners and quota share owners, or their representatives. Members may include (but are not limited to) independent harvesters, processors which own vessels, or quota share holders which neither process nor harvest. Entities which do not own trawl permitted vessels or quota shares may not participate in risk pool activities, including negotiations over governance structures, unless they are acting on behalf of a vessel owner(s) or quota share holder(s).

***Agents –***

Risk pools may hire agents to enact and enforce the provisions of the risk pooling arrangement. These arrangements may include: monitoring vessel performance and enforcing the terms of any agreed-upon reward/penalty structure, or dictating harvesting activity with the intention of reducing bycatch. Risk pools may also form an entity which self-monitors and self-enforces the agreement rather than using a third party.

**Option:** Risk pools will be entitled to designate an agent for whom National Marine Fisheries Service (NMFS) will provide a "qualifying risk pool holding account" to which QP governed by the risk pool agreement may be transferred.

***Qualifying Risk Pool Holding account –***

**Option A:** Qualifying risk pools would be assigned a holding account into which all risk pool species managed by the pool would be deposited until used. No limited entry permit or vessel designation required.[1]

**Option B**: Qualifying risk pools could elect to open a holding account into which all risk pool species managed by the pool would be deposited until used. No limited entry permit or vessel designation required.

**Option C:** No risk pool holding accounts allowed. All qualifying risk pool QP would be held in accounts established under current program rules.

*Application, oversight, enforcement, and monitoring* – As a condition for receiving the privilege of forming a risk pool, the risk pool and its members agree to make public the identities of those entities participating in the risk pool and all information pertaining to the amounts of QS and QP controlled and harvested under the terms of the risk pool agreement (but not the exvessel value of such product), regardless of confidentiality protections that might otherwise restrict the release of such information.

**Option A**: Risk pools are able to form and function without direct acceptance of their formation agreement by NMFS and without a requirement that they submit performance reports to an oversight body such as the Council or NMFS. However, risk pool contracts must be made available to NMFS or state agencies upon request.

**Option B:** Risk pools are able to function only after review and acceptance of their formation agreement and related contracts by NMFS. Annual performance reports must be submitted to NMFS and provided to the Council.

***Risk pool agreement –***

Any risk pool contract must include standards and requirements consistent with the elements, exceptions, and criteria above. Such agreements must be signed by risk pool members and those members (names of any person or corporation) must be clearly identifiable next to the signature.

[1] Option A frees up limited entry permits for use by active fishermen. It also facilitates auditing of QP controlled by the pool and its usage. Finally, NMFS OLE states a holding account will save money to the program overall by reducing enforcement/auditing costs.

## CFAs

As with risk pools, the GAP had a lengthy discussion on CFAs. The GAP considered, but ultimately rejected three potential modifications to the control rules.

The GAP considered whether a higher cumulative cap for species in aggregate (1.5-2 times the current QS limit) should be considered for CFAs. **The GAP continues to feel that higher caps for CFAs are unnecessary and would create many inequities, while also impairing program functioning overall.** Among the objections were issues surrounding the need for the exception, lack of access to fish by those not in a CFA, the fact that quota movement into one community necessarily means it leaves another, concern over community enhancement rather than mitigation, and many others. Because the GAP resoundingly rejected this modification to the control caps, we did not discuss CFA requirements.

The GAP also considered a higher accumulation limit for sablefish south of 36° to accommodate a request by the City of Morro Bay. The GAP believes that much of this fish will be landed in Morro Bay simply because it has to be caught south of 36° and there are few other viable landing options. The GAP believes Morro Bay is actually likely to benefit as a result of trawl rationalization, in the form of landings significantly above the levels to which they dropped after initial overfished species designations and the loss of the primary processor. Based on that belief, **the GAP does not support any adjustment to the sablefish cap.**

Finally, the GAP considered a more limited modification to the control language to allow CFAs to leverage multi-year landings into a port without any change to the accumulation limits themselves. In the past (November 2010 and April 2011), the GAP has stated that safe harbors for CFAs are unnecessary as a single control cap could be used to leverage additional landings into a port. However, as the draft EA makes clear, multi-year landing agreements, which may be necessary in order for communities to be able to raise the funds to purchase quota, would violate the QS control rules. After significant discussion, **the GAP rejected a modification to the control language to allow communities to form long-term leverage agreements.** The primary reasons for this were that it is unnecessary as landings can be attracted in different ways, no other fishery participants have the long-term security the communities would receive under that exemption, and it is unfair to allow one fishery participant to conduct activities in this manner while forbidding all other fishery participants from doing so.

**Recommendation Summary:**

- **The GAP continues to feel that higher caps for CFAs are unnecessary and would create many inequities, while also impairing program functioning overall.**
- **The GAP does not support any adjustment to the sablefish cap.**
- **The GAP rejected a modification to the control language to allow communities to form long-term leverage agreements.**

**Cost Recovery**

The GAP believes program costs have the potential to make or break the trawl rationalization program overall. This issue is much larger than the issue of cost recovery alone. Before delving into specific recommendations, the GAP offers the following guiding principles:

1) **The Magnuson-Stevens Act, NOAA Catch Share Policy, other applicable law, and council motions to date should form the basis for determining program costs and cost recovery parameters.**
2) **It is critical that program costs are streamlined to the extent possible.**
3) **Possible future cost efficiencies should be anticipated and steps should be taken to facilitate cost reduction (e.g. If it is anticipated that a given position may no longer be necessary if the expected fleet consolidation occurs, then perhaps a contract rather than full term hire position should be considered).**
4) **A clear nexus to the trawl rationalization program needs to be demonstrated for all costs attributed to this program.**
5) **Costs should be fully transparent.**
6) **Cost savings from previous management should be accurately accounted for and credited to the fishery.**

Based on those guiding principles, **the GAP recommends that a program cost review committee be created.** The GAP believes there are three strong justifications for the creation of this committee. First, **the committee could be tasked with identifying total program costs.** In preliminary discussions with certain agencies, it is unclear to the GAP whether certain cost requests should be attributable to the trawl rationalization program, or whether they are better formulated as general groundfish management costs. Second, there is clearly a great deal of disagreement and confusion about what constitutes incremental costs. **The committee could be tasked with reviewing the applicable law and policy and recommending appropriate incremental costs to the council.** Finally, the committee could be tasked with **identifying long term cost efficiencies** which could run the gamut from changes in fleet behavior to bring costs down to how to structure program management so it is flexible to anticipated changes rather than locking in significant cost increases.

**CFAs Recommendation Summary:**

- **The GAP recommends that a program cost committee be created. The committee could be tasked with:**
  - **Identifying total program costs.**
  - **Reviewing the applicable law and policy and recommending appropriate incremental costs to the council.**
  - **Identifying long term cost efficiencies**

On the specific issues raised in Agenda Item E.7.b, Supplemental NMFS Report 2, the GAP offers the following recommendations.

1) Should the cost recovery program be developed for the trawl fishery as a whole or further subdivided?

   **The GAP recommends option a.**

   a. Development of separate cost recovery programs for each sector is consistent with our previous recommendations and is the most equitable option.

2) What entity should pay the fee?

   **The GAP recommends:**

   - **For the CP Sector: Option a**
     - **Charge each vessel based on the value of whiting harvested by that vessel.**
   - **For the MS Sector: Option b (as modified).**
     - **Charge each mothership based on the ex-vessel value of whiting ~~processed~~ received by that MS**
   - **For the shorebased IFQ Sector: Option b.**
     - **Charge each first receiver based on the ex-vessel value of IFQ species processed.**

**These options are in line with the pre-existing buyback structure (50 C.F.R. 600.1013). Duplicating the existing process will be most efficient.**

3) How should fee collection be structured?
   - **For the CP Sector: The GAP recommends Option a**
     - **Bill entity chosen under #2 in last quarter of the calendar year.**
   - **For the MS Sector: The GAP recommends Option b.**
     - **Bill entity chosen under #2 in last quarter of the calendar year.**
   - **For the Shorebased IFQ Sector: The GAP recommends Option b.**
     - **Fishermen billed at time of landing by first receiver, and collected monthly by the Agency in coordination with the buyback fee.**

**As in #2 above, this is in line with the buyback process (50 C.F.R. 600.1014) and will be most efficient.**

4) Linkage to permitting requirements?
   - **For all Sectors: The GAP recommends Option a.**

The GAP is concerned with the potential for a fisherman to be unfairly penalized if his cost recovery fee is deducted by the buyer (as is the case with buyback fees), but is not paid by that buyer to NMFS.

5) How are agency costs identified? (depends on choice made in #1)
   - The GAP believes the issue of cost identification is premature. If it is clear costs will be well over 3% for the shoreside quota share program, then a quick, inexpensive cost recovery identification process makes sense. The GAP believes that is not yet clear and this decision should be made after the review committee has completed its tasks. ~~once this becomes more clear.~~

6) How is the ex-vessel value of the fish harvested under the LAPP calculated to insure fee does not exceed 3%?
   - **For the CP sector: The GAP recommends Option c.**
   - **For the MS Sector: The GAP recommends a new option, which would calculate the fee based on information from the buyback form as is done in option c for the shoreside sector. This will be easiest administratively.**
   - **For the shoreside sector: The GAP recommends Option c.**

PFMC
06/12/11

# GROUNDFISH MANAGEMENT TEAM REPORT ON PRIORITY TRAILING ACTIONS UNDER TRAWL RATIONALIZATION SLATED FOR PRELIMINARY ACTION

The Groundfish Management Team (GMT) reviewed the reports under this agenda item and received a briefing from Mr. Jim Seger. Mr. L.B. Boydstun also participated in this discussion. Some potential benefits and costs were discussed relative to Community Fishing Associations (CFAs) and risk pools in general, but it is yet uncertain how these collectives will perform, and how the fishery overall will be affected. The GMT suggests that information regarding CFAs and risk pools remain transparent and available for analysis so that their relative benefits and costs to individual fishermen, to the collectives themselves, and to local communities can be evaluated and monitored.

Regarding whether CFAs and risk pools should be allowed to exceed existing control limits and/or the degree to which they should exceed these control limits, it is unclear how changing control limits will affect individuals, collectives, and fleet-wide behavior in the future. That is, with or without control limit allowances, how these collectives will change the current distribution of fishing effort and quota share and quota pound (QS/QP) holdings, and the magnitude and direction (i.e., positive or negative) of potential impacts on fishing operations and communities is not known.

In general, some potential benefits and costs relative to CFAs and risk pools were noted during the GMT's discussion of these items. These potential benefits and costs may include, but are not limited to:

1) increased communication and information sharing between fishermen and/or communities;
2) more cooperative rather than competitive behavior between fishermen and/or sectors within a community;
3) increasing a fisherman's and/or community's ability to plan for current and future fisheries changes;
4) the redistribution of QS/QP from communities with historical landings, to communities without historical landings but an interest in participating in this fishery;
5) possible local effects on ecological communities due to concentration of QS/QP in particular geographic areas;
6) decreasing the total number of vessel accounts with deficits fleet-wide and the magnitude of these deficits, relative to constraining species (e.g., yelloweye, cowcod) allocations; and
7) whether fishermen within risk pools will engage in more or less risk relative to constraining species allocations and possible rollover provisions (i.e., account deficits will "rollover" to the following year).

Some or all of these items may result in higher or lower probabilities of exceeding constraining species allocations fleet-wide, changes in the distribution of fishing effort and QS/QP holdings geographically, and impacts to associated fishing operations and communities.

Estimated West Coast Groundfish Trawl Rationalization Program
NMFS Northwest Region, NW Fisheries Science Center and Office of Law Enforcement Implementation costs

| A1 | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | | TIQ Development | | | | TIQ Implementation | | | |
| 4 | | | FY2007 | FY2008 | FY2009 | FY2010 | FY2011 | FY2012 | FY2013 | FY2014 |
| 5 | **NMFS Northwest Region** | Base Groundfish Management Program (sum of rows 6 and 7) | $1,400,000 | $1,400,000 | $1,400,000 | $1,400,000 | $1,400,000 | $1,400,000 | $1,400,000 | $1,400,000 |
| 6 | | Base Non TIQ salaries & benefits | $1,400,000 | $1,400,000 | $1,400,000 | $1,400,000 | $950,000 | $950,000 | $950,000 | $950,000 |
| 7 | | Base TIQ salaries & benefits | $0 | $0 | $0 | $0 | $450,000 | $450,000 | $450,000 | $450,000 |
| 8 | | NEW TIQ Regional Management (permitting, catch monitor administration) (sum of rows 9 and 10) | $0 | $200,000 | $200,000 | $900,000 | $1,040,000 | $1,040,000 | $1,040,000 | $1,040,000 |
| 9 | | Salaries & benefits | $0 | $200,000 | $200,000 | $600,000 | $740,000 | $740,000 | $740,000 | $740,000 |
| 10 | | Contract - PSMFC Oversight of Catch Monitoring | $0 | $0 | $0 | $300,000 | $300,000 | $300,000 | $300,000 | $300,000 |
| 11 | | NEW Quota Share/Vessel Account System (sum of rows 12 and 13) | $0 | $0 | $600,000 | $500,000 | $470,000 | $400,000 | $400,000 | $400,000 |
| 12 | | Grant - PSMFC - catch database | $0 | $0 | $400,000 | $300,000 | $100,000 | $100,000 | $100,000 | $100,000 |
| 13 | | Transfer to NWFSC - QS/vessel acct./permits database | $0 | $0 | $200,000 | $200,000 | $370,000 | $300,000 | $300,000 | $300,000 |
| 14 | | **TIQ Management Incremental Increase (sum of row 8 and 11)** | **$0** | **$200,000** | **$800,000** | **$1,400,000** | **$1,510,000** | **$1,440,000** | **$1,440,000** | **$1,440,000** |
| 15 | | **TIQ Management Total (sum of row 7, 8 and 11)** | **$0** | **$200,000** | **$800,000** | **$1,400,000** | **$1,960,000** | **$1,890,000** | **$1,890,000** | **$1,890,000** |
| 16 | | **Groundfish Management Total (sum of row 5, 8 and 11)** | **$1,400,000** | **$1,600,000** | **$2,200,000** | **$2,800,000** | **$2,910,000** | **$2,840,000** | **$2,840,000** | **$2,840,000** |



Agenda Item E.7.b
Supplemental NMFS Report 3
June 2011

Estimated West Coast Groundfish Trawl Rationalization Program
NMFS Northwest Region, NW Fisheries Science Center and Office of Law Enforcement Implementation costs

| A1 | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | | **TIQ Development** | | | | **TIQ Implementation** | | | |
| 4 | | | FY2007 | FY2008 | FY2009 | FY2010 | FY2011 | FY2012 | FY2013 | FY2014 |
| 17 | **NMFS Office of Law Enforcement** | Base OLE funded GF Enforcement (NOAA & States) (sum of rows 18 and 19) | $1,500,000 | $1,660,000 | $2,070,000 | $2,200,000 | $2,200,000 | $2,200,000 | $2,300,000 | $2,400,000 |
| 18 | | Base GF Enforcement OLE salaries & benefits | $1,130,000 | $1,370,000 | $1,620,000 | $1,000,000 | $1,000,000 | $1,000,000 | $1,100,000 | $1,200,000 |
| 19 | | Cooperative Enforcement Program | $370,000 | $290,000 | $450,000 | $1,200,000 | $1,200,000 | $1,200,000 | $1,200,000 | $1,200,000 |
| 20 | | NEW TIQ Enforcement (sum of rows 21 and 22) | $0 | $0 | $0 | $690,000 | $1,300,000 | $1,300,000 | $1,300,000 | $1,300,000 |
| 21 | | Salaries and benefits | $0 | $0 | $0 | $0 | $230,000 | $970,000 | $730,000 | $710,000 |
| 22 | | Contract Trawl techs | $0 | $0 | $0 | $250,000 | $420,000 | $30,000 | $270,000 | $270,000 |
| 23 | | Supplies | $0 | $0 | $0 | $150,000 | $50,000 | $0 | $0 | $20,000 |
| | | Joint Enforcement Agreement (State Enf. Funds) | $0 | $0 | $0 | $290,000 | $600,000 | $300,000 | $300,000 | $300,000 |
| 24 | | **TIQ Enforcement Incremental Increase (row 20)** | **$0** | **$0** | **$0** | **$690,000** | **$1,300,000** | **$1,300,000** | **$1,300,000** | **$1,300,000** |
| 25 | | **TIQ Enforcement Total (row 20)** | **$0** | **$0** | **$0** | **$690,000** | **$1,300,000** | **$1,300,000** | **$1,300,000** | **$1,300,000** |
| 26 | | **Groundfish Enforcement Total (sum of row 17 and 20)** | **$1,500,000** | **$1,660,000** | **$2,070,000** | **$2,890,000** | **$3,500,000** | **$3,500,000** | **$3,600,000** | **$3,700,000** |

Estimated West Coast Groundfish Trawl Rationalization Program
NMFS Northwest Region, NW Fisheries Science Center and Office of Law Enforcement Implementation costs

| A1 | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | | **TIQ Development** | | | | **TIQ Implementation** | | | |
| 4 | | | FY2007 | FY2008 | FY2009 | FY2010 | FY2011 | FY2012 | FY2013 | FY2014 |
| 27 | **Northwest Fisheries Science Center** | Base West Coast Groundfish Surveys/Assessments | $5,400,000 | $5,400,000 | $5,400,000 | $5,400,000 | $5,400,000 | $5,500,000 | $5,600,000 | $5,700,000 |
| 28 | | Base West Coast Groundfish Observer Program (sum of rows 29 to 33) | $5,050,000 | $5,050,000 | $5,050,000 | $5,050,000 | $5,050,000 | $5,050,000 | $5,050,000 | $5,050,000 |
| 29 | | Base Non TIQ salaries | $830,000 | $830,000 | $830,000 | $830,000 | $340,000 | $340,000 | $340,000 | $340,000 |
| 30 | | Base Non TIQ other costs | $120,000 | $120,000 | $120,000 | $120,000 | $120,000 | $120,000 | $120,000 | $120,000 |
| 31 | | Base Non TIQ grant to PSMFC | $4,130,000 | $4,130,000 | $4,130,000 | $4,130,000 | $3,340,000 | $3,340,000 | $3,340,000 | $3,340,000 |
| 32 | | Base TIQ salaries | $0 | $0 | $0 | $0 | $500,000 | $500,000 | $500,000 | $500,000 |
| 33 | | Base TIQ grant to PSMFC | $0 | $0 | $0 | $0 | $750,000 | $750,000 | $750,000 | $750,000 |
| 34 | | NEW Expanded TIQ Observer Program (sum of rows 35 to 38) | $0 | $0 | $0 | $520,000 | $1,490,000 | $1,020,000 | $1,180,000 | $910,000 |
| 35 | | Salaries | $0 | $0 | $0 | $230,000 | $600,000 | $670,000 | $710,000 | $740,000 |
| 36 | | Studies to improve ITQ Program efficiency | $0 | $0 | $0 | $180,000 | $410,000 | $160,000 | $300,000 | $0 |
| 37 | | Equipment | $0 | $0 | $0 | $110,000 | $380,000 | $90,000 | $70,000 | $70,000 |
| 38 | | Other ITQ costs (travel, rents, printing, supplies) | $0 | $0 | $0 | $0 | $100,000 | $100,000 | $100,000 | $100,000 |

Estimated West Coast Groundfish Trawl Rationalization Program
NMFS Northwest Region, NW Fisheries Science Center and Office of Law Enforcement Implementation costs

| A1 | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | | TIQ Development | | | | TIQ Implementation | | | |
| 4 | | | FY2007 | FY2008 | FY2009 | FY2010 | FY2011 | FY2012 | FY2013 | FY2014 |
| 39 | | NEW Economic Data Collection Program (sum of rows 40 to 42) | $0 | $0 | $0 | $0 | $380,000 | $390,000 | $400,000 | $420,000 |
| 40 | | Salaries | $0 | $0 | $0 | $0 | $240,000 | $250,000 | $260,000 | $280,000 |
| 41 | | Database management | $0 | $0 | $0 | $0 | $100,000 | $100,000 | $100,000 | $100,000 |
| 42 | | Other ITQ costs (travel, rents, printing, supplies) | $0 | $0 | $0 | $0 | $40,000 | $40,000 | $40,000 | $40,000 |
| 43 | | **TIQ Science Incremental Increase (sum of row 34 and 39)** | **$0** | **$0** | **$0** | **$520,000** | **$1,870,000** | **$1,410,000** | **$1,580,000** | **$1,330,000** |
| 44 | | **TIQ Science Total (sum of row 32,33,34,39)** | **$0** | **$0** | **$0** | **$520,000** | **$3,120,000** | **$2,660,000** | **$2,830,000** | **$2,580,000** |
| 45 | | **Groundfish Science Total (sum of rows 27,28,34,39** | **$10,450,000** | **$10,450,000** | **$10,450,000** | **$10,970,000** | **$12,320,000** | **$11,960,000** | **$12,230,000** | **$12,080,000** |
| 46 | | | | | | | | | | |
| 47 | | **NMFS TIQ Increase (sum of row 14,24, and 43** | **$0** | **$200,000** | **$800,000** | **$2,610,000** | **$4,680,000** | **$4,150,000** | **$4,320,000** | **$4,070,000** |
| 48 | | **NMFS TIQ Total (sum of row 15, 25, and 44)** | **$0** | **$200,000** | **$800,000** | **$2,610,000** | **$6,380,000** | **$5,850,000** | **$6,020,000** | **$5,770,000** |
| 49 | | **NMFS Groundfish Program Total (sum of row 16, 26, and 45)** | **$13,350,000** | **$13,710,000** | **$14,720,000** | **$16,660,000** | **$18,730,000** | **$18,300,000** | **$18,670,000** | **$18,620,000** |

Estimated West Coast Groundfish Trawl Rationalization Program
NMFS Northwest Region, NW Fisheries Science Center and Office of Law Enforcement Implementation costs

| A1 | B | C | M | N |
|---|---|---|---|---|
| 3 | | | | |
| 4 | | | Description of actions | Method of calculation |
| 5 | **NMFS Northwest Region** | Base Groundfish Management Program (sum of rows 6 and 7) | Staff support for Annual regulations, Biannual specifications, permits. | Gap analysis was derived from analysis of all existing groundfish program staff and how much effort each would put into TIQ activities and then analyzing any resulting gaps in activities that would need to be filled with new staff. All existing staff effort that is focused on TIQ is shown as Base TIQ salaries. All incremental gaps are shown as "NEW TIQ Regional Management". This new staff effort would not be needed "but for" the new TIQ program. |
| 6 | | Base Non TIQ salaries & benefits | That portion of groundfish program staff that historically did not work on TIQ related activities and will continue to not work on TIQ related activities. | Developed based on estimated workload of each staff in FTE increments |
| 7 | | Base TIQ salaries & benefits | That portion of groundfish program staff that are now working on TIQ related activities - these are non-incremental TIQ costs | |
| 8 | | NEW TIQ Regional Management (permitting, catch monitor administration) (sum of rows 9 and 10) | The new TIQ required additional staff support to draft regulations, to manage the IT quota tracking system, to provide increased permit staff and staff for trailing amendments to the program - cost recovery, community fishing associations, monitoring design, etc. Also includes PSMFC catch monitoring contract | |
| 9 | | Salaries & benefits | This includes 2 new staff in 2009/2010 and an additional 3 staff in FY11 - These include IT administrator, permits assistant, trailing actions. | |
| 10 | | Contract - PSMFC Oversight of Catch Monitoring | Includes salary of catch monitor coordinator, monitoring equipment, software and training costs | |
| 11 | | NEW Quota Share/Vessel Account System (sum of rows 12 and 13) | Wholly new databases and IT infrastructure were developed and must be maintained for the new program. These systems provide catch accounting from processors, quota use and trade tracking, and compilation of bycatch and overfished species tracking. | The new TIQ program requires data management to get catch information from shoreside processors and first receivers, data from discards and bycatch from the observer program, and information on quota share ownership and trading. Those PSMFC grant pays for maintenance of the catch data. The NWFSC maintenance funds ongoing work on quota tracking and catch accounting. The observer data system is covered below under the NW Fisheries Science Center. |
| 12 | | Grant - PSMFC - catch database | staff support for ongoing maintenance of PACFIN data feed | |
| 13 | | Transfer to NWFSC - QS/vessel acct./permits database | staff support for development and ongoing maintenance of catch accounting database | |
| 14 | | **TIQ Management Incremental Increase (sum of row 8 and 11)** | This is the total estimated incremental cost for the NMFS Regional Office | |
| 15 | | **TIQ Management Total (sum of row 7, 8 and 11)** | This is the total estimated cost of the TIQ program for the NMFS Regional Office | |
| 16 | | **Groundfish Management Total (sum of row 5, 8 and 11)** | This is the total cost of the Groundfish management program, including TIQ, for the NMFS Regional Office | |

Estimated West Coast Groundfish Trawl Rationalization Program
NMFS Northwest Region, NW Fisheries Science Center and Office of Law Enforcement Implementation costs

| A1 | B | C | M | N |
|---|---|---|---|---|
| 3 | | | | |
| 4 | | | Description of actions | Method of calculation |
| 17 | **NMFS Office of Law Enforcement** | Base OLE funded GF Enforcement (NOAA & States) (sum of rows 18 and 19) | Ongoing groundfish enforcement staff and funding for states through Joint Enforcement agreeements. | |
| 18 | | Base GF Enforcement OLE salaries & benefits | Estimated staff support for groundfish enforcement | |
| 19 | | Cooperative Enforcement Program | State Joint Enforcement Agreement Funds provided to WA, OR, CA. | |
| 20 | | NEW TIQ Enforcement (sum of rows 21 and 22) | It was recognized that the requirements for more detailed catch accounting would require increased ENF presence in the fishery at least initially. | |
| 21 | | Salaries and benefits | Increased NMFS enforcement staff - 4 officers and trawl IQ manager, increased costs in FY12 represent costs for moving staff | |
| 22 | | Contract Trawl techs | | |
| 23 | | Supplies | | |
| | | Joint Enforcement Agreement (State Enf. Funds) | These are the funds currently budgeted for Joint Enforcement Agreements for TIQ | |
| 24 | | **TIQ Enforcement Incremental Increase (row 20)** | This is the total estimated incremental cost for the NMFS NW and SW Offices of Law Enforcement | |
| 25 | | **TIQ Enforcement Total (row 20)** | This is the total estimated cost of the TIQ program for the NMFS NW and SW Offices of Law Enforcement and includes a request for state JEA funds | |
| 26 | | **Groundfish Enforcement Total (sum of row 17 and 20)** | This is the total cost of the Groundfish enforcement program, including TIQ, for the NMFS NW and SW Offices of Law Enforcement | |

Estimated West Coast Groundfish Trawl Rationalization Program
NMFS Northwest Region, NW Fisheries Science Center and Office of Law Enforcement Implementation costs

| A1 | B | C | M | N |
|---|---|---|---|---|
| 3 | | | | |
| 4 | | | Description of actions | Method of calculation |
| 27 | **Northwest Fisheries Science Center** | Base West Coast Groundfish Surveys/Assessments | No change in west Coast groundfish resource surveys/assessments/data management before/after TIQ | |
| 28 | | Base West Coast Groundfish Observer Program (sum of rows 29 to 33) | Funding for the observer program for the shorebased fishery including trawl, non-trawl sectors. In FY 11 through FY14, $753K in savings from observer sea days will be used to administer the TIQ fisheries, and the remainder will be used to maintain existing coverage in non TIQ fisheries. | |
| 29 | | Base Non TIQ salaries | That portion of groundfish observer program staff that historically did not work on trawl related activities and will continue to not work on TIQ related activities. | |
| 30 | | Base Non TIQ other costs | Internal NMFS costs associated with non-TIQ fisheries (travel, supplies) | |
| 31 | | Base Non TIQ grant to PSMFC | Grant for non-TIQ observer salaries and related program costs ($3M observer salaries, remainder = program administration) | |
| 32 | | Base TIQ salaries | That portion of groundfish observer program staff that are now working on TIQ related activities - these are non-incremental TIQ costs | |
| 33 | | Base TIQ grant to PSMFC | $753K savings of former observer salaries for trawl fisheries now used for TIQ | |
| 34 | | NEW Expanded TIQ Observer Program (sum of rows 35 to 38) | Increased funding for 100% coverage for TIQ fishery, includes staffing for data management, and analysis for fishery-dependent TIQ data. | |
| 35 | | Salaries | Includes 7 new FTE - Debriefers, data analyst, database assistant, data manager, supervisors - these are incremental costs and would not exist "but for" development of the TIQ observer requirements | |
| 36 | | Studies to improve ITQ Program efficiency | | |
| 37 | | Equipment | | |
| 38 | | Other ITQ costs (travel, rents, printing, supplies) | | |

Estimated West Coast Groundfish Trawl Rationalization Program
NMFS Northwest Region, NW Fisheries Science Center and Office of Law Enforcement Implementation costs

| A1 | B | C | M | N |
|---|---|---|---|---|
| 3 | | | | |
| 4 | | | Description of actions | Method of calculation |
| 39 | | NEW Economic Data Collection Program (sum of rows 40 to 42) | Economic data collection is mandatory under catch share regulations. Baseline and new data will be used to develop performance measures and determine whether TIQ is meeting its goals and objectives. MSRA requires a report for this purpose after five years and then periodically thereafter. Funds will cover staff support for program administration and data analysis, database maintenance, outreach costs and assistance with compliance | |
| 40 | | Salaries | New funding and staff support for program administration and analysis. Includes 1 economist and additional staff time. | |
| 41 | | Database management | Funding for database development and maintenance, analysis tools for reporting, and survey fielding. | |
| 42 | | Other ITQ costs (travel, rents, printing, supplies) | Database and analysis equipment and software. Outreach and assistance with compliance. | |
| 43 | | **TIQ Science Incremental Increase (sum of row 34 and 39)** | This is the total estimated incremental cost for the NMFS Northwest Fisheries Science Center | |
| 44 | | **TIQ Science Total (sum of row 32,33,34,39)** | This is the total estimated overall cost of the TIQ program for the NMFS Northwest Fisheries Science Center | |
| 45 | | **Groundfish Science Total (sum of rows 27,28,34,39** | This is the total cost of the Groundfish management program, including TIQ, for the NMFS Northwest Fisheries Science Center | |
| 46 | | | | |
| 47 | | **NMFS TIQ Increase (sum of row 14,24, and 43** | | |
| 48 | | **NMFS TIQ Total (sum of row 15, 25, and 44)** | | |
| 49 | | **NMFS Groundfish Program Total (sum of row 16, 26, and 45)** | | |

Estimated West Coast Groundfish Trawl Rationalization Program
Observer and Catch Monitor Reimbursement and State Implementation Costs

| A1 | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | | **TIQ Development** | | | | **TIQ Implementation** | | | |
| 4 | | | FY2007 | FY2008 | FY2009 | FY2010 | FY2011 | FY2012 | FY2013 | FY2014 |
| 56 | **Observer and Catch Monitor Salary Reimbursement** | **Reimbursement for Observer and Catch Monitors (sum of rows 57 and 58)** | **$0** | **$0** | **$0** | **$600,000** | **$3,920,000** | **$2,520,000** | **$1,250,000** | **$0** |
| 57 | | Grant - PSMFC reimbursement of catch monitor costs | $0 | $0 | $0 | $150,000 | $800,000 | $530,000 | $260,000 | $0 |
| 58 | | Grant - PSMFC reimbursement of observer costs | $0 | $0 | $0 | $450,000 | $3,120,000 | $1,990,000 | $990,000 | $0 |
| 59 | | | | | | | | | | |
| 60 | **State Funding** | **Funds for state reporting improvements and Enforcement costs (sum of rows 61 and 62)** | **$0** | **$0** | **$0** | **$890,000** | **$1,420,000** | **$1,340,000** | **$1,340,000** | **$1,340,000** |
| 61 | | Grant - PSMFC for state reporting | $0 | $0 | $0 | $600,000 | $420,000 | $420,000 | $420,000 | $420,000 |
| 62 | | Cooperative Enforcement (through Joint Enforcement Agreements | $0 | $0 | $0 | $290,000 | $1,000,000 | $920,000 | $920,000 | $920,000 |

Estimated West Coast Groundfish Trawl Rationalization Program
Observer and Catch Monitor Reimbursement and State Implementation Costs

| A1 | B | C | M | N |
|---|---|---|---|---|
| 3 | | | | |
| 4 | | | Description of actions | Method of calculation |
| 56 | **Observer and Catch Monitor Salary Reimbursement** | **Reimbursement for Observer and Catch Monitors (sum of rows 57 and 58)** | 90% reimbursement in 2011, 50% in 2012, 25% in 2013 | |
| 57 | | Grant - PSMFC reimbursement of catch monitor costs | | |
| 58 | | Grant - PSMFC reimbursement of observer costs | | |
| 59 | | | | |
| 60 | **State Funding** | **Funds for state reporting improvements and Enforcement costs (sum of rows 61 and 62)** | | |
| 61 | | Grant - PSMFC for state reporting | State funding was provided to increase the ability of the states to provide catch information to NMFS. Only includes requested funds from WA and OR | |
| 62 | | Cooperative Enforcement (through Joint Enforcement Agreements | FY11-FY14 = CA. OR and WA requested annual funding for TIQ enforcement activities | |

# Cost Recovery Program Options – Part Two

**Introduction**

This document presents six key questions regarding cost recovery program options for Council consideration. Each question is followed by a list of potential options, subdivided by sector where appropriate. The following list of questions and potential options are only the beginning of the process. As the Council chooses to pursue one option over another, more questions will arise and need to be addressed.

## Questions and Options for Council Consideration on Cost Recovery

1. **Should the cost recovery program be developed for the trawl fishery as a whole, or further subdivided?**

   **Options**

   a. **3 separate cost recovery programs developed for each of the 3 sectors: shore-based IFQ, MS, CP**
      - **costs would be calculated for each sector**
      - **each sector would be assessed a fee based on the sector-specific cost calculation**

   b. **2 separate cost recovery programs developed for the at-sea and shore-based sectors: MS & CP, shore-based IFQ**
      - **costs would be calculated for each sector**
      - **each sector would be assessed a fee based on the sector-specific cost calculation**

   c. **1 cost recovery program for the trawl fishery as a whole**
      - **costs would be calculated for the trawl fishery as a whole,**
      - **equal portion of the costs assessed to each sector, not to exceed 3% of the ex-vessel value**

   d. **1 cost recovery program for the trawl fishery as a whole**
      - **costs would be calculated for the trawl fishery as a whole,**
      - **each sector would be assessed a portion of the costs based on Council decision, taking into account estimated costs attributable to each sector and benefits received by each sector**

**2. What entity should pay the fee?**

**Options for CP sector**

**a. Charge each vessel based on value of whiting harvested by that vessel**

**b. Charge the coop based on value of whiting harvested by the entire coop**

**Options for MS sector**

**a. Charge each catcher vessel based on value of whiting harvested by that vessel**

**b. Charge each mothership based on the value of whiting processed by that MS**

**c. Charge each coop(s) based on value of whiting harvested by the entire coop**

- **If there is a non-coop fishery, option a or b may be used**

**Options for shore-based IFQ sector**

**a. Charge each catcher vessel based on the value of IFQ species harvested by that vessel**

**b. Charge each first receiver based on the value of IFQ species processed**

**3. How should fee collection be structured?**

**Options for CP sector**

**a. Bill entity chosen under #2 in last quarter of the calendar year**

**- It is unclear how the other MSA options ( e.g. filing of landing report, sale of such fish) apply to the CP sector**

**b. Other?**

-

**Options for MS sector**

**a. Bill entity chosen under #2 in last quarter of the calendar year**

**b. Bill entity chosen under #2 in last quarter of the calendar year**

- **It is unclear how the other MSA options ( e.g. filing of landing report, sale of such fish) apply to the CP sector**

**c. Other?**

**Options for shore-based sector**

**a. Bill entity chosen under #2 in last quarter of the calendar year**

**b. Fishermen billed at time of landing by first receiver, and collected monthly by the Agency in coordination with buyback fee**

4. **Linkage to permitting requirements?**
   a. **None**
   b. **Prior year's payment required for a complete permit application**
   c. **Quota transactions suspended until payment received**
   d. **30 days after failure to pay, IFQ account and/ or permit is suspended, and after 90 days, RA sends account to collections (modeled after SERO Cost Recovery Program)**
   e. **Same as 4d. but with an administrative appeals process**

5. **How are agency costs identified? (depends on choice made in #1)**
   a. **Implement a system to capture time allocation information for all personnel who work/ collaborate on management or enforcement of LAPP**
   b. **Random sampling to assess costs, then extrapolate costs across the year**
   c. **Use yearly projections of costs, as calculated and provided by the Agency, to determine fee percentage at the beginning of each fishing year**

6. **How is the ex-vessel value of the fish harvested under the LAPP calculated to ensure fee does not exceed 3%?**

   **<u>Options for CP sector</u>**

   a. **use EDC pricing and tonnage data to calculate value**
   b. **require submission of pricing and tonnage data to the Agency at the end of each fishing year, for purpose of value calculations**
   c. **use shorebased pricing and at-sea tonnage to calculate value**

   **<u>Options for MS sector</u>**

   a. **use EDC pricing and tonnage data to calculate value**
   b. **require submission of pricing and tonnage data to the Agency at the end of each fishing year, for purpose of value calculations**
   c. **use shore-based pricing and at-sea tonnage to calculate value**

   **<u>Options for shore-based sector</u>**

   a. **calculated from landing information as recorded on e-fish ticket**
   b. **calculated from landing information as recorded on paper fish ticket**
   c. **calculated from information on buyback form**

## Options Considered, but Rejected

NMFS considered various fee collection schemes such as collecting from IFQ holders based on QS, quarterly timing of fee collection, and charging fee on unused QS. These options were rejected for being impractical, and in the case of the latter option, for failing to create an appropriate incentive for industry.

Other regions use systems of task codes to account for hours spent on the LAPP, this option was considered but rejected because the costs of implementing and staffing such a system would only add to the financial burden associated with the LAPP. It was also suggested that costs be reassessed at the close of each year, and any refunds or additional fees be processed at that time; this option was rejected for being impractical, time-consuming, and costly.

A standardized pricing scheme used across all sectors of the LAPP was rejected for being inaccurate, and unfair to some communities.

Oregon
John Kitzhaber, M.D, Governor

Department of Fish and Wildlife
Fish Division
3406 Cherry Avenue NE
Salem, OR 97303
503-947-6200
Fax: 503-947-6202
TTY: 503-947-6339
www.dfw.state.or.us

May 24, 2011

Mr. Frank Lockhart, Sustainable Fisheries
Division Manager
National Marine Fisheries Service,
Northwest Region
7600 Sand Point Way, N.E., BIN C15700
Seattle, WA 98115-0070

Dear Mr. Lockhart,

We have reviewed our current groundfish management, monitoring, and enforcement programs in relation to the recently implemented trawl rationalization program (TIQ) to determine increased costs to the state of Oregon directly related to TIQ implementation. The areas of increased needs were in enforcement and management.

Enforcement

The following represents the anticipated costs for implementing and maintaining two Fish and Wildlife Division Troopers to enforce the regulations surrounding the TIQ. The need for two additional Troopers is identified at this time; however, it is difficult to accurately assess the level of enforcement needed to ensure a high level of compliance with this new program. The cost breakdown includes annual pay/benefits, one time equipment expenses, and administrative expenses. The annual pay/benefit amount is based upon the top step Trooper rate since it is unknown what experience level of Trooper will fill the position. As of April 7, 2011, Oregon ports accounted for at least 61% (with Astoria and Charleston being one and two respectively) of all of the IFQ landings on the West Coast: Astoria – 34%; Charleston – 18%; and Newport – 9%. The port in Brookings, OR was listed as part of 5 other West Coast ports that accounted for another 26% of the IFQ landings.

| FY1 - 2 Troopers | |
|---|---|
| Salary/Benefits | $241,738 |
| Vehicles (one time expense) | $80,000 |
| Admin | $34,423 |
| Total | $356,161 |

| FY2 - 2 Troopers | |
|---|---|
| Salary/Benefits | $241,738 |
| | |
| Admin | $34,423 |
| Total | $276,161 |

Biennium Total: $632,322

Management

In the management arena, the need for one additional position is identified at this time. This position would be responsible for tracking the trawl fishery, preparing decision-making documents for state and federal processes, and serving as a liaison between management and industry. As noted before, Oregon has the bulk of the current trawl landings. There has been a substantial increase in the need to provide guidance to industry participants since the implementation of this program at both the port level and the manager level. This has reduced our capacity to complete tasks and interact on other important commercial fishery issues. This position would be at the Natural Resource Specialist 2 level and would assist our dedicated Groundfish Management Team member focused on commercial issues. The annual pay/benefit amount is based on the top step rate as it is unknown what experience level of biologist will fill the position. The "Supplies and Services" item primarily covers travel associated with this position. Travel would consist of attendance at meetings of the Pacific Fishery Management Council and associated advisory bodies and ad-hoc committees, state sponsored public meetings, and port level "touch-bases" with industry.

| FY- Natural Resource Specialist 2 | |
|---|---|
| Salary/Benefits | $83,880 |
| Supplies and Services | $10,000 |
| Admin | $21,264 |
| Total | $115,144 |

Biennium Total: $230,288

In total, Oregon is requesting $391,305 annually (plus and additional $80,000 for the first year) or $782,610 per biennium (plus and additional $80,000 for the first year) as part of the TIQ cost recovery program. This is to address increased enforcement and management costs associated with the implementation of this program.

I would be happy to discuss this in more detail. Please do not hesitate to contact me.

Sincerely,

Steve Williams

Steve Williams
Deputy Administrator for Fish Division
Oregon Department of Fish and Wildlife

Cc: Lt. Dave Anderson, OSP
Gway Kirchner, MRP

Science, Service, Stewardship

Agenda Item E.7.b Supplemental NMFS Report 4
Priority Trailing Actions under Trawl Rationalization

# *Cost Recovery:*
## *Preliminary Program Options*

June 2011

NOAA FISHERIES SERVICE

NOAA FISHERIES SERVICE

# Policy and Legal Guidance

## MSA

- **The Secretary is authorized and shall collect a fee to recover the actual costs directly related to the management, data collection, and enforcement of any limited access privilege program**

## "The Design and Use of Limited Access Privilege Programs"

- **The relevant costs to recover are the incremental costs, i.e., those costs that would not have been incurred but for the IFQ program**

## NOAA Catch Share Policy

- **It is NOAA policy to compute and recover from participants only the incremental operating costs associated with LAPPs**

## Council Motion, November 2010

- **…transparency should include relevant information on the Federal and State costs of current management in as much detail as possible (i.e. sectors, observers, rulemaking, enforcement, etc)**

NOAA FISHERIES SERVICE

# Questions and Options for Council Consideration #1:

**Should the cost recovery program be developed for the trawl fishery as a whole, or further subdivided?**

**<u>Options</u>**

**a. 3 separate cost recovery programs developed for each of the 3 sectors: shore-based IFQ, MS, CP**
- **costs would be calculated for each sector**
- **each sector would be assessed a fee based on the sector-specific cost calculation**

**b. 2 separate cost recovery programs developed for the at-sea and shore-based sectors: MS & CP, shore-based IFQ**
- **costs would be calculated for each sector**
- **each sector would be assessed a fee based on the sector-specific cost calculation**

**c. 1 cost recovery program for the trawl fishery as a whole**
- **costs would be calculated for the trawl fishery as a whole,**
- **equal portion of the costs assessed to each sector, not to exceed 3% of the ex-vessel value**

**d. 1 cost recovery program for the trawl fishery as a whole**
- **costs would be calculated for the trawl fishery as a whole,**
- **each sector would be assessed a portion of the costs based on Council decision, taking into account estimated costs attributable to each sector and benefits received by each sector**

NOAA FISHERIES SERVICE

## Questions and Options for Council Consideration #2:

**What entity should pay the fee?**

**Options for CP sector**

a. Charge each vessel based on value of whiting harvested by that vessel
b. Charge the coop based on value of whiting harvested by the entire coop

**Options for MS sector**

a. Charge each catcher vessel based on value of whiting harvested by that vessel
b. Charge each mothership based on the value of whiting processed by that MS
c. Charge each coop(s) based on value of whiting harvested by the entire coop

- If there is a non-coop fishery, option a or b may be used

**Options for shore-based IFQ sector**

a. Charge each catcher vessel based on the value of IFQ species harvested by that vessel
b. Charge each first receiver based on the value of IFQ species processed

NOAA FISHERIES SERVICE

# Questions and Options for Council Consideration #3:

**How should fee collection be structured?**

**Options for CP sector**

a. **Bill entity chosen under #2 in last quarter of the calendar year**

   **- It is unclear how the other MSA options ( e.g. filing of landing report, sale of such fish) apply to the CP sector**

b. **Other?**

**Options for MS sector**

a. **Bill entity chosen under #2 in last quarter of the calendar year**
   - **It is unclear how the other MSA options ( e.g. filing of landing report, sale of such fish) apply to the CP sector**

b. **Other?**

**Options for shore-based sector**

a. **Bill entity chosen under #2 in last quarter of the calendar year**
b. **Fishermen billed at time of landing by first receiver, and collected monthly by the Agency in coordination with buyback fee**

NOAA FISHERIES SERVICE

## Questions and Options for Council Consideration #4:

**Linkage to permitting requirements?**

a. **None**
b. **Prior year's payment required for a complete permit application**
c. **Quota transactions suspended until payment received**
d. **30 days after failure to pay, IFQ account and/ or permit is suspended, and after 90 days, RA sends account to collections (modeled after SERO Cost Recovery Program)**
e. **Same as 4d. but with an administrative appeals process**

NOAA FISHERIES SERVICE

## Questions and Options for Council Consideration #5:

**How are agency costs identified? (depends on choice made in #1)**

a. **Implement a system to capture time allocation information for all personnel who work/ collaborate on management or enforcement of LAPP**
b. **Random sampling to assess costs, then extrapolate costs across the year**
c. **Use yearly projections of costs, as calculated and provided by the Agency, to determine fee percentage at the beginning of each fishing year**

NOAA FISHERIES SERVICE

# Questions and Options for Council Consideration #6:

**How is the ex-vessel value of the fish harvested under the LAPP calculated to ensure fee does not exceed 3%?**

**Options for CP sector**

a. use EDC pricing and tonnage data to calculate value
b. require submission of pricing and tonnage data to the Agency at the end of each fishing year, for purpose of value calculations
c. use shorebased pricing and at-sea tonnage to calculate value

**Options for MS sector**

a. use EDC pricing and tonnage data to calculate value
b. require submission of pricing and tonnage data to the Agency at the end of each fishing year, for purpose of value calculations
c. use shore-based pricing and at-sea tonnage to calculate value

**Options for shore-based sector**

a. calculated from landing information as recorded on e-fish ticket
b. calculated from landing information as recorded on paper fish ticket
c. calculated from information on buyback form

Science, Service, Stewardship

# NOAA Fisheries West Coast Groundfish Trawl Rationalization Program

# Incremental Costs

NOAA FISHERIES SERVICE

# THEN (April 2011)…



## NOAA Fisheries West Coast Groundfish Trawl Rationalization Program Implementation costs

| | | TIQ Development | | | | TIQ Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | FY2007 | FY2008 | FY2009 | FY2010 | FY2011 | FY2012 | FY2013 | FY2014 |
| NMFS Northwest Region | Base Groundfish Management Program | $1,400,000 | $1,400,000 | $1,400,000 | $1,400,000 | $1,400,000 | $1,400,000 | $1,400,000 | $1,400,000 |
| | NEW TIQ Regional Management (permitting, catch monitor administration) | $0 | $200,000 | $200,000 | $900,000 | $1,040,000 | $1,040,000 | $1,040,000 | $1,040,000 |
| | NEW Quota Share/Vessel Account System | $0 | $0 | $600,000 | $500,000 | $470,000 | $400,000 | $400,000 | $400,000 |
| | **TIQ Management Increase** | **$0** | **$200,000** | **$800,000** | **$1,400,000** | **$1,510,000** | **$1,440,000** | **$1,440,000** | **$1,440,000** |
| | **TIQ Mangement Total** | **$0** | **$200,000** | **$800,000** | **$1,400,000** | **$1,960,000** | **$1,890,000** | **$1,890,000** | **$1,890,000** |
| | **Groundfish Management Total** | **$1,400,000** | **$1,600,000** | **$2,200,000** | **$2,800,000** | **$2,910,000** | **$2,840,000** | **$2,840,000** | **$2,840,000** |
| NMFS Office of Law Enforcement | Base OLE funded GF Enforcement (NOAA & States) | $1,500,000 | $1,660,000 | $2,070,000 | $2,200,000 | $2,200,000 | $2,200,000 | $2,300,000 | $2,400,000 |
| | NEW TIQ Enforcement | $0 | $0 | $0 | $694,926 | $800,000 | $1,300,000 | $1,300,000 | $1,300,000 |
| | **TIQ Enforcement Increase** | **$0** | **$0** | **$0** | **$694,926** | **$800,000** | **$1,300,000** | **$1,300,000** | **$1,300,000** |
| | **TIQ Enforcement Total** | **$0** | **$0** | **$0** | **$694,926** | **$800,000** | **$1,300,000** | **$1,300,000** | **$1,300,000** |
| | **Groundfish Enforcement Total** | **$1,500,000** | **$1,660,000** | **$2,070,000** | **$2,894,926** | **$3,000,000** | **$3,500,000** | **$3,600,000** | **$3,700,000** |
| Northwest Fisheries Science Center | Base West Coast Groundfish Surveys/Assessments | $5,400,000 | $5,400,000 | $5,400,000 | $5,400,000 | $5,400,000 | $5,500,000 | $5,600,000 | $5,700,000 |
| | Base West Coast Groundfish Observer Program | $5,050,000 | $5,050,000 | $5,050,000 | $5,050,000 | $5,050,000 | $5,050,000 | $5,050,000 | $5,050,000 |
| | NEW Expanded TIQ Observer Program | $0 | $0 | $0 | $520,000 | $1,490,000 | $1,020,000 | $1,180,000 | $910,000 |
| | NEW Economic Data Collection Program | $0 | $0 | $0 | $0 | $380,000 | $390,000 | $400,000 | $420,000 |
| | **TIQ Science Increase** | **$0** | **$0** | **$0** | **$520,000** | **$1,870,000** | **$1,410,000** | **$1,580,000** | **$1,330,000** |
| | **TIQ Science Total** | **$0** | **$0** | **$0** | **$520,000** | **$3,120,000** | **$2,660,000** | **$2,830,000** | **$2,580,000** |
| | **Groundfish Science Total** | **$10,450,000** | **$10,450,000** | **$10,450,000** | **$10,970,000** | **$12,320,000** | **$11,960,000** | **$12,230,000** | **$12,080,000** |
| Observer and Catch Monitor Salary Reimbursement | Reimbursement for Observer and Catch Monitors | $0 | $0 | $0 | $600,000 | $3,920,000 | $1,520,000 | $1,250,000 | $0 |
| State Funding | Funds for state reporting improvements and TIQ costs | $0 | $0 | $0 | $600,000 | $500,000 | $0 | $0 | $0 |
| | **TIQ Increase** | **$0** | **$200,000** | **$800,000** | **$3,814,926** | **$8,600,000** | **$6,670,000** | **$5,570,000** | **$4,070,000** |
| | **TIQ Total** | **$0** | **$200,000** | **$800,000** | **$3,814,926** | **$10,300,000** | **$8,370,000** | **$7,270,000** | **$5,770,000** |
| | **Groundfish Program Total** | **$13,350,000** | **$13,710,000** | **$14,720,000** | **$17,864,926** | **$22,650,000** | **$20,820,000** | **$19,920,000** | **$18,620,000** |

NOW…

Estimated West Coast Groundfish Trawl Rationalization Program
NMFS Northwest Region, NW Fisheries Science Center and Office of Law Enforcement Implementation costs

| A1 | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | | TIQ Development | | | | TIQ Implementation | | | |
| 4 | | | FY2007 | FY2008 | FY2009 | FY2010 | FY2011 | FY2012 | FY2013 | FY2014 |
| 5 | NMFS Northwest Region | Base Groundfish Management Program (sum of rows 6 and 7) | $1,400,000 | $1,400,000 | $1,400,000 | $1,400,000 | $1,400,000 | $1,400,000 | $1,400,000 | $1,400,000 |
| 6 | | Base Non TIQ salaries & benefits | $1,400,000 | $1,400,000 | $1,400,000 | $1,400,000 | $950,000 | $950,000 | $950,000 | $950,000 |
| 7 | | Base TIQ salaries & benefits | $0 | $0 | $0 | $0 | $450,000 | $450,000 | $450,000 | $450,000 |
| 8 | | NEW TIQ Regional Management (permitting, catch monitor administration) (sum of rows 9 and 10) | $0 | $200,000 | $200,000 | $900,000 | $1,040,000 | $1,040,000 | $1,040,000 | $1,040,000 |
| 9 | | Salaries & benefits | $0 | $200,000 | $200,000 | $600,000 | $740,000 | $740,000 | $740,000 | $740,000 |
| 10 | | Contract - PSMFC Oversight of Catch Monitoring | $0 | $0 | $0 | $300,000 | $300,000 | $300,000 | $300,000 | $300,000 |
| 11 | | NEW Quota Share/Vessel Account System (sum of rows 12 and 13) | $0 | $0 | $600,000 | $500,000 | $470,000 | $400,000 | $400,000 | $400,000 |
| 12 | | Grant - PSMFC - catch database | $0 | $0 | $400,000 | $300,000 | $100,000 | $100,000 | $100,000 | $100,000 |
| 13 | | Transfer to NWFSC - QS/vessel acct./permits database | $0 | $0 | $200,000 | $200,000 | $370,000 | $300,000 | $300,000 | $300,000 |
| 14 | | **TIQ Management Incremental Increase (sum of row 8 and 11)** | $0 | $200,000 | $800,000 | $1,400,000 | $1,510,000 | $1,440,000 | $1,440,000 | $1,440,000 |
| 15 | | **TIQ Management Total (sum of row 7, 8 and 11)** | $0 | $200,000 | $800,000 | $1,400,000 | $1,960,000 | $1,890,000 | $1,890,000 | $1,890,000 |
| 16 | | **Groundfish Management Total (sum of row 5, 8 and 11)** | $1,400,000 | $1,600,000 | $2,200,000 | $2,800,000 | $2,910,000 | $2,840,000 | $2,840,000 | $2,840,000 |

Estimated West Coast Groundfish Trawl Rationalization Program
NMFS Northwest Region, NW Fisheries Science Center and Office of Law Enforcement Implementation costs

| A1 | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | | TIQ Development | | | | TIQ Implementation | | | |
| 4 | | | FY2007 | FY2008 | FY2009 | FY2010 | FY2011 | FY2012 | FY2013 | FY2014 |
| 17 | NMFS Office of Law Enforcement | Base OLE funded GF Enforcement (NOAA & States) (sum of rows 18 and 19) | $1,500,000 | $1,660,000 | $2,070,000 | $2,200,000 | $2,200,000 | $2,200,000 | $2,300,000 | $2,400,000 |
| 18 | | Base GF Enforcement OLE salaries & benefits | $1,130,000 | $1,370,000 | $1,620,000 | $1,000,000 | $1,000,000 | $1,000,000 | $1,100,000 | $1,200,000 |
| 19 | | Cooperative Enforcement Program | $370,000 | $290,000 | $450,000 | $1,200,000 | $1,200,000 | $1,200,000 | $1,200,000 | $1,200,000 |
| 20 | | NEW TIQ Enforcement (sum of rows 21 and 22) | $0 | $0 | $0 | $690,000 | $1,300,000 | $1,300,000 | $1,300,000 | $1,300,000 |
| 21 | | Salaries and benefits | $0 | $0 | $0 | $0 | $230,000 | $970,000 | $730,000 | $710,000 |
| 22 | | Contract Trawl techs | $0 | $0 | $0 | $250,000 | $420,000 | $30,000 | $270,000 | $270,000 |
| 23 | | Supplies | $0 | $0 | $0 | $150,000 | $50,000 | $0 | $0 | $20,000 |
| | | Joint Enforcement Agreement (State Enf. Funds) | $0 | $0 | $0 | $290,000 | $600,000 | $300,000 | $300,000 | $300,000 |
| 24 | | TIQ Enforcement Incremental Increase (row 20) | $0 | $0 | $0 | $690,000 | $1,300,000 | $1,300,000 | $1,300,000 | $1,300,000 |
| 25 | | TIQ Enforcement Total (row 20) | $0 | $0 | $0 | $690,000 | $1,300,000 | $1,300,000 | $1,300,000 | $1,300,000 |
| 26 | | Groundfish Enforcement Total (sum of row 17 and 20) | $1,500,000 | $1,660,000 | $2,070,000 | $2,890,000 | $3,500,000 | $3,500,000 | $3,600,000 | $3,700,000 |

Estimated West Coast Groundfish Trawl Rationalization Program
NMFS Northwest Region, NW Fisheries Science Center and Office of Law Enforcement Implementation costs

| A1 | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | | TIQ Development | | | | TIQ Implementation | | | |
| 4 | | | FY2007 | FY2008 | FY2009 | FY2010 | FY2011 | FY2012 | FY2013 | FY2014 |
| 27 | Northwest Fisheries Science Center | Base West Coast Groundfish Surveys/Assessments | $5,400,000 | $5,400,000 | $5,400,000 | $5,400,000 | $5,400,000 | $5,500,000 | $5,600,000 | $5,700,000 |
| 28 | | Base West Coast Groundfish Observer Program (sum of rows 29 to 33) | $5,050,000 | $5,050,000 | $5,050,000 | $5,050,000 | $5,050,000 | $5,050,000 | $5,050,000 | $5,050,000 |
| 29 | | Base Non TIQ salaries | $830,000 | $830,000 | $830,000 | $830,000 | $340,000 | $340,000 | $340,000 | $340,000 |
| 30 | | Base Non TIQ other costs | $120,000 | $120,000 | $120,000 | $120,000 | $120,000 | $120,000 | $120,000 | $120,000 |
| 31 | | Base Non TIQ grant to PSMFC | $4,130,000 | $4,130,000 | $4,130,000 | $4,130,000 | $3,340,000 | $3,340,000 | $3,340,000 | $3,340,000 |
| 32 | | Base TIQ salaries | $0 | $0 | $0 | $0 | $500,000 | $500,000 | $500,000 | $500,000 |
| 33 | | Base TIQ grant to PSMFC | $0 | $0 | $0 | $0 | $750,000 | $750,000 | $750,000 | $750,000 |
| 34 | | NEW Expanded TIQ Observer Program (sum of rows 35 to 38) | $0 | $0 | $0 | $520,000 | $1,480,000 | $1,020,000 | $1,180,000 | $910,000 |
| 35 | | Salaries | $0 | $0 | $0 | $230,000 | $600,000 | $670,000 | $710,000 | $740,000 |
| 36 | | Studies to improve ITQ Program efficiency | $0 | $0 | $0 | $180,000 | $410,000 | $160,000 | $300,000 | $0 |
| 37 | | Equipment | $0 | $0 | $0 | $110,000 | $380,000 | $90,000 | $70,000 | $70,000 |
| 38 | | Other ITQ costs (travel, rents, printing, supplies) | $0 | $0 | $0 | $0 | $100,000 | $100,000 | $100,000 | $100,000 |

Estimated West Coast Groundfish Trawl Rationalization Program
NMFS Northwest Region, NW Fisheries Science Center and Office of Law Enforcement Implementation costs

| A1 | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | | TIQ Development | | | | TIQ Implementation | | | |
| 4 | | | FY2007 | FY2008 | FY2009 | FY2010 | FY2011 | FY2012 | FY2013 | FY2014 |
| 39 | | NEW Economic Data Collection Program (sum of rows 40 to 42) | $0 | $0 | $0 | $0 | $380,000 | $390,000 | $400,000 | $420,000 |
| 40 | | Salaries | $0 | $0 | $0 | $0 | $240,000 | $250,000 | $260,000 | $280,000 |
| 41 | | Database management | $0 | $0 | $0 | $0 | $100,000 | $100,000 | $100,000 | $100,000 |
| 42 | | Other ITQ costs (travel, rents, printing, supplies) | $0 | $0 | $0 | $0 | $40,000 | $40,000 | $40,000 | $40,000 |
| 43 | | TIQ Science Incremental Increase (sum of row 34 and 39) | $0 | $0 | $0 | $520,000 | $1,870,000 | $1,410,000 | $1,580,000 | $1,330,000 |
| 44 | | TIQ Science Total (sum of row 32,33,34,39) | $0 | $0 | $0 | $520,000 | $3,120,000 | $2,660,000 | $2,830,000 | $2,580,000 |
| 45 | | Groundfish Science Total (sum of rows 27,28,34,39 | $10,450,000 | $10,450,000 | $10,450,000 | $10,970,000 | $12,320,000 | $11,960,000 | $12,230,000 | $12,080,000 |
| 46 | | | | | | | | | | |
| 47 | | NMFS TIQ Increase (sum of row 14,24, and 43 | $0 | $200,000 | $800,000 | $2,610,000 | $4,680,000 | $4,150,000 | $4,320,000 | $4,070,000 |
| 48 | | NMFS TIQ Total (sum of row 15, 25, and 44) | $0 | $200,000 | $800,000 | $2,610,000 | $6,380,000 | $5,850,000 | $6,020,000 | $5,770,000 |
| 49 | | NMFS Groundfish Program Total (sum of row 16, 26, and 45) | $13,350,000 | $13,710,000 | $14,720,000 | $16,660,000 | $18,730,000 | $18,300,000 | $18,670,000 | $18,620,000 |

NOAA FISHERIES SERVICE

# Percentage of Costs by Sector

## Rough Estimates

| | 2005-2009 Average Revenue (from 2011-12 Spex FEIS) | MSA Limit on Cost recovery | Percentage Costs by Sector - Region | Percentage Costs by Sector - OLE | Percentage Costs by Sector - NWFSC | Percentage Costs by Sector – WA | Percentage Costs by Sector – OR | Percentage Costs by Sector – CA |
|---|---|---|---|---|---|---|---|---|
| | **(Millions-2009$)** | **(3%)** | **(estimated)** | | | | | |
| **Non-Tribal Limited Entry Trawl** | | | | | | | | |
| CP-whiting | $11,600,000 | $348,000 | 10 to 10.4% | 1% | 5% | 5% | 0% | 0% |
| Mothership-whiting | $7,500,000 | $225,000 | 12 to 15.2% | 12% | 5% | 10% | 0% | 0% |
| Shoreside total | $38,000,000 | $1,140,000 | 74 to 78% | 87% | 90% | 85% | 100% | 100% |
| **Total non-tribal Trawl** | **$57,100,000** | **$1,713,000** | **$1,440,000** | **$1,300,000** | **$1,330,000** | **$594,218** | **$391,305** | **$770,000** |

NOAA FISHERIES SERVICE

# Costs by Sector, Across Agencies

| | Region | Enforcement | Northwest Science Center |
|---|---|---|---|
| **Total** | **$1,440,000** | **$1,300,000** | **$1,330,000** |
| Proportion of Costs - CP-whiting | $149,760 | $13,000 | $66,500 |
| Proportion of Costs - Mothership-whiting | $218,880 | $156,000 | $66,500 |
| Proportion of Costs - Shoreside | $1,065,600 | $1,131,000 | $1,130,500 |

| **Total NOAA Costs by Sector** | |
|---|---|
| CP-whiting | $229,260 |
| MS-Whiting | $441,380 |
| Shoreside | $3,327,100 |

NOAA FISHERIES SERVICE

# Costs by Sector, Across States

| | Washington | Oregon | California |
|---|---|---|---|
| Proportion of Costs - CP-whiting | $29,711 | $0 | $0 |
| Proportion of Costs - Mothership-whiting | $59,422 | $0 | $0 |
| Proportion of Costs - Shoreside | $505,085 | $391,305 | $770,000 |

| **Total State Costs by Sector** | |
|---|---|
| CP-whiting | $29,711 |
| MS-Whiting | $59,422 |
| Shoreside | $1,666,390 |

NOAA FISHERIES SERVICE

# Costs by Sector, Bottom Line

| | 2005-2009 Average Revenue (from 2011-12 Spex FEIS) | MSA Limit on Cost recovery 3% | Surplus or Deficit |
|---|---|---|---|
| CP-whiting | $11,600,000 | $348,000 | $89,029 |
| Mothership-whiting | $7,500,000 | $225,000 | -$275,802 |
| Shoreside total | $38,000,000 | $1,140,000 | -$3,083,490 |
| **Total non-tribal Trawl** | **$57,100,000** | **$1,713,000** | |

NOAA FISHERIES SERVICE

# Concluding Remarks

- Funding can only come from cost recovery fees or appropriations
- Cost recovery fees insufficient to fully fund agency needs under existing fishery
  - Appropriations needed to fund existing program
- Important to explore ways to:
  - Increase value of fishery
  - Reduce Program Costs

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# Questions?

# SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON PRIORITY TRAILING ACTIONS UNDER TRAWL RATIONALIZATION SLATED FOR PRELIMINARY ACTION

Mr. Jim Seger briefed the Scientific and Statistical Committee (SSC) on control limit safe harbors for community fishing associations (CFAs) and risk pools. The SSC reviewed Agenda Item E.7.a Attachments 1 and Supplemental Attachment 2, which contain analyses of control limit safe harbors for CFAs. No analysis of risk pool safe harbors was available to the SSC, thus our review focused only on the CFA control limits.

The rationale for setting control limits under Amendment 20 included the following five objectives: 1) preventing excessive shares, 2) preventing the exertion of market power without impacting efficient operations, 3) dispersion of harvest and landings to the benefit of communities, 4) fairness and equity, and 5) sector health. Relaxing the control limits for CFAs may reduce the benefits achieved, however, it would be very difficult to provide a quantitative evaluation of this effect. This is due to the lack of available data and the complexity of the analysis that would be required. Nevertheless, the reviewed attachments provide useful information and analyses that can be used to inform the setting of control limits, and how changes in control limits may affect the stated objectives.

The Council has asked what quantity of landings is needed by a port to maintain its infrastructure and remain viable. Figures A-3 and A-4 of Attachment 1 depict the amounts of various species landed at ports relative the current control limits. Given the available data, this historical analysis is informative as it may point to the amount of landings necessary to maintain continued operation. The SSC notes, however, that there are several qualifications:

- It does not show whether other fisheries or conditions have changed or will change. The combined effect of groundfish and other landings and activity is important. The SSC recommends that the percentage of landings that are limited entry trawl groundfish be added to the bottom of each port listed in the figures. This would provide information about the relative importance of groundfish landings in each port.
- The analysis of landings is on an annual basis. How landings are distributed throughout the year, which may be affected by trawl rationalization, is also important.
- The life span of infrastructure and the level of activity necessary for infrastructure investment are significant factors to long-term port viability. These quantities are not captured in the analysis.

The interaction between ports and their effect on one another is an important consideration to the adjustment of control limits. Tables A-4 through A-6 describe the number of vessels delivering to each port. The SSC recommends that these data also be used to show the relationship between ports by using a matrix of ports where each cell contains the number of vessels delivering to any two ports.

PFMC
06/11/11

State of Washington
**DEPARTMENT OF FISH AND WILDLIFE**

Mailing Address: 600 Capitol Way N • Olympia, WA 98501-1091 • (360) 902-2200, TDD (360) 902-2207
Main Office Location: Natural Resources Building • 1111 Washington Street SE • Olympia, WA

April 29, 2011

Mr. Frank Lockhart, Sustainable Fisheries Division Manager
National Marine Fisheries Service, Northwest Region
7600 Sand Point Way, N.E., BIN C15700
Seattle, Washington 98115-0070

Dear Mr. Lockhart:

As the West Coast Trawl Catch Share Program has gotten underway, the Washington Department of Fish and Wildlife (WDFW) has identified the following costs for our activities associated with the management, data collection and analysis, and enforcement of the trawl rationalization program. WDFW had submitted preliminary estimates to you in 2009; however, as the trawl rationalization program has been implemented, we have incurred higher-than-anticipated costs, primarily due to the electronic fish ticket system.

Management and Data Collection

As we have transitioned to the electronic fish ticket system, many issues have arisen which need to be addressed on a daily basis, such as recording catch across multiple catch areas and having insufficient data fields to record landings, and reconciling revised fish tickets (e.g., some processors submit several fish ticket revisions within a few days and there does not seem to be an end point specified). Having a dedicated staff person to run the program, complete data quality checks, work with the first receivers to ensure electronic tickets are completed correctly, work with WDFWs enforcement staff on potential investigations, and address unanticipated problems with the system with Pacific States Marine Fisheries Commission (PSMFC) staff and the other users is essential to successful implementation. While we would hope that specific problems with the fish ticket design and completion would diminish over time as formats are revised and fish dealers become more comfortable with the new system, the work needed to: check for data quality, follow up with potential investigations, and coordinate with PSMFC and other users is expected to be ongoing, similar to our engagement in the PacFIN data coordination process.

Data Collection and Analysis

WDFW currently does not have the funding through PacFIN to adequately cover port sampling of the coastal groundfish fishery, or the funding needed to process and read the age structures collected by port samplers. We currently employ four port sampling staff—one supervisor and three field staff in Bellingham, Neah Bay, and Westport. For the past several years, the sampler in Neah Bay has also sampled the Makah tribal fishery, which has increased over time. With the implementation of the trawl rationalization program, there are non-whiting groundfish landings occurring in Ilwaco, which has not occurred for over ten years and we are not staffed to adequately sample these landings.

As you know, port samplers collect biological data and age structures, and enter that data in to a coastwide biological data system, which is accessed by stock assessment teams and fishery managers. Not only do the lengths and weights feed into the assessments, for some species, the average weights are also used to calculate catch estimates in the recreational bottomfish fishery.

In addition to biological sampling, WDFW port samplers also do species composition of groundfish landed in market categories (e.g., minor shelf and slope rockfish), and collect logbooks and enter logbook data, which is used to determine fishing location. Logbook data are also used by enforcement staff, as needed, to support prosecution of fishing violations. Samplers also work with fishermen and processors to answer questions regarding regulations and correct errors associated with fish tickets and logbooks.

Also, port samplers and temporary technicians process the samples in the lab in the Montesano office. These samples, as well as samples from Oregon and California, are then transferred to be aged in the lab in the Olympia office. These age structures are then processed in the lab, which for species such as lingcod, is a time-consuming process. Those age structures are then read by dedicated age readers with several years of experience. WDFW age readers have participated in coastwide efforts to standardize age reading and cross-read structures with California, Oregon, and National Marine Fisheries Service (NMFS) staff.

As you know, the Council relies on sound science to form the basis of its decisions and age data, in particular, is a key component of our groundfish stock assessments. As has been noted by the Groundfish Management Team and others, there are higher amounts of groundfish being landed under the trawl rationalization program—both in the number of species and amounts of each species, such as lingcod, being landed. This provides an opportunity for us to collect much-needed biological samples and age structures for a greater variety of species; however, those structures need to be processed, read, and entered in to the coastwide biological data system. While it may be argued that this work is not necessary for trawl rationalization implementation,

it is new work resulting from the trawl rationalization program and directly contributes to the success of managing the West Coast Groundfish fishery by building the foundation for future new assessments and improving the data for stocks previously assessed.

Enforcement

WDFW enforcement officers, particularly our dedicated marine division, are essential to ensuring compliance with groundfish fishing regulations, conducting investigations of potential violations, and following up with prosecution of those violations. Our enforcement officers are rigorously trained and educated on the complex system of groundfish fisheries and regulations. We provide an at-sea and on-the-dock presence and officers stationed on the coast can quickly respond to potential violations. With the implementation of the trawl rationalization program and increased landings into Washington ports, new investigative officers are needed to ensure compliance with the program as well as other groundfish regulations.

In summary, WDFW has identified annual costs (see enclosed) associated with staff to support electronic fish ticket data entry, quality control, and coordination; port sampling and age reading; and enforcement. These costs are the result of implementing the trawl rationalization program and WDFW does not have the funds to cover these activities.

If you have any questions, please feel free to contact Michele Culver, Regional Director, at (360) 249-1211 or at Michele.Culver@dfw.wa.gov.

Sincerely,

Philip Anderson
Director

Enclosure

cc: Council Members
John Stein, NWFSC
Michele Culver, WDFW

## WDFW Estimated Costs to Implement Trawl Catch Share Program

**Annual Costs: $594,217**

| ***Scientific Technician 4 (Port Sampler)*** | Cost/Mo | # Months | Total |
|---|---|---|---|
| Salary and Benefits | $5,336 | 12 | $64,032 |
| Travel | $500 | 12 | $6,000 |
| Goods/Services | $125 | 12 | $1,500 |
| Indirect | $1,341 | 12 | $16,095 |
| | | ***Subtotal*** | ***$87,627*** |

| ***Information Technology Specialist 5*** | Cost/Mo | # Months | Total |
|---|---|---|---|
| Salary and Benefits | $8,225 | 12 | $98,700 |
| Travel | $0 | 0 | $0 |
| Goods/Services | $125 | 12 | $1,500 |
| Indirect | $1,879 | 12 | $22,545 |
| | | ***Subtotal*** | ***$122,745*** |

| ***Age Reader*** | Cost/Mo | # Months | Total |
|---|---|---|---|
| Salary and Benefits | $6,000 | 12 | $72,000 |
| Travel | $0 | 0 | $0 |
| Goods/Services | $125 | 12 | $1,500 |
| Indirect | $1,378 | 12 | $16,538 |
| | | ***Subtotal*** | ***$90,038*** |

| ***Fish & Wildlife Enforcement Officers (2)*** | Cost/Mo | # Months | # FTEs | Total |
|---|---|---|---|---|
| Salary and Benefits | $7,934 | 12 | 2 | $190,416 |
| Travel | $85 | 12 | 2 | $2,040 |
| Vehicle Lease-Purchase | $585 | 12 | 2 | $14,040 |
| Goods/Services | $1,323 | 12 | 2 | $31,752 |
| Indirect | $2,315 | 12 | 2 | $55,560 |
| | | | ***Subtotal*** | ***$293,808*** |

# City of Morro Bay
Morro Bay, CA 93442
(805) 772-6200
www.morro-bay.ca.us

May 19, 2011

Pacific Fishery Management Council
7700 NE Ambassador Place Suite 101
Portland Oregon, 97220

RE: Priority Trailing Actions on Trawl Rationalization, Safe Harbor from Control Limits for Community Fishing Associations (CFAs).

We are providing these comments in response to some of the questions raised in previous Council discussions of CFAs and to assist you in developing a Preliminary Preferred Alternative that addresses concerns and meets the needs of Communities that desire to stabilize access to ground fish in the trawl rationalization program.

ISSUE: **Why does a community such as Morro Bay or Monterey want to form a CFA/Quota bank and why does a community need to exceed established control limits.**

From the Trawl IQ program Final EIS, Chapter 4, page 236.
" Each port has unique characteristics which may give it advantages or disadvantages in attracting landings, such as productive fishing grounds with relatively low OFS catch rates, well-developed infrastructure, or a concentration of well-capitalized fishing and processing operations. However, infrastructure development and concentrated capital depend to some degree on a threshold level of economic activity in the first place. Therefore, ports with those advantages are in position to enhance their position, while ports with poor infrastructure or lacking readily available capital are vulnerable to further decline over time".

The trawl rationalization program final EIS identifies four factors for assessing a community's comparative advantage: relative bycatch rate; fishing infrastructure; economic efficiency of the local fleet; and initial distribution of quota. Applying these factors, the final EIS identifies a number of Central California communities as "vulnerable", either because of their high degree of dependence on the fishery, their low degree of resilience relative to loss of Pacific Coast groundfish landings, or a combination of the two.

The Communities of Morro Bay and Monterey have a high degree of dependence on groundfish landing to support harbor infrastructure. We are also concerned about the relative economic efficiency of individual operators under the trawl IQ program that we foresee will cause QS historically landed in these ports to consolidate overtime in a few less vulnerable ports.

Vulnerable communities that wish to stabilize or enhance their engagement in the Pacific Coast groundfish fishery can potentially do so by acquiring quota and offering it to fishermen at advantageous lease rates to attract and stabilize deliveries in their geographic area. Vulnerable communities can form a Community Fishing Association such as the Central Coast Community Quota Bank to hold such quota for the social and economic benefit of the community and to work collectively to reduce costs and make individual operators more competitive in the Trawl IQ program. However, communities are currently limited to holding and controlling the same amount of QS that a fishing firm may hold and control.

Individual fishing firms operate to make a profit, and can make deliveries where and when they choose. If there is sufficient price disparity among potential delivery ports, a firm is likely to re-direct landings to a port offering higher value, rather than forgo value to deliver based on personal relationships. In other words, a firm is likely to value profit over social stability, and has sufficient flexibility under the trawl rationalization program to pursue profitability, even if that comes at the expense of a port community's stability.

A fishing community, on the other hand, represents the aggregate interests of the fishery stakeholders who live and work within its boundaries, and must attract deliveries to its port to maintain its engagement in the fishery and its overall fishing economy. The scale and scope of its interests suggests that its QS holding and usage needs are likely to be greater than those of an individual firm. Further, because a community is likely to value social stability over profit, it may discount the income it receives from its QS for social welfare purposes, and may need more QS than a firm in order to cover its administrative and overhead expenses and initiate special programs such as new entrant incentives.

CFA's or Community Quota Banks will place a high value on creating support and incentives for new entrants to the fishery, understanding that new entrants will keep the port alive and the fleet diverse. If there are no community quota banks or other cooperatives with ability to hold ample QS to distribute to new entrants then demand for QS will be consolidated over time to a few ports and firms. New entrants are likely to be priced out of the fishery or forced to sign delivery contracts with one of the large processing firms in return for credit.

The accumulation limits were designed to permit a fishing firm to acquire enough QS to support the fishing operations of two Pacific coast groundfish vessels. A **fishing community would need more than a single fishing firm's QS to support infrastructure investments and to draw and hold the processing capacity necessary to support fleet deliveries.** Further, some communities have had a high degree of dependence on deliveries of one or more specific species (such as Morro Bay's dependence on sablefish), and may need to acquire QS in excess of the species accumulation limit to stabilize their fishing economies.

ISSUE: **If an exception is made for the Morro Bay CQB (or Monterey or Fort Bragg in the future) how can that not be offered to a similar private arrangement seeking to compete in the Trawl IQ program and what would prevent such an exception from being abused by the targets of creating the control limits?**

A qualified Community Fishing Association should be formed around certain protections against abuse already developed by PFMC, such as the QS ownership will be managed by a public benefit/social welfare corporation, supported by a broad group of community participants with goals beyond individual profitability. We have accepted these terms and incorporated them into our planning for the Central Coast Community Quota Bank (CCCQB). From the perspective of the PFMC the purpose of the CCQCB is to comply with Magnuson Stevens' requirements to mitigate negative community impacts and in line with all of the work the PFMC has done in the FEIS on this issue. While we think other communities will use the Community Quota Bank tool, it is unlikely that private parties will see this route as useful method of getting around ownership control caps. The nature of the conditions that we have accepted in formulating a public benefit corporation with broad community social and economic goals makes a clear distinction between private parties requesting similar treatment. The structure being proposed by the CCCQB is that of a non-profit corporation and all of the QS will be held by the CQB and leased to participating fishermen. Though the CQB might be holding QS in excess of the accumulation caps, individuals will not be directly benefiting from the use of those QS in any way, as all benefits will accrue to the non-profit for support of its public benefit and social welfare goals.

ISSUE: **The IQ program is designed to let the free market reorganize trawl groundfish landings around efficiency and increased accountability. Why not just let the free market work?**

Because Magnuson Stevens foresaw that such programs will have negative community impacts due primarily to consolidation and requires all reasonable steps to avoid or mitigate those impacts. The FEIS for the Trawl IQ program outlined that the Council would complete trailing amendments to the program in the early years to mitigate these negative community impacts in part by Allowing for CFA's that stabilize groundfish landings in vulnerable ports. We think we have a mechanism that can work to mitigate negative community impacts while still achieving the overall goals of the trawl IQ program (increased efficiency and accountability) but to execute our strategy we will need scale in excess of individual control limits.

ISSUE: **Why not work within the existing Control limits and use a small amount of QS as an inducement for private parties to bring additional Quota Landings to a community?**

It has been suggested that communities do not need a higher accumulation limit, because a community can use the amount of QP available to it under the current QS accumulation limit as an inducement to attract deliveries in excess of that amount. However, it is reasonable to assume a community would need multi-year delivery agreements to amortize investments and to induce processors to maintain delivery markets.

**If those multi-year agreements cumulatively control the delivery of QP in an amount that back-calculates to an amount of QS that exceeds the relevant accumulation limit, absent an accumulation limit amendment, those agreements would constitute a control rule violation.** Further, requiring communities to use QP leveraging to induce the landings places them in competition with each other and the processing sector for some portion of their desired delivery volume. While this approach enhances ex-vessel price competition, it makes amortization of community infrastructure investments less secure. This approach would therefore increase the cost of funds for those investments, and could make some otherwise supportable projects infeasible.

ISSUE: **What special privilege exactly is the Central Coast Community Quota Bank asking for?**

We are asking for an exception to the cumulative control limits for designated CFA's up to 2 times the existing cumulative limit and exception from species control limits based on geographic designation of a CFA and the history of that location's landings in certain species that historically have disproportionately supported that community. We suggest exceptions to species control limits based on a 10 year average of species landings in that community relative to the total OY of that species. **We are not asking for any other special privileges and will compete with other participants equally in other regards, although we do anticipate working in Risk Pools, cooperatively working to reduce costs and create efficiencies, just like every other successful participants most likely will in some fashion.**

ISSUE: **What is the cost to other participants of granting CFA's and exception to the control limits?**

The special privileges requested are very limited; one can postulate that by granting an exception regulators will put CFA's in a position to acquire larger amounts of QS, therefore possibly driving up the price of other QS to some unknown extent to other participants. Frankly it would seem unlikely that CFA's are going to have any substantial effect on the QS market given the difficulties in raising funds to acquire quota and that even with a limited exception to the control limits that we suggest, the proportion of the overall QS market held by any single CFA is relatively small. We have heard the argument that many CFA's collectively could increase QS market price. We do think that some other Quota Banks will be formed for the same purposes that we are attempting to form the CCQCB, but unfortunately when the challenges are carefully considered it is unlikely that there will be a large number of designated CFA's in the West coast trawl IQ program. If we are wrong in this regard, we suggest that is exactly what you are hoping to achieve in granting a control rule exception to CFA's to ameliorate negative community impacts. CFA's should be required to have active and successful New Entrant programs as we will institute in the CCQCB, so that if QS price and fishing costs are prohibitive to new entrants as most people expect, then successful CFAs will be a catalyst for long term stability and success in the fishery.

ISSUE: **Will other communities, besides Morro Bay, benefit from the CQB structure? Is there support for the CQB from other communities in the fishery?**

Right now Morro Bay has been leading this effort and is farthest along in developing a structure and financing model for a designated Community Quota Bank that will try to acquire QS to stabilize groundfish landings in our community. We hope we can make it work for our community and strongly suspect it will be replicated, if successful, in other communities like ours such as Monterey/ Moss landing. The CCCQB is very open to sharing its experience and research around structure and financing with other communities, in fact, we anticipate sharing knowledge and resources among other CQB's as these entities are formed.

Thank you for your time and consideration.

Andrea Lueker
City Manager

Jeremiah O'Brien
President MBCFO

Chris Kubiak
CEO Central Coast Sustainable Groundfish Association

Shoreside Trawl Individual Quota Program
Trailing Amendments
Control Rule "Safe Harbor" for Risk Pool Agreements

Submitted May 19, 2011

Contact:
Merrick Burden
Environmental Defense Fund
206.932.5270
mburden@edf.org

Joe Sullivan
Mundt MacGregor, LLP
206.319.1104
jsullivan@mundtmac.com

1. Background. One of the most challenging aspects of the Pacific Coast groundfish trawl individual fishing quota (IFQ) program is the small amount of constraining species quota pounds (QP) fishermen hold. Specifically, the aggregate QP amounts for seven overfished species (i.e., yelloweye rockfish, canary rockfish, cowcod, boccaccio rockfish, darkblotched rockfish, Pacific ocean perch, and widow rockfish) and for Pacific halibut are very small.

Under the IFQ program, a person cannot fish if they have a QP account deficit. Therefore, if a person harvests an amount of any IFQ program species that exceeds their QP allocation for that species, they are required to cease fishing until they have obtained an amount of QP adequate to cover their deficit. Given the very small amounts of constraining species QP allocated, most IFQ program fishermen face a significant risk of unintentionally exceeding their constraining species QP allocation.

There are currently two potential sources from which a fisherman could obtain the constraining species quota necessary to cover a QP deficit and return to fishing: the QP market, or a risk pool arrangement under which the risk pool provides "insurance" against such events.

Under the QP market model with no risk pool arrangement (i.e., the "pure" market model), fishermen with a constraining species QP deficit obtain the necessary QP through purchase. Fishermen who use their constraining species QP more efficiently are able to harvest greater amounts of target species QP per unit of constraining species QP, and therefore are able to pay more for constraining species quota shares (QS) and QP. Under this model, fishermen who are better at avoiding constraining species catch ultimately acquire QS and QP in amounts approaching the accumulation limits, and fishermen who are

worse at doing so ultimately exit the fishery either by becoming inactive QP lessors, or by selling their QS.

There are several problems with the pure market model for constraining species QP usage under the IFQ program. One class of problems is related to the thin and patchy initial distribution of constraining species QP among fishermen, i.e., the total amount allocated is very small, and the distribution among fishermen is highly variable. There is also a specific problem with incentives that the pure market model creates regarding sharing of constraining species avoidance information and techniques.

The very small amount of constraining species QP available is especially problematic because constraining species catch events are not entirely predictable and catch volumes per event can vary widely. As a result, a fisherman taking all reasonable measures to avoid constraining species catch may nonetheless unintentionally harvest his or her entire annual QP allocation for one or more constraining species stocks well before having harvested his or her target species QP. For precisely this reason, constraining species QP is unlikely to be available from other active fishermen until they have ceased fishing for the year, as they have a strong incentive to retain their constraining species QP to cover their own risk.

Constraining species QP may be available from QS holders who are not fishing, but may be very expensive, as constraining species QP represents the opportunity value of the otherwise foregone target species catch, and the value of clearing a QP account deficit and being able to return to fishing. Under these circumstances, the constraining species QP market could result in a substantial transfer of Pacific Coast groundfish resource rent from active fishermen to inactive QS holders.

Further, the patchy distribution of constraining species QS presents significant equity issues. Ironically, fishermen who conducted the cleanest fishing during the QS calculation base years were "rewarded" with the lowest initial allocations of constraining species QS. These fishermen enter the QS and QP market at a substantial disadvantage, and question whether a market based approach to constraining species QP usage is fair.

The pure market model of constraining species QP usage also creates perverse incentives regarding sharing of constraining species avoidance information and techniques. Under the pure market model, fishermen compete with each other to capture the most value from their constraining species QP, in order to position themselves to out-bid their competitors for additional QS and QP. Under this model, each fisherman has an incentive to hoard, rather than share, constraining species catch data and avoidance techniques, as those data and techniques represent a competitive advantage in QP market transactions. However, both the frequency and magnitude of constraining species catch events are likely to be greater if fishermen do not share this information. Hoarding information therefore increases the risk of cumulative constraining species catch triggering a regulatory overfishing determination, which could in turn result in large areas of otherwise productive fishing grounds being closed, or, in an extreme case, could result in the fishery being closed before the available target species QP is harvested.

In light of the factors set forth above, it does not appear that a market-based approach to constraining species QP usage alone will facilitate successful prosecution of the Pacific Coast groundfish fishery.

This issue has been recognized for some time. The risks associated with constraining species catch events in an IFQ fishery first led to the consideration of insurance-like pooling arrangements during the development of Amendment 20. As an alternative to a pure market-based approach to constraining species catch management, the Council discussed "risk pools", i.e., arrangements under which fishermen would pool quota and develop terms for covering inadvertent catch events, should they occur. The risk pool trailing amendment before the Council for consideration is a natural outgrowth of those discussions.

2. The Control Rule and Accumulation Limit Issue. As part of the development of the Pacific Coast groundfish trawl rationalization program, the Council adopted strict accumulation limits that restrict the amount of QS that an entity can hold or control, and developed detailed definition of "control".

The control rule provides that "no person may own or control, or have controlling influence over, by any means whatsoever an amount of QS or IBQ for any individual species that exceeds the Shorebased IFQ Program accumulation limits". See 50 CFR 660.140(d)(4)(A); Final Allocation Rule, pages 87-88.

As it stands, each person that is party to a risk pool agreement could use the agreement to exert "control" over the constraining species QP that is governed by the agreement. For example, if the risk pool agreement provides for QP coverage of a qualifying catch event, and the risk pool fails to provide that coverage, the party entitled to QP coverage could potentially use the agreement to force a QP transfer.

QP is only issued for a year at a time. Therefore, if a risk pool agreement governs the use of QP over multiple years, or even if the agreement simply requires a party to cover a QP overage in the present year with QP from a future year, each party to the agreement could be considered to be exercising control over the QS that generates the QP that is governed by the risk pool agreement. In other words, if a risk pool agreement governs QP from a future year, it is not just controlling future QP – it is controlling the QS that gives rise to that QP.

In summary, if a multi-year risk pool agreement governs an amount of constraining species QP that back-calculates to an amount of QS that exceeds one or more accumulation limits, its parties could be considered to be violating those accumulation limits through the control each of them exercises under the agreement.

This issue could potentially be avoided by limiting risk pool agreements to a single year term, and limiting the quota they govern to QP for a single year. However, this limitation presents its own set of problems. Consider the case of a fisherman operating in compliance with risk pool rules who has a constraining species catch event which exceeds the amount of constraining species QP available in the pool for that year. The fisherman would be required to cease operating until the deficit is covered. If risk pool participants are unable to acquire additional constraining species QP to cover the deficit, the

deficit would persist into the following year. If the risk pool agreement does not persist into the following year, the fisherman is left without risk pool coverage, and the fisherman's only recourse is the constraining species QP market. As noted in the background section, above, it is not at all clear that the fisherman in deficit could obtain constraining species QP on the market in a reasonable amount of time and at a reasonable cost, even if he or she were entitled to monetary relief from the risk pool. This result is fundamentally unfair to the affected fisherman.

Further, the risk of an uncovered catch event creates an incentive among risk pool participants to race for constraining species coverage from the pool. A race for coverage is inconsistent with the need to conduct fishing operations such that constraining species catch is minimized, and if triggered, would undercut the pool's ability to function as desired.

It is important to note that any form of agreement among the risk pool participants to cover the fisherman's QP deficit in the subsequent year implicates the control rule and accumulation limit issues identified above. In other words, absent a risk pool control rule exemption, resolving this situation through informal or "side" agreements concerning constraining species QP coverage would expose pool participants to same risks of a regulatory violation as an explicit multi-year risk pool agreement.

3. Risk Pool Exemption Elements. Because the QS and QP markets alone do not adequately address the constraining species problem, and because single year risk pool agreements do not provide robust risk protection, we propose that qualifying risk pool agreements be exempted from application of the QS accumulation limit control rule. The specific elements of the exemption we propose are identified in the following subsections.

3.1 Scope of Exemption. The constraining species QS governed by a qualifying risk pool agreement should not be subject to an accumulation limit or cap. Risk pools are a form of insurance. As the size of the constraining species QP pool available to cover inadvertent catch events increases, the arrangement becomes more effective for reducing risk, and economies of scale reduce each member's costs related to monitoring catch patterns, adapting fishing plans and enforcing risk pool rules.

It is important to note that risk pools may have a tiered structure. Under this structure, the primary risk pool agreements are fishing plans adopted by individual fishing associations. Associations may then enter into an "umbrella" risk pool agreement, under which they provide constraining species catch "re-insurance" for each other. If a tiered structure approach is used, the risk pool agreement control rule exemption should extend to both the primary agreements adopted by participating fishing associations, and to the "umbrella" agreement under which the associations provide each other with constraining species catch re-insurance.

3.2 Covered Species. The basic criteria for including constraining species within the scope of the risk pool exception are:

(i) Is the species subject to substantial catch variability, leading to uncertainty when setting expectations and planning fishing activity?

(ii) Does the species concerned constrain access to target species? and

(iii) Does QP for the species exhibit "thin market" conditions, i.e., are price expectations and the ability to locate quota on a market unclear?

Applying these criteria, we propose that the Council designate the seven overfished species identified above and Pacific halibut as species eligible for a risk pool accumulation limit and control rule exemption. We also suggest a procedure be established for re-evaluating whether to modify the eligible species designations on a regular basis.

We understand the Council may desire further analysis on whether to include Pacific halibut as a covered species under a potential risk pool exemption. If so, we suggest that analysis be framed by the three criteria set forth above.

3.3 Term of Agreement and Withdrawal from Agreement. The term of a risk pool agreement should be determined voluntarily by members, and should not be limited by regulation. A risk pool agreement with an extended term will allow fishermen to amortize the investments in risk pool infrastructure over a reasonable period of time, and encourage them to devote time and resources to developing and refining the agreement, as opposed to re-negotiating and renewing it.

We understand that there are concerns that a risk pool agreement with a multi-year term that covers a substantial amount of QP could place fishermen outside of the risk pool at a disadvantage in the constraining species QP market. We believe that concern is not well founded, as we believe constraining species QP is actually likely to be more available to Pacific Coast groundfish fishermen generally in the presence of risk pool arrangements than in their absence (as further discussed in Section 4, below). However, if the Council wishes to address this issue, we propose that rather than limiting the term of risk pool agreements, the Council consider requiring that risk pool agreements allow members to withdraw from a pool on giving a reasonable amount of advance notice, subject to the withdrawing member or members having fulfilled their obligations under the risk pool agreement.

This approach allows the risk pool agreement to persist, providing a basic level of stability and predictability for the participants, but it also gives risk pool participants the opportunity to exit on reasonable terms if they decide to switch pools or to pursue a purely market-based approach to managing their constraining species catch.

If the Council decides to consider a notice and withdrawal option, we propose that the Council have one, two and three year advance notice periods analyzed.

3.4 Permissible Terms. The sole purpose of a risk pool agreement should be to manage the risk of constraining species catch events. Accordingly, the scope of risk pool agreements that are exempted from the control rule should be limited to the terms and conditions that address the risk of constraining species catch events.

Specifically, risk pool agreements should be prohibited from being used to impose or enforce delivery terms, such as delivery locations, receiving parties and ex-vessel prices.

On the other hand, risk pool agreements should be able to govern all harvesting activities that can affect constraining species catch, including but not limited to the time, area, method and means of fishing operations, and should be able to include both incentives and disincentives that reduce the likelihood of constraining species catch.

3.5 Risk Pool Participation Eligibility. Eligibility to participate in primary risk pools should be limited to QS holders and to owners or charterers of vessels to which trawl limited entry licenses have been assigned.

Quota share holders are appropriate participants in primary risk pool arrangements because their interest is directly dependent upon harvesting activity governed by the risk pool agreement, even if they do not actually fish themselves.

Persons who own, charter or operate vessels to which a trawl limited entry license has been assigned are appropriate participants in primary risk pooling arrangements because their activities are directly governed by the risk pool agreement.

As reference in 3.1, above, risk pools may have a tiered structure. If this structure is adopted, fishermen's associations should be eligible to participate in "umbrella" risk pool agreements.

3.6 Risk Pool Agreement Disclosure. To qualify for a control rule exemption, a risk pool agreement should be required to be filed with the National Marine Fisheries Service as a public document, and the filing should identify all risk pool participants at each tier. This will enable the agency to verify that it does not contain prohibited terms. It will also enable the agency to more effectively monitor risk pool performance, which is important for both constraining species management purposes and control rule enforcement.

On the other hand, the risk pool agreement filing requirement should not be a substantive application and approval process. In addition, the risk pool agreement filing requirement should not extend to the individual fishing plans which specify the time, area, methods and means restrictions imposed on participants. Risk pool fishing plans will likely include proprietary and highly sensitive catch information, which risk pool participants may be very reluctant to disclose unless they are assured it will be maintained as confidential.

We do not believe risk pool participants should have an obligation to disclose the amount of constraining species QP that is managed under the agreement. If NMFS independently determines that a person's QP holdings are public information, making a risk pool agreement and the identities of risk pool participants public will make it possible for interested persons to calculate the amount of QP governed by the agreement.

3.7 Holding Accounts. We request that the Council authorize risk pool constraining species holding accounts, that could be opened and maintained without being designated to a trawl limited entry license and vessel. This would facilitate segregation and management of risk pool QP without the burden of setting up "proxy" vessel accounts, and reduce the risk of an inadvertent use of constraining species QP that is assigned to the risk pool. It would also facilitate NMFS monitoring of risk pool QP usage.

4. Risk Pool "Cost" vs. Benefits. As noted above, there are concerns that a risk pool agreement with a multi-year term that covers a substantial amount of QP could place fishermen outside of the risk pool at a disadvantage in the constraining species QP market. This has been characterized as a "cost" that a risk pool exemption could impose, which should be weighed against any benefits that a risk pool exemption may generate.

We question whether there is any such cost associated with the proposed risk pool control rule exemption. Arrangements under which fishermen pool their constraining species QP, adopt rules designed to reduce their constraining species catch and adaptively manage their fishing operations on the basis of shared catch information are demonstrably more likely to result in lower overall constraining species catch than individual, uncoordinated harvesting activity. Lower constraining species catch risk will result in less constraining species QP hoarding. Less constraining species QP hoarding will free up constraining species QP earlier and in larger amounts, and facilitate, rather than impair, constraining species QP markets.

Further, as noted above, those who are likely to "need" constraining species QP are those that are active in the fishery. By this, "active" means those that have a direct interest in prosecuting fishery resources and gaining profit from that activity. There are likely to be "inactive" quota holders that lease fish to active participants. Lease arrangements in this case are likely to reflect the desire of the inactive quota holder to maximize revenue through those lease arrangements.

Under a setting without risk pools, this is likely to translate into high prices for constraining species QP and trades which go to the highest bidder. These trades would condition the market, and could lead to substantial resource revenue transfer from active fishermen to inactive QS holders. Further, a market conditioned by this type of trading favors fishing operations with greater access to capital, and disadvantages small scale fishing operations. Over time, QP trades in this market setting could be expected to produce more rapid and more extensive QS and QP consolidation, with small scale fishing operations being disproportionately displaced.

As a separate but related matter, we respectfully submit that active fishermen who project a need for constraining species QP are fundamentally misreading market dynamics if they expect to be able to fill that need through pure market trades with other active fishermen who hold more constraining species QP than they may need. In our experience, active fishermen who have more constraining species QP than they may need to cover their target species holdings are not likely to offer their constraining

species QP for lease. Instead, they are much more likely to offer to harvest the target species QP of fishermen with inadequate constraining species QP, on a conditional lease payment basis.

Under a setting with risk pools, trades of constraining species QP among active fishermen are likely to be done on a risk management basis, rather than a profit extraction basis. These trades will dampen efforts to maximize revenue extraction through constraining species QP leasing, and reduce the net transfer of resource revenue from active fishermen to inactive QS holders.

Finally, as noted above, under the pure market model, fishermen compete with each other to capture the most value from their constraining species QP, in order to position themselves to out-bid their competitors for additional QS and QP. Under this model, each fisherman has an incentive to hoard, rather than share, constraining species catch data and avoidance techniques, as those data and techniques represent a competitive advantage in QP market transactions. However, both the frequency and magnitude of constraining species catch events are likely to be greater if fishermen do not share this information. Hoarding information therefore increases the risk of cumulative constraining species catch triggering a regulatory overfishing determination, which could in turn result in large areas of otherwise productive fishing grounds being closed, or, in an extreme case, could result in the fishery being closed before the available target species QP is harvested. We believe the potential costs associated with management measures implemented in response to a regulatory overfishing determination far exceed the speculative costs associated with constraining species QP being managed and used under a risk pool arrangement.

**Alliance of Communities for Sustainable Fisheries**
**256 Figueroa Street #1, Monterey, CA 93940**
**(510) 653-3617**
**www.alliancefisheries.org**

Mr. Mark Cedergreen, Chair
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220-1384

RE: West Coast Trawl IFQ program-June council meeting comments

Dear Chair Cedergreen and Council Members,

The Alliance of Communities for Sustainable Fishing (ACSF) is a 501-c-3 organization made up of Central California public agencies managing harbors, and commercial and recreational fishing organizations. The ACSF is a regional organization, covering Pillar Point Harbor south to Port San Luis. We seek to connect fishermen with their communities and promote economically and environmentally sustainable fisheries in Central California to support harbor infrastructure, preserve working waterfronts, and deliver fresh high quality seafood to the California consumer.

Many of our harbors have historically been reliant on trawl groundfish landings for the daily activity that keeps them economically healthy. Reductions in trawl landings in recent years have created impacts on our Port economies and fishing businesses. While groundfish stocks are in a positive rebuilding trend, we are very concerned that the required infrastructure and skilled fishermen may no longer be in place in the long term future. The West Coast trawl IFQ program may ultimately lead to improved accountability and environmental performance in the fishery, but in the near future there will surely be transfer of Quota Shares and consolidation of effort into the largest vessels and to the least vulnerable communities. The groundfish vessels in the Central Coast of California have historically among the smaller in the fleet, and NMFS has identified many Central Coast harbors as vulnerable to dislocation of historic groundfish landings. As the Council considers priority trailing amendments in the West Coast Trawl IFQ program, we urge you to consider these points:

1: The ACSF supports reasonable safe harbors from control rules for designated Community Fishing Associations and risk pools for managing over fished species. Vulnerable communities such as those in our region will have to work collectively to attempt to stabilize our traditional access to groundfish by developing strategies to avoid over fished species and reducing individual vessel costs.

2: The June Council agenda contains an informational report on a pilot Electronic Monitoring (EM) program in the Morro Bay area that was innovative and successful at demonstrating that EM can be just as effective in achieving full accountability as 100% human observers, at a fraction of the cost, if designed correctly. 100% human observer costs in the West Coast Trawl sector will be prohibitively expensive for our smaller vessels and will accelerate negative community impacts of consolidation in the Trawl IFQ program within a very short time. We support the recommendation contained in the informational report to commence a larger EM pilot program in the West Coast Trawl IFQ program no later than January 1, 2012 .

Thank you for considering these points.

FTE for Kathy Fosmark

Kathy Fosmark
Co-Chair
ACSF

Frank Emerson
Co-Chair
ACSF

Supporting Associations & Organizations

Ventura County Commercial Fishermen's Association
Port San Luis Commercial Fishermen's Association
Morro Bay Commercial Fishermen's Association
Monterey Commercial Fishermen's Association
Fishermen's Association of Moss Landing
Fishermen's Marketing Association
Santa Cruz Commercial Fishermen's Marketing Association
Half Moon Bay Fishermen's Marketing Association
Western Fishboat Owners Association
West Coast Seafood Processors Association
Federation of Independent Seafood Harvesters
Golden Gate Fishermen's Association
California Fisheries Coalition
California Wetfish Producers Association
Recreational Fishing Alliance
Carmel River Steelhead Association
Port San Luis Harbor District
City of Morro Bay Harbor
City of Monterey Harbor
Moss Landing Harbor District
Santa Cruz Port District
Pillar Pt. Harbor, San Mateo County Harbor District

# CONSIDERATION OF INSEASON ADJUSTMENTS – PART II, IF NECESSARY

This agenda item considers inseason adjustments to 2011 groundfish fisheries. Inseason adjustments are also considered under Agenda Item E.5. Should the Council adopt preliminary recommendations under Agenda Item E.5, then final action will be taken under this agenda item. However, should the Council make final recommendations under Agenda Item E.5, then this agenda item will be cancelled.

**Council Action:**

**1. Adopt final inseason adjustments to 2011 groundfish fisheries, as necessary.**

Reference Materials:

None at time of briefing book distribution.

Agenda Order:

a. Agenda Item Overview — Kelly Ames
b. Reports and Comments of Advisory Bodies and Management Entities
c. Public Comment
d. **Council Action:** Adopt Final Recommendations for Adjustments to 2011 Groundfish Fisheries

PFMC
05/16/11

**June 2011 Scorecard. Allocations[a] and projected mortality impacts (mt) of overfished groundfish species for 2011. Bolded numbers represent updates after inseason action.**

| Fishery | Bocaccio b/ | | Canary | | Cowcod b/ | | Dkbl | | Petrale | | POP | | Widow | | Yelloweye | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Date*** **: 12 June, 2011** | Allocation a/ | Projected Impacts | Allocation a/ | Projected Impacts | Allocation a/ | Projected Impacts | Allocation a/ | Projected Impacts | Allocation a/ | Projected Impacts | Allocation a/ | Projected Impacts | Allocation a/ | Projected Impacts | Allocation a/ | Projected Impacts |
| **Off the Top Deductions** | 13.4 | 13.4 | 20.0 | 20.0 | 0.3 | 0.3 | 18.7 | 18.7 | 65.4 | 64.5 | 12.8 | 12.9 | 61.0 | 60.9 | 5.9 | 5.9 |
| EFPc/ | 11.0 | 11.0 | 1.3 | 1.3 | 0.2 | 0.2 | 1.5 | 1.5 | 2.0 | 2.0 | 0.1 | 0.1 | 11.0 | 11.0 | 0.1 | 0.1 |
| Research d/ | 1.7 | 1.7 | 7.2 | 7.2 | 0.1 | 0.1 | 2.1 | 2.1 | 17.0 | 17.0 | 1.8 | 1.8 | 1.6 | 1.6 | 3.3 | 3.3 |
| Incidental OA e/ | 0.7 | 0.7 | 2.0 | 2.0 | -- | -- | 15.0 | 15.0 | 1.0 | 0.1 | 0.0 | 0.1 | 3.3 | 3.3 | 0.2 | 0.2 |
| Tribal f/ | | | 9.5 | 9.5 | | | 0.1 | 0.1 | 45.4 | 45.4 | 10.9 | 10.9 | 45.0 | 45.0 | 2.3 | 2.3 |
| **Trawl Allocations** | 60.0 | 60.0 | 34.1 | 34.1 | 1.8 | 1.8 | 265.0 | 265.0 | 876.0 | 876.0 | 137.0 | 137.0 | 491.0 | 491.0 | 0.6 | 0.6 |
| **---SB Trawl** | 60.0 | 60.0 | 25.9 | 25.9 | 1.8 | 1.8 | 250.5 | 250.5 | 871.0 | 871.0 | 119.6 | 119.6 | 342.1 | 342.1 | 0.6 | 0.6 |
| **---At-Sea Trawl** | | | 8.2 | 8.2 | | | 14.5 | 14.5 | 5.0 | 5.0 | 17.4 | 17.4 | 147.9 | 147.9 | | |
| **a) At-sea whiting MS** | | | 3.4 | 3.4 | | | 6.0 | 6.0 | | | 7.2 | 7.2 | 61.2 | 61.2 | | |
| **b) At-sea whiting CP** | | | 4.8 | 4.8 | | | 8.5 | 8.5 | | | 10.2 | 10.2 | 86.7 | 86.7 | | |
| **Non-Trawl Allocation** | 189.6 | 55.9 | 29.8 | 17.2 | 0.9 | 0.2 | 14.0 | 5.8 | 35.0 | 0.0 | 7.0 | 0.4 | 49.0 | 10.0 | 10.5 | 9.6 |
| Non-Nearshore | 57.9 | | 2.3 | | | | | | | | | | | | | |
| LE FG | | | | 1.4 | | | | 4.8 | | | | 0.3 | | 0.1 | 0.8 | 0.8 |
| OA FG | | | | 0.2 | | | | 0.8 | | | | 0.1 | | 0.0 | 0.1 | 0.1 |
| Directed OA: Nearshore | 0.7 | 0.5 | 4.0 | **3.2** | | 0.0 | | 0.2 | | | | | | 0.2 | 1.1 | 1.0 |
| Recreational Groundfish | | | | | | | | | | | | | | | | |
| WA | | | 2.0 | 0.7 | | | | -- | | -- | | -- | | -- | 2.6 | 2.5 |
| OR | | | 7.0 | 2.4 | | | | -- | | -- | | -- | | 1.0 | 2.4 | 2.1 |
| CA | 131.0 | 55.4 | 14.5 | 9.3 | | 0.2 | | -- | | -- | | -- | | 8.7 | 3.1 | 3.1 |
| **TOTAL** | 263.0 | 129.3 | 83.9 | 71.3 | 3.0 | 2.3 | 297.7 | 289.5 | 976.4 | 940.5 | 156.8 | 150.3 | 601.0 | 561.9 | 17.0 | 16.1 |
| **2011 Harvest Specification** | **263** | **263** | **102** | **102** | **3.0** | **3.0** | **298** | **298** | **976** | **976** | **157** | **157** | **600** | **600** | **17** | **17** |
| **Difference g/** | 0.0 | 133.7 | 18.1 | 30.7 | 0.0 | 0.7 | 0.3 | 8.5 | -0.4 | 35.5 | 0.2 | 6.7 | -1.0 | 38.1 | 0.0 | 0.9 |
| **Percent of OY** | 100.0% | 49.2% | 82.3% | 69.9% | 100.0% | 76.7% | 99.9% | 97.1% | 100.0% | 96.4% | 99.9% | 95.7% | 100.2% | 93.7% | 100.0% | 94.7% |

| Key | |
|---|---|
| | = not applicable |
| -- | = trace, less than 0.1 mt |
| | = Fixed Values |
| | = off the top deductions |

a/ Formal allocations are represented in the black shaded cells and are specified in regulation in Tables 1b and 1e. The other values in the allocation columns are 1) off the top deductions, 2) set asides from the trawl allocation (at-sea petrale only) 3) ad-hoc allocations recommended in the 2011-12 EIS process, 4) HG for the recreational fisheries for canary and YE.

b/ South of 40°10' N. lat.

c/ EFPs are amounts set aside to accommodate anticipated applications. Values in this table represent the estimates from the 11-12 biennial cycle, which are currently specified in regulation.

d/ Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs.

e/ The GMT's best estimate of impacts as analyzed in the 2011-2012 Environmental Impact Statement (Appendix B), which are currently specified in regulation.

f/ Tribal values in the allocation column represent the the values in regulation. Projected impacts are the tribes best estimate of catch.

g/ Petrale and widow allocations round higher than the ACL as a result of rounding issues. Projected impacts are under the ACL; there is no conservation concern.